

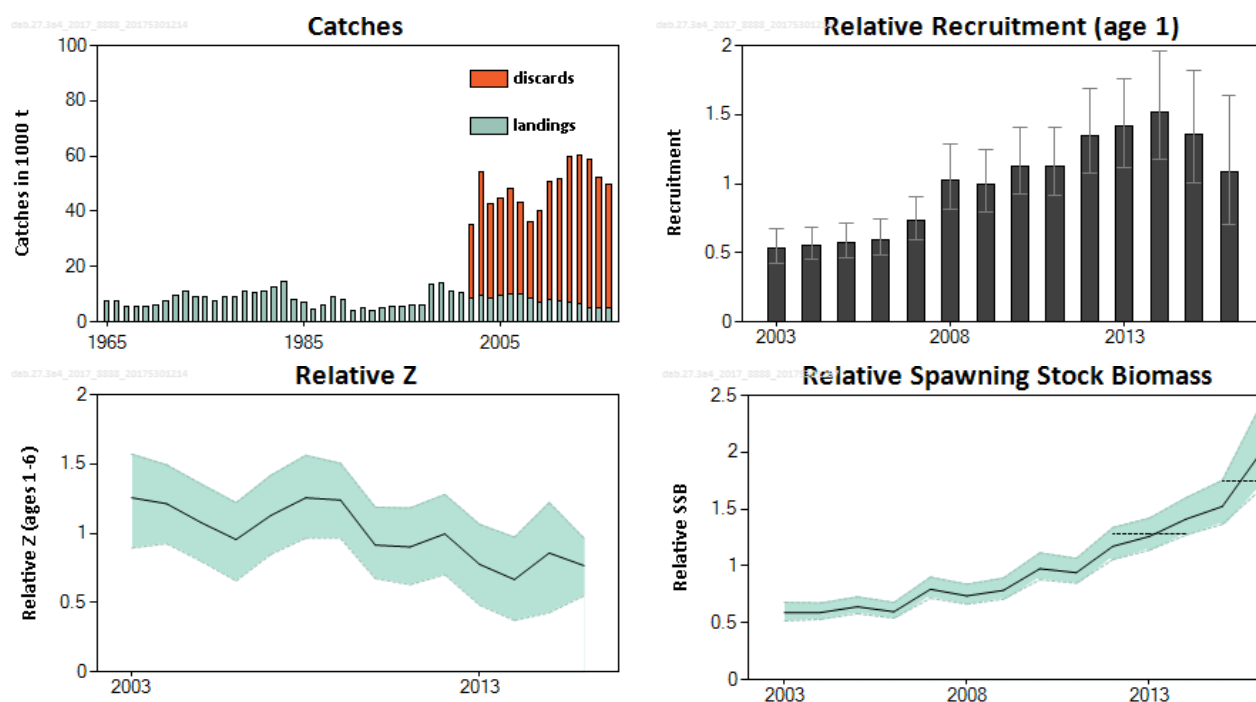
## Dab (*Limanda limanda*) in Subarea 4 and Division 3.a (North Sea, Skagerrak and Kattegat)

### ICES stock advice

ICES advises that when the precautionary approach is applied, catches should be no more than 64 452 tonnes in each of the years 2018 and 2019. If discard rates do not change from the average of the last three years (2014–2016), this implies annual landings of no more than 6116 tonnes.

### Stock development over time

The assessment is indicative of trends only. The biomass (SSB) has been increasing since 2006. Total mortality (Z) has declined since 2003. Recruitment (R) showed an increasing trend until 2014, but has declined in the latest two years of the time-series.

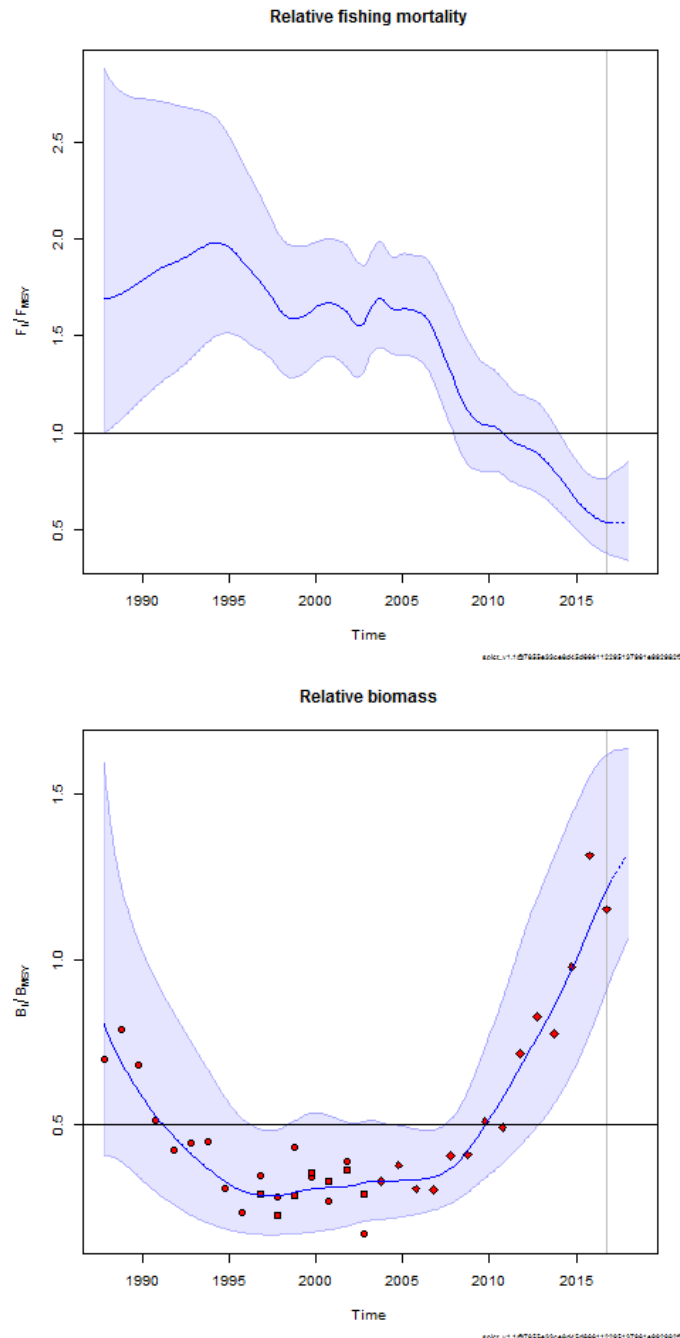


**Figure 1** Dab in Subarea 4 and Division 3.a. Summary of the stock assessment. Top left: official landings (1965–2001) and ICES estimates of landings and discards (2002–2016). Top right: relative recruitment (age 1). Lower left: relative fishing pressure. Lower right: relative spawning–stock biomass. Dashed lines indicate the average biomass index of the respective year range. Shaded areas in Z and SSB and error bars in R show 90% confidence intervals.

### Stock and exploitation status

**Table 1** Dab in Subarea 4 and Division 3.a. State of the stock and fishery relative to reference points. The fishing pressure and stock size status indicators are based on the SPiCT analyses shown in Figure 2.

		Fishing pressure			Stock size		
		2014	2015	2016	2014	2015	2016
Maximum sustainable yield	$F_{MSY}$	✓	✓	✓	$MSY B_{trigger}$	✓	✓
	proxy			Below	proxy		Above trigger
Precautionary approach	$F_{pa}$ , $F_{lim}$	✓	✓	✓	$B_{pa}$ , $B_{lim}$	✓	✓
				Below possible reference points			Above possible reference points
Management plan	$F_{MGT}$	–	–	–	$B_{MGT}$	–	–
				Not applicable			Not applicable



**Figure 2** Dab in Subarea 4 and Division 3.a. SPICT analysis showing fishing mortality relative to  $F_{MSY}$  and exploitable biomass relative to  $B_{MSY}$ . The symbols in the relative biomass plot indicate observed biomass indices (red dots = BTS Q3 Isis, red squares = BTS Q3 Tridens, red diamonds = combined BTS Q3 index) while the shaded areas in both plots indicate 95% confidence intervals. The horizontal lines indicate levels relative to the  $F_{MSY}$  and  $MSY B_{trigger}$  proxies.

### Catch options

The ICES framework for category 3 stocks was applied (ICES, 2012). A survey-based estimated SSB was used as the index of stock development. The advice is based on a comparison of the two latest SSB values (index A) with the three preceding values (index B), multiplied by the recent average catch. The index is estimated to have increased by more than 20% and thus the uncertainty cap was applied.

The Surplus Production in Continuous Time (SPiCT; Pedersen and Berg, 2017) analysis suggests that fishing mortality is below and the stock size above proxies of the MSY reference points (Figure 2). Therefore, no additional precautionary buffer was applied.

**Table 2** Dab in Subarea 4 and Division 3.a. The basis for the catch options.\*

Index A (2015–2016)		1.75
Index B (2012–2014)		1.28
Index ratio (A/B)		1.36
Uncertainty cap	Applied	1.2
Average catch (2014–2016)		53710 tonnes
Discard rate (2014–2016)		0.91
Precautionary buffer	Not applied	-
Catch advice**		64452 tonnes
Landings corresponding to the catch advice***		6116 tonnes

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

\*\* [Average catch] × [uncertainty cap].

\*\*\* [Average catch] × [uncertainty cap] × [1 – discard rate]].

### Basis of the advice

**Table 3** Dab in Subarea 4 and Division 3.a. The basis of the advice.

Advice basis	Precautionary approach.
Management plan	ICES is not aware of any agreed precautionary management plan for dab in this area.

### Quality of the assessment

Dab in Subarea 4 and Division 3.a. was benchmarked in 2016 (ICES, 2016a). Spawning–stock biomass (SSB) is now estimated with a survey-based assessment model, taking into account available age and weight data from three beam trawl surveys (2003–2016, Q3).

The downward trend in fishing mortality estimated by the assessment mirrors that observed in other stocks (plaice and sole) caught by the same fleets. It is expected that the downward trend is seen in all bycatch species from these fleets, supporting the results of the assessment.

### Issues relevant for the advice

Dab is mainly a bycatch species in the demersal fisheries for North Sea plaice and sole and has high discards. Landings data prior to 1998 are not complete and are not indicative of catches. Discards were estimated for the years 2002–2016. Discard information was available for the most important fisheries, but discard values had to be raised in some cases. This procedure may introduce uncertainty in the estimation of total catch, given the extremely high proportion of discards in the catch (91%). Furthermore, survival rates of discards are unknown.

Large effort reductions of about 60% in beam and otter trawl fisheries took place in the period 2000–2015 (STECF, 2016).

ICES was requested to assess the risk to the stocks of dab and flounder of having no catch limits for these stocks (ICES, 2017a). ICES advised that the risk of having no catch limits for the stocks of dab and flounder is currently considered to be low and not inconsistent with the objectives of the Common Fisheries Policy (ICES, 2017a). The advice is valid as long as dab and flounder remain largely bycatch species, with the main fleets catching dab and flounder continuing to fish the target species (plaice and sole) sustainably within the  $F_{MSY}$  ranges provided by ICES. Consequently, the combined TAC for dab and flounder for Subarea 4 and Division 2.a was removed by the European Commission Council Regulation (EU) 2017/595 in March (EU, 2017).

During the benchmark the total catch was revised. Therefore, the advice this year is based on the average catch of the most recent three years and not on the recent advised catch.

In 2017, for the first time, the fishing pressure and stock size status indicators are based on the SPiCT analyses.

## Reference points

**Table 4** Dab in Subarea 4 and Division 3.a. Reference points, values, and their technical basis.

Framework	Reference point	Value	Technical basis	Source
MSY approach	MSY $B_{\text{trigger\_proxy}}$	$\frac{B}{B_{MSY}} = 0.5^*$	Relative value from the SPiCT model. $B_{MSY}$ is estimated directly from the SPiCT assessment model and changes when the assessment is updated.	ICES (2017b)
	$F_{MSY\_proxy}$	$\frac{F}{F_{MSY}} = 1^*$	Relative value from the SPiCT model. $F_{MSY}$ is estimated directly from the SPiCT assessment model and changes when the assessment is updated.	ICES (2017b)
Precautionary approach	$B_{lim}$	Not defined		
	$B_{pa}$	Not defined		
	$F_{lim}$	Not defined		
	$F_{pa}$	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 proxy MSY reference points.

## Basis of the assessment

**Table 5** Dab in Subarea 4 and Division 3.a. Basis of the assessment and advice.

ICES stock data category	3 ( <a href="#">ICES, 2016b</a> ).
Assessment type	Survey trends-based assessment (based on SURBA assessment) (ICES, 2017b).
Input data	Catch statistics, age-based survey index (combined BTS Q3), annual weight-at-age from surveys.
Discards and bycatch	Discards were quantified for the period 2002–2016. Discards ranged between 87% and 93% of the total
Additional indicators	SPiCT assessment, including additional surveys.
Other information	This stock was last benchmarked in 2016 (WKNSEA; ICES, 2016a).
Working group	Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak ( <a href="#">WGNSSK</a> )

## Information from stakeholders

There is no additional available information.

**History of the advice, catch, and management**

**Table 6** Dab in Subarea 4 and Division 3.a. ICES advice and official landings. All weights are in tonnes.

Year	ICES advice	Predictions corresp. to advice		Agreed TAC * in 2.a and 4, dab & flounder	Official landings in 4 and 3.a		ICES landings in 4 and 3.a, dab	ICES discards in 4 and 3.a, dab	ICES total catch in 4 and 3.a, dab
		landings	catches		dab & flounder	dab			
2006		-	-	17100	14923	9914	10236	37977	48214
2007		-	-	17100	14192	10127	9881	33328	43208
2008		-	-	18810	11791	8551	8645	27379	36024
2009		-	-	18810	10148	7060	7040	33421	40461
2010		-	-	18810	11195	7830	8279	42486	50765
2011		-	-	18434	10565	7372	7422	44460	51882
2012	No increase in catch	-	-	18434	9059	6749	7047	52632	59679
2013	No new advice, same as for 2012	-	-	18434	7960	6084	6611	53476	60087
2014	No more than 7% increase in landings	< 7795 **	-	18434	7025	4957	5047	53733	58780
2015	No new advice, same as for 2014	< 7795 **	-	18434	6204	4321	5082	47372	52454
2016	Precautionary approach (increase catches by no more than 20%)		< 76075 ***	18434	6691 ^	4955 ^	5085	44811	49896
2017	Precautionary approach (same advised catch value as given for 2016)		< 76075 ***	no TAC					
2018	Precautionary approach (increase catches by no more than 20%)		< 64452 ***	-					
2019	Precautionary approach (increase catches by no more than 20%)		< 64452 ***	-					

\* EU combined TAC for dab and flounder in EU waters of Division 2.a and Subarea 4.

\*\* Advice based on landings.

\*\*\* Advice based on recent three years' average catch.

^ Preliminary.

## History of the catch and landings

**Table 7** Dab in Subarea 4 and Division 3.a. Catch distribution by fleet in 2016 as estimated by ICES.

Catch (2016)	Landings				Discards
	Beam trawl 61%	Otter trawl 22%	Seines 6%	Others 11%	
49896 tonnes	5085 tonnes				44811 tonnes

**Table 8** Dab in Subarea 4 and divisions 3.a. History of commercial landings. Official estimates of landings, and ICES estimates of landings and discards. All weights are in tonnes.

### Subarea 4: Official landings

Year	Belgium	Germany	Denmark	France	Faroes	UK	Netherlands	Norway	Sweden	Total area 4
1950	254	92	900	139	0	2555	2031	0	0	5971
1951	462	114	1800	90	0	3503	2221	0	0	8190
1952	386	74	1562	227	0	2823	2904	0	0	7976
1953	357	58	1337	189	0	2591	1383	0	0	5915
1954	255	62	1666	177	0	2393	1099	0	0	5652
1955	305	92	2923	161	0	1993	1149	0	0	6623
1956	338	99	1766	138	0	1660	1368	0	99	5468
1957	336	73	1983	154	0	1785	1669	0	127	6127
1958	290	71	2320	175	0	1885	1517	0	84	6342
1959	285	93	1433	146	0	2011	1265	0	6	5239
1960	246	70	1833	154	0	1813	1052	0	0	5168
1961	227	67	1497	161	0	1734	916	0	0	4602
1962	205	54	1357	147	0	1524	795	0	0	4082
1963	306	40	1660	128	0	1481	1000	0	0	4615
1964	424	48	1612	672	0	1177	1049	0	0	4982
1965	432	64	1841	734	0	1099	1349	0	0	5519
1966	507	65	1589	719	0	1215	1767	0	0	5862
1967	384	77	659	716	0	1147	1341	0	0	4324
1968	334	57	861	350	0	877	1516	0	0	3995
1969	302	69	984	448	0	689	1630	0	0	4122
1970	338	71	1476	588	0	752	1958	0	0	5183
1971	409	46	1546	618	0	986	2941	0	0	6546
1972	638	46	1816	727	0	1057	3617	0	0	7901
1973	678	41	1899	873	0	1349	3638	1179	0	9657
1974	281	59	1168	310	0	1227	4101	0	0	7146
1975	600	45	944	418	0	992	4031	0	3	7033
1976	489	52	852	306	0	816	3402	0	0	5917
1977	652	70	743	371	0	907	3959	0	0	6702
1978	520	64	799	513	0	1038	3473	0	0	6407
1979	484	87	1366	630	0	951	4724	0	1	8243
1980	518	24	1376	639	0	777	5023	0	0	8357
1981	542	31	1968	447	0	737	4729	0	0	8454
1982	460	42	2356	594	0	1002	5111	0	0	9565
1983	541	49	4428	495	0	1034	5318	0	0	11865
1984	603	35	3438	486	0	920	0	0	0	5482
1985	509	24	3535	404	0	1030	0	0	0	5502
1986	445	34	1400	289	0	1036	0	0	1	3205
1987	514	36	1574	434	0	1373	0	0	0	3931
1988	697	72	1324	349	0	1221	3404	0	0	7067
1989	443	117	1280	223	0	1232	2521	0	0	5816
1990	416	162	1103	214	0	802	0	0	4	2701
1991	491	290	1160	258	0	1249	0	0	0	3448
1992	464	218	699	217	0	1049	0	0	0	2647
1993	548	493	1016	235	0	1017	0	0	0	3309
1994	397	626	1307	133	0	1398	0	0	0	3861
1995	410	0	1306	155	1	1993	0	0	0	3865
1996	527	718	1484	177	0	1928	0	0	0	4834
1997	507	945	1399	124	0	2284	0	0	0	5259

Year	Belgium	Germany	Denmark	France	Faroes	UK	Netherlands	Norway	Sweden	Total area 4
1998	757	796	1024	126	0	2085	7971	0	0	12759
1999	802	758	1101	0	0	1964	8651	0	0	13276
2000	684	892	785	124	0	1534	6527	49	0	10595
2001	575	878	839	206	0	1368	5886	47	0	9799
2002	516	582	1126	228	0	1224	4951	51	0	8678
2003	396	642	1580	154	0	1204	4955	77	0	9008
2004	382	767	1136	121	0	1158	4989	55	0	8608
2005	372	1105	1128	121	0	1193	5352	131	0	9402
2006	369	1149	949	129	0	1415	5071	107	0	9189
2007	436	526	634	194	0	1212	6313	118	0	9433
2008	372	375	670	160	0	847	5544	61	0	8029
2009	349	262	489	197	0	648	4588	29	0	6562
2010	337	365	523	179	0	724	5097	16	0	7241
2011	243	312	622	166	0	646	4808	30	0	6827
2012	455	253	421	126	0	665	4136	40	0	6096
2013	406	332	404	84	0	647	3314	26	0	5213
2014	304	282	253	72	0	505	2907	23	0	4346
2015*	242	244	250	75	0	336	2438	10	0	3595
2016*	321	244	412	75	0	372	2611	35	0	4070

\*Preliminary catch statistics.

**Subarea 4: ICES estimates of landings and discards**

Year	Total landings	Total discards
2002	7806	24044
2003	8371	39951
2004	7819	30345
2005	8635	31379
2006	9447	34476
2007	9130	29438
2008	8116	25284
2009	6539	30636
2010	7700	39202
2011	6851	41659
2012	6194	45491
2013	5511	49393
2014	4376	49633
2015	4046	37742
2016	4129	39874

**Division 3.a: Official landings**

Year	Belgium	Germany	Denmark	France	Netherlands	Norway	Sweden	Total area 3.a.
1950	0	34	1253	0	0	0	0	1287
1951	0	17	1315	0	0	0	0	1332
1952	0	21	1273	0	0	0	0	1294
1953	0	9	1114	0	0	0	0	1123
1954	0	4	1233	0	0	0	0	1237
1955	0	3	1254	0	0	0	0	1257
1956	0	5	1462	0	0	0	614	2081
1957	0	5	2025	0	0	0	694	2724
1958	0	4	1578	0	0	0	628	2210
1959	0	2	1307	0	0	0	634	1943
1960	0	1	1313	0	0	0	0	1314
1961	0	0	1367	0	0	0	0	1367
1962	0	2	1681	0	0	0	0	1683
1963	0	0	1565	0	0	0	0	1565
1964	0	1	1574	0	0	0	0	1575
1965	0	1	2051	0	0	0	0	2052
1966	0	0	1755	0	0	0	0	1755
1967	0	0	1115	0	0	0	0	1115
1968	0	0	1535	13	0	0	0	1548
1969	0	0	1430	0	0	0	0	1430
1970	0	0	1079	0	0	0	0	1079
1971	0	0	1242	0	0	0	0	1242
1972	0	0	1669	0	0	0	0	1669
1973	0	0	1449	0	0	0	0	1449
1974	0	0	2003	0	0	0	0	2003
1975	0	0	1959	0	2	0	88	2049
1976	10	0	1493	0	80	0	0	1583
1977	11	0	2105	0	142	0	60	2318
1978	2	0	2515	0	39	0	74	2630
1979	3	0	2616	0	15	0	82	2716
1980	3	0	2218	0	3	0	109	2333
1981	0	0	2574	0	5	0	100	2679
1982	1	0	2823	0	22	0	56	2902
1983	1	0	2759	0	34	0	112	2906
1984	0	0	2695	0	0	0	74	2769
1985	1	0	1486	0	0	0	58	1545
1986	5	0	1551	0	0	0	52	1608
1987	19	0	2182	0	0	0	57	2258
1988	13	0	2150	0	15	0	76	2254
1989	4	0	2302	0	0	0	40	2346
1990	3	0	1535	0	0	0	36	1574
1991	5	1	1556	0	0	0	47	1609
1992	10	0	1412	0	0	0	32	1454
1993	7	0	1656	0	0	0	32	1695
1994	9	0	1917	0	0	0	35	1961
1995	3	0	1482	0	0	0	45	1530
1996	0	0	1387	0	0	0	18	1405
1997	0	0	990	0	0	0	22	1012
1998	0	0	942	0	0	0	19	961
1999	0	0	661	0	0	0	12	673
2000	0	0	647	0	0	1	6	654
2001	0	0	751	0	0	7	7	765
2002	0	0	968	0	0	3	6	977
2003	0	0	674	0	173	14	4	865
2004	0	0	637	0	138	1	3	779
2005	0	0	738	0	95	0	3	836
2006	0	20	566	0	117	18	4	725



Year	Belgium	Germany	Denmark	France	Netherlands	Norway	Sweden	Total area 3.a.
2007	0	9	547	0	126	3	9	694
2008	0	12	475	0	26	2	7	522
2009	0	4	478	0	3	1	12	498
2010	0	4	426	0	151	0	8	589
2011	0	10	517	0	0	11	7	545
2012	0	5	632	0	0	10	6	653
2013	0	11	654	0	174	26	6	871
2014	0	12	501	0	75	2	21	611
2015*	0	8	687	0	0	8	23	726
2016*	0	9	647	0	189	14	24	883

\*Preliminary catch statistics.

**Division 3.a: ICES estimates of landings and discards**

Year	Total landings	Total discards
2002	1010	2587
2003	1062	4980
2004	828	3928
2005	902	3912
2006	789	3501
2007	751	3890
2008	529	2095
2009	501	2785
2010	579	3284
2011	571	2801
2012	853	7141
2013	1100	4083
2014	672	4100
2015	1036	9630
2016	956	4937

**Summary of the assessment**

**Table 9** Dab in Subarea 4 and Division 3.a. Assessment summary. Weights are in tonnes. Landings: official estimates 1965–2001, ICES estimates 2002–2016.

Year	Recruitment Age 1 Relative	SSB Relative	Landings tonnes	Discards tonnes	Z Ages 1–6 Relative
1965			7571		
1966			7617		
1967			5439		
1968			5543		
1969			5552		
1970			6262		
1971			7788		
1972			9570		
1973			11106		
1974			9149		
1975			9082		
1976			7500		
1977			9020		
1978			9037		
1979			10959		
1980			10690		
1981			11133		
1982			12467		
1983			14771		
1984			8251		
1985			7047		
1986			4813		
1987			6189		
1988			9321		
1989			8162		
1990			4275		
1991			5057		
1992			4101		
1993			5032		
1994			5824		
1995			5395		
1996			6243		
1997			6274		
1998			13722		
1999			13951		
2000			11255		
2001			10565		
2002			8588	26631	
2003	0.54	0.59	9433	44930	1.26
2004	0.55	0.59	8647	34273	1.21
2005	0.57	0.64	9537	35291	1.08
2006	0.60	0.60	10236	37977	0.95
2007	0.73	0.80	9881	33328	1.13
2008	1.03	0.74	8645	27379	1.26
2009	1.00	0.79	7040	33421	1.24
2010	1.13	0.98	8279	42486	0.91
2011	1.13	0.94	7422	44460	0.90
2012	1.34	1.17	7047	52632	1.00
2013	1.42	1.26	6611	53476	0.78
2014	1.52	1.41	5047	53733	0.67
2015	1.36	1.52	5082	47372	0.86
2016	1.09	1.97	5085	44811	0.77

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