

	<p>International Atlantic Salmon Research Board</p> <p><i>Report of the Meeting of the Scientific Advisory Group of the International Atlantic Salmon Research Board to Identify Potential Research Priorities</i></p>	<p>ICRIS(24)02</p> <p>Agenda item: 3</p>
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Report of the Meeting of the Scientific Advisory Group of the International Atlantic Salmon Research Board to Identify Potential Research Priorities

Purpose

The purpose of this paper is to present the report of the Scientific Advisory Group’s meeting to identify potential research priorities to inform the International Atlantic Salmon Research Board’s (the Board) discussions at its Inter-Sessional Meeting to be held by video conference in February 2024.

Decisions

- no decisions are required at the Inter-Sessional Meeting.

Background

During its 2022 Annual Meeting, the Board considered the ‘Report of the Review of the Metadatabase of Salmon Survey Data and Sample Collections of Relevance to Mortality of Salmon at Sea’, [ICR\(22\)03](#). In addition to making recommendations about the Metadatabase, the Working Group had recommended that the Board may wish to:

- consider its overall vision, scope and purpose;
- assess whether the funding available to the Board is commensurate with its vision, scope and purpose;
- identify the priorities the Parties now have for the Board; and
- consider establishing a process for requesting and reviewing proposals.

At that meeting, [CNL\(22\)10](#), the Chair noted that it would be difficult to give these recommendations sufficient time and attention. Therefore, an Inter-Sessional Meeting of the Board was held in January 2023 by video conference, [ICR\(23\)02](#), at which it was agreed that, prior to seeking funding opportunities, the Board should identify what its research priorities are to help focus its efforts. To facilitate this work, the Board agreed to task its SAG to identify a prioritised list of research needs based on the current state of knowledge and the Board’s Inventory of Marine Research.

During its 2023 Annual Meeting, [CNL\(23\)10](#), the Board agreed ‘Terms of Reference for the International Atlantic Salmon Research Board’s Scientific Advisory Group to Identify Potential Research Priorities’, [ICR\(23\)14](#). It also agreed to hold an Inter-Sessional Meeting of the Board in February 2024 for initial discussions on the results of the SAG’s work, and that a period of inter-sessional correspondence would follow that meeting to further the debate and allow a decision on this matter to be taken at the Board’s 2024 Annual Meeting.

It was further agreed that decisions on what to do with the results of the SAG’s work and the revised ‘Guidelines on Submitting Proposals for Research, Workshops, Symposia and Other Activities for Support by the IASRB’ would be taken once the Board had considered the results of the SAG’s work to develop a prioritised list of research needs / topics. It was noted that the results of the SAG’s work may impact any successor for SALSEA-Track and the Board agreed to postpone seeking proposals for a successor for SALSEA-Track until it had considered the SAG’s work. However, these decisions are for the Annual Meeting in June and the discussions held during the Inter-Sessional Meeting of the Board will inform these decisions at the Annual Meeting in June.

The full report of the meeting of the Scientific Advisory Group of the International Atlantic Salmon Research Board to Identify Potential Research Priorities is provided below.

Secretariat
Edinburgh
25 January 2024

SAG(23)10

Report of the Meeting of the Scientific Advisory Group of the International Atlantic Salmon Research Board to Identify Potential Research Priorities

20 October, 16 – 17 and 29 – 30 November 2023

By Video Conference

1. Opening of the Meeting

1.1 The Chair of the Scientific Advisory Group (SAG), Peder Fiske (Norway), opened the meeting. He welcomed members of the SAG and the NGO representative (hereinafter referred to as the participants) and thanked them for agreeing to undertake the work assigned to them. He noted that during its 2022 Annual Meeting, the International Atlantic Salmon Research Board (the Board) had considered the ‘Report of the Review of the Metadatabase of Salmon Survey Data and Sample Collections of Relevance to Mortality of Salmon at Sea’, [ICR\(22\)03](#). In addition to making recommendations about the Metadatabase, the Working Group had recommended that the Board may wish to:

- consider its overall vision, scope and purpose;
- assess whether the funding available to the Board is commensurate with its vision, scope and purpose;
- identify the priorities the Parties now have for the Board; and
- consider establishing a process for requesting and reviewing proposals.

1.2 An Inter-Sessional Meeting of the Board was held in January 2023 by video conference, [ICR\(23\)02](#), at which it was agreed that, prior to seeking funding opportunities, the Board should identify what its research priorities are to help focus its efforts. To facilitate this work, the Board agreed to task its SAG to identify a prioritised list of research needs based on the current state of knowledge and the Board’s Inventory of Marine Research. During the 2023 Annual Meeting of the Board, [CNL\(23\)10](#), the Board agreed ‘Terms of Reference for the International Atlantic Salmon Research Board’s Scientific Advisory Group to Identify Potential Research Priorities’, [ICR\(23\)14](#).

1.3 The Chair noted that the purpose of this meeting was to address those Terms of Reference and to report to the Board.

1.4 A list of participants at the meeting is contained in Annex 1.

2. Adoption of the Agenda

2.1 The SAG adopted its Agenda, [SAG\(23\)04](#) (Annex 2).

3. Consideration of the Terms of Reference, ICR(23)14, and Working Methods

3.1 The SAG discussed the Terms of Reference for the meeting, [ICR\(23\)14](#), which were as follows:

‘The Scientific Advisory Group will:

- *develop a prioritised list of research needs / topics that the Board may consider directing resources towards to advance the understanding of the*

drivers of Atlantic salmon marine mortality. In support of this task, the SAG may consider the following sources of information during their deliberations:

- *current state of knowledge on the drivers of marine mortality;*
- *the Board's [Inventory of Marine Research](#) and [Metadatabase of Salmon Survey Data and Sample Collections of Relevance to Mortality of Salmon at Sea](#);*
- *'Report of the Working Group to Review the SALSEA-Track Programme and the Inventory of Research Relating to Salmon Mortality in the Sea', [ICR\(20\)07](#), including the suggested attributes for a potential Board signature project;*
- *'Report of the Review of the Metadatabase of Salmon Survey Data and Sample Collections of Relevance to Mortality of Salmon at Sea', [ICR\(22\)03](#);*
- *other relevant sources of information related to salmon marine mortality; and*
- *consulting with a wider representation of researchers outside of the SAG, if appropriate.*
- *for each research need identified, provide a brief assessment of how the expected information gained could be applicable to the development of management options that could help mitigate the impact of marine mortality on stock productivity'.*

3.2 In addition to the sources of information contained within the Terms of Reference listed above, and to remind the SAG of the context of its work, the SAG considered the vision, scope and purpose of the Board as contained in the 'Revised Terms of Reference for the International Atlantic Salmon Research Board and its Scientific Advisory Group', [ICR\(23\)18](#), agreed by the Council of NASCO at its 2023 Annual Meeting.

3.3 The SAG then considered its working methods to undertake the Terms of Reference. Each participant had been asked to prepare for the initial session of the meeting by creating a list of three research needs / topics, together with three sentences explaining the importance of each of these topics, that they felt the Board should direct resources towards. These were collated in the document 'Proposed Research Needs / Topics Submitted by Members of the SAG', SAG(23)03.

3.4 Following a suggestion from the Chair, the SAG agreed that:

- each need or topic would have a 'topic lead' and that person would be responsible for revising and writing a brief assessment of the need / topic by streamlining and merging similar topics received where appropriate and the Group's discussions during session one, i.e. the first meeting;
- the Secretariat would then collate these assessments and circulate them to participants for consideration and discussion with external researchers, where appropriate, in advance of the second session of the meeting;
- the second and third sessions of the meeting would allow an opportunity for re-considering the revised list and assessments and to commence prioritising the list;
- there would be a final opportunity to consult with external researchers, where appropriate, in advance of the fourth session of the meeting, at which the assessments and order of priority would be finalised; and

- the final session would allow the Group to consider the Draft Report of the Meeting.

4. Identification of Research Needs / Topics

4.1 During the first session of the meeting, on 20 October, the SAG considered the initial list of proposed needs and topics contained in SAG(23)03. The Chair had prepared a strawman document based on the initial list, which streamlined and merged proposed topics where appropriate. Working from this document, the reasoning behind each topic and its potential management implications were discussed in depth by the SAG.

4.2 The SAG considered the topic of ‘Climate change and implications for salmon at sea’ for possible inclusion on the list. The SAG noted that the Steering Committee of the 2023 Theme-based Special Session on Climate Change, CNL(23)83, had recommended that:

‘NASCO recognises the climate change research that is ongoing across the Parties / jurisdictions that can inform drivers of Atlantic salmon mortality. NASCO may wish to look for opportunities to facilitate funding and increase international scientific collaboration both through the Parties / jurisdictions and the International Atlantic Salmon Research Board.’

4.3 The SAG noted that the direct effects of climate change on salmon marine survival will be difficult to assess. Increased knowledge about, for example, migration routes, growth in relation to conditions at sea and interactions between freshwater and marine life stages of salmon may inform the assessment of the effects of climate change. The effect of climate change on salmon could, therefore, be viewed as an overriding theme that may be incorporated into all the topics suggested by the SAG. It was, therefore, not included as a stand-alone topic on the list.

4.4 A topic lead was assigned for each topic identified by the Chair and was tasked with writing the brief summary in light of similar topics received and, where appropriate, the discussions on their topic during the first session of the meeting. These summaries were compiled by the Secretariat into the document ‘Grouped Research Needs / Topics after the 20 October SAG Meeting’, SAG(23)05, and issued to all participants to allow external consultations to take place in advance of the second session of the meeting on 16 November.

4.5 At the second and third sessions of the meeting, the SAG considered the topics listed in SAG(23)05 in depth. It was noted that several of the topics may be linked, and future projects may, therefore, relate to more than one of these topics. For example, ‘Studying basin-wide patterns of marine growth and survival of Atlantic salmon’ may be closely linked to ‘Understanding the impact of the freshwater environment on mortality occurring at sea’ and future projects may wish to consider looking at both environments. Another example of potentially linked topics discussed was ‘Migration of salmon at sea’ and ‘Quantifying the mortality of Atlantic salmon caught as bycatch in pelagic and coastal fisheries’. However, the SAG felt that each topic should feature in the list as a stand-alone topic.

4.6 The SAG agreed the topics and research needs to be included in the list.

5. Prioritisation of the Identified List of Research Needs / Topics

5.1 Prior to the second session of the meeting, participants were asked to rank the topics contained in document SAG(23)05 in order of priority, with a score of 1 being the highest priority. The Secretariat collated the responses provided, in document SAG(23)06rev, adding together the scores given by the individual participants for each topic. The lowest scoring topic, therefore, had the highest priority ranking by the SAG.

- 5.2 During the sessions on 16 and 17 November, the SAG considered the collated order of priorities in SAG(23)06rev. The SAG noted the broad agreement between participants on the order of priority and that while one topic was clearly of higher priority to the SAG than the other four, there were three ‘bands’ of scoring: the first topic scored 10 points; the second and third topics scored 17 and 19 points; and the final two topics scored 29 and 30 points. The SAG, therefore, agreed to prioritise in three ranks: first; second; and third. The SAG wished to retain a note of the individual scores given to each topic to allow the Board to see the level of agreement in the SAG’s scoring of topics.
- 5.3 The SAG also noted that the kind of project the Board wishes to prioritise may affect the topic areas chosen and / or the level of priority allocated to the topics on the list. For example, the SAG discussed whether the Board’s priority might be for desktop projects, which would be easier to fund, field projects which are likely to require external funding, or a mixture of both. Another example discussed was whether the Board would wish to give higher priority to those projects with more potential direct management implications, or that have a more regional focus (i.e. of high importance in one part of the North Atlantic but not another). However, the SAG noted that these questions are for the Board to consider and focused on what the SAG felt was the highest priority for research.

6. Development of the SAG’s Assessments in Relation to each Identified Research Need / Topic

- 6.1 The summaries written by the topic leads following the first session of the meeting on 20 October, and compiled into document SAG(23)05, provided a basis for the assessments in relation to each identified research topic / need. These were considered by the SAG in advance of the second session on 16 November. Consultations were also held with external researchers. The feedback received in advance of the 16 November meeting was contained in document SAG(23)06rev.
- 6.2 During the sessions on 16 and 17 November, participants considered the text of the summaries contained in document SAG(23)05 and the feedback in SAG(23)06rev and made the following observations:
- the SAG discussed the Board’s request for an assessment of how the information gained from each of the proposed research needs could be applicable to the development of management options. The SAG noted that while research at sea is extremely important, there are often fewer direct management implications. Research in the freshwater environment is more likely to lead to potential management options. Research in fresh water could also be carried out at a basin-wide scale, with the Board, for example, potentially funding the collation of findings from across the North Atlantic. However, the Board’s current purpose and scope is to look at the causes of marine mortality so the SAG retained its main focus on the marine stage; and
 - projects looking at salmon at sea, including interactions between the freshwater environment and mortality of salmon at sea, are often only able to study those salmon that survive at sea as they collect samples from returning adults. It would be beneficial to be able to study those salmon that die at sea too.
- 6.3 Following the 17 November session of the meeting, the Secretariat compiled the topics, priority rankings and draft assessments into a working document for consideration by the SAG inter-sessionally, in advance of the meeting on 29 November. The changes proposed to the document were included in the ‘Draft Prioritised List of Research Needs

and Topics for Consideration by the International Atlantic Salmon Research Board, SAG(23)07.

6.4 During the meeting on 29 November, the SAG considered the proposed changes in document SAG(23)07 and made further changes to the document which were contained in document SAG(23)07rev for consideration during the final session of the meeting on 30 November.

6.5 The SAG agreed its 'Prioritised List of Research Needs and Topics for Consideration by the International Atlantic Salmon Research Board, SAG(23)08 (Annex 3).

7. Other Business

7.1 There was no other business.

8. Report of the Meeting

8.1 The SAG agreed the report of its meeting.

9. Close of the Meeting

9.1 The Chair thanked participants for their contributions and closed the meeting of the SAG.

2023 SAG Meeting List of Participants

Canada

**Julien April

European Union

**Jaakko Erkinaro

Norway

**Peder Fiske (Chair)

Russian Federation

**Sergey Prusov

United Kingdom

**Alan Walker

United States

**Tim Sheehan

NGOs

Dave Meerburg (NGO Representative)

Secretariat

Emma Hatfield

Louise Forero

**Nominated SAG Member

SAG(23)04

***Meeting of the Scientific Advisory Group of the International Atlantic Salmon
Research Board***

By Video Conference

20 October, 16 – 17 and 29 – 30 November 2023

Agenda

1. Opening of the Meeting
2. Adoption of the Agenda
3. Consideration of the Terms of Reference, ICR(23)14, and Working Methods
4. Identification of Research Needs / Topics
5. Prioritisation of the Identified List of Research Needs / Topics
6. Development of the SAG's Assessments in Relation to each Identified Research Need / Topic
7. Other Business
8. Report of the Meeting
9. Close of the Meeting

Prioritised List of Research Needs and Topics for Consideration by the International Atlantic Salmon Research Board

Background

During an inter-sessional meeting of the International Atlantic Salmon Research Board (the Board) held in January 2023, the Board tasked its Scientific Advisory Group (the SAG) with identifying a prioritised list of research needs based on the current state of knowledge and the Board’s Inventory of Marine Research.

During the Board’s 2023 Annual Meeting, [CNL\(23\)10](#), the Board agreed ‘Terms of Reference for the International Atlantic Salmon Research Board’s Scientific Advisory Group to Identify Potential Research Priorities’, [ICR\(23\)14](#).

The SAG has now met, ICRIS(24)02, to address these Terms of Reference and this document contains the SAG’s prioritised list of research needs and topics for consideration by the Board.

General Considerations on Climate Change

The SAG noted that the Steering Committee of the 2023 Theme-based Special Session on Climate Change, CNL(23)83, had recommended that ‘NASCO recognises the climate change research that is ongoing across the Parties / jurisdictions that can inform drivers of Atlantic salmon mortality. NASCO may wish to look for opportunities to facilitate funding and increase international scientific collaboration both through the Parties / jurisdictions and the International Atlantic Salmon Research Board.’

The SAG considered that the direct effects of climate change on salmon marine survival will be difficult to assess. Increased knowledge about, for example, migration routes, growth in relation to conditions at sea and interactions between the freshwater and marine life stages of salmon may inform the assessment of the effects of climate change. The effect of climate change on salmon could, therefore, be viewed as an overriding theme that may be incorporated into all the topics that the SAG has suggested below.

Prioritised List of Research Needs / Topics

The table below provides the agreed rankings of the five research needs / topics identified by the SAG. The ranks are identified on the basis of the total score, with the individual scores from SAG members being provided for transparency. A rank of ‘1’ indicates the highest priority. Therefore, the lower the total score, the higher the priority. Although five topics were identified, there are only three ranks because the scores were very similar for those topics ranked as ‘2’ and those topics ranked as ‘3’.

Topic	Rank	Score
Studying basin-wide patterns of marine growth and survival of Atlantic salmon	1	Total: 10 <i>Individual Scores: 1,1,1,1,1,2,3</i>
Migration of salmon at sea	2	Total: 17 <i>Individual Scores: 1,2,2,2,3,3,4</i>
Understanding the impact of the freshwater environment on mortality occurring at sea	2	Total: 19 <i>Individual Scores: 1,2,2,3,3,3,5</i>
Potential interactions between pink salmon and Atlantic salmon	3	Total: 29 <i>Individual Scores: 2,4,4,4,5,5,5</i>
Quantifying the mortality of Atlantic salmon caught as bycatch in pelagic and coastal fisheries	3	Total: 30 <i>Individual Scores: 3,4,4,4,5,5,5</i>

Assessments of Research Needs / Topics

Studying basin-wide patterns of marine growth and survival of Atlantic salmon

(Priority Level: 1)

Research Context

Many studies conducted in different parts of the distribution range of Atlantic salmon suggest that their marine survival is linked to growth and ocean productivity. However, some research reveals quite different patterns across regions. An Atlantic basin-wide study linking survival, growth and oceanic conditions is currently missing. It could provide insights into the drivers of Atlantic salmon marine mortality.

Approaches

Different approaches could be used, individually or combined, to address this knowledge gap. They include, but are not limited to: 1. Conducting a comprehensive literature review; 2. Gathering and analysing existing data about salmon and oceanic conditions; 3. Extracting and analysing new information from existing or novel samples (e.g. using automated scale circuli measuring tool, chemistry, stable isotopes and genetics) or studies (e.g. regarding physical marine habitat or by partitioning the marine mortality estimates into components of estuarine, near-shore and more distant mortality).

Expected Outcomes

The expected information gained by research on this topic does not have clear direct management implications. However, anticipated outcomes could be used in support of developing management options by identifying the main drivers of marine mortality and how these have changed over time. For example, if information gained through this research indicates that salmon are negatively impacted by a reduced amount of food sources, a direct management option could be to modify regulation for those fisheries reducing the availability of salmon prey in critical periods or areas. Information gained under this topic could also be used to help forecast the evolution of salmon abundance in a context of changing environment, thus helping to prioritise management actions at all stages of the salmon's life cycle and set realistic expectations for future productivity / abundance.

Migration of salmon at sea

(Priority Level: 2)

Research Context

A primary research need and data requirement for understanding the drivers of Atlantic salmon marine mortality is their location in the marine environment in time and space. Historically we have had a rudimentary understanding of the marine migration of the species across its range, but we do not have the specificity to properly identify, investigate and / or rank potential mortality stressors. In recent decades, advances have further elucidated the details of Atlantic salmon marine migration through small and large tagging, telemetry, survey and modelling studies. However, these advances have been focused primarily on the early post-smolt and kelt phases and less information is available about the critical late post-smolt phase and the returning adult phase, when individuals re-enter coastal waters and may be susceptible to numerous anthropogenic stressors. In addition, not all populations have been studied, nor have year-to-year variations been thoroughly investigated, and the wide knowledge base necessary to model the marine migration of all salmon populations is, therefore, missing.

A critical research need that the Board may consider directing resources towards is to continue to map Atlantic salmon marine migration in time and space across the entire North Atlantic. Progress on this research need could be made via a small number of individual research studies or via large-scale, well-co-ordinated, studies covering the entirety of the species range.

Approaches

Progress could be made by employing a wide variety of approaches such as tagging, telemetry, DNA of historical samples, eDNA, modelling based on start- and endpoints and chemical analyses of archival otoliths and scales. These approaches could be used within individual studies or in concert. In addition, results from these studies, and all previous studies, should be combined to inform future modelling efforts to maximise the information gained from each effort.

Expected Outcomes

The potential implications from such an effort are wide and varied. Having a better understanding of where salmon are in the marine environment in time and space could be used to aid in the planning of marine developments such as new offshore wind or aquaculture facilities. In addition, having a better understanding of the marine migration of Atlantic salmon could also help explain observed patterns of growth and inform the question of potential bycatch of Atlantic salmon in pelagic fisheries occurring within the east and west North Atlantic. Further, until a better understanding of where salmon are in the North Atlantic in time and space and where and when salmon are thought to be disappearing, the question about what can be done about it cannot be answered. Having this fundamental information is a critical need to better inform the discussion of potential management options. Having this detailed information may also offer the possibility of eliminating the likelihood of other hypothesised stressors being relevant, which will, therefore, allow future researchers and managers to focus their effort on the remaining stressors. Finally, a detailed understanding of current marine migration is an essential requirement to understanding how migration may change with a changing climate and therefore what old stressors may remain relevant and what new stressors may become relevant in the future.

Understanding the impact of the freshwater environment on mortality occurring at sea

(Priority Level: 2)

Research Context

The core question of this research topic is: ‘to what extent do freshwater characteristics such as temperature, pH and pollution affect smolt quality (e.g. physiology, size and run timing) in a manner that influences marine survival?’

Noting that we choose, for simplicity of writing here, to refer to the quality of the smolts, but we recognise that this quality can be influenced by a range of intrinsic (parental contributions) and extrinsic (environmental) factors acting on the egg to smolt stages. But that said, we require an understanding of what determines the quality of smolts in ways that affect their probability of survival during the marine phase.

Examples of such freshwater influences include those determining smolt size, which may affect patterns of marine growth of salmon and hence may influence their mortality rates. Thus, an understanding of how the freshwater environment influences smolt size (and perhaps growth patterns) is required, to aid in fully understanding factors that influence growth (and hence size-related mortality) in the marine environment. Linking to other proposed research topics, for example, ‘Studying basin-wide patterns of marine growth and survival of Atlantic salmon’, should consider including freshwater influences on growth patterns. Similarly, does growth in fresh water influence sea-age profile, i.e. whether smolts become 1SW or MSW returning adults, and associated migration of salmon at sea? Better characterising the influence of the freshwater environment may be useful for more accurately partitioning mortality between freshwater influences and factors occurring directly in the marine environment. Furthermore, one must not ignore the overriding past, present and future influences of climate-related changes in the freshwater environment that will influence smolt size, smolt age and other ‘quality’ aspects through a range of mechanisms.

Approaches

The core challenges of characterising ‘smolt quality’, and the intrinsic and extrinsic factors that influence this quality, mean that this research topic can be addressed using a wide range of field- and lab-based research methods, and existing and new data collection.

It is envisaged that comparisons between studies throughout the oceanic basin area will build the broad, general relationships and understandings, providing the added value as compared to site- or stock-specific studies.

Expected Outcomes

Although this topic may not at first appear directly related to salmon in the marine environment, it is relevant to the scope of the prioritisation exercise where the freshwater influences can help explain the fate of salmon at sea. It also has the advantage that some pressures acting in fresh water can potentially be mitigated by direct interventions in the freshwater phase (e.g. habitat restoration, etc.) that could provide benefits for marine survival. For example, reducing river temperatures through the direct management of abstraction and flows could mitigate the potential impacts of climate change.

However, as much of the research and management in the freshwater environment can be implemented at local and national scales, and the relative importance of some freshwater factors will vary from place to place (ranging from absent to the primary influence), there is a challenge to identify and focus on the element(s) where research sponsored by the Board can provide ‘added value’ to the research and management communities.

Similar to the growth and migratory patterns topics, the ‘added value’ element of research supported by the Board may start with a basin-scale review of our understanding of smolt

quality and freshwater influences. Such a review should contribute to explaining the observed changes in marine mortality, and predicting what will happen in the future for Atlantic salmon populations. In particular, can a common thread across the basin that contributes to our understanding of changes in marine mortality patterns over time be identified? Such knowledge might not lead to direct management actions but would certainly provide indirect support to overall management approaches.

Potential interactions between pink salmon and Atlantic salmon

(Priority Level: 3)

Research Context

At its Annual Meeting in 2022, NASCO made a statement ([CNL\(22\)47](#)) calling for mitigation efforts for pink salmon and encouraging research efforts on the topic in the Convention area. Based on this statement, the Terms of Reference for the NASCO Working Group on Pink Salmon ([CNL\(23\)69](#)) further call for consideration of both research and data needs and possible management measures to better understand the effects of pink salmon on Atlantic salmon.

Very little is known about the potential interactions between pink salmon and native Atlantic anadromous salmonids, or possible direct and / or indirect impacts on Atlantic salmon populations. Such interactions may take place at different life stages, including the marine feeding migration.

Survival of Atlantic salmon at sea is believed to be density-independent because the density of Atlantic salmon at sea is low. Pink salmon are known to affect the marine ecosystem and growth, abundance, distribution, phenology and survival of a variety of other organisms in the Pacific Ocean. Data from the Pacific suggest reduced growth and survival of other salmonids in years when pink salmon are abundant. The abundance of pink salmon in the North Atlantic is very low in comparison with its abundance in the Pacific. However, in the north-eastern part of the distribution of Atlantic salmon (northern Norway and Russia), pink salmon likely outnumber Atlantic salmon in the sea every second year; odd-year spawning pink salmon are currently abundant whereas even-year spawners are scarce in the same areas.

Approaches

First, it is important to understand the scale and nature of the possible interactions. Are pink salmon a problem for native species, and, if yes, under which circumstances, at which scale, on which temporal and spatial extent? Second, what kind of policy and management decisions should be taken, how much effort, cost and risk on native species should be tolerated when mitigating the potential negative effects of pink salmon?

Potential interactions could, for example, be investigated by diet analysis estimating overlap between pink salmon and Atlantic salmon, by modelling of migration routes of pink salmon smolts and Atlantic salmon smolts from rivers to estimate overlap in distribution, studying return migration and its timing and by comparing scale growth and relative abundances in the sea of both species. Such comparisons could make use of the year-to-year variation and investigate whether the variables differ between odd and even years.

Expected Outcomes

Improved understanding and scientific data on the impacts of pink salmon would be readily applicable to the development of management options. If invasive pink salmon not only impact native salmonids in spawning rivers, but also in the ocean, this will have even broader management implications. For example, evidence of competition for resources between the species, and density-dependent impacts on Atlantic salmon in the ocean, could call for even more efforts to reduce pink salmon spawning than those planned and implemented so far. In contrast, fewer intraspecific impacts than suggested in some predictions and risk assessments would probably call for reconsideration of feasible management measures in different jurisdictions.

Quantifying the mortality of Atlantic salmon caught as bycatch in pelagic and coastal fisheries

(Priority Level: 3)

Research Context

The potential for post-smolt Atlantic salmon bycatch in the large-scale small-pelagic fisheries of the North-East Atlantic (as well as in coastal fisheries) has been of concern for years, but investigations have been hampered by the lack of detailed fishery catch and post-smolt distribution data. Advances have been made detailing post-smolt distribution in the North-East Atlantic and, given the renewed focus on the potential bycatch issue, progress has been made towards identifying the fishery data required to enable an understanding of the magnitude of the problem. Although this research topic is a North-East Atlantic issue, it has the potential to affect populations from a large portion of the species' range and does provide the potential for management actions to be developed if the bycatch of salmon was determined to be significant. This issue was highlighted in the ICES Advice for 2023, where the lack of progress on previous recommendations on this subject was noted and a list of data deficiencies and research needs provided.

Approaches

To enable a determination of the scale of post-smolt Atlantic salmon bycatch, progress could be made on two main fronts. Firstly, a quantitative analysis of the risk of exposure and bycatch risk to salmon stocks could be carried out through developing an improved understanding of post-smolt and adult salmon migration routes in time and space, together with knowledge of gear- and fisheries-specific fishing effort data (in both smaller-scale inshore and larger-scale offshore fisheries). At the same time, since bycatch data collection is difficult to access directly at present, research is required to complete the development of eDNA data collection methods from scientific and commercial pelagic trawls to improve detection of salmon bycatch, including to quantify levels of uncertainty.

Expected Outcomes

If the magnitude of the bycatch of salmon at sea is determined to be large in some fisheries, there is potential for direct management actions through modification to these to minimise bycatch (such as targeted closed areas in both time and space). It must be recognised, however, that requests for adjustments to fishing patterns will be challenging and the evidence base for salmon bycatch will, therefore, need to be clear.