

Golden redfish (*Sebastes norvegicus*) in subareas 5, 6, 12, and 14 (Iceland and Faroes grounds, West of Scotland, North of Azores, East of Greenland)

ICES advice on fishing opportunities

ICES advises that when the Greenland and Iceland management plan for golden redfish is applied, catches in 2020 should be no more than 43 568 tonnes.

Stock development over time

Spawning-stock biomass (SSB) shows a decreasing trend since 2015, but remains well above MSY $B_{trigger}$. Fishing mortality (F) has been stable in the last decade and is slightly above F_{MSY} . Recruitment (R) after 2013 is record low for the time-series.

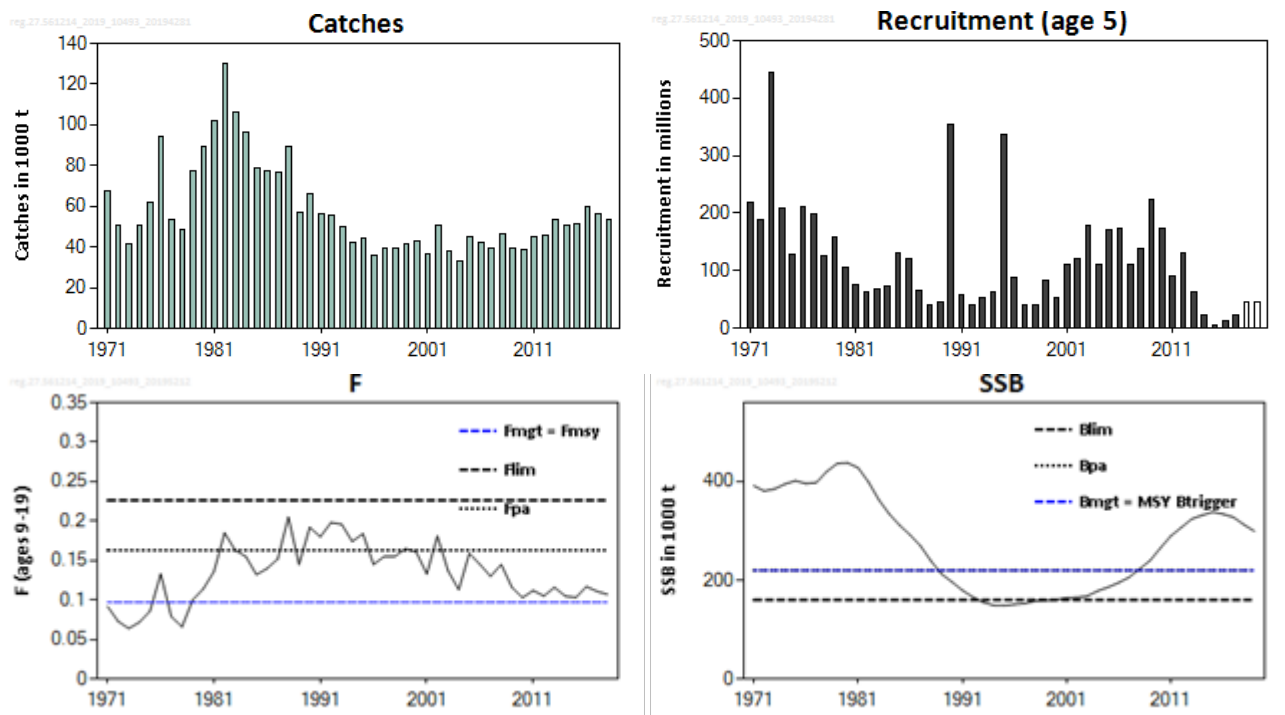


Figure 1 Golden redfish in subareas 5, 6, 12, and 14. Summary of the stock assessment. The 2018–2019 values in the recruitment plot (unshaded) are assumed to be the average of the five smallest year classes in 1980–2007.

Stock and exploitation status

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

Table 1 Golden redfish in subareas 5, 6, 12, and 14. 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	✓	✓	✓	Above trigger
Precautionary approach	F_{pa}, F_{lim}	✓	✓	✓	Harvested sustainably	B_{pa}, B_{lim}	✓	✓	✓	Full reproductive capacity
Management plan	F_{MGT}	✓	✓	✓	Within expected range	B_{MGT}	✓	✓	✓	Above

Catch scenarios

Table 2 Golden redfish in subareas 5, 6, 12, and 14. Assumptions made for the interim year and in the forecast. All weights are in tonnes.

Variable	Value	Notes
$F_{\text{ages 9-19}}$ (2019)	0.098	Based on calendar year catches following the management plan.
SSB (2020)	285 401	From the assessment
$R_{\text{age 5}}$ (2019)	41.7 million	Average of the five lowest in 1980-2007.
$R_{\text{age 5}}$ (2020)	41.7 million	Average of the five lowest in 1980-2007.
Total catch (2019)	45 882	Based on calendar year catches following the management plan.

Table 3 Golden redfish in subareas 5, 6, 12, and 14. Annual catch scenarios. All weights are in tonnes.

Basis	Total catch (2020)	F_{9-19} (2020)	SSB (2021)	% SSB change *	% Advice change **
ICES advice basis					
Management plan	43 568	0.097	270 513	-5	0

* SSB 2021 relative to SSB 2020.

** Advice value for 2020 relative to advice value for 2019.

Advised catch is the same as for last year.

Basis of the advice

Table 4 Golden redfish in subareas 5, 6, 12, and 14. The basis of the advice.

Advice basis	Greenland and Iceland management plan for golden redfish.
Management plan	<p>A management plan for golden redfish, aimed at providing maximum sustainable yield, has been evaluated by ICES (ICES, 2014) and is considered to be precautionary. ICES has been requested to give advice according to this plan.</p> <p>The management plan states that:</p> <ul style="list-style-type: none"> If $SSB_Y \geq SSB_{MGT}$: the catch for year Y+1 corresponds to the fishing mortality $F_{Y+1} = F_{MGT}$ If $SSB_Y < SSB_{MGT}$: the catch for year Y+1 corresponds to $F_{Y+1} = F_{MGT} \times SSB_Y / SSB_{MGT}$ <p>where SSB_Y is the spawning-stock biomass in year Y, $F_{MGT} = 0.097$, and $SSB_{MGT} = 220\ 000$ tonnes. The expected range of realized fishing mortality (F) following the management plan (F_{MGT}) is between 0.07 and 0.16.</p>

Quality of the assessment

Because of the aggregating behavior of the species, survey indices are often largely dominated by a few large hauls. This causes high uncertainties in the survey indices and large interannual fluctuation in estimates of the biomass index. The catch-at-age data do not show recruitment entering the population consistent with the survey indices.

This assessment is considered to be consistent with previous assessments.

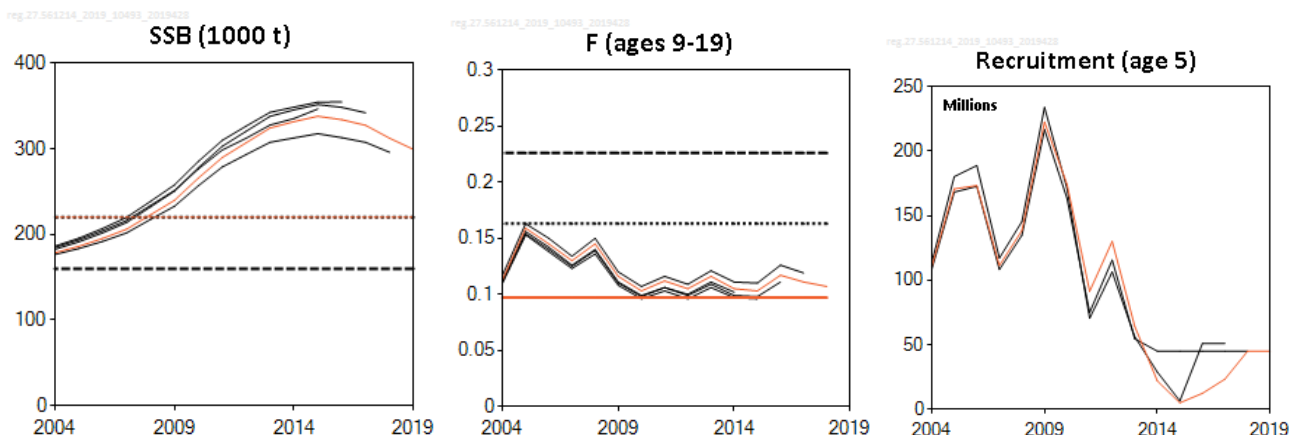


Figure 2 Golden redfish in subareas 5, 6, 12, and 14. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

Since 2009, surveys of golden redfish have consistently shown very low abundance of small fish (< 30 cm). This is consistent with patterns seen in a number of other redfish stocks in the area. While current indices of adult biomass are high but decreasing, the absence of any indications of incoming cohorts raises concerns about the future productivity of the stock.

The Icelandic quota year runs from 1 September to 31 August the following year. This explains the discrepancy between the expected catches in 2019 shown in Table 2 and the TAC for 2019 shown in Table 7.

Reference points

Table 5 Golden redfish in subareas 5, 6, 12, and 14. Reference points, values, and their technical basis. All weights are in tonnes.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	220 000	B_{pa}	ICES (2014)
	F_{MSY}	0.097	Average of ages 9–19. F_{max} in the 2012 Gadget assessment, leading to < 1% probability of going below B_{lim} , based on recruitment patterns since 1975 and with large assessment uncertainty.	ICES (2014)
Precautionary approach	B_{lim}	160 000	Lowest SSB in the 2012 Gadget assessment.	ICES (2014)
	B_{pa}	220 000	$B_{lim}/\exp(0.2 \times 1.645)$	ICES (2017)
	F_{lim}	0.226	The F that leads to B_{lim} in the long term. From stochastic simulations.	ICES (2017)
	F_{pa}	0.163	$F_{lim}/\exp(0.2 \times 1.645)$	ICES (2017)
Management plan	SSB_{MGT}	220 000	MSY $B_{trigger}$	ICES (2014)
	F_{MGT}	0.097	F_{MSY}	ICES (2014)

Basis of the assessment

Table 6 Golden redfish in subareas 5, 6, 12, and 14. Basis of assessment and advice.

ICES stock data category	1 (ICES, 2018).
Assessment type	Analytical assessment (Gadget model) that uses catches in the model and in the forecast (ICES, 2019).
Input data	Landings data and length distributions of catches from Iceland, Greenland, and the Faroes; survey data by length from IS-SMB and GER(GRL)-GFS-Q4, age data from Icelandic catches and IS-SMH.
Discards and bycatch	Considered negligible.
Indicators	None.
Other information	Benchmarked in 2014 (ICES, 2014).
Working group	North-Western Working Group (NWWG).

Information from stakeholders

There is no additional available information.

History of the advice, catch, and management

Table 7 Golden redfish in subareas 5, 6, 12, and 14. ICES advice and official catch. All weights are in tonnes.

Year	ICES advice	Catch corresponding to advice	Iceland TAC *,###	Greenland TAC ~	ICES catch
1987	No increase in F	83000	95000		77127
1988	No increase in F	84000	85000		89989
1989	TAC*	117000 *	77000		57050
1990	TAC*	116000 *	80000		66632
1991	Precautionary TAC	77000 (117000 *)	55000#		56364
1992	Precautionary TAC	76000 (116000 *)	90000		55710
1993	Precautionary TAC*	120000 *	104000		50350
1994	Precautionary TAC, if required	100000 *	90000		42515
1995	TAC	90000 *	77000		44765
1996	TAC for Division 5.a (28 000 t); precautionary TAC for Division 5.b and Subarea 15 (4000 t)	32000 **	65000		36597
1997	Effort 75% of 1995 value	32000 **	65000		39761
1998	Effort reduced in steps of 25% from the 1995 level	37200 **	65000		39825
1999	Effort not increased compared to 1997	35000 **	65000		42040
2000	Catch not increased compared to 1998	35000 **	60000		43550
2001	Effort not increased compared to 1999	33000 **,^	57000		37326
2002	25% reduction in effort	29000 ^^	65000		51092
2003	25% reduction in effort (2001)	31000 ^^	60000		39220
2004	25% reduction in effort (2002)	37400 ^^	57000		33451
2005	Maintain fishable biomass above Upa	37000 ^^	57000		45329
2006	Maintain fishable biomass above Upa	37000 ^^	57000		42211
2007	Maintain fishable biomass above Upa	37000 ^^	57000	5000 ~	39134
2008	Maintain fishable biomass above Upa	37000 ^^	57000	1000 ~	46251
2009	Maintain fishable biomass above Upa	< 30000	50000		39177
2010	Maintain fishable biomass above Upa	< 30000	50000	6000 ~	38648
2011	Same advice as last year	< 30000	37500	8500 ~	45354
2012	Maintain catches	< 40000	40000	8500 ~	45635
2013	Maintain catches	< 40000	45000	8500 ~	53263

Year	ICES advice	Catch corresponding to advice	Iceland TAC *,###	Greenland TAC ~	ICES catch
2014	20% increase in catches (relative to 2010–2012)	< 51980	52000	8500 ~	50736
2015	Management plan	< 47300	45600	8500 ~	51645
2016	Management plan	< 51000	48500	8500 ~	59698
2017	Management plan	≤ 52800	47205	7520 ~	56101
2018	Management plan	≤ 50800	45450	6222 ~	53428
2019	Management plan	≤ 43600	39240	5239 ~	
2020	Management plan	≤ 43568			

* Deep-sea *S. mentella* and *S. norvegicus* combined until 2010.

** *S. norvegicus* only.

^ In Division 5.a only.

^^ Both divisions 5.a and 5.b and Subarea 14.

Year ending 31 August.

From 1992 onwards: quota year September–August.

~ Demersal redfish (*Sebastes norvegicus* and *S. mentella*).

History of the catch and landings

Table 8 Golden redfish in subareas 5, 6, 12, and 14. Catch distribution by fleet in 2018 as estimated by ICES. All weights are in tonnes.

Catch (2018)	Landings		Discards
53428	Bottom trawl 93%	Other gear 7%	Discarding is considered negligible
	53428		

Table 9 Golden redfish in subareas 5, 6, 12, and 14. History of commercial catch; ICES estimated values are presented by area in the fishery. All weights are in tonnes.

Year	Area				Total
	Division 5.a	Division 5.b	Subarea 6	Subarea 14	
1978	31 300	2 039	313	15 477	49 129
1979	56 616	4 805	6	15 787	77 214
1980	62 052	4 920	2	22 203	89 177
1981	75 828	2 538	3	23 608	101 977
1982	97 899	1 810	28	30 692	130 429
1983	87 412	3 394	60	15 636	106 502
1984	84 766	6 228	86	5 040	96 120
1985	67 312	9 194	245	2 117	78 868
1986	67 772	6 300	288	2 988	77 348
1987	69 212	6 143	576	1 196	77 127
1988	80 472	5 020	533	3 964	89 989
1989	51 852	4 140	373	685	57 050
1990	63 156	2 407	382	687	66 632
1991	49 677	2 140	292	4 255	56 364
1992	51 464	3 460	40	746	55 710
1993	45 890	2 621	101	1 738	50 350
1994	38 669	2 274	129	1 443	42 515
1995	41 516	2 581	606	62	44 765
1996	33 558	2 316	664	59	36 597
1997	36 342	2 839	542	37	39 761
1998	36 771	2 565	379	109	39 825
1999	39 824	1 436	773	7	42 040
2000	41 187	1 498	776	89	43 550
2001	35 067	1 631	535	93	37 326
2002	48 570	1 941	392	189	51 092
2003	36 577	1 459	968	215	39 220
2004	31 686	1 139	519	107	33 451
2005	42 593	2 484	137	115	45 329

Year	Area				Total
	Division 5.a	Division 5.b	Subarea 6	Subarea 14	
2006	41 521	656	0	34	42 211
2007	38 364	689	0	83	39 134
2008	45 538	569	64	80	46 251
2009	38 442	462	50	224	39 177
2010	36 155	620	220	1 653	38 648
2011	43 773	493	83	1 005	45 354
2012	43 103	491	41	2 017	45 635
2013	51 330	372	92	1 499	53 263
2014	47 769	201	60	2 706	50 736
2015	48 769	270	44	2 562	51 645
2016	54 041	165	50	5 442	59 698
2017	50 119	1 397	93	4 501	56 101
2018*	48 014	1 330	80	4 004	53 428

* Preliminary.

Summary of the assessment

Table 10 Golden redfish in subareas 5, 6, 12, and 14. Assessment summary. Weights are in tonnes. ICES Subarea 6 is not considered part of the stock and catches are not included in the assessment. Recruitment in thousands.

Year	Recruitment Age 5	SSB	Catches	F Ages 9–19
1971	218 300	391 613	67 860	0.092
1972	189 300	380 946	50 870	0.073
1973	444 000	384 985	41 699	0.064
1974	208 900	395 085	50 578	0.072
1975	129 200	401 476	61 900	0.086
1976	211 700	395 918	94 400	0.133
1977	198 300	397 844	53 733	0.079
1978	126 200	420 352	48 816	0.066
1979	159 500	436 570	77 208	0.1
1980	105 600	437 729	89 175	0.114
1981	75 100	427 858	101 974	0.136
1982	63 300	398 935	130 401	0.185
1983	67 400	362 748	106 442	0.163
1984	73 700	334 028	96 034	0.155
1985	131 800	311 013	78 623	0.132
1986	121 700	291 454	77 060	0.14
1987	65 100	269 224	76 551	0.152
1988	41 300	238 752	89 456	0.205
1989	44 900	212 571	56 677	0.145
1990	353 000	196 612	66 250	0.192
1991	59 000	179 652	56 072	0.18
1992	40 000	166 132	55 670	0.198
1993	53 600	155 027	50 249	0.196
1994	63 300	149 252	42 386	0.174
1995	335 400	148 736	44 159	0.184
1996	87 500	151 132	35 933	0.145
1997	41 000	153 024	39 219	0.155
1998	41 600	157 912	39 446	0.155
1999	83 200	158 914	41 267	0.165
2000	52 000	160 684	42 774	0.161
2001	111 000	164 556	36 791	0.133
2002	121 600	165 076	50 700	0.181
2003	179 300	168 167	38 252	0.137
2004	110 400	178 515	32 932	0.113
2005	170 800	186 135	45 192	0.159
2006	173 400	195 346	42 211	0.145

Year	Recruitment Age 5	SSB	Catches	F Ages 9–19
2007	111 400	206 210	39 136	0.13
2008	138 500	222 962	46 187	0.145
2009	222 700	239 893	39 128	0.116
2010	174 300	265 753	38 428	0.103
2011	91 400	289 874	45 271	0.112
2012	130 100	307 070	45 597	0.105
2013	64 300	324 289	53 201	0.116
2014	21 900	331 802	50 677	0.105
2015	4 900	338 145	51 601	0.103
2016	12 300	334 077	59 648	0.117
2017	23 300	327 515	56 017	0.111
2018	41 700	312 332	53 348	0.107
2019	41 700	299 040		

Sources and references

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