ICES WGRECORDS REPORT 2017

ECOSYSTEM PROCESSES AND DYNAMICS STEERING GROUP

ICES CM 2017/SSGEPD:17

REF. SCICOM

Report of the Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS)

19 September 2017

Fort Lauderdale, USA

ICES International Council for the Exploration of the Sea

CIEM Conseil International pour l'Exploration de la Mer

International Council for the Exploration of the Sea
Conseil International pour l'Exploration de la Mer

H. C. Andersens Boulevard 44–46
DK-1553 Copenhagen V
Denmark
Telephone (+45) 33 38 67 00
Telefax (+45) 33 93 42 15
www.ices.dk
info@ices.dk

Recommended format for purposes of citation:

ICES. 2017. Report of the Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS), 19 September 2017, Fort Lauderdale, USA. ICES CM 2017/SSGEPD:17. 45 pp.

Contents

Executive summary

Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS) was established to provide a forum for the coordination of work on diadromous species following the disbanding of the Diadromous Fish Committee. The role of the Group is to coordinate work on diadromous species, organise Expert Groups, Theme Sessions and Symposia, and help to deliver the ICES Science Plan. The annual meeting of WGRECORDS was held on 19 September 2017 during the ICES Annual Science Conference in Fort Lauderdale, Florida, and chaired by Russell Poole (Ireland) and Johan Dannewitz (Sweden).

The annual meeting received reports from ICES Expert Groups and workshops working on diadromous species, and considered their progress and future requirements. During the meeting, the following areas were discussed in more detail:

- The ongoing work of WGDAM, especially how the group should prioritize their work during the final year, with particular focus on methods for monitoring and status assessment;
- The ongoing need for a scientific review of the stock assessment methods used by individual countries in their national eel management plans, for coordination at the international level and a need for ICES to provide advice in support of the EU Regulation and implementation of the recovery plan;
- A new Resolution for a **Workshop on Tools for Eel** (WKTEEL) to support the further development of the eel database, setting up quality checking of the data being entered and creating tools for integrating and analysing the data;
- International Year of the Salmon – progress and engagement by ICES;
- The initiation of a pan-regional diadromous subgroup (DSG) within the Regional Coordination Group (RCG) of the Baltic Sea. The subgroup will have a coordinating function and identify data collection needs for diadromous species in relation to the EU data collection regulation. During the WGRECORDS meeting, a summary from the first meeting with the DSG was presented and discussed;
- A theme session on assessment methods for data limited fish stocks, to be held in the 2019 ASC;
- Working Group self-evaluation of the work carried out by WGRECORDS during the three year term 2015–2017;
- The need of a continuation of the working group and a ToR draft resolution for the years 2018–2020 including a change to a more recognisable acronym.

The Group noted and discussed the completion of the work of three expert groups in 2015–2017: the Working Group on the Effectiveness of Recovery Actions for Atlantic Salmon (WGERAAS) and the two workshops: WKCCISAL (Potential Impacts of Climate Change on Atlantic Salmon Stock Dynamics) and WKEELDATA (Designing an Eel Data Call).

A self-evaluation by the group indicated a continuing need of a coordination group for diadromous species to assist EGs in achieving their goals within the framework of the

Science plan, keep ICES abreast of important issues relating to Diadromous fish species and ensure these issues are communicated to relevant EGs and SGs within both SCICOM and ACOM. A new draft Resolution for the period 2018–2020 was proposed, including a change of acronym to WGDIAD.

1 Administrative details

Working Group name

Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS)

Year of Appointment within current cycle

2015

Reporting year within current cycle (1, 2 or 3)

3

Chair(s)

Johan Dannewitz, Sweden

Russell Poole, Ireland

Meeting venue(s) and dates

22–23 September 2015, Copenhagen, Denmark (@ASC 2015), 9 participants from 4 countries

22–23 September 2016, Riga, Latvia (@ASC 2016), 7 participants from 5 countries

18–19 September 2017, Fort Lauderdale, USA (@ASC 2017), 13 participants from 8 countries

2 Terms of Reference and Summary of Workplan

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
a	Stimulate international scientific co-operation in the study of diadromous fish species and provide a mechanism through which issues relating to these species, including in estuarine and fresh waters, can be addressed and coordinated within the ICES science plan;	There were many topics within the prevcious ICES Science Plan that are very relevant to the research on diadromous fish species currently being undertaken or planned.While not as clearly defined in the new science plan, there is still a need to be able to draw the various elements of ICES work together to support the management advice provided on diadromous fish, particularly in delivering		1,2 and 3	Report of WG and establish and maintain a network of diadromous fish experts

		commitments under various regulations, including the EU-Habitats and Water Framework Directives and the EU Eel Regulation		
b	Propose activities, including experts groups, theme sessions and symposia, to support the Science Plan and the work of ACOM Experts Groups on diadromous species and review their outputs;	ICES is well placed to co-ordinate scientific activities which generate up to date information on the biology of these species, the threats to their status and advice on measure to be taken to restore and rebuild depleted populations.	1,2 and 3	Organise theme sessions, symposia or expert groups. Co-ordinate feedback from theses sources for use in publications and CRR documents
c	Assist SSGEPD to integrate these activities with those of other Expert Groups reporting to SSGEPD. WGRECORDS will report annually by 31 December (via SSGEPD) for the attention of SSGEPD and SCI-COM.	Issues relating to rare and data poor species arewidely dispersed across the ICES Science plan. This group provides a focal point for reporting new developments and concerns regarding diadromous fish in particular back to ICES via the SSGEF.	1,2,and 3	Keep ICES abreast of important issues relating to Diadromous fish species and ensure these issues are communicated to other EGs and SGs.

Summary of Work plan

Year 1	Coordinate scientific activities (theme sessions, symposia, EGS, CRRs and report to SSGEPD)
Year 2	Coordinate scientific activities (theme sessions, symposia, EGS, CRRs and report to SSGEPD)
Year 3	Coordinate scientific activities (theme sessions, symposia, EGS, CRRs and report to SSGEPD)

3 Summary of Achievements of the WG during 3-year term

WGRECORDS is a coordination group for diadromous species. Each year the group produces a comprehensive annual report outlining all the activities in the diadromous fish area, including summary reports form the EGs and workshops under both ACOM and SCICOM.

The main achievements of the WG during 2015–2017 are presented below in bullet form. See also Annex 6 for more details.

Specific Deliverables	Number	Year
Meetings	4	2015-2017
WG reports	3	2015-2017
CRR report	1	2015 (delayed publication)
Co-ordinated Theme Sessions	3	2015-2017
Assisted with formation of new EGs & drafting Resolutions	4	2015/2016
Disseminated Information	ad hoc	2015-2017
Co-ordinated between EGs and ACOM/SCICOM	5	2015-2017
Assisted Secretariat with Adhoc Advice	1	2015/'16
Provided Feedback on Science Plan	3	2015-2017

4 Final report on ToRs, workplan and Science Implementation Plan

A full annual report was produced by WGRECORDS in 2015 and in 2016 and this current report combines the end of year report for 2017 with a summary and evaluation of the full three year period. More details of the work done on multi-annual ToRs, including fulfilment of the work plan and highlights during the 3 year-term, are presented in Annex 6.

5 Cooperation

- Cooperation with other WG

The role of WGRECORDS is to co-ordinate work on diadromous species, organise Expert Groups, Theme Sessions and Symposia, and help to deliver the ICES Science Plan. Another role is to support chairs of EGs to help them achieve their ToRs. WGRECORDS therefore has close collaboration with all EGs on diadromous fish.

- Cooperation with Advisory structures

An important role of WGRECORDS is to keep ICES updated on important issues relating to Diadromous fish species and ensure these issues are communicated to both ACOM and SCICOM leadership and relevant EGs and SGs. Several EGs under the WGRECORDS umbrella are organised under ACOM. Issues related to advice on diadromous species, including Adhoc advice requests, are normally reviewed and discussed within WGRECORDS and, if necessary, WGRECORDS with its broad competence can assist in the process of producing advice.

- Cooperation with other IGOs:
    - The **North Atlantic Salmon Conservation Organisation** (NASCO) meets annually and the opportunity was often taken to hold informal meetings. These meetings provided the opportunity for preliminary

discussions about the organisation of the Expert Groups (EGs) and proposals for future theme sessions and symposia relating to Atlantic salmon. Discussions were held on the requirements for Expert Groups to address new and ongoing issues on Atlantic salmon including issues arising from the NASCO Annual Meetings

- The **International Year of the Salmon** (IYS) is an international framwork for collaborative outreach and research, and is conceived as an intensive burst of internationally coordinated, interdisciplinary, stimulating scientific research focused on salmon and their relation to people. New technologies, new observations, and new analytical methods, some developed exclusively during the IYS, will be focused on knowledge gaps that prevent a clear understanding of the future of salmon in a rapidly changing world.
- Wojciech Wawrzynski (Head of Science Support) and Niall Ó Maoiléidigh (SCICOM Member) are now the ICES representatives to IYS and will be feeding information back to WGRECORDS and other WGs as it becomes available.

6 Summary of Working Group evaluation and conclusions

The 2017 meeting agreed that the WG has fulfilled the ToRs and Workplan for the term 2015–2017. It was also concluded by the WG at its 2017 meeting that there is a continuing need for a WG that coordinates the work on diadromous fish species within ICES. A detailed evaluation performed by the group can be found in Annex 6, and a ToR draft resolution for 2018–2020 is presented in Annex 4.

7 Report of the 2017 meeting

7.1 Meetings held in 2017

The annual meeting of WGRECORDS was held on Tuesday, 19 September during the ICES 2017 Annual Science Conference in Fort Lauderdale, Florida, and chaired by Johan Dannewitz (Sweden) and Russell Poole (Ireland). There were 13 participants in total from 8 countries (Annex 1) including the chairs of Theme Session N "Population status, life histories, ecology, assessment, and management of diadromous fishes". Presentations of the work carried out by EG's working on diadromous fish were given by the respective chair or, if not present, by the WGRECORDS chairs.

7.2 Opening of annual meeting and adoption of the agenda

The agenda (Annex 2) for the annual meeting was adopted.

7.3 Summary Outcomes of the Meeting

Outcomes from meetings and activities during the last year include:

- Compilation and review of work carried out by EG's under the WGRECORDS umbrella, and consideration of their progress and future requirements. In par-

ticular, the ongoing work of WGDAM was discussed with focus on how the group should prioritize their work during the final year;

- A WGDAM/WGRECORDS co-ordinated theme session (Theme N) at the Annual Science Conference in Fort Lauderdale, Florida, on "Population status, life histories, ecology, assessment and management of diadromous fishes", chaired by Karen Wilson (USA) and Lari Veneranta (FI), was well attended and attracted 16 papers and 9 posters.
- WGDAM held a half-day update workshop during the ASC to set and update WGDAM work guidelines for ToR tasks 2 and 3. This was fully supported and attended by the WGRECORDS meeting also held during the ASC.
- Further discussions took place around the ongoing need for a scientific review of the stock assessment methods used by individual countries in their national eel management plans, for co-ordination at the international level and a need for ICES to provide advice in support of the EU Regulation and implementation of the recovery plan. The chairs of WGRECORDS then communicated this discussion with the chairs of SCICOM and ACOM at the WGCHAIRS workshop at the ASC.
- An update on the Year of the Salmon.
- Presentation and discussion about the initiation of a pan-regional diadromous subgroup (DSG) within the Regional Coordination Group (RCG) of the Baltic. The subgroup will have a coordinating function and identify data collection needs for diadromous species in relation to the EU data collection regulation.
- Agreement on a theme session on assessment methods for data limited fish stocks, to be held in the 2019 ASC; a theme session proposal will be completed in 2018 by WGTRUTTA, with assistance from WGRECORDS.
- Agreement on a ToR draft resolution for years 2018–2020.
- Agreement on a change of the acronym from WGRECORDS to the more recognisable acronym WGDIAD.

8 Reviews of Expert Groups on Diadromous Species

During 2017, WGRECORDS has co-ordinated the activities of six Expert Groups and two Workshops related to diadromous species, including three ACOM EGs, three SCICOM EGs, and two SCICOM Workshops, which are listed below, and the details of their work are summarised separately in the following sections. Below each summary, notes from the WGRECORDS post-presentation discussions have been added for the record.

- Joint EIFAAC/ICES/GFCM Working Group on Eel – WGEEL (ACOM) – Report available
- Working Group on Baltic Salmon and Trout – WGBAST (ACOM) – Report available
- Working Group on North Atlantic Salmon – WGNAS (ACOM) – Report available
- Working Group on the Effectiveness of Recovery Actions for Atlantic Salmon – WGERAAS (SCICOM) – Report available [WG concluded]

- Working Group on Data Limited Diadromous Fish WGDAM (SCICOM) – First Report available
- Working Group on Sea Trout WGTRUTTA (SCICOM) – First Report available
- Workshop on Potential Impacts of Climate Change on Atlantic Salmon Stock Dynamics WKCCISAL (SCICOM) – Report available
- Workshop on Designing an Eel Data Call WKEELDATA (ACOM) – Report available

8.1 WGEEL – Joint EIFAC/ICES Working Group on Eel

The Joint EIFAAC/ICES/GFCM Working Group on Eel [WGEEL] (chaired by: Alan Walker, UK) met at the Fisheries Research Institute (FRI), Kavala, Greece, from 3rd to 10th October 2017. Thirty-one experts attended the meeting, representing 19 countries, along with four experts invited by the chair and representatives of the EU Commission DG MARE and the General Fisheries Commission of the Mediterannean (GFCM).

The recruitment of European eel from the ocean remained low in 2017. The glass eel recruitment compared to the 1960–1979 was only 1.6% in the North Sea and 8.7% in the Elsewhere Europe series, based on available data series. For the yellow eel data series, recruitment was 24% of the level during the reference period.

The silver eel biomass and mortality rate estimates reported in 2015 indicate the stock in the EU-area were not within the biomass limits of the Eel Regulation. In most management units as last reported, anthropogenic mortality exceeded a level that can be expected to lead to recovery. No updates were available for 2016 and 2017, but these are expected in the 2018 Eel Management Plan reporting schedule.

The total reported landings from commercial fisheries in 2016 were 2260 t of eel. Landings were for the first time in this report presented for each eel stage, habitat and country.

Glass eel fisheries within the EU take place in France, UK, Spain, Portugal and Italy. Glass eel landings have declined sharply from 1980, when reported landings were larger than 2000 tonnes (6000 million eels) to 57 t (171 million eels) in 2017. Some non-EU countries (e.g. Morocco) also have glass eel fisheries, but data were not available.

Yellow and silver eel landings are not always reported separately, so are combined here. The total landings of yellow and silver eels decreased from 18 000–20 000 tonnes in the 1950s to 2000–3000 tonnes since 2009. In 2017, the figure is 2280 tonnes for yellow and silver landings, combined. Most yellow and silver eel landings come from fresh, transitional and coastal waters.

Recreational catches and landings are poorly reported so amounts must be treated as a minimum but were estimated as 2 t for glass eel in 2017, and 241 tonnes for yellow and silver eel combined in 2016 (2017 data not available at time of writing). Overall, the impact of recreational fisheries on the eel stock remains largely unquantified even though landings can be thought to be at a similar order of magnitude to those of commercial fisheries.

Aquaculture production was about 5000–6000 t in most recent years (reported data from the Eel Data Call 2017 and WGEEL Country Reports). European eel aquaculture is only

based on wild recruits. It should be noted that part of the production are eels subsequently released for stocking.

About 10 million stocked eels were reported in 2017, though these were stocked at a variety of life history stages and times after first capture.

The working group has developed a Data call for 2018, as Part 2 following on from Part 1 in 2017. Part 2 requires updates for recruitment, landings, aquaculture and stocking, but also full time series of silver eel biomass stock estimates, silver eel mortality biomass equivalents, mortality rate estimates and silver eel time series. The call includes nine data spreadsheets, one overview spreadsheet, and one feedback spreadsheet, each to be supplied in separate Annexes. The overview sheet was added to the Data call based on experiences from 2017 to ensure a more systematic way of filling in the data spreadsheets.

A workshop to develop the process for data checks etc. will be held in July 2018 – a draft Resolution has been submitted to ICES and is provided in Annex 7.

The European eel' listing on Appendix II of the Convention on International Trade in Endangered Species (CITES) come into force March 2009, so any international trade in this species needs to be accompanied by a permit. Since 2010, all trade into and out of the EU was banned. For 2017, Turkey had an export quota of 70 t. Other countries have not reported any quotas to CITES (CITES export quotas database consulted 07/10/2017), however, it is understood that Tunisia intends to establish an export quota.

8.2 WGBAST – Working Group on Baltic Salmon and Trout

The Baltic Salmon and Trout Assessment Working Group [WGBAST] (Chair: Stefan Palm, Sweden) met in Gdańsk, Poland, 27 March – 4 April 2017. A total of 27 persons from all Baltic Sea countries attended the meeting (whereof five via correspondence). The group was mandated to assess the status of salmon in Gulf of Bothnia and Main Basin (Subdivision 22–31), Gulf of Finland (Subdivision 32) and sea trout in Subdivision 22–32, and to propose consequent management advices for fisheries in 2018.

Salmon stocks in Subdivision 22–31 were assessed using Bayesian methodology, with a stock projection model used for evaluation of the impacts of different catch options. Due to technical problems, the model could only be used with data up to 2015. The development in stock status, however, was evaluated using the latest fisheries and river monitoring data (from 2016).

Section 2 of the report covers catches and other data on salmon in the sea, and also summarizes information affecting the fisheries and the management of salmon. Section 3 reviews data from salmon rivers and stocking statistics. Status of salmon stocks in the Baltic Sea is evaluated in Section 4. The same section also deals with sampling protocols and data needs. Section 5 presents the status of sea trout stocks.

- The total salmon catch in 2016 (excluding recent estimates of trolling catches; see below) was the second lowest in the time-series since the 1970s, although the level has been similar in recent years. Efforts in several important commercial fisheries decreased to their lowest recorded.
- The total share of recreational catches in the sea and rivers continues to increase. In particular, the offshore trolling fishery has developed rapidly. Ac-

cording to preliminary estimates, the total salmon catch may have been 20 000–30 000 individuals larger in recent years than previously known. Most of this extra fishing mortality, so far not accounted for in the assessment, has likely yielded too high estimates of natural (post-smolt) mortality.

- The natural salmon smolt production has gradually increased in the Gulf of Bothnia rivers, and in the most recent years also in the Main Basin and Gulf of Finland. Continued increase of smolt production is predicted in 2017–2018 for most rivers, mainly as a result of good spawning runs in 2013–2016. The current (2016) total production in all Baltic Sea rivers is close to 3.5 million wild smolts, corresponding to about 85% of the overall potential smolt production capacity. In addition, about 4.5 million reared salmon smolts were released into the Baltic Sea in 2016.
- An increasing proportion of the assessed river stocks have reached 75% of PSPC with high or very high certainty, especially in the north. At current fishing pressure and natural mortalities, a continued positive status development is predicted. As previously, most weak salmon rivers are located in the Main Basin and Gulf of Finland, but status has improved also among these southern stocks. In particular, wild Estonian (Gulf of Finland) stocks show recovery.
- M74-related juvenile mortality increased in spring 2016, and is expected to increase further in 2017. It is hard to predict how long elevated levels of M74 will persist beyond 2017. Recent disease outbreaks (the cause still unknown) in several wild salmon rivers with large numbers of dead spawners is another health-related concern for the future.
- The exploitation rate of Baltic salmon in the sea fisheries has been reduced to such a low level that most stocks are predicted to recover. However, weak stocks also need longer term stock-specific rebuilding measures, including fisheries restrictions in estuaries and rivers, habitat restoration and removal of migration obstacles.
- Some positive signs can be seen for sea trout in the Baltic Sea, but many populations are still considered vulnerable. Stocks in the Gulf of Bothnia are particularly weak, although spawner numbers are improving. In general, stock status is higher in the Main Basin and in the southern Gulf of Finland.
- Exploitation rates in most fisheries that catch sea trout in the Baltic Sea area should be reduced. This also includes fisheries for other species where sea trout is caught as bycatch. In areas where stock status is good, existing fishing restrictions should be maintained in order to retain the present situation.

8.3 WGNAS – Working Group on North Atlantic Salmon

The Working Group on North Atlantic Salmon [WGNAS] met at ICES HQ on 29 March – 7 April 2016 chaired by Gérald Chaput (Canada).

Number of meeting participants: 26 in person participants representing twelve countries from North America (NAC) and the Northeast Atlantic (NEAC): Canada, USA, Iceland, Norway, Finland, Ireland, UK(England & Wales), UK (Scotland), UK(Northern Ireland), Russia, France, and the ICES Secretariat (Denmark). Information was also provided by

correspondence or by WebEx link from Greenland, Faroes, Denmark, France, and Spain for use by the Working Group.

WGNAS met to consider questions posed to ICES by the North Atlantic Salmon Conservation Organisation (NASCO) and also generic questions for regional and species Working Groups posed by ICES.

The terms of reference were addressed by reviewing working documents prepared prior to the meeting as well as development of analyses, documents and text during the meeting.

The report is presented in five sections, structured to the terms of reference. Sections include:

1) Introduction;

2) Catches, farming and significant developments, threats and opportunities;

3) The status of stocks in the Northeast Atlantic Commission area;

4) The status of stocks in the North American commission area; and

5) The status of stocks in the Atlantic salmon in the Greenland commission area.

The need to develop catch advice in 2017 was dependent on the outcome of applying two indicator frameworks prior to the meeting.

The Framework of Indicators (FWI) for West Greenland was updated during the Working Group in 2015, with the advice that there were no mixed-stock fishery options for 2015 to 2017 in either NAC or WGC that would be consistent with a 75% chance or greater of simultaneously meeting the seven (for West Greenland) and six (for NAC) management objectives for 2SW salmon. The West Greenland FWI was applied in January 2017. It did not indicate the need to update catch options, hence no new management advice for this fishery was requested by NASCO for 2017.

The Faroes FWI for multi-annual catch options for NEAC stocks was also updated in 2016 along with management advice for 2016 and 2017. The conclusion in 2016 was that there were no fishery options that ensure a greater than 95% probability of each stock complex achieving its SER in both 2016 and 2017. The NEAC FWI was applied in January 2017. It did not indicate the need to update catch options, hence no new management advice for this fishery was requested by NASCO for 2017.

In summary of the findings of the Working group on North Atlantic Salmon:

- In the North Atlantic, exploitation rates on Atlantic salmon continue to be among the lowest in the time-series.
- Nominal catch in 2016 was 1209 t. This is down on the previous year (1282 t in 2015) and 10% and 19% on the previous five year and ten year mean values, respectively.
- The provisional estimate of farmed Atlantic salmon production in the North Atlantic area for 2016 is 1512 kt; production of farmed Atlantic salmon in this area has been over one million tonnes since 2009 and in 2016 provisional worldwide production of 2262 kt is 1800 times the catch of wild Atlantic salmon.

- The Working Group reported on a range of new findings regarding salmon assessment and management, including tracking programs of Atlantic salmon in the Northwest Atlantic, monitoring of bycatch in mackerel fisheries in Iceland providing additional information on salmon at-sea, recovery programmes in the River Rhine, and progress in life cycle modelling to further opportunities for understanding salmon dynamics.
- A number of threats were discussed including disease events in wild salmon in Sweden and Russia, introgression of farmed salmon in wild salmon populations that affect phenotype, and sea lice monitoring in Norway.
- In response to specific questions from NASCO, information is provided on prey and key prey species of Atlantic salmon during the marine phase, and on the status of key prey species of salmon. Atlantic salmon are opportunistic feeders and changes in diet reflect changes in distribution at sea and changes in prey size availability as salmon grow. Prey consumed by Atlantic salmon include fish species that are commercially exploited in the North Atlantic (herring, capelin, blue whiting, mackerel) as well as numerous fish and invertebrate forage species that are not fished.
- A workshop was convened by ICES to respond to the question from NAS-CO on the impacts of climate change on Atlantic salmon stock dynamics. The workshop report is presented separately.
- Specific for the NEAC area, exploitation rates on NEAC stocks continue to decline and catches in 2016 were 1043 t, among the lowest in the time-series. Northern NEAC stock complexes, prior to the commencement of distant-water fisheries in were considered to be at full reproductive capacity. The southern NEAC maturing 1SW stock complex however, was considered to be at risk of suffering reduced reproductive capacity and the non-maturing 1SW stock complex to be suffering reduced reproductive capacity.
- Information describing the blue whiting fishery characteristics in the Northeast Atlantic and information on observations of Atlantic salmon by-catch in these fisheries are presented. None of the information available to the Working Group suggested that salmon are taken frequently as bycatch in the blue whiting fishery as much of the blue whiting catch is taken at a time prior to salmon smolts emigrating into the marine environment. Further, blue whiting are mainly captured at some depth, while salmon are generally thought to be distributed in surface waters. It is nonetheless recognised that uncertainties remain as detection of small numbers of post-smolts in large catches of blue whiting would be very difficult.
- Specific for the NAC area, the 2016 provisional harvest in Canada was 134.8 t; overall, harvests remain very low relative to pre-1990 values (>1000 t). The majority of harvest fisheries on NAC stocks were directed toward small salmon. In recreational fisheries, large salmon could only be retained in 22 rivers in Quebec.
- In 2016, the midpoints of the estimates of returns to rivers for all regions of NAC except Labrador, are suffering reduced reproductive capacity. The 5th percentile of the estimated returns to Labrador was below CL and for this region the stock is at risk of suffering reduced reproductive capacity.

- The continued low abundance of salmon stocks across North America, despite significant fishery reductions, strengthens the conclusions that factors acting on survival in the first and second years at sea, at both local and broad ocean scales are constraining abundance of Atlantic salmon.
- In Greenland a total catch of 27.1 t was reported for 2016 compared to 56.8 t in 2015. North American origin salmon comprised 66% of the sampled catch.

8.4 WGERAAS – Study Group on Effectiveness of Recovery Actions for Atlantic Salmon

The Working Group on Effectiveness of Recovery Actions for Atlantic Salmon (WGERAAS) was established in 2012 in response to a question to ICES Working Group on North Atlantic Salmon (WGNAS) by the North Atlantic Salmon Conservation Organisation (NASCO). The NASCO question resulted in a new ToR for WGNAS: "provide a review of examples of successes and failures in wild salmon restoration and rehabilitation and develop a classification of activities which could be recommended under various conditions or threats to the persistence of populations".

WGERAAS met on 18–22 February 2013 in Belfast, Northern Ireland, on 12–16 May 2014 at ICES HQ in Copenhagen, Denmark, and for a third and final time at that same location on 10–12 November 2015.

At the 2013 meeting the Working Group decided that the development of a 'classification system' for rebuilding and recovery actions for Atlantic salmon (ToR a) would be best achieved by the development of a river-specific database; 'Database on Effectiveness of Recovery Actions for Atlantic Salmon' (DBERAAS). Local experts provided a range-wide overview of conservation status, programme goals, population stressors and the benefits of recovery actions. To further highlight the results from DBERAAS detailed case studies were compiled and presented on a number of rivers, providing 'on-the-ground' examples of the effects of stressors, benefit of actions, and the results of recovery and rebuilding programmes.

An analysis of DBERAAS suggested that Climate Change (resulting in low marine survival), barriers to migration, and habitat destruction were the most common stressors having a high or very high negative impact on Atlantic salmon populations. Improvements in river connectivity, improvements in water quality, and habitat restoration were the three actions most likely to have a high or very high benefit to recovery and restoration actions. The case studies were largely in agreement with the results from DBERAAS, and further highlighted that successful restoration and recovery actions are generally characterised by being conducted on stocks experiencing relatively high marine survival, with few stressors acting on the stock thereby reducing synergistic and additive effects, with actions addressing most or all stressors, and not relying (solely) on stocking.

The Working Group recommends that the primary principles of any recovery or restoration programme for Atlantic salmon should to be founded on habitat restoration and protection combined with sound management based on population monitoring. As stocking poses substantial risks to wild salmon populations a time-limited stocking programme should only be considered in cases where population extirpation is imminent

and should not inhibit the use of other restoration and recovery actions. Also recommended is pre- and post-project evaluation and continuous monitoring of restoration/recovery programmes to assess costs, benefits and impacts. Outcomes of such studies should be published in order to inform stakeholders and contribute towards a better understanding of restoration/recovery action successes and failures.

8.5 WGDAM – Working Group on Data Limited Diadromous Fish

WGDAM, a subgroup of WGRECORDS (Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species) started working in autumn 2015. The main task of WGDAM is to update the status and distribution knowledge of poorly understood diadromous fish species for ICES. Diadromous fish are species that have separate feeding and reproduction areas in saline and fresh water and migrate between them.

In 2005 the ICES Diadromous Fish Committee (SGSDFS) published a report on diadromous fish species (ICES CM 2005/I:02 Ref. ACFM, ACE, G) to report on the status and distribution of recognized poorly understood species. Since the 2005 report, there have been increasing legal drivers to protect and restore these species mainly for biodiversity reasons. These legal drivers and associated science have further highlighted knowledge gaps in the biology of these species. Pressure from development in freshwater, transitional and marine zones continues to threaten the life cycle of these species. More scientific information is required for these data poor diadromous species.

The report indicates specific cases where changes to the status of diadromous species are occurring and which are directly related to human impact and ecosystem changes, and reviews the current status of selected species by existing national and international criteria. All data poor diadromous species are not covered in this report, and thus it should be used as initial guidance for future work to cover possible data and management gaps. This report focuses mainly on species in the European area.

The main threats to diadromous fish are the same as in the previous reporting period: migration barriers (e.g., dams), river construction, inputs to the rivers, lagoons and estuaries (pollution, eutrophication, acidification), habitat loss and overfishing, for example. Many of the diadromous species are still in great difficulty, including the European sturgeon, allis and twaite shad, European eel, river lamprey, and natural stocks of migratory whitefish as well as coastal grayling in the Baltic Sea. Differences between areas and populations are large, e.g., sea trout in some areas are in great danger, but not in other areas. Species that have reproduction cycles dependent on rivers are threatened due to high human pressure applied to coastal areas and riverine habitats, including incompatible land use for e.g. for the purposes of the forestry and agriculture.

Since the previous reporting period, more data have been collected and knowledge has increased for some species, particularly those species that have been the focus of ICES working groups (eels, lampreys and sea trout). This report raises the need for better data on other migratory species living in the transition zone of fresh and marine environment, such as unique populations of thin lip grey mullet, smelt, whitefish and coastal grayling.

The establishment of WGDAM work was delayed and actual work was postponed to start in 2016. At the moment, group consists of 80 participants in 18 countries. The work in 2016 and 2017 has been done by correspondence, except a meeting held in ICES ASC

2017. The meeting had eight participants and the agenda was to set and update WGDAM work guidelines for ToR tasks 2 and 3.

At this point, WGDAM has been working on report that covers tasks 1 &2 in ToR, status update of diadromous species as well as identifying the biological knowledge gaps. The report is still under preparation. WGDAM will organize a workshop in March 13th to 15th 2018 in Copenhagen. The workshop will focus especially on recommendations for monitoring of diadromous fish.

With support of WGRECORDS, WGDAM established a theme session (Theme N) for the annual ICES ASC that was held in Florida. The topic of the session was "Population status, life histories, ecology, assessment and management of diadromous fishes". During the theme session 16 oral and eight poster presentations were given focusing on these issues, covering in total nine species. The overall attendance to theme was good, with an estimated 40 participants in first half and 50 in latter half. Of wide variety of species, the European and American eels were most popular study target in theme with eight presentations or posters. Other theme presentations covered species specific studies, multi-species approaches, effect environmental factors, methods for habitat restoration and growth analyses. Considering the future work in WGDAM, the high attendance of North American researchers was welcome and hopefully leads to new collaboration. The theme session, presentations and posters raised the need for more information on the status, current threats, and restoration possibilities for other more poorly understood diadromous species, as well as examples of new possibilities in management and restoration for viable fisheries. In particular, the function of diadromous fish species at the ecosystem scale of reproduction and feeding areas should be highlighted in future work.

8.6 WGTRUTTA – Working Group with the Aim to Develop Assessment Models and Establish Biological Reference Points for Sea Trout (Anadromous *Salmo trutta*) Populations

Summary of Year 1 – 2017

Sea trout are the anadromous migratory form of the brown trout (*Salmo trutta*) which go to sea to feed and mature as adults prior to returning to spawn, usually in their natal rivers. Extensive overviews of sea trout fisheries and biology have been prepared for ICES by the Study Group on Anadromous Trout (SGAT) (ICES, 1994) and the Workshop on Sea Trout (WKTRUTTA, WKTRUTTA2); (ICES, 2013, 2016). This Working Group builds on the scene-setting work of WKTRUTTA 1 and 2.

Stock declines, for example in areas where marine mixed stock fisheries prevail (e.g. the Baltic) and where there is salmon farming, have raised concerns about our lack of knowledge of the complex and variable life cycle of this species. Sea trout have historically taken second place to Atlantic salmon in national fishery assessment programmes and management priorities. As a result relatively few sea trout stocks have been studied for sufficient time to allow the development of population models.

By using existing abundance data from different life stages, information on habitat quality and fisheries data etc., the Working Group will develop and evaluate different ways to model sea trout populations. Models taking into account e.g. habitat variation within rivers and between catchments, occurrence of lakes, migration obstacles and resident

trout etc. will be evaluated. Biological Reference Points (BRPs) will be developed and considered across the natural range of sea trout.

2017: The first meeting of the WGTRUTTA took place in Gothenburg, Sweden from 24 to 26 April, 2017. The meeting was chaired by Johan Höjesjö (Sweden) and Alan Walker (UK). The meeting was attended by 33 experts from 15 countries – all but 3 (Latvia, Spain and Iceland) of the countries thought to be supporting sea trout production from the natural range of the species. Spain and Iceland provided information but could not be physically represented at the meeting. During the meeting, contact was made with additional expertise in Latvia who will support the WG.

Representatives from each country first gave presentations on national reviews of sea trout data collection, assessment and management practices. These provided a regional overview of a baseline of information and knowledge, updated from WKTRUTTA2, to support the WG to consider creating the sea trout database. Experts then presented updates on method development, data collection and sea trout/trout biology.

The working group established and divided tasks among group members and prioritized these among available data sources. The group has begun to create a database in a gradient across European rivers to be able to develop (*and test*) new and existing population models (sub-group 1). In parallel, the group has started to develop population models, examining the effects of salmon, and resident trout (sub-group 2), applying trout recruitment versus habitat score systems (sub-group 3), and developing stock recruitment relationships based on sea trout life history (sub-group 4).

Dissemination

A report was prepared after the April 2017 meeting, and the WG was presented at the ICES Annual Science Conference (ASC) in Fort Lauderdale, Florida in September 2017, at the WGRECORDS meeting and Theme session N: Population status, life histories, ecology, assessment, and management of diadromous fishes.

Reference List

ICES. (1994) Report of the Study Group on Anadromous Trout. Trondheim Norway 29-31 August 1994. ICES CM 1994 M:4.

ICES. (2013) Report of the Workshop on Sea Trout (WKTRUTTA) 12-14 November 2013 ICES Head-quarters, Copenhagen, Denmark. SCICOM Steering Group on Ecosystem Functions; ICES CM 2013/SSGEF:15; Ref. WGBAST, WGRECORDS, SCICOM

ICES. (2016) Report of the Workshop on Sea Trout 2 (WKTRUTTA2), 2–5 February 2016, ICES Headquarters, Copenhagen, Denmark. ICES CM 2016/SSGEPD:20. 121 pp.

8.7 WKCCISAL – Workshop on Potential Impacts of Climate Change on Atlantic Salmon Stock Dynamics

Introduction

This report is the output of the International Council for the Exploration of the Seas (ICES) Workshop on Potential Impacts of Climate Change on Atlantic Salmon Stock Dynam-

ics (WKCCISAL) that took place 27–28 March 2017 at ICES Secretariat in Copenhagen. The main aim was to provide the scientific basis to respond to a request for advice from the North Atlantic Salmon Conservation Organization (NASCO).

With changing climatic and oceanic conditions, there is potential for effects to be reflected in salmon feeding, growth, survival and migratory routes. WKCCISAL aims to review predicted climatic changes over the distributional range of wild Atlantic salmon as well as literature and research on the biological and environmental drivers that affect stock dynamics.

The present report summarizes current knowledge of ongoing and future anthropogenic climate change (CC) and its associated consequences on Atlantic Salmon stock dynamics.

The following Terms of Reference (ToR) were provided to the Workshop:

a) Identify the changes in climate that may potentially impact wild Atlantic salmon in its distributional range based on the predictions of climate change including those from the most recent International Panel on Climate Change (IPCC).

b) Review the conclusions of published literature and research on the biological and environmental drivers that impact on stock dynamics of Atlantic salmon.

c) Given the predicted changes in climate identified in (a) and the drivers that impact Atlantic salmon identified in (b), identify and describe the potential effects of climate change on Atlantic salmon stock dynamics including (but not limited to) the impacts on: i) the biological characteristics (growth, condition, maturity, fecundity, time at-sea, survival, etc.) that may affect the productivity of the stocks;

ii) the riverine, estuarine and marine habitat and potential consequences for salmon;

iii) the interactions with other species (parasites, predators, preys and competing species including invasive species);

iv) the migration routes used by salmon and the timing of migration and implications of such changes;

v) the interpopulation genetic diversity.

The Workshop decided to address these ToRs by explaining the background of CC, the latest Intergovernmental Panel on Climate Change (IPCC) CC forecasts under different emission scenarios, and scaling issues, and weather in Section 1. In Section 2 environmental and biological drivers in freshwater, transitional waters, and marine waters that impact on Atlantic salmon stock dynamics and explanation will be identified, the importance discussed, and some examples given. Furthermore projections of CC effects on these drivers (based on the literature and modelling outputs) are presented and discussed. In Section 3 the consequences of CC driven changes in biological and environmental drivers on salmon are discussed, followed by the overall conclusions in Section 4. Additionally an overview of a literature review of CC effects on Atlantic salmon is provided in an Excel table.

It needs to be noted that in this report we review CC effects on the fish species Atlantic salmon and not on fisheries for it. It is evident that changes in salmon stocks are very likely to have knock-on effects for commercial and recreational fisheries, but this is not the focus of the study presented here in this report.

Climate change

Anthropogenic climate change refers to the anthropogenic emission of greenhouse gases leading to significant global warming and other related climate changes (ice melting, sea level rise, extreme weather, etc.). Human-made greenhouse gas emissions "have increased since the pre-industrial era, driven largely by economic and population growth, and are now higher than ever" (IPCC, 2014). At present, over 60% of the anthropogenic greenhouse gas emissions are CO_2 emissions (IPCC, 2014). CO_2 emissions are party taken up by ocean (about 30%) and the land (about 30% via plants and soils), while about 40% remain in the atmosphere, leading to increasing CO_2-concentrations in atmosphere (see Figure 1). Both direct and indirect measurements (ice cores) of atmospheric CO_2 have shown that his has led to atmospheric concentrations of carbon dioxide that are unprecedented in at least the last 800 000 years (IPCC, 2014). As greenhouse gases absorb Earth´s outgoing longwave radiation, higher concentration of greenhouse gases lead to global warming; a phenomenon that has been observed since the mid-20th century (IPCC, 2014). Global warming affects not only the atmosphere but also our oceans, leading to higher sea temperatures, acidification, sea ice melt, sea level rise, changes in primary production and dissolved oxygen and many other changes. Besides seas and oceans, Global Climate Change also affects terrestrial systems, the freshwater environment of lakes and rivers, and the transitional waters between the marine and freshwater.

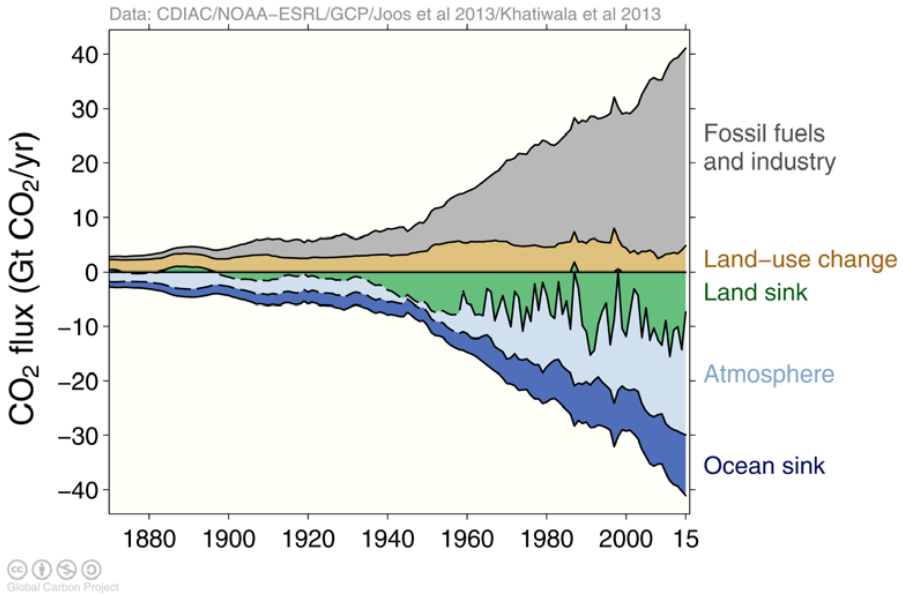

Figure 1. The fate of anthropogenic greenhouse gas emission for the period 187–-2015. Illustration from the Global Carbon Project (Le Quéré *et al.*, 2016).

Earth system models are the state-of-the-art tool to study possible developments and consequences of anthropogenic climate change (IPCC, 2014). They "integrate the interactions of atmosphere, ocean, land, ice, and biosphere to estimate the state of regional and global climate under a wide variety of conditions" (Heavens *et al.*, 2013). Based on their performance, the Earth System Models that were featured in the latest report on climate change of the International Panel on Climate Change have been found to be suit-

able "for their application for quantitative future predictions and projection" (Flato *et al*., 2013). One of the challenges concerning Earth System models is that they are computationally expensive and can therefore only be run with relatively coarse grid resolution and a limited number of variables and processes. With growing computing power, focus was set on including more processes and refining the model grid, leading to a current grid resolution of about 1 to 2 degrees of latitude/longitude for the atmospheric component and around 1 degree of latitude/longitude for the ocean (Flato *et al*., 2013). Despite this progress in refining the resolution of Earth System Models, the current resolution does not suffice to reproduce realistic small-scale features, which are important for coastal regions and rivers. In order to gain small-scale information, it is possible to combine results of Earth System Modelling with downscaling methods (i.e. a procedure that takes information that is known at large scales, for example the output of an Earth System Model, to make predictions at local scales). The IPCC recognizes that downscaling offers additional value arising from higher resolution of stationary features like bathymetry and coastlines (Flato *et al*., 2013).

An example of downscaling is found in the EURO_CORDEX project. This is the European branch of the CORDEX initiative (http://www.euro-cordex.net/index.php.en) and it has produced ensemble climate simulations based on multiple dynamical and empirical-statistical downscaling models forced by multiple global climate models for the European region. Different from most other regions of the earth, already co-ordinated ensembles of regional climate simulations at rather high spatial resolution for Europe already exist. These climate scenarios were provided on grid-sizes down to 25 km and are based on the previous generation of emission scenarios (SRES, a detailed explanation follows in the next paragraph). The EURO-CORDEX simulations considered the new RCP scenarios (a detailed explanation follows in the next para-graph), and also increased the spatial resolution. EURO-CORDEX simulations have focused on various grid-resolutions (~50 km, 25 km and 12 km (0.44^{o}, 0.22^{o} and 0.11^{o}) for a common EURO-CORDEX domain (Figure 2).

Figure 2. The area and landmass covered in the EURO-CORDEX domain (Source: http://www.euro-cordex.net/index.php.en).

In order to estimate possible consequences of climate change, the IPCC utilises different future emission scenarios that range between being very optimistic (i.e. humankind is able to reduce emissions drastically in future) and very pessimistic (i.e. humankind will not reduce emissions in future). These scenarios are updated on a regular basis, integrating newly available information. Representative Concentration Pathways (RCPs) are four greenhouse gas trajectories utilised in the latest IPCC report (IPCC, 2014). These scenarios supersede the Special Report on Emissions Scenarios (SRES) projections published in 2000. The emission estimate for 2016 implies that all RCP scenarios apart from RCP8.5 are outdated (Figure 3). Concurrently, the SRES-scenarios B1, B1T and B2 are out of date; while scenarios A1, A1T and A2 are still conform with anthropogenic emissions. Regardless of the currently most likely RCP scenario, the residual inertia in climate systems is such that a complete cessation in carbon emissions, or even negative carbon emissions (currently technically outside our reach), would still leave fish exposed to continued global warming in freshwater for at least half a century (e.g. Graham and Harrod, 2009) with effects on the oceans predicted to continue for up to 1000 years (e.g. Mathesius, 2015). Hence, regardless of the success or failure of programmes aimed at curbing CC, major changes in fish communities can be expected over the next 50+ years with a concomitant need to adapt management strategies accordingly. Therefore this study considers the CC effects on Atlantic salmon from the present until the year 2100.

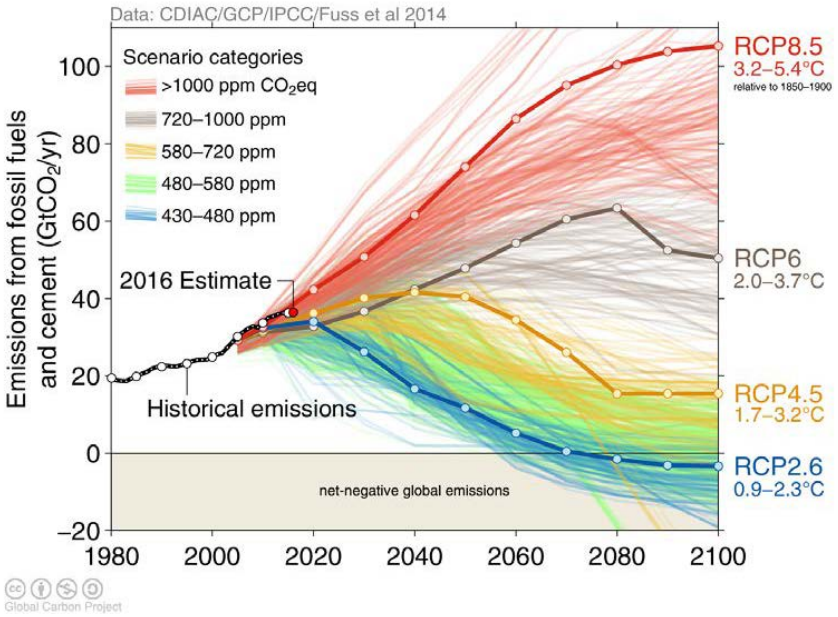

Figure 3. Representative Concentration Pathways and their associated emissions from fossil fuels. Illustration from the Global Carbon Project (2016): www.globalcarbonproject.org/carbonbudget published on 14 November 2016.

Weather

If climate is defined as average weather over a large number of years, as such, climate change and weather are interconnected. Observations show that there have been changes in weather (e.g. Kendon *et al*., 2014; van Haaren *et al*., 2013), and changes in weather over time identify climate change. The chaotic nature of weather makes it unpredictable beyond a few days, whereas as we have seen from the paragraphs above projecting changes in climate due to changes in atmospheric composition or other factors is a very different and much more manageable issue, especially on large scales. Extremes in weather, as noted previously, have been observed more frequently during the last few decades and when averaged out over the number of years will indicate changes in the average weather over time, thus climate. These extremes in weather have been predicted by the IPCC in various reports (e.g. IPCC 2007; 2013; 2014).

Under the more extreme climate change scenario (RCP8.5), and for across the geo-graphic range of Atlantic salmon, there are projected to be changes in seasonal precipitation as early as the 2021–2050 time period. These changes are not uniform and vary with region and season. For example, a reduction in summer precipitation is shown for UK and Ireland in 2021–2050 while an increase in summer precipitation is shown for Scandinavia for the same time period. This picture changes moving into the 2071–2100 period with more severe reductions show in summer for UK, Ireland and France, Spain and Portugal (up to 40% or even 60% reduction in southern areas) while Scandinavia and the Baltic have projected increases of 10–40%. In winter 2071–2100, projected increases in rainfall of up to 40% are expected in all regions within the salmon range.

Interannual/ interdecadal variability (teleconnection patterns)

One of the ways climate and weather connect to the environment of Atlantic salmon is through teleconnection patterns; recurring and persistent, large-scale patterns of pressure and circulation anomalies spanning vast geographical areas. Teleconnection patterns are also referred to as preferred modes of low frequency (i.e. long time-scale) variability. Although some of these patterns last several weeks to several months, they can be persistent for several consecutive years, reflecting an important part of both the interannual and interdecadal variability of the atmospheric circulation. Many of the teleconnection patterns are planetary-scale in nature, spanning entire ocean basins and continents.

An example of an Atlantic teleconnection pattern is the Atlantic Multidecadal Oscillation (AMO) occurring in the North Atlantic Ocean with a periodicity of ~20–40 years, with major oscillations between warm and cool conditions (Friedland *et al*., 2014). It is based upon the average anomalies of sea surface temperatures (SST) in the North Atlantic basin, typically over 0–80N (Figure 4). Since the turn of the millennium the North Atlantic has been characterized as a strong warm period, while the period between 1960 and 1990 was characteristically cold.

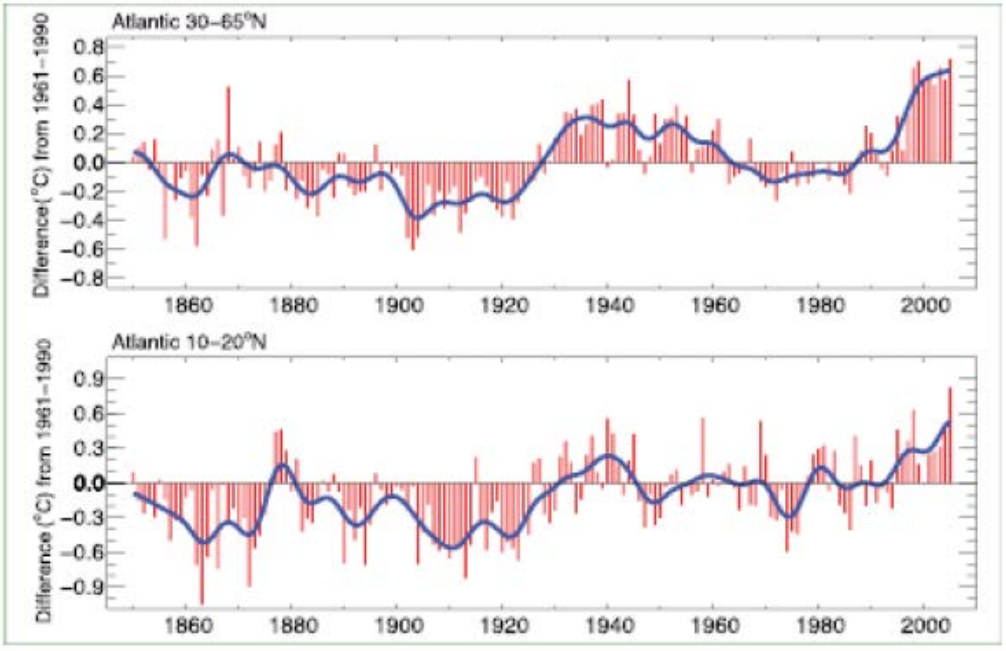

Figure 4. Atlantic Multidecadal Oscillation index from 1850 to 2005 represented by annual anomalies of SST in the extratropical North Atlantic (30–65°N; top), and in a more muted fashion in the tropical Atlantic (10°N–20°N) SST anomalies (bottom). Both series come from HadSST2 (Rayner *et al*., 2006) and are relative to the 1961 to 1990 mean (°C). The smooth blue curves show decadal variations (from IPCC, 2007).

A second example of an Atlantic teleconnection pattern and the only one prominent throughout the year in the northern hemisphere is the North Atlantic Oscilation (NAO) (Barnston and Livezey, 1987). It is essentially a north–south dipole in sea level pressure characterised by synchronous out-of-phase pressure and height anomalies between temperate and high latitudes over the Atlantic (IPCC, 2007), and therefore corresponds to

changes in the prevailing westerlies across the North Atlantic into Europe (Figure 5). The NAO has the strongest signature in the winter months (December to March) when its positive/negative phase exhibits an enhanced/diminished Iceland Low and Azores High (Hurrell *et al*., 2003). The NAO is the dominant pattern of near-surface atmospheric circulation variability over the North Atlantic, accounting for one third of the total variance in monthly Mean Sea

Level Pressure (MSLP) in winter. It is closely related to the Northern Annular Mode (NAM), which has similar structure over the Atlantic but is more zonally symmetric. A high or positive winter NAO corresponds to mild winter climate and strong storms in Western Europe. A low or negative index accords with weaker winter storms and lower air temperature (Jonsson and Jonsson, 2004).

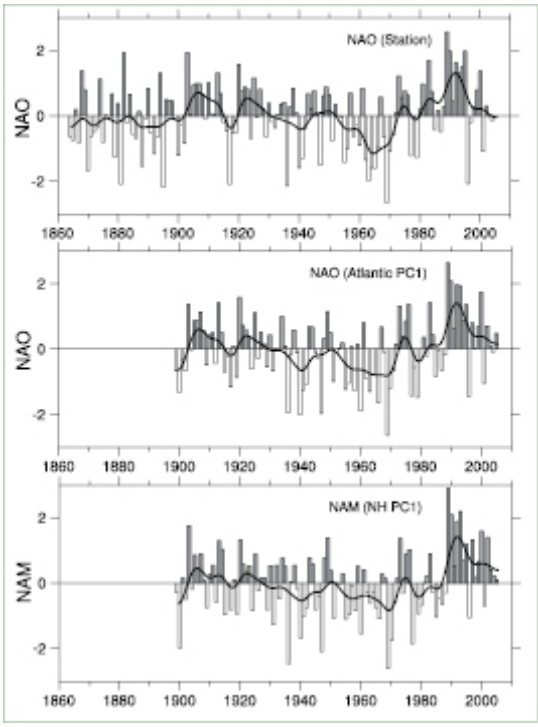

Figure 5. Normalised indices (units of standard deviation) of the mean winter (December–March) NAO developed from sea level pressure data. In the top panel, the index is based on the difference of normalised sea level pressure between Lisbon, Portugal and Stykkisholmur/Reykjavik, Iceland from 1864 to 2005. The average winter sea level pressure data at each station were normalised by dividing each seasonal pressure anomaly by the long-term (1864 to 1983) standard deviation. In the middle panel, the index is the principal component time-series of the leading EOF of Atlantic-sector sea level pressure. In the lower panel, the index is the principal component time-series of the leading EOF of NH sea level pressure. The smooth black curves show decadal variations (taken from IPCC, 2007).

Environmental and biological drivers

Strictly speaking, biological and environmental drivers are the physical, biological, and chemical controls that shape the characteristics of ecosystems across broad spatial scales (Alexander *et al*., 2016). However, particularly in the marine environment, climate forcing

indices are often used to represent environmental drivers although they are not causal (Link *et al*., 2010).

Temperature and precipitation, primary drivers affecting aquatic ecosystems in general are also major drivers for salmon in freshwater. Changes in these influences many other environmental factors including: river discharge and level, pH, dissolved oxygen levels, water colour, and light penetration. Changes in biotic factors including food availability and interspecific competitions will also impact salmon productivity in the freshwater phase.

Marine environmental drivers include temperature (typically mean sea surface temperature is used), and various teleconnection patterns (recurring and persistent, large-scale pattern of pressure and circulation anomalies that span vast geographical areas) such as the North Atlantic Oscillation (NAO) and Atlantic Multidecadal Oscillation (AMO). The NAO, for example, has been shown to have an influence beyond just the marine, with a significant influence on continental weather patterns and productivity in freshwater systems (Jennings *et al*., 2000).

In northern Europe and North America, climate change is projected to result in warmer, drier summers and milder, wet winters with more precipitation falling as rain and less as snow, a decrease in ice covered periods, and more frequent periods with extreme weather events (IPCC, 2014).

Effects of CC on salmon

When discussing CC effects on Atlantic salmon it is important to consider the current emission scenarios and effects on the environment of the species. The residual inertia in climate systems is such that even a total cessation of emissions tomorrow or even negative emissions would leave the environment exposed to continued climate change for at least 50 years, with continued effects in the world's oceans lasting many centuries. Thus, for the next 50 years at least, CC induced changes are going to occur in our environment, and changes in our seas and oceans for many more years to come. Atlantic salmon populations will have to cope with these changes if they are to persist.

Another important factor when discussing potential climate change effects on Atlantic salmon is the issue of scale, and how to distinguish between global and local effects. The global effects of CC on environmental factors can be predicted with a certain degree of confidence. Downscaling to examine how these effects change on a local scale has proven to be much more difficult. As a result, it is equally difficult to predict the effects of climate change on specific salmon populations. Predicting the effects on the entire Atlantic salmon stock complex might be a more manageable task, or perhaps to distinguish between effects on northern or southern stocks.

It appears that Global Climate Change, resulting in rising sea, stream and air temperatures, is a major driver acting on a wide range of factors influencing the Atlantic salmon's life cycle. In freshwater, this can cause lethal increases in temperature for ova, juveniles, or adults in streams with few thermal refugia, perhaps ultimately resulting in losses of individual populations. However, in areas where lethal temperatures are not exceeded, growth and ultimately smolt production and adult population size could increase. But faster growth and higher stream temperatures could also result in earlier migrating smolts, which could reduce marine survival are there can be a mismatch in migration

timing and optimum food availability. Globally rising stream temperatures could also facilitate population expansion into habitats that until recently were below the minimal temperature requirements for salmon. In the freshwater habitat rising stream temperatures can also be a factor in the expansion of the range or population size of invasive species that negatively impact on Atlantic salmon stocks. This can include the deliberate or unintentional introduction of non-native strains of salmon.

Because of their location at the junction of rivers and the ocean, estuaries tend to be sites of major human settlements, and are therefore especially vulnerable to effects of anthropogenic climate change. Unfortunately, few climate effect studies have been completed in these transition ecosystems. Climate-change related changes in freshwater (e.g. increased temperatures, altered discharge affecting estuarine salinity and turbidity) can reduce the ability of salmon to successfully osmo-regulate and survive. Altered freshwater discharge patterns may directly affect the amount and quality of estuarine habitat used by salmon. Channels used by young salmon will not only be affected by changing freshwater discharge patterns but changing channel characteristics can affect salinity and temperature distributions, both critical for osmo-regulating salmon. Climate related changes in marine teleconnection patterns may reduce upwelling, which could reduce nutrient supplies to estuaries, affecting foodwebs and young salmon.

In the marine environment, the effects of rising water temperatures are, just like in freshwater, not uniform across stocks. Some stocks appear to be experiencing in-creases in marine survival, while for others, marine survival decreases. This is probably a result of the extremely complex interactions between multitudes of factors at-sea and the interaction between the events in the freshwater phase and their subsequent success in the marine environment. As mortality is strongly linked with growth, it appears lack of feeding opportunities either qualitatively or quantitatively is the main factor. Changes in foodwebs have already altered prey availability and quality in some areas, and CC induced changes to teleconnections like the NAO can change migration routes for post-smolts moving them into areas of reduced feeding potential. Add to this changing predator fields due to rising SST, as well as increases in mortality due to parasites, and continued low marine survival appears very likely in many stocks, something that has been observed since the mid-1990s.

Changing weather patterns, possibly due to changes in teleconnections, also impact on freshwater. Increases in the number and magnitude of extreme weather events have already been observed in recent years, and are predicted to increase under CC. This can result in extreme precipitation that can locally almost destroy entire year classes of juveniles due to extreme flooding, but changes in precipitation patterns can also mean droughts which are equally destructive for juveniles, but also occasionally for adults.

What is likely also damaging for Atlantic salmon populations experiencing stress un-der CC are synergistic effects of interactions with other stressors. Unfortunately, CC is not the only human induced stressors currently working on salmon stock dynamics. This study has shown that additional stressors like overexploitation and the re-lease of aquaculture or hatchery fish can act synergistically with climate change to reduce population levels even more dramatically than either stressor is singly capable of. It is a real possibility that certain populations can persist under just CC, but will be extirpated by the addition of one or more synergistic stressors.

It is extremely unlikely that Atlantic salmon as a species will become globally extinct within the next 100 years under CC. However, it is very likely that some populations will suffer significant reductions in abundance, especially towards the southern extreme of the range. Genetic adaptation or phenotypic plasticity might allow some populations to persist, but this depends on the speed of change. Too fast and fish will not be able to adapt. Also natural selection comes at a cost of high mortality, which might also see many populations in the southern and central part of the range experience reductions in productivity.

Towards the northern end of the distribution range expansion might occur, as will a general increase in productivity of many stocks. It is doubtful if this will compensate for losses elsewhere in the range. And the loss of southern stocks can also mean the loss of very unique genetic types, altering the overall genetic structure and future evolutionary potential.

One of biggest challenges in evaluating effects of climate change is projecting extreme events. We know that climate change will increase variability. Many of our projections are at seasonal or even annual scales (e.g. river discharge, temperature). Yet it is at the daily or even finer scale that the most significant deleterious consequences can occur for salmon (e.g. extreme low flows combined with high temperatures, extreme flood events).

Maybe the greatest uncertainty in this assessment is our inability to predict sudden large phase-shifts in either climate, marine, or terrestrial systems. Under present emission scenarios the world is moving into uncharted territories. From past phases of global warming it might be possible to predict some of the coming changes, but the current emissions occur at such a rate that there is no reference for it, which might result in dramatic and unforeseen effects, such as large phase-shifts. How Atlantic salmon will react to such a phase shift remains to be seen.

Reference

S. Mathesius, M. Hofmann, K. Caldeira and H. J. Schellnhuber. 2015: Long-term response of oceans to CO_2 removal from the atmosphere, Nature Climate Change, 5, 1107–1113, doi:10.1038/nclimate2729.

8.8 WKEELDATA – Workshop on Designing an Eel Data Call

A **Workshop on Designing an Eel Data Call** (WKEELDATA), chaired by: Caroline Durif, Norway, met in Rennes, France, from 28 February to 2 March 2017 to plan a data call that is to be sent to all countries having natural production of European eel.

The workshop follows a need to standardize data reporting, increase its coverage, and improve data quality. A data call will ensure a more consistent and systematic approach to data reporting.

European eel life cycle is complex with a unique spawning area in the Sargasso Sea but growth areas widely distributed across Europe. The stock is genetically panmictic but the continental eel stock shows strong local and regional differences in population dynamics and local stock structures (sex ratio, length and age distributions). Da-ta are reported to the Working Group on Eel (WGEEL), which generates the advice. Data correspond to

several different life stages, from juveniles to prespawning eels, caught with various fishing gears in different habitats (from freshwater to saltwater environments). Local impacts by fisheries may vary from almost nil to heavy overexploitation. Other forms of anthropogenic mortality (e.g. hydropower, pumping stations) also impact on eel and vary in distribution and local relevance.

Most, but not all EU Member States reported quantitative estimates of the required stock indicators to the EU in 2012, and 2015. The reliability and accuracy of these data have not yet been fully evaluated, but WGEEL has identified weaknesses during its annual meetings. One of the main shortcomings is the lack of stock indicators in some non-European countries within the natural range of the European eel.

ICES started to launch official calls for fisheries-dependent data in 2012. Since then, data calls have been an integrated element in the process of addressing recurring ad-vice requests as well as special requests.

The terms of reference were addressed by reviewing the data requirements and de-fining data quality standards. The WKEELDATA group reviewed the spreadsheets that are requested to be filled in by each country assessor. The types of data were rated according to how well they responded to the requests of WGEEL. At present, recruitment time-series of eels recruiting to continental habitats are the only data that are organized into a database. WKEELDATA participants agreed that expanding this database was the most efficient and sustainable manner to organise data from WGEEL. Notable progress was made during and after the workshop towards this aim. The WKEELDATA participants developed a 2-year plan to carry this out in a reasonable and realistic manner. New spreadsheets were created to facilitate data entry. These spreadsheets which follow the structure of the database, are included in the data call along with the main text. The main text for the data call was drafted during the workshop and finalized the months following the workshop.

9 New Expert Groups

A draft resolution was submitted by WGEEL for consideration by ACOM: The **Workshop on Tools for Eel** (WKTEEL); (see Annex 5). This will support the further development of the eel database, setting up quality checking of the data being entered and creating tools for integrating and analysing the data.

10 Theme Session 2018

There were no theme session proposals for ASC in Hamburg 2018. However, a suggested theme session on "Challenges and solutions for stock assessments of data poor species with special reference to diadromous species and other listed or sensitive species", planned for ASC in 2019, was discussed at the meeting. A theme session proposal will most likely be finalised by WGTRUTTA with support from WGRECORDS and submitted before deadline in 2018.

11 Proposals for Symposia

11.1 Symposia

There were no specific proposals for symposia.

11.2 International Year of the Salmon

Niall Ó Maoiléidigh updated the Group on the International Year of the Salmon (IYS). The IYS is an international framework for collaborative outreach and research, and is conceived as an intensive burst of internationally coordinated, interdisciplinary, stimulating scientific research focused on salmon and their relation to people. New technologies, new observations, and new analytical methods, some developed exclusively during the IYS, will be focused on knowledge gaps that prevent a clear understanding of the future of salmon in a rapidly changing world.

Further progress on developing an International Year of the Salmon event was made during 2016. Primary Partners have been identified as North Pacific Anadromous Fish Commission (NPAFC) and North Atlantic Salmon Conservation Organization (NASCO) - international inter-governmental organizations established to conserve anadromous salmon in the North Pacific and Atlantic oceans respectively http://www.npafc.org/new/science_IYS.html and //www.nasco.int/iys.html.

ICES has agreed to be a Secondary Partners. The following organizations have also indicated a willingness to participate in the IYS: DFO, UBC, SFU, PICES, Pacific Salmon Commission, World Meteorological Program, Pacific Salmon Foundation, Vancouver Aquarium, U.S. National Marine Fisheries Service, Tula Foundation, First Nations Fisheries Council and Ocean Networks Canada, Ocean Tracking Networks as well as NASCO's accredited NGOs, EIFAAC, and the OSPAR Commission.

The IYS early activities were reported to SCICOM, WGNAS and WGRECORDS in 2015 and 2016 (see relevant ICES reports).

At SCICOM in September 2016, ICES formally accepted the invitation from the IYS Steering Committee to become a partner. ICES appointed the Head of Science Support and the SCICOM Representative for Ireland to engage with the process and be part of the North Atlantic Steering Committee and the Symposium Steering Committee. In November 2016, NASCO held a meeting of the North Atlantic Steering Committee which ICES attended. In March 2017 SCICOM approved a resolution to support the IYS symposium in third quarter 2018 with issue of journal to be allocated (pending discussions with Editor in Chief). ICES recognised this as high priority given that ICES are the primary advice providers for Atlantic salmon in the North Atlantic and have been advising the North Atlantic Salmon Conservation Organisation since 1983. Given the current persistent decline in salmon stocks in the North Atlantic, and a similar decline for some important Pacific salmon stocks, there is a need to share information to inform on a wider research initiative to explain and this decline and inform rational management. It is anticipate that a wide range of participants will attend this symposium given the existing links between the Pacific, Atlantic (East and West) and Baltic and the degree of international interest in wild salmon biology and science between freshwater and marine environments. Specifically, it is anticipated that there will be involvement of scientists from

ICES, NASCO, NPAFC, PICES, universities, government, semi state organisations, NGO (e.g. Atlantic Salmon Trust, Atlantic Salmon Federation). The outputs of the symposium and the research activities associated with the IYS are expected to feed into the advice process of the ICES ACOM and WGNAS and enhance ICES advice to NASCO. There will also be links with the ICES Science Plan through SCICOM, Environmental Processes and Dynamic Steering Group (EPDSG) and associate EGs i.e. WGRECORDS, WKTRUT-TA and others.

12 Proposals for Publications

There were no new proposals for publications.

The CRR "Marine Recoveries of Tags from Atlantic Salmon – from 1960's to present" edited by Niall Ó Maoiléidigh (Ireland), Lars Peter Hansen (Norway), Jan Arge Jacobsen (Faroes Islands), Ted Potter (UK), Dave Reddin (Canada) and Jonathan White (Ireland) is now in the final production stage with ICES PUBCOM and due to be published shortly (CRR No. 282). Due to unavoidable circumstances, the production of this publication was delayed in 2016/2017.

ICES COOPERATIVE RESEARCH REPORT

RAPPORT DES RECHERCHES COLLECTIVES

NO. 282; SEPTEMBER 2015

FIFTY YEARS OF MARINE TAG RECOVERIES FROM ATLANTIC SALMON

Editors: Niall Ó Maoiléidigh • Jonathan White • Lars P. Hansen • Jan Arge Jacobsen • Ted Potter • Ian Russell • Dave Reddin • Tim Sheehan

EGs should consider this route of CRR (Co-operative Research Reports) for publishing Working Group materials. The CRR come under the Publishing Committee, documents are peer-reviewed, open access, can provide a topical commentary and also be used as guides or handbooks. Publications can be from 30-200 pages but are more typically 80-100 pages. CRRs are catalogued and held in the ICES library.

13 Update from the Baltic Regional Coordination Group (RCG Baltic) meeting in Finland

Given the geographical span as well as the regional need to organise and coordinate data collection of diadromous species, the Liaison Meeting of 2016 discussed the need for a pan-regional subgroup on these species (eel, salmon, sea trout) and wished to initiate a subgroup on this to prepare advise on what needs to be done for diadromous species in a Regional Workplan, including listing end user needs (variables required, frequency, intensity), including possible needs for regional agreements (e.g. setting index rivers) and time frame for implementation.

Eleven experts on diadromous species met during the Baltic meeting September 2017, along with one representative of the Commission and one from ICES. The experts 'represented' 7 countries: Finland, Sweden, Poland, Germany, Latvia, Estonia, and UK.

The Baltic meeting was selected because (i) it was one of the first meetings of 2017 and so the outcomes could then be circulated to the later RCG meetings, and (ii) the Baltic is the region where most diadromous species are listed in the EU MAP: salmon, sea trout and eels (sea trout data collection not being a requirement of the EU MAP in other regions).

The diadromous experts considered the proposal for a pan regional sub group on diadromous species, confirmed this proposal, and therefore initiated the sub group (DSG). The first meeting of the DSG was chaired by Alan Walker (UK), but following the Rules of Procedures, a chair will be elected during the first year of the DSG once the membership is fully established.

During the Baltic RCG, the DSG addressed its ToRs (drafted by AW and Uwe Krumme, the chair of the Baltic RCG). The key findings are summarised below, and detailed in an Annex to the Baltic RCG report.

As the North Atlantic RCG took place in the same week as the Baltic meeting, a telecom was held between the two groups to review developments on diadromous species coordination during the week.

As the DSG is pan-regional, the reporting format was discussed with the chairs of the NA and the NS&EA RCGs and agreed that the diadromous annex to the Baltic report would also be included as an annex to these other RCG reports. The same process is proposed for the Med&BS RCG, but has not been discussed with the chair of that RCG yet.

Summary of findings against the seven ToRs

1) The proposal for a pan-regional sub group for diadromous species was supported, and Aims and Objectives in the form of ToRs were drafted for consideration at the Liaison Meeting 2017.

2) WGBAST and WGEEL have recently reported on data collection programmes, management or assessment units, and WGNAS through a workshop in 2012. These WGs will be asked to advise on data collection requirements and benefits of regional coordination through their roles as end users. WGEEL has initiated an official data call in 2017.

3) The DSG examined the recent STECF reports from 2016 and 2017 for recommendations to ease the reporting and evaluation of national work plans and technical reports. Time limits prevented further progress during the meeting.

4) Regional coordination in the Baltic is well established, though not fully implemented for all species and stocks. Outside the Baltic, regional coordination is less well established and the benefits less obvious, though some potential opportunities for eel were suggested. Advice should be sought from the ICES assessment working groups as end users.

5) Following the intent of the EU MAP, end user feedback is required from which to agree on designated rivers and management units, and so questions are posed to the ICES assessment Working Groups. However, in support of this work the DSG drafted proposals for criteria to identify 'index' rivers, using eel in the Baltic as an example.

6) The RCG sub group on Quality compiled landings per harbour, including eels and salmon, as a way to check for data submission errors. However, the ma-

rine focussed databases are not ideal for incorporating all the DCF Data for diadromous species because some data are unique, e.g. data from fresh instead of marine waters, and some biological data types. The WGEEL and ICES are developing eel-specific databases, and the ICES will continue to examine ways to adapt the Regional Database to suit diadromous species. Data provision through databases should facilitate quality assurance processes.

7) This ToR was interpreted to refer to evaluation of national (and future regional) sampling programmes. To start, an overview of salmon, sea trout and eels data collected by Member States in the Baltic region was prepared, highlighting data collected within or outside the DCF, and those used in international, regional or national assessments. This will be expanded to all EU Member States in 2018.

14 Future coordination of Science on Diadromous Species

14.1 Participation in open sessions during the ASC

The chairs of WGRECORDS participated in open sessions held during the ASC in Fort Lauderdale.

14.2 Participation in EG CHAIRS meeting during the ASC

The Chairs of WGRECORDS attended the EG Chairs meeting during the ASC, where participants met the chairs of ACOM and SCICOM and had possibilities to share their experiences and raise issues they consider important to ICES work. These meetings are of particular importance for WGRECORDS that coordinates activities of both ACOM and SCICOM EGs.

15 Draft resolution for WGDIAD 2018–2020

A new multi-annual Resolution and Terms of Reference for WGRECORDS was tabled by the Chairs, discussed and agreed. It was also decided that the EG should preferably change acronym from WGRECORDS to the more recognisable WGDIAD.

The full draft resolution is included in Annex 4.

Annex 1: List of participants

Name	Institution	email
Johan Dannewitz co-chair	Swedish University of Agricultural Sciences	johan.dannewitz@slu.se
Russell Poole co-chair	Marine Institute, Ireland	russell.poole@marine.ie
Björn Kullmann	University of Hamburg, Germany	bjoern.kullmann@uni-hamburg.de
Laura Wichmann	University of Hamburg, Germany	Wichmann.Laura@web.de
Marko Freese	Thunen Institute of Fisheries Ecology, Germany	Marko.Freese@thuenen.de
Jan-Dag Pohlmann	Thunen Institute of Fisheries Ecology, Germany	jan.pohlmann@thuenen.de
Caroline Durif	Institute of Marine Research, Norway	caroline.durif@imr.no
Alan Walker	CEFAS, UK	alan.walker@cefas.co.uk
Niall O'Maoileidigh	Marine Institute, Ireland	niall.omaoileidigh@marine.ie
Lari Veneranta	LUKE Finland	Lari.Veneranta@luke.fi
Karen Wilson	Univ Southern Maine, US	karen.wilson@maine.edu
Henrik Sparholt	Nordic Marine Think Tank	henrik.sparholt@gmail.com
Peter-Jan Schon	AFBINI, UK	Pieter-Jan.Schon@afbini.gov.uk

Annex 2: Agenda

Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species [WGRECORDS]

Chair: Johan Dannewitz (Sweden), Russell Poole (Ireland)

Agenda: Tuesday 19th September 09.00-18.00 (Meeting Room 316)

(lunch from 13.00 to 15.00)

Welcome and Introductions

Adoption of the Agenda and Appointment of a Rapporteur

Intersessional Activities, past and future

Review of current Expert Groups/Workshops on diadromous species

- **WGEEL -** EIFAAC/ICES/GFCM Joint Working Group on Eel (Chair: Alan Walker, UK)
- **WGBAST -** Working Group on Baltic Salmon and Trout (Chair: Stefan Palm, SE)
- **WGNAS -** Working Group on North Atlantic Salmon (Chair: Gerald Chaput, Ca)
- **WGERAAS -** Working Group on Effectiveness of Recovery Actions for Atlantic Salmon (Chair: Denis Ensing, UK)
- **WKCCISAL** - Workshop on Climate Change Impact on Salmon (Chair: Denis Ensing, UK)
- **WGDAM –** Working Group on Data Poor Diadromous Fish (Chairs: Lari Veneranta, Finland and Karen Wilson US)
- **WGTRUTTA** – Working Group on Sea Trout (Chairs: Johan Höjesjö, SE and Alan Walker, UK)
- **WKEELDATA –** Workshop on Designing an Eel Data Call (Chair: Caroline Durif, No)

Break for Lunch

Proposals for New (SCICOM?) Expert Groups

-

Theme Sessions 2018 & 2019

-

Proposals for Symposia

-

Update on the International Year of the Salmon (Niall?)

Update from the RCMs

- Short presentation from Alan Walker on highlights from the Baltic RCM

The Way Forward

[Wojciech Wawrzynski, head of Science support at ICES to attend this section]

- General Discussion
- WGRECORDS Report for 2017 – end of term report
- ToRs for 2018 to 2020
- Chairs for 2018 to 2020
- Change of name to a more recognisable Acronym

Any Other Business

- **?**

Close Meeting

Annex 3: Recommendations

WGRECORDS was established to provide a forum for the coordination of work within ICES on diadromous species. Specific recommendations regarding science requirements, management and advisory needs for diadromous fish are not listed here but can be found in reports from WGs under the WGRECORDS umbrella.

Annex4: Draft Resolution for the Working Group on the Science to Support Conservation, Restoration and Management of Diadromous Species (WGDIAD)

The **Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species** (WGRECORDS), will be renamed the **Working Group on Science to Support Conservation, Restoration and Management of Diadromous Species** (WGDIAD), chaired by Johan Dannewitz, Sweden (2018); Dennis Ensing, UK (2018–2020); and provisionally Hugo Maxwell, Ireland (2019-2020) will meet by correspondence and annually at the ICES ASCs in September 2018, 2019 and 2020 to work on ToRs and generate deliverables as listed in the Table below.

WGRECORDS will report on the activities of each year by 31 December (via EPDSG) for the attention of SCICOM.

ToR descriptors

ToR	Description	Background	Science Plan topics addressed	Duration	Expected Deliverables
a	Stimulate international scientific co-operation in the study of diadromous fish species and provide a mechanism through which issues relating to these species and their environment, including also aspects connected to estaurine and fresh water habitats used by these species, can be addressed and coordinated within the ICES science plan;	There is a need to coordinate and draw the various elements of ICES work together to support the management advice provided for multiple species of diadromous fish, particularly in delivering commitments under various regulations, including the EU-Habitats and Water Framework Directives and the EU Eel Regulation.	1, 4, 11, 13, 15, 25, 26, 27, 28, 31	Year 1, 2 and 3	Report of the WG and maintenance of a previously established network of diadromous fish experts.
b	Identify scientific needs and propose activities, including experts groups, theme sessions and symposia, to support the implementation of the Science Plan and the work of SCICOM and ACOM Experts Groups on diadromous species and review their outputs;	ICES is well placed to coordinate scientific activities which generate up to date information on the biology and ecology of diadromous species, threats to their status, including climate change, and advice on measures to be taken to restore habitats and ecosystems, and rebuild depleted populations.	1, 4, 11, 13, 15, 25, 26, 27, 28, 31	Year 1, 2 and 3	Organise theme sessions, symposia or expert groups. Co-ordinate feedback from these sources for use in publications and CRR documents. Liaise with and support chairs of EGs and WKs to achieve their aims.
c	Assist EPDSG and ICES to integrate important activities	Issues relating to, for example, rare and data	1, 4, 11, 13, 15, 25, 26, 27, 28,	Year 1, 2 and 3	Keep ICES abreast of important

with those of other Expert Groups reporting to EPDSG, other SGs and/or ACOM.	limited species are widely dispersed across the ICES Science plan. This group provides a focal point for both internal and external communication and reporting of new developments and concerns regarding diadromous fish.	31	issues relating to Diadromous fish species and ensure these issues are communicated within the ICES community to relevant EGs and SGs.

Summary of the Work Plan

Year 1	Coordinate scientific activities (theme sessions, symposia, EGs, CRRs and reports to EPDSG)
Year 2	Coordinate scientific activities (theme sessions, symposia, EGs, CRRs and reports to EPDSG)
Year 3	Coordinate scientific activities (theme sessions, symposia, EGs, CRRs and reports to EPDSG)

Supporting information

Priority	The Working Group will provide the mechanism to coordinate scientific activities relating to diadromous fish species and their environment in support of the ICES Science Plan. It will also permit ICES to respond fully to requests from NASCO and the EU/FAO/IUCN/CITES for scientific advice on management strategies, research needs and data deficiencies.
Resource requirements	Meeting facilities at the ASC in 2018–2020
Participants	National representatives and other invited experts working with diadromous species
Secretariat facilities	Secretarial support for organisation of the meeting and preparation of the report.
Financial	No financial implications.
Linkages to ACOM and groups under ACOM	The proposal originates from EPDSG but will have direct significance to ACOM for advice from WGNAS, WGBAST, WGEEL in particular.
Linkages to other committees or groups	Besides EPDSG, there are linkages to the SCICOM steering groups HAPISG and EOSG and all Expert Groups working on issues of relevance for diadromous species in relation to improving scientific understanding and coordinating scientific activities.
Linkages to other organizations	NASCO, FAO, EIFAAC and GFCM, HELCOM, CITES

Annex 5: Draft Resolution for the Workshop on Tools for Eel (WKTEEL)

The **Workshop on Tools for Eel** (WKTEEL), chaired by Laurent Beaulaton, France, will be established and will meet in Rennes, France, 2–6 July 2018 to:

a) Further develop the WGEEL database structure to integrate the information from the 2018 Data call;

b) Develop an efficient method to integrate the information from the 2018 Data call into the database to (i) check for duplicate entries and return files to the WGEEL to select the appropriate values, and (ii) adapt scripts to quality check the data before their insertion in the database;

c) Design batches of tools, figures, maps and tables to (i) upload files to run the checks for database integration (a user friendly interface), (ii) show, analyse and extract information from the database to provide the results, tables and figures needed by the WGEEL, and (iii) verify that the information inserted into the database is in accordance with the Data call files from 2017 (and thereafter);

d) Implement the above tools, figures and maps.

WKTEEL will report by 31st August for the attention of the Advice Committee.

Supporting information

Priority	1. The EU Regulation (EC 1100/2007) and associated Guidance obliges EU Member States to report national stock indicators, to take management measures and to report progress. Non-EU countries have no such legal obligation, but the same aspirations are necessary to provide a whole-stock assessment and management. The Working Group continues to provide EIFAAC, ICES and the GFCM countries with scientific support in implementing and improving such actions. 2. The EU has requested annually recurring scientific advice on the European eel because the EU "has adopted or may adopt rules for the protection of anadromous and catadromous species (such as eels or salmon), including for the non-marine part of their life cycle", as described in the 2017 AA between the EU and ICES. Specifically for eel, the advice is sought in support of the Eel Regulation (EC 1100/2007). 3. WKEELDATA and WGEEL have implemented a Data call system for formalizing and standardizing the data provision to support WGEEL work. The WGEEL will now develop procedures to automate checking these submission for errors, and automate their analysis and reporting for the WGEEL core activity of reporting on the state of the stock and impacts. These procedures will make the WGEEL activities much more efficient and facilitate quality assurance. Consequently, these activities

	are considered to have a very high priority.
Scientific justification	Term of Reference a) The WGEEL is developing a database to integrate data reported by EU and non-EU countries in support of WGEEL recurring duties to report updates on the state of the stock. At the same time, the WGEEL is implementing a Data call process to formalize and standardize reporting. The 2018 Data call was developed during the WGEEL 2017 meeting but the database needs to be furthe developed to be made ready for these new data. Term of Reference b) The WGEEL wishes to implement automatic checking procedures to ensure the correct data are uploaded and analysed. In particular, historic data sometimes gets revised because of new analyses and it is essential to actions these revisions in the database. The work will develop autmoated scripts for this. Term of Reference c) When complete, the eel database can be used to automate the generation of the annual update on the state of the eel stock, e.g. geenrating tables, figures and associated text for landings, recruitment, biomass and mortality estimates. This WKTEEL will develop the processes to achieve these. Term of Reference b) The WKTEEL will test all these developments so that they are finalised ahead of the WGEEL 2018 meeting.
Resource requirements	This work will require access to the SharePoint.
Participants	The Workshop will be open to members of the EIFAAC/ICES/GFCM WGEEL, national eel experts and data providers, and invited specialists. The Group will liaise with the ICES Data Experts.
Secretariat facilities	Support to provide access to the SharePoint and formatting the report.
Financial	No financial implications as members will attend at their own expense.
Linkages to advisory committees	This links to ACOM because the WGEEL description of the stock is a recurring ToR set by ACOM, and this WG will make the process more efficient and better quality assured.
Linkages to other committees or groups	This work links closely to WGDIAM.
Linkages to other organizations	The work of this group is to support the ICES Scientific Advice which is used by EU DG MARE and DG ENV, the CITES Secretariat, FAO EIFAAC, GFCM.

Annex 6: WGRECORDS self-evaluation

1) Working Group name

Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS)

2) Year of Appointment

2015

3) Chairs:

Johan Dannewitz, Sweden

Russell Poole, Ireland

4) Meeting venue(s) and dates:

22-23 September 2015, Copenhagen, Denmark (@ASC 2015), 9 participants from 4 countries

22-23 September 2016, Riga, Latvia (@ASC 2016), 7 participants from 5 countries

18-19 September 2017, Fort Lauderdale, USA (@ASC 2017), 13 participants from 8 countries

5) If applicable, please indicate the research priorities (and sub priorities) of the Science Plan to which the WG make a significant contribution.

The EG was established to provide a forum for the co-ordination of work on diadromous species following the disbanding of the Diadromous Fish Committee. The role of the Group is to co-ordinate work on diadromous species, organise Expert Groups, Theme Sessions and Symposia, and help to deliver the ICES Science Plan. EGs under the WGRECORDS umbrella are particularly focused on Science Plan topics 1, 4, 11, 13, 15, 25, 26, 27, 28, 31.

6) In bullet form, list the main outcomes and achievements of the WG since their last evaluation. Outcomes including publications, advisory products, modelling outputs, methodological developments, etc.

- Co-ordination of three Theme Sessions 2015-2017;
- Assisted within the process of forming four new EGs, including drafting of Resolutions;
- Continuous co-ordination between EGs and ACOM and SCICOM;
- Continuous support to chairs of EGs to help them fulfil their ToRs;
- Assisted Secretariat with an Adhoc advice request from the Netherlands regarding a fish passage project in the Wadden Sea;
- Provided feedback on the implementation of the Science Plan at several occasions;
- One CRR publication on Marine Recoveries of Salmon Tags;
- Three stand-alone WG reports 2015-2017;
- An overview of deliverables can be found in table A-1 below.

7) *Has the WG contributed to Advisory needs? If so, please list when, to whom, and what was the essence of the advice.*

- Supporting EGs and ACOM in discussions regarding Advisory needs on diadromous fish;
- The EG assisted ICES Secretariat in finding experts on diadromous fish for reviewing a Wadden Sea fish passage audit, as a response to an Adhoc advice request from the Netherlands in 2015.

8) *Please list any specific outreach activities of the WG outside the ICES network (unless listed in question 6). For example, EC projects directly emanating from the WG discussions, representation of the WG in meetings of outside organizations, contributions to other agencies' activities.*

- An informal meeting with diadromous fish experts at the annual meeting of NASCO in 2015;
- Representation of diadromous fish experts at the Regional Coordination Meeting for the Baltic Sea in September 2017, with the aim of initiating a sub-group on diadromous fish (DSG). This subgroup will have a coordinating function and identify data collection needs for diadromous species in relation to the EU data collection regulation, and outcomes of DSG will be implemented in the Regional Workplan;

9) *Please indicate what difficulties, if any, have been encountered in achieving the workplan.*

No particular problems or difficulties have been encountered.

10) *Does the group think that a continuation of the WG beyond its current term is required? (If yes, please list the reasons)*

Yes, but with somewhat revised ToRs and a new, more recognisable acronyme, see next question.

11) *If you are not requesting an extension, does the group consider that a new WG is required to further develop the science previously addressed by the existing WG.*

The group consider it important with an EG that coordinates the work on diadromous fish within ICES. A ToR draft resolution for 2018-2020 is included in Annex 4.

12) *What additional expertise would improve the ability of the new (or in case of renewal, existing) WG to fulfil its ToR?*

Members of the WG and persons within the WGs net-work have all expertise needed to fulfil the ToR.

13) *Which conclusions/or knowledge acquired of the WG do you think should be used in the Advisory process, if not already used? (please be specific)*

The WG is willing, and have the competence, to support EGs and ACOM in discussions regarding Advisory needs on diadromous fish if needed.

Table A-1. Terms of Reference for WGRECORDS 2015–2017, and summaries of the outcomes.

ToR	Description	Background	Expected Deliverables	Outputs from WGRECORDS
a	Stimulate international scientific co-operation in the study of diadromous fish species and provide a mechanism through which issues relating to these species, including in estuarine and fresh waters, can be addressed and coordinated within the ICES science plan;	There were many topics within the previous ICES Science Plan that are very relevant to the research on diadromous fish species currently being undertaken or planned. While not as clearly defined in the new science plan, there is still a need to be able to draw the various elements of ICES work together to support the management advice provided on diadromous fish, particularly in delivering commitments under various regulations, including the EU-Habitats and Water Framework Directives and the EU Eel Regulation	Report of WG and establish and maintain a network of diadromous fish experts	* a network of scientists was setup for emailing, including the Chairs of current EGs/Wkshps * Sharepoint for WGRECORDS was set up * Annual meetings were held and from those, full annual reports were produced. * Each meeting integrated information from the EGs relating to diadromous fish. * EG summaries and subsequent discussion points were included in the WGRECORDS Reports
b	Propose activities, including experts groups, theme sessions and symposia, to support the Science Plan and the work of ACOM Experts Groups on diadromous species and review their outputs;	ICES is well placed to co-ordinate scientific activities which generate up to date information on the biology of these species, the threats to their status and advice on measure to be taken to restore and rebuild depleted populations.	Organise theme sessions, symposia or expert groups. Co-ordinate feedback from these sources for use in publications and CRR documents	* The annual WGRECORDS meeting assisted with the organising of Theme Sessions relating to diadromous species, one theme session was held each year. * WGRECORDS liaised with the ASC committee to combine and edit theme session proposals to ensure high quality well represented Themes. * One CRR on Marine Recoveries of Salmon Tags was published

ToR	Description	Background	Expected Deliverables	Outputs from WGRECORDS
c	Assist SSGEPD to integrate these activities with those of other Expert Groups reporting to SSGEPD.	Issues relating to rare and data poor species are widely dispersed across the ICES Science plan. This group provides a focal point for reporting new developments and concerns regarding diadromous fish in particular back to ICES via the SSGEF.	Keep ICES abreast of important issues relating to Diadromous fish species and ensure these issues are communicated to other EGs and SGs.	* The Chairs of WGRECORDS attended ACOM/SCICOM EG Chairs meetings. * A full update on the "International Year of the Salmon" was included on the Agenda, other invited, and offered, presentations were included in the annual meetings * In 2015/'16 WGRECORDS gave advice to the Secretariat on an ad hoc for advice request from the Netherlands.
	WGRECORDS will report annually by 31 December (via SSGEPD) for the attention of SSGEPD and SCI-COM.			* WGRECORDS produced 3 full annual reports