ECOREGION Celtic Seas
STOCK Herring in Division VIIa North of 52º30'N (Irish Sea)

Advice for 2014

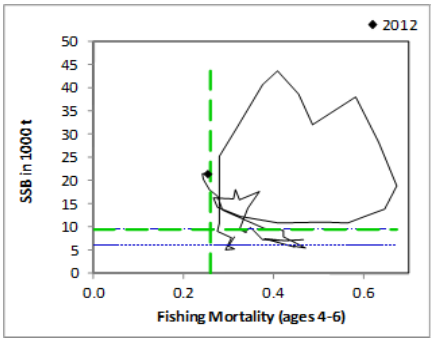
ICES advises on the basis of the MSY approach that catches in 2014 should be no more than 5251 t. Discards are considered to be low and all catches are therefore assumed to be landed.

ICES advises that activities that have a negative impact on the spawning habitat of herring, such as extraction of marine aggregates and marine construction on the spawning grounds, should not occur.

Stock status

F (Fishing Mortality)	2010	2011	2012	
MSY (F_{MSY})	✓	✓	✓	Appropriate
Precautionary approach (F_{pa},F_{lim})	?	?	?	Undefined

SSB (Spawning-Stock Biomass)	2011	2012	2013	
MSY ($B_{trigger}$)	✓	✓	✓	Above trigger
Precautionary approach (B_{pa},B_{lim})	✓	✓	✓	Full reproductive capacity



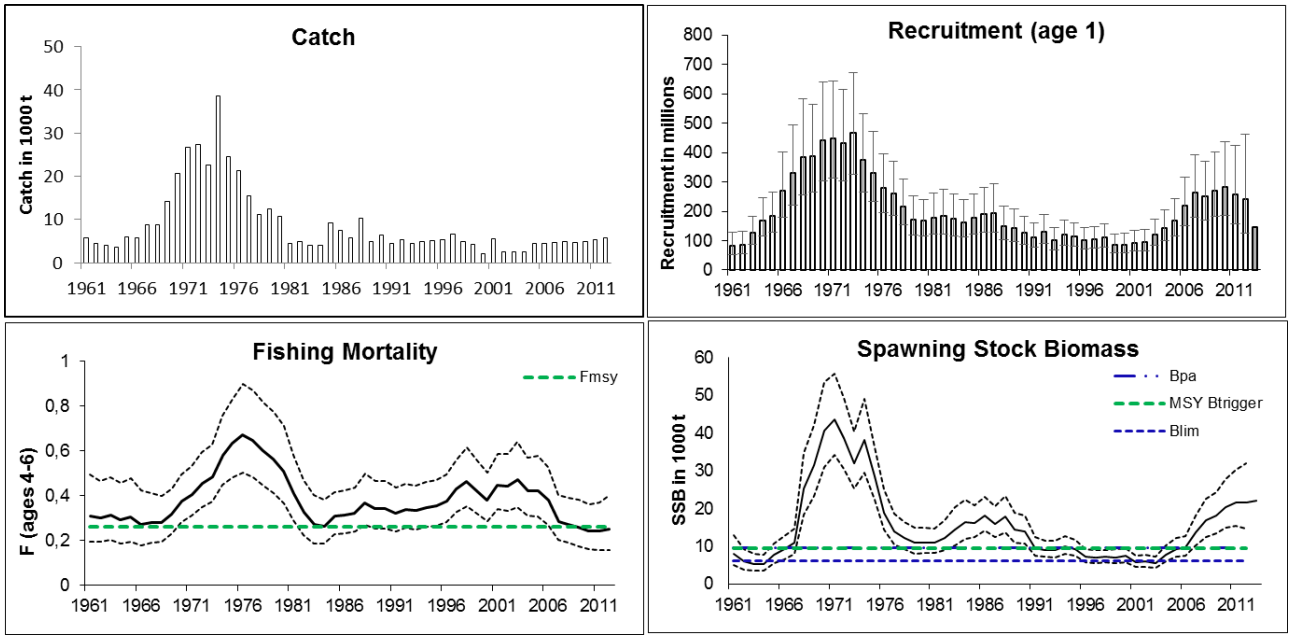


Figure 5.4.14.1 Herring in Division VIIa North of 52º30'N (Irish Sea). Summary of stock assessment with observed landings. Estimates are shaded. Top right: SSB/F over the time-series used in the assessment.

The spawning-stock biomass has been above MSY $B_{trigger}$ since 2006. Fishing mortality has decreased since 2003 to the lowest in the time-series and is now around F_{MSY}. Recruitment is increasing and estimated above the average of the time-series since 2006 (2004 year class).

Management plans

No specific management objectives are known to ICES. A management plan is currently being developed for Division VIIa (North).

Biology

Herring is an important prey species in the ecosystem and also one of the dominant planktivorous fish. This autumn-spawning stock is considered part of the Malin Shelf stock complex. A component of the Division VIIaN herring stock is known to mix seasonally with herring in Subarea VI, but the extent is unknown. Juvenile herring from the Celtic Sea herring stock are present in the Irish Sea. Spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Gravel extraction or disturbance in the close vicinity of any herring spawning will disturb that spawning activity and will reduce the available area for successful spawning.

Environmental influence on the stock

There are irregular cycles in the productivity of herring stocks (weights-at-age and recruitment). It is thought that the environment plays an important role (through transport, prey, and predation).

The fisheries

The fishery has not changed in recent years. UK pelagic trawlers take the majority of catches during the 3rd and 4th quarters. A small local gillnet fishery continues to record landings on the traditional Mourne herring grounds in the 4th quarter. Herring fisheries tend to be clean with little bycatch of other fish. There are no observations of discarding or slippage in the Irish Sea fisheries that target herring.

Catch distribution	Total catch (2012) = 5.7 kt. 100% are assumed to be landed (99% pelagic trawlers and 1% gillnet).

Effects of the fisheries on the ecosystem

The human consumption fisheries for herring are considered relatively clean, with little bycatch of other fish or cetaceans.

Quality considerations

The interannual variation in herring migration patterns affect the selectivity of both the fishery and acoustic survey. The assessment is performed on a mixed stock (including juveniles from the Celtic Sea), which affects the estimates of the younger ages. The acoustic survey data are uncertain and the timing of the survey is occastionally mismatched with the migration pattern of the spawning-stock biomass. Input data quality and sampling coverage is good for this stock.

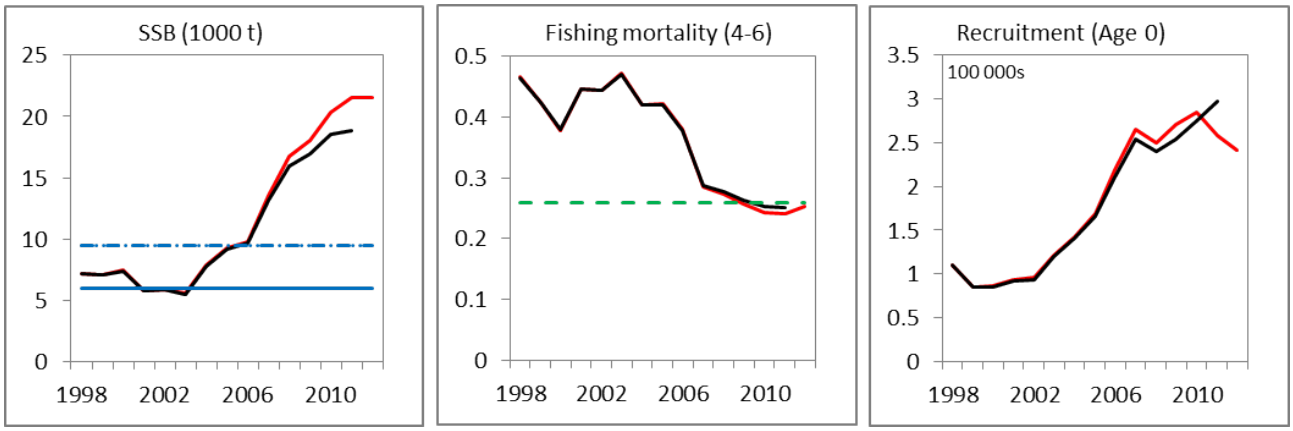


Figure 5.4.14.1 Herring in Division VIIa North of 52°30'N (Irish Sea). Historical assessment results (final-year recruitment estimates included). The stock was benchmarked in 2012.

Scientific basis

Assessment type	Analytical assessment (FLSAM).
Stock data category	Category 1.
Input data	Two survey indices (Northern Ireland Acoustic Surveys AC(VIIaN)), larvae survey NINEL); commercial catch-at-age data and annual maturity ogives, annual stock weights from AC(VIIaN).
Discards and bycatch	Discards are not included in the assessment and are considered to be low.
Indicators	Two survey indices (NIGFS-WIBTS-1Q and NIGFS-WIBTS-4Q).
Other information	Benchmarked in 2012 (WKPELA; ICES, 2012).
Working group report	HAWG (ICES, 2013).

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Reference points

	Type	Value	Technical basis
MSY	MSY $B_{trigger}$	9 500 t.	Provisional based on B_{pa}.
Approach	F_{MSY}	0.26	Based on stochastic simulations (ICES, 2012).
Precautionary approach	B_{lim}	6 000 t.	Lowest observed SSB of ICA assessment.
	B_{pa}	9 500 t.	$B_{pa} = B_{lim} \times 1.58$.
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

Unchanged since 2012.

Outlook for 2014

Basis: F (2013) = TAC constraint = 0.22; SSB (2014) = 22 864; R (2013) = 145 million; Catch (2013) = 4 993.

Rationale	Catch (2014)	Basis	F (2014)	SSB (2015)	%SSB change [1)]	%TAC change [2)]
MSY approach	5 251	F_{MSY}	0.26	16 275	−29%	5%
Zero catch	0	F = 0	0	23 588	3%	−100%
Other options	4 244	TAC −15% ($F_{2012} \times 0.96$)	0.21	17 559	−23%	−15%
	4 993	Stable TAC ($F_{2012} \times 1.15$)	0.22	16 596	−27%	0%
	5 742	TAC +15% ($F_{2012} \times 1.34$)	0.29	15 669	−31%	+15%

Weights in tonnes.
[1)] SSB 2015 relative to SSB 2014.
[2)] Human consumption catch 2014 relative to TAC 2013.

MSY approach

Following the ICES MSY approach implies fishing mortality at F_{MSY} = 0.26, resulting in catches of less than 5251 t in 2014. This is expected to lead to an SSB of 16 275 t in 2015. Discards are considered to be low, and therefore, all catches are assumed to be landed.

Precautionary approach

The SSB is well above B_{pa} and F_{pa} is undefined, but current F is just below F_{MSY}. ICES does not advise using B_{pa} as a target in 2014.

Additional considerations

The catches have been close to TAC levels and the main fishing effort has not varied considerably.

The acoustic survey estimates since 2007 suggest that SSB is at highest abundance within the 18-year time-series. Estimates from an enhanced acoustic survey series since 2007 indicate and confirm the significant increase in 1+ herring biomass. The acoustic survey provides estimates of numbers-at-age; however, the 1- to 3-ringers in the area are a mixture of at least two adjacent stocks, Celtic Sea and Division VIIa(N). Splitting the current acoustic spawning stock biomass estimates according to season of origin does not change the perception of a significant increase in Irish Sea "autumn" spawning biomass.

Gravel substrate is an important fish habitat for herring spawning. Herring spawning and nursery areas are sensitive and vulnerable to anthropogenic influences. Activities that have an impact on the spawning habitat of herring, such as extraction of marine aggregates (e.g. gravel and sand; Groot, 1979, 1996) and construction in the marine environment, can impact spawning. Herring regularly abandon and repopulate spawning grounds and absence of spawning in any particular year does not mean that the spawning ground is not required to maintain a resilient herring population.

Uncertainties in the assessment

The final assessment model is dominated by information from the catch, with the survey information having less influence on the model fit. The assessment model describes the data reasonably well and there is very little retrospective pattern in the assessment. The largest occurrence of mixed fish from different spawning season origins is in the age 1 data (recruitment age in the assessment). The assessment model does not appear to estimate recruitment well and should be considered as a smoothed estimate.

An area east of the Isle of Man has been seasonally closed since 1973. The fleet is sometimes able to fish spawning aggregations if they occur outside the closed area. The effect of this is that the age structure of the catches from year to year can vary widely.

Comparison with previous assessment and advice

The basis for the assessment has not changed from last year (MSY approach). Compared to the assessment in 2012, SSB_{2012} is now estimated to be 2% higher and F_{2011} 4% lower.

Sources

Groot, S. J. de. 1979. The potential environmental impact of marine gravel extraction in the North Sea. Ocean Managemen,t 5: 233–249.

Groot, S. J. de. 1996. The physical impact of marine aggregate extraction in the North Sea. ICES Journal of Marine Science, 53: 1051–1053.

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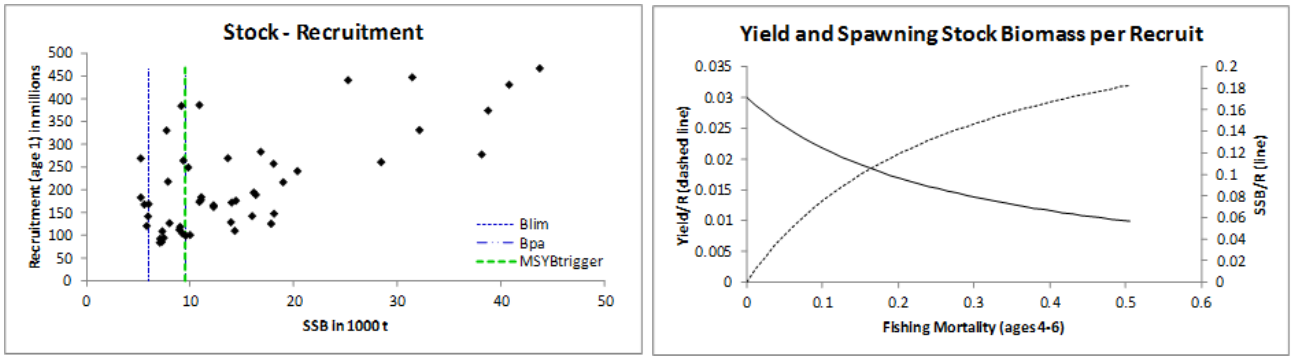

Figure 5.4.14.2 Herring in Division VIIa North of 52º30'N (Irish Sea). Stock–recruitment and yield-per-recruit analysis.

Table 5.4.14.1 Herring in Division VIIa North of 52º30'N (Irish Sea). ICES advice, management, and catch.

Year	ICES Advice	Predicted catch corresp. to advice	Agreed TAC	ICES catch
1987	TAC	4.3	4.5	5.8
1988	TAC (Revised advice in 1988)	10.5 (5.6)	10.5	10.2
1989	TAC	5.5	6.0	5.0
1990	Precautionary TAC	5.7	7.0	6.3
1991	TAC	5.6	6.0	4.4
1992	TAC	6.6	7.0	5.3
1993	TAC	4.9–7.4	7.0	4.4
1994	Precautionary TAC	5.3	7.0	4.8
1995	Precautionary TAC	5.1	7.0	5.1
1996	If required, precautionary TAC	5.0	7.0	5.3
1997	No advice given	-	9.0	6.6
1998	*Status quo* F	6.5	9.0	4.9
1999	F =.Proposed F_{pa} = 0.36	4.9	6.6	4.1
2000	F = 90% F(98) = 0.31	3.9	5.4	2.0
2001	*Status quo* F = 0.26	5.1	6.9	5.5
2002	Average catch of 1996–2000	4.8	4.8	2.4
2003	2002 TAC	4.8	4.8	2.4
2004	Advice 2003 catch	4.8	4.8	2.5
2005	*Status quo* TAC	4.8	4.8	4.4
2006	*Status quo* TAC	4.8	4.8	4.4
2007	*Status quo* TAC	4.8	4.8	4.6
2008	*Recent catches*	4.4	4.8	4.9
2009	*Same advice as last year*	4.4	4.8	4.6
2010	Recent TAC	4.8	4.8	4.9
2011	No increase in catch	< 4.8	5.2	5.2
2012	No increase in catch	-	5.280	5.7
2013	MSY approach	< 5.1	4.993	
2014	MSY approach	< 5.251		

Weights in thousand tonnes.

Table 5.4.14.2 Herring in Division VIIa North of 52º30'N (Irish Sea). ICES catch estimates in tonnes by country.

Country	Ireland	UK	Unallocated	Total
1987	1 200	3 290	1 333	5 823
1988	2 579	7 593	-	10 172
1989	1 430	3 532	-	4 962
1990	1 699	4 613	-	6 312
1991	80	4 318	-	4 398
1992	406	4 864	-	5 270
1993	0	4 408	-	4 408
1994	0	4 828	-	4 828
1995	0	5 076	-	5 076
1996	100	5 180	22	5 302
1997	0	6 651	-	6 651
1998	0	4 905	-	4 905
1999	0	4 127	-	4 127
2000	0	2 002	-	2 002
2001	862	4 599	-	5 461
2002	286	2 107		2 393
2003	0	2 399	-	2 399
2004	749	1 782	-	2 531
2005	1 153	3 234	-	4 387
2006	581	3 821	-	4 402
2007	0	4 629		4 629
2008	0	4 895		4 895
2009	0	4 594		4 594
2010	0	4 894	-	4 894
2011	0	5 202	-	5 202
2012	18	5 675		5 693

Table 5.4.14.3 Herring in Division VIIa North of 52º30'N (Irish Sea). Summary of the assessment. Low = lower limit and High = higher limit of 95% confidence interval. Catches are estimated by the assessment and differ from the ICES catch statistics.

Year	Recruits Age 0 (Thousands) Mean	Recruits Low	Recruits High	Total biomass (tonnes) Mean	Total biomass Low	Total biomass High	Spawing biomass (tonnes) Mean	Spawing biomass Low	Spawing biomass High	Catches (tonnes)	Yield / SSB (ratio)	Mean F ages 4-6 Mean	Mean F Low	Mean F High
1961	81 146	50 845	129 503	26 108	19 860	34 323	7 969	4 945	12 842	5 418	0.68	0.312	0.196	0.497
1962	85 648	55 803	131 455	19 908	15 212	26 056	5 955	3 845	9 222	3 952	0.664	0.3	0.194	0.465
1963	127 644	88 491	184 120	21 093	16 369	27 180	5 201	3 381	7 999	3 613	0.695	0.314	0.204	0.484
1964	169 566	116 712	246 357	26 849	20 678	34 863	5 194	3 513	7 679	4 140	0.797	0.292	0.186	0.459
1965	184 057	127 171	266 389	31 351	24 455	40 192	7 689	5 484	10 779	5 512	0.717	0.307	0.196	0.478
1966	269 952	180 948	402 736	47 052	35 646	62 106	9 112	6 549	12 680	5 844	0.641	0.274	0.178	0.422
1967	331 042	221 119	495 610	64 861	48 922	85 993	10 853	7 980	14 761	8 224	0.758	0.279	0.189	0.413
1968	385 001	254 792	581 750	81 634	61 684	108 036	25 210	18 281	34 765	10 131	0.402	0.28	0.196	0.399
1969	386 930	265 509	563 879	93 620	73 604	119 080	31 382	23 380	42 123	14 564	0.464	0.317	0.232	0.432
1970	441 529	303 867	641 558	119 731	95 327	150 381	40 741	31 033	53 488	18 836	0.462	0.375	0.283	0.497
1971	447 754	311 919	642 744	127 644	102 991	158 198	43 695	34 248	55 749	22 948	0.525	0.407	0.311	0.534
1972	431 490	302 741	614 994	107 152	87 808	130 757	38 716	30 388	49 326	22 561	0.583	0.455	0.349	0.594
1973	467 428	324 280	673 766	102 334	83 668	125 165	32 080	25 409	40 503	22 902	0.714	0.486	0.375	0.63
1974	374 745	263 965	532 016	101 215	82 634	123 973	38 101	29 558	49 113	29 057	0.763	0.582	0.448	0.756
1975	332 036	234 153	470 839	79 063	65 037	96 114	28 396	22 250	36 239	23 249	0.819	0.633	0.483	0.831
1976	278 452	195 297	397 012	64 667	52 848	79 128	18 941	14 368	24 970	19 370	1.023	0.673	0.504	0.898
1977	261 712	184 571	371 095	53 263	43 384	65 392	13 966	10 503	18 572	14 983	1.073	0.648	0.483	0.869
1978	217 510	152 752	309 721	47 193	38 151	58 378	12 218	9 183	16 258	12 641	1.035	0.602	0.445	0.815
1979	172 992	119 004	251 472	42 277	33 853	52 798	10 995	8 072	14 977	11 950	1.087	0.564	0.411	0.775
1980	166 875	115 666	240 756	35 066	28 122	43 726	11 039	8 244	14 782	8 754	0.793	0.511	0.366	0.712
1981	178 260	121 766	260 965	32 338	25 202	41 495	10 849	8 096	14 537	5 504	0.507	0.412	0.29	0.584
1982	184 795	123 678	276 113	36 461	27 667	48 050	12 232	8 832	16 940	5 092	0.416	0.325	0.225	0.471
1983	174 556	117 275	259 815	40 660	30 676	53 893	14 376	10 187	20 286	4 916	0.342	0.274	0.187	0.403
1984	163 244	111 509	238 982	43 958	34 072	56 714	16 309	11 863	22 423	5 322	0.326	0.266	0.186	0.381
1985	176 840	121 071	258 298	46 958	37 416	58 932	16 102	12 418	20 879	6 523	0.405	0.31	0.229	0.418
1986	189 852	128 712	280 034	45 890	36 879	57 102	18 057	14 154	23 036	6 995	0.387	0.315	0.234	0.423
1987	194 853	128 691	295 030	40 619	32 343	51 014	15 945	12 302	20 667	6 222	0.39	0.323	0.24	0.435
1988	148 449	101 646	216 804	42 404	33 991	52 899	17 785	13 573	23 303	7 121	0.4	0.368	0.271	0.499
1989	143 344	98 107	209 438	38 369	30 528	48 224	14 271	10 828	18 809	5 678	0.398	0.343	0.252	0.467
1990	126 500	87 287	183 331	36 607	29 446	45 510	13 905	10 685	18 096	5 784	0.416	0.342	0.252	0.465
1991	110 857	76 250	161 171	30 394	24 667	37 450	9 539	7 336	12 402	4 872	0.511	0.323	0.239	0.437
1992	129 703	89 151	188 699	25 438	20 721	31 229	8 999	7 149	11 329	4 165	0.463	0.34	0.256	0.452
1993	100 208	69 609	144 256	28 970	23 664	35 465	8 917	7 033	11 305	4 715	0.529	0.335	0.251	0.447
1994	119 491	83 611	170 770	26 213	21 551	31 882	9 965	7 923	12 533	4 439	0.445	0.348	0.261	0.463
1995	113 210	80 127	159 952	25 463	20 936	30 971	9 232	7 330	11 627	4 808	0.521	0.355	0.267	0.47
1996	101 722	71 608	144 500	23 086	19 091	27 918	7 274	5 740	9 219	5 007	0.688	0.375	0.284	0.495
1997	104 820	74 131	148 214	21 343	17 644	25 819	7 037	5 537	8 943	4 878	0.693	0.429	0.328	0.562
1998	109 864	76 662	157 446	20 492	16 674	25 185	7 213	5 771	9 017	4 030	0.559	0.466	0.352	0.616
1999	84 965	58 892	122 583	19 881	16 202	24 395	7 064	5 505	9 066	3 750	0.531	0.424	0.321	0.559
2000	86 336	59 726	124 802	18 303	14 915	22 459	7 418	5 819	9 455	2 975	0.401	0.379	0.286	0.502
2001	93 526	64 837	134 910	18 266	14 667	22 749	5 774	4 477	7 446	3 490	0.605	0.447	0.341	0.587
2002	95 511	65 339	139 616	18 915	14 978	23 886	5 897	4 568	7 612	2 798	0.474	0.443	0.334	0.588
2003	121 662	84 929	174 281	19 776	15 554	25 143	5 540	4 316	7 110	2 440	0.44	0.472	0.348	0.639
2004	142 629	99 591	204 264	21 985	17 369	27 827	7 824	5 973	10 248	2 713	0.347	0.421	0.311	0.57
2005	168 721	117 400	242 476	25 694	20 222	32 646	9 309	7 106	12 195	3 596	0.386	0.422	0.307	0.58
2006	218 819	151 239	316 596	29 231	22 838	37 414	9 782	7 496	12 766	3 761	0.384	0.379	0.272	0.529
2007	265 136	179 826	390 919	39 696	30 367	51 891	13 602	10 256	18 041	4 203	0.309	0.286	0.202	0.405
2008	249 946	168 846	369 999	44 312	34 008	57 736	16 778	12 505	22 509	4 915	0.293	0.274	0.191	0.392
2009	270 222	181 310	402 736	46 630	35 487	61 271	18 010	13 289	24 409	4 937	0.274	0.258	0.173	0.384
2010	284 361	185 327	436 316	48 582	36 670	64 363	20 315	14 851	27 788	4 975	0.245	0.243	0.163	0.364
2011	258 074	156 837	424 657	48 630	35 721	66 205	21 530	15 310	30 278	5 292	0.246	0.242	0.158	0.371
2012	241 832	126 238	463 274	48 291	33 273	70 087	21 541	14 529	31 937	5 767	0.268	0.253	0.159	0.403
2013*	144 514						22 114							

* Geometric mean recruitment 1996–2010 and SSB from assessment model.