REPORT OF ICES ADVISORY COMMITTEE

ON

NORTH ATLANTIC SALMON STOCKS

TO

NORTH ATLANTIC SALMON CONSERVATION ORGANIZATION

NEAC Area

CNL(13)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 2012 fisheries.**
2. **Review and report on the development of age-specific stock conservation limits.**
3. **Describe the status of the stocks.**
4. **Further develop a risk-based framework for the provision of catch advice for the Faroese salmon fishery reporting on the implications of selecting different numbers of management units.**

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:

In the event that NASCO informs ICES that the Framework of Indicators (FWI) indicates that reassessment is required

5. **Provide catch options or alternative management advice for 2013-2016, 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.**

6. **Update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice.**

Composition of NEAC stock complexes

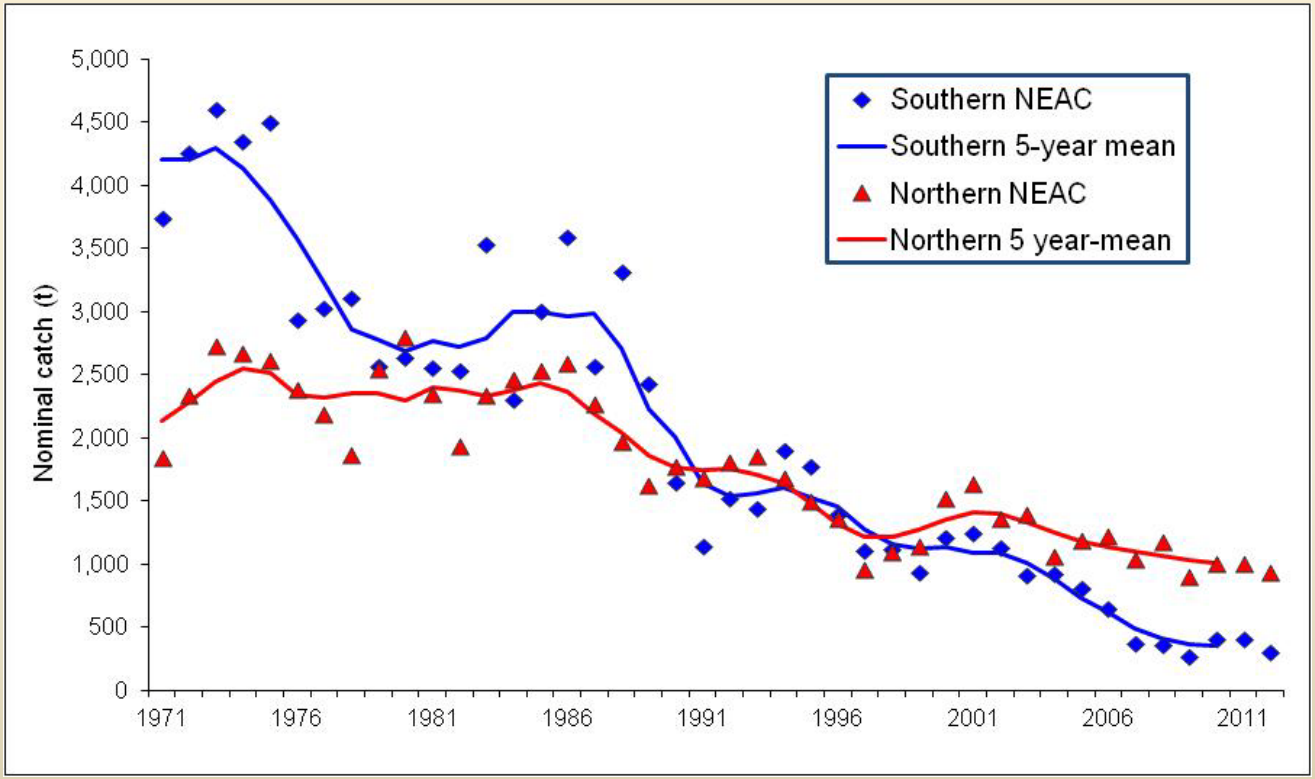
Southern NEAC countries:	Northern NEAC countries:
Ireland	Finland
France	Norway
UK (Scotland)	Russia
UK (Northern Ireland)	Sweden
UK (England & Wales)	Iceland (north/east regions)
Iceland (south/west regions)	

Key Events of Fisheries in 2012

- No fishery for salmon has been prosecuted at Faroes since 2000
- New coastal fishery has started in the Murmansk Region of the Russian Federation - by local Sami people
- Gear and effort - No significant changes in gear type were reported in 2012; changes in effort were recorded

Catches

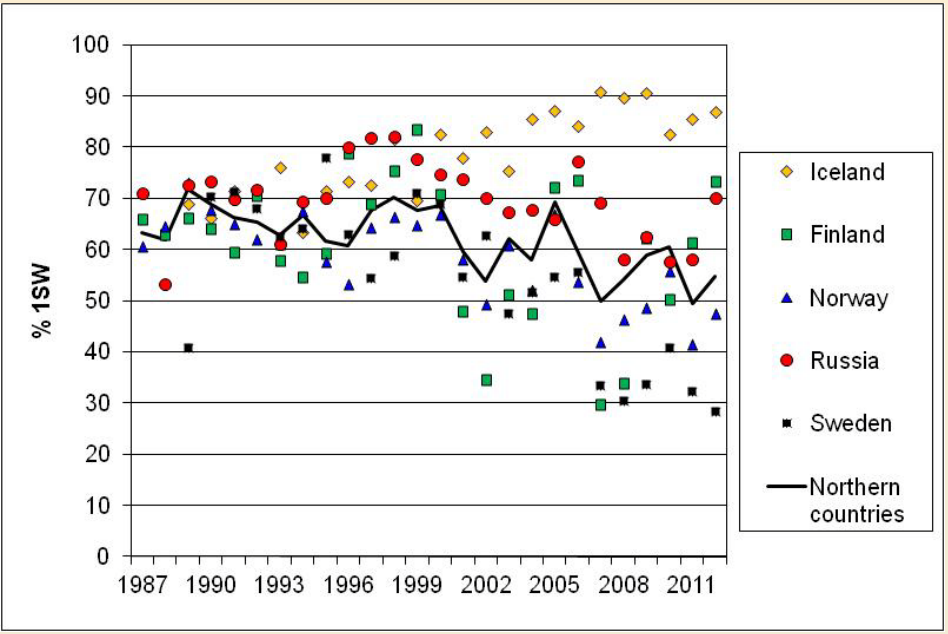
Nominal Catch (t) in 2012	NEAC	NEAC North	NEAC South
	1240	939	301
	2nd lowest	2nd lowest	2nd lowest



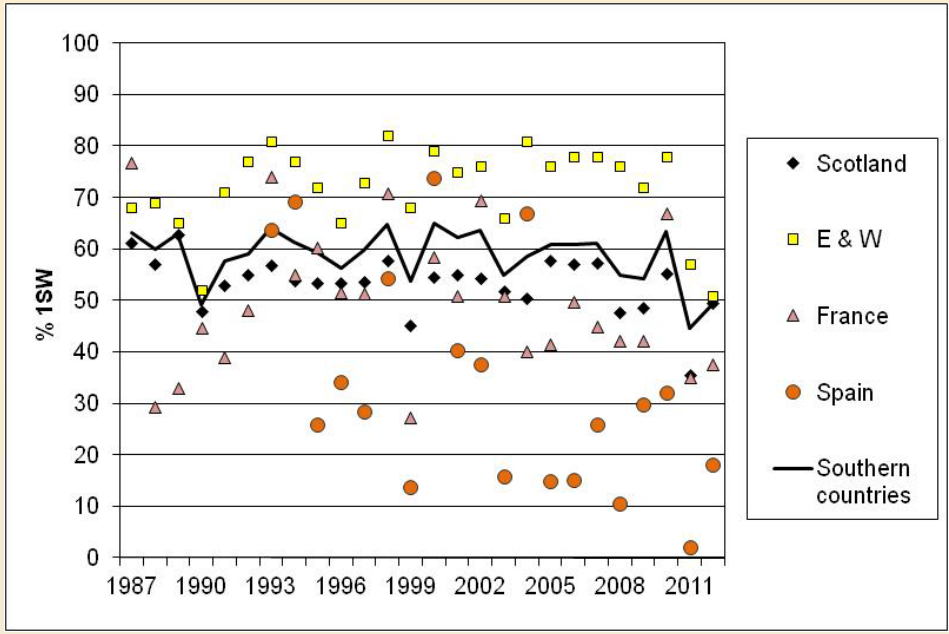
- Decline in catches has been more pronounced in Southern NEAC

Composition of Catches

Northern NEAC



Southern NEAC



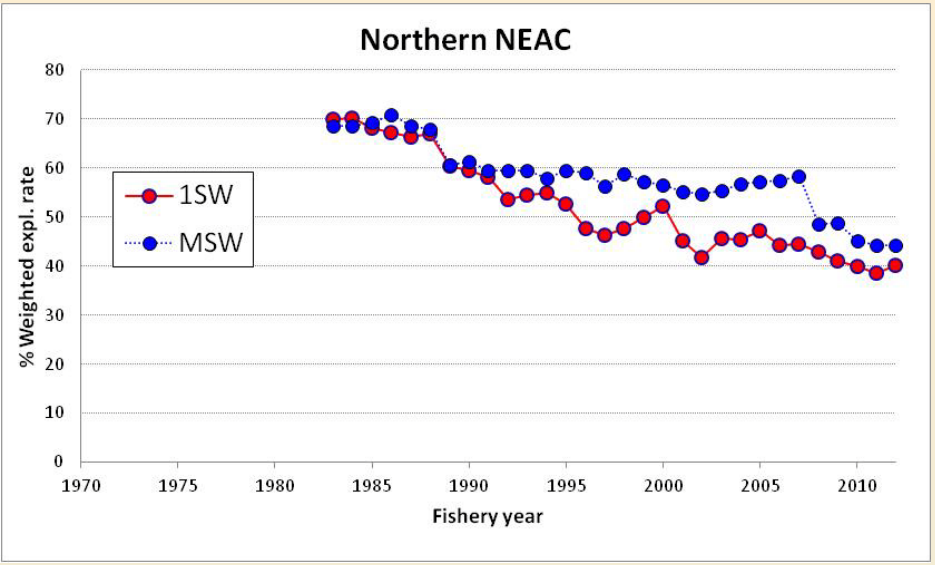
Age composition

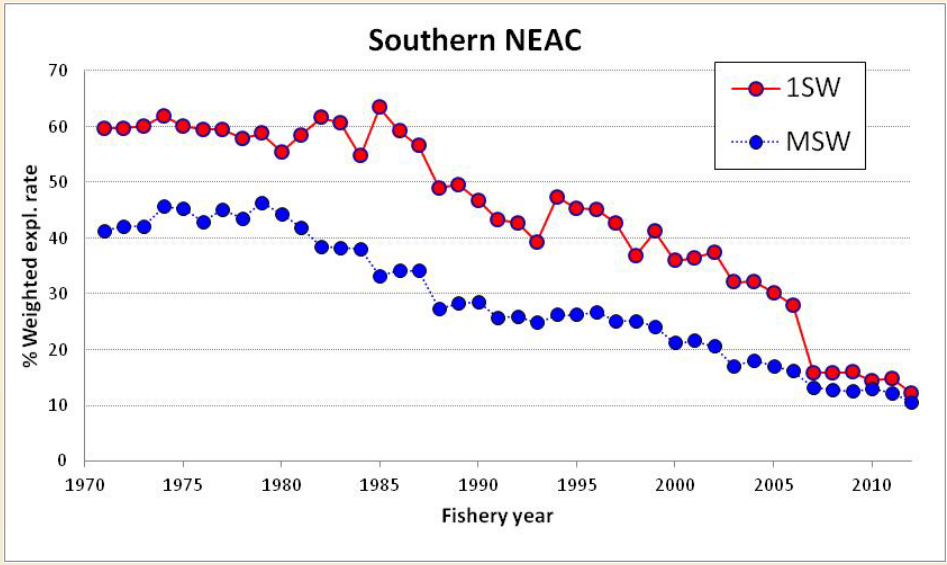
- Similar overall percentages of 1SW salmon in the catches in N. NEAC and S. NEAC – lower % of 1SW in recent years
- Considerable variability among individual countries, particularly in S. NEAC and more recently in N. NEAC

Farmed fish

- Low levels in most countries (except Norway, Sweden, Iceland). In Norway, farmed salmon ranged from 5% in rod fisheries (among lowest on record) to ~40% in samples from some net fisheries

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

By-catch in pelagic fisheries

- Icelandic Directorate of Fisheries started a screening programme to investigate the incidence of salmon by-catch in mackerel/herring fisheries in 2010:
  - **In 2010**, 170 salmon recovered in 35 403 t (**4.8 salmon/1000 t**)
  - **In 2011**, 233 salmon recovered in 38 153 t (**6.1 salmon/1000 t**)
  - **In 2012**, 48 salmon recovered in 37 349 t (**1.3 salmon/1000 t**)
  - 6 tagged salmon recovered in 2010-11 (4 Norway, 2 Ireland); no tagged fish recovered in 2012
- Faroese Marine Research Institute initiated similar sampling in 2011 to investigate salmon by-catch in the mackerel fishery
  - **In 2011**, 76 salmon observed in 31 315 t of fish (**1.5 salmon/1000 t**)
  - No screening undertaken in 2012

Development of age-specific stock conservation limits

- River-specific CLs available for France, Ireland, UK (England & Wales) and Norway
- River-specific CLs for Ireland updated in 2012
- Work progressing in UK (Scotland), Iceland, UK (N. Ireland) and Finland
- 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

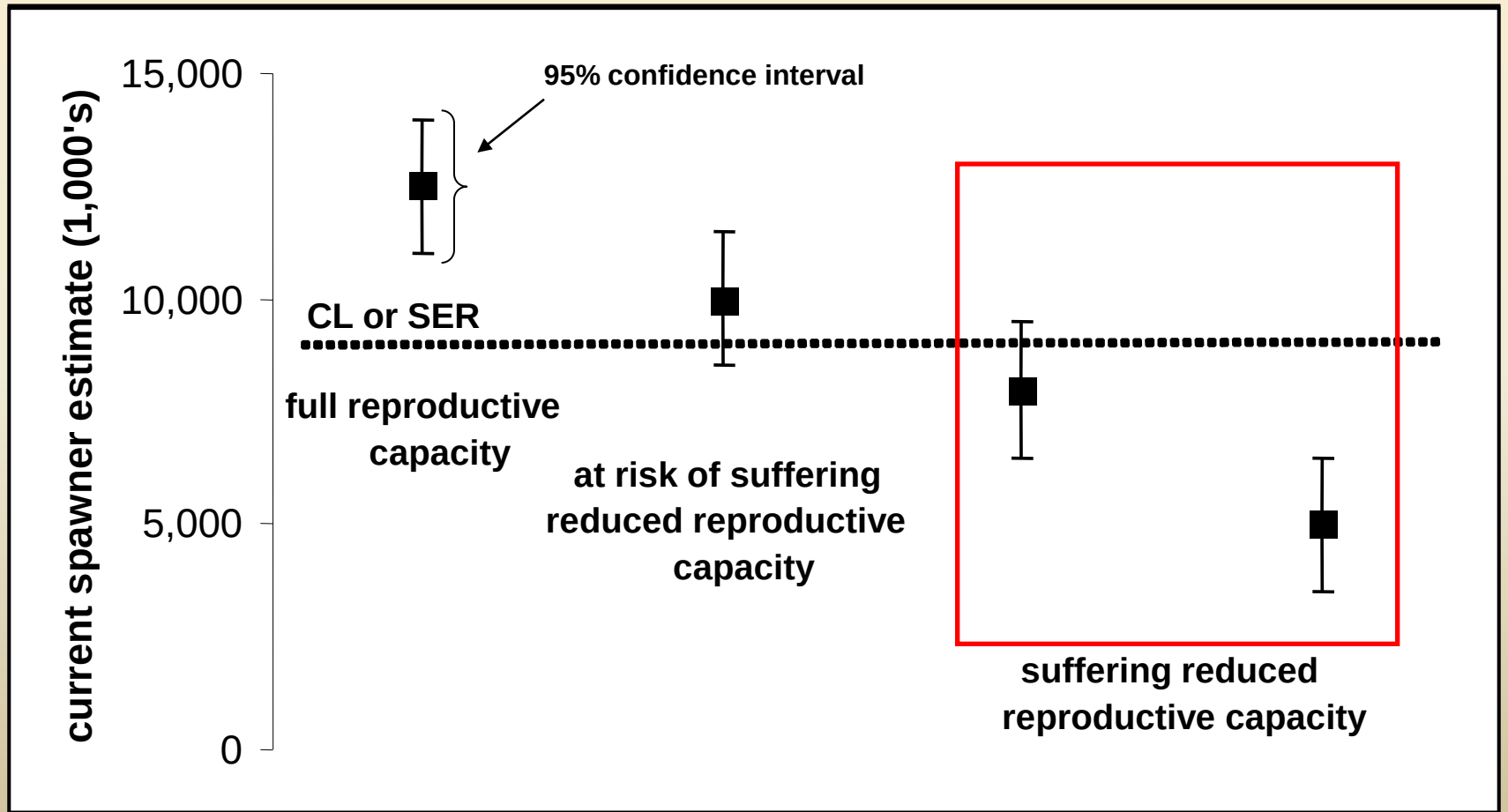
Development of age-specific stock conservation limits

- National CLs are summed to develop Northern and Southern NEAC stock complex CLs by age group
  - Northern NEAC 1SW spawners – 158 145
  - Northern NEAC MSW spawners – 131 408
  - Southern NEAC 1SW spawners – 564 874
  - Southern NEAC MSW spawners – 275 411

- Stock complex CLs have been used to provide management advice for distant water fisheries

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:

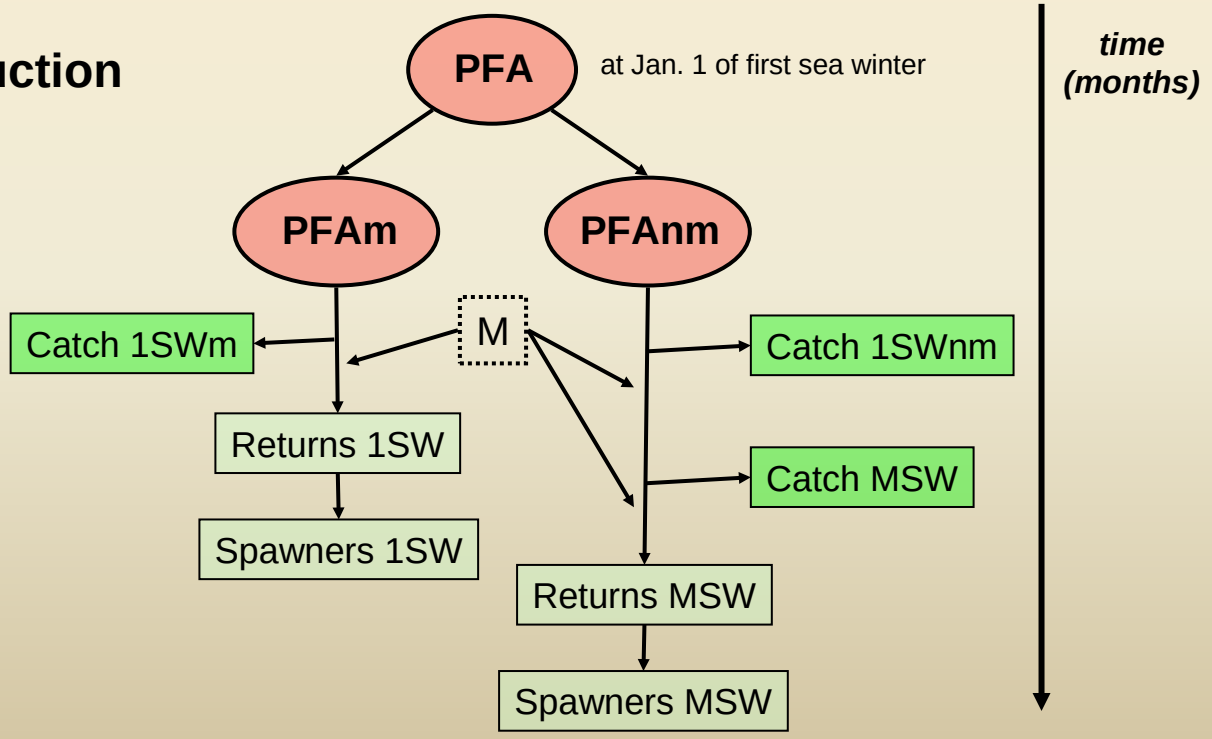


Status of Stocks - PFA

PFA (Pre-Fishery Abundance)

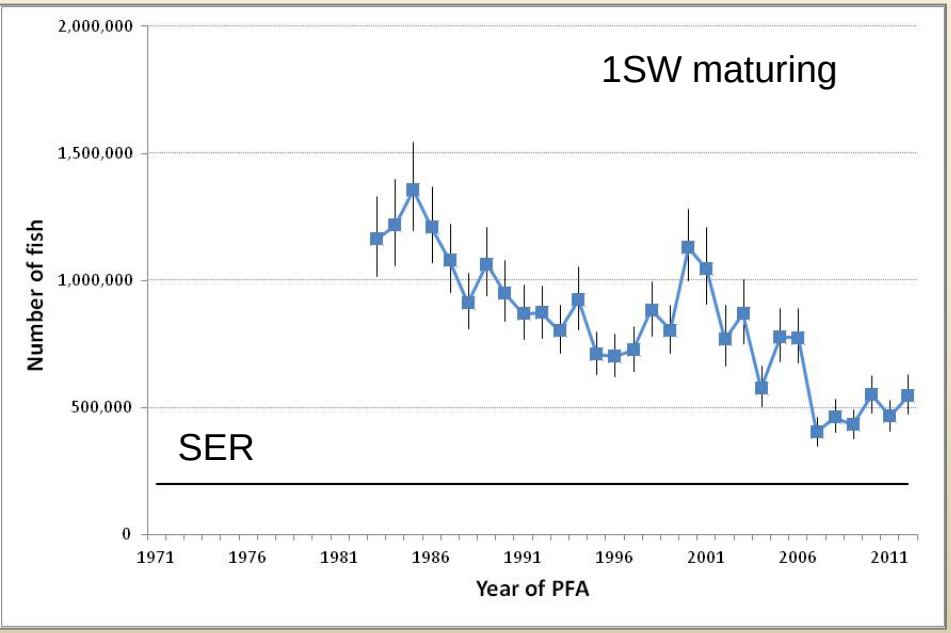
- Estimated abundance of salmon in the first winter at sea (as of 1 Jan)
- Estimated for 1SW maturing (1SW) and 1SW non-maturing (MSW)
- Estimated by stock complex (Northern NEAC, Southern NEAC)

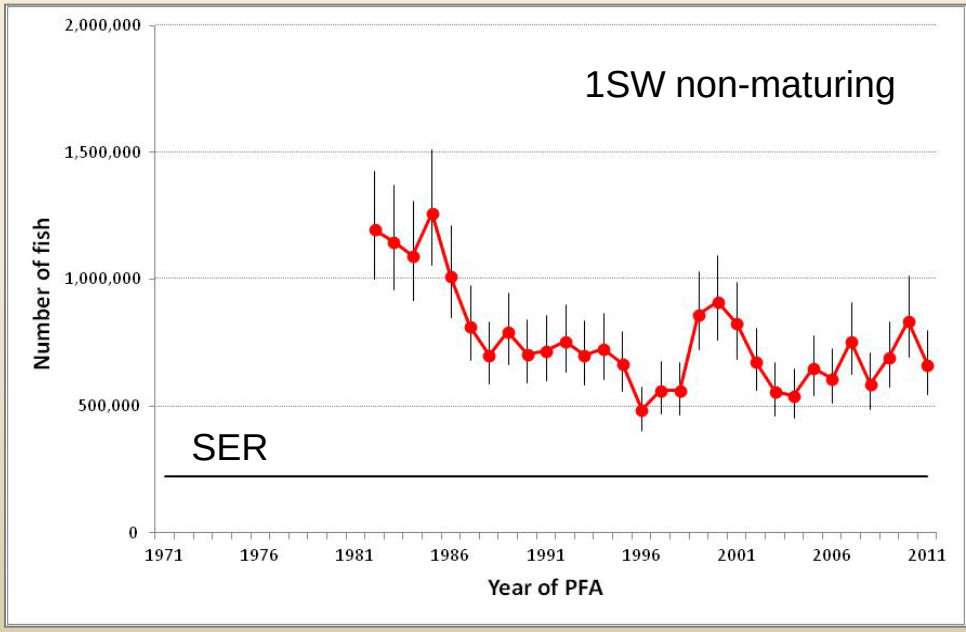
Run reconstruction



Status of Stocks - Trends in PFA for Northern NEAC

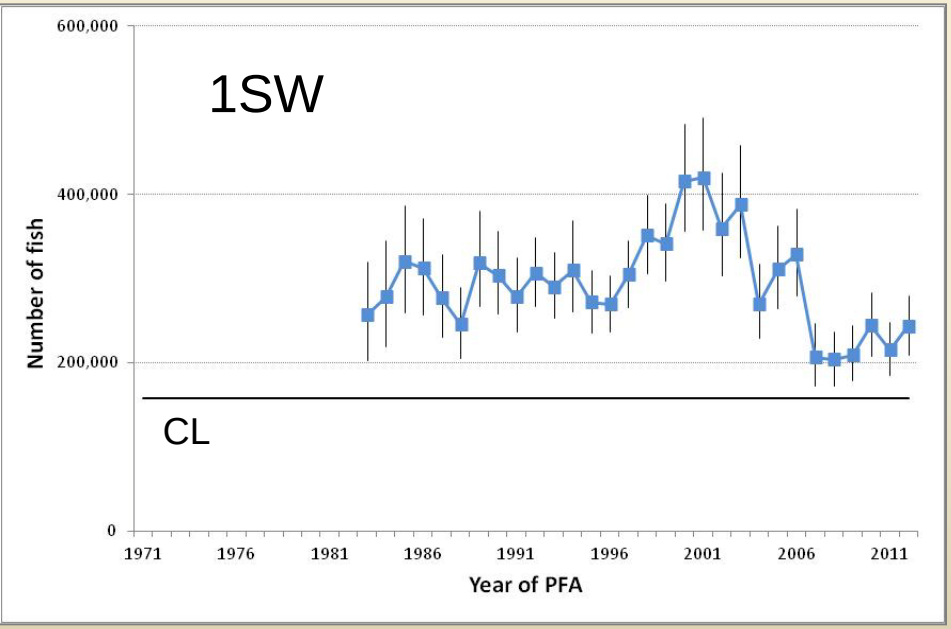
- General decline interrupted by a short period of increased recruitment from 1998 to 2003. Decline more marked in maturing 1SW fish
- Both stock complexes have been at full reproductive capacity prior to the commencement of distant water fisheries
- Patterns are broadly consistent with the general decline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

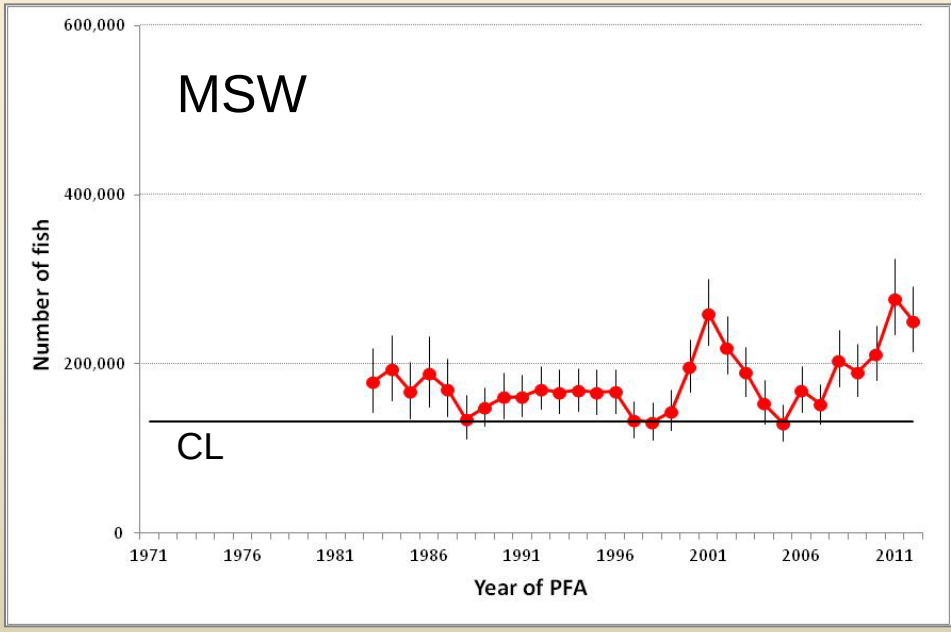




Status of Stocks - Trends in Spawners for Northern NEAC

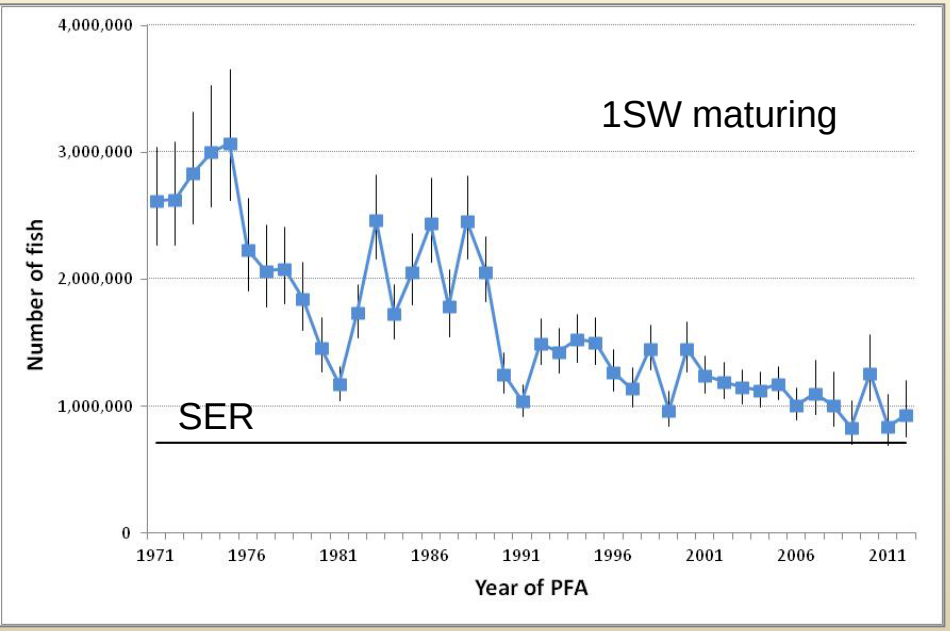
- 1SW spawners have been at full reproductive capacity throughout the time series, but at lower levels in more recent years
- MSW spawners have been at full reproductive capacity or at risk of reduced reproductive capacity; marked increase since 2005 and at full reproductive capacity in recent years

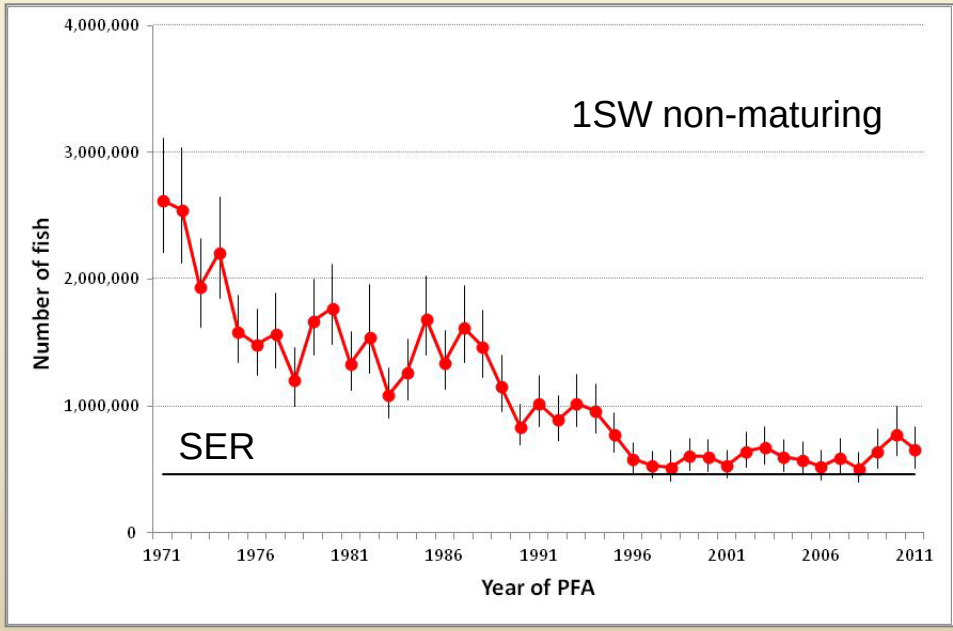




Status of Stocks - Trends in PFA for Southern NEAC

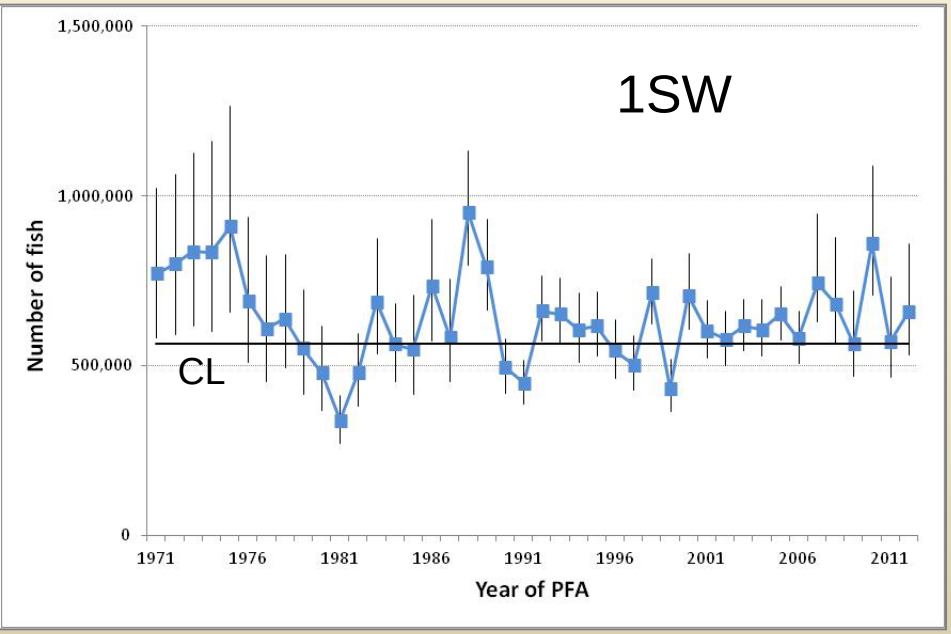
- Maturing 1SW stock at full reproductive capacity over most of the time period; first assessed as at risk of suffering reduced reproductive capacity in 2009
- Non-maturing 1SW stock has been at full reproductive capacity before 1996 but at risk of suffering reduced reproductive capacity in the majority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

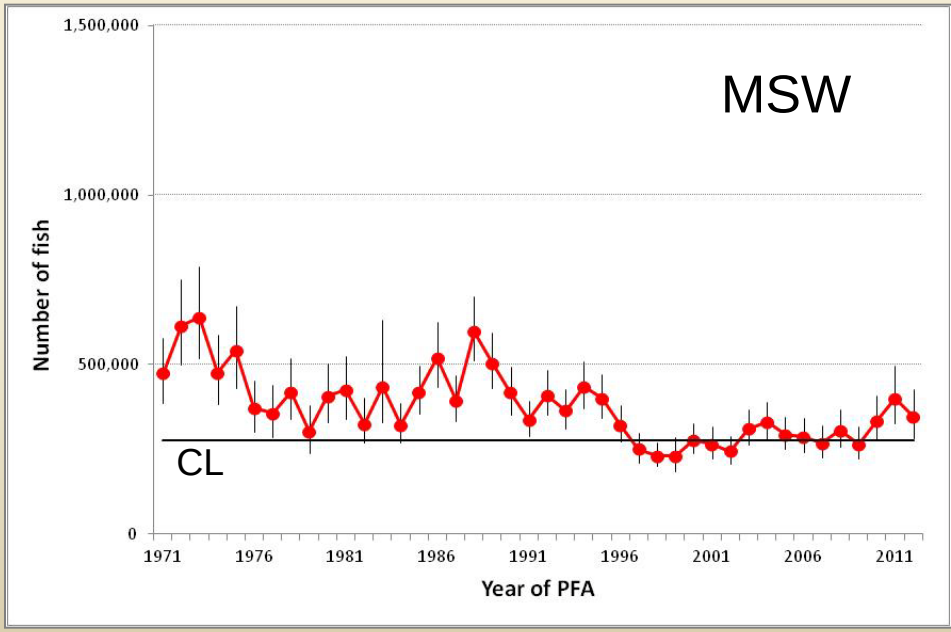




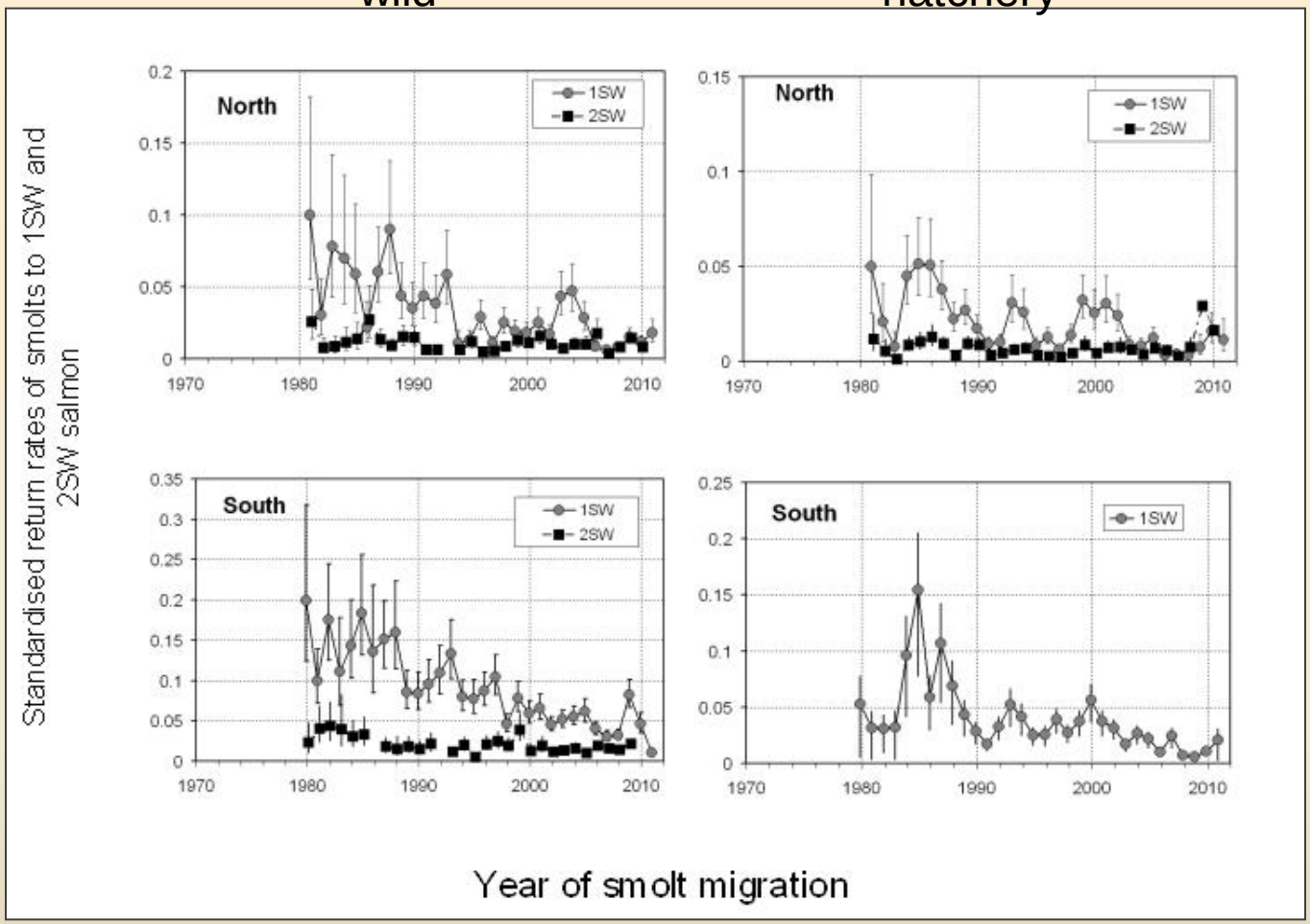
Status of Stocks - Trends in Spawners for Southern NEAC

- 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
- 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



- General decline in marine survival
- 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

Further develop a risk-based framework

Further develop a risk-based framework for the provision of catch advice for the Faroese salmon fishery reporting on the implications of selecting different numbers of management units *

** Advise on:*

- *The limitations for defining management units smaller than the current NEAC stock complexes (i.e. >4)*
- *The implications of applying probabilities of achieving CLs to separate management units versus the use of simultaneous probabilities*
- *The choice of risk levels for achieving management objectives*

Risk-based management

Single stock (HW) fisheries

- NASCO guidance that management should be based on CLs
- There should be a high probability of meeting or exceeding CLs
- Probability threshold frequently set at 75%

Mixed stock fisheries (MSFs) - homewater

- NASCO guidance that homewater MSFs should be managed in the same way
- MSF should not operate if one or more exploited stocks not expected to achieve the MO (e.g. has less that 75% prob. of achieving CL)
- This is guaranteed if harvest limited to surplus for weakest stock (assumes total catch from that stock)
- Larger harvest possible if variability in stock composition of catch taken into account
- Risks also affected by other factors (e.g. number of stocks, large variations in stock size or stock status)

Risk-based management

Mixed stock fisheries (MSFs) – distant water

- Exploit >1000 stocks
- If management was based on homewater principles, there would be a negligible probability of all stocks achieving their MOs at same time ….. …..so a minimal chance of a fishery operating
- NASCO has agreed on the use of stock complexes as appropriate management units (MUs) (sum of 100s of stocks)
- Result – fishery can operate if some stocks below CL ..... ….. if shortfall in weak stocks balanced by excess in healthy stocks
- So, excess in one large stock can mask shortfall in several small stocks (and *vice versa*)
- As a result, ICES proposes a high (95%) risk level for these fisheries
- Risk to individual stocks depends on:
  - Management objective
  - Level of harvest or exploitation rate
  - No. of stocks in MU
  - Relative status of stocks (e.g. large v. small)

Risk-based management

MSF at W. Greenland

- Risk mitigated by:

1. Share allocation
   - WG takes only 40% of surplus
   - Harvest of balance can be targeted at healthy stocks in homewaters (or foregone)
2. Requirement for >75% prob. of attainment of MOs in all MUs <u>simultaneously</u>
   - for 6 MUs this is broadly equivalent to requiring ~95% prob. of each MU achieving its MO (if all equal)
   - but also possible for one MU to be at 75% probability if all others at 100%

Risk-based management

Implications for Faroes MSF

- Assuming fishery operates under a TAC, the risks to individual stocks will be affected by:
  1. Number (and nature) of river stocks in each stock complex
  2. Probability set for attaining CL/SER for the stock complex
  3. Choice of simultaneous or independent probability of attaining CL/SER
  4. Share allocation

Implications for Faroes MSF

Number of river stocks per Management Unit (MU)

- Number of rivers / fish per MU previously considered by ICES (2010):
  - 6 NAC MUs have average CLs of ~25k
  - 4 NEAC MUs have CLs of 130k to 570k
- ICES has previously recommended that the NEAC catch advice should be based on more MUs than the 4 used at present
- ICES has proposed a method to estimate the stock composition at country level based on historic tagging data and PFA estimates – provides best approximation. Not appropriate for defining MUs smaller than this.
- Ongoing genetic analyses may provide additional data, but not expected to identify smaller MUs
- ICES has provided catch option tables for the 4 stock complexes and for the 10 NEAC countries by sea-age (i.e. 20 MUs)

Simultaneous v independent attainment of CL/SER

Probability of attaining CL/SER

Simultaneous attainment (SA) - must meet agreed probability (e.g. 75%) for all MUs simultaneously

- Some individual MUs can fall below independent attainment (e.g. 95%) if others higher
- No fishery if any one MU has less than 75% probability of meeting CL

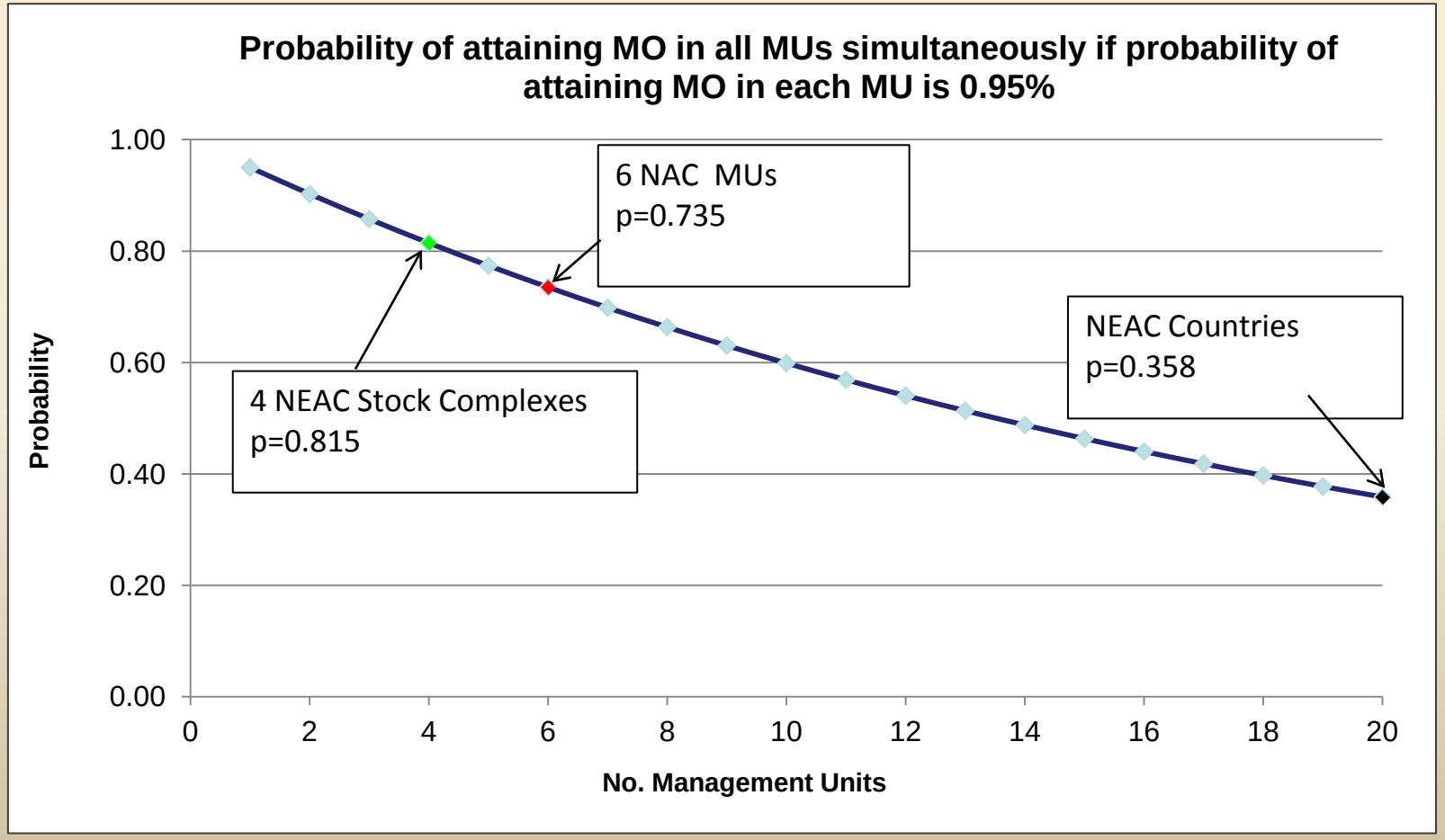
Independent attainment (IA) - all MUs must be over agreed probability limit (e.g. 95%)

- No fishery if <u>any</u> MU less than limit

N.B. For W. Greenland, 75% probability of simultaneous attainment is broadly equivalent to ~95% probability of independent attainment

Implications for Faroes MSF

- For Faroes, with 20 MUs, 95% probability of independent attainment would equate to a low probability of simultaneous attainment (~36%)
- So, with a simultaneous attainment approach, one MU could be at ~36% probability if all others at 100%



Risk-based framework - conclusions

- ICES considers it would be informative to provide managers with catch option tables for the 10 NEAC countries and the 4 stock complexes as a basis for management decisions for the Faroes fishery.
- As these management units (MUs) each encompass a large number of individual river stocks, choosing a high probability level of attaining CLs in individual MUs would be less risky than the use of a lower probability of simultaneous attainment.
- ICES recommends that management decisions should be based principally on a 95% probability of attainment of CLs in each MU individually.
- The simultaneous probability may still be used as a guide, but managers should be aware that this probability will be quite low when large numbers of MUs are used.

Risk-based framework - other issues

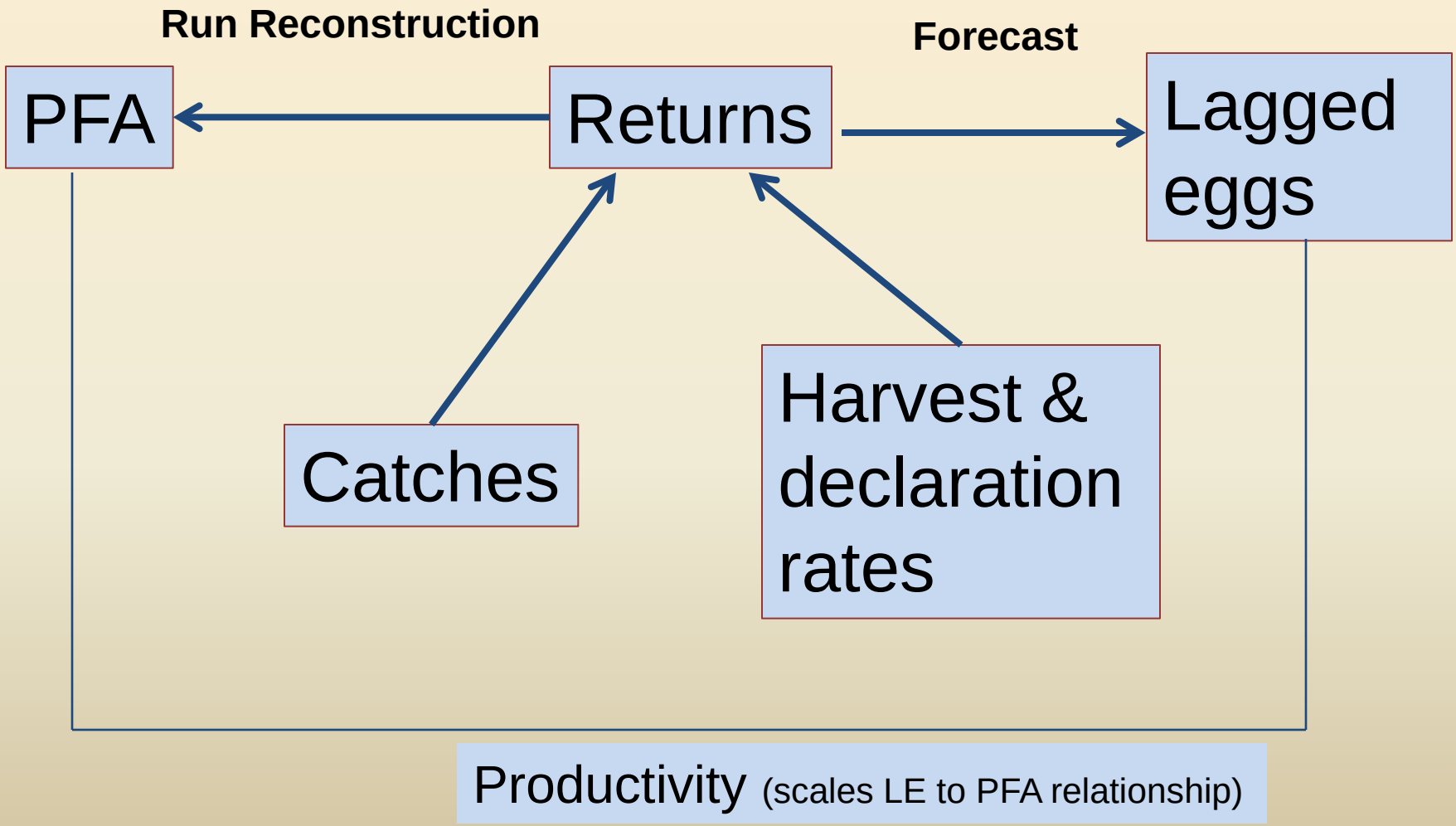
ICES (2011, 2012) has previously indicated that the following issues also require decisions by managers as a basis for formal catch advice:

- **Fishing season** - ICES (2011) recommended managing on season operating from October to June. Current catch advice in line with this.
- **Share arrangement** – Following responses from NEAC, ICES (2012) used the baseline period of 1984–1988 with which to calculate the share allocation. This value (8.4%) continues to be applied.

A decision by managers is required on all aspects of the proposed risk framework

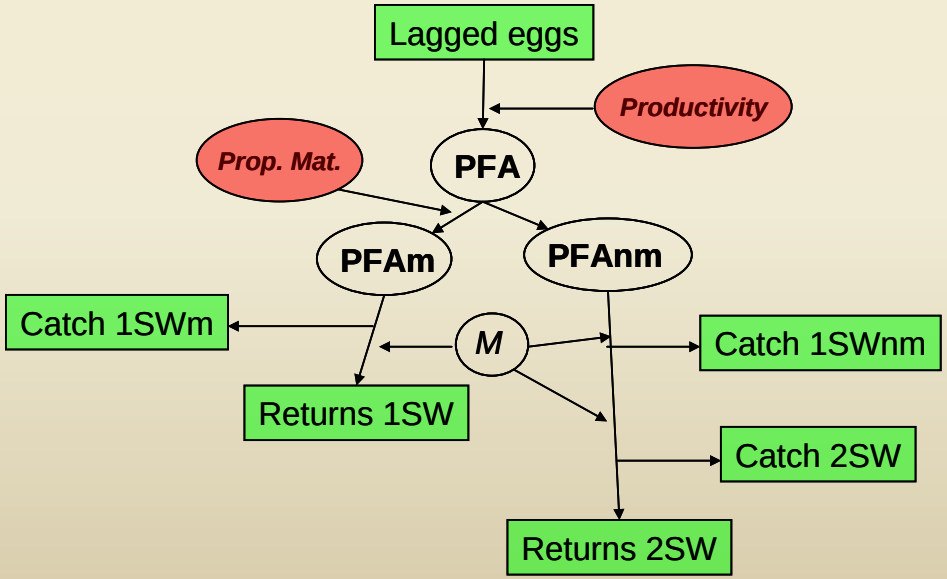
Catch options & management advice

Provide catch options or alternative management advice for 2013-2016
- Forecast Model



Provide catch options or alternative management advice for 2013-2016 - Forecast Model

- Combined sea age models for Southern and Northern NEAC
- Maturing PFA (PFAm) and the non maturing PFA (PFAnm) are modelled together simultaneously
- Same approach now used at country level

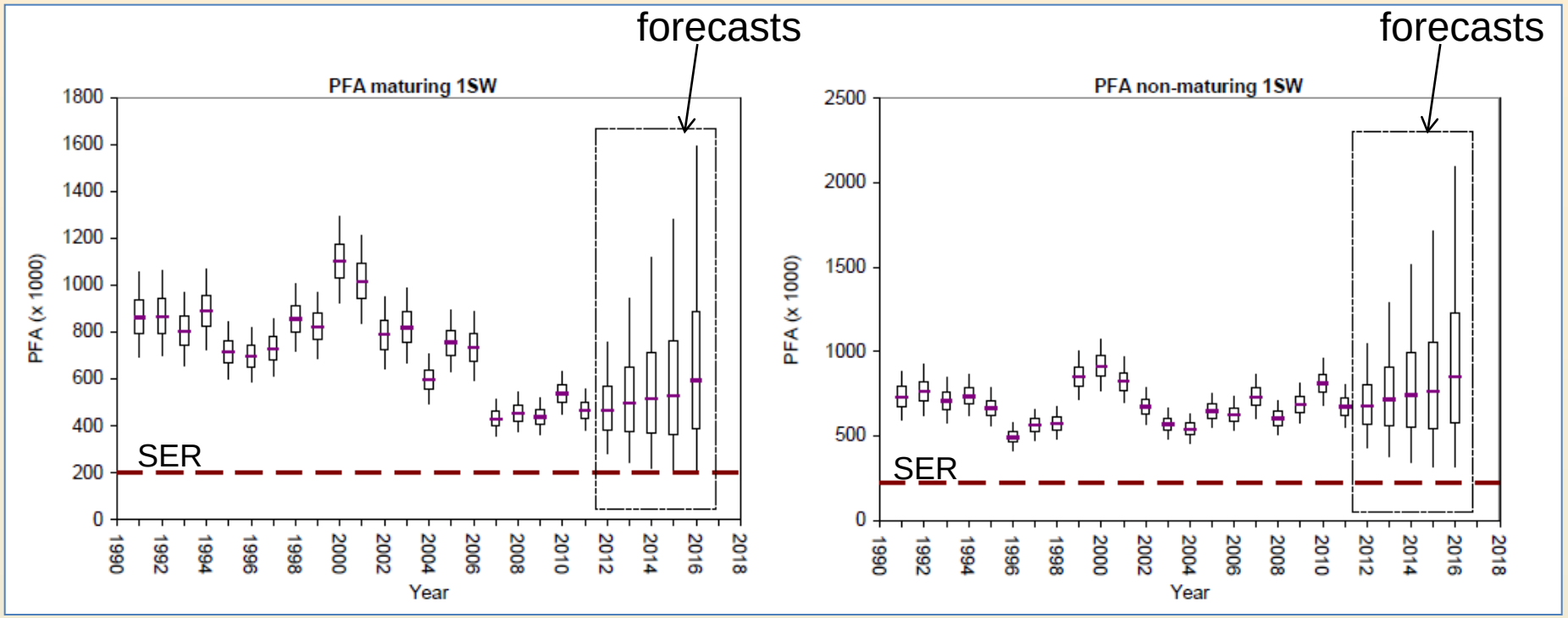


$PFA_y = LE_y * e^{\alpha_y}$

$PFA.m_y = PFA_y * p.Mat_y$

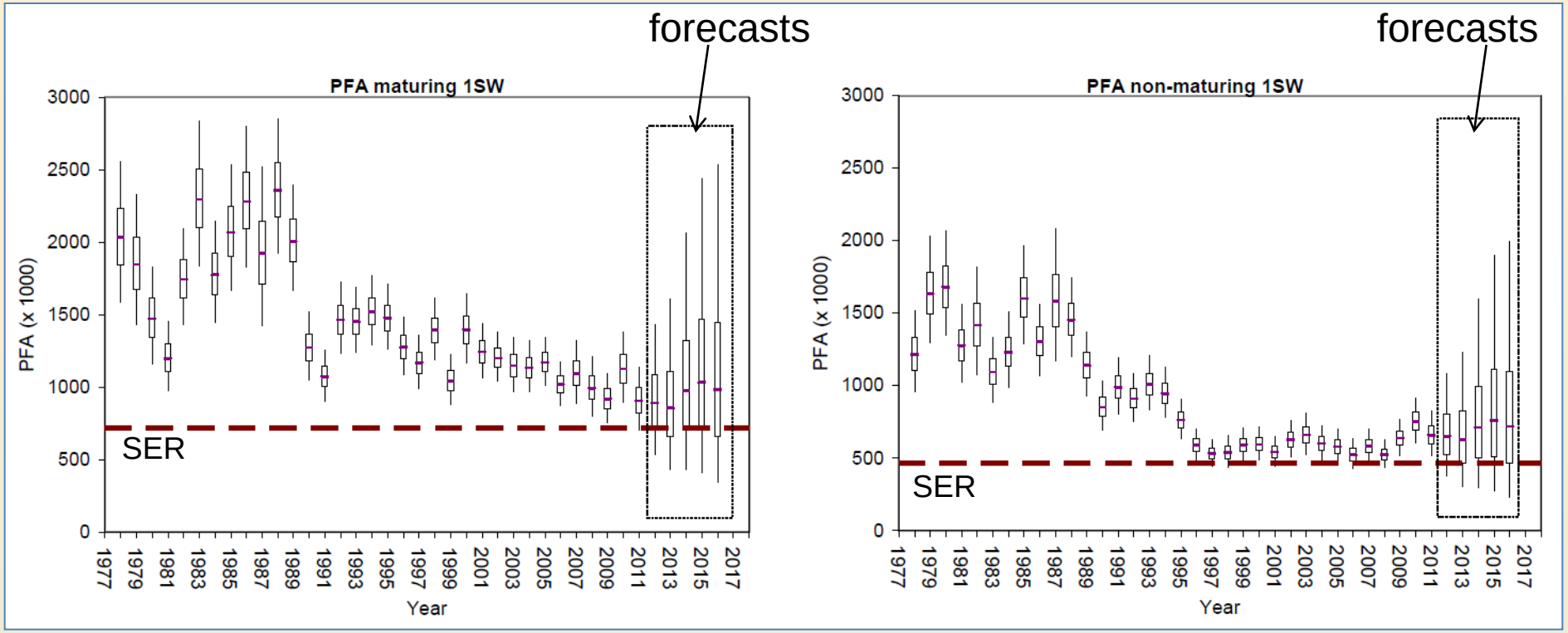
$PFA.nm_y = PFA_y * (1\text{-}p.Mat_y)$

Northern NEAC PFA Forecast



- Decline in PFA for maturing 1SW – 2011 value among lowest in time series. Non-maturing PFA relatively stable
- 2012 forecasts are predicted to be equal to 2011 values, with subsequent small increases predicted for 2013 to 2016; uncertainties increase as forecast years progress
- Relatively high probabilities of meeting SERs

Southern NEAC PFA Forecast



- Declines in PFA for both maturing and non-maturing fish; 2011 values among lowest in time series
- Little change in forecasts – small increase predicted in last 3 forecast years, but uncertainties increase as forecast years progress and low probabilities of meeting SERs

Probabilities of meeting SERs

Southern NEAC - Probabilities of forecast PFA for 1SW maturing and 1SW non-maturing being above SERs for the PFA years 2012 to 2016 range from 70% - 85%

Northern NEAC - Probabilities of forecast PFA for 1SW maturing and 1SW non-maturing fish being above SERs for the PFA years 2012 to 2016 range from 95% - 100%

Southern NEAC

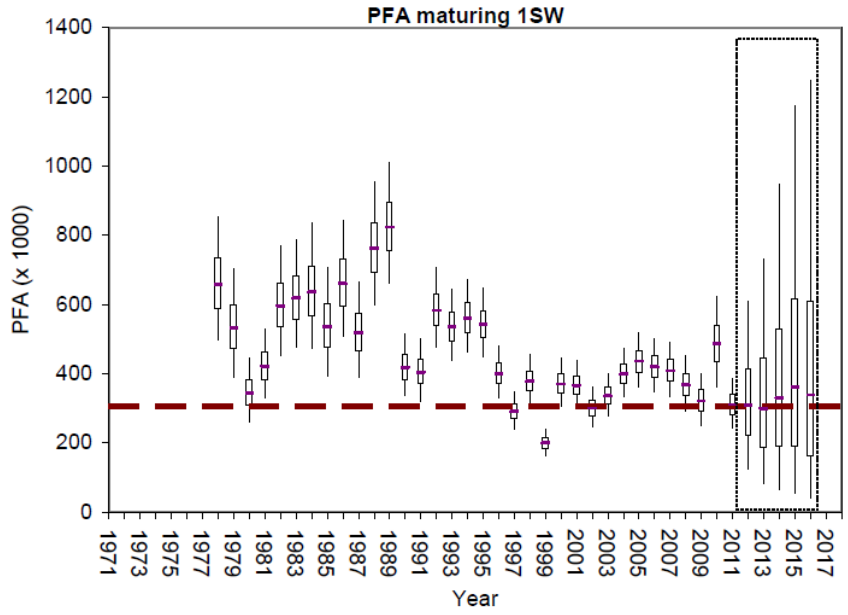
	1SW Maturing	1SW Non-maturing
SER	715,358	463,566
PFA Year	Probability of PFA meeting or exceeding SER	
2012	0.767	0.853
2013	0.673	0.756
2014	0.743	0.795
2015	0.753	0.797
2016	0.701	0.749

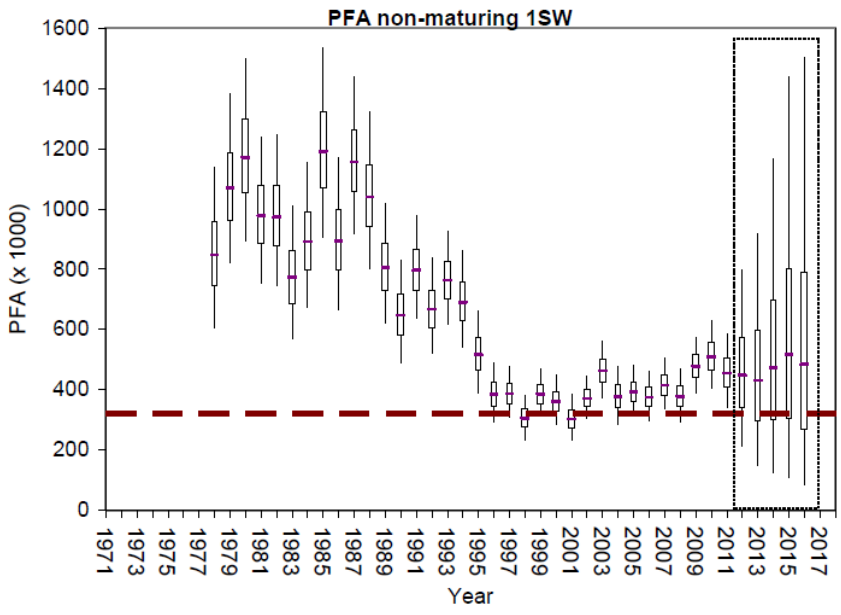
Northern NEAC

	1SW Maturing	1SW Non-maturing
SER	201,014	222,888
PFA Year	Probability of PFA meeting or exceeding SER	
2012	0.995	1.000
2013	0.979	0.998
2014	0.962	0.992
2015	0.946	0.985
2016	0.946	0.983

Country PFA Forecasts - example

UK (Scotland)





Probability that PFAs will be greater than or equal to country and age specific SERs			
		Maturing	Non-maturing
UK (Scotland)	SER	305,206	320,577
Year		*p*	*p*
2012		0.507	0.790
2013		0.485	0.706
2014		0.541	0.718
2015		0.573	0.729
2016		0.543	0.685

Applying the risk-based framework

Assumptions

- no fishery operated in 2012/13
- TAC allocated to Faroes is the same each year and taken in full
- homewater fisheries also take their full catch allocation

Input data for catch at Faroes required for assessment

- mean weights
- proportion by sea-age
- discard rates
- proportion of fish farm escapees
- composition of catches by management unit
- proportion of non-maturing 1SW fish

In most cases the only data available to estimate these parameters comes from sampling programmes conducted at Faroes in the 1980s and 1990s

Modelling procedure

➢ Attainment of the management objective is assessed by determining (for each age group / MU) the probability that:

PFA – harvest – SER is greater than zero

Faroes Catch Options

Northern NEAC stock complexes
Have a high probability (>95%) of achieving their CLs for TACs at Faroes of up to ~60t in 2013/14 season and up to ~40t in 2014/15 and 2015/16

Southern NEAC stock complexes
All have less than 95% probability of achieving their CLs in each year and at every TAC option

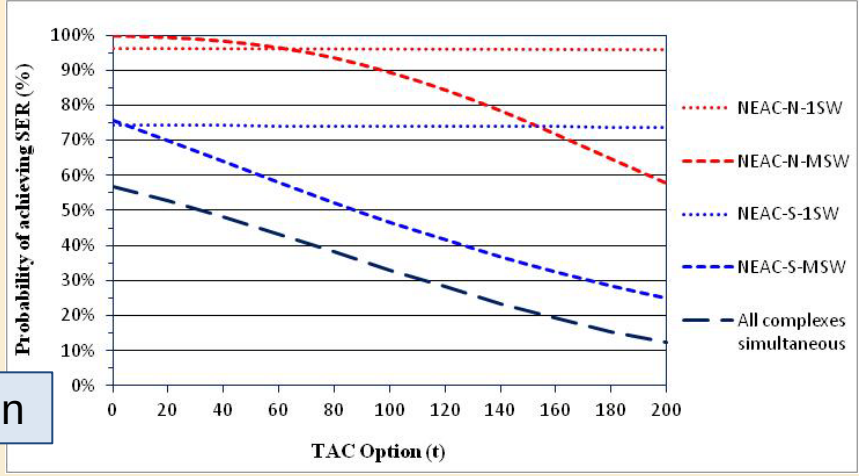
There are therefore no catch options that ensure a greater than 95% probability of each stock complex achieving its CL, and none that gives a greater than 60% probability of simultaneous attainment of all CLs in all stock complexes.

Catch options for 2013/14 season:	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW	All complexes simultaneous
	0	96%	100%	74%	76%	57%
	20	96%	99%	74%	70%	53%
	40	96%	98%	74%	64%	48%
	60	96%	96%	74%	58%	43%
	80	96%	93%	74%	52%	38%
	100	96%	89%	74%	47%	33%
	120	96%	84%	74%	42%	28%
	140	96%	78%	74%	37%	23%
	160	96%	72%	74%	32%	19%
	180	96%	65%	74%	28%	15%
	200	96%	58%	74%	25%	12%
Catch options for 2014/15 season:	**TAC option (t)**	**NEAC-N-1SW**	**NEAC-N-MSW**	**NEAC-S-1SW**	**NEAC-S-MSW**	**All complexes simultaneous**
	0	95%	99%	75%	80%	59%
	20	95%	98%	75%	75%	56%
	40	95%	97%	75%	71%	52%
	60	94%	94%	75%	66%	48%
	80	94%	91%	75%	62%	44%
	100	94%	87%	75%	57%	39%
	120	94%	82%	75%	53%	34%
	140	94%	77%	75%	49%	30%
	160	94%	71%	75%	45%	26%
	180	94%	66%	75%	41%	22%
	200	94%	60%	75%	38%	19%
Catch options for 2015/16 season:	**TAC option (t)**	**NEAC-N-1SW**	**NEAC-N-MSW**	**NEAC-S-1SW**	**NEAC-S-MSW**	**All complexes simultaneous**
	0	95%	99%	70%	80%	55%
	20	95%	97%	70%	76%	52%
	40	95%	95%	70%	72%	49%
	60	94%	92%	70%	68%	46%
	80	94%	89%	70%	65%	42%
	100	94%	85%	70%	61%	38%
	120	94%	81%	70%	57%	34%
	140	94%	76%	70%	53%	30%
	160	94%	71%	70%	50%	27%
	180	94%	65%	70%	47%	23%
	200	94%	60%	70%	44%	20%

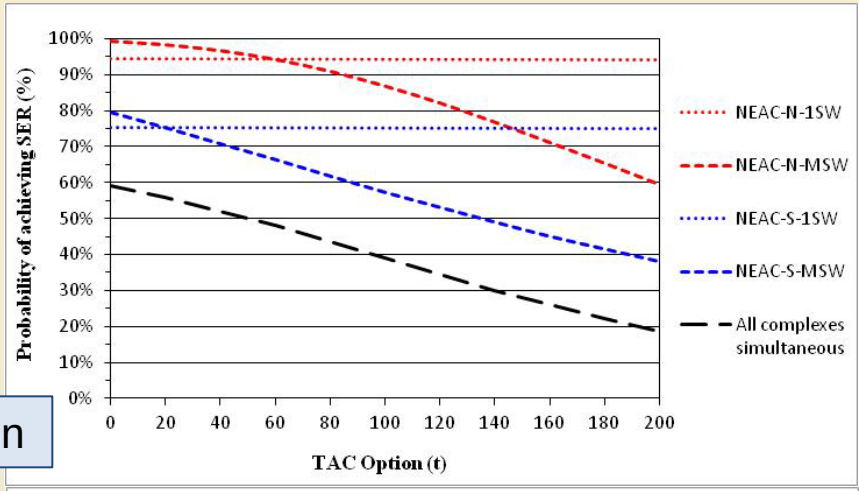
Faroes Catch Options

- Flatness of risk curves for 1SW stocks indicates risk to these MUs is affected very little by harvest at Faroes, mostly because the exploitation rate on these stock components is very low in the fishery.

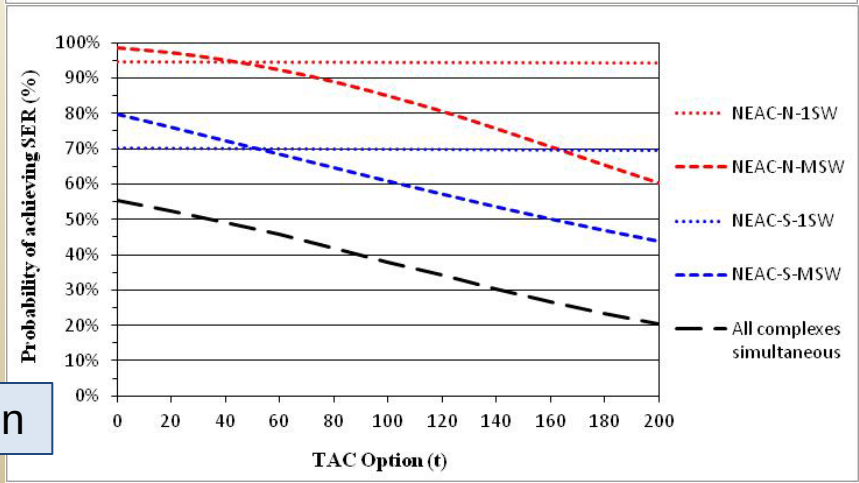
2013/14 season



2014/15 season



2015/16 season



Exploitation rates (at Faroes)

Exploitation rates
Values for Faroes only (i.e. taking account of share allocation). Total exploitation rate (assuming full exploitation of homewater allocation) would be ~12x higher

➢ Exploitation rate on maturing 1SW fish is very low

Catch options for 2013/14 season:	TAC option (t)	NEAC-N-1SW	NEAC-N-MSW	NEAC-S-1SW	NEAC-S-MSW
	0	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.3%	0.0%	0.3%
	40	0.0%	0.6%	0.0%	0.5%
	60	0.0%	0.9%	0.0%	0.8%
	80	0.0%	1.2%	0.0%	1.0%
	100	0.1%	1.5%	0.0%	1.3%
	120	0.1%	1.8%	0.0%	1.5%
	140	0.1%	2.1%	0.0%	1.8%
	160	0.1%	2.4%	0.0%	2.0%
	180	0.1%	2.8%	0.1%	2.3%
	200	0.1%	3.1%	0.1%	2.6%
Catch options for 2014/15 season:	**TAC option (t)**	**NEAC-N-1SW**	**NEAC-N-MSW**	**NEAC-S-1SW**	**NEAC-S-MSW**
	0	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.3%	0.0%	0.2%
	40	0.0%	0.6%	0.0%	0.5%
	60	0.0%	0.9%	0.0%	0.7%
	80	0.0%	1.2%	0.0%	0.9%
	100	0.0%	1.5%	0.0%	1.2%
	120	0.1%	1.7%	0.0%	1.4%
	140	0.1%	2.0%	0.0%	1.6%
	160	0.1%	2.3%	0.0%	1.9%
	180	0.1%	2.6%	0.0%	2.1%
	200	0.1%	2.9%	0.1%	2.3%
Catch options for 2015/16 season:	**TAC option (t)**	**NEAC-N-1SW**	**NEAC-N-MSW**	**NEAC-S-1SW**	**NEAC-S-MSW**
	0	0.0%	0.0%	0.0%	0.0%
	20	0.0%	0.3%	0.0%	0.2%
	40	0.0%	0.5%	0.0%	0.5%
	60	0.0%	0.8%	0.0%	0.7%
	80	0.0%	1.0%	0.0%	0.9%
	100	0.0%	1.3%	0.0%	1.2%
	120	0.1%	1.5%	0.0%	1.4%
	140	0.1%	1.8%	0.0%	1.7%
	160	0.1%	2.0%	0.0%	1.9%
	180	0.1%	2.3%	0.0%	2.1%
	200	0.1%	2.5%	0.1%	2.4%

Catch Options by NEAC country (MSW)

- Only 3 countries have a high probability (>95%) of achieving their MSW CLs with TAC options at Faroes
- Probabilities of achieving MSW CLs in 2013/14 vary between 27% & 100%
- Probabilities decrease for increasing TAC options at Faroes.
- Probability of simultaneous attainment in all 10 countries is <6% in every year.

Catch options for 2013/14 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MUs simultaneous
	0	78%	81%	99%	100%	100%	72%	88%	27%	85%	57%	5.1%
	20	69%	77%	98%	100%	100%	67%	82%	26%	83%	55%	3.4%
	40	60%	73%	96%	99%	100%	63%	77%	25%	82%	54%	2.3%
	60	51%	69%	94%	98%	99%	59%	73%	24%	81%	52%	1.4%
	80	43%	65%	92%	97%	99%	55%	68%	23%	80%	51%	0.9%
	100	36%	62%	89%	96%	98%	51%	64%	22%	78%	49%	0.5%
	120	30%	59%	87%	95%	97%	47%	61%	22%	77%	48%	0.4%
	140	25%	56%	83%	93%	96%	44%	57%	21%	75%	47%	0.3%
	160	20%	53%	80%	92%	95%	40%	55%	20%	74%	45%	0.1%
	180	17%	51%	77%	90%	94%	37%	52%	19%	73%	44%	0.1%
	200	14%	48%	73%	88%	92%	34%	49%	19%	71%	43%	0.1%

Catch options for 2014/15 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MUs simultaneous
	0	75%	69%	98%	100%	100%	73%	87%	29%	82%	52%	3.9%
	20	66%	64%	97%	99%	100%	69%	82%	28%	81%	50%	2.6%
	40	58%	60%	96%	98%	100%	66%	78%	27%	80%	49%	1.8%
	60	50%	56%	94%	97%	99%	62%	74%	26%	78%	47%	1.2%
	80	43%	53%	92%	96%	99%	59%	70%	25%	77%	46%	0.8%
	100	37%	49%	90%	95%	98%	56%	67%	24%	76%	45%	0.5%
	120	32%	46%	87%	93%	97%	52%	64%	24%	75%	44%	0.4%
	140	27%	44%	84%	92%	96%	49%	62%	23%	73%	43%	0.2%
	160	23%	41%	82%	90%	95%	46%	59%	22%	72%	41%	0.2%
	180	20%	39%	79%	88%	94%	44%	57%	22%	71%	40%	0.1%
	200	16%	37%	76%	87%	92%	41%	55%	21%	70%	39%	0.0%

Catch options for 2015/16 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MUs simultaneous
	0	75%	68%	98%	100%	100%	69%	88%	30%	75%	50%	3.2%
	20	68%	64%	97%	99%	100%	65%	84%	29%	74%	48%	2.2%
	40	61%	60%	96%	98%	100%	62%	80%	28%	72%	47%	1.5%
	60	54%	57%	94%	97%	99%	59%	76%	27%	71%	46%	1.0%
	80	48%	54%	92%	96%	99%	55%	74%	26%	70%	45%	0.7%
	100	42%	51%	90%	95%	98%	52%	71%	26%	68%	44%	0.5%
	120	37%	48%	88%	93%	97%	49%	69%	25%	67%	42%	0.4%
	140	32%	46%	86%	92%	96%	46%	66%	24%	66%	41%	0.2%
	160	28%	43%	84%	90%	95%	44%	64%	24%	64%	41%	0.2%
	180	25%	41%	82%	89%	94%	41%	62%	23%	63%	40%	0.1%
	200	22%	39%	80%	87%	92%	39%	61%	22%	62%	39%	0.1%

Catch Options by NEAC country (1SW)

- Only 1 country has a high probability (>95%) of achieving 1SW CLs with TAC options at Faroes
- Probabilities of achieving 1SW CLs in 2013/14 vary between 28% & 98%
- Probabilities are hardly affected by increasing TAC options at Faroes (due to low expl. rate).
- Probability of simultaneous attainment in all 10 countries is <2% in every year.

Catch options for 2013/14 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MUs simultaneous
	0	87%	85%	90%	98%	75%	54%	50%	56%	58%	28%	1.3%
	20	87%	85%	90%	98%	75%	54%	50%	56%	58%	28%	1.3%
	40	87%	85%	89%	98%	75%	54%	50%	56%	58%	28%	1.3%
	60	86%	85%	89%	98%	75%	54%	50%	56%	58%	28%	1.3%
	80	86%	84%	89%	98%	75%	54%	50%	56%	58%	28%	1.3%
	100	86%	84%	89%	97%	75%	54%	50%	56%	58%	28%	1.3%
	120	86%	84%	89%	97%	75%	54%	50%	56%	58%	28%	1.3%
	140	86%	84%	89%	97%	75%	54%	50%	56%	58%	28%	1.3%
	160	86%	84%	89%	97%	75%	54%	50%	56%	58%	28%	1.3%
	180	86%	84%	89%	97%	75%	54%	50%	56%	58%	28%	1.2%
	200	86%	84%	89%	97%	75%	54%	49%	56%	58%	28%	1.2%

Catch options for 2014/15 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MUs simultaneous
	0	83%	74%	89%	97%	75%	58%	55%	53%	58%	26%	1.2%
	20	83%	74%	89%	97%	75%	57%	55%	53%	58%	26%	1.2%
	40	83%	74%	89%	97%	75%	57%	55%	53%	58%	26%	1.1%
	60	83%	74%	89%	96%	75%	57%	55%	53%	58%	26%	1.1%
	80	83%	74%	89%	96%	75%	57%	55%	53%	58%	26%	1.1%
	100	83%	74%	89%	96%	75%	57%	55%	53%	58%	26%	1.1%
	120	83%	73%	89%	96%	75%	57%	55%	53%	58%	26%	1.1%
	140	83%	73%	89%	96%	75%	57%	55%	53%	58%	26%	1.1%
	160	83%	73%	89%	96%	75%	57%	55%	53%	58%	26%	1.1%
	180	83%	73%	89%	96%	75%	57%	54%	53%	58%	26%	1.1%
	200	83%	73%	89%	96%	75%	57%	54%	53%	58%	26%	1.1%

Catch options for 2015/16 season:	TAC option (t)	Russia	Finland	Norway	Sweden	Iceland	Scotland	N. Ireland	Ireland	England & Wales	France	All MUs simultaneous
	0	83%	73%	90%	96%	75%	55%	61%	52%	51%	26%	1.1%
	20	83%	73%	90%	96%	75%	54%	61%	52%	51%	26%	1.0%
	40	83%	73%	90%	96%	75%	54%	61%	52%	51%	26%	1.0%
	60	83%	73%	90%	96%	75%	54%	61%	52%	51%	26%	1.0%
	80	83%	72%	90%	96%	75%	54%	61%	52%	51%	26%	1.0%
	100	83%	72%	89%	96%	75%	54%	61%	52%	51%	26%	1.0%
	120	83%	72%	89%	96%	75%	54%	61%	52%	51%	26%	1.0%
	140	83%	72%	89%	96%	75%	54%	61%	52%	51%	26%	1.0%
	160	83%	72%	89%	96%	75%	54%	61%	52%	51%	26%	1.0%
	180	83%	72%	89%	96%	75%	54%	61%	52%	51%	26%	1.0%
	200	83%	72%	89%	95%	75%	54%	61%	52%	51%	26%	1.0%

Catch Advice

- There are no catch options for the Faroes fishery that would allow all stock complexes to achieve their CLs with a greater than 95% probability in any of the seasons 2013/14 to 2015/16.
- In the absence of specific management objectives, ICES advises that there are no mixed stock fishery options on the NEAC stock complexes at Faroes in 2013 to 2016.
- The results from the assessment conducted by ICES in 2013 based on smaller management units (countries) are in line with this advice.
- While stocks remain in a depleted state and in the absence of a fishery at Faroes, particular care should be taken to ensure that fisheries in homewaters are managed to protect stocks that are below their CLs.

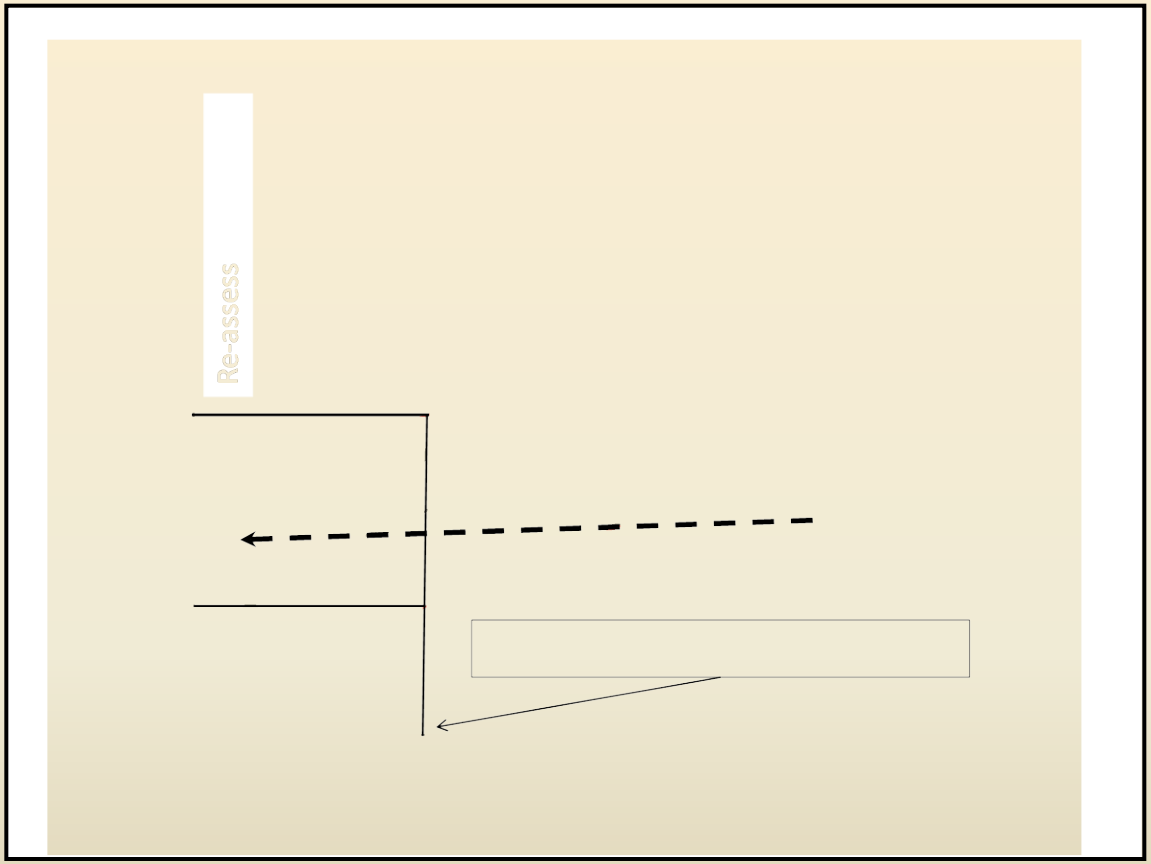
Framework of Indicators

NASCO has asked ICES to update the Framework of Indicators used to identify any significant change in the previously provided multi-annual management advice

- A Framework of Indicators (FWI) was developed by ICES in 2012 in support of developing multi-year catch advice for the Faroes fishery.
- Multi-year regulatory measures approved for Faroes by NASCO in 2012, and FWI was applied in Jan 2013 to evaluate the appropriateness of the 2013/2014 advice.
- Status of stocks should be re-evaluated if the FWI suggests that the PFA estimates are deviating substantially from the median values from the forecast (i.e. both over- and under- estimates).
- FWI indicated that the abundance (PFA) of one of the stock components (Southern NEAC MSW fish) had been over estimated and a full reassessment was triggered in 2013.

NEAC Framework of Indicators

- Values of indicator (e.g. counts) are plotted against the PFA (median)
- Predicted confidence intervals (75%) shown in red
- Based on forecast PFA in the year in question (e.g. 2013), the values of the indicator corresponding to the upper and lower 75% confidence interval are estimated
- If the realised indicator value falls outside these limits, a reassessment is suggested by this indicator



NEAC FWI

- Apply a binary score to each indicator value
- If the current year's value is outside the 75% CIs (below or above) then that indicator receives a score of 1. If the indicator is within the 75% CI, it receives a score of -1 [Zero if no data]
- Indicator values above or below the upper and lower CI values summed in separate columns for each stock complex
- **Previously, either an over- or under- estimate of forecast PFA triggers a reassessment**

FWI NEAC 2013 — Indicators suggest: **REASSESS**

Indicators for Northern NEAC 1SW PFA

	Insert data from 2012 here	N reg	Slope	Intercept	r^2	Median PFA	12.5%ile	87.5%ile	Reassess in year 2013? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% confidence limits below	Outside 75% confidence limits above
1 Returns all 1SW NO PFA est	218000	23	0.536108	-73170.20	0.91	577600	194219.71	278751.74	-1	-1	NO	NO
2 Survivals W 1SW NO Imsa	4.4	28	0.000012	-4.14	0.42	577600	-1.59	7.56	-1	-1	NO	NO
3 Survivals H 1SW NO Imsa	1.8	29	0.000006	-1.11	0.26	577600	-0.75	5.47	-1	-1	NO	NO
4 Counts all NO Øyensåa (1SW)	1500	13	0.002703	256.13	0.33	577600	708.37	2926.92	-1	-1	NO	NO
5 Counts all NO Nausta (1SW)	2039	14	0.002486	-490.54	0.39	577600	2.84	1888.12	-1	1	NO	YES
							Sum of scores		-5	-3		
											Indicators do not suggest that the PFA forecast is an overestimation.	Indicators do not suggest that the PFA forecast is an underestimation.

Indicators for Northern NEAC MSW PFA

	Insert data from 2012 here	N reg	Slope	Intercept	r^2	Median PFA	12.5%ile	87.5%ile	Reassess in year 2013? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% conf.lim. below	Outside 75% conf.lim. above
1 PFA-MSW-CoastNorway	291000	23	0.344433	-12251.11	0.71	827300	241156.14	304240.14	-1	-1	NO	NO
2 Orkla counts		17	0.013484	-3478.47	0.57	827300	5699.58	9654.44	0	0	Uninformative	Uninformative
3 Målselv counts	5137	21	0.003871	14.46	0.22	827300	2135.00	4299.62	-1	1	NO	YES
4 Counts all NO Nausta	2039	14	0.004249	-1647.46	0.36	827300	874.76	2861.04	-1	-1	NO	NO
							Sum of scores		-3	-1		
											Indicators do not suggest that the PFA forecast is an overestimation.	Indicators do not suggest that the PFA forecast is an underestimation.

Indicators for Southern NEAC 1SW PFA

	Insert data from 2012 here	N reg	Slope	Intercept	r^2	Median PFA	12.5%ile	87.5%ile	Reassess in year 2013? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% conf.lim. below	Outside 75% conf.lim. above
1 Ret. W 1SW UK(E&W) Itchen M	572	24	0.000330	-106.71	0.34	1187000	80.15	489.51	-1	1	NO	YES
2 Ret. W 1SW UK(E&W) Frome M	156	39	0.000497	65.49	0.31	1187000	103.51	1206.63	-1	-1	NO	NO
3 Ret. W 1SW UK(Sc.) North Esk M	7964	31	0.006129	5122.42	0.52	1187000	9092.67	15701.63	1	-1	YES	NO
4 Ret. W 1SW UK(NI) Bush M	648	18	0.004420	-2435.32	0.61	1187000	1028.93	4593.43	1	-1	YES	NO
5 Ret. Freshw 1SW UK(NI) Bush	648	37	0.000673	478.23	0.23	1187000	477.32	2078.00	-1	-1	NO	NO
							Sum of scores		-1	-3		
											Indicators do not suggest that the PFA forecast is an overestimation.	Indicators do not suggest that the PFA forecast is an underestimation.

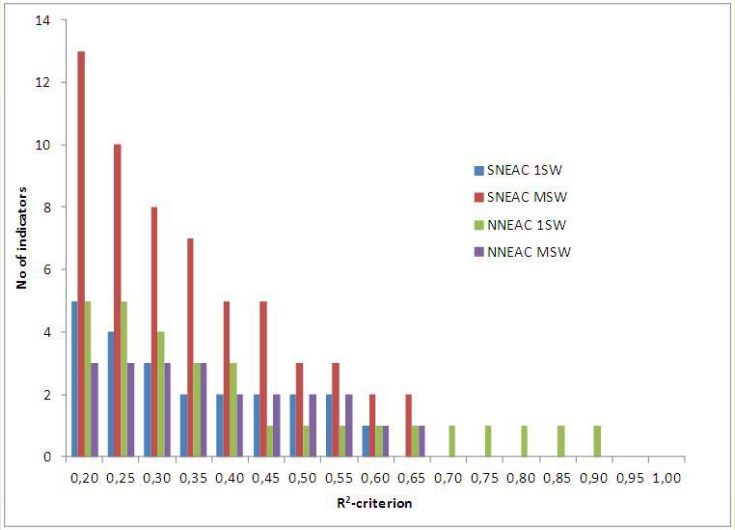
Indicators for Southern NEAC MSW PFA

	Insert data from 2012 here	N reg	Slope	Intercept	r^2	Median PFA	12.5%ile	87.5%ile	Reassess in year 2013? Outside 75% conf.lim. below	Outside 75% conf.lim. above	Outside 75% conf.lim. below	Outside 75% conf.lim. above
1 Ret. W 2SW UK(Sc.) Baddoch NM		24	0.000034	3.23	0.45	793000	16.15	43.45	0	0	Uninformative	Uninformative
2 Ret. W 2SW UK(Sc.) North Esk NM	5487	31	0.003676	4605.52	0.21	793000	4169.18	10871.97	-1	-1	NO	NO
3 Ret. W 1SW UK(Sc.) North Esk NM	7964	30	0.006340	8457.39	0.35	793000	9717.50	17251.95	1	-1	YES	NO
4 Ret. W MSW UK(E&W) Itchen NM	168	24	0.000289	-96.89	0.70	793000	63.66	201.60	-1	-1	NO	NO
5 Ret. W 1SW UK(E&W) Itchen NM	572	23	0.000426	-2.64	0.25	793000	113.40	556.46	-1	1	NO	YES
6 Ret. W MSW UK(E&W) Frome NM	156	39	0.000737	104.10	0.44	793000	166.05	1211.31	1	-1	YES	NO
7 Ret. W 1SW UK(E&W) Frome NM	156	38	0.000720	119.80	0.37	793000	160.53	1220.74	1	-1	YES	NO
8 Catch W MSW Ice Ellidaar NM	12	40	0.000092	-22.38	0.55	793000	-7.16	108.62	-1	-1	NO	NO
9 Ret. Freshw 2SW UK(NI) Bush	250	36	0.000157	41.30	0.24	793000	27.20	304.15	-1	-1	NO	NO
10 Ret. W 1SW UK(NI) Bush NM	648	18	0.005612	-802.38	0.66	793000	2008.18	5288.18	1	-1	YES	NO
11 Ret. W 1SW UK(E&W) Tamar NM	1364	14	0.009158	-1853.33	0.44	793000	4120.15	6698.35	1	-1	YES	NO
12 Count MSW UK(E&W) Lune NM	1695	15	0.003815	-1088.59	0.36	793000	1324.41	2548.60	-1	-1	NO	NO
13 Count MSW UK(E&W) Fowey NM	52	15	0.000200	-45.65	0.24	793000	69.89	155.38	1	-1	YES	NO
							Sum of scores		0	-10		
											Indicators suggest that the PFA forecast is an overestimation. REASSESS	Indicators do not suggest that the PFA forecast is an underestimation.

Not available

FWI developments in 2013

- FWI was updated - 53 possible indicator datasets were considered and 26 fulfilled the inclusion criteria:
  - 5 for Northern NEAC 1SW PFA
  - 3 for Northern NEAC MSW PFA
  - 5 for Southern NEAC 1SW PFA
  - 13 for Southern NEAC MSW PFA
- Criteria for inclusion :
  - sample size (N) ≥ 10;
  - reliable predictor ($r^2 \geq 0.2$);
  - data set updated annually; and
  - new value available by January 15



- If a stricter r^2 criterion is applied, the number of informative indicators decreases rapidly.
- The criterion of $r^2 \geq 0.2$ has therefore been retained in order to have sufficient indicators to be able to use the FWI even in the event of one or more indicators being unavailable by the time the FWI is applied each year.

FWI developments in 2013

- ICES proposes a slight change to future operation of FWI - in the event of a closed fishery, a one-tailed test should be used so that the indicators are only compared to the upper 75% confidence limit (i.e. to signal an under-estimate of forecast PFA); in the event of an open fishery a two-tailed approach would apply.

- Had this approach been used in 2012, no reassessment would have been required.

- ICES further proposes that the updated FWI is applied in January 2014 to assess whether a new assessment and multi-year catch advice will be required (updated spreadsheets have been prepared).

- If too few indicators are available to run the FWI by the agreed time, this would automatically trigger an assessment for the coming year.

Recommendations

- ICES welcomed the opportunistic assessment of the incidence of salmon by-catch in pelagic fisheries at Iceland and recommends that similar sampling should continue in order to provide further information on the by-catch of salmon in pelagic fisheries in this area.

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/2013/WGNAS/wgnas_2013.pdf

Acknowledgements

Members (20) of participating countries (11) to the Working Group on North Atlantic Salmon, 3 – 12 April, 2013

NEAC sub-group chair: Jaakko Erkinaro (Finland)