

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 stock advice

ICES advises that when the Greenland and Iceland management plan for golden redfish is applied, catches in 2018 should be no more than 50 800 tonnes.

Stock development over time

Spawning-stock biomass (SSB) has steadily increased for the past 20 years and is well above $MSY B_{trigger}$. Recruitment (R) is estimated to have been low since 2011. Fishing mortality (F) since 2010 has been estimated at around F_{MSY} .

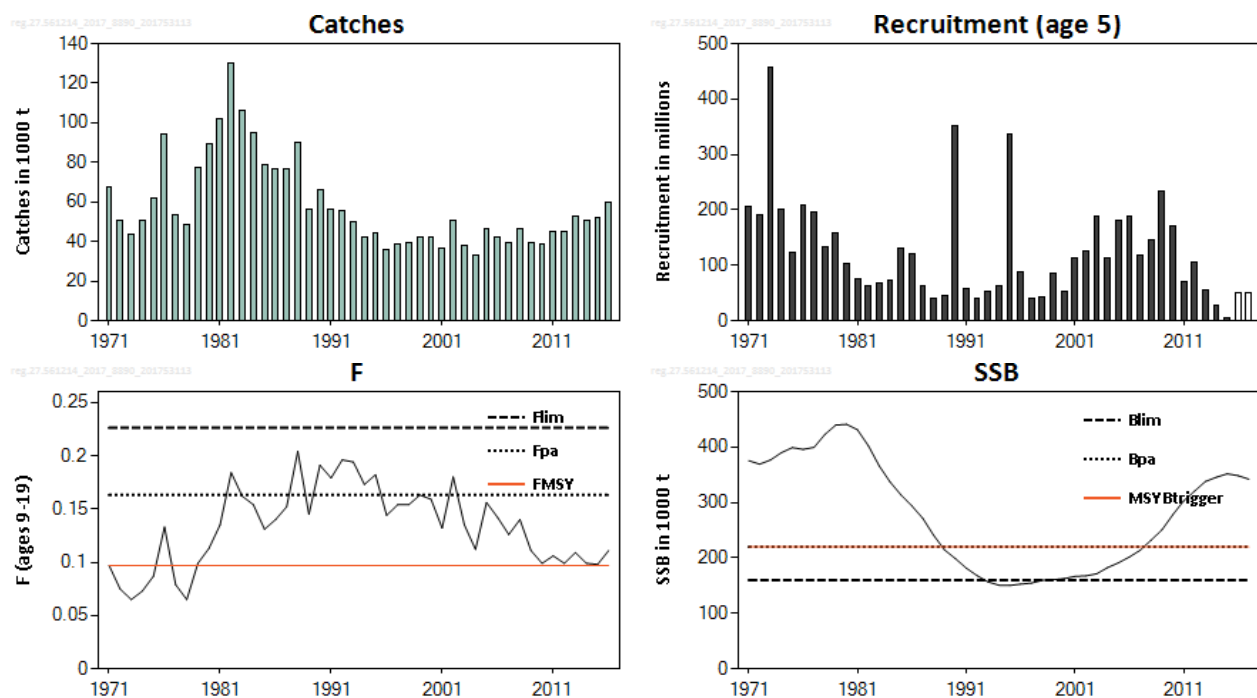


Figure 1 Golden redfish in subareas 5, 6, 12, and 14. Summary of the stock assessment. The 2016 and 2017 values in the recruitment plot (unshaded) are the average from 2011 to 2015. Note: $F_{MGT} = F_{MSY}$, and $SSB_{MGT} = MSY B_{trigger}$.

Stock and exploitation status

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			
		2014	2015	2016	2015	2016	2017	
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 options

Table 2 Golden redfish in subareas 5, 6, 12, and 14. The basis for the catch options.

Variable	Value	Source	Notes
F ages 9–19 (2017)	0.097	ICES (2017)	Based on calendar year catches following the TAC and the management plan.
SSB (2018)	333 800 t	ICES (2017)	
R age 5 (2017)	51 000 thousand	ICES (2017)	Average of 2011–2015.
R age 5 (2018)	51 000 thousand	ICES (2017)	Average of 2011–2015.
R age 5 (2019)	51 000 thousand	ICES (2017)	Average of 2011–2015.
Total catch (2017)	52 700 t	ICES (2017)	Based on calendar year catches following the TAC and the management plan.

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

Basis	Total catch (2018)	F_{9-19} (2018)	SSB (2019)	% SSB change *	% TAC change **
ICES advice basis					
Management plan	50 800	0.097	322 500	-3.4%	-3.6%

* SSB 2019 relative to SSB 2018.

** Catch in 2018 relative to assumed catches in 2017 (52 700 t).

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

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 trends from various data sources, with the catch-at-age data showing a less steep increase in stock size than the survey biomass.

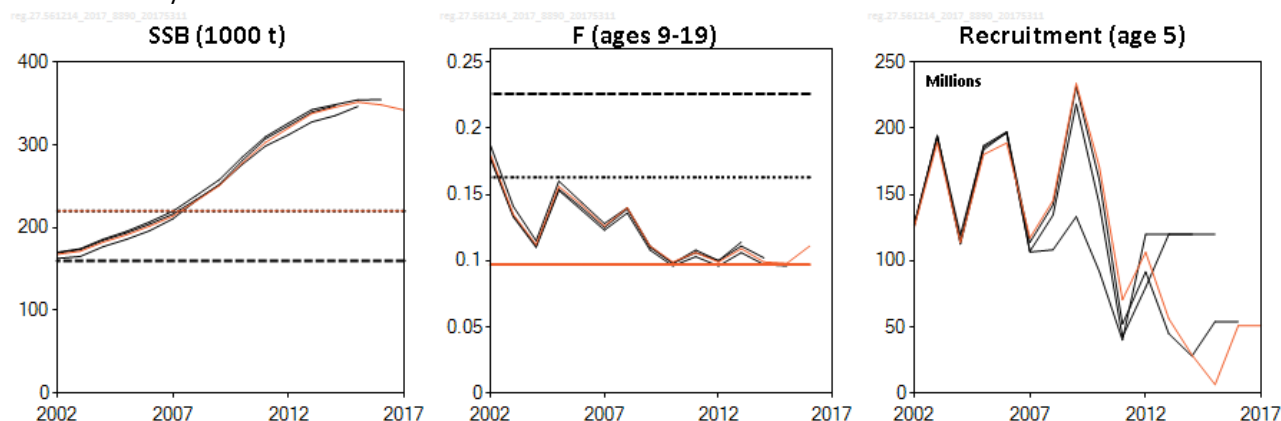


Figure 2 Golden redfish in subareas 5, 6, 12, and 14. Historical assessment results (final-year recruitment estimates included).

Issues relevant for the advice

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

Reference points

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

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	220 000 t	$B_{lim} \times \exp(0.2 \times 1.645)$	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}	160 000 t	Lowest SSB in the 2012 Gadget run.	ICES (2014)
	B_{pa}	220 000 t	$B_{pa} = B_{trigger} = B_{lim} \times \exp(0.2 \times 1.645)$.	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}	220 000 t	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.
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 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	Predicted catch corresp. 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 (28000 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~	
2018	Management plan	≤ 50800			

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

** *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 2016 as estimated by ICES.

Catch (2016)	Landings		Discards
	Bottom trawl 93%	Other gear 7%	Negligible
59 698 tonnes	59 698 tonnes		

Table 9 Golden redfish in subareas 5, 6, 12, and 14. History of commercial catch and landings; 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

* Provisional.

Summary of the assessment

Table 10 Golden redfish in subareas 5, 6, 12, and 14. Assessment summary. Note: catch in the assessment does not include redfish from Subarea 6. Weights are in tonnes.

Year	Recruitment (age 5)	SSB	Catch (excl. Subarea 6)	Mean F (ages 9–19)
	thousands	tonnes		
1971	206500	375400	67860	0.097
1972	191500	369200	50870	0.075
1973	457900	376800	41699	0.065
1974	200400	389900	50578	0.073
1975	122100	399000	61900	0.087
1976	207500	395800	94400	0.133
1977	196300	399400	53733	0.079
1978	133900	422900	48816	0.065
1979	157700	439700	77208	0.099
1980	103700	441100	89175	0.113
1981	74800	431200	101974	0.135
1982	63500	402100	130401	0.184
1983	67900	365700	106442	0.162
1984	74000	336800	96034	0.154
1985	131800	313600	78623	0.131
1986	121400	293900	77060	0.140
1987	64200	271600	76551	0.152
1988	41200	241000	89456	0.204
1989	44900	214700	56677	0.145
1990	352000	198800	66250	0.191
1991	58700	181700	56072	0.179
1992	39800	168100	55670	0.196
1993	54100	156900	50249	0.194
1994	64200	151000	42386	0.173
1995	336300	150500	44159	0.182
1996	89100	152900	35933	0.144
1997	41300	154800	39219	0.154
1998	42000	159700	39446	0.154
1999	85200	160800	41267	0.163
2000	52900	162700	42774	0.159
2001	113300	166800	36791	0.132
2002	125000	167700	50700	0.180
2003	189300	171500	38252	0.135
2004	113700	182600	32932	0.112
2005	180300	191300	45192	0.156
2006	189000	201800	42211	0.142
2007	117200	214000	39136	0.126
2008	145500	232200	46187	0.140
2009	234000	250700	39128	0.111
2010	171000	278000	38428	0.099
2011	70500	303000	45271	0.106
2012	106400	320600	45555	0.099
2013	56200	338000	53201	0.109
2014	28800	345600	50677	0.099
2015	6400	351800	51601	0.098
2016	51000	348500	59648	0.111
2017	51000	342100		

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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