

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 2019 should be no more than 43 600 tonnes.

Stock development over time

Spawning-stock biomass (SSB) has steadily increased for two decades but has decreased in recent years. SSB remains well above $MSY B_{trigger}$. Recruitment (R) estimates in 2001–2012 are close to average. Fishing mortality (F) has decreased in the past two decades and is now above F_{MSY} and below F_{PA} .

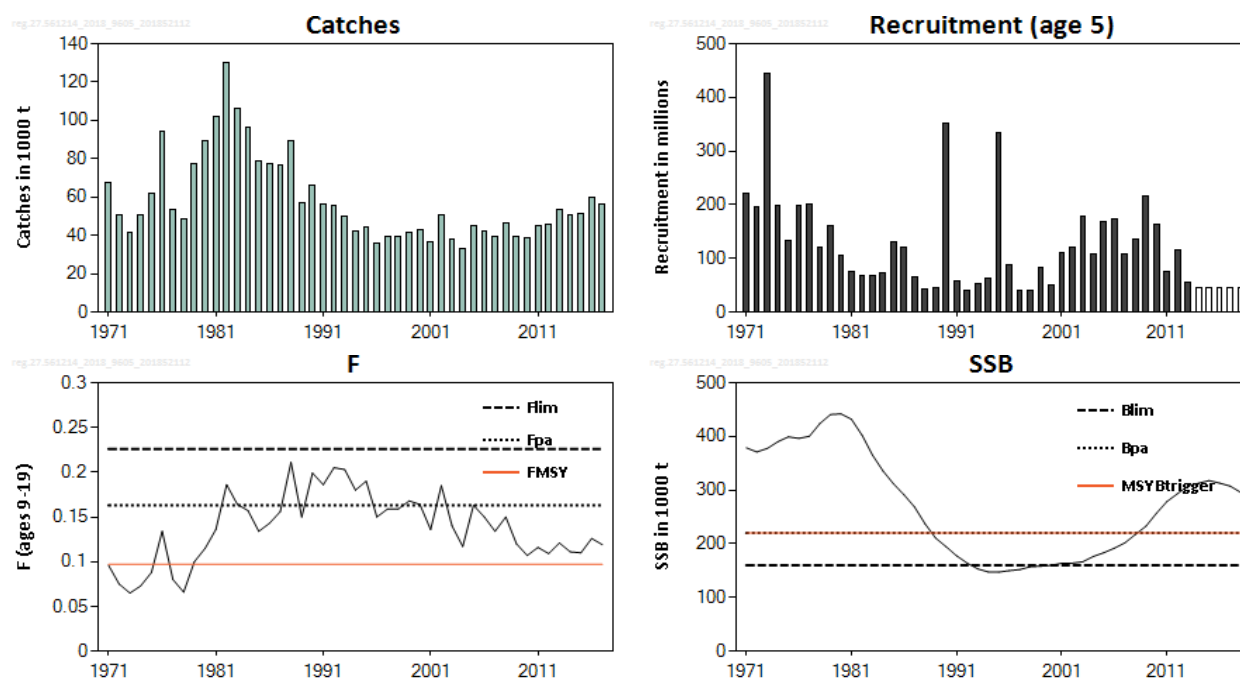


Figure 1 Golden redfish in subareas 5, 6, 12, and 14. Summary of the stock assessment. The 2014–2018 values in the recruitment plot (unshaded) are assumed to be the average of the five smallest year classes in the time-series. Note: $F_{MGT} = F_{MSY}$, and $SSB_{MGT} = MSY B_{trigger}$.

Stock and exploitation status

ICES assesses that fishing pressure on the stock is above F_{MSY} and below F_{pa} and F_{lim} ; and 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. The expected range of realized F following the management plan (F_{MGT}) can be found in the management plan evaluation advice (ICES, 2014).

	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_{MGT}	✔	✔	✔ Within expected range	SSB_{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 _{ages 9–19} (2018)	0.103	Based on calendar year catches following the TAC and the management plan
SSB (2019)	323000	
R _{age 5} (2018)	45 million	Average of the five lowest in 1980–2007
R _{age 5} (2019)	45 million	Average of the five lowest in 1980–2007
R _{age 5} (2020)	45 million	Average of the five lowest in 1980–2007
Total catch (2018)	46400	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 (2019)	F _{9–19} (2019)	SSB (2020)	% SSB change *	% Advice change **
ICES advice basis					
Management plan	43600	0.097	314000	-2.8%	-14.2%

* SSB 2019 relative to SSB 2018.

** Advice value 2019 relative to advice value 2018.

Advised catch has decreased because the stock is estimated to be smaller than 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:</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 $SSB_{MGT} = 220$ kt.</p>

Quality of the assessment

The latest assessment shows downwards revision of the stock biomass (about 12%) and upward revision of fishing mortality for a long period. The reason for this revision was investigated and the previous assessments were found to be not fully converged at an optimum solution. This year's assessment has fully converged and the stock trends from this year's assessment are considered to be more accurate.

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 assessment indicates different stock developments from various data sources, with the catch-at-age data showing a smaller increase in stock size than the survey biomass.

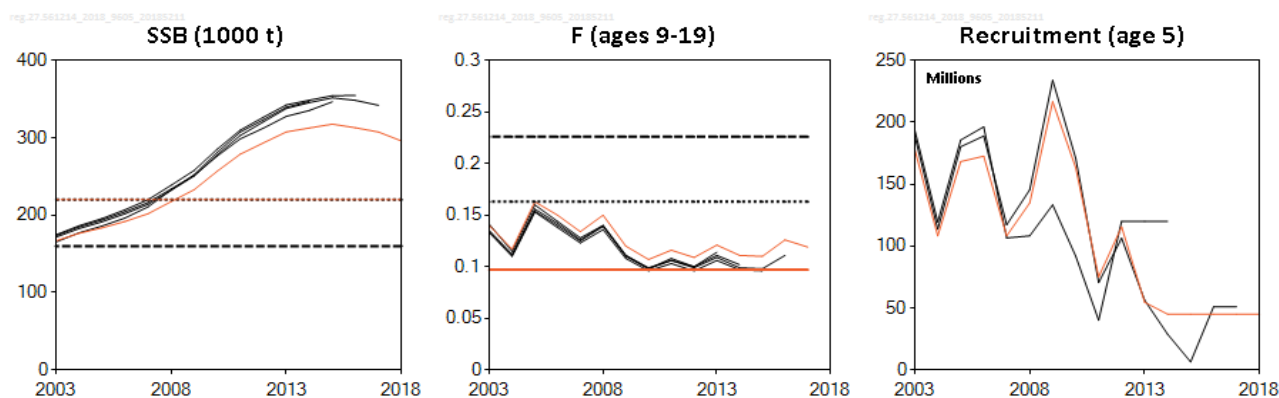


Figure 2 Golden redfish in subareas 5, 6, 12, and 14. Historical assessment results (final-year recruitment estimates included).

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. A pessimistic recruitment assumption has been used in the forecast.

The Icelandic quota year runs from 1 September – 31 August the following year. This explains the discrepancy between the expected catches in 2018 shown in Table 2 and the TAC for 2018 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 $B_{trigger}$	220000	$B_{lim} \times \exp(0.2 \times 1.645)$	ICES (2014)
	F_{MSY}	0.097	Average of ages 9–19. F_{max} in the 2012 Gadget run, 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}	160000	Lowest SSB in the 2012 Gadget run	ICES (2014)
	B_{pa}	220000	$B_{pa} = B_{trigger} = B_{lim} \times \exp(0.2 \times 1.645)$	ICES (2017)
	F_{lim}	0.226	F that leads to B_{lim} in the long term. From stochastic simulations.	ICES (2017)
	F_{pa}	0.163	$F_{lim}/\exp(1.645 \times 0.2)$	ICES (2017)
Management plan	SSB _{mgt}	220000	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, 2016)
Assessment type	Analytical assessment (Gadget model) that uses catches in the model and in the forecast (ICES, 2018)
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
2014	20% increase in catches (rel. 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	8500~	56101
2018	Management plan	≤ 50800	45450	8500~	
2019	Management plan	≤ 43600			

* 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 2017 as estimated by ICES. All weights are in tonnes.

Catch (2017)	Landings		Discards
	Bottom trawl 95%	Other gear 5%	
56101	56101		negligible

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

Year	Area				Total
	Division 5.a	Division 5.b	Subarea 6	Subarea 14	
1978	31300	2039	313	15477	49129
1979	56616	4805	6	15787	77214
1980	62052	4920	2	22203	89177
1981	75828	2538	3	23608	101977
1982	97899	1810	28	30692	130429
1983	87412	3394	60	15636	106502
1984	84766	6228	86	5040	96120
1985	67312	9194	245	2117	78868
1986	67772	6300	288	2988	77348
1987	69212	6143	576	1196	77127
1988	80472	5020	533	3964	89989
1989	51852	4140	373	685	57050
1990	63156	2407	382	687	66632
1991	49677	2140	292	4255	56364
1992	51464	3460	40	746	55710
1993	45890	2621	101	1738	50350
1994	38669	2274	129	1443	42515
1995	41516	2581	606	62	44765
1996	33558	2316	664	59	36597
1997	36342	2839	542	37	39761
1998	36771	2565	379	109	39825
1999	39824	1436	773	7	42040
2000	41187	1498	776	89	43550
2001	35067	1631	535	93	37326
2002	48570	1941	392	189	51092
2003	36577	1459	968	215	39220
2004	31686	1139	519	107	33451
2005	42593	2484	137	115	45329
2006	41521	656	0	34	42211
2007	38364	689	0	83	39134
2008	45538	569	64	80	46251
2009	38442	462	50	224	39177
2010	36155	620	220	1653	38648
2011	43773	493	83	1005	45354
2012	43103	491	41	2017	45635
2013	51330	372	92	1499	53263
2014	47769	201	60	2706	50736
2015	48769	270	44	2562	51645
2016	54041	165	50	5442	59698
2017*	50119	1397	93	4501	56101

* Preliminary

Summary of the assessment

Table 10 Golden redfish in subareas 5, 6, 12, and 14. Assessment summary. Weights are in tonnes. Catches from ICES subareas 6 and 12 are not included in the assessment.

Year	Recruitment Age 5	SSB	Catches	F Ages 9–19
	thousands	tonnes	tonnes	per year
1971	220100	378700	67860	0.096
1972	195600	371100	50870	0.075
1973	444300	377700	41699	0.065
1974	199400	390200	50578	0.073
1975	133500	399200	61900	0.088
1976	198600	396400	94400	0.134
1977	200400	400300	53733	0.080
1978	120900	423900	48816	0.066
1979	161200	440700	77208	0.100
1980	106000	442000	89175	0.115
1981	75400	431900	101974	0.136
1982	67800	402300	130401	0.186
1983	67900	365300	106442	0.164
1984	73900	335700	96034	0.157
1985	131600	311700	78623	0.134
1986	121400	291300	77060	0.143
1987	64800	268400	76551	0.156
1988	42900	237300	89456	0.21
1989	45800	210800	56677	0.150
1990	352800	194600	66250	0.199
1991	59200	177600	56072	0.186
1992	41500	164200	55670	0.21
1993	53300	153300	50249	0.20
1994	63900	147700	42386	0.180
1995	334100	147400	44159	0.190
1996	87600	150100	35933	0.150
1997	40700	152100	39219	0.159
1998	41100	157200	39446	0.159
1999	82300	158300	41267	0.168
2000	51100	160100	42774	0.164
2001	109900	163800	36791	0.136
2002	120900	164000	50700	0.185
2003	178600	166700	38252	0.140
2004	108300	176500	32932	0.117
2005	168300	183500	45192	0.163
2006	172700	191900	42211	0.150
2007	108300	201800	39136	0.134
2008	134900	217500	46187	0.150
2009	216700	232900	39128	0.120
2010	163400	256900	38428	0.107
2011	75000	278800	45271	0.116
2012	115600	293400	45555	0.109
2013	54600	307700	53201	0.121
2014	45000	312800	50677	0.111
2015	45000	317700	51601	0.110
2016	45000	313100	59648	0.126
2017	45000	307500	56017	0.119
2018	45000	296000		

Sources and references

ICES. 2014. Iceland, Faroe Islands, and Greenland request to ICES on evaluation of a proposed long-term management plan and harvest control rule for golden redfish (*Sebastes marinus*). In Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 2, Section 2.2.3.1.

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