

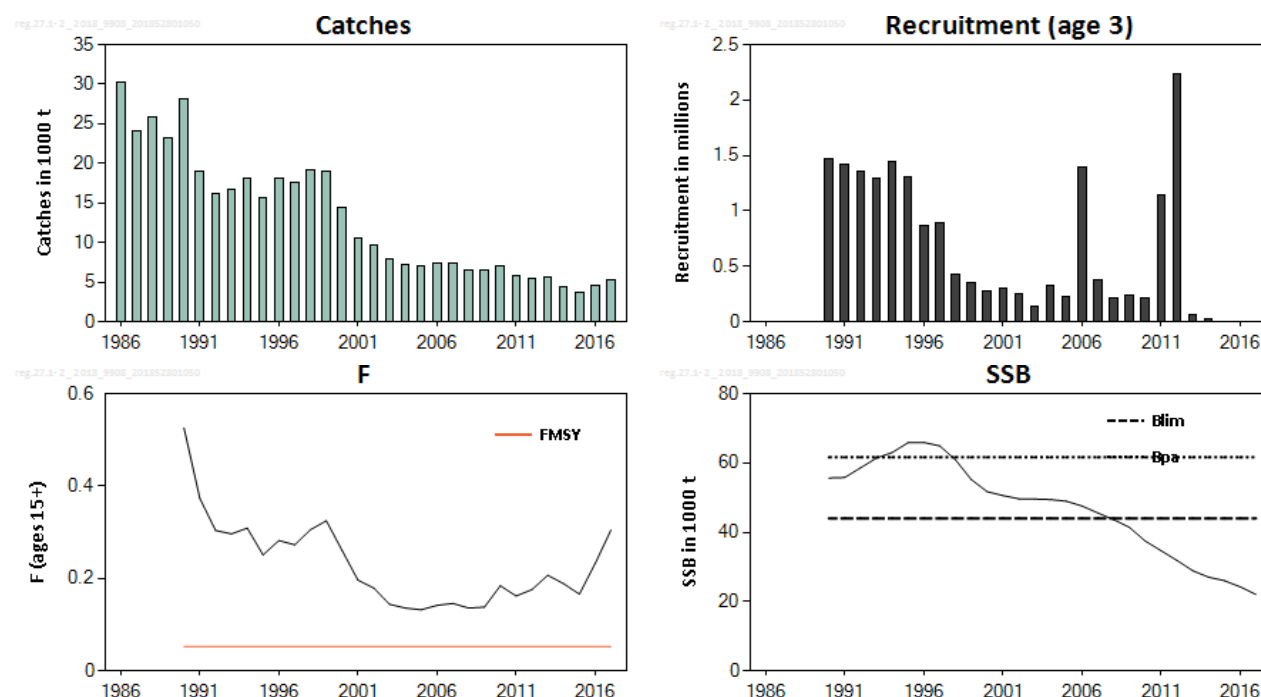
## Golden redfish (*Sebastes norvegicus*) in subareas 1 and 2 (Northeast Arctic)

### ICES advice on fishing opportunities

ICES advises that when the precautionary approach is applied, there should be zero catch in each of the years 2019 and 2020.

### Stock development over time

The spawning-stock biomass (SSB) shows a declining trend since the late 1990s and is currently at the lowest in the time-series. Recruitment in 2006 (the 2003 yearclass) is now entering the SSB and fishery but the SSB has not yet ceased declining. The large recruitment estimates for 2011 and 2012 have high uncertainty. Fishing mortality (F) decreased until around 2005 but is now rising again.



**Figure 1** Golden redfish in subareas 1 and 2. Summary of the stock assessment (weights in thousand tonnes). Recruitment (up to 2014 only), mortality, and SSB.

### Stock and exploitation status

ICES assesses that the spawning stock size is below  $B_{pa}$  and  $B_{lim}$ . The current exploitation rate is above the  $F_{MSY}$  proxy.

**Table 1** Golden redfish in subareas 1 and 2. State of the stock and fishery relative to reference points.

		Fishing pressure			Stock size		
		2015	2016	2017	2015	2016	2017
Maximum sustainable yield	$F_{MSY}$	✗	✗	✗ Above	$MSY B_{trigger}$	?	?
Precautionary approach	$F_{pa}, F_{lim}$	?	?	?	$B_{pa}, B_{lim}$	✗	✗
Management plan	$F_{MGT}$	—	—	— Not applicable	$B_{MGT}$	—	— Not applicable
							?
							Undefined
							Reduced reproductive capacity
							Not applicable

## Catch scenarios

The stock is below the biomass limit reference point ( $B_{lim}$ ). The contribution of the relatively strong 2003 year class to the fishable biomass is still small and uncertain. Until there is evidence that recruits are contributing to the fishable population, ICES is not able to identify catch levels that will, with high probability, give an increase in stock size above  $B_{lim}$ . Therefore, the advice is for zero catch. This applies to both commercial and recreational fishing.

## Basis of the advice

**Table 2** Golden redfish in subareas 1 and 2. The basis of the advice.

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

## Quality of the assessment

This species is difficult to distinguish from the *Sebastes mentella* stock in the same area, particularly for juvenile specimens. Given that the *S. mentella* stock is at a much higher biomass level, this raises the possibility that some or all of those identified as juvenile *S. norvegicus* in the survey data, and as larger individuals in the catch, may be misidentified *S. mentella*. This implies a high level of uncertainty concerning the size of the most recent sign of good recruitment (the 2008 and 2009 year classes), and some uncertainty around the size of the 2003 yearclass as these fish are similar sizes to the *S. mentella*.

The available survey data only covers the younger portions of the stock and therefore the model tuning data does not have good coverage of mature fish. This leads to a high dependency on fisheries data. Most fisheries report only “redfish”, and the fraction that is *S. norvegicus* is estimated based on historical landing patterns. Biological sampling data from the commercial catch are only available from the Norwegian fleet.

## Issues relevant for the advice

There is no significant direct fishery, and measures have been taken to attempt reduce the bycatch mortality by area closures. However fishing mortality has been rising in recent years, and a further bycatch reduction is needed to minimize all sources of fishing mortality. It is imperative to minimize catches on the remaining mature fish and to protect incoming recruits.

## Reference points

**Table 3** Golden redfish in subareas 1 and 2. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$			
	$F_{MSY}$	0.0525	$F_{0.1}$	ICES (2018b)
Precautionary approach	$B_{lim}$	44 000	Defined as the lowest SSB leading to good recruitment (SSB in 2002, as estimated at WKREDFISH)	ICES (2018b)
	$B_{pa}$	61 600	$B_{lim} \times \exp(1.645 \times 0.2)$	ICES (2018b)
	$F_{lim}$			
	$F_{pa}$			
Management plan	$SSB_{MGT}$			
	$F_{MGT}$			

Given the poor status of the stock,  $F_{MSY}$  is not required for management. A preliminary analysis gives  $F_{0.1}(15+) = 0.0525$  as an  $F_{MSY}$  proxy.

## Basis of the assessment

**Table 4** Golden redfish in subareas 1 and 2. The basis of the assessment.

ICES stock data category	1 ( <a href="#">ICES, 2016a</a> )
Assessment type	Age-length structured model (Gadget). (ICES, 2018a)
Input data	Catch numbers-at-age and -length, and -at-length from the trawl, gillnet, and longline fisheries, by year; numbers-at-age-and-length and numbers-at-length from the winter survey in the Barents Sea (BS-NoRu-Q1-Btr); numbers-at-length from the coastal survey in the Barents Sea (NOcoast-Aco-Q4); commercial catches (total catch in tonnes, split by gear); one survey index (Barents Sea winter survey, total swept area estimate, length distributions, age and length distributions); annual maturity data from the Barents Sea winter survey; natural mortalities are assumed constant (at 0.05, following the WKRED 2012 benchmark).
Discards and bycatch	Discard estimates are not available. Discarding is assumed negligible. Bycatch is included.
Indicators	None
Other information	The latest benchmark was in February 2018 (WKREDFISH; ICES, 2018b).
Working group	Arctic Fisheries Working Group ( <a href="#">AFWG</a> )

## Information from stakeholders

There is no additional available information.

## History of the advice, catch, and management

**Table 5** Golden redfish in subareas 1 and 2. History of ICES advice, the agreed TAC, and official and ICES catches. Weights are in tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	Official catches*	ICES catches
1987	Precautionary TAC	-	-	34 595	24 000
1988	Reduction in F; TAC	15 000	-	41 494	26 000
1989	Status quo F; TAC	24 000	-	46 688	23 234
1990	Status quo F; TAC	23 000	-	63 156	28 072
1991	Precautionary TAC	24 000	-	67 768	19 041
1992	If required, precautionary TAC	25 000	-	31 773	16 185
1993	Precautionary TAC	12 000	12 000	29 517	16 651
1994	If required, precautionary TAC	-	-	30 841	18 120
1995	If required, precautionary TAC	-	-	25 899	15 616
1996	If required, precautionary TAC	-	-	26 118	18 043
1997	If required, precautionary TAC	-	-	26 109	17 511
1998	Management plan required as a prerequisite to continued fishing	-	-	33 199	19 155
1999	Management plan required as a prerequisite to continued fishing	-	-	30 195	18 986
2000	Management plan required as a prerequisite to continued fishing	-	-	24 537	14 461
2001	Management plan required as a prerequisite to continued fishing	-	-	28 965	10 547
2002	Management plan required as a prerequisite to continued fishing	-	-	16 637	9 643
2003	Management plan required as a prerequisite to continued fishing	-	-	10 361	7 840
2004	No directed trawl fishery and low bycatch limits	-	-	12 699	7 206
2005	More stringent protective measures	-	-	15 501	7 037
2006	More stringent protective measures	-	-	40 313	7 388
2007	More stringent protective measures	-	-	27 181	7 372
2008	No directed fishery and low bycatch limits	-	-	19 694	6 599
2009	No directed fishery and low bycatch limits	-	-	16 732	6 487
2010	No directed fishery and low bycatch limits	-	-	18 906	6 981

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	Official catches*	ICES catches
2011	Same advice as last year	-	-	18 814	5 852
2012	Same advice as last year	-	-	16 577	5 517
2013	No fishery	-	-	15 082	5 609
2014	No fishery	-	-	23 217	4 436
2015	No fishery	-	-	29 484	3 629
2016	No fishery	-	-	40 104	4 674
2017	Precautionary approach: zero catch advice	0		36 541**	5 340**
2018	Precautionary approach: zero catch advice	0			
2019	Precautionary approach: zero catch advice	0			
2020	Precautionary approach: zero catch advice	0			

\* Includes both *Sebastes mentella* and *S. norvegicus*. The working group has allocated redfish catches by species.

\*\* Provisional figures

### History of the catch and landings

**Table 6** Golden redfish in subareas 1 and 2. Catch distribution by fleet in 2017 as estimated by ICES.

Total catch (2017)	Commercial landings				Discards	Recreational Fisheries
5340 t	18% gillnet	15% longline	64% trawl	3% other gears	Discarding is assumed to be negligible	Unknown
	5340 t					

**Table 7** Golden redfish in subareas 1 and 2. History of ICES estimated commercial catches is presented for each country participating in the fishery.

Year	Faroe Islands	France	Germany**	Greenland	Iceland	Netherlands	Norway	Portugal	Russian Federation**	Spain	UK (Eng. & Wales)	UK (Scotl)^	Ireland	Poland	Denmark	Total
1989	3	796	412	-	-	-	20662	-	1264	-	97	-	-	-	-	23234
1990	278	1679	387	1	-	-	23917	-	1549	-	261	-	-	-	-	28072
1991	152	706	981	-	-	-	15872	-	1052	-	268	10	-	-	-	19041
1992	35	1289	530	623	-	-	12700	5	758	2	241	2	-	-	-	16185
1993	139	871	650	14	-	-	13137	77	1313	8	441	1	-	-	-	16651
1994	22	697	1008	5	4	-	14955	90	1199	4	135	1	-	-	-	18120
1995	27	732	517	5	1	1	13516	9	639	-	159	9	1	-	-	15616
1996	38	671	499	34	-	-	15622	55	716	81	229	98	-	-	-	18043
1997	3	974	457	23	-	-	14182	61	1584	36	164	22	5	-	-	17511
1998	78	494	131	33	-	-	16540	6	1632	51	118	53	19	-	-	19155
1999	35	35	228	47	14	-	16750	3	1691	7	135	34	7	-	-	18986
2000	17	13	160	22	16	-	13032	16	1112	-	-	73	-	-	-	14461
2001	37	30	238	17	-	-	9134	7	963	1		119	1	-	-	10547
2002	60	31	42	31	3	-	8561	34	832	3		46	-	-	-	9643
2003	109	8	122	36	4	89	6853	6	479	-		134	-	-	-	7840
2004	19	4	68	20	30	33	6233	5	722	3		69	-	-	-	7206
2005	47	10	72	36	8	48	6085	56	614	8		52	-	-	-	7037
2006	111	8	35	44	31	21	6305	69	713	9		39	3	-	-	7388
2007	146	15	67	84	68	20	5784	225	890	5		55	13	-	-	7372
2008	274	63	30	71	27	2	5216	72	749	4		85	6	-	-	6599
2009	70	1	58	81	66	1	5451	30	698	-		31	-	-	-	6487
2010	171	51	31	72	22	-	5994	28	565	3		44	-	1	-	6981
2011	24	53	9	51	22	1	4681	25	919	6		13	-	48	-	5852
2012	87	182	71	58	23	5	4247	17	681	-		100	12	34	-	5517
2013	83	353	1	45	8	-	3771	36	797	-		493	1	19	1	5609
2014	67	219	6	20	29	1	3053	5	806	-		211	-	21	-	4436
2015	76	53	24	211	35	-	2492	-	664	2		57	-	17	1	3629
2016	181	31	40	87	-	1	3239	-	918	2		76	71	22	7	4674
2017*	194	17	19	67	65	2	3354	90	1307	44		160	-	27	.	5340

\* Preliminary figures.

\*\* Includes former GDR prior to 1991.

\*\*\* USSR prior to 1991.

^ From 2000 corresponds to UK (E&W) and UK (Scot.)

## Summary of the assessment

**Table 8** Golden redfish in subareas 1 and 2. Assessment summary. Weights are in tonnes.

Year	Recruitment age 3 thousands	SSB	Landings	F ages 15+
1986			30203	
1987			24077	
1988			25908	
1989			23234	
1990	1467	55650	28072	0.53
1991	1417	55807	19041	0.37
1992	1357	58595	16185	0.30
1993	1288	61412	16651	0.30
1994	1439	63017	18120	0.31
1995	1309	65844	15616	0.25
1996	865	65895	18043	0.28
1997	887	64909	17511	0.27
1998	433	60906	19155	0.31
1999	349	55172	18986	0.32
2000	274	51710	14461	0.26
2001	303	50596	10547	0.196
2002	251	49668	9643	0.179
2003	133	49595	7841	0.144
2004	323	49439	7206	0.136
2005	224	48954	7037	0.132
2006	1399	47563	7388	0.142
2007	383	45565	7372	0.146
2008	209	43638	6599	0.136
2009	243	41406	6487	0.138
2010	211	37472	6981	0.184
2011	1144	34677	5852	0.162
2012	2234	31881	5517	0.176
2013	61	28902	5609	0.21
2014	30	27042	4436	0.189
2015		26031	3629	0.166
2016		24244	4675	0.23
2017		22039	5340	0.30

## Sources and references

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