

ECOREGION Widely distributed and migratory stocks
STOCK Spurdog (*Squalus acanthias*) in the Northeast Atlantic

Advice for 2015 and 2016

ICES advises on the basis of the MSY and the precautionary considerations that there should be no target fishery and that bycatch should be minimized. Survival of discards is highly variable. Bycatch should be managed as part of a rebuilding plan, including close monitoring of the stock and fishery.

Stock status

		Fishing pressure			
		2011	2012	2013	
MSY (F_{MSY})		✓	✓	✓	Appropriate
Precautionary approach (F_{pa} , F_{lim})		?	?	?	Undefined
		Stock size			
		2012	2013	2014	
MSY ($B_{trigger}$)		✗	✗	✗	Below trigger
Precautionary approach (B_{pa} , B_{lim})		?	?	?	Undefined

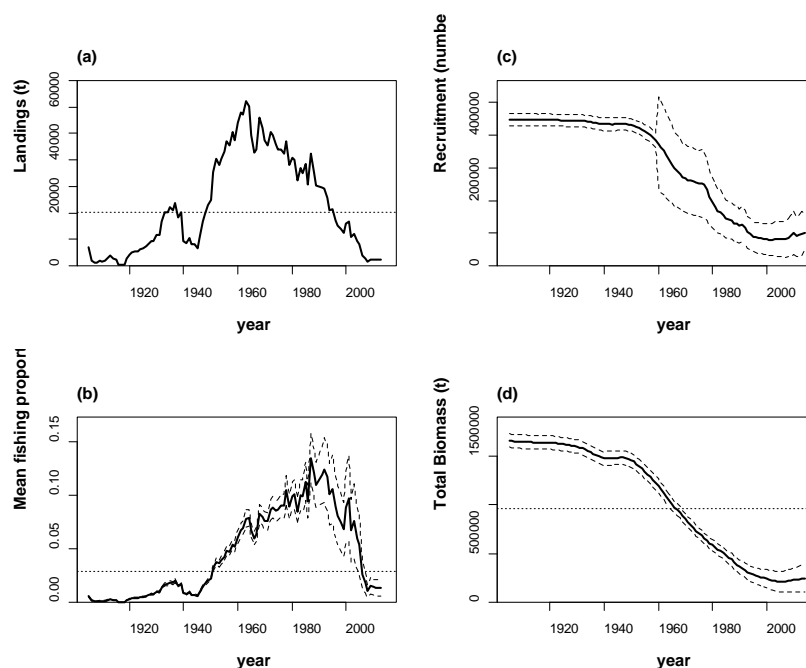


Figure 9.3.26.1 Spurdog in the Northeast Atlantic. Summary of stock assessment (weights in tonnes). Long-term trends in (a) landings, (b) mean harvest rate (average ages 5–30), (c) recruitment (number of pups), and (d) total biomass. Dashed lines reflect estimates of precision (± 2 standard deviation) and dotted horizontal lines indicate the associated MSY levels.

The spawning biomass and recruitment have declined substantially since the 1960s to the lowest observed. SSB and recruitment are now showing slight increases from these historical lows. Fishing mortality has declined substantially and is estimated to be well below the MSY level.

Management plans

There is no management plan for this stock in the ICES area.

Biology

Squalus acanthias is a long-lived, slow-growing, live-bearing, and late-maturing species, and is therefore particularly vulnerable to exploitation. Population productivity is low, with low fecundity and a protracted gestation period (2 years). Spurdog form size- and sex-specific shoals and aggregations of large fish (including of mature females) are easily targeted by longline and gillnet fisheries.

Environmental influence on the stock

The effect of changes in the environment on spurdog populations is not known. There may be indirect effects, as spurdog predate on small pelagic fish, which are affected by environmental conditions. An increased frequency of occurrence in Norwegian waters in recent years may be caused by immigration to this area due to food availability and favourable environmental conditions.

The fisheries

Spurdog are largely taken in mixed demersal and gillnet fisheries. As the TAC was set at zero, there have been no target fisheries in EC or Norwegian waters since 2011. An unquantified amount of discarding now takes place in mixed demersal trawl and gillnet fisheries operating in EC waters. Discard mortality is low in longline fisheries, and higher in trawl and gillnet fisheries. Exact levels are unknown, and will vary with soaktime and quantity caught.

Catch distribution Total catch (2013) is unknown; the official catch in 2013 was 332 t. Discarding is known to take place but cannot be fully quantified.

Quality considerations

There are concerns over the quality of the catch data (including total catch and length compositions of the landings). Discarding rates since the zero TAC was introduced are uncertain, as is the survivorship of the discards. In the absence of commercial data, information from scientific trawl surveys will be increasingly important to monitor any stock recovery. See supporting information for more details.

An estimate of total catch is used in the assessment for the years after the introduction of a zero TAC. Reported landings are not representative of true removals.

Scientific basis

Stock data category	1 (ICES, 2014a).
Assessment type	Age-length and sex-structured model (De Oliveira et al., 2013).
Input data	GLM standardized Scottish survey index, Scottish survey length–frequency data (ScoGFS-WIBTS-Q1, ScoGFS-WIBTS-Q4, Sco-IBTS-Q1, Sco-IBTS-Q3), total landings, and UK (E & W) and UK (Scotland) landings length frequencies.
Discards and bycatch	Discarding is known to take place but cannot be quantified.
Indicators	None.
Other information	A benchmark assessment was carried out in 2010 (ICES, 2010).
Working group report	Working Group on Elasmobranch Fishes (WGEF).

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Reference points

	<i>Type</i>	<i>Value</i>	<i>Technical basis</i>
MSY approach	MSY $B_{trigger}$	963 700 t	MSY $B_{trigger} = B_{msy}$ (in terms of total biomass).
	MSY harvest ratio	0.029	Catch as a proportion of the total biomass, assuming average selection over the period 2008–2010, reflecting a non-target selection pattern.
Precautionary approach	B_{lim}	Not defined.	
	B_{pa}	Not defined.	
	F_{lim}	Not defined.	
	F_{pa}	Not defined.	

(last changed in 2014)

Outlook for 2015 and 2016

Basis: $F_{prop}(2014) = F_{prop}$, the harvest rate associated with a total catch of 2384 t = 0.013; $B_{tot}(2015) = 253\,137$ t total biomass; Recruitment (2014) = 101 581 pups; Catch (2014) = 2384 t (average 2007–2009).

Rationale	Catch		Basis	F_{prop}		B_{tot}		% catch change rel. to 2014		% B_{tot} change rel. to 2015	
	2015	2016		2015	2016	2016	2017	2015	2016	2016	2017
MSY rule	1408	1474	$F_{prop, MSY}$ $B_{tot}(2015)/B_{MSY}$	0.008	0.008	259 310	265 544	-41%	-38%	2.4%	4.9%
Zero catch	0	0	Zero catch	0.000	0.000	260 732	268 453	-100%	-100%	3.0%	6.1%
Last non-zero TAC	1422	1422	TAC 2009 = 1422	0.008	0.008	259 296	265 583	-40%	-40%	2.4%	4.9%
Average 2007–2009	2384	2384	Average 2007–2009 = 2384	0.013	0.013	258 324	263 642	0%	0%	2.0%	4.1%
$F_{prop, MSY}$	5362	5369	F_{prop} at MSY	0.029	0.029	255 316	257 623	125%	125%	0.9%	1.8%

Weights in tonnes.

MSY approach

Following the ICES MSY approach implies a harvest rate of 0.008 (lower than the F_{MSY} proxy because SSB in 2015 is well below MSY $B_{trigger}$), which corresponds to catches from mixed fisheries of no more than 1408 t in 2015 and 1474 t in 2016. This is expected to lead to a total biomass of 259 310 t in 2016 and 265 544 t in 2017.

However, considering the low stock size over the last two decades and the very low productivity of the stock, it is not possible to identify any non-zero catch that would be compatible with the MSY approach. Therefore, ICES advises that there should be no target fishery and that bycatch should be minimized. Survival of discards is highly variable. Any possible provision for bycatch to be landed should be part of a rebuilding plan, including close monitoring of the stock and fishery.

Precautionary considerations

It is not possible to identify any non-zero catch that would be compatible with the precautionary approach; recovery to any candidate B_{pa} will be slow and not biologically feasible under the short-term management time frames.

Spurdog is showing some signs of increase from the historical lows in the mid-2000s, but this period is very short in comparison to the longer-term decline. Spurdog is a long-lived, slow-growing, and late-maturing species and is therefore particularly vulnerable to fishing mortality. ICES thus advises on the basis of the precautionary considerations that there should be no target fishery and that bycatch should be minimized. Survival of discards is highly variable. Any possible provision for bycatch to be landed should be part of a rebuilding plan, including close monitoring of the stock and fishery.

Additional considerations

The stock suffered high harvest rates for more than four decades, and was not managed during this time. Management measures have been restrictive only since 2009.

Historically, spurdogs were subjected to large targeted fisheries but were also taken as a bycatch in mixed trawl fisheries. In the latter fisheries, measures to reduce overall demersal fishing effort may have benefitted spurdog recovery. Discarding of spurdogs has increased with the introduction of zero TACs; some individuals do survive after discarding although the number of survivors varies considerably depending on several factors (e.g. size of catch, catch method, time on deck, etc.).

Harvest ratios have reduced below the MSY level in recent years. However, given the very low productivity of the stock, the timescale for recovery, even under zero catch, will be over a decadal time-frame (Table 9.3.26.4). Conservative management is needed as part of a rebuilding plan to deal with bycatches in mixed fisheries.

Regulations and their effects

Management measures began to impinge on fishing activities from 2007 onwards.

The current zero TAC results in increased discarding from mixed fisheries, a proportion of which are dead fish.

In 2009, a maximum landing length (100 cm) was introduced in EC waters, and this deterred many of the fisheries targeting mature female spurdog.

Norway has a minimum landing size of 70 cm (first introduced in 1964), and from 2011 no directed fishery has been permitted in Norway.

Restrictions on landings of spurdog are thought to have contributed to the increased retention of starry smooth-hounds.

Information from the fishing industry

Reports suggest that the zero TAC since 2011 has increased regulatory discards of spurdogs in mixed fisheries.

Revisions in data and methodologies

The benchmark assessment methodology implemented in 2011 has not been modified. Reliable catch data since 2011 are not available.

Uncertainties in assessment and advice

Because of the number of assumptions made within the assessment model, uncertainty is likely to be underestimated. Estimates of total landings of Northeast Atlantic spurdog have been used, together with UK length–frequency distributions. However, there are still concerns over the quality of the data as a consequence of (a) uncertainty in the historical level of catches because of misreporting and generic landings categories; (b) lack of commercial length–frequency information for countries other than the UK; and (c) lack of discard information. In addition, the survey data examined should be extended to cover the whole stock. Future assessments require updated and validated growth parameters (particularly for larger individuals) and better estimates of natural mortality.

Comparison of the basis of previous assessment and advice

The basis for the assessment has not changed from 2012. The advice in 2012 was based on the precautionary approach. This year's advice is based on the MSY approach and the precautionary approach.

Sources

- ICES. 2010. Report of the Benchmark Workshop on Deep-water Species (WKDEEP). 17–24 February, Copenhagen, Denmark. ICES CM 2010/ACOM:38. 247 pp.
- ICES. 2011. Report of the Working Group on Elasmobranch Fishes (WGEF), 20–24 June 2011, Copenhagen, Denmark. ICES CM 2011/ACOM:19. 492 pp.
- ICES. 2012. Report of the Working Group on Elasmobranch Fishes (WGEF), Lisbon, 19–26 June 2012. ICES CM 2012/ACOM:19.
- ICES. 2014a. Advice basis. *In* Report of the ICES Advisory Committee, 2014. ICES Advice 2014, Book 1, Section 1.2.

ICES. 2014b. Report of the Working Group on Elasmobranch Fishes (WGEF), 17–26 June 2014, Lisbon, Portugal. ICES CM 2014/ACOM:19. 671 pp.

De Oliveira, J. A. A., Ellis, J. R., and Dobby, H. 2013. Incorporating density dependence in pup production in a stock assessment of NE Atlantic spurdog *Squalus acanthias*. ICES Journal of Marine Science, 70: 1341–1353.

Table 9.3.26.1 *Squalus acanthias* in the Northeast Atlantic. ICES advice, management, and landings.

Year	ICES advice	Predicted catch corresp. to advice	Agreed TAC	ICES landings*
1999	None		8.9 ^a	12.4
2000	None		8.9 ^a	15.9
2001	None		8.9 ^a	16.7
2002	None		7.1 ^a	11.0
2003	None		5.6 ^a	12.2
2004	None		4.5 ^a	9.4
2005	None		1.1 ^a	8.4
2006	F = 0	0	1.1 ^a	4.1
2007		0	3.7 ^b	2.9
2008	F = 0	0	2.6 ^c	1.8
2009	No fishery	0	1.4	2.6
2010	No new advice, same as for 2009	0	0.142 ^d	1.3
2011	F = 0	0	0	0.6
2012	F = 0	0	0	0.3
2013	F = 0	0	0	0.3
2014	No new advice, same as for 2013	0	0	
2015	No target fishery, minimize bycatch	0		
2016	No new advice, same as for 2015	0		

Weights in thousand tonnes.

^a TAC for ICES Subarea IV and Division IIa (EC).

^b Combined TAC for ICES Subarea IV and Division IIa (EC) and for ICES Division and Subareas IIIa, I, V, VI, VII, VIII, XII, and XIV (EU and international waters).

^c Combined TAC for ICES Subarea IV and Division IIa (EC) and for ICES Subareas I, V, VI, VII, VIII, XII, and XIV (EU and international waters).

^d Landing of bycatch permitted up to 10% of the 2009 quota.

* Landings for total stock area: Subareas I–IX.

Table 9.3.26.2 *Squalus acanthias* in the Northeast Atlantic. WG estimates of total landings by country (1980–2013).

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Belgium	1097	1085	1110	1072	1139	920	1048	979	657	750	582	393	447	335	396	391
Denmark	1404	1418	1282	1533	1217	1628	1008	1395	1495	1086	1364	1246	799	486	212	146
Faroe Islands	0	22	0	0	0	0	0	0	0	6	2	3	25	137	203	310
France	17 514	19 067	12 430	12 641	8356	8867	7022	11 174	7872	5993	4570	4370	4908	4831	3329	1978
Germany	43	42	39	25	8	22	41	48	27	24	26	6	55	8	21	100
Iceland	36	22	14	25	5	9	7	5	4	17	15	53	185	108	97	166
Ireland	108	476	1268	4658	6930	8791	5012	8706	5612	3063	1543	1036	1150	2167	3624	3056
Netherlands	217	268	183	315	0	0	0	0	0	0	0	0	0	0	0	0
Norway	5925	3941	3992	4659	4279	3487	2986	3614	4139	5329	8104	9633	7113	6945	4546	3940
Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portugal	2	0	0	0	0	0	1	5	3	2	128	188	250	323	190	256
Russia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	8	653	0	0	0	0	0	0	0	0	0	0	0	0
Sweden	399	308	398	300	256	360	471	702	733	613	390	333	230	188	95	104
UK (E&W)	9229	9342	8024	6794	8046	7841	7047	7684	6952	5371	5414	3770	4207	3494	3462	2354
UK (Sc)	4994	3970	3654	4371	4957	6749	6267	8043	8075	8024	7768	8531	9677	6614	4676	8517
Total	40 968	39 961	32 402	37 046	35 193	38 674	30 910	42 355	35 569	30 278	29 906	29 562	29 046	25 636	20 851	21 318

Table 9.3.26.2 (continued) *Squalus acanthias* in the Northeast Atlantic. WG estimates of total landings by country (1980–2013).

Country	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Belgium	430	443	382	354	400	410	23	11	13	20	17	0	0	7	1	0	0	0
Denmark	142	196	126	131	146	156	107	232	219	82	68	0	0	0	11	26	31	20
Faroe Islands	51	218	362	486	368	613	340	224	295	225	271	241	144	462	179	104	0	0
France	1607	1555	1286	998	4342	4304	2569	1705	1062	2426	715	453	366	577	348	131	42	13
Germany	38	21	31	54	194	304	121	98	138	144	6	0	0	1	1	1	1	0
Iceland	156	106	80	57	107	199	276	200	142	71	75	36	52	95	58	51	44	6
Ireland	2305	2214	1164	904	905	1227	1214	1416	1076	940	614	558	163	214	26	11	2	27
Netherlands	0	0	0	0	28	39	27	10	25	41	34	28	26	5	7	2	28	3
Norway	2748	1567	1293	1461	1643	1424	1091	1119	1054	1010	790	616	711	543	541	246	108	251
Poland	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Portugal	120	100	46	21	2	3	4	4	9	6	10	9	4	2	2	3	2	2
Russia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Spain	0	0	28	95	372	363	306	135	17	71	106	16	15	32	6	4	0	4
Sweden	154	196	140	114	123	238	0	275	244	170	148	95	9	80	5	0	0	0
UK (E&W)	2670	3066	4480	4461	3654	4516	2823	3109	1729	1887	434	386	91	194	8	0	2	1
UK (Sc)	6873	5665	4501	3248	3606	2897	2120	3708	3342	1263	766	415	178	345	56	1	1	6
Total	17 294	15 347	13 919	12 384	15 890	16 693	11 020	12 246	9365	8356	4054	2853	1759	2557	1248	580	261	332

Table 9.3.26.3

Squalus acanthias in the Northeast Atlantic. Summary table of estimates from the spurdog assessment: recruitment (number of pups), total biomass (tonnes), harvest rate (fishing proportion averaged over ages 5–30), and WG estimates of catch (tonnes) used in the assessment.

	R (pups)	B _{tot} (t)	Catch (t)	F _{prop} (5-30)
1980	194517	586414	40968	0.099
1981	178369	563219	39962	0.101
1982	167952	540433	32402	0.085
1983	165597	524746	37046	0.100
1984	154639	503214	35194	0.099
1985	144153	482359	38674	0.113
1986	141588	457365	30910	0.094
1987	137549	439403	42354	0.134
1988	130157	409212	35569	0.121
1989	130698	385706	30277	0.110
1990	121928	366801	29906	0.114
1991	127916	348548	29563	0.120
1992	117597	330032	29046	0.124
1993	103180	311231	25637	0.117
1994	99145	295683	20851	0.101
1995	87977	284231	21318	0.106
1996	87367	272148	17295	0.089
1997	86327	263736	15347	0.081
1998	84650	256762	13919	0.075
1999	82211	250646	12385	0.068
2000	82122	245646	15889	0.089
2001	80504	236746	16693	0.097
2002	80137	226875	11020	0.067
2003	82465	222723	12247	0.076
2004	82188	217241	9364	0.060
2005	82345	214615	8357	0.054
2006	81662	212924	4055	0.026
2007	83513	215591	2853	0.018
2008	86982	219551	1737	0.011
2009	91749	224770	2561	0.016
2010	101399	229615	2384	0.014
2011	91208	233931	2384	0.014
2012	93457	238353	2384	0.014
2013	99445	243135	2384	0.014

Table 9.3.26.4

Squalus acanthias in the Northeast Atlantic. Extension of short-term forecasts to the medium- to longer-term (3, 5, 10, and 30 years beyond 2014). Estimates of total biomass relative to the total biomass in 2014 for different future catch options, assuming that the catch in 2014 is 2384 tonnes (see Outlook table for 2015 and 2016). Point estimates are shown in the upper third of the table, with corresponding lower and upper values (reflecting ± 2 standard deviations) given in the middle and bottom third of the table.

	Medium-term projections				F _{prop,MSY}
	MSY rule	zero	TAC 2009	Ave land 2007-9	
ave Catch	2746	0	1422	2384	6125
Point estimates					
+ 3 yrs	1.07	1.08	1.07	1.06	1.04
+ 5 yrs	1.12	1.15	1.12	1.11	1.06
+ 10 yrs	1.25	1.32	1.27	1.23	1.11
+ 30 yrs	1.85	2.21	2.02	1.88	1.35
Point estimates - 2 standard deviations					
+ 3 yrs	1.05	1.06	1.05	1.04	1.01
+ 5 yrs	1.08	1.11	1.08	1.07	1.02
+ 10 yrs	1.18	1.25	1.19	1.15	1.04
+ 30 yrs	1.57	1.97	1.81	1.65	1.18
Point estimates + 2 standard deviations					
+ 3 yrs	1.09	1.11	1.10	1.09	1.06
+ 5 yrs	1.16	1.18	1.16	1.15	1.10
+ 10 yrs	1.33	1.39	1.34	1.31	1.18
+ 30 yrs	2.13	2.44	2.22	2.12	1.53

"ave Catch" is the average for the period 2015-2043