SAG(17)6

Draft Report of the Meeting of the Scientific Advisory Group of the International Atlantic Salmon Research Board

Varbergs Kusthotell, Varberg, Sweden

5 June 2017

1. Opening of the Meeting

1.1 The Chairman of the Scientific Advisory Group (SAG), Dr Niall Ó Maoiléidigh (European Union), opened the meeting and welcomed participants to Varberg.

1.2 A list of participants is contained in Annex 1.

2. Adoption of the Agenda

2.1 The SAG adopted its Agenda, SAG(17)5 (Annex 2).

3. Review of the Updated Inventory of Research and the Metadatabase of Salmon Survey Data and Sample Collections

Research Inventory

3.1 The Chairman presented an overview of the Inventory of Research Relating to Salmon Mortality in the Sea, SAG(17)2. For 2017, the total annual expenditure on the 53 ongoing projects (3 of which are uncosted) is approximately £6.9million. Approximately 40% of the expenditure is associated with long-term monitoring programmes. He indicated that there are twelve new projects, some of which have been ongoing for some time and one of which is completed. Seven of these new projects involve acoustic telemetry. The new projects are as follows:

Canada

- Tracking the migration behavior of Atlantic salmon kelts (Middle and Baddeck rivers), through a unique inland brackish sea of Cape Breton, Canada;
- Evaluating the role of bottom-up effects of prey availability on the survival or local abundance of repeat spawning Atlantic salmon between two ecosystems;
- Movements and survival rates of acoustic tagged smolts from Campbellton River, Newfoundland;
- Research into factors of early marine phase postsmolt mortality using acoustic predator-detection tags *(Northwest Miramichi River, New Brunswick, Canada);*
- Research into factors of early marine phase postsmolt mortality using acoustic predator-detection tags *(Stewiacke River, Inner Bay of Fundy, Nova Scotia, Canada);*

- Migration, distribution, survival of smolts from Nashwaak River;
- Early marine phase migration, and survival of Atlantic post-smolts from multi-sea-winter salmon populations of Quebec;
- West River Acid Rain Mitigation Project.

European Union - Ireland

- Sea lice model for the sustainable development of Atlantic salmon fisheries and aquaculture;
- Unlocking the archive: using scale and otolith chronologies to resolve climate impacts.

European Union - UK (Northern Ireland)

- COMPASS (Collaborative Oceanography & Monitoring for Protected Areas and Species).

United States

- Effects of climate-driven ecosystem change on Atlantic salmon growth and survival at sea; analyses of West Greenland salmon.

3.2 The SAG has previously recognised that as there is insufficient time available to thoroughly review the inventory at its meetings or at the meetings of the ICES Working Group on North Atlantic Salmon and the Board had, therefore, agreed that review of the inventory should be conducted by a SAG Sub-Group every 3 or 4 years. The inventory was last reviewed in 2012 by the Sub-Group on the Future Direction of Research on Marine Survival of Salmon and, if the agreed schedule is followed, the next review of the inventory would be due in 2017. However, the SAG noted that one of the purposes of the review is to identify research needs and it recognised that the Board has agreed that its current priority is to partition mortality of salmon along their migration routes through telemetry studies (SALSEA - Track). The SAG also considered that it might be appropriate to wait until after the IYS to conduct the next review of the inventory. The SAG, therefore, recommends to the Board that the need for a further review of the inventory should be reconsidered in 2019 or 2020.

3.3 The SAG noted that Table 3 in the inventory allocates projects to their relevant SALSEA work package and that this presentation continued to be informative and should be retained.

3.4 The SAG recommended to the Board that the Parties be asked to provide any comments on the inventory to the Secretariat by 1 July and, thereafter, that the revised inventory should be uploaded to the IASRB website.

3.5 Professor Ken Whelan of the Atlantic Salmon Trust (AST) informed the SAG that the AST had recently appointed Matt Newton as a coordinator for telemetry projects in the UK and that some new projects would be commencing soon and would then be available for inclusion in the inventory.

3.6 Mr Mark Saunders (North Pacific Anadromous Fish Commission) indicated that the inventory was a valuable source of information and that there was interest in developing an inventory for research on salmon in the Pacific.

Metadatabase

3.7 The Secretary reported that the Board had previously decided that it could play an important role with regard to marine salmon survey data and sample co-ordination by establishing a metadatabase of existing datasets and sample collections of relevance to mortality of salmon at sea. This metadatabase was established in 2014 and is made available on the IASRB's website. Prior to the 2016 Annual Meeting, the metadatabase contained the following eleven entries:

- Greenland tag recaptures (data);
- SALSEA-Merge biological samples (biological samples);
- External tag recoveries from tagging programmes in Canada, USA, EU, Norway and Russia and international adult salmon tagging at Faroes and Greenland (data);
- Faroes CWT recoveries (data);
- Greenland catch data (data);
- North-East Atlantic run reconstruction data (data);
- SALSEA Greenland (biological samples);
- SALSEA North America biological samples (biological samples);
- North American Run Reconstruction Data (data);
- SALSEA-Merge marine feeding (data);
- SALSEA-Merge Genetics Database: Genetically-based Regional Assignment of Atlantic Salmon Protocol (GRAASP) (data).

3.8 In 2015, the SAG had discussed the high value of archival scale collections that, as a result of advances in analytical methods, can now be used for genetic, stable isotope and growth studies. Additional information may be obtained in the future in response to further advances in analytical methods. The SAG had noted that these collections may be lost when individual scientists retire unless appropriate arrangements are in place to archive them and ensure their safe storage so that they may be available for analysis. The SAG recognised that, even if the scales themselves are not lost, the information accompanying them could be or they could be damaged while in storage. In 2016, it was recognised that the Board could play a role in identifying such scale collections, raising their profile with a view to safeguarding them for future use. The IASRB agreed that information on these scale collections should, as a first step, be included in the IASRB metadatabase. Accordingly, Parties/jurisdictions were requested to provide details to the Secretariat of any archival scale collections and information has been received from the Russian Federation and the United States. The Board had also agreed that information on the West Greenland Sampling Programme Biological Characteristics database should be included in the metadatabase. The following new datasets have been included in the metadatabase since 2016:

- Kolarctic Coastal samples;
- PINRO Atlantic salmon scales collection;

- USA origin juvenile and adult scale samples; and
- West Greenland Sampling Database.

3.9 The Chair encouraged other Parties/jurisdictions to contribute details of scale collections for inclusion in the metadatabase. He referred to the existence of scale collections in Ireland dating back to the 1920s which are stored in a secure facility and a metadatabase entry will be developed during the course of a new project and the information provided to NASCO.

4. Update on the International Year of the Salmon

4.1 At its 2016 Annual Meeting, the Council had recognised that an International Year of the Salmon (IYS) could provide a very good opportunity to raise awareness of the factors driving salmon abundance, the environmental and anthropogenic challenges they face and the measures being taken to address these. An Outline Proposal for an IYS, entitled '*Salmon and People in a Changing World*', which included a proposed rationale, vision, themes and timings for the IYS, together with details of its scope, a governance model and initial budgetary considerations, was broadly accepted by the Council in 2016 subject to some provisional points of clarification. The focal year of the IYS is 2019. There are five research themes for the IYS and the Board has previously recognised that there might be some synergies between the IYS and SALSEA - Track. The IYS research themes are as follows:

- Status of Salmon: to understand the present status of salmon and their environment;
- Salmon in a changing salmosphere: to understand and quantify the effects of natural environmental variability and anthropogenic factors affecting salmon distribution and abundance and to make projections of their future changes;
- New Frontiers: to develop new technologies and analytical methods to advance salmon science and to explore the uncharted regions of the salmosphere;
- Human Dimension: to investigate the cultural, social and economic elements that depend upon sustainable salmon populations;
- Information Systems: to develop an integrated archive of accessible electronic data collected during the IYS and tools to support future research.

4.2 In 2016, the SAG noted that the SALSEA - Track programme fitted well into the first three of these themes. There was support for the proposed international symposium as a means to improve exchanges between scientists working in the Pacific and Atlantic.

4.3 The Chairman referred to Council document CNL(17)12 which provides an update on IYS activities since last year. He referred to ICES being a core partner of NASCO in the IYS and its interest in facilitating improved dialogue between scientists working in the Pacific and Atlantic. He referred to consideration of climate change issues at the last meeting of the Working Group on the North Atlantic Salmon at which there had been valuable input from scientists in the North Pacific.

4.4 The Chair welcomed Mr Mark Saunders and Dr George Iwama from the North Pacific Anadromous Fish Commission (NPAFC). Mr Saunders provided an update on IYS activities in the North Pacific. He indicated that NPAFC had conducted its Annual Meeting about two weeks ago and that there is considerable interest in this hemispheric

approach to salmon research and outreach. He indicated that 2015 witnessed the largest EL Ninô event in the Pacific, both in magnitude and duration, and impacts on salmon stocks are still evident. He indicated that the Committees envisaged under the IYS Outline Proposal had been established in a flat rather than hierarchical structure. An IYS Secretariat had been established for the North Pacific to support planning and fund raising. The North Pacific Steering Committee had considered the timing and scope of the IYS symposium proposed for autumn 2018. The NPAFC IYS Working Group had considered potential research activities aligned with NPAFC's Science Plan and a large winter survey involving five vessels is planned. A primer has been developed which identifies impact measures for each IYS outcome and the intention would be to discuss this within the Coordinating Committee. He indicated a number of overlapping priorities in the North Pacific and North Atlantic including understanding survival across life history type, aquaculture/wild salmon interactions, with expansion of the research inventory to cover the hemisphere.

4.5 Mr Dan Morris indicated that he was looking forward to the IYS Special Session to be held during the Annual Meeting and he hoped that the SAG would find the programe that had been developed to be relevant and of interest. He noted that NPAFC has a large emphasis on research and orders of magnitude of investment that was impressive. NPAFC and NASCO are approaching the IYS differently and the situation in the two oceans is very different with greater abundance and utilisation in the Pacific but scarcity in the North Atlantic. He noted that the NPAFC Steering Committee has an expansive view of the IYS over a five year period. There is a need to develop an approach for collaboration since in NASCO the IYS is having to fit in with other activities. There is a need to identify what we have in common, including interest in a better understanding of how habitats are changing, sharing data, a joint symposium and possibly research at the salmosphere level. He advocated dreaming big to make the IYS a success.

5. Developments in relation to SALSEA - Track

5.1 In 2014, the IASRB had endorsed the need for an international telemetery programme and adopted a Resolution (ICR(14)10) encouraging Parties to continue the development of local collaborative telemetry projects, encouraging the development of large international collaborative projects building on local efforts and encouraging Parties to make efforts to identify funding sources. The Board had noted that the telemetry programme should build on the success and identity of the SALSEA Programme and had recognised that there may be a role for the Board in co-ordinating efforts and supporting fund raising initiatives. In 2014, a Telemetry Workshop organised by the Board had developed 12 outline project proposals utilising telemetry. The Board had recognised that if the international telemetry programme is to proceed, it would be important to liaise with the project leaders with a view to following progress and, where appropriate, to provide support to assist with their implementation.

5.2 In 2015, the Board had recognised the high value of the SALSEA brand and the strong impact of NASCO as the international forum for consultation and co-operation on wild Atlantic salmon. The Board reaffirmed its commitment to an international telemetry project under the SALSEA brand, namely SALSEA - Track. Specifically, the Board agreed to support SALSEA - Track as a continuing commitment to understanding the factors affecting the mortality of salmon at sea, to make funds available to prepare a vision statement for SALSEA - Track and to advance existing initiatives towards an integrated collaborative telemetry programme.

5.3 In 2016, the Board had confirmed that it endorsed the twelve projects but noted that, if they changed substantially, they should be referred to the SAG. It was recognised that there might be scope to combine some of these projects into larger projects within the North American and North-East Atlantic Commission areas.

5.4 The Chairman of the Board, Mr Rory Saunders (USA) introduced paper ICR(17)3. He provided an update on progress with the twelve projects, noted additional new projects relating to telemetry that had been included in the inventory and referred to funding provided to the IASRB to support two projects (see 5.5).

5.5 Dr Cathal Gallagher presented updates on two projects for which funding had been provided to the IASRB through an EU 'grant for action' award. The Lice Track project aims to develop a sea lice integrative model, and involves parties in Norway, Scotland and Ireland. A planning workshop had been held in early 2017. The main test site is in an Irish National Salmonid Index Catchment where there is some salmon farming located in close proximity but with high densities in some years and low densities in others. The field work is underway and sentinel cages have been deployed. A second project, Smolt Track, has also commenced with an expert workshop at which there was a review of tagging techniques and sharing best practice and development of SOPs. The project involves partners in Denmark, England, Northern Ireland, Spain and Ireland where there are different mortality factors operating e.g. sea lice in Ireland and cormorants in Denmark. New partners are seeking to join the project.

5.6 Mr Lawrence Talks made a presentation on the SAMARCH project which involves ten partners in England and France. Funding has just been approved for the project to establish a genetic dataset. The project will be conducted from 2017 - 2022 with funding of €7.8million. It will aim to track sea trout kelts in the estuary and costal waters. It should provide information to establish a genetic dataset, improve stock assessment for salmon and sea trout and support the protection of salmon and sea trout stocks.

5.7 Mr Tim Sheehan provided an overview of a new approach for tracking marine species in the open ocean, through a collaborative effort between NOAA Fisheries, Woods Hole Oceanographic Institute, (WHOI), and the Atlantic Salmon Federation. The approach is designed to overcome many of the significant challenges associated with tracking Atlantic salmon throughout their marine migration.

5.8 The new approach, ROAM (RAFOS Ocean Acoustic Monitoring), is a modification of RAFOS, a commonly used technique for sub-surface oceanographic monitoring. Hydrophones are used to detect and record 'pong' detections while also collecting a suite of environmental data. Once the sound source detections are downloaded from the hydrophone, the estimated distance of the hydrophone from the sound source can be calculated for each 'pong' recorded. Daily position estimates can then be calculated to approximately one square kilometre based on triangulation from the daily distance estimates.

5.9 He described a study plan to track sub-adult Atlantic salmon captured at Greenland throughout the Labrador Sea during their return migration using the ROAM approach. A total of 8 sound sources would adequately cover the study area which ranges from Nova Scotia (Canada) north to Disko Bay (Greenland). The sound source would need to be custom built and would cost approximately $100K. The sound source would remain

active for a period up to 10 years and efforts are being pursued to have them deployed in-kind by a potential collaborator. The ROAM archive and PSAT tag costs have yet to be determined but are expected to be approximately equal to current acoustic and PSAT costs if not cheaper. The tentative plan is for sound source deployment to occur in 2018/19 with tagging to occur in 2018/19-2020/21. NOAA Fisheries, WHOI, and ASF are currently working to organize this project.

5.10 Mr Sheehan noted that as with any new effort, there would be initial start-up costs, although these costs may be considered reasonable given the scope of the project. This is a new approach for old technology and although expectations are high for success, field and laboratory testing is needed and ongoing. It was noted that the technique is not appropriate for nearshore positioning given issues with sound propagation in shallow environments nearshore. It was also noted that any large scale tagging is inevitably difficult to coordinate. However, the ROAM approach may provide an ability to accurately track Atlantic salmon further out to sea than was previously able. The miniaturization of the RAFOS approach will overcome many of the cons from contemporary tracking technologies and the archive and PSAT version will provide different approaches for tracking different life stages. In addition to precise location estimates, concurrent environmental data will also be collected. Sound source coverage from Nova Scotia (Canada) north to Disko Bay (Greenland and eastward from France north to the Kola Peninsula (Russia) may be theoretically achievable with 20 sound sources at an approximate cost of $1 million. This could provide a monitoring network covering the range of Atlantic salmon across the North Atlantic.

5.11 In response to a question from the Chair, Mr Sheehan indicated that while the ROAM project was not a specific project within the 12 endorsed by the Board, it was technically part of the satellite tagging programme at West Greenland and could be extended to other projects. He indicated that the technology exists but it needs to be included in existing satellite housing and it could reduce the size of these tags by 50%. The technology is already being used by oceanographers and should not have impacts on marine mammals. For the smolt tags there would be a need for tag recovery programs but at the moment the focus was on satellite tags. It was noted that interference from other sound sources was not a problem in the open ocean but it could be in costal areas. The Ocean Tracking Network (OTN) was aware of this development and had expressed interest but had not looked at the details.

5.12 The SAG noted the enormous potential of this development in terms of being able to monitor tagged fish across the entire north Atlantic at a relatively modest cost. The SAG recommended that this research should continue to be reported at the SAG and brought to the attention of the IASRB.

5.13 Mr Dave Meerburg (ASF Canada) updated the SAG on its smolt and kelt tracking studies in the Gulf of St Lawrence. A more detailed report is available in the report of the 2017 meeting of the ICES Working Group on North Atlantic Salmon.

6. Progress Reports on Projects Funded by the IASRB

6.1 Mr Tim Sheehan indicated that the United States had previously made a contribution of £16,900 ($26,000) to the IASRB to support an extension of a study undertaken in 2014/15 (SAG(15)4). The extension study is being led by Dr. Ian Bradbury, Fisheries and Oceans Canada, and is 'Enhancement of a North American Atlantic Salmon genetic baseline for

individual and stock identification'. The details of the project were to be finalised following last year's Annual Meeting and the research was to be initiated thereafter. He provided an update on the project to the SAG on behalf of Dr. Bradbury. The funds are to support the genetic processing and analysis of approximately 670 individual scale samples collected from the West Greenland fishery to obtain region of origin assignments for North American origin fish. The target years are 1970, 1971, 1972, 1976, 1980, 1981 and 1982. These years were selected to increase the sample size of North American region of origin assignments prior to 1990. Previous work supported by the Board (SAG(15)4) presented a time-series of North American region of origin contributions to the West Greenland fishery (1968-2014); however, sample size prior to 1990 was low. Mr Sheehan confirmed that the funds had been transferred to DFO and that sample collection had been completed. The initial processing has been completed and the laboratory is currently re-running samples whose preliminary genetic results were found to be deficient. Final results are expected by October 2017 and a final report will be provided to the SAG at their 2018 Meeting.

7. Review of Project Applications for Potential Funding by the IASRB

7.1 Under the Board's Guidelines for Submitting Proposals for Research, Workshops, Symposia and Other Activities for Support by the IASRB, ICR(09)10, applications seeking either only endorsement by the Board or funding support from the Board may be considered. Applications are reviewed by the SAG which makes its recommendations to the Board.

7.2 The Chairman referred to an application by the Atlantic Salmon Trust for endorsement by the Board of a 'suspects model' and a request for £5,000 funding to help organise and run a scientific workshop of 6 to 8 specialists in Autumn 2017. Professor Walter Crozier (Atlantic Salmon Trust) presented documents SAG(17)4 and ICR(17)4 and referred to a request for endorsement for the project and support for the workshop which would examine in detail the feasibility of the framework proposed in SAG(17)4 and support the development of a consortium bid for funding in the form of a Concerted Action or other appropriate science support mechanism. The Atlantic Salmon Trust has funded the work to date and will continue to support its further development on a partnership basis into the future.

7.4 The SAG considered that the development of the 'suspects model' was a valuable initiative that could support new modelling approaches being developed by the ICES Working Group on North Atlantic Salmon. It recommended that the Board endorse the development of the model and approve the request for funding. Mr Mark Saunders indicated that there is considerable interest in a similar approach in the Pacific and that IYS funds may be available to allow participation of scientists from the Pacific in the AST Workshop.

7.5 The Board had previously agreed that it would be important to have reserves available to it so that it could continue to support initiatives such as the Greenland and Faroes GSI projects; the Board's support had assisted in securing additional funding from other sources. These projects had resulted in new information of value to management with limited financial support from the Board. The Sub-Group on the Future Direction of Research on Marine Survival of Salmon had noted in 2012 that the Board had very limited resources and recognized that if it is to continue to play a role in supporting research on salmon at sea it should consider how it can address this situation.

8. Other Business

8.1 There was no other business.

9. Report of the Meeting

9.1 The SAG agreed a report of its meeting.

10. Date and Place of the Next Meeting

10.1 The SAG agreed to hold its next meeting in conjunction with the Thirty-Fifth Annual Meeting of NASCO during 12 - 18 June 2018.

11. Close of the Meeting

11.1 The Chairman of the SAG thanked the participants for their contributions and closed the meeting.