Contents

6 Porbeagle in the Northeast Atlantic (Subareas I–XIV)

6.1 Stock distribution

WGEF considers that there is a single-stock of porbeagle *Lamna nasus* in the NE Atlantic that occupies the entire ICES area (Subareas I–XIV). This stock extends from Norway, Iceland and the Barents Sea to Northwest Africa. For management purposes the southern boundary of the stock is 36°N and the western boundary at 42°W.

The information used to identify the stock unit is in the Stock Annex (WGEF 2011).

A transatlantic migration has been reported (Green, 2007) and more recently a porbeagle tagged with a pop-up archival transmission tag off Ireland crossed over half of the North Atlantic before the tag was released (Bendall *et al*., 2012). Furthermore, a recent work (Pade, 2009) has confirmed that some gene flow occurs across the North Atlantic.

6.2 The fishery

6.2.1 History of the fishery

The main countries catching porbeagle in recent years were France and, to a lesser extent, Spain, UK and Norway. The only regular, directed target fishery that has existed recently was the French fishery (although there have been occasional targeted fisheries in the UK). However, historically there were important Norwegian, Danish and Faroese target fisheries. In addition, the species is taken as a bycatch in mixed fisheries, mainly in UK, Ireland, France and Spain.

A detailed history of the fishery is in the stock annex.

6.2.2 The fishery in 2011

No fishery has been allowed since the implementation of a zero TAC in 2010. However, some landings are reported in 2011 as in 2010 (Table 6.1b). The 2011 total landing (17 t) but must be considered as provisional and dead discards are not fully quantified. The 2008–2010 landings figures have been revised by using FAO and ICCAT data base. The 2010 landings are now close to 100 t with the same landing limits than in 2010. These landings are reported mainly by Spain, with smaller contributions of Faroe Islands, France and Norway.

6.2.3 ICES advice applicable

The advice is biennial and consequently the 2010 advice remains valid for 2011 and 2012.

ICES reiterated the precautionary advice it gave in 2008 for 2009:

'Given the state of the stock, no targeted fishing for porbeagle should be permitted and bycatch should be limited and landings of porbeagle should not be allowed.'

In 2010, ICES also advised that there was no catch option that would be compatible with the ICES MSY framework.

6.2.4 Management applicable

Since 2012, EC Regulations 23/2010, 57/2011 and 44/2012 have prohibited fishing for porbeagle in EU waters and, for EU vessels, to fish for, to retain on board, to tranship and to land porbeagle in international waters.

EC Regulation 40/2008 established a TAC for porbeagle taken in EC and international waters of I, II, III, IV, V, VI, VII, VIII, IX, X, XII and XIV of 581 t. In 2009, the TAC was reduced to 436 t (a decrease of 25%) and regulations stated that "*A maximum landing size of 210 cm (fork length) shall be respected*" (EC Regulation No 43/2009).

In 2007 Norway banned all direct fisheries for porbeagle, based on the ICES advice. Specimens taken as bycatch can be landed and sold as before.

It is forbidden to catch and land porbeagle in Sweden since 2004.

EC Regulation 1185/2003 prohibits the removal of shark fins of this species, and subsequent discarding of the body. This regulation is binding on EC vessels in all waters and non-EC vessels in Community waters.

In 2007 Norway banned all direct fisheries for porbeagle, based on the ICES advice. In the period 2007–2011, specimens taken as bycatch could be landed and sold. Since 2011, live specimens must be released, whereas dead specimens can (not must) be landed. The number of specimens landed must be reported in addition to weight. Since 2012, landings of porbeagle are not remunerated. From 2011, the regulations also include recreational fishing.

6.3 Catch data

6.3.1 Landings

Tables 6.1a, b and Figures 6.1–6.2 show the historical landings of porbeagle in the Northeast Atlantic. From 1971 upwards, France remained the major contributor.

Note that these data need to be treated as underestimates and with some caution (see Section 6.3.3).

More detailed information on landings is presented in the stock annex.

6.3.2 Discards

No information is available on the discards of the non targeted fishery, although as a high value species, it is likely that specimens caught as bycatch were landed and not discarded before quota was restrictive.

Discards are thought to have been limited, although some métiers (e.g. gillnet fisheries in the Celtic sea) can be seasonally important.

Because of the EU adoption of a maximum landing size, some large fish were discarded by boats of the directed fishery in 2009 but there is no account of the number these discards.

6.3.3 Quality of catch data

Landings data are incomplete and further studies are required to better collate or estimate historical catch data (more information is available in the stock annex). Recent data are lacking as dead bycatch is discarded (i.e. removals from the stock).

6.4 Commercial catch composition

Only limited length–frequency data are available for porbeagle. However, length distributions by sex are available for 2008 and 2009 (Hennache and Jung, 2010) for the French target fishery (Figure 6.3). They can be considered to be representative of the international catch length distribution in these years, given the high contribution of the French fishery to these catches.

The composition by weight class (<50 kg and ≥50 kg) of the French fishery catches reveals that the proportion of large porbeagle in the landings has decreased since 1993 (Table 6.2).

Sampling of the catches of the French fishery carried out in 2009 highlighted the dominance of porbeagle (89% of catch weight), with other species including blue shark (10%), common thresher (0.6%) and tope (0.3%).

6.4.1 Conversion factors

Length–weight relationships are available from different areas and for different periods (Table 6.3). The conversion factors collected from the French targeted fishery landings have been updated using data from the 2009 sampling.

6.5 Commercial catch–effort data

A cpue series was presented at the 2009 WGEF for the French targeted fishery (Biais and Vollette, 2009). It was based on 17 boats which had landed more than 500 kg of porbeagle per year for more than six years after 1972 and more than four years from 1999 onwards (to include a boat which has entered recently in the fishery, given the limited number of boats in recent years). This series is longer than the previous ones (in stock annex) and it provides catch and effort (days at sea) by vessel and month. A GLM analysis was carried out at 2009 ICCAT-ICES porbeagle stock assessment meeting to get a standardized cpue series.

At the 2009 ICCAT-ICES meeting standardized catch rates were also presented for North Atlantic porbeagle during the period 1986–2007, caught as low prevalent bycatch in the Spanish surface longline fishery targeting swordfish in the Atlantic Ocean (Mejuto *et al.*, 2009). The analysis was performed using a GLM approach that considered several factors such as longline style, quarter, bait and also spatial effects by including seven zones.

The nominal and the standardized catch rate series of the French fleet demonstrate higher values occurring at the end of the 1970s (Figure 6.4). Since then, cpue has varied between 400–900 kg per day without displaying any trend.

This absence of trend in the last part of the times-series has been confirmed by an analysis of the effect of porbeagle aggregating behaviour, as well as an effect of cooperation between skippers. The analysis was carried out for years 2001–2008 for which period detailed data were available (Biais and Vollette, 2010). This analysis showed also that local abundance in the French fishing area may likely be multiplied/divided by two between successive years. Consequently, short-term changes must be considered with caution when using French cpue to assess a stock abundance trend of the Northeast Atlantic stock.

Spanish data were more variable (Figure 6.5), possibly as porbeagle is only a bycatch in this fishery, and so the fleet may operate in areas where there are fewer porbeagle.

6.6 Fishery-independent surveys

No fishery-independent survey data are available for the NE Atlantic, although records from recreational fisheries may be available. Tagging studies are the only fishery-independent data currently available (see Section 6.8).

6.7 Life-history information

The life-history information (including habitat description) is presented in stock annex.

Saunders *et al.* (2011) report on the migration of three porbeagles tagged off Ireland with archival pop-up tags (PAT) in 2008 and 2009. One shark migrated 2400 km to the northwest of Morocco, residing around the Bay of Biscay for about 30 days. The other two remained more localized in off-shelf regions around the Celtic Sea/Bay of Biscay and off western Ireland. They occupied a vertical depth range of 0–700 m in waters of 9–17°C. They were positioned higher in the water column by night than by day. The Irish tagging programme is continuing. 7 PATs should be deployed in 2012–2013. (Saunders, pers. comm.)

The United Kingdom (Cefas) has also launched a tagging program in 2010 to address the issue of bycatch of porbeagle and to further promote the understanding of their movement patterns in UK marine waters. Altogether, 21 satellite tags were deployed between July 2010 and September 2011, and 15 tags popped off after two to six months. However, four tags failed to communicate. Six tags remain deployed. The tags attached to sharks in the Celtic Sea generally popped off to the south of the release positions while those to sharks off the northwest coast of Ireland popped off in diverse positions. One of them popped off in the western part of North Atlantic, one close to the Gibraltar Straits and another in the North Sea. Several tags popped off close to the point of release (Bendall *et al.*, 2012).

In June–July 2011, France (Ifremer and IRD) joined this international tagging effort in cooperation with Cefas by a survey on the shelf edge in the West of Brittany. Three PATs were deployed by Ifremer-IRD and three by Cefas (results in Bendall *et al.*, 2012). Pop-off dates were set at 12 months for three Ifremer-IRD PSATs which were all used to tag large females (LT>2 m). Only one has yet popped off prematurely in February 2012 near Norway revealing migration to the Norwegian Sea through the Saint George's Channel. The French tagging program should allow deploying nine more PATs in 2012 or in 2013.

Information on sex-ratio segregations, the likelihood of a nursery ground in the Saint Georges Channel, the diet and on life-history parameters were provided by a research programme carried out by the NGO APECS (Hennache and Jung, 2010) and are available in the stock annex.

6.7.1 Genetic information

A preliminary study of the genetic diversity (mitochondrial DNA haplotype and nucleotide diversities) was carried out recently on 156 individuals from the Northeast Atlantic and Northwest Atlantic, demonstrating no significant population structure across the North Atlantic. It has shown mtDNA haplotype diversity is very high, and sequence diversity is low, suggesting that most females breed, indicating the stock is likely to be genetically robust (Pade, 2009), although further confirmation is required.

6.8 Exploratory assessment models

6.8.1 Previous studies

The first assessment of the NE Atlantic stock was carried out in 2009 by the joint ICCAT/ICES meeting using a Bayesian Surplus Production (BSP) model (Babcock and Cortes, 2009) and an age structured production (ASP) model (Porch *et al.*, 2006).

6.8.2 Stock assessment

The 2009 assessments have not been updated since.

* BSP model

The BSP model uses catch and standardized cpue data (see Section 6.5.2 in ICES, 2009 (WGEF) report and ICCAT, 2009). Because the highest catches occurred in the 1930s and 1950s, long before any cpue data were available to track abundance trends, several variations of the model were tried, either starting the model run in 1926 or 1961, and with a number of different assumptions. An informative prior was developed for the rate of population increase (r) based on demographic data of the NW Atlantic stock. The prior for K was uniform on log K with an upper limit of 100 000 t. This upper limit was set to be somewhat higher than the total of the catch series from 1926 to the present (total catch= 92 000 t). All of the trials demonstrated that the population continued to decline slightly after 1961, consistent with the trend in the French cpue series.

The model runs used the most biologically plausible assumptions about unfished biomass or biomass in 1961. The relative 2008 biomass (B2008/BMSY) can be estimated between 0.54 and 0.78 and the relative 2008 fishing mortality rates (F_{2008}/F_{MSY}) between 0.72 and 1.15.

*ASP model

An age-structured production model was also applied to the NE Atlantic stock of porbeagle to provide contrast to the BSP model (see ICCAT, 2009). The same input data used in the BSP model were applied but incorporating age-specific parameters for survival, fecundity, maturity, growth, and selectivity. The stock–recruitment function is also parameterized in terms of maximum reproductive rate at low density.

Depending on the assumed F in the historic period (the model estimated value was considered to be unrealistic), the 2008 relative spawning–stock fecundity (SSF_{2008}/SSF_{MSY}) was estimated between 0.21 and 0.43 and the 2008 relative fishing mortality rate (F_{2008}/F_{MSY}) between 2.54 and 3.32.

The conclusions of these assessments were that the exploratory assessments indicate that current biomass is below B_{MSY} and that recent fishing mortality is near or possibly above F_{MSY}. However, the lack of cpue data for the peak of the fishery adds considerable uncertainty in identifying the current status relative to virgin biomass.

6.8.3 Stock projections

The projections (using the BSP model) were that sustained reductions in fishing mortality would be required if there is to be any stock recovery. Recovery of this stock to B_{msy} under zero fishing mortality would take ca. 15–34 years. Although model outputs suggested that low catches (below 200 t) may allow the stock to increase under

most credible model scenarios, the recovery to B_{MSY} could be achieved within 25–50 years under nearly all model scenarios (Table 6.4).

Yield and Biomass per Recruit

A yield-per-recruit analysis using FLR (ww.flr-project.org) was conducted by the ICCAT/ICES WG.

The effects of different selection patterns on the NE Atlantic porbeagle stock were evaluated: flat-topped and dome-shaped curves and with maximum selectivity at either age 5 or 13 (age 13 corresponds to age-at-maturity of females and to the current maximum landing length of 210 cm fork length).

The analysis demonstrates that both potential stock size and yields are increased if fishing mortality is reduced on immature fish. If the fishing mortality on individuals greater than 210 cm is reduced to 0, the stock levels are slightly improved at expense of yield (Table 6.5).

6.9 Quality of assessments

The assessments (and subsequent projections) conducted at the joint ICCAT/ICES meeting that are summarized in this report must be considered exploratory assessments, using several assumptions (carrying capacity for the SSB model, F in the historic period in the ASP model).

Hence, it must be noted that:

- There was a lack of cpue data for the peak of the fishery;
- Catch data are considered underestimates, as not all nations have reported catch data throughout the time period;
- The cpue index used in the assessment was French fleet catch per day. An analysis carried out on years 2001–2008 shows that local abundance varies likely a lot between consecutive years in the French fishing area. Hence, this series may not be reflective of stock abundance.

Consequently, the model outputs should be considered highly uncertain (ICCAT report).

6.10 Reference points

No reference points have been proposed for this stock.

ICCAT uses F/F_{MSY} and B/B_{MSY} as reference points for stock status of pelagic shark stocks. These reference points are relative metrics rather than absolute values. The absolute values of B_{MSY} and F_{MSY} depend on model assumptions and results and are not presented by ICCAT for advisory purposes.

6.11 Conservation considerations

At present, the porbeagle shark subpopulations of the NE Atlantic and Mediterranean are listed as Critically Endangered in the IUCN red list (Stevens *et al*., 2006a, b).

In 2010, Sweden (on behalf of the member states of the European Union) proposed that porbeagle be added to Appendix II of CITES. This proposal did not get the support of the required majority at the fifteenth CITES Conference of Parties in Doha.

In 2012, the renewal of that proposal at the next CITES Conference of the Parties is supported by Germany which is preparing a draft for approval by EU member states.

6.12 Management considerations

WGEF/ICCAT considered all available data in 2009. This included updated landings data and cpue from the French and Spanish fisheries. An analysis of the French cpue was undertaken in 2010. It showed that large changes of local abundance may occur in the fishing area and consequently, these cpue should be used with caution to get an abundance index as long as information on porbeagle spatial distribution remains limited.

Using the French cpue series as well as the Spanish cpue series (Figure 6.5), stock projections based on the BSP model demonstrated that low catches (below 200 t) may allow the stock to increase under most credible model scenarios and that the recovery to B_{MSY} could be achieved within 25–50 years under nearly all model scenarios. However, management should account for both the uncertainty in the input parameters for this assessment and the low productivity of the stock.

WGEF reiterates that this species has a low productivity, and is highly susceptible to overexploitation.

The Norwegian and Faroese fisheries have ceased and have not resumed. That no fisheries had developed before restrictive quotas were put in place is considered by WGEF to indicate that the stock had not recovered. However, the time that has elapsed since the end of the northern fisheries is probably longer than the generation time of the stock, so recovery may have taken place although not detected. However, the social and economic environment may have changed too much to allow fisheries resumption in the same countries and fisher knowledge may have been lost. Furthermore, feeding grounds may have moved in relation with changes in prey abundance and distribution. But, in the absence of any quantitative data to demonstrate stock rebuilding, and in regard of this species' low reproductive capacity, WGEF considers the stock is probably still depleted.

WGEF considers that target fishing should not proceed without a programme to evaluate sustainable catch levels. However, WGEF underlined that the present fishing ban hampers any quantitative assessment in the near future.

The maximum landing length (MLL) was adopted by the EC. It constituted a potentially useful management measure in targeted fisheries, as it should deter targeting areas with mature females. However, there are potential benefits from reducing fishing mortality on juveniles. Given the difficulties in measuring (live) sharks, other body dimensions (height of the first dorsal fin and pre-oral length) should be preferred. The correlation with fork length is high (Bendall *et al*, 2012) but further studies, so as to better account for natural variation (e.g. potential ontogenetic variation and sexual dimorphism) in such measurements, are needed to identify the most appropriate options for managing size restrictions.

Further ecological studies on porbeagle, as highlighted in the scientific recommendations of ICCAT (2009), would help to further develop management measures for this species. Such work could usefully build on recent and ongoing tagging projects.

Studies on porbeagle bycatch should be continued to get operational ways to reduce bycatch and to improve the post-release survivorship of discarded porbeagle

All fisheries dependent data should be provided by the member states having fisheries for this stock as well as other countries longlining in the ICES area.

There are no fishery-independent survey data. In the absence of target fisheries, a dedicated longline survey covering the main parts of the stock area could usefully be initiated if stock recovery is to be monitored appropriately.

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Table 6.1a. Porbeagle in the NE Atlantic. Working Group estimates of porbeagle landings data (tonnes) by country (1926–1970). Data derived from ICCAT, ICES and national data. Data are considered an underestimate.

Year	Estimated Spanish data	Denmark	Norway (NE Atl)	Scotland
1926			279	
1927			457	
1928			611	
1929			832	
1930			1505	
1931			1106	
1932			1603	
1933			3884	
1934			3626	
1935			1993	
1936			2459	
1937			2805	
1938			2733	
1939			2213	
1940			104	
1941			283	
1942			288	
1943			351	
1944			321	
1945			927	
1946			1088	
1947			2824	
1948			1914	
1949			1251	
1950	4	1900	1358	
1951	3	1600	778	
1952	3	1600	606	
1953	4	1100	712	
1954	1	651	594	
1955	2	578	897	
1956	1	446	871	
1957	3.	561	1097	
1958	3	653	1080	7
1959	3	562	1183	9
1960	2	362	1929	10
1961	5	425	1053	9
1962	7	304	444	20
1963	3	173	121	17
1964	6	216	89	5
1965	4	165	204	8
1966	9	131	218	6
1967	8	144	305	7
1968	11	111	677	7
1969	11	100	909	3
1970	10	124	269	5

Table 6.1b. Porbeagle in the NE Atlantic. Working Group estimates of porbeagle landings data (tonnes) by country (1971–2010). Data derived from ICCAT, ICES and national data. Data are considered an underestimate.

	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984
Denmark	311	523	158	170	265	233	289	112	72	176	158	84	45	38
Faroe Is	1		5			1	5	9	25	8	6	17	12	14
France	550	910	545	380	455	655	450	550	650	640	500	480	490	300
Germany			6	3	4	.	.	.	.	.	.	.	.	.
Iceland			2	2	4	3	3	.	1	1	1	1	1	1
Ireland			.	.	.	.	.	.	.	.	.	.	.	.
Netherlands			.	.	.	.	.	.	.	.	.	.	.	.
Norway	111	293	230	165	304	259	77	76	106	84	93	33	33	97
Portugal			.	.	.	.	.	.	.	.	.	.	.	.
Spain	11	10	12	9	12	9	10	11	8	12	12	14	28	20
Sweden			.	.	3	.	.	5	1	8	5	6	5	9
UK (E,W, Nl)		4	14	15	16	25	.	.	1	3	2	1	2	5
UK (Scot)	7	15	13	.	.	.	.	.	.	.	.	.	.	.
Japan			NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	991	1755	985	744	1063	1185	834	763	864	932	777	636	616	484

	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998
Denmark	72	114	56	33	33	46	85	80	91	93	86	72	69	85
Faroe Is	12	12	33	14	14	14	7	20	76	48	44	8	9	7
France	196	208	233	341	327	546	306	466	642	824	644	450	495	435
Germany	.	.	.	.	.	.	.	.	1	.	.	.	.	2
Iceland	1	1	1	1	1	.	.	1	3	4	5	3	2	3
Ireland	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Netherlands	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Norway	80	24	25	12	27	45	35	43	24	26	28	31	19	28
Portugal	.	.	3	3	2	2	1	0	1	1	1	1	1	1
Spain	23	26	30	61	40	26	46	15	21	49	17	39	23	22
Spain (Basque Country)	.	.	.	.	.	.	.	.	.	.	.	20	12	27
Sweden	10	8	5	3	3	2	2	4	3	2	2	1	1	1
UK (Eng,Wal & Nl)	12	6	3	3	15	9	.	.	.	.	0	.	.	1
UK (Scot)	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Japan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	2	NA
Total	406	399	389	471	462	690	482	629	862	1047	827	628	633	612

Table 6.1b. (continued). Porbeagle in the NE Atlantic. Working Group estimates of porbeagle landings data (tonnes) by country (1971–2010). Data derived from ICCAT, FAO, ICES and national data. Data are considered an underestimate.

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Denmark	107	73	76	42	21	20	4	3	2	2	4	0	2
Faroe Is	10	13	8	10	14	5	19	21	13	11	13	14	NA
France	273	361	339	439	394	374	246	185	347	239	305	9	2
Germany	0	17	1	3	5	6	5	0		2	0	0	0
Iceland	3	2	4	2	0	1	0	1	0	1	1	1	1
Ireland	8	2	6	3	11	18	3	4	8	7	3	0	0
Netherlands	.	0			0		0		0	0	0	0	0
Norway	34	23	17	14	19	24	11	27	10	12	10	12	10
Portugal	0	15	4	11	4	57	10	6	2	1	0	0	0
Spain	15	11	23	49	22	9	10	26	6	143	73	60	2
Sweden	1	1	1	.	.	5	0	.	1	0	0	0	0
Spain (Basque Country)	41	38	45	16	22	10	11	5	16	13	3	0	0
UK (Eng,Wal & Nl)	6	7	10	7	25	24	24	11	26	14	11	0	0
UK (Scot)	.	.	1	.	.	.	.	.	.	1	0	2	0
Japan	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total	498	563	535	596	537	553	343	289	431	446	423	98	17

Table 6.2. Porbeagle in the NE Atlantic. Proportion of small (<50 kg) and large (≥50 kg) porbeagle taken in the French longline fishery 1992–2009 (Source Hennache and Jung, 2010).

	% Weight of in the catches of porbeagle:	
Year	< 50 kg	>50 kg
1992	26.0	74.0
1993	29.7	70.3
1994	33.1	66.9
1995	49.9	53.1
1996	31.9	68.1
1997	39.2	60.8
1998		
1999		
2000	Data not available by weight category	
2001		
2002		
2003	53.7	46.3
2004	44.0	56.0
2005	40.0	60.0
2006	44.3	55.7
2007	44.9	55.1
2008	45.9	54.1
2009	51.8	48.2

Table 6.3. Porbeagle in the NE Atlantic. Length–weight relationships of porbeagle from scientific studies.

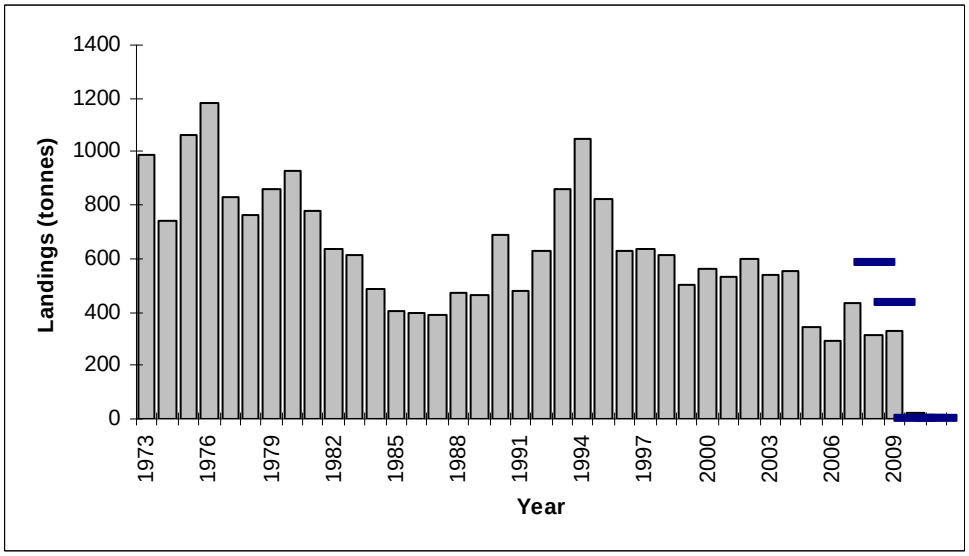
Stock	L–W relationship	Sex	n	Length range	Source
NW Atlantic	W = (1.4823 x 10–5) LF 2.9641	C	15	106–227 cm	Kohler *et al.*, 1995
NE Atlantic (Bristol Channel)	W = (1.292 x 10–4) LT 2.4644	C	71	114–187 cm	Ellis and Shackley, 1995
NE Atlantic (N/NW Spain)	W = (2.77 x 10–4) LF 2.3958	M	39		Mejuto and Garcés, 1984
	W = (3.90 x 10–6) LF 3.2070	F	26		
NE Atlantic (SW England)	W = (1.07 x 10–5) LT 2.99	C	17		Stevens, 1990
NE Atlantic (Biscay / SW England/W Ireland)	W = (4 x 10–5) LF 2.7316	M	564	88–230 cm	Hennache and Jung, 2010
	W = (3 x 10–5) LF 2.8226	F	456	93–249 cm	
	W = (4 x 10–5) LF 2.7767	C	1020	88–249 cm	

Table 6.4. Average probabilities across the five most credible BSP model runs for the Northeast Atlantic porbeagle population (ICCAT, 2009).

Total catch in tons	Probability of some increase within 10 years	Probability of stock rebuilding to BMSY within:	
		20 years	50 years
0	1.00	0.478	0.946
100	1.00	0.414	0.872
200	0.98	0.368	0.754
300	0.89	0.326	0.596
400	0.72	0.286	0.464

Table 6.5. Fishing mortality, yield, biomass and SSB relative to that achieved at the effort level corresponding to the F0.1 level for a flat-topped selection pattern with maximum selection-at-age 3.

Selection Pattern	Age Max Selection	Maximum Landing Length	F	Yield	Biomass	SSB
Domed	5	No	211%	68%	202%	120%
Flat	13	No	211%	79%	280%	176%
Domed	13	No	279%	68%	295%	178%
Flat	5	Yes	150%	84%	134%	105%
Domed	5	Yes	217%	67%	206%	120%
Flat	13	Yes	698%	35%	377%	191%
Domed	13	Yes	698%	35%	377%	191%



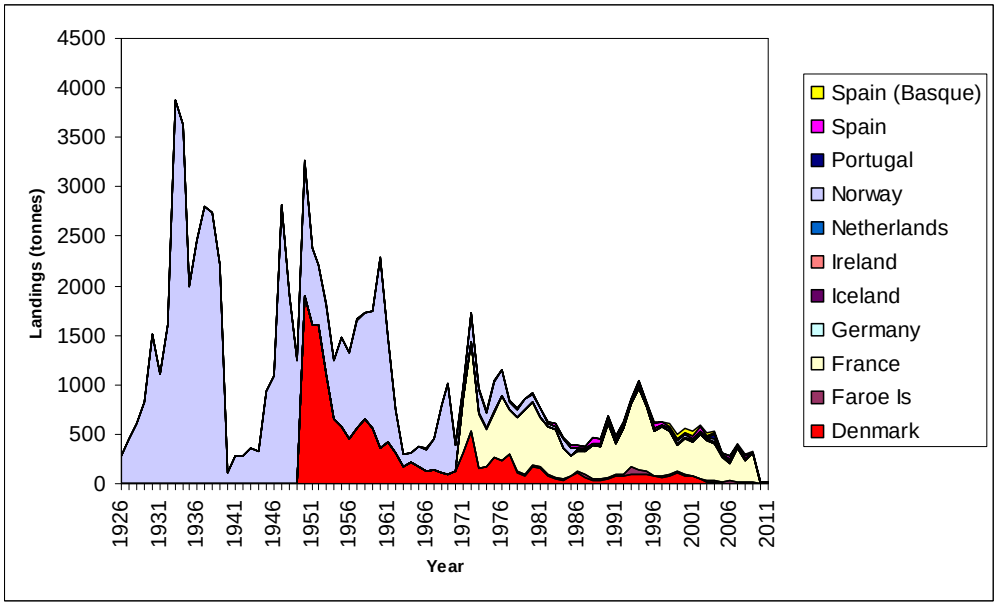


Figure 6.1. Porbeagle in the NE Atlantic. Working Group estimates of landings of porbeagle in the NE Atlantic for 1971–2011 (top, black lines indicates 2008–2011 TAC) and longer term trend in landings (1926–1970) for those fleets reporting catches.

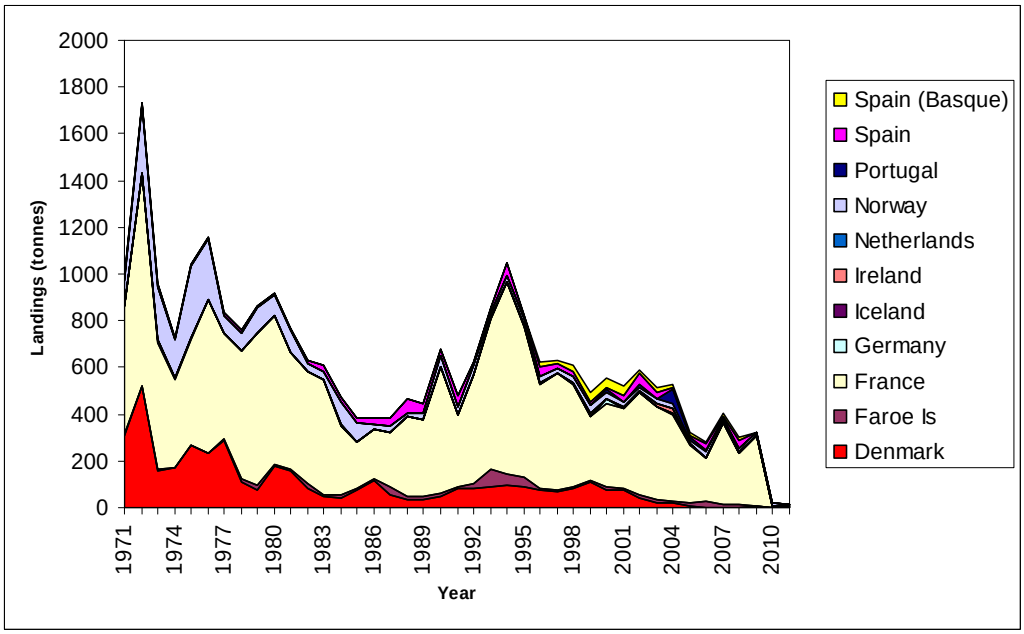


Figure 6.2. Porbeagle in the NE Atlantic. Working Group estimates of landings of porbeagle in the NE Atlantic for 1971–2011 by country.

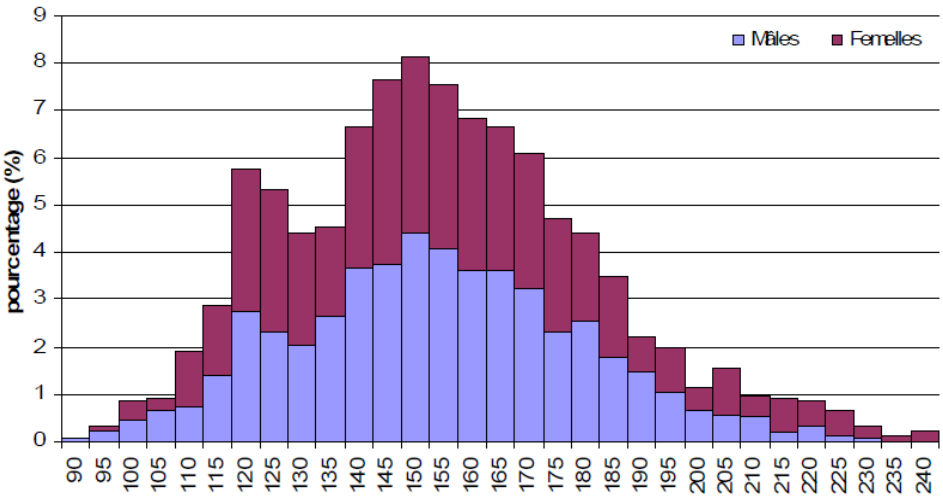


Figure 6.3. Porbeagle in the NE Atlantic. Length–frequency distribution of the landings of the Yeu porbeagle targeted fishery in 2008–2009 (n =1769). Source: Hennache and Jung, 2010.

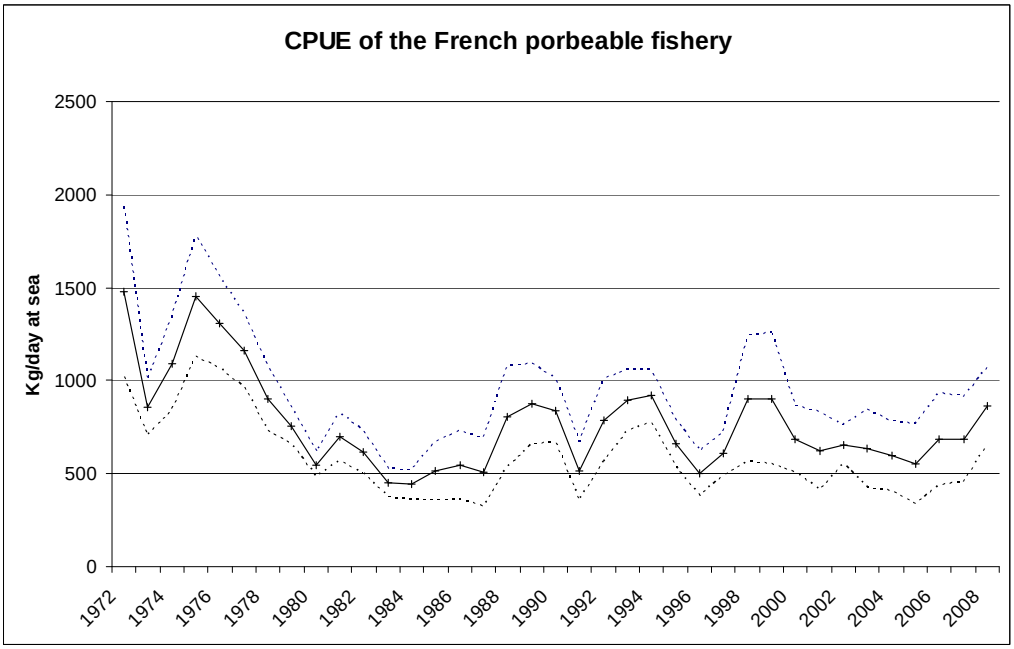


Figure 6.4. Porbeagle in the NE Atlantic. Nominal cpue (kg/day at sea) for porbeagle taken in the French fishery (1972–2008) with confidence interval (±2 SE of ratio estimate). From Biais and Vollette, 2009.

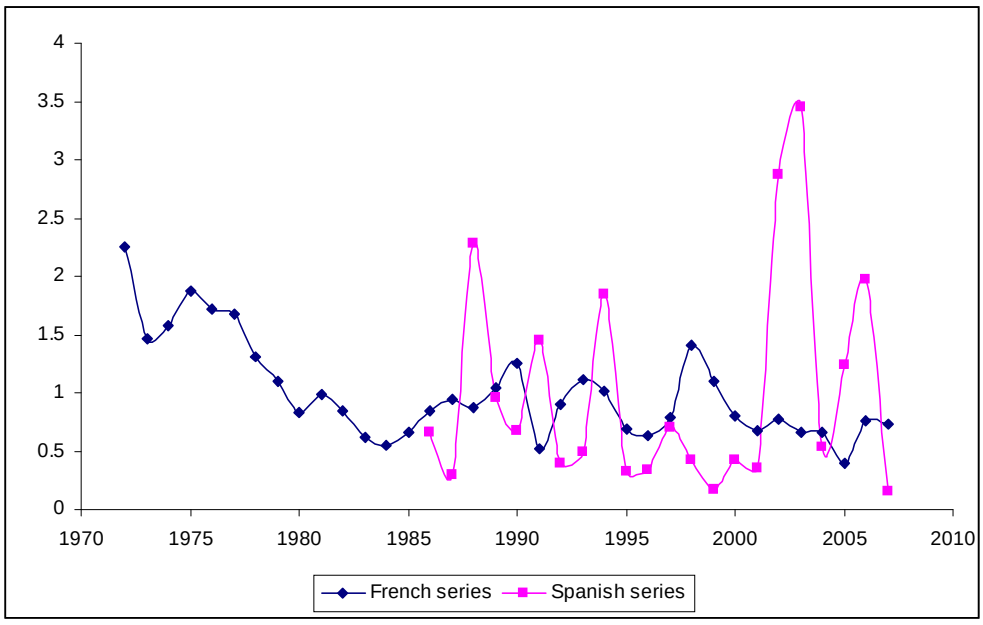


Figure 6.5. Porbeagle in the NE Atlantic. Temporal trends in standardized cpue for the French target longline fishery for porbeagle (1972–2007) and Spanish longline fisheries in the NE Atlantic (1986–2007).