

ECOREGION Widely Distributed and Migratory Stocks
STOCK Blue whiting in Subareas I-IX, XII, and XIV (Combined stock)

Advice for 2011

Management Objective (s)	Landings in 2011
Transition to an MSY approach with caution at low stock size	50 700 to 223 000 for transition to the MSY framework by 2011 and 2015, respectively
Cautiously avoid impaired recruitment (Precautionary Approach)	Zero landings
Cautiously avoid impaired recruitment and achieve other objective(s) of a management plan (e.g., catch stability)	40 100 tonnes

See section “Quality considerations”. For the advice related to the transition to an MSY approach, the lower end of the range reflects concerns with the current status of the stock and indications of recruitment failure.

Stock status

Fishing mortality	2007	2008	2009
F_{MSY}	Above	Above	Above
F_{PA}/F_{lim}	Between	Between	Between
Spawning Stock Biomass (SSB)	2008	2009	2010
MSY B_{trigger}	Above	Below	Below
B_{PA}/B_{lim}	Above	Between	Below

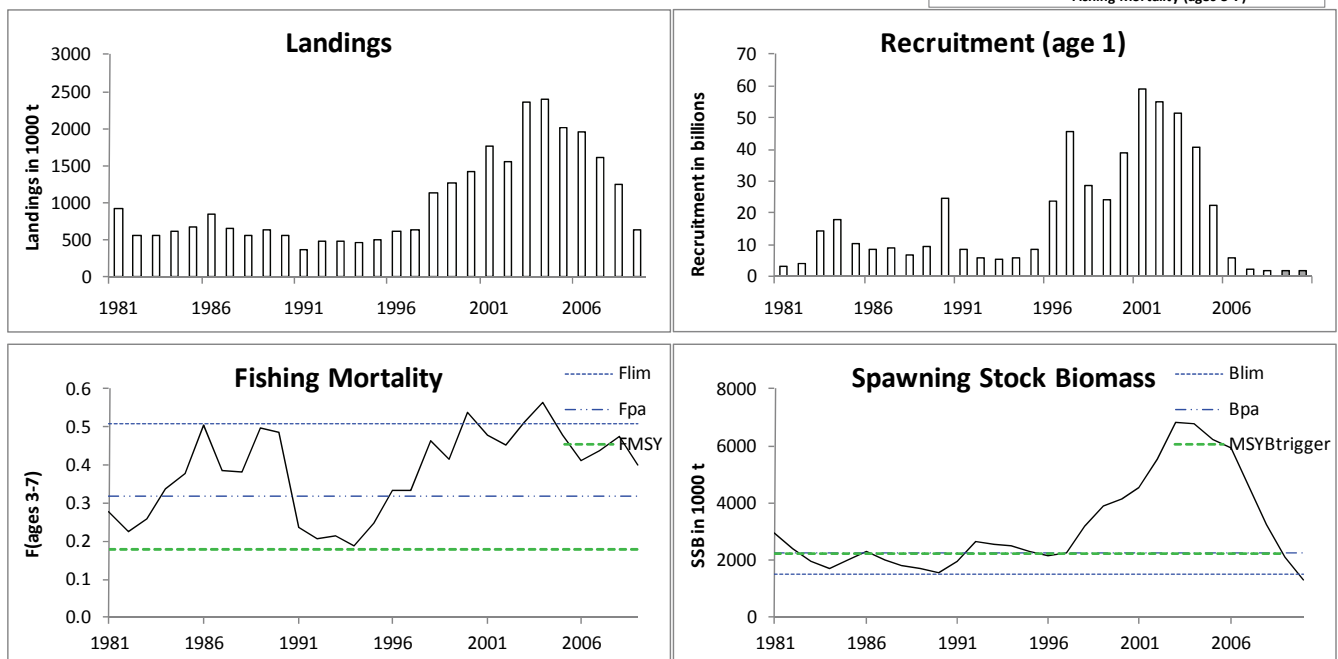
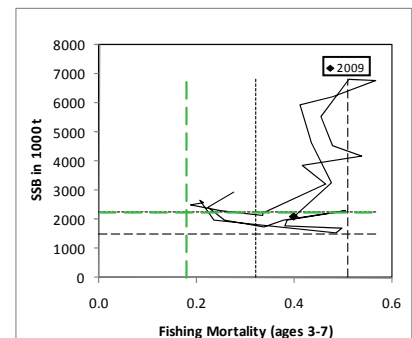


Figure 9.4.4.1 Blue whiting in Subareas I-IX, XII, and XIV. Summary of stock assessment (weights in ‘000 tonnes). Top right: SSB and F over the years.

Year classes since 2005 are estimated to be among the lowest. Due to recent poor recruitment, SSB declined from a peak of 6.8 million tonnes in 2003 to 1.3 million tonnes (below B_{lim}) at the beginning of 2010.

Management plans

A management plan has been agreed by Norway, EU, the Faroe Islands and Iceland, and NEAFC in 2008 (Annex 9.4.4) which uses a target F at 0.18 if SSB is above B_{pa}, and a linear reduction to F=0.05 for SSB between B_{pa} and B_{lim} and F=0.05 for SSB below B_{lim}. ICES has evaluated the plan in 2008 and concludes that it is in accordance with the precautionary approach (ICES, 2008).

Biology

Blue whiting is widely distributed in the eastern part of the North Atlantic with the highest concentrations along the edge of the continental shelf between 300 and 600 m. Most of the spawning takes place along the shelf edge and banks west of the British Isles. Juveniles are abundant in many areas, with the main nursery area believed to be the Norwegian Sea. Recent work on stock identification suggests that there is likely to be more than one single stock in the Northeast Atlantic.

Environmental influence on the stock

The position and strength of the North Atlantic sub-polar gyre (SPG) appears to influence the spawning distribution of blue whiting (ICES, 2009a). This could impact on recruitment success through food availability and predation levels. However, these mechanisms are not yet fully understood.

The fisheries

The main fisheries on blue whiting in 2009 took place in the Faroese region, west of Scotland and around the Porcupine Bank. The majority of the blue whiting catches occur in the first half of the year for human consumption and industrial purposes.

Catch by fleet Total catch (2009) 630 kt where 100% landings (mainly pelagic trawl)

Effects of the fisheries on the ecosystem

Blue whiting are feeding on zooplankton and small fish in the same area as herring and mackerel. Blue whiting plays an important role in the pelagic ecosystems, as a predator, and as a food resource for larger fish and marine mammals.

Quality considerations

In the last three years, there have been significant changes in the perception ($\pm 40\%$) of the magnitude of the SSB and F. Although the absolute estimates are uncertain, there is a consistent trend of a declining stock, in both the assessment and in the surveys. All available information confirms that recruitment has been at a very low level since 2006. The uncertainties associated with the assessment have a significant effect on the advice provided for the transition to MSY approach as well as the option under the management plan.

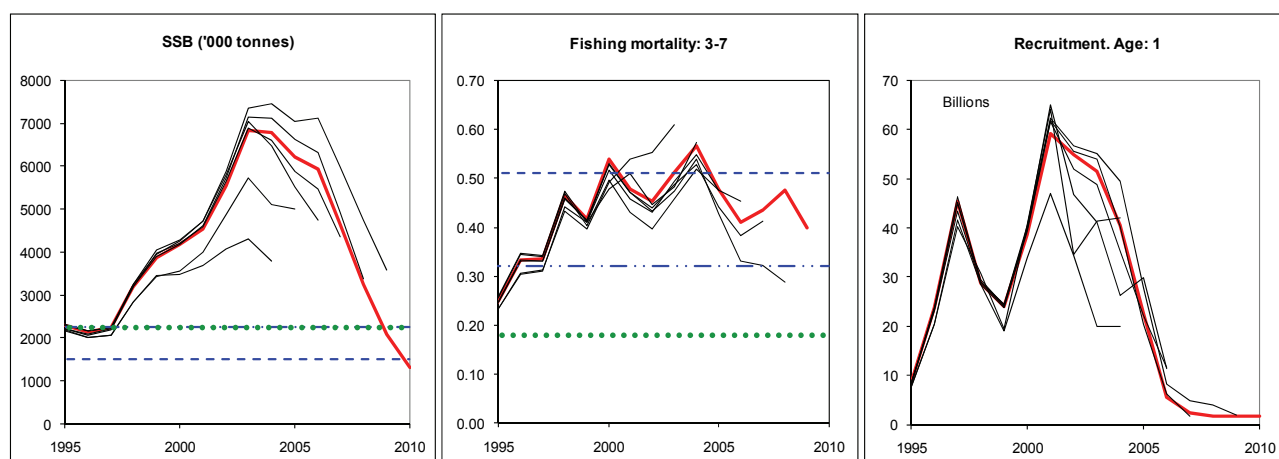


Figure 9.4.4.2 Blue whiting in Subareas I-IX, XII, and XIV. Historical assessment results (final year recruitment estimates included).

Scientific basis

Assessment type	Age based analytical (SMS)
Input data	Three surveys: Norwegian spawning ground survey 1993–2003, International Ecosystem survey in the Nordic Seas 2000–2010, IBWSSS (2004–2010)
Discards and by-catch	Not included in the assessment
Indicators	Not used
Other information	-
Working group report	WGWIDE

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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY Approach	MSY B _{trigger}	2.25 million t	B _{pa}
	F _{MSY}	0.18	F _{0.1} tested in management strategy evaluation conducted in 2008 (Anon, 2008; ICES, 2008)
Precautionary Approach	B _{lim}	1.50 million t	B _{loss}
	B _{pa}	2.25 million t	B _{lim} exp(1.645*σ), with σ = 0.25.
	F _{lim}	0.51	F _{loss}
	F _{pa}	0.32	F _{med} (1998).

(unchanged since: 2010)

MSY reference points should be considered as provisional.

Yield and spawning biomass per Recruit F-reference points (2010):

	Fish Mort	Yield/R	SSB/R
	Ages 3-7		
Average last 3 years	0.44	0.05	0.16
F _{max} ^[*]			
F _{0.1}	0.21	0.04	0.24
F _{med}	0.25	0.05	0.22

[*] F_{max} not well defined

Outlook for 2011

Basis: F (2010) = [catch constraint] =0.51; SSB (2011) =796; Catch(2010) =548 (Coastal States TAC + NEAFC allocation) ; F₂₀₀₉ =0.40; R(2011, 2012) =lowest observed = 1.759 billion at age 1.

Rationale	Catch (2011)	Basis	F (2011)	SSB (2012)	%SSB change¹	% TAC change²
MSY framework	50.7	F _{MSY} *SSB ₍₂₀₁₁₎ / MSY B _{trigger}	0.06	790	-1%	-91%
MSY transition	223	F _{pa}	0.32	621	-22%	-59%
Precautionary approach	0	SSB(2012)<B _{pa}	0.00	840	6%	-100%
Management plan	40.1	F=0.05 for SSB(2011)<B _{lim}	0.05	800	1%	-93%
Zero catch	0	F=0	0.00	840	6%	-100%
<i>Status quo</i>	32.2	F ₂₀₀₉ * 0.1	0.04	808	2%	-94%
	78.0	F ₂₀₀₉ * 0.25	0.10	763	-4%	-86%
	148	F ₂₀₀₉ * 0.50	0.20	694	-13%	-73%
	211	F ₂₀₀₉ * 0.75	0.30	633	-20%	-62%
	267	F ₂₀₀₉ * 1	0.40	579	-27%	-51%

Weights in '000 tonnes.

¹⁾ SSB 2012 relative to SSB 2011

²⁾ Catch 2011 relative to TAC 2010.

MSY approach

Following the ICES MSY framework implies fishing mortality to be reduced to 0.06 (35% of F_{MSY} because SSB in 2011 is 35% of MSY $B_{trigger}$), resulting in landings of 50 700 tonnes in 2011. This is expected to lead to an SSB of 790 000 tonnes in 2012.

Following the transition scheme towards the ICES MSY framework implies fishing mortality be limited by F_{pa} (0.32), and corresponding to landing of 223 000 tonnes. This is expected to lead to an SSB of 621 000 tonnes.

PA approach

This would imply zero catch in 2011 as SSB in 2012 will remain below B_{pa} with any fishery in 2011.

Management plan(s)

Following the management plan agreed by Norway, EU, the Faroe Islands, Iceland, and NEAFC in November 2008 (see Appendix 9.4.4.1) implies a TAC of 40 100 tonnes in 2011, which is a reduction of 93% compared to the TAC in 2010.

Policy paper

In light of the EU policy paper on fisheries management (17 May 2010, ([COM\(2010\) 241](#)) this stock is classified under category 4.

Additional considerations

Management considerations

The large reduction in catch options for 2011 is based on an uncertain estimate of the stock status as indicated by Figure 9.4.4.2. However, all available information shows that the recruitment (age 1 fish) has been at a historical low level since 2006 and that spawning stock biomass has declined sharply since 2003. The remaining stock consist mainly of older fish, so there is no immediate sources for rebuilding the stock in short-term and the decline is expected to continue if recruitment remains at the recent low level, even with small catches.

The management plan is particularly sensitive to fluctuation to absolute stocks abundance. This information could be taken into account in the management plan by adopting wide constraints on TAC changes; i.e. limiting inter-annual variability in TAC. At present, this has not been agreed (see Article 7 of the management plan).

Recent work on stock identification suggests that there is likely to be more than one single stock in the Northeast Atlantic (ICES, 2009b) but this has yet to be confirmed.

Data and methods

The assessment is based on catch-at-age data from commercial catches from 1981–2009 and three acoustic surveys (Norwegian spawning ground survey 1993–2003, international ecosystem survey in the Nordic Seas 2000–2010, and IBWSSS 2004–2010). The IBWSSS survey is the only survey that covers almost the entire distributional area of the spawning stock.

The survey plan for the IBWSSS was not entirely followed in 2010, resulting in incomplete coverage of the survey area. The gap in area coverage occurred in an area of concentrated fishing effort and thus was likely to have contained a high biomass of blue whiting. The mean acoustic density for the un-surveyed rectangles was estimated by interpolating values from surrounding surveyed rectangles following established methods (ICES, 2010a).

With the use of the IBWSS 2004-2009 time series (without the 2010 observations data) the assessment halved the estimated F in 2009 and doubled SSB for 2010. However, excluding the 2010 IBWSS point in the assessment still results in SSB being below B_{pa} in 2012 even in the absence of fishing in 2011.

Limited information was available on discarding and discards are not included in the assessment. However, discarding is considered to be minor.

The same assessment model has been used during the last five years, and the results are consistent with two other age based assessment models. The three assessment models applied this year gave a similar picture of the state of the stock. Indications of low recruitment of year classes 2005-2009 are consistent in both the survey and catch data. Stock

summary results with added 95% confidence limits (Figure 9.4.4.5) show that the overall decrease in F since 2000 is not really that significant. The decreases in recruitment and SSB are however very significant.

Comparison with previous assessment

Although the perception that the stock is declining has not changed over the six years, the estimated abundance and fishing mortality for recent years have changed greatly. As a result, the catch advice has also varied greatly. Compared to last year, the SSB for 2009 is estimated to be about 42% lower and the fishing mortality in 2008 to be about 65% higher.

Sources

- Anon., 2008. Report of the Working Group established by the Blue Whiting Coastal States on Blue Whiting management strategies. 26 – 30 May, 2008. Charlottenlund Castle, Denmark. 65 pp.
- ICES. 2008. Report of the ICES Advisory Committee, 2008. ICES Advice, 2008. Book 9. 345 pp.
- ICES. 2009a. Report of the Workshop on Blue Whiting Recruitment (WKBLUR), 10–12 November 2009, ICES Headquarters, Copenhagen. ICES CM 2009/RMC:09. 62 pp.
- ICES, 2009b. Report of the Stock Identification Methods Working Group (SIMWG). ICES CM 2009/LRC:12
- ICES. 2010a. Report of the Working Group on Northeast Atlantic Pelagic Ecosystem Surveys (WGNAPES), 17-20 August 2010, Hamburg, Germany. ICES CM 2010/SSGESST:20. 96 pp.
- ICES, 2010. Report of the Working Group on Widely Distributed Stocks (WGWIDE), 28 August -3 September 2010, Vigo, Spain. ICES CM 2010/ACOM:12.

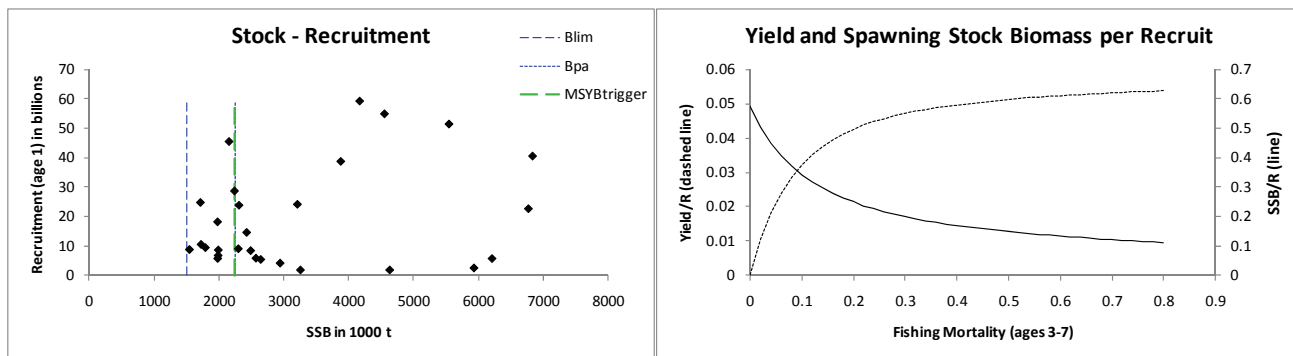


Figure 9.4.4.3 Blue whiting in Subareas I–IX, XII, and XIV (Combined stock). Stock–recruit relationship and yield per recruit plot.

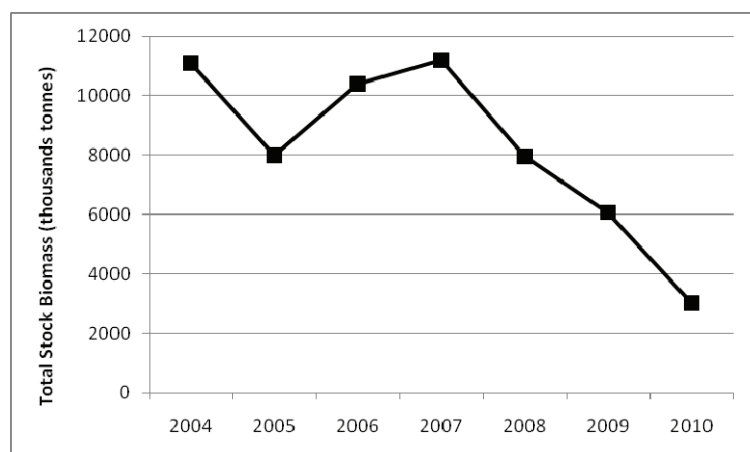


Figure 9.4.4.4 Blue whiting in Subareas I–IX, XII, and XIV (Combined stock). Total stock biomass (in thousand tonnes) from the IBWSS survey, 2004-2010.

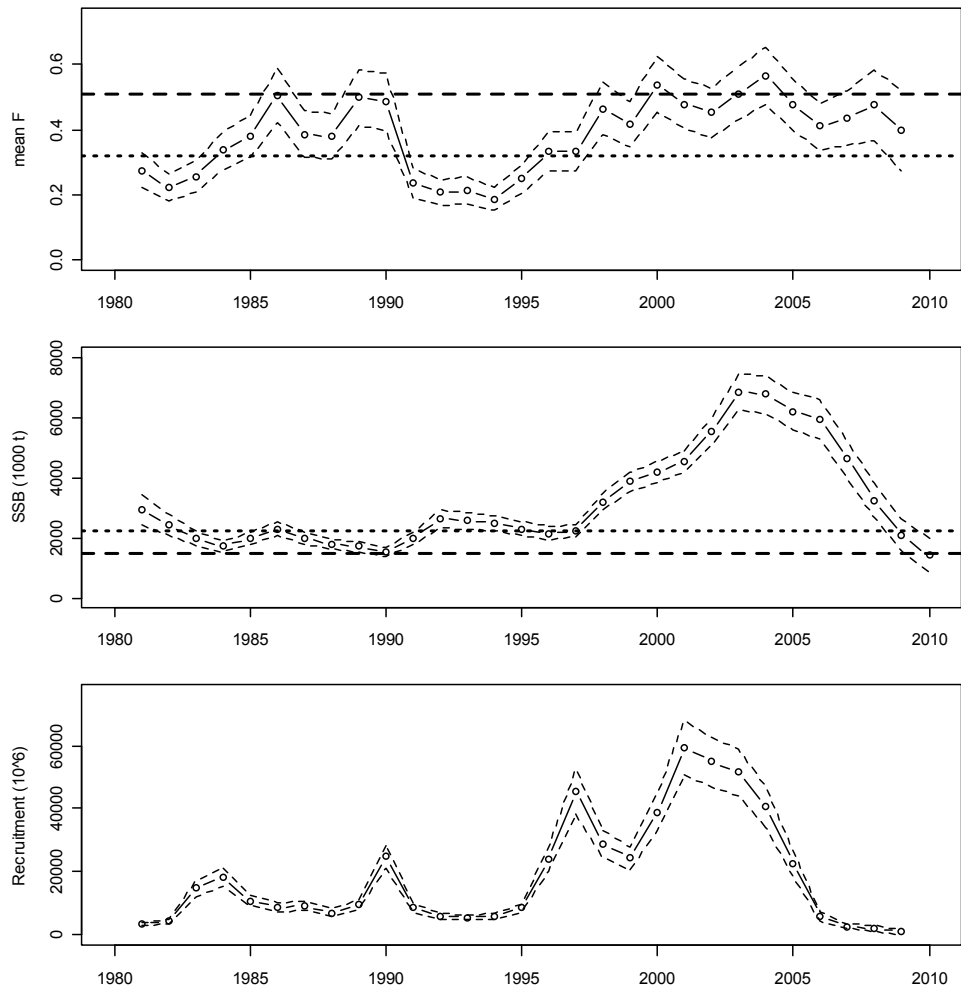


Figure 9.4.4.5 Blue whiting in Subareas I-IX, XII, and XIV (Combined stock). Stock summary with mean value and 95% confidence interval. SSB at 1st January 2010 does not include age 1.

Table 9.4.4.1 Blue whiting in Subareas I–IX, XII, and XIV (Combined stock). ICES advice, management and landings.

Year	ICES Advice	Predicted Catch corresp. to advice	Agreed TAC	ICES catch
1987	TAC for northern areas; no advice for southern areas	950	-	665
1988	TAC for northern areas; no advice for southern areas	832	-	558
1989	TAC for northern areas; no advice for southern areas	630	-	627
1990	TAC for northern areas; no advice for southern areas	600	-	562
1991	TAC for northern areas; no advice for southern areas	670	-	370
1992	No advice	-	-	475
1993	Catch at <i>status quo</i> F (northern areas); no assessment for southern areas	490	-	481
1994	Precautionary TAC (northern areas); no assessment for southern areas	485	650 ¹	459
1995	Precautionary TAC for combined stock	518	650 ¹	579
1996	Precautionary TAC for combined stock	500	650 ¹	646
1997	Precautionary TAC for combined stock	540		672
1998	Precautionary TAC for combined stock	650		1125
1999	Catches above 650 000 t may not be sustainable in the long run	650		1256
2000	F should not exceed the proposed F_{pa}	800		1412
2001	F should not exceed the proposed F_{pa}	628		1780
2002	Rebuilding plan	0		1556
2003	F should be less than the proposed F_{pa}	600		2321
2004	Achieve 50% probability that F will be less than F_{pa}	925		2378
2005	Achieve 50% probability that F will be less than F_{pa}	1075		2027
2006	F old management plan	1500	2100 ²	1966
2007	F should be less than the proposed F_{pa}	980	1847 ³	1612
2008	F should be less than F_{pa}	835	1250 ⁴	1246
2009	Maintain stock above B_{pa}	384	606 ⁵	636
2010	Follow the agreed management plan	540	548	
2011	See scenarios	-		

Weights in '000 t.

¹NEAFC proposal for NEAFC regions 1 and 2.

²Agreed TAC from four Coastal States of 2 million tonnes, and an additional allocation to Russia in the international zone of 100 000 t.

³Agreed TAC from four Coastal States of 1.7 million tonnes, and an additional allocation to Russia and Greenland of 147 000 t.

⁴Agreed TAC from four Coastal States of 1.1 million tonnes, and an additional allocation to Russia and Greenland.

⁵Agreed TAC from four Coastal States of 0.59 million tonnes, and an additional allocation to Russia (0.016 million tonnes).

Table 9.4.4.2 Blue whiting in Subareas I–IX, XII, and XIV (Combined stock). Landings (tonnes) by country for the period 1989–2009, as estimated by the Working Group.

Country	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Denmark	18 941	26 630	27 052	15 538	34 356	41 053	20 456	12 439	52 101	26 270	61 523	64 653	57 686	53 333	51 279	82 935	89 500	41 450	56 979	48 659	18 134	248
Estonia					6 156	1 033	4 342	7 754	10 982	5 678	6 320						**					
Faroes	79 831	75 083	48 686	10 563	13 436	16 506	24 342	26 009	24 671	28 546	71 218	105 006	147 991	259 761	205 421	329 895	322 322	266 799	321 013	317 859	225 003	58354
France	2 191	2 191			13 436	1 195	24 342	26 009	24 671	28 546	71 218	105 006	147 991	259 761	205 421	329 895	322 322	266 799	321 013	317 859	225 003	8831
Germany	5 546	5 417	1 699	349	1 332	100	2	6 313	6 876	4 724	17 969	3 170	12 655	19 060	17 050	22 803	15 293	22 823	36 437	34 404	25 259	5044
Iceland	4 977	4 977			1 332	100	2	6 313	6 876	4 724	17 969	3 170	12 655	19 060	17 050	22 803	15 293	22 823	36 437	34 404	25 259	120202
Ireland	4 646	2 014			781		3	222	1 709	25 785	45 635	35 240	25 200	29 854	17 825	22 580	75 393	73 488	54 910	31 132	22 852	8776
Japan					918	1 742	2 574															
Latvia					10 742	10 626	2 582															
Lithuania						2 046																
Netherlands	800	2 078	7 750	17 369	11 036	18 482	21 076	26 775	17 669	24 469	27 957	35 843	46 128	73 595	37 529	45 832	95 311	147 783	102 711	79 875	78 684	35686
Norway	233 314	301 342	310 938	137 610	181 622	211 489	229 643	339 837	394 950	347 311	560 568	528 797	533 280	573 311	571 479	834 540	957 684	738 490	642 451	539 587	418 289	225995
Poland																						
Portugal	5 979	3 557	2 864	2 813	4 928	1 236	1 350	2 285	3 561	2 439	1 900	2 625	2 032	1 746	1 659	2 651	3 937	5 190	5 323	3 897	4 220	2043
Spain	24 847	30 108	29 490	29 180	23 794	31 020	28 118	25 379	21 538	27 683	27 490	23 777	22 622	23 218	17 506	13 825	15 612	17 643	15 173	13 557	14 342	20637
Sweden ***	1 229	3 062	1 503	1 000	2 058	2 867	3 675	13 000	4 000	4 568	9 299	12 993	3 319	2 086	18 549	65 532	19 083	2 960	101	464		
UK / Scotland	5 183	8 056	6 019	3 876	6 867	2 284	4 470	10 583	14 326	33 398	92 383	98 853	42 478	50 147	26 403	27 382	57 028	104 539	72 106	43 540	38 150	173
USSR / Russia *	177 521	162 932	125 609	151 226	177 000	139 000	116 781	107 220	86 855	118 656	130 042	178 179	245 198	315 478	290 068	355 319	346 762	332 226	329 100	236 369	225 163	149650
TOTAL	557 847	627 447	561 610	369 524	475 026	480 679	459 414	578 905	645 982	672 437	1 128 969	1 256 228	1 412 927	1 780 170	1 556 792	2 318 935	2 377 568	2 026 953	1 968 456	1 612 330	1 246 465	635 639

* From 1992 only Russia

** Reported to the EU but not to the ICES WGNPBW. (Landings of 19,467 tonnes)

*** Imprecise estimates for Sweden: reported catch of 34265 t in 1993 is replaced by the mean of 1992 and 1994, i.e. 2,867 t, and used in the assessment.

Table 9.4.4.3 Blue whiting in Subareas I–IX, XII, and XIV (Combined stock). Total landings by country and area for 2009 in tonnes.

Area	Denmark	Faroe Islands	France	Germany	Iceland	Ireland	Netherlands	Norway	Portugal	Russia	Spain	UK/Scotland	Grand Total
IIIa	20	1 411			498		33	2 346		41 589		18	45 915
IIIb										271			271
IIIa	117							14					131
IVa	106	221			312			16 334		5 228		33	22 234
IVb	5							17					22
Va					433								433
Vb		16 427	2 296		40 432		101	1 623		54 577			115 456
VIa		27 727		2 557	33 679	3 836	12 149	123 351		15 099		116	218 514
VIb		1 924			34 166		203	17 320		20 509			74 122
VIIb							355						355
VIIc		3 937	4 670	2 456	7 065	4 585	23 195	58 904		6 198			111 010
VIIg										1 692			1 692
VIIIa			1 865				3						1 868
VIIIc											20 637		20 637
VIIj				31			2					6	39
VIIIk					562			5 786					6 348
IXa*									2 043				2 043
XII		6 707			3 045			300		4 487			14 539
XIVa					10								10
Grand Total	248	58 354	8 831	5 044	120 202	8 776	35 686	225 995	2 043	149 650	20 637	173	635 639

*Value for area IXa is summed across CN, CS and S subdivisions of this area.

Table 9.4.4.4 Blue whiting in Subareas I–IX, XII, and XIV (Combined stock). Landings (tonnes) by main areas.

Area	Norwegian Sea fishery (SAs 1+2; Divs. Va, XIVa-b)	Fishery in the spawning area (SA XII; Divs. Vb, VIIa-b, VIIa-c)	Directed- and mixed fisheries in the North Sea (SA IV; Div. IIIa)	Total northern areas	Total southern areas (SAs VIII+IX; Divs. VIIId-k)	Grand total
1988	55 829	426 037	45 143	527 009	30 838	557 847
1989	42 615	475 179	75 958	593 752	33 695	627 447
1990	2 106	463 495	63 192	528 793	32 817	561 610
1991	78 703	218 946	39 872	337 521	32 003	369 524
1992	62 312	318 081	65 974	446 367	28 722	475 089
1993	43 240	347 101	58 082	448 423	32 256	480 679
1994	22 674	378 704	28 563	429 941	29 473	459 414
1995	23 733	423 504	104 004	551 241	27 664	578 905
1996	23 447	478 077	119 359	620 883	25 099	645 982
1997	62 570	514 654	65 091	642 315	30 122	672 437
1998	177 494	827 194	94 881	1 099 569	29 400	1 128 969
1999	179 639	943 578	106 609	1 229 826	26 402	1 256 228
2000	284 666	989 131	114 477	1 388 274	24 654	1 412 928
2001	591 583	1 045 100	118 523	1 755 206	24 964	1 780 170
2002	541 467	846 602	145 652	1 533 721	23 071	1 556 792
2003	931 508	1 211 621	158 180	2 301 309	20 097	2 321 406
2004	921 349	1 232 534	138 593	2 292 476	85 093	2 377 569
2005	405 577	1 465 735	128 033	1 999 345	27 608	2 026 953
2006	404 362	1 428 208	105 239	1 937 809	28 331	1 966 140
2007	172 709	1 360 882	61 105	1 594 695	17 634	1 612 330
2008	68 352	1 111 292	36 061	1 215 704	30 761	1 246 465
2009	46 629	533 996	22 387	603 012	32 627	635 639

Table 9.4.4.5 Blue whiting in Subareas I–IX, XII, and XIV (Combined stock). Summary of stock assessment.

Year	Recruitment Age 1 thousands	SSB tonnes	Landings tonnes	Mean F Ages 3-7
1981	3265984	2941621	922980	0.276
1982	4093310	2425601	550643	0.224
1983	14535084	1975976	553344	0.257
1984	18127218	1721477	615569	0.337
1985	10465637	1987465	678214	0.378
1986	8561892	2296382	847145	0.505
1987	8966428	1984246	654718	0.386
1988	6676171	1788074	552264	0.380
1989	9371963	1711381	630316	0.498
1990	24739219	1541932	558128	0.486
1991	8691313	1977744	364008	0.236
1992	5660195	2642320	474592	0.207
1993	5340586	2567544	475198	0.214
1994	5757306	2486791	457696	0.188
1995	8345394	2306967	505176	0.249
1996	23780570	2152841	621104	0.334
1997	45471634	2237088	639681	0.335
1998	28648633	3207216	1131955	0.464
1999	24101588	3876778	1261033	0.417
2000	38709775	4168134	1412449	0.538
2001	59250114	4550795	1771805	0.479
2002	54900683	5546266	1556955	0.454
2003	51438222	6836066	2365319	0.511
2004	40513960	6771823	2400795	0.566
2005	22606837	6210258	2018344	0.478
2006	5634958	5932354	1956239	0.411
2007	2431319	4631475	1612269	0.436
2008	1759061	3255375	1251851	0.476
2009	1759061*	2097420	634978	0.399
2010	1759061*	1313230**		
Average	18178773	3171421	1016371	0.383

*Value replaced (lowest observed)

** SSB in 2010 does not include the 11% of age 1 that is assumed mature.

Appendix 9.4.4.1

The management plan was agreed by Norway, EU, The Faroe Islands and Iceland, and NEAFC in November 2008.

1. *The Parties agree to implement a long term management plan for the fisheries on the Blue Whiting stock, which is consistent with the precautionary approach, aiming at ensuring harvest within safe biological limits and designed to provide for fisheries consistent with maximum sustainable yield, in accordance with advice from ICES.*
2. *For the purpose of this long term management plan, in the following text, "TAC" means the sum of the coastal State TAC and the NEAFC allowable catches.*
3. *As a priority, the long term plan shall ensure with high probability that the size of the stock is maintained above 1.5 million tonnes (B_{lim}).*
4. *The Parties shall aim to exploit the stock with a fishing mortality of 0.18 on relevant age groups as defined by ICES.*
5. *While fishing mortality exceeds that specified in paragraph 4 and 6, the Parties agree to establish the TAC consistent with reductions in fishing mortality of 35% each year until the fishing mortality established in paragraph 4 and 6 has been reached. This paragraph shall apply only during 2009 and 2010.*

For the purposes of this calculation, the fishing percentage mortality reduction should be calculated with respect to the year before the year in which the TAC is to be established. For this year, it shall be assumed that the relevant TAC constrains catches.

6. *When the fishing mortality in paragraph 4 has been reached, the Parties agree to establish the TAC in each year in accordance with the following rules:*
 - *In the case that the spawning biomass is forecast to reach or exceed 2.25 million tonnes (SSB trigger level) on 1 January of the year for which the TAC is to be set, the TAC shall be fixed at the level consistent with the specified fishing mortality.*
 - *In the case that the spawning biomass is forecast to be less than 2.25 million tonnes on 1 January of the year for which the TAC is to be set (B), the TAC shall be fixed that is consistent with a fishing mortality given by:*

$$F = 0.05 + [(B - 1.5)(0.18 - 0.05) / (2.25 - 1.5)]$$

In the case that spawning biomass is forecast to be less than 1.5 million tonnes on 1 January of the year for which the TAC is to be set, the TAC will be fixed that is consistent with a fishing mortality given by $F = 0.05$.

7. *When the fishing mortality rate on the stock is consistent with that established in paragraph 4 and the spawning stock size on 1 January of the year for which the TAC is to be set is forecast to exceed 2.25 million tonnes, the Parties agree to discuss the appropriateness of adopting constraints on TAC changes within the plan.*
8. *The Parties, on the basis of ICES advice, shall review this long term management plan at intervals not exceeding five years and when the condition specified in paragraph 4 is reached*