Report of the Meeting of the Working Group on Pink Salmon

Harbour Hotel, Galway, Ireland

9 & 10 March 2024

1. Opening of the Meeting

1.1 The Chair, Jarle Steinkjer (Norway), opened the meeting and welcomed the members of NASCO's Working Group on Pink Salmon to its inaugural meeting. He thanked everyone especially for their flexibility to enable this meeting to happen over a weekend to tie in with the timing of the ICES Working Group on North Atlantic Salmon.

1.2 The Chair commented that, in considering its Terms of Reference, the Working Group should bear in mind additional obligations under various Conventions (see PSWG(24)10 (Annex 1)), and that pink salmon is regarded as an alien species. In particular, he highlighted Principle 15 of the Convention on Biological Diversity as being very important; this promotes the Precautionary Approach and states:

> '*In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.'*

Furthermore, highlighted the update of the Convention on Biological Diversity by the Kunming-Montreal Global Biodiversity Framework in 2022, in particular Target 6 which is to:

> '*Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 percent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands*'

Additionally, he referenced NASCO's Williamsburg Resolution Article 6, which states:

> *'No non-indigenous fish should be introduced into a river containing Atlantic salmon without a thorough evaluation of the potential adverse impacts on the Atlantic salmon population(s) which indicates that there is no unacceptable risk of adverse ecological interactions.*
>
> *Introductions into any Commission area of reproductively viable non-indigenous anadromous salmonids or their gametes should not be permitted*.'

1.3 A list of participants is contained in Annex 2.

2. Adoption of the Agenda

2.1 The Working Group adopted its Agenda, PSWG(24)09 (Annex 3).

3. Update on the Status of Pink Salmon in the Convention Area

3.1 The Chair noted the seven papers submitted in advance of the meeting and thanked the meeting participants. These papers are:

- Canada (PSWG(24)04rev – Annex 4)
- EU – Finland (PSWG(24)07 – Annex 5);
- EU – Ireland (PSWG(24)05 – Annex 6);
- EU – Sweden (PSWG(24)02 – Annex 7);
- Norway (PSWG(24)03 – Annex 8);
- Russian Federation (PSWG(24)08 – Annex 9); and
- United Kingdom (PSWG(24)06rev – Annex 10).

3.2 Information on each Party's / jurisdiction's work on pink salmon was presented and discussed. The papers and presentations are annexed to this report.

3.3 A presentation was given by Julien April (Canada) titled 'Status of pink salmon in Eastern Canada', PSWG(24)11 (Annex 11).In 2023, the provisional number of pink salmon recorded in the Canadian freshwater distribution range of Atlantic salmon represent a decrease from previous years. The presentation concluded that 'while some rivers have been visited by pink salmon in different years, there is currently no proof of establishment and reproduction in eastern Canada'. The Working Group commented on the wide distribution shown.

3.4 A presentation was given by Jaakko Erkinaro (EU – Finland) on 'Pink salmon in Finland', PSWG(24)12 (Annex 12), covering information on the Teno / Tana and Näätämöjoki / Neidenelva rivers, on Atlantic salmon and pink salmon monitoring. Pink salmon numbers in the Teno had increased from 5,000 in 2017 and 2019 to 50,000 in 2021 and 170,000 in 2023. Atlantic salmon stock status was referred to as being very poor. The presentation covered different monitoring methods including sonar, video, snorkelling and eDNA. Pink salmon were noted to spawn in very shallow water close to riverbanks and successful reproduction has been documented. The distribution of pink salmon in tributaries was noted, with larger tributaries entered in earlier years than smaller ones, some up to 250-300 km upstream.

3.5 A presentation was given by Michael Millane (EU – Ireland) titled 'EU (Ireland) Briefing for NASCO pink salmon working group', PSWG(24)13, (Annex 13). The presentation gave a general overview of pink salmon occurrence in Ireland, from the first pink salmon record in 1973, with sparse anecdotal reports of individual fish until 2017 when unprecedented numbers have been detected in a number of Irish rivers in odd-years since that time. The presentation also noted that an eDNA surveillance project was undertaken in 2023 in Ireland in areas where pink salmon had occurred since 2017 and / or there were large Atlantic salmon runs. This project is a precursor to the EU-funded NASCO-led PINKTrack project.

3.6 A presentation was given by Tom Staveley (EU – Sweden) on 'Pink salmon in Sweden' PSWG(24)14 (Annex 14). The presentation covered the west coast of Sweden and outlined a similar scenario to that shown in Ireland. There is no mandatory reporting

for recreational fisheries so voluntary reporting is being relied on. Interest in pink salmon only started in 2021, with the species currently classed as 'alien with the risk of being invasive', and therefore not currently classed as 'invasive' in Sweden. Results from 2023 monitoring were discussed, with a spread all the way down the coast across about 20 sites, and with the southern limit moved. The Group's discussion included an assessment of the sampling methods in light of the turbid water conditions, which had been challenging.

3.7 A presentation was given by Eirik Frøiland (Norway) on 'Pink salmon in Norway', PSWG(24)15 (Annex 15). The presentation discussed monitoring methods, such as counting fences, traps and beach seine, and removal of pink salmon. Some traps were reported to have removed 99 % of the pink salmon present. In 2023, over 350,000 pink salmon were caught. The distributions observed were also presented, with more pink salmon being observed further west compared to 2021. Despite high catches in the measures targeted to remove pink salmon, we must assume that the total number of spawning individuals in Norway has increased, based on observations of pink salmon in rivers with unsuccessful or no measures. Local fishermen are obliged to report all pink salmon caught, and catches can be reported through a phone app. In the Group's discussion, the aggressive nature of the pink salmon was noted including the ability to dig riverbanks to pass fences.

3.8 A presentation was given by Sergey Prusov (Russian Federation) titled 'Pink Salmon Fishery in the Northern Fisheries Basin', PSWG(24)16 (Annex 16). The distribution of introduced pink salmon in the Barents Sea, White Sea and Kara Sea as well as the westernmost dispersal of pink salmon of native populations to the Lena River were discussed. Fisheries for both Atlantic salmon and introduced pink salmon are regulated in the Russian Federation. The Fisheries Regulations stipulate some restrictions in relation to pink salmon and most of them are similar to those established for Atlantic salmon and aimed, in the first place, at conserving the native species. There is an exception for recreational fishing for pink salmon in rivers and creeks where Atlantic salmon do not spawn. Pink salmon are not considered as invasive because they have been present for decades and since the 2000s the nominal catch of introduced pink salmon of odd-year line has consistently exceeded the catch of the native species, Atlantic salmon. In years of high abundance of pink salmon their numerous run to small size salmon rivers might negatively affect catch-and-release Atlantic salmon fly fishing.

3.9 Very low catches of pink salmon were recorded in the White Sea in 2023 compared to 2021, despite high numbers of juveniles counted in 2022. There is no commercial fishery for anadromous fish in the Barents Sea so catch figures are only from the White Sea. Higher numbers were seen in the rivers flowing into the Barents Sea in the western part of the Kola Peninsula, while numbers to the east were lower .

3.10 In the Group's discussion, comment was made on the different spawning periods of pink salmon and Atlantic salmon, with pink salmon viewed as having plasticity. The Russian Federation commented that most pink salmon spawning was observed in the first half of August, with Atlantic salmon and sea trout observed to begin a month later, in mid- to late September. Therefore pink salmon spawning did not overlap with either. An additional comment was made on an extensive experiment in 1956-1980 to introduce pink salmon to the White Sea, which found that population was spawning too late, in late August or September in the cold peninsula waters, with the result that a self-reproducing population did not establish. Eggs from a more northern population were

introduced in the 1980s. The introduction in 1985 laid the foundation for the growth of natural production of the odd-year line.

3.11 A presentation was given by Colin Bean (UK – Scotland) titled 'Pink salmon in the UK', PSWG(24)17 (Annex 17). The complex situation in the UK due to four different administrations was raised. In Scotland responsibility for dealing with freshwater invasive species lies with the Scottish Environment Protection Agency. Scotland is the only nation that operates an eDNA sampling framework within the UK. pink salmon records are well distributed around the UK but in terms of numbers most records in freshwater occur in Scotland and in coastal areas, from north-east England. Limited monitoring has been done using cameras and drones, with drones being useful in describing the distribution of redds. In 2017 some redds were monitored to see if eggs hatch and produce alevin, and in 2022 evidence was provided to show that pink salmon smolts had been produced in two monitored rivers. Some initial information on pink salmon has been established, such as the timing of their life cycle, which has seen spawning in mid-August. Early information has been based on observations and the use of a reporting app. The use of eDNA provides the potential to develop this approach and a new system of monitoring, including validating records on the app. The preferred method for eDNA is to use qPCR. A sampling framework was developed in 2023, through dialogue with countries outside the United Kingdom. However, there are potential issues with acquiring funding and equipment in a timely manner. In the Group's discussion, a question was asked on whether fish recorded as pink salmon had been verified. They had been verified, with two reported in 2022 of which one was eliminated after being found to be a salmon / trout hybrid.

3.12 The United States member was given the opportunity to share information; he commented that the US had no information on pink salmon and he was attending in order to listen and learn from other members of the Working Group.

4. Consideration of the Terms of Reference

4.1 The Working Group considered its Terms of Reference (ToRs) as agreed by Council in 2023.

4.2 As background, the Chair reminded the Working Group that the Council agreed to adopt a 'Statement of the Council Regarding Pink Salmon, *Oncorhynchus gorbuscha*, in the NASCO Convention Area'. This included agreement to establish a standing NASCO working group on pink salmon. The Chair reminded the Working Group of the Council's Statement:

> *'The Council of NASCO urges each Party to take the following actions, consistent with the Williamsburg Resolution:*
>
> - *co-operate to minimise adverse effects of pink salmon on wild Atlantic salmon. Such co-operation could include data sharing and exchange of information on monitoring and surveillance programmes, scientific understanding of impacts and best practice on methods to prevent the spread and establishment of populations of pink salmon without damage to wild Atlantic salmon stocks;*
> - *initiate corrective measures, without delay, when significant adverse effects on wild Atlantic salmon stocks are identified, and that these should be designed to achieve their purpose promptly;*

- *encourage research and data collection in relation to pink salmon in the Convention area;*
- *develop and distribute educational materials to increase awareness of the risks that pink salmon pose to wild Atlantic salmon and the need for the measures to control their spread; and*

The Council of NASCO agrees to establish a Standing NASCO Working Group on the threat of pink salmon with the aim to agree Terms of Reference for this Group at the Annual Meeting in 2023, taking into consideration the advice from ICES on pink salmon, expected in September 2022, and relevant recommendations of the External Performance Review.'

4.3 The Chair advised the Working Group that, taking into account the 'Statement of the Council Regarding Pink Salmon' and information provided by ICES, the ToRs ask the Group to:

- consider the research and data collection needs in relation to pink salmon in the Convention area, such that management measures may be underpinned by robust data;
- consider the threats posed by the increase in the abundance of pink salmon and the implications they have for the conservation and management of wild Atlantic salmon;
- consider how Parties should co-operate efficiently and effectively to minimise adverse effects of pink salmon on wild Atlantic salmon;
- consider the corrective measures that might be implemented by Parties when significant adverse effects on wild Atlantic salmon stocks are identified;
- identify good practice in the production of educational materials that increase awareness of the risks that pink salmon pose to wild Atlantic salmon and the need for the measures to control their spread; and
- propose Terms of Reference and a timeframe for regular meetings of NASCO's Working Group on Pink Salmon.

4.4 The Chair advised that the ToRs cannot be changed but noted that the Group's final Term of Reference required it to propose permanent ToRs and a time frame for regular meetings for this Working Group.

4.5 The Chair asked the Working Group to consider each of its ToRs separately and provide a list of actions and next steps. He noted that it was an inaugural meeting to get to know each other and understand what everyone can do and would like to see done. He clarified that the current ToRs were for this inaugural meeting alone and it is the role of the Working Group to develop permanent ToRs and decide on a timetable of meetings.

5. Consideration of Research and Data Collection Needs

5.1 The Chair noted that item 5 relates to the first bullet of the ToRs, which asks the Working Group to 'consider the research and data collection needs in relation to pink salmon in the Convention area, such that management measures may be underpinned by robust data.'

5.2 He reminded the Working Group that the Council's Statement on Pink Salmon 'urges each Party to take the following actions, consistent with the Williamsburg Resolution' and that one of the bullets is to 'encourage research and data collection in relation to pink salmon in the Convention area'.

5.3 The Group had an extensive discussion on the standardisation of methods for monitoring the distribution and abundance of pink salmon. The importance of standardising methods across different regions was emphasised while acknowledging the challenges posed by varying environmental conditions.

5.4 Key points that were raised included:

- the need for standardised methods to monitor pink salmon distribution and abundance, with an emphasis on standardising eDNA monitoring protocols;
- concerns about the quality assurance of data and the importance of assessing pink salmon impacts on ecosystems;
- challenges in monitoring pink salmon interactions with other fish species and ecosystems, particularly in regions where monitoring tools are limited;
- considerations for improving monitoring techniques, including eDNA, for ecosystem analysis and assessing pink salmon survival and reproduction; and
- recommendations for selecting index sites for monitoring to ensure data quality and efficiency.

5.5 In discussing the standardisation of eDNA the preparation of standardised eDNA methods in the EU was raised as being in progress. However it was also raised that it would be of value to have a standard that is pink salmon specific.

5.6 Suggestions were made for creating a toolbox approach for monitoring pink salmon, allowing flexibility based on regional differences and research needs. The discussion included proposals for developing Best Management Practices (BMP) for pink salmon monitoring, with NASCO having a long history of producing guidelines. It was agreed that BMP for pink salmon monitoring would need to be adaptive given the current state of knowledge.

5.7 Overall the Working Group highlighted the importance of collaboration, innovation and adaptation in monitoring pink salmon populations and their ecological impacts. The need for standardised approaches was stressed, while recognising the necessity of flexibility and adaptation to local conditions.

5.8 The use of biennial meetings to assess long-term impacts and risks associated with pink salmon was discussed.

6. Consideration of the Possible Threats Posed by Increased Pink Salmon Abundance and the Implications for the Conservation and Management of Wild Atlantic Salmon Stocks

6.1 The Chair noted that item 6 relates to the second bullet of the ToRs, which asks the Working Group to 'consider possible threats that the increase in the abundance of pink salmon might pose to populations of Atlantic salmon and the implications they have for the conservation and management of wild Atlantic salmon stocks.'

6.2 He reminded the Working Group that, in 2023, the Council agreed that a half-day Theme-based Special Session (TBSS) on pink salmon would be held during the Annual

Meeting in 2024. The objective of NASCO's Theme-based Special Sessions is to allow for greater exchange of information on a topic related to NASCO's Resolutions, Agreements and Guidelines. He noted that the pink salmon TBSS is scheduled for Wednesday 5 June from 13:00 to 17:00 hrs and is titled 'Management of pink salmon in the North Atlantic and their potential threats to wild Atlantic salmon'.

6.3 The Chair reminded participants that not all Parties think pink salmon is a threat but some do, and invited discussion on what is meant by threats to wild Atlantic salmon, what the implications of these might be and the data needs associated with assessing this.

6.4 The Group raised that Agenda Item 6 was very similar to Agenda Item 5 and clarified that Council had requested the establishment of a Standing Working Group to address the implication of pink salmon, rather than the production of recommendations. The purpose of the meeting is to understand what the permanent ToRs for the Working Group could be, which could include the production of recommendations.

6.5 The discussion further considered whether the potential threats listed in various Risk Assessments produced after the 2017 pink salmon incursions are still valid and whether any new threats have emerged. It was raised that Risk Assessments had been completed by Norway and the UK, with Ireland in the process of producing one.

6.6 The implications of pink salmon presence were discussed further, including the potential effects on Atlantic salmon of management measures to control pink salmon.

7. Consideration of Efficient Co-operation Between Parties to Minimise Adverse Effects of Pink Salmon

7.1 The Chair noted that item 7 relates to the third bullet of the ToRs, which asks the Working Group to 'consider how Parties should co-operate efficiently to minimise adverse effects of pink salmon on wild Atlantic salmon.'

7.2 He reminded the Working Group that Council's Statement urges the Parties to:

> '*co-operate to minimise adverse effects of pink salmon on wild Atlantic salmon. Such co-operation could include data sharing and exchange of information on monitoring and surveillance programmes, scientific understanding of impacts and best practice on methods to prevent the spread and establishment of populations of pink salmon without damage to wild Atlantic salmon stocks*.'

and he invited discussion of questions such as: what does efficient co-operation mean; what does efficient co-operation need and, given Agenda item 6, what does the Working Group mean by adverse impacts?

7.4 The discussion recognised the importance of efficient forums for information exchange and co-operation, with mention of the value of co-operation with North Pacific Anadromous Fish Commission (NPAFC). This included a suggestion to formalise co-operation with Pacific groups while keeping a targeted focus on NASCO's objectives.

7.5 The value of including Iceland and the Faroe Islands in the Working Group was raised and their inclusion was deemed essential to ensure comprehensive representation and knowledge sharing. It was also recognised that Greenland has potential significance as a stepping stone in the expansion of pink salmon's range. Plans to incorporate updates on pink salmon information from Iceland and potentially the Faroe Islands through existing forums such as the Working Group on North Atlantic Salmon (WGNAS) were discussed. Overall, the discussion emphasised the need for continued collaboration,

information sharing, and targeted focus on NASCO's objectives in addressing the presence and implications of pink salmon.

8. Consideration of Corrective Measures to Prevent Significant Adverse Effects on Wild Atlantic Salmon Stocks

8.1 The Chair noted that this item relates to the fourth bullet of the ToRs, which asks the Working Group to 'consider the corrective measures that might be implemented by Parties to prevent significant adverse effects on wild Atlantic salmon stocks.'

8.2 He reminded the Group that in relation to this discussion, Council's Statement urges the Parties to 'initiate corrective measures, without delay, when significant adverse effects on wild Atlantic salmon stocks are identified, and that these should be designed to achieve their purpose promptly'.

8.3 The discussion explored the complexities of determining thresholds for action regarding the presence of pink salmon and the need for effective monitoring and response strategies. This included discussing at what point the presence of pink salmon becomes a problem, with considerations about the number of fish, their reproductive activity and the vulnerability of local Atlantic salmon populations.

8.4 Effective monitoring was highlighted as essential for understanding pink salmon impacts and deciding when corrective measures are needed. The need for proportionate responses to the level of risk was emphasised, for instance considering that some management measures to reduce pink salmon abundance can have direct negative impact on Atlantic salmon. This includes the bycatch of Atlantic salmon in fisheries targeting pink salmon and migration delay when using removal barriers.

8.5 The Working Group shared lessons from past experiences, including the importance of early action, local stakeholder involvement and the need for adequate funding and staffing for monitoring and response efforts.

8.6 The Group raised the need for clear criteria for when action should be taken, considering factors such as local stakeholder input, scientific evidence of adverse effects and government authority. In addition, the Group stressed the importance of adopting a strategic approach based on best evidence to prioritise actions and address gaps in current efforts. Some advocated for a precautionary approach, assuming negative effects based on risk assessments and taking action before adverse effects are observed.

8.7 The Group emphasised that any criteria or guidelines for action should be defined clearly to avoid misunderstandings and ensure consistent interpretation across jurisdictions. Overall, the discussion reflected a recognition of the need for co-ordinated, evidence-based, strategies to manage the presence of pink salmon effectively and mitigate potential impacts on native Atlantic salmon populations.

9. Identification of Good Practice in Production of Educational Materials

9.1 The Chair noted that this item relates to the fifth bullet of the ToRs, which asks the Working Group to 'identify good practice in the production of educational materials that increase awareness of the risks that pink salmon pose to wild Atlantic salmon and the need for the measures to control their spread.'

9.2 He reminded the Working Group that in relation to this, Council's Statement urges the Parties to 'develop and distribute educational materials to increase awareness of the risks that pink salmon pose to wild Atlantic salmon and the need for the measures to control their spread.'

9.3 He stated that this is something that Norway have a lot of experience of, where they have been developing information to minimise the risks of introduction of *Gyrodactylus salaris* for many years and asked the Working Group if anyone had similar experience.

9.4 Members of the Group highlighted the extensive efforts made in Norway, Sweden, and the UK to raise awareness about the presence of *G. salaris* and pink salmon and the need for effective identification methods. All three countries have undertaken extensive awareness campaigns using various media platforms such as TV, radio, newspapers, social media (e.g. Facebook, Instagram, X), websites, webinars, and magazines. These campaigns aim to educate the public, especially anglers, about the presence of *G. salaris* and pink salmon and their potential impacts.

9.5 Educational materials included brochures, posters, short films, information sheets, advice notes and media articles, providing information about identification and what actions anglers should take.

9.6 The challenges in identifying pink salmon accurately were raised, especially for individuals who are not familiar with the species. Common identification features include black spots on the tail, a black tongue, and black spots on the adipose fin. However, misidentification can occur, especially with species like charr. Efforts to improve identification methods and encourage reporting will contribute to better monitoring and management.

9.7 The Group raised that while there is extensive awareness about the presence of *G. salaris* and understanding of its impact on Atlantic salmon, there is a lack of scientific evidence regarding the impact of pink salmon on Atlantic salmon populations. This makes it challenging to provide clear guidance to anglers and policymakers regarding the management of pink salmon.

9.8 The Working Group acknowledged the importance of reviewing and revising its Terms of Reference (ToRs) to ensure they reflect its current objectives and priorities accurately. Overall, the discussion underscored the ongoing efforts to address the challenges associated with pink salmon identification and awareness while highlighting the need for collaboration and effective communication among stakeholders.

10. Proposals for Revised Terms of Reference and Timeframe for the Working Group

10.1 The Chair noted that this is the sixth and final bullet of the ToRs, which asks the Working Group to 'Propose revised Terms of Reference and a timeframe for regular meetings of NASCO's Working Group on Pink Salmon.'

10.2 He give some background to the ToRs for NASCO's other Standing Working Group, on *Gyrodactylus salaris* (GSWG). This Working Group produced a road map, last updated in 2018, called ''Road Map' to enhance information exchange and cooperation on monitoring, research and measures to prevent the spread of *G. salaris* and eradicate it if introduced'. Much of that Working Group's work revolves around its Road Map.

10.3 In NASCO's most recent performance review, reported to the Council in 2023, the Review Panel recommended that the 'Road Map' be made into a more action-oriented document, laying out the measures that should be taken by each Party, and should, therefore, be called an Action Plan.

10.4 The Review Panel also recommended that the GSWG's ToRs should be revised to reflect an action-oriented mandate, including making specific recommendations for

measures to prevent the further spread of the parasite and for its eradication in areas where it has been introduced, rather than merely developing recommendations to enhance co-operation in that regard.

10.5 The Chair proposed that the Pink Salmon Working Group (PSWG) should reflect on the comments from the Review Panel with respect to what this might mean for setting up ToRs for the PSWG into the future and the GSWG ToRs were shared for reference.

10.6 The Chair asked the Working Group what it though its permanent ToRs should be and what should be the timeline for its meetings, taking into account the GSWG ToRs, the ToRs given for the first meeting of this PSWG and the comments from the Review Panel about an action-oriented mandate for a NASCO Standing Working Group.

10.8 The discussion on the ToRs for the PSWG highlighted several key points. It was noted that *G. salaris* has a comprehensive road map with specific actions, while achieving a similar output for pink salmon is challenging due to the lack of knowledge about its effects and management strategies.

10.9 The Group emphasised the need for action-oriented ToRs for the PSWG, focusing on developing specific recommendations and tools rather than broad objectives. There were suggestions to develop a toolbox for monitoring methods and to identify and address data gaps.

10.10 There was a discussion on the frequency of meetings, with suggestions ranging from annual to biennial meetings. It was proposed to hold in-person meetings every two years with online meetings in between.

10.11 The Group discussed the collection and reporting of pink salmon data, including the possibility of including eDNA data. It was suggested that the PSWG could hold a database of pink salmon data and facilitate data exchange among jurisdictions.

10.12 There were also discussions about the timeline for developing recommendations and the process for approving ToRs. It was noted that ToRs would evolve over time, with an initial focus on setting up mechanisms for data exchange and reporting. Overall, the discussion highlighted the need for specific, action-oriented ToRs to address the challenges posed by pink salmon and to facilitate collaboration among jurisdictions.

10.13 The Group proposed Draft Terms of Reference for the Working Group on Pink Salmon for Council's consideration, see PSWG(24)19, (Annex 18).

11. Other Business

11.1 There was no other business.

12. Report of the Meeting

12.1 The process for reporting to the Heads of Delegation (HoD) was clarified, with the drafting of a report containing proposed ToRs and discussions. The report would be circulated among the delegates for approval before being sent out in official mailings. The report of the meeting would, therefore, be agreed by correspondence.

13. Close of the Meeting

13.1 The Chair thanked the participants for their contributions and closed the meeting.

Spread of alien species

The UN describes the spread of alien species and habitat destruction as the biggest threats to natural biodiversity.

The damage potential can be dramatic both biologically and economically. Examples are the spread of zebra mussels and *Gyrodactylus salaris.*

Conventions & International Agreements

There are several conventions and international agreements to prevent the spread of alien species that **most nations have ratified**.

Convention on Biological Diversity (CBD)

Article 8 (h):
Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species.

Precautionary Approach

Principle 15 of CBD:

“In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation.”

Kunming-Montreal Global Biodiversity Framework (2022)

TARGET 6

Eliminate, minimize, reduce and or mitigate the impacts of invasive alien species on biodiversity and ecosystem services by identifying and managing pathways of the introduction of alien species, preventing the introduction and establishment of priority invasive alien species, reducing the rates of introduction and establishment of other known or potential invasive alien species by at least 50 percent, by 2030, eradicating or controlling invasive alien species especially in priority sites, such as islands .

NASCO: The Williamsburg Resolution

Resolution by the Parties to the Convention for the Conservation of Salmon in the North Atlantic Ocean to Minimise Impacts from Aquaculture, Introductions and Transfers, and Transgenics on the Wild Salmon Stocks.

Article 6: **Non-Indigenous Fish**

No non-indigenous fish should be introduced into a river containing Atlantic salmon without a thorough evaluation of the potential adverse impacts on the Atlantic salmon population(s) which indicates that there is no unacceptable risk of adverse ecological interactions.

Introductions into any Commission area of reproductively viable non-indigenous anadromous salmonids or their gametes should not be permitted.

Annex 2

Pink Salmon Working Group Meeting – List of Participants

Julien April	Ministère des Forêts de la Faune et des Parcs du Quebec – Canada
Thomas Staveley	Swedish University of Agricultural Sciences
Jaakko Erkinaro	Natural Resources Institute Finland (Luke)
Michael Millane	Inland Fisheries Ireland
Eirik Frøiland	Norwegian Environment Agency
Jarle Steinkjer (Chair)	Norwegian Environment Agency
Sergey Prusov (virtual participant)	Knipovich Polar Research Institute of Marine Fisheries and Oceanography Freshwater Resources Division – Russian Federation
Colin Bean (virtual participant)	University of Glasgow
Øyvind Fjeldseth (NGO) (virtual participant)	Norwegian Association of Hunters & Anglers
Emma Hatfield	Secretary, NASCO
Clare Cavers	Assistant Secretary, NASCO

Annex 3

PSWG(24)09

Meeting of the NASCO Working Group on Pink Salmon

Harbour Hotel, Galway, Ireland

9 – 10 March 2024

Agenda

1. Opening of the Meeting
2. Adoption of the Agenda
3. Update on the Status of Pink Salmon in the Convention Area
4. Consideration of the Terms of Reference
5. Consideration of Research and Data Collection Needs
6. Consideration of the Possible Threats Posed by Increased Pink Salmon Abundance and the Implications for the Conservation and Management of Wild Atlantic Salmon Stocks
7. Consideration of Efficient Co-operation Between Parties to Minimise Adverse Effects of Pink Salmon
8. Consideration of Corrective Measures to Prevent Significant Adverse Effects on Wild Atlantic Salmon Stocks
9. Identification of Good Practice in Production of Educational Materials
10. Proposals for Revised Terms of Reference and Timeframe for the Working Group
11. Other Business
12. Report of the Meeting
13. Close of the Meeting

Annex 4

PSWG(24)04rev

Status of pink salmon in Canada in 2023[1]

Introduction

The current expansion of pink salmon (*Oncorhynchus gorbuscha*) in the Atlantic Ocean may pose some threats to wild Atlantic salmon (*Salmon salar*) and other endemic species (ICES 2022, Northern Hemisphere Pink Salmon Expert Group 2023). In Eastern Canada, increasing numbers of pink salmon have been observed in 2017, 2019 and 2021 (ICES 2022). The general context and research gaps associated with the arrival of pink salmon in the distribution range of Atlantic salmon have been addressed in the literature (ICES 2022, Northern Hemisphere Pink Salmon Expert Group 2023, Lennox *et al*. 2023). Here, provisional pink salmon records in Eastern Canada during 2023 are presented, together with recent analyses to better understand the status of the species in this region.

Records of pink salmon in Eastern Canada

In 2023, a provisional total of three pink salmon has been recorded in the Canadian freshwater distribution range of Atlantic salmon. This represents a decrease from previous years (2017 = 4, 2019 = 5, 2021 = 14). These observations occurred in Newfoundland and Labrador, where most of the 2017 to 2021 pink salmon where also observed. Quebec is the only other Eastern Canadian province that recorded pink salmon since 2017 (2019 = 2 in the Ungava Bay, 2021 = 2 in the Ungava Bay and 1 in the Lower-North-Shore region).

A pink salmon has also been caught in Nunavut in 2023. While being north of the northernmost known rivers harbouring sustainable Atlantic salmon populations in America, a few Atlantic salmon have also been observed in this area in the past (Bilous and Dunmall. 2020).

Pink salmon monitoring in Eastern Canada takes several forms. This includes awareness campaigns and voluntary reporting of bycatch in fisheries. The monitoring of adult Atlantic salmon using counting fences and other aquatic species survey also contributes with information on pink salmon abundance and distribution.

Origin of pink salmon in Eastern Canada

The analyses of pink salmon individuals from different countries showed that fish found in Ungava Bay were genetically similar to the Norwegian counterparts (Northern Hemisphere Pink Salmon Expert Group 2023). This suggest that Northern Europe and the White Sea region is the most probable origin of pink salmon individuals that were found in Eastern Canada, rather than Western Canada.

Establishment and reproduction of pink salmon in Eastern Canada

While some rivers have been visited by pink salmon in different years, there is currently no proof of establishment and reproduction in Eastern Canada.

Broad scale environmental DNA surveys

Environmental DNA (eDNA) represents an effective tool to detect pink salmon in the vast and remote regions of Northeastern Canada. Broad scale projects targeting tens of rivers and over

[1] Revised on 10 March to remove author names and affiliations from title.

a thousand of kilometres have been conducted in both Newfoundland and Labrador (Crowley *et al*. 2024) and Quebec (Northern Hemisphere Pink Salmon Expert Group 2023). Results from those projects broadly confirmed the range of occurrence provided by direct fish observations while revealing new fine resolution information (for details see Northern Hemisphere Pink Salmon Expert Group 2023 and Crowley *et al*. 2024).

Monitoring of Saint-Fond River, Ungava Bay

Saint-Fond River, located in the Ungava Bay, represents the area in Quebec where most of the pink salmon have been caught or detected with eDNA in 2019 and 2021. In this context, three different projects have been conducted in this river in 2023 and 2024.

To verify and potentially manage the entrance of pink salmon, as well as to assess the state of Arctic charr (*Salvelinus alpinus*) in this system, a counting fence with a cage have been installed in Saint-Fond River in 2023. No pink salmon have been observed.

An eDNA project has also been conducted in 2023 in Saint-Fond River and tributaries in case pink salmon arrived while the barrier was not yet installed or totally impassible. This involved six different sampling sites and seven sampling dates in 2023. No pink salmon have been detected.

Habitat survey have been performed to identify potential spawning ground in the Saint-Fond River. The approach used was based on the assumption that groundwater springs provide critical winter thermal refugia for species trying to colonize environment that have temperature close to their lower thermal limit (Dunmall *et al*. 2016). Those winter thermal refugia could be relatively easy to locate during winter since the ice in those area is likely to form later than elsewhere on the river and may even remain unfrozen. Habitat survey have therefore been conducted both in August 2023 and February 2024. The area that presents the best characteristics for pink salmon spawning should be revisited in the future to verify if they are used or not, for instance using fry electrofishing.

References

Bilous, M. and Dunmall, K. 2020. Atlantic salmon in the Canadian Arctic: potential dispersal, establishment, and interaction with Arctic char. Reviews in Fish Biology and Fisheries, 30, 463-483.

Dunmall, K. M., Mochnacz, N. J., Zimmerman, C. E., Lean, C. and Reist, J. D. 2016. Using thermal limits to assess establishment of fish dispersing to high-latitude and high-elevation watersheds. Canadian Journal of Fisheries and Aquatic Sciences, 73, 1750-1758.

Crowley, S. E., Bentzen, P., Kess, T., Duffy, S. J., Messmer, A. M., Watson, B., Dempson, J.B., *et al*. 2024. eDNA metabarcoding reveals riverine fish community structure and climate associations in northeastern Canada. Environmental DNA, 6(1), e517.

ICES. 2022. Distribution and abundance of pink salmon across the North Atlantic. ICES Advice: Recurrent Advice. Report. https://doi.org/10.17895/ices.advice.21020050.v1

Lennox, R. J., Berntsen, H. H., Garseth, Å. H., Hinch, S. G., Hindar, K., Ugedal, O., Utne, K.R., *et al*. 2023. Prospects for the future of pink salmon in three oceans: From the native Pacific to the novel Arctic and Atlantic. Fish and Fisheries.

Northern Hemisphere Pink Salmon Expert Group. 2023. A review of pink salmon in the Pacific, Arctic, and Atlantic oceans. NPAFC Technical Report 21. 58 pp. https://doi.org/10.23849/TFOY9313

Annex 5

PSWG(24)07

Status on the work of pink salmon in Finland

Introduction of the alien pink salmon in Northwest Russia have resulted in variable occurrence and catches in Finnish part of the large River Teno/Tana catchment already since 1960s, but from 2017 on, their abundance and distribution quickly increased to unprecedented levels in odd years.

Development in pink salmon abundances have been monitored as part of the standard monitoring programs in the Teno/Tana system designed for Atlantic salmon population assessment, using sonar monitoring, video arrays, snorkelling counts and catch statistics.

In 2017, the total run of pink salmon in the Teno/Tana system was likely higher than ever before, estimated at c. 5000 individuals, which mostly based on catch information, but since 2019 a sonar in the main stem of the river has been used for run size estimation. In 2019, the pink salmon run was estimated at 5000 individuals, in 2021 c. 50 000 ind, and the preliminary estimate for 2023 is c. 170 000 individuals.

In 2023, a barrier fence and a trap for pink salmon were installed in the lower part of the Teno/Tana river in Norway with an aim of preventing pink salmon migration further upstream. The operation was not successful: only less than 8000 pink salmon were captured in the trap, and the vast majority of the run continued upstream from the fence. Pink salmon were captured in different areas in the Teno/Tana main stem upstream from the trap by local people with special permits for using drift nets, gill nets and seine, and the estimated catch in Finland was c. 20 000 individuals.

Pink salmon have mostly entered and colonized the main stem, the largest tributaries, and the three large headwater branches of the uppermost part of the river system, but in later years, an increasing number of the smaller tributaries have been colonized as well. In 2023, again, a few new tributaries, and tributaries to tributaries, were included in the known distribution area of pink salmon in the Teno/Tana system. Obviously, only some of the tributaries of the Teno/Tana are monitored by electronic or visual observations, and eDNA surveys have complemented the understanding of development in distribution of the alien species in this large river system. Research projects have been conducted e.g. on pink salmon spawning sites, egg development, juvenile migration and feeding.

In the River Näätämöjoki/Neidenelva, another transboundary river between Finland and Norway, only few individuals of pink salmon have been captured or observed on the Finnish part of the river system in 2023 and also in recent earlier odd years. The steep Skoltefossen waterfall on the lower Norwegian site appears to be an almost total obstacle for pink salmon, and local efforts to remove pink salmon from the fishway bypassing the Skoltefossen (>10 000 removed in 2023) have been effective to stop the pink salmon from migrating further upstream.

Annex 6

PSWG(24)05

Status on the work of pink salmon in Ireland

1. Pink salmon were first recorded in Ireland in August 1973 in the River Moy when a single specimen was caught by an angler.
2. Until 2017, pink salmon have been rarely observed in Irish waters.
3. Between 2017 to 2021, pink salmon were recorded in unprecedented numbers in odd years (2017, n=36; 2019, n=11; and 2021, n=45) in a number of river systems throughout Ireland. In 2023, only a single pink salmon was recorded in Ireland, in the River Moy.
4. Since 2017, in advance of the main fishing season in odd years, anglers have been requested by the competent State Authority, Inland Fisheries Ireland (IFI) to report observations and catches of pink salmon in Irish river systems to assist with monitoring of the occurrence and distribution of the species and enable the collection of specimens for verification and examination.
5. In 2019, IFI published a report, "Assessment of potential ecological impacts of pink salmon and their capacity for establishment in Ireland" which concludes that environmental and ecological conditions are considered favorable for establishment of pink salmon but the information to evaluate the potential impacts remains limited. Overall, the level of impact is likely to be predicated on the extent of establishment and local abundance of pink salmon in Ireland. If pink salmon become a regular feature in Irish rivers, better understanding of their lifecycle will be required to evaluate their potential for long-term establishment and concomitant impacts.
6. Ireland *via* IFI is currently involved in a number of pink salmon related projects. This includes:
    a. The PinkSIES project which aims to assess potential impacts on native salmonids both at sea and in recently invaded rivers throughout the North-east Atlantic.
    b. An eDNA surveillance project for pink salmon in Irish rivers. eDNA water samples were taken in a total of 13 catchments in the period July to November 2023. Catchments were selected to provide a good geographical representation of rivers throughout the country with further consideration given to those catchments which contain sizeable runs of Atlantic salmon and those where pink salmon have previously been recorded.
    c. The NASCO-led, EU-funded PINKTRACK project which will evaluate eDNA approaches to detect pink salmon with the intention of supporting the establishment of an EU network for monitoring in this regard. This project commenced in November 2023. University College Dublin is also a partner in this project.
    d. Finalisation of a risk assessment for pink salmon in Ireland which also provides a brief overview of management options to eradicate or control pink salmon as informed by existing practices elsewhere.

Annex 7

PSWG(24)02

Status of pink salmon work in Sweden

The following pink salmon projects are currently being undertaken in Sweden:

1. **Pink salmon in Sweden** is a research project financed through the Swedish Research Council FORMAS during 2023-2024. Website: https://www.slu.se/pink-salmon

   The project aims to:

   a. Give an overall picture of the distribution of spawning pink salmon on the Swedish west coast and southern Baltic Sea using environmental DNA (eDNA). Sampling was conducted in July-August 2023 across 27 rivers in western and southern Sweden. Based on these results, there is evidence that pink salmon has spread over much of the west coast. The results are currently being finalised for publication.

   b. Determine spawning success by examining whether there are any pink salmon fry in selected rivers. Based on eDNA from results from part a, 10 sites across 5 rivers will be investigated using eDNA and electrofishing to try to detect if pink salmon reproduction was successful. Surveys will be conducted in February, March, April and May 2024.

   c. Increase public awareness and reporting of pink salmon. To date, we have spread information through webinars, conference presentations, information at exhibitions, stickers, website and social media and interviews.

      The new knowledge generated in the project will help develop proposals for future monitoring programs for pink salmon in Sweden.

2. **NASCO PINKTrack** is financed through the European Commission and national funding through the Swedish Agency for Marine and Water Management from 2023-2026.

   This project intends to address concerns relating to increased pink salmon numbers in the North Atlantic under the beneficiary of NASCO, through a consortium comprised of state agencies and research institutes based in EU jurisdictions, which is supported by technical expertise from Norway. The project will undertake work to better understand the extent of occurrence of pink salmon in EU waters through the use of environmental DNA (eDNA), which will enable it to elucidate temporal and geographic patterns of spread and provide an 'early warning system' of their presence to inform appropriate management responses.

   Sweden is involved primarily in the establishment and undertaking of an eDNA sampling programme in multiple river systems along the Swedish west coast.

3. **Nordic cooperation and strategies for managing the invasive pink salmon** funded by the Nordic Council of Ministers, 2024.

   The overall objective is to discuss common Nordic strategies for managing pink salmon. Since the numbers of pink salmon vary immensely between Nordic countries, we will discuss and propose a Nordic risk analysis regarding the increasing pink salmon populations across the region.

   This will include different scenarios that are occurring and that may occur in the future, for example, best case: pink salmon populations are kept down resulting in low spread, to a

worse case: pink salmon spread in large abundances across the Norwegian Sea, North Sea and Baltic Sea. This group will also discuss pros and cons relating to country-specific mitigations, as watercourses and their associated environments can differ considerably throughout the Nordic.

Experts from Sweden (project lead), Norway, Finland, Iceland and the Faroe Islands are included in this international project and will be conducted between May-December 2024.

More information regarding observations and reports of pink salmon in Sweden can be found in the following publication: Pink salmon distribution in Sweden: The calm before the storm?

Active researchers and project leaders involved in pink salmon work in Sweden:

Tom Staveley, Department of Aquatic Resources, Institute of Freshwater Research, Swedish University of Agricultural Sciences.

Ida Ahlbeck Bergendahl, Department of Aquatic Resources, Institute of Freshwater Research, Swedish University of Agricultural Sciences.

Annex 8

PSWG(24)03

Status on the Work on Pink Salmon in Norway

We assume that the development of the situation in Norway in recent years leading up to 2023 is already well known to the members of the PSWG. An English summary of the situation can be found in the Blue Book series from Atlantic Salmon Trust (Whelan and Mo (Eds) 2022, No 40.).

In 2023 the efforts to prevent pink salmon from spawning in Norwegian rivers were the most extensive so far. Norway spent more than 4,5 mill Euro, including monitoring activities. Targeted measures to remove pink salmon were performed in 94 rivers, and around 1/3 of these had full funding from the Government (equipment and labour). The measures were performed by local stakeholders (landowners and angling organizations mostly). This resulted in a total removal of 249 496 pink salmon. In addition, 13 282 pink salmon were reported from angling and 98 770 pink salmon were caught in the bag net fishery at sea. Figure 1 shows the geographical distribution of the catches in the targeted measures in 2023.

Most of the pink salmon removed by targeted measures were caught using temporary weirs (170 293 ind.). This is the recommended method in the action plan from the Norwegian Environment Agency (NEA). The weirs are installed as early as possible when the spring melting flood settles. Prior to 2023, only a few homemade weirs were in use by volunteers. In 2023, 21 rivers had weirs supplied by the Government, either rigid weirs made from aluminium or floating weirs/resistance board weirs made from plastic. Still many additional rivers had homemade weirs, as the Government funding was limited. The rivers with no weir used beach seine, gill nets, spear fishing and removals from fish ladders. Figure 2 shows the location of rivers with weirs and other methods used in 2023.

Ideally the weir operations should result in fish entering the traps continuously, and being carefully sorted by species so that the native fish are released upstream with minimal delay for the ascending fish. In theory this can remove all ascending pink salmon with little harm to native fish. In some rivers this was the case, where >99% of the pink salmon were removed whilst only a few salmon, sea trout and char were harmed and had to be put down. There are also examples of weirs that did not function well, where a high proportion of pink salmon managed to pass the weir. The weir in river Tana is such a case. There are no reports of high losses of native fish species – the total reported numbers are 101 salmon, 98 sea trout and 31 char (all rivers and all methods combined).

Other negative impacts of the measures are being discussed in an evaluation process. Delay of both descending smolts and kelts, ascending native fish, and injuries from manual handling of fish and contact with the equipment are key topics. There will be a written report from a national competence group appointed by the NEA. Based on advice from this group, the NEA will seek to improve the measures towards 2025.

Research on the invasion and its effects on salmon, biodiversity and water quality is a key issue, whatever policy is implemented to manage this species. Lack of knowledge has been and is still a cause of disagreement on how to handle the situation. We believe that research and shearing of information between the parties of Nasco should be a priority. To get an impression of the current status of knowledge, we recommend reading the report from the 3rd International

Seminar on Pink salmon in the Barents region and in Northern Europe 2023. This is available in English on the NEA web page (https://www.miljodirektoratet.no/pukkellaks).

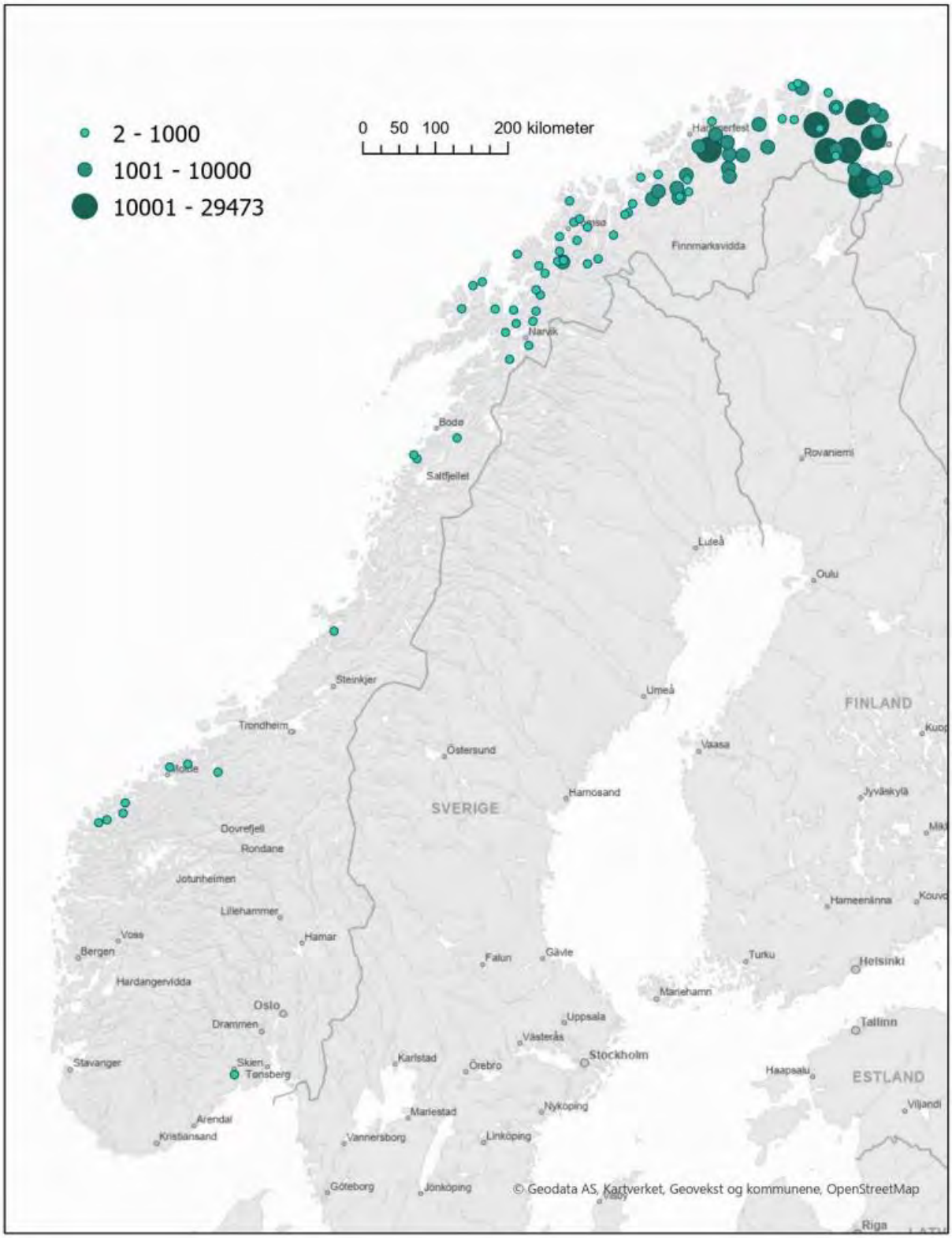


Figure 1: *Catches of pink salmon in targeted measures in Norway 2023. Figure: Marianne Kvaal.*

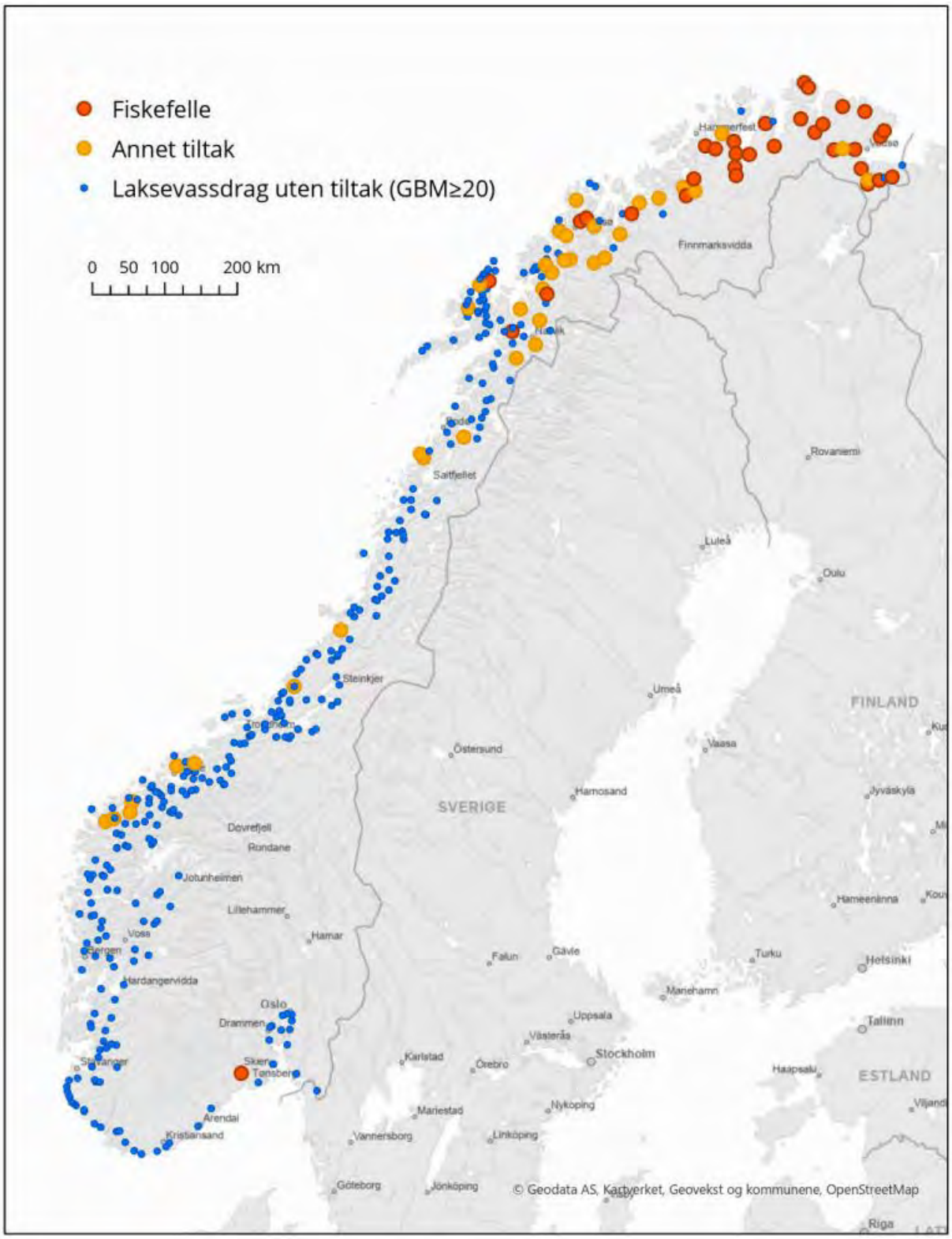


Figure 2: *Geographical localization of the weirs (red), other methods (orange) and rives with no measures (blue).*

Annex 9

PSWG(24)08

Pink Salmon Fishery in the Northern Fisheries Basin

1.Introduction

In the Northern fisheries basin pink salmon (*Oncorhynchus gorbuscha)* is an introduced species of Pacific salmon. First experiments to introduce salmon from the Far East into waters of the Kola Peninsula were carried out in the 1930s, when chum salmon (*Oncorhynchus keta*) was chosen as a species for introduction. The experiments, were, however, unsuccessful and the project was closed. It was resumed in 1956 when pink salmon was chosen as a target species for experiments. This species was considered most suitable for introduction since its juveniles do not stay for a long time in rivers, they feed poorly during the migration period and adult fish return to spawn after only 13-15 months of their sea migrations. It was suggested that the White Sea rivers had many spawning grounds suitable for pink salmon and that the fish would make use of food availability in the White Sea and would not undertake extensive migrations. The goal of the project was acclimatization of pink salmon in the area. With abundant enough fishable stocks established the Northern basin fishing industry would get additional resources for the fishery.

From 1956 to 1980 over 200 million artificially fertilized eggs were transferred to the Kola Peninsula, mostly from South Sakhalin. During that period, significant year-to-year variations in returns of adult fish were observed in the area of introductions as well as a rapid decline of abundance of developing stock in the absence of additional transfers of eggs from the native area. As the temperature conditions in the White Sea rivers were found to be the only constraint for the natural pink salmon reproduction, it was decided to use the northern pink salmon populations from the Magadan region as donors. For introductions fertilized eggs of pink salmon from the Ola River were used, which at the stage of eyed egg were transferred to the Murmansk region hatcheries for artificial incubation (Gordeeva et al., 2015).

The 1985 introduction using eggs from the Magadan pink salmon of odd-year spawning line laid the foundation for the growth of its natural production in the new area. In 1989 a massive run of pink salmon from natural spawning was observed in rivers of the Kola Peninsula. In the same year, odd-year spawning pink salmon eggs from the Far East were transferred for the last time. There were no transfers of eggs until 1998, when even-year spawning pink salmon eggs from the Ola River were incubated for the last time (Alekseev et al., 2019).

In the new area pink salmon have spread widely in rivers of the White and Barents Seas. To the east of the Kola Peninsula they come into rivers flowing into the Kara Sea - Ob', Taz, Yenisey. Now, the Pyasina River, which estuary is located in the south-west of the Taymyr Peninsula, is the eastern most point of pink salmon distribution in the Kara Sea basin (Bogdanov, Kizhevatov. 2007, 2015), while the Tymyr Peninsula is considered a natural border between native and new area of pink salmon distribution.

2. Regulation

There are at present two anadromous species in the Northern fishery basin, Atlantic salmon (*Salmo salar*) and pink salmon, whose life cycles include extensive periods in marine and freshwater habitats. Both are included in the List of Anadromous Species (Rosrybolovstvo's Order 147 of 26 Feb 2009). Their fisheries in the Russian Federation's internal waters and territorial sea are carried out in accordance with Article 29.1 of Federal Law 166-FZ of 20 Dec 2004 "On fisheries and conservation of aquatic biological resources".

Management of anadromous fish fisheries in the Russian Federation is based on decisions of a commission for regulation of fishery of anadromous fish (hereinafter referred to as Commission). The Commissions are established by the relevant subjects of the Russian Federation. They are headed by the highest rank official of the subject. Annually, the Commissions decide on the catch limits, times, locations of harvesting as well as other conditions of fisheries for anadromous fish.

Fishing for anadromous species in commercial, coastal, traditional and recreational fishery is only allowed on the basis of contract for use of fishing site and within its limits, except for recreational fishing for pink salmon outside the limits of fishing sites, in waters which are not Atlantic salmon spawning grounds, within the boundaries of the Murmansk and Archangelsk regions, Nenets Autonomous Okrug, Republic of Karelia and Komi Republic.

Fishery of aquatic biological resources in the Northern fisheries basin is regulated by the Fisheries Regulations for the Northern fisheries basin (current version is approved by Order N 292 of 13 May 2021 by the Ministry of Agriculture of Russia (hereinafter referred to as the Fisheries Regulations).

The Fisheries Regulations stipulate some restrictions in relation to pink salmon and most of them are similar to those established for Atlantic salmon and aimed, in the first place, at conserving the native species. For instance, fishing for Atlantic and pink salmon is prohibited:

- in the Barents Sea from the Varanger Fjord in the west to Cape Svyatoy Nos in the east;
- outside the fishing sites in rivers and creeks, which are Atlantic salmon spawning grounds;
- on days (periods), as established by the Commission, to allow spawners migrate to spawning grounds;
- in estuaries of Atlantic salmon rivers and creeks in the Murmansk region, at the distance less than 500 m from each side of the estuary and at the same distance offshore where the rivers enter the sea;
- in commercial fisheries in Atlantic salmon rivers and creeks of the Murmansk region where net gears are used, except for counting fences deployed in accordance with the decision of the Commission;
- in recreational fishery in the Murmansk region with stationary pound nets of different types and with gill nets both drift and fixed.

3. Catches

Similarly to its native area, pink salmon introduced into waters of the North West of Russia have two genetically distinct lines (odd-year and even-year). In the new area, however, the species forms commercial fish stocks only in odd years in the White Sea basin where it has been harvested in coastal areas and at counting fences in some rivers since 1960s. The largest catches were recorded in the Murmansk region, where before 2000s they exceeded 100 t four times – in 1973, 1975, 1977 and 1997. In 2001 the catch for the first time was as big as 300 t, but later, until 2015, the catch in odd years varied from 45 to 118 t. Since 2015, the catch of pink salmon in odd years was increasing and reached 382 t in 2019 and in 2021 exceeded 600 t, with 400 t taken at the counting fence in the Varzuga River. In 2023, the pink salmon catch in the Murmansk region was 155 t, with 137 t of it taken in commercial fisheries and 17 t in recreational fishery on fishing sites. There are no estimates of recreational catches by anglers catching pink salmon outside the fishing sites, in waters that are not Atlantic salmon spawning grounds. In 2023, the total nominal catch of pink salmon in the European North of Russia amounted to 206 t which was 71% less than in 2021 and 47% and 21% less than the average catch of pink salmon in previous 5 and 10 odd years, respectively (Table).

Table. Total reported nominal catches of pink salmon by Northwestern regions of Russia (in tonnes round fresh weight), 1993-2023.

Year	Murmansk Region			Arkhangelsk	Nenets	Karelia	Total
	Barents Sea	White Sea	Total	region	AO	Republic	catch
1993	0,0	32,5	32,5	28,0	0,0	3,0	63,5
1994	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1995	0,0	19,4	19,4	15,0	0,0	8,2	42,6
1996	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1997	0,0	110,9	110,9	23,9	0,0	3,9	138,7
1998	0,0	0,0	0,0	0,0	0,0	0,0	0,0
1999	0,0	27,6	27,6	16,5	0,0	6,6	50,7
2000	0,0	8,6	8,6	0,7	0,0	1,7	11,0
2001	0,0	296,5	296,5	35,0	0,0	8,1	339,6
2002	0,0	0,8	0,8	0,4	0,0	0,2	1,4
2003	0,0	71,6	71,6	33,3	0,0	46,5	151,4
2004	0,0	0,2	0,2	0,9	0,0	0,1	1,2
2005	0,0	45,4	45,4	46,4	0,0	33,8	125,6
2006	0,0	0,5	0,5	0,3	0,0	0,0	0,8
2007	0,0	84,4	84,4	34,2	0,0	44,3	162,9
2008	0,0	0,0	0,0	0,5	0,0	0,0	0,5
2009	0,0	113,0	113,0	19,5	0,0	6,0	138,5
2010	0,0	0,0	0,0	0,0	0,0	0,0	0,0
2011	0,0	64,0	64,0	34,2	0,1	0,0	98,3
2012	0,0	0,0	0,0	0,1	0,1	0,0	0,2
2013	0,0	117,7	117,7	82,8	0,5	0,0	201,0
2014	0,0	2,8	2,8	7,3	1,0	0,0	11,1
2015	0,1	160,7	160,8	58,7	1,0	0,0	220,5
2016	0,0	3,9	3,9	4,3	0,1	0,0	8,3
2017	0,5	277,1	277,6	92,8	3,1	0,0	373,5
2018	0,0	1,4	1,4	2,9	0,0	0,0	4,3
2019	0,2	381,5	381,7	30,6	2,9	2,6	417,8
2020	0,0	0,3	0,3	0,4	0,2	0,0	0,9
2021	1,1	603,0	604,1	105,8	1,3	4,3	715,5
2022	0,0	2,0	2,0	2,1	0,9	0,1	5,0
2023	6,5	148,1	154,6	44,8	5,8	0,5	205,7
Means (odd years only)							
5YM (2013-2021)	0,4	308,0	308,4	74,1	1,8	1,4	385,7
10YM (2003-2021)	0,2	191,8	192,0	53,8	0,9	13,8	260,5

Pink salmon fishery at counting fences is considered the most efficient way of harvesting the fish that run to spawn. However, for example, in the Murmansk region, where there are more than 27 fishing sites designated for recreational fishery in 23 rivers of the Barents Sea basin and 44 fishing sites in 24 rivers of the White Sea basin, the deployment of counting fences on sites for recreational fishery is prohibited by the Fisheries Regulations. Over the last 20 years, there have only been two counting fences annually deployed for anadromous fish commercial fishery – in the Varzuga River and its tributary Kitsa River (the White Sea basin), whereas in 1958-1997, when Atlantic salmon was exploited commercially on a large scale, the total number of rivers where counting fences were deployed in different years was 36, with the largest number of fences deployed in one year in 1978 – in 23 rivers (Prusov et al., 2021).

Pink salmon fishery in the White Sea is conducted both in "traditional" fishing sites used mostly for Atlantic salmon fishery and in "new" sites allocated for pink salmon fishery, e.g. in sites in the Kandalaksha Bay where Atlantic salmon fishery is prohibited by the Fisheries Regulations.

In 1997, the total nominal catch of odd-year line pink salmon in the Northern fisheries basin for the first time exceeded Atlantic salmon nominal catch (does not include fish caught and released in recreational rod fisheries) and in 2001 it exceeded the nominal catch of the native species by three times (Figure).

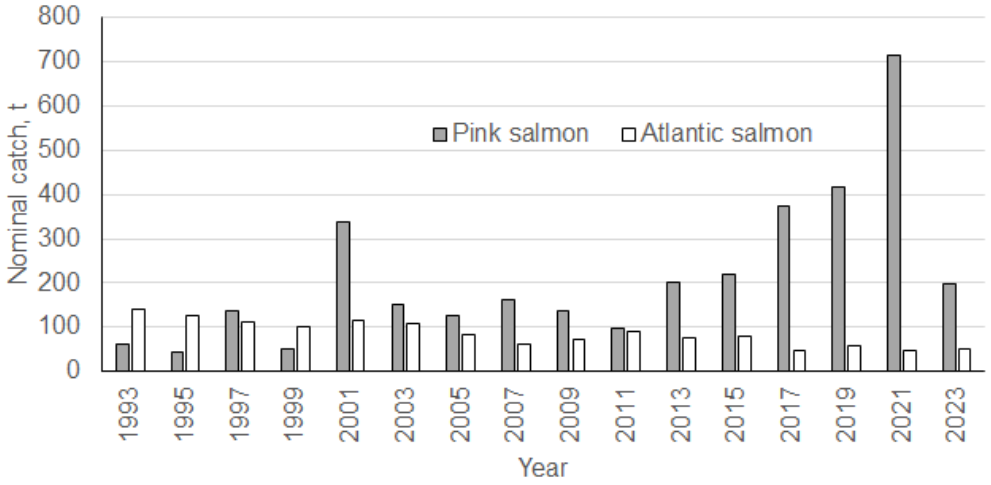


Figure. Total reported nominal catches of pink salmon and Atlantic salmon (do not include fish caught and released in recreational rod fisheries) in the Northern Fisheries basin of Russia, 1993-2023.

4. Conclusions

Pink salmon in the Northern fisheries basin is a fishery-targeted species harvested in accordance with Article 29.1 of the Federal Law "On fisheries and conservation of aquatic biological resources".

In the Kola Peninsula, pink salmon spawning migration into rivers begins in late June – early July and continues until late August – early September. The migration reaches its peak in the first half of July. Pink salmon adults enter both rivers, where Atlantic salmon spawns, and non-salmon watercourses. They usually do not perform extensive migrations upstream and prefer to spawn on rapids and riffles in lower and middle reaches of rivers. In large river systems (Ponoi, Umba, Varzuga), some individuals were observed in spawning tributaries of the upper reaches (more than 100-200 km from the river mouth). In the Kola Peninsula rivers, massive pink salmon spawning usually occurs in early August. Since pink salmon spawns earlier than Atlantic salmon which in the Kola Peninsula spawns in September-October, pre-spawning competition is not thought to have any notable impact on reproduction of these two species. However, in years of pink salmon high abundance an interspecific competition for better passages and resting pools may occur in freshwater. This interaction can be observed in small rivers or minor tributaries of a large river system during a relatively short period of massive pink salmon run in July until its spawning in August.

Despite the absence of convincing evidence of an adverse impact of pink salmon on Atlantic salmon reproduction at present, unlimited harvesting of pink salmon by all types of fishery is recommended. In large rivers where traditionally the fishery at counting fences takes place it is recommended to harvest all pink salmon during its entire spawning run (Alekseev et al., 2019).

References

Alekseev, M.Y., Tkachenko, A.V., Zubchenko, A.V., Shkatelov, A.P. and A.M. Nikolaev. 2019. Distribution, spawning and the possibility of fishery of introduced pink salmon *Oncorhynchus gorbuscha* Walbaum in rivers of Murmansk oblast. Russian Journal of Biological Invasions. 10 (2): 109-117.

Bogdanov, V.D., and Ya.A. Kizhevatov. 2007. Pink salmon (*Oncorhynchus gorbuscha*, Walbaum, 1792) in reservoirs and watercourses of the Yamalo-Nenets Autonomous Okrug. Scientific Bulletin of the Yamalo-Nenets Autonomous Okrug, 6 (50) 2: 3–4. (In Russian)

Bogdanov, V.D., and Ya.A. Kizhevatov. 2015. Pink salmon (*Oncorhynchus gorbuscha*, Walbaum, 1792) a new species of aquatic biological resources in the Yamalo-Nenets Autonomous Okrug. Bulletin of the Astrakhan State Technical University. Series: Fisheries, 3: 7–14. (In Russian)

Gordeeva, N.V., E.A. Salmenkova, and S.V. Prusov. 2015. Variability of biological and population genetic indices in pink salmon, *Oncorhynchus gorbuscha*, transplanted into the White Sea basin. Journal of Ichthyology. 55 (1): 69–76.

Prusov, S.V., Zubchenko, A.V., Alekseev, M.Y., Tkachenko, A.V., Samokhvalov, I.V., Dolotov, S.I., Kuzmin, D.O. and A.G., Potutkin. 2021. Status of anadromous fish stocks and fisheries in the Murmansk region. PINRO Press, Murmansk. 71 pp.

Annex 10

PSWG(24)06rev

Pink Salmon Update 2023 – United Kingdom[2]

Pink salmon were first introduced into rivers entering the White Sea Basin in the 1950's (Alekseev et al., 2019). These fish quickly established self-sustaining populations in northern Russia, Norway and Finland (April et al., 2023). They were first recorded in Scotland and England in 1960. In the 56 years between 1960 and 2016, a total of 17 Pink salmon were recorded in Scotland and 11 confirmed captures were recorded from English rivers and coastal waters. During this period, a single individual was captured near the mouth of River Wye which forms the border between England and Wales. Most of these fish (89%) were captured in 'odd' years and catches were most prevalent (74%) in east coast river catchments and coastal areas. Although Pink salmon were first recorded in Ireland in 1973, there is no published record of Pink salmon having occurred in Northern Ireland prior to 2017. All of these records are incidental. No dedicated monitoring was in place to detect the presence or number of Pink salmon within the UK, and there was no legal requirement to report their capture. Other captures or sightings may have gone unreported.

The sudden, and unexpected, increase in Pink salmon records throughout the UK, and particularly Scotland, in 2017 resulted in increased concern from fisheries managers and Government agencies (Bean, 2017; Armstrong et al., 2018) about the potential impact of this invasive non-native species on Atlantic salmon and other native fishes. Table 1 summarises historic and current Pink salmon records for Scotland and England and Wales, and these confirm that the number of fish recorded in Scotland and England remain higher than those observed in years prior to the 2017 invasion. The unexpected appearance of Pink salmon in Scotland was matched by an increase in the number of records reported from other parts of Europe (ICES, 2022; April et al., 2023).

Country	First Record	Pre-2017	2017	2018	2019	2020	2021	2022	2023
Scotland	1960	17	131	0	18	0	171	1	47
England	1960	11	8 (~200)	1	(3)	0	15 (14)	1	1 (1)
Wales	1980*	1*	0	0	1	0	0	0	0
Northern Ireland	2017	0	2	0	1	0	0	0	2

Table 1 – Pink salmon records from Scotland, England, Wales and Northern Ireland between 1960 and 2023. (*) denotes Pink salmon capture from the River Wye and allocated to Wales. Figures in parentheses are captures made in coastal waters. Pink salmon were captured in coastal areas of eastern Scotland but numbers are unrecorded. The rapid rise in Pink salmon records prompted the Great Britain Non-Native Species Secretariat to commission a rapid risk Assessment and full Risk Assessment for this species (see also Bean 2022).

[2] Revised on 1 March 2024 to include a slight change to the numbers in Tables 1 and 2 and to the wording in the 'Next Steps' paragraph.

Pink salmon in Scotland

Activity relating to the monitoring and management of Pink salmon in Scotland is governed by the Scottish Environment Protection Agency (SEPA)-led Pink salmon Task Force (PSTF). The Task Force comprises representation from SEPA, the Marine Directorate of the Scottish Government, NatureScot and Fisheries Management Scotland. The Atlantic Salmon Trust have recently been asked, and have agreed to, join this group. The Pink salmon Task Force co-ordinates monitoring, advice and actions to ensure that any Pink salmon in Scotland can be properly identified and their presence reported. Going forward, it will also play a co-ordinating role in relation to Pink salmon management.

From the beginning, a key priority for the PSTF has been to ensure that Pink salmon records are properly collected, verified and recorded. This has been achieved within the PSTF through the development of a Topic Sheets (Scottish Government) and Advice Notes (FMS). These materials are regularly updated and include information on issues such fish identification, legal capture). Given that most records arise from anglers, FMS have played a pivotal role in collecting these data from this sector, and the FMS Advice Note sheet directs anglers to a bespoke, publicly available, online-based survey app. The Pink salmon App allows anglers to record fish details (length, weight, sex, spawning condition, alive/dead), as well as the date of capture/sighting, location of capture/sighting and method of capture. It also offers the opportunity to upload a photograph of the fish, which can, if provided, be used to verify the record. An online dashboard provides access to all records submitted since 2017 and this information is also uploaded into the National Biodiversity Network (NBN) Atlas to allow for monitoring of invasive non-native species at a UK scale.

Interrogation of the data collected from 2017-2021 suggested that that the Pink salmon recording may be spatially biased towards those rivers on the east coast of Scotland, which are most heavily used by anglers. In preparation for the anticipated arrival of Pink salmon in 2023, the PTSF developed a baseline eDNA-based monitoring programme to ascertain the extent of pink salmon incidences beyond those reported through the online reporting tools. Two sampling approaches were used (Table 2). The first of these (Tier 1) included the collection of triplicate one-litre water samples from 31 sites at two locations: a) 1 km above the Tidal Limit; and b) at a location equivalent to the first 10% of the river length. Tier 1 water samples were collected by SEPA staff. At Tier 2 sites, triplicate three-litre water samples were collected from 16 rivers at locations within the lower, middle and upper catchment. In larger river systems similar samples were collected from large tributaries at their confluence with the main river channel. Sample blanks were also collected at each site. All water samples for Tier 2 sites were collected by Fishery Trust and District Salmon Fishery Board staff. Tier 1 sampling was funded by SEPA and all of the Tier 2 sampling was funded by the Scottish Government's Marine Fund Scotland. All samples were collected during August-September and processed by the Marine Directorate of the Scottish Government using a single species qPCR assay for Pink salmon (*sensu* Gargan *et al*. 2021; Fossøy *et al*. 2022).

Pink salmon records 2023		
FMS App	**+ve eDNA (Tier 1)**	**+ve eDNA (Tier 2)**
River Dee (Aberdeenshire) (2)	River Ayr (+ve)	River Laxford (+ve)
River Dionard (1)	River Beauly (+ve)	River Spey (+ve)
River Forth (1)	River Dee (+ve)	River Tweed (+ve)

Halladale River (1)	River Ewe (+ve)	River Clyde (suspected)
River Laxford (4)	River Helmsdale (+ve)	River Thurso (suspected)
River South Esk (1)	River Laxford (+ve)	
River Tay (1)	River Naver (+ve)	
River Thurso (1)	River Spey (+ve)	
River Tweed (35)	River Thurso (+ve)	
	River Ugie (+ve)	
	River Clyde (suspected)	
	River Forth (suspected)	
	River Stinchar (suspected)	
	River Tay (suspected)	

Table 2 – Pink salmon records from Scotland 2023 collected by the FMS App and eDNA. Pink salmon records entered onto the FMS App are compared with positive and suspected Pink salmon eDNA data collected during Tier 1 and Tier 2 sampling events. (+ve) denotes sites where all replicates tested positive for Pink salmon DNA and (suspected) records are those which were positive in at least one replicate.

The information collected by the Pink salmon App and the data derived from eDNA surveys are complementary. Data collected in 2023 indicate that eDNA is an effective tool for determining the presence of Pink salmon in locations where physical records have been added to the Pink salmon App, and in places where the presence of pink salmon was suspected but not physically confirmed (i.e. the rivers Beauly and Spey). eDNA data also showed that Pink salmon were much more widely distributed than the App suggests.

In addition to the collection of Pink salmon distribution data, a single box trap was temporarily installed within the River Thurso to investigate its potential to prevent Pink salmon from gaining access to the upper river (Figure 1).

Figure 1 – The removable Pink salmon trap installed in the River Thurso during the summer of 2023.

High flows during the summer of 2023 limited the efficacy of this device and eDNA analyses detected Pink salmon both above and below the trap. Successful recruitment of Pink salmon smolts was described in this river following spawning in 2021 (Skora *et al*., 2023) but the success of Pink salmon following spawning in 2023 is unknown.

Pink salmon in England and Wales

There is no equivalent of the Scottish Pink salmon Task Force in England and Wales, although the Environment Agency and Natural Resources Wales rely, in the same way, on the provision of reports by fishery managers, netsmen, recreational anglers and members of the public.

The Centre for Environment Fisheries and Aquaculture Science (Cefas) leads on the reporting to ICES on salmon stocks and fisheries in England and Wales. This involves close collaboration with the nvironment Agency and Natural Resources Wales to access their data and expertise. The reporting is achieved through the annual ICES data call submission and providing additional data and supporting information to the Working Group on North Atlantic Salmon (WGNAS). This year, the WGNAS has a ToR on updating knowledge of the abundance and distribution of pink salmon in the North Atlantic, and an information request for this has been added to the data call. Cefas also supports the UK delegation in reporting to NASCO.

Awareness of the Pink salmon issue and guidance in England is actively promoted by the Environment Agency through the production of a regularly updated Advisory Note. The Advisory Note also provides a link to an extension to the FMS Pink salmon App named Pink Salmon in England.. Natural Resources Wales also provide advisory materials in the form of a dedicated Pink salmon webpage. A reporting function is also included within the page, although this is not linked to the FMS Pink salmon App.

Pink salmon awareness is also promoted by others, such as the Atlantic Salmon Trust, The Angling Trust, Wild Trout Trust and other organisations involved in fish and fisheries management throughout Great Britian.

Records of Pink salmon in rivers are fewer in England and Wales than those in Scotland. However, the continued existence of coastal net fisheries in NE England, initially for salmon but now for sea trout, mean that Pink salmon can be intercepted in those areas.

The number of Pink salmon recorded in England during 2023 was low, with only two individuals being reported to the Environment Agency. One of these individuals was captured by a netsman off of the NE coast of England near Bridlington, and the second was captured by an angler in the River Great Ouse (Cambridgeshire). No Pink salmon were recorded in Wales during this period.

In terms of eDNA-based surveillance, Cefas has also been involved in research based on eDNA and fishing surveys to monitor the occurrence of pink salmon adults and juveniles in rivers throughout England, Wales, Scotland (Skóra *et al*., 2023), and Iceland (Skóra *et al*., 2024).

Pink salmon in Northern Ireland

The Department of Agriculture, Environment and Rural Affairs (DAERA) coordinates the provision of advice and guidance within Northern Ireland. As in previous years, DEARA publishes a Notice to Anglers, as well as a Pink salmon Information Sheet which contains a link to the CEDaR Online Recording App and the Invasive Species Northern Ireland website. As is the case for England and Wales, there is no surveillance programme in place for Pink salmon within Northern Ireland.

The number of Pink salmon recorded in Northern Ireland is very low and has never exceed more than two individuals in any given year. In 2023, single records of Pink salmon were

reported for the rivers Bann (at Carnroe) and Foyle. The Pink salmon recovered from the River Foyle requires verification.

There are currently no plans to initiate an eDNA-based monitoring strategy in Northern Ireland.

Next steps

All administrations will continue to monitor Pink salmon and maximise awareness amongst all fishery stakeholders in order to encourage reports to map the occurrence and abundance of this species. In Scotland, the most recent eDNA monitoring framework will continue to be refined and consideration will be given to further management options if Pink salmon numbers continue to increase. There are currently no plans to initiate eDNA-based surveillance programmes for Pink salmon in England, Wales or Northern Ireland. UK salmon management jurisdictions will continue to support and co-ordinate efforts to investigate and manage the risks posed by this invasive non-native species.

References

April, J., Bean, C.W., Berntsen, H., Dunmal, K.M., Ensing, D., Erkinaro, J., Farley, E., Fossøy, F., Gilk-Baumer, S., Habicht, C., Howard, K., Irvine, J.R., Karlsson, S., Kendall, N.W., Kitching, T., Langan, J.A., Latham, S., Lee, E., Meerburg, D., Millane, M., Munro, A., Orlov, P., Oxman, D., Radchenko, V.I., Schubert, A., Thorstad, E.B., Utne, K., Walker, A. & Wells, A. (2023). A review of pink salmon in the Pacific, Arctic, and Atlantic oceans. *North Pacific Anadromous Fish Commission Tech. Rep.* **21**. 58 pp.

Armstrong, J.D., Bean, C.W. & Wells, A. (2018) The Scottish invasion of pink salmon in 2017. *Journal of Fish Biology*, **93**(1), 8–11.

Bean, C.W. (2017). Proceedings of an International Pink Salmon Workshop. NOVOTEL, Edinburgh, 21 September 2017.

Bean, C.W. (2022). Assessing the Risks Posed by Pink Salmon to UK Waters. In: Whelan, K. and Mo, T.A. (Eds) (2022) *Pink Salmon and Red Skin Disease Emerging Threats for Atlantic Salmon*. Atlantic Salmon Trust, Blue Book Series, no. 40. Atlantic Salmon Trust, Battleby, Perth, Scotland.

Fossøy, F., Erkinaro, J., Orell, P., Pohjola, J.-P., Brandsegg, H., Andersskog, I.P.Ø. & Sivertsgård, R. 2022. *Monitoring the pink salmon invasion in Tana using eDNA. Assessment of pink salmon, Atlantic salmon and European bullhead*. NINA Report 2213. Norwegian Institute for Nature Research. 23 pp.

Gargan, L.M., Mo, T.A. Carlsson, J.E.L. Ball, B. Fossøy, F. & Carlsson, J. (2021). Development of an environmental DNA assay and field validation for the detection of invasive pink salmon *Oncorhynchus gorbuscha*. *Environmental DNA*, **4**(2): 284–290.

ICES. (2022). Distribution and abundance of pink salmon across the North Atlantic. In: Report of the ICES Advisory Committee, 2022. ICES Advice 2022.
Skóra, M.E., Guðbergsson, G., Copp, G.H. & Jones, J.I. (2024). Evidence of successful recruitment of non-native pink salmon *Oncorhynchus gorbuscha* in Iceland. Journal of Fish Biology, **104**(1), 329–334.

Skóra, M.E., Jones, J.I., Youngson, A.F., Robertson, S., Wells, A., Lauridsen, R.B., & Copp, G.H. (2023). Evidence of potential establishment of pink salmon *Oncorhynchus gorbuscha* in Scotland. Journal of Fish Biology, **102**(3), 721–726.

PSWG(24)11

Status of pink salmon in Eastern Canada

NASCO Working Group on Pink Salmon

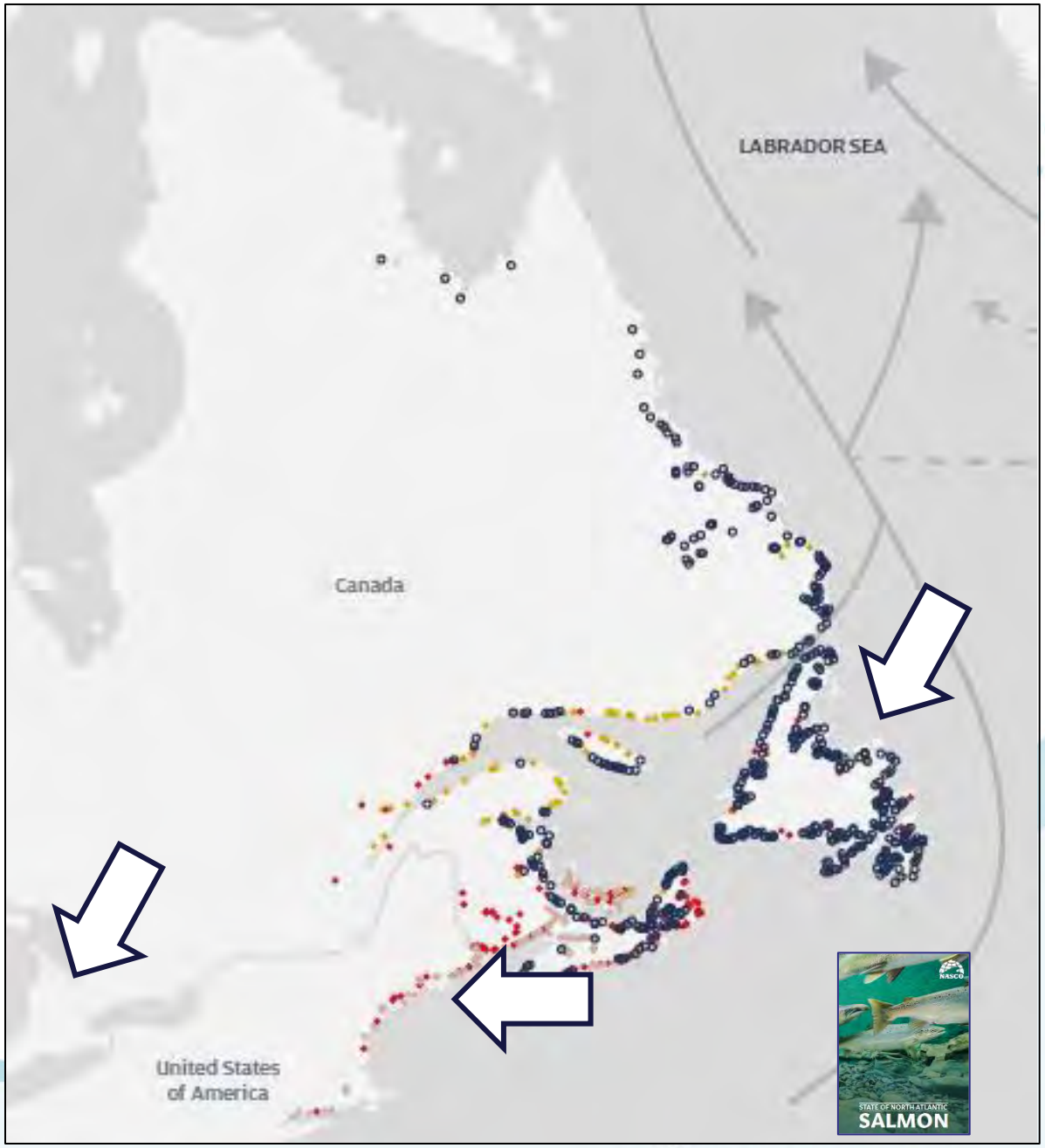
March 2024

Julien April, biologist Ph.D.

Ministère des Forêts, de la Faune et des Parcs du Québec

Trends in distribution and abundance of pink salmon in the north American distribution range of Atlantic salmon

- Pink salmon have been introduced in some areas in eastern North America.
- The only establish self-sustaining populations are located in the Laurentian Great Lakes in North America. They don’t appear to colonize the St. Lawrence River and its tributaries.
- Pink salmon introduced in Newfoundland were considered extinct by 1991.

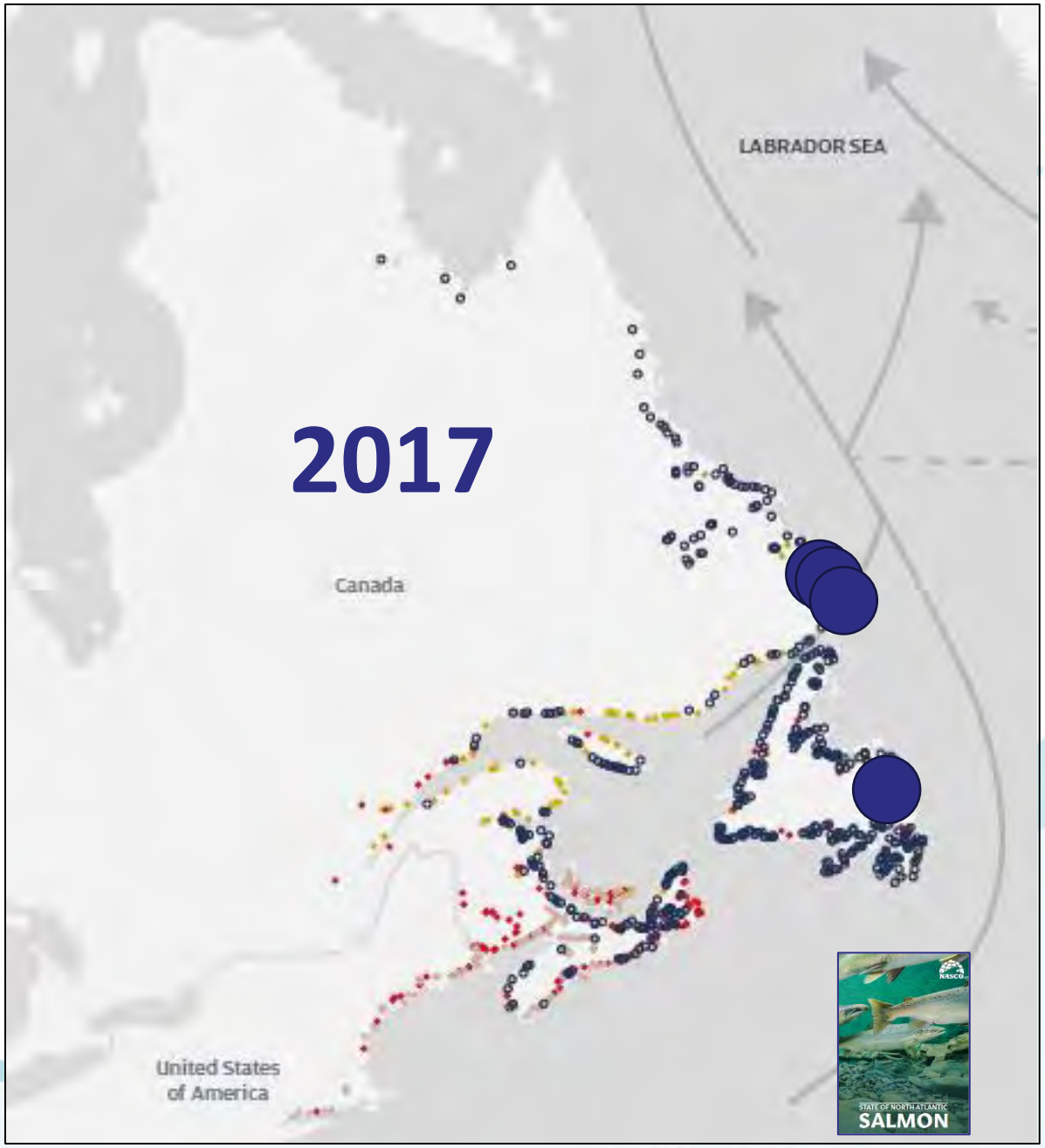


Introduction of pink salmon

Votre gouvernement

Trends in distribution and abundance of pink salmon in the north American distribution range of Atlantic salmon

2017 = 4 pink salmons

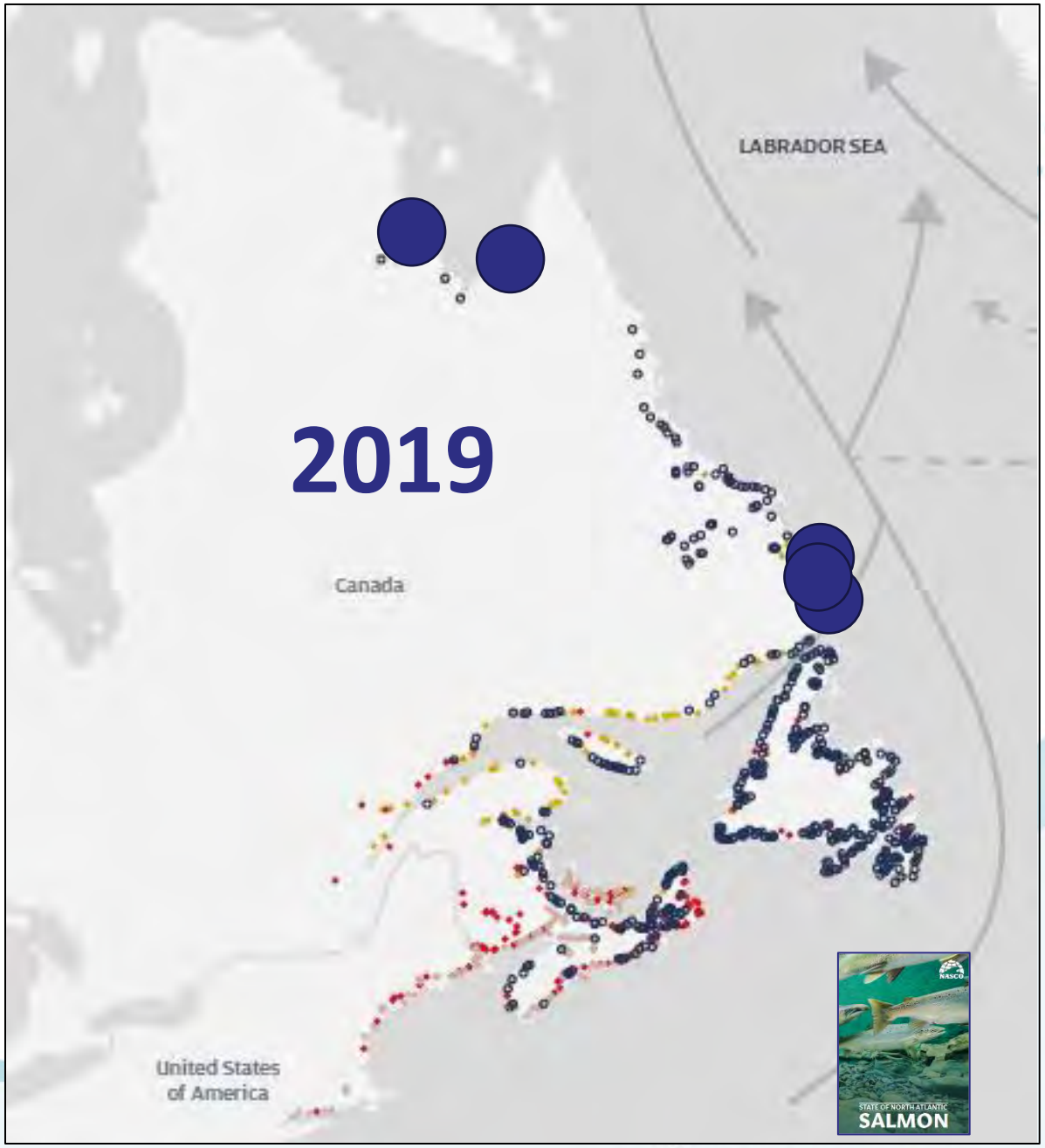


Observations of pink salmon

Votre gouvernement

Trends in distribution and abundance of pink salmon in the north American distribution range of Atlantic salmon

2019 = 5 pink salmons

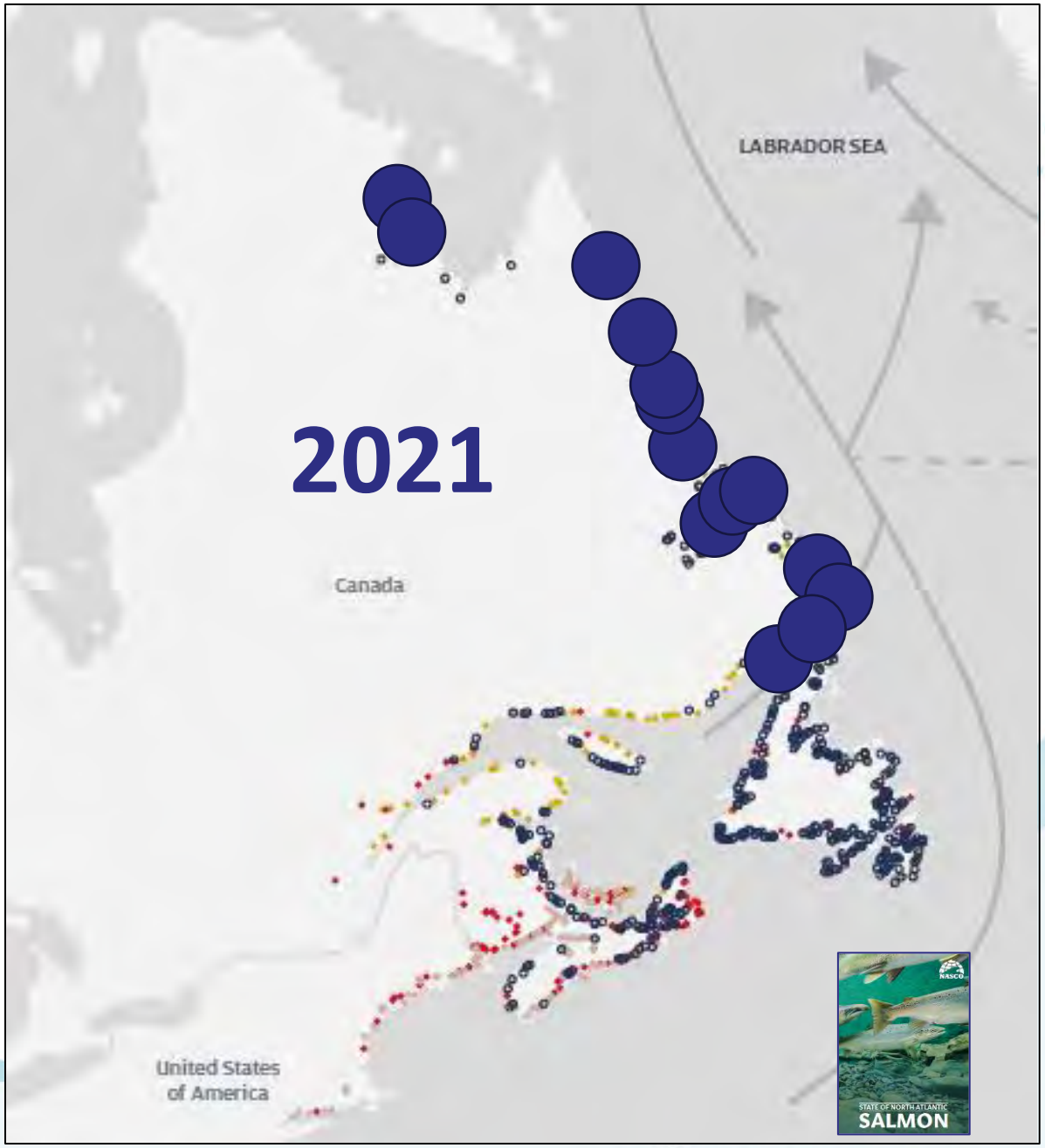


Observations of pink salmon

Votre gouvernement

Trends in distribution and abundance of pink salmon in the north American distribution range of Atlantic salmon

2021 = 14 pink salmons



Observations of pink salmon

Votre gouvernement

Trends in distribution and abundance of pink salmon in the north American distribution range of Atlantic salmon

2023 = 3 pink salmons
(provisional number)

Observations of pink salmon

Votre gouvernement

Trends in distribution and abundance of pink salmon in the north American distribution range of Atlantic salmon

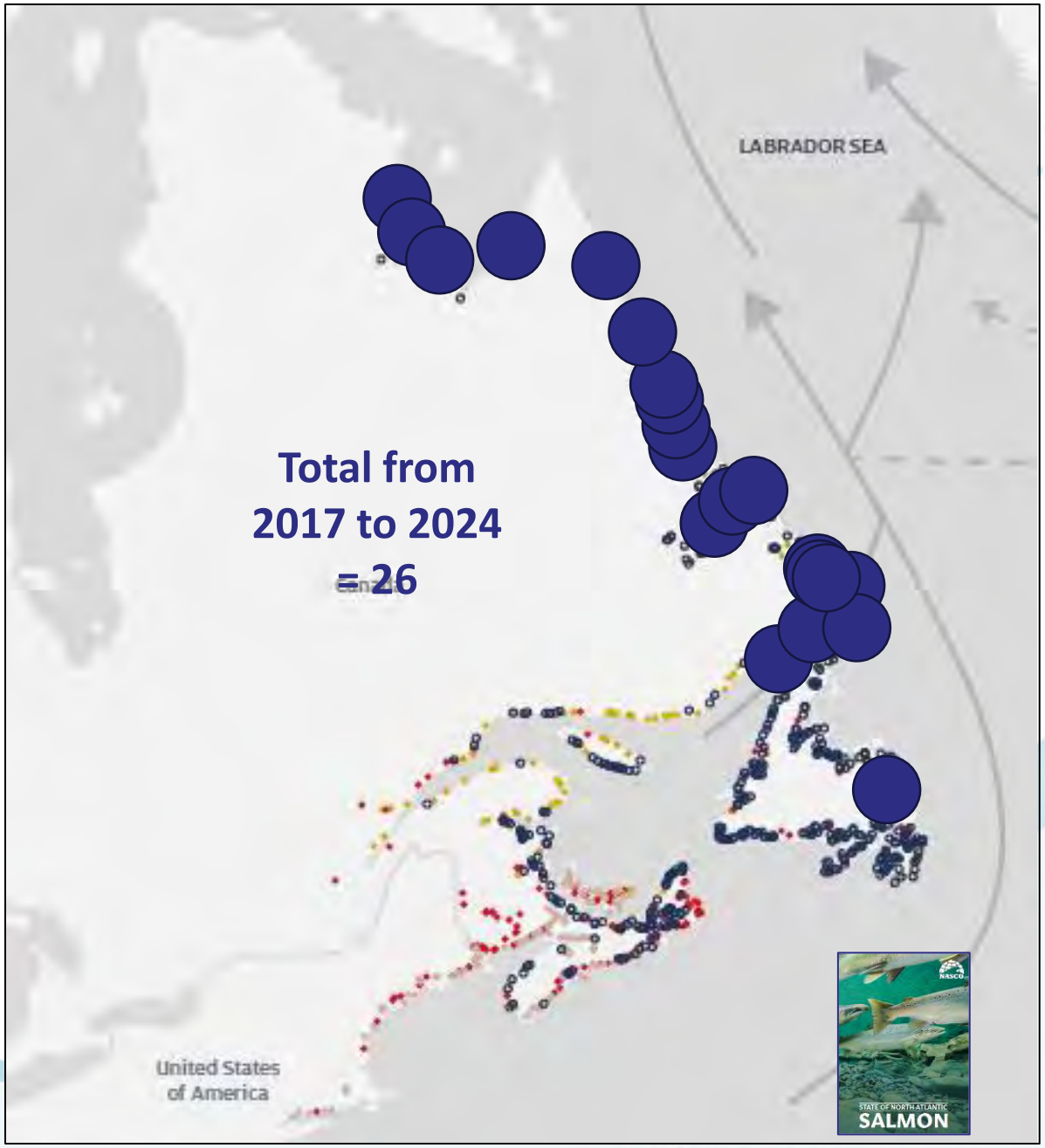
2023 = 3 pink salmons
(provisional number)

One pink salmon have also been caught in Nunavut near Iqaluit

Observations of pink salmon

Trends in distribution and abundance of pink salmon in the north American distribution range of Atlantic salmon

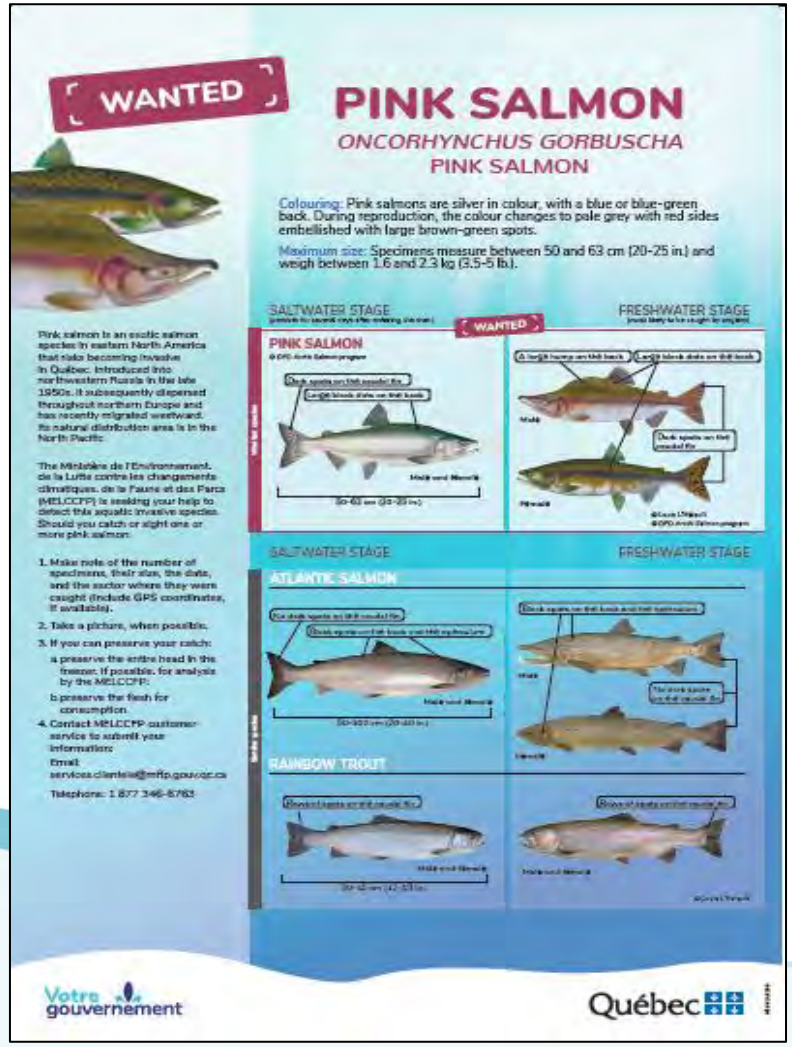
- Mean recorded length of 49 cm.
- Present distribution range of Pink salmon cover about 28 % of Atlantic salmon rivers
- About half in freshwater and half in marine environment.
- Observations in sparsely inhabited areas. Many from First Nations subsistence fishery. The others from counting fences, angling and commercial fishery.

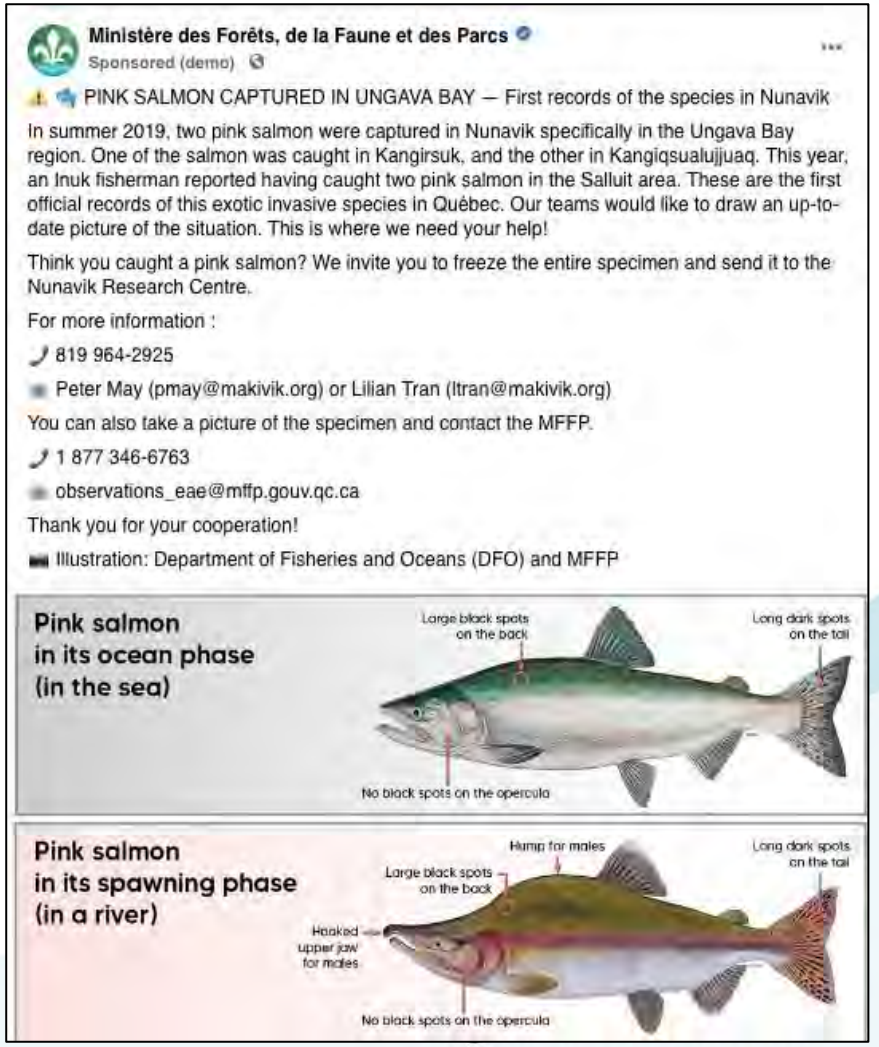


Votre gouvernement

Awareness campaign and tracking network involving First Nations

- **Posters**
- **Social media**
- **Radio….**





Environmental DNA (eDNA)

Utility :

- Extremely effective for species detection

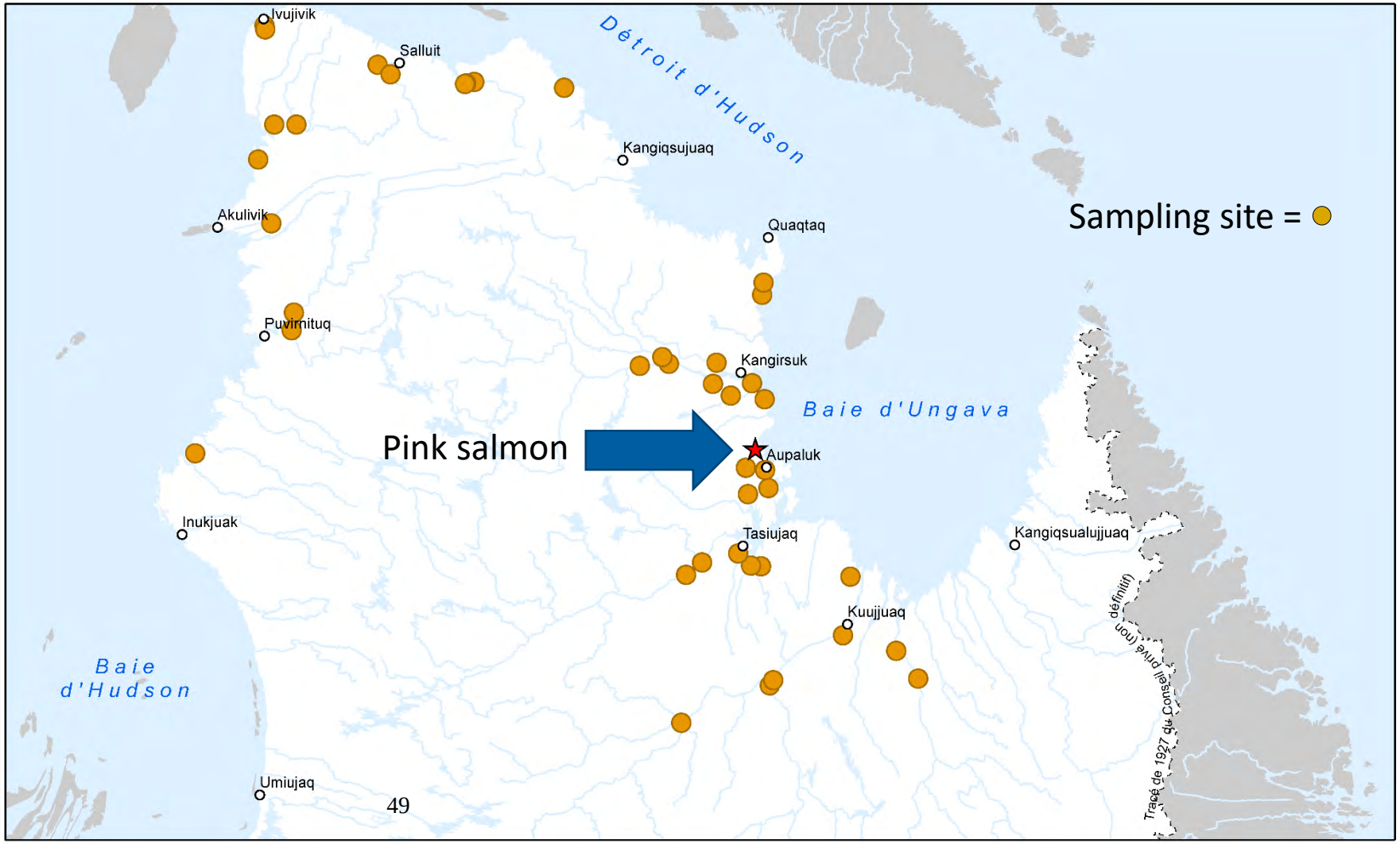
Commonly used methods :

- qPCR for species specific analyses
- Meta-barcoding for community analyses

Meta-barcoding project in Quebec in 2021

Main results :

- **Pink salmon detected in a river located in the Ungava Bay.**
- **Pink salmon have been caught in this area in the past.**

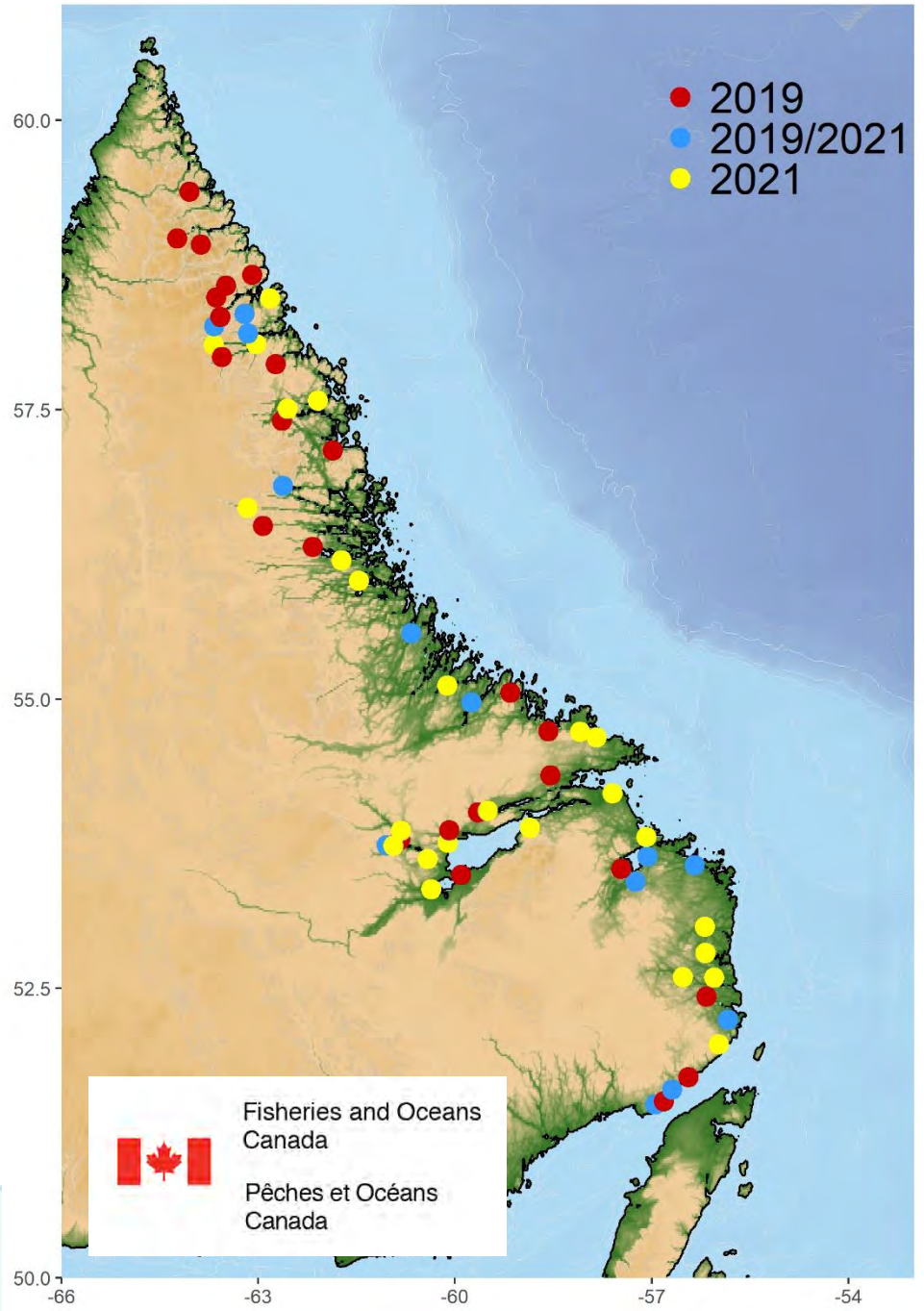


qPCR and meta-barcoding project in Labrador in 2019 and 2021

Conducted by Ian Bradbury (DFO) and collaborators

Preliminary results :

- **Pink salmon detected in 5 rivers in 2019 and 7 rivers in 2021.**
- **One river had pink salmon detected in both years.**
- **Detections ranged the entire sample distribution.**

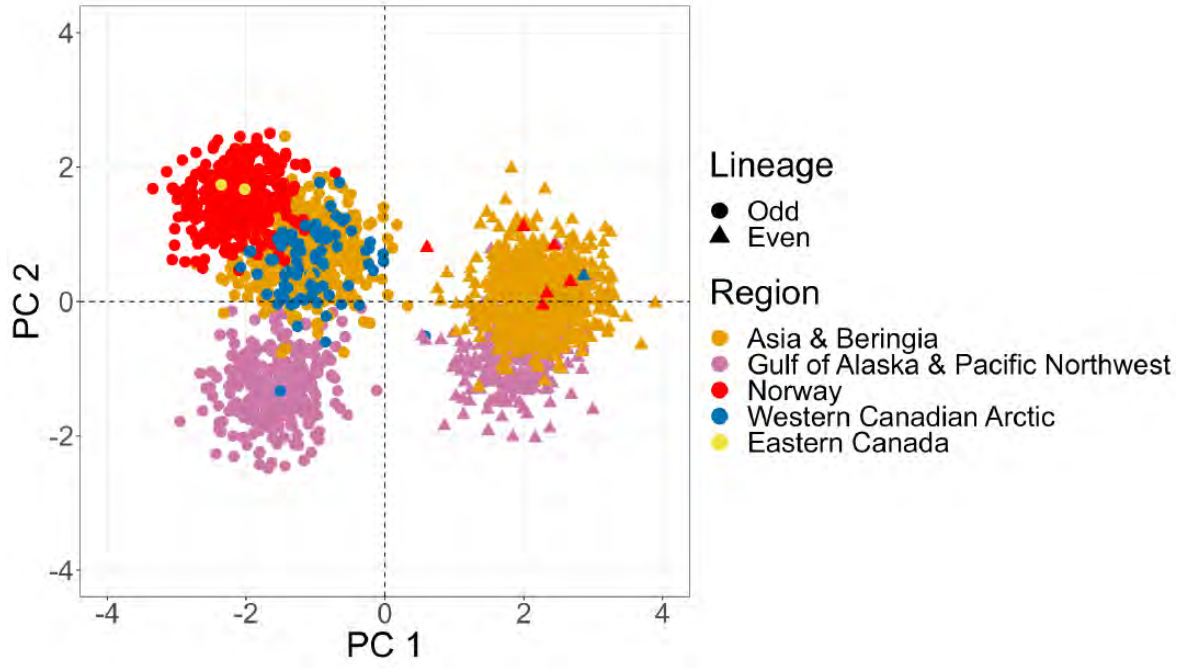


Votre gouvernement

(Crowley et al. 2024)

Origin of pink salmon in eastern Canada

Origin of samples



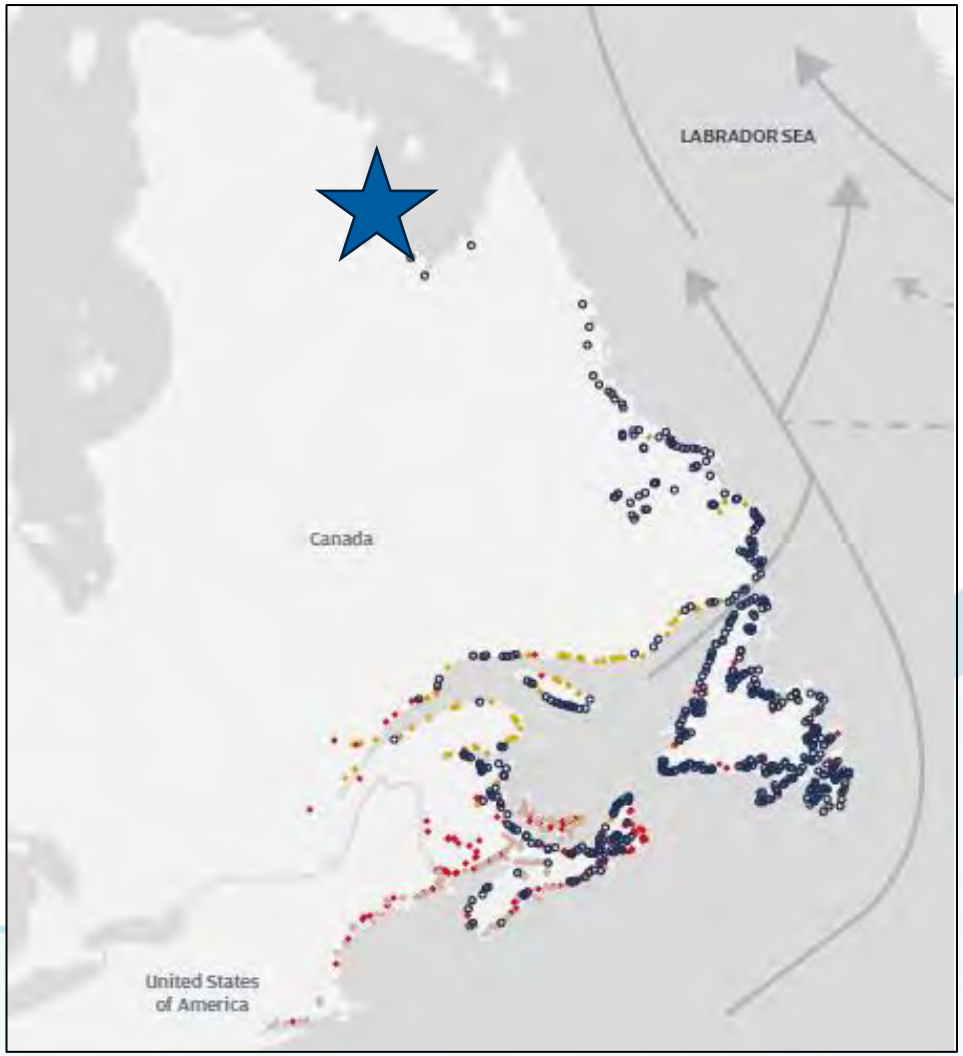
Principal component analysis (PCA) results of genotyped pink salmon

Northern Hemisphere Pink Salmon Expert Group. 2023.

Saint Fond River, Ungava Bay, Northern Quebec

Saint-Fond River:

- **Pink salmon observed in 2019 and 2021.**
- **eDNA detection in 2021.**
- **Concern for Inuit.**



Votre gouvernement

Monitoring of Saint Fond River in 2023

Counting fence with a cage :

- To assess the state of Arctic charr (*Salvelinus alpinus*)
- To verify and potentially manage the entrance of pink salmon

No pink salmon have been observed

Votre gouvernement

Monitoring of Saint Fond River in 2023

eDNA using qPCR :

- Six different sampling sites
- Seven sampling dates

No pink salmon have been detected.

Monitoring of Saint Fond River in 2023

Habitat survey

Conducted in August and February/March to identify potential spawning ground

Winter survey based on the assumption that:

- **Groundwater springs provide critical winter thermal refugia for species trying to colonize environment that have temperature close to their lower thermal limit (Dunmall et al. 2016).**
- **Such thermal refugia could be relatively easy to locate during winter since the ice in those area is likely to form later than elsewhere on the river and may even remain unfrozen.**

The area that presents the best characteristics for pink salmon spawning should be revisited in the future to verify if they are used or not, for instance using fry electrofishing.

Establishment and reproduction of pink salmon in Eastern Canada

While some rivers have been visited by pink salmon in different years, there is currently no proof of establishment and reproduction in Eastern Canada.

Acknowledgments

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Véronique Nadeau

Ministère de l'Environnement, de la Lutte contre les changements climatiques, de la Faune et des Parcs
Québec

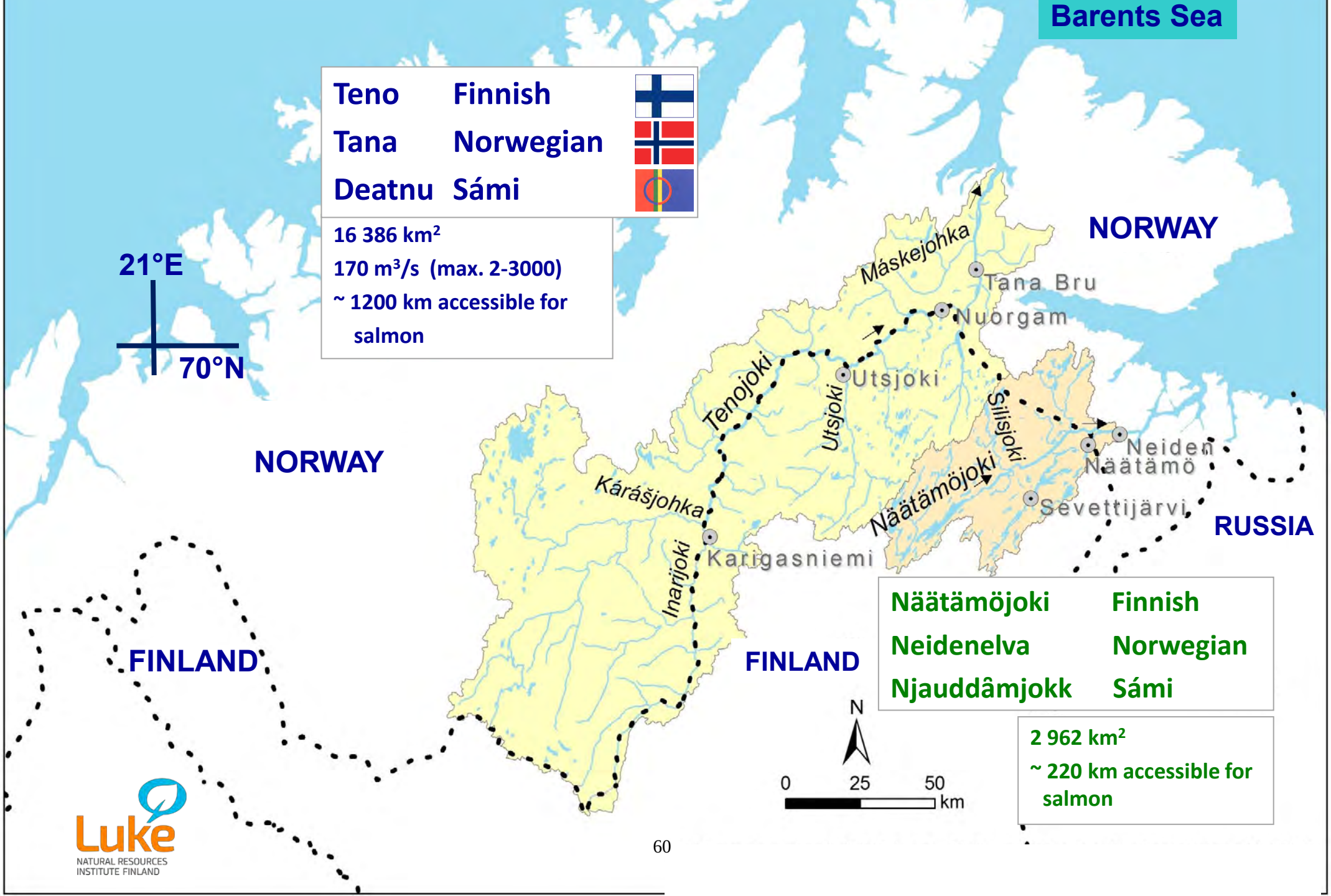
Questions?

Pink salmon in Finland

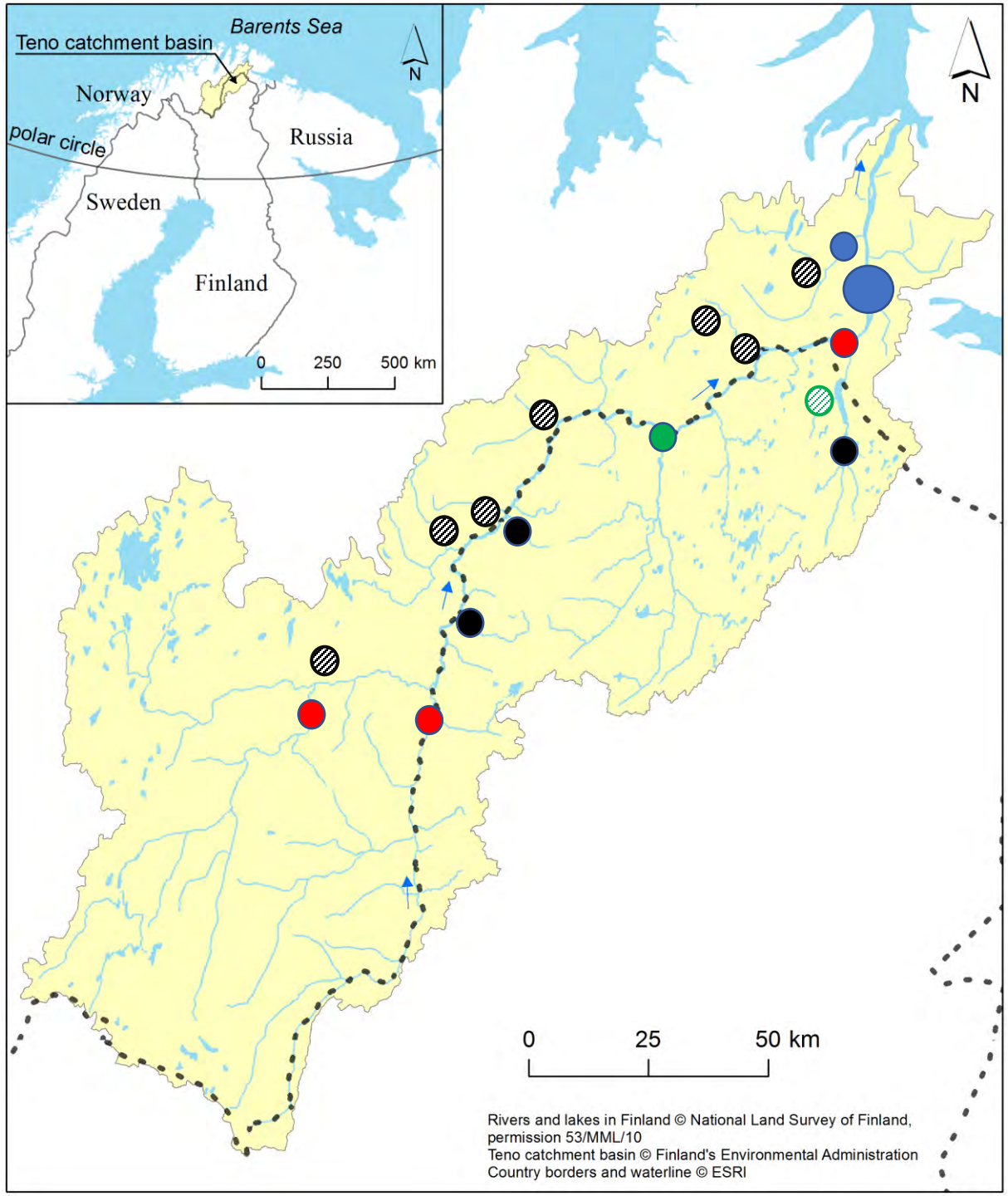
Jaakko Erkinaro

Natural Resources Institute Finland (Luke)

Photo: Pekka Tuuri


Barents Sea
Teno Finnish
Tana Norwegian
Deatnu Sámi
16 386 km²
170 m³/s (max. 2-3000)
~ 1200 km accessible for salmon
21°E
70°N
NORWAY
NORWAY
Máskejohka
Tana Bru
Nuorgam
Tenojoki
Utsjoki
Utsjoki
Siilisjoki
Neiden
Näätämö
Näätämöjoki
Sevettijärvi
RUSSIA
Kárášjohka
Karigasniemi
Inarijoki
FINLAND
FINLAND
Näätämöjoki Finnish
Neidenelva Norwegian
Njauddâmjokk Sámi
2 962 km²
~ 220 km accessible for salmon
N
0 25 50
km
Luke
NATURAL RESOURCES INSTITUTE FINLAND

Monitoring sites at the Teno/Tana river system 2023



- Sonar
- Video
- Video (new)
- Snorkelling
- Snorkelling (new)
- Weir+trap (pink salmon removal)

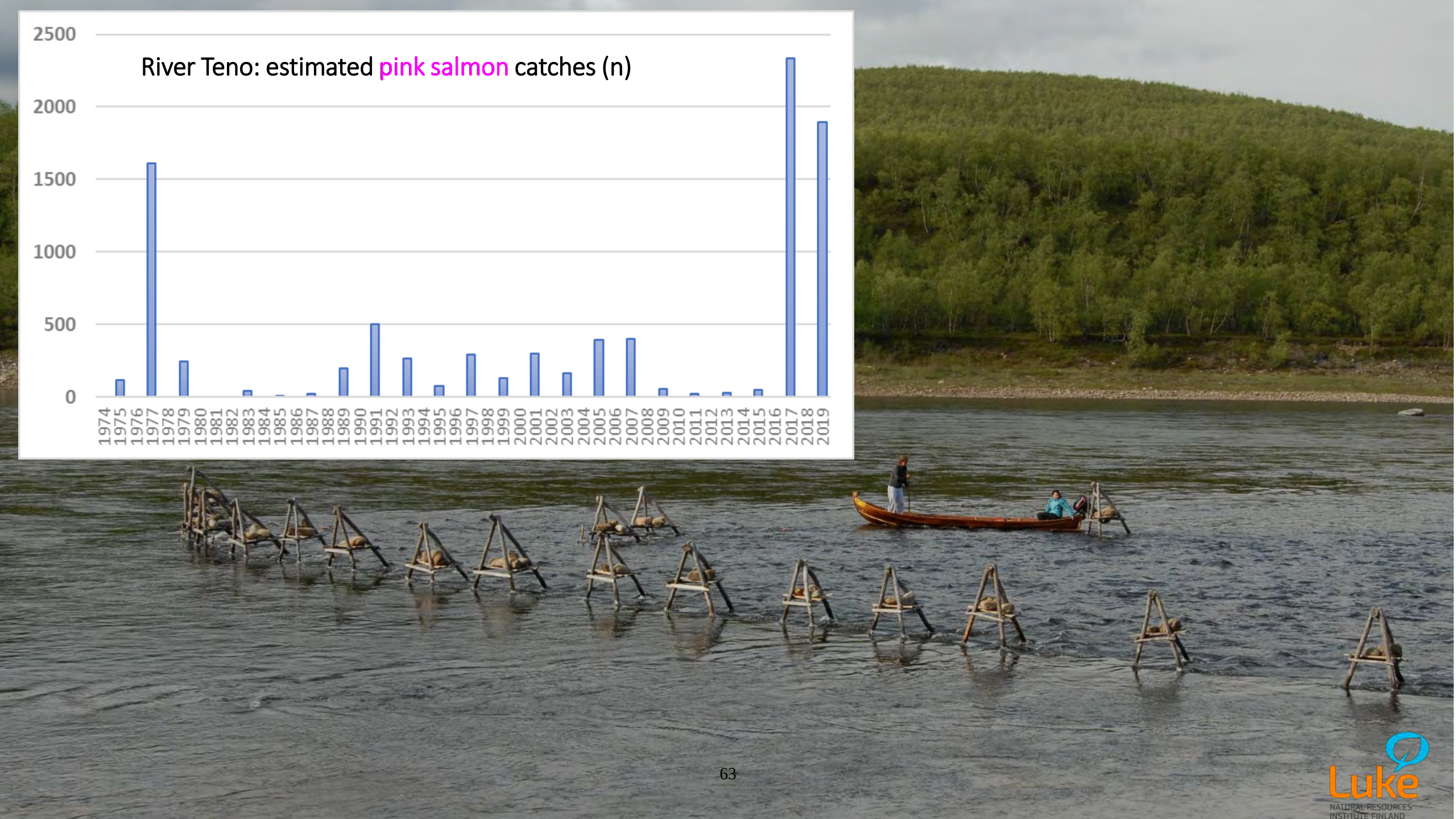
DEANUCÁZÁDAGA GUOLÁSTANHÁLDDAHUS TANAVASSDRÄGETS FISKEFÖRVALTNING

NINA

Luke NATURAL RESOURCES INSTITUTE FINLAND

Teno Atlantic salmon stock status: attainment of *spawning targets (2023) and management targets* (= 75% probability for reaching the *spawning target* over the previous 4 years)

Salmon population	Spawning target attainment 2023	Management target attainment 2020-2023
Teno main stem	69 %	0 %
Máskejohka	-	0 %
Pulmankijoki	89 %	0 %
Lákšjohka	30 %	0 %
Utsjoki	90 %	55 %
Leavvajohka	61 %	59 %
Báišjohka	20 %	1 %
Nilijoki	63 %	0 %
Akujoki	67 %	0 %
Kárášjohka	59 %	0 %
Iešjohka	-	0 %
Inarijoki	35 %	0 %



Luke
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Teno/Tana river, sonar in the lower main stem

What are we counting?

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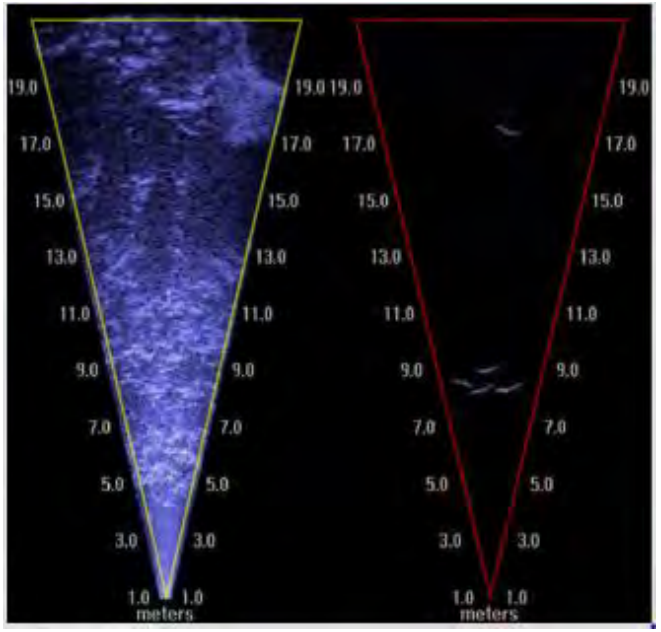
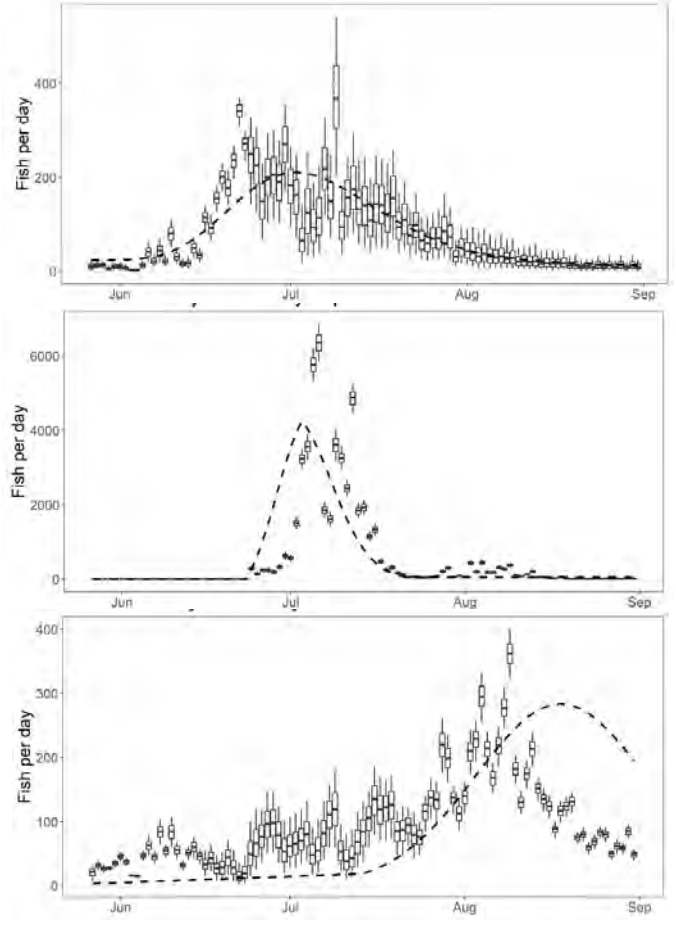
NATURAL RESOURCES INSTITUTE FINLAND

Species differentiation in sonar data?

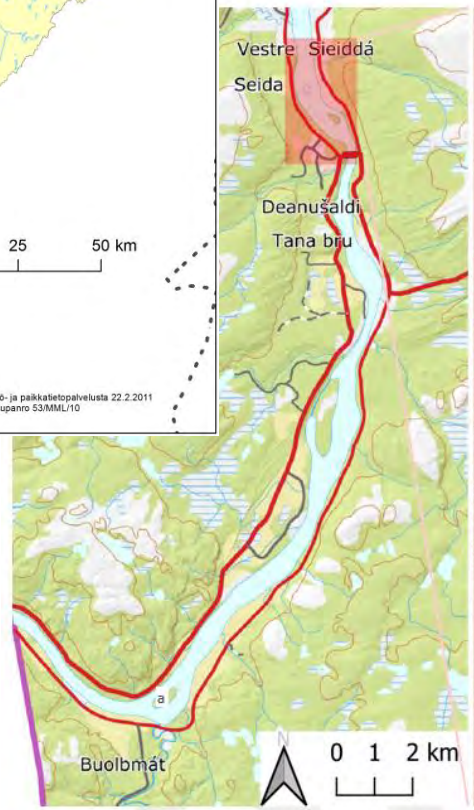
Migratory salmonid fish in the Teno/Tana in ~ 45-65 cm length class: **Atlantic salmon (1SW), pink salmon, sea trout**



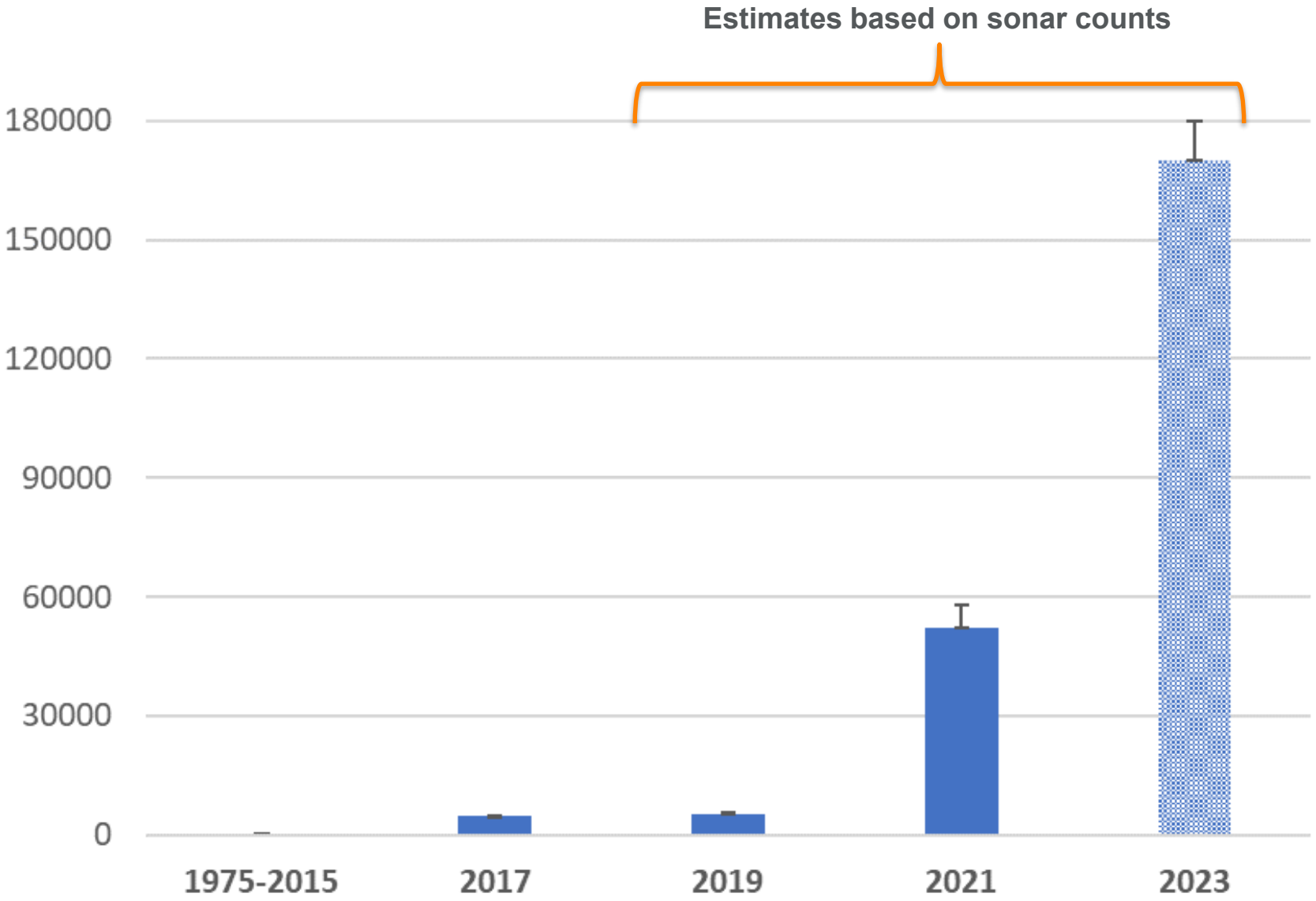
Bayesian modeling:
Data from sonar, video, catch(?), school size, run timing, size distribution …



Fence and trap in the lower Teno/Tana river in 2023



Development of pink salmon abundance in the Teno/Tana river



Removal fishery on pink salmon in the Teno river

- ✓ Developing pink-specific fishing methods **based on traditional knowledge of Sámi** in the Teno area
- ✓ Two main methods: seine and drift net
  - Modified and **tailored to catch pink salmon** during their migration and congregation at spawning areas **AND to avoid native Atlantic salmon** to the extent possible



Teno/Tana 2023

Pink salmon:

- Run size 170 000 individuals
- Removed from the Tana fence/trap: 7600
- Removed from the Maskejohka trap: 2500
- Local catch on the Finnish side: 15-20 000

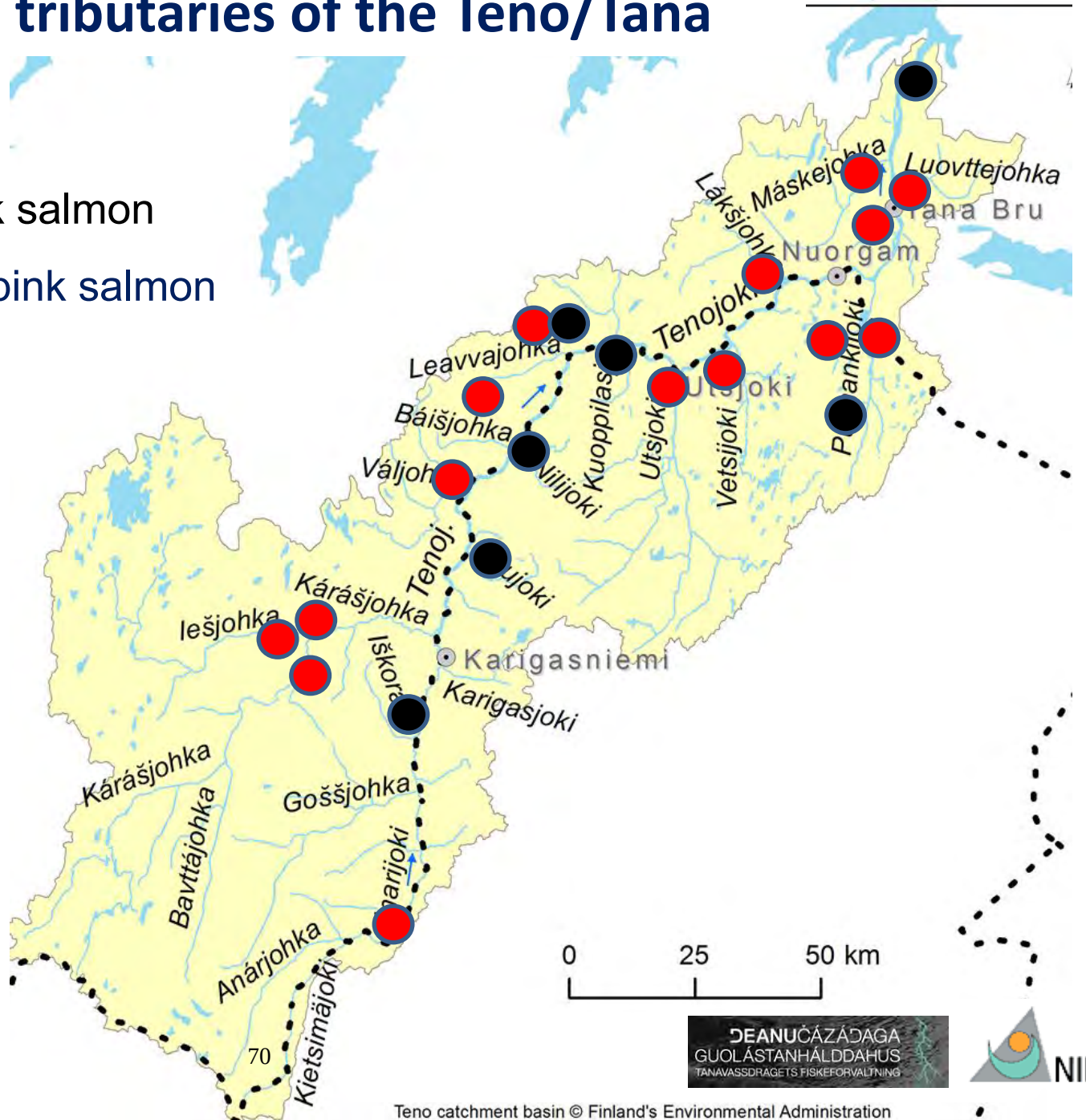
Atlantic salmon:

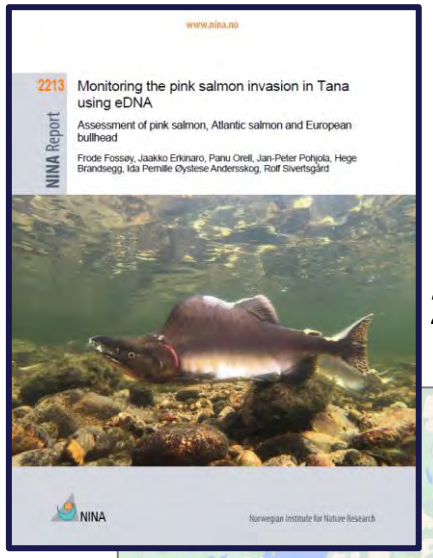
- Run size 18 000 individuals
- Released from the Tana trap: 14
- Released from the Maskejohka trap: 160
- Bycatch in pink salmon fishery on the Finnish side… small ?

Records of pink salmon in tributaries of the Teno/Tana

Pink salmon observed:

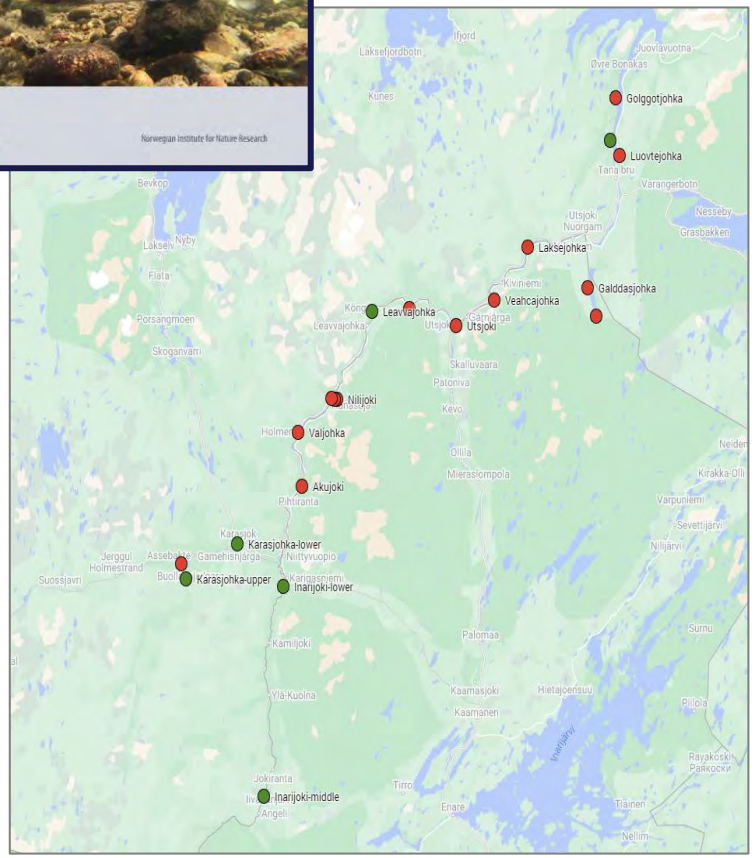
- Máskejohka
- Luovttejohka
- Lišmmajohka
- Pulmankijärvi
- Kálddasjohka
- Lákšjohka
- Vetsijoki
- Utsjoki
- Leavvajohka
- Báišjohka
- Váljohka
- Inarijoki
- Kárášjohka
- Geaimmejohka
- Iešjohka



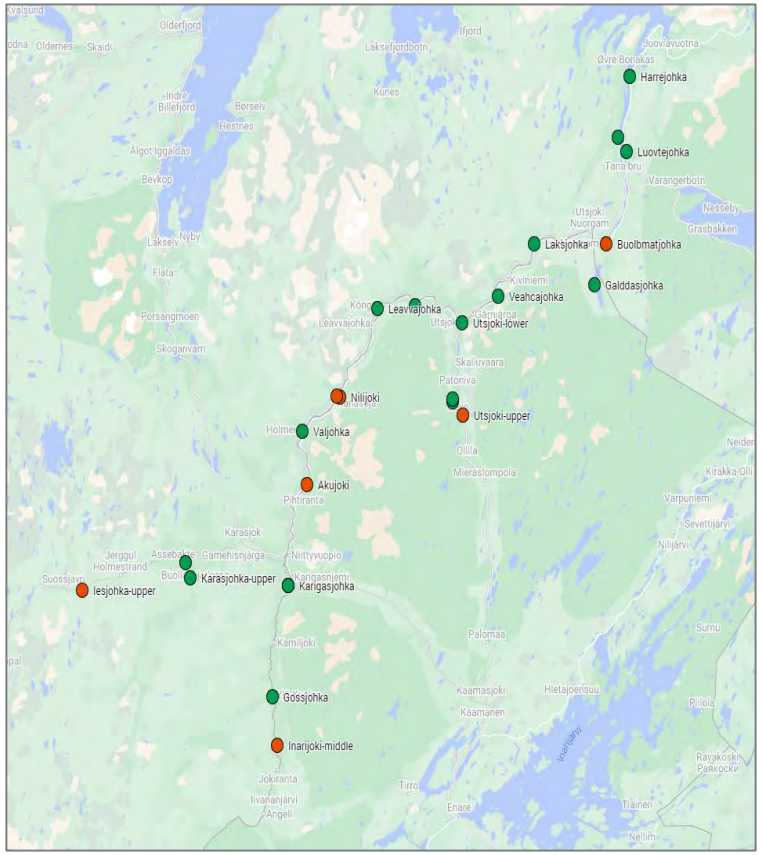


Teno river: pink salmon eDNA

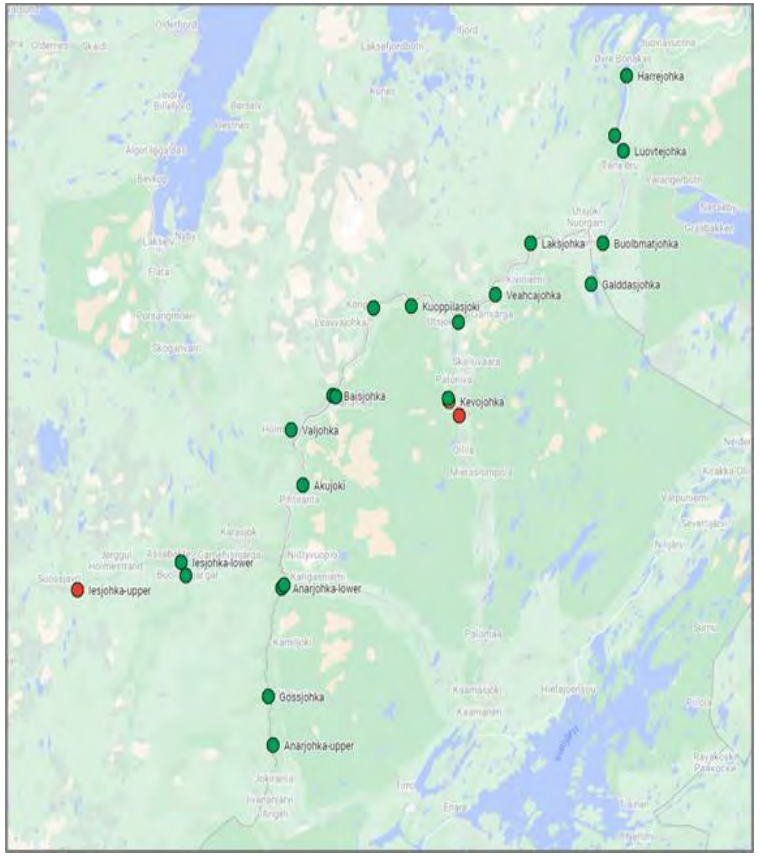
2019



2021



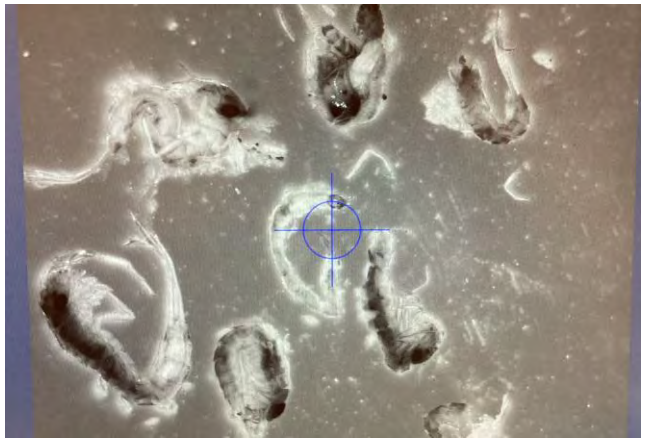
2023

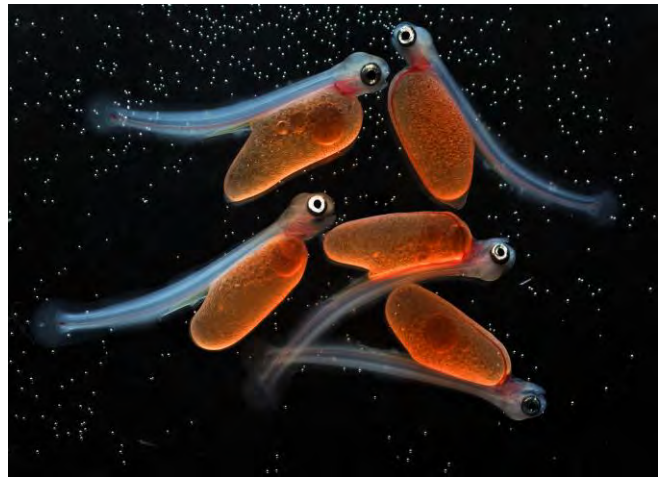


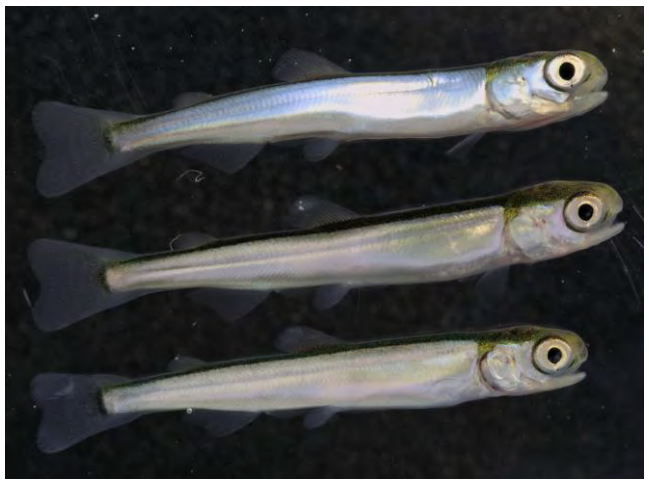
Luke
NATURAL RESOURCES INSTITUTE FINLAND

UNIVERSITY OF OULU


Photo: Aino Erkinaro








Photos:JP Pohjola, M.Kytökorpi, P.Orell, J.Erkinaro

Several research projects completed and underway:

Received: 3 March 2022 | Accepted: 1 July 2022
DOI: 10.1111/jfb.15157

BRIEF COMMUNICATION

JOURNAL OF FISH BIOLOGY

Development of invasive pink salmon (*Oncorhynchus gorbuscha* Walbaum) eggs in a large Barents Sea river

Jaakko Erkinaro[1] | Panu Orell[1] | Jan-Peter Pohjola[2] | Mikko Kytökorpi[2] | Henni Pulkkinen[1] | Jorma Kuusela[2]

REGULAR ARTICLE | Open Access

JOURNAL OF FISH BIOLOGY

Active feeding of downstream migrating juvenile pink salmon (*Oncorhynchus gorbuscha*) revealed in a large Barents Sea river using diet and stable isotope analysis

Jaakko Erkinaro, Panu Orell, Mikko Kytökorpi, Jan-Peter Pohjola, Michael Power

First published: 20 November 2023 | https://doi.org/10.1111/jfb.15625

River Näätämönjoki/Neidenelva

Pink salmon were removed from the fish pass at the Skoltefossen falls on the Norwegian side of the system, or were otherwise captured below the falls. Very few passed the waterfall and entered upstream to Finland

Photos: Jaakko Erkinaro

Acknowledgements:

Panu Orell
Mikko Kytökorpi
Karl Gjelland
Sigurd Domaas
Pierre Fagard
Morten Falkegård
Jorma Kuusela
…
…

Photo: Pekka Tuuri

EU (Ireland) Briefing for NASCO pink salmon working group

Michael Millane, Conor McCormick and Paddy Gargan

Inland Fisheries Ireland

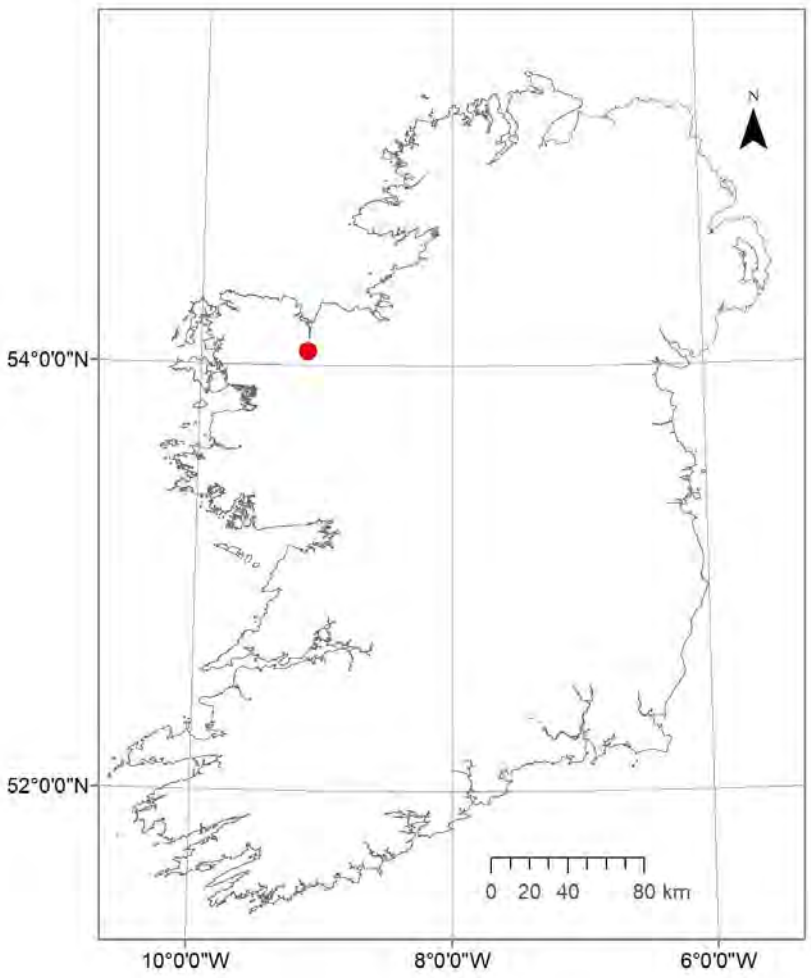
NASCO Pink Salmon Working Group 2024 09-03-2024

Iascach Intíre Éireann
Inland Fisheries Ireland

Status

First record in August 1973 when a single specimen was caught by an angler in the River Moy

Until 2017, individuals have been infrequently observed in Irish waters and such reports are largely anecdotal and unverified



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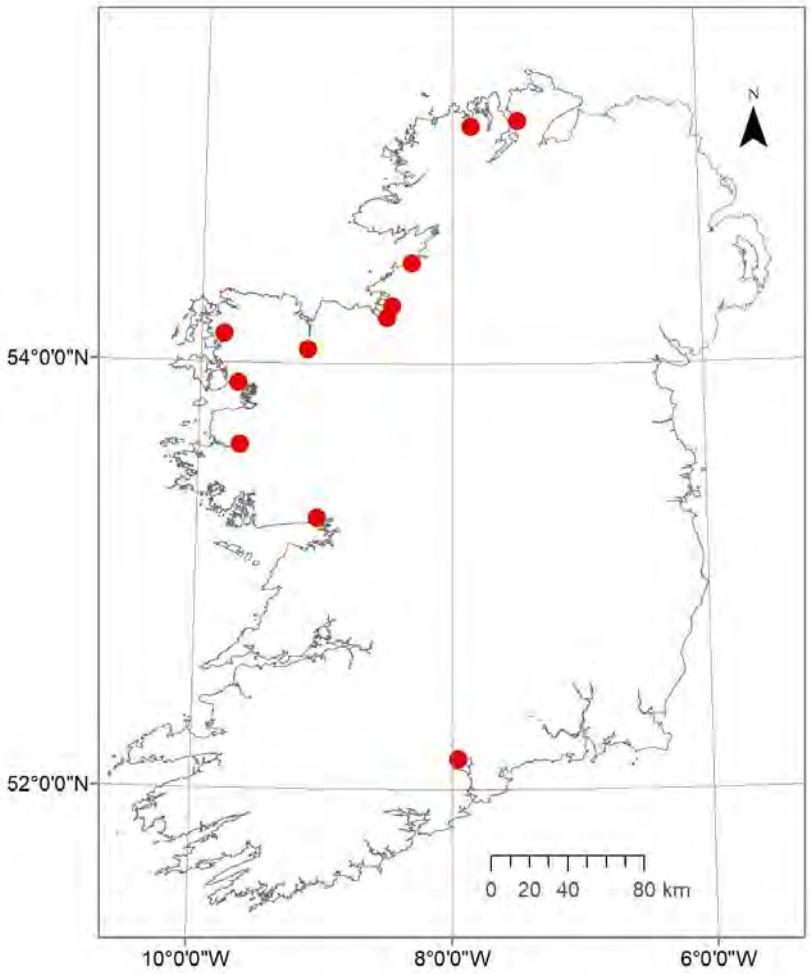
Year	No. fish	No. rivers
2017	36	11



Iascach Intíre Éireann
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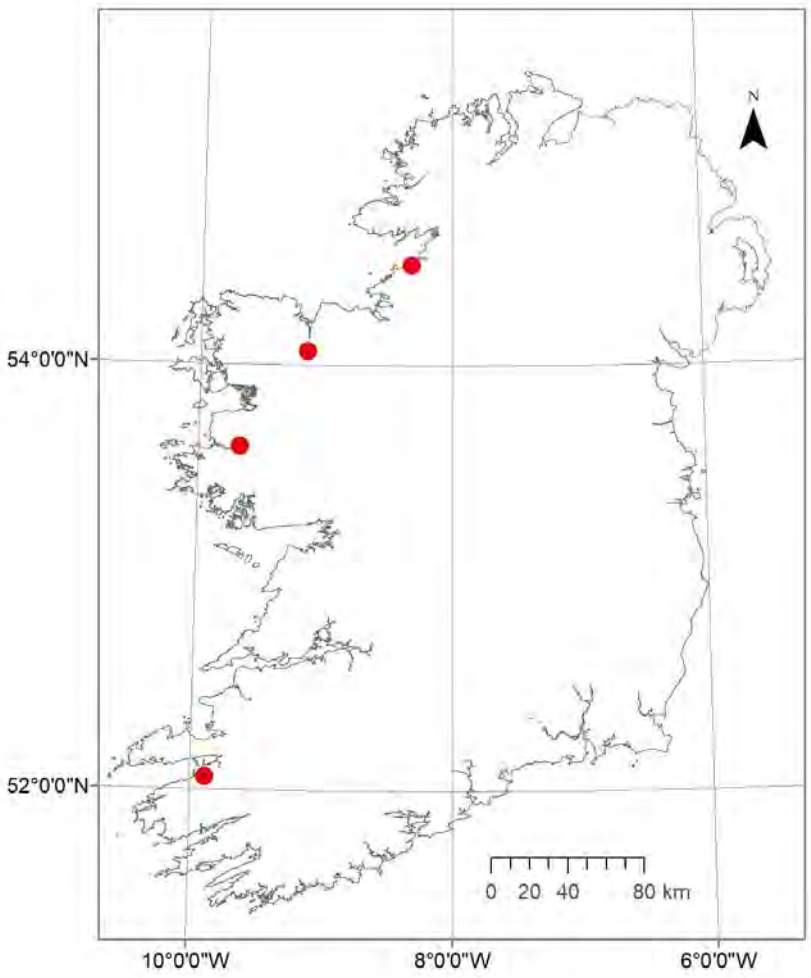
Until 2017, individuals have been infrequently observed in Irish waters and such reports are largely anecdotal and unverified

Year	No. fish	No. rivers
2017	36	11
2019	11	4



Iascach Intíre Éireann
Inland Fisheries Ireland

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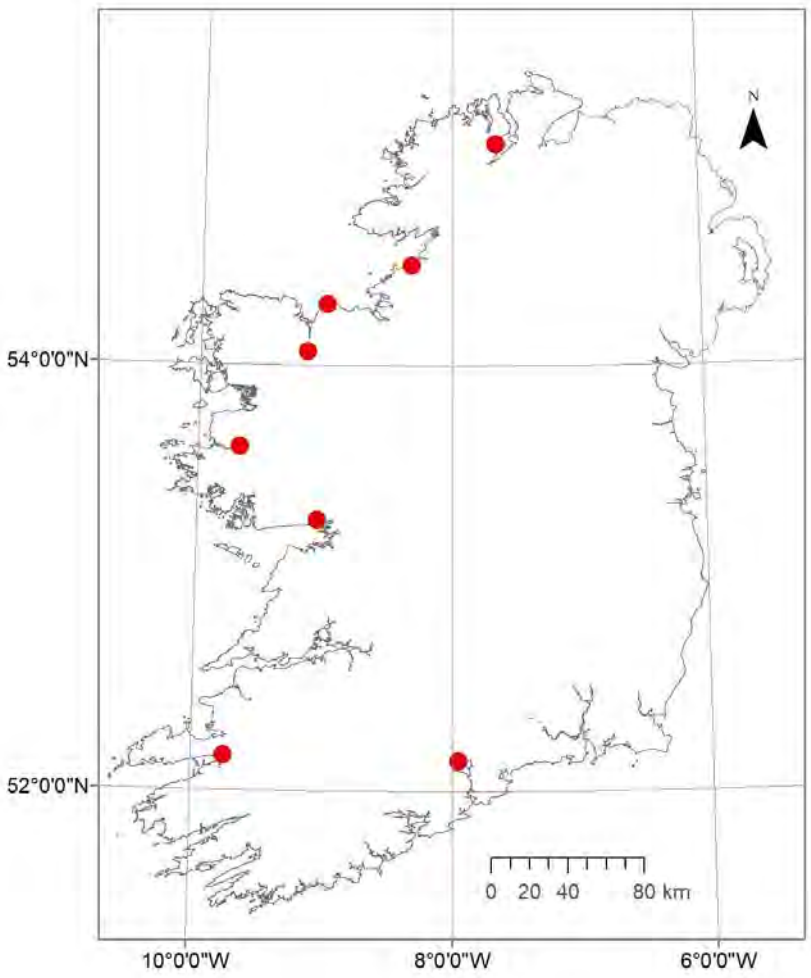
Until 2017, individuals have been infrequently observed in Irish waters and such reports are largely anecdotal and unverified

Year	No. fish	No. rivers
2017	36	11
2019	11	4
2021	45	8

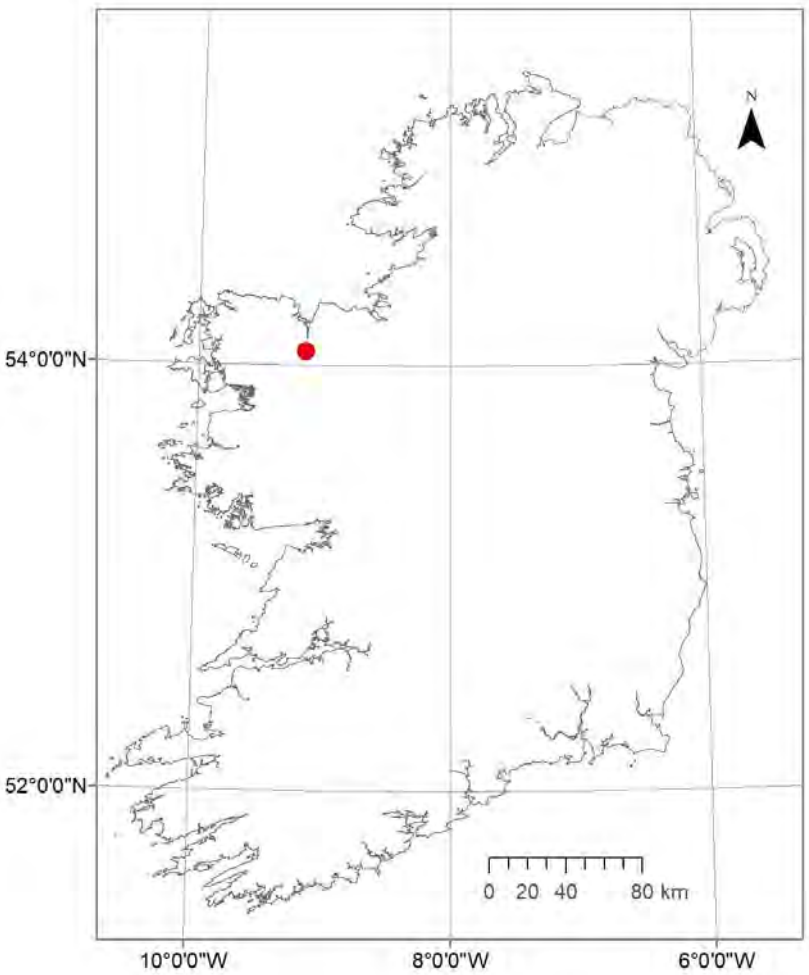


Iascach Intíre Éireann
Inland Fisheries Ireland

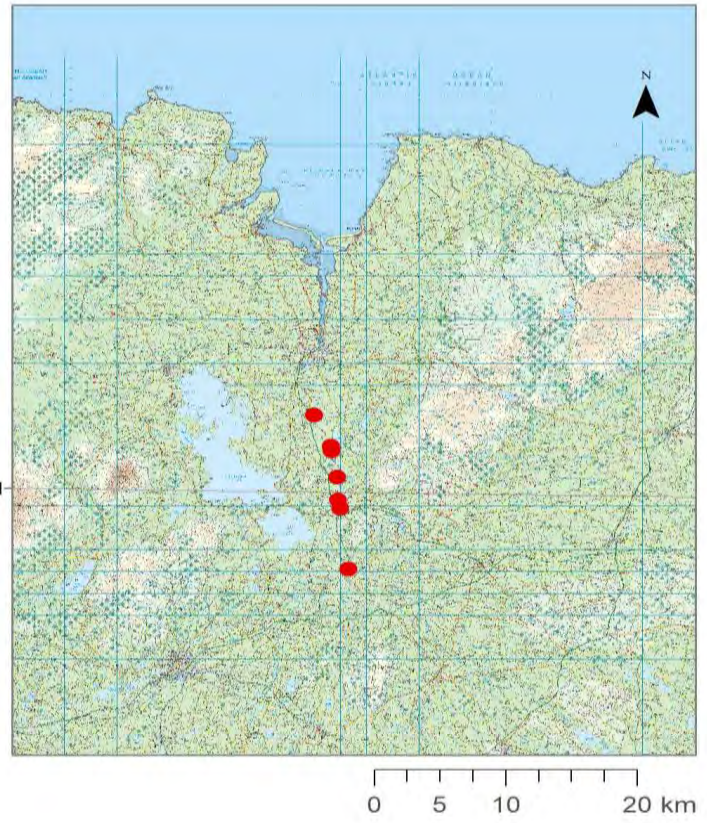
Status

River Moy 2023

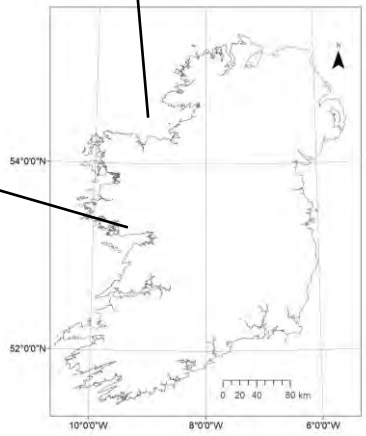
Year	No. fish	No. rivers
2017	36	11
2019	11	4
2021	45	8
2023	1	1



Iascach Intíre Éireann
Inland Fisheries Ireland



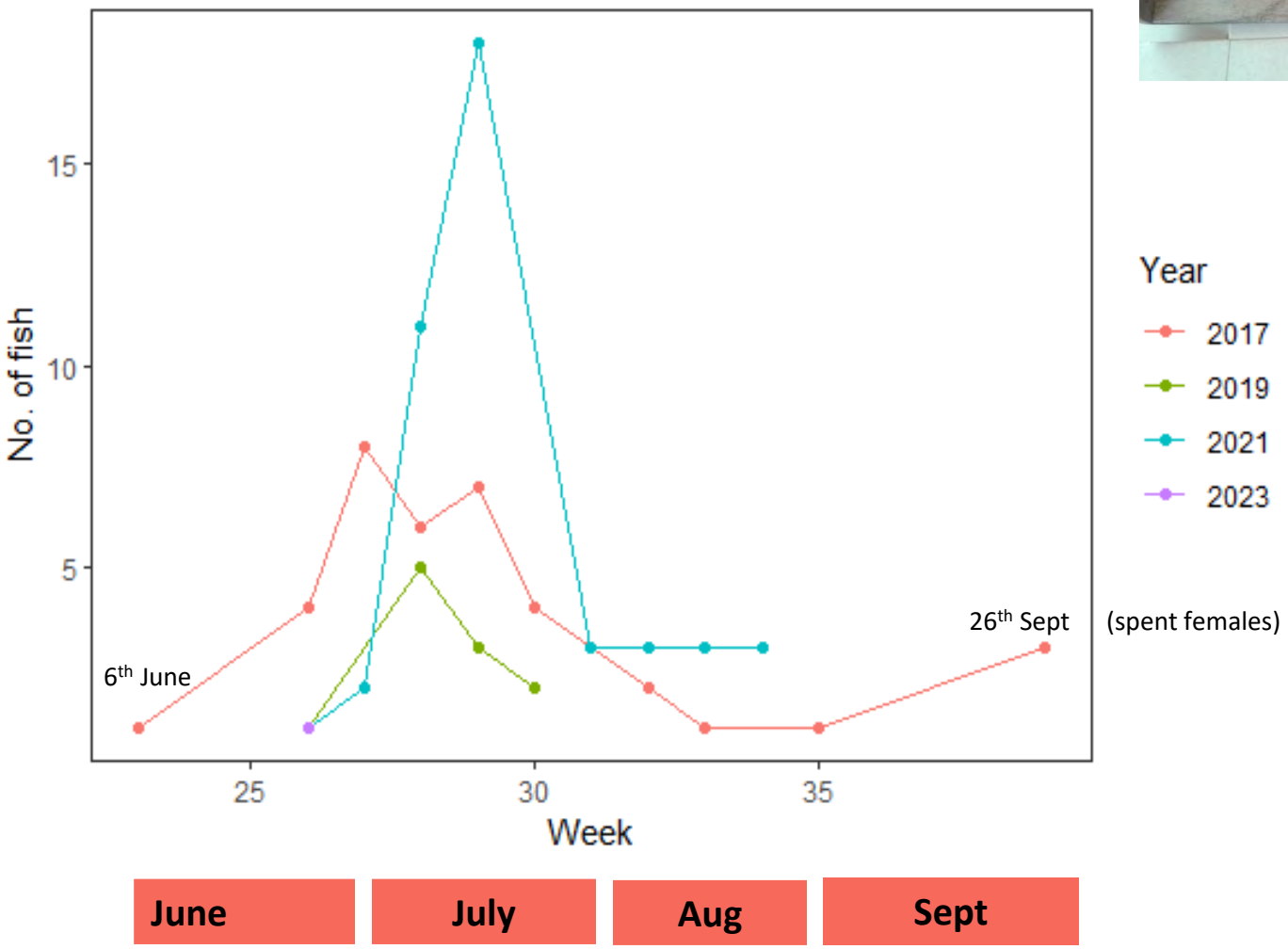
Moy fish caught c. 6 km to 25 km upstream of head of tide



Corrib fish caught c. 34 km upstream of head of tide

Incursion into freshwater (2017)

Time of occurrence



(spent females)

Biological characteristics

Parameter	N	Mean	Min	Max
Length (cm)	49	45.6	35	59.3
Weight (kg)	63	1.2	0.5	2.3

Parameter	N	Male	Female
Sex	49	39	10

All sexed fish considered mature / ripe

Pathogens and parasites tested for in 2017, with no significant identified

Redds

No evidence to date
Moy survey in 2021 after reported redd activity
Dead specimens encountered in 2017 (spent females)

Creating stakeholder awareness to promote reporting

RTE

Anglers asked to watch out for Pacific pink salmon

Anglers have been asked to report any sighting of Pacific pink salmon in Irish rivers and waterways over the coming months.

19 May 2023

Irish Examiner

Public urged to report sightings of invasive pacific pink salmon in Irish waters

The presence of large numbers of this non-native species could pose a threat to native species such as Atlantic salmon and sea trout,...

18 May 2023

Buzz.ie

Inland Fisheries Ireland calls on anglers to look out for Pacific pink salmon in Ireland's waterways

The non-native species post a competitive threat to Ireland's native species such as Atlantic salmon and sea trout.

19 May 2023

Connaught Telegraph

Inland Fisheries Ireland alert over Pacific pink salmon in Irish rivers

INLAND Fisheries Ireland is urging anglers, and the general public, to report sightings of Pacific pink salmon in Irish rivers over the...

19 May 2023

Large media interest after IFI press releases & social media (27 specimens retained from 2021)

Stakeholder awareness

Iascach Intíre Éireann
Inland Fisheries Ireland

Pink salmon

Oncorhynchus gorbuscha

Non-native Fish Species Alert!

Anglers who encounter pink salmon in Irish river systems are requested to contact us immediately and record:

- date and location of capture,
- length and weight of the fish,
- and take a photograph.

Such fish should be tagged & retained for Inland Fisheries Ireland. Used tags will be replaced.

info@fisheriesireland.ie ☎ 01 8842600

To report any sightings of pink salmon please contact

☎ 1890 34 74 24

Iascach Intíre Éireann
Inland Fisheries Ireland

What are pink salmon?

Pink or humpback salmon are a migratory species of salmon, native to river systems in the northern Pacific Ocean and adjacent regions of the Bering Sea and Arctic Ocean. Outside of its native range, the species has established self-sustaining populations in rivers in northern Norway and in the far northwest of Russia. These populations are believed to have originated from stocking programmes undertaken in this part of Russia in the second half of the 20th century.

Potential reoccurrence of pink salmon in Ireland in 2021

The widespread occurrence of pink salmon in Ireland in 2017 and 2019 was unprecedented with fish recorded in multiple river systems throughout the country. Previous to this, pink salmon were rarely recorded here. With a typical two-year lifecycle, there is potential for reappearance of pink salmon in Irish river systems in 2021 and anglers are asked to be vigilant in this regard.

Identification of pink salmon

- Adult fish fresh from the sea are blue-green to steel blue on the back, with silver sides and a white underbelly
- Typical length range: 40-55 cm (maximum 76 cm)
- Typical weight range: 1.0-2.5 kg (maximum 6.8 kg)
- Males develop a pronounced humpback in freshwater
- Large black oval spots on tail
- Very small scales, much smaller than a similarly-sized Atlantic salmon
- Upper jaw typically extends beyond eye
- Anal fin rays: 11-19. Atlantic salmon have 7-11 rays
- No dark spots on gill cover

Dead specimens may be encountered along rivers, as these fish die after spawning

https://www.fisheriesireland.ie/sites/default/files/migrated/docman/Pink%20Salmon%20Alert%202021.pdf

Assessment of potential ecological impacts

- Environmental and ecological conditions are considered favourable for establishment
- Very limited information available to comprehensively evaluate the potential impacts
- The establishment capacity likely to be determined by the level of propagule pressure experienced.
- No overlap in the late summer-autumn spawning period with either Atlantic salmon or brown / sea trout
- Aggressive behaviour towards native fish - push out Atlantic salmon from holding pools
- Limited scope for food resource competition
- Novel food source for native salmonids?

https://www.fisheriesireland.ie/sites/default/files/2021-08/assessment-of-potential-ecological-impacts-of-pink-salmon-and-their-capacity-for-establishment-in-ireland.pdf

Current and upcoming projects

- Risk assessment based on EU risk assessment template

- PinkSIES project (Michał Skora *et al.* QMUL)

assess impact on native salmonids both at sea and in recently-invaded rivers by determination of the distribution of pink salmon feeding grounds in the North Atlantic, assessment of competition with Atlantic salmon at sea, determination of field metabolic rates (hence thermal sensitivity) of both salmon species, prediction of future marine distributions, and evaluation of the ecological role of pink salmon fry in recently-invaded rivers.

Current and upcoming projects

- eDNA surveillance

- EU-funded NASCO PINKTRACK project
  - *Standardisation and evaluation of methods / approaches*
  - *NINA involved*
  - *EU surveillance network*

Thank you

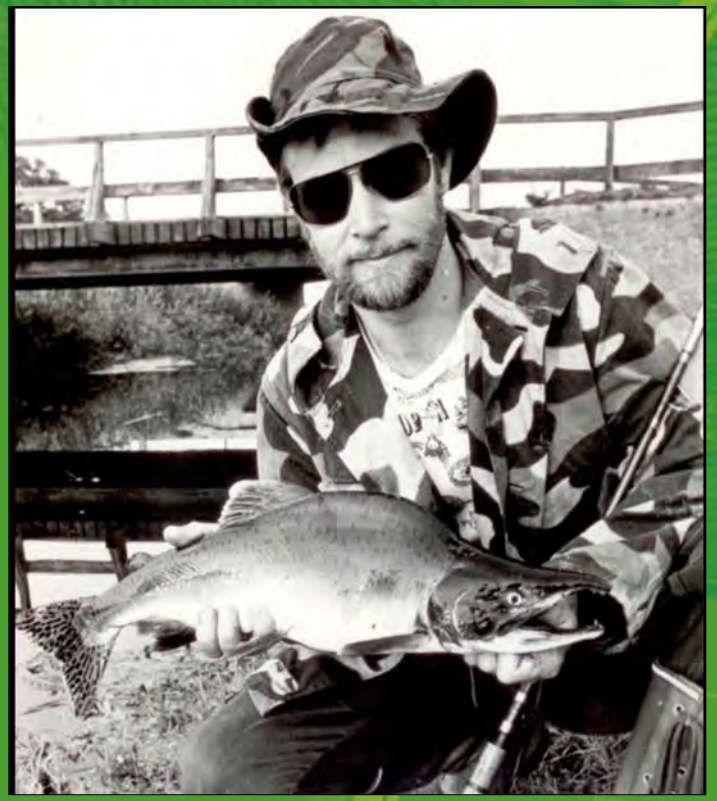
Acknowledgements

- Inland Fisheries Ireland
- Angling stakeholders and IFI staff who provided specimens


SLU
SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

NASCO working group on pink salmon - Sweden

Tom Staveley
Researcher
Institute of Freshwater Research
Department of Aquatic Resources (SLU Aqua)
Swedish University of Agricultural Sciences



Börje Dahllöf, Nybroån, Skåne 1975

Pink salmon in Sweden

1. Data so far
2. Projects
   a) The invasive pink salmon
   b) Nordic cooperation
   c) PINKTrack

SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

Pink salmon records 2017-2021

Skagerrak

Lake Vänern

Enningsdalsälven

Örekilsälven-Kvistrum

Ljungskileviken

Göta älv-Trollhätten

Göta älv-Lilla Edet

Säveån

Gothenburg

Ätran-Nydala

Ätran-Herting

Ätran-Vessingebo

Fylleån

Laholm

Kattegat

- 1974-2016: ca. 5 reports
- 2017: 46 reported
- 2019: 5 reported
- 2021: 70 reported

Received: 3 June 2022 | Revised: 5 July 2022 | Accepted: 20 July 2022

DOI: 10.1002/ece3.9194

Ecology and Evolution Open Access WILEY

NATURE NOTES

Pink salmon distribution in Sweden: The calm before the storm?

Thomas A. B. Staveley | Ida Ahlbeck Bergendahl

Department of Aquatic Resources, Institute of Freshwater Research, Swedish University of Agricultural Sciences, Drottningholm, Sweden

Correspondence
Thomas A. B. Staveley, Department of Aquatic Resources, Institute of Freshwater Research, Swedish University of Agricultural Sciences, Stångholmsvägen 2, SE-178 93 Drottningholm, Sweden.
Email: tom.staveley@slu.se

Funding information
Swedish University of Agricultural Sciences.

Abstract

Pink salmon distribution has recently expanded substantially across northern Europe. On the Swedish west coast, relatively few pink salmon have been observed to date; nonetheless, a notable rise in 2021 (70 observations). However, with no national monitoring together with a ceased Atlantic salmon commercial fishery, there is little opportunity to understand the extent of the spread in this region. Here, we present the current data and address the need for future monitoring and research in order to understand the potential impacts of this invasive species in Sweden's aquatic ecosystems.

KEYWORDS
invasive species, North Atlantic, river, salmonid, temperate

TAXONOMY CLASSIFICATION
Invasion ecology

The invasive pink salmon:

distribution, reproductive potential and biodiversity threats in Sweden

NINA
Norsk institutt for naturforskning

LÄNSSTYRELSEN
VÄSTRA GÖTALANDS LÄN

LÄNSSTYRELSEN
HALLANDS LÄN

LÄNSSTYRELSEN
I SKÅNE LÄN

SLU
Sveriges lantbruksuniversitet
Swedish University of Agricultural Sciences

A Swedish Research Council FORMAS funded project 2023-24

PI: Tom Staveley & Ida A Bergendahl, SLU Aqua

MIX Research
Sweden

The invasive pink salmon:

distribution, reproductive potential and biodiversity threats in Sweden

Team kick-off. Pink salmon in Sweden
Gothenburg 2023

A Swedish Research Council FORMAS funded project 2023-24

PI: Tom Staveley & Ida A Bergendahl, SLU Aqua

NINA
Norsk institutt for naturforskning

LÄNSSTYRELSEN
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HALLANDS LÄN

LÄNSSTYRELSEN
I SKÅNE LÄN

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Swedish University of Agricultural Sciences

MIX Research
Sweden

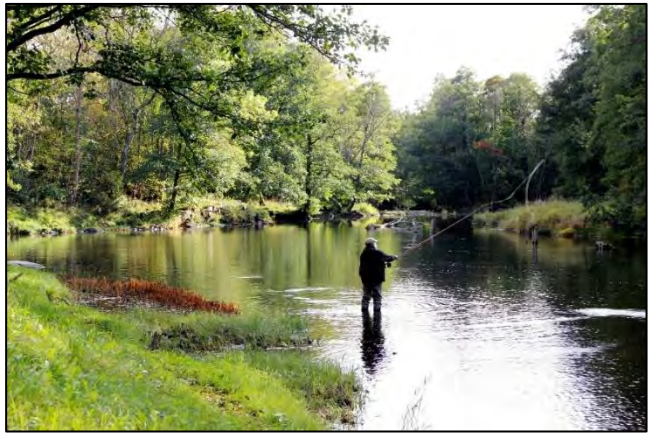
Short-term goals

- Determine the distribution of pink salmon in Swedish rivers
- Understand the reproductive success of pink salmon in Swedish rivers

Long-term goals

- Determine threats and impacts to native fish species
- Assess societal and traditional values of salmonids
- Solutions to tackle pink salmon

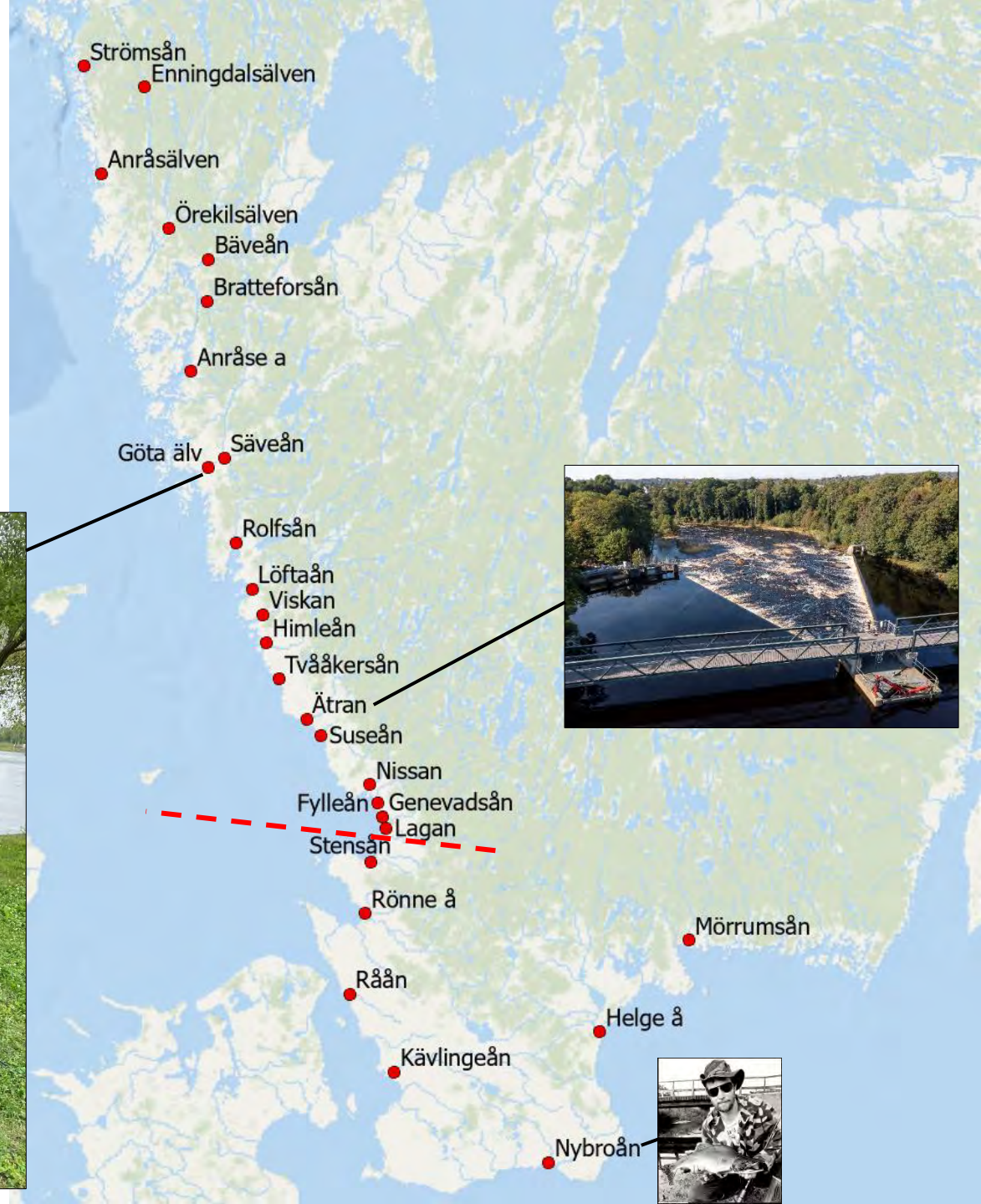

Photo: Hans Schibli




3: Awareness
1: Distribution
2: Reproduction

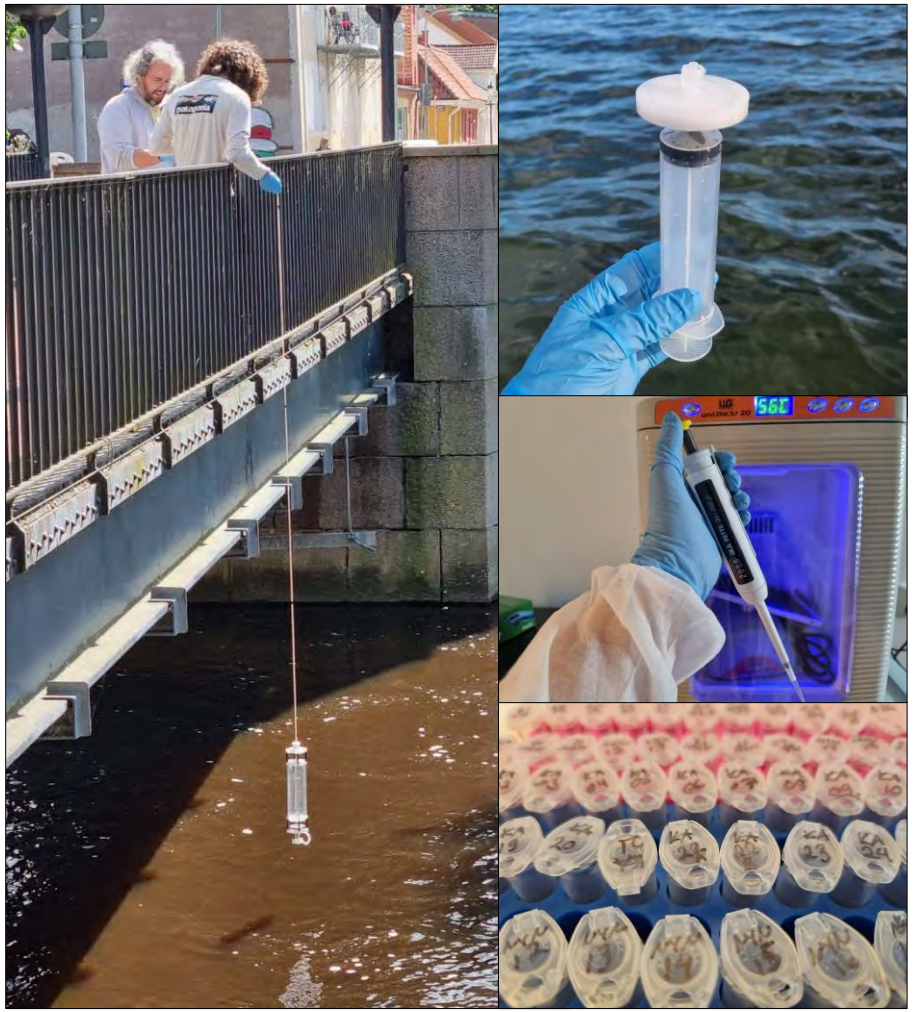
Work package 1:
Distribution of pink salmon in Sweden

- 2023: 13 reports
- eDNA sampling



Work package 1:

eDNA sampling – qPCR & metabarcoding



Work package 1:
Distribution of pink salmon in Sweden

Preliminary results

- eDNA sampling
  - 9 rivers systems positive

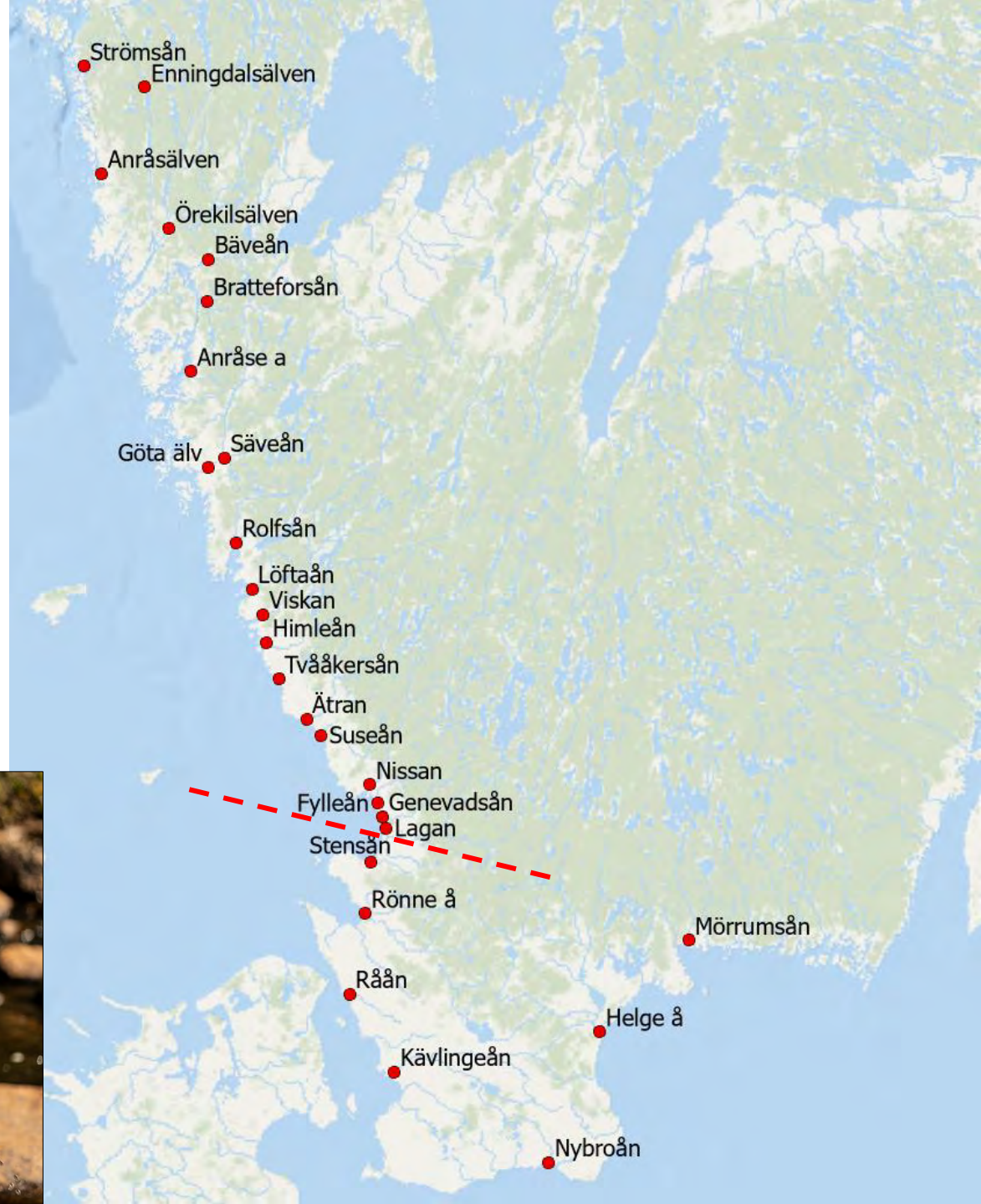



Photo: Håvard Vistnes

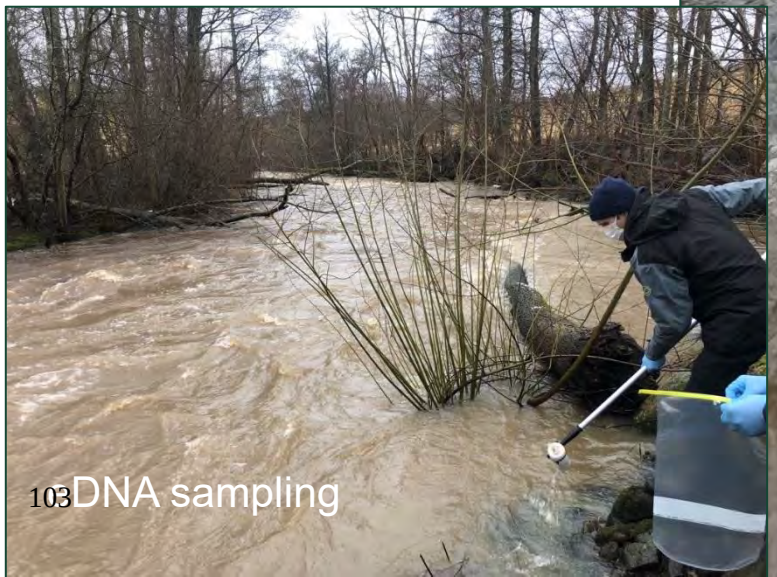
Work package 2:

Long-term establishment of pink salmon

Sampling 5 rivers with high detections of pink salmon from 2023 to investigate spawning success

- **eDNA**
- **Electrofishing**

Surveys in February, March, April & May 2024


eDNA sampling

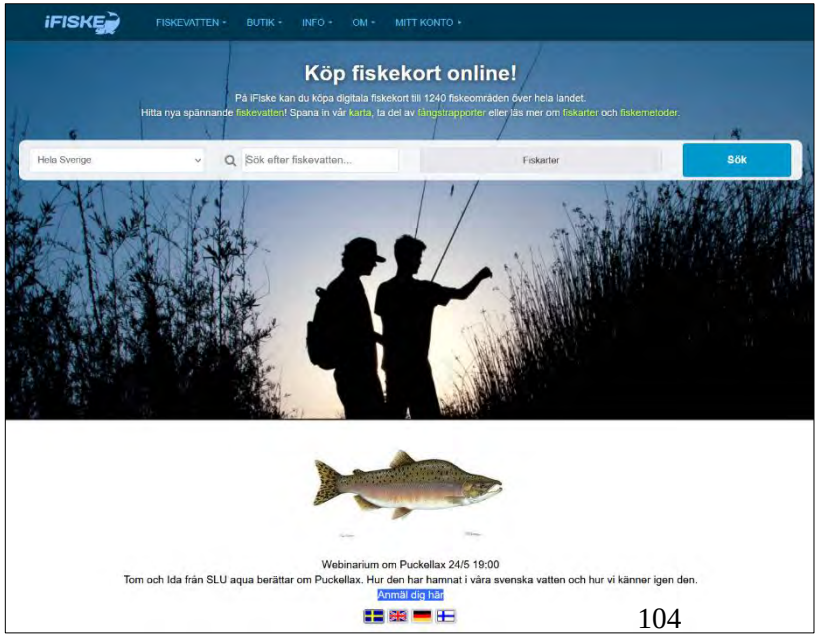

Electrofishing

Work package 3:

Awareness & public outreach

Raise awareness

Webinars, Stickers, Posters, Website & Social media



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startpage slu / departments / department of aquatic resources / research / biodiversity and conservation / Pink salmon in Sweden

Pink salmon in Sweden

Pink salmon is an alien species in Sweden. SLU is mapping its distribution.
Help us by reporting pink salmon sightings!

slu.se/pink-salmon

Report sightings here!

If you catch or see a pink salmon please report it here on Rappen.

Pink salmon FWS, U.S. Fish and Wildlife Service, QC Public domain, https://commons.m.wikimedia.org/wiki/File:Pink_salmon_FWS.jpg

What is a pink salmon?

Black dots on the tail, black tongue. The male has a distinct bump on its back during spawning

About the project

During 2023-2024 SLU are investigating the distribution of pink salmon in Sweden

Work package 3:

Awareness & public outreach

Future exhibitions & events

- Havets hus aquarium (west coast)
- Baltic Sea Science Centre (east coast)
- Webinars
- Meetings and seminars

Nordic cooperation and strategies for managing the invasive pink salmon

Since the numbers of pink salmon vary immensely between Nordic countries, we will discuss and propose a Nordic risk analysis regarding the increasing pink salmon populations across the region.

NASCO PINKTrack

The project aims to:

- better understand the extent of occurrence of pink salmon in EU waters through the use of environmental DNA (eDNA).
- Identify temporal and geographic patterns of spread and provide an ‘early warning system’.
- inform appropriate management responses.

Sweden is involved primarily in the eDNA sampling programme in multiple river systems along the Swedish west coast.

Thank you for your attention

Tom Staveley
Researcher

Institute of Freshwater Research, Stockholm
Department of Aquatic Resources (SLU Aqua)
Swedish University of Agricultural Sciences

tom.staveley@slu.se
@tabstaveley

www.slu.se/pink-salmon


Institute of Freshwater Research

SCIENCE AND EDUCATION FOR SUSTAINABLE LIFE

Norwegian Environment Agency

PSWG(24)15

Pink salmon in Norway

Eirik Frøiland

Photo: Malin Solheim Høstmark

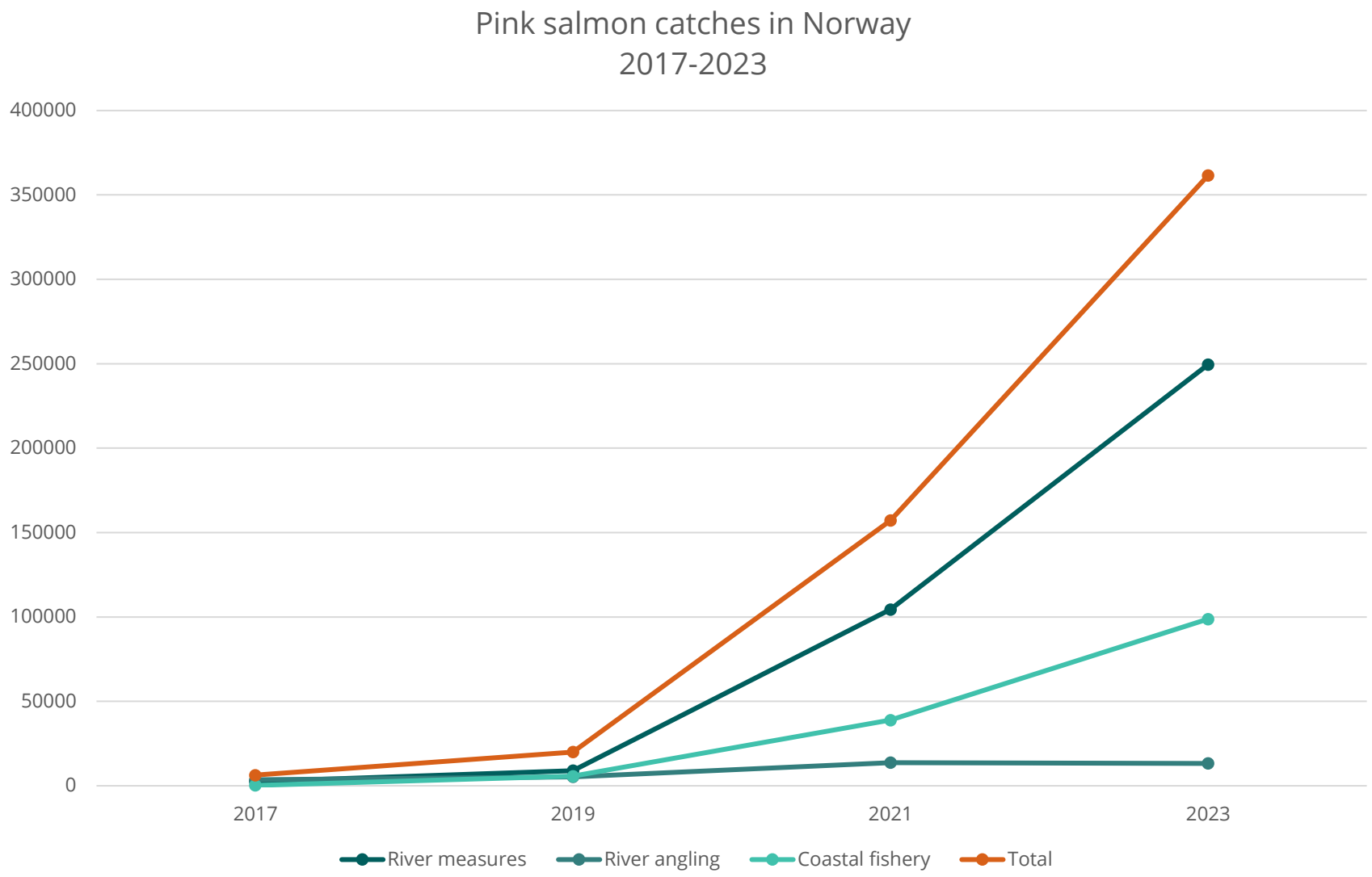

Pink salmon catches in Norway
2017-2023
400000
350000
300000
250000
200000
150000
100000
50000
0
2017
2019
2021
2023
River measures
River angling
Coastal fishery
Total

Foto: Lars Åke Andersen

Photo: Joacim Henriksen

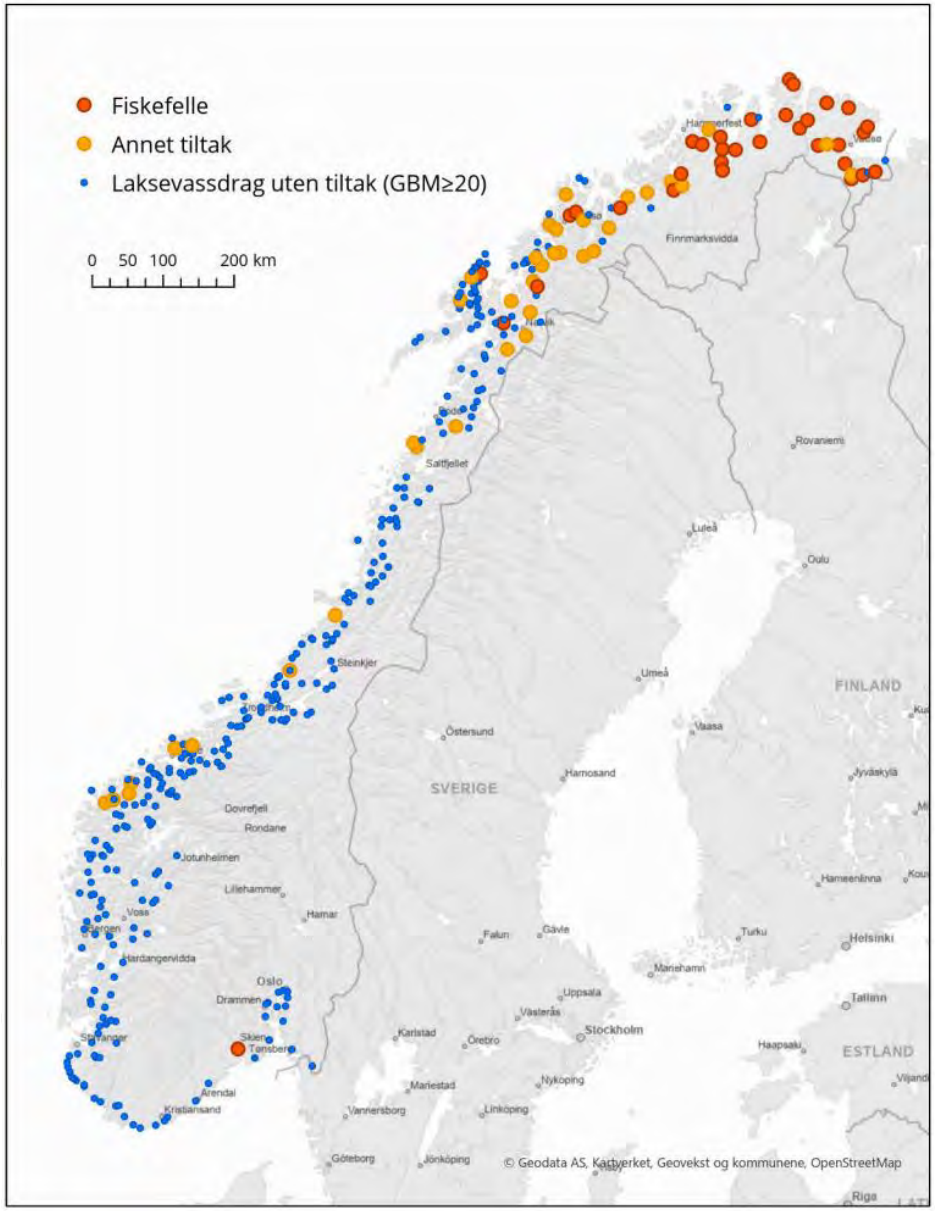
Photo: Båtsfjord JFF

Sea salmon fishery

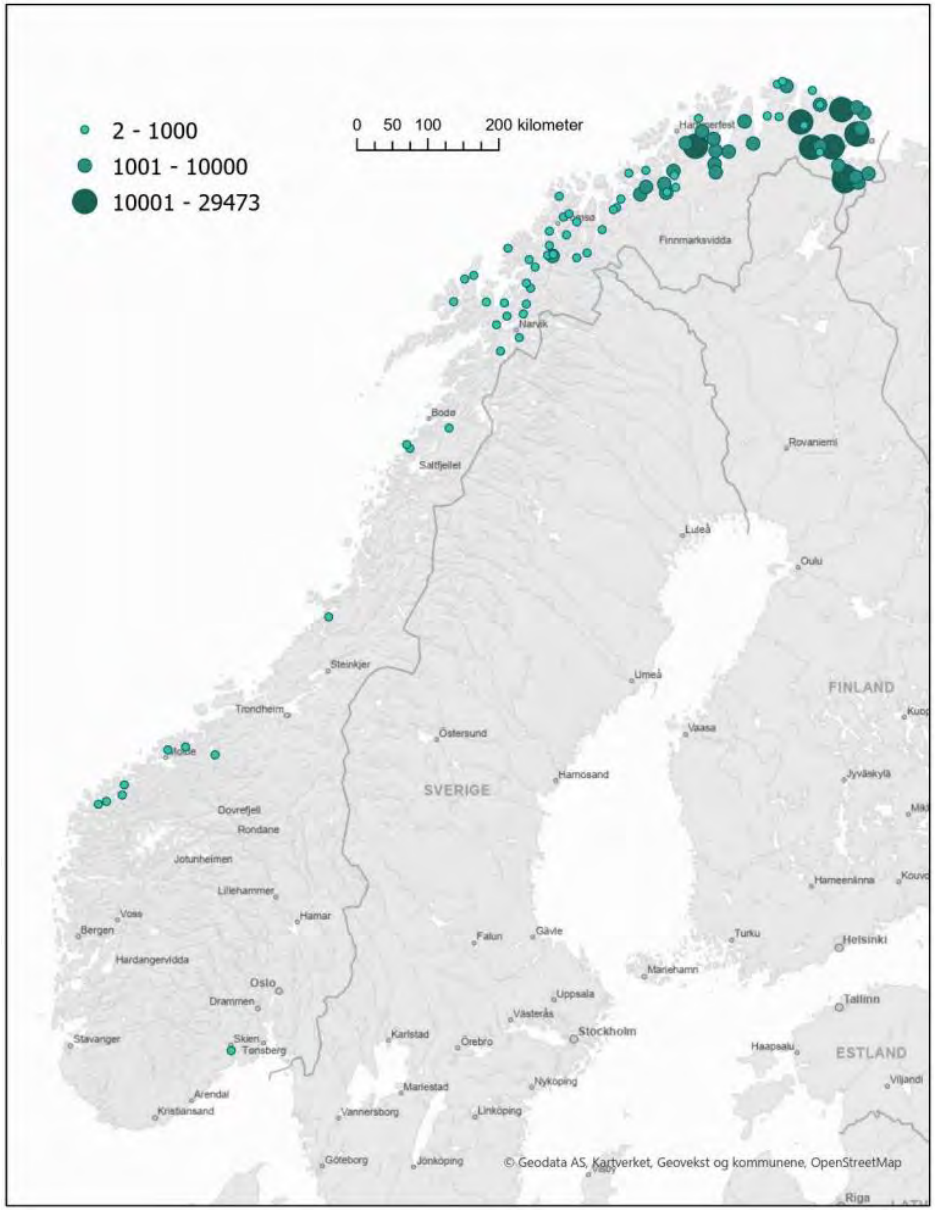
- Bag nets or other methods of coastal fishing are not chosen as methods to control pink salmon, due to high risk of overexploitation of Atlantic salmon
- Research in 2023 show that more than 60 % of bag net caught atlantic salmon was either dead or had injuries that did not allow release (unpublished, Havn, T.B., Ulvan, E.M., Bøe, K. & Karlsen, D.H.)
- The catch in two nets in this project was 14 % Atlantic and 86 % pink salmon (n=140 vs. 890)

Photo: Dag H. Karlsen and Torgeir Havn

Measures

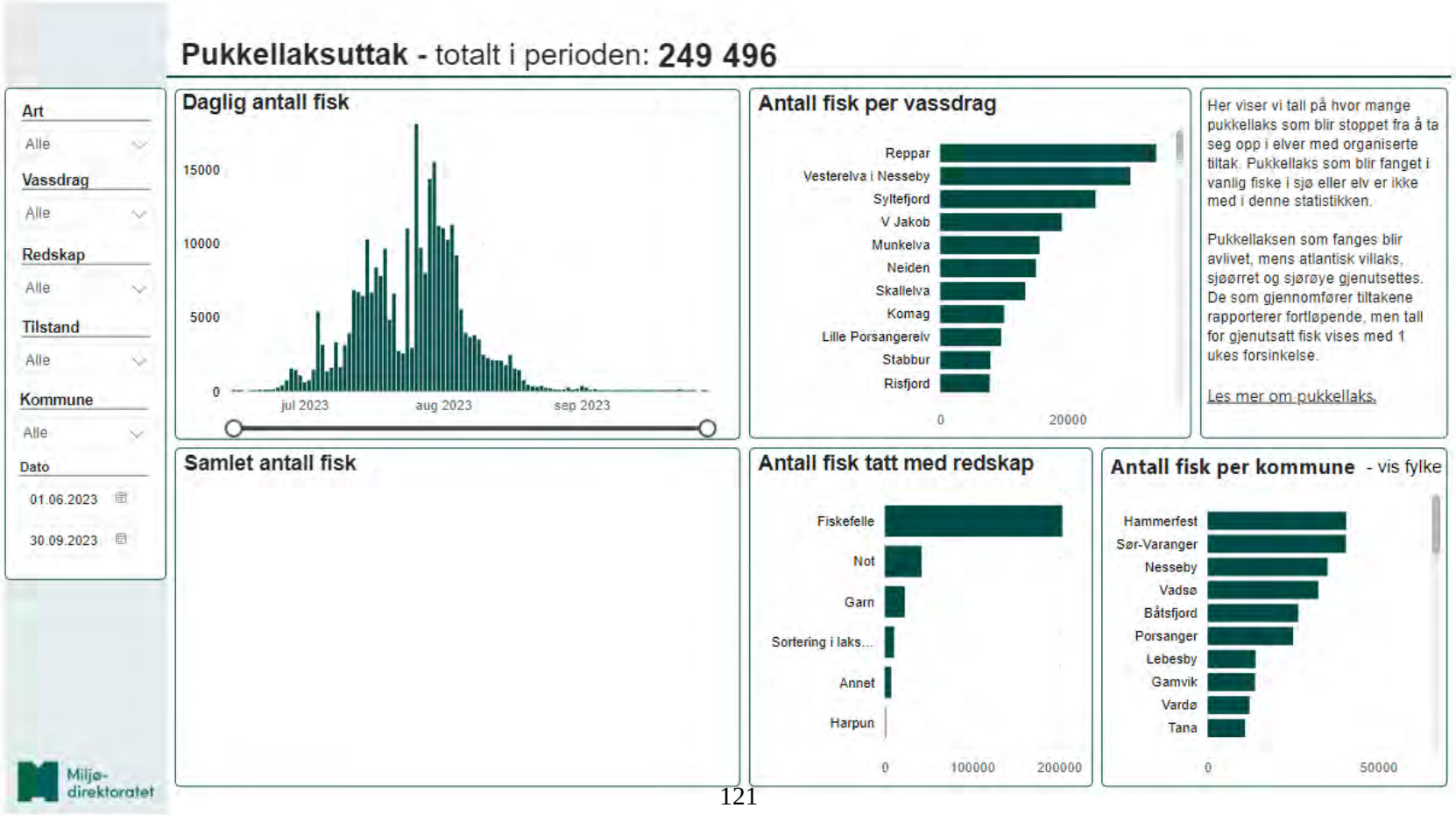


Catches

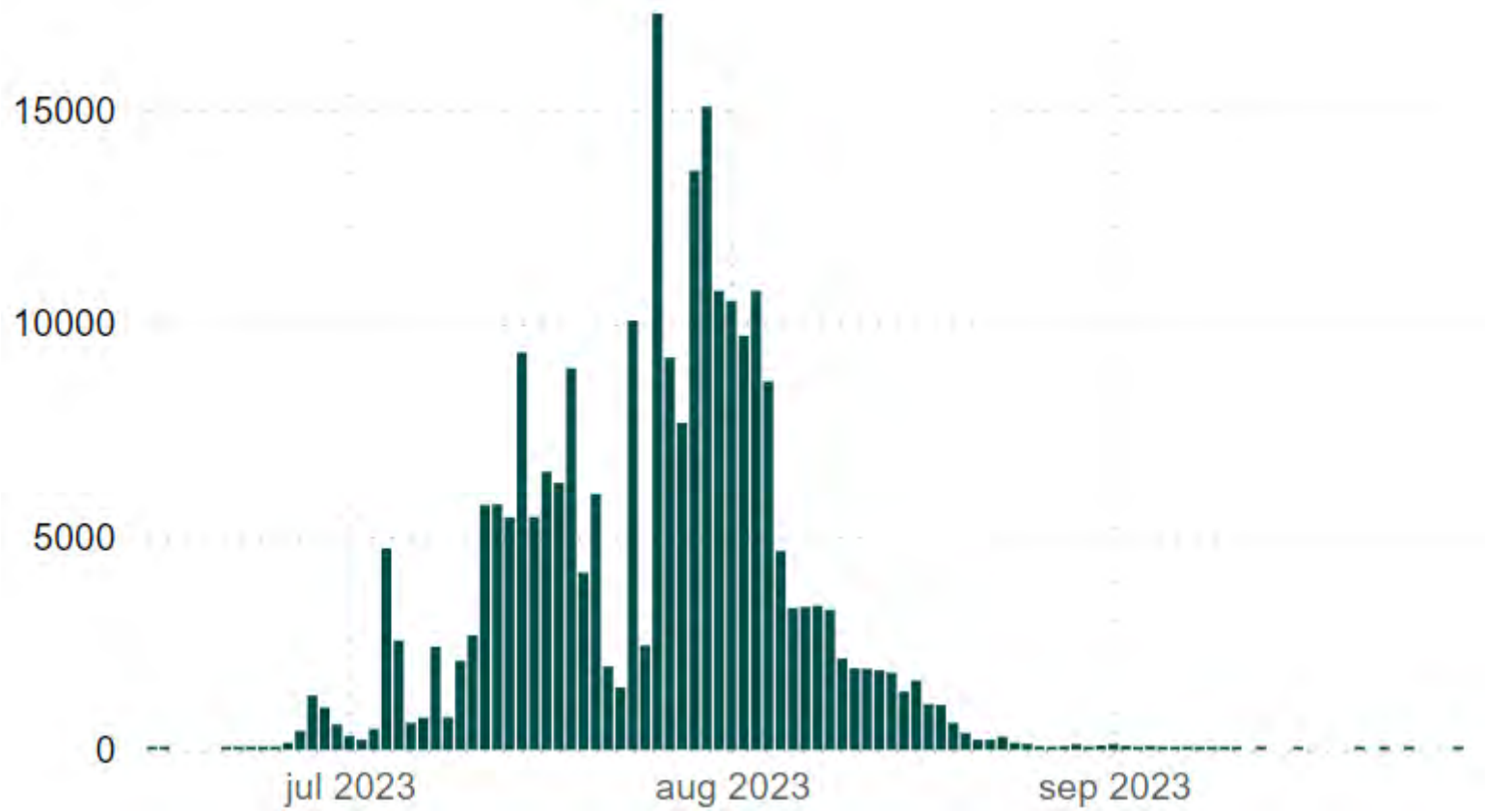


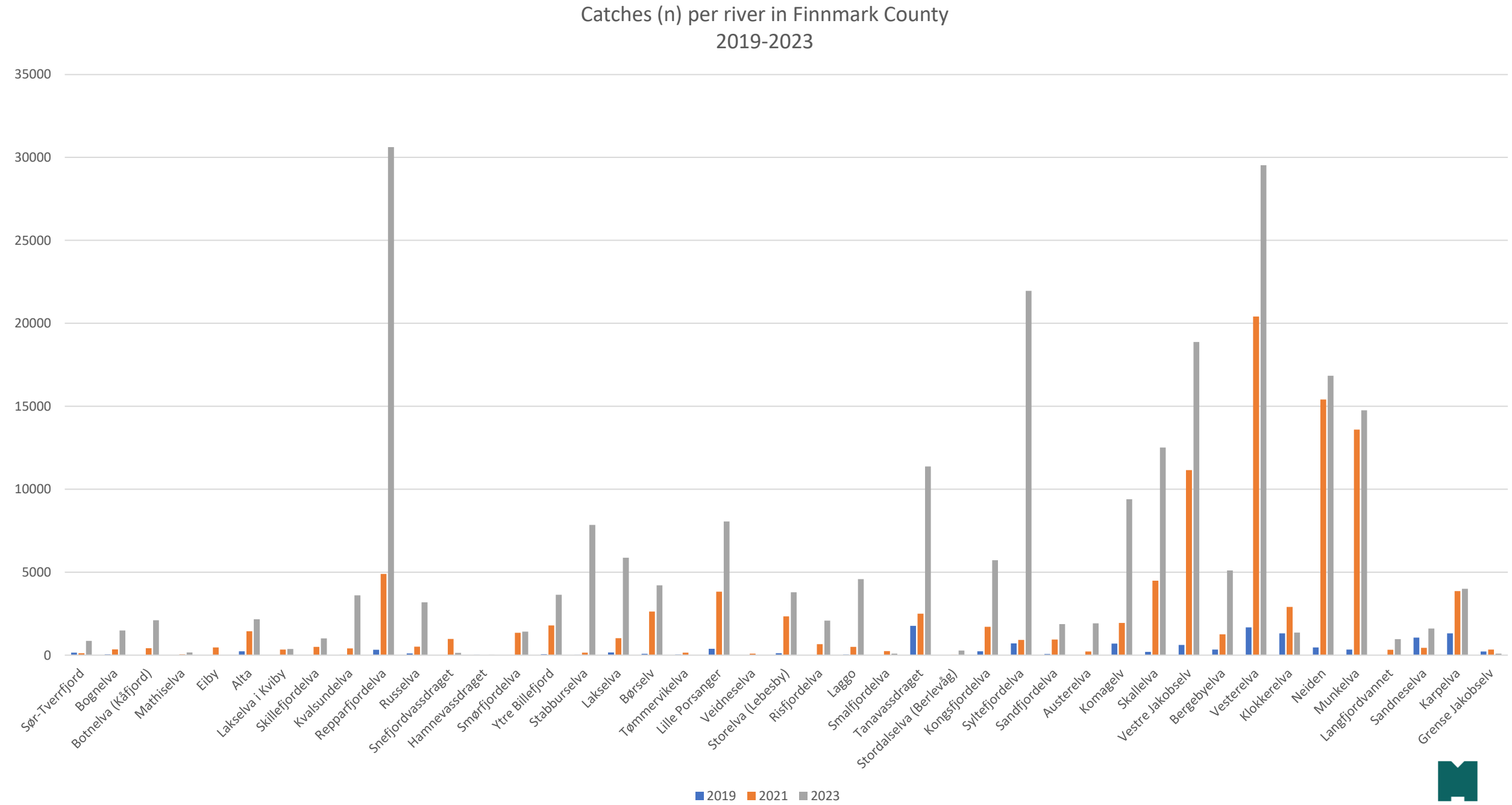
Pukkellaks-uttak

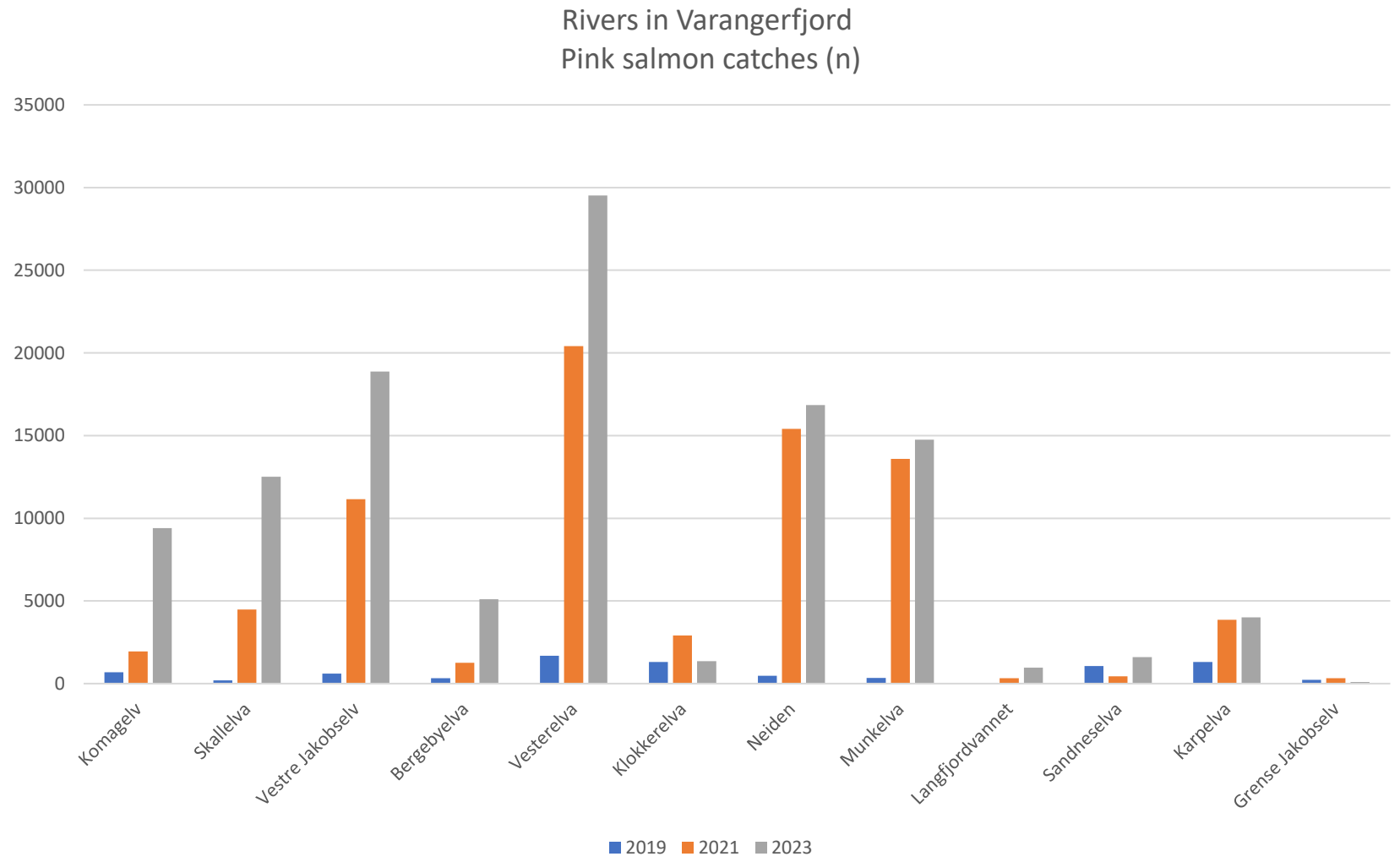
Oversikt over pukkellaks som blir stoppet i norske elver. Pukkellaks er en fremmed art som kan gjøre stor skade på lokale fiskearter og naturmangfold.

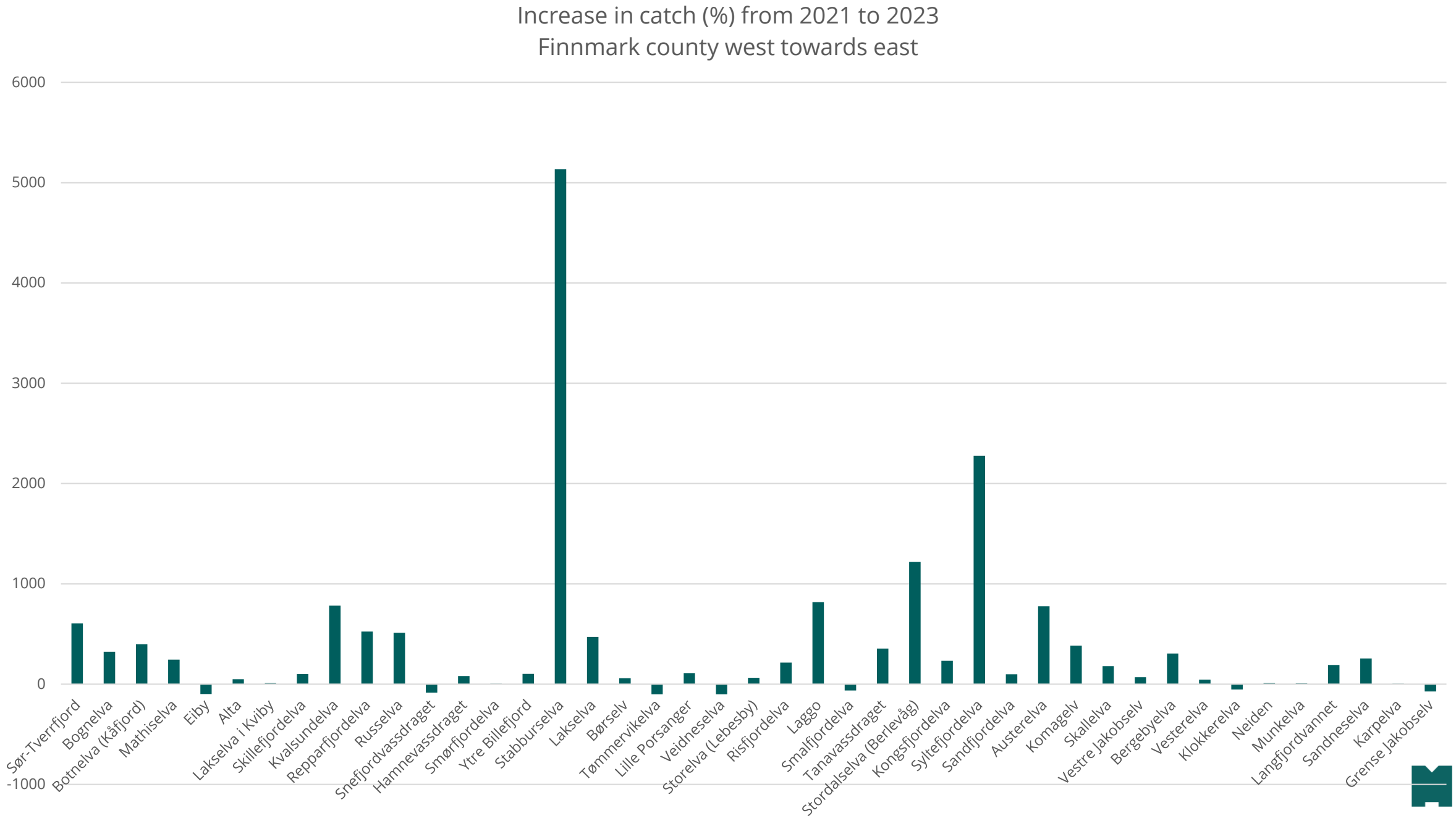


Daily pink salmon removals from rivers in Norway 2023 (n)



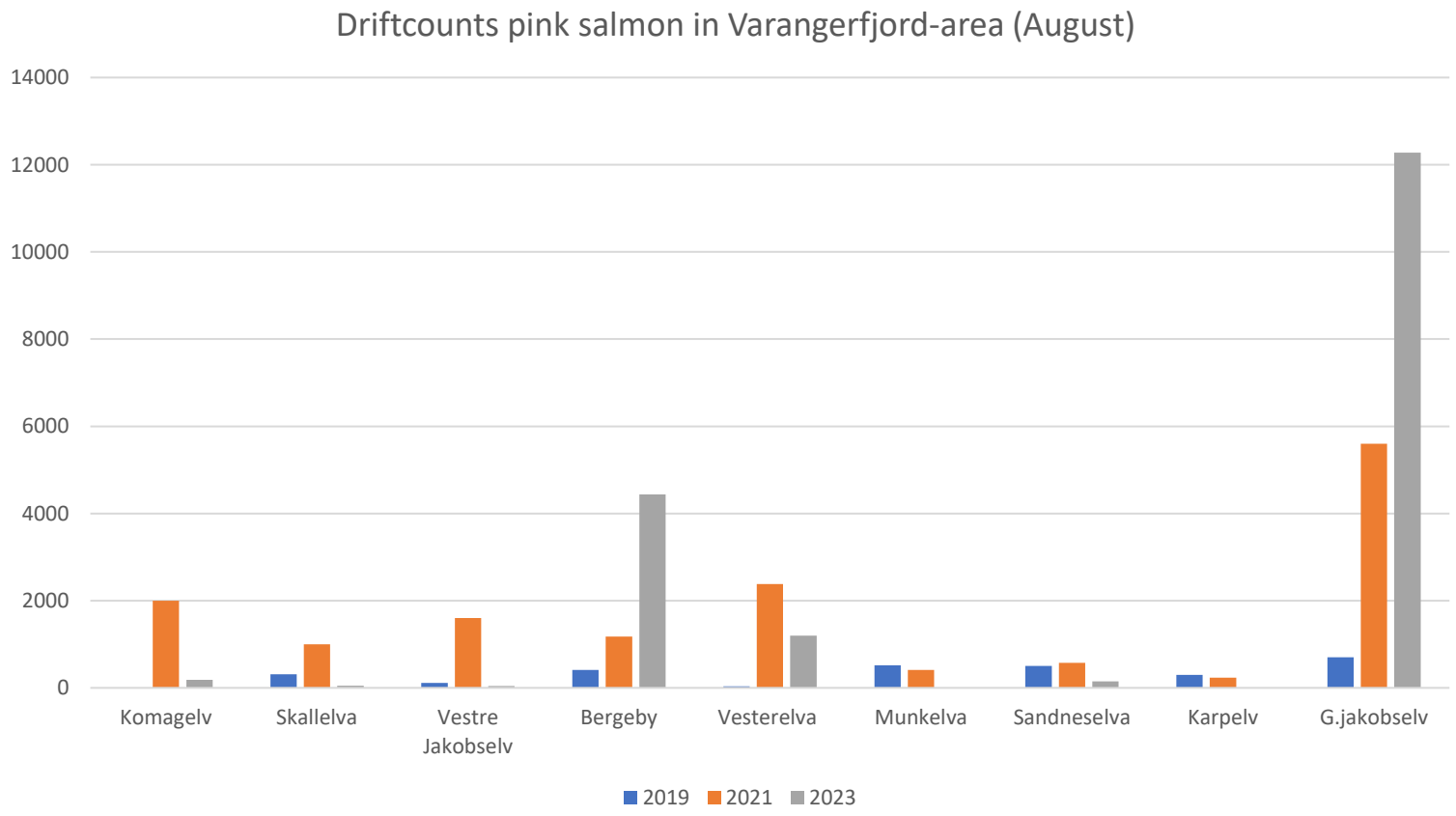

Catches (n) per river in Finnmark County
2019-2023
35000
30000
25000
20000
15000
10000
5000
0
Sør-Tverrfjord
Bognelva
Botnelva (Kåfjord)
Mathiselva
Eiby
Alta
Lakselva i Kviby
Skillefjordelva
Kvalsundelva
Repparfjordelva
Russelva
Snefjordvassdraget
Hamnevassdraget
Smørfjordelva
Ytre Billefjord
Stabburselva
Lakselva
Børselv
Tømmervikelva
Lille Porsanger
Veidneselva
Storelva (Lebesby)
Risfjordelva
Laggo
Smalfjordelva
Tanavassdraget
Stordalselva (Berlevåg)
Kongsfjordelva
Syltefjordelva
Sandfjordelva
Austerelva
Komagelv
Skallelva
Vestre Jakobselv
Bergebyelva
Vesterelva
Klokkerelva
Neiden
Munkelva
Langfjordvannet
Sandneselva
Karpelva
Grense Jakobselv
2019
2021
2023

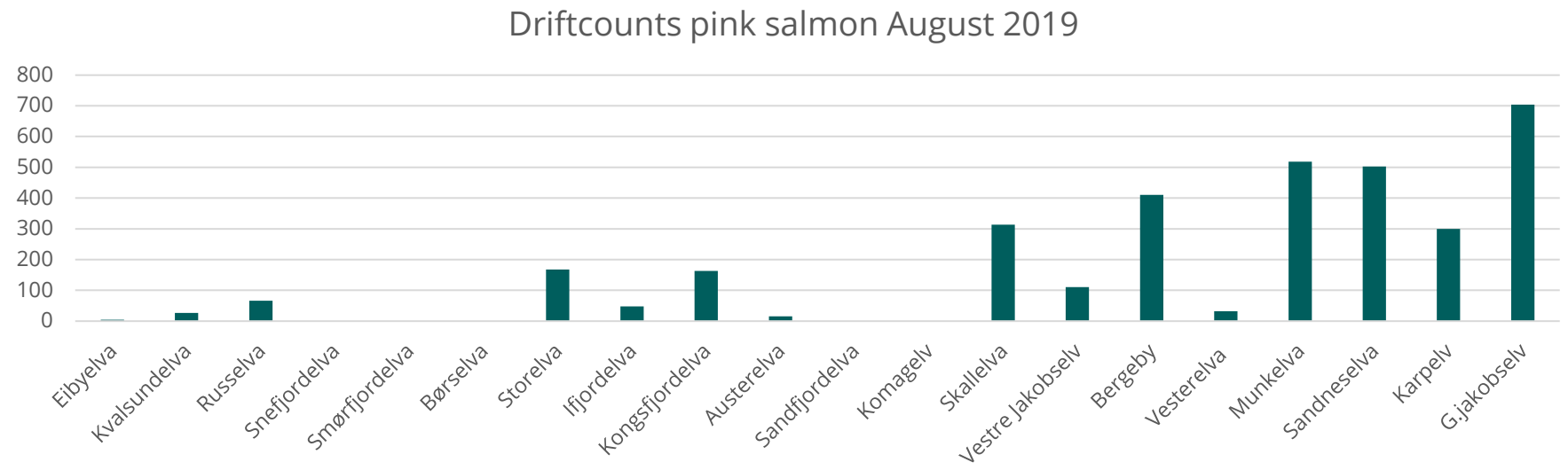

Rivers in Varangerfjord
Pink salmon catches (n)
35000
30000
25000
20000
15000
10000
5000
0
Komagelv
Skallelva
Vestre Jakobselv
Bergebyelva
Vesterelva
Klokkerelva
Neiden
Munkelva
Langfjordvannet
Sandneselva
Karpelva
Grense Jakobselv
2019
2021
2023

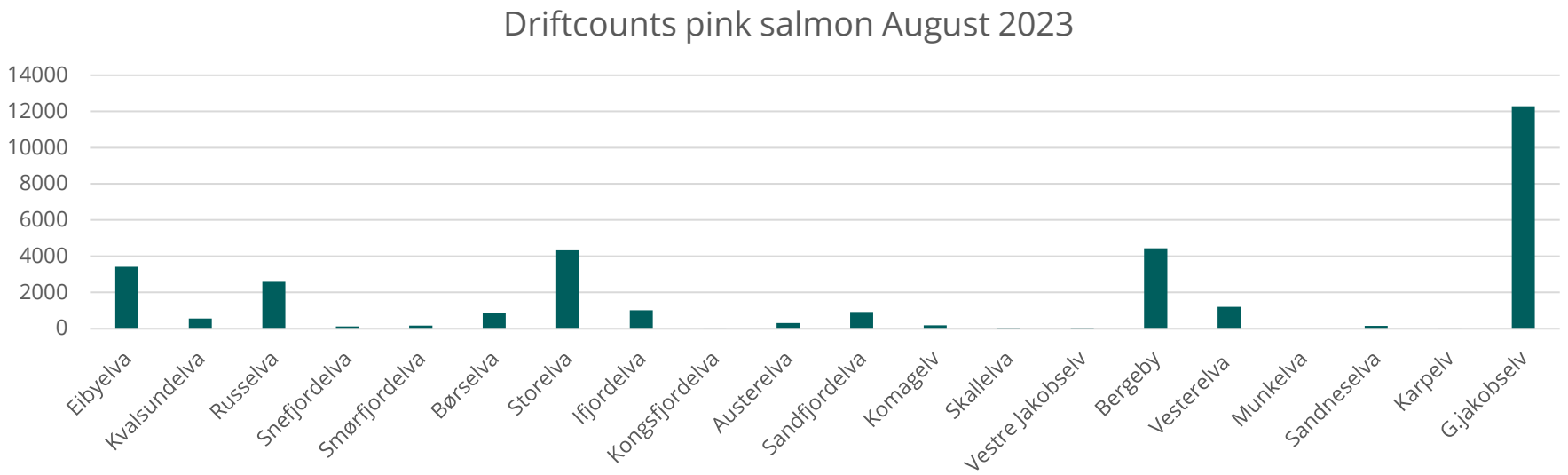

Increase in catch (%) from 2021 to 2023
Finnmark county west towards east
6000
5000
4000
3000
2000
1000
0
-1000
Sør-Tverrfjord
Bognelva
Botnelva (Kåfjord)
Mathiselva
Eiby
Alta
Lakselva i Kviby
Skillefjordelva
Kvalsundelva
Repparfjordelva
Russelva
Snefjordvassdraget
Hamnevassdraget
Smørfjordelva
Ytre Billefjord
Stabburselva
Lakselva
Børselv
Tømmervikelva
Lille Porsanger
Veidneselva
Storelva (Lebesby)
Risfjordelva
Laggo
Smalfjordelva
Tanavassdraget
Stordalselva (Berlevåg)
Kongsfjordelva
Syltefjordelva
Sandfjordelva
Austerelva
Komagelv
Skallelva
Vestre Jakobselv
Bergebyelva
Vesterelva
Klokkerelva
Neiden
Munkelva
Langfjordvannet
Sandneselva
Karpelva
Grense Jakobselv

Counts upstream the traps in Varanger:

River	Number removed	Counted upstream trap
Austerelva/Persfjord	1016	275
Komagelv	7221	180
Vesterelva	28901	1200
Karpelv	3972	3
Sandneselva	1606	150
Munkelva	14694	0
Sandfjordelva	1405	860
Vestre Jakobselv	18122	44
Kongsfjord	5343	5
Skallelva	12401	46
Total	**94681**	**2763**
Reference (no removals):		
G.Jakobselv – Norwegian side	0	12280 (no trap)

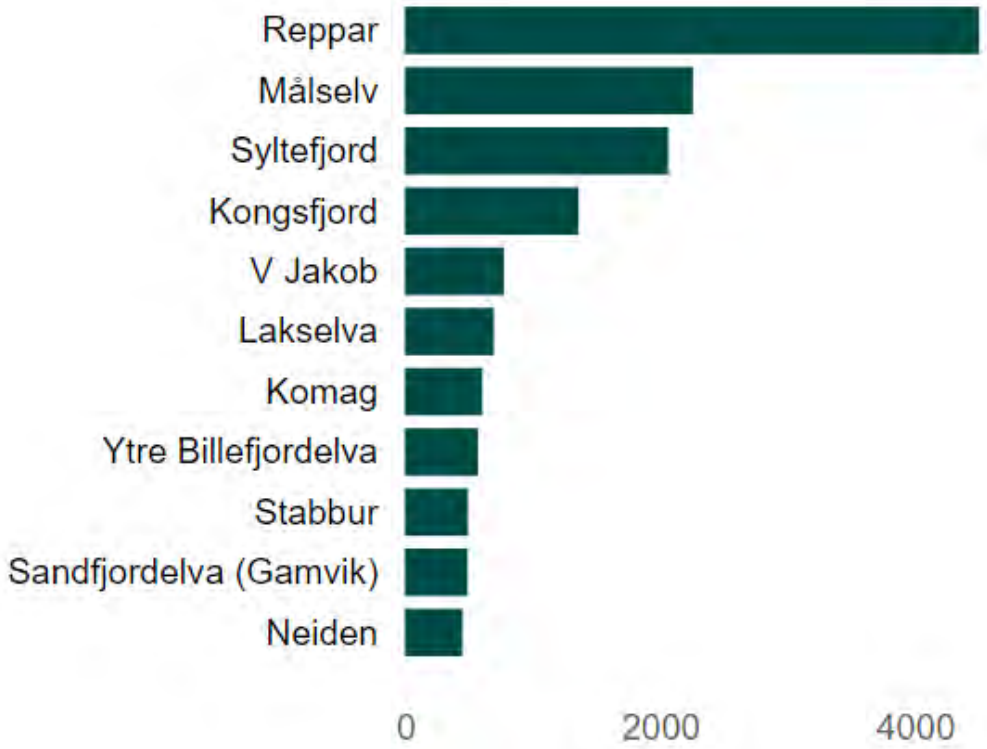

Driftcounts pink salmon in Varangerfjord-area (August)
14000
12000
10000
8000
6000
4000
2000
0
Komagelv
Skallelva
Vestre Jakobselv
Bergeby
Vesterelva
Munkelva
Sandneselva
Karpelv
G.jakobselv
2019
2021
2023


Driftcounts pink salmon August 2019
800
700
600
500
400
300
200
100
0
Eibyelva
Kvalsundelva
Russelva
Snefjordelva
Smørfjordelva
Børselva
Storelva
Ifjordelva
Kongsfjordelva
Austerelva
Sandfjordelva
Komagelv
Skallelva
Vestre Jakobselv
Bergeby
Vesterelva
Munkelva
Sandneselva
Karpelv
G.jakobselv


Driftcounts pink salmon August 2023
14000
12000
10000
8000
6000
4000
2000
0
Eibyelva
Kvalsundelva
Russelva
Snefjordelva
Smørfjordelva
Børselva
Storelva
Ifjordelva
Kongsfjordelva
Austerelva
Sandfjordelva
Komagelv
Skallelva
Vestre Jakobselv
Bergeby
Vesterelva
Munkelva
Sandneselva
Karpelv
G.jakobselv

Atlantic salmon in the traps (top 11 rivers)

Released



Dead or put down

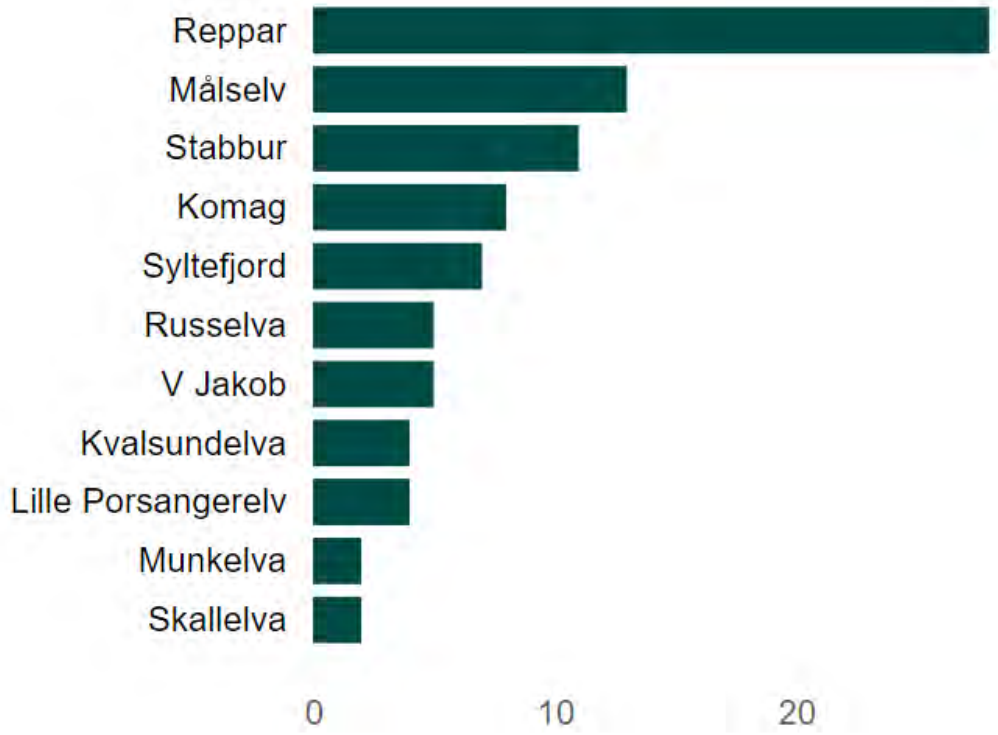


Photo: Malin Solheim Høstmark

Photo: Malin Solheim Høstmark

Summary:

- Effective measures in many rivers in 2023:
  - High removals of pink salmon – some rivers >99%
  - Low overall loss of native fish
- Still we must assume that the total number of spawning pink salmon in Norway have increased (maybe 150 000 in Tana alone).
- Further increase/spread westwards, but limited to the counties Finnmark and Troms. No increase in Nordland county.
- Important to develop methods for the large rivers.
- More monitoring and research needed on impacts of both the pink salmon and the weirs.

Norwegian
Environment
Agency

PSWG(24)16

Pink Salmon Fishery in the Northern Fisheries Basin

Sergey Prusov

Polar branch of VNIRO («PINRO» named after N.M.Knipovich)

Federal Agency for Fisheries
RUSSIAN FEDERAL RESEARCH INSTITUTE OF FISHERIES AND OCEANOGRAPHY «VNIRO»
Polar branch of VNIRO («PINRO» named after N.M.Knipovich)

- Atlantic salmon and pink salmon are in the List of Anadromous Fish (Rosrybolovstvo's Order 147 of 26 Feb 2009).

- Fisheries for anadromous fish in the Russian Federation's internal waters and territorial sea are carried out in accordance with Article 29.1 of Federal Law 166-FZ of 20 Dec 2004 "On fisheries and conservation of aquatic biological resources".

- Management of anadromous fish fisheries in the Russian Federation is based on decisions of a commission for regulation of fishery of anadromous fish (hereinafter referred to as Commission).

- The Commissions are established by the relevant subjects of the Russian Federation. The Commission is headed by the highest rank official of the subject.

- Annually, the Commissions decide on the catch limits, times, locations of harvesting as well as other conditions of fisheries for anadromous fish.

- Fishing for anadromous fish in commercial, coastal, traditional and recreational fishery is only allowed on the basis of contract for use of fishing site and within its limits, except for recreational fishing for pink salmon outside the limits of fishing sites, in waters which are not Atlantic salmon spawning grounds.

Federal Agency for Fisheries
RUSSIAN FEDERAL RESEARCH INSTITUTE OF FISHERIES AND OCEANOGRAPHY «VNIRO»
Polar branch of VNIRO («PINRO» named after N.M.Knipovich)

- Fishery of aquatic biological resources in the Northern fisheries basin is regulated by the Fisheries Regulations for the Northern fisheries basin (current version is approved by Order N 292 of 13 May 2021 by the Ministry of Agriculture of Russia (hereinafter referred to as the Fisheries Regulations).

- The Fisheries Regulations stipulate some restrictions in relation to pink salmon and most of them are similar to those established for Atlantic salmon and aimed, in the first place, at conserving the native species.

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Polar branch of VNIRO («PINRO» named after N.M.Knipovich)

- Fishing for anadromous fish is prohibited:

✓ In the Barents Sea from the Varanger Fjord in the west to Cape Svyatoy Nos in the east
✓ Outside the fishing sites in Atlantic salmon rivers
✓ On days (periods), as established by the Commission, to allow spawners migrate to spawning grounds
✓ In estuaries of Atlantic salmon rivers in the Murmansk region, at the distance less than 500 m from each side of the estuary and at the same distance offshore where the rivers enter the sea
✓ In commercial fisheries in Atlantic salmon rivers of the Murmansk region with net gears except for counting fences deployed in accordance with the decision of the Commission

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- Pink salmon in the Northern fisheries basin is a fishery-targeted species harvested in coastal areas of the White Sea and at counting fences in some rivers since 1960s.
- The largest catches were recorded in the Murmansk region where before 2000s pink salmon catches exceeded 100 t four times – in 1973, 1975, 1977 and 1997.
- In 2001 the pink salmon catch in the Murmansk region reached 300 t for the first time.
- In 2023, the total nominal catch of pink salmon in the European North of Russia amounted to 206 t which was 71% less than in 2021 and 47% and 21% less than the average catch of pink salmon in previous 5 and 10 odd years, respectively.

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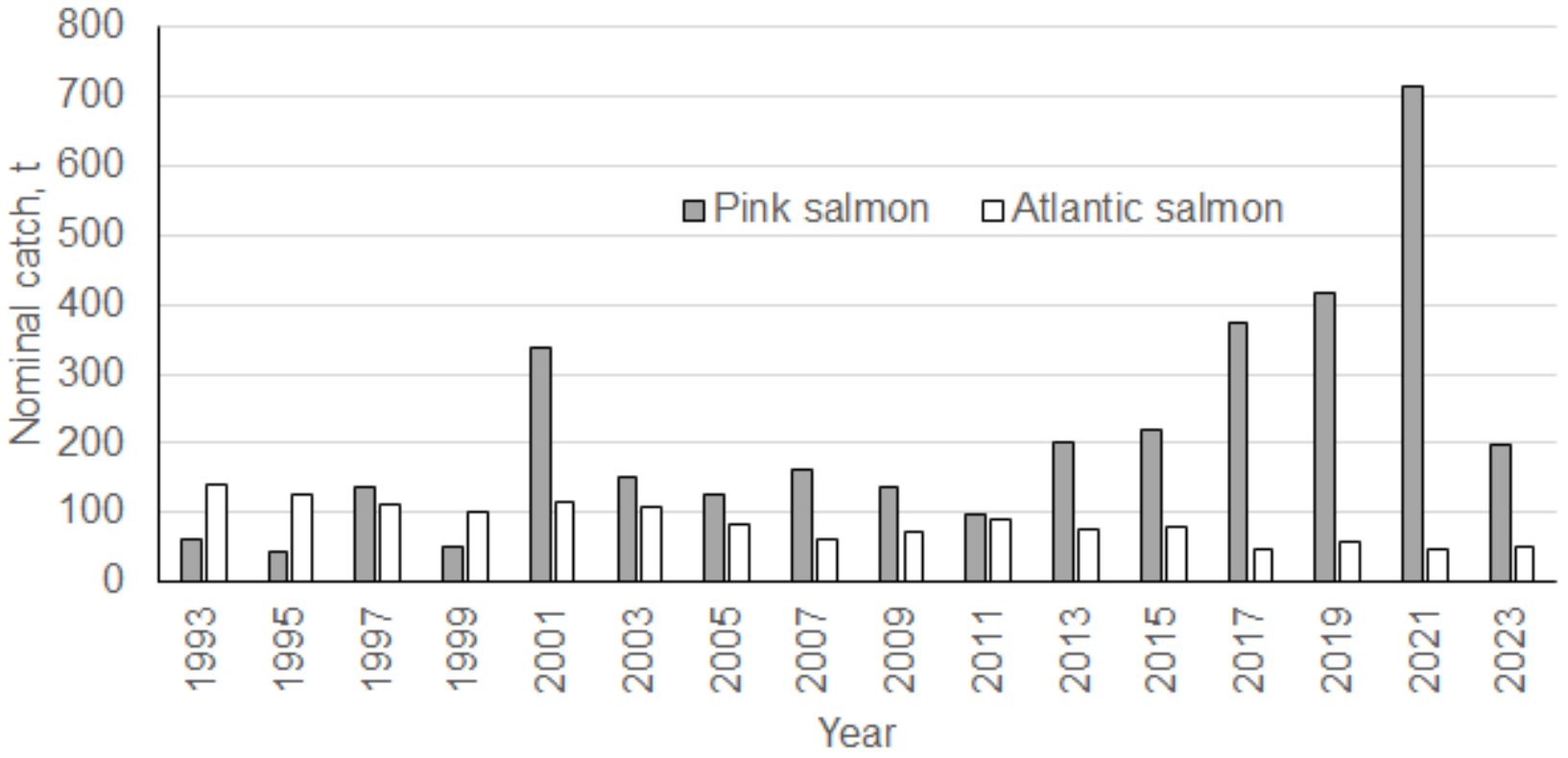
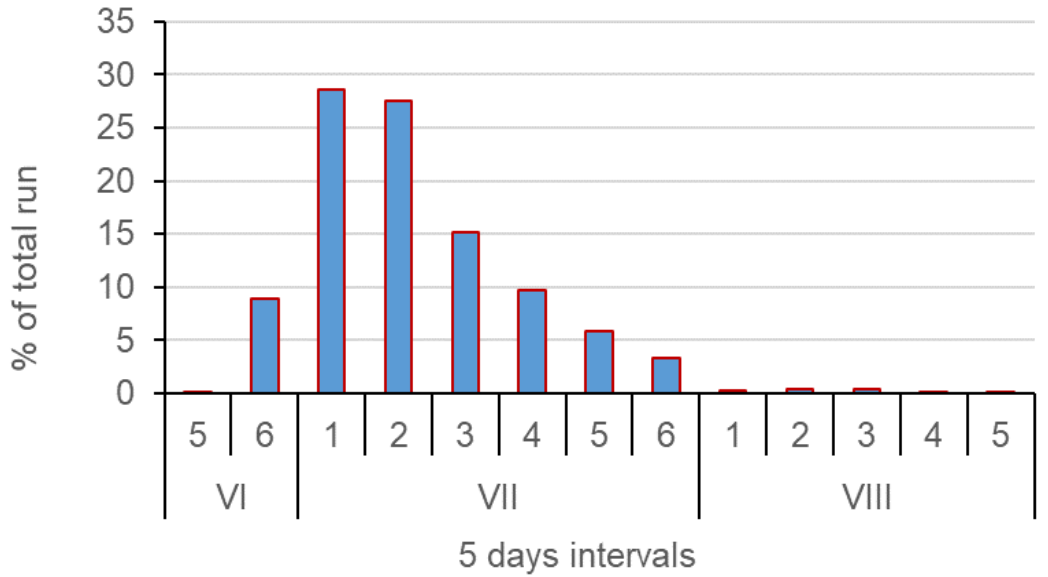
Polar branch of VNIRO («PINRO» named after N.M.Knipovich)

- In 1997, the total nominal catch of odd-year line pink salmon in the Northern fisheries basin exceeded Atlantic salmon nominal catch for the first time.



- In the Kola Peninsula, pink salmon spawning migration into rivers begins in late June – early July and continues until late August – early September.
- The migration reaches its peak in the first half of July.
- Massive pink salmon spawning usually occurs in early August.
- Since pink salmon spawns earlier than Atlantic salmon which in the Kola Peninsula spawns in September-October, pre-spawning competition is not thought to have any notable impact on reproduction of these two species.



Migratory dynamics of spawning pink salmon to the Varzuga River.

- Pink salmon in the Northwest Russia is not considered as an invasive species.
- Pink salmon is a non-native to the North North Atlantic and were introduced as a food source, and considered to be a beneficial organism in commercial, artisanal and recreational catch-and-take fisheries.
- There is no convincing evidence of an adverse impact of pink salmon on Atlantic salmon reproduction at present, however unlimited harvesting of pink salmon by all types of fishery is recommended (Alekseev et al., 2019).

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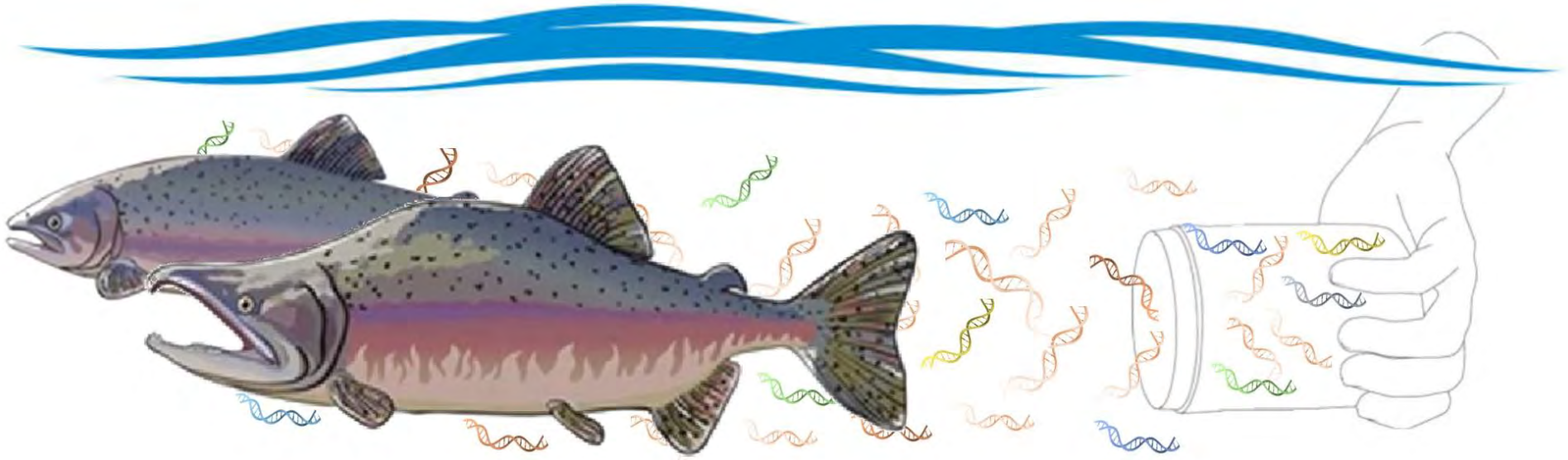
PSWG(24)17

Pink salmon in the UK



Colin Bean

Inaugural NASCO Pink salmon Working Group Meeting
09-10 March 2024

gov.scot

Scottish Government
Riaghaltas na h-Alba
gov.scot
marinescotland

SEPA
Scottish Environment Protection Agency
Buidheann Dion Àrainneachd na h-Alba

NatureScot
Scotland's Nature Agency
Buidheann Nàdair na h-Alba

Atlantic Salmon Trust

Fisheries Management Scotland

The River Dee

NESS
District Salmon Fishery Board

Environment Agency

Cefas

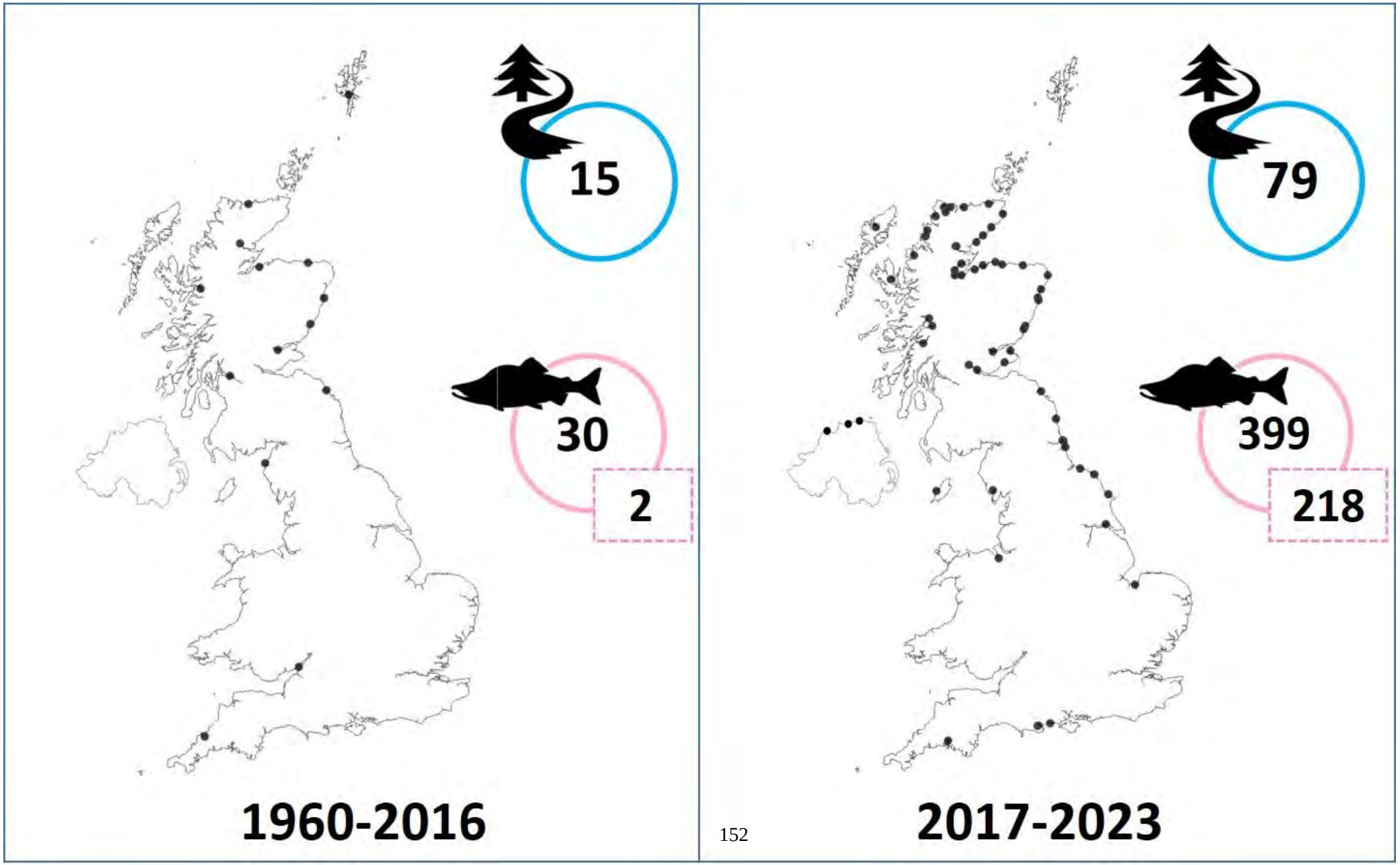
Cyfoeth Naturiol Cymru
Natural Resources Wales

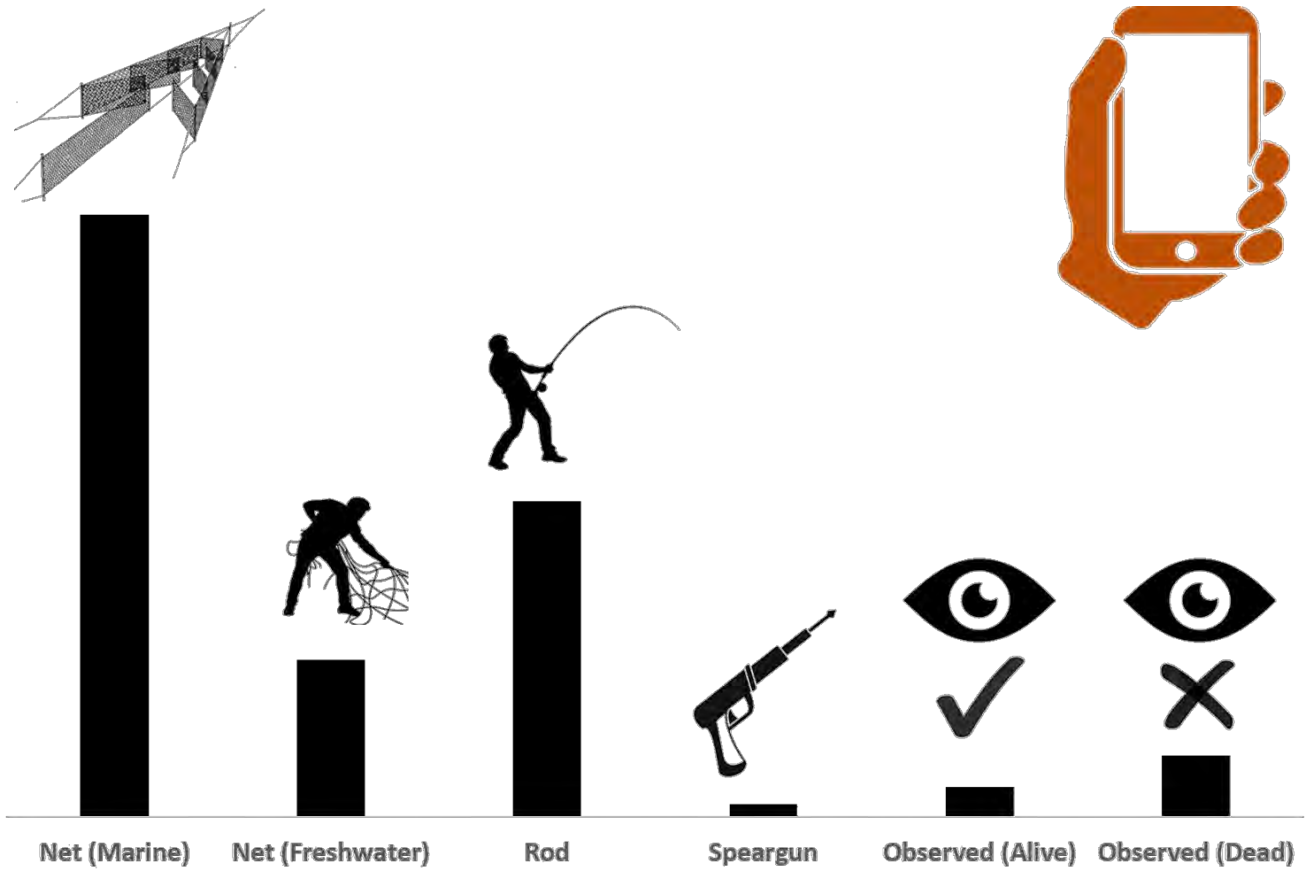
Department of Agriculture, Environment and Rural Affairs

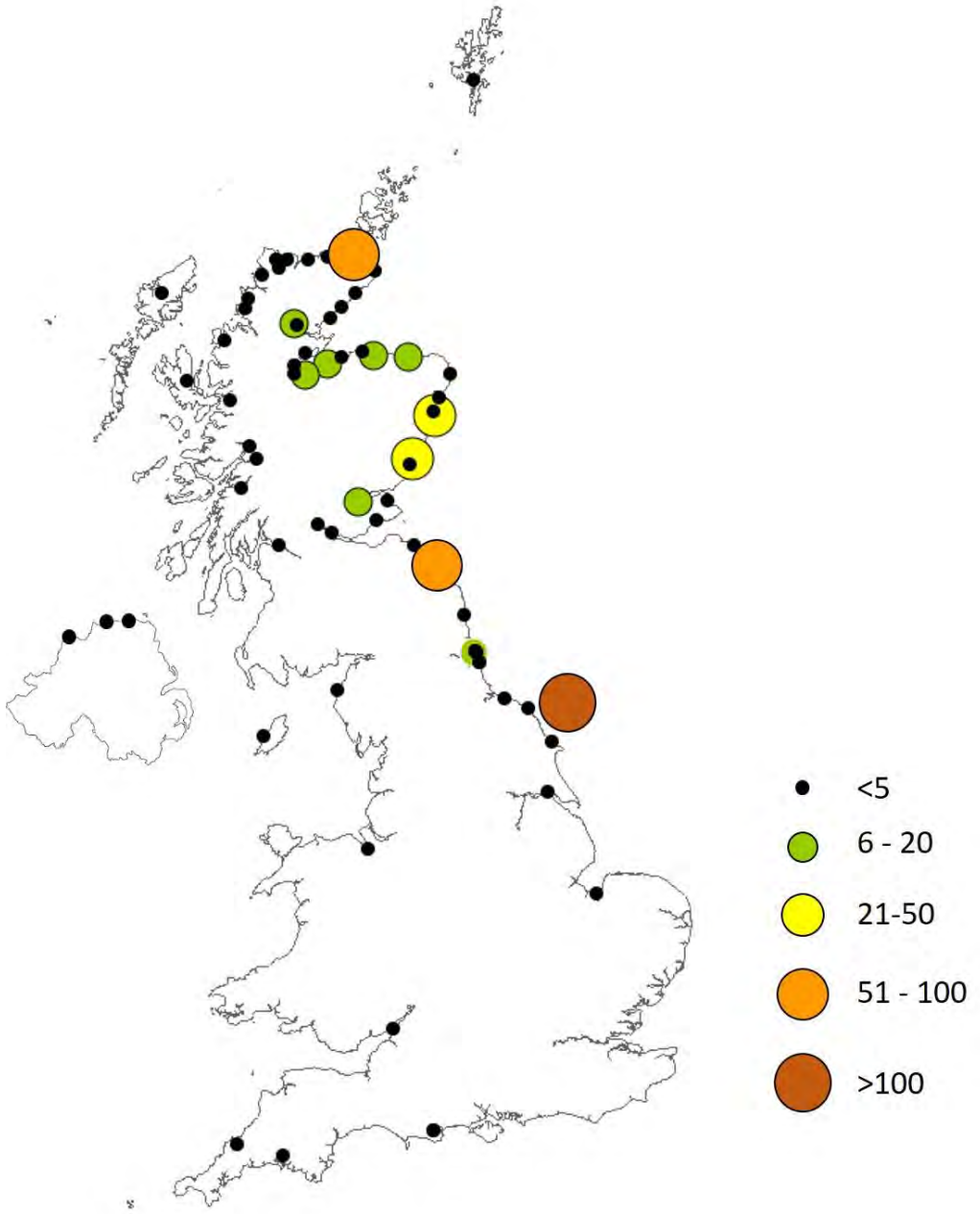
afbi Agri-Food and Biosciences Institute

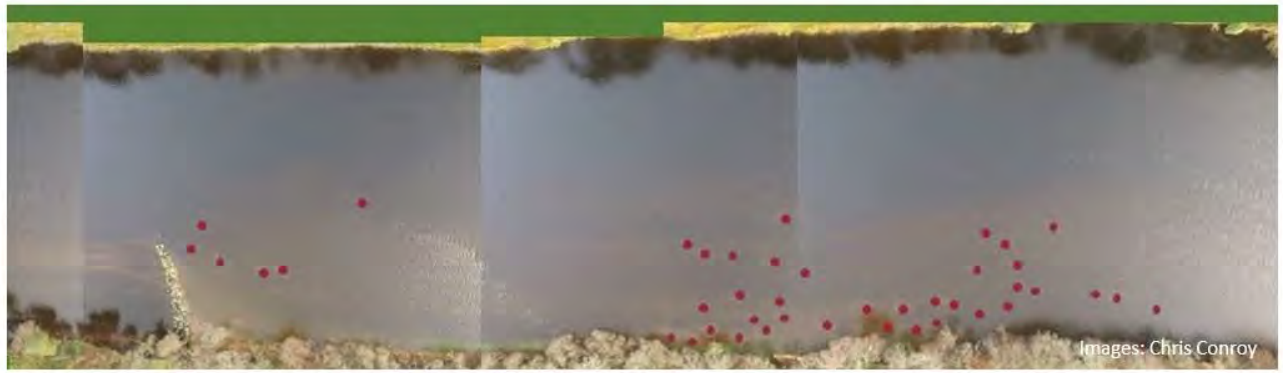
Loughs Agency
Gníomhaireacht na Lochanna
Factrie fur Loughs

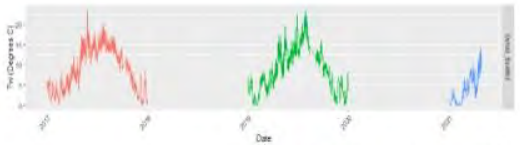
	Country	First Record	Pre-2017	2017	2018	2019	2020	2021	2022	2023
	Scotland	1960	17	131	0	18	0	171	1	47
	England	1960	11	8 (~200)	1	0 (3)	0	15 (14)	1	1 (1)
	Wales	1980*	1*	0	0	1	0	0	0	0
	Northern Ireland	2017	0	2	0	1	0	0	0	2


15
30
2
1960-2016
79
399
218
2017-2023

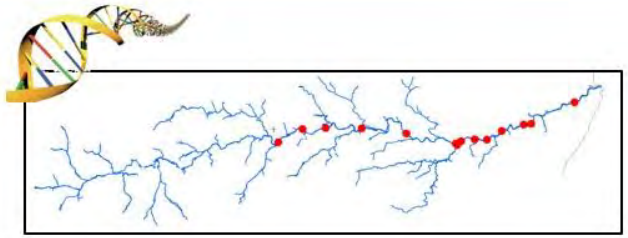

Net (Marine)
Net (Freshwater)
Rod
Speargun
Observed (Alive)
Observed (Dead)


<5
6 - 20
21-50
51 - 100
>100





Data: Iain Malcolm MSS

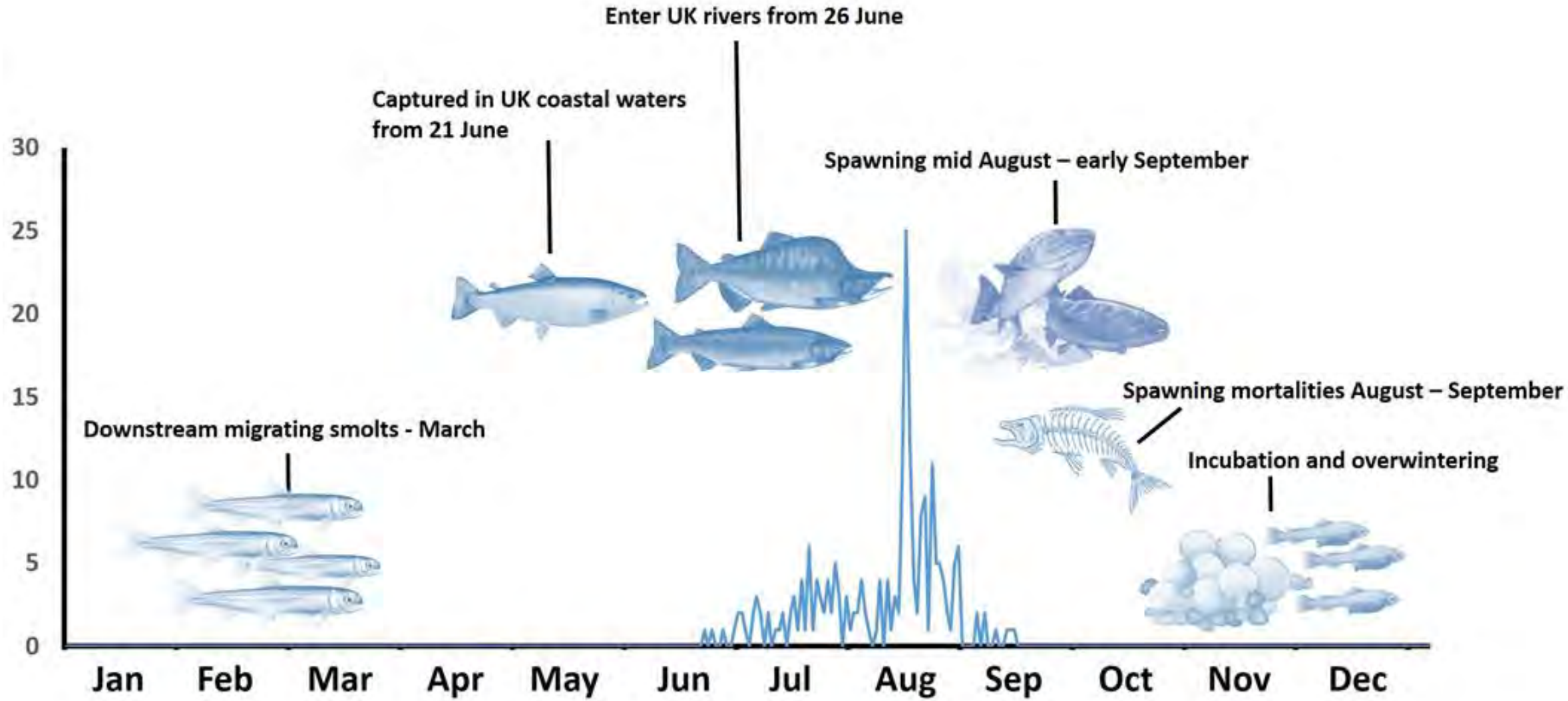


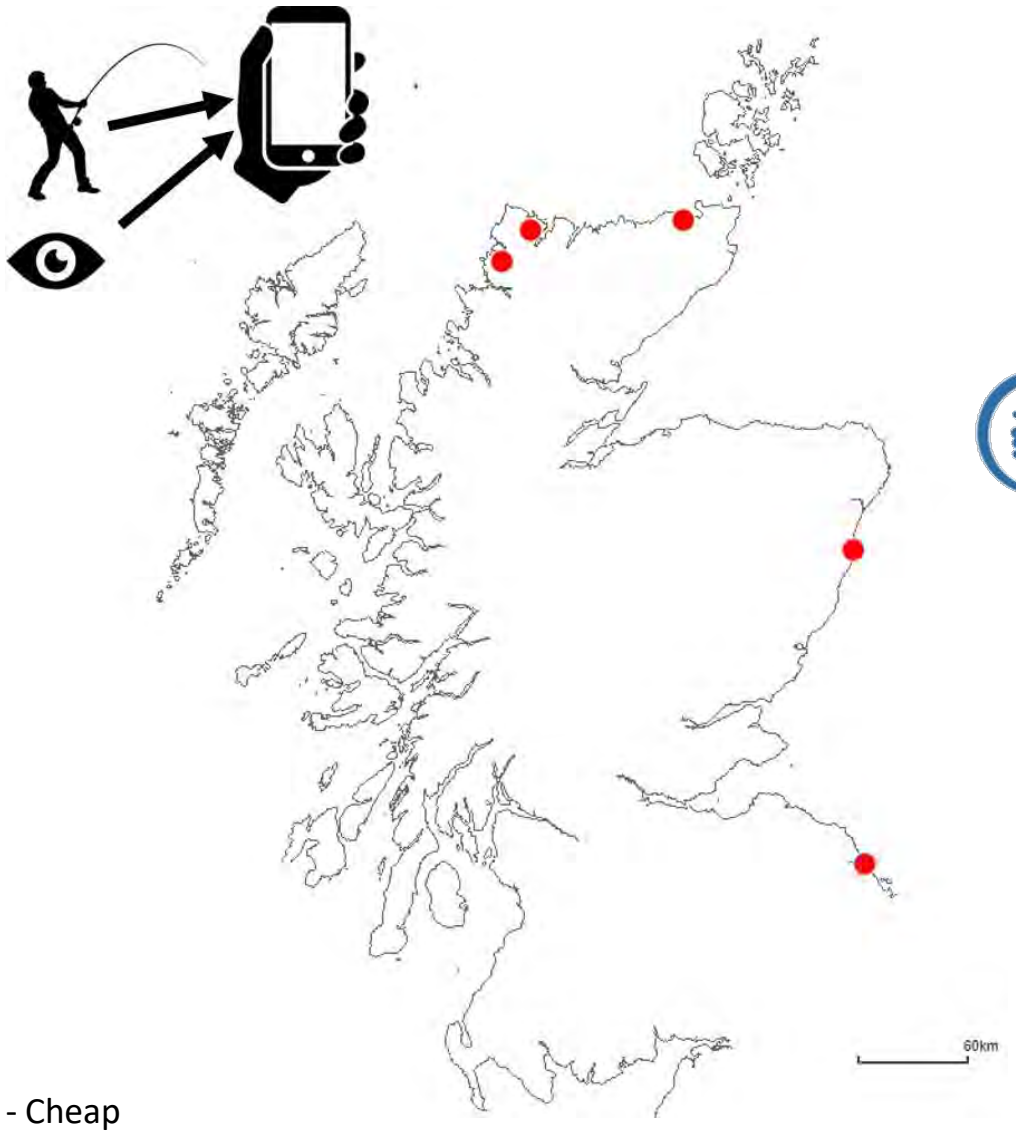
Weekly, bi-weekly and monthly sampling June-Dec 2021 – MSS/Dee DSFB/NatureScot

Hatching and emergence data derived from Quinn (2005)

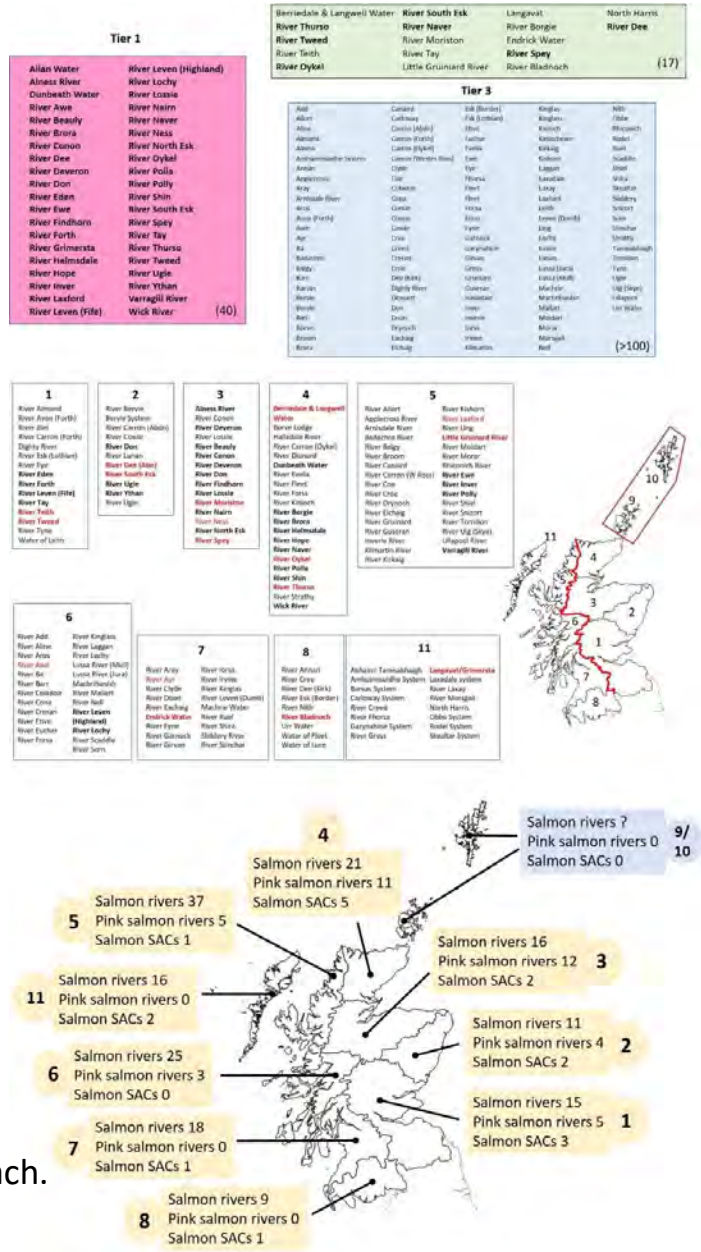
Pink salmon qPCR assay used:

- Gargan *et al*. 2021 (DOI:10.1002/edn3.250) tested the pink salmon COI assay salmonid species (*O. mykiss*, *O. keta*, *S. alpinus*, *S. trutta* and *S. salar*)
- Additionally MSS tested the assays against selection of 10 fish species reported in Scottish rivers

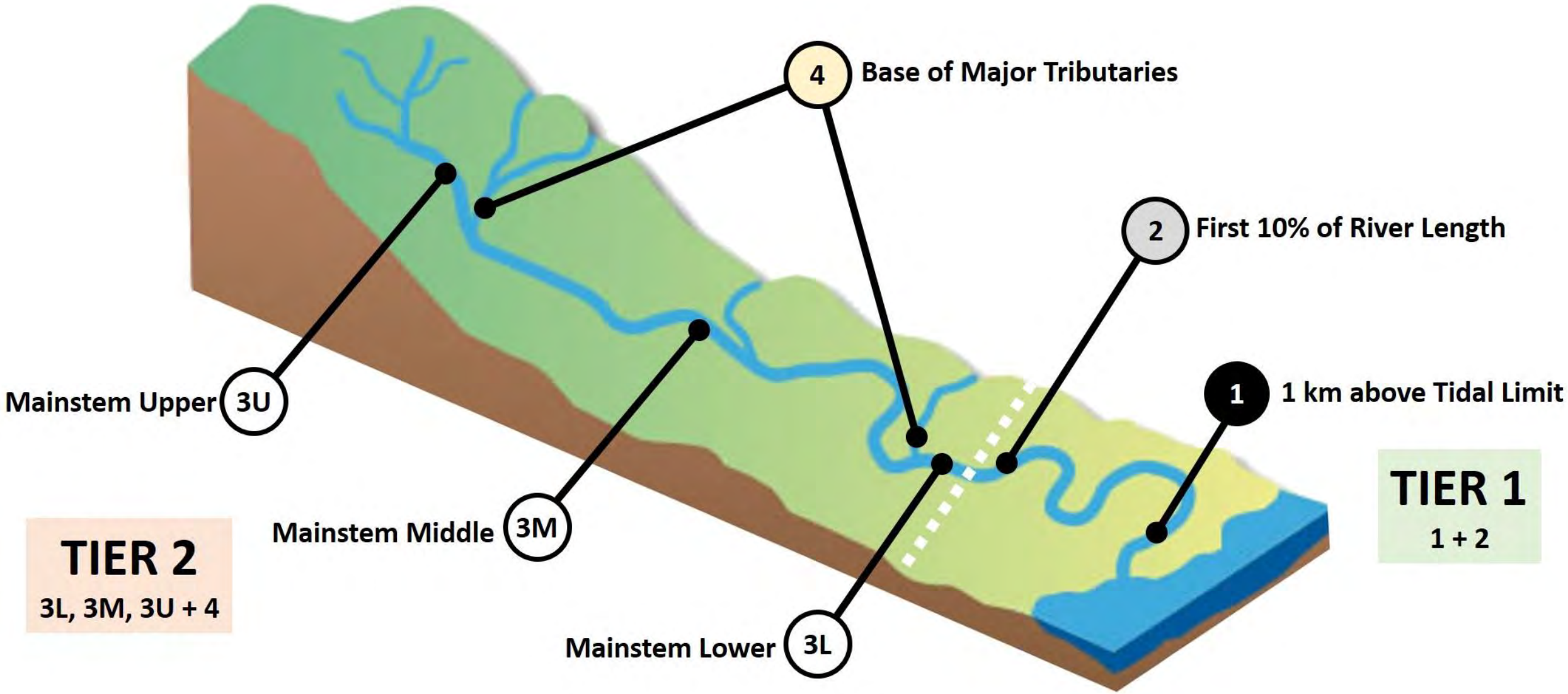

Enter UK rivers from 26 June
Captured in UK coastal waters from 21 June
Spawning mid August – early September
Spawning mortalities August – September
Incubation and overwintering
Downstream migrating smolts - March
30
25
20
15
10
5
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

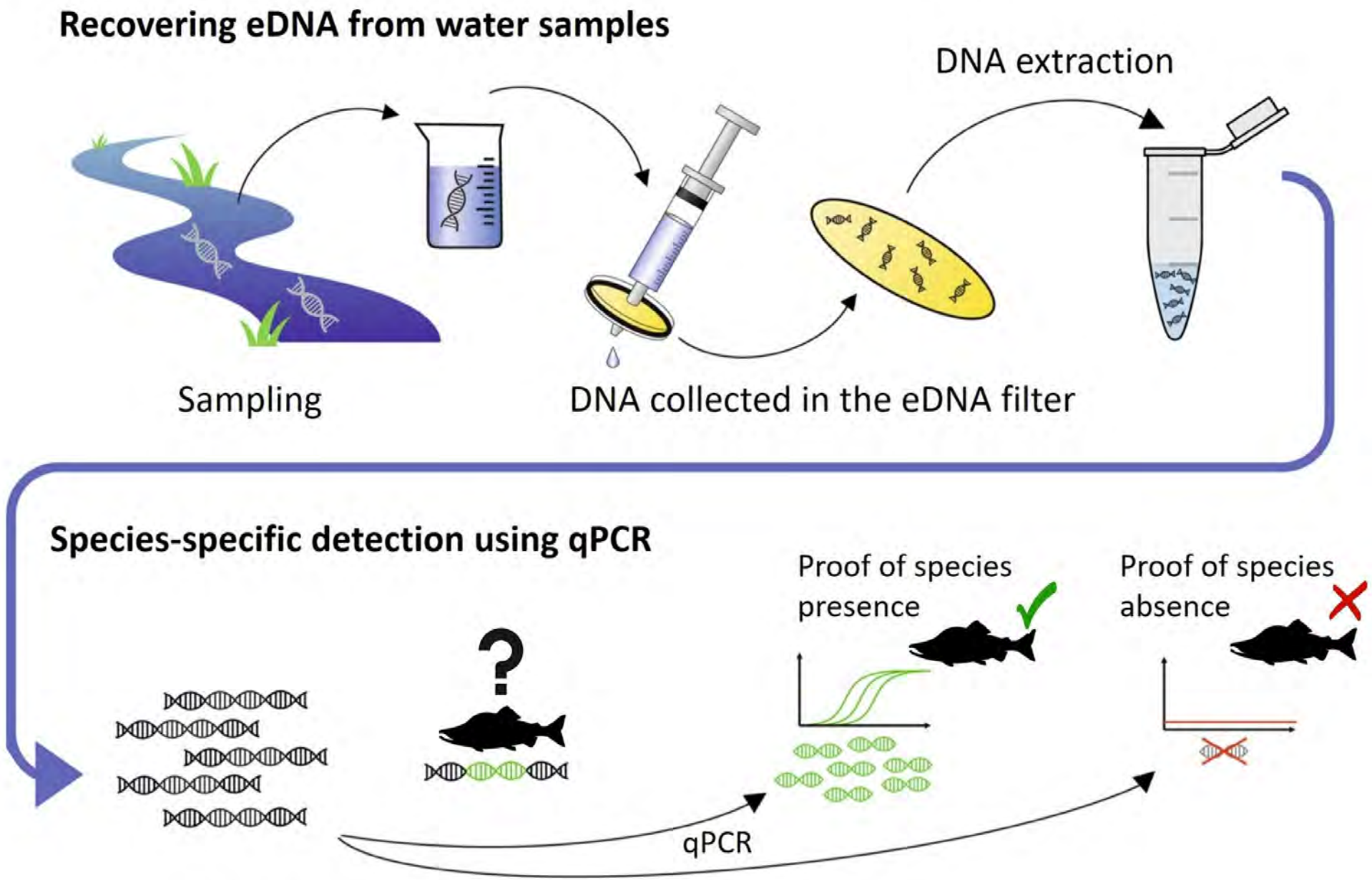


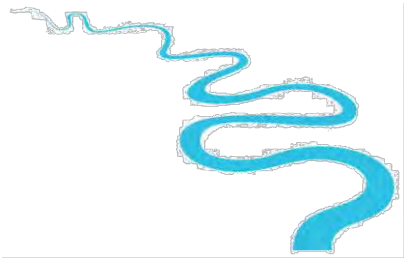
- Cheap
- Established – App available
- Useful but potentially spatially biased



- Scalable costs.
- New, but field tested approach.
- Validates records from App.
- Can reduce spatial bias.


4
Base of Major Tributaries
2
First 10% of River Length
1
1 km above Tidal Limit
Mainstem Upper
3U
Mainstem Middle
3M
Mainstem Lower
3L
TIER 2
3L, 3M, 3U + 4
TIER 1
1 + 2


Recovering eDNA from water samples
DNA extraction
Sampling
DNA collected in the eDNA filter
Species-specific detection using qPCR
Proof of species presence
Proof of species absence
qPCR



Spatial Sampling

– ***Tier 1***: At least one river from each Atlantic salmon Reporting District was included to ensure national scale coverage (31 sites)

– ***Tier 2***: A smaller number of catchments sampled more intensively (upper, middle and lower catchments plus the confluence with major tributaries) (13 sites across the country)

Sampling Period

– Mid-June to Mid/Late-August

– 2x per year

- Mid-June (to determine time of entry)
- Mid-Late August (to detect spawning)

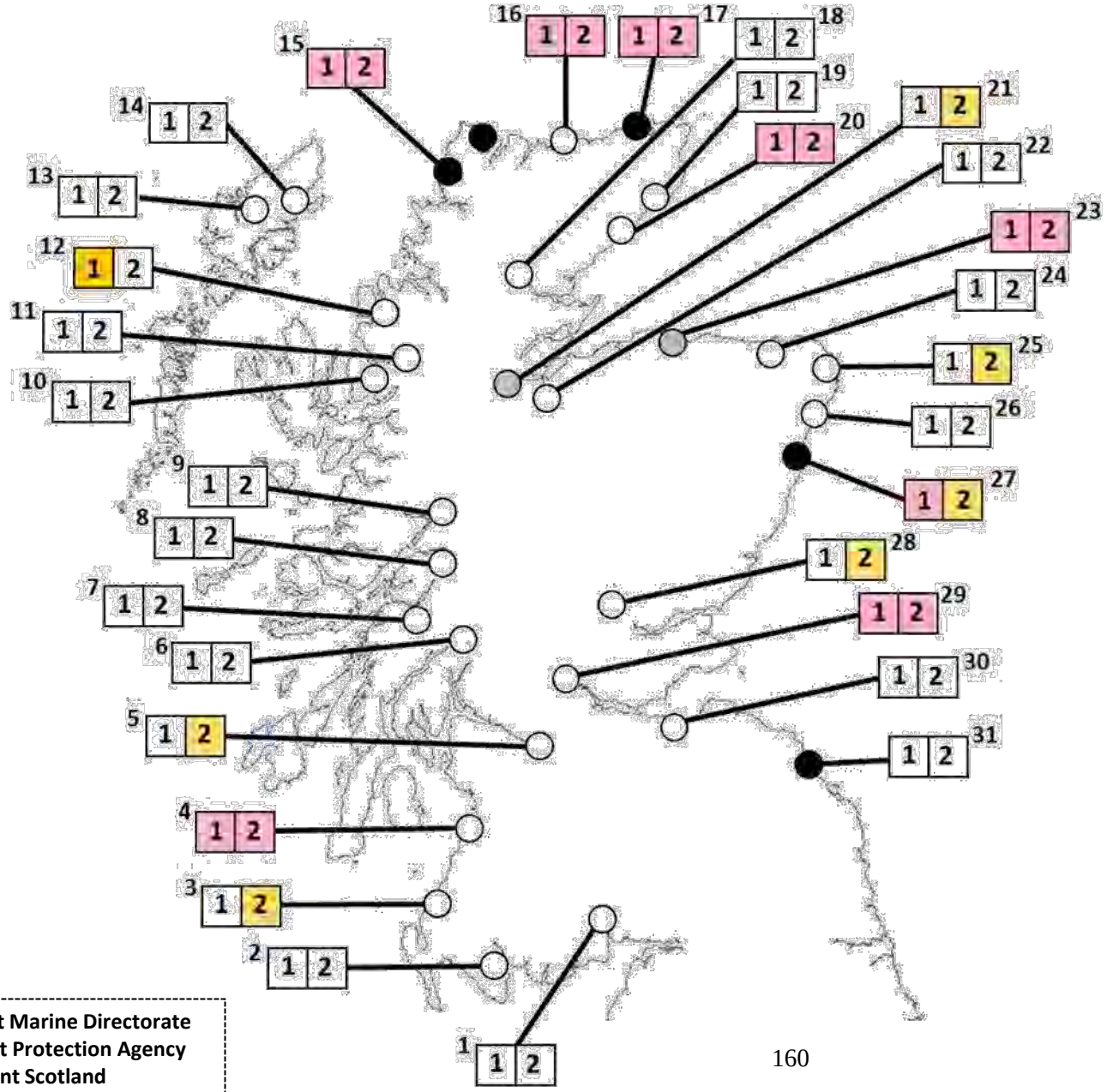
Sampling Protocol

– 3 samples per sampling point collected at 30-50 cm depth.

– Sample blank collected at each site.

– Filtration: a 50 ml syringe or Vampire pump filter 3L of water through 0.45 µm Sterivex or Sylphium filter cartridge before fixing.

– qPCR.



Physical Sighting
- Confirmed Physical Record/Sighting
- Unconfirmed Physical Record/Sighting
- No Physical Record/Sighting

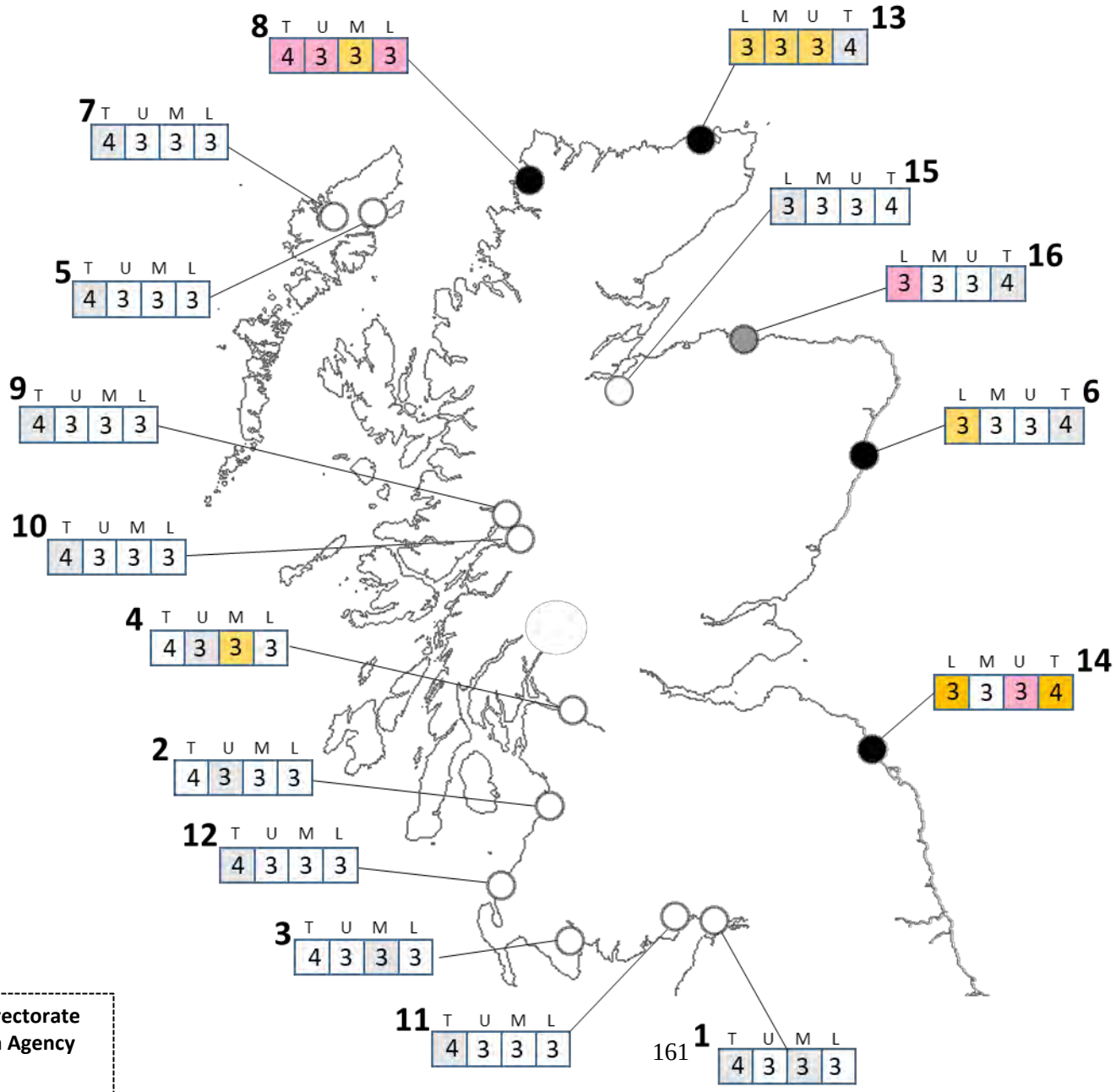
eDNA Surveillance
- Positive eDNA Detection
- Suspected eDNA Detection
- Inconclusive eDNA Detection
- No eDNA Detection

Physical sighting | 1 D/S | 2 U/S — Tier 1

1 River Nith	16 River Naver
2 River Bladnoch	17 River Thurso
3 River Stinchar	18 River Oykel
4 River Ayr	19 Berriedale River
5 River Clyde	20 River Helmsdale
6 River Fyne	21 River Beauly
7 River Awe	22 River Ness
8 River Leven (Lochaber)	23 River Spey
9 River Lochy (Lochaber)	24 River Deveron
10 River Balgie	25 River Ugie
11 River Torridon	26 River Ythan
12 River Ewe	27 River Dee
13 Abhainn Ghriomarstaidh	28 River Tay
14 Abhainn Ghrioda	29 River Forth
15 River Laxford	30 River Esk
	31 River Tweed

Data:
- Scottish Government Marine Directorate
- Scottish Environment Protection Agency
- Fisheries Management Scotland
- NatureScot

MONITORING > eDNA SAMPLING RESULTS – TIER 2



Physical Sighting

- Confirmed Physical Record/Sighting
- Unconfirmed Physical Record/Sighting
- No Physical Record/Sighting

eDNA Surveillance

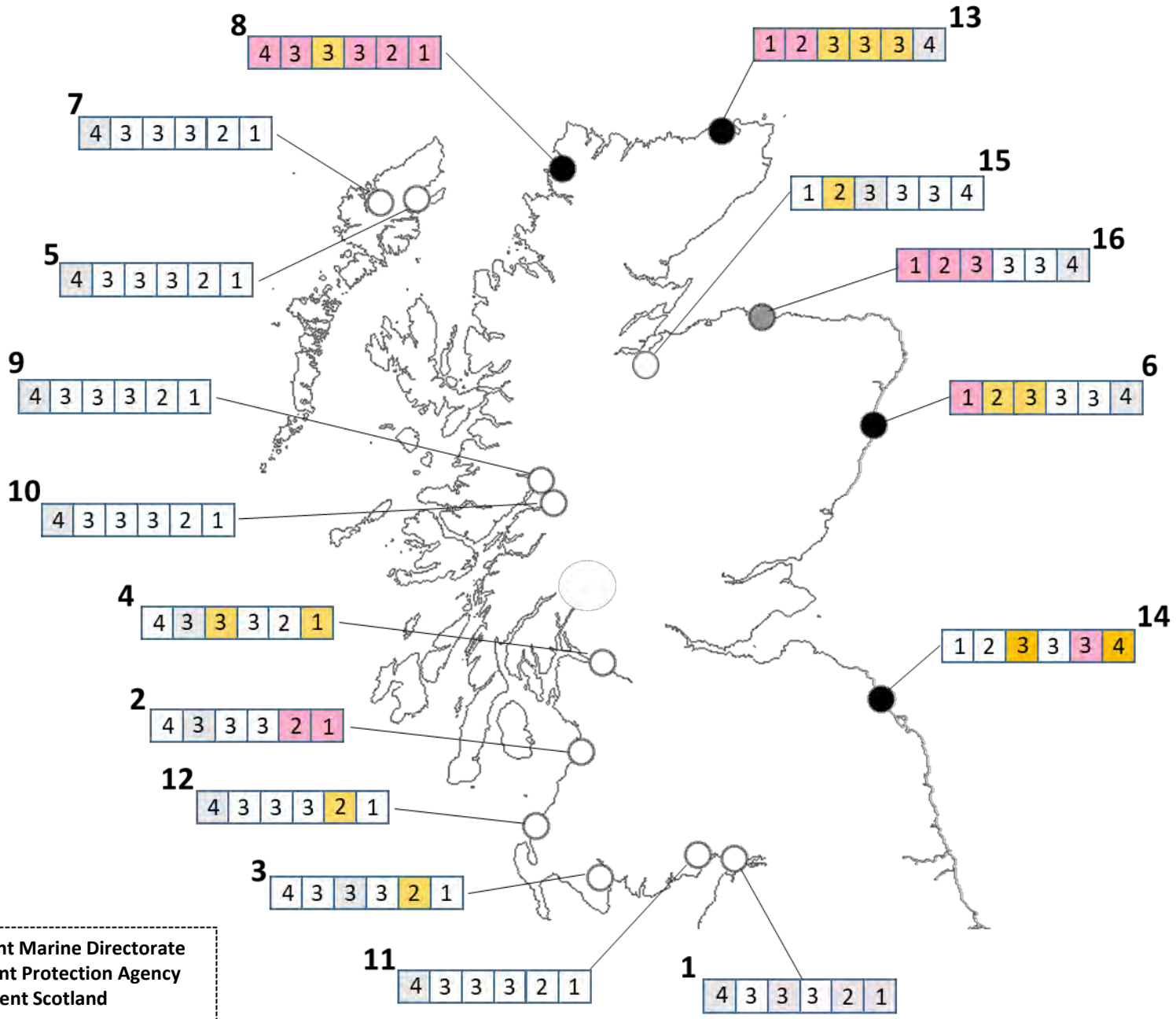
- Positive eDNA Detection
- Suspected eDNA Detection
- Inconclusive eDNA Detection
- No eDNA Detection
- Not sampled

Physical sighting | 3 Lower | 3 Middle | 3 Upper | 4 Trib

Tier 2

1 Annan	9 Leven (Lochaber)
2 Ayr	10 Lochy
3 Bladnoch	11 Nith
4 Clyde	12 Stinchar
5 Creed	13 Thurso
6 Dee (Abn)	14 Tweed
7 Grimersta	15 Ness
8 Laxford	16 Spey

Data:
- Scottish Government Marine Directorate
- Scottish Environment Protection Agency
- Fisheries Management Scotland
- NatureScot



Physical Sighting

- Confirmed Physical Record/Sighting
- Unconfirmed Physical Record/Sighting
- No Physical Record/Sighting

eDNA Surveillance

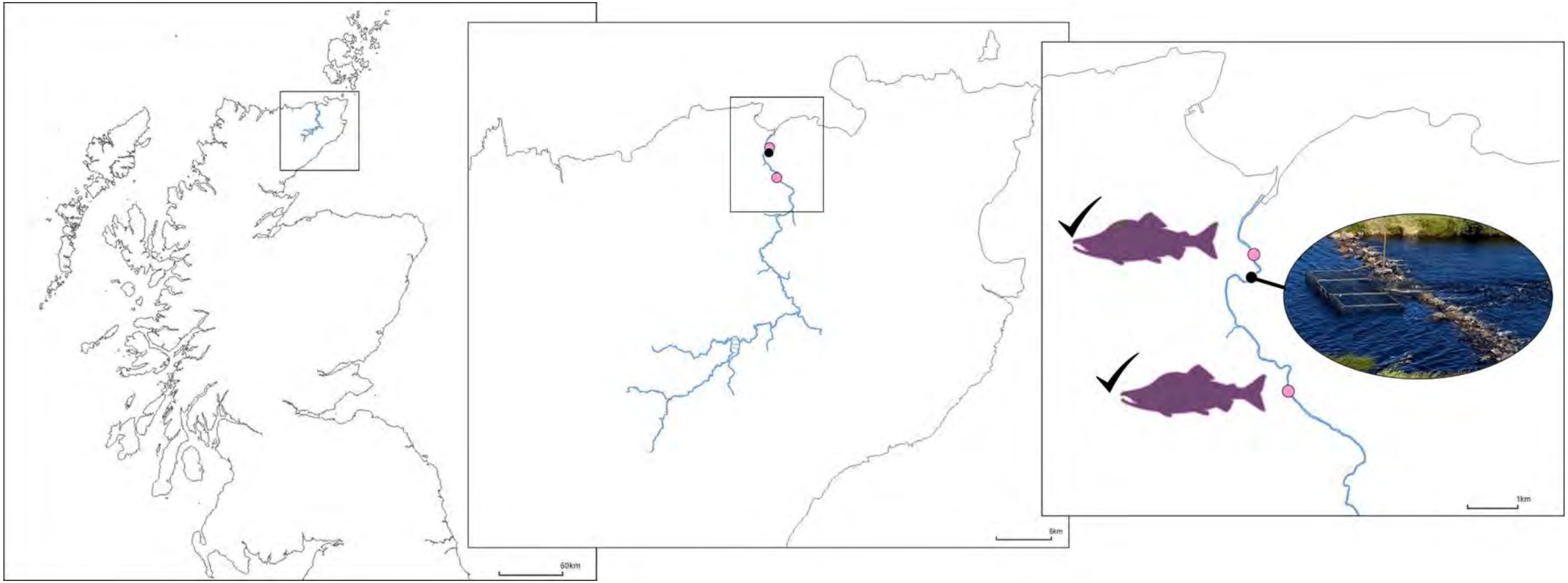
- Positive eDNA Detection
- Suspected eDNA Detection
- Inconclusive eDNA Detection
- No eDNA Detection
- Not sampled

Physical sighting	1	2	3	3	3	4
	D/S	U/S	Lower	Middle	Upper	Trib
	Tier 1		Tier 2			

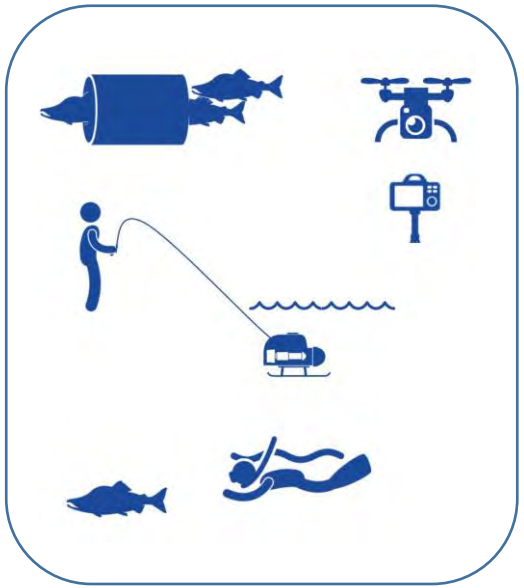
1 Annan	9 Leven (Lochaber)
2 Ayr	10 Lochy
3 Bladnoch	11 Nith
4 Clyde	12 Stinchar
5 Creed	13 Thurso
6 Dee (Abn)	14 Tweed
7 Grimersta	15 Ness
8 Laxford	16 Spey

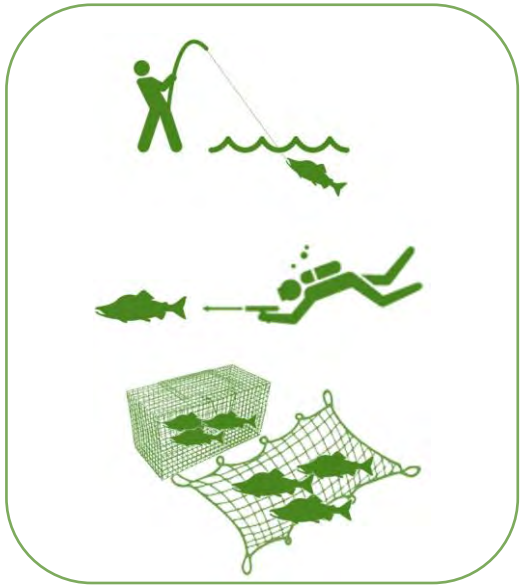
Data:
- **Scottish Government Marine Directorate**
- **Scottish Environment Protection Agency**
- **Fisheries Management Scotland**
- **NatureScot**

Pink salmon records 2023		
FMS App	**+ve eDNA (Tier 1)**	**+ve eDNA (Tier 2)**
River Dee (Aberdeenshire) (1)	River Ayr (+ve)	River Laxford (+ve)
River Dionard (1)	River Beauly (+ve)	River Spey (+ve)
River Forth (1)	River Dee (+ve)	River Tweed (+ve)
Halladale River (1)	River Ewe (+ve)	River Clyde (suspected)
River Laxford (4)	River Helmsdale (+ve)	River Thurso (suspected)
River South Esk (1)	River Laxford (+ve)	
River Tay (1)	River Naver (+ve)	
River Thurso (1)	River Spey (+ve)	
River Tweed (35)	River Thurso (+ve)	
	River Ugie (+ve)	
	River Clyde (suspected)	
	River Forth (suspected)	
	River Stinchar (suspected)	
	River Tay (suspected)	


60km
6km
1km

TAKE HOME MESSAGES & LESSONS LEARNED





The Pink salmon App continues to yield important information of Pink salmon abundance, distribution and other population metrics (such as sex and size of fish, spawning state and spawning behaviour).

BUT not all fish are entered, some records may be incorrect, and information on distribution can be spatially biased. This is supported by the current study.

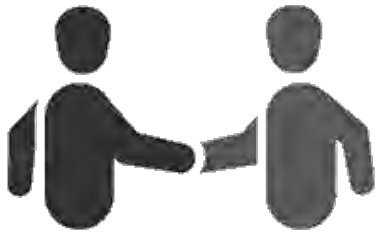
Surveillance of Pink salmon using a molecular approach is effective and is likely to be a more reliable, alternative to other *active* monitoring approaches over wide areas.

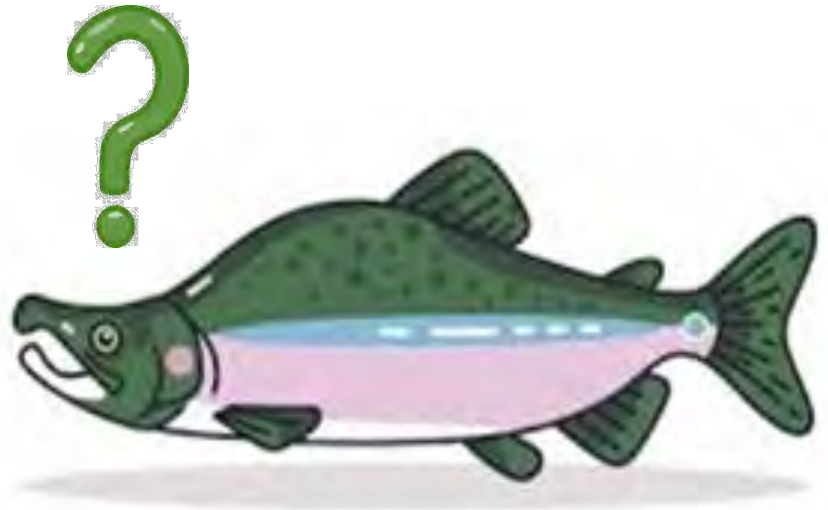
Proper sampling design is critical to ensure that spatial bias is eliminated but this is dependant on the resources available.

Some collection of samples could be integrated into existing work programmes for Government Agencies and others.

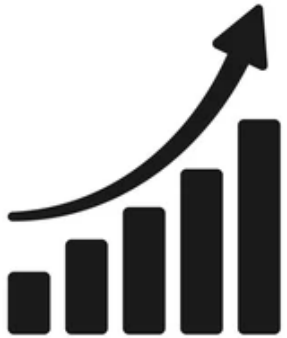
Training fishery biologists and others in the collection of samples is easily achieved.

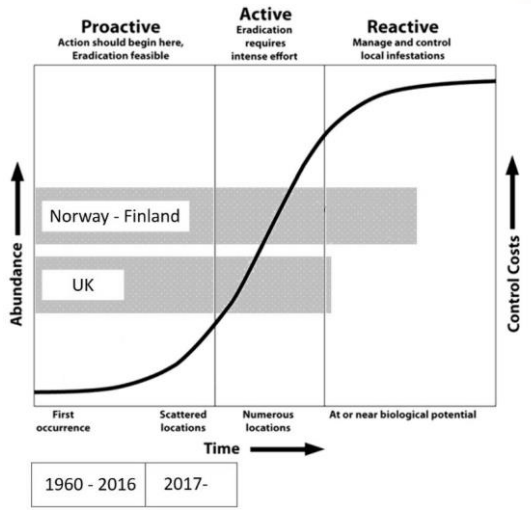
Adequate time MUST be given for the purchase of consumables and it would be useful to have a central store of key items (such as Vampire pumps) available for use





Co-operation, partnership and data sharing





Resource may depend on increasing trends and potential impact

Annex 18

PSWG(24)19

Draft Terms of Reference for the Working Group on Pink Salmon

Taking into consideration **Principle 15 of the Convention on Biological Diversity**, i.e.

> *'In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'*

the Pink Salmon Working Group is charged with the following Terms of Reference:

1. Exchange information among the Parties / jurisdictions on the status of pink salmon across the NASCO Convention area.
2. Identify best practice methodologies to monitor pink salmon distribution and abundance in the marine and freshwater environments.
3. Report biennially on the status of pink salmon, within each Party / jurisdiction, at an appropriate spatial scale.
4. Identify knowledge gaps to understand the potential impacts of pink salmon on wild Atlantic salmon.
5. Identify proportionate corrective measures that could be implemented by Parties / jurisdictions to prevent adverse effects on wild Atlantic salmon stocks. and
6. Review and modify, as necessary, these Terms of Reference for agreement by the Council.

The Working Group will meet annually. The timing and duration will be considered by the Chair and Secretariat in consultation with the Working Group. Even-year meetings will be in person, with virtual meetings in odd years. However, should the need arise, the Working Group would seek to meet inter-sessionally.