

## Porbeagle (*Lamna nasus*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)

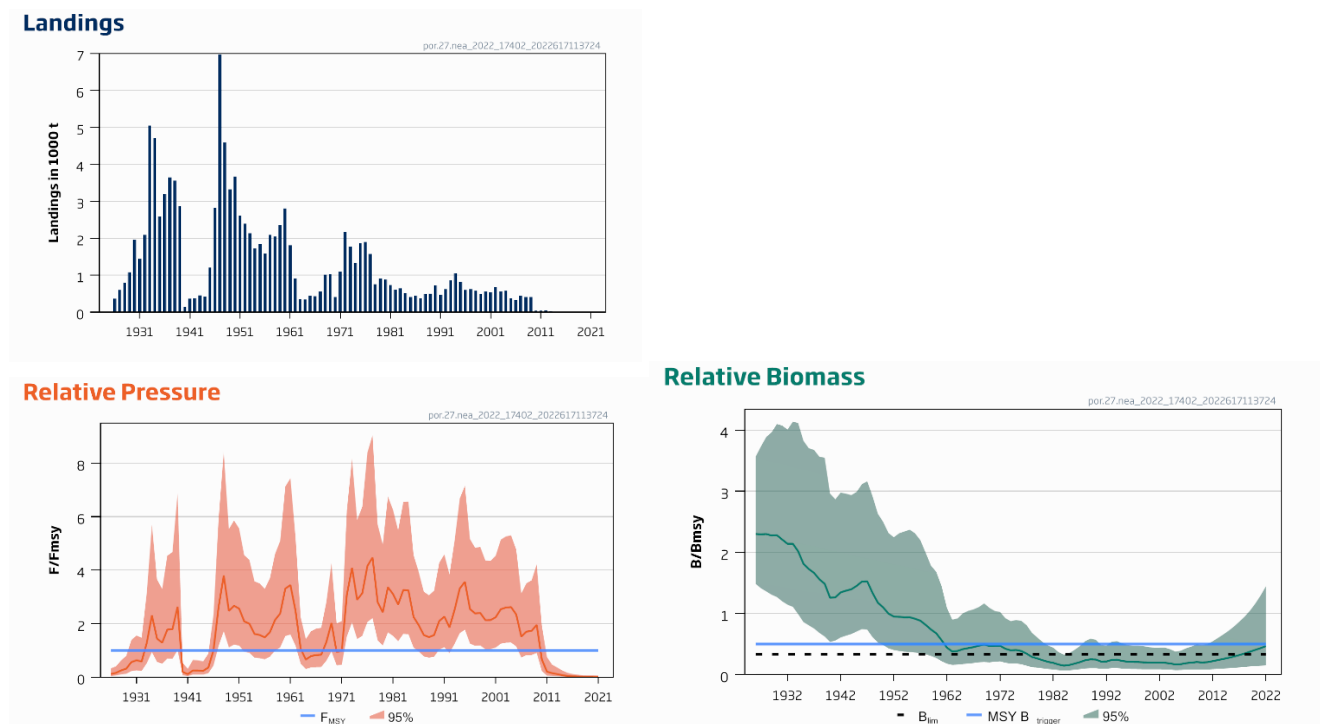
### ICES advice on fishing opportunities

**Please note: The present advice replaces the advice issued in October 2019 for catches in 2023.**

ICES advises that when the MSY approach is applied, catches in 2023 and 2024 should be no more than 219 tonnes and 231 tonnes respectively.

### Stock development over time

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



**Figure 1** Porbeagle in the Northeast Atlantic. Summary of the stock assessment. Landings from 1926–2021 (estimates of discards are only available for year 2018 and are not shown on the figure). Relative fishing pressure and relative biomass.

### Catch scenarios

**Table 1** Porbeagle in the Northeast Atlantic. The basis for the catch scenarios.

Variable	Value	Notes
$F_{2022}/F_{MSY}$	0.01	Status quo $F/F_{MSY}$ ( $= F_{2021}/F_{MSY}$ )
$B_{2023}/B_{MSY}$	0.50	Short-term forecast, $B_{2023}$ , as of 1st of January 2023
Projected catches (2022)	8	Short-term forecast; in tonnes.

**Table 2a** Porbeagle in the Northeast Atlantic. Annual catch scenarios for 2023. All weights are in tonnes.

Basis	Total catch (2023)	Projected catches * (2023)	Fishing mortality $F_{2023}/F_{MSY}$	Probability of SSB (2053) > $B_{lim}$ (%)	Stock size ** $B_{2024}/B_{MSY}$	% B change ***	% Advice change ^
ICES advice basis							
MSY approach (15th percentile of predicted catch distribution under $F = F_{MSY}$ )	219	na	0.35	95	0.53	1.06	-
Other scenarios							
$F = F_{MSY}$	617	na	1	67	0.51	1.02	-
MSY approach (35th percentile of predicted catch distribution under $F = F_{MSY}$ )	422	na	0.68	79	0.52	1.04	-
MSY approach (20th percentile of predicted catch distribution under $F = F_{MSY}$ )	269	na	0.43	92	0.53	1.05	-
MSY approach (10th percentile of predicted catch distribution under $F = F_{MSY}$ )	175	na	0.28	98	0.53	1.06	-
$F = F_{2022} = F_{sq}$	6	na	0.01	100	0.54	1.07	-
$F = 0$	0	na	0	100	0.54	1.07	-

\* The information available does not allow an estimate of possible discards.

\*\* Biomass as of 1 January

\*\*\* Biomass 2024 relative to biomass 2023

^ Previous advice was zero catch in 2020–2023 (ICES, 2019). The advice for 2023 and 2024 is a non-zero catch because the advice is now based on the MSY approach using a category 2 assessment method and forecast after being benchmarked (ICES, 2022c).

**Table 2b** Porbeagle in the Northeast Atlantic. Annual catch scenarios for 2024 (basis in Table 2a). All weights are in tonnes.

Basis	Total catch (2024)	Projected catches * (2024)	Fishing mortality $F_{2024}/F_{MSY}$	Probability of SSB (2053) > $B_{lim}$ (%)	Stock size ** $B_{2025}/B_{MSY}$	% B change ***	% Advice change ^
ICES advice basis							
MSY approach (15th percentile of predicted catch distribution under $F = F_{MSY}$ )	231	na	0.35	95	0.56	1.05	-
Other scenarios							
$F = F_{MSY}$	632	na	1	67	0.53	1.02	-
MSY approach (35th percentile of predicted catch distribution under $F = F_{MSY}$ )	439	na	0.68	79	0.54	1.04	-
MSY approach (20th percentile of predicted catch distribution under $F = F_{MSY}$ )	282	na	0.43	92	0.55	1.05	-
MSY approach (10th percentile of predicted catch distribution under $F = F_{MSY}$ )	186	na	0.28	98	0.56	1.06	-
$F = F_{2022} = F_{sq}$	7	na	0.01	100	0.58	1.07	-
$F = 0$	0	na	0	100	0.58	1.07	-

\* The information available does not allow an estimate of possible discards.

\*\* Biomass as of 1 January

\*\*\* Biomass 2025 relative to biomass 2024

^ Previous advice was zero catch in 2020–2023 (ICES, 2019). The advice for 2023 and 2024 is a non-zero catch because the advice is now based on the MSY approach using a category 2 assessment method and forecast after being benchmarked (ICES, 2022c).

## Basis of the advice

**Table 3** Porbeagle in the Northeast Atlantic. The basis of the advice.

Advice basis	MSY approach (percentile of predicted catch distribution under $F = F_{MSY}$ set at 15%)
Management plan	ICES is not aware of any agreed precautionary management plan for porbeagle in this area

## Quality of the assessment

The stock was benchmarked in 2022 (ICES, 2022c) and a surplus production model is now applied.

The extended time-series of estimated landings (1926–2021) was revised at the 2022 benchmark in collaboration with ICCAT. Landings from 1926 to 2009 are assumed close to catches with negligible discards. From 2010, when the zero TAC was introduced, discards are likely to be a large proportion of the catch in mixed fisheries, although they are unquantified.

Three commercial biomass indices were used in the assessment, all of which were provided by standardization of CPUE series with GLMs. In addition, a composite biomass survey series was used formed by commercial CPUEs (2000–2009) supplemented by survey indices (2018–2019; ICES, 2022c). This series thus provides information on the trend in biomass since the zero TAC was introduced.

There is no historical retrospective as this is the first advice based on the ICES category 2 assessment.

## Issues relevant for the advice

The ICES catch advice is based on the 15th percentile of predicted catch distribution, which was considered more precautionary than the 35th percentile (as suggested in ICES, 2022b). This is justified by the model uncertainty and the low productivity of the stock, thus ensuring a 95% probability of the stock biomass exceeding  $B_{lim}$  within two generations (2053). This equates to a relative  $F$  between 0.3 and 0.4 (Tables 2 and 10).

In 2010, the TAC was reduced to zero and subsequently porbeagle has been included on the list of prohibited species in UK, EU and international waters (which is also in line with ICCAT Recommendation 2015-06). It has also been listed in Appendix II of CMS since 2008, and in Appendix II of CITES since 2014 (ICES, 2022b).

This species was formerly targeted in longline fisheries and it is also a bycatch species in gillnet and pelagic trawl fisheries. Discarding is known to occur in these fisheries but has not been quantified. Any potential mortality from recreational fisheries is also unquantified.

The benchmarked assessment has used a range of biomass indices, most of which were from historic data sources. Future assessments of the stock will require the introduction of relevant data collection programmes to provide suitable biomass indices. Appropriate monitoring of which life-history stages are being exploited (i.e. the sex and length composition of the catch) and of the stock's reproductive capacity would also be required.

## Reference points

**Table 4** Porbeagle in the Northeast Atlantic. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis*	Source
MSY approach	MSY $B_{trigger}$	$0.5 \times B_{MSY} = 0.25 \times K$	Relative value from the SPiCT model. $B_{MSY}$ is estimated directly from the SPiCT assessment model and changes when the assessment is updated.	ICES (2021), ICES (2022d)
	$F_{MSY}$	$r/2$	Relative value from the SPiCT model. $F_{MSY}$ is estimated directly from the SPiCT assessment model and changes when the assessment is updated.	ICES (2021), ICES (2022d)
Precautionary approach	$B_{lim}$	$0.3 \times B_{MSY}$	Relative value from the SPiCT model. $B_{MSY}$ is estimated directly from the SPiCT assessment model and changes when the assessment is updated.	ICES (2021), ICES (2022d)
	$B_{pa}^{**}$	Not defined		
	$F_{lim}$	$1.7 \times F_{MSY}$	Relative value (the F that drives the stock to $B_{lim}$ ).	ICES (2021), ICES (2022d)
	$F_{pa}^{**}$	Not defined		
Management plan	$SSB_{mgt}$	Not defined		
	$F_{mgt}$	Not defined		

\* No reference points are defined for this stock in terms of absolute values. The SPiCT-estimated values of the ratios  $F/F_{MSY}$  and  $B/B_{MSY}$  are used to estimate stock status relative to the MSY reference points. K is the carrying capacity and r is intrinsic biomass growth rate.

\*\*  $B_{pa}$  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  $F > F_{lim}$ .

## Basis of the assessment

**Table 5** Porbeagle in the Northeast Atlantic. The basis of the assessment.

ICES stock data category	2 ( <a href="#">ICES, 2022a</a> and <a href="#">2022b</a> )
Assessment type	SPiCT assessment (ICES, 2022c)
Input data	Landings. Three standardized commercial CPUE series (1950 to 2009) and a composite survey series (2000–2019).
Discards and bycatch	Unquantified
Indicators	None
Other information	This stock was benchmarked in 2022 (ICES, 2022c)
Working group	Working Group on Elasmobranch Fishes ( <a href="#">WGEF</a> ).

## History of advice, catch, and management

**Table 6** Porbeagle in the Northeast Atlantic. History of ICES advice, the agreed TAC, and ICES estimates of landings. Weights are in tonnes.

Year	ICES advice	Catch corresp. to advice	Agreed TAC	ICES landings
2005	No fishery			378
2006	No new advice, same as for 2005	0		325
2007	No target fishery, prevent bycatch	0		439
2008	No new advice, same as for 2007	0	581	409
2009	No target fishery, prevent bycatch	0	436	410
2010	No new advice, same as for 2009	0	0	34
2011	Catch = 0	0	0	33
2012	No new advice, same as for 2011	0	0	48
2013	Catch = 0	0	0	28
2014	No new advice, same as for 2013	0	0	21
2015	No new advice, same as for 2014	0		12
2016	Precautionary approach, fishing mortality minimized and no targeted fisheries	0		11
2017	Quadrennial advice	0		9
2018	Quadrennial advice	0		6

Year	ICES advice	Catch corresp. to advice	Agreed TAC	ICES landings
2019	Quadrennial advice	0		11
2020	Precautionary approach	0		7
2021	Same advice as for 2020	0		7
2022	Same advice as for 2020	0		
2023	MSY approach	222		
2024	MSY approach	234		

### History of catch and landings

The distribution of this stock extends into the NEAFC Regulatory Area, but the proportional split of catches cannot be determined.

**Table 7** Porbeagle in the Northeast Atlantic. Catch distribution by fleet in 2021 as estimated by ICES.

Catch	Commercial landings	Commercial discards	Recreational catches
Unknown	All gears 7 tonnes	Unknown	Unknown

**Table 8** Porbeagle in the Northeast Atlantic. History of commercial catches (ICES estimates) is presented by country participating in the fishery. All weights are in tonnes\*. Blank cell = no data reported; 0 = value less than 0.5.

Year	Denmark	Faroe Islands	France	Germany	Iceland	Ireland	Netherlands	Norway	Portugal	Spain	Sweden	UK	Japan	Discards	Total
1926								363							363
1927								595							595
1928								794							794
1929								1082							1082
1930								1957							1957
1931								1438							1438
1932								2084							2084
1933								5049							5049
1934								4714							4714
1935								2591							2591
1936								3197							3197
1937								3647							3647
1938								3553							3553
1939								2877							2877
1940								135							135
1941								368							368
1942								374							374
1943								458							458
1944								417							417
1945								1206							1206
1946	1400							1414							2814
1947	3300							3671							6971
1948	2100							2490							4590
1949	1700							1626							3326
1950	1900							1765		4					3669
1951	1600							1013		3					2616
1952	1600							789		3					2392
1953	1100	100						927		4					2131
1954	651	300						772		1					1724
1955	578	100						1167		2					1847
1956	446							1132		1					1579
1957	561	100						1426		3					2090
1958	653	300						1080		3		7			2043

Year	Denmark	Faroe Islands	France	Germany	Iceland	Ireland	Netherlands	Norway	Portugal	Spain	Sweden	UK	Japan	Discards	Total
1959	562	600						1183		3		9			2357
1960	362	500						1929		2		10			2803
1961	425							1369		5		9			1808
1962	304							577		7		20			908
1963	173							157		3		17			350
1964	216							116		6		5			343
1965	165							265		4		8			442
1966	131							283		9		6			429
1967	144							397		8		7			556
1968	111							880		11		7			1009
1969	100							909		11		3			1023
1970	124							269		10		5			408
1971	311	1	550					208		11		7			1088
1972	523		1317					293		10		19			2162
1973	158	5	1350	6	2			209		12		27			1769
1974	170		967	3	2			165		9		15			1331
1975	265		1251	4	4			304		12	3	16			1859
1976	233	1	1373		3			259		9		25			1903
1977	289	5	1188		3			78		10					1573
1978	112	9	538					76		11	5				751
1979	72	25	703		1			106		8	1	1			917
1980	176	8	589		1			84		12	8	3			881
1981	158	6	451		1			93		12	5	2			728
1982	84	17	450		1			32		14	6	1			605
1983	45	12	517		1			33		28	5	2			643
1984	38	14	307		1			118		20	9	5			512
1985	72	12	200		1			79		23	10	12			409
1986	114	12	246		1			23		26	8	6			436
1987	56	33	223		1			25	3	30	5	3			379
1988	33	14	350		1			12	3	69	3	3			488
1989	33	14	357		1			27	2	42	3	15			494
1990	46	14	577		0			46	2	26	2	9			722
1991	85	7	292		0			34	1	47	2				468
1992	80	20	452		1			43	0	15	4				615
1993	91	76	632	1	3			24	1	21	3				852
1994	93	48	815		4			26	1	52	2				1041
1995	86	44	635		5			27	1	19	2	0			819
1996	72	8	442		3			28	1	41	1		3		599
1997	69	9	489		2			17	1	25	1		2		615
1998	85	7	428	2	3			27	1	25	1	1			580
1999	107	10	306	0	3	8		32	0	18	1	6			491
2000	73	13	385	17	2	2	0	23	15	13	1	7			551
2001	76	8	380	1	4	6		17	4	24	1	10			531
2002	42	10	528	3	2	3		14	11	54		7			674
2003	21	14	443	5	0	3	0	19	4	27		25			561
2004	20	5	423	6	1	0		24	57	11	5	24			576
2005	3	18	298	5	0	3	0	12		14	0	24			378
2006	3	21	223	0	1	4		27		34		12			325
2007	2	14	369	2	0	8	0	10		8	0	26			439
2008	2	10	319	2	1	7		12		41	0	15			409
2009	4	13	291		1	3		10		77		11			410
2010		14	7		1	0	0	12							34
2011	2	18	1		1			11							33
2012	3	25	2		1			17				0			48

Year	Denmark	Faroe Islands	France	Germany	Iceland	Ireland	Netherlands	Norway	Portugal	Spain	Sweden	UK	Japan	Discards	Total
2013		17	1		1			9							28
2014		15	1		0			5							21
2015		7			1		0	4							12
2016	0	3			2			6							11
2017	0	1	1		1			6							9
2018		1	1		1			3						88**	6
2019	1	1	2		3			4							11
2020	0	1			3			3							7
2021		2			2			5							7

\*The figures in the table are rounded. Total catches were calculated using unrounded inputs and computed values may not match exactly when calculated using the rounded figures in the table.

\*\*Based on French data.

## Summary of the assessment

**Table 9** Porbeagle in the Northeast Atlantic. Assessment summary.

Year	Relative exploitable biomass			Catches tonnes	Relative fishing pressure		
	B/B <sub>MSY</sub>	High	Low		F/F <sub>MSY</sub>	High	Low
1926	2.3	3.57	1.48	363	0.120	0.33	0.043
1927	2.3	3.73	1.41	595	0.164	0.41	0.066
1928	2.3	3.89	1.36	794	0.26	0.63	0.103
1929	2.28	3.96	1.31	1082	0.32	0.80	0.128
1930	2.28	4.1	1.27	1957	0.56	1.40	0.23
1931	2.21	4.07	1.20	1438	0.63	1.56	0.26
1932	2.14	4.01	1.14	2084	0.59	1.48	0.23
1933	2.14	4.14	1.11	5049	1.28	3.2	0.52
1934	2.02	4.12	0.99	4714	2.3	5.7	0.94
1935	1.81	3.83	0.86	2591	1.44	3.7	0.57
1936	1.73	3.7	0.81	3197	1.29	3.3	0.50
1937	1.66	3.68	0.75	3647	1.78	4.5	0.70
1938	1.56	3.56	0.68	3553	1.79	4.7	0.69
1939	1.49	3.55	0.62	2877	2.6	6.9	1.01
1940	1.26	2.96	0.53	135	0.196	0.53	0.072
1941	1.26	2.9	0.56	368	0.116	0.32	0.043
1942	1.35	2.98	0.61	374	0.25	0.65	0.100
1943	1.37	2.96	0.64	458	0.25	0.63	0.099
1944	1.40	2.9	0.66	417	0.24	0.60	0.096
1945	1.45	2.99	0.70	1206	0.36	0.88	0.149
1946	1.52	3.1	0.74	2814	1.01	2.3	0.43
1947	1.53	3.2	0.74	6971	2.6	5.9	1.16
1948	1.34	2.9	0.61	4590	3.8	8.4	1.72
1949	1.18	2.6	0.53	3326	2.5	5.5	1.11
1950	1.10	2.5	0.48	3669	2.7	5.9	1.22
1951	1.00	2.32	0.43	2616	2.6	5.6	1.18
1952	0.95	2.25	0.40	2392	2.1	4.6	0.95
1953	0.95	2.31	0.39	2131	2.0	4.4	0.91
1954	0.94	2.34	0.37	1724	1.62	3.6	0.73
1955	0.94	2.37	0.37	1847	1.58	3.5	0.71
1956	0.91	2.31	0.36	1579	1.49	3.3	0.67
1957	0.88	2.2	0.35	2090	1.69	3.7	0.77
1958	0.81	1.99	0.33	2043	2.1	4.6	0.99
1959	0.74	1.78	0.31	2357	2.4	5.1	1.11
1960	0.67	1.68	0.27	2803	3.3	7.1	1.54
1961	0.56	1.44	0.22	1808	3.4	7.4	1.60

Year	Relative exploitable biomass			Catches	Relative fishing pressure		
	B/B <sub>MSY</sub>	High	Low	tonnes	F/F <sub>MSY</sub>	High	Low
1962	0.44	1.09	0.179	908	2.5	5.2	1.17
1963	0.38	0.90	0.159	350	1.06	2.2	0.50
1964	0.39	0.92	0.164	343	0.66	1.43	0.31
1965	0.42	1.00	0.173	442	0.79	1.72	0.36
1966	0.43	1.04	0.180	429	0.83	1.82	0.38
1967	0.45	1.07	0.190	556	0.84	1.85	0.38
1968	0.47	1.11	0.20	1009	1.31	2.8	0.61
1969	0.49	1.17	0.21	1023	2.0	4.3	0.96
1970	0.47	1.09	0.20	408	0.95	2.0	0.45
1971	0.47	1.04	0.21	1088	0.98	2.1	0.46
1972	0.47	1.03	0.22	2162	3.1	6.2	1.52
1973	0.42	0.92	0.194	1769	4.1	8.2	2.0
1974	0.40	0.88	0.181	1331	2.9	5.9	1.43
1975	0.40	0.89	0.183	1859	3.1	6.4	1.55
1976	0.39	0.88	0.169	1903	4.2	8.4	2.1
1977	0.34	0.81	0.146	1573	4.5	9.1	2.2
1978	0.29	0.68	0.122	751	2.8	5.7	1.38
1979	0.26	0.61	0.115	917	2.4	5.0	1.19
1980	0.24	0.53	0.104	881	3.4	6.8	1.67
1981	0.21	0.48	0.092	728	3.1	6.3	1.54
1982	0.193	0.44	0.084	605	2.7	5.5	1.34
1983	0.165	0.37	0.074	643	3.3	6.6	1.62
1984	0.147	0.33	0.066	512	3.2	6.6	1.61
1985	0.157	0.35	0.070	409	2.3	4.6	1.11
1986	0.180	0.41	0.080	436	1.95	3.9	0.96
1987	0.20	0.47	0.090	379	1.58	3.2	0.78
1988	0.24	0.55	0.101	488	1.50	3.1	0.73
1989	0.25	0.59	0.106	494	1.58	3.2	0.77
1990	0.25	0.57	0.107	722	2.1	4.3	1.03
1991	0.21	0.48	0.095	468	2.3	4.6	1.12
1992	0.21	0.47	0.097	615	1.86	3.8	0.90
1993	0.24	0.54	0.108	852	2.5	5.1	1.25
1994	0.24	0.55	0.108	1041	3.3	6.7	1.64
1995	0.22	0.51	0.099	819	3.6	7.2	1.78
1996	0.21	0.48	0.093	599	2.5	5.2	1.26
1997	0.21	0.47	0.092	615	2.4	4.8	1.17
1998	0.21	0.47	0.090	580	2.4	4.9	1.19
1999	0.20	0.47	0.088	491	2.1	4.4	1.04
2000	0.199	0.45	0.088	551	2.1	4.3	1.05
2001	0.196	0.44	0.087	531	2.2	4.5	1.11
2002	0.197	0.44	0.088	674	2.5	5.1	1.25
2003	0.194	0.44	0.095	561	2.6	5.3	1.29
2004	0.183	0.42	0.081	576	2.6	5.3	1.30
2005	0.166	0.38	0.073	378	2.3	4.8	1.15
2006	0.172	0.39	0.075	325	1.52	3.1	0.74
2007	0.188	0.43	0.082	439	1.71	3.5	0.83
2008	0.196	0.46	0.084	409	1.73	3.6	0.83
2009	0.21	0.49	0.087	410	1.96	4.2	0.91
2010	0.199	0.48	0.082	34	0.66	1.93	0.23
2011	0.20	0.50	0.084	33	0.21	0.75	0.057
2012	0.22	0.55	0.089	48	0.153	0.47	0.050
2013	0.24	0.60	0.095	28	0.116	0.37	0.037
2014	0.26	0.66	0.100	21	0.076	0.25	0.023
2015	0.28	0.72	0.105	12	0.048	0.167	0.0138
2016	0.30	0.79	0.112	11	0.033	0.121	0.0091
2017	0.32	0.87	0.119	9	0.025	0.095	0.0068
2018	0.35	0.95	0.126	6	0.0190	0.075	0.0048



Year	Relative exploitable biomass			Catches	Relative fishing pressure		
	B/B <sub>MSY</sub>	High	Low	tonnes	F/F <sub>MSY</sub>	High	Low
2019	0.38	1.05	0.135	11	0.0177	0.072	0.0044
2020	0.40	1.16	0.141	7	0.0166	0.070	0.0040
2021	0.43	1.29	0.145	7	0.0142	0.064	0.0031
2022	0.47	1.44	0.145				

### Medium term forecast

**Table 10** Porbeagle in the Northeast Atlantic. Extension of short-term forecasts to cover two generations (up to 2053). Catch per year for each fishing mortality option (upper panel), probabilities (in %) of  $B > B_{lim}$  (middle panel) and  $B > B_{lim}$  and  $F < F_{MSY}$  (lower panel) per year from 2023 to 2053 for fishing mortalities increasing from 0 to 1.2  $F_{MSY}$ . Catch in 2022 corresponds to  $F$  status quo (8 tonnes). The 10th, 15th, 20th, and 35th percentiles of the predicted catch distributions under  $F = F_{MSY}$  equate with relative fishing mortalities ( $F_{2023}/F_{MSY}$ ) of 0.28, 0.35, 0.43, and 0.68, respectively.

Catch	Year							
Fishing mortality	2023	2024	2028	2033	2038	2043	2048	2053
$F = 0$	0	0	0	0	0	0	0	0
$F = 0.01 F_{MSY}$	6	7	9	12	14	17	19	21
$F = 0.1 F_{MSY}$	63	67	86	111	136	160	180	197
$F = 0.2 F_{MSY}$	126	133	167	213	258	300	337	367
$F = 0.28 F_{MSY}$	175	186	230	288	346	400	447	485
$F = 0.3 F_{MSY}$	188	199	245	306	367	423	472	512
$F = 0.35 F_{MSY}$	219	231	282	350	416	478	532	577
$F = 0.4 F_{MSY}$	250	263	319	392	463	529	587	635
$F = 0.43 F_{MSY}$	269	282	340	416	490	558	618	668
$F = 0.5 F_{MSY}$	312	327	389	470	548	620	683	737
$F = 0.6 F_{MSY}$	373	390	456	540	622	696	762	818
$F = 0.68 F_{MSY}$	422	439	507	592	674	748	814	871
$F = 0.7 F_{MSY}$	435	451	520	605	686	760	826	882
$F = 0.8 F_{MSY}$	496	512	580	662	741	812	875	929
$F = 0.9 F_{MSY}$	556	572	637	714	787	853	911	962
$F = F_{MSY}$	617	632	691	761	826	884	936	981
$F = 1.1 F_{MSY}$	677	690	742	802	857	907	951	989
$F = 1.2 F_{MSY}$	737	748	790	839	883	922	956	986

$P(B_t > B_{lim})$	Year							
Fishing mortality	2023	2024	2028	2033	2038	2043	2048	2053
$F = 0$	81	83	90	95	98	99	100	100
$F = 0.01 F_{MSY}$	81	83	90	95	98	99	100	100
$F = 0.1 F_{MSY}$	81	83	89	94	97	99	100	100
$F = 0.2 F_{MSY}$	81	82	88	93	96	97	99	99
$F = 0.28 F_{MSY}$	81	82	87	91	94	96	97	98
$F = 0.3 F_{MSY}$	81	82	87	91	94	95	96	97
$F = 0.35 F_{MSY}$	81	82	87	90	93	94	95	95
$F = 0.4 F_{MSY}$	81	82	86	89	91	92	93	93
$F = 0.43 F_{MSY}$	81	82	86	89	90	91	92	92
$F = 0.5 F_{MSY}$	81	82	85	87	89	89	89	88
$F = 0.6 F_{MSY}$	81	81	84	85	85	85	84	83
$F = 0.68 F_{MSY}$	81	81	83	84	83	82	81	79
$F = 0.7 F_{MSY}$	81	81	83	83	82	81	80	78
$F = 0.8 F_{MSY}$	81	81	82	81	79	77	75	74
$F = 0.9 F_{MSY}$	81	81	80	78	76	74	72	70
$F = F_{MSY}$	81	80	79	76	73	70	68	67
$F = 1.1 F_{MSY}$	81	80	78	74	70	68	65	64
$F = 1.2 F_{MSY}$	81	80	76	72	68	65	63	61

P( $F_t < F_{MSY}$ and $B_t > B_{lim}$ ) Fishing mortality	Year							
	2023	2024	2028	2033	2038	2043	2048	2053
$F = 0$	70	72	80	87	91	94	95	96
$F = 0.01 F_{MSY}$	70	72	80	87	91	94	95	96
$F = 0.1 F_{MSY}$	69	72	79	86	90	92	94	94
$F = 0.2 F_{MSY}$	68	70	76	82	86	88	90	91
$F = 0.28 F_{MSY}$	66	67	73	78	82	84	86	87
$F = 0.3 F_{MSY}$	66	67	72	77	81	83	85	86
$F = 0.35 F_{MSY}$	64	65	70	75	78	81	82	83
$F = 0.4 F_{MSY}$	62	63	68	72	76	78	79	80
$F = 0.43 F_{MSY}$	61	62	66	71	74	76	78	79
$F = 0.5 F_{MSY}$	59	59	63	67	70	73	74	75
$F = 0.6 F_{MSY}$	55	56	59	63	66	67	68	69
$F = 0.68 F_{MSY}$	52	53	56	59	62	63	64	65
$F = 0.7 F_{MSY}$	52	52	55	58	61	62	63	63
$F = 0.8 F_{MSY}$	48	48	51	54	56	58	58	59
$F = 0.9 F_{MSY}$	45	45	48	51	52	53	54	54
$F = F_{MSY}$	42	42	44	47	49	49	50	50
$F = 1.1 F_{MSY}$	39	39	42	44	45	46	46	46
$F = 1.2 F_{MSY}$	37	37	39	41	42	42	42	43

## Sources and references

ICES. 2019. Porbeagle (*Lamna nasus*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). In Report of the ICES Advisory Committee, 2019. ICES Advice 2019, por.27.nea. <https://doi.org/10.17895/ices.advice.4831>

ICES. 2021. ICES fisheries management reference points for category 1 and 2 stocks (2021). ICES Technical Guidelines. Report. <https://doi.org/10.17895/ices.advice.7891>

ICES. 2022a. Advice on fishing opportunities. In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, Section 1.1.1.1. <https://doi.org/10.17895/ices.advice.19928060>

ICES. 2022b. ICES technical guidance for harvest control rules and stock assessments for stocks in categories 2 and 3. In Report of ICES Advisory Committee, 2022. ICES Advice 2022, Section 16.4.11. <https://doi.org/10.17895/ices.advice.19801564>

ICES. 2022c. Benchmark Workshop for selected elasmobranch stocks (WKELASMO). ICES Scientific Reports. 4:47. 136 pp. <https://doi.org/10.17895/ices.pub.21025021>

ICES. 2022d. Working Group on Elasmobranch Fishes (WGEF). ICES Scientific Reports, 4:74. <http://doi.org/10.17895/ices.pub.21089833>. In prep.

Pedersen, M. W., and Berg, C. W. 2017. A stochastic surplus production model in continuous time. Fish and Fisheries, 18(2): 226–243. <https://doi.org/10.1111/faf.12174>

[Download the stock assessment data and figures.](#)

*Recommended citation:* ICES. 2022. Porbeagle (*Lamna nasus*) in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters). In Report of the ICES Advisory Committee, 2022. ICES Advice 2022, por.27.nea, <https://doi.org/10.17895/ices.advice.19754584>