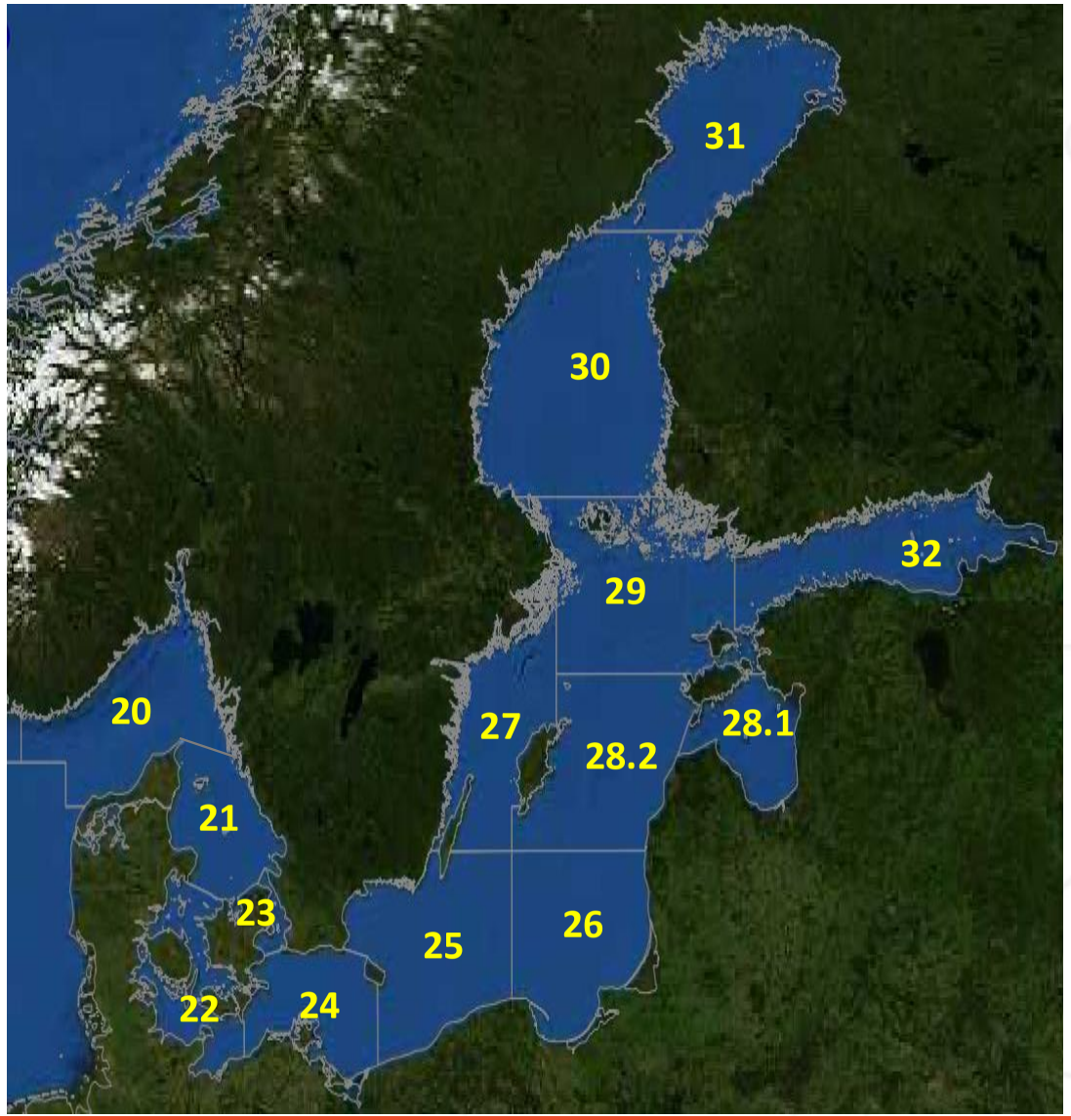
ICES advice on fishing opportunities in 2019 – Baltic Sea

Eskild Kirkegaard, ICES ACOM Chair

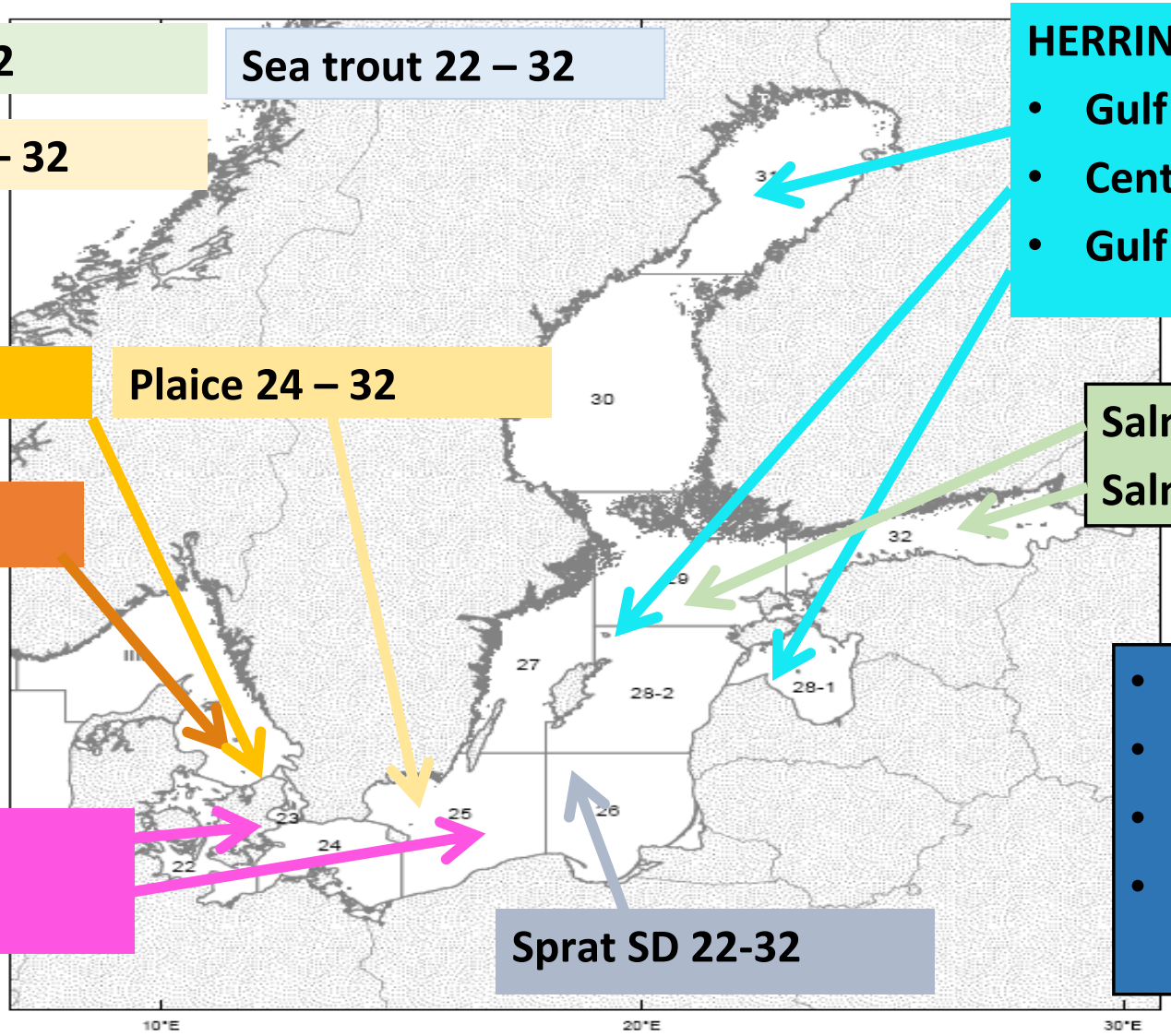
Conference on State of Fish Stocks in the Baltic Sea
Szczecin, 15th June 2018

ICES
CIEM

Science for sustainable seas



Baltic Sea Subdivisions



Stocks assessed by ICES

Rules for advice on fishing opportunities

The advice rules applied by ICES in developing advice on fishing opportunities depends on:

- **management strategies agreed by relevant management bodies and**
- **the information and knowledge available for the stock**

EU Multi Annual Plans (MPAs)

Advice on:

- status of stock and exploitation for all stocks
- advice and advice on fishing opportunities for stocks for which TACs are set.

EU Multiannual Plan for cod, herring and sprat stocks (MAP)

Stock	Target fishing mortality ranges consistent with achieving maximum sustainable yield (F_{MSY})	
	Column A (Part of the range of F_{MSY} as referred to in Article 4(2) and (3))	Column B (Part of the range of F_{MSY} as referred to in Article 4(4))
Western Baltic cod	0,15-0,26	0,26-0,45
Eastern Baltic cod	Not defined	Not defined
Central Baltic herring	0,16-0,22	0,22-0,28
Gulf of Riga herring	0,24-0,32	0,32-0,38
Bothnian Sea herring	0,11-0,15	0,15-0,18
Bothnian Bay herring	Not defined	Not defined
Western Baltic herring	0,23-0,32	0,32-0,41
Baltic sprat	0,19-0,26	0,26-0,27

Type of advice depends on whether a stock is considered a target stock in the MAP or not, and whether F ranges are defined for the stock.

a) Target stocks with F ranges and not shared with third party. Advice to be based on F range.
b) Target stocks with no range defined or shared with third party. Advice to be based agreed management plan, ICES MSY or ICES PA.
c) Non-target stocks with TAC and shared with third party. Advice to be based on agreed management plans, ICES MSY or ICES PA.
d) Non-target stocks with TAC and not shared with third party. Advice to be based on ICES PA.
e) Non-target stocks with no TAC. No advice on fishing opportunities.

Basis for advice

Stocks	Basis for catch advice	Comments
HERRING:		
• Gulf of Bothnia	ICES MSY	Target stock but no MAP for combined stock
• Central Baltic	EU MAP	Target stock
• Gulf Riga	EU MAP	Target stock
• Western Baltic, Skagerrak, Kattegat	ICES MSY	Target stock, sharred with Norway
Cod:		
• Western Stock	EU MAP	Target stock
• Eastern Stock	ICES PA	Target stock but no analytical assessment, cat 3
Sprat	EU MAP	Target stock
Salmon		
• Subdivisions 22 – 31	ICES MSY	No MAP
• Subdivision 32	ICES PA	No MAP
Plaice		
• Subdivisions 21 – 23	ICES PA	TAC non-target stock
• Subdevisions 24 - 32	ICES PA	TAC non-target stock
Other flatfish stocks	No catch advice	Non-target stocks with no TAC

F ranges

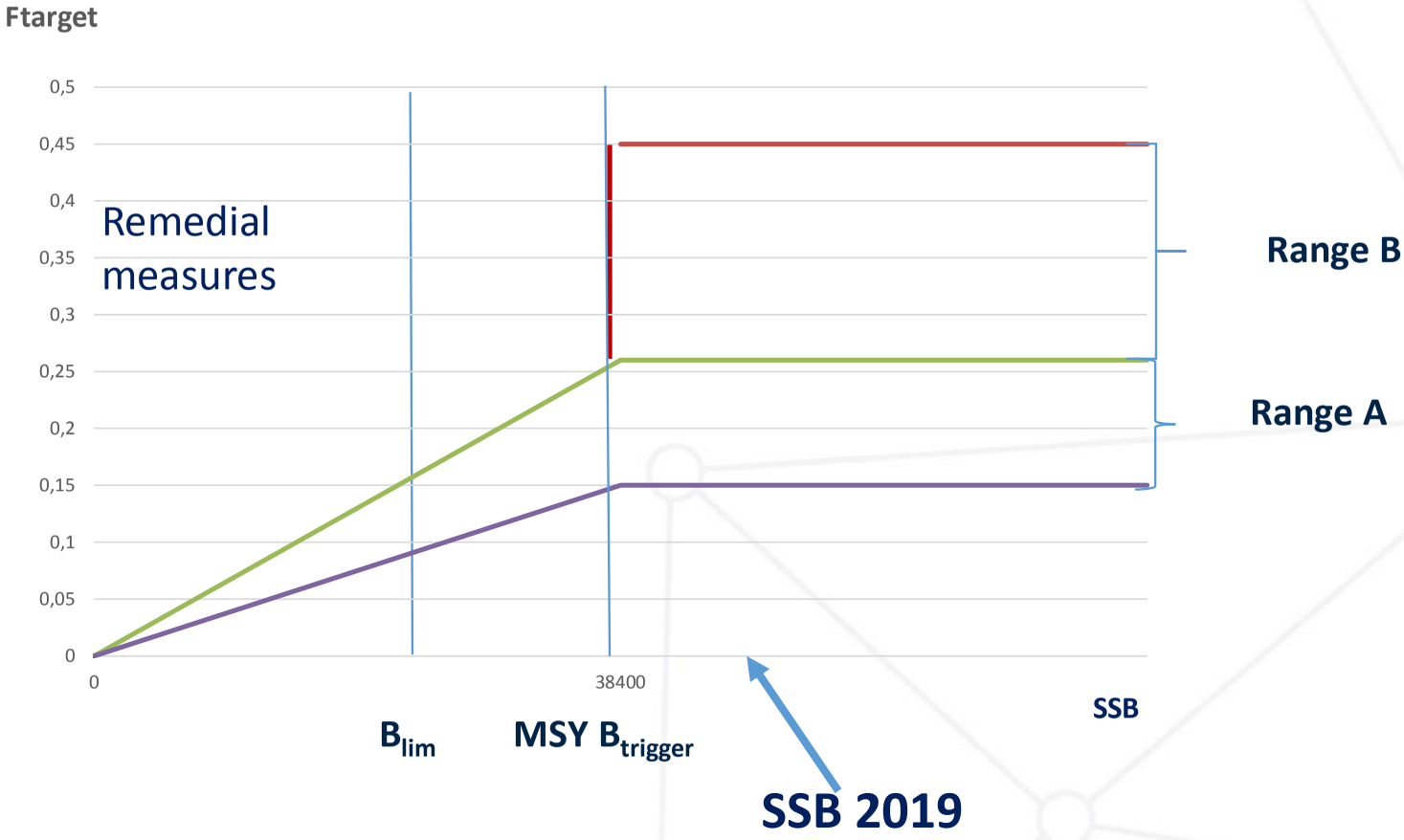
The F ranges in the MAP are consistent with the ranges provided by ICES in 2015.

These were evaluated to result in no more than 5% reduction in long-term yield compared with MSY.

The ranges are considered precautionary:

less than 5% probability that the stock size will be below Blim.

ICES understanding of the harvest control rule in the MAP.



Western Baltic cod

Conditions for using upper F ranges

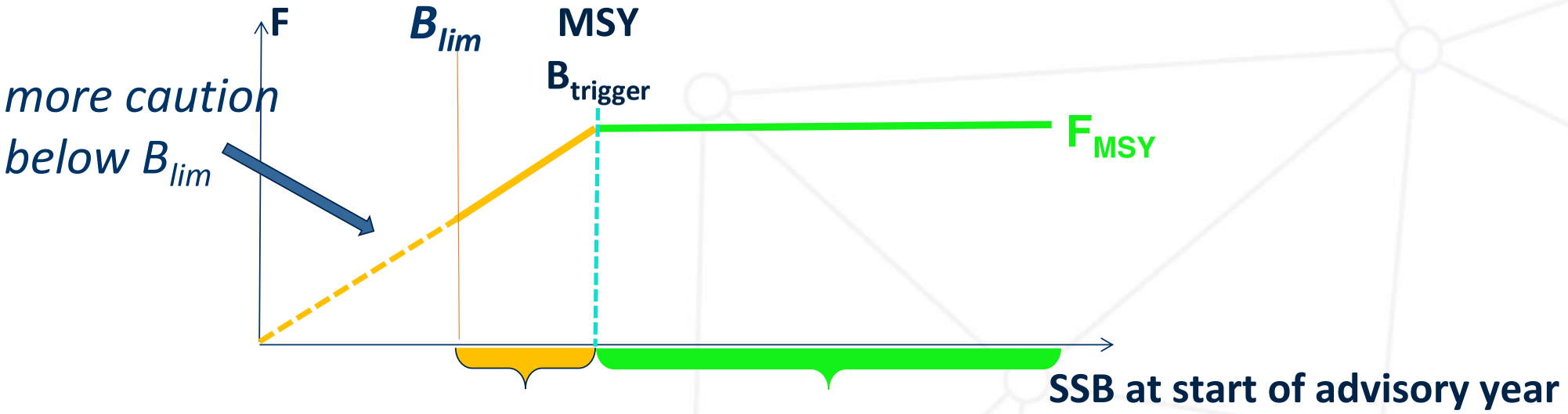
- if, on the basis of scientific advice or evidence, it is necessary for the achievement of the objectives in the case of mixed fisheries;

- if, on the basis of scientific advice or evidence, it is necessary to avoid serious harm to a stock caused by intra- or inter-species stock dynamics; or

- in order to limit variations in fishing opportunities between consecutive years to not more than 20 %.

ICES MSY approach

- ✓ **Maximize long term average yield**
- ✓ **Safeguard against low SSB**
- ✓ **Stay within precautionary boundaries**



ICES PA approach

Category 1 and 2 stocks

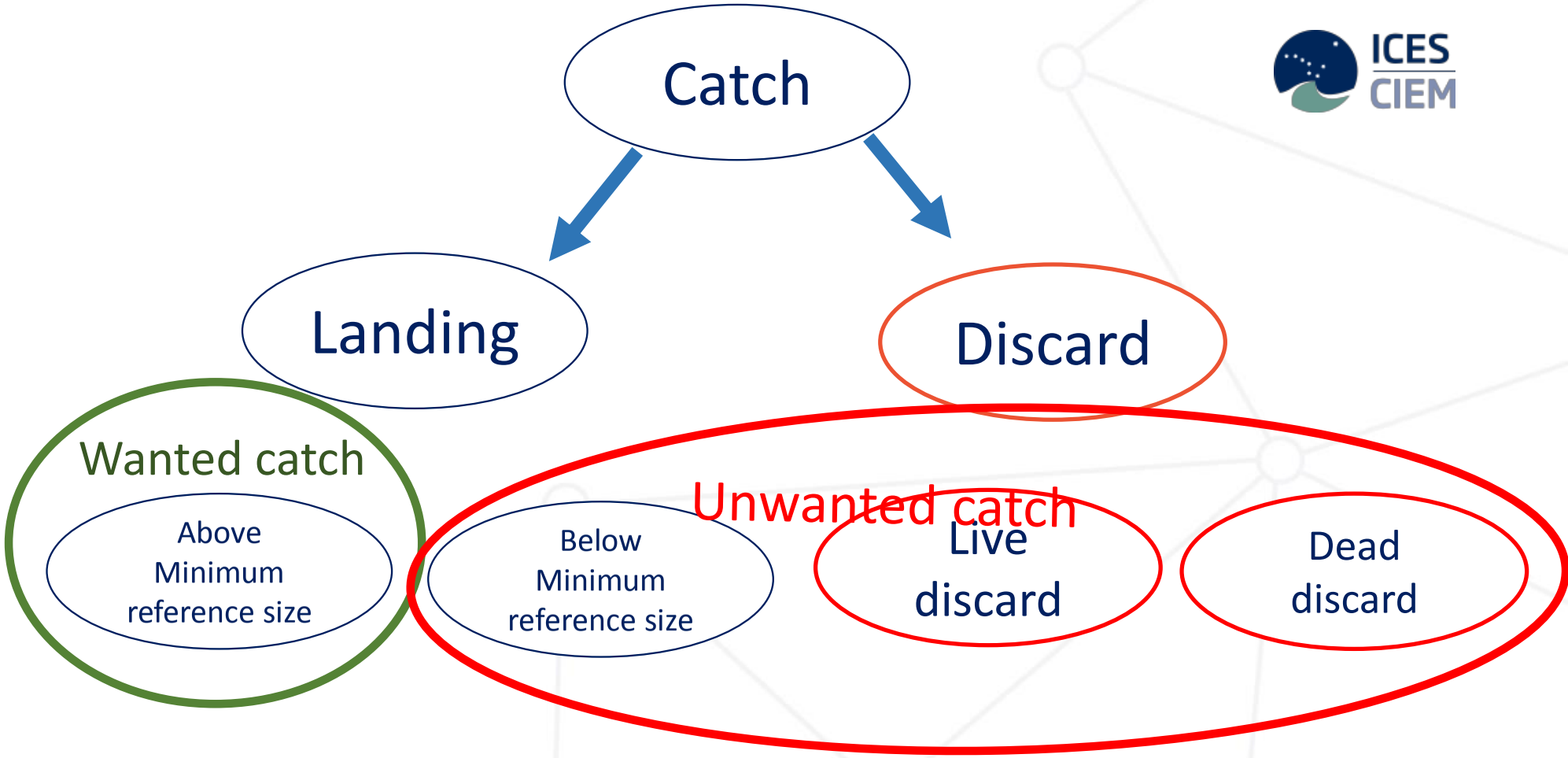
ICES in developing an advice rule based on Fpa and Bpa.

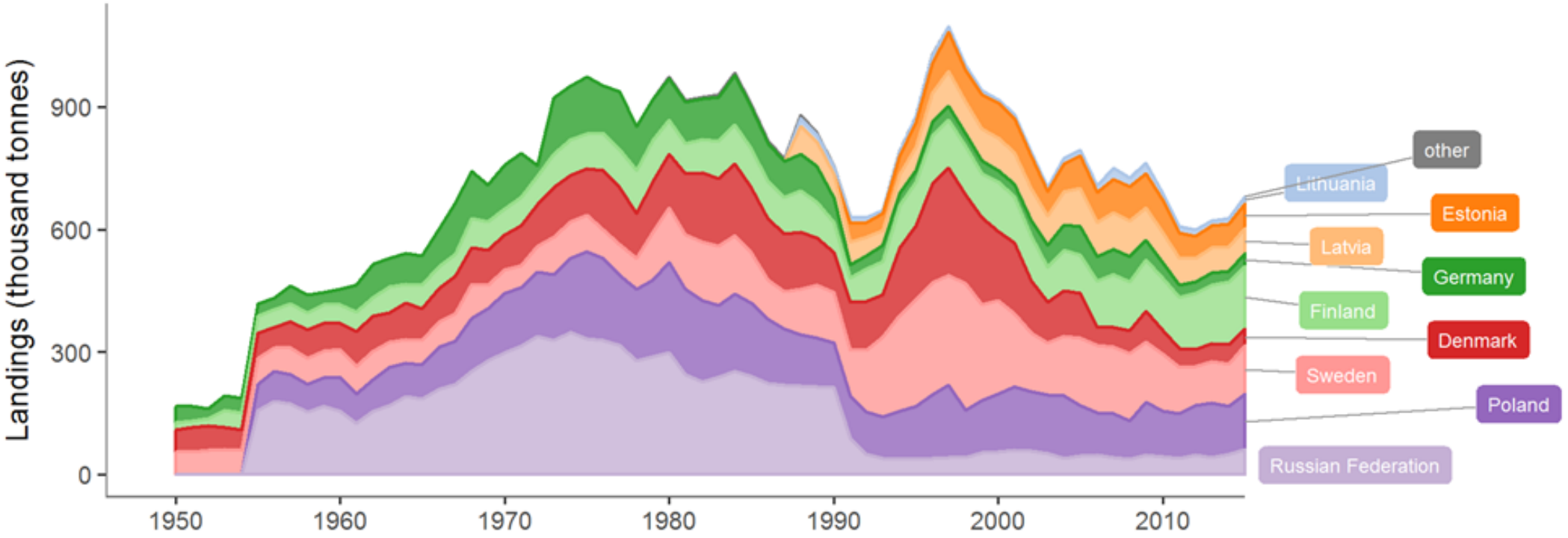
Category 3 and 4 stocks

Advice: (previous advice) multiplied by index ratio:
(average index last 2 years)/(average index previous 3 years)

also incorporating:

1. Uncertainty cap (20% change limit, to dampen noise)
2. Precautionary buffer – 20% reduction. Applied first time advice is given and based on status relative to reference points.


Catch
Landing
Discard
Wanted catch
Above Minimum reference size
Unwanted catch
Below Minimum reference size
Live discard
Dead discard



Historical Nominal Catches 1950-2010,
Official Nominal Catches 2006-2015. Accessed 2017/July. ICES, Copenhagen.

Baltic Sea – Landings (t) by country

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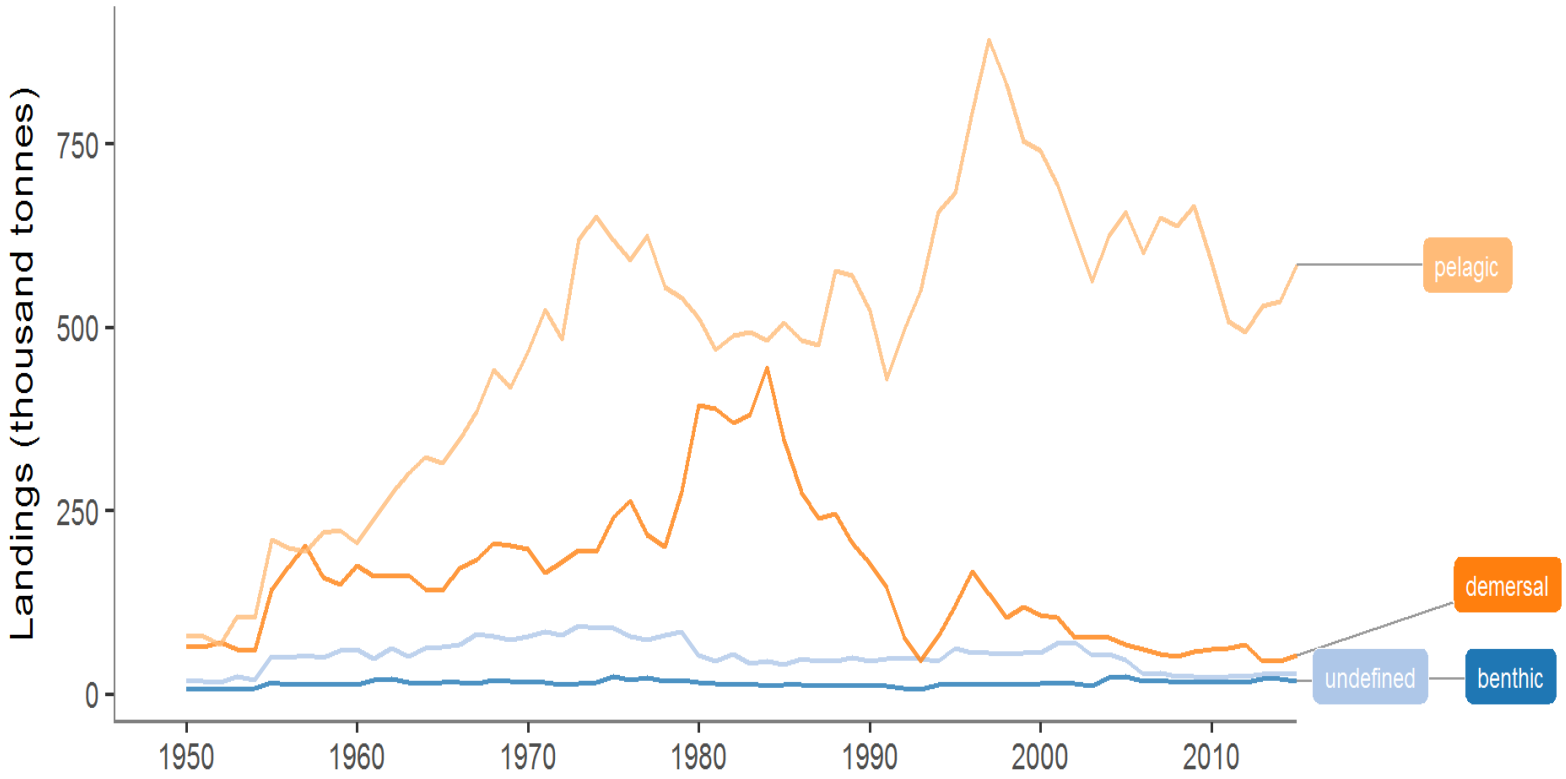


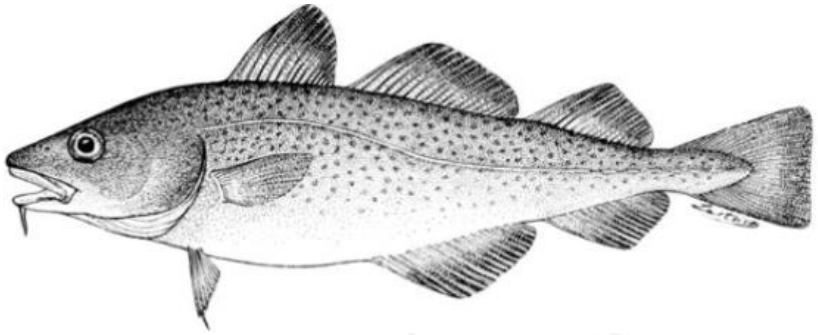
Historical Nominal Catches 1950-2010,
Official Nominal Catches 2006-2015. Accessed 2017/July. ICES, Copenhagen.

Baltic Sea – Landings (t) by species group

Science for sustainable seas

Baltic Sea	Advice 2015		Advice 2016		Advice 2017		Advice 2018		Advice 2019		% change
	Catch	Landings	Catch	Landings	Catch	Landings	Catch	Landings	Catch	Landings	2018-2019
Brill in 22–32	29		23		18		12		12		0%
Cod in 22–24	10196		7797		3475		5295		15201		187%
Cod in 24–32	29085		29220		26994		26071		16685		-36%
Dab in 22–32		1,428	2980		3069	1657	2762		2762		0%
Flounder in 22 and 23		1745	3042		3650	2847	4030		4030		0%
Flounder in 24 and 25		17182	28908		34690	22548	41628		41628		0%
Flounder in 26 and 28		3257		2606	2527	2085	1617		1617		0%
Flounder in 27 and 29-32		228		274	329		395		395		0%
Herring in 25–29 and 32	193000	193000	201000	201000	216000		267745		155333		-42%
Herring in 30 and 31	186534	186534	103254	103254	141008		95566		88703		-7%
Herring in 28.1	34300	34300	26200	26200	23078		29195		26932		-8%
Herring in 3a and 22-24	44439	44439	52547	52547	56802		35612		0		-100%
Plaice in 21-23	4031	2626	8639	4642	8333		5405		15237		182%
Plaice in 24-32		881	2156	1063	2587		3104		3725		20%
Salmon in 32	11800		11800		11800		11800		11800		0%
Salmon in 22–31	116000		116000		116000		116000		116000		0%
Sprat in 22–32	222000	222000	205000	205000	314000		301722		301125		0%
Turbot in 22–32		220		198	194			186		-	NA
Total	723614	707840	670766	596784	836754	29137	820159		673385		-18%

Western Baltic Cod stock



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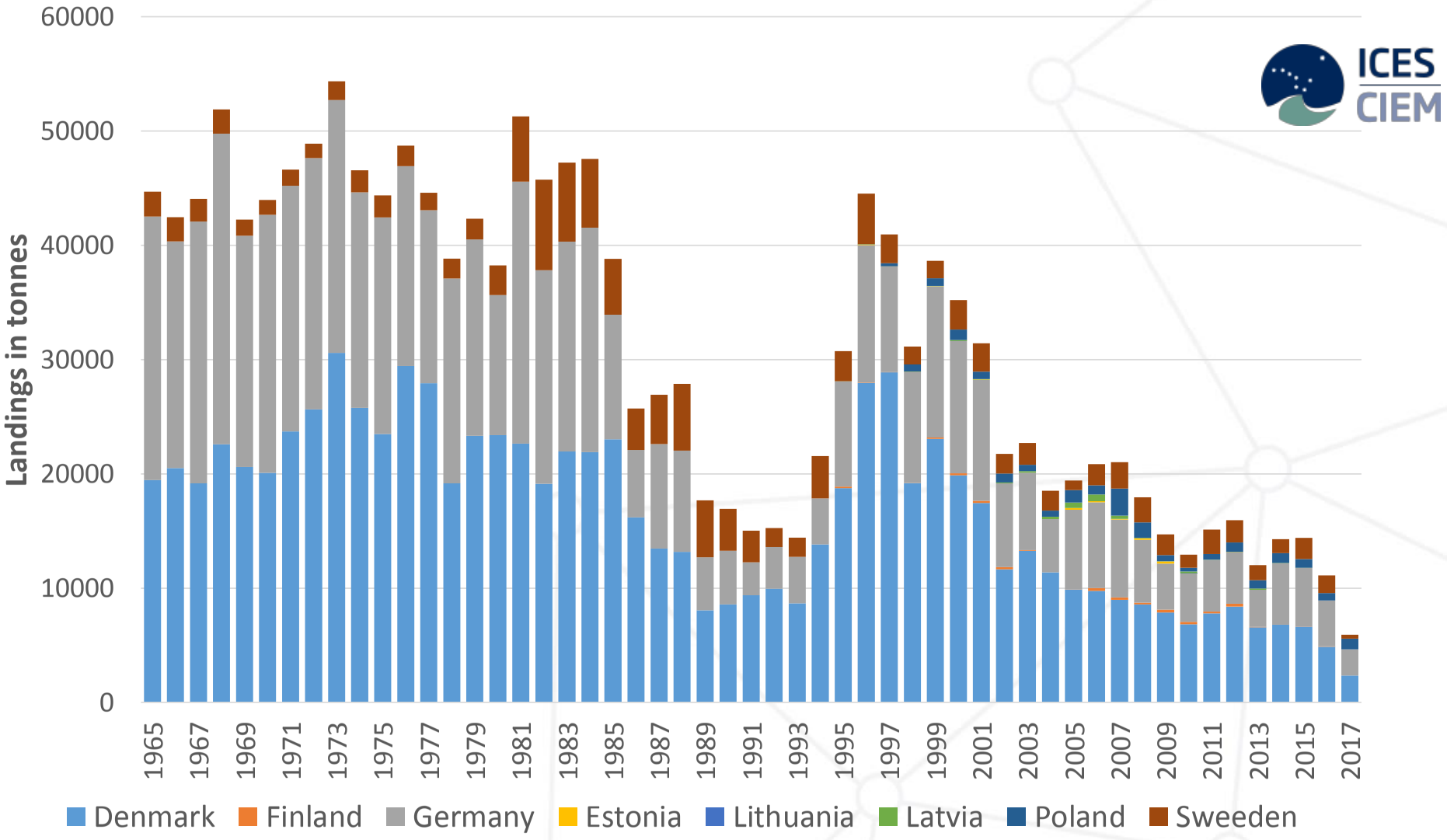

Cod Western Baltic – SD 22-24 landings by country

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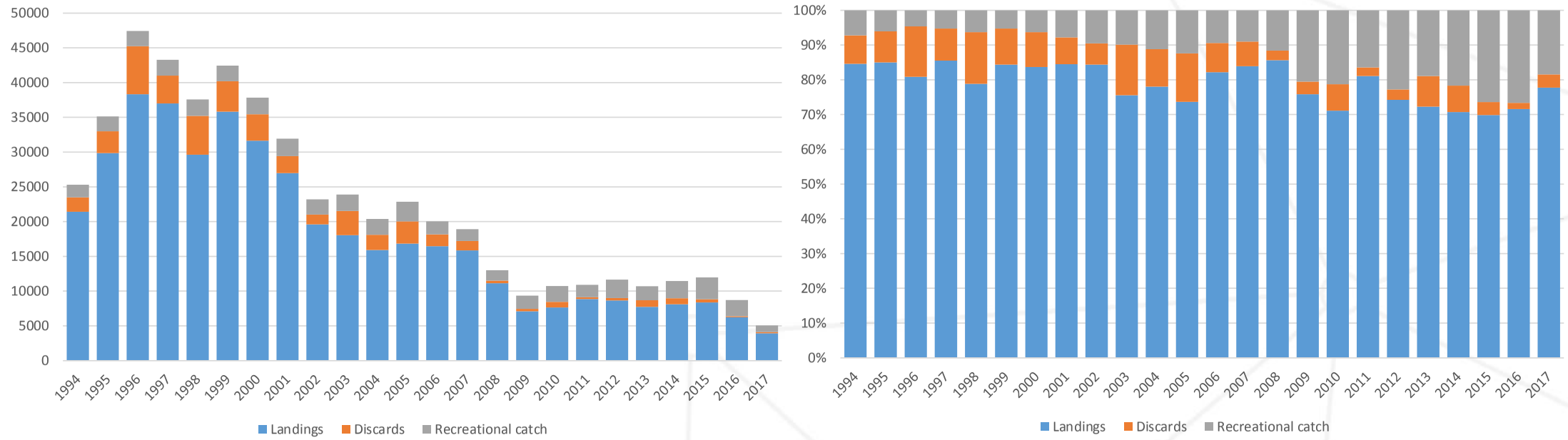

Western Baltic cod. Commercial landings, discard and recreational catch in tonnes and relative.

Western Baltic cod stock – Catches

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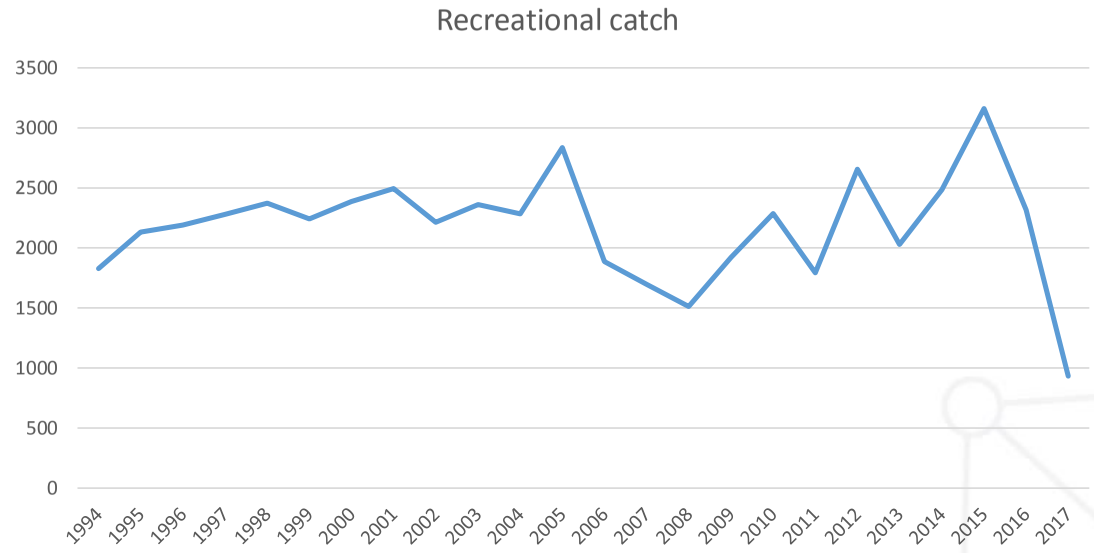

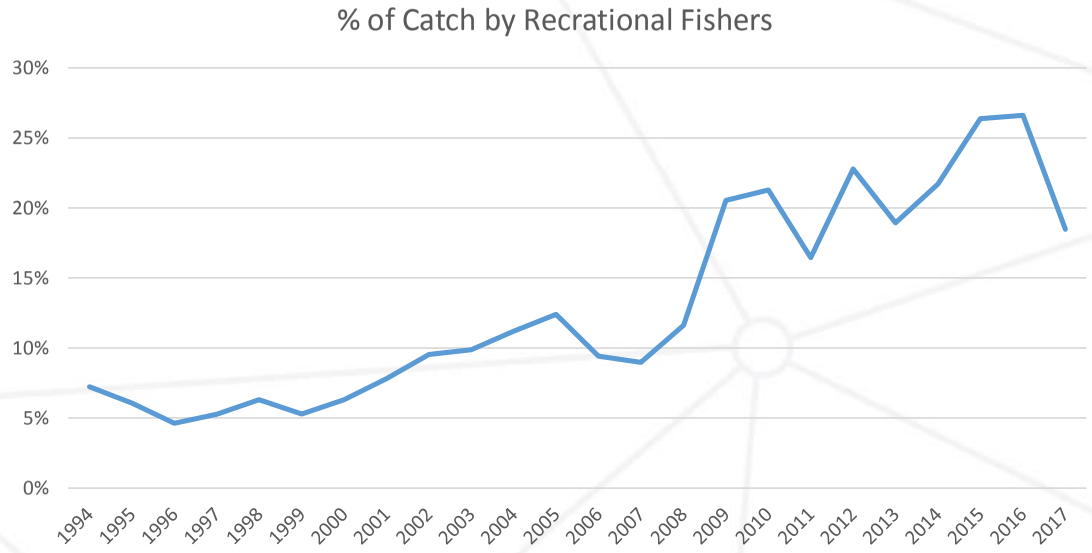

Only Germen data included in the assessment.

Western Baltic cod stock – Recreational catches

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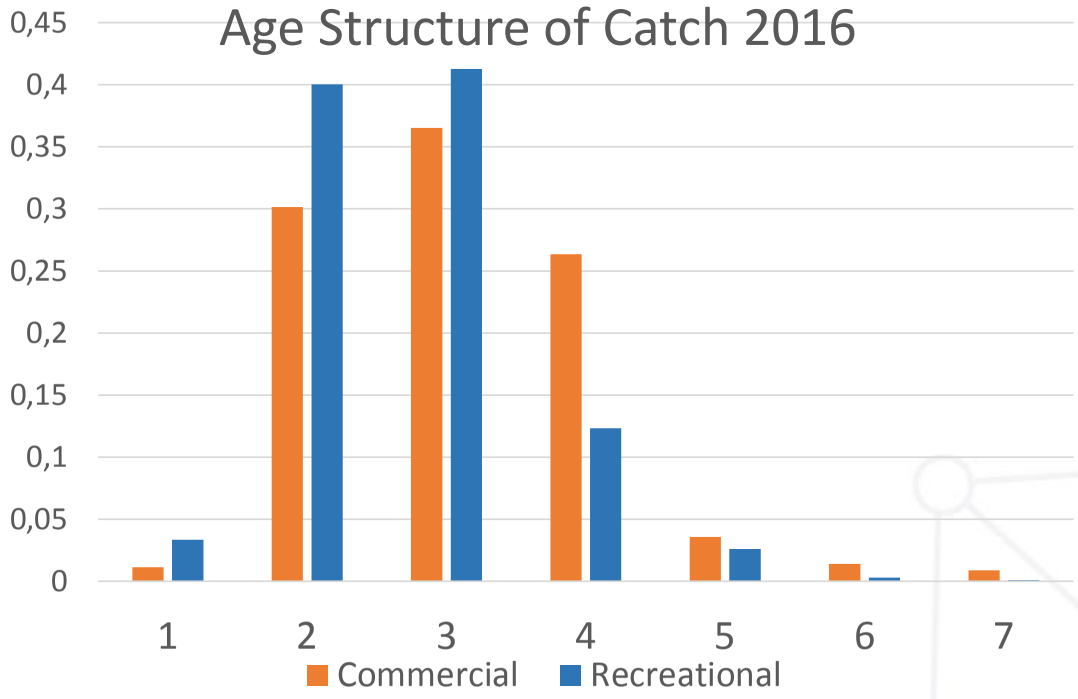

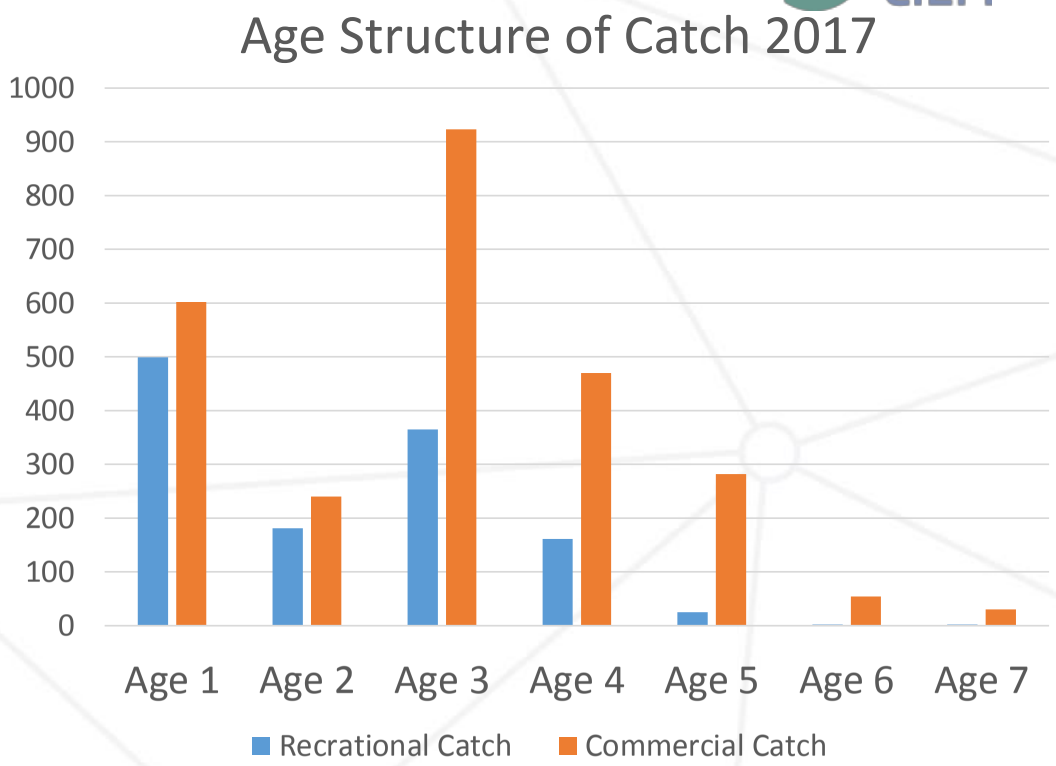

Relative age composition in commercial and recreational catches in 2016 & 2017.

Western Baltic cod stock – Selectivity

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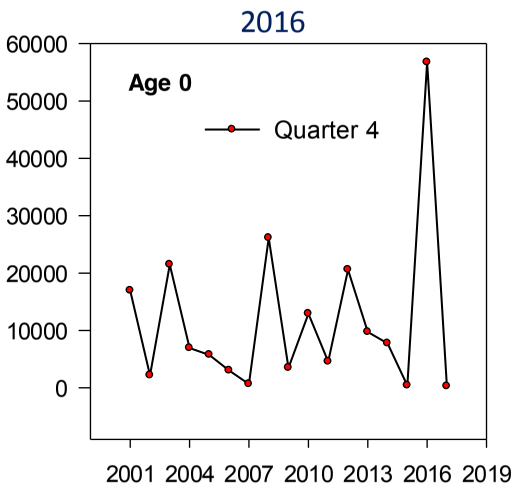

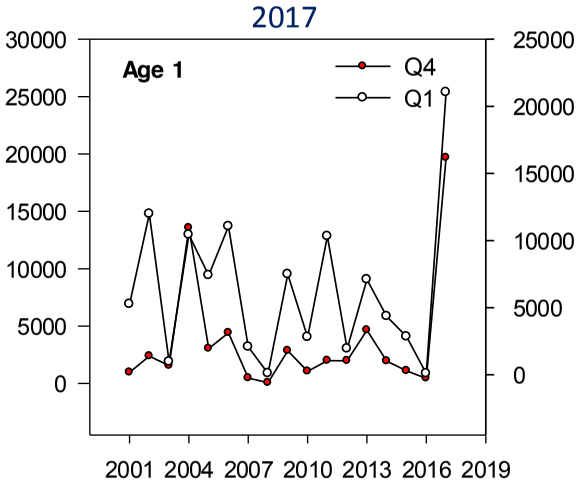

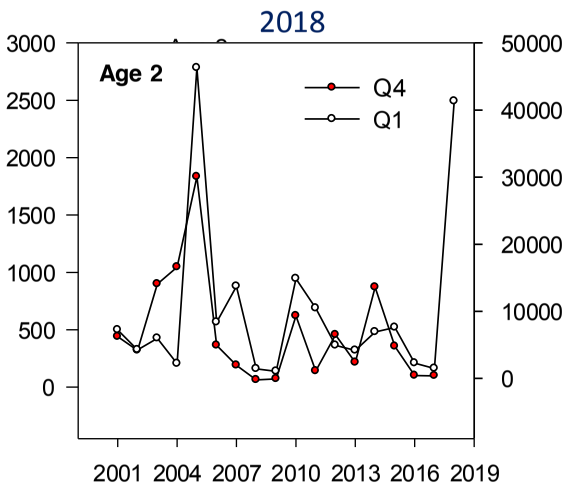

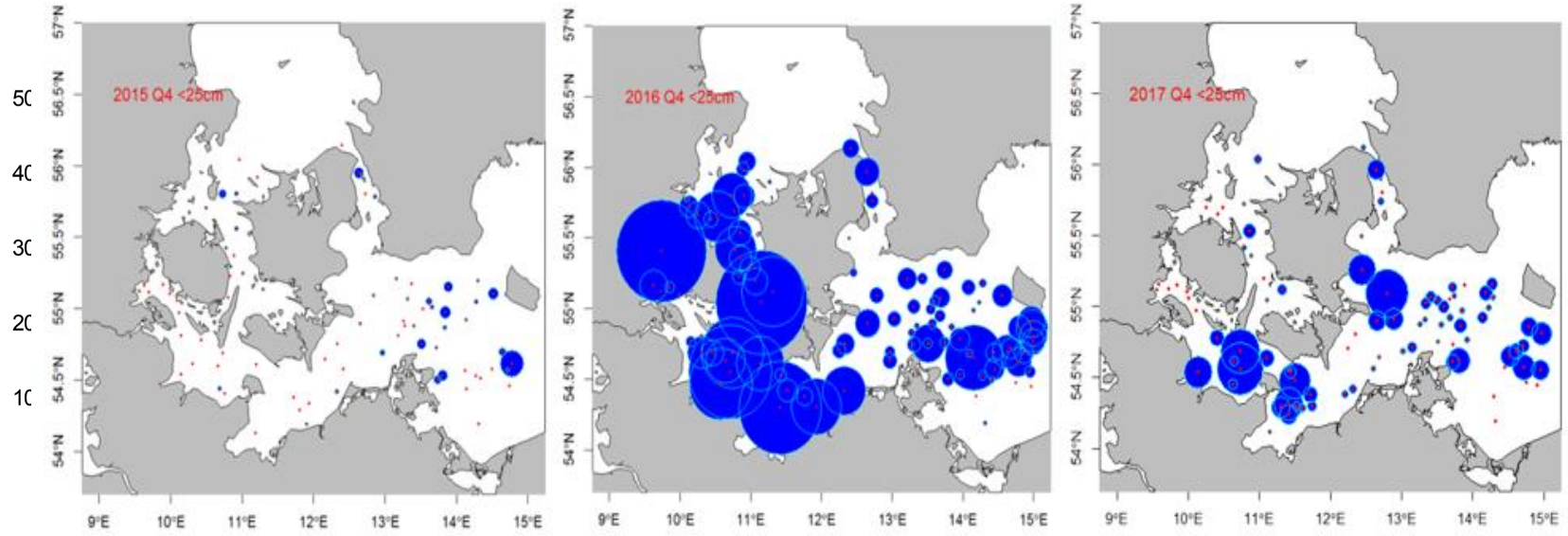

Western Baltic cod stock – Strong 2016 Year Class

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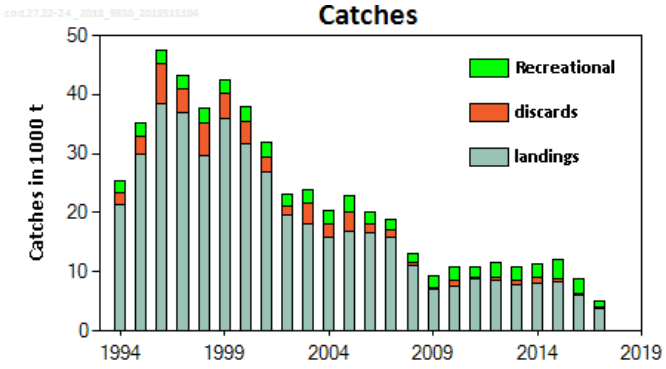
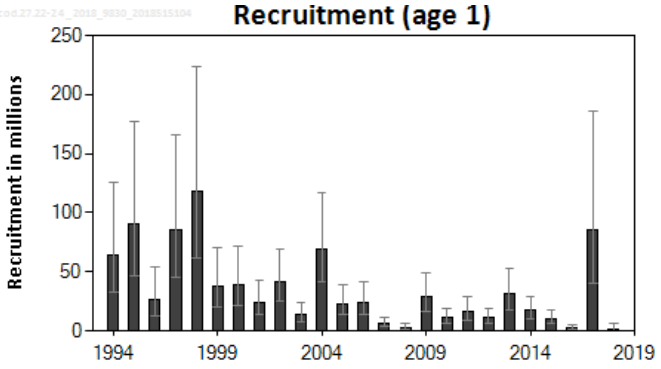
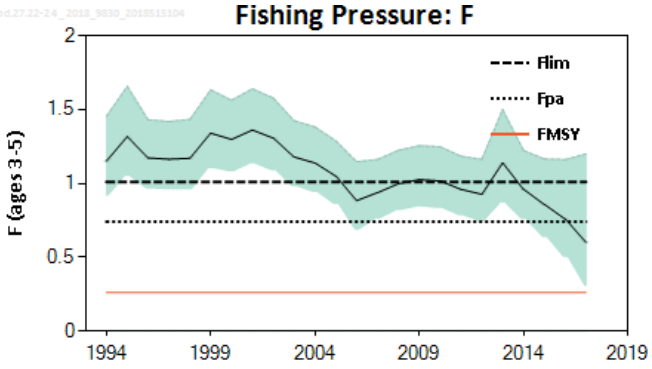
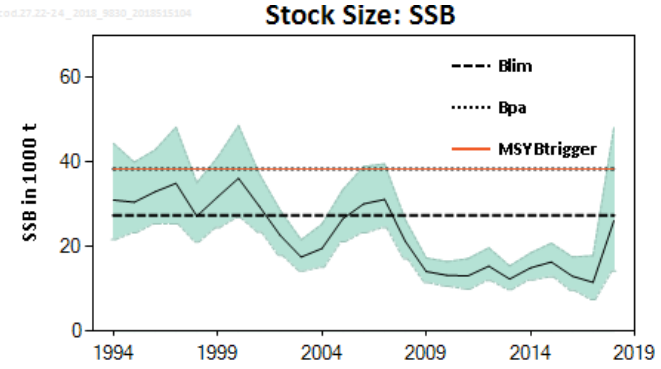






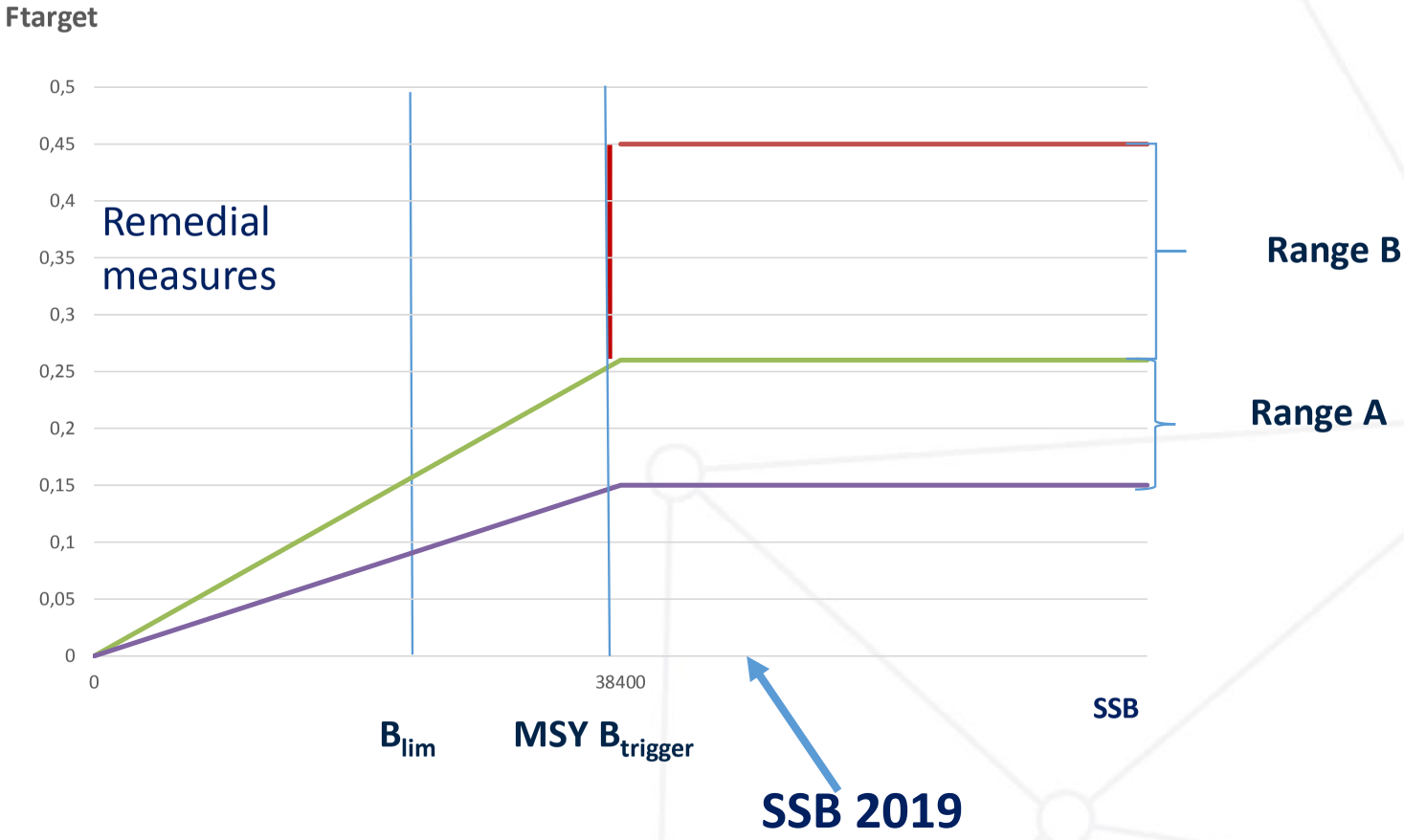


		Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018	
Maximum sustainable yield	F_{MSY}	✗	✗	✗	Above	MSY $B_{trigger}$	✗	✗	✗ Below trigger
Precautionary approach	F_{pa},F_{lim}	0	0	✓	Harvested sustainably	B_{pa},B_{lim}	✗	✗	✗ Reduced reproductive capacity
Management plan	F_{MGT}	✗	✗	✗	Above	B_{MGT}	✗	✗	✗ Increased risk

- SSB increasing rapidly and will be above MSY $B_{trigger}$ in 2019 (48 734 t)
- F decling but, still above F_{MSY}
- Strong 2016 yearclass
- Commercial catches in 2017 was 3,923t, lowest observed.
- Discards in 2017 estimated to 4.8 % of total commercial catch.
- Recreational catches in 2017 estimated to 932 t.

Variable	Value	Notes
$F_{ages\ 3–5}$ (2018)	0.20	Based on catch constraint for 2018.
SSB (2019)	48 734	Based on catch constraint for 2018.
R_{age1} (2018)	1633	SAM assessment.
R_{age1} (2019)	15 685	Sampled from the last ten years.
R_{age1} (2020)	15 240	Sampled from the last ten years.
Total catch (2018)	5612	Commercial + recreational catches.
Commercial catches (2018)	3858	Calculated as the 2018 TAC (5597 tonnes) plus an assumed discard ratio as in 2017 (4.8%), and accounting for the proportion of western Baltic cod in commercial catches in subdivisions 22–24 in 2017 (66%).
Recreational catches (2018)	1754	As it is unclear how the bag limit will affect the fisheries in 2018, the same recreational catch (1754 tonnes) assumed for 2017 was applied in the forecast, i.e. average over 3 years (2014–2016) of recreational catch (2654 tonnes) minus the estimated reduction (900 tonnes) due to the introduction of the bag limit in 2017*.

ICES understanding of the harvest control rule in the MAP.



Western Baltic cod

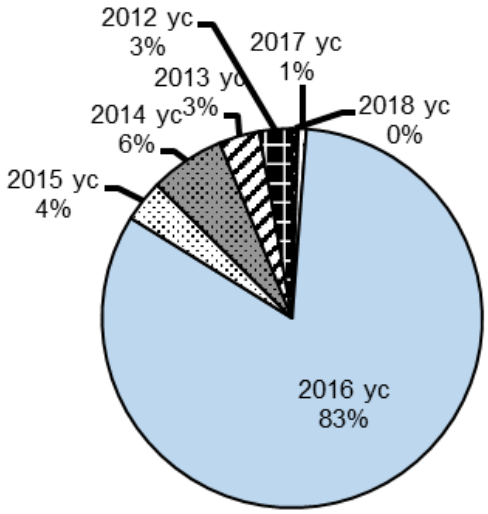
ICES advises that when the EU multiannual plan (MAP) is applied, total catches in 2019 that correspond to the F ranges in the plan are between 9,094 tonnes and 23,992 tonnes.

Depending on the management decision for recreational catches, assumed to be between 1,754 tonnes (regulation unchanged) and 3,227 tonnes (increase proportional to ICES catch advice), the corresponding commercial catches are between 5,867 tonnes and 22,238 tonnes.

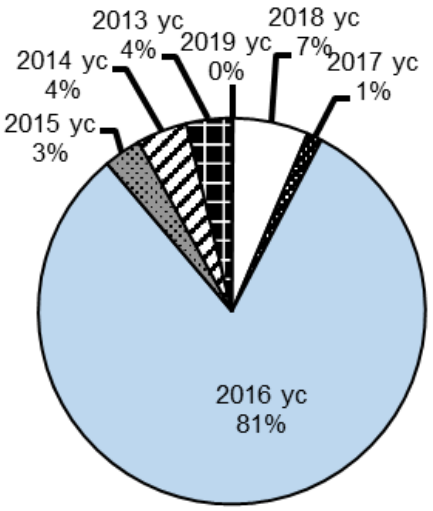
According to the MAP, catches higher than those corresponding to F_{MSY} (15,021 tonnes) can only be taken under conditions specified in the MAP, whilst the entire range is considered precautionary when applying the ICES rule.

Basis	Total catch * (2019)	Recreational catch	Commercial catch	F_{total} (2019)	$F_{commercial}$ (2019)	SSB (2020)	% SSB change ***	% Advice change ^
ICES advice basis								
EU MAP**: F_{MSY}	15021	1754	13267	0.26	0.23	75334	55	184
F = MAP $F_{MSY\ lower}$	9094	1754	7340	0.15	0.12	82691	70	191^^
F = MAP $F_{MSY\ upper}$	23992	1754	22238	0.45	0.42	63804	31	NA ^^^
EU MAP**: F_{MSY}	15021	3227‡	11794	0.26	0.20	75334	55	184
F = MAP $F_{MSY\ lower}$	9094	3227‡	5867	0.15	0.10	82691	70	191^^
Other scenarios								
F_{MSY}	15021	1754	13267	0.26	0.23	75334	55	184
Zero commercial catch	1754	1754	0	0.03	0.00	91905	89	−67
F = F_{pa}	35123	1754	33369	0.74	0.70	49290	1	563
F = F_{lim}	43288	1754	41534	1.01	0.97	39365	−19	718
SSB (2020) = B_{lim}	53332	1754	51578	1.46	1.41	27400	−44	907
SSB (2020) = B_{pa}	44086	1754	42332	1.04	1.00	38401	−21	733
SSB (2020) = MSY $B_{trigger}$	44086	1754	42332	1.04	1.00	38401	−21	733
F = F_{2018}	12067	1754	10313	0.2	0.17	78916	62	128

Yield 2019

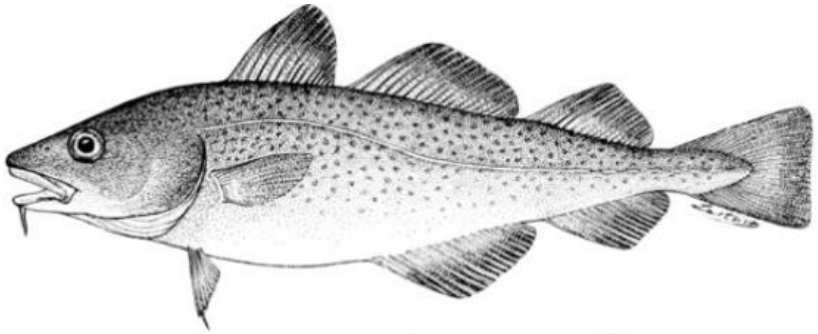


SSB 2020



There is a risk of growth overfishing because the 2016 year class fish have not yet reached their full growth potential. To make use of the full growth potential of the 2016 year class, ICES suggests to use the $F_{MSY\ lower}$ value in the MAP when setting the TAC for 2019.

Eastern Baltic Cod stock



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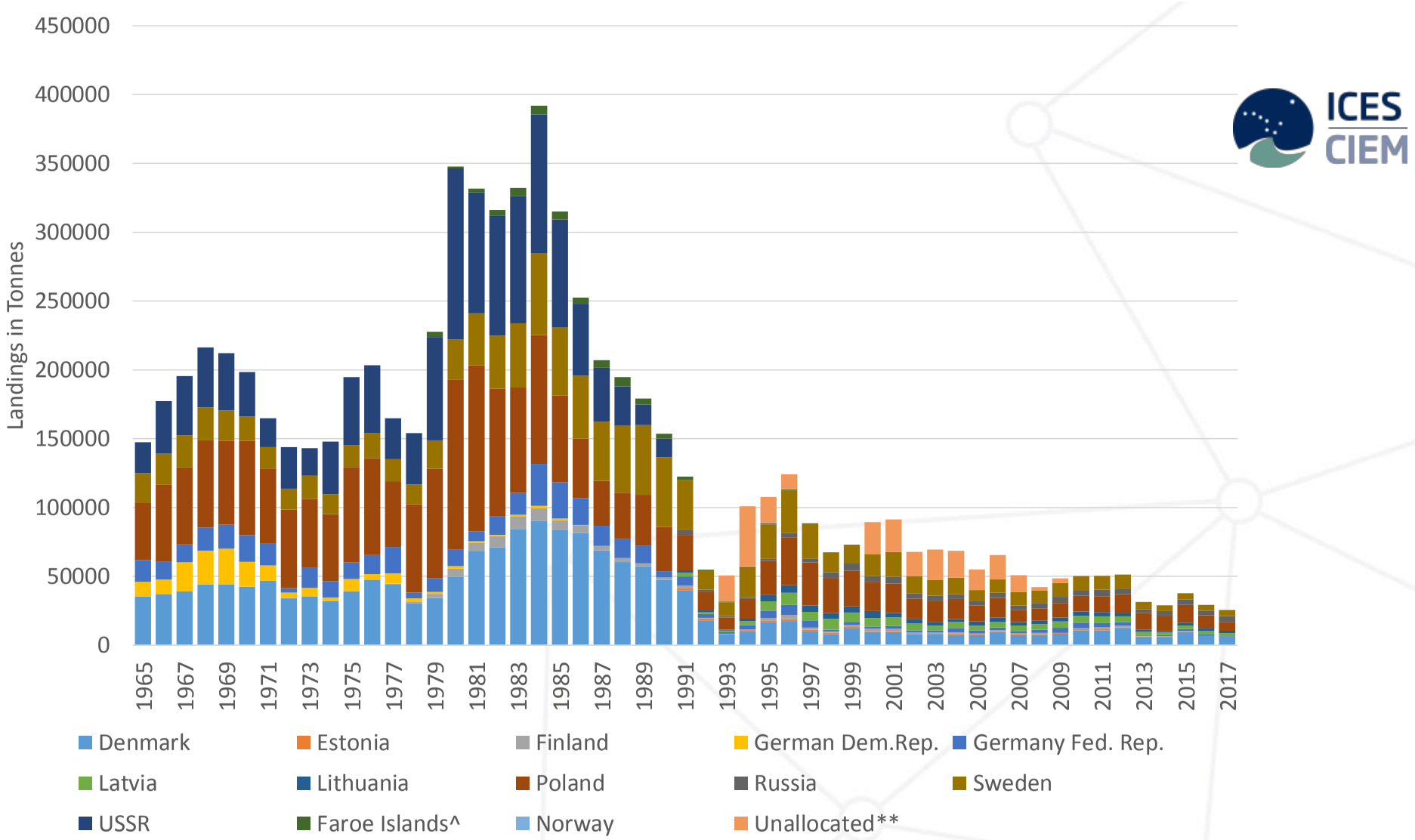

Cod Eastern Baltic – Landings SDs 25 – 32 by country

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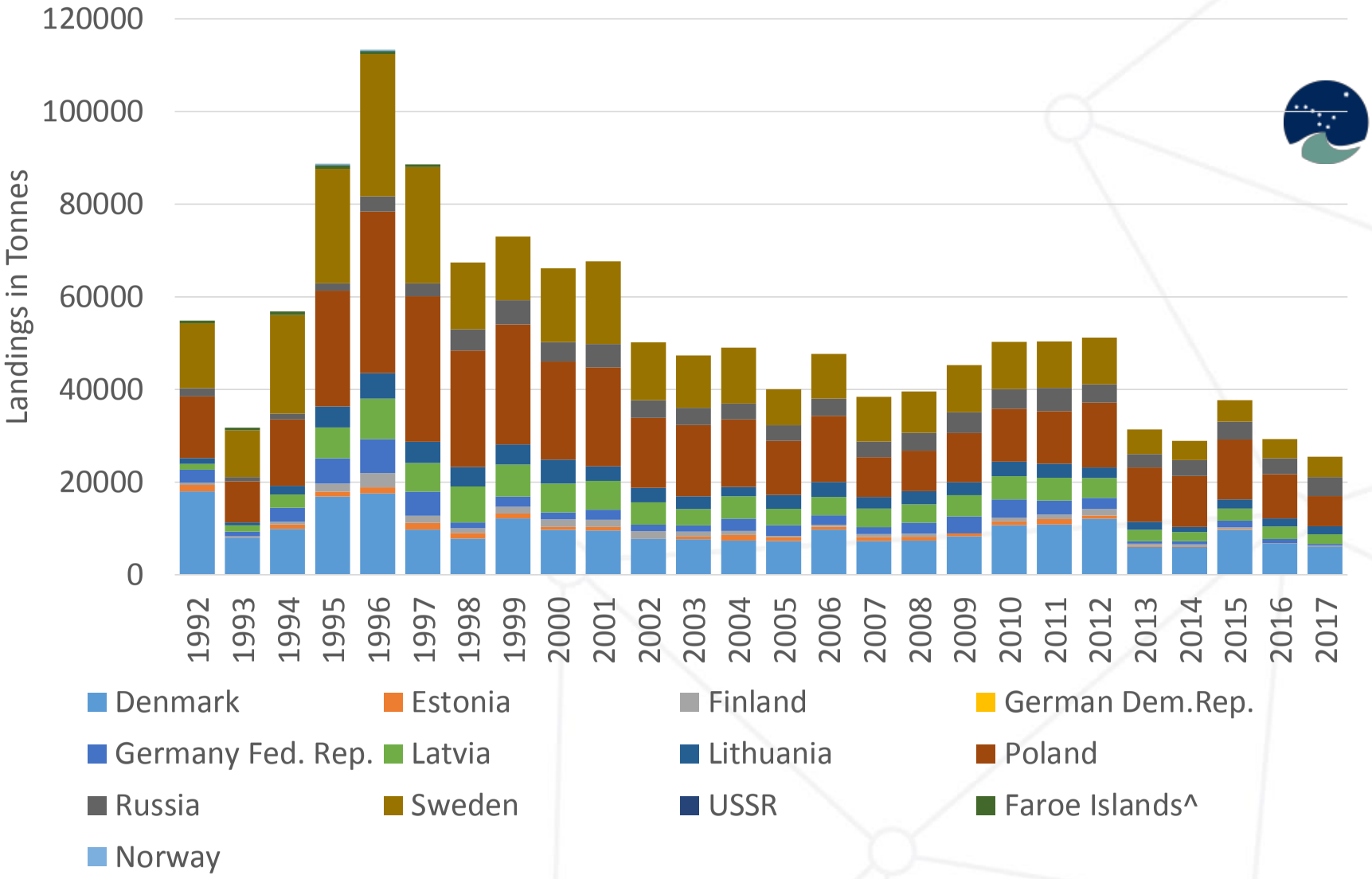

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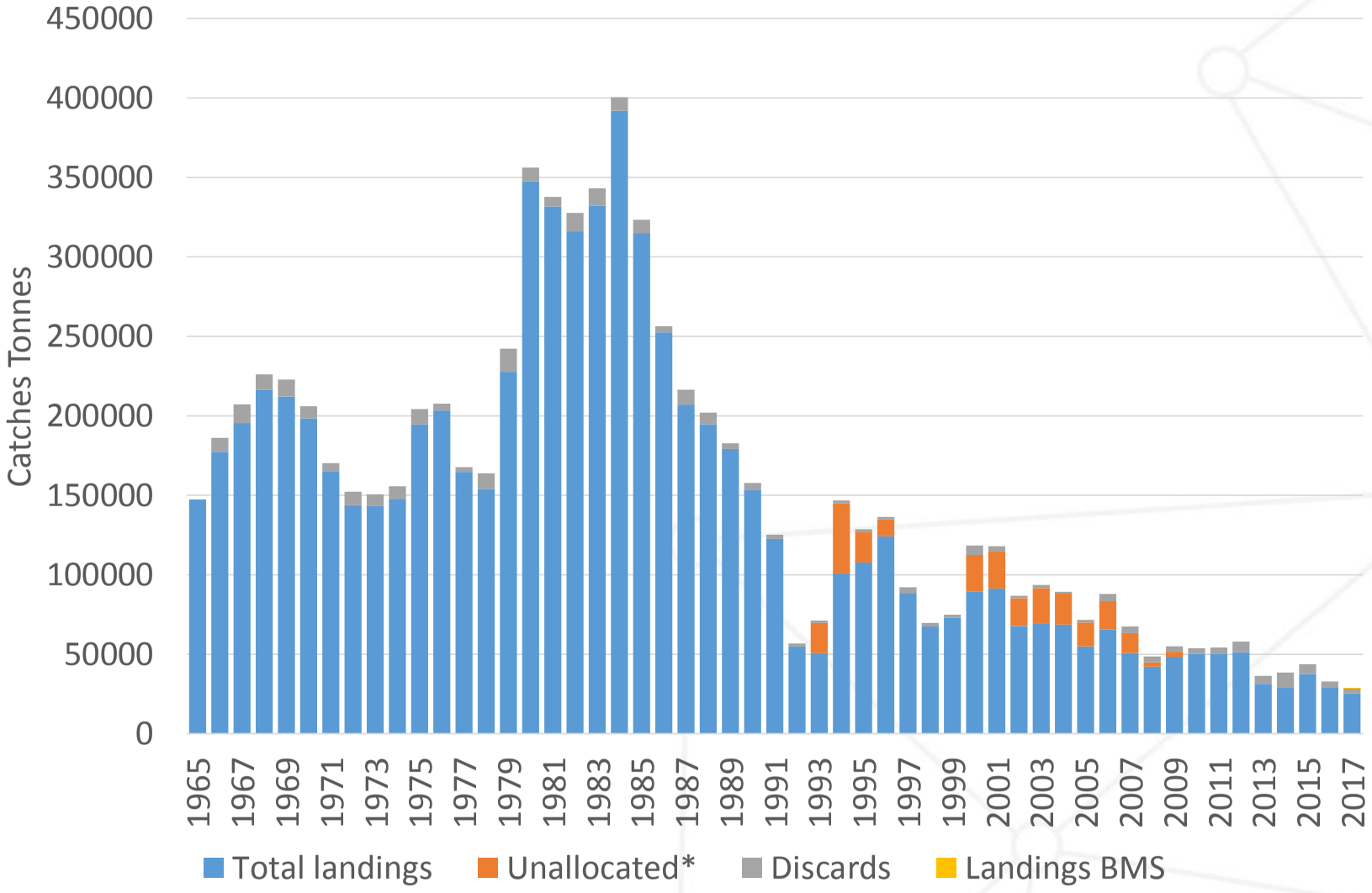
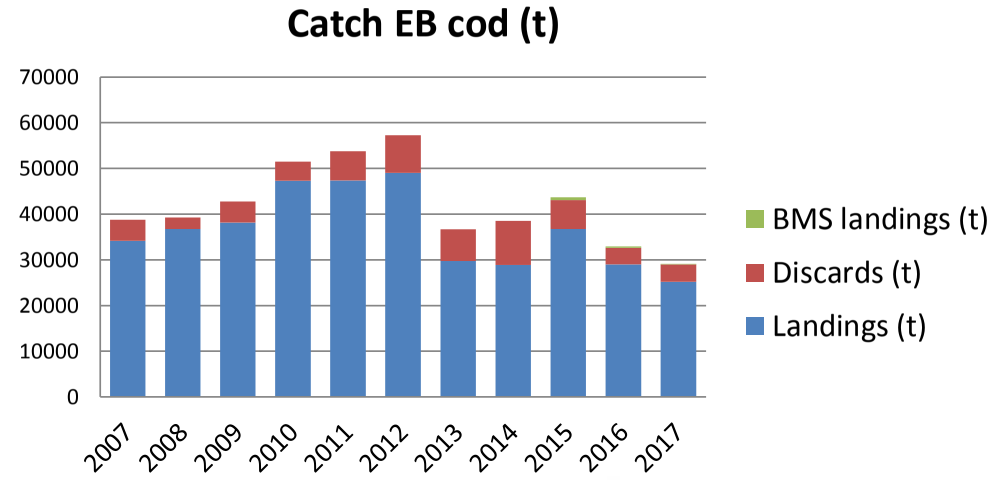
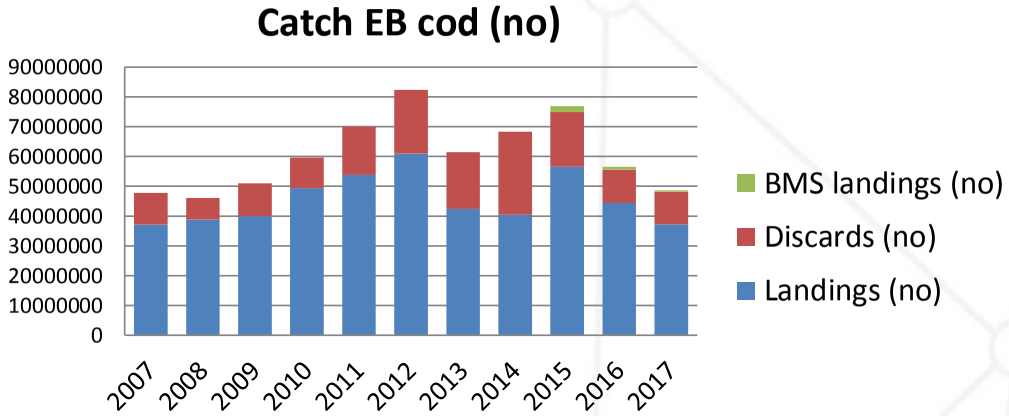


Eastern Baltic cod stock – Catches

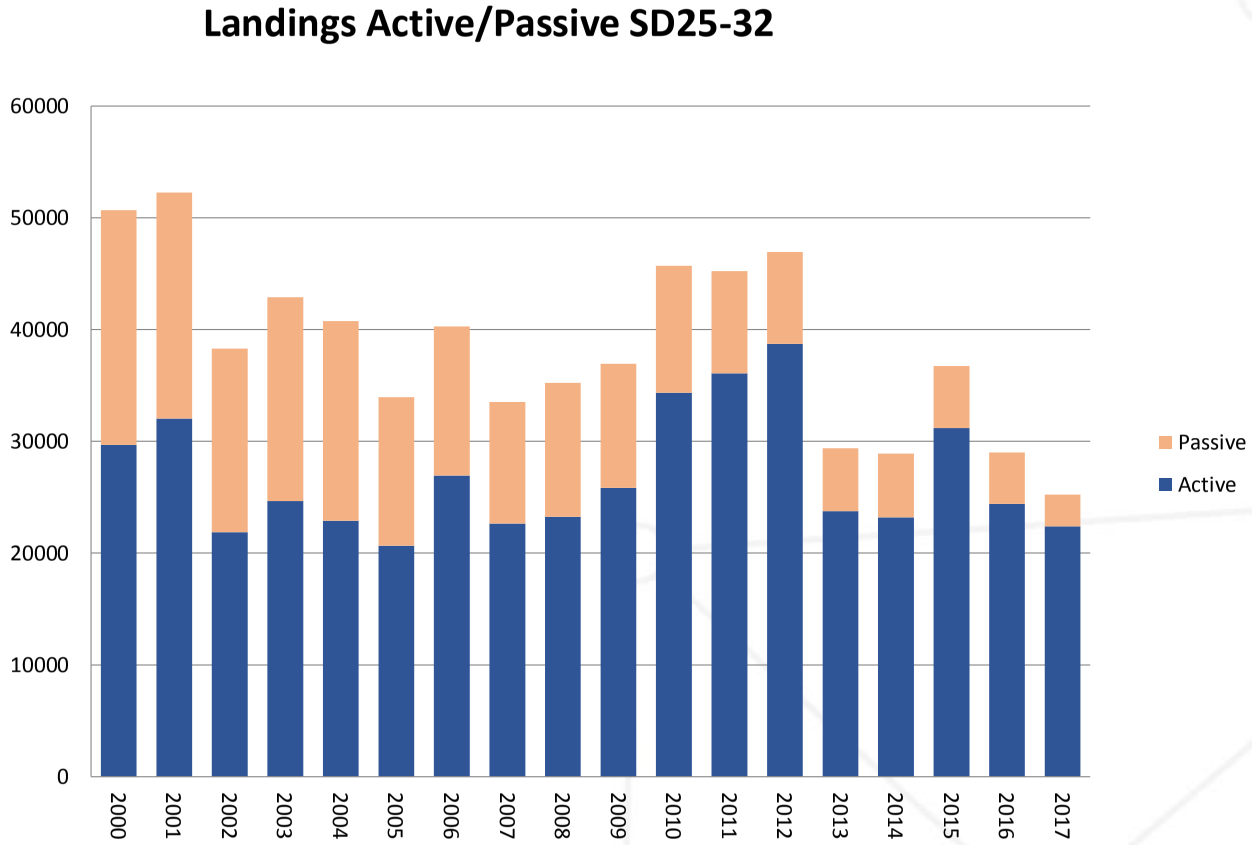
Catch SD25-32



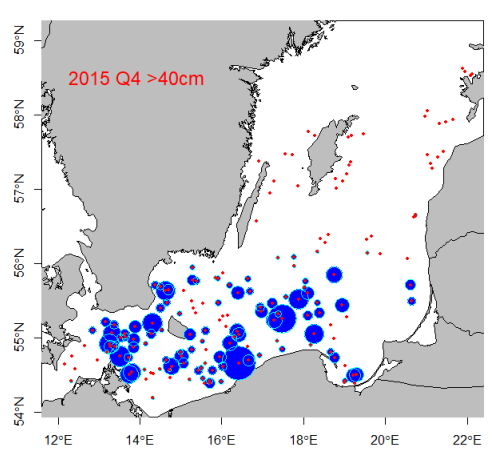
In weight:
Discards 13%

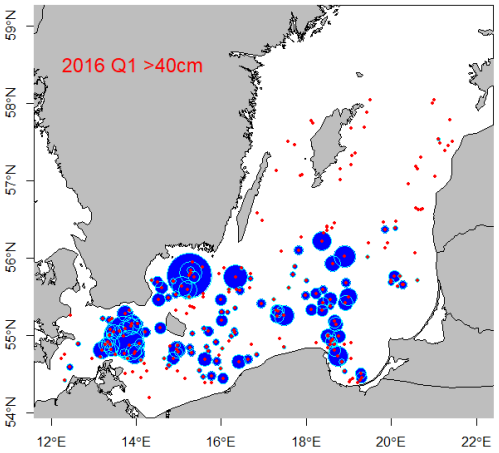


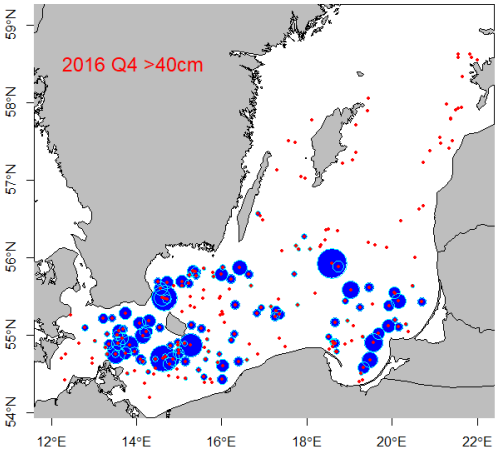
In numbers:
Discards 22%

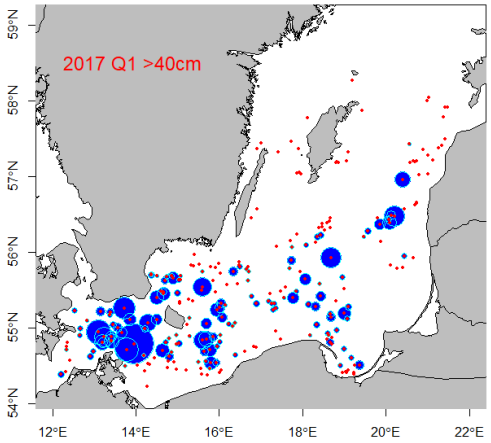


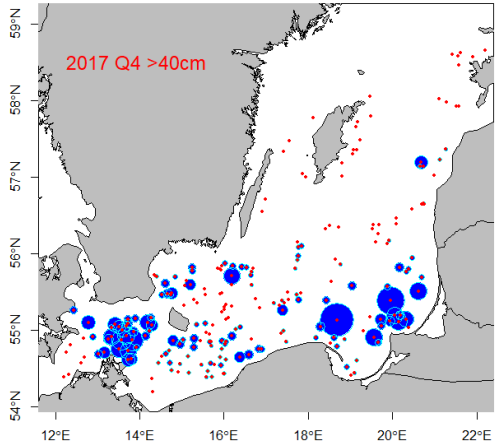
Eastern Baltic cod stock – Landings by gear type

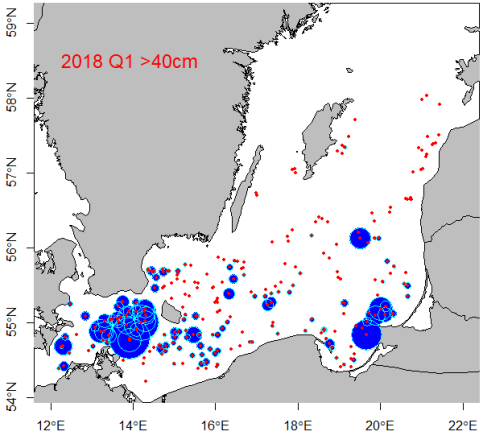






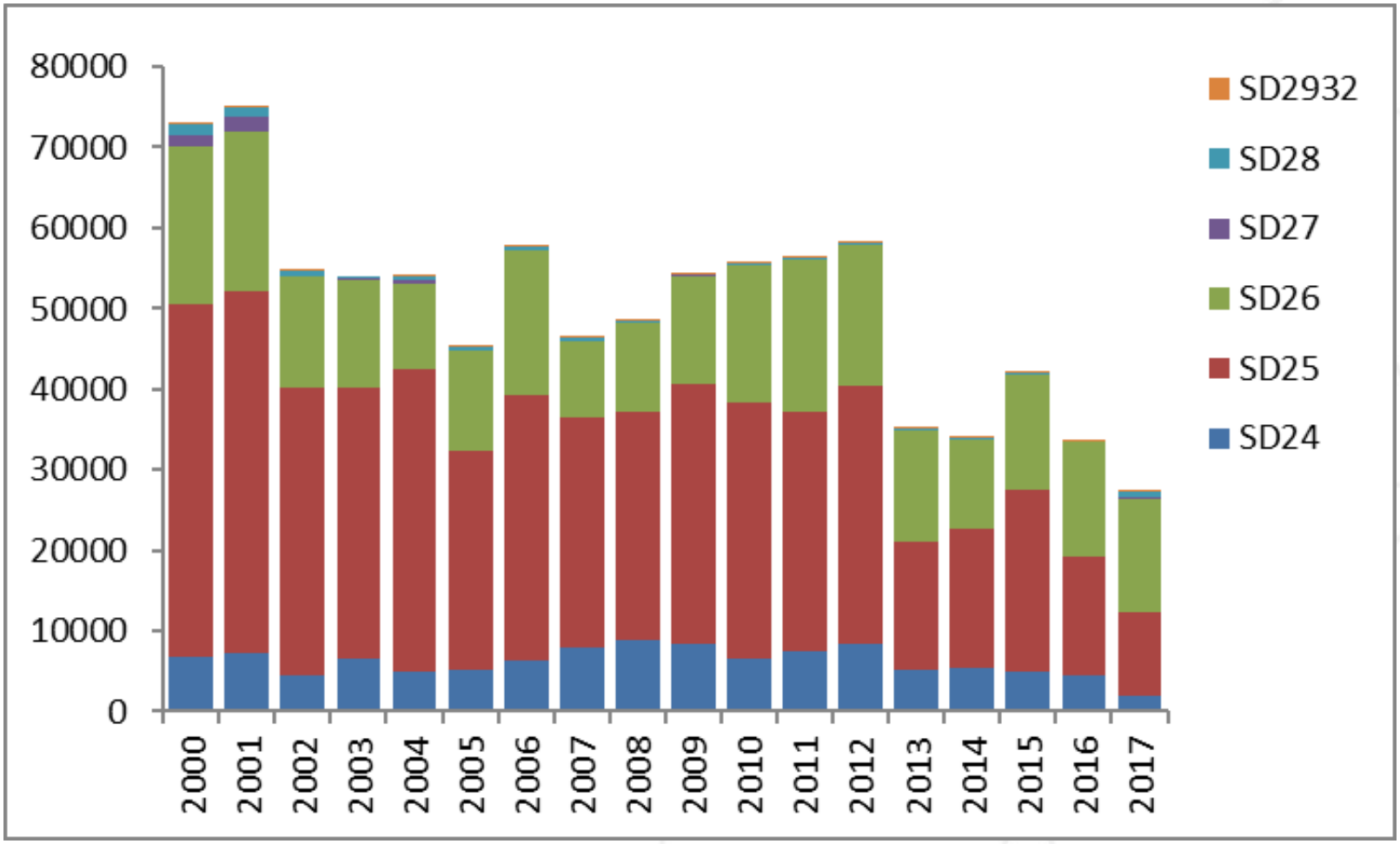




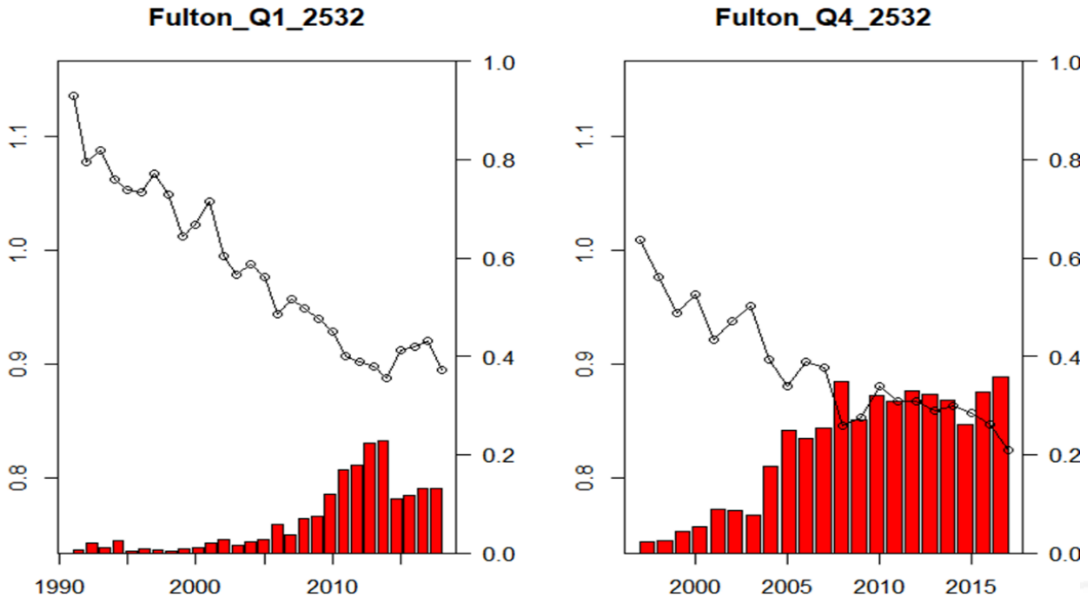


Eastern Baltic cod stock – Distribution cod > 40 cm BITS survey

Science for sustainable seas



Eastern Baltic cod stock – Landings by subdivision



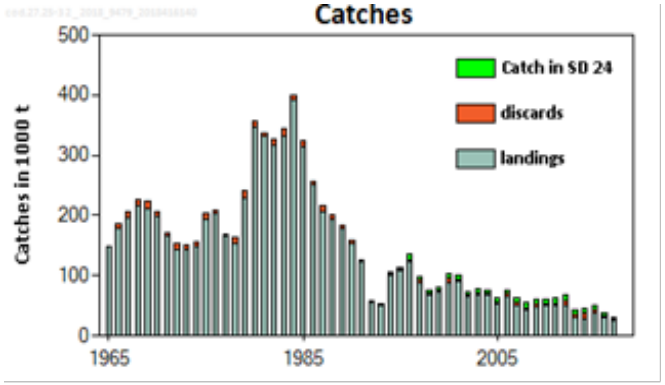
Average condition of cod at 40–60 cm in length in Q1 and Q4 BITS survey in SD 25–32. The lines show mean values for Fulton K, the bars show the proportion of cod at Fulton K <0.8.

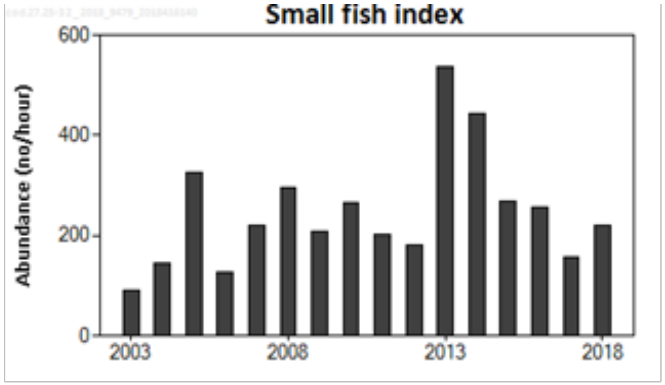
The L50 (50% percent mature and contributing to spawning) was around 35–40 cm in the early 1990s and has declined to around 20 cm since late 2000s

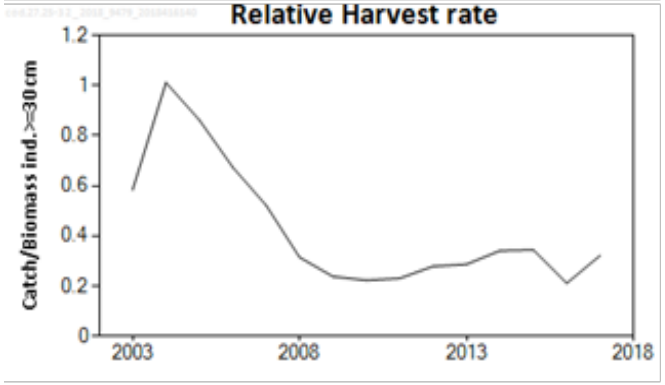
Cod is a transport host for two seal parasite species, cod worm (*Pseudoterranova decipiens*) and liver worm (*Contracaecum osculatum*)

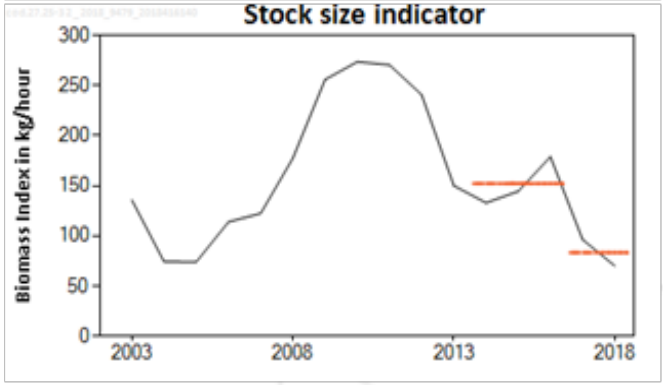
Foto: Bastian Huwer, DTU Aqua

Low condition
Hypoxia
Early maturation
Parasite infestation
Seal predation





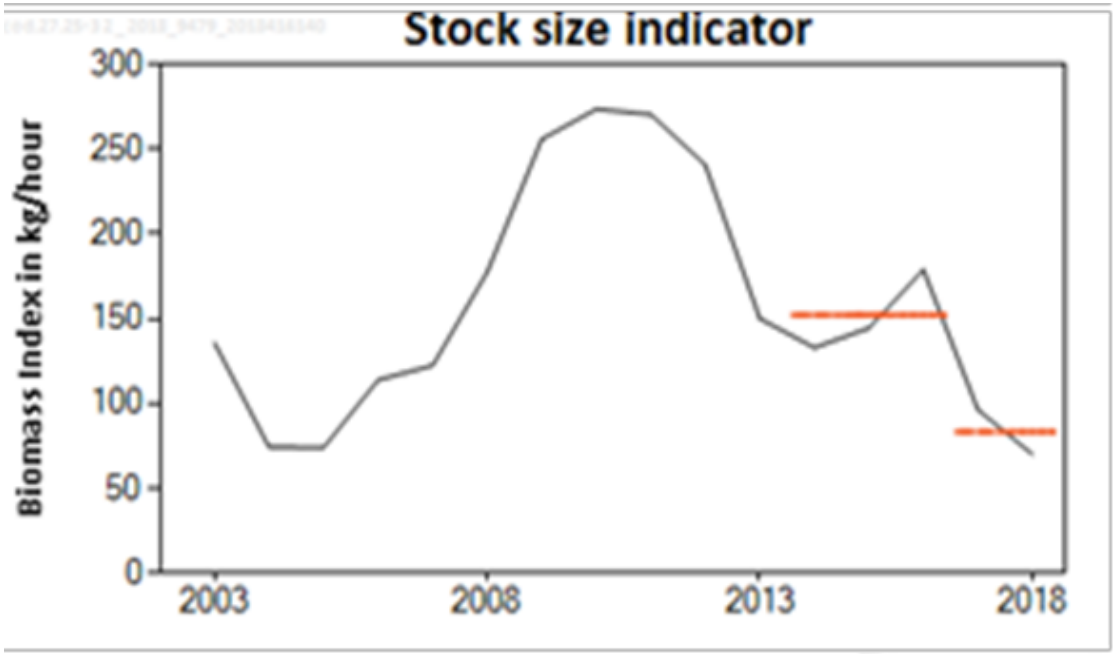




	Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018
Maximum Sustainable Yield	$F_{MSY\ proxy}$	✗	✗	✗ Above	MSY $B_{Trigger\ proxy}$	✓	✗	✗ Below trigger
Precautionary Approach	F_{pa}, F_{lim}	?	?	? Undefined	B_{pa}, B_{lim}	✓	?	? Undefined
Management plan	F_{MGT}	–	–	– Not applicable	SSB_{MGT}	–	–	– Not applicable

- Small fish index (cod < 30 cm) has declined from a maximum in 2013
- Stock size indicator (biomass of cod ≥ 30 cm) has decreased after 2010;
- Exploitation rate decreased during 2005-2009; slight increase followed by no clear trend
- Landings include fish above and below Minumun Conservation Reference Size (MCS, 35 cm)
- Landings below MCS < 1% (316 t)
- Discarding: 10% (observer data), considered an underestimate

Eastern Baltic cod stock – Status of stock and exploitation

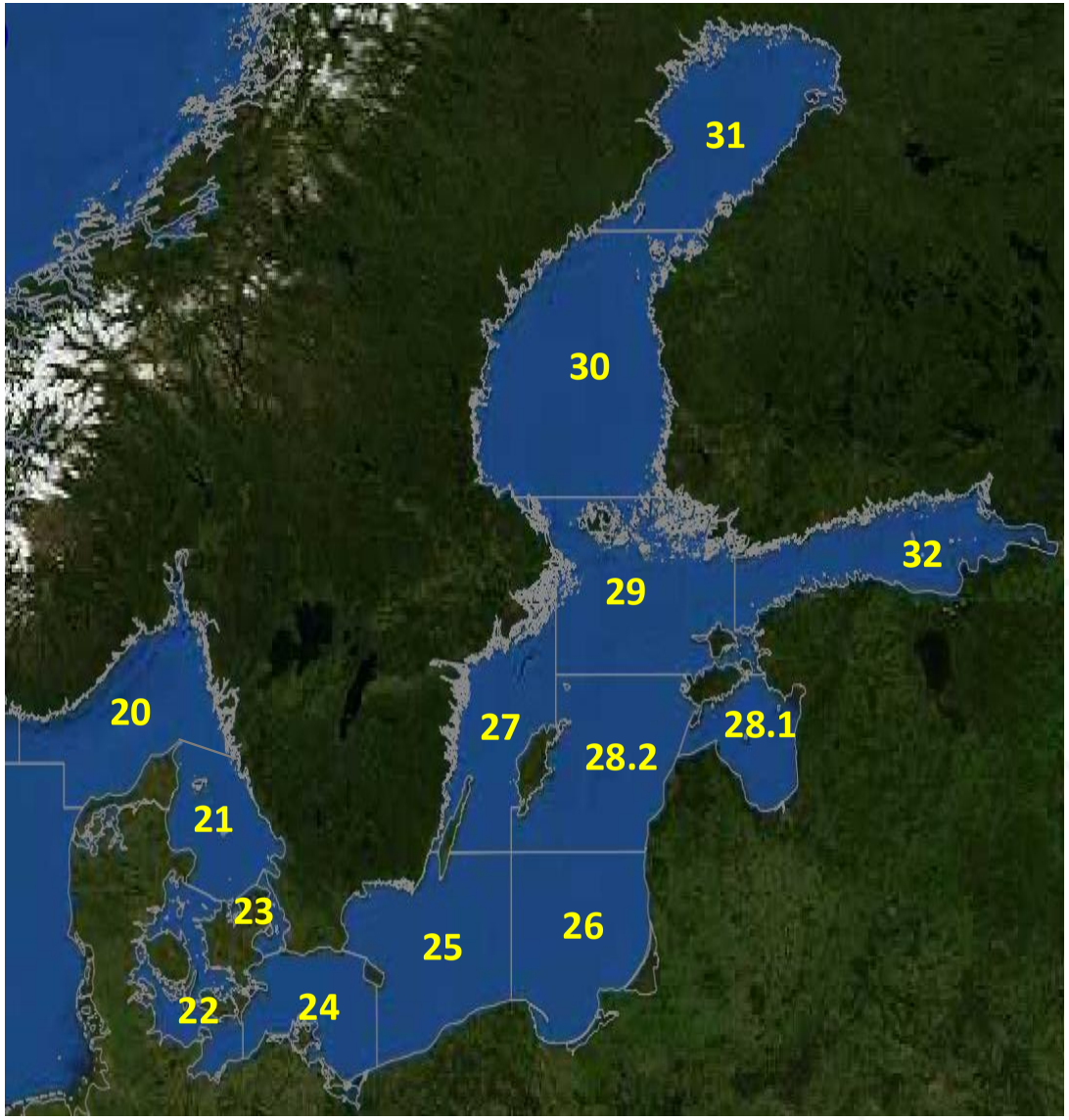


The precautionary buffer was last applied in 2015 .
The fishing mortality is above and the biomass below proxies of the MSY reference points; therefore, the precautionary buffer was applied to the advice.

Index A (2017, 2018)		83
Index B (2014, 2015, 2016)		152
Index ratio (A/B)		0.55
Uncertainty cap	Applied	0.80
Advised catch for 2018		26 071 tonnes
Precautionary buffer	Applied	0.80
Catch advice**		16 685 tonnes
% Advice change***		−36%

ICES advises that when the precautionary approach is applied, catches in 2019 from the eastern Baltic cod stock should be no more than 16 685 tonnes. This advice applies to all catches from the stock in subdivisions 24–32.

Flatfish stocks



* Plaice in subdivisions 21-23
* Plaice in subdivisions 24-32

➔ Management areas for plaice: 21 & 22-32

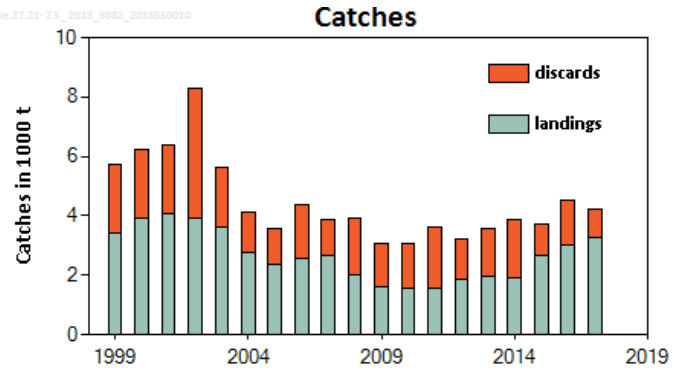
* Turbot in subdivisions 22-32

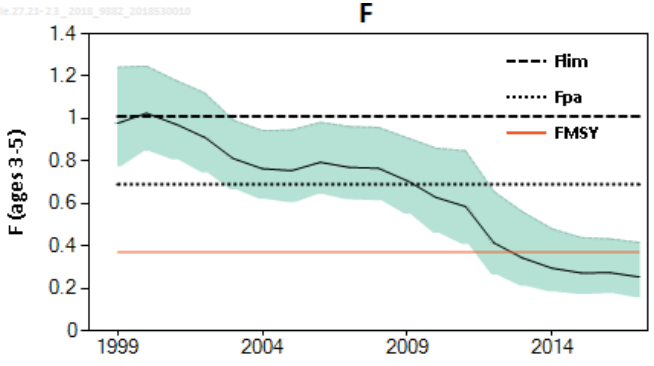
* Brill in subdivisions 22-32

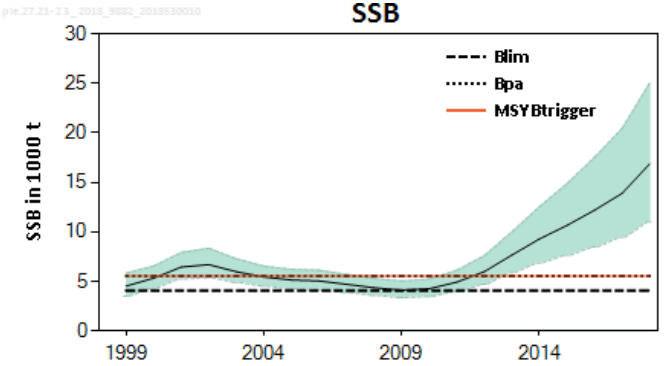
* Dab in subdivisions 22-32

* Flounder in subdivisions 22-23
* Flounder in subdivisions 24-25
* Flounder in subdivisions 26 and 28
* Flounder in subdivisions 27 and 29-32

Plaice in subdivisions 21-23







	Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018
Maximum Sustainable Yield	F_{MSY}	✓	✓	✓ Below	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	–	–	– Not applicable	SSB_{MGT}	–	–	– Not applicable

* SSB strongly increased from 2009 and above MSY $B_{trigger}$ since 2012
* F: declined and below F_{MSY} since 2013
* Recruitment: increasing

- Catch (2017) = 4242 t (23% discarded)

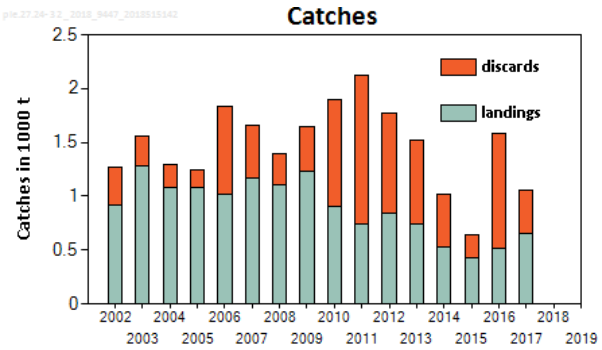
Plaice in subdivisions 21-23

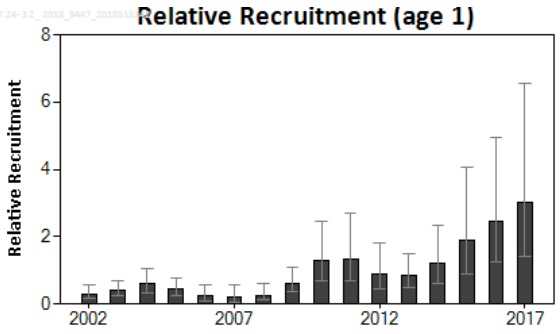
ICES advises that when the precautionary approach is applied, as requested by the European Commission, this corresponds to catches in 2019 of no more than 15 237 tonnes.

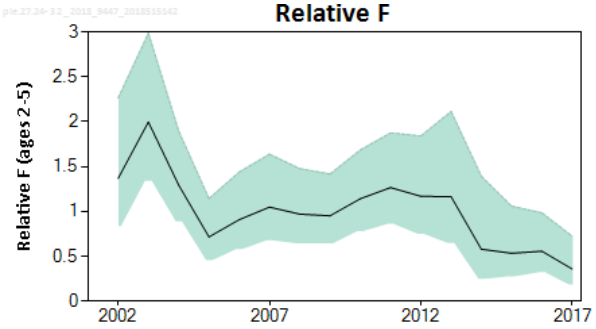
Assumptions 2018: F(2018) = F(2017) = 0.26 ➔ Catch 3747 t ➔ SSB(2019) = 22044>>> MSY $B_{trigger}$ (5 550 kt)

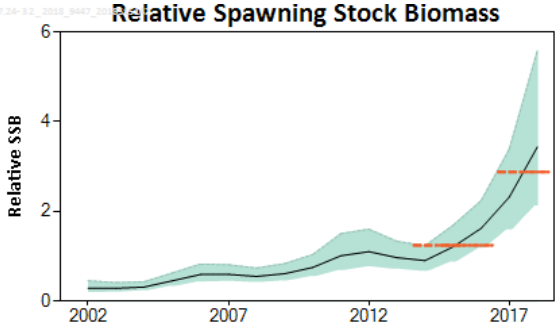
Basis	Total catch (2019)	Wanted catch* (2019)	Unwanted catch* (2019)	F (2019)	SSB (2020)	% SSB change **	% Advice change ***
ICES advice basis							
Precautionary approach: F_{PA}	15237	11651	3586	0.69	17271	−16	+182
Other scenarios							
F = 0	0	0	0	0	29679	+45	−100
F_{MSY}	9338	7140	2198	0.37	21949	+7	+73
$F = F_{lim}$	19669	15040	4629	1.01	13735	−33	+264
SSB (2020) = B_{pa}	30096	23012	7084	2.45	5550	−73	+457
SSB (2020) = MSY $B_{trigger}$	30096	23012	7084	2.45	5550	−73	+457
SSB (2020) = B_{lim}	32239	24651	7588	3.06	4077	−80	+496
$F = F_{2018}$	6821	5216	1605	0.26	23670	−5	+26

Plaice in subdivisions 24-32









		Fishing pressure				Stock size			
		2015	2016	2017			2016	2017	2018
Maximum Sustainable Yield	F_{MSY} proxy	✓	✓	✓	Below proxy	MSY $B_{Trigger}$ proxy	✓	✓	✓ Above proxy
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	–	–	–	Not applicable	SSB_{MGT}	–	–	– Not applicable

- Strong increase in stock size
- F in 2017 is the lowest observed in the time-series
- Catch (2017) = 1058 t (38.6% discarded)
- Discarding varies depending on market prices and quota of target species (e.g. cod), and can affect all lengths

Plaice in subdivisions 24-32

SSB trend from
exploratory stock assessment
used as stock size indicator:

The relative fishing mortality is below and the relative stock size above proxies of the MSY reference points; therefore, no additional precautionary buffer was applied.

Index A (2017, 2018)		2.9
Index B (2014, 2015, 2016)		1.24
Index ratio (A/B)		2.3
Uncertainty cap	Applied	1.20
Advised catch for 2018		3104 tonnes
Discard rate (2017)		0.38
Precautionary buffer	Not applied	-
Catch advice**		3725 tonnes
% change in advice ^		+20%

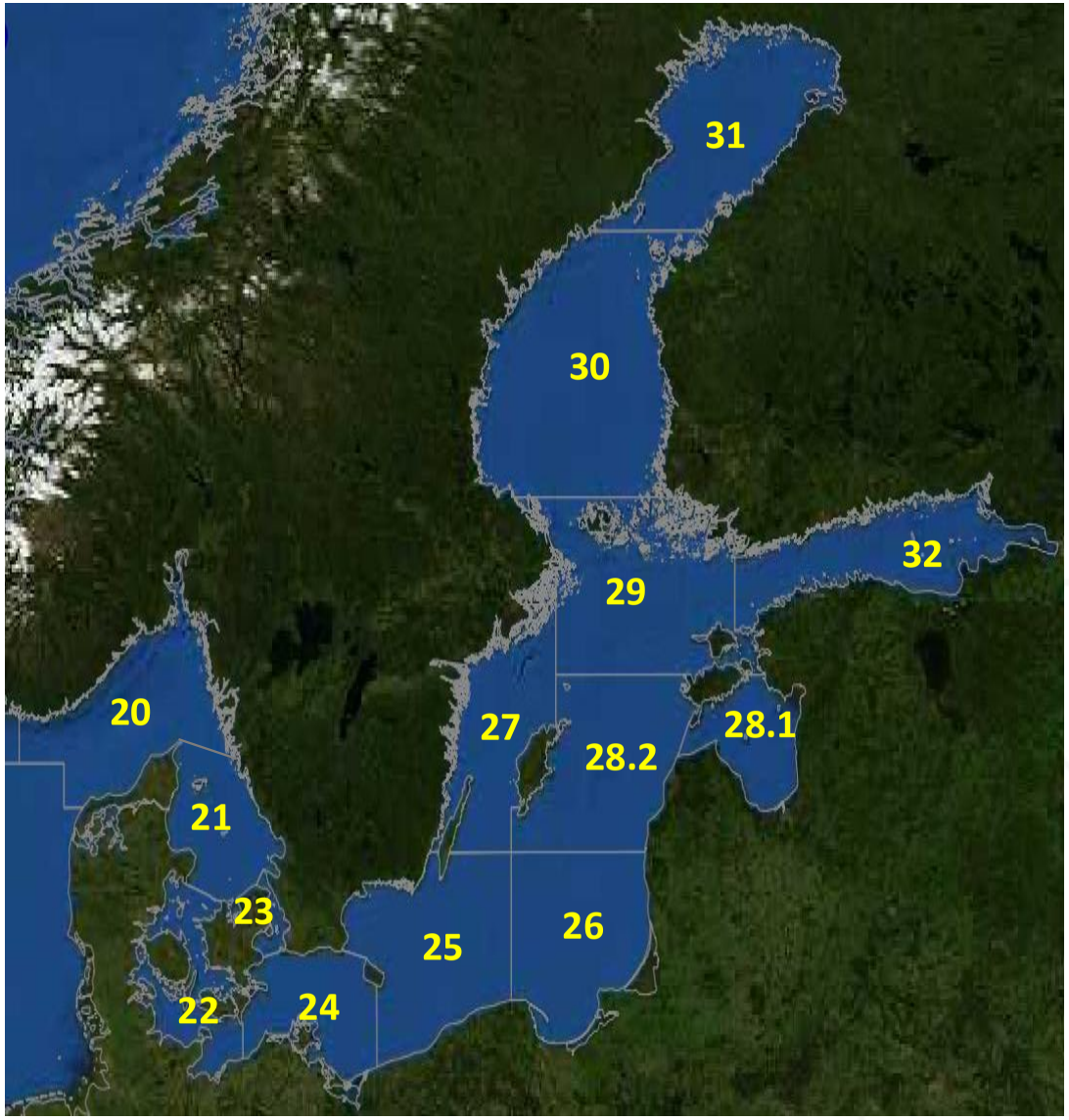
Plaice – Catch by management area

Table 4 Plaice in subdivisions 24–32. Catch and landings overview and calculation of catches by management area for plaice in subdivisions 21–23 and 24–32.

Basis		Catch 2017	Landings 2017	ICES stock advice 2019 (catch)
Stock area-based	SDs 21–23	4 242	3 243	15 237
	SDs 24–32	1 051	650	3 725
Total advised catch, 2019 (SDs 21–32)				18 962
Management area-based	SD 21	1 337	801	
	SDs 22–23	2 905	2 442	
	SDs 22–32	3 956	3 092	

	calculation	results
Share of SD 21 of the total catch in SDs 21–23 in 2017	1 337 t / 4 242 t (catch in 2017 SD 21 / catch in 2017 SDs 21–23)	0.315
Catch in 2019 for SD 21	15 237 t × 0.315 (ICES stock advice in 2019 (catch) for SDs 21–23 × share)	**4 802**
Catch in 2019 for SDs 22–32	18 962 t–4 802 t (total advised catch in 2019 SDs 21–32 – catch SD 21)	**14 160**
Share of SD 21 of the total landings in SDs 21–23 in 2017	801 t / 3 243 t (landings in 2017 SD 21 / landings in 2017 SDs 21–23)	0.247

Pelagic stocks



* Herring: Western Baltic spring spawners (subdivisions 20-24)

* Herring: Central Baltic (subdivisions 25-29 & 32, excluding Gulf of Riga)

* Herring: Gulf of Riga (Subdvision 28.1)

* Herring: Subdivision 30

* Herring: Subdivision 31

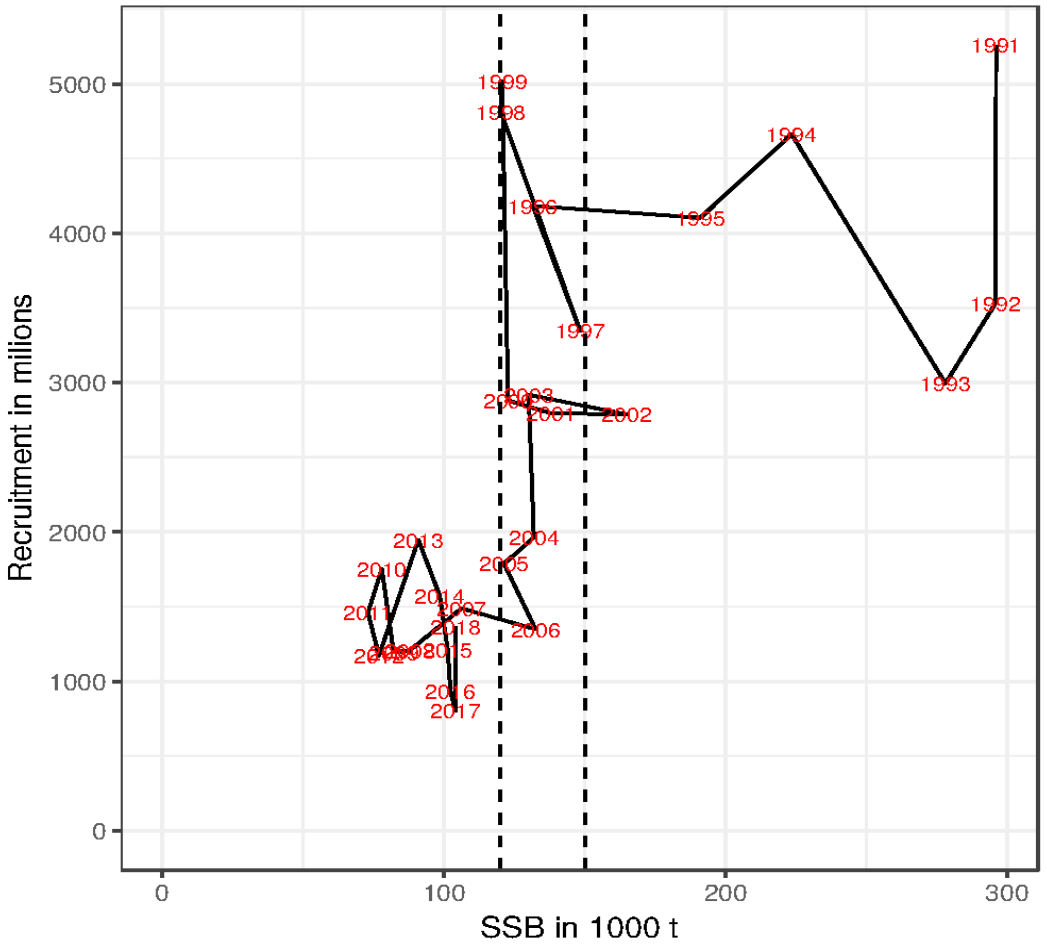
* Sprat: subdivisions 22-32

Western Baltic spring spawning herring (subdivisions 20-24)

This stock was benchmarked in 2018

Revised Reference Points

Reference point	Old Value	New Value
MSY $B_{trigger}$	110 000	150 000
F_{MSY}	0.32	0.31
B_{lim}	90 000	120 000
B_{pa}	110 000	150 000
F_{lim}	0.52	0.45
F_{pa}	0.45	0.35



Western Baltic spring spawning herring (subdivisions 20-24)

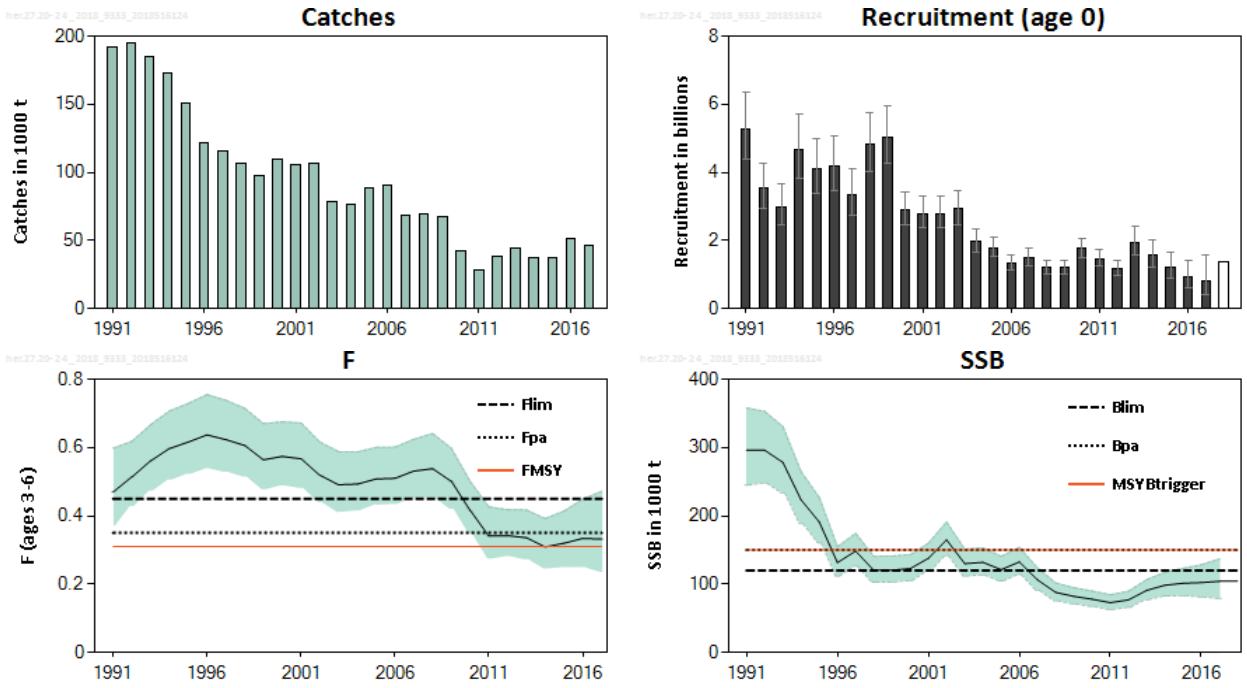


Figure 1 Herring in subdivisions 20–24, spring spawners. Commercial catches, recruitment, fishing mortality, and spawning

- SSB below B_{lim}
- F above F_{MSY}
- Recruitment has been low since the mid-2000s
- Recruitment 2016 & 2017 lowest in the time series
- Catch (2017) = 46 340 (~ 99.6% directed fishery; discarding negligible)

		Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018	
Maximum sustainable yield	F_{MSY}	✗	✗	✗	Above	MSY $B_{Trigger}$	✗	✗	✗ Below trigger
Precautionary approach	F_{pa},F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa},B_{lim}	✗	✗	✗ Increased risk
Management plan	F_{MGT}	–	–	–	Not applicable	SSB_{MGT}	–	–	– Not applicable

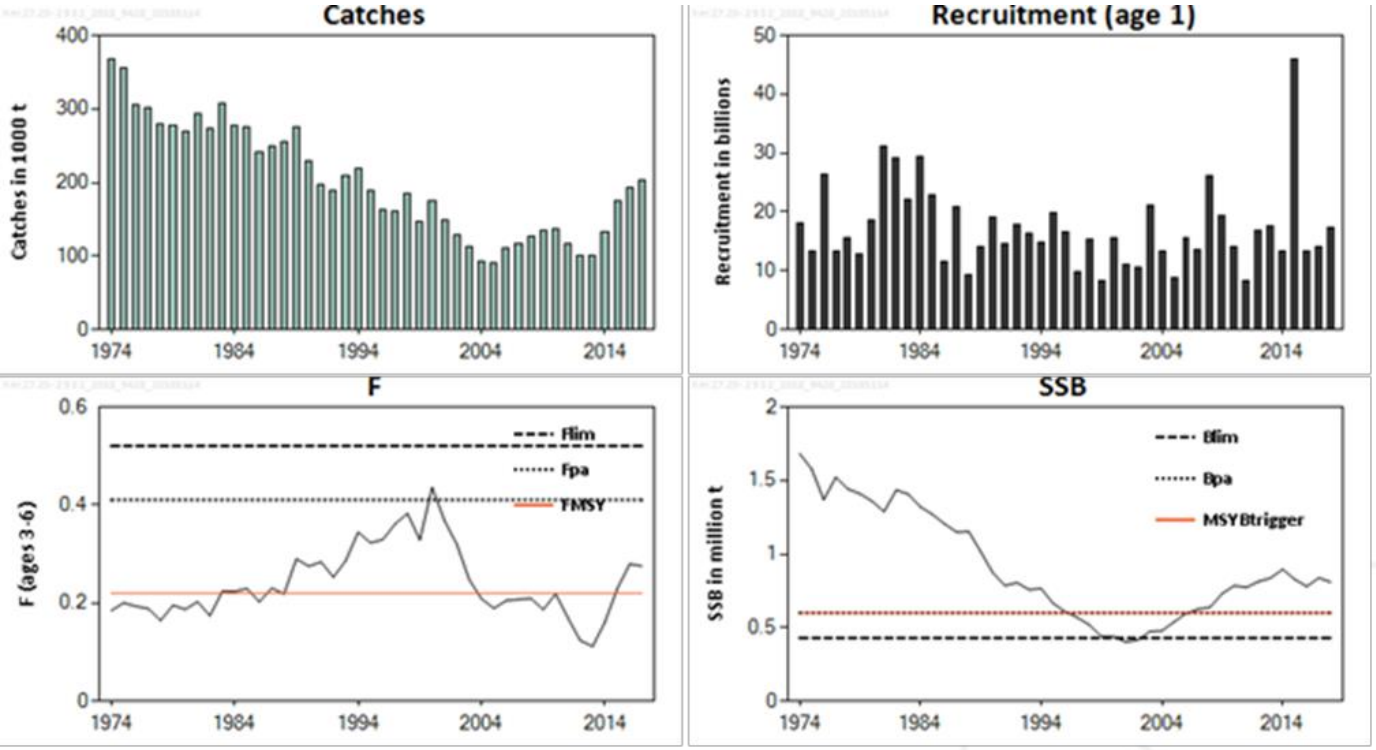
Mixing with North Sea herring in Division 3a and eastern part of Subarea 4

Herring (*Clupea harengus*) in subdivisions 20–24, spring spawners (Skagerrak, Kattegat, and western Baltic)

ICES advises that when the MSY approach is applied, there should be zero catch in 2019.

Basis	Total catch (2019)	F_{3-6} (2019)	SSB* (2019)	SSB* (2020)	% SSB change **	% advice change ***
ICES advice basis						
MSY approach: zero catch	0	0	97 975	117 962	20%	-100%
Other scenarios						
MAP (2018)^: $F = F_{MSY} \times SSB_{2018}/MSY\ B_{trigger}$	26 849	0.22	95 790	93 555	-2.3%	-22%
MAP (2018)^: $F = F_{MSY\ lower} \times (SSB_{2018}/MSY\ B_{trigger})$	19 289	0.15	96 445	100 319	4.0%	-44%
MAP (2018)^: $F = F_{MSY\ upper} \times (SSB_{2018}/MSY\ B_{trigger})$	32 149	0.26	95 309	88 869	-6.8%	-7.1%
F_{MSY}	37 118	0.31	94 840	84 275	-11.1%	7.2%
$F = F_{pa}$	41 178	0.35	94 418	80 704	-14.5%	19.0%
$F = F_{lim}$	50 711	0.45	93 433	72 478	-22%	46%
SSB (2020) = B_{lim} ^^	0	0	97 975	117 962	20%	-100%
SSB (2020) = B_{pa}^^	0	0	97 975	117 962	20%	-100%
SSB (2020) = MSY $B_{trigger}$^^	0	0	97 975	117 962	20%	-100%
$F = F_{2018}$	35 869	0.30	94 959	85 373	-10.1%	3.6%
MAP (2016)^^^: $F = F_{MSY} \times SSB_{y-1}/\ MSY_{MAP}B_{trigger}$	36 391	0.30	94 910	85 158	-10.3%	5.1%
MAP (2016)^^^: $F = F_{MSY.lower} \times SSB_{y-1}/\ MSY_{MAP}B_{trigger}$	27 188	0.22	95 760	93 262	-2.6%	-21%
MAP (2016)^^^: $F = F_{MSY.upper} \times SSB_{y-1}/\ MSY_{MAP}B_{trigger}$	44906	0.39	94 067	77 788	-17.3%	30%
F = 0 {SSB_{2021} = 147 941} ^^^^	0	0	97 975	117 962	20%	-100%
F = 0.05 {SSB_{2021} = 134 648} ^^^^	6 540	0.05	97 462	111 782	14.7%	-81%
F = 0.1 {SSB_{2021} = 122 673} ^^^^	12 776	0.1	96 951	105 941	9.3%	-63%
F = 0.15 {SSB_{2021} = 111 881} ^^^^	18 724	0.15	96 443	100 422	4.1%	-46%

Central Baltic herring stock (subdivisions 25-29 & 32, excluding G. Riga)



	Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018
Maximum Sustainable Yield	F_{MSY}	✗	✗	✗ Above	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{ranges}	✓	✓	✓ Within range	MSY $B_{trigger}$	✓	✓	✓ Above

- SSB above MSY $B_{trigger}$ since 2006
- F has been above F_{MSY} since 2015
- Recruitment in 2015 the highest observed
- Catch (2017) = 202 517 t (mainly pelagic trawls; discarding negligible)

* Some catch of Central Baltic herring stock occurs in Gulf of Riga, and viceversa

Central Baltic herring stock (subdivisions 25-29 & 32, excluding G. Riga)

Basis	Total catch (2019)	F_{total} (2019)	SSB (2019)	SSB (2020)	% SSB change *	% Advice change **
ICES advice basis						
EU MAP^^: F_{MSY}	155333	0.22	735005	716594	-3%	-42%
EU MAP^^: F_{lower}	115591	0.16	750157	766194	2%	-42%***
EU MAP^^: F_{upper}	192787	0.28	720202	670935	-7%	-42%^
Other scenarios						
ICES MSY approach: F_{MSY}	155333	0.22	735005	716594	-3%	-42%
20% decrease in TAC ^^^	210703	0.31	712928	649472	-9%	-21%
F = 0	0	0	791368	916969	16%	-100%
$F = F_{pa}$	263813	0.41	690577	587317	-15%	-1%
$F = F_{lim}$	318710	0.52	666102	525436	-21%	19%
$SSB (2020) = B_{lim}$	408365	0.73	622595	429752	-31%	53%
$SSB (2020) = B_{pa}$	254003	0.39	694799	598630	-14%	-5%
$SSB (2020) = MSY\ B_{trigger}$	254003	0.39	694799	598630	-14%	-5%
$F = F_{2018}$	232886	0.35	703741	623242	-11%	-13%

The decreased catch advice is due to a change in the perception of the stock size. The stock size was downscaled and fishing mortality was upscaled due to the low survey indices in the last two years. There is also a downward revision of the 2014 year class.

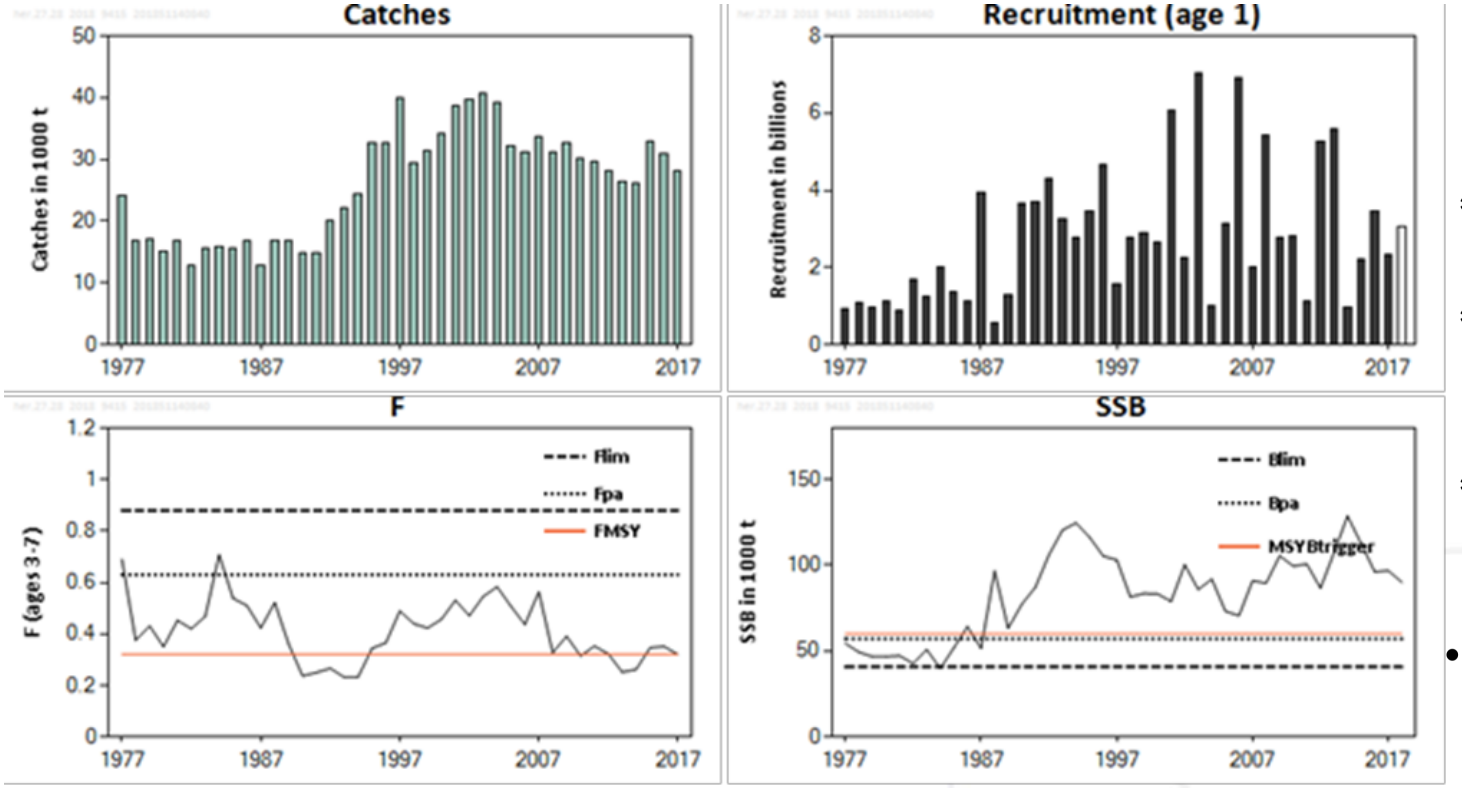
Herring: information on catch opportunities by management area

A possible way to set TACs by management area (SDs 25-29 & 32, excluding G. Riga; G. Riga) consistent with the stock advice is by assuming for 2018:

- Central Baltic herring caught in G. Riga: 4363 t (average of 2013-2017)
- G. Riga herring caught in Subdvision 28.2: 251 t (average of 2013-2017)

The corresponding TAC in the central Baltic management area for 2019 would be calculated as 155 333 tonnes + 251 tonnes – 4363 tonnes = 151 221 tonnes .

Gulf of Riga herring stock (Subdivision 28.1)



	Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018
Maximum Sustainable Yield	F_{MSY}	✗	✗	✓ At	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✓	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{ranges}	✓	✓	✓ Within range	MSY $B_{trigger}$	✓	✓	✓ Above

* SSB above MSY $B_{trigger}$ since late 1980s

* F close to F_{MSY} since 2008, generally above

* High and low recruitment in recent years

- Catch (2017) = 30865 t (~ 77% trawl, 23% trapnets ; discarding negligible)

* Some catch of Central Baltic herring stock occurs in Gulf of Riga, and viceversa

Gulf of Riga herring stock (Subdivision 28.1)

ICES advises that when the EU multiannual plan (MAP) is applied, catches in 2019 that correspond to the F ranges in the plan are between 20 664 tonnes and 31 237 tonnes. According to the MAP, catches higher than those corresponding to FMSY (26 932 tonnes) can only be taken under conditions specified in the MAP. This advice applies to all catches from the stock in subdivisions 28.1 and 28.2.

Basis	Total catch(2019)	F_{total}(2019)	SSB (2019)	SSB(2020)	% SSBchange **	% Advice change ***
ICES advice basis						
EU MAP*: F_{MSY}	26932	0.32	91669	92404	0.8%	8.1%
EU MAP*: F_{lower}	20664	0.24	93020	99670	7.1%	6.5%^
EU MAP*: F_{upper}	31237	0.38	90698	87477	-3.6%	7.0%^^
Other scenarios						
ICES MSY approach: F_{MSY}	26932	0.32	91669	92404	0.8%	8.1%
F = 0	0	0	97030	124349	28.2%	-100.0%
$F = F_{pa}$	47115	0.63	86754	69785	-19.6%	89.1%
$F = F_{lim}$	59942	0.88	83040	56105	-32.4	140.6%
$SSB (2020) = B_{lim}$	75061	1.25	77788	40800	-47.5%	201.2%
$SSB (2020) = B_{pa}$	58989	0.86	83335	57100	-31.5%	136.7%
$SSB (2020) = MSY B_{trigger}$	56232	0.80	84172	60000	-28.7%	125.7%
$F = F_{2018}$	24584	0.29	92183	95113	3.2%	-1.3%

Assumptions 2018: TAC constraint + stock catch in Central Baltic – catch of Central Baltic herring in Gulf of Riga (24919 t) ➔ F(2018) = 0.29 MSY B = 60 000 t

Herring: information on catch opportunities by management area

A possible way to set TACs by management area (SDs 25-29 & 32, excluding G. Riga; G. Riga) consistent with the stock advice is by assuming for 2018:

- Central Baltic herring caught in G. Riga: 4363 t (average of 2013-2017)
- G. Riga herring caught in Subdvision 28.2: 251 t (average of 2013-2017)

The corresponding TAC in the Gulf of Riga management area for 2019 would be calculated as 26932 tonnes – 251 tonnes + 4363 tonnes = 31044 tonnes.

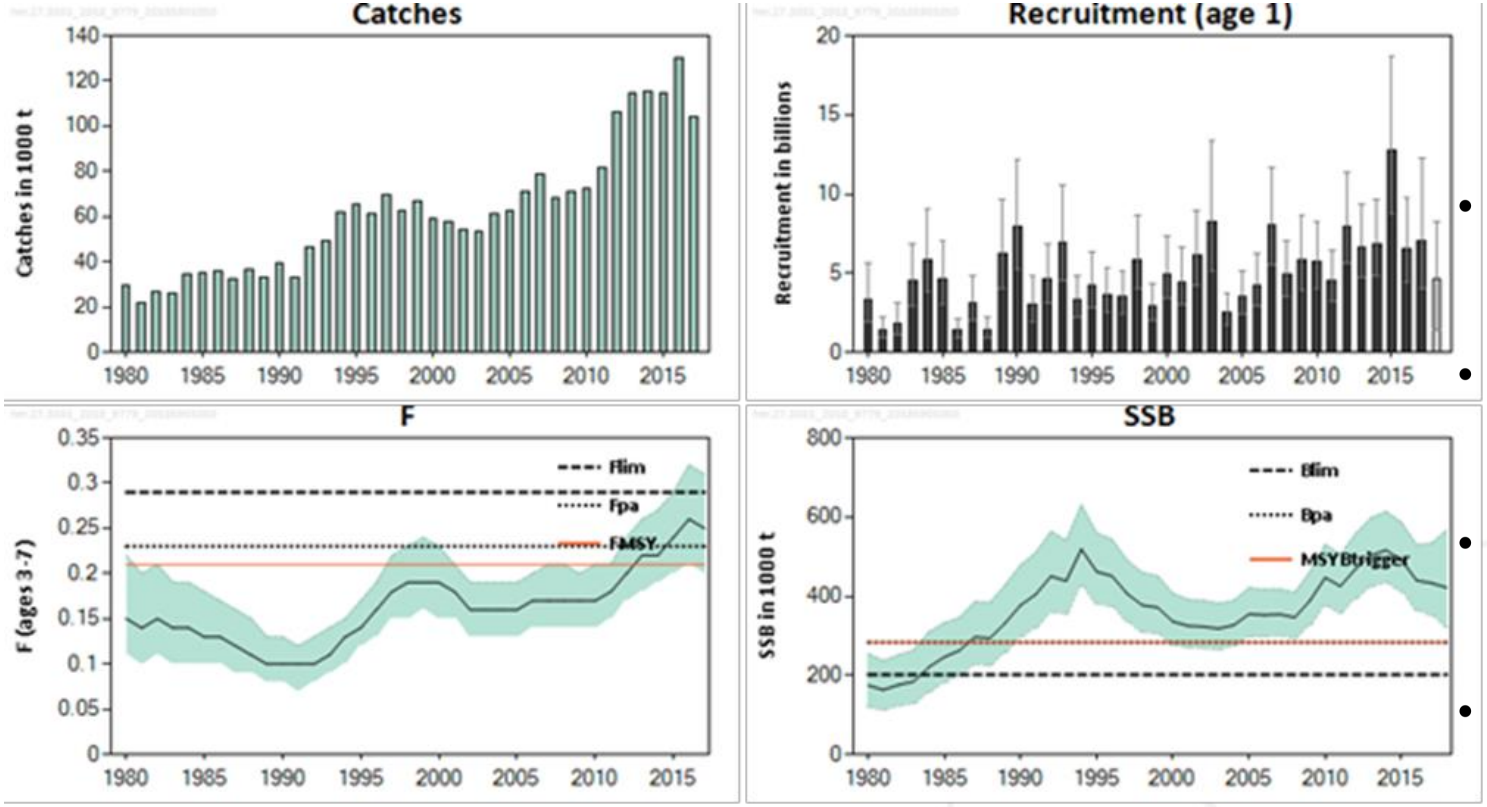
Gulf of Riga herring stock (Subdivision 28.1)

The EC has requested ICES to identify if **intra-specific density dependence** is known to occur for Gulf of Riga herring based on existing, updated scientific evidence (EC, 2018).

In the short term this stock is not expected to increase to biomasses outside the range estimated by the assessment in recent years. Mean weights in the stock have also been stable in recent years suggesting little evidence for declining growth due to intra-species interactions. The stock has been declining in recent years and the direct and indirect effects on other stocks are within the range of what would have occurred in previous years without observing significant detrimental inter-species effects.

Therefore ICES does not consider that the evidence is sufficient to justify an application of the upper FMSY range based on the condition; “to avoid serious harm to a stock caused by intra- or inter-species stock dynamics”, set out in the MAP.

Herring in Subdivisions 30 & 31 (Gulf of Bothnia)



- Two stocks merged last year at benchmark
- SSB has decreased in the last five years but above MSY $B_{trigger}$
- F increasing trend and now above F_{MSY}
- High and low recruitment in recent years

Catches 2017 104 358 tonnes (96% trawl, 3.3% trap nets)

	Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018
Maximum sustainable yield	F_{MSY}	✗	✗	✗ Above	MSY $B_{trigger}$	✓	✓	✓ Above trigger
Precautionary approach	F_{pa}, F_{lim}	o	o	o Increased risk	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{MGT}	-	-	- Not applicable	SSB_{MGT}	-	-	- Not applicable

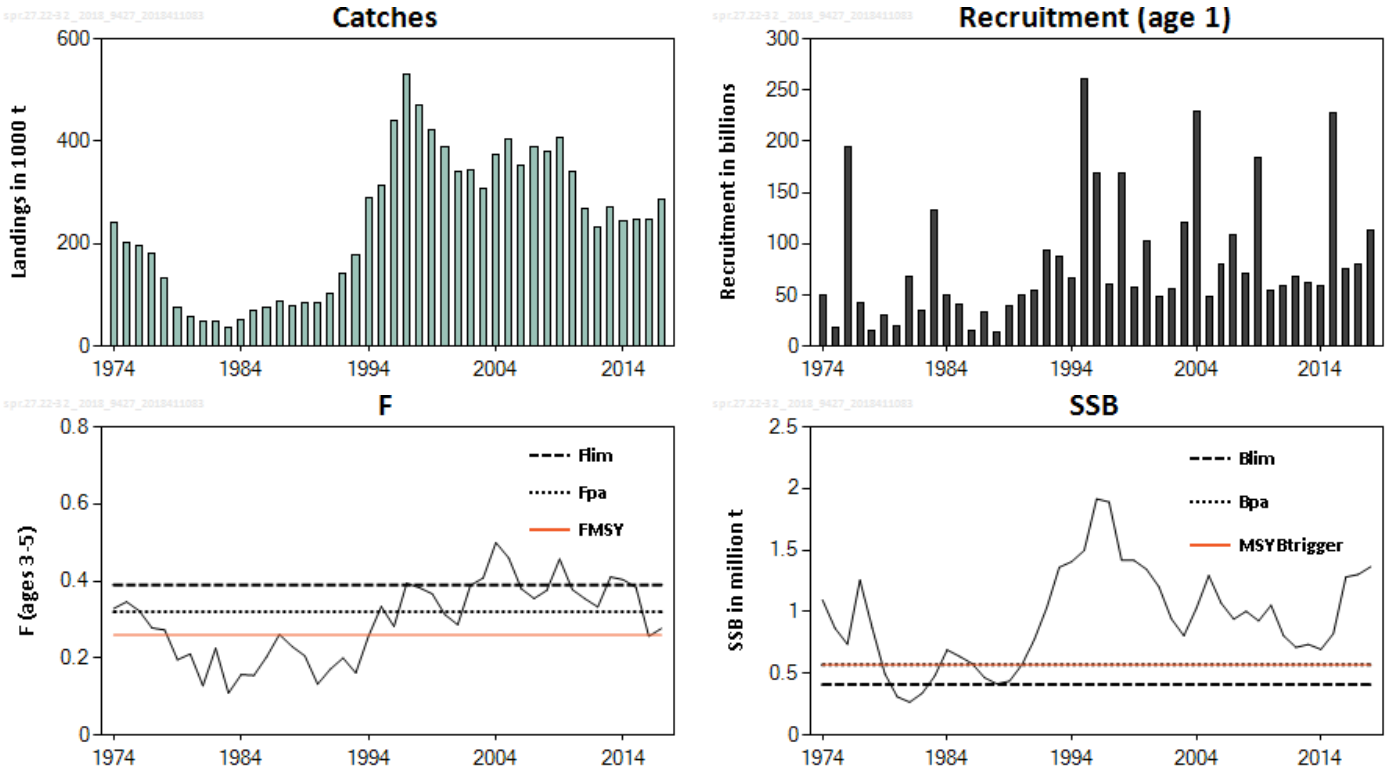
Herring in Subdivisions 30 & 31 (Gulf of Bothnia)

ICES advises that when the MSY approach is applied, catches in 2019 should be no more than 88 703 tonnes.

Basis	Catch (2019)	F_{total} (2019)	SSB (2019)	SSB (2020)	% SSB change *	% TAC change **	% Advice change ***
ICES advice basis							
MSY approach: F_{MSY}	88703	0.21	414047	394945	-5%	5%	-7%
Other scenarios							
F = 0	0	0	427665	499703	17%	-100%	-100%
F = F_{pa}	96179	0.23	412682	386391	-6%	14%	1%
F = F_{lim}	117632	0.29	408765	361564	-12%	39%	23%
SSB (2020) = B_{lim}	264259	0.84	376633	202272	-46%	212%	177%
SSB (2020) = B_{pa}	189165	0.52	394597	283180	-28%	124%	98%
SSB (2020) = MSY $B_{trigger}$	189165	0.52	394597	283180	-28%	124%	98%
F = F_{2018}	84133	0.198	414846	399991	-4%	-1%	-12%
F = proposed $F_{MSY\ lower}$ ^	65662	0.151	418125	421393	1%	22%	-31%^^^
F = proposed $F_{MSY\ upper}$ ^^	88703	0.21	414047	394945	-5%	5%	-7%‡

Assumptions 2018: Catch constraint (84 599t); F(2018) = 0.198

Sprat in subdivisions 22-32



	Fishing pressure				Stock size			
		2015	2016	2017		2016	2017	2018
Maximum Sustainable Yield	F_{MSY}	✗	✓	✗ Above	MSY $B_{Trigger}$	✓	✓	✓ Above trigger
Precautionary Approach	F_{pa}, F_{lim}	✗	✓	✓ Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓ Full reproductive capacity
Management plan	F_{ranges}	✗	✓	✗ Above	MSY $B_{trigger}$	✓	✓	✓ Above

- SSB above MSY $B_{trigger}$ since early 1990s increasing
- F has declined in recent years and is close to F_{MSY}
- Recruitment: last 3 years close to average
- Catch (2017) = 285 701 t

Sprat in subdivisions 22-32

ICES advises that when the EU multiannual plan (MAP) is applied, catches in 2019 that correspond to the F ranges in the plan are between 225 752 tonnes and 311 523 tonnes. According to the MAP, catches higher than those corresponding to FMSY (301 125 tonnes) can only be taken under conditions specified in the MAP, whilst the entire range is considered precautionary when applying the ICES advice rule.

Basis	Total catch (2019)	F_{total} (2019)	SSB (2019)	SSB (2020)	% SSB change *	% TAC change **	% Advice change ***
ICES advice basis							
EU MAP^^: F_{MSY}	301125	0.26	1424129	1386388	-2.7	-1.24	3.2
EU MAP^^: $F_{MSY\ lower}$	225752	0.19	1455973	1476851	1.43	-26	3.0^
EU MAP^^: $F_{MSY\ upper}$	311523	0.27	1419656	1374084	-3.2	2.2	3.2^
Other scenarios							
MSY approach = F_{MSY}	301125	0.26	1424129	1386388	-2.7	-1.24	3.2
F = 0	0	0	1546000	1764000	14	-100	-100
F = F_{pa}	361745	0.32	1396992	1314342	-5.9	19	24
F = F_{lim}	429350	0.39	1366673	1235411	-9.6	41	47
SSB (2020) = B_{lim}	602596	1.63	521409	410201	-21	98	107
SSB (2020) = B_{pa}	597889	1.16	707028	569675	-19	96	105
SSB (2020) = MSY $B_{trigger}$	597889	1.16	707028	569675	-19	96	105
F = F_{2018}^^^	304000	0.26	1423000	1383000	-2.8	-0.30	4.2

Assumptions : Catch constraint of 304 900 t in 2018 (EU quota of 262 300 t and Russian quota of 42 600 t).➔ F(2018) = 0.26

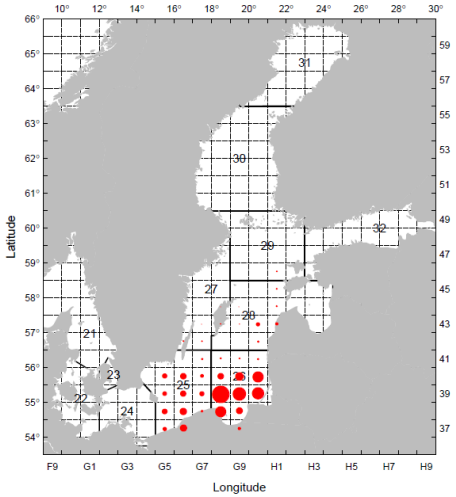
Sprat in subdivisions 22-32

ICES recommends that a spatial management plan is developed for the fisheries that catch sprat, with the aim to improve cod condition.

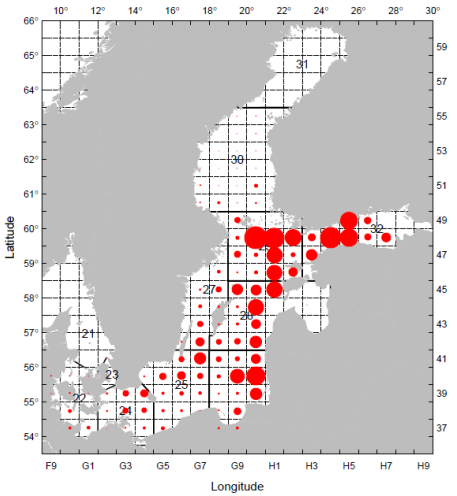
The abundance of cod in subdivisions 25–26 is high compared to other areas in the Baltic and the cod condition is considered to be limited by food availability. Sprat and herring are important food items for cod (especially sprat), but the present high biomass of the two prey stocks is mainly distributed outside the distribution area for cod.

The relative catch proportion of sprat in the main cod distribution area has since 2010 increased from 37% of the total catch to 53% in 2012–2017. Any increase in fishing pressure on sprat in the main cod distribution area may deteriorate the feeding condition for cod as prey availability decreases.

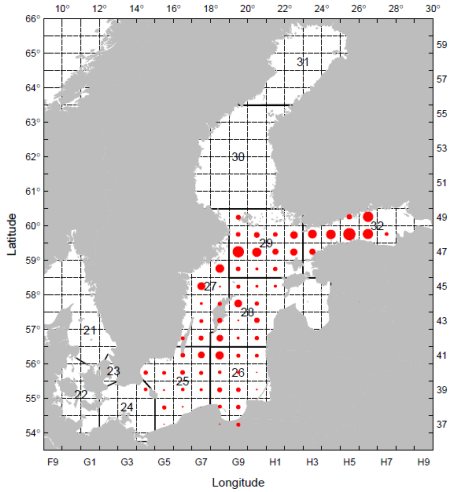
Cod (BITS 2017 Q4)



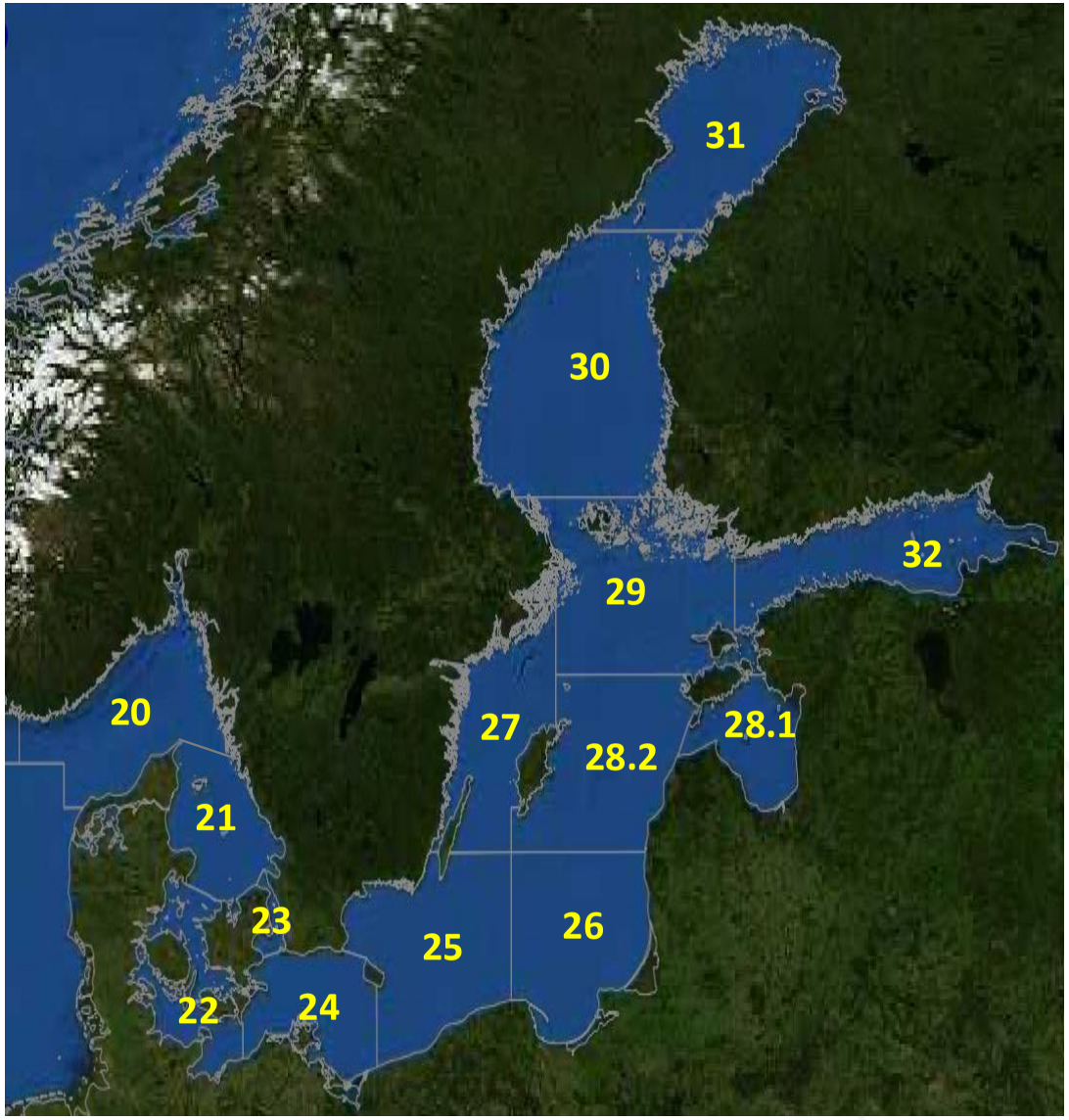
Sprat (BIAS 2017 Q4)



Herring (BIAS 2017 Q4)



Salmon and sea trout



* Salmon in subdivisions 22-31

* Salmon in subdvision 32

* Sea trout in subdivisions 22-32

Thank you

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