



Background Document for Basking shark *Cetorhinus maximus*



## OSPAR Convention

The Convention for the Protection of the Marine Environment of the North-East Atlantic (the "OSPAR Convention") was opened for signature at the Ministerial Meeting of the former Oslo and Paris Commissions in Paris on 22 September 1992. The Convention entered into force on 25 March 1998. It has been ratified by Belgium, Denmark, Finland, France, Germany, Iceland, Ireland, Luxembourg, Netherlands, Norway, Portugal, Sweden, Switzerland and the United Kingdom and approved by the European Community and Spain.

## Convention OSPAR

La Convention pour la protection du milieu marin de l'Atlantique du Nord-Est, dite Convention OSPAR, a été ouverte à la signature à la réunion ministérielle des anciennes Commissions d'Oslo et de Paris, à Paris le 22 septembre 1992. La Convention est entrée en vigueur le 25 mars 1998. La Convention a été ratifiée par l'Allemagne, la Belgique, le Danemark, la Finlande, la France, l'Irlande, l'Islande, le Luxembourg, la Norvège, les Pays-Bas, le Portugal, le Royaume-Uni de Grande Bretagne et d'Irlande du Nord, la Suède et la Suisse et approuvée par la Communauté européenne et l'Espagne.

## Acknowledgement

This report has been prepared by the *Association pour l'Etude et la Conservation des Sélaciens* (APECS) and Ms Amelia Curd (France). Thanks are also due for contributions provided by Colin Speedie, Sarah Fowler, David Sims, Jean-Luc Solandt

Photo acknowledgement:

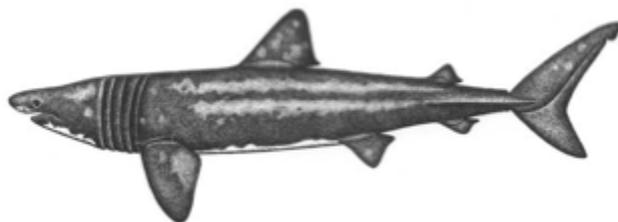
Cover page: Basking shark, wikipedia

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# Background Document for Basking shark

## *Cetorhinus maximus*



(Martin R.A. & Harvey-Clark, 2004)

### Executive Summary

This Background Document for Basking shark – *Cetorhinus maximus* – has been developed by OSPAR following the inclusion of this species on the OSPAR List of threatened and/or declining species and habitats (OSPAR Agreement 2008-6). The document provides a compilation of the reviews and assessments that have been prepared concerning this species since the agreement to include it in the OSPAR List in 2003. The original evaluation used to justify the inclusion of *Cetorhinus maximus* in the OSPAR List is followed by an assessment of the most recent information on its status (distribution, population, condition) and key threats prepared during 2009-2010. Chapter 7 provides proposals for the actions and measures that could be taken to improve the conservation status of the species. In agreeing to the publication of this document, Contracting Parties have indicated the need to further review these proposals. Publication of this background document does not, therefore, imply any formal endorsement of these proposals by the OSPAR Commission. On the basis of the further review of these proposals, OSPAR will continue its work to ensure the protection of *Cetorhinus maximus*, where necessary in cooperation with other competent organisations. This background document may be updated to reflect further developments or further information on the status of the species which becomes available.

### Récapitulatif

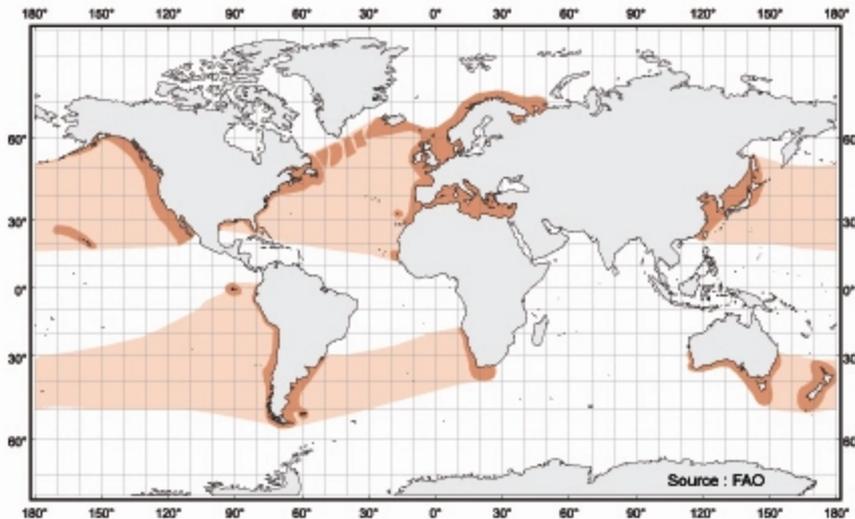
Le présent document de fond sur le requin pèlerin a été élaboré par OSPAR à la suite de l'inclusion de cette espèce dans la liste OSPAR des espèces et habitats menacés et/ou en déclin (Accord OSPAR 2008-6). Ce document comporte une compilation des revues et des évaluations concernant cette espèce qui ont été préparées depuis qu'il a été convenu de l'inclure dans la Liste OSPAR en 2003. L'évaluation d'origine permettant de justifier l'inclusion du requin pèlerin dans la Liste OSPAR est suivie d'une évaluation des informations les plus récentes sur son statut (distribution, population, condition) et des menaces clés, préparée en 2009-2010. Le chapitre 7 fournit des propositions d'actions et de mesures qui pourraient être prises afin d'améliorer l'état de conservation de l'espèce. En se mettant d'accord sur la publication de ce document, les Parties contractantes ont indiqué la nécessité de réviser de nouveau ces propositions. La publication de ce document ne signifie pas, par conséquent que la Commission OSPAR entérine ces propositions de manière formelle. A partir de la nouvelle révision de ces propositions, OSPAR poursuivra ses travaux afin de s'assurer de la protection du requin pèlerin, le cas échéant avec la coopération d'autres organisations compétentes. Ce document de fond pourra être actualisé pour tenir compte de nouvelles avancées ou de nouvelles informations qui deviendront disponibles sur l'état de l'espèce.

## 1. Background Information

### Name of species (feature)

*Cetorhinus maximus* (Gunnerus, 1765), basking shark

The basking shark is the world's second largest fish and is widely distributed in coastal waters on the continental shelves of boreal and warm temperate regions in both the northern and southern hemispheres. The basking shark, a plankton-feeding pelagic shark, can reach 12 metres in length and weigh up to 4 tonnes.



**Figure 1:** Global basking shark distribution (Compagno, 2001)

The basking shark (*Cetorhinus maximus*) is a K strategist species, with low fecundity, giving birth to fully developed young and attaining maturity at a late age and size. They are ovoviviparous (producing eggs which hatch within the uterus) and have a long gestation period.

## 2. Original Evaluation against the Texel-Faial selection criteria

### List of OSPAR Regions and Dinter biogeographic zones where the species occurs

OSPAR Regions: All (see FAO distribution map (figure 1)).

Dinter Biogeographic Provinces: Warm-temperate waters, Cold-temperate waters, Azores shelf, Lusitanian (Cold/Warm), Seamounts and plateaus

### List of OSPAR Regions and Dinter biogeographic zones where the species is under threat and/or in decline

All where it occurs

### Original evaluation against the Texel-Faial criteria for which the species was included on the OSPAR List

**Global importance:** This species occurs throughout temperate seas in all oceans. Although sightings of surface feeding sharks are frequent in the OSPAR area, there is no evidence to suggest that populations in the OSPAR region are of particular global importance.

**Regional importance:** In the OSPAR maritime area, basking sharks are observed most frequently in the waters around the British Isles and the Republic of Ireland and along the coast of northern France. The coast of Norway is presumably also important, since there has been such a large fishery there. Our current state of knowledge has not allowed us to identify this species' reproductive zones. Only one report of a birthing event was recorded in the coastal waters of the Isle of Man in 2006 ([www.manxbaskingsharkwatch.com](http://www.manxbaskingsharkwatch.com)).

**Decline:** There are no firm estimates for the global population or regional populations of basking sharks. The total number of records is usually in tens, hundreds or, at most, low thousands, including repeat sightings. The total number removed from the whole of the NE Atlantic during the past 50 years is probably between 80 – 106 000 animals (Sims & Reid, 2002).

Most basking shark fisheries appear to have collapsed after initial high yields. Landings throughout the northeast Atlantic have also fluctuated, but a continued downwards trend is evident over the past few decades. A few well-documented declines in catches by directed fisheries for the basking shark suggest that reduction in numbers caught of at least 50% to over 90% have occurred in some areas over a very short period (usually ten years or less, Fowler, 2005). These apparent declines have persisted into the long-term with no apparent recovery several decades after exploitation has ceased.

**Rarity:** Basking sharks are a highly mobile species for which the global population size and structure remains unknown. It is therefore very difficult to define its degree of rarity. Nevertheless, the collapse of landings in the North-East Atlantic could indicate this species is increasingly rare.

**Sensitivity:** Compagno (1984) considers basking sharks to be extremely vulnerable to overfishing, because they spend long periods surface feeding (Sims & Quale, 1998) and ascribes this to a slow growth rate, lengthy maturation time, probable low fecundity and probable small size of existing populations. The population productivity estimated at 0.013 – 0.023 (Musik *et al.*, 2000) is very low for a marine fish species, making basking sharks very sensitive.

**Threats:**

- The main threat to basking sharks is accidental by-catch. Currently in the OSPAR maritime area, targeted fisheries are forbidden, but by-catches sometimes occur in set nets, trawls and through entanglement in pot lines. The magnitude of this threat is unknown due to lack of reporting.
- Accidental boat collisions are being increasingly reported and evident from scars on sharks.
- The increase of recreational boat traffic and wildlife watching may constitute indirect threats for basking sharks which may affect their behaviour in traditional feeding, pupping and breeding grounds.
- Anthropogenic pollution from land/riverine runoff and changing seawater temperature may induce a degradation in the basking shark's habitat by altering the composition and distribution of its primary food source, copepod zooplankton. Clearly there has been a shift in the timing and distribution of *Calanus* copepod community in the North Atlantic which may be affecting basking shark populations or distribution (Beaugrand *et al.*, 2002)

### 3. Current status of the species or habitat

**Distribution in OSPAR maritime area**

No change from the time it was listed. The species occurs in all OSPAR areas. Hot-spots for surface sightings occur around the south-west peninsula of England, west of Scotland, the Isle of Man and

Brittany. Distribution in other areas is uncertain but there is evidence from tagging for regular feeding behaviour along the continental shelf break and around oceanographic fronts. Foraging behaviour was also observed on the Mid-Atlantic ridge.

#### **Population (current/trends/future prospects)**

No firm estimates are available for the total global population or regional populations of this species. There is only very limited information available on wider population trends. The variation in numbers of sightings is only obtainable on a local, or regional scale. Some evidence exists for unpredictable cycles in the numbers of basking sharks entering coastal waters. Certain years have seen very large influxes of sharks to some United Kingdom areas, while in others the numbers recorded are low (Kunzlik 1988, Speedie 1998, Fairfax 1998).

The following section focuses on two areas where there is good surface observation data: one in the UK and one in French waters (Table 1).

Whilst sightings recording schemes do not allow for in-depth ecological studies of a species, they provide the means to note the long-term presence or absence of a species and hence the identification of its greater trends and exceptional events. The information collected also allows for the identification of important sectors and/or periods where basking sharks will spend time near the surface where they are particularly exposed to a number of threats (fishing by-catch, boat collisions, pollution).

#### **Condition (current/trends/future prospects)**

Catches in well-documented fisheries for basking sharks (especially from the North-East Atlantic) have declined by 50 – 90% over short periods (typically a few decades or less). These declines have persisted into the long-term with no apparent recovery several decades after exploitation has ceased. Other data, based on sightings, suggest similar declines (CITES, 2002). However, though some monitoring data for this species are available, most knowledge is based on sightings of sharks feeding on plankton near the sea surface during spring and summer and no data analysis has provided robust information on population trends (Sims *et al*, 2005).

It is important to note that the numbers of basking sharks sightings and copepod abundance showed downward trends and were positively correlated. (Sims & Reid, 2002).

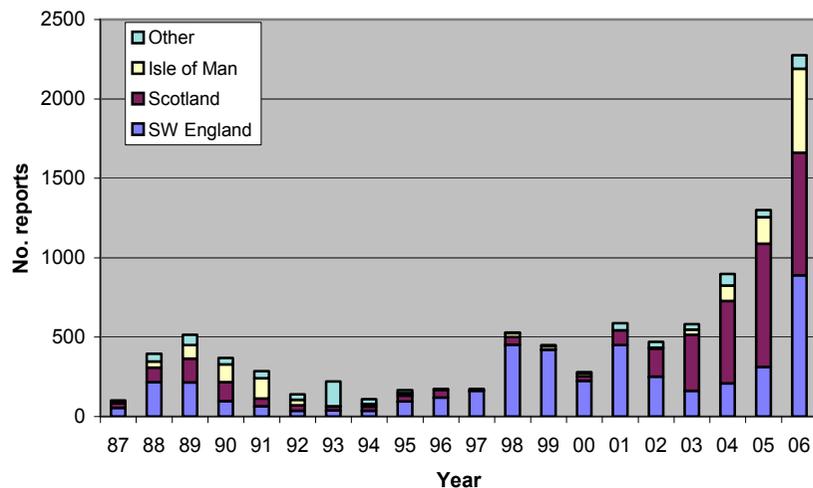
In conclusion, very little data permit the identification of real trends. Targeted fisheries will have largely contributed to the decline in basking shark stocks, but nothing can be affirmed since baseline levels of basking shark populations cannot be determined. Despite targeted fishing of basking sharks having ceased in the OSPAR maritime area, the most abundant data sets, which are derived from sighting schemes, present large inter-annual variations and do not allow us to identify population trends. Thus the precautionary principle must be applied to this highly sensitive yet enigmatic species.

**Table 1:** Sightings recording schemes in Britain, Republic of Ireland and France

	British zone	French zone
References	<p><b>Doyle J.I., Solandt J.L., Fanshawe S., Richardson P., 2005.</b> Marine conservation Society Basking Shark Report 1987-2004. Marine Conservation Society, Ross on Wye, UK.</p> <p>Bloomfield A &amp; Solandt J-L (2008). <b>Marine Conservation Society Basking Shark Watch 20 year report (1987-2006).</b> Marine Conservation Society, Ross on Wye, UK</p> <p><a href="http://www.mcsuk.org/marineworld/baskingsharks/1987-2006+report">http://www.mcsuk.org/marineworld/baskingsharks/1987-2006+report</a></p>	<p>Unpublished datas, APECS</p>
Background	<p>The lack of ecological data led the Marine Conservation Society (MCS) to launch the Basking Shark Watch Project in 1987 as part of its campaign to protect basking sharks. The basking shark watch database is currently the most extensive database on basking shark surface sightings in the UK.</p> <p>Since 1987, the MCS has successfully raised public and media awareness of basking sharks in UK waters. MCS encourages the public to report basking shark sightings online on the MCS website and regularly reports basking shark watch results to the general public via their annual summary reports (<a href="http://www.mcsuk.org">www.mcsuk.org</a>).</p> <p>Different zones were prospected :</p> <ul style="list-style-type: none"> <li>- South West of England</li> <li>- Scotland</li> <li>- Isle of Man</li> <li>- North Ireland</li> <li>- Ireland</li> <li>- Wales</li> </ul>	<p>In France, the basking shark sightings recording scheme is managed by the APECS (Association Pour l'Etude et la Conservation des Sélaciens) and is based on a collaboration with sea users who are invited to report all encounters. Data collection is achieved via sightings record cards, which are distributed every spring via different organisations along the coastline and are also available on the website: <a href="http://www.asso-apecs.org">www.asso-apecs.org</a>. Every year, an awareness-raising campaign is led by means of posters placed in strategic coastal spots, i.e. port authorities.</p> <p>The analysis of data collected between 1997 and 2005 demonstrates that Brittany (NW France) is a area of high abundance for this species. The results for the sector (1° to 7° West / 47° &amp; 49°30 N &amp; 1° to 3°35 West / 49°30 &amp; 50° N) are presented below.</p> <p>For data analysis, two sectors were defined :</p> <p>Northern Brittany; corresponding to an area North of 48°10'N</p> <p>Southern Brittany: the area South of this same parallel</p>

Temporal distribution

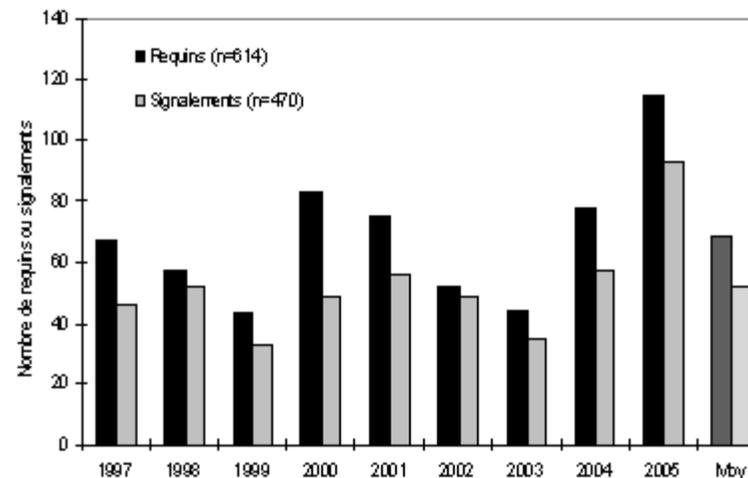
The total number of reports received varies annually (figure 2). The greatest number of reports was received in 2006 (2275), and the least in 1993 and 1994 (both 80). The data shows a distinct peak in sightings between 1988 and 1990 and sightings increased again approximately 10 years later following a period when few sightings were reported between 1992 and 1997. Between 1997 and 1999, numbers of basking sharks reported increased by over 90% reaching a maximum of 3896 in 1999. Since 1998 sighting reports have remained relatively high, but the number of sharks reported decrease by 70% between 1999 and 2000. In 2006, 7708 sharks were reported to MCS Basking Shark Watch from a total of 2222 reports (an average of 3.46 sharks per report).



**Figure 2:** Total number of basking shark reports sent to basking shark watch (1987-2006) by region.

In Brittany, the annual distribution of reported observations between 1997 and 2005 does not reveal any clear tendencies (figure 3). Only 2005 stands out from this series with 93 reports, well above the yearly average of 52.

To a lesser extent, the years 1999 and 2003 had total sightings that were inferior to the average, with 33 and 35 records respectively. The number of individuals and number of sightings are similar, with the most pronounced differences occurring in 2000 and 2001, as these were years where large groups of basking sharks were observed.



**Figure 3:** Annual distribution of the number of basking sharks observed (“requins”) and reported (“signalements”) in Brittany from 1997 to 2005

Over 90% of reported sharks were seen between May and August. The greatest number of basking shark sightings was reported in June (figure 4). Historically, sightings have peaked earliest in the southwest (around May and June), followed by the Isle of Man (June and July) and lastly in Scotland (around August), but recent years have shown some deviations, particularly in SW England.

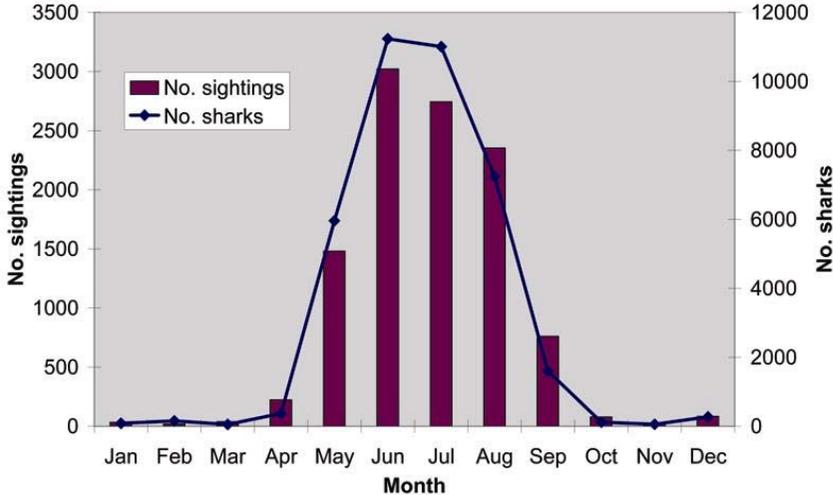


Figure 4: Monthly variation in the number of basking sharks (1987-2006)

A marked seasonality can be noted both for the number of reports and for the number of sightings: 93% of observations occur between April and August (Figure 5).

Two peaks in observation are evident: :  
 One end of April – beginning of June, with an important proportion observed in southern Brittany.  
 A second peak of weaker intensity between the 10th of July and the 20th of August, with the majority of observations recorded in northern Brittany.

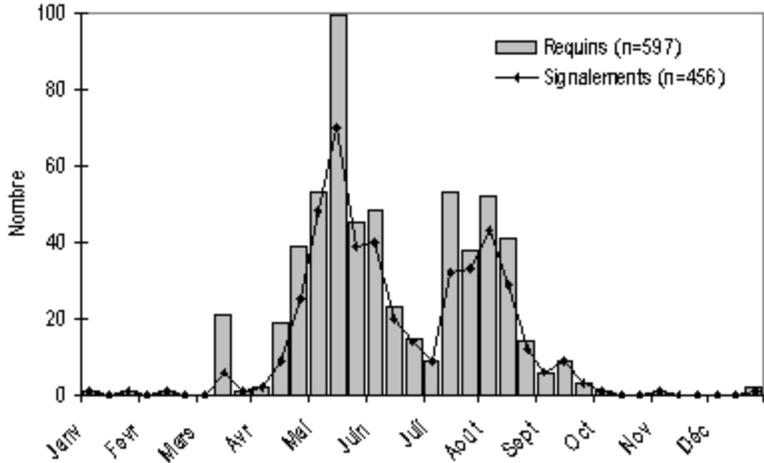


Figure 5: Monthly variation in the number of basking sharks observed (“requins”) and recorded (“signalements”) in Brittany from 1997 to 2005

Spatial distribution

The most obvious trend in the basking shark reports coming in to MCS is that there is a 'channel' of sightings of sharks (figure 6):

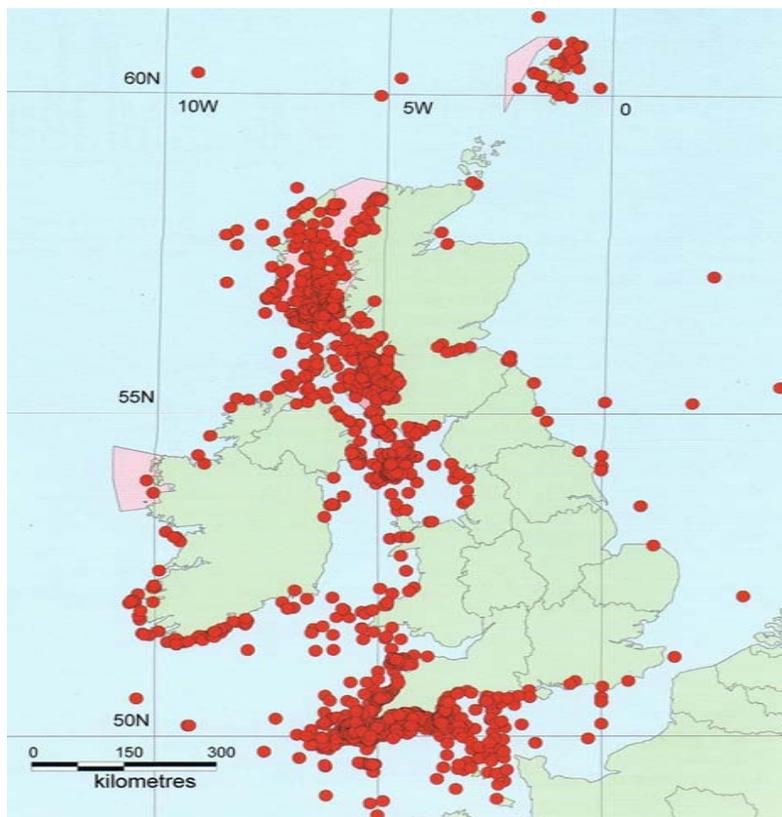
- up to the Isle of Man, and into Scottish waters in the area of the Clyde sea,
- up the Irish sea between the Southwest (principally Cornwall, Devon and Dorset),
- up into the seas off the Minch (Skye and Mull and other inner Hebridean Islands)
- and northwards into the waters of Shetland.

Since 1987, the data spread over time shows that there has been an increase in

Each observation having been located within a square of the 10'x10' latitude/longitude grid, the number of sharks observed per grid square was mapped (figure 7). Thanks to this map two hotspots along the Atlantic face of Brittany were identified:

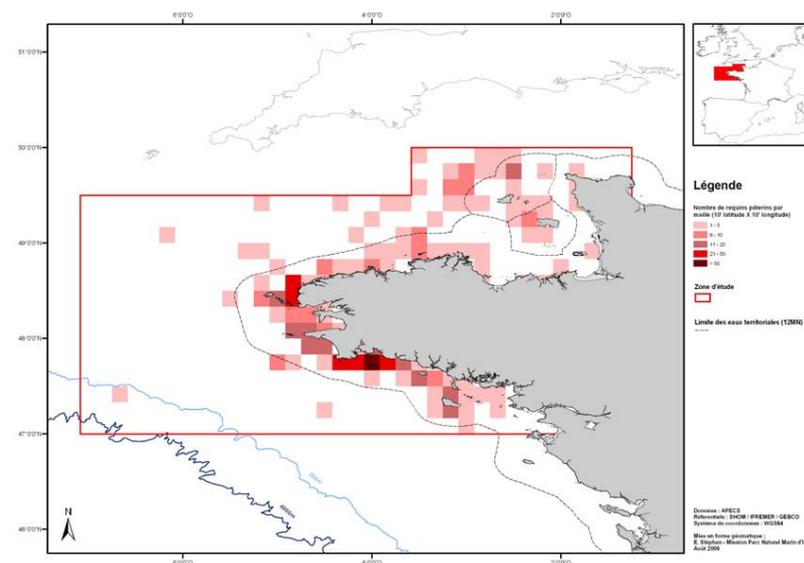
- The surroundings of the Glénans Isles
- The North of the mer d'Iroise
- The approach to the l'île de Groix and Belle-Ile in the Morbihan, the waters around the Raz headland in the Finistère and the entrance to the Casquets traffic separation scheme in the English Channel are also sectors with high

the number and geographic spread of sightings reported from Scottish waters.



**Figure 6:** Distribution of basking shark sightings around the UK and Ireland (1987-2004) (Source: Marine Conservation Society)

basking shark activity



**Figure 7:** Geographic distribution of basking shark sightings reported in Brittany from 1997 to 2005

<p>Shoal size</p>	<p>Between 1987 and 2006, the majority of basking sharks reports were of individuals (59%), although basking shark were also regularly seen in pairs (13%) and in groups of between 3 – 9 sharks (21%). Out of the 31 reports of very large sharks (&gt; 100 sharks) have been recorded, the vast majority were in south England.</p>	<p>The majority of basking shark reports (85.5%) concern solitary individuals. The majority of observed groups were made up of 2 individuals (60.3%), with the largest group size counting 15 individuals.</p>
<p>Size distribution</p>	<p>Size was recorded for 11713 sharks, 31% of all sharks reported. Most sharks (38%) for which size was recorded were in the 4-6 m size class, followed by the 2-4 m class (27%). Very few sharks were less than 2 m in length (2.3%).</p>	<p>Only 72% (n=441) observations were sufficiently detailed to rank basking sharks by size. Specimens measuring between 3-6m are most common (61%) while individuals of a larger size (&gt;9 m) are rare (1.6%)</p>

### Limitations in knowledge

The basking shark is a little-known species for which maximum research effort within the OSPAR area has been focused around the British Isles. The current approach to conservation of basking sharks relies heavily on the precautionary principle, which states that insufficient scientific knowledge about biology and stock status is no defence for a lack of action. It is not known whether there are discrete local populations of basking sharks or whether there is a relationship between regional population abundance and global trends. The degree to which mixing or interchange occurs between populations remains unknown.

On a small spatial and temporal scale, it has been demonstrated that basking sharks feed in a selective manner in zones where zooplankton concentrations are high, along thermal fronts in particular. However, the factors which influence basking shark distribution and abundance in the long-term are not well-known. An understanding of population dynamics is essential for the long-term management of a species, by allowing the implementation of efficient and lasting conservation measures.

It would be advantageous to develop improved information on migration patterns and over-wintering areas of basking sharks which may help to identify the areas where they mate and where pregnant females reside, and thus help guide efforts to minimise unnatural mortality in these areas. The first trans-atlantic migration of a basking shark (8 m) raises the question of migration patterns at different life stages.

Whilst data on the broad-scale relative abundance of this species in UK and northern French waters are available thanks to sighting schemes collated by APECS and the Marine Conservation Society, absolute population abundance has not been determined. Tagging programmes allow us to further our knowledge on shark movements.

A better knowledge of by-catch and illegal fishing would allow us to be able to protect basking sharks more efficiently. Genetic research studies on the origins of shark fins in the Asian market is also an area of research which could feasibly be furthered. (Magnussen *et al*, 2007).

## 4. Evaluation of threats and impacts

### Fishing

Basking shark numbers declined in parts of the OSPAR area as a result of historic fisheries. Fishing for this species is now banned in the EEZs of Norway and the EU and in international waters managed by NEAFC. There is therefore no legal directed fishery anywhere in the OSPAR area. Levels of accidental by-catch in fisheries directed at other species are unknown. Current threat from fishing is therefore unknown but there is no evidence to suggest that it is high.

The main threat to basking shark populations is from fishing operations. Since 2007, by-catch is the main concern, as targeted fishing on basking sharks is banned in European waters (common fisheries policy: EC n°41/2007 2006, article 5.6<sup>1</sup>).

In addition, because these fish congregate in bays and shallow water, they are also at risk from collisions with vessels and may be harassed by shark, cetacean and marine wildlife watchers. Collisions seem to be relatively frequent – large areas of scarring are often observed on the head,

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<sup>1</sup> It is forbidden for community vessels to fish, stow on board, transfer or disembark the following species in all EU and non-EU waters : - the basking shark (*Cetorhinus maximus*) and - the great white shark (*Carcharodon carcharias*)

dorsal fins and dorsal surfaces of UK sharks (CITES, 2002; [www.manxbaskingsharkwatch.com](http://www.manxbaskingsharkwatch.com); [www.mcsuk.org](http://www.mcsuk.org)).

Habitat destruction and climate change also threaten this highly vulnerable species.

### Human Impacts

Disturbance and harassment from increasing inshore leisure traffic and a fascinated public have been identified as potential threats to large marine species like basking sharks. Wildlife watching and recreational boat traffic (jet-ski use), and interaction with ferries have all resulted in collisions, and some confirmed basking shark mortalities (Doyle *et al*, 2005).

The negative impacts of boat strikes, fisheries and by-catch can range from the extreme to those which have only a limited effect on the shark. These impacts are rarely recorded, however, anecdotal evidence suggests it to be a serious issue affecting many sharks.

Basking sharks can be affected by:

- Propellers/collisions
- Harassment

In order to establish appropriate management regimes, it is essential that the extent of these impacts are understood. Kelly *et al*, in 2004, show that there is a low level of reported incidents and a lack of awareness of marine protection legislation amongst all sectors.

### Climate change

There is potential for global warming to affect the timing and species assemblages of phytoplankton and zooplankton blooms (Sims & Reid, 2002), and there is evidence that plankton blooms/fish recruitment coupling events that occur in the North Sea may have already been permanently disrupted by warming of this relatively enclosed water body (Beaugrand *et al*, 2002; Beaugrand *et al*, 2003). This is likely to have knock-on consequences to many species that rely on high productivity waters, including the basking shark, which lies at the end of a very short food chain, *i.e.* phytoplankton – zooplankton – basking shark.

## 5. Existing Management measures

Despite this vulnerability, the protection for basking sharks in Europe is limited and varies spatially.

Concern over the strong possibility that populations are depleted as a result of exploitation by fisheries and the lack of scientific knowledge of the species, has led to the basking shark being listed as Vulnerable (A1a,d+2d) worldwide since 1996 and Endangered (A1ad) in the North Pacific and the north-eastern Atlantic in the IUCN Red List since 2000 (IUCN, 2004; IUCN, 2007: <http://www.iucnredlist.org>).

The basking shark is listed on several international conventions. In 2000, the species was listed in Appendix III of the Convention on International Trade in Endangered Species (CITES). In 2002, on the basis of a UK proposal, the CITES listing was upgraded to Appendix II, which requires that international trade in these species is monitored through a licensing system to ensure that trade can be sustained without detriment to wild populations.

In addition to OSPAR, basking sharks are also listed on UNCLOS, the Barcelona Convention, the Bern Convention, and the Bonn Convention on Migratory Species (CMS) (table 2). These international conventions do not protect a species *per se* but encourage contracting countries to take the necessary steps towards protecting the species within their own territory, and/or to establish partnerships whose

aim is to improve the species conservation status. Parties to CMS are required to protect Endangered Appendix I species. The UNEP/CMS recommendation n°8.16 adopted in 2005 calls upon range states listed in Appendix I or II to develop a global migratory sharks conservation instrument (CMS, 2005).

**Table 2:** International Conventions of relevance to basking sharks in the OSPAR Regions

Convention		Listing
United Nations Convention on the Law of the Sea (UNCLOS)		Annex I (Highly Migratory Species) since december 1982
Bern Convention on the Conservation of European Wildlife and Natural Habitats		Appendix II Strictly Protected Fauna Species (Mediterranean only) since december 1997
OSPAR Convention for the protection of the marine environment for the North-East Atlantic		OSPAR List of Threatened and/or Declining Species and Habitats since 2003
Convention on the Conservation of Migratory Species (Bonn Convention)		Appendix I – Endangered Migratory Species Appendix II- Migratory species conserved through Agreements since November 2005
Convention on International Trade in Endangered Species of Flora and Fauna (CITES)		Appendix II

At a European scale, some implementing measures were taken by the Common Fisheries Policy:

- a Total Allowable Catch (TAC) of zero was adopted in 2001 in the ICES regions IV, VI & VII, which forbids commercialisation of this shark in these areas (Annex 1D, EC regulation n°2555/2001).

This TAC was applied until 2006 and was subsequently replaced in 2007 by a ban on EC vessels to fish, keep on board, embark or disembark basking sharks inside and outside European waters (Article 5.6, EC regulation n°41/2007). This ban is also applicable to all third party vessels fishing in European waters (article 13.2 du règlement). Basking sharks are also concerned by the EC regulation n°1185/2003 relative to the removal of shark fins on board fishing vessels (a process known as finning), which was adopted by the EC at the end of 2003.

On a national scale, basking sharks are currently fully protected within the territorial waters of the United Kingdom, Guernsey and Isle of Man, Malta and continental United States and partially protected in New Zealand where directed fishing is prohibited (table 3). The target fishery was closed in Norway, following the listing on Appendix I of CMS, but bycatch must be landed.

In the United Kingdom, basking sharks have been studied in depth and listed as a priority species under the UK Biodiversity Action Plan since 1999 (English Nature, 1999). In the UK, some national initiatives can be shown like the wise scheme ([www.wisescheme.org](http://www.wisescheme.org)), to limit impact from ecotourism. Within the framework of this scheme, nearly 800 individuals have been trained so far in safe observation techniques for the basking shark and other species.

**Table 3:** National conservation measures in the OSPAR area

	Text	Year	Extent	Regulation
Isle of Man	Schedule 5 of the Manx Wildlife Act	1990	12 nm	It is forbidden: - to capture, kill, injure or catch basking sharks - to disturb basking sharks and to damage or obstruct access to an area used by basking sharks for shelter or protection - to have in possession, to transport or to sell basking sharks or any products derived from the latter
Guernesey, Alderney & Sark (Channel Islands)	Fishing Ordinance, Part I, Section II	Aug. 1997	3 nm	It is forbidden: - to capture, kill or injure basking sharks - to ship, have in one's possession, sell, buy, import or export basking sharks - Animals captured accidentally must be released at sea.
UK	Schedule 5 of the Wildlife and Countryside Act	Apr. 1998	12 nm	It is forbidden : - to capture, kill or catch basking sharks - to have in one's possession or to sell basking sharks or any products derived from basking sharks
Jersey (Channel Islands)	Conservation of wildlife	2000	12 nm	It is forbidden to kill or capture basking sharks
UK / England & Wales	Countryside and Rights of Way Act	2000	12 nm	It is forbidden to kill or capture basking sharks
UK / Scotland	Nature Conservation Act (Scotland)	2004	12 nm	It is forbidden to kill or capture basking sharks

## 6. Conclusion on overall status

There is no known change in the status of this species since it was proposed to be listed by OSPAR in 2004. Future trends are currently very unclear. The pronounced migratory character and vulnerability of this species underlines the need to strengthen our knowledge of basking sharks by pooling the efforts of research teams within different countries.

The collapse of landings thirty years ago was a turning point in the interest in the conservation of this species. However it has not proved possible to assess the effects of past fishing mortality on basking shark populations in the North-east Atlantic because no reliable estimates of population size have been made.

Nowadays, the targeted fishing of basking sharks is entirely banned (ICES, 2006), but by-catch persists, notably in driftnets, entanglement in lobster/crab and prawn pot ropes and trawlers, for which very few data are available.

The low productivity of this marine fish species makes basking sharks very sensitive to population collapse from anthropogenic sources (e.g. the Californian / west coast Canadian populations have not recovered since a fisheries programme and an eradication programme were introduced along that coast between the 1930s and 1970s. The eradication programme (which killed sharks by ramming them with boats with large spikes attached to their hulls) between the 1950s and the 1970s in Canada was introduced to eliminate basking sharks in order to protect salmon nets. The shark population has yet to recover (Solandt, *comm.pers.*).

Various research programmes have been implemented in order to understand the population size and distribution of basking sharks. The sightings recording schemes developed for the most part in British and French waters only provide information on the relative surface abundance of basking sharks. Most observations occur in the spring and summer, in shallow coastal areas.

Tracking studies have brought valuable information on this species. There is some evidence that *C. maximus* is highly migratory and tracks seasonal zooplankton aggregations closely. These tags have demonstrated that basking sharks move between different economic zones and as a result are not afforded statutory protection for the majority of the time. Therefore conservation measures for this species need to be framed on an international level, as has been attempted through listing on several international agreements.

Current management measures, while ostensibly helpful, do not appear to be sufficient to allow for the recovery of this species. Very few countries that are Party to CMS have implemented protection for this Appendix I species.

## 7. Action to be taken by OSPAR?

### **Action/measures that OSPAR could take, subject to OSPAR agreement**

As set out in Article 4 of Annex V of the Convention, OSPAR has agreed that no programme or measure concerning a question relating to the management of fisheries shall be adopted under this Annex.

**Table 4:** Summary of key priority actions and measures which could be taken for Basking shark. Where relevant, the OSPAR Commission should draw the need for action in relation to questions of fisheries management to the attention of the competent authorities. Where action within the competence of the Commission is desirable to complement or support action by those authorities or bodies, the Commission shall endeavour to cooperate with them.

<b>Key threats</b>	<ul style="list-style-type: none"> <li>- Incidental captures</li> <li>- Increase of recreational boat traffic and wildlife watching</li> <li>- Habitat degradation and alterations in zooplankton composition</li> <li>- Shark fin market</li> </ul>	
<b>Other responsible authorities</b>	<p>EC, FAO, RFMOs                  [OSPAR Contracting Parties: Iceland, Norway, Denmark, Sweden, Netherlands, Belgium, Germany, UK, Ireland, France, Portugal, Spain]</p>	
<b>Already protected? Measures adequate?</b>	<ul style="list-style-type: none"> <li>- EC regulation n°41/2007 of the 21/12/2006 (article 5.6) banning basking shark fishing in the EC</li> <li>- EC regulation n°1185/2003 of the 26/06/03 banning finning in the EC</li> <li>- Norwegian fishing regulations</li> <li>- IUCN Red List (Endangered A1ad+2d)</li> <li>- CITES Appendix II</li> <li>- CMS Appendix I, II (Bonn convention) – not fully implemented by all Parties in the OSPAR area.</li> <li>- Bern convention</li> <li>- Barcelona convention</li> <li>- Fully protected within the territorial waters of the United Kingdom, Guernsey and Isle of Man</li> <li>- UK Biodiversity Action Plan</li> </ul>	<ul style="list-style-type: none"> <li>- European regulations limit global fishing effort on this vulnerable species in a significant way. Nevertheless, as basking sharks carry out ocean-wide migrations, protection measures need to extend beyond territorial and community waters.</li> </ul>

<p><b>Recommended A+M</b></p>	<p><b>OSPAR Commission</b></p>	<p>OSPAR should emphasise to relevant scientific bodies the following research needs:</p> <ul style="list-style-type: none"> <li>- Pooling research efforts between different countries and strengthening transnational communication between research teams</li> <li>- Improving our knowledge of this species by furthering or initiating research programs:             <ul style="list-style-type: none"> <li>- to quantify and monitor population size, structure, dynamics and movement patterns and range of individuals occurring</li> <li>- to elucidate migration and over-wintering areas which may identify locations where basking sharks mate and the pregnant females reside</li> <li>- to grasp the relationship between zooplankton availability and basking shark presence</li> <li>- to continue surveillance of basking shark sightings (casual users and observers embarked on fishing vessels and using effort-based observation from fixed points on land) distribution trends over time in order to fully understand the impacts of climate change on this species. These studies should be run concurrently between all range states in the OSPAR region using the same methodology over a number of years.</li> <li>- initiate or further develop satellite telemetry research projects on basking shark populations</li> <li>- Develop research programs on basking shark population genetics in order to determine the degree of mixing between populations.</li> </ul> </li> </ul>
	<p><b>Contracting Parties</b></p>	<ul style="list-style-type: none"> <li>- Encourage OSPAR Members that are Party to CMS to implement the Appendix I listing by protecting the species within their waters</li> <li>- Statutory protection</li> <li>- Extend protection under the UK Wildlife and Countryside Act to all UK waters (including the EEZ) and apply similar measures in northern Ireland, the republic of Ireland and France, where basking sharks are usually sighted</li> <li>- Develop a boating code of conduct</li> <li>- Develop local management measures,</li> </ul>

		including provision of guidelines and codes of conducts to sea-users and establish surveys of sea-users to determine whether boat strike and disturbance is a regular occurrence.
	<b>OSPAR should communicate to relevant authorities the need for:</b>	<ul style="list-style-type: none"> <li>- Improved fishery by-catch knowledge</li> <li>- Improve accidental bycatch data collection :</li> <li>- obligatory declarations in the log books</li> <li>- embarking scientific observers on board fishing vessels</li> <li>- Extending the Bern Convention listing to OSPAR waters</li> <li>- Listing basking sharks on the Habitats Directive</li> </ul>

**Brief summary of the proposed monitoring system (see annex 2)**

Given the highly mobile nature of this species, a large-scale international conservation effort must be envisaged. As basking sharks undergo transatlantic migrations, it would be interesting to pursue partnerships with countries outside the OSPAR maritime area, namely Canadian and American research teams. This might be achieved through the proposed CMS Instrument for migratory sharks.

Relevant Contracting Parties should be encouraged to report to OSPAR on

- Sighting schemes
- Satellite tagging
- Research relating to food availability
- Genetic research to determine whether there are one or several basking shark populations
- Accidental by-catch
- Codes of conduct in basking shark hotspots with high boat traffic

## Annex 1: Overview of data and information provided by Contracting Parties

Contracting Party	Feature occurs in CP's Maritime Area	Contribution made to the assessment (e.g. data/information provided)	National reports References or weblinks
<i>Belgium</i>			
<i>Denmark</i>			
<i>European Commission</i>			
<i>France</i>	Y	Y Data on basking shark occurrence along French coast, trends on sightings in Brittany (NW France) over last years (1997-2005)	Stephan E., Jung A. et Guerin S., 2000. Basking shark ( <i>Cetorhinus maximus</i> ) apparent abundance off french coasts in 1997 and 1998. Abstracts of the 3 <sup>rd</sup> meeting of European Elasmobranch Association, Boulogne-sur-Mer. 1pp. <a href="http://www.asso-apecs.org">www.asso-apecs.org</a>
<i>Germany</i>	Y	N	Fricke R., 2008. Rote Liste der marinen Fische und Rundmäuler Deutschlands (Pisces: Gnathostomata, Petromyzontomorphi). Bonn (BfN) (in press).
<i>Iceland</i>	Y	Y	Jónbjörn Pálsson, Pers. comm
<i>Ireland</i>	Y	Y	Berrow S. and Whooley P., 2008. IWDG Miol Mor Publication Issue 33, summer 2008.  Doyle J.I., Solandt J.L., Fanshawe S., Richardson P., 2005. Marine conservation Society Basking Shark Report 1987-2004. Marine Conservation Society, Ross on Wye, UK.
<i>Netherlands</i>	Y-rare	Y	Muus et al. (1999) Zeevissen van Noord- en West-Europa, Schuyt en Co. (ISBN 90 6097 510 3) (in Dutch)  Camphuysen, K.; Couperus, B.; Weichler, T. (2001). Foraging basking sharks <i>Cetorhinus maximus</i> in the North Sea, summer 2001 [Foeragerende reuzenhaaien ( <i>Cetorhinus maximus</i> ) in de Noordzee, zomer 2001]. Het Zeepaard 61(5): 127-132 (in Dutch)
<i>Norway</i>	Y	N	

Background document for Basking Shark - *Cetorhinus maximus*

Portugal	Y	Y Landings basking sharks between 1987 and 2006	Joao Correia, pers. comm, 2008
Spain	Y	N	
Sweden	Y		Gärdenfors, U (ed). 2005. The 2005 red list of Swedish species. Uppsala (ArtDatabanken).
UK	Y	Y Data on basking shark occurrence Marine Conservation Society	Bloomfield A., Solandt J.L., 2006. Basking shark watch-2006 report. Marine Conservation Society. 11 p  Doyle J.I., Solandt J.L., Fanshawe S., Richardson P., 2005. Marine conservation Society Basking Shark Report 1987-2004. Marine Conservation Society, ross on Wye, UK.  Noble L.R., Jones C.S., Sarginson J., Metcalfe J.D., Sims D.W., Pawson M.G., 2006. Conservation genetics of basking sharks. Final project report. Department for Environment Food and rural affairs (DEFRA) Tender CR 0288. 85p.  Sims D.W., Southall E.J., Metcalfe J.D., Pawson M.G., 2005. Basking shark population assessment. Final report for Global Wildlife Division of Data. Department for Environment Food and rural affairs (DEFRA) Tender CR 0247. 74p.  Speedie C.D., Johnson L.A., 2008. the basking shark ( <i>Cetorhinus maximus</i> ) in West Cornwall. Key sites, anthropogenic threats and their implications for conservation of the species. Natural England Research Report NERRO18. 45p.  www.mcsuk.org

*C.maximus* was nominated in 2001 for inclusion in the OSPAR List by Germany, Iceland, Portugal, UK, WWF

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- Mathew Carden, DEFRA, London UK

## Summaries of country-specific information provided

**United Kingdom:** Since 1987, MCS has successfully raised public and media awareness of basking sharks in UK waters. MCS encourages the public to report basking shark sightings online on the MCS website and regularly reports basking shark watch results to the general public via annual summary reports. MCS is joint lead partner of the basking shark species action plan ([www.ukbap.org.uk](http://www.ukbap.org.uk)) along with the Shark Trust and the Wildlife Trust.

A major UK Defra research programme was carried out between 2003 and 2006 by Cefas and the University of Plymouth (Sims *et al.* 2005). David Sims' research team researched satellite tagging in UK waters before taking an interest in basking shark food availability and determining the relationship between basking shark distribution and thermal fronts, zones which are prolific for zooplankton. Genetic studies aiming to show whether there are one or several populations have been put into place. Research teams have worked specifically in Cornish and Hebridean waters. The important number of basking sharks observed off the west coast of Scotland make this area particularly important for basking shark conservation (Speedie *et al.*, in press).

**Ireland:** In Ireland, since 1992, the Irish Whale and Dolphin Group ([www.iwdg.ie](http://www.iwdg.ie)) log, in parallel to their cetacean records, basking sharks strandings and sightings. Most observations take place during the spring (Berrow S. & Whooley P., 2008).

**France:** In France, the zones where basking shark sightings are most frequent are in two specific parts of Brittany: the waters surrounding the Glénan Isles and the north of the mer d'Iroise. The Casquets traffic separation scheme in the English Channel also has regular basking shark sightings. An annual sightings scheme has been running in Brittany since 1997, and along the whole of the French coast since 1998.

From 2003, APECS has initiated a study program for the basking sharks (sex ratio, size) in order to grasp a better knowledge of the individuals present in the waters around Brittany, and to learn whether the basking sharks make up a small local population or belong to a much vaster one, and to better understand their movements. Every spring, monitoring is carried out in the waters surrounding the Glénan Isles and the north of the mer d'Iroise.

**Azores:** Basking shark occurrence in the Azores area is very rare (Santos *et al.*, 1997).

**Iberian Peninsula:** Several authors have recorded the presence of basking sharks in Atlantic Iberian Peninsula waters, but data is scarce (Valeiras J. *et al.*, 2001). In Portugal, a few observations and accidental bycatches occur very infrequently, and concern mostly single basking sharks (João Correia, Filipe Pereira, pers. comm.). From 1987 to 2006, fish landings in Portugal indicate a total basking shark capture of 13.5 tonnes (Joao Correia, pers.comm).

**Iceland:** *Cetorhinus maximus* does visit Icelandic waters, particularly the warmer waters off the southern and western coast. It is occasionally seen, but only single animals (Jónbjörn Pálsson, Pers. comm).

**The Netherlands:** In summer young individuals are sometimes observed foraging of the Dutch Coast.

## Annex 2: Detailed description of the proposed monitoring and assessment strategy

### Rationale for the proposed monitoring

Basking sharks have life-history traits that make them especially vulnerable. The main threats to this species are fishing by-catches, increased boat traffic, and destruction of habitats. Furthermore a lot remains to be learnt about their biology and population dynamics.

Given its vulnerability and the threats facing this species, it is important to coordinate research activities for this species on an OSPAR area scale, and to further research in zones that have had little prospecting to date (particularly Norway and the Iberian Peninsula)

### Use of existing monitoring programmes

The feeding habits of basking sharks lead them to spend long hours on the sea surface filtering zooplankton, a characteristic which allows relatively easy sightings of this species and subsequent abundance estimates. Thus, different sightings schemes have been implemented across the OSPAR maritime area, essentially in French and British waters.

Awareness-raising campaigns are led every spring along the British and French coastline. Users of leisure vessels are invited to report sightings by means of a public sightings recording scheme. In parallel, research teams using line transect methods around the southern Hebrides, Isle of Man, Cornish coast and Brittany with a very precise protocol (effort-corrected counts from ship surveys) collect data on different biotic and abiotic parameters. Some programmes are dedicated to tagging of basking sharks with satellite pop-up tags.

Any OSPAR monitoring strategy for basking sharks will therefore essentially be to bring together the outputs of the different ongoing monitoring, assessment and research efforts across the OSPAR area, ensuring at the same time that any significant gaps are filled. At the same time, it would be expedient to further research efforts in non-prospectored zones (*i.e.* the Iberian peninsula and Scandinavia).

In the UK, since 1987, the Marine Conservation Society (MCS) has successfully raised public and media awareness of basking sharks in UK waters. Three hotspots with high sighting densities have been identified: Southwest England (particularly Cornwall and South Devon), the Isle of Man and the west coast of Scotland (particularly around the islands of Coll, Tiree and Mull). The MCS publishes reports on basking shark watch results. Many research teams work on basking shark research in the British Isles, where research effort is highest in the OSPAR zone.

In France, most sightings occur in Brittany and the Gulf of Normandy. The non-governmental organisation APECS (*Association pour la Protection, l'Etude et la Conservation des Sélaciens*) has been working on basking sharks in Brittany since 1997, and along the whole French coastline since 1998. A gridding of the Breton study zone "Glénan Isles" and "north of the mer d'Iroise" was established in 2003. These tracking campaigns aim to acquire a better understanding of basking sharks (photo-identification, biopsies). Three basking sharks were equipped with Argos tags, but no reliable data was collected. Since 2006 a plankton survey of the areas known for their frequent basking shark sightings is underway and since 2007 an evaluation of anthropic efforts has been running.

Results from the basking sharks monitoring and other research programmes are not formally coordinated or reported on across the OSPAR area at present.

The focus should be on ensuring that the resulting available information is collated for this species at the OSPAR level. Therefore, the relevant Contracting Parties (UK, France) should report monitoring data to OSPAR. It may be necessary for OSPAR to consider how best to ensure consistency of monitoring and data reporting

OSPAR could encourage the implementation of research programmes in non-prospectured zones. Every year the European Elasmobranch Association organises a meeting to allow European researchers to exchange research ideas on sharks, skates and rays. This NGO based in Plymouth was created in 1996 (<http://www.eulasmob.org/>) and gathers together the majority of research teams working on basking sharks. The EEA could be the organisation with which data collected via the OSPAR network is exchanged and analysed.

## Synergies with monitoring of other species or habitats

As basking sharks come to feed on the surface, it is natural to link their observations with cetacean monitoring programmes, as is already the case with several organisations (eg., the Irish Whale and Dolphin Group, the Hebridean Whale and Dolphin Trust). Surveys on board cetacean research vessels can also record basking shark sightings data. Raising awareness among the fishing and merchant community would increase sightings recording at no extra cost.

The EC regulation n°812/2004 laying down measures concerning incidental catches of cetaceans in fisheries and amending Regulation (EC) No 88/98 stipulates that Member States should have observers monitor incidental catches of cetaceans and to collect the data necessary to extrapolate the by-catch observed to the whole fishery concerned. It is suggested that these observers, who by definition must be competent biologists, log all by-catches, including shark species. In France, 15 observers have been trained and given permission by the fishing authorities to collect data, in addition to cetaceans, on 11 sharks, 6 rays and 3 angel sharks, including the basking shark, the porbeagle (*Lamna nasus*), the common skate (*Dipturus batis*) and the angel shark (*Squatina squatina*), all four of which are on the OSPAR list. The OSPAR commission could encourage all Contracting Parties to increase their observation effort in terms of numbers and detail recorded.

## Assessment criteria

Data is insufficient to determine a critical level below which conservation efforts must be multiplied. The current approach to conservation of basking sharks relies heavily on the precautionary principle, which states that insufficient scientific knowledge about biology and stock status is no defence for a lack of action.

With our current level of knowledge, there is a need for further research effort in the UK and France as well as other Contracting Parties, where basking sharks are often seen.

## Techniques/approaches

- Continue sightings programmes in British and French waters, further research in Scandinavia and the south of the OSPAR region. Expand further fixed-point and mobile effort-corrected basking shark (and other marine megafauna) watches across the OSPAR region with coordinated methodology.
- Further satellite tagging programmes, covering different sexes and age classes.
- Further research on food availability and distribution
- Further genetic research on basking shark populations in order to determine whether there are one or several
- Increased reporting of by-catches: encourage fishermen to declare by-catches in their log books
- Draw up codes of conduct in basking shark hotspots

## Selection of monitoring locations

Basking sharks should be monitored in Britain, Ireland, France, Norway, Spain and Portugal. Efforts should be concentrated in Norway, Spain and Portugal.

## Timing and Frequency of monitoring.

Monitoring should take place annually- :

In the north of the OSPAR maritime area, as is already the case, during the spring and summer months to coincide with plankton blooms,

In the south of the OSPAR area, not enough data have been collected to identify a preferential monitoring period, or indeed whether there is a high enough abundance of basking sharks to merit a targeted research programme.

## Data collection and reporting

The basic data categories to be recorded are:

☞ For a sighting at sea by a leisure vessel user/member of the public

☞ For a sighting carried out by a research team:

- GPS position
- photo-identification of dorsal fin
- size estimation
- animal behaviour (feeding yes or no)
- sex determination, as well as the recording of any distinctive marks, by getting into the water with the basking shark if behaviour and weather conditions will allow it
- abiotic factors: water temperature/air temperature: wind strength and direction/sea state/ cloud cover/ GPS position
- counting the time for which the dorsal fin is out of the water and comparing it to the total time the basking shark is observed
- biopsy (and tagging if it's part of the program)
- plankton sampling once all other parameters have been recorded. If the sighting lasts a long time, regular plankton samples along its path should be carried out.
- Afterwards, if the shark is still within sight, carry out simple ethological surveying: behaviour, surrounding vessels, types of vessels, behaviour in response to surrounding activities etc.

## Quality assurance

It is essential that awareness raising campaign efforts are equal along the whole coastline and that clear pointers are given in identifying basking sharks, so that their dorsal fins are not confused with those of porbeagles or cetaceans.

For sightings recording schemes, it is important that one is not afraid to discard data if reliability or accuracy is in doubt.

During ship-based surveys (and effort-corrected land-based surveys), prospecting efforts (time and distance surveyed) must be recorded in order to carry out effective comparisons between different sectors.

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## Annex 4: Biological and Historical Fishing Background Information

### Biological Background Information

This species occurs mainly in the temperate waters of continental and insular shelves and shelf slopes in the OSPAR zone, from the surface and shoreline, to depths of at least 1264 m as reported in Gore *et al*, 2008. They are occasionally recorded well offshore in oceanic waters and spend a large amount of time feeding in deeper water on the edge of continental and insular shelves (Sims *et al*, 2005).

Basking sharks forage along thermal fronts and actively select areas that contain high densities of large zooplankton (Sims & Quayle, 1998).

Geographical distribution in the OSPAR area is derived from three types of data:

- sightings of sharks reported in the frame of public sightings recording schemes
- effort-corrected counts from ship surveys
- geolocations determined from satellite telemetry

Public schemes and ship surveys are mostly carried out in the UK and France.

In UK waters and the Irish Sea, most observations occur during the spring and summer months. Hotspots have been identified off the coast of Cornwall and Devon (south-west peninsula of England), the Hebrides, the Isle of Man and the Isle of Arran (Marine Conservation Society).

In the waters of southern Devon and Cornwall, the Wildlife Trust Basking Shark Project has recently identified two sites often frequented by basking sharks between 1999 and 2004 (Speedie & Johnson, 2008):

- the Lizard peninsula
- the Lands End peninsula

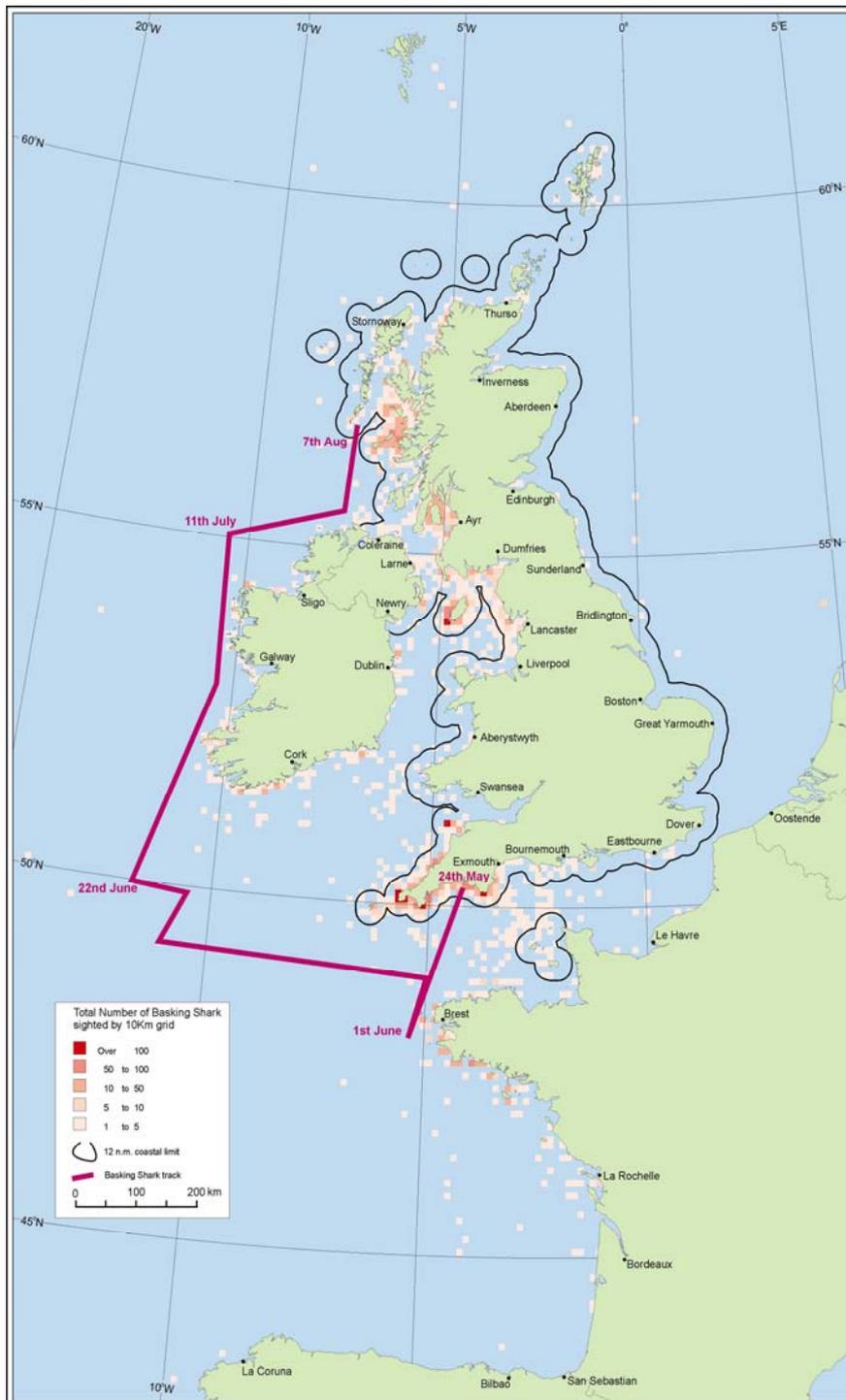
In Scotland, some key sites were identified for surface sighted basking sharks. (Speedie *et al*, in press)

- In the Firth of Clyde – The Lamont Shelf
- The island of Coll, particularly the area around Gunna Sound
- The island of Canna, particularly the Northwest of the island
- The islet group at Hyskeir

In France, observational data has allowed two areas to be identified where basking sharks are often encountered in the spring and summer months (APECS, unpublished data) (figure 2 & 9):

- Brittany, and in particular two sectors: the waters surrounding the Glénan isles and the north of the Mer d'Iroise
- To a lesser extent, the entry to the traffic separation scheme of the Casquets in the English Channel

**Figure 8:** Basking shark sighting densities (by 10km grid cell) compiled by the Marine Conservation Society (MCS) between 1987 and 2004 and *l'Association pour l'Etude et la Conservation des Sélaciens* (APECS) between 1997 and 2005. The pink line indicates the movement of a satellite-tracked basking shark between Plymouth (May 2001) and the outer Hebrides in Scotland (August 2001). Basking sharks are regularly sighted within the 12 nm limit, but tracked sharks (pink line) spent the majority of their time (78%), outside the 12 nm limit of UK water (*i.e.* outside the protected area) (Solandt *et al*, 2006; Sims *et al*, 2005)



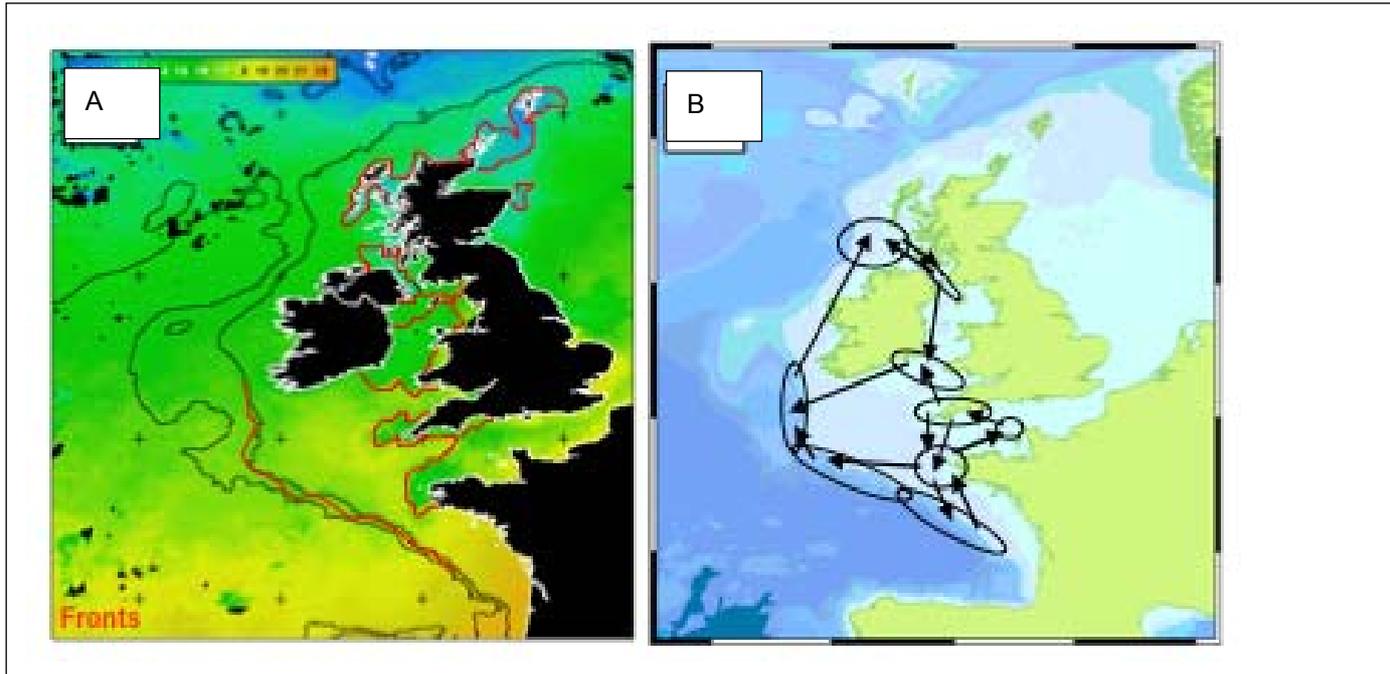
The number of observations is highly variable from year-to-year (APECS, unpublished data). These interannual variations have also been observed in the United Kingdom (Sims & Reid, 2002, Cotton *et al*, 2005), and appear to be correlated with the availability of the basking sharks' food source: zooplankton.

Although these types of monitoring provide useful information on where basking sharks occur at the surface, they do not reliably indicate the total distribution area. They do not provide information when sharks are not at the surface. In addition, several biases exist because public shark sightings are heavily dependent on weather conditions, on public awareness and also on area frequentation by the public.

Other methods are used to study the distribution and abundance of basking sharks. Tracking experiments have been developed to study individual large-scale movements. This method consists of equipping sharks with electronic tags which record its activity via a number of physical parameters (temperature, depth, light intensity), and an emitter to transmit the data via a satellite system.

Most tracked sharks remain on continental shelf edges during winter, spending more time at greater depths and less near the surface (Sims *et al*, 2005). Some individuals move into shallower shelf waters in higher latitudes as the summer season progresses, with a greater proportion of time spent at feeding at the surface, particularly after the thermocline has developed and zooplankton densities are at their height. However, one shark tagged on the Isle of Man recently was seen moving - via open ocean waters - to the coastal waters of Newfoundland in 2007 (Gore *et al*, 2008).

Sims *et al* (2005) found that the largest migration of the sharks observed in the UK shark tagging project was from the Plymouth area, south into waters off north-west Brittany, west through the western approaches to southern Ireland, around the atlantic coast of Ireland, and eventually into the sea of the Hebrides in less than three months of tracking (Figure 8). This single immature shark roamed through the inshore territorial waters and EEZ of several States. Figure 9 illustrates those areas where sharks tagged in UK waters were most commonly recorded. In the summer, basking sharks tended to move north between centres of high zooplankton abundance associated with thermal fronts (figure 9A). In winter, there was a tendency for the sharks to remain in deeper water, generally in the southern region of the shelf (figure 9B). These results suggest it unlikely that there are separate populations of basking sharks inhabiting northern or southern UK waters, but rather that individuals move freely between these areas and the waters of adjacent states and probably form a single population in this part of the North-east Atlantic.



**Figure 9:** Breakdown of location of tidal and shelf break fronts (red lines) on NE Atlantic continental shelf (A) and location of shark hotspots (B) where sharks were observed most frequently from the archival tracking experiment. Remote sensing image is a monthly composite of sea surface temperature during August 2002 from AVHRR on NOAA satellites. (Data reproduced with permission, Sims *et al*, 2005).

In Britain, Southall *et al*, 2005 compared the data derived from surface observations with that of geolocalised satellite tags. The broad distribution patterns revealed by these different methods are similar, but there are considerable differences in density distributions.

Surface sightings data show high densities, or “hotspots” in the Hebridean Sea, Clyde Sea, Irish Sea and close inshore around Devon and Cornwall. Tag geolocations, in contrast, identified two areas where individuals spent considerable time outside the distributions indicated by surveys and public sighting: the Celtic Sea and Western Approaches of the English Channel.

It was thought that basking sharks carried out migrations on a scale linked to the North-east Atlantic, until a recent study (Gore *et al*, 2008) with a tagged individual showed the migration of a mature basking shark tagged in south-west Isle of Man reaching the east of the Newfoundland shelf edge (Canada). This basking shark travelled a horizontal distance of 9589 km and reached a record depth of 1264 m. This result provides the first evidence for a link between European and American populations and indicates that basking sharks make use of deep-water habitats beyond the shelf edge.

### Historical Fishing Background Information

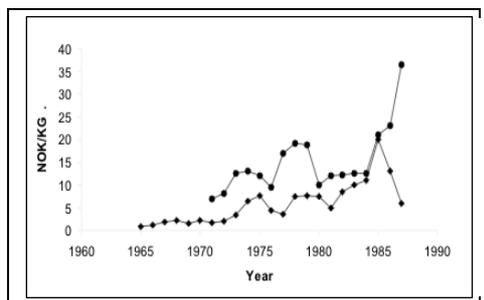
Basking sharks have proven to be exceptionally sensitive to exploitation (Compagno, 2001). Long periods spent surface feeding (Sims & Quale, 1998) make this species an easy target for harpoon fisheries.

Unregulated commercial and subsistence fisheries for basking sharks have existed in the North-east Atlantic region for at least two hundred years (McNally, 1976; Fairfax, 1998). Targeted fisheries have been recorded from Norway, Ireland, Scotland, Iceland and France and Galicia (north coast of Spain)

in the OSPAR Area (Compagno, 1984, Chenard *et al* 1951). Indeed, the earliest directed fisheries for pelagic sharks were probably for this species (Pawson & Vince, 1999).

Historically, basking sharks were fished mainly for liver oil<sup>2</sup>, which was used as lighting fuel for lamps in the past, along with exploitation of their meat and hide. The recently burgeoning market for shark fins includes a demand for basking shark fins, with single, large fins fetching up to US\$ 57 000 (Clarke, 2004) (Hareide, 2006) (figure 10).

Despite the finning ban on European Community vessels (EC 1185/2003 of the 26/06/03) navigating inside and outside of EU waters, two factors are largely responsible for the current inability to assess the extent of basking shark exploitation and trade in its products: firstly, most nations do not collect species-specific information on the volume of their shark fisheries. Secondly, and more importantly from a tracking and regulation enforcement perspective, accurate species identification of basking sharks products remains difficult for the non expert (CITES, 2006).



**Figure 10:** Basking sharks in the Northeast Atlantic prices (NOK/kg) of liver (diamonds) and fins (circles). (Hareide, 2006).

The biology of basking sharks makes them especially vulnerable to exploitation. Even the life history characteristics of basking sharks are inadequately known and key parameters such as growth rate, natural mortality and fecundity are assumed rather than known; there is little doubt that the species is relatively unproductive and incapable of sustaining even modest mortality rates. The most recent estimates of population resilience or productivity ( $r_{msy}$ ) range from 0.013 to 0.023 (S.E. Smith, *pers. comm.*) and maximum age is assumed to be 50, with female maturity being reached around 18 years (Pauly, 2002), annual fecundity (female pups per litter) of 1.5, and a natural mortality of 0.091. This productivity is very low for a marine fish species, hence the sensitivity of basking sharks to unregulated fisheries mortality.

Even though targeted basking sharks fishing is nowadays totally banned (EC n°41/2007 of the 21/12/2006 and equivalent Norwegian regulations), population recovery will be very slow and the species remains threatened and vulnerable, although the recent size increases reported by public sightings schemes for UK sharks give a tantalising evidence that the North-east Atlantic population may be recovering from decades of exploitation (Bloomfield & Solandt, 2008).

Basking sharks are accidentally caught by trawlers and drift-nets in particular. The extent of this phenomenon is unknown and merits more attention, particularly as the high prices fetched by basking shark fins on the Asian market incites a greater exploitation of accidental bycatch in countries where this species is not protected.

Landings throughout the North-east Atlantic have also fluctuated, but a continued downwards trend is evident over the past few decades. A few well-documented declines in catches by directed fisheries

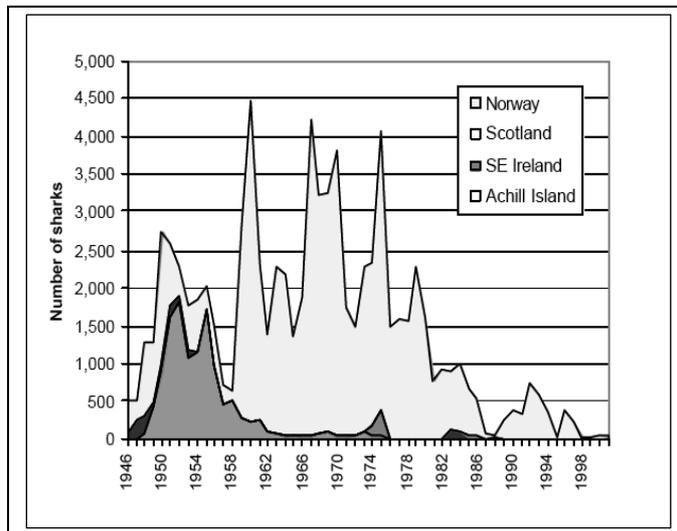
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<sup>2</sup> The liver comprises about 17-25% of the total body weight (Mc Nally 1976).

for the basking shark suggest that reduction in numbers caught of at least 50% to over 90% have occurred in some areas over a very short period (usually ten years or less, Fowler S., 2005) (figure 11). These declines have persisted into the long-term with no apparent recovery several decades after exploitation has ceased.

*Background on historical fishing grounds within the OSPAR zone*

In this document four historical basking shark fisheries are briefly overviewed: those of Ireland, Norway, Scotland and France.



**Figure 11:** Targeted North-east Atlantic basking shark catches 1946-2001 (CITES, 2006)

**Norway:** Norwegian fishermen have always been major catchers of basking sharks in the North-east Atlantic. Norway has a basking shark fishery that dates back to the 16<sup>th</sup> century when the dry flesh was used for human consumption. In the 1960s, a high demand for shark livers spurred a great expansion in this traditional fishery and catches between 1266 and 4266 basking sharks per year were made in the period 1959-80 (Kunzlik 1988, Bonfil 1994). This fishery subsequently declined with the decline of the whaling fleet, which also harpooned basking sharks. Vessels required a licence to take basking sharks. Since 2006, the targeted fishing of basking sharks in Norway is forbidden. In 2006, Norwegian by-catch of basking sharks was 16 t (ICES, 2007)

**Ireland:** In Ireland, there were two historical basking sharks fisheries off the Irish west coast:

- the 18<sup>th</sup> to 19<sup>th</sup> century Sunfish Bank fishery
- the mid – 20<sup>th</sup> century Achill Island fishery

A fishery around Achill Island, in Ireland, operated from 1947 to 1975 with decreasing catches after an initial peak of 1800 sharks taken in 1952 (Fowler, 1996). The season only lasted for a few weeks in April and May. A third fishery operated briefly off Waterford.

**Scotland:** Fairfax (1998) and Kunzlik (1988) presented data on landings from the 20th century Scottish basking shark fisheries which focused on the Firth of Clyde and West Coast. Several such fisheries started up in the 1940s, some targeted full time at the basking shark during the summer season, while others were more opportunistic. Fishing ceased after the decline in basking shark stocks and the uncertain price of their oil, and when the basking shark was listed on domestic wildlife conservation legislation in the UK in 1998 (the Wildlife and Countryside Act) which prohibited it being intentionally killed.

**France:** On the southern coast of Brittany, an artisanal basking shark fishery started up in 1942, during the war. The basking shark then became the base of an entire subsistence economy. After the war, the fishery became an additional source of seasonal revenue which continued until the early 1960s. 1957 marked the beginning of a more industrial fishery. Two boats from Concarneau were equipped with harpoon-cannons to practice this fishing method: around a hundred basking sharks could then be fished per season (Gautier, 1960). The last basking shark was harpooned in Brittany in May 1990 (APECS, unpublished).



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**OSPAR's vision is of a healthy and diverse North-East Atlantic ecosystem**

ISBN 978-1-906840-59-4  
Publication Number: 419/2009

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