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REPORT

Advice on fishing opportunities for Barents Sea shrimp in 2024

Institute of Marine Research – IMR

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

Tittel (norsk og engelsk):

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1 - Advice on fishing opportunities

Based on the MSY approach and an updated assessment methodology endorsed by an international panel of experts in 2022 (ICES 2022), the catches in 2024 should not exceed 143 000 tonnes.

2 - Stock development over time

Fishing pressure on the stock is below F_{MSY} and F_{lim} and stock biomass is above MSY $B_{trigger}$ and B_{lim} .

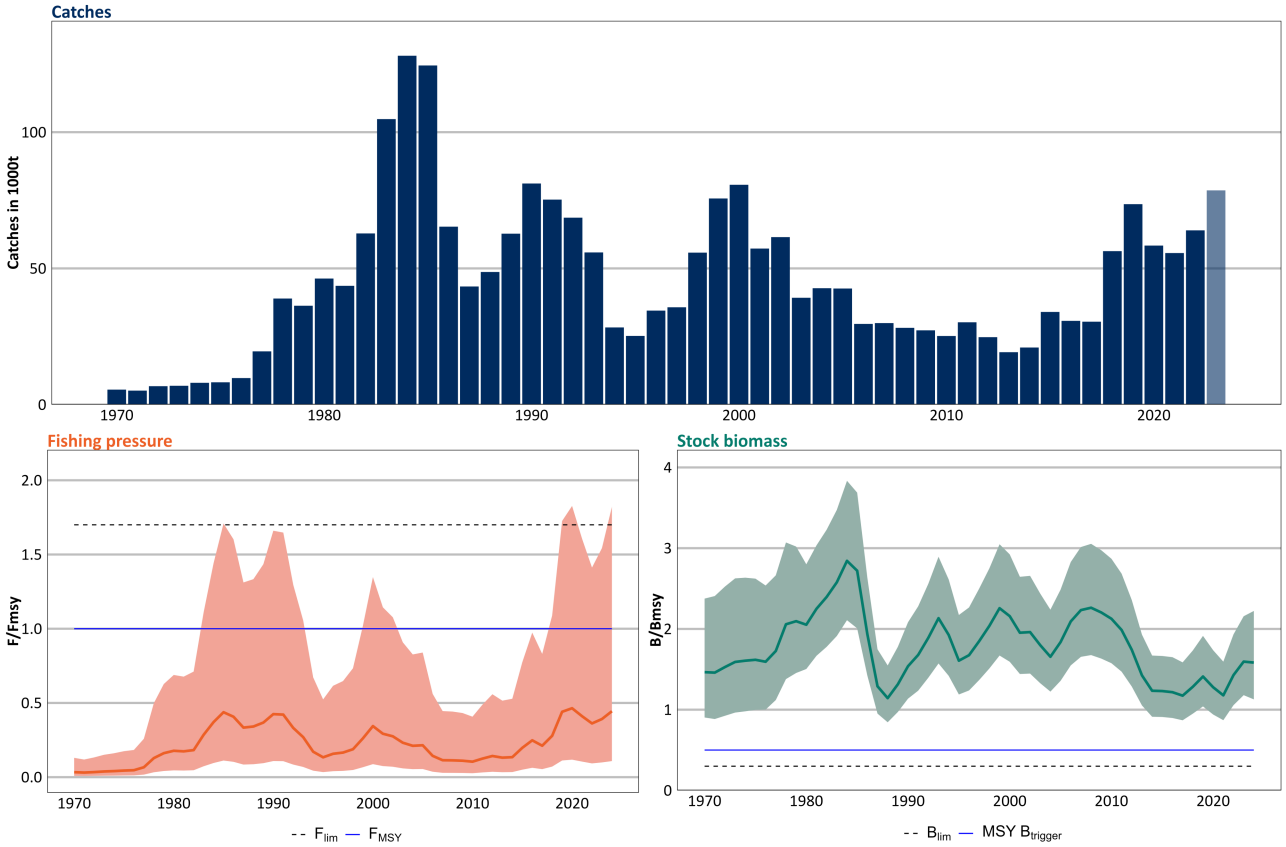

Figure 1: Northern shrimp in subareas 1 and 2. Summary of the stock assessment. Top: total catches (paler bar indicates catches based on preliminary information). Bottom: fishing mortality (left) and stock biomass (right) relative to FMSY and BMSY, respectively. Lines show medians and shaded areas indicate the 95% confidence intervals.

3 - Catch scenarios

Table 1: Northern shrimp in ICES subareas 1 and 2. The basis for the catch scenarios.

Variable	Value	Notes
Mean F2023/F_{MSY}	0.44	Corresponds to the estimated catch in 2023.
Median B_{2023} /B_{MSY}	1.58	B2023 is the biomass at the end of 2023, considering the estimated catch in 2023.
Catch 2023	78 643	Preliminary data. All catches are assumed to be landed.

Table 2: Northern shrimp in ICES subareas 1 and 2. Annual catch scenarios for 2024.

Basis	Fish at Fmsy	Fmsy mode	Constant catch			
			100kt	125kt	150kt	175kt
Catches (kt)	174	143	100	125	150	175
Stock size (B/B_{msy})	1.48	1.51	1.56	1.53	1.50	1.47
Fishing mortality (F/F_{msy})	1.00	0.82	0.56	0.71	0.86	1.01
Probability of falling below B_{lim}	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Probability of falling below MSY $B_{trigger}$	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Probability of exceeding F_{msy}	50.0%	38.9%	21.1%	31.6%	41.5%	50.5%
Probability of exceeding F_{lim}	23.0%	15.4%	6.2%	11.2%	17.1%	23.4%

4 - Basis of the advice

Table 3: Northern shrimp in subareas 1 and 2. The basis of the advice.

Advice basis	MSY approach using F_{MSY} mode.
Management plan	No agreed precautionary management plan for northern shrimp in this area.

5 - Quality of assessment

Data from the part of the 2022 survey area that was not used in the previous assessment due to delayed coverage was now included. All the survey data for 2023 was available at the time of the assessment. The quality of the input data can therefore be considered as good.

The stock was benchmarked in 2022 (ICES, 2022). Revised methods for estimation of CPUE and survey index, updated stock priors and a change to SPiCT were accepted. Combined, these changes resulted in a lower estimate of B_{MSY} and F_{MSY} but did not alter the overall trends over time or the perception of the state of the stock with respect to reference points. Compared to the pre-benchmark assessment in 2021, the 2022 assessment resulted in a downward revision of stock biomass and an upward revision of F compared to previous assessments (Figure 2). This yearâ€™s assessment is in line with the 2022 assessment (IMR-PINRO 2023).

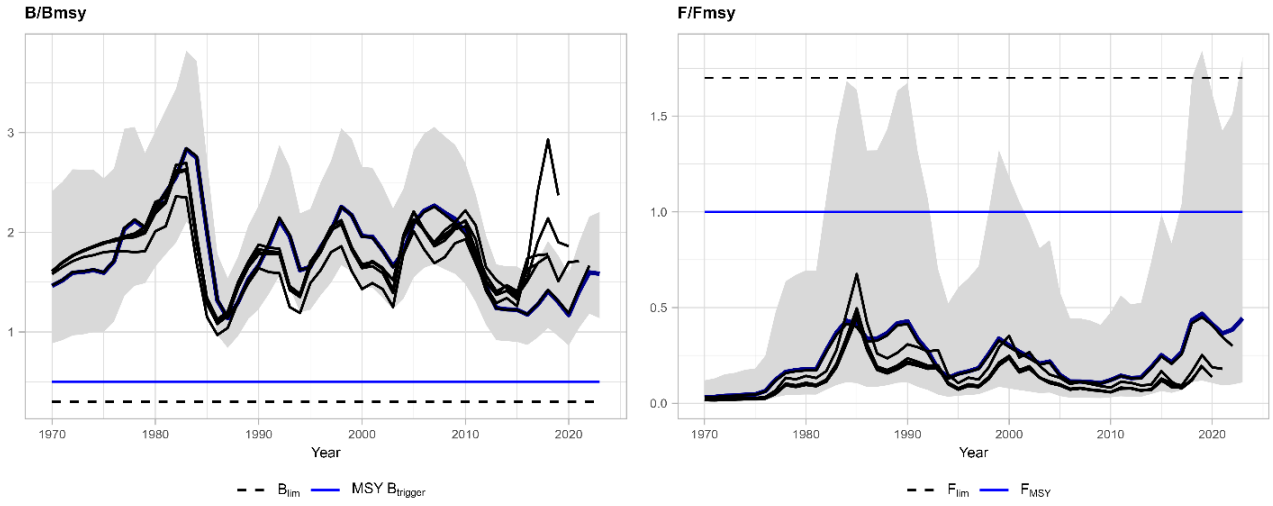

Figure 2: Northern shrimp in subareas 1 and 2. Historical assessment results. Black lines show B/B $_{MSY}$ and F/ F $_{MSY}$ trends as assessed in prior years, dark-blue lines the current assessment, and shaded areas the 95% confidence intervals of the current assessment. The stock assessment has undergone revisions during a benchmark in 2022.

6 - Issues relevant for the advice

The advice was derived by IMR (Institute of Marine Research) based on the assessment framework endorsed in 2022 by the benchmark workshop on Pandalus stocks (WKPRAWN) (ICES 2022). The mode of the probability distribution of F_{MSY} is used as the basis for the advice, given the higher uncertainty on the right-hand side of its probability distribution. Catches corresponding to the fishing mortality at median F_{MSY} would imply catches of 174 000 tonnes in 2024.

7 - Reference points

Table 4: Northern shrimp in ICES subareas 1 and 2. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{trigger}$	0.5 x B_{MSY} = 0.25 x K *	Relative value. B_{MSY} is estimated directly from the assessment model and changes when the assessment is updated.	ICES (2013)
MSY approach	F_{MSY}	r/2	Relative value. F_{MSY} is estimated directly from the assessment model and changes when the assessment is updated.	ICES (2013)
Precautionary approach	B_{lim}	0.3 x B_{MSY}	50% of MSY	ICES (2013)
Precautionary approach	B_{pa}	Not defined	**	
Precautionary approach	F_{lim}	1.7 x F_{MSY}	Relative value (the F that drives the stock to B_{lim})*	ICES (2013)
Precautionary approach	F_{pa}	Not defined		
Management plan	B_{mgt}	Not defined		
Management plan	F_{mgt}	Not defined		

* Fishing mortality is presented in relation to F_{MSY} , and total stock biomass is presented in relation to B_{MSY} . K is the carrying capacity and r is the intrinsic biomass growth rate. These values are directly estimated from the stock assessment and change when the assessment is updated.

** B_{pa} and F_{pa} are not defined. The assessment provides probability distributions for B and F, so it is possible to directly estimate the probabilities of $B < B_{lim}$ and of $F > F_{lim}$.

8 - Basis of the assessment

Table 5: Northern shrimp in ICES subareas 1 and 2. Basis of the assessment and advice.

Assessment type	Surplus production in continuous time (SPiCT)
Input data	Fishery catches since 1970. Three survey indices: the Norwegian shrimp survey 1982–2004 [G3653], the Russian shrimp survey 1984–2005 [G4941], and the Norwegian–Russian ecosystem survey (Eco-Norw-Q3 [A5216]) since 2004; one fishery-based index (standardized CPUE from Norwegian logbooks) since 1980.
Discards and bycatch	Discarding is considered to be negligible.
Indicators	None
Other information	None

9 - History of the advice, catch, and management

Table 6: Northern shrimp in ICES subareas 1 and 2. ICES advice and official landings. All weights are in tonnes.

Year	Advice	Catches corresponding to advice	Agreed TAC	Reported landings
2005	No increase compared to 2004	43600	-	42618
2006	No increase in catch above recent level	40000	-	29627
2007	Catch that will prevent exceeding F_{lim} in the long term	50000	-	29931
2008	Catch that will prevent exceeding F_{lim} in the long term	50000	-	28188
2009	Catch that will prevent exceeding F_{lim} in the long term	50000	-	27272
2010	Catch that will prevent exceeding F_{lim} in the long term	50000	-	25198
2011	Catch that will prevent exceeding F_{MSY} in the long term	60000	-	30226
2012	Catch that will prevent exceeding F_{MSY} in the long term	60000	-	24756
2013	Catch that will maintain stock at current high biomass	60000	-	19249
2014	No new advice, same as for 2013	60000	-	20964
2015	Move exploitation towards F_{MSY}	< 70000	-	34022
2016	Move exploitation towards F_{MSY}	< 70000	-	30749
2017	Move exploitation towards F_{MSY}	≤ 70000	-	30442
2018	MSY approach: move exploitation towards F_{MSY}	≤ 70000	-	56341
2019	MSY approach: move exploitation towards F_{MSY}	≤ 70000	-	76086
2020	MSY approach: mode of the F_{MSY} distribution as basis of advice	≤ 150000	-	61877
2021	MSY approach: mode of the F_{MSY} distribution as basis of advice	≤ 140000	-	58030
2022	MSY approach: mode of the F_{MSY} distribution as basis of advice	≤ 140000	-	63970
2023	MSY approach: mode of the F_{MSY} distribution as basis of advice **	≤ 156000	-	* 78643
2024	MSY approach: mode of the F_{MSY} distribution as basis of advice **	≤ 143000		

* Estimated total catches based on reported catches up to November.

** In 2022 and 2023 assessment and advice was carried out by IMR which compiled catches for 2022 and 2023 and gave advice for 2023 and 2024.

10 - History of the catch and landings

Table 7: Northern shrimp in ICES subareas 1 and 2. ICES catches (tonnes). "Others" are EU, UK, Iceland, Faroes, and Greenland.

Year	Norway	Russia	Others	Total
1970	5508	0	0	5508
1971	5116	0	26	5142
1972	6772	0	0	6772
1973	6921	0	0	6921
1974	8008	0	0	8008
1975	8197	0	2	8199
1976	9752	0	0	9752
1977	14700	0	4854	19554
1978	20484	18270	189	38943
1979	25435	10474	390	36299
1980	35061	11219	0	46280
1981	32713	9886	1011	43610
1982	43451	15552	3835	62838
1983	70798	29105	4903	104806
1984	76636	43180	8246	128062
1985	82123	32104	10262	124489
1986	48569	10216	6538	65323
1987	31353	6690	5324	43367
1988	32021	12320	4348	48689
1989	47064	12252	3432	62748
1990	54182	20295	6687	81164
1991	39663	29434	6156	75253
1992	39657	20944	8021	68622
1993	32663	22397	806	55866
1994	20162	7108	1063	28333
1995	19337	3564	2319	25220
1996	25445	5747	3320	34512
1997	29079	1493	5163	35735
1998	44792	4895	6103	55790
1999	52612	10765	12293	75670
2000	55333	19596	5768	80697
2001	43031	5846	8408	57285
2002	48799	3790	8899	61488
2003	34172	2776	2277	39225
2004	35918	2410	4406	42734
2005	37253	435	4930	42618

Year	Norway	Russia	Others	Total
2006	27352	4	2271	29627
2007	25558	192	4180	29930
2008	20662	417	7109	28188
2009	19784	0	7489	27273
2010	16776	0	8419	25195
2011	19928	0	10298	30226
2012	14159	5	10600	24763
2013	8846	1067	9335	19248
2014	10234	741	9989	20964
2015	16618	1151	16253	34022
2016	10898	2491	17359	30749
2017	7010	3849	19582	30442
2018	23126	12561	20654	56341
2019	23925	28081	21576	73582
2020	19116	21265	18000	58380
2021	30177	12379	13085	55642
2022 ***	35330	3790	24850	* 63970
2023 ***	36535	12288	29820	** 78643

* Preliminary data.

** Estimated total catches based on reported catches up to November. *** In 2022 and 2023 assessment and advice was carried out by IMR which compiled catches for 2022 and 2023 and gave advice for 2023 and 2024.

11 - Summary of the assessment

Table 8: Northern shrimp in ICES subareas 1 and 2. Assessment summary. Biomass is relative to BMSY at the end of the year and fishing mortality relative to FMSY. High and low values are the 95% confidence intervals. Catches are in tonnes. Catches for 2023 were estimated based on reported catches up to November.

Year	Stock biomass relative to B_{MSY}			Total catch	Fishing mortality relative to F_{MSY}		
	B/B_{MSY}	Low	High	tonnes	F/F_{MSY}	Low	High
1970	1.46	0.89	2.41	5508	0.03	0.01	0.12
1971	1.52	0.92	2.50	5142	0.03	0.01	0.13
1972	1.59	0.97	2.63	6772	0.04	0.01	0.15
1973	1.60	0.98	2.63	6921	0.04	0.01	0.16
1974	1.62	1.00	2.63	8008	0.04	0.01	0.18
1975	1.59	1.00	2.54	8199	0.05	0.01	0.18
1976	1.71	1.11	2.64	9752	0.06	0.02	0.25
1977	2.03	1.36	3.04	19554	0.12	0.03	0.48
1978	2.11	1.46	3.06	38943	0.16	0.04	0.64
1979	2.04	1.49	2.80	36299	0.17	0.04	0.67
1980	2.23	1.66	3.01	46280	0.18	0.05	0.69
1981	2.40	1.78	3.23	43610	0.18	0.05	0.69
1982	2.55	1.90	3.44	62838	0.28	0.07	1.08
1983	2.83	2.10	3.82	104806	0.37	0.10	1.43
1984	2.75	2.03	3.72	128062	0.43	0.11	1.68
1985	2.00	1.47	2.72	124489	0.42	0.11	1.64
1986	1.32	0.97	1.78	65323	0.34	0.09	1.32
1987	1.14	0.84	1.54	43367	0.34	0.09	1.32
1988	1.30	0.96	1.75	48689	0.37	0.09	1.43
1989	1.53	1.13	2.07	62748	0.42	0.11	1.63
1990	1.67	1.23	2.27	81164	0.43	0.11	1.67
1991	1.87	1.38	2.54	75253	0.34	0.09	1.31
1992	2.12	1.56	2.87	68622	0.27	0.07	1.07
1993	1.96	1.44	2.66	55866	0.18	0.05	0.70
1994	1.62	1.20	2.19	28333	0.13	0.03	0.52
1995	1.65	1.22	2.23	25220	0.16	0.04	0.60
1996	1.85	1.37	2.50	34512	0.17	0.04	0.65
1997	2.01	1.49	2.72	35735	0.18	0.05	0.72
1998	2.26	1.67	3.04	55790	0.26	0.07	1.00
1999	2.17	1.61	2.94	75670	0.34	0.09	1.32
2000	1.96	1.45	2.66	80697	0.30	0.08	1.18
2001	1.96	1.44	2.65	57285	0.27	0.07	1.05
2002	1.82	1.34	2.46	61488	0.24	0.06	0.94
2003	1.66	1.23	2.24	39225	0.21	0.05	0.81

Year	Stock biomass relative to B			Total catch	Fishing mortality relative to F		
	B/ B	Low	High	tonnes	F/ F	Low	High
2004	1.80	1.33	2.43	42734	0.22	0.06	0.85
2005	2.09	1.55	2.82	42618	0.15	0.04	0.58
2006	2.22	1.64	2.99	29627	0.11	0.03	0.44
2007	2.27	1.68	3.06	29930	0.11	0.03	0.44
2008	2.20	1.63	2.96	28188	0.11	0.03	0.43
2009	2.13	1.58	2.88	27273	0.11	0.03	0.41
2010	2.00	1.48	2.69	25195	0.12	0.03	0.47
2011	1.76	1.30	2.38	30226	0.14	0.04	0.56
2012	1.45	1.07	1.96	24763	0.13	0.03	0.52
2013	1.24	0.92	1.68	19248	0.13	0.03	0.53
2014	1.23	0.91	1.66	20964	0.19	0.05	0.74
2015	1.22	0.90	1.66	34022	0.25	0.06	0.99
2016	1.17	0.87	1.59	30749	0.21	0.05	0.84
2017	1.27	0.94	1.72	30442	0.27	0.07	1.04
2018	1.41	1.04	1.91	56341	0.43	0.11	1.70
2019	1.30	0.96	1.77	73582	0.47	0.12	1.84
2020	1.17	0.86	1.58	58380	0.41	0.11	1.62
2021	1.41	1.04	1.90	55642	0.37	0.09	1.42
2022	1.60	1.18	2.16	63970	0.39	0.10	1.51
2023	1.58	1.14	2.20	* 78643	* 0.44	* 0.11	* 1.81
2024	1.58	1.02	2.45				

* Based on estimated catches for the year.

12 - Sources and references

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Insert reference to assessment report

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