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Presentation to the Council by the Chair of the ICES Working Group on North Atlantic Salmon



REPORT OF ICES ADVISORY COMMITTEE ON NORTH ATLANTIC SALMON STOCKS TO NORTH ATLANTIC SALMON **CONSERVATION ORGANIZATION**

June 1 to 4, 2010

CNL(10)8



Advice generated by ICES in response to terms of reference from NASCO

With respect to salmon in the North Atlantic:

- 1. overview of salmon catches and landings
- 2. describe how catch and release mortality and unreported catch are incorporated in stock assessments
- 3. report on significant new or emerging threats to, or opportunities for, salmon conservation and management
- 4. investigate associations between changes in biological characteristics of Atlantic salmon, environmental changes and variations in marine survival



Advice generated by ICES in response to terms of reference from NASCO

With respect to salmon in the North Atlantic:

- 5. further develop approaches to forecast pre-fishery abundance
- provide a compilation of tag releases and advise on progress with analysing historical tag recovery data from oceanic areas
- 7. identify relevant data deficiencies, monitoring needs and research requirements



Overview of salmon catches and landings

Nominal catch in 2009 in the North Atlantic = 1300 t

- lowest of the time series
 - lowest of time series for NEAC (north and south)
 - 2nd lowest (after 2007) for NAC





Partitioning of nominal catch into areas fished

- Majority of nominal catch in 2009 was taken in rivers
- Higher proportion of catches from coastal areas in NEAC compared to NAC





Partitioning of nominal catch into areas fished

North American Commission

• Total catch relatively constant, majority in river fisheries

Northern North-East Atlantic Commission

• Approx. 50:50 river and coastal but increasing in rivers

Southern North-East Atlantic Commission

• Large declines in catches from coastal fisheries, majority of catch since 2007 taken in rivers





Catch and release fishing

- Not included in nominal catch
- Occur in river rod fisheries
- Increasing number of countries are reporting (10 in 2008, 9 in 2009)
- Practice is increasing in popularity
 - 143 000 released fish in 2009
 - 214 000 released fish in 2008









Catch and release fishing



- Percentage of rod catch released varies by country
 - ~ 0% in Finland to 100% in USA (1995 to 2008)
- There is mortality associated with catch and release fishing
 - in 2009, ICES reported to NASCO on effects of C&R fishing on salmon survival
 - survival decreases at water temperatures above 18°C





Unreported Catches

- 327 t in 2009 (incomplete, no reports from Canada, St. P&M, Russia, Spain)
 - 317 t from NEAC (decreasing annually)
 - 10 t from West Greenland (same value as previous years)
 - No NAC estimate (value in 2006 was 56 t)

Unreported catch has been 23% to 34% of nominal catch, over the period 1987 to 2006





Farming and Sea Ranching





Farmed production in 2009

- North Atlantic = 1 076 kt
 - 80% from Norway
 - 12% from UK(Scotland)
- Worldwide = 1 385 kt
 - above 1 million t since 2002
 - > 1000 times the nominal catch in 2009

Sea ranching in 2009 = 43 t

• 42 t from Iceland as ranching to rod fisheries





Describe how catch and release mortality and unreported catch are incorporated in stock assessments and how to be best incorporated in future advice

Catch and Release Mortality (Table 2.6.1)

• ICES (2009) previously reviewed information on the levels of prespawning mortality of salmon and the implications for stock assessments

• In most areas of <u>NAC</u>, mortality from catch and release is incorporated in the river-specific and regional assessments of spawning escapements and returns.

- Catch and release statistics in some areas are minimal values as they are not required to be reported.
- Improvements in future: more complete reporting, studies to further understand the impacts of C&R on mortality, behaviour, spawning success



<u>Describe how catch and release mortality</u> and unreported catch <u>are incorporated in stock assessments and how to</u> <u>be best incorporated in future advice</u>

Catch and Release Mortality (Table 2.6.1)

- In many countries in <u>NEAC</u>, C&R statistics are not available
- Even when available, no corrections for C&R mortality have been applied (except UK(E&W) for national compliance monitoring)

• Improvements in future:

- Consideration should be made for incorporating mortality associated with C&R in river-specific, regional and national assessments.
- ICES recommends continued monitoring of catch and release in all countries and incorporation in future assessments.



<u>Describe how</u> catch and release mortality and <u>unreported</u> <u>catch are incorporated in stock assessments and how to</u> <u>be best incorporated in future advice</u>

Unreported Catch (Table 2.6.2)

- Descriptions of approaches for evaluating unreported catches have been reported at various meetings (ICES, 1996; ICES, 2000; ICES, 2002)
- Detailed reports describing national procedures for evaluating unreported catch were submitted by parties to NASCO in 2007 during special theme session
- Unreported catches at West Greenland are incorporated similarly in the NAC and NEAC run-reconstruction models
- Unreported catches, when available are not treated equally between NAC and NEAC.



<u>Describe how</u> catch and release mortality and <u>unreported</u> <u>catch are incorporated in stock assessments and how to</u> <u>be best incorporated in future advice</u>

Unreported Catch (Table 2.6.2)

• In most NEAC countries, estimates of unreported catches are provided and incorporated in the run-reconstruction models

• In most NAC areas, unreported catches are not incorporated in the run reconstruction models, even when provided

• In both NAC and NEAC, unreported catches may be incorporated in assessment of spawners and returns depending upon where the unreported catches occurs and the assessment models used

• Where available, unreported catches should be incorporated in the assessment models.



Potential threats

Red vent syndrome

- Returning salmon with swollen and/or bleeding vents
- Linked to presence of the nematode worm (Anisakis simplex)
- Noted since 2005, increase in Southern NEAC and Iceland in 2007, lower in 2008 and 2009
- Exception of UK(England & Wales) where infection rate was higher in 2009 (30%-40% infection)
- Also noted in North America (Scotia-Fundy and Quebec) in 2008, 2009
- · Effects on survival or spawning in the wild are unknown







Potential threats



Reduced sensitivity and development of resistance towards treatment in salmon lice

- ICES (2009) previously highlighted concerns of evidence from Norway regarding development of reduced sensitivity of salmon lice to oral treatment
- Reduced sensitivity to treatment reported over much larger areas of Norway in 2009, along much of the coast including northern part
- Monthly sea lice reports from farms show number of adult lice on salmon in January and February 2010 continued to increase in several areas compared with earlier years (www.lusedata.no)
- The increase in geographic spread of incidences of treatment failure and resistance, gives cause for concern for survival of wild salmon smolt migrations in 2010.



Potential threats

Catches of pink salmon in the NEAC area

- Pink salmon were introduced to Atlantic salmon rivers in White Sea region of Russia between the 1950s and 1990s.
- Pink salmon now spawn naturally in a number of salmon rivers in Russia and possibly in some other NEAC countries
- Fisheries targeting pink salmon also catch Atlantic salmon (same gears, same period)
- Catch of pink salmon in 2009 was 139 t, double the catch of A. salmon.

•Potential interactions between pink salmon and Atlantic salmon in freshwater and the sea are unknown



Progress on Development of Conservation Limits

- Conservation limits defined for several <u>Norwegian tributaries of the River</u> <u>Tana</u> (R. Teno in Finnish) and the river system as a whole
 - Assessments suggest that spawning populations have been very low in five Norwegian tributaries of the River Tana in recent years
- Progress river-specific conservation limits for Atlantic salmon stocks in <u>UK(Scotland)</u>
 - CL for the North Esk and transport model based on wetted area has been developed to allow river-specific CLs to be estimated for salmon stocks in UK(Scotland)
 - Continued efforts will include further evaluation of the data and methods in collaboration with local biologists and stakeholders.



Reintroduction of salmon in the River Rhine

- First adult salmon recorded in 1990, more than 30 years after extirpation
- Naturally produced juveniles first observed in 1994
- Since the start of the programme, more than 5600 adult salmon, mainly from stocking, have been recorded in the Rhine and its tributaries
- Downstream migration of salmon smolts monitored in the Rhine in 2007 to 2009
- In 2009, 15% of smolts reached the sea. In 2007, 46% reached the sea, possibly because of good discharge compared to other years.
- Planned re-opening of the Haringvliet dam by end of 2010, with objective to improve migratory fish species passage





Research on Marine Ecology of Atlantic Salmon

- Update provided on SALSEA-Merge (NEAC marine research initiative)
 - large number of projects (report from IASRB)
- Update provided on SALSEA-North America
 - marine survey conducted in September 2009



- Update provided on SALSEA West Greenland
 - enhanced sampling program consisting of full autopsies of 412 salmon in 2009
 - recommend that it be continued in 2010







Atlantic salmon genetics - new initiatives

- Project to develop a standardized genetic data base for North America
 - supported by Natural Sciences and Engineering Research Council of Canada (NSERC) grant to university with collaborators
 - eventually to combine, calibrate and integrate databases of salmon populations from both sides of the Atlantic
 - example of genetic identification of region of origin of salmon at West Greenland
- <u>Mixed stock coastal fisheries</u> in northern Norway
 - pilot project to examine composition of catches in coastal salmon fishery in Finnmark County, North Norway
 - co-operative project between Finland, Russia and Norway being developed to model the coastal migration of returning spawners to northern rivers and to support informed management of coastal fisheries



Investigate associations between changes in biological characteristics of Atlantic salmon, environmental changes and variations in marine survival

- Approach for estimating at-sea survival of repeat spawning adult salmon, applied to data from the LaHave River, Canada
 - Decadal comparisons indicate mortality in the second return year at sea increased from the 1980s to the 1990s, consistent with a regime shift in the far oceanic environment



 Preliminary report, second meeting, <u>Study Group on the</u> <u>Identification of Biological Characteristics for Use as Predictors of</u> <u>Salmon Abundance</u> [SGBICEPS]



Compiled standard biological measures over time series (>15 years) sufficient to account for natural variability and to facilitate trend analysis

Data for stocks from USA, Canada, Iceland, Russia, Finland, Norway, Sweden, UK(Scotland), UK(England & Wales), UK(N. Ireland) and France, and for three stocks in the Baltic Sea





Results of some new analyses completed during second meeting

• Mean lengths of N NEAC and S NEAC fish are correlated suggesting 1SW salmon in NE Atlantic experience similar growth conditions in first year at sea

• Further, reduced growth in first year at sea leads to reduced survival or delayed maturation, and/or that better growth leads to increased survival or earlier maturation.





Wider geographical patterns - Meta analysis

Significant changes over time

- Reduced river ages for NEAC north and south
- Earlier adult return dates for North America
- Reduced size of 1SW and 2SW fish in NEAC north and south
- Decreased proportion 1SW and increased proportion 2SW in NEAC north and Baltic





Case Studies

Run timing of smolts and sea survival

- <u>River Burrishoole</u> (Ireland) smolt run begins ~ 10 days earlier than in 1970s
- <u>River Bush</u> (UK(N.Ireland)) smolt run occurred earlier by 3.6 to 4.8 days every 10 years
 - believed linked to changes in river temperatures
 - survival to 1SW influenced by smolt run timing, later emigrating cohorts have better survival





Case Studies

North Esk (UK(Scotland))

Early mortality at sea not river-age dependent, age 1 to 4 smolts have equal probability of returning to reproduce
"what goes out, comes back"





Next steps

- Valuable work completed by SGBICEPS
- Work of Study Group was constrained by the lack of wider representation and the difficulties of involving oceanographers
- ICES recommends that the data sets collated by the Study Group should be fully utilised and made available to ICES in support of further analyses as appropriate



Further develop approaches to forecast pre-fishery abundance

ICES Study Group on Salmon Stock Assessment and Forecasting (<u>SGSAFE</u>) did not meet in the past year and no further developments to the forecast models were made in 2010

Performance of the models from 2009 were assessed :

- assumptions of the dynamic model were consistent with the observations and the recruitment dynamics
- retrospective comparison was undertaken to investigate the model's ability to predict PFAs
 - forecasts overestimated run-reconstructed values for 2008 PFA, over estimation is consistent with the recent pattern in the productivity. As productivity declines, the forecast is an over-estimate
 - uncertainties were greater when forecast was further into the future
- Models were considered sufficient and suggestions for further work were provided



Provide compilation of tag releases and advise on progress with analysing historical tag recovery data from oceanic areas

Compilation of tag releases by ICES member countries in 2009 provided in a separate report

- almost 3.5 million salmon, all life stages, marked and released to the wild in 2009
- 80% were adipose clipped juveniles from hatcheries
- broad range of tag types and increasing numbers of PIT, acoustic, radio, and DST tags being used





streamer



Provide compilation of tag releases and advise on progress with analysing historical tag recovery data from oceanic areas

Workshop on Learning from Salmon Tagging records (WKLUSTRE)

- third of a series of three workshops
- objectives: to record and analyse data from old tagging experiments

ICES endorsed the recommendations made by WKLUSTRE

- long-term storage of the tag databases so that the data are not lost, possibly at ICES Data Centre
- combine the reports of the three Workshops (WKDHUSTI, WKSHINI, WKLUSTRE) into an ICES Co-operative Research Report
- peer-reviewed publication of results (possibly as special issue of ICES journal)



Identify relevant data deficiencies, monitoring needs and research requirements

ICES recommends that

• Study Group on Salmon Stock Assessment and Forecasting (SGSSAFE) meet to continue work to develop models, particularly with regard to combining sea age classes, to incorporating environmental variables, and in the spatial disaggregation below the stock complex level.

• Efforts be initiated to transfer and archive in the ICES Data Centre the following data sets:

- biological characteristics database from international sampling of West Greenland fisheries,
- tagging database from international waters,
- any other international databases which would be of interest to the Working Group and others in the scientific community

• Other recommendations within presentations for each Commission Area



Identify relevant data deficiencies, monitoring needs and research requirements

ICES notes that factors other than fishing are currently constraining and, in some areas, threatening with extirpation populations of Atlantic salmon throughout the North Atlantic

• Factors acting in both the freshwater and marine environment are of concern.

• A review of successes and failures in wild salmon restoration could lead to a classification of activities which could be recommended under various conditions or threats to the persistence of populations.

• Such a classification would be of benefit to management tasked with rebuilding and restoration actions.

• Such a review could be undertaken by a Study Group.



Acknowledgements

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- Chair WKLUSTRE: L.P. Hansen (Norway)
- Chair SGBICEPS: I, Russell (UK(England & Wales))

