3.4.3 Norway request to ICES on the status and harvest potential of the harp seal stocks in the Greenland Sea and the White Sea/Barents Sea, and of the hooded seal stock in the Greenland Sea

ICES advice

Greenland Sea harp seal

ICES estimates the 2017 total stock size at 650 300 animals (95% CI: 471 200–829 300).

The reported catch in 2016 is at historically low levels of 1 442 seals.

ICES advises that:

- an annual catch at the current level (average 2012–2016) will not be impacting the stock;
- an annual catch level of 21 500 1+ animals is consistent with maintaining the population of 1+ animals at the current (2017) level; and
- an annual catch level of 26 000 1+ animals is consistent with reducing the population *over a 15-year period, in such a manner that the population size would remain above a level of 70% of the maximum population size with 80% probability.*

If pups are hunted, two pups are considered the equivalent of one 1+ animal.

White Sea/Barents Sea harp seal

ICES estimates the 2017 total stock size at 1 408 000 animals (95% CI: 1 251 680–1 564 320).

The reported catch in 2016 is at historically low levels of nine 1+ animals and no pups.

ICES advises that:

- an annual catch at the current level (average 2012–2016) will not be impacting the stock;
- an annual catch level of 10 090 1+ animals is consistent with maintaining the population of 1+ animals at the current (2017) level; and
- because of the poor knowledge of the reproductive status of this stock, ICES cannot advise on an annual catch that, with 80% probability, would be consistent with the population remaining above 70% of the maximum population size over the next 15 years.

If pups are hunted, two pups are considered the equivalent of one 1+ animal.

Greenland Sea hooded seal

ICES estimates that the stock remains at a historically low level, with a 2017 total stock estimate of about 80 000 animals. There have been no reported catches in recent years.

ICES advises that no catches should be taken from this stock, with the exception of those for scientific purposes.

Request

The Royal Norwegian Ministry of Trade, Industry and Fisheries requested ICES as follows:

New information is now available on both the harp and hooded seal stocks. Therefore we would request an assessment of status and harvest potential of the harp seal stocks in the Greenland Sea and the White Sea/Barents Sea, and of the hooded seal stock in the Greenland Sea.

ICES should also assess the impact on the harp seal stocks in the Greenland Sea and the White Sea/Barents Sea of an annual harvest of:

1. current harvest levels,
2. sustainable catches (defined as the fixed annual catches that stabilizes the future 1 + population),
3. catches that would reduce the population over a 15-years period in such a manner that it would remain above a level of 70% of the maximum population size, determined from population modeling, with 80% probability.

Stock development over time

No surveys of pup production have been conducted since the most recent ICES advice in 2013. The most recent surveys were conducted in 2012 for the Greenland Sea harp seal stock, in 2013 for the White Sea/Barents Sea harp seal stock, and in 2012 for the Greenland Sea hooded seal stock.

Greenland Sea harp seal

A population model estimates a 2017 abundance of 543 800 (95% CI: 366 500–719 400) 1+ animals and 106 500 (95% CI: 76 500–136 400) pups. The total population estimate is 650 300 (95% CI: 471 200–829 300) seals. Using current catch levels, the model projects an increase in the 1+ population of 58% over the next 15 years (equivalent to a 3.9% per annum increase) (Figure 3.4.3.1).

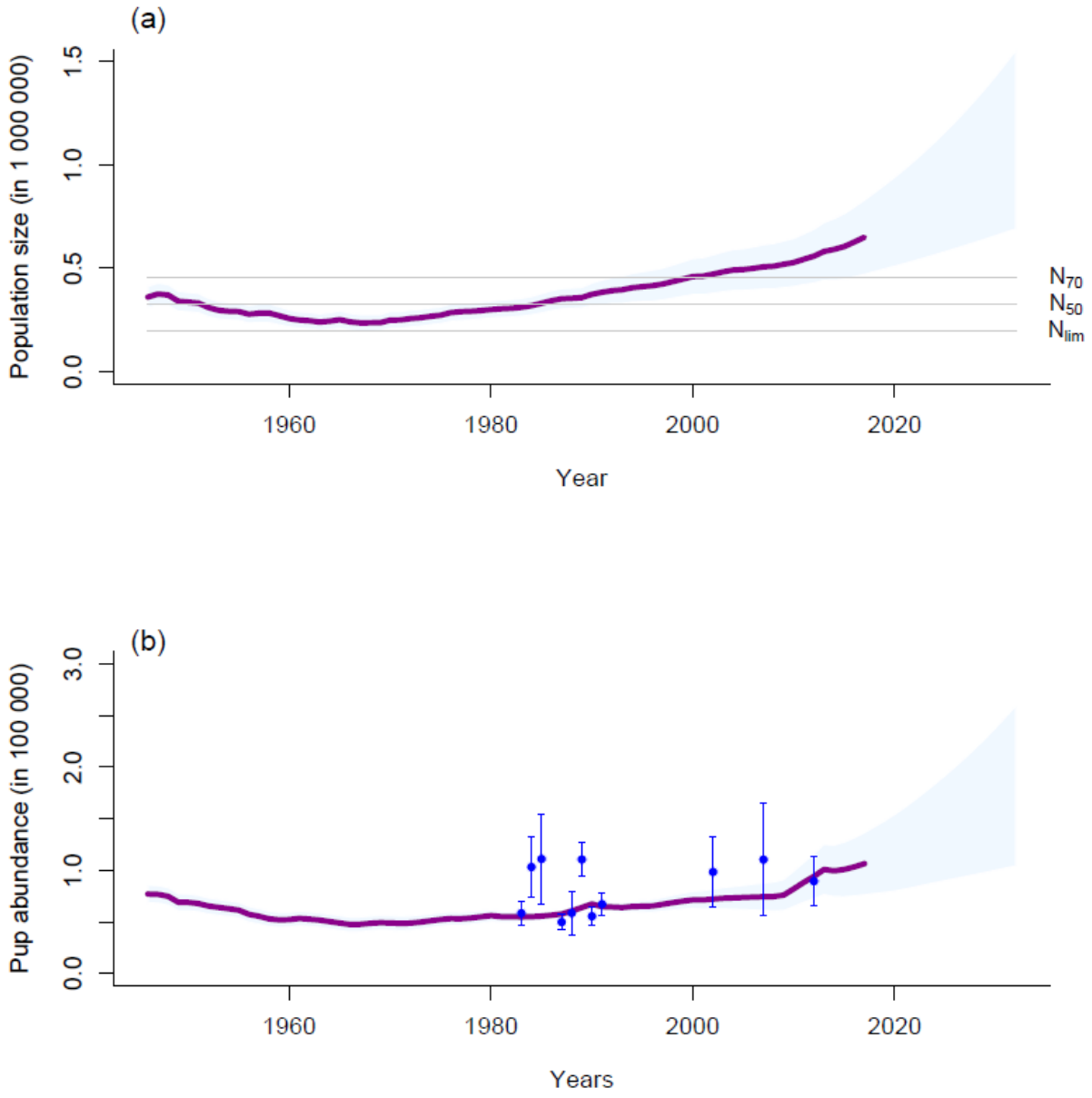

Figure 3.4.3.1 Modelled population trajectories for Greenland Sea harp seal; (a) total population and (b) pups (full lines with blue confidence bands). Future projections are illustrated by blue confidence bands only. N_{70}, N_{50}, and N_{lim} denote 70%, 50%, and 30% of the estimated maximum population size, respectively. Observed pup production estimates and 95% confidence intervals are shown.

White Sea/Barents Sea harp seals

The model estimates of abundance for White Sea harp seals in 2017 are 1 197 000 (95% CI: 1 042 800–1 351 200) 1+ animals and 211 000 (95% CI: 185 100–236 900) pups. The total population estimate is 1 408 000 (95% CI: 1 251 680–1 564 320). The model indicates that with no catch the 1+ population will increase by 12% over the next 15 years, equivalent to an increase of 0.8% per annum (Figure 3.4.3.2).

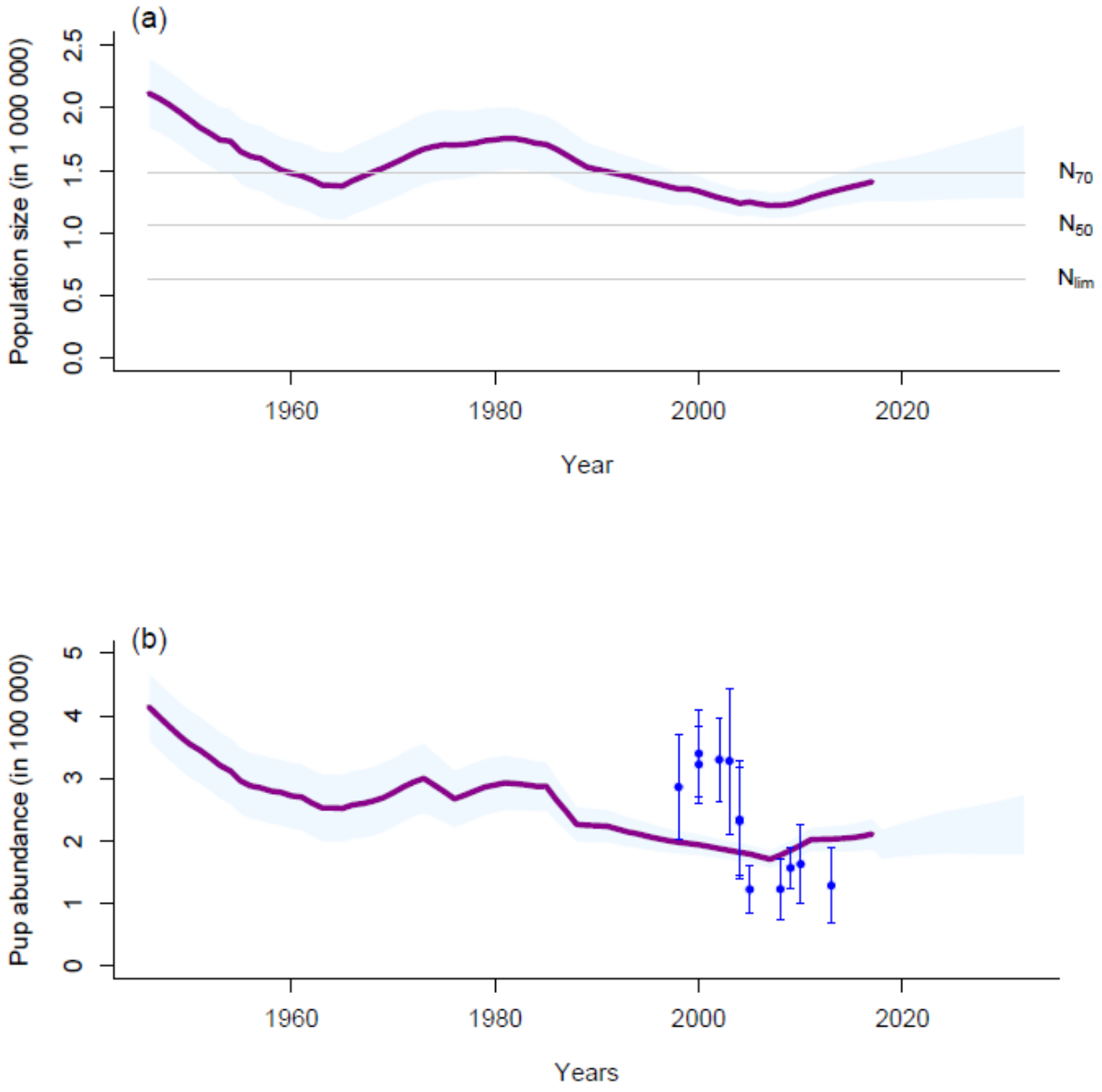

Figure 3.4.3.2 Modelled population trajectories for White Sea/Barents Sea harp seal; (a) total population and (b) pups (full lines with blue confidence bands). Future projections are illustrated by blue confidence bands only. N_{70}, N_{50}, and N_{lim} denote 70%, 50%, and 30% of the estimated maximum population size, respectively. Observed pup production estimates and 95% confidence intervals are shown.

Greenland Sea hooded seal

The estimated 2017 abundance of Greenland Sea hooded seals was 66 860 1+ animals (95% CI: 45 860–87 860) and 13 600 (95% CI: 9 250–17 950) pups. The estimated total 2017 population is 80 460 seals (95% CI: 59 020–101 900). All model runs indicate a stock that is currently well below the Limit Reference Level (Figure 3.4.3.3).

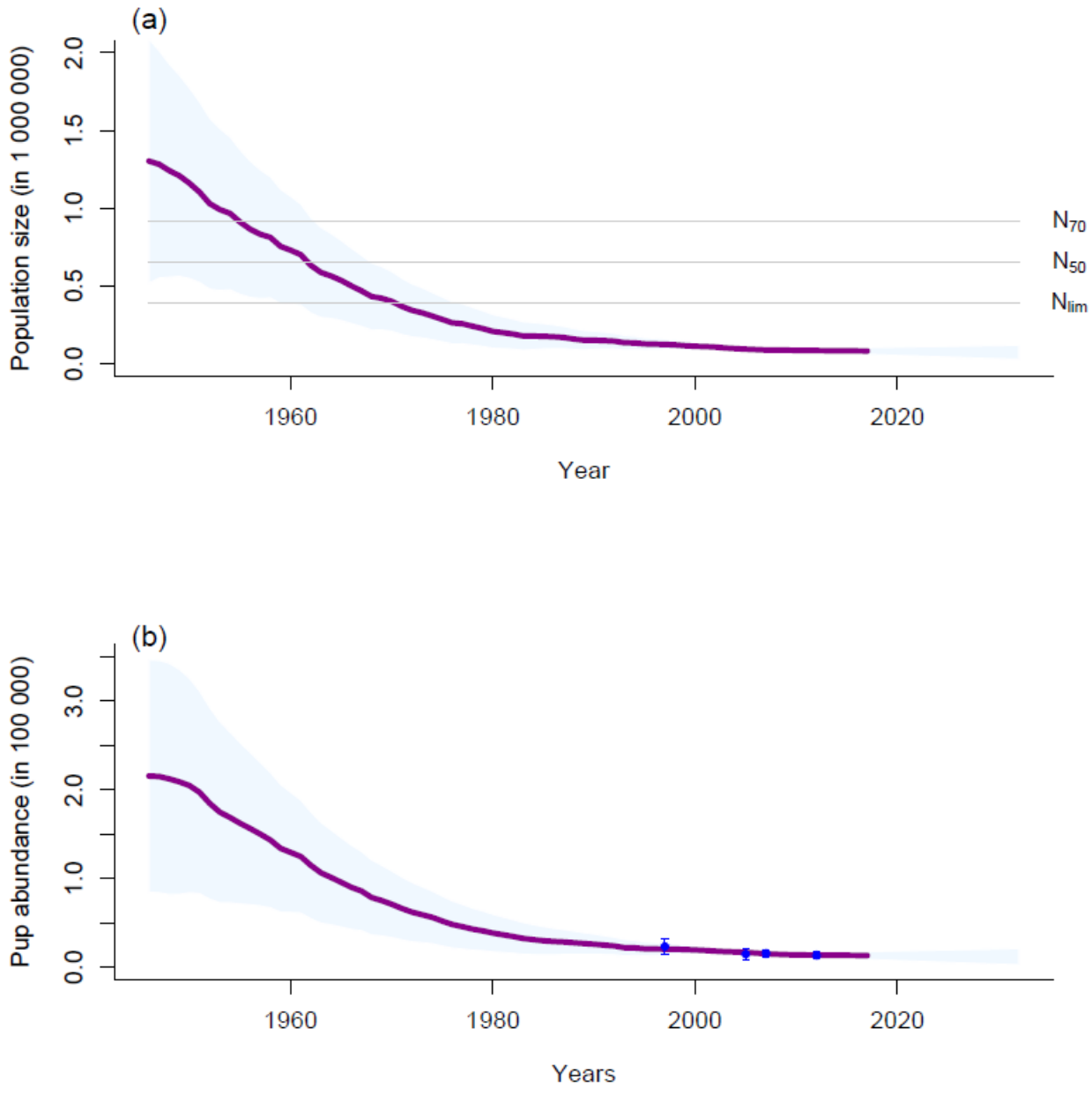

Figure 3.4.3.3 Modelled population trajectories for Greenland Sea hooded seal a) total population and b) pups (full lines with blue confidence bands). Future projections are illustrated by blue confidence bands only. N_{70}, N_{50}, and N_{lim} denote 70%, 50%, and 30% of the estimated maximum population size, respectively. Observed pup production estimates and 95% confidence intervals are shown.

Catch options

Table 3.4.3.1 Variables used in deriving catch options for the three seal stocks. Production and population values are in number of animals.

Variable	Greenland Sea harp seal	White Sea/Barents Sea harp seal	Greenland Sea hooded seal
Pup production (SD)	106500 (15300)	211000 (13200)	13600 (2200)
Total population (SD)	650300 (91300)	1408000 (79800)	80500 (10900)
Adult mortality M_{1+} (SD)	0.12 (0.02)	0.13 (0.006)	0.17 (0.05)
Pup mortality M_0 (SD)	0.27 (0.19)	0.27 (0.05)	0.34 (0.02)
Reproductive rate	0.84	0.76	0.70

Table 3.4.3.2 Catch options for the three seal stocks. In the "current catch" option it is assumed that 80% of the harvest consists of pups. In the other options it is assumed that animals aged 1+ years comprise 100% of the catch. Catches of pups are included, with two pups counting as one 1+ animal. Catch values are in number of animals.

Options	Greenland Sea harp seal	White Sea/Barents Sea harp seal	Greenland Sea hooded seal
Current catch (average of last 5 years)	7456	0	0
Sustainable catch	21500	10090	0
Catch to N_{70}	26000	-	0

Greenland Sea harp seal

An average of the modelled reproductive rates over the past decade was used in the projections (Table 3.4.3.1). There were only two observed reproductive rates in the last decade (2009, 2014). This resulted in an average reproductive rate of 0.84, which is higher than the rate of 0.81 used in the 2013 advice (ICES, 2013). The projected catches, consistent with unchanged stock size and with a stock size at 70% of the maximum stock size over the next 15 years, are higher than advised in 2013 (ICES, 2013) because of the increased reproductive rate used in the projections (Table 3.4.3.2).

White Sea/Barents Sea harp seal

The harp seal stock in the White Sea/Barents Sea is considered data limited because of the time elapsed since 2006 when the last observation of reproductive rate (0.84) was made. The reproductive rate used by ICES in the projections is the average of the reproductive rates (0.76, Table 3.4.3.1) over the last 10 years as estimated in the assessment model.

ICES developed an advice approach for seal stocks in 2005 (ICES, 2005), as described in the section "Basis of the advice". According to the rules ICES should apply the Potential Biological Removal (PBR) approach for providing catch advice. However, the PBR approach gave unrealistic results. It is therefore not possible for ICES to respond to the request regarding the number of catches that, while reducing the population over a 15-year period would allow the population size, with 80% probability, to remain above a level of 70% of the maximum population size, determined from population modelling.

Greenland Sea hooded seal

All model runs indicate a stock currently well below the Limit Reference Level (30% of the maximum population level observed previously) developed as part of the ICES precautionary approach framework for these stocks in 2005. Consequently, ICES repeats its 2013 advice that no catches should be taken from this stock, with the exception of those for scientific purposes (Table 3.4.3.2).

Basis of the advice

Advice for all three stocks is provided using an age-structured population dynamics model. Data inputs include information on catches, the age-specific proportion of mature females, and the pregnancy rates of the mature animals (referred to as reproductive rates). The model is fitted to independent estimates of pup production obtained from aerial surveys and historical mark–recapture estimates of pup production. There are no independent estimates of mortality rates for harp seals. Model fitting to the pup production data is achieved by adjusting the starting population, pup mortality (M_0) rate, and mortality rates of animals aged 1 year and older (M_{1+}).

The reproductive rate data are an important input to the model. This information is needed for the "conversion" of pup numbers into an estimate of total population size. The amount of information available for each stock varies. In periods where data are missing, a linear transition between estimates is assumed. For the Greenland Sea harp seal stock, reproductive data are available from three periods (1959–1990, 2009, and 2010–2014) over the model fitting period (1950–2016). For the White Sea/Barents Sea harp seal stock, information on reproductive rates is available for four periods (1962–1972, 1976–1985, 1988–1993, and 2006). For the Greenland Sea hooded seal stock, the reproductive data are limited to two periods (1990–1994 and 2008–2010).

Advice rule

ICES uses the following control rules to determine which assessment approach to follow (ICES, 2005):

1. Data-limited stocks.
   a) If the stock has no recent abundance estimates, then no harvest should occur.
   b) If the stock has 1–2 recent abundance estimates, then the control rules collapse to the point where the only concern is whether the abundance is less than or greater than N_{lim}, such that:
      i. if the abundance is greater than N_{lim}, then the Potential Biological Removal (PBR) protocol is used to set the TAC (ICES, 2016);
      ii. if the abundance is less than N_{lim}, then no harvest should occur.
2. Data-rich stocks. For these stocks the full set of control rules established under the multi-tier system would apply. For example,
   a) if the abundance is greater than N_{70}, management objectives would be based upon the appropriate ICES model and would require that the population remain above the N_{70} level;
   b) if the abundance is greater than N_{50}, the management objective must include efforts to conserve the population (i.e. projections of proposed management actions must have a >0.8 probability of the population returning to N_{70} within 10 years);
   c) if the abundance is greater than N_{lim}, and less than N_{50}, then significant conservation measures will be required (i.e. a 95% chance of recovery would be required, leading to something like the PBR protocol for setting harvest levels);
   d) if the abundance is less than N_{lim}, then no harvest should occur.

Quality of the assessment

The amount of data available for the assessment is limited compared to many fish stock assessments, but is good compared to many other marine mammal stocks. The population model is similar in structure to that used for other seal stocks (Canada harp, hooded, and grey seals; UK grey seals).

The model estimates pup production, and fits the estimates to observed pup production obtained from the aerial surveys by adjusting adult and juvenile mortality rates.

The key model input data is catches, reproductive rates, and maturity-at-age. Reproductive rates for stocks in the northwestern Atlantic can vary considerably between years. However, for the three stocks concerned, the amount of data available on reproductive rates is limited. To make up for the lack of information, ICES estimates reproductive data for years where they are missing by interpolating between years with data. This means that the reproductive rates used for years with no data are changing in a straight line, when they likely bounce around. This results in model "stiffness" and the model being unable to capture the year-to-year variability in pup production. The fit between estimated and observed pup production is therefore poor.

For the White Sea/Barents Sea stock the observed pup abundance shows a major shift in 2005. Since 2005 there has been little change in pup production. This shift implies a significant change in production. However, the model is unable to capture this sudden step-like shift, owing in part to the lack of annual data on reproductive rates.

The model includes uncertainty in mortality rates, but uncertainty in reproductive rates is not included. The total model uncertainties presented in figures 3.4.3.1–3.4.3.3 are therefore underestimates.

Because there is no independent information on mortality rates to help bound these parameters, the model estimates of M_0 and M_{1+} are highly correlated.

The reproductive rates are also important when projecting into the future. In the case of the White Sea/Barents Sea, data on reproductive rates are not available since 2006. ICES advises that new data be obtained since it is such a key component in the assessment model fitting and projections.

Despite the uncertainties associated with the estimated stock sizes and projected catch levels, ICES considers the information sufficiently robust to form the basis for reliable advice on catch options.

Issues relevant for the advice

Poor ice conditions, with no suitable ice for pupping, occurred in the White Sea in 2015 and 2016. Seals with pups were observed on the ice at the entrance to the White Sea. Ice also accumulated in the southeastern Barents Sea (Pechora Sea). If similar poor conditions are encountered in the White Sea during 2017, the Pechora Sea should be searched to see if pupping also occurs in this area.

Reference points

Table 3.4.3.3 Reference points (RPs) for each stock of harp and hooded seals (ICES, 2005). N_{max} = historical maximum population size (estimated). N_{70} = 70% of N_{max} (first precautionary RP). N_{lim} = 30% of N_{max} (limit RP or N_{lim}).

	N_{lim}	N_{70}	N_{max}
Greenland Sea harp seal	195090	455210	650300
White Sea/Barents Sea harp seal	634590	1480710	2115300
Greenland Sea hooded seal	390840	911960	1302800

History of the advice, catch, and management

Tables 3.4.3.4–3.4.3.6 indicate the quota and allocations for the three seal stocks.

Table 3.4.3.4 Greenland Sea harp seal quota and allocations, 1985–2016.

Year	Quota	Allocations	
		Norway	Soviet/Russia
1985	25000	7000	4500
1986	11500	7000	4500
1987	25000	20500	4500
1988	28000	21000	7000
1989	16000	12000	9000
1990	7200	5400	1800
1991	7200	5400	1800
1992–1993	10900	8400	2500
1994	13100	10600	2500
1995	13100	10600	2500
1996	13100	10600	2500
1997–1998	13100	10600	2500
1999–2000	17500	15000	2500
2001–2005	15000	15000	0
2006–2007	31200	31200	0
2008	31200	31200	0
2009	40000	40000	0
2010	42000	42000	0
2011	42000	42000	0
2012–2013	25000	25000	0
2014–2016	21270	21270	0

Table 3.4.3.5 White Sea/Barents Sea harp seal quota and allocations, 1979–2016.

Year	Quota	Allocations	
	Total	Norway	Soviet/Russia
1979–1980	50000	16000	34000
1981	60000	17500	42500
1982	75000	17500	57500
1983	82000	18000	64000
1984	80000	18000	62000
1985–1986	80000	19000	61000
1987	80000	19000	61000
1988	70000	16600	53400
1989–1994	40000	9500	30500
1995	40000	8750	31250
1996	40000	9500	30500
1997–1998	40000	5000	35000
1999	21400	5000	16400
2000	27700	5000	22700
2001–2002	53000	5000	48000
2003	53000	10000	43000
2004–2005	45100	10000	35100
2006	78200	10000	68200
2007	78200	15000	63200
2008	55100	10000	45100
2009	35000	7000	28000
2010	7000	7000	0
2011	7000	7000	0
2012–2013	7000	7000	0
2014	7000	7000	0
2015–2016	19200	7000	12200

Table 3.4.3.6 Greenland Sea hooded seal quota and allocations, 1985–2016.

Year	Quota	Allocations	
	Total	Norway	Soviet/Russia
1985	20000	8000	3300
1986	9300	6000	3300
1987	20000	16700	3300
1988	20000	16700	5000
1989	30000	23100	6900
1990	27500	19500	8000
1991	9000	1000	8000
1992–1994	9000	1700	7300
1995	9000	1700	7300
1996	9000	1700	7300
1997	9000	6200	2800
1998	5000	2200	2800
1999–2000	11200	8400	2800
2001–2003	10300	10300	
2004–2005	5600	5600	
2006	4000	4000	
2007–2016	0	0	0

History of catches

Information is available on numbers caught (either as part of a harvest or for scientific purposes) for all stocks (tables 3.4.3.7–3.4.3.9).

Table 3.4.3.7 Catches of harp seals in the Greenland Sea from 1946 through 2016. Totals include catches for scientific purposes (further details in ICES, 2016). Catches are in numbers.

Year	Norwegian catches			Russian catches			Total catches		
	Pups	1+ animals	Total	Pups	1+ animals	Total	Pups	1+ animals	Total
1946–1950[a]	26606	9464	36070	-	-	-	26606	9464	36070
1951–1955[a,b]	30465	9125	39590	-	-	-[b]	30465	9125	39590
1956–1960[a,b]	18887	6171	25058	1148	1217	2365[b]	20035	7388	27423
1961–1965[a]	15477	3143	18620	2752	1898	4650	18229	5041	23270
1966–1970[a]	16817	1641	18458	1	47	48	16818	1688	18506
1971	11149	0	11149	-	-	-	11149	0	11149
1972	15100	82	15182	-	-	-	15100	82	15182
1973	11858	0	11858	-	-	-	11858	0	11858
1974	14628	74	14702	-	-	-	14628	74	14702
1975	3742	1080	4822	239	0	239	3981	1080	5061
1976	7019	5249	12268	253	34	287	7272	5283	12555
1977	13305	1541	14846	2000	252	2252	15305	1793	17098
1978	14424	57	14481	2000	0	2000	16424	57	16481
1979	11947	889	12836	2424	0	2424	14371	889	15260
1980	2336	7647	9983	3000	539	3539	5336	8186	13522
1981	8932	2850	11782	3693	0	3693	12625	2850	15475
1982	6602	3090	9692	1961	243	2204	8563	3333	11896
1983	742	2576	3318	4263	0	4263	5005	2576	7581
1984	199	1779	1978	-	-	-	199	1779	1978
1985	532	25	557	3	6	9	535	31	566
1986	15	6	21	4490	250	4740	4505	256	4761
1987	7961	3483	11444	-	3300	3300	7961	6783	14744
1988	4493	5170	9663	7000	500	7500	11493	5670	17163
1989	37	4392	4429	-	-	-	37	4392	4429
1990	26	5482	5508	0	784	784	26	6266	6292
1991	0	4867	4867	500	1328	1828	500	6195	6695
1992	0	7750	7750	590	1293	1883	590	9043	9633
1993	0	3520	3520	-	-	-	0	3520	3520
1994	0	8121	8121	0	72	72	0	8193	8193
1995	317	7889	8206	-	-	-	317	7889	8206
1996	5649	778	6427	-	-	-	5649	778	6427
1997	1962	199	2161	-	-	-	1962	199	2161
1998	1707	177	1884	-	-	-	1707	177	1884
1999	608	195	803	-	-	-	608	195	803
2000	6328	6015	12343	-	-	-	6328	6015	12343
2001	2267	725	2992	-	-	-	2267	725	2992
2002	1118	114	1232	-	-	-	1118	114	1232
2003	161	2116	2277				161	2116	2277
2004	8288	1607	9895				8288	1607	9895
2005	4680	2525	7205				4680	2525	7205
2006	2343	961	3304				2343	961	3304
2007	6188	1640	7828				6188	1640	7828
2008	744	519	1263				744	519	1263
2009	5177	2918	8035	-	-	-	5117	2918	8035
2010	2823	1855	4678	-	-	-	2823	1855	4678
2011	5361	4773	10134	-	-	-	5361	4773	10134
2012	3740	1853	5593	-	-	-	3740	1853	5593
2013	13911	2122	16033	-	-	-	13911	2122	16033
2014	9741	2245	11986				9741	2245	11986
2015	2144	93	2237	-	-	-	2144	93	2237
2016	426	1016	1442	-	-	-	426	1016	1442

[a] For the period 1946–1970 only 5-year averages are given., [b] For the years 1955, 1956, and 1957 the Soviet Union combined catches of harp and hooded seals reported at 3 900, 11 600 and 12 900, respectively. These catches are not included.

Table 3.4.3.8 Catches of harp seals in the White Sea/Barents Sea, 1946–2016 (further details in ICES, 2016).

Year	Norwegian catches			Russian catches			Total catches		
	Pups	1+ animals	Total	Pups	1+ animals	Total	Pups	1+ animals	Total
1946–1950[a]			25057	90031	55285	145316			170373
1951–1955[a]			19590	59190	65463	124653			144243
1956–1960[a]	2278	14093	16371	58824	34605	93429	61102	48698	109800
1961–1965[a]	2456	8311	10767	46293	22875	69168	48749	31186	79935
1966–1970[a]			12783	21186	410	21596			34379
1971	7028	1596	8624	26666	1002	27668	33694	2598	36292
1972	4229	8209	12438	30635	500	31135	34864	8709	43573
1973	5657	6661	12318	29950	813	30763	35607	7474	43081
1974	2323	5054	7377	29006	500	29506	31329	5554	36883
1975	2255	8692	10947	29000	500	29500	31255	9192	40447
1976	6742	6375	13117	29050	498	29548	35792	6873	42665
1977	3429	2783	6212	34007	1488	35495	37436	4271	41707
1978	1693	3109	4802	30548	994	31542	32341	4103	36344
1979	1326	12205	13531	34000	1000	35000	35326	13205	48531
1980	13894	1308	15202	34500	2000	36500	48394	3308	51702
1981	2304	15161	17465	39700	3866	43566	42004	19027	61031
1982	6090	11366	17456	48504	10000	58504	54594	21366	75960
1983	431	17658	18089	54000	10000	64000	54431	27658	82089
1984	2091	6785	8876	58153	6942	65095	60244	13727	73971
1985	348	18659	19007	52000	9043	61043	52348	27702	80050
1986	12859	6158	19017	53000	8132	61132	65859	14290	80149
1987	12	18988	19000	42400	3397	45797	42412	22385	64797
1988	18	16580	16598	51990	2501	54401	51918	19081	70999
1989	0	9413	9413	30989	2475	33464	30989	11888	42877
1990	0	9522	9522	30500	1957	32457	30500	11479	41979
1991	0	9500	9500	30500	1980	32480	30500	11480	41980
1992	0	5571	5571	28351	2739	31090	28351	8310	36661
1993	0	8758	8758	31000	500	31500	31000	9258	40258
1994	0	9500	9500	30500	2000	32500	30500	11500	42000
1995	260	6582	6842	29144	500	29644	29404	7082	36486
1996	2910	6611	9521	31000	528	31528	33910	7139	41049
1997	15	5004	5019	31319	61	31380	31334	5065	36399
1998	18	814	832	13350	20	13370	13368	834	14202
1999	173	977	1150	34850	0	34850	35023	977	36000
2000	2253	4104	6357	38302	111	38413	40555	4215	44770
2001	330	4870	5200	39111	5	39116	39441	4875	44316
2002	411	1937	2348	34187	0	34187	34598	1937	36535
2003	2343	2955	5298	37936	0	37936	40279	2955	43234
2004	0	33	33	0	0	0	0	33	33
2005	1162	7035	8197	14258	19	14277	15488	9405	22474
2006	147	9939	10086	7005	102	7107	7152	10041	17193
2007	242	5911	6153	5276	200	5476	5518	6111	11629
2008	0	0	0	13331	0	13331	13331	0	13331
2009	0	0	0	0	0	0	0	0	0
2010	0	105	105	5	5	10	5	110	115
2011	0	200	200	0	0	0	0	200	200
2012	0	0	0	0	9	9	0	9	9
2013	0	0	0	0	0	0	0	0	0
2014	0	0	0	0	0	0	0	0	0
2015	0	0	0	0	0	0	0	0	0
2016	0	28	28	0	0	0	0	28	28

[a] For the period 1946–1970 only 5-year averages are given.

Table 3.4.3.9 Catches of hooded seals in the Greenland Sea from 1946 through 2016. Totals include catches for scientific purposes.

	Norwegian catches			Russian catches			Total catches		
Year	Pups	1+ animals	Total	Pups	1+ animals	total	Pups	1+ animals	Total
1946–1950[a]	31152	10257	41409	-	-	-	31152	10257	41409
1951–1955[a,b]	37207	17222	54429	-	-	-[b]	37207	17222	54429
1956–1960[a]	26738	9601	36339	825	1063	1888[b]	27563	10664	38227
1961–1965[a]	27793	14074	41867	2143	2794	4937	29936	16868	46804
1966–1970[a]	21495	9769	31264	160	62	222	21655	9831	31486
1971	19572	10678	30250	-	-	-	19572	10678	30250
1972	16052	4164	20216	-	-	-	16052	4164	20216
1973	22455	3994	26449	-	-	-	22455	3994	26449
1974	16595	9800	26395	-	-	-	16595	9800	26395
1975	18273	7683	25956	632	607	1239	18905	8290	27195
1976	4632	2271	6903	199	194	393	4831	2465	7296
1977	11626	3744	15370	2572	891	3463	14198	4635	18833
1978	13899	2144	16043	2457	536	2993	16356	2680	19036
1979	16147	4115	20262	2064	1219	3283	18211	5334	23545
1980	8375	1393	9768	1066	399	1465	9441	1792	11233
1981	10569	1169	11738	167	169	336	10736	1338	12074
1982	11069	2382	13451	1524	862	2386	12593	3244	15837
1983	0	86	86	419	107	526	419	193	612
1984	99	483	582	-	-	-	99	483	582
1985	254	84	338	1632	149	1781	1886	233	2119
1986	2738	161	2899	1072	799	1871	3810	960	4770
1987	6221	1573	7794	2890	953	3843	9111	2526	11637
1988	4873	1276	6149	2162	876	3038	7035	2152	9187
1989	34	147	181	-	-	-	34	147	181
1990	26	397	423	0	813	813	26	1210	1236
1991	0	352	352	458	1732	2190	458	2084	2542
1992	0	755	755	500	7538	8038	500	8293	8793
1993	0	384	384	-	-	-	0	384	384
1994	0	492	492	23	4229	4252	23	4721	4744
1995	368	565	933	-	-	-	368	565	933
1996	575	236	811	-	-	-	575	236	811
1997	2765	169	2934	-	-	-	2765	169	2934
1998	5597	754	6351	-	-	-	5597	754	6351
1999	3525	921	4446	-	-	-	3525	921	4446
2000	1346	590	1936	-	-	-	1346	590	1936
2001	3129	691	3820	-	-	-	3129	691	3820
2002	6456	735	7191	-	-	-	6456	735	7191
2003	5206	89	5295	-	-	-	5206	89	5295
2004	4217	664	4881	-	-	-	4217	664	4881
2005	3633	193	3826	-	-	-	3633	193	3826
2006	3079	568	3647	-	-	-	3079	568	3647
2007	27	35	62	-	-	-	27	35	62
2008	9	35	44	-	-	-	9	35	44
2009	396	17	413	-	-	-	396	17	413
2010	14	164	178	-	-	-	14	164	178
2011	15	4	19	-	-	-	15	4	19
2012	15	6	21	-	-	-	15	6	21
2013	15	7	22	-	-	-	15	7	22
2014	24	0	24	0	0	0	24	0	24
2015	5	6	11	0	0	0	5	6	11
2016	10	8	18	0	0	0	10	8	18

[a] For the period 1946–1970 only 5-year averages are given.

[b] For the years 1955, 1956, and 1957 the Soviet Union combined catches of harp and hooded seals reported at 3 900, 11 600, and 12 900, respectively. These catches are not included.

Sources and references

ICES. 2005. Request from the Norwegian Government regarding Greenland Sea harp and hooded seals and White Sea/Barents Sea harp seals. *In* Report of the ICES Advisory Committee on Fishery Management, Advisory Committee on the Marine Environment and Advisory Committee on Ecosystems, 2005. ICES Advice 2005, Volume 3, Section 1.4.1.2.

ICES. 2013. Status and harvest potential of the harp seal stocks in the Greenland Sea and the White Sea/Barents Sea, and of the hooded seal stock in the Greenland Sea. *In* Report of the ICES Advisory Committee, 2013. ICES Advice 2013, Book 3, Section 3.3.3.1.

ICES. 2016. Report of the Joint ICES/NAFO/NAMMCO Working Group on Harp and Hooded Seals, 23–30 September 2016, Copenhagen, Denmark. ICES CM 2016/ACOM:21. 85 pp.