

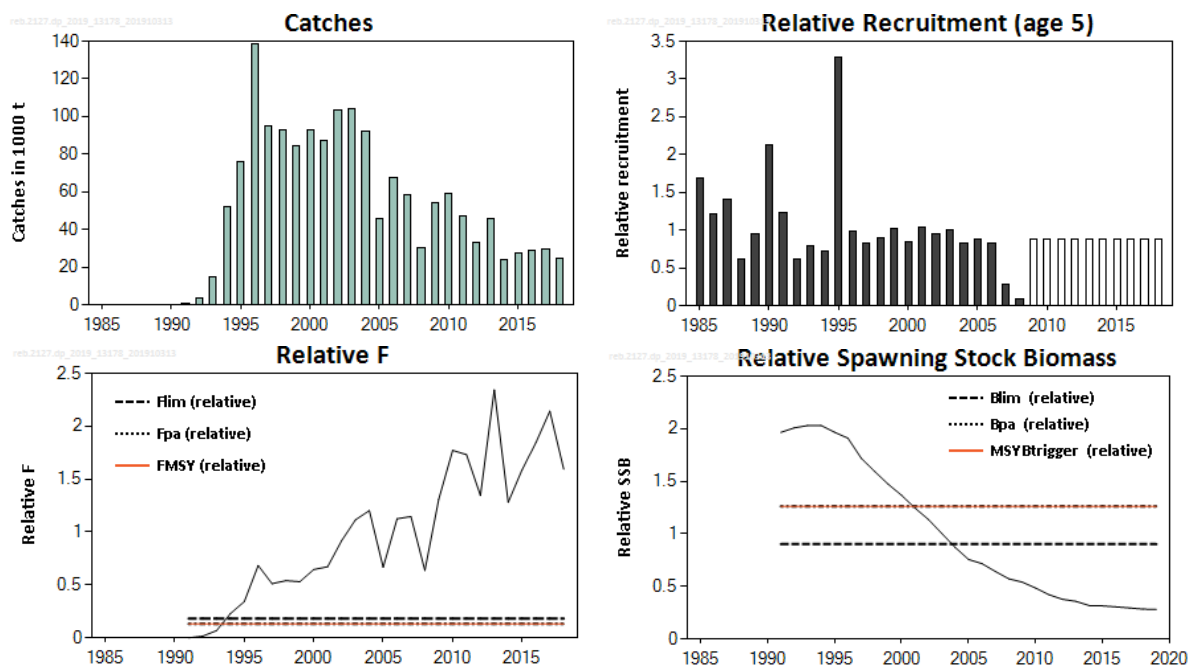
**Beaked redfish (*Sebastes mentella*) in ICES subareas 5, 12, and 14 (Iceland and Faroe grounds, North of Azores, East of Greenland) and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m)**

**ICES advice on fishing opportunities**

ICES advises that when the MSY approach is applied, there should be zero catch in each of the years 2020 and 2021.

**Stock development over time**

The spawning-stock biomass (SSB) has been declining since the mid-1990s and has been below  $B_{lim}$  since 2005. The fishing mortality (F) shows an increasing trend since the beginning of the fishery in 1991. The F has been above  $F_{MSY}$  since 1994 and above  $F_{lim}$  since 1995. Recruitment (R) estimates were stable between 1996 and 2006. Recruitment estimates in 2007 and 2008 were low.



**Figure 1** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Top left: Catches (thousand tonnes). Top right: Relative recruitment (R) at age 5. Relative recruitment (R) since 2009 is assumed to be at the geometric mean of 1985–2008. Bottom left: Relative fishing mortality (F). Bottom right: Relative spawning-stock biomass (SSB). R, F, and SSB are expressed relative to the average of the time-series (1985–2018 for R, 1991–2018 for F, and 1991–2019 for SSB).

**Stock and exploitation status**

ICES assesses that fishing pressure on the stock is above  $F_{MSY}$ ,  $F_{pa}$ , and  $F_{lim}$ , and that spawning stock size is below  $MSY B_{trigger}$ ,  $B_{pa}$ , and  $B_{lim}$ .

**Table 1** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1+2 (deep pelagic stock > 500 m). State of the stock and fishery relative to reference points.

	Fishing pressure			Stock size			
		2016	2017	2018	2017	2018	2019
Maximum sustainable yield	$F_{MSY}$	✘	✘	✘ Above	$MSY B_{trigger}$	✘	✘ Below trigger
Precautionary approach	$F_{pa}, F_{lim}$	✘	✘	✘ Harvested unsustainably	$B_{pa}, B_{lim}$	✘	✘ Reduced reproductive capacity
Management plan	$F_{MGT}$	—	—	— Not applicable	$B_{MGT}$	—	— Not applicable

## Catch scenarios

**Table 2** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1+2 (deep pelagic stock > 500 m). Assumptions made for the interim year and in the forecast. All values, except for the catch, are relative to the average of the time-series in the stock assessment (see Table 13).

Variable	Value	Notes
Relative F (2019)	2.30	F of fully selected lengths corresponding to the assumed catch in 2019
Relative SSB (2020)	0.255	Based on the short-term forecast
Relative $R_{age 5}$ (2019–2021)	0.88	Geometric mean 1985–2008
Total catch (2019)	29 658 t	Sum of declared unilateral quotas in 2019

**Table 3** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Catch scenarios. The values in the columns “Relative F” and “Relative SSB” are relative to the average of the time-series in the stock assessment (see Table 13). Catch is in tonnes.

Basis	Relative F (2020)	Catch (2020)	Relative SSB (2021)	Relative F (2021)	Catch (2021)	Relative SSB (2022)	%SSB change *	% advice change ^
ICES advice basis								
MSY approach	0	0	0.287	0	0	0.320	25	
Other scenarios								
$F_{MSY} \times SSB_{(2020)} / MSY B_{trigger}$	0.030	380	0.286	0.030	462	0.319	25	
$F_{MSY}$	0.13	1583	0.285	0.13	1901	0.314	23	
$0.1 \times F_{2019}$	0.38	4646	0.280	0.38	5420	0.304	19	
$0.2 \times F_{2019}$	0.72	8610	0.274	0.72	9672	0.292	14	
$0.3 \times F_{2019}$	1.01	12004	0.268	1.01	13049	0.281	10	
$0.4 \times F_{2019}$	1.27	14920	0.264	1.27	15764	0.272	7	
$0.5 \times F_{2019}$	1.50	17432	0.260	1.50	17967	0.265	4	
$0.6 \times F_{2019}$	1.70	19603	0.257	1.70	19772	0.259	3	
$0.7 \times F_{2019}$	1.88	21483	0.254	1.88	21263	0.254	-1	
$0.8 \times F_{2019}$	2.04	23114	0.251	2.04	22503	0.249	-2	
$0.9 \times F_{2019}$	2.18	24532	0.249	2.18	23542	0.245	-4	
$1 \times F_{2019}$	2.30	25767	0.247	2.30	24416	0.242	-5	

\* SSB in 2022 relative to SSB in 2020.

^ No advice was given for 2019. The advice for 2018 was for zero catch.

The advised catch for 2020 and 2021 is the same as the advised catch for 2017 and 2018, i.e. zero catch. There was no ICES advice for 2019.

## Basis of the advice

**Table 4** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). The basis of the advice.

Advice basis	MSY approach
Management plan	ICES is not aware of any agreed precautionary management plan for redfish in this area.

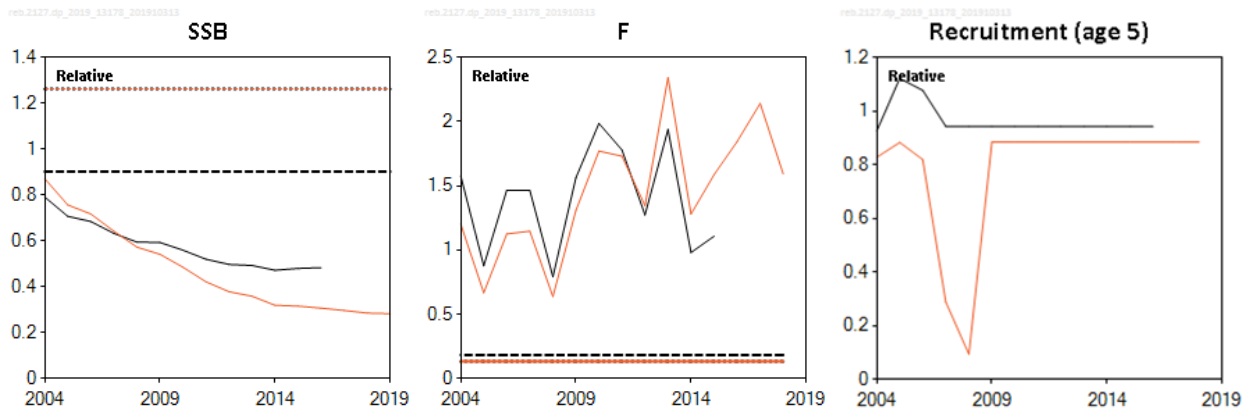
## Quality of the assessment

A fishery-independent time-series from an international trawl–acoustic survey is available from 1999 and provides a biomass index every two years from 1999 to 2015, and also in 2018. Survey coverage has been reduced over time (Table 5). The survey conducted in June/July 2018 only covered part of the stock distribution. The biomass estimate was adjusted to the total stock area, assuming the same distribution of biomass as was observed in the 2015 survey. The increased uncertainty around the accuracy of this assessment can only be addressed through more complete survey coverage in the future.

The most recent assessment shows some downwards revision of stock size and recruitment compared to the 2016 assessment. This revision is likely to be a consequence of the survey biomass estimate in 2018 being lower than the value predicted in the 2016 assessment.

From 2009 onwards the geometric mean of the recruitment is an assumed value, because estimates from the assessment take about 8–10 years to stabilize.

In recent years ICES has not obtained catch estimates disaggregated by depth from all countries (ICES, 2019). ICES recommends that all countries should report depth information on a haul basis, in accordance with the NEAFC logbook format. Action is needed through NEAFC and NAFO to provide ICES with timely and complete information that may lead to more reliable catch statistics.



**Figure 2** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Historical assessment results (relative to the mean). Relative recruitment (R) for the last 10 years is assumed to be at the geometric mean of the preceding period.

### Issues relevant for the advice

The SSB is forecasted to remain below  $B_{lim}$ , even with no catches being taken in 2020 and 2021. ICES advises, therefore, a zero catch for 2020 and 2021.

There is no agreement on the TAC for this stock. The Russian Federation has, since 2011, unilaterally decided on a Russian quota that considers both redfish management units (the shallow and the deep pelagic redfish in ICES subareas 5, 12, and 14 as well as in NAFO subareas 1 and 2) as a single stock (Table 8). However, Russian scientists consider the deep and shallow pelagic stocks as a single stock. Until new information is available, ICES continues to use its current stock definition.

The total catches by all countries fishing for pelagic redfish have considerably exceeded the sum of ICES advised catch for both shallow pelagic and deep pelagic redfish stocks. This is particularly true since 2017, when the advice was for zero catch for both stocks.

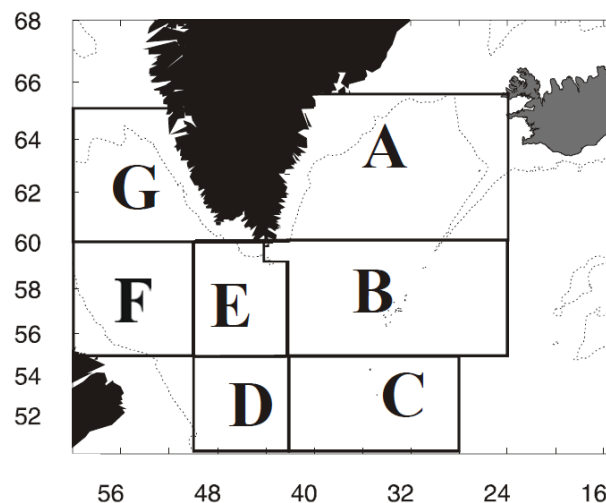
*Sebastes mentella* is a slow-growing, late-maturing species, and any recovery from a low stock level would therefore extend over many years. Simulations show that even at the present low catch levels there is a high probability that the pelagic redfish stock will not recover over the next decade (ICES, 2014). There are indications from length distribution data that there may have been some improvement in recruitment since 2009. However, further information is required before these estimates are confirmed and it will be several years before these year classes could contribute to the SSB.

The current assessment relies on survey information. The next available survey will be in 2021. Since no new significant information that may alter the perception of the stock status is expected to become available before that time, ICES is now providing advice for 2020 and 2021.

**Table 5** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Survey biomass estimates (thousand tonnes) 1999–2018 for each survey area (see Figure 3) and the total area coverage (thousand nm<sup>2</sup>). Areas C–F were not surveyed in 2015 and Areas B–F were not surveyed in 2018.

Year	Survey biomass (thousand tonnes) by survey area						Total biomass	Total biomass as used in the assessment	Area covered (thousand nm <sup>2</sup> )
	A	B	C	D	E	F			
1999	277	568	12	27	52	0	935	935	296
2001	497	316	28	79	64	18	1001	1001	420
2003	476	142	20	13	27	0	678	678	405
2005	221	95	0	8	65	3	392	392	386
2007	276	166	1	5	62	11	522	522	349
2009	291	121	0	8	37	1	458	458	360
2011	342	112	0	1	18	0	474	474	343
2013	193	75	0	2	10	0	280	280	340
2015	153	43	-	-	-	-	196	196	201
2018	130	-	-	-	-	-	130	166*	103

\* Scaled based on the area of the 2015 survey by the proportion of biomass found outside of the 2018 survey area.



**Figure 3** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Redfish survey areas.

## Reference points

**Table 6** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Reference points, relative values, and their technical basis.

Framework	Reference point	Relative value *	Technical basis	Source
MSY approach	MSY B <sub>trigger</sub>	1.26	B <sub>pa</sub>	ICES (2016)
	F <sub>MSY</sub>	0.13	Maximizes long-term yield in stochastic simulations based on recruitment estimates from 1985 to 2006, while being constrained to remain less than, or equal to F <sub>pa</sub> .	ICES (2016)
Precautionary approach	B <sub>lim</sub>	0.90	Proxy set at B <sub>pa</sub> /1.4	ICES (2016)
	B <sub>pa</sub>	1.26	B <sub>loss</sub> . In the absence of any evidence of recruitment impairment = SSB in 2001 (the minimum biomass from the years corresponding to the year classes with reliable recruitment estimates, 1990–2001).	ICES (2016)
	F <sub>lim</sub>	0.18	The F that leads to B <sub>lim</sub> in the long term. From stochastic simulations.	ICES (2016)
	F <sub>pa</sub>	0.13	F <sub>lim</sub> / 1.4	ICES (2016)
Management plan	SSB <sub>MGT</sub>	Not defined		
	F <sub>MGT</sub>	Not defined		

\* All values are relative to the average of the time-series in the stock assessment (see Table 13).

## Basis of the assessment

**Table 7** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). The basis of the assessment.

ICES stock data category	2 (ICES, 2018).
Assessment type	Analytical age-length structured assessment (Gadget model) that uses catches in the model and in the forecast (ICES, 2019).
Input data	Commercial catches (international landings); length and age data from catches; survey index and length data (International Acoustic and Trawl Survey for redfish); natural mortality is assumed to be 0.05 for all ages and years.
Discards and bycatch	Not included. Considered to be negligible.
Indicators	None.
Other information	Benchmarked in 2016 (WKDEEPRED; ICES, 2016).
Working group	North Western Working Group (NWWG)

## Information from stakeholders

There is no additional available information.

## History of the advice, catch, and management

**Table 8** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). History of ICES advice, the agreed TAC, and ICES estimates of catches. All weights are in tonnes.

Year	ICES advice *	Predicted catch corresponding to advice *	TAC *	Total deep and shallow pelagic TAC **	Unilateral Russian Federation TAC #	Total ICES catch * (shallow and deep pelagic)	ICES catch (deep pelagic stock)
1991	TAC	66000				27238	59
1992	Preference for no major expansion of the fishery	-				65962	3398
1993	TAC	50000				115835	15064
1994	TAC	100000				148689	51820
1995	TAC	100000				175843	75707
1996	No specific advice	-		153000		180322	138552
1997	No specific advice	-		153000–158000		122825	95079

Year	ICES advice *	Predicted catch corresponding to advice *	TAC *	Total deep and shallow pelagic TAC **	Unilateral Russian Federation TAC #	Total ICES catch * (shallow and deep pelagic)	ICES catch (deep pelagic stock)
1998	TAC not over recent (1993–1996) levels of 150000 t			15300		116968	92818
1999	TAC to be reduced from recent (1993–1996) levels of 150000 t			153000		109665	84153
2000	TAC set lower than recent (1997–1998) catches of 120000 t	85000		120000		126329	93113
2001	TAC less than 75% of catch 1997–1999	< 85000		95000		128818	86993
2002	TAC less than 75% of catch 1997–1999. Revised to be below current catch levels	< 85000		95000###		146344	103128
2003	TAC not to exceed current catch levels	119000		119000###		160984	104296
2004	TAC not to exceed current catch levels	120000		120000###		125905	91954
2005	Limit catch to 41000 t	41000	75000	116000###		73714	45485
2006	Catch less than 41000 t	41000	62000	99000###		83022	67228
2007	No fishery until clear indications of recovery of the stock	0	46000	73000###		64642	58516
2008	Starting point for adaptive management strategy	20000	46000	73000###		32104	30045
2009	Starting point for adaptive management strategy	20000	46000	73000###		56386	54006
2010	Reducing fishing: Starting point for adaptive management strategy	20000	46000	73000###		61486	59288
2011	Reducing fishing: Starting point for adaptive management strategy	20000	38000	60000###	29480	47567	47333
2012	Reducing fishing: Starting point for adaptive management strategy	20000	32000	54856	29480	35979	32806
2013	Precautionary considerations. Management plan to be developed and implemented	20000	26000	47918	27300	47567	46052
2014	Same advice as last year	20000	20000	43160	27300	30178	23755
2015	Precautionary consideration	< 10000	9500	34843	27300	33028	27433
2016	Reduce catches significantly	< 10000	8500	34041	27300	30621	28654
2017	MSY approach	0	7500	30848	27300	29992	29891
2018	MSY approach	0	6500	30055	24900	29052	24453
2019	No advice given		6000	29658	24900		
2020	MSY approach	0					
2021	MSY approach	0					

\* Up to 2009, the shallow pelagic and deep pelagic stocks were considered to be one stock and covered by one advice and one TAC.

\*\* Sum of all quotas in force for both shallow and deep pelagic stocks combined.

# Unilateral Russian Federation TAC for both shallow and deep pelagic stocks combined.

## No agreed NEAFC proposal.

## History of the catch and landings

**Table 9** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Catch distribution by fleet in 2018 as estimated by ICES. All weights are in tonnes.

Total catch (2018)	Commercial landings	Commercial discards
24453	100% pelagic trawl 24453	Negligible

**Table 10** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). History of the commercial catch (in tonnes). ICES estimated values are presented by area.

Year	Division 5.a	Subarea 12	Subarea 14	NAFO Division 1F	Total
1991	0	7	52	0	59
1992	1862	280	1257	0	3398
1993	2603	6068	6393	0	15064
1994	14807	16977	20036	0	51820
1995	1466	53141	21100	0	75707
1996	4728	20060	113765	0	138552
1997	14980	1615	78485	0	95079
1998	40328	444	52046	0	92818
1999	36359	373	47421	0	84153
2000	41302	0	51811	0	93113
2001	27920	0	59073	0	86993
2002	37269	2	65858	0	103128
2003	46627	21	57648	0	104296
2004	14446	0	77508	0	91954
2005	11726	0	33759	0	45485
2006	16452	51	50531	254	67288
2007	17769	0	40748	0	58516
2008	4602	0	25443	0	30045
2009	16828	4658	32920	0	54406
2010	8552	0	50736	0	59288
2011	0	7	47326	0	47333
2012	5530	608	26668	0	32806
2013	5274	0	40778	0	46052
2014	603	0	23152	0	23755
2015	1821	0	25612	0	27433
2016	2601	0	26053	0	28654
2017	1639	0	28252	0	29891
2018	711	0	23742	0	24453

**Table 11** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). Catches inside and outside the NEAFC Regulatory Area (RA) as estimated by ICES. Weights are in tonnes.

Year	Inside the NEAFC RA	Outside the NEAFC RA	Catches
2012	27276	5530	32806
2013	40778	5274	46052
2014	23152	603	23755
2015	25612	1821	27433
2016	26053	2601	28654
2017	28252	1639	29891
2018	23742	711	24453

**Table 12** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1 and 2 (deep pelagic stock > 500 m). History of the commercial catch (in tonnes). ICES estimated values are presented by country.

Year	Bulgaria	Canada	Estonia	Faroes	France	Germany	Greenland	Iceland	Japan	Latvia	Lithuania	Netherlands	Norway	Poland	Portugal	Russia	Spain	UK	Ukraine	Total
1991								59												59
1992								3398												3398
1993				310		1135		12741					878							15064
1994						2019		47435					523		377	1465				51820
1995	1140	181	5056	1572	68	8271	1579	25898	396	1501	6868	4	3169		2955	15868	227		956	75707
1996	1654	307	3351	3748		15549	1671	57143	196	512	5031		5161		1903	36400	5558	123	245	138552
1997		9	315	435		11200		36830	3				2849		3307	33237	6895			95079
1998			76	4484		8368	302	46537	1		34		438		4073	25748	2758			92818
1999			53	3466		8218	3271	40261					3337		4240	11419	9885	5		84153
2000			7733	2367		6827	3327	41466			0		3108		3694	14851	9740			93113
2001			878	3377		5914	2360	27727			7515		4275		2488	23810	8649			86993
2002			15	3664		7858	3442	39263			9771		4197		2208	25309	7402			103128
2003				3938		7028	3403	44620			0		5185		2109	28638	9374			104296
2004				4670		2251	2419	31098			0		6277	1889	2286	31067	9996			91954
2005				1800		1836	1431	12919			1027		3950	1240	1088	16323	3871			45485
2006				3498		1830	744	20942			1294		5968	1356	1313	23670	6673			67288
2007				2902		1110	1961	18097		575	1394		4628	636	2067	21337	3810			58516
2008				2632			1170	6723			749		571	219	1733	15106	1142			30045
2009				3206			1519	15125		1355	2613			178	1596	25309	2907			54006
2010				3195			1932	14772		1963	2228		2388	3	2203	22803	7801			59288
2011				2028		1787		11994		845	1348		1066		1540	22364	4361			47333
2012				1438		1523		5912		724	558		3362		250	18377	632			32806
2013				1882		1176		8545		1200	1163		2979			26463	2644*			46052
2014				721		890		2081		867	1024		1965			15475	732*			23755
2015				779		918		1968			330		1547		202	20214	1475*			27433
2016				567		715		2601		549	803		1396			21619	404			28654
2017				559		772		1929			911		970			24355	395			29891
2018				438		357		1138		441	900		868			20113	198			24453

\* Data provided by NEAFC.



## Summary of the assessment

**Table 13** Beaked redfish in ICES subareas 5, 12, and 14 and in NAFO subareas 1+2 (deep pelagic stock > 500 m). Assessment summary. Values of recruitment total biomass SSB and F are relative to the average of the time-series. Catch is in tonnes.

Year	Relative recruitment* (age 5)	Relative SSB	Catch	Relative F (over fully selected lengths)
1985	1.70			
1986	1.21			
1987	1.41			
1988	0.62			
1989	0.95			
1990	2.1			
1991	1.23	1.97	59	0.00029
1992	0.62	2.0	3398	0.0159
1993	0.79	2.0	15064	0.068
1994	0.72	2.0	51820	0.23
1995	3.3	1.97	75707	0.34
1996	0.99	1.91	138552	0.68
1997	0.82	1.72	95079	0.51
1998	0.90	1.59	92818	0.54
1999	1.02	1.47	84153	0.53
2000	0.84	1.37	93113	0.65
2001	1.05	1.25	86993	0.67
2002	0.94	1.14	103128	0.92
2003	1.01	1.00	104296	1.11
2004	0.83	0.87	91954	1.20
2005	0.88	0.76	45485	0.67
2006	0.82	0.72	67288	1.13
2007	0.29	0.64	58516	1.15
2008	0.093	0.57	30045	0.64
2009	0.88	0.54	54006	1.31
2010	0.88	0.48	59288	1.77
2011	0.88	0.42	47333	1.73
2012	0.88	0.38	32806	1.35
2013	0.88	0.36	46052	2.30
2014	0.88	0.32	23755	1.28
2015	0.88	0.32	27433	1.59
2016	0.88	0.31	28654	1.85
2017	0.88	0.30	29891	2.10
2018	0.88	0.28	24453	1.59
2019		0.28		

\* Recruitment in 2009 and later years has been set at the geometric mean of the period 1985–2008 because of unreliable estimates in the assessment.

## Sources and references

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