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JOINT REPORT

Advice on fishing opportunities for beaked redfish in 2023 and 2024 in ICES subareas 1 and 2

Institute of Marine Research – IMR

Polar branch of the FSBSI “VINRO” (“PINRO”)

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Advice on fishing opportunities for beaked redfish in 2023 and 2024 in ICES subareas 1 and 2

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Stock Name: Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic)

Advice on fishing opportunities

The ad hoc Joint Russian-Norwegian working group on Arctic Fisheries (JRN-AFWG) advises that when the status quo approach is applied, catches in 2023 should be no more than 66 779 tonnes, and catches in 2024 should be no more than 70 164 tonnes.

Stock development over time

Fishing pressure on the stock is above F_{MSY19+} and spawning-stock size is above B_{pa} and B_{lim}.

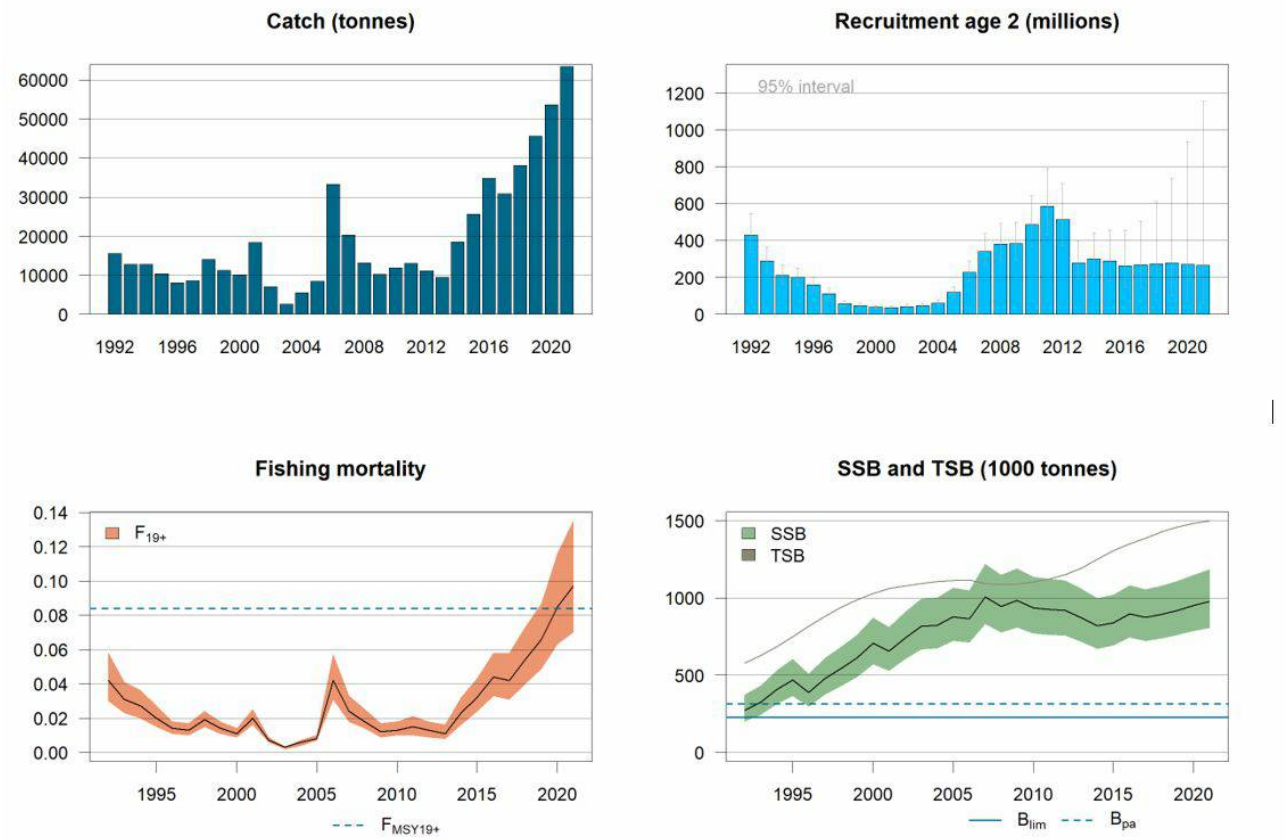

Figure 1 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Catch, recruitment, F, SSB and TSB (total stock biomass, age 2+) with 95 % confidence levels. The biomass reference points relate to SSB.

Catch scenarios

Table 1 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Assumptions made for the interim year and in the forecast. SSB, catch in tonnes, and recruitment in thousands.

Variable	Value	Notes
$F_{ages19+}$ (2022)	0.097	$F_{sq} = F_{2021}$. From assessment
SSB (2023)	1 018 117	Short-term forecast
$R_{age\ 2}$ (2022)	307 756	Regression surveys vs. recruitment
$R_{age\ 2}$ (2023)	328 242	10-years average
$R_{age\ 2}$ (2024)	328 242	10-years average
Total catch (2022)	64 159	Short-term forecast

Table 2a Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Annual catch scenarios for 2023. All weights are in tonnes.

Basis	Total catch (2023)	F_{total} (2023)	SSB (2024)	% SSB change *	% TAC change **	% Advice change ***
Advice basis						
$F_{2023} = F_{2022}$	66 779	0.097	1 040 323	6.5	-0.6	-0.6
Other scenarios						
Precautionary Approach	41 886	0.060	1 063 318	8.8	-37.7	-37.7
F = 0	0	0.000	1 102 083	12.8	-100.0	-100.0
$F_{2023} = 1.1 \times F_{2022}$	73 190	0.107	1 034 405	5.9	8.9	8.9
$F_{2023} = 1.2 \times F_{2022}$	79 555	0.117	1 028 534	5.3	18.4	18.4
$F_{2023} = 0.9 \times F_{2022}$	60 320	0.088	1 046 286	7.1	-10.3	-10.3
$F_{2023} = 0.8 \times F_{2022}$	53 814	0.078	1 052 295	7.7	-19.9	-19.9
F = 0.08	55 428	0.080	1 050 804	7.6	-17.5	-17.5
F = 0.084	58 112	0.084	1 048 325	7.3	-13.5	-13.5
F = 0.10	68 767	0.100	1 038 488	6.3	2.3	2.3
Suggested 50 000 t cap for all evaluated HCRs	50 000	0.072	1 055 819	8.1	-25.6	-25.6
* SSB 2024 relative to SSB 2021 (976 956 tonnes).						
** Catch in 2023 relative to TAC set by Norway and Russia for 2022 (67 210 tonnes).						
*** Advice value for 2023 relative to the advice value for 2022.						

Table 2b Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Annual catch scenarios for 2024. All weights are in tonnes.

Basis	Total catch (2024)	F_{total} (2024)	SSB (2025)	% SSB change *	% TAC change **	% Advice change ***
Advice basis						
$F_{2024} = F_{2023}$	70 164	0.097	1 055 435	8.0	5.1	5.1
Other scenarios						
F = 0.06	45 191	0.060	1 101 812	12.8	-32.3	-32.3
F = 0.08	58 950	0.080	1 076 409	10.2	-11.7	-11.7
F = 0.084	61 627	0.084	1 071 423	9.7	-7.7	-7.7
F = 0.10	72 098	0.100	1 051 791	7.7	8.0	8.0
Suggested 50 000 t cap for all evaluated HCRs	50 000	0.072	1 092 973	11.9	-25.1	-25.1

* SSB 2025 relative to SSB 2021 (976 956 tonnes).

** Catch in 2024 relative to TAC in 2023 under the status quo scenario (66 779 tonnes).

*** Advice value for 2024 relative to the advice value for 2023.

The advice for 2023 is 0.9% higher than the advice for 2021 due to increasing stock size and status quo advice but 0.6% lower than the advice for 2022.

Basis of the advice

Table 3 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). The basis of the advice.

Advice basis	Status quo
Management plan	There is no agreed management plan for this stock. Long-term management plan options have been evaluated by ICES (ICES, 2018a).

Quality of the assessment

The stock was benchmarked in 2018. The choice of a scaling coefficient for the Norwegian–Russian ecosystem survey is a source of potential bias of up to 50%, but the advice is robust to this uncertainty.

Data from the pelagic survey in the Norwegian Sea was reviewed in the recent benchmark assessment and the survey is now included in the assessment model. However, the survey series still does not appropriately cover the geographical distribution of the adult population, and further inclusion of the slope survey should be prioritized.

Age determination is lacking for some surveys and catches in recent years. To account for the lack of catch-at-age data in some years a procedure using length distribution and a time-averaged age-length key was applied.

To smooth out spurious variations in SSB, caused by limited sample size in the weight-at-age of the 19+ group, a fixed weight-at-age function (i.e. common across years) was adopted for the assessment model during the Arctic Fisheries Working Group (AFWG) meeting in 2018 (ICES 2018b).

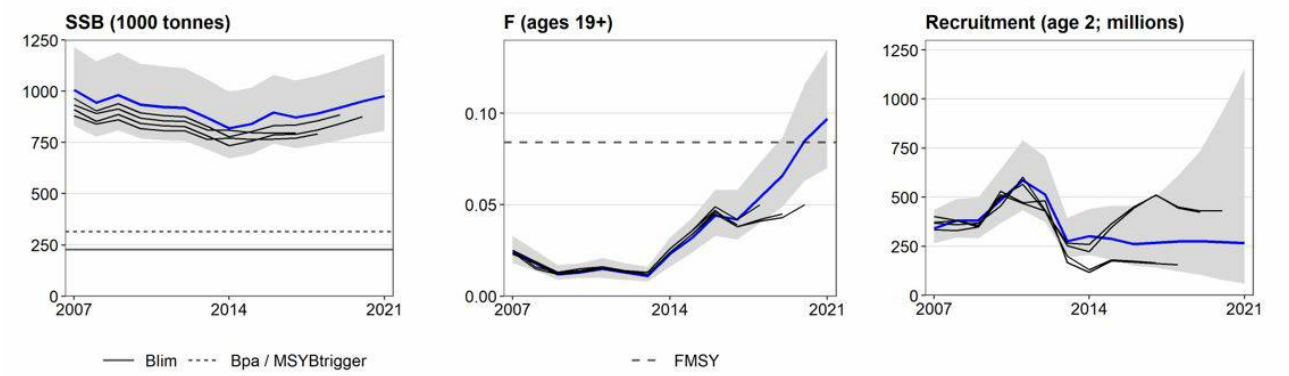

Figure 2: Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Historical assessment results. There was a benchmark revision in 2018.

Issues relevant for the advice

Due to the suspension of Russian scientists from ICES, the assessment was conducted by a Joint Russian-Norwegian working group on Arctic Fisheries (JRN-AFWG) consisting of scientists from VNIRO (Russia) and IMR (Norway) (Howell et al., 2022).

This advice has been conducted outside ICES and should not be considered as ICES advice. However, the assessment has been conducted following the previous procedures and based on the methodology agreed at the ICES benchmark in 2018 (ICES, 2018c).

There has been a significant change in the selectivity, with the fraction of the catch in the 19+ age class increasing in recent years (since 2017) and especially since the last assessment. Any evaluation of a F_{MSY} or F_{pa} value is conditional on the F_{bar} and selectivities used in the evaluation. As a result of the changing selectivity, applying the same target F_{bar} will result in a reduction of the catch as a fraction of the fishable stock. Given that the catch is close to advice, and the SSB is relatively stable, we therefore propose F_{19+} status quo as an approximation to maintain the same overall fraction of the stock being caught. We note that this stock is due for a benchmark in 2024 prior to the next release of advice, and the advice basis should be revised at that time.

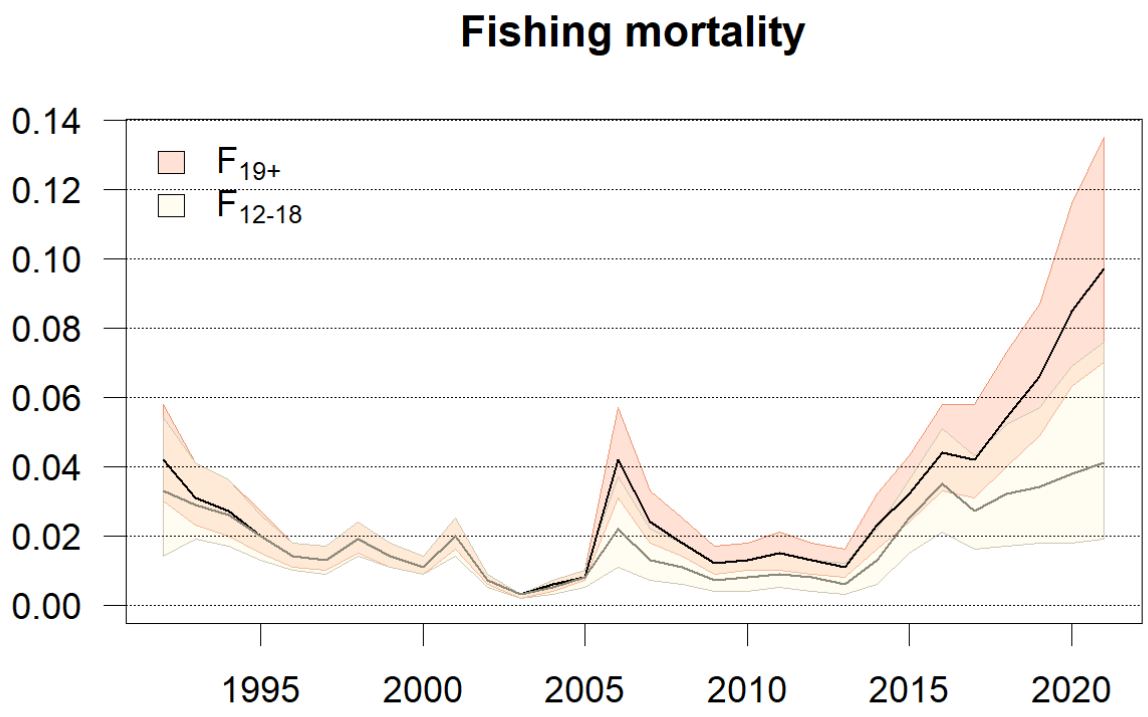

Figure 3 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Fishing mortalities for ages 12-18 and the 19+-group with 95 % confidence levels.

Long-term management plan options have been proposed by Norway and Russia and evaluated by ICES (ICES, 2018a). In the absence of an agreed management plan, the advice is based on the MSY approach. The advice has been based on F_{19+} = 0.06. This is the highest fishing mortality of those tested during the MSE evaluations (ICES, 2018a) that was found to be precautionary. The present advice is above F_{19+} = 0.06, due to the selectivity issues mentioned above and has led to a rise in biomass.

There is no international agreement on the sharing of TAC among countries and between national and international waters.

Bycatch of the endangered golden redfish (*Sebastes norvegicus*) should be kept at a minimum to allow for rebuilding of that stock.

Reference points

Table 4 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	315 000 t	B_{pa}	ICES (2018a)
	F_{MSY}	0.084	$F_{0.1}$	ICES (2018a)
Precautionary approach	B_{lim}	227 000 t	~B_{loss} (SSB in 1992)	ICES (2018a)
	B_{pa}	315 000 t	~$B_{lim} \times e^{(1.645 \times 0.2)}$	ICES (2018a)
	F_{lim}			
	F_{pa}			
Management plan	SSB_{mgt}			
	F_{mgt}			

Basis of the assessment

Table 5 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Basis of the assessment and advice.

ICES stock data category	1 (ICES, 2016)
Assessment type	Statistical catch-at-age model
Input data	Commercial catches: international landings (tonnes), age frequencies and weight-at-age from catch sampling of the pelagic and demersal fisheries and from the survey; survey indices: numbers-at-age from BS-NoRu-Q1-Btr, Eco-NoRu-Q3-Btr, Ru-Q4-Btr;proportion-at-age from deep pelagic ecosystem survey annual maturity data from BS-NoRu-Q1-Btr, Eco-NoRu-Q3-Btr, and commercial catch sampling; natural mortalities were fixed at 0.05.
Discards and bycatch	Discarding and bycatch are assumed negligible.
Other information	Last benchmark was in January 2018 (WKREDFISH; ICES, 2018c). Proposed management plans were evaluated in 2018 (WKREBMSE; ICES, 2018a).
Working group	Joint Russian-Norwegian working group on Arctic Fisheries (JRN-AFWG)

History of the advice, catch, and management

Table 6 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). ICES advice, agreed TACs, the official and unreported landings, and ICES catches. All weights are in tonnes.

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	ICES catches
1987	Precautionary TAC	70000*	85000	35000
1988	F = $F_{0.1}$; TAC	11000	-	41000
1989	*Status quo* F; TAC	12000	-	47000
1990	*Status quo* F; TAC	18000	-	63000
1991	F at F_{med}; TAC	12000	-	68000
1992	If required, precautionary TAC	22000	-	32000
1993	If required, precautionary TAC	18000	18000	12814
1994	If required, precautionary TAC	-	-	12721
1995	Lowest possible F	-	-	10284
1996	Catch at lowest possible level	-	-	8075
1997	Catch at lowest possible level	-	-	8598
1998	No directed fishery, reduce bycatch	-	-	14045

Year	ICES advice	Predicted catch corresponding to advice	Agreed TAC	ICES catches
1999	No directed fishery, reduce bycatch	-	-	11209
2000	No directed fishery, bycatch at lowest possible level	-	-	10075
2001	No directed fishery, bycatch at lowest possible level	-	-	18418
2002	No directed fishery, bycatch at lowest possible level	-	-	6993
2003	No directed fishery, bycatch at lowest possible level	-	-	2520
2004	No directed trawl fishery and low bycatch limits	-	-	5493**
2005	No directed trawl fishery and low bycatch limits	-	-	8465**
2006	No directed trawl fishery and low bycatch limits	-	-	33261**
2007	No directed trawl fishery and low bycatch limits	-	15500^	20219**
2008	Protection of juveniles, no directed trawl fishery and low bycatch limits	-	14500^	1309 6 **
2009	Protection of juveniles, no directed trawl fishery and low bycatch limits	-	10500^	10246**
2010	Protection of juveniles, no directed trawl fishery and low bycatch limits	-	8600^	11924**
2011	Protection of juveniles, no directed trawl fishery and low bycatch limits	-	7900^	12962**
2012	Protection of juveniles, no directed fishery and low bycatch limits	-	7500^	11059**
2013	$F_{0.1}$	< 47000	19500^	9 389 **
2014	*Status quo* catch	< 24000	36800^^	18 426 **
2015	Precautionary approach	< 30000	30000#	25 570
2016	Precautionary approach	< 30000	30000#	3 4754
2017	Precautionary approach	< 30000	30000#	3 0783
2018	Precautionary approach	< 32658	32658#	38 046
2019	Precautionary approach	< 53757	53757#	45 640
2020	Precautionary approach	< 55860	55860#	53631
2021	Precautionary approach	< 66158	66158#	63482 ^^^
2022	Precautionary approach	< 67210	67210#	
2023	*Status quo* approach	< 66779^^^		
2024	*Status quo* approach	< 70164^^^		

* Includes both *Sebastes mentella* and *S. norvegicus* .

** Includes the pelagic catches in the Norwegian Sea outside the EEZ.

^ TAC set by the North-East Atlantic Fisheries Commission (NEAFC) for an Olympic fishery in international waters.

^^ Sum of TAC set by NEAFC in international waters and by Norway in the Norwegian Economic Zone.

^^^ In 2022 assessment and advice was carried out by the Joint Russian-Norwegian working group on Arctic Fisheries (JRN-AFWG) which compiled catches for 2021 and gave advice for 2023 and 2024.

TAC set by jointly by Norway and Russia

History of catch and landings

Table 7 Beaked redfish in subareas 1 and 2. Catches inside and outside the NEAFC Regulatory Area (RA) as estimated by JRN-AFWG.

Year	Inside the NEAFC RA (tonnes)	Outside the NEAFC RA (tonnes)	Total catches (tonnes)	Proportion inside the NEAFC RA (%)
2019	6060	39580	45640	13. 3 %
2020	5469	48162	53631	10.2 %
2021	2872	60610	63482	4.5 %

Year	Other countries	Denmark	Estonia	Faroe Islands	France	Germany	Greenland	Iceland	Ireland	Latvia	Lithuania	Netherlands	Norway	Poland	Portugal	Russia	Spain	UK		Total
																		England & Wales	Scotland **	
1993	**Can.** 8	4		13	50	35	1						5182		963	6260	5	293	-	12814
1994		28		4	74	18	1		3				6511		895	5021	30	124	12	12721
1995				3	16	176	2		4				2646		927	6346	67	93	4	10284
1996				4	75	119	3		2				6053		467	925	328	76	23	8075
1997				4	37	81	16		6				4657	1	474	2972	272	71	7	8598
1998				20	73	100	14		9				9733	13	125	3646	177	93	41	14045
1999				73	26	202	50		3				7884	6	65	2731	29	112	28	11209
2000				50	12	62	29	48	1				6020	2	115	3519	87		130	10075
2001				74	16	198	17	3	4				13937	5	179	3775	90		120	18418
2002			15	75	58	99	18	41	4				2152	8	242	3904	190		188	6993
2003				64	22	32	8	5	5				1210	7	44	952	47		124	2520
2004	**Swe.** 1			588	13	10	4	10	3				1375	42	235	2879	257		76	5493
2005			5	1147	46	33	39	4	4			7	1760		140	5023	163		95	8465
2006	**Can.** 433		396	3808	215	2483	63	2513	4	341	845		4710	2496	1804	11413	710		1027	33261
2007			684	2197	234	520	29	1587	17	349	785		3209	1081	1483	5660	2181		202	20219
2008				1849	187	16	25	9	9	267	117	13	2220	8	713	7117	463		83	13096
2009	**EU** 889			1343	15	42		33				3	2677	338	806	3843	177		80	10246
2010				979	175	21	12	2		243	457		2065		293	6414	1184		79	11924
2011				984	175	835		2		536	565		2471	11	613	5037	1678		55	12962
2012				259		517		36		447	449		2114	318	1038	4101	1780			11059
2013				697		80	21	1		280	262		1750	84	1078	3677	1459			9389
2014				743	215	446	15	-		215	167	3	13149	103	505	1704	1162			18426
2015				657	49	242	48	3		537	192	3	19433	5	678	1142	2529		52	25570
2016				502	134	493	74	24	0	1243	1065		18191	208	1066	8419	3213		3213	34754
2017			4	443	45	763	66	3		562	790		17077	102	1060	6593	2838		2838	30783
2018				425	67	2473	82	10		1020	1010	374	18594	275	699	10497	2457		2457	38046
2019				156	370	1599	615	10			653	244	23844	471	1422	13444	2222		2222	45640
2020				149	163	1807	62	5		2	1081	1483	32950	4	870	13874	744		744	53631
2021*				290	218	1166	85	6			1379		43797	2	381	14887	615		615	63482 ^

* Provisional figures. ** Includes UK (E&W) since 2000

^ In 2022 assessment and advice was carried out by the Joint Russian-Norwegian working group on Arctic Fisheries (JRN-AFWG) which compiled catches for 2021 and gave advice for 2023 and 2024.

Summary of the assessment

Table 9 Beaked redfish in ICES subareas 1 and 2 (Northeast Arctic). Assessment summary. High and low refer to 95% confidence bounds.

Year	Recruitment			Spawning-stock biomass			Total	Fishable	Catches	Fishing mortality		
	Recruitment age 2	High 95%	Low 95%	SSB	High 95%	Low 95%	Biomass Ages-2+	Biomass Ages-6+		F ages 19+	High 95%	Low 95%
	thousands			tonnes								
1992	429977	547252	337834	272832	370101	201127	578519	538268	15590	0.042	0.058	0.03
1993	289490	365156	229503	323633	427869	244791	625353	574249	12814	0.031	0.041	0.023
1994	209655	264337	166284	408052	528118	315282	683931	633320	12721	0.027	0.036	0.02
1995	200014	251339	159170	469927	600659	367648	749296	703309	10284	0.02	0.027	0.015
1996	159840	200852	127203	388973	505507	299303	815380	783244	8075	0.014	0.018	0.011
1997	111468	139928	88797	478373	606875	377080	879859	855375	8598	0.013	0.017	0.01
1998	57486	72381	45655	540768	678977	430692	939125	917192	14045	0.019	0.024	0.015
1999	46459	58519	36885	608797	755222	490761	987290	970504	11209	0.014	0.018	0.011
2000	36893	46354	29364	705479	866531	574360	1028121	1016753	10075	0.011	0.014	0.009
2001	35692	45505	27995	655042	807472	531387	1061862	1055391	18418	0.02	0.025	0.016
2002	42423	54032	33309	738944	902669	604915	1076126	1070770	6993	0.007	0.009	0.006
2003	45546	58175	35658	815196	989820	671379	1092350	1087725	2520	0.003	0.003	0.002
2004	61313	77705	48379	821177	994104	678332	1105561	1100773	5493	0.006	0.007	0.004
2005	117600	148460	93155	876777	1057921	726650	1111756	1105858	8465	0.008	0.01	0.007
2006	228265	288780	180431	863053	1042471	714514	1114103	1106351	33261	0.042	0.057	0.031
2007	341155	437321	266135	1006505	1212420	835563	1093005	1080772	20219	0.024	0.033	0.018
2008	379932	490519	294277	943961	1141892	780338	1086510	1065557	13096	0.018	0.025	0.014
2009	381522	497778	292418	981572	1185259	812888	1089978	1056792	10246	0.012	0.017	0.009
2010	484675	642042	365879	934873	1130950	772791	1102470	1058427	11924	0.013	0.018	0.01
2011	585041	790237	433126	924087	1117215	764345	1121726	1072615	12962	0.015	0.021	0.01
2012	514156	707787	373497	918287	1108923	760423	1150236	1097864	11059	0.013	0.018	0.009
2013	277390	394846	194875	870554	1053448	719413	1193293	1132140	9389	0.011	0.016	0.008
2014	301447	440457	206309	818776	992986	675129	1251414	1186181	18426	0.023	0.032	0.016
2015	287730	456560	181331	839740	1014367	695176	1306128	1251762	25570	0.032	0.043	0.024
2016	261768	455820	150328	896320	1076019	746632	1349036	1314328	34754	0.044	0.058	0.033
2017	267611	505336	141719	872141	1049785	724558	1385571	1349432	30783	0.042	0.058	0.031
2018	273985	609408	123181	892107	1072432	742104	1426595	1392068	38046	0.054	0.073	0.04
2019	277225	733569	104767	919610	1105110	765248	1458710	1426141	45640	0.066	0.087	0.049
2020	271416	936334	78676	950770	1143785	790328	1482233	1449024	53631	0.085	0.116	0.063
2021	265735	1155311	61122	976956	1179110	809461	1497178	1463463	63482	0.097	0.135	0.07
2022	307756 *			996124								

* Assumed value (regression between survey indices and recruitment time series)

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