G. salaris *Roadmap Update – European Union*

EU – Finland

EU Finland reports on progress against the 11 recommendations in the 'Road Map' to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of *Gyrodactylus salaris* and eradicate it if introduced. NEAC document NEA(18)08:

EU-interreg -project "Our Precious Transboundary Waters" on transboundary waters between Finland and Norway has been started in late 2023.

The project includes a work package, which aims to prevent the spread of *G. salaris* to the rivers of upper Lapland. The responsible partner of the work package is the Norwegian Veterinary Institute (Veterinærinstituttet) together with the Finnish Food Authority and the Natural Research Institute Finland (Luke). The Norwegian Food Safety Authority (Mattilsynet) and the Swedish national Veterinary Institute (statens Veterinärmedicinska Anstalt) also participate in the cooperation to intensify the fight against *G. salaris*.

The work package will draw up a i) communication plan and communication material to increase awareness of the threat posed by the parasite, ii) a contingency plan for the spread of *G. salaris*, and iii) develop the monitoring of *G. salaris* by validating the environmental DNA (eDNA) method for the monitoring of *G. salaris* in waters in the area.

Eight new road signs informing the public about *G. salaris* have been installed in Finnish Lapland. The digital brochures have been updated and are currently being translated into three Sámi languages. Five videos and two podcasts are in their final stages of production and will be published in June. A social media campaign will be launched to distribute the videos online.

The contingency plan for the possible spread of salmon parasite *G salaris* to Teno/Tana and Näätämönjoki/Neiden rivers is late from the schedule but under preparation in Luke. For matters in which cooperation between Finland and Norway is essential, a separate annex will be prepared for inclusion in each country's own preparedness plan.

The environmental DNA (eDNA) method for monitoring of G*yrodactylus salaris* has been validated for Finnish Food Authority. No G*. salaris* has been detected in the eDNA samples filtered from the Teno river system. Based on the results obtained so far, the method appears suitable for monitoring of *G. salaris*.

In the Näätämö/Neiden River, the regulations on *G. salaris* will be updated when the fisheries agreement is renewed through negotiations with Norway.

EU – Ireland

1 Scope

Parties and jurisdictions of the North-East Atlantic Commission of NASCO are encouraged to report on progress in relation to the 11 recommendations in the 'Road Map' to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of *Gyrodactylus salaris* and eradicate it if introduced, as agreed by the Commission in 2018, NEA(18)08. This document provides a status update for EU (Ireland) in this regard in advance of the 2026 meeting of the North-East Atlantic Commission.

2 Background

Gyrodactylus salaris is listed as a notifiable disease in Ireland and legislation is in place preventing the transfer of live fish capable of carrying the parasite to or within Irish waters. The parasite is not listed in Council Directive 2006/88/EC, which has been applied since 1 August 2008, and replaces the previous fish health regime under Directive 91/67/EEC. However, Ireland retained additional guarantees under Decision 2004/453/EC in respect of *G. salaris* and can continue to impose controls on imports and suspected or confirmed outbreaks under the European Communities (Health of Aquaculture Animals and Products Regulations) 2008. These additional guarantees have been recognised as "national measures" under Article 43 of Council Directive 2006/88/EC. This has been reflected in Commission Decision 2010/221/EU, which replaces Commission Decision 2004/453/EC.

Gyrodactylus salaris has not been recorded on the island of Ireland to date.

A detailed contingency plan for dealing with any outbreak of *G. salaris* in Ireland was published in 2017 by the Fish Health Unit (FHU) of the Marine Institute (MI) with input from Inland Fisheries Ireland (IFI) and other stakeholders with statutory interests in salmonids (Anon. 2017). This plan has been forwarded to the NASCO Secretariat and is currently being updated with a new version envisaged to be issued later in 2026.

The plan sets out in detail the operational responsibilities and actions to be taken in the event of a suspected outbreak of gyrodactylosis. This includes the following:

- The convening of the National Disease Strategy Group (NDSG) to activate and oversee the implementation of the contingency plan. The group will comprise senior representatives from relevant Government Departments and State Bodies as well as expert national and international veterinary scientists;
- The establishment of a National Control Centre (NCC) overseen by the NDSG for the purposes of co-ordinating control / eradication measures. The NCC will include representatives of the FHU, IFI, Departmental veterinary inspectors, the cross-border Loughs Agency and relevant representation from Northern Ireland.
- A communications strategy.
- Detailed actions to be implemented on the suspicion or confirmation of a gyrodactylosis outbreak.
- Sampling, testing and fish disposal protocols.
- Containment, eradication and treatment options.

3 Progress in relation to the recommendations in NEA(18)08

This section reports on Irish progress in relation to the 11 recommendations in the 'Road Map' to enhance information exchange and co-operation on monitoring, research and measures to prevent the spread of *G. salaris* and eradicate it if introduced, as agreed by the North-East Atlantic Commission of NASCO in 2018 (NEA(18)08).

1. **Preventive measures and contingency planning**

Measure	Progress
a) Appropriate steps should be taken to prevent the spread of *G. salaris* on fishing equipment, boats, etc. by use of approved disinfection methods.	In general, Inland Fisheries Ireland (IFI) has been at the forefront in planning and implementing management measures to protect native species and habitats from the threat posed by aquatic invasive species (AIS). These include monitoring, control and eradication operations and protocols, research on AIS impacts, risk assessments, biosecurity guidelines and a programme of stakeholder engagement-related education and awareness initiatives. Biosecurity guidance has been developed for anglers, boaters, scuba divers, paddle sports enthusiasts and inland fisheries personnel which advise of appropriate prevention measures and disinfection protocols to minimise the risk of introducing or spreading AIS (https://tinyurl.com/y2qym83b). In addition, IFI and MI have co-produced and widely circulated awareness literature to highlight the issue of *Gyrodactylus* among stakeholders and advise on biosecurity measures that can be taken to minimise the risk of introduction of the parasite to Ireland (i.e. A Guide to Protecting Freshwater Fish Stocks in Ireland from the Parasite *Gyrodactylus salaris* https://tinyurl.com/5bcmtmkf).
b) All movements of live fish should be recorded so that movements can be traced in the event of an outbreak of *G. salaris*.	In Ireland, this practice is largely governed by European Communities (Health of Aquaculture Animals and Products) Regulations 2008 (S.I. 261 of 2008) based on the European Commission's Council Directive 2006/88/EC which applies to the import, movement, sale and supply of aquatic animals for fish stocking or ornamental purposes. Under the regulations, where appropriate, notification of the import and movement of fish must be made to the MI and this must be accompanied by an appropriate health certificate stating that the animals are free of the diseases listed in Part II Annex IV of the Directive and diseases for which Ireland has national measures granted under Commission Decision 2010/221/EU.

Measure	Progress
c) The risk of *G. salaris* introduction through the processing of fish carcasses should be assessed and, where appropriate, mitigated through control of processing.	As detailed in the contingency plan, this is addressed under the European Communities (Health of Aquaculture Animals and Products) Regulations 2008 (as amended) as follows: • It is an offence for any person to act in contravention of any of the provisions of a Restriction Notice. • It is an offence to place on the market or release into the wild or a put and take fishery, any aquaculture animal that may pose a risk of spreading disease to other aquatic animals. • It is an offence to place on the market for farming or restocking, any aquatic animal intended for destruction or slaughter in accordance with disease control measures under Regulation 14 of S.I. No 261 of 2008. • It is an offence for any person who knows or suspects that a listed disease, including *G. salaris*, is present in any aquatic animal to fail to notify the MI. • It is an offence for a person except under the authority of a Sanitary Slaughter Permit issued by the MI, to dispose of any aquatic animal (whether alive or dead) which comes from a designation area.
d) Physical barriers to fish migration should be considered as a measure to prevent the spread of *G. salaris* within a catchment and to uninfected catchments.	This measure is listed as an option in the contingency plan for dealing with any outbreak of *G. salaris* in Ireland (Anon. 2017).
e) Where possible, routine breaks in production and disinfection on rainbow trout and salmon freshwater aquaculture sites should be implemented as part of a control programme in infected areas.	This measure is listed as an option in the contingency plan for dealing with any outbreak of *G. salaris* in Ireland (Anon. 2017).
f) Permission to stock fish into infected river catchments should be based on an assessment of the increased risk of transmission of the parasite to non-infected rivers (e.g. through migration and other routes).	Under the European Communities (Health of Aquaculture Animals and Products) Regulations 2008 (as amended): • All fish movements require prior notification to the MI. • The MI can immediately restrict movements of fish to and from fish farms in Ireland in the event of a suspicion of fish disease there.

Measure	Progress
	• MI can restrict all movements of fish or gametes of fish along with feedstuffs for fish into and out of areas designated or suspected as being infected with *G. salaris*.
g) NEAC Parties and their relevant jurisdictions should have contingency plans in place for treatment, containment or eradication. These plans should be developed in consultation with stakeholders. A legal base for the use of rotenone or other treatments, containment and eradication measures should be put in place. Contingency plans should be tested periodically and updated as required.	A detailed contingency plan for dealing with any outbreak of *G. salaris* in Ireland was published in 2017 by the Fish Health Unit (FHU) of the MI with input from IFI and other stakeholders with statutory interests in salmonids (Anon. 2017). As detailed in the contingency plan, the European Communities (Health of Aquaculture animals and products) Regulations 2008 (as amended) allow the MI to take the following measures where there is reason to believe *G. salaris* is present or is suspected to be present: • To designate such an area as it considers appropriate to prevent or limit the spread of *G. salaris* by issuing in writing, a Restriction Notice. • To regulate all movements of live fish, dead fish, eggs of fish and fish food to, from or within the restricted area. All movements can be prohibited except under the authority and in accordance with the conditions of a Movement Permit issued by the MI. • To direct the operator of a fish farm to remove dead or dying fish from their premises and dispose of them in a specified manner. • To authorise the removal of dead or dying fish from non-farmed waters. • Where the MI has issued a Restriction Notice in respect of a specific Containment Zone, arrangements may be made to vary the extent of the containment zone, using the measures provided for under Regulation 12(3) of S.I. No 261 of 2008 (as amended). • In addition, under the conditions of S.I. No 261 of 2008, all fish movements require prior notification of the MI. The MI can use this information to immediately restrict movements of fish to and from fish farms in Ireland in the event of a suspicion of fish disease there. Under the Inland Fisheries Act 2010, the Minister of the Department of Communications, Climate Action and Environment (DCCAE) has the power to introduce bye-laws to protect wild salmonid fisheries under threat from any outbreak of *G. salaris* (e.g. impose

Measure	Progress
	fishing controls). The Minister may, at the request of IFI or on his or her own initiative, make such bye-laws as are in his or her opinion expedient for the more effectual protection of wild salmonid fisheries. The use of rotenone in dealing with any outbreak of *G. salaris* in Ireland is considered in the contingency plan where it states that the relevant Local Authority must be consulted in the event of proposals to use this chemical. A comprehensive legal assessment has not been undertaken to date. The contingency plan has not been tested to date. A new version of the plan is envisaged to be issued later in 2026.
h) NEAC Parties and their relevant jurisdictions should endeavour to ensure that adequate resources are available for the implementation of measures to contain and eradicate *G. salaris*.	As outlined in the contingency plan (Anon. 2017), the National Disease Strategy Group (NDSG) which is comprised of key Government and State Body officials is responsible for securing the financial and other resources required to implement the contingency arrangements.

2. **Co-operation on management**

Measure	Progress
a) The North-East Atlantic Commission (NEAC) should retain an item on *G. salaris* on the agendas for its annual meetings. This would facilitate reports by its Parties and their relevant jurisdictions and by the Working Group on measures to prevent the further spread of the parasite and to eradicate it in areas where it has been introduced and on other aspects of this 'Road Map'.	Acknowledged.

b) The Working Group on *G. salaris* in the North-East Atlantic Commission Area should meet again in 2018 and then every 3 years thereafter, or more frequently if circumstances require, to provide a forum for more detailed information exchange and review of progress in implementing this 'Road Map'.	Acknowledged. EU (Ireland) was represented and provided a briefing paper for the Working Group meeting held in Edinburgh in October 2022.
c) Contingency plans developed by NEAC Parties and their relevant jurisdictions should be made available to the Working Group at its next meeting with the view to sharing information on approaches and challenges. The plans should be made available on the websites of the Competent Authorities with links to them from the NASCO website.	Acknowledged. The Irish contingency plan was sent to the NASCO Secretariat in advance of the 2018 NASCO meeting. The plans have not yet been made available on the websites of the Competent Authorities.

3. **Monitoring methods for use in watercourses, lakes and in aquaculture.**

Measure	Progress
The Working Group should review new developments with regard to monitoring for, and detection of, *G. salaris*, and develop recommendations for their inclusion in international guidelines.	Acknowledged.

4. **Distribution of *G. salaris* in the NEAC area and adjacent areas.**

Measure	Progress
a) Existing monitoring programmes on salmonids in the wild and in aquaculture environments undertaken by NEAC Parties and their relevant jurisdictions should be retained and expanded as necessary. They	Since 2005, wild salmon juveniles from selected river systems are examined annually for the presence of *G. salaris* in Ireland (Appendix 1). This monitoring is undertaken in conjunction with the catchment-wide electrofishing programme overseen by IFI with sample analyses undertaken by the FHU of the MI. Further to this, the MI are responsible

should provide genetic data for all *Gyrodactylus* species isolated during monitoring. Reports on these programmes should be provided to the Working Group at their next meeting.	for investigating unexplained abnormal or significant fish mortalities encountered in Ireland which may be a result of fish disease.
b) Information should be requested from all NEAC Parties and their relevant jurisdictions which have wild Atlantic salmon but which have not participated in the Working Group to date.	Acknowledged.
c) NEAC Parties and their relevant jurisdictions should identify *G. salaris* as an impact factor in the NASCO river database for those rivers infected by the parasite.	Acknowledged.
d) The NASCO Secretariat should make a request to the OIE reference laboratory for *G. salaris* seeking information on the distribution of *G. salaris* in countries that have wild and/or farmed susceptible species, but which do not have wild Atlantic salmon.	Not directly applicable to Ireland.

5. **Research to inform the effective management of *G. salaris***

Measure	**Progress**
a) The NEAC Parties and their relevant jurisdictions should conduct applied research to inform the effective management of *G. salaris*, particularly the following: • the distribution and genetics of *G. salaris*;	Acknowledged. There is no ongoing or presently planned research on *G. salaris* in Ireland (as the parasite is not present), except for the ongoing annual monitoring programme. As outlined in the contingency plan, the FHU will provide training opportunities for all relevant persons to develop and maintain their skills in field and administrative procedures in relation to *G. salaris*.

• the effects of salmon genetics on susceptibility to *G. salaris*; • the effect of environmental factors on pathogenicity; • to clarify the classification of *G. salaris* and *G. thymalli* and then develop a reliable method to distinguish between pathogenic and non-pathogenic strains; • general biology and mechanisms of spread of the parasite; • effect of environmental parameters and ecology on the distribution of *G. salaris*; • detection and diagnostic methods for *G. salaris*; • new environmentally-friendly treatment methods in rivers and lakes, e.g. acid aluminum and chloride.	Ireland intends to keep abreast of information concerning applied research on the effective management of *G. salaris via* participation in the *G. salaris* Working Group and NEAC.
b) The Working Group should keep research requirements and monitoring needs under review and report regularly to the NEAC.	Acknowledged.

6. **Classification of *Gyrodactylus* species**

Measure	**Progress**
NEAC Parties and their relevant jurisdictions should only support any future proposal to synonomise *G. salaris* and *G. thymalli* if, in parallel, OIE standards and national legislation recognize the different pathogenicity and host predilection of these two species.	Acknowledged.

7. **Publicity, education, and awareness.**

Measure	Progress
a) NEAC Parties and their relevant jurisdictions should develop publicity material on the threat of the parasite to wild Atlantic salmon and specify measures to prevent its spread; strategies for the effective dissemination of this material should be developed particularly with regard to targeting high risk groups. Existing material should be reviewed and updated as appropriate in the light of current knowledge. The NASCO Secretariat should develop standard text as a basis for such publicity material.	As regards Ireland, please refer to response to 1 (a) for information on this.
b) This material should be made available on the web sites and promoted on the social media platforms of the Competent Authorities and NASCO with a view to highlighting the serious risks posed by the spread of the parasite.	As regards Ireland, please refer to response to 1 (a) for information on this.

8. **Continuity of current measures in the EU Animal Health Law.**

Measure	Progress
Relevant NEAC Parties and their relevant jurisdictions should seek to ensure continuity in the provisions related to *G. salaris* in current EU animal health legislation (Regulation 2016/429) which should be retained, in particular with regard to additional guarantees.	Acknowledged.

9. **Criteria for diagnosis and establishing *G. salaris*-free zones.**

Measure	Progress
NEAC Parties and their relevant jurisdictions should implement the diagnostic standards in the OIE Manual of Diagnostic Tests for Aquatic Animals	This is already referenced in the contingency plan (Anon. 2017).

10. **Trade in live susceptible fish species**

Measure	Progress
a) Trade in disinfected eggs is preferable to trade in live susceptible fish species. However, where movements of live susceptible fish species are approved, NEAC Parties and their relevant jurisdictions should ensure that trade in live susceptible fish species only takes place between areas of equal *G. salaris* status or from a higher to lower status area.	Under Irish regulations, notification of the import and movement of fish must be made to the MI and this must be accompanied by an appropriate health certificate stating that the animals are free of the diseases listed in Part II Annex IV of the Directive and diseases for which Ireland has national measures granted under Commission Decision 2010/221/EU.
b) NEAC Parties and their relevant jurisdictions should ensure the health status of the traded live susceptible fish species and/or their eggs, and the competence of the certifying Authority.	Under Irish regulations, notification of the import and movement of fish must be made to MI and this must be accompanied by an appropriate health certificate stating that the animals are free of the diseases listed in Part II Annex IV of the Directive and diseases for which Ireland has national measures granted under Commission Decision 2010/221/EU.

11. **Shared catchments**

Measure	Progress
NEAC Parties and their relevant jurisdictions with shared catchments or having catchments in close proximity should implement appropriate mechanisms for cooperation, including the establishment and strengthening of inter-country	The Irish contingency plan facilitates the involvement of relevant cross-border and Northern Irish authorities if required and outlines the mechanisms for cooperation which include representation on the National Disease Strategy Group and National Control Centre.

working groups and the development of common contingency plans to control and eradicate *G. salaris*.	

5 References

Anon. (2017). Operations Manual for dealing with Outbreaks of *Gyrodactylus salaris* in Ireland. Fish Disease Operations Manual for Ireland. Marine Institute, Ireland, 47 pp.

Appendix 1

Irish river systems sampled for the presence of *G. salaris* (2005 – 2025).

Catchment	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Avoca (Aughrim)										X											
Ballynahinch																X					
Bandon																					X
Barrow (Greese)					X																
Barrow (Poulmounty)			X							X											
Boyne trib.									X												
Bride						X									X				X		
Bunowen															X						
Corrib (Abbert)						X		X													
Corrib (Cong)														X							
Corrib (Owenriff)														X			X				
Cloonee															X						
Colligan															X						
Crana																		X			
Dawros																	X				
Dunkellin						X										X			X		
Eanymore						X															
Emlagh							X														
Erne										X											
Erne (Aughnacliffe)				X																	
Erne (Bunnoe)			X																		
Erne (Burrin)			X																		
Erne (Swanlinbar)			X																		
Erriff						X	X						X	X	X	X	X	X			
Feale					X				X												X
Garavogue						X														X	
Glen							x														
Inny																		X		X	

Catchment	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Laune										X			X								
Leannan							X				X			X		X	X	X			
Lee		X																			
Liffey																	X				
Maine											X		X								X
Moy								X													
Mulkear (Bilboa)					X																
Munster Blackwater										X	X	X	X	X					X*		
Munster Blackwater (Araglin)								X													
Munster Blackwater (Finnow)								X				X									
Munster Blackwater (Owentaraglin)																		X			
Newport (Mayo)																			X		
Nore																	X			X	
Owenascaul																X					
Owennacurra																X					X
Owenboliska						X															
Owenea														X				X			
Owentocker																		X			
Owenwee							X														
Screebe		X	X					X													
Shannon (Brosna)			X						X												
Shannon (Carrigahorig)		X								X											
Shannon (Little Brosna)			X																		
Shannon (Lower)															X						
Sheen																					X
Slaney	X																			X	
Suir											X										
Suir	X																			X	
Swilly																X					
Tullaghobegley									X												

Catchment	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Waterville (Currane)													X								

* Two sites sampled.

EU – Sweden

Information on monitoring, research, and measures to prevent the spread of *Gyrodactylus salaris*.

Summary

Gyrodactylus salaris is an endemic parasitic species in rivers draining into the Baltic Sea and is widespread among Baltic Sea populations of Atlantic salmon (*Salmo salar*) stocks. The parasite was first discovered on salmon in Baltic aquaculture facilities in 1952.

A national monitoring program was initiated in 2001, screening juvenile Atlantic salmon in both infected and non-infected rivers along the Swedish west coast. Since 2002. *G. salaris* has been a notifiable pathogen and must be reported to the Swedish Board of Agriculture in accordance with the regulations on biosecurity measures, notification and monitoring of animal diseases and pathogens. Stocking of salmonids has been prohibited in designated west coast rivers since 1999.

On the Swedish west coast, where rivers drain into the Atlantic Ocean, *G. salaris* was first detected on wild Atlantic salmon in 1989 in the river Säveån, near Gothenburg. In the same year, the parasite was also detected in a fish farm in the river Lagan. Since then, *G. salaris* has spread to most rivers south of Anråse å and Kungsbackaån. The most recent detection occurring in 2025 in the river Munkedalsälven, a tributary to Örekilsälven (Figure 1). The parasite has not been detected in the rivers Strömsån and Anråse å, in the northern part of the Swedish west coast. However, no sampling has been conducted in the rivers Bäveån, Arödsån, Bratteforsån and Enningdalsälven.

Following the 2025 detection of the parasite on one individual salmon parr in River Munkedalsälven, emergency measures were immediately implemented. Expanded electrofishing surveys and environmental DNA (eDNA) sampling were carried out in River Munkedalsälven and River Örekilsälven. Despite the expanded monitoring, no further detections of the parasite have been observed and so far, the parasite have been detected on one salmon smolt. The Swedish Agency for Marine and Water Management (SwAM) coordinated actions with the SVA and the County Administrative Board, and informed local stakeholders, including fisheries associations and fishing rights holders, who were advised to disinfect equipment and apply precautionary measures. Coordination was also established with Norwegian authorities.

Emergency measures were introduced immediately after detection, including a fishing ban in the river Munkedalsälven and mandatory disinfection of fishing equipment before and after fishing in the salmon-bearing section of the Örekilsälven. These amendments to national fisheries regulations entered into force without prior consultation due to urgency.

Swedish authorities consider *G. salaris* a threat to remaining uninfected Atlantic salmon populations as well as to neighbouring Norwegian stocks. Consequently, stocking of salmonids is prohibited in uninfected or low-prevalence rivers and in waters connected to Norway due to the risk of transmission. Responsible national and regional agencies provide information on these risks throughout their websites.

Since 2020, SVA has been responsible for monitoring *G. salaris* on the Swedish west coast and collaborates with the Norwegian Veterinary Institute (NVI) on species identification and haplotype analyses, as well as participating in Norwegian workshops on the parasite.

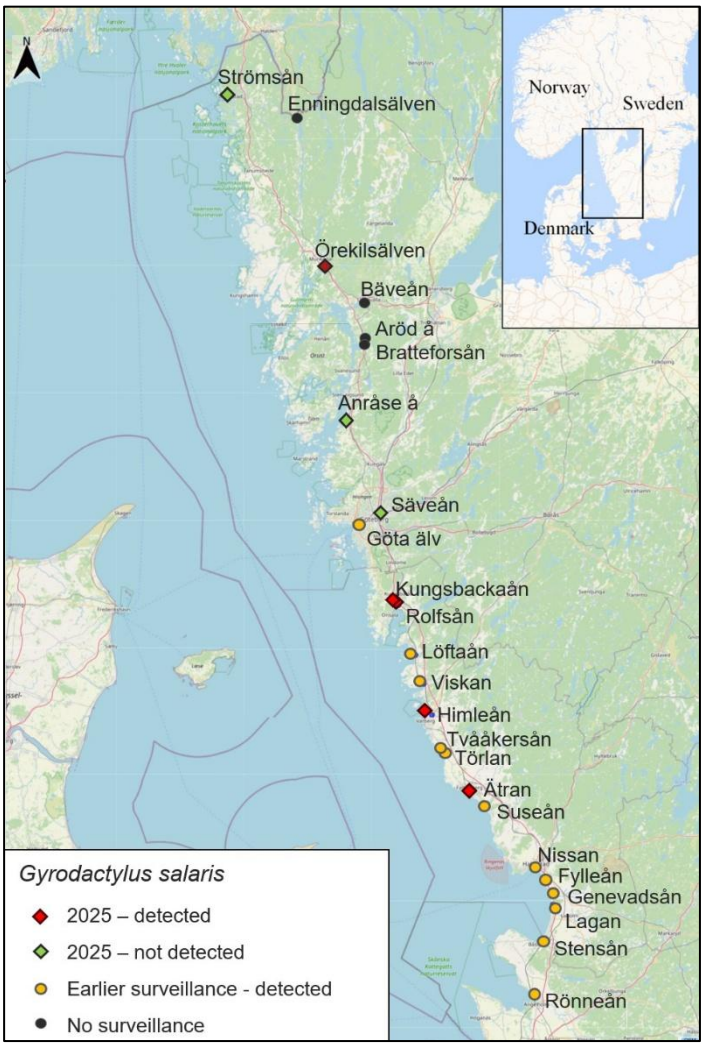

Figure 1. *Location of 24 salmon rivers showing where Gyrodactylus salaris was monitored and detected in 2025. Eight rivers were monitored; four were infected with the parasite (red diamonds), while three showed no signs of infection (green diamonds). Yellow circles indicate historical monitoring where G. salaris has previously been detected. Note: The river Säveån has been historically infected, but no parasites have been detected since 2021.*

Distribution of *Gyrodactylus salaris* in the Baltic Sea

The monogenean ectoparasite *G. salaris* is mainly distributed in the Baltic Sea region. It lives on salmon in freshwater, feeding on the fish´s skin, primarily on the fins. *G. salaris* was first detected in 1952 in a fish farm in the river Indalsälven, in northern Sweden, as was scientifically described in 1957. Although infected individual salmon may die, the parasite generally has a

Table 1. *Results from electrofishing surveys of salmon parr for presence of Gyrodactylus sp. in seven rivers on the Swedish west coast in 2025.*

River Sampling point	Date	No of parr	*Gyrodactylus* sp.	
			Infected parr No (%)	No of parasites, median on infected individuals (min, max)
Anråsån	**2/4**	**19**	**0**	**-**
Kvarndalen		**19**	**0**	-
Örekilsälven		**25**	**1 (4)**	**8 (8, 8)**
Munkedalsälven	23/4	3	1(33)	8 (8, 8)
Skäret	24/4	10	0	-
Stenshöljan	24/4	12	0	-
Säveån	**8/4**	**26**	**0**	**-**
Jonsereds fabriker		18	0	-
Nedströms Kåhögsbron		8	0	-
Kungsbackaån	**3/4**	**32**	**29 (91)**	**58 (1, 448)**
Alafors		10	9 (90)	79 (2, 273)
Hovgården		9	9 (100)	90 (1, 448)
Lillån		13	11 (85)	53 (1, 231)
Rolfsån		**40**	**13 (33)**	**98 (2, 504)**
Bosgården	14/4	2	1 (50)	18 (18, 18)
Fälån	4/4	7	3 (43)	15 (2, 107)
Island pool	14/4	17	9 (53)	125 (38, 504)
Sundtorpsåsen	14/4	14	0	-
Himleån	**9/4**	**21**	**21 (100)**	**60 (2, 855)**
Göingegården norrfåran		10	10 (100)	247 (2, 638)
Ställverket		11	11 (100)	60 (6, 855)
Strömsån	**23/4**	**16**	**0**	**-**
Kanotklubben		8	0	-
Ödegården		8	0	-
Total		**179**	**64 (36)**	**(1, 855)**

limited effect on Atlantic salmon stocks in Baltic Sea rivers. Experimental studies have shown that Atlantic salmon from the Baltic region exhibit a decrease in parasite load after 4-7 weeks. In contrast, Atlantic salmon from the Swedish west coast (river Ätran), as well as from the river Storån in Denmark and the river Coon in Scotland, showed a continuous increase in parasite numbers over an eight-week experiment period. This suggests that Atlantic salmon from the Swedish west coast are more susceptible to *G. salaris* than those from the Baltic Sea region.

The parasite has likely been present in the Baltic Sea region for a long time (i.e. natural adaptation) and can tolerate salinity levels of up to approximately 5-10 PSU.

Genetic relationships

Genetic data from the Swedish University of Agricultural Sciences (SLU) and Natural Resources Institute Finland (Luke) were converted to the SalSea format (12 loci) for Atlantic salmon populations from rivers in the Baltic Sea, the Swedish west coast and Lake Vänern.

The datasets were then merged with the SalSea baseline, and a joint dendrogram was constructed to illustrate genetic relationships among salmon populations across different parts of Europe (Fig. 2).

Consistent with previous studies, Atlantic salmon from the Baltic Sea formed distinct groups, including the land-locked populations in lake Vänern. In contrast, salmon populations from the Swedish west coast (rivers Göta älv, Lagan and Ätran) were clearly separated from the Baltic Sea populations, but showed close genetic affinity to populations in southern Norway (Fig. 2).

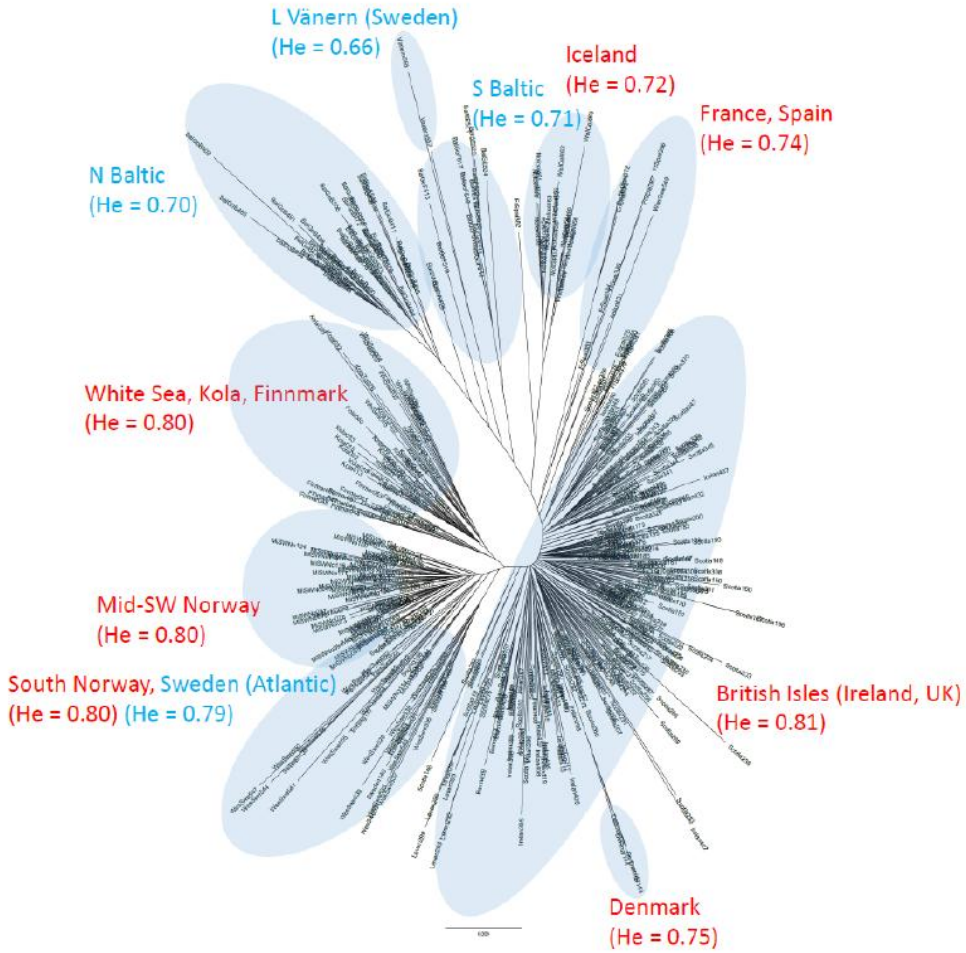

Figure 2. *Neighbour-Joining dendrogram (based on pairwise Chord distance) depicting genetic relationships at 12 common microsatellites among Atlantic salmon from various parts of Europe (Palm & Söderberg 2020). Following the marker calibration and conversion of allele lengths, SalSea genetic baseline samples (marked with red font) were merged with corresponding data from populations studied by SLU/Luke (blue font). "He" denotes expected heterozygosity calculated across loci and samples within the encircled geographically defined groups/regions.*

Stock sensitivity to *Gyrodactylus salaris*

It is suggested that Atlantic salmon stocks from the northern Swedish west coast may be more sensitive to *G. salaris* as they are isolated from the southern stocks (and those in the Baltic Sea) by more saline ocean waters with >30 PSU, as compared to approx. 10-20 PSU in the southern part of the Swedish west coast. The Swedish authorities consider *G. salaris* to be a great threat to remaining uninfected stocks, and to nearby Norwegian stocks.

A trend analysis showed that there was a negative development of Atlantic salmon densities in all Swedish waters over time, regardless of whether *G. salaris* was present or not. When comparing density of Atlantic salmon before established presence of *G. salaris* with densities afterwards there was no clear pattern. This concurs with a later BACI-analysis of parr densities before and after established presence of *G. salaris* in several Swedish west coast rivers, where no consistent trends in parr densities were found. Some *G. salaris* rivers had negative parr densities trends after parasite introduction (or detection) whereas some had positive parr density development (Table 2). These results suggest that the Atlantic salmon populations on the southern Swedish west coast may have some resistance to *G. salaris*. It can also be noted that in the River Säveån, the first Atlantic river with *G. salaris* detection in 1989, the parasite was not detected in the year of 2021 - 2025.

Table 2. *Results of BACI analysis of parr densities using electrofishing data from 8 Atlantic salmon rivers on the Swedish west coast. Parr densities of infected rivers were compared to parr densities of uninfected rivers 10 years before and 20 years after infection of G. salaris.*

River	Trend	Densities (parr/100m^2)	Survival 0+ to 1+	Haplotype	Year of infection
Viskan	no trend	p=0.009860 **	p=0.663936	Not known	1998
Ätran	negative	p=8.201e-08 ***	p=0.03032 *	A&C	1991-1994
Suseån	no trend	p=0.119913	p=0.330669	A&C	1997
Nissan	negative	p=1.074e-05 ***	p=0.177935	Not known	1998
Fylleån	negative	p=6.010e-05 ***	p=0.26740	C	1994
Genevadsån	positive	p=0.2680397	p=0.222434	Not known	1997
Stensån	positive	p=0.5799	p=0.381836	Not known	1997
Rönneå	positive	p=0.781683	p=0.83758	Not known	1997

Monitoring methods

Initial investigations aimed to detect *G. salaris* in Atlantic salmon rivers were made between 1989-1992. Subsequently, an annual monitoring program was launched in 2001 and is currently ongoing. In the present program, salmon fry and parr are collected by electrofishing and then screened for *Gyrodactylus* sp. Cooperation is ongoing with Norway (NVI) to determine species and haplotype if parasites are found at new locations.

Sampling

Salmon parr are caught using electrofishing. The coordinates, length, width and fished area of the sampling site, as well as water and air temperature and water and river bottom properties are recorded in a sampling protocol. Most collected parr are euthanized, and weight and is measured before they are preserved in 95% ethanol. At some sampling locations, the parr is anaesthetised and investigated immediately, then released once they are fully awake again.

Analyses

Presence of *Gyrodactylus* sp. is investigated at 40 x through a microscope. The number of parasites on and around the dorsal fin and the pectoral fins are registered in the sampling

protocol. If *Gyrodactylus* sp. is found on a sampling site that is considered free from *G. salaris*, the parasites are sent for morphological and genetic analyses (species and haplotype) at the NVI. Genetic analysis is performed using conventional PCR and sequencing of the internal transcribed spacer region (ITS) and the cytochrome oxidase 1 gene (CO1) according to the World Organisation for Animal Health (WOAH) Aquatic manual

(https://www.woah.org/en/blog/disease/gyrodactylosis-g-salaris/).

Monitoring and distribution in Swedish Atlantic salmon rivers

G. salaris has gradually spread to several Atlantic salmon rivers and rearing facilities along the Swedish west coast since its first detection in the river Säveån in 1989. The spread may have occurred through stocking of salmon and rainbow trout, or via contaminated equipment, boats and other gear moved between rivers. In response to this spread, a monitoring program was initiated in 2001. The program was previously managed by SLU, but since 2020, responsibility for annual monitoring has been taken over by the SVA.

In 2025, eight rivers were monitored, and four were found to be infected: Rolfsån, Kungsbackaån and Himleån and Örekilsälven (Fig. 1). This marks the first detection of *G. salaris* in Örekilsälven and the parasite has not previously been recorded this far north along the Swedish west coast. Only a single infected individual was identified, and additional sampling is planned for 2026.

The river Strömsån, located in the northern part of the Swedish west coast, was included in the monitoring program in 2022 and has shown no signs of infection to date. Overall, both historical and recent monitoring indicate that 17 of 24 Atlantic salmon rivers along the Swedish west coast have been infected with *G. salaris* (Fig. 1). *G. salaris* was last detected in Säveån in 2020, in two salmon parr infected with one and two *G. salaris* each. In 2021-2025 a total of 100 salmon parr have been examined in Säveån with no evidence of gyrodactylid infection. This suggests that infection pressure has decreased substantially and now be absent form this river system.

Detection of *G. salaris* in 2025 and management response

Following the detection of *G. salaris* in the River Munkedalsälven, a tributary to River Örekilsälven, emergency measures were implemented immediately. Expanded electrofishing surveys and environmental DNA (eDNA) sampling were conducted in the river system, with no further detections of the parasite.

SwAM coordinated actions with the National Veterinary Institute and the County Administrative Board. Local stakeholders, including fisheries associations and fishing rights holders, were informed and advised to disinfect equipment and apply precautionary measures. Information about the detection and the implemented measures was also communicated through press releases and published on the official websites of SwAM and SVA, and further disseminated by relevant stakeholders. Coordination was also established with Norwegian authorities, including the Norwegian Environment Agency and the Norwegian Veterinary Institute.

Following the detection, emergency measures were introduced to reduce the risk of spread. Amendments to national fisheries regulations entered into force immediately, without prior consultation due to urgency. The measures include a total fishing ban in River Munkedalsälven and mandatory disinfection of fishing equipment before and after fishing in the salmon-bearing section of the Örekilsälven. Further long-term management measures are under evaluation.