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

20 September 2011

Gdansk, Poland



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## Executive summary

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WGRECORDS held an informal meeting on 6 June 2011, during the NASCO Annual Meeting in Ilillusat, Greenland. The annual meeting of WGRECORDS was held on 20 September 2011, during the ICES Annual Science Conference in Gdansk, Poland. The meetings were chaired by Ted Potter (UK) and attended by 16 participants from 11 countries.

WGRECORDS 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.

At the informal meeting in Ilillusat, initial 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 Meeting. The Annual Meeting received reports from all the ICES Expert Groups working on diadromous species, and considered their progress and future requirements.

The Group reviewed the work of all the Expert Groups working on diadromous species. Particular interest was noted by groups working in different areas in:

- use of wetted area production models for salmon and eel;
- methods to assess Baltic sea trout which may be applicable to stocks elsewhere;
- data collection procedures adopted for salmon in the Baltic under the DFC;
- impacts of climate change on diadromous stocks;
- impacts of low-head hydropower generation on diadromous fish;
- approaches being proposed for evaluation of eel stocks.

The Group supported the continuation of three existing Expert Groups and noted a continuing interest in their work: the Workshop on Age Determination in salmon [WKADS]; the Workshop on Baltic Eel [WKBALTEEL]; and the Workshop on Salmon Tagging Archive [WKSTAR].

The Group noted that the following Expert Groups on diadromous species had completed their work: the Study Group on Data Requirements and Assessment Needs for Baltic Sea Trout [SGBALANST]; the Study Group on Salmon Stock Assessment and Forecasting [SGSSAFE]; the Study Group on International Post-evaluation on Eels [SGIPEE]; and the Workshop on Age Reading of European and American Eel [WKA-REA-2].

The Group proposed the establishment of the Workshop on Eel and Salmon DCF Data to advise EU on revisions to the DFC relating to these species.

The Group agreed that the Study Group on Effectiveness of Recovery Actions for Atlantic Salmon [SGERAAS] be dissolved, because it has been unable to meet; the work will be subsumed into WGNAS as far as is practical. It is hoped that this group might be revitalised in 2–3 years when there are more data to discuss.

A proposal for a 2012 ASC Theme Session on the impacts of renewable energy facilities on diadromous species had been submitted in September and further ideas were put forward for Theme Sessions in 2013.

There was strong support for maintaining the work of the WGRECORDS and it was proposed that the ToR of should be rolled over unchanged for the years 2012 to 2014.

Niall O'Maoileidigh, Ireland and Atso Romakkaniemi, Finland offered to take on the chairmanship of the WG for the period 2012 to 2014, and they were unanimously nominated by the annual meeting. They will provide a particular focus on issues relating to the North Atlantic and Baltic respectively. The Working Group will continue to hold its annual meeting during the ASC.

## **1 Meetings held in 2011**

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An informal meeting of WGRECORDS was held during the NASCO Annual Meeting in Illilusat, Greenland on 6 June 2011. The meeting was attended by 10 participants from eight countries (Annex 1). This meeting provided the opportunity for preliminary discussions about the organisation of the Expert Groups (EGs), particularly on topics relating to Atlantic salmon.

The formal annual meeting of WGRECORDS was held on 20 September 2011, during the ICES Annual Science Conference at Gdansk, Poland. The meeting was attended by 12 participants from nine countries (Annex 1).

## **2 Opening of annual meeting and adoption of the agenda**

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

## **3 Review of Expert Groups on diadromous species**

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The informal meeting held preliminary discussions about the future work of the EGs working on North Atlantic salmon. The annual meeting received reports from all the EGs working on diadromous species and considered the need for further meetings and/or revised terms of reference. During 2010/2011, WGRECORDS has co-ordinated the activities of nine ongoing or proposed Workshops/Study Groups related to diadromous species in addition to receiving reports from three ACOM EGs. Details of the work of the EGs that met in 2011 are summarised below.

### **3.1 WGEEL - Joint EIFAC/ICES Working Group on Eel (Chair: Russell Poole)**

The Working Group met in Hamburg, Germany on 9–14 September 2011 to address the following ToRs:

- a) assess the trends in recruitment and stock, for international stock assessment, in light of the implementation of the Eel Management Plans;
- b) develop methods to post-evaluate effects of management actions at the stock-wide level (in conjunction with SGIPEE);
- c) develop methods for the assessment of the status of local eel populations, the impact of fisheries and other anthropogenic impacts, and of implemented management measures (in conjunction with SGAESAW 2);
- d) provide practical advice on the establishment of international databases on eel stock, fisheries and other anthropogenic impacts, as well as habitat and eel quality related data, and the review and development of recommendations on inclusion of data quality issues, including the impact of the implementation of the eel recovery plan on time-series data, on stock assessment methods;
- e) review and develop approaches to quantifying the effects of eel quality on stock dynamics and integrating these into stock assessments;
- f) respond to specific requests in support of the eel stock recovery Regulation, as necessary; and
- g) report on improvements to the scientific basis for advice on the management of European and American eel.

Thirty-nine people attended the meeting from fifteen countries. A full report was submitted to ICES and EIFAAC/FAO. The following is a summary of the report and the main recommendations.

### Conclusions

Indications are that the eel stock is at an historical minimum, continues to decline and is outside safe biological limits. Recruitment to the stock is at a historically low level and there is no obvious sign of recovery. Current levels of anthropogenic mortality are not sustainable, and there is an urgent need that these should be reduced to as close to zero as possible until a recovery of the stock is achieved.

Recruitment in recent years has been especially low. All glass eel recruitment-series demonstrate clear and marked decadal reductions since the early 1980s. For the last five years the series based on glass eel average between 1% (continental North Sea) and 7% (continental Atlantic) of 1960–1979 levels respectively. A difference in spatial pattern of recruitment is observed at most stations in the North Sea, where the decline is sharper than elsewhere. Recruitment of continental yellow eel has been declining continuously since the 1950s and is currently at 9% of 1960–1979 level.

Total landings data have been found to be unreliable and it is hoped that the implementation of the DCF and eel Regulation/CITES traceability schemes might improve this situation. There was a great heterogeneity among the landings data with incomplete and inconsistent reporting by countries and changes in management practices were found to have also changed the reporting of non commercial and recreational fisheries.

Stocking with glass eel has decreased since the early 1990s and appears now to be at a relatively low level and still decreasing. This has partly been compensated for by an increasing number of young yellow eels stocked since the late 1980s.

The Working Group applied a modified ICES precautionary diagram to the EMU eel biomass data as reported in the Country Reports and the Eel Management Plans. The preliminary information clearly indicates the wide variation in stock status within and between countries, the need to standardize methodology and presentation, and the wide range in contributions to the eel stock of different EMUs and countries. The data allowed a preliminary assessment of stock status in 40 Eel Management Units. Many of the EMUs lie in the orange and red zones. For some EMUs, the %SPR is above 100%, so the anthropogenic mortality is estimated below zero. This situation is found when positive impacts occur (e.g. stocking).

A number of topics were reviewed in support of local assessment of eel stocks to further improve the estimation of silver eel production. Mark-recapture techniques for silver eel escapement tend to fall into one of two approaches: a/ single point assessments where M-R data are gathered and treated mathematically as closely as possible to a single point in space and time and b/ a new survival model approach under development for data with multiple mark and recapture sites over longer periods of time and distance and where multiple silver eel inputs to the population and/or losses occur throughout the assessment due to fishing and other mortality.

Methods used for determination of silvering stage were reviewed and compared to assess their practicality and efficiency as tools to evaluate the number of potential spawners in a sample. External objective criteria (such as body measurements) are more accurate than observations based on skin colour or the visibility of the lateral line. Commonly used indices were applied on several datasets consisting of yellow



and downstream migrating eels (i.e. that were caught as they were moving downstream) in order to develop a tool for estimating silver eel biomass from appropriately timed yellow eel surveys or sampling. The silvering index, based on eye diameters, pectoral fin length, body length and body weight, was preferred for an accurate description of the sample. A model that predicts the silvering rate based solely on length of eels gave very similar results and is very promising as a simple and reliable method to estimate the proportion of future spawners. Practical guidelines are specified to measure body parameters. Because silvering occurs over summer, the appropriate period for such a survey would be September, just before migratory movements. A seasonal trend in the mean size of silver eels was confirmed from several countries across Europe. Small eels (which are males in most cases) migrate earlier in the season, followed by larger females. The previous observations of Vøllestad (1992) that age and size of silver eels increase with latitude were also confirmed and there appears to be an increase in silver eel size over the years (since the 1940s).

On examining the gathering and use of eel data from Water Framework Directive and Data Collection Framework programmes in EU Member States, the WG concluded that both sampling programmes for eels can be useful but they (especially the DCF) should specifically include eel in scientific surveys to maximize the value of such work and properly address the needs of all eel stock assessments and reporting to the EU. It is recommended that a (series of) data workshop(s) be held as soon as possible to provide support and coordination for data collection, analysis and reporting.

Analysis of the use of wetted area models for estimating silver eel production revealed a lack of consistency within and between countries on how productive area is determined and reported. The types of habitats considered in these estimates varied between EMU's and countries and differences were found in the estimated areas and these create uncertainty for stock assessment at the international level. A consistent approach to including all types of natural eel habitat is necessary, and may require more data collection to inform this process.

The European Eel Quality Database (EEQD) integrates data of contaminants, diseases and parasites, and fat content. New data were incorporated in 2010 for 1361 records of contaminants, diseases or parasites, but the data do not yet support a comprehensive overview on the quality of eel throughout its distribution.

Trend analyses of contaminants in Belgium and the Netherlands reveal the expected decreases in average concentrations, but some pollutants clearly persist in the environment long after their use was banned (e.g. PCBs). *Anguillicoloides crassus* continues its spread across Europe and is pretty much ubiquitous.

The development of an Eel Quality Index was initiated as a means to combine the effects of different quality pressures into an estimate of the overall quality of eels. The Index was illustrated using information on PCB levels in eels from case studies in four countries. The approach should be further developed to include other pollutants, diseases and parasites affecting the quality of eels. Some fisheries for eel (and other species) have been closed in Belgium, France and Germany because pollution levels are so high as to be a risk to the health of consumers.

An extensive range of scientific papers have been published in the peer reviewed literature since the WGEEL 2009 meeting, a bibliography of which is presented. Given the current focus of WGEEL towards stock recovery it was decided to review only those scientific advances with direct relevance to stock management. These included

recent genetic findings, artificial reproduction, advances in Japanese eel science, eel quality, stocking, hydropower and oceanic phase. While the review was informative it also highlighted gaps in current knowledge particularly with reference to stocking, and mitigation measures to reduce the impact of hydropower.

### 3.2 SGIPEE - Study Group on International Post-evaluation on Eels (Chair: Laurent Beaulaton, France)

The Study Group met in London, UK on 24–27 May 2011 (hosted by the Environment Agency) to address the following ToRs:

- a) Review stock assessment and post-evaluation methods available for species of eels, and those used by ICES EGs on other species, that could be successfully applied to eels at the stock-wide level in 2012;
- b) Adapt methods for stock-wide post-evaluation of *Anguilla anguilla* and apply them to data collated by WGEEL at its annual meetings; (this may include aggregation of EMU post-evaluation);
- c) Analyze sensitivity of the selected methods to stock improvement or deterioration using simulated data;
- d) Submit recommendations to WGEEL on: the best available post-evaluation method for 2012; gaps in data or knowledge that need to be filled before 2012; and methods that should be developed and data that should be collected after 2012 for the next stock-wide evaluation.

This Report summarizes the presentations, discussions and recommendations of the 2011 session of the Study Group; the meeting was attended by 13 people from 8 countries.

This study group is intended to design, test, analyse and report on a method of scientific ex-post evaluation at the stock-wide level of applied management measure for eel restoration. After a first meeting mainly focused on designing the appropriate framework and the methods for eel ex-post evaluation and reviewing available data, this meeting test the reliability of this framework.

The scientific basis and the applicability of the modified ICES precautionary diagram have been improved. The possibilities of data deficiencies and inconsistencies have been explored and a first draft of a quality control sheet has been designed. Additionally a power analysis has been conducted to see the ability to detect any change in stock status indicator (recruitment and silver eel biomass). It shows that, given the high natural variability of biological processes, the probability to detect any change, even in case of strong management measures, is very low in 2012 but increase with time. As a consequence, in the short term, the most important parameter to post-evaluate the result of implemented eel management measures is anthropogenic mortality since most effects on biomass will only show up after several years.

The Study Group recommended that:

- a) Since short-term post-evaluation of eel management is primarily focused on (achieved and intended) mortality levels (rather than biomass-levels), SGIPEE recommends that WGEEL considers the relation between biomass reference point and mortality reference point, taking into account the objective of the EU Eel Regulation and previous ICES advice;
- b) Since short-term post-evaluation is primarily focused on mortality levels and long-term post-evaluation on future recruitment trends, SGIPEE recommends that the power-analyses (on simulated silver eel escapements

in this report) are extended to cover mortality estimates and recruitment trends;

- c) the spatial coverage of the international stock assessment done by the Joint EIFAAC/ICES Working Group on Eels is improved through the participation of countries throughout the distribution area, particularly through integration of ICES, EIFAAC and GFCM eel assessment and advice;
- d) assessments of anthropogenic impacts and the dynamics of the stock (current, past and future) are improved.

The following two recommendations made by WGEEL 2010 (ICES, 2010b) were endorsed by the Study Group:

- e) The 2001 meeting of WGEEL (ICES 2002b) recommended the formation of an international commission that could act as a clearing house for handling and coordinating data collection and storage, stock assessment, management and research. Noting the urgent need to plan and coordinate the data collection and tool development for the 2012 post-evaluation; this recommendation is re-iterated;
- f) In particular, it is recommended to organise a (series of) workshops in relation to local eel stock monitoring, with a focus on standardisation and coordination, preparing for the 2012 post-evaluation, setting the scene for the 2013 international stock assessment. The study group also underline that wetted area data is of utmost importance and should be collected and made publically available in priority.

### **3.3 WKAREA-2 - Workshop on Age Reading of European and American Eel (Chair: Françoise Daverat)**

The Workshop exchanged information by correspondence in 2010 and met in Bordeaux, France in March 2011 to address the following ToRs:

- a) to exchange samples (>100 per species) of European and American eel otolith pictures, including known age eels, with samples prepared using different protocols and representing a range of eel subpopulations, and environment types encountered in both species range;
- b) to apply the age estimation criteria defined during the previous meeting in an inter-calibration process involving the exchanged images and a significant number of readers (>20);
- c) to analyse readings and interpret the results of the inter-calibration of European and American eel age reading;
- d) to make recommendations and feedback on the age estimation criteria to increase age estimation precision and accuracy and improve the inter reader agreement;
- e) to incorporate the findings with the report and manual developed by WKAREA 2009 for formal publication; and
- f) to address the generic ToRs adopted for workshops on age calibration (see 'PGCCDBS Guidelines for Workshops on Age Calibration').

The workshop commenced with the analysis of the results of the experienced reader intercalibration exercise that had been carried out several months prior to the meeting. This intercalibration exercise was based on image exchange for both species. The readings had been performed on a web platform device allowing the positioning of

age checks on the pictures and recording the number of checks identified by each reader. A total of 21 readers participated to the exchange. A collection of 117 European eel pictures and 44 American eel otolith pictures were used for the exchange. The overall agreement rate of the readings with the modal age ranged from 66.2% to 13.2%. The results showed that more agreement would have been obtained if the reading rules had been applied more consistently. Some readers discarded some “difficult” otoliths. The absence of metadata such as the location, date of capture and habitat type of the otolith was also identified as a source of misinterpretation of growth patterns. It was recognized for future readings that metadata should be included and that all otoliths would be read, with the addition of a reading confidence parameter. A reference collection composed of 38 *A. Anguilla* and 19 *A. rostrata* known age otolith pictures was set up, with one blind file and one fully annotated file. The manual was updated with more details included for the different preparation protocols. A protocol for age reading and training age reading and routine age reading was proposed, including the use of the reference collection.

The WAKAREA2 made the following recommendations:

Recommendation	For follow up by:
1. Set up new validation projects to obtain known age eels from different locations using direct (mark recapture of marked otoliths)	ICES
2. Provide indirect estimation of age with direct estimation of growth rate (mark recapture of fish)	ICES
3. Investigate alternative methods of age estimation such as otolith chemistry (lead radium decay)	ICES
4. Validate new methods of otolith preparation	Other members
5. the validation projects should be funded at international level	ICES
6. DCF should support/manage the reference collection	WG DIM (group on Data and Information management)

### 3.4 WKBALTEEL - Workshop on Baltic Eel (Chair: Willem Dekker)

The Workshop met in Stockholm, Sweden on 2–4 November 2010 to:

- a) assess the status of the eel stock in the Baltic, to identify available data, to summarize the documentation available in national management plans;
- b) prepare the work of SGIPEE as regards the Baltic by assessing the status of the eel stock in the Baltic region as a whole, following the assessment framework developed by WGEEL/SGIPEE, and to make the required data available to WGEEL/SGIPEE;
- c) assess the anthropogenic impacts on the stock in the Baltic, focusing on international interactions between countries/rivers, and to relate that to the targets/limits of the (national) Eel Management Plans and the (international) EU recovery plan;
- d) consider data requirements for the assessment of the international interactions, and to identify data and knowledge gaps.

Twenty people attended the meeting, from nine countries. Unfortunately, Russia was not represented, but otherwise all countries around the Baltic participated in this Workshop. In the preparatory process for this Workshop, contacts were made and information exchanged with the Kaliningrad State Technical University, Russia.

The objective of this Workshop has been to document and present the information on the eel stock in the Baltic currently available, to standardize stock status assessments (cf. SGIPEE), to initiate a common assessment for the whole Baltic stock, to identify and quantify interactions between management measures taken in different countries, and to suggest future improvements by means of further standardization, cooperation and integration of monitoring and assessment efforts; and identify future data requirements and current knowledge gaps.

The impact of coastal fisheries in the countries around the outlet of the Baltic has been quantified using information from tag-recapture studies; these studies have addressed the national fisheries only. Though impacts on the escaping silver eels from other countries have been documented in long-running tagging programmes, these impacts so far have remained unquantified. To quantify the impact of the outlet-countries on the total Baltic stock, international tagging experiments are required, in which eels are tagged on the east-side and recaptured in the west. Such an experiment cannot be organized by individual countries, neither east nor west. A joint initiative for a pan-Baltic tagging programme is required (high information tracking studies; mass-marking methods for quantification).

The scientific documentation of the stock status and advice on potential management actions will benefit from further integration and coordination in monitoring and research. To this end, field programmes can be (further) integrated, expertise be shared, a central database designed (or a standardized data exchange procedure developed), and a joint assessment of stock status developed. Because the interactions between countries in the Baltic are essentially regional in character, a regional monitoring and assessment procedure will relieve the truly international assessment addressed by SGIPEE and WGEEL.

The first post-evaluation of the Eel Regulation is foreseen in 2012. Individual countries will report on the status of their stock and fisheries, other anthropogenic impacts and protective measures. Standardisation (of the data and/or the reporting) will greatly facilitate the international post-evaluation process. As a pragmatic interim goal for further integration of eel stock management in the Baltic, a full integration of the data collection and analysis by 2012 is recommended. An integrated assessment will set the scene for joint management advice, as a basis for strengthening cooperation between HELCOM States with regard to protection of eel in the Baltic Sea.

The WKBALTEEL made the following recommendations:

- To coordinate, standardize, integrate and jointly organize eel stock monitoring in the Baltic;
- To set up data exchange/storage procedures for data on the Baltic eel stock (recent and historical data);
- To initiate (new) field programmes to quantify the interactions between management areas in the Baltic (marking restocked eels, international silver eel tagging experiments);
- To organize a series of practical workshops on eel data collection and working procedures, to support local programmes, to coordinate and standardize, and to explore post-evaluation methods for local eel stocks;
- To evaluate the status of the stock, the anthropogenic impacts and the effect of protective measures by 2012 on a pan-Baltic level;
- To develop pan-Baltic management advice by 2012.

### 3.5 WGBAST - Working Group on Baltic Salmon and Trout Working Group (Report from Chair: Johan Dannewitz)

The Baltic Salmon and Trout Assessment Working Group (WGBAST) met in Riga, Latvia, 23–30 March 2011. 13 persons from 8 Baltic countries attended the meeting. The group was mandated to assess the status of salmon in Gulf of Bothnia and Main Basin (subdivision 22–31) and Gulf of Finland (subdivision 32), and to propose consequent management advices for fisheries in 2011.

Terms of Reference for 2011 were:

- a) Address generic ToRs for Fish Stock Assessment Working Groups (see table below);
- b) Evaluate the possible reasons for the low at-sea survival of salmon stocks;
- c) Prepare for a benchmark assessment of the salmon stocks in the autumn of 2012;
- d) Consider the SGBALANST 2011 report in relation to improvements of the sea trout assessment and advice.

Fish Stock	Name	Stock Coord.	Assess. Coord. 1	Assess. Coord. 2	Perform assessment	Advice
sal-2431	Salmon in the Main Basin and Gulf of Bothnia (Salmon in Subdivisions 22–31)	Finland	Finland	Finland	Y	Update
sal-32	Salmon in Subdivision 32 (Gulf of Finland)	Finland	Finland	Finland	Y	Update
trt-bal	Sea trout in Subdivisions 22–32 (Baltic Sea)	Poland	Denmark	Sweden	N	No advice

Salmon stocks in subdivision 22–31 were assessed using Bayesian methodology, and a stock projection model was used for evaluation of the impacts of different fishing effort scenarios on the stocks. For salmon in subdivision 32, the assessment of stock status is mainly based on trend analyses of electrofishing data.

The working group report covers catches and reviews data from salmon rivers including stocking statistics. The report also summarizes information affecting the fisheries, the natural survival and the management of salmon. There is a section describing the assessment methodology for Salmon stocks in the Baltic Main Basin and Gulf of Bothnia in detail. Salmon stocks in Gulf of Finland and ongoing work on Baltic sea trout are presented in two additional sections. There is a special section dealing with sampling protocols and data needs.

The results of 2011 working group meeting could be summarised as follows:

- The increasing trend in natural smolt production of salmon populations has levelled off. The current production is around 2.6 million wild smolts, which is about 65–70% of the overall potential smolt production capacity for wild salmon stocks.
- Post-smolt survival has declined during the last 15 years and has remained at very low levels since 2005. The decline in survival has suppressed recovery of wild salmon stocks. The reason behind the decline in natural survival is not clear, but previous analyses indicate that predation from grey seals and recruitment of herring may affect the survival of post-smolts. However, the picture is complex and the observed decline may

well be explained by a combined effect of many different factors of which some are unknown. This year, the by-catch of salmon in the pelagic trawling fishery was analysed in a pilot study. Results indicate that the by-catch of salmon (of different sizes) may be rather large. However, uncontrolled exploitation of salmon in the pelagic trawling fishery is most likely not responsible for the decline in post-smolt survival.

- The driftnet ban in 2008 resulted in a reduction in offshore salmon catches to the lowest level recorded, but subsequent increases in the longline fishery have resulted in a harvest rate that is approaching the combined harvest rate for longlines and driftnets in the mid 2000s.
- The group has assessed the probability of salmon rivers to reach 50% and 75% of the potential smolt production capacity by 2011. The large, northernmost stocks are likely or very likely to reach the 50% objective, but it is uncertain or unlikely that they will reach the 75% objective. Southern stocks and a few small northern stocks have varying and on average much poorer status.
- Information from rivers in Baltic Main Basin and Gulf of Bothnia indicates a dramatic decline in number of spawners in 2010. The weak spawning run may represent a temporary decline due to cold winter conditions, or the beginning of a down going trend due to further declining survival rates at sea and/or higher-than-estimated exploitation rates.
- Salmon stocks in Gulf of Finland show indications of some recovery, but the status of most stocks is still poor.
- The group reviewed the work of the Study Group on Data Requirements and Assessment needs for Baltic Sea Trout (SGBALANST). A strategy for how to improve assessment of sea trout stocks in the Baltic Sea, including initial steps in assessment on a regional level, was provided in the report. The idea is to establish trend-rivers for sea trout, for which a measure of recruitment status will be analysed on an assessment unit level, taking into account variation in habitat quality by using the habitat classification system developed by SGBALANST. In addition, by using available time series of electrofishing data, the trend-rivers will be used to investigate trends in recruitment status.
- The group agreed on a time plan for carrying out model improvements following ICES inter benchmark protocol in 2012. The focus of this work will be to improve assessment of salmon in Southern Main Basin, and to prepare the assessment model for inclusion of new data sets.

The group recommended that TAC for salmon in subdivision 22–31 is set to reduce salmon fishing effort in 2012 relative to the 2010 level. For salmon in Subdivision 32, the group recommended that fishing on wild salmon from Estonian and Russian rivers should be minimized and any increase in total catches from present levels should be prevented. The advice for sea trout was not updated from last year.

### **3.6 SGBALANST - Study Group on Data Requirements and Assessment Needs for Baltic Sea Trout (Report from Chair: Erik Degerman)**

The **Study Group met** by correspondence from January 2010 to March 2011, and during the WGBAST meeting in Riga, Latvia, in March 2011 to:

- a) review habitat classification systems for sea trout used by all countries;

- b) establish a common classification system of habitat quality, using both field and GIS data, to facilitate the use of data from sea trout index rivers on a wider scale;
- c) identify the habitat range of sea trout with respect to depth, water quality and main substrate on the macro-habitat scale, and with respect to stream slope and width, discharge and catchment size on a metahabitat scale;
- d) establish, where possible, habitat quality criteria for water temperature, oxygen, total-phosphorus, nitrogen and pH;
- e) provide a provisional list of rivers to be selected as index rivers in different areas of the Baltic Sea.

### Background

Sea trout (*Salmo trutta*) stocks in the Baltic Sea are only directly targeted by the commercial fishery in a few areas, mainly in the Main Baltic and along the coasts. In the coastal fishery it is caught in salmon traps or as a by-catch in gill net fishing for other species. The catches in the non-commercial fishery is generally not known. WGBAST has focussed on assessment of Baltic salmon (*Salmo salar*) stocks, whereas the work with sea trout has been limited due to lack of data on populations, sea migrations and non-commercial catches. Sea trout generally undertake shorter marine migrations fishing regulations have been handled nationally. However, a drastic decline in the stocks of sea trout in the Bothnian Bay and Bothnian sea was noted by WGBAST. As a result, the WGBAST wanted to know if there was a need for a international assessment of sea trout, and, if so, how this could be carried out.

### Previous work of SGBALANST

To address these questions, the SG started to work in 2007/2008, when the availability of data for an assessment of sea trout (*Salmo trutta*) in the Baltic Sea was investigated. It was found that although hundreds of trout rivers were monitored using electrofishing, data on smolt production and ascending spawners were scarce in trout rivers, i.e. smaller streams and rivers (catchments <1000 km<sup>2</sup>). Complete data on habitat area and quality, parr abundance, smolt production and number of ascending spawners was available only from one small river.

Data on ascending spawners and smolt production were available from a few of the large salmon rivers, as a result of salmon monitoring. However, in these rivers the available habitat for sea trout was unknown and the monitoring of parr was generally only concentrated in the main stem, not the tributaries were sea trout mainly spawn. Accordingly, true assessment of stock status and characteristics (Stock/Recruitment) was not possible.

In 2009, focus was put on recruitment, i.e. electrofishing data, as a mean to study trends in population recruitment (parr abundance) in regions. If regions with a certain fishing pressure showed common trends, this could be a way of estimating the effects of fishing on stocks. To study how stocks moved in the sea, in order to identify assessment units, available data on sea migrations were compiled. It was found that many populations were short migrating (<200 km), but that long-migrating populations existed in all regions (ICES subdivisions). Data on parr densities and environmental status was compiled from 295 rivers, covering all the Baltic sea area except Germany and the Kaliningrad area in Russia.

It was concluded that the status of sea trout populations in the Bothnian Bay, Bothnian Sea and Gulf of Finland was poor, and that by-catches of trout in fisheries aimed



at whitefish or pikeperch may be an important factor. Also, the coastal herring fishery may be a problem in the southern Baltic Sea.

### Habitat criteria for trout parr

The work in 2010/2011 focussed on establishing habitat criteria for trout parr, defining a common habitat description and to suggest how recruitment data can be used for an international stock status evaluation. A common habitat description was needed to facilitate comparison of status of populations as assessment initially will be carried out only by quantifying recruitment of young sea trout in natal streams and rivers by electrofishing. Rivers with different habitat characteristics may have different densities of trout. Further, rivers with low habitat quality, due to physical or chemical reasons, must be identified so that they are not used to evaluate the effects of fishing pressure on stocks. Such an evaluation should be focussed to rivers with good habitat quality, where fishing pressure in the sea may be an important factor for stock status.

In 2010/2011 this comparison of the parr habitat description at electrofishing sites was performed between countries, and it was concluded that comparable data were present in the electrofishing field data, allowing sites to be compared with regard to important habitat features (e.g. wetted width, velocity, average depth, dominating substratum, shade).

To enable comparisons of parr densities among sites, rivers and regions physical habitat criteria for sea trout of parr habitat and spawning areas was established as a part of the work 2010-2011. From this a common sea trout parr habitat classification system (trout habitat score; THS) was constructed.

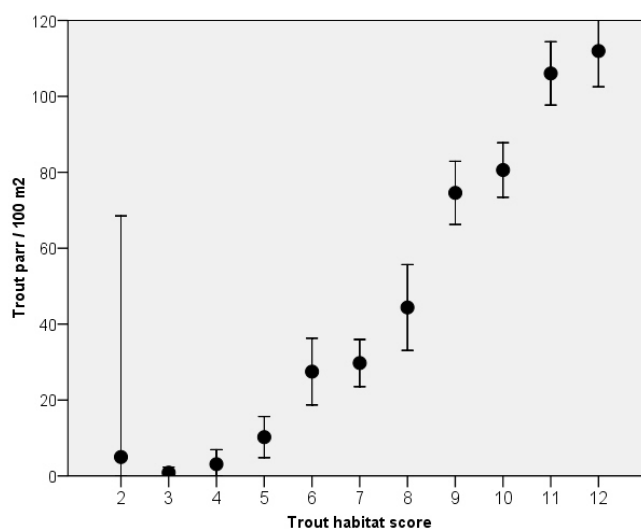


Figure 1. Average abundance of trout parr ( $\pm 95\%$  confidence interval) for each trout habitat score (THS) class (n=3213 fishing occasions from southern Sweden).

The SG also compiled a review of trout parr requirements regarding temperature, sediment deposition and chemical constituents of the water, further enabling identification of rivers where the freshwater habitat may negatively influence the recruitment.

THS has been tested on Swedish and Danish data and was well correlated with trout parr densities (Figure 1). Thus, expected parr densities for a site/river may be pre-

dicted from habitat characteristics. Similarly, low densities in a good habitat may be detected, indicating an insufficient spawning population.

### **3.7 WGNAS - Working Group on North Atlantic Salmon (Chair: Gerald Chaput)**

The Working Group met in Copenhagen in March 2011 to address the following questions posed by NASCO and OSPAR to ICES:

#### **a ) With respect to Atlantic salmon in the North Atlantic area:**

- provide an overview of salmon catches and landings, including unreported catches by country and catch and release, and production of farmed and ranched Atlantic salmon in 2009;
- report on significant new or emerging threats to, or opportunities for, salmon conservation and management;
- continue the work already initiated to investigate associations between changes in biological characteristics of all life stages of Atlantic salmon, environmental changes and variations in marine survival with a view to identifying predictors of abundance ;
- describe how catch and release mortality and unreported catch are incorporated in national and international stock assessments and indicate how they can best be incorporated in future advice to NASCO;
- further develop approaches to forecast pre-fishery abundance for North American and European stocks with measures of uncertainty;
- provide a compilation of tag releases by country in 2009 and advise on progress with analysing historical tag recovery data from oceanic areas;
- identify relevant data deficiencies, monitoring needs and research requirements.

#### **b ) With respect to Atlantic salmon in the Commission areas:**

- describe the key events of the 2009 fisheries;
- Review, update and/or report on the development of age-specific stock conservation limits;
- describe the status of the stocks and provide annual catch options or alternative management advice for 2011–2013, with an assessment of risks relative to the objective of exceeding stock conservation limits and advise on the implications of these options for stock rebuilding;
- further investigate opportunities to develop a framework of indicators or alternative methods that could be used to identify any significant change in previously provided multi-annual management advice;
- provide clarification of the levels of reported and unreported catch in the subsistence fishery at West Greenland since 2002.

#### **c ) Effects of mariculture on populations of wild fish (OSPAR request 2010/3):**

- To provide advice on the current state of knowledge on the interaction of finfish mariculture on the condition and wild fish populations (both salmonid and non-salmonid) both at a local and regional scale,

including from parasites, escaped fish and the use of fish feed in mariculture.

Some of the key conclusions of the WG were as follows:

- The provisional total nominal catch of salmon in all areas of the North Atlantic for 2010 was 1589 tonnes, 21% greater than in 2009 (1313 t), but still 10% and 28% below the averages of the last five years (1753 t) and 10 years (2201 t) respectively.
- The increase in returns and catches was particularly marked in parts of UK and France, and there was a substantial increase in the catch in the some fisheries. Nevertheless, salmon stocks are still considered to be in a depleted state throughout much of the North Atlantic, with more southerly stocks in both North America and Europe generally being more severely affected.
- The West Greenland fishery is currently subject to a multi-annual regulation for 2009–2011 and so no update to the catch advice for West Greenland was requested. The reported catch has been increasing progressively since 2002, and the 2010 catch of 40 t represents a 53% increase on 2009. It is not clear how much the increases have been due to improved reporting.
- There has been no fishery at Faroes since 2000. WGNAS reported that their ability to develop a risk-based framework for provision of catch advice was constrained principally by the availability of data on the likely origin of any catch at Faroes. This means that the risk framework may initially have to be applied on large groups of stocks (e.g. Northern and Southern NEAC stock complexes), and additional management objectives will be needed to safeguard individual river stocks in different countries/regions.
- WGNAS is not asked to provide advice on NEAC homewater fisheries, but the report notes that the precautionary approach is to fish only on salmon from rivers where stocks have been shown to be at full reproductive capacity. WGNAS therefore reiterated its concerns about mixed stock fisheries and noted that such fisheries (mainly coastal and distant water fisheries) pose particular difficulties for management, as they cannot target only river stocks that are at full reproductive capacity.

### **3.8 SGSSAFE - Study Group on Salmon Stock Assessment and Forecasting (Chair: Gerald Chaput)**

The Study Group met in Moncton, Canada from 1 to 4 March 2011 to address the following ToRs:

- a) Update and further develop stock and/or catch forecast models for salmon stocks in the NASCO North American and North East Atlantic Commission areas;
- b) Explore the possibility of incorporating physical and biological variables into the models that may explain variation in salmon survival;
- c) Evaluate options for developing forecast models which include all sea-age classes;
- d) Evaluate methods for incorporating uncertainty in the assessments;

- e) Develop risk analyses for the provision of salmon catch advice.

This was the second meeting of the Study Group, which was convened to support WGNAS through the development of common Pre Fishery Abundance forecast models for both NAC and NEAC salmon stocks. Progress of the Study Group relative to the terms of reference are described.

***a) Update and further develop stock and/or catch forecast models for salmon stocks in the NASCO North American and North East Atlantic Commission areas***

The model for NAC originally developed during the first Study Group meeting of 2009 was refined to account for covariance in the productivity parameters among the regions. Pre-Fishery Abundance (PFA) of 1SW non-maturing salmon is modelled for each region proportionally to lagged spawners using a first order autocorrelated function. The inter-regional variance in the productivity parameter was modelled as a multinormal distribution which ascribes correlation in productivity between regions among years. The justification for using the inter-region covariance matrix for the productivity parameter is that the fish share a common marine environment during part of their life cycle but there can be regional specificities in the evolution of the freshwater and or the marine coastal environment and subsequent variation in productivities.

The revised NEAC model developed by the Study Group is a combined sea age group model with uncertainty in the returns and lagged eggs structured in a hierarchical Bayesian framework. The differences from the 2009 model structure include: a single productivity parameter is estimated for the lagged eggs to PFA association and the proportion maturing is uncoupled from the productivity parameter estimation. The productivity parameter remains a first order autocorrelated function and in addition the proportion maturing is modelled as a first order autocorrelated function. The revised model was applied to develop catch advice for the NEAC south and NEAC north stock complexes by WGNAS at its meeting in March 2011.

***b) Evaluate options for developing forecast models which include all sea-age classes***

The combined sea-age class models have been developed for the NEAC stocks but not for the NAC stock. At present, the spawning stock variable for NEAC is lagged eggs from both sea-age groups and both maturing and non-maturing recruitments are modelled simultaneously with a common productivity parameter. For NAC, only 2SW spawners are used and the Working Group has only considered the recruitment of the non-maturing 1SW salmon which is the sea-age group exploited at West Greenland; the maturing 1SW salmon are not exploited in that fishery.

Some points of discussion were raised regarding the assumptions on heritability of age at maturity in the two differing assumptions for NAC and NEAC. For the NEAC model, the assumption is that an egg is an egg regardless of its sea-age origin. However, there is an interest in conserving the sea-age structure of the spawning stock which is why the conservation limits are defined by sea-age group. A preliminary examination of this assumption could be done by comparing the variation in the proportion maturing parameter with the corresponding proportions of the lagged eggs contributed by one of the sea-age groups of the spawners. For the NAC model, the assumption is that there is perfect heritability in that 2SW salmon spawners are the only contributor to 1SW non-maturing salmon and that no other sea-age groups (including 3SW and repeat spawning MSW salmon) produce recruitment of 1SW non-maturing salmon. The Study Group did not have time to consider a combined sea-

age group model for NAC but the model structure similar to that developed for NEAC could be considered.

*c) Evaluate methods for incorporating uncertainty in the assessments*

From the very first Study Group meeting, the development of inference and forecast models in a hierarchical Bayesian framework was considered the most appropriate approach to use. Both the NAC and NEAC models incorporate the uncertainty in the input data (or pseudo-observations) to the models. Further developments which would consider physical or biological variables to characterize the functional relationship between spawners and recruitment must also consider how to incorporate the uncertainty in those variables and in the forecasts.

*d) Develop risk analyses for the provision of salmon catch advice*

The development of the catch advice in a risk analysis framework within the Bayesian structure is complete for the NAC model. A similar approach for NEAC was proposed by the Working Group in 2010, further developed at the Study Group and is being completed by the Working Group (see Section 3.10).

*e) Explore the possibility of incorporating physical and biological variables into the models that may explain variation in salmon survival*

A very good scientific literature review of biotic and abiotic factors associated with biological characteristics and survival of Atlantic salmon is available in the SGBICEPS report (ICES 2010c). The factors vary between NAC and NEAC and even within areas of NEAC. Progress on this term of reference would require the development of models at scales below the stock complex level. No specific work (exploration of forecast models and environmental variables) on this term of reference was done during the Study Group.

**Next steps**

The models developed by the Study Group have been presented to the Working Group and are being used to develop catch advice for both NAC and NEAC. The Study Group tasks are considered complete and no further meetings are planned.

### **3.9 WKSTAR - Workshop on Salmon Tagging Archive (Chair: Lars Petter Hansen)**

The ToRs of this Workshop were to:

- a) Complete the compilation and checking of the historical salmon tag recovery information from distant waters collated by WKDUHSTI, WKSHINI and WKLUSTRE for archiving in the ICES Data Centre;
- b) Develop an appropriate database structure to facilitate the storage of archival tag recovery data which is consistent with ICES Data Centre requirements;
- c) Complete the preparation of a draft report (for potential submission as a Cooperative Research Report, to document and describe the historic data sets).

The work of this Workshop was delayed pending the completion of analysis and preparation of papers on salmon tag recoveries at Greenland and in the Norwegian Sea for the NASCO/ICES Salmon Summit in October 2011. The report will now be drafted in 2012 prior to a CRR publication request being submitted in September 2012.

### **3.10 SGERAAS - Study Group on Effectiveness of Recovery Actions for Atlantic Salmon (Co-chairs: Tim Sheehan and Jamie Gibson)**

The ToRs of this Study Group were to:

- a) Develop a classification system for recovery / re-building programs for Atlantic salmon, including threats to populations, population status, life history attributes, actions taken to re-build populations, program goals, and metrics for evaluating the success of re-building programs;
- b) Populate the system by collecting data on recovery / re-building programs for Atlantic salmon populations from around the North Atlantic;
- c) Summarize the resulting data set to determine the conditions under which various re-building actions are successful and when they are not;
- d) Provide recommendations on appropriate recovery / rebuilding actions for Atlantic salmon given threats to populations, status and life history.

The chairs have been unable to convene a meeting of this Study Group in 2010/2011 and do not expect to be able to do so in the near future. It is therefore proposed that this group should be disbanded for the time being, and the question from NASCO that the group was to address will be picked up by WGNAS as far as possible.

### **3.11 WKADS Workshop on Age Determination of Salmon (Chair: Jonathan White)**

The Workshop on Age Determination of Salmon (WKADS) met in Galway, Ireland (from 18 to 20 January 2011) with the following ToRs:

- a) **Aging techniques:**
  - i) Digital Scale reading
    - 1. Review application and standard operating procedures
    - 2. Review of use of circuli & spacings to establish growth patterns in salmon from different origins (i.e. case histories or examples of analyses?)
    - 3. Review evidence of using other features in reading scales and differentiating real spawning marks from other erosion marks
    - 4. Detail advantages and disadvantages
    - 5. Make recommendations for investigations and applications
  - ii) Strontium-calcium relationship in otoliths
    - 1. Review of methods and the use of Strontium-calcium relationship in otoliths
    - 2. Assess its application in determining smolt age and migration timing (i.e. case histories or examples of analyses?)
    - 3. Detail advantages and disadvantages
    - 4. Make recommendations for investigations and applications
  - iii) Thin slice from salmon pelvic fin ray
    - 1. Review of methods, applications and potential applications (i.e. case histories or examples of analyses)
    - 2. Detail advantages and disadvantages
    - 3. Make recommendations for investigations and applications
- b) **Ageing applications: Life cycle timings and growth rates:**
  - i) Review progress on the IBSFC salmon life cycle description.
  - ii) Review available evidence from ageing techniques, of any recent changes in life cycle timings, assess if such can be determined through techniques

a. to c. and make recommendations to this end, and if possible summaries such changes.

Specific to:

1. Smolt age,
  2. Sea age,
  3. Late running grilse.
- c) Address the generic ToRs adopted for workshops on age calibration (see 'PGCCDBS Guidelines for Workshops on Age Calibration')

The overall objectives of the Workshop was to review, assess, document and make recommendations on current methods of ageing Atlantic salmon. The Workshop primarily focused on digital scale reading to measure age and growth, with a view to standardisation.

Recommendations from the Workshop included standardising digital scale reading, compilation of a digital image reference collection, detailing of characteristics and reference points, itemising scale marks and issues in their separation. Approaches to future sample and data collection to address questions of changing life histories and proposals for future data analyses were also made.

The Workshop began with presentations detailing reasons for scale reading and the procedures used by different laboratories, a theoretical review and practical demonstrations. Notable variations were found in the approaches taken by different laboratories. The most prevalent issues were presented and discussed in working sessions to reach consensus on how they should be addressed and the necessary steps to provide further information about them.

The previous report “No. 188 Atlantic Salmon Scale Reading Guidelines” (ICES 1992) was confirmed as the primary reference point for practitioners. As such its definitions are still appropriate and so were adopted, though technology has moved forward enabling greater detailing in measurements and image storage. Groups in the working sessions detailed:

- The procedure of digital scale reading being adopted by the Celtic Sea Trout Project (Poole 2010) was considered appropriate for reading salmon scales and should be adopted.
- A digital image reference collection was compiled to include recognised scale features and age groups.
- Scale spawning marks and erosion marks, commonly acknowledged as being difficult to recognise were detailed.
- Scales from farm escapees and wild salmon were noted as being more complex to distinguish than in the past. The other common distinguishing marks were listed and should include morphology.
- Important reference points on scales were listed for accurate calculation of growth periods with digital apparatus.
- Approaches to data analyses being used on the more detailed data sets being collated from digital scale reading were presented and discussed.
- Approaches for determining changes in growth and life histories from scales were discussed and recommendations were made for the necessary data collection.
- In Northern Europe (Finland and Norway) collecting scale samples from an alternative position below the adipose fin was found to provide more

information; this location is further back on the fish than recommended in the earlier scale reading guidelines (ICES 1992). A recommendation for future collection from this alternative position requires further consideration, owing to the long history of using the 'recognised' sampling location. Switching could undermine the continuity of the time series.

#### **4 Proposals for New SCICOM Expert Groups**

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WG RECORDS discussed the proposed Terms of References and meeting arrangements for existing and new EGs.

The WG noted that the following EGs were being disbanded:

- the Study Group on Data Requirements and Assessment Needs for Baltic Sea Trout [SGBALANST] has completed its work;
- the Study Group on International Post-evaluation on Eels [SGIPEE] has completed its meetings; the work will be taken forward in WGEEL;
- the Study Group on Salmon Stock Assessment and Forecasting [SGSSAFE] has also completed its meetings, although the final report is yet to be submitted;
- the Workshop on Age Reading of European and American Eel [WKAREA-2] has completed its work;
- the Study Group on Effectiveness of Recovery Actions for Atlantic Salmon [SGERAAS]; there was felt to be continuing interest in this topic in both the Baltic and Atlantic, but in the absence of anyone to take on the chair it was agreed that it should be disbanded; it was proposed that until such time as the SG could be reconvened people were urged to report relevant work to WGNAS so that this could be compiled under the NASCO request for reports on significant new or emerging threats to, or opportunities for, salmon conservation and management.

The WG supported the continuation of the following EGs and noted a continuing interest in their work:

- the Workshop on Age Determination in salmon [WKADS] will hold its second meeting in 2012 [this WK falls under PGCCDBS] (see Annex 3 for new ToRs);
- the Workshop on Baltic Eel [WKBALTEEL], which had been established by ACOM in 2010, is planning to meet three or four more times;
- the Workshop on [WKSTAR] will meet in June 2012 to draft a Cooperative Research Report with the aim of submitting a formal request for this to be published in September.

The meeting also discussed the need for a new Workshop to address the requirements for collecting data on salmon and eel under the EU Data Collection Framework. Changes to the EU Data Collection Framework in 2007 introduced requirements to undertake monitoring and collect data on eel and salmon. However, the specific data requested for eel are not well aligned with what is needed for national and regional assessments of eel under the EU Eel Regulation and to report progress under Eel Management Plans. Nor are the requirements for salmon entirely appropriate to support national and international assessments and the provision of advice to NASCO and the EU. The DCF is due to be reviewed in 2013, and this Workshop will recommend data collection for salmon and eel that should be taken into



account in that review. The proposed ToR for the Workshop on Eel and Salmon DCF Data [WKESDCF] are shown in Annex 3.

## 5 Theme Sessions 2012 and 2013

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Prior to the annual meeting, WGRECORDS had coordinated the preparation of the following Theme Session proposal for the 2012 Annual Science Conference (see also Annex 4):

**Title: How does renewable energy production affect fish, seabirds and marine mammals?**

**Conveners: Erwin Winter (Netherlands) and Alistair Maltby (UK)**

The annual meeting discussed possible topics for Theme Sessions in 2013, and the following ideas were proposed:

- Implication of climate change for diadromous and migratory species over broad geographic scales;
- Parasites and diseases in a changing environment;
- Drug resistance in fish parasites and diseases;
- Changes in distribution of fish on response to climate change;
- Long term planning to respond to effects of climate change on diadromous fish stocks.

Further discussion on these will be conducted by correspondence during the coming year.

## 6 Proposals for Symposia

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WGRECORDS noted the forthcoming NASCO/ICES Symposium “Salmon at Sea: Scientific advances and their implications for management”, which would provide a forum for disseminating findings from the SALSEA programme and other recent investigations. The symposium will take place from 11 to 13 October 2011 in La Rochelle, France; and would include some invited keynote speakers, including representatives from the Pacific. Selected papers will be published in the ICES Journal of Marine Science.

## 7 Future of WGRECORDS

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### 7.1 Future co-ordination of science on diadromous species

The meeting discussed the continuing role of WGRECORDS. It was agreed that the WG provided a very useful forum for the discussing and sharing information on the problems facing different diadromous species (particularly salmon and eel) in different areas (particularly North Atlantic and Baltic). These species face a number of problems in common, but without this co-ordination it would be much more difficult to raise their profile in ICES. Similarly the WG provides the opportunity to co-ordinate and plan future work, often allowing a more efficient approach to be taken (e.g. the organisation of the workshop on data requirements for both salmon and eel under the DCF). It is also one of the few groups in ICES giving significant attention to issues in freshwater. It was felt that, without the WG, there would be little opportunity for these interactions within the current structures and processes of ICES. There was therefore strong support for the continuation of the WG. The WG proposed that

the ToR of WGRECORDS should be rolled over unchanged and should apply to the years 2012 to 2014 (see Annex 5).

The Chair advised the group that he had had further informal discussions with the project leaders of three EU-INTERREG programmes relating to diadromous species (the Celtic Sea Trout Project, the Living North Sea Project and the Atlantic Aquatic Resource Conservation Project). There was continuing interest in these groups to work through ICES to promote issues affecting diadromous species, and particularly in species such as sea trout. It was hoped that a Theme Session on the impacts renewable energy would generate contributions from some of the groups involved in these projects.

## **7.2 Participation in SSGEF session during the ASC**

The Chair reminded members of the WG that they might wish to attend the forthcoming meeting of SSGEF to highlight the work of the EGs on diadromous species. The WG had previously agreed that while the chair would represent the overall programme of work on diadromous species within SSGEF, the chairs and members of EGs were encouraged to attend the meetings to present information on their particular areas of work. There was no requirement for any members of the WG to make a presentation at the SSGEF, but the chair of SSGEF was expected to present highlights from the work of the EGs.

## **7.3 Nomination of new Chair**

It was proposed that for the future, it might be helpful to have co-chairs for the WG who could address salmon and eel or Baltic and Atlantic issues. Niall O'Maoileidigh, Ireland and Atso Romakkaniemi, Finland offered to take of the chairmanship of the WG for the period 2012 to 2014, and they were unanimously nominated by the Working Group. Russell Poole, Ireland and Johan Dannewitz, Sweden provisionally offered to take on the chair for the following three years, 2015 to 2017.

## **8 Any other business and Close**

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No issues were raised under AOB. The Chair thanked the WG members for their active participation and support during the meeting and wished them, and the new Co-chairs, good fortune with the continued work of the group in the future.

## Annex 1: List of participants

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### Meeting held on 6 June 2011<sup>1</sup>

### Meeting held on 20 September 2011<sup>2</sup>

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## **Annex 2: Agenda**

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- 1 ) Welcome and introductions**
- 2 ) Adoption of Agenda and Appointment of Rapporteur**
- 3 ) Review of Expert Groups on diadromous species**
  - 3.1 ) WGEEL - Joint EIFAC/ICES Working Group on Eel (Chair: Russell Poole)
  - 3.2 ) SGIPEE - Study Group on International Post-evaluation on Eels (Chair: Laurent Beaulaton, France)
  - 3.3 ) WKAREA-2 - Workshop on Age Reading of European and American Eel (Chair: Françoise Daverat)
  - 3.4 ) SGBALTEEL – Study group on Baltic Eel (Chair: Willem Dekker)
  - 3.5 ) WGBAST - Working Group on Baltic Salmon and Trout Working Group (Chair: Johan Dannewitz)
  - 3.6 ) SGBALANST - Study Group on Data Requirements and Assessment Needs for Baltic Sea Trout (Chair: Erik Degerman)
  - 3.7 ) WGNAS - Working Group on North Atlantic Salmon (Chair: Gerald Chaput)
  - 3.8 ) SGSSAFE - Study Group on Salmon Stock Assessment and Forecasting (Chair: Gerald Chaput)
  - 3.9 ) WKSTAR - Workshop on Salmon Tagging Archive (Chair: Lars Petter Hansen)
  - 3.10 ) SGERAAS - Study Group on Effectiveness of Recovery Actions for Atlantic Salmon (Co-chairs: Tim Sheehan and Jamie Gibson)
  - 3.11 ) WKADS - Workshop on Age Determination of Salmon (Chair: Jonathan White)
- 4 ) Proposals for New SCICOM Expert Groups**
- 5 ) Theme Sessions 2012 & 2013**
- 6 ) Proposals for Symposia**
- 7 ) Future of WGRECORDS**
  - 7.1 ) Future co-ordination of science on diadromous species.
  - 7.2 ) Participation in SSGEF session during the ASC (Details to be announced).
  - 7.3 ) Nomination of new Chair.
- 8 ) Any other business**

Close

### Annex 3: Proposals for new Expert Group (Category 2 Resolutions)

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#### Proposals submitted to PGCCDBS

The **Workshop on Age Determination of Salmon** (WKADS-2) (Chair: Jonathan White) will meet in ICES HQ Copenhagen from TBA to TBA June 2012 (location and date TBC) to:

- a) Investigate possible effects on age reading of scale deformation owing to scale and acetate slide rolling through jewellers rollers.
- b) Investigate potential differences in circuli number and spacings on scales taken from the 1984 recommended scale collection location against the highlighted improved scale collection location below the adipose fin.
- c) Identify sources of age determination error in terms of bias and precision: i.e. analyse different validation techniques and describe the corresponding interpretational differences between readers and laboratories, and agree on a common ageing criteria;
- d) Establish a database of digitised images of agreed-age scales with annotation corresponding to the agreed age structures in WebGR
- e) Establish a protocol for Inter-lab calibration/ quality control including informal 'open checking and comparison' and a formal policy of sample exchange and checking.
- f) Re-examine the relationships given in the ICES report No 188 (Anon, 1984) concerning back calculated lengths.
- g) Review and consider the process of salmon scale reading.
- h) Review data collection with a view to formalising data analyses to address questions raised on changes in salmon life styles.
- i) Address the generic ToRs adopted for workshops on age calibration (see ['PGCCDBS Guidelines for Workshops on Age Calibration'](#)).

WKADS will report by [DATE TBA] to the attention of the PGCCDBS, WG RECORDS, WGNAS, WGBAST, SSGEF and SCICOM.

#### Supporting Information

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Scientific justification and relation to action plan:	Digital salmon scale reading can provide detailed information on seasonal growth and life histories which is of vital importance in the assessment and management of salmon stocks. Initial work on the standardisation of measurements and recording across labs was undertaken by WKADS in 2011, but further work is required on a number of key questions, including the preferred scale sampling location on the fish, differences in their circuli numbers and spacing and their possible deformation during preparation. Progress on method standardisation has been made by adoption of the methods used for sea trout scale reading, with some adaptations. This needs to be further developed to establish a standard process, while agreed informal inter-lab quality control needs to be developed to ensure comparability of data sets, to broaden the existing skill base and ensure continuity. Furthermore there have been perceived changes in growth rates and life strategies of salmon over the past 20 years. These should be examined and may lead to the need to update the standard back calculated length relationships given in the ICES report No 188 (Anon, 1984).
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Resource requirements:	None.
Participants:	The Group is normally attended by some 20–25 members and guests.
Secretariat facilities:	None.
Financial:	
Linkages to advisory committees:	Direct linkages to ACOM in terms of provision of advice and accurate stock assessment.
Linkages to other committees or groups:	There are linkages with WGBAST and WGNAS in relation to the use of age data in salmon stock assessments and with SCICOM and WGRECORDS in relation to improving scientific understanding of salmon and co-ordinating science on diadromous species. Linkage to PGCCDBS.
Linkages to other organizations:	Links to ongoing initiatives within NASCO, particularly in relation to marine survival investigations.

**A Workshop on Eel and Salmon DCF Data [WKESDCF]** (Co-chairs: Ted Potter (UK) and Alan Walker (UK)) will be established, and will conduct preliminary work by correspondence and meet in Copenhagen on 3–6 July 2012 to:

- 1a. Conduct preparatory work to develop a standard protocol for eel stock assessment, specify indicators for international stock assessment and recovery of the stock.
- 1b. Determine the data requirements to support national and international assessments of eel stock, related to the EU Eel Regulation to support stock recovery and sustainable management of eel.
- 1c. Describe the options available for national and regional eel monitoring and survey programmes required to meet the data requirements for eel outlined in 1a.
- 1d. Propose a mechanism for data exchanges, quality assurance and availability for eel stock assessment
- 2a. Determine the data requirements to support national and international assessments of salmon required to undertake stock assessments and provide catch advice for NASCO and the EU to support sustainable management of salmon stocks.
- 2b. Describe the national monitoring and survey programmes required to meet these data requirements for salmon.
3. Consider options for integrating salmon and eel surveys and monitoring.

WKESDCF will submit its report by 1 August 2012 for the attention of ACOM, PGCCDBS and WGEEL, WGNAS and WGRECORDS.

### Supporting information

Priority	Changes to the EU Data Collection Framework in 2007 introduced requirements to undertake monitoring and collect data on eel and salmon. However, the specific data requested for eel are not well aligned with what is needed for national and regional assessments of eel under the EU Eel Regulation and to report progress under Eel Management Plans. Nor are the requirements for salmon entirely appropriate to support national and international assessments and the provision of advice to NASCO and the EU. The DCF is due to be reviewed in 2013, and this Workshop will
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	recommend data collection for salmon and eel that should be taken into account in that review. The meeting has been agreed in principle by the European Commission.
Scientific justification	It is important that fishery management decisions are based upon the best scientific assessments that can be achieved based on practical monitoring programmes. There is therefore a need to define clearly the nature of the assessments that will be undertaken and to plan the data collection and monitoring programmes to support these as far as possible.
Resource requirements	Provision of 2 meeting rooms at ICES Headquarters
Participants	National representatives on salmon and eel from EU Member States Representative from the European Commission is dealing with the current and future DCF are welcome to attend the workshop.
Secretariat facilities	Secretarial support for organisation of the meeting.
Financial	None
Linkages to advisory committees	The Workshop will have direct significance to PGCCDBS and ACOM in support of advice via WGEEL to EU and via WGNAS to NASCO.
Linkages to other committees or groups	SSGEF, WGEEL, WGNAS, WGRECORDS
Linkages to other organizations	NASCO, EU

## Annex 4: Proposed Theme Session for the 2012 ASC

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The Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS) and the EU InterReg Living North Sea Programme propose a Theme Session for the 2012 Annual Science Conference:

**Title: How does renewable energy production affect fish, seabirds and marine mammals?**

**Conveners:** Erwin Winter (Netherlands) and Alistair Maltby (UK)

**Description:**

Globally, there is an increasing interest in the use of renewable energy technologies to generate electricity due to concerns over climate change. It is widely recognized that a shift in energy production from fossil fuels to alternative energy sources is needed (e.g. EU directive on the promotion of the use of energy from **renewable** sources). The principal renewable energy technologies in aquatic environments have traditionally been hydropower in rivers and tidal turbines in estuaries, and there has been renewed interest in developing such schemes. In addition, the marine environment is increasingly being used for renewable power generation: e.g. offshore wind farms, tidal stream generators and wave power. All these technologies will affect aquatic ecosystems during their construction, operational and decommissioning stages. These effects can range from severe negative impacts (e.g. on species such as Atlantic salmon or European eel that have to pass hydropower or tidal turbine sites that cause high mortality rates), to potentially positive effects (e.g. the creation of foundations for offshore wind turbines that may serve as artificial reefs). There have been many studies of the effects of hydropower on diadromous fish species, but there are particular concerns about new technologies and the cumulative effects of multiple low-head schemes. In addition, many of the effects on fish, seabirds and marine mammals (e.g. extra mortality, altered habitats and behavioural responses) remain poorly understood for most species. Yet there is a growing demand from governments to assess ecological risks in planning and carrying out new renewable energy schemes.

Across fish (marine and diadromous), seabird and marine mammal species, papers are welcome on the following topics:

- Ecological risk assessments of offshore wind, tidal, wave and hydro-power generation facilities,
- Behavioural responses to the building or operation of structures associated with these renewable energy technologies
- Population effects of renewable energy schemes,
- Cumulative effects of multiple renewable energy schemes
- Mitigation measures of adverse effects of renewable energy technologies in marine, estuarine or riverine habitats.

### Supporting information

Priority:	High
Scientific justification:	This is a high profile issues where there is potential conflict between national and international policies to enhance renewable energy generation and requirements to protect ecosystems and biodiversity.



Participants:	It is expected that responses to a call for contributions will reflect the wide interest and active research current in this subject area.
Linkages to other committees or groups:	SSGEF, SSGHIE, SSGSUE, WGNAS, WGEEL, WGBAST
Linkages to other organizations:	EU INTERREG Living North Sea, NASCO

## Annex 5: Proposed ToR for WGRECORDS for 2012–2014

**2011/2/SSGEF11**      The Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species (WGRECORDS), chaired by Niall O'Maoileidigh\*, Ireland, and Atso Romakkaniemi\*, Finland, will meet by correspondence and annually at the ICES ASCs in September 2012, 2013 and 2014 to:

- 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;
- 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;
- c) Assist SSGEF to integrate these activities with those of other Expert Groups reporting to SSGEF.

WGRECORDS will report annually by 31 December (via SSGEF) for the attention of SCICOM.

### Supporting Information

Priority	The Working Group will provide the mechanism to coordinate scientific activities relating to diadromous fish species in support of the ICES Science Plan. It will also permit ICES to respond fully to request from NASCO and the EU for scientific advice on research needs and data deficiencies in these areas.
Scientific Justification:	There are many topics within the new ICES Science Plan that are very relevant to the research on diadromous fish species currently being undertaken or planned. However, there is a need to be able to draw the various elements of this 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.
Resource Requirements	Meeting facilities at the ASC in 2012–2014
Participants	National representatives and other invited experts working on diadromous fisheries
Secretariat Facilities	Secretarial support for organisation of the meeting and preparation of the report.
Financial	None
Linkages to Advisory Committees	The proposal originates from SSGEF but will have direct significance to ACOM.
Linkages to other Commit- tees or Groups	There are linkages with SCICOM and all Expert Groups working on issues relating to diadromous species in relation to improving scientific understanding of salmon and coordinating scientific activities.
Linkages to other Organisa- tions	NASCO

## Annex 6: Recommendations

RECOMMENDATION	FOR FOLLOW UP BY:
1. Organise meeting facilities for a full day meeting of WGRECORDS during (not preceding) each of the 2012, 2013 and 2014 ASCs.	ICES Secretariat in consultation with Chairs
2. Review the ideas presented for Theme Sessions (Sec 5) with a view to submitting one or more proposals for the 2013 ASC in Sept 2012.	Chairs/prior to 2012 meeting
3. Finalise ToR for an Expert Group to provide advice on changes to the EU Data Collection Framework that would better meet the requirements for international stock assessments.	Chair/ Russell Poole