REPORT OF ICES ADVISORY COMMITTEE

ON

NORTH ATLANTIC SALMON STOCKS

TO

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

NEAC Area

CNL(14)8

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

10.2 With respect to Atlantic salmon in the North-East Atlantic Commission area:

1. Describe the key events of the 2013 fisheries.
2. Review and report on the development of age-specific stock conservation limits.
3. Describe the status of the stocks.
4. Provide recommendations on how a targeted study of pelagic by-catch in relevant areas might be carried out with an assessment of the need for such a study considering the current understanding of pelagic by-catch impacts on Atlantic salmon populations.

No catch advice provided – Faroes Framework of Indicators (applied January 2014) did not signal a significant change in stock status. Previous multi-year agreement continues; no reassessment required.

Composition of NEAC stock complexes

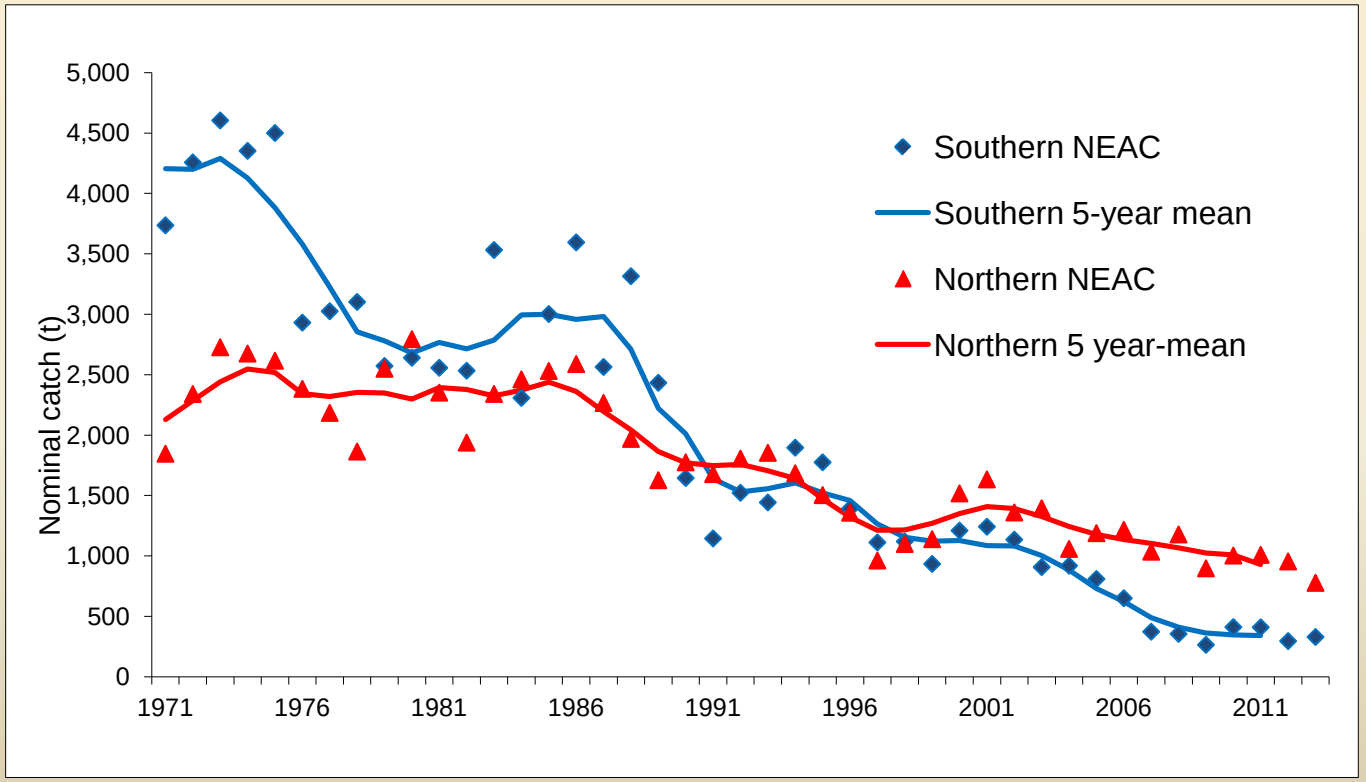
Southern NEAC countries:	Northern NEAC countries:
Ireland	Finland
France	Norway
UK (Scotland)	Russia
UK (Northern Ireland)	Sweden
UK (England & Wales)	Iceland (north/east regions)
Iceland (south/west regions)	

Key Events of Fisheries in 2013

- No fishery for salmon has been prosecuted at Faroes since 2000
- In France, TACs have been updated for the 30 salmon rivers in Brittany on the basis of data from the Scorff index river
- Gear and effort - No significant changes in gear type were reported in 2013; changes in effort were recorded (mainly reductions)

Nominal Catch

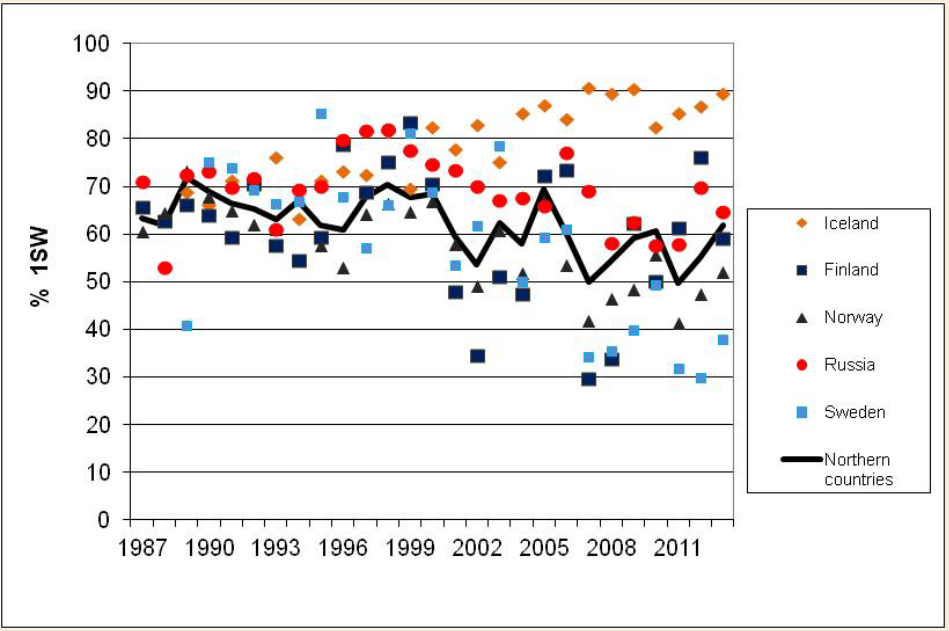
Nominal catch (t) in 2013	NEAC	NEAC North	NEAC South
	1107	778	329
	Lowest	Lowest	3rd Lowest



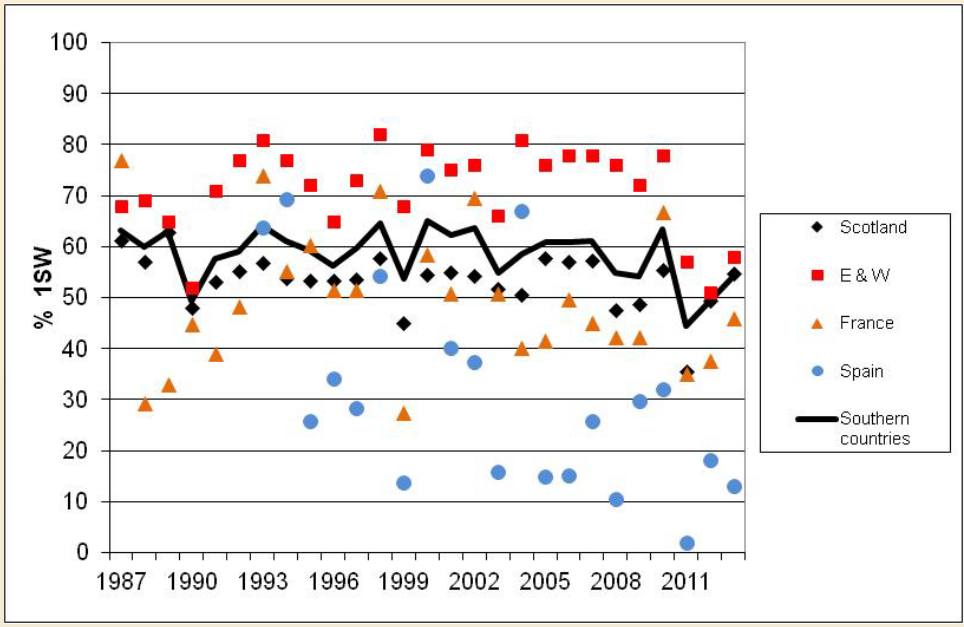
- Decline in catches has been more pronounced in Southern NEAC

Composition of Catches

Northern NEAC



Southern NEAC



Age composition

- % 1SW increased in 2013 from lows in 2011 in both S and N NEAC; values within the range for the period, but evidence for decline in %1SW, particularly for N NEAC
- Similar overall percentages of 1SW salmon in the catches in N. NEAC and S. NEAC
- Considerable variability among individual countries; variability increasing in N NEAC

Composition of Catches

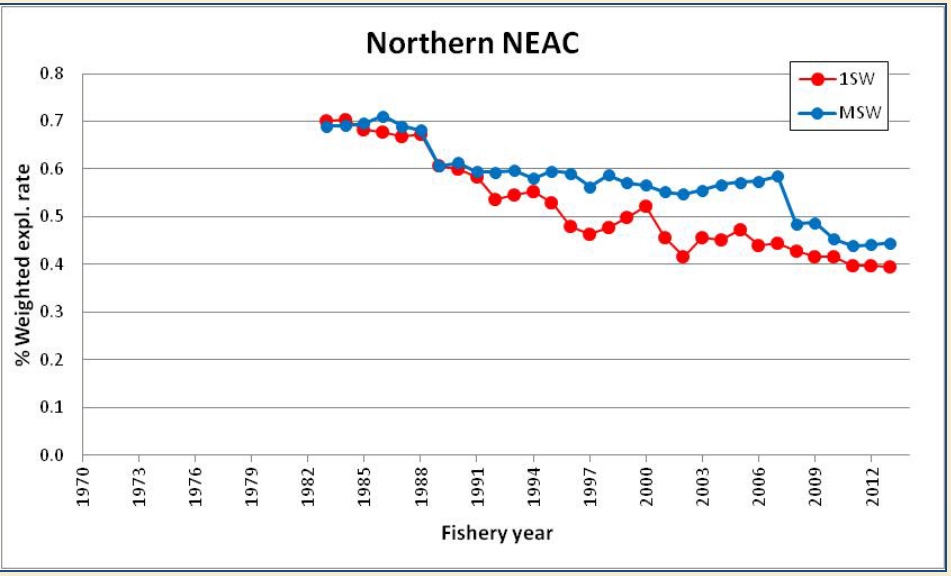
Farmed

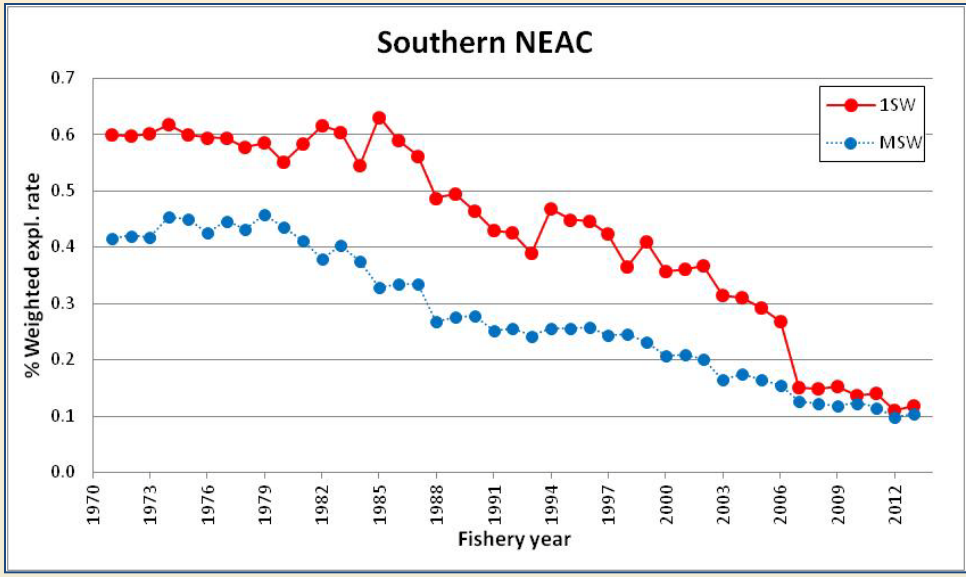
- Generally low in most countries, with the exceptions of Norway, Iceland and Sweden. Similar levels to previous years.
- Lowest on record (3.5%) for Norwegian rod caught fish, but samples taken from Norwegian rivers in autumn higher than most recent years (21%)
- 198,000 salmon escapees reported from Norwegian farms in 2013 – up from 30,000 in 2012
- Such fish ignored in assessments of national stocks

Ranching

- Ranching for rod fisheries in two Icelandic rivers continued into 2013 - 29 t were reported as ranched salmon in contrast to 125 t harvested as wild
- Swedish catches also now split into ranched (9.6 t) and wild (5.1 t)
- Ranching occurs on a much smaller scale in other countries, but not reported separately

Exploitation rates (all fisheries)





- Weighted estimates based on national returns (outputs from NEAC PFA run reconstruction model)
- General decline over the time-series for both Northern and Southern NEAC
- Exploitation rates substantially lower in Southern NEAC; decline also greater, with a sharp drop for 1SW fish in 2007

Development of age-specific stock conservation limits

- River-specific CLs developed and in use in France, Ireland, UK (England & Wales) & Norway. Some further developments:
  - Norway CLs updated on tributaries of Teno/Tana
  - UK (E&W) – one CL revised following barrier removal

- Work progressing in Finland, UK (N. Ireland), UK (Scotland) and Iceland:
  - Finland (River Teno) information collected to allow CLs to be set; report to be published in 2014.
  - UK (N. Ireland) – some existing CLs & CLs developed for 2 new rivers
  - UK (Scotland) – appraising CL transportation options; funding for new counters

Development of age-specific stock conservation limits

- Where available, river-specific CLs are summed to provide national CLs
- Interim approach has been developed for estimating national CLs for the other countries
- National Stock CLs are not appropriate for homewater fisheries management:
  - relatively imprecise
  - do not account for differences in status of individual river stocks
- National CLs are summed to develop Northern and Southern NEAC stock complex CLs by age group
- Stock complex CLs have been used to provide management advice for distant water fisheries

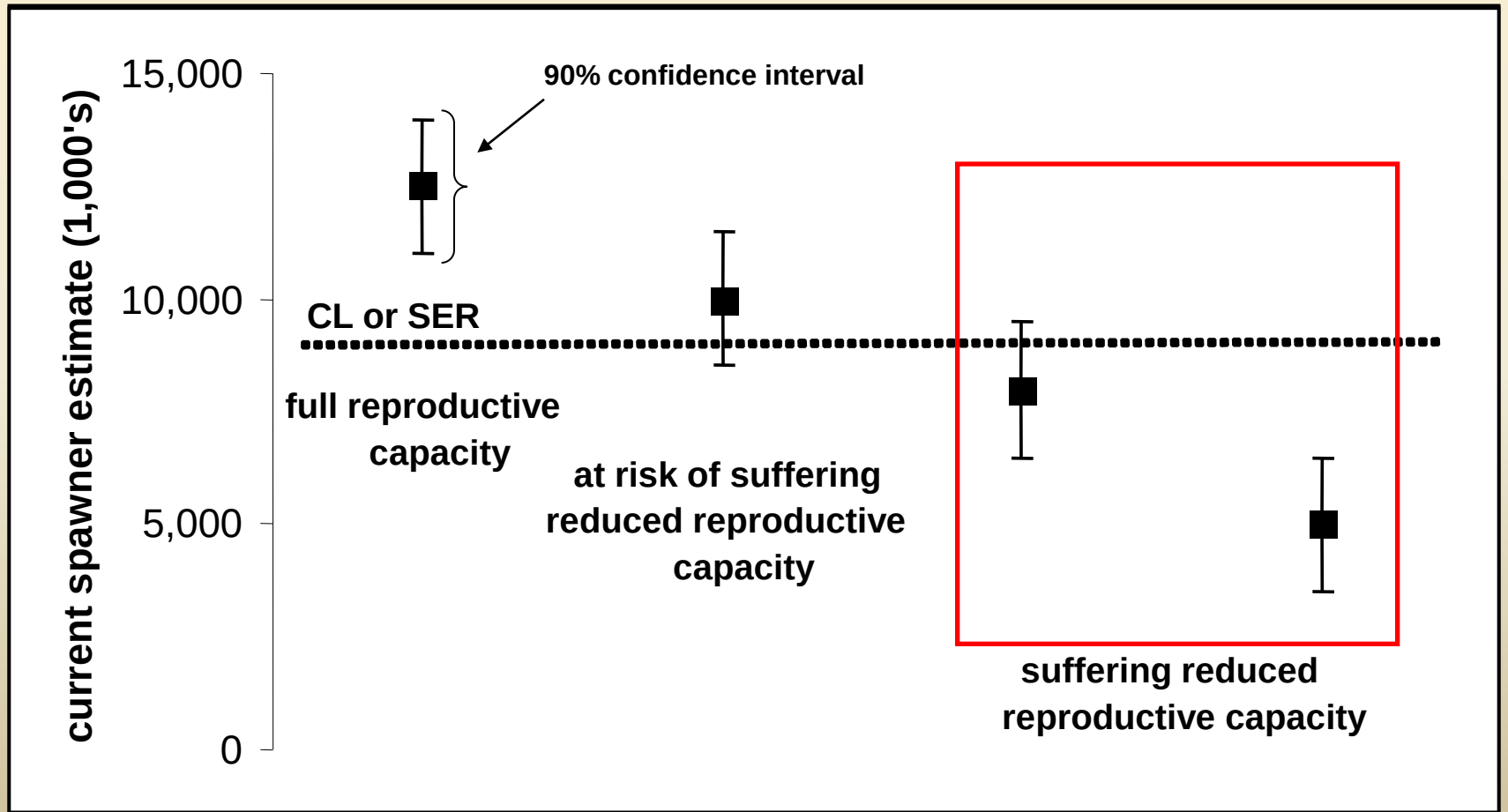
Development of age-specific stock conservation limits

N. NEAC	National model CLs		River-specific CLs		CLs used	
	1SW	MSW	1SW	MSW	1SW	MSW
Finland	16,975	13,889			16,975	13,889
Iceland (N&E)	5,986	1,565			5,986	1,565
Norway			64,467	71,218	64,467	71,218
Russia	66,896	42,031			66,896	42,031
Sweden	1,257	1,117			1,257	1,117
N. NEAC Total					**155,581**	**129,820**

S. NEAC	National model CLs		River-specific CLs		CLs used	
	1SW	MSW	1SW	MSW	1SW	MSW
France			17,400	5,100	17,400	5,100
Iceland (S&W)	19,422	1,265			19,422	1,265
Ireland			211,471	46,943	211,471	46,943
UK (E & W)			54,677	30,163	54,677	30,163
UK (NI)	17,205	1,986			17,205	1,986
UK (Scotland)	241,597	189,892			241,597	189,892
S. NEAC Total					**561,771**	**275,348**

Conservation Limits & Stock Status

- CLs are used to estimate the SER (Spawner Escapement Reserve, the CL increased to take account of natural mortality between the recruitment date (1st Jan) and return to home waters
- ICES terminology for the assessment of stock status and advice where there are no specific management objectives:

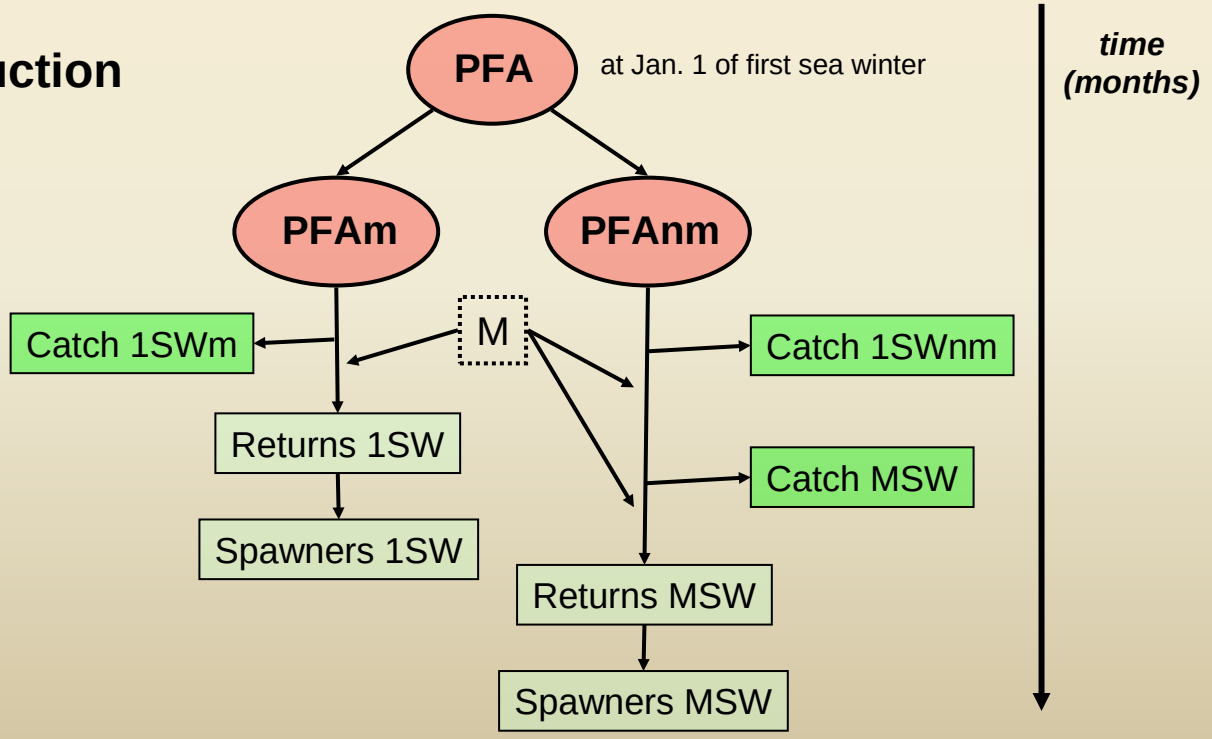


Status of Stocks - PFA

PFA (Pre-Fishery Abundance)

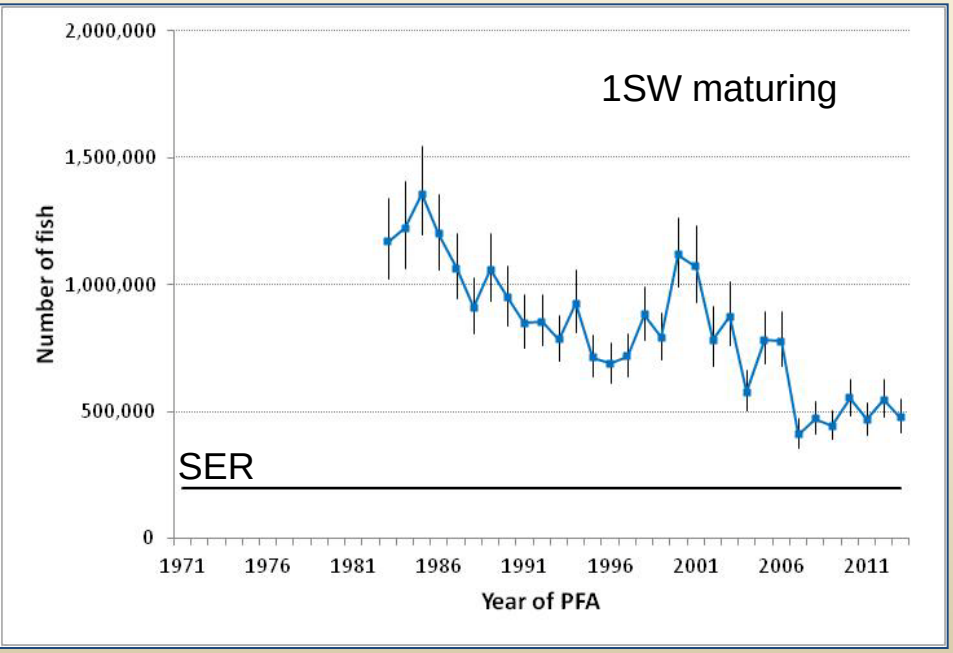
- Estimated abundance of salmon in the first winter at sea (as of 1 Jan)
- Estimated for 1SW maturing (1SW) and 1SW non-maturing (MSW)
- Estimated by stock complex (Northern NEAC, Southern NEAC)

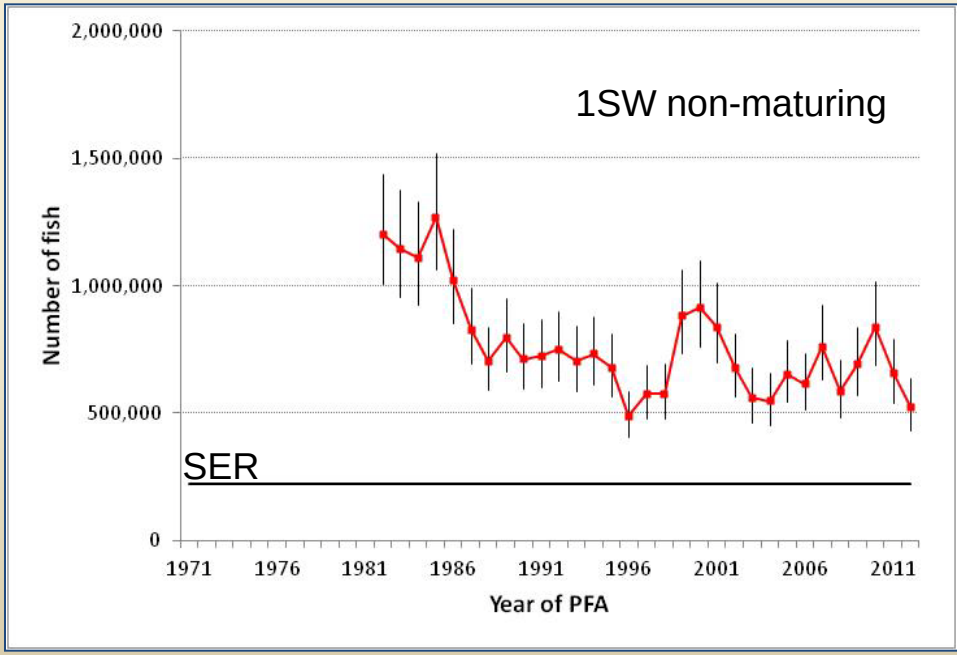
Run reconstruction



Status of Stocks - Trends in PFA for Northern NEAC

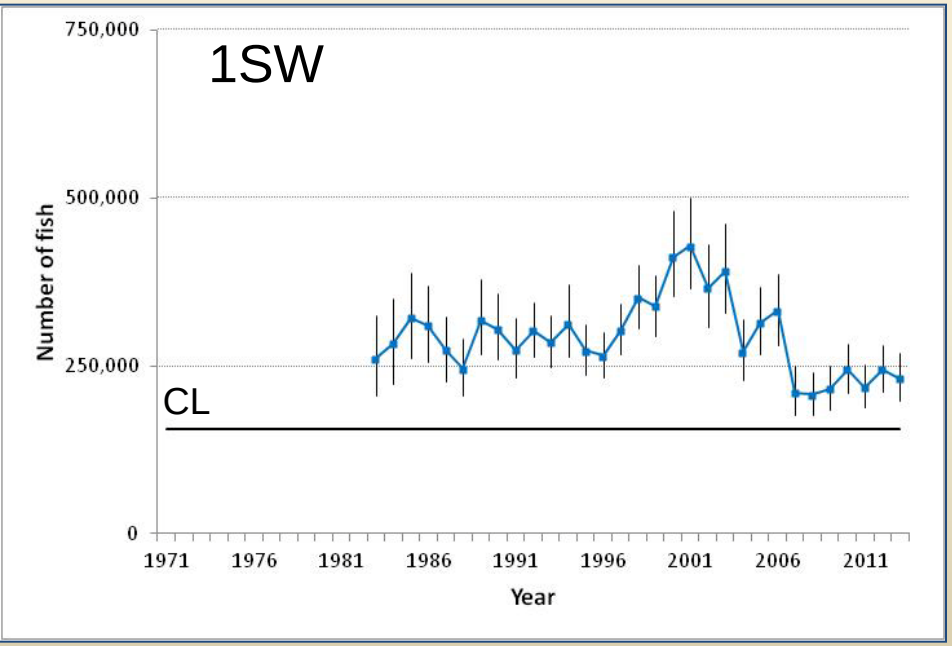
- General decline interrupted by a short period of increased recruitment from 1998 to 2003. Decline more marked in maturing 1SW fish
- Both stock complexes have been at full reproductive capacity prior to the commencement of distant water fisheries throughout time series
- Patterns are broadly consistent with the general decline in marine survival of 1SW and 2SW salmon in most monitored stocks in the area

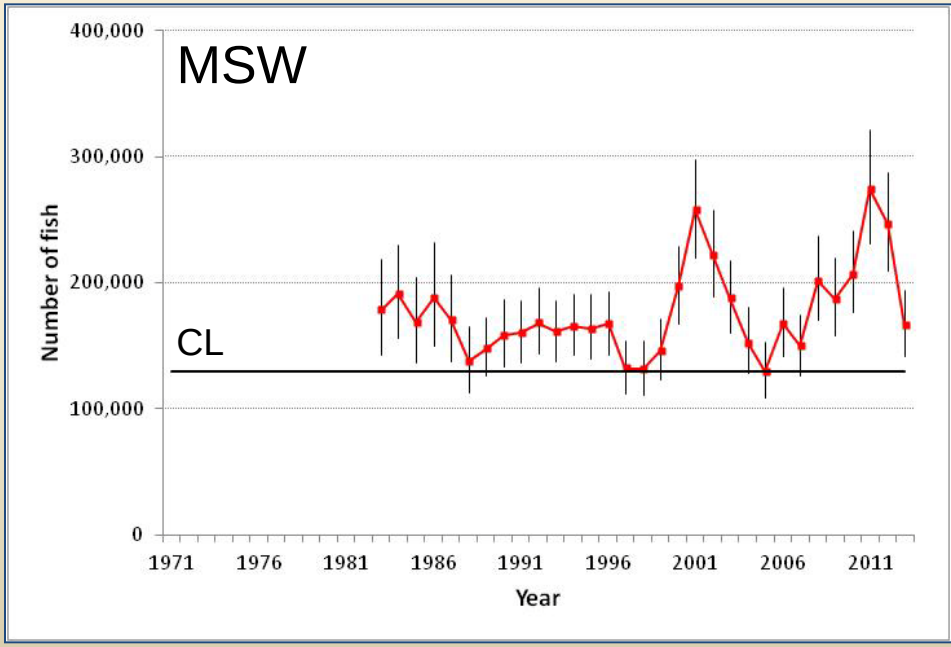




Status of Stocks - Trends in Spawners for Northern NEAC

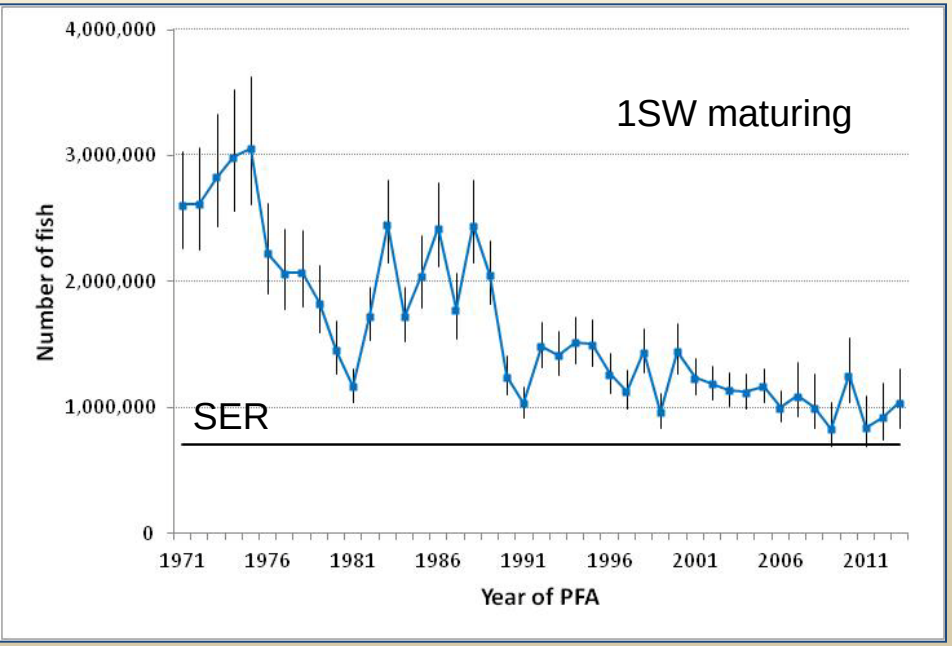
- 1SW spawners have been at full reproductive capacity throughout the time series, but at lower levels in more recent years
- MSW spawners at full reproductive capacity in most years (and consistently in last 6 years), but at risk of reduced reproductive capacity in some years
- MSW spawners increasing since 2005, but sharp drop in 2013

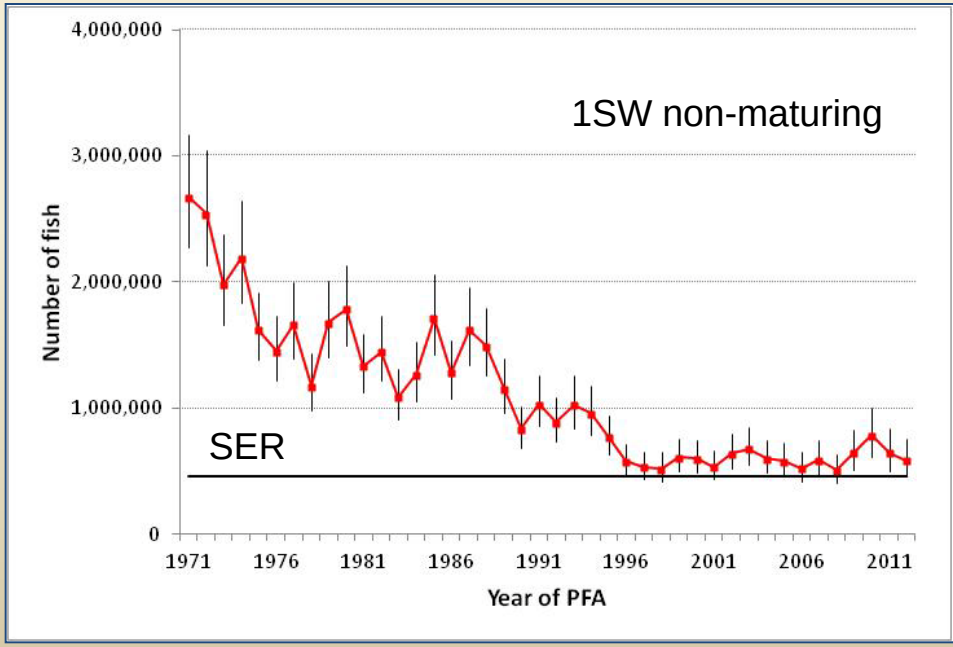




Status of Stocks - Trends in PFA for Southern NEAC

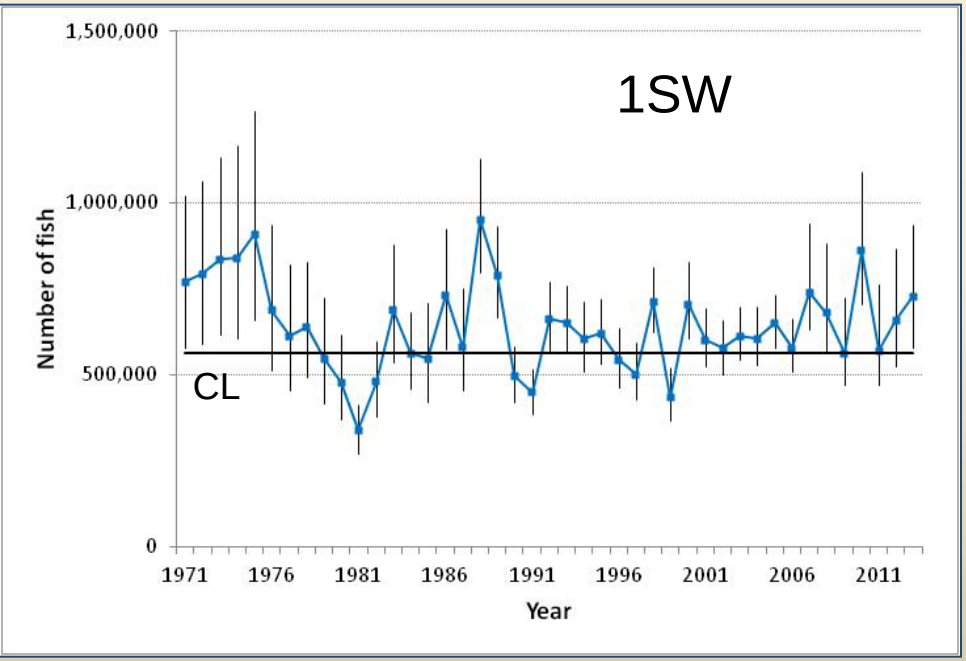
- Maturing 1SW stock at full reproductive capacity prior to the commencement of distant water fisheries over most of the time period; first assessed as at risk of suffering reduced reproductive capacity in 2009
- 1SW maturing fish at full reproductive capacity in latest PFA year
- Non-maturing 1SW stock at full reproductive capacity before 1996 but at risk of suffering reduced reproductive capacity in the majority of assessment years since, including the latest PFA year

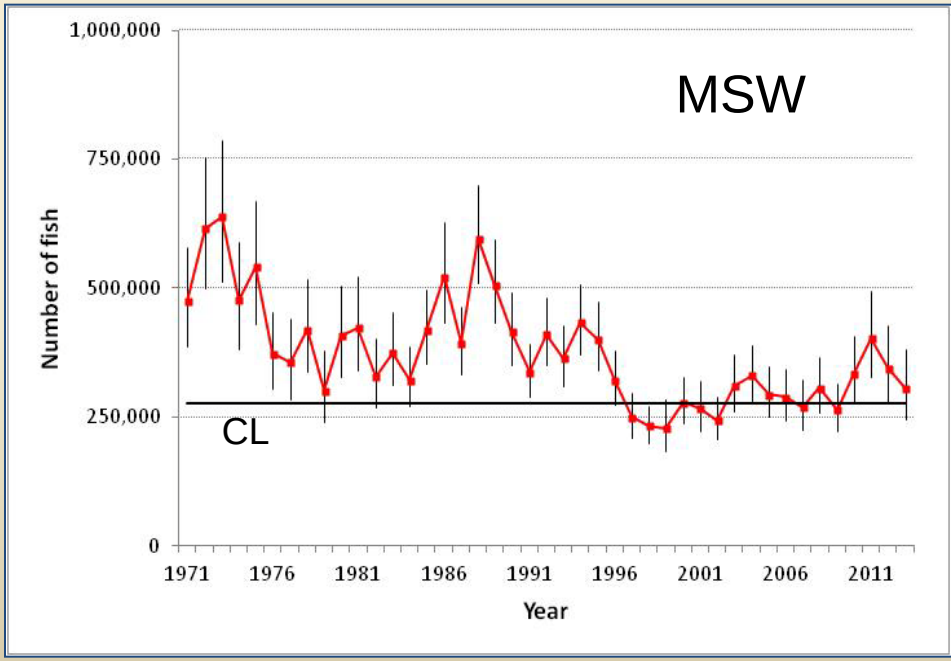




Status of Stocks - Trends in Spawners for Southern NEAC

- Decline in both 1SW and MSW spawners, particularly MSW
- 1SW stock has been at risk of suffering reduced reproductive capacity or suffering reduced reproductive capacity for most of the time series; but not in 2013
- MSW stock mainly at full reproductive capacity until 1997. Mainly at risk of suffering reduced reproductive capacity or suffering reduced reproductive capacity since this time





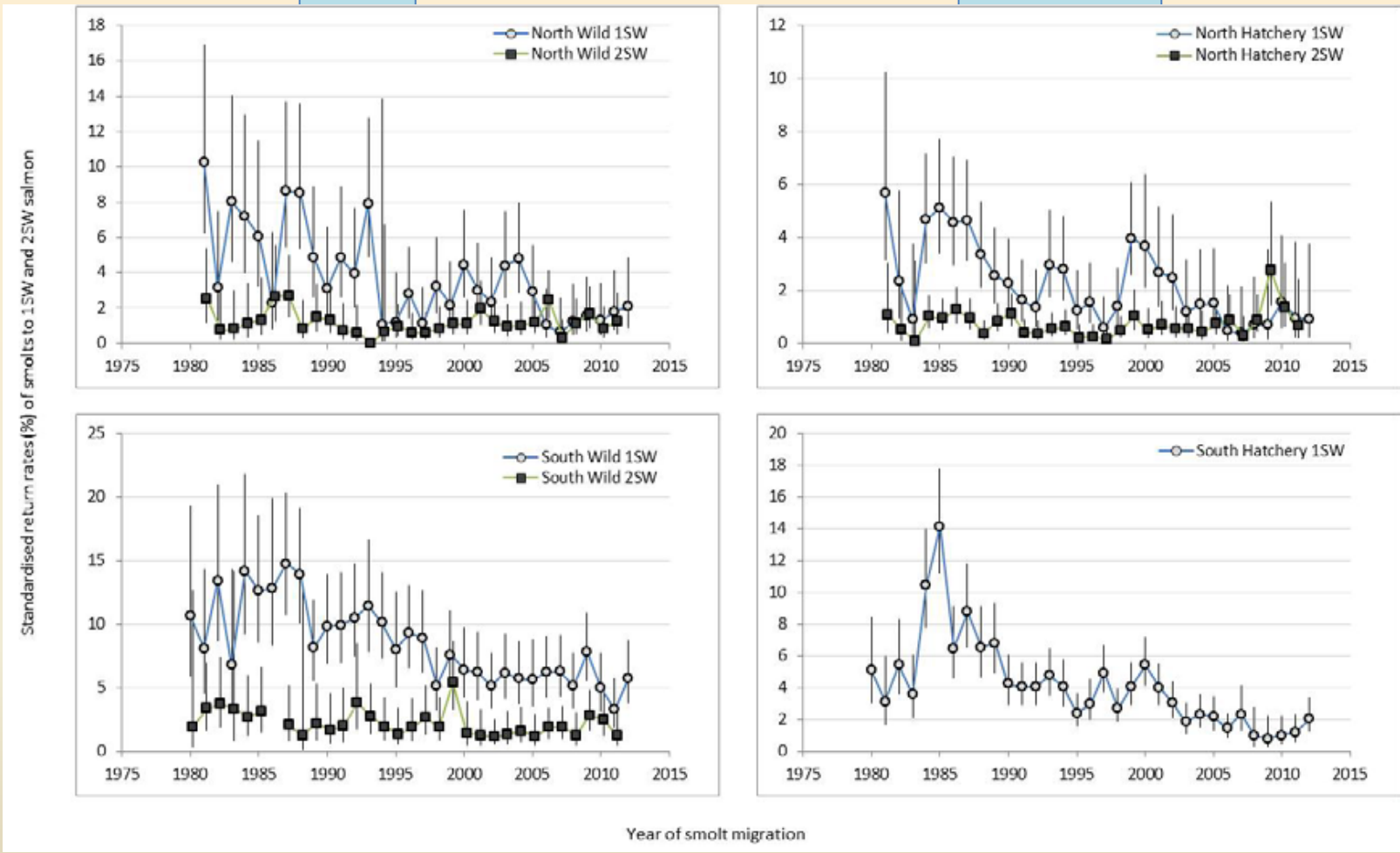
Status of Stocks - Marine Survival

Wild

Hatchery

N NEAC

S NEAC



- General decline in marine survival, particularly marked for 1SW
- Returns strongly influenced by factors in the marine environment

Overview of Status of Stocks

- Despite management measures aimed at reducing exploitation in recent years there has been little improvement in the status of stocks

- The continued low abundance of wild Atlantic salmon is mainly a consequence of continuing poor survival in the marine environment and pressures in freshwater

NASCO has asked ICES to provide recommendations on how a targeted study of pelagic by-catch in relevant areas might be carried out with an assessment of the need for such a study considering the current understanding of pelagic by-catch impacts on Atlantic salmon populations[5];

[5] *In response to question 2.4, if ICES concludes that there is a need for a study, provide an overview of the parameters and time frame that should be considered for such a study. Information reported under previous efforts and on migration corridors of post-smolts in the Northeast Atlantic developed under SALSEA-Merge should be taken into account.*

Salmon By-catch

SGBYSAL (ICES 2004, 2005)

- Mid 1990s on – growing concerns about high capture of post-smolts in mackerel catches in Norwegian research surveys in Norwegian Sea (June-Aug). If replicated in commercial pelagic vessels could be a big problem
- Screening on Russian commercial vessels and Russian research cruises indicated low levels of by-catch
- Widely discrepant estimates (60 to >1 million) post smolts taken
- Concerns expressed about extrapolating from scientific salmon surveys due to different gear / operation
- Best data from surveys undertaken on same spatial/temporal scale; should only be used for extrapolation when gear used similar to commercial fishery
- Screening of commercial catches should be primary method of by-catch estimation
- Research cruises should continue to help add knowledge on temporal / spatial distribution of salmon at sea and overlap with pelagic fisheries
- More research needed on salmon migration routes and screening needed in processing plants

Salmon By-catch

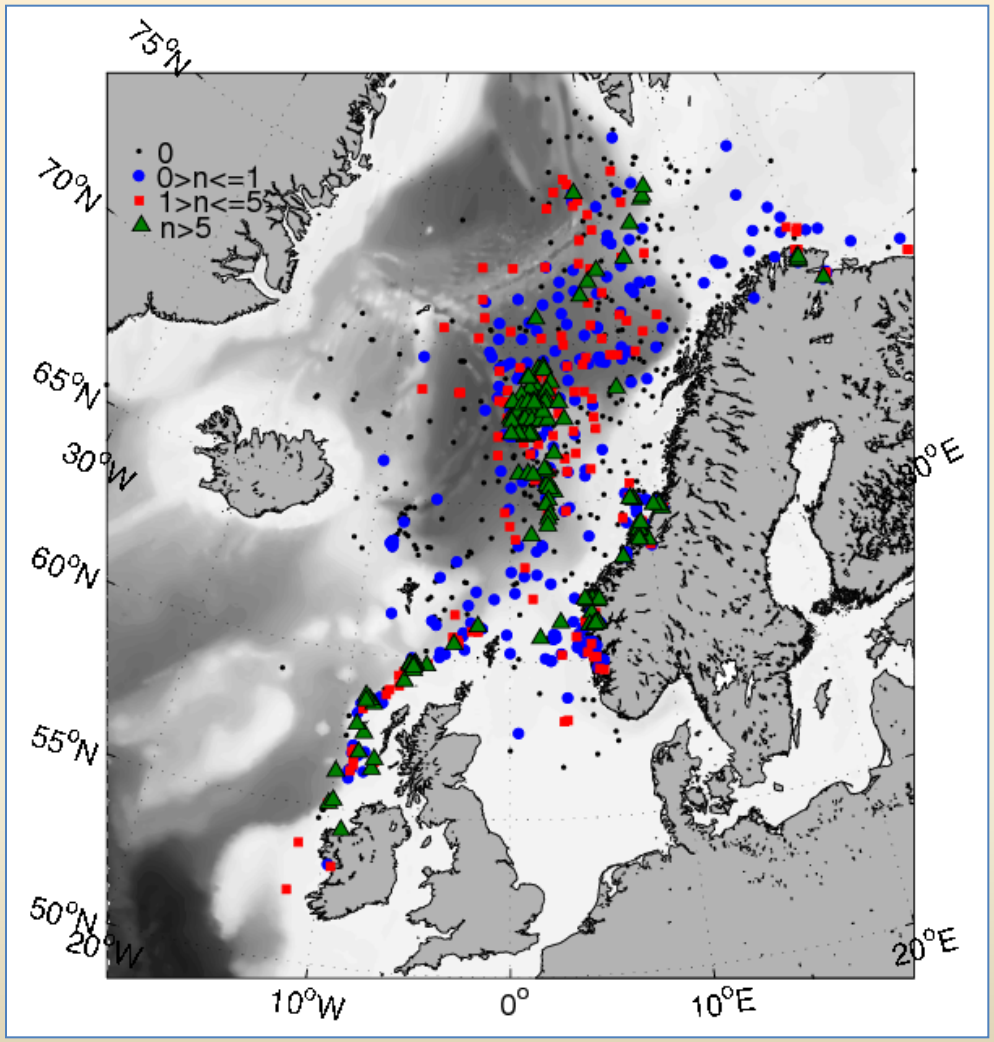
Subsequent developments

- WGNAS endorsed SGBYSAL findings (2005) and reiterated that direct on board measurements were the most reliable method for by-catch estimation
- Upper estimate of potential post-smolt by-catch represented about 5% of the estimated combined PFA of NEAC stock complexes (5-yr averages) at the time
- Limited further data in next few years - ICES considered previous findings remained valid – i.e. relatively low impacts of by-catch on PFA / returns

More recent developments / information

- New information on post-smolts (e.g. SALSEA-Merge)
- Pelagic fisheries have changed – mackerel catches have increased substantially and fishing areas have extended north and west
- Screening of (mainly) Icelandic commercial catches
- Data from internationally-coordinated pelagic trawl survey (International Ecosystem Survey of the Nordic Seas) – mainly targeting mackerel

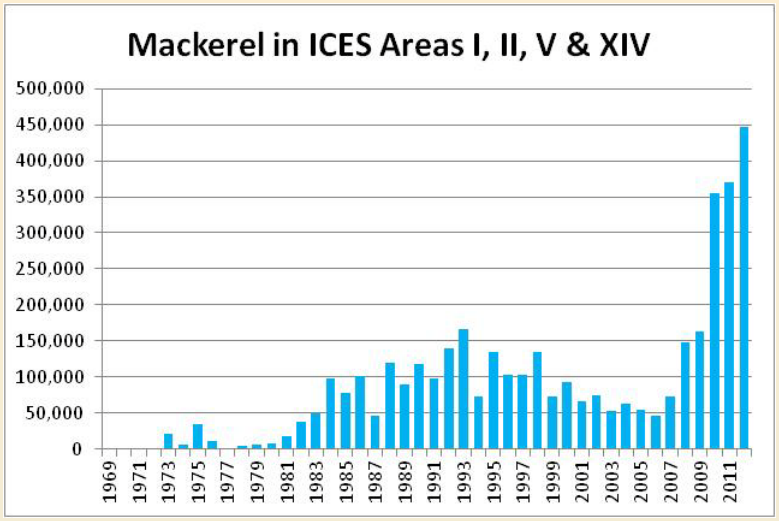
Post-smolt distribution



Distribution of Atlantic salmon post-smolts (number per hour of trawling). Data from SALSEA-Merge project, incorporating earlier research surveys.

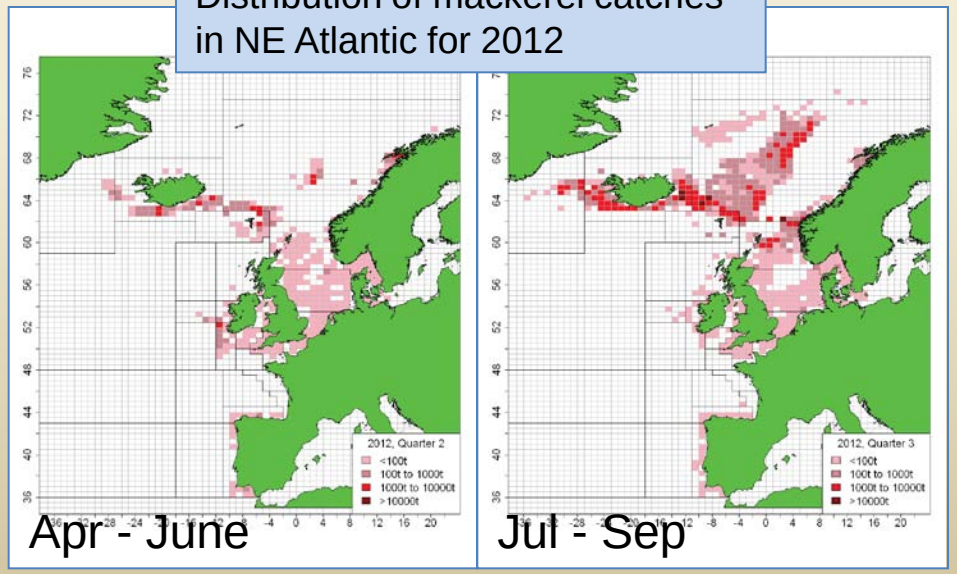
- ❑ Northward migration along shelf edge
- ❑ Subsequent widespread distribution of recaptures in Norwegian Sea over summer months as fish migrate further north
- ❑ Higher concentration of recaptures in eastern areas

Pelagic fishery changes



- ❑ Mackerel stock has expanded N & W
- ❑ Distribution extended as far west as SE Greenland
- ❑ Increased catches in northern areas with high catches in Iceland & Faroes (where catches low prior to 2008)
- ❑ These areas accounted for ~half the total for the whole NE Atlantic in 2012
- ❑ Total catch in N area ~500,000 t

Distribution of mackerel catches in NE Atlantic for 2012



Apr - June

Jul - Sep

- ❑ Some potential overlap with distribution of post-smolts

Screening of commercial catches

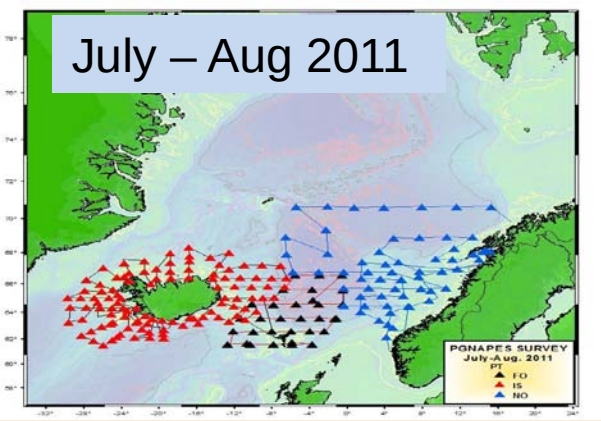
Icelandic screening of herring and mackerel fisheries, 2010-2013

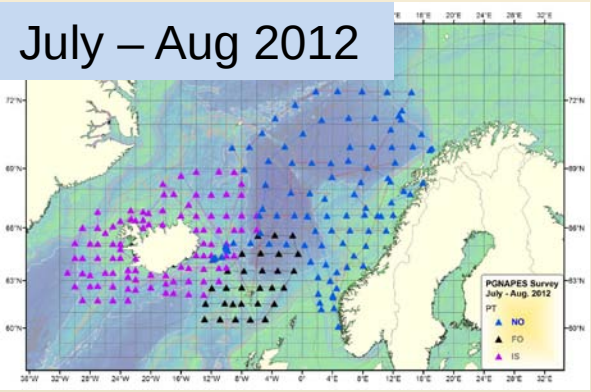
- Screening of both landings and catches on board fishing vessels by Inspectors from Icelandic Fisheries Directorate (9 – 40k t screened annually)
- Screening of landings only when some level of by-catch indicated
- By-catch rates varied somewhat among years, and typically higher in landings (mean 5.4 salmon/1000 t; range 4.7 – 6.2) than in catches (mean 2.1 salmon/1000 t; range 0 – 5.5)
- Icelandic mackerel catch ~150 000 t in recent years
- If by-catch rates considered representative for total fishery, total salmon by-catch in Icelandic fisheries would be in the range 300 – 800 individuals
- By-catch composition: salmon 20-50 cm = 15%; salmon 50-70 cm = 69%; salmon 70-100 cm = 16% of the salmon caught

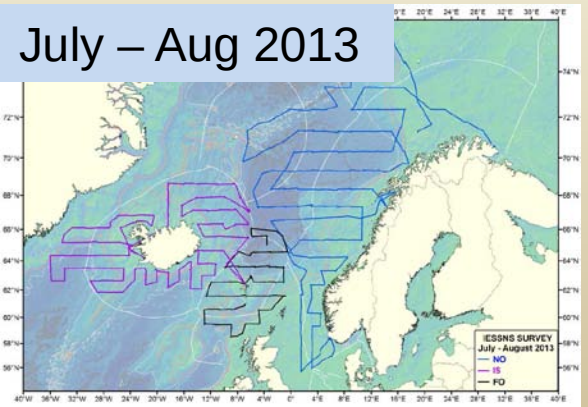
Faroese screening of pelagic fisheries, 2011

- Screening of 33,315 t of mackerel taken in pelagic trawls undertaken at land-based freezing plants
- By-catch rate of 2.4 salmon / 1000 t

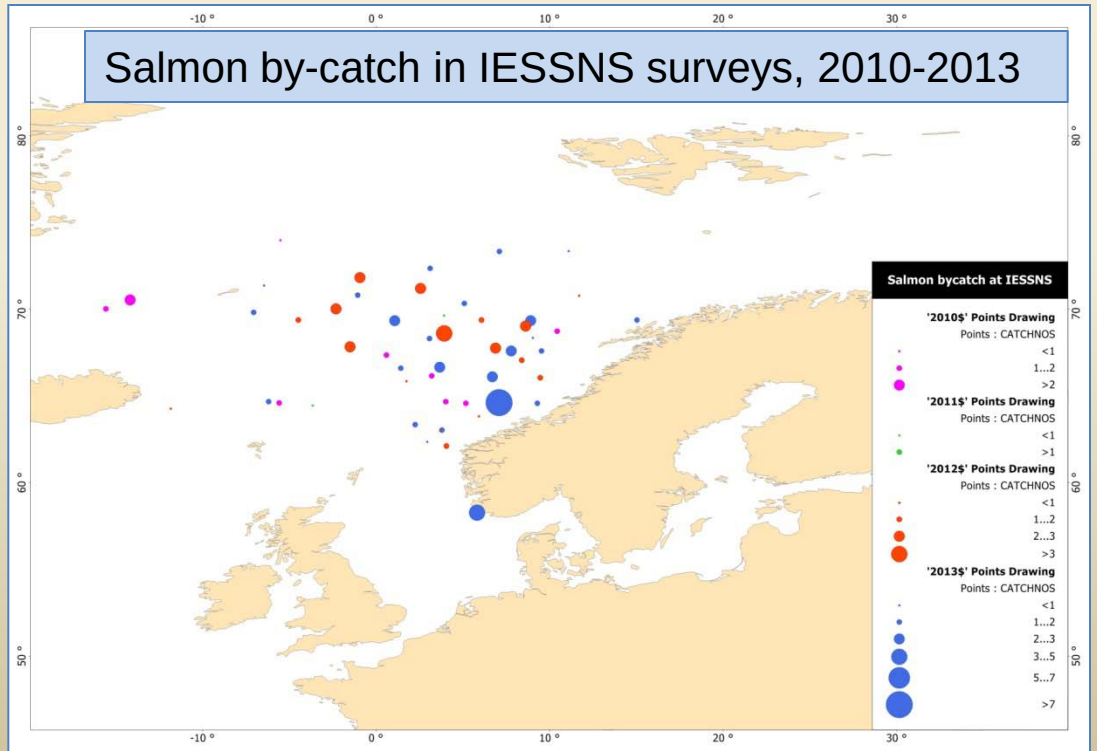
International Ecosystem Survey of the Nordic Seas (IESSNS)







- Widespread coverage of Norwegian Sea (2010-13) using standardised pelagic trawl, mainly targeting mackerel
- Whole catches screened – high certainty of by-catch
- Salmon by-catch mostly in eastern parts of Norw. Sea
- By-catch levels low, but small mackerel catches
- Scaled up, by-catch rates 20-50 x higher than that recorded in commercial screening (ave. 103 salmon / 1000t)



By-catch Summary

- ❑ Issues very similar to those highlighted by SGBYSAL
- ❑ Screening in commercial catches indicates low level of by-catch - e.g. Icelandic estimates (300-800) represent 0.01-0.03% of total NEAC PFA
- ❑ IESSNS estimates 20-50 x higher, but unclear how representative these might be given differences in design and operation of netting gear
- ❑ At 50x higher, by-catch in whole mackerel fishery <6% of PFA
- ❑ Continue to have broad spread of estimates
- ❑ Direct screening of commercial catches regarded as the most appropriate assessment approach for extrapolation purposes
- ❑ There is some overlap in post-smolt distribution & pelagic fisheries, but also apparent differences in where highest catches of mackerel and post-smolts occur
- ❑However, uncertainties

ICES Recommendations

Estimates of by-catch in pelagic fisheries remain highly uncertain. It would be informative to increase efforts to obtain reliable estimates:

❖ Collate all available information on post-smolt and salmon marine distribution, particularly from SALSEA-Merge project

❖ Collate information on possible interceptive pelagic fisheries operating in the identified migration routes and feeding areas of Atlantic salmon. This would require close co-operation with scientists working on pelagic fish assessments in the relevant areas and provision of disaggregated catch data in time and space which overlap areas known to have high densities of post- smolts or adults.

❖ Review pelagic fisheries identifying important factors such as gear type and deployment, effort and time of fishing in relation to known distribution of post-smolt and salmon in space and time and investigate ways to inter-calibrate survey trawls with commercial trawls.

❖ Carry out comprehensive catch screening on commercial vessels fishing in areas with known high densities of salmon post-smolts or adults. This would require significant resources and would need to be a well co-ordinated and well-funded programme.

❖ Integrate information and model consequences for productivity of salmon from different regions of Europe and America.

Might be approached as a phased investigation with the first elements possibly carried out by a combined Salmon/Pelagic Workshop / Study Group. The major element (catch screening) would require some preparation and agreement between NASCO parties and could be conducted as a joint collaborative exercise with co-operation from the pelagic fishing industry.

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

Supporting information and details in the report of the ICES Working Group on North Atlantic Salmon available at:
http://www.ices.dk/sites/pub/Publication%20Reports/Expert%20Group%20Report/acom/2014/WGNAS/wgnas_2014.pdf?guardian-download=1400083057,8082,0,986c554d2c9792b5dd78cd8b24b3e0f4bbd3fbe4

Acknowledgements

Members (21) of participating countries (12) to the Working Group on North Atlantic Salmon, 19-28 March 2014

NEAC sub-group chair: Jaakko Erkinaro (Finland)