



Background Document for Porbeagle shark
Lamna nasus



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 “Marine and Coastal Nature Conservation Unit” of the German Federal Agency for Nature Conservation (BfN) in collaboration with Dr. Sarah Fowler, Naturebureau International, UK

Photo acknowledgement

Cover page: ©Lisa Natanson/NOAA. The porbeagle shark is being caught for research purposes (as a part of NOAA's tagging programme).

Contents

Background Document for Porbeagle shark <i>Lamna nasus</i>	4
Executive Summary	4
Récapitulatif	4
1. Background information.....	5
Name of species	5
2. Original evaluation against the Texel-Faial selection criteria	5
List of OSPAR Regions and Dinter biogeographic zones where the species occurs	5
List of OSPAR Regions where the species is under threat and/or in decline	5
Original evaluation against the Texel-Faial criteria for which the species was included on the OSPAR List	5
3. Current status of the species	6
Distribution in OSPAR Maritime Area.....	6
Population (current/trends/future prospects)	6
Condition (current/trends/future prospects).....	6
Limitations in knowledge	7
4. Evaluation of threats and impacts	7
5. Existing management measures	8
6. Conclusion on overall status.....	8
7. Action to be taken by OSPAR	9
Action/measures that OSPAR could take, subject to OSPAR agreement	9
Brief summary of proposed monitoring system (see annex 2).....	10
Annex 1: Overview of data and information provided by Contracting Parties	12
Summaries of country-specific information provided	12
Annex 2: Detailed description of the proposed monitoring and assessment strategy	13
Rationale for the proposed monitoring.....	13
Use of existing monitoring programmes	13
Synergies with monitoring of other species or habitats	13
Assessment criteria.....	13
Techniques/approaches.....	13
Selection of monitoring locations	13
Timing and Frequency of monitoring	13
Data collection and reporting	13
Annex 3: References	14

Background Document for Porbeagle shark *Lamna nasus*

Executive Summary

This Background Document on the Porbeagle shark *Lamna nasus* 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 2008. The original evaluation used to justify the inclusion of *L.nasus* 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 *L.nasus*, 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 taupe 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 2008. L'évaluation d'origine permettant de justifier l'inclusion du Requin taupe 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 taupe, 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

Porbeagle shark (*Lamna nasus*) Bonnaterre, 1788

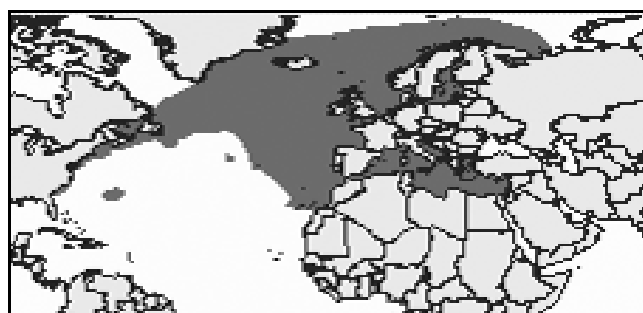
2. Original evaluation against the Texel-Faial selection criteria

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

OSPAR Regions: I, II, III, IV, V

Biogeographic Zones: South Iceland-Faeroe Shelf, Finnmark subprovince, West Norwegian subprovince, Skagerrak subprovince, Boreal, Boreal-Lusitanian, Lusitanian-Boreal, Warm Lusitanian subprovince, Cool Lusitanian subprovince, Azores subprovince (Macaronesian province), Cool - temperate Waters, Warm-temperate Waters

Figure 1: Distribution of Porbeagle shark, *Lamna nasus* in the OSPAR Area



List of OSPAR Regions where the species is under threat and/or in decline

OSPAR Regions: All where it occurs

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

Table 1: Summary assessment of Porbeagle shark *Lamna nasus* against Texel-Faial criteria

Criterion	Comments	Evaluation
Global importance	Wide-ranging and widely distributed globally.	Does not qualify
Regional importance	One or two stocks are largely restricted to the OSPAR Area, which is of regional importance for these stocks, but not for the species globally.	Does not qualify
Rarity	Seriously depleted, but aggregations still occur and it is not naturally rare.	Uncertain
Sensitivity	Very sensitive to fisheries because of its low intrinsic rate of population increase and slow recovery from depletion.	Qualifies
Keystone species	An apex marine predator, but may now be too severely depleted still to have a role in ecosystem function and regulation.	Unknown

Decline	Severely declined, with landings from various target fisheries in the OSPAR Area reduced by 85% to 99% of their baseline in the 1930s, or 50% in ~30 years, with a slight decline in catch per unit effort during the past decade.	Qualifies
---------	--	-----------

3. Current status of the species

Distribution in OSPAR Maritime Area

Lamna nasus is a wide-ranging, coastal and oceanic pelagic shark that may be found throughout the OSPAR Area (Figure 1) in water temperatures of 2–18°C, preferring 5–10°C (Campana and Joyce 2004, Svetlov 1978). They are most commonly reported on continental shelves and slopes from near the surface to depths of 200 m, but have occasionally been caught at depths of 350–700 m. They range from close inshore (particularly in summer), to far offshore (where they are often associated with submerged banks and reefs), including movements into the High Seas outside 200 mile EEZs (Campana and Gibson 2008, Pade *et al.* 2009), although only one tagged animal has been recorded crossing the Atlantic (Francis *et al.* 2008). The North-East Atlantic stock is generally considered to be separate from those in the North-West Atlantic and Mediterranean (Heessen 2003; Campana *et al.* 1999, 2001; ICES WGEF 2007). Sharks tagged in the Celtic Sea (OSPAR Region III) remained in that area (Pade *et al.* 2009). FAO (2007) noted that there may be a separate North Atlantic stock off Iceland in OSPAR Region I (Matsumoto 2005), in which case there are two stocks within the OSPAR Area.

Population (current/trends/future prospects)

ICES and ICCAT consider that the North-East Atlantic stock of *L. nasus* is depleted. Landings of this valuable species have declined steeply and had almost ceased in most northern fisheries before TACs were introduced. Catch per unit effort (CPUE) in the last target fishery (based in France) has been declining slowly since an apparent peak in 1994, with recent CPUE being the lowest since the early years of the fishery (ICES WGEF 2008). (It should be noted that CPUE may under-represent the stock trend in an aggregating species, since fishers may continue to be able to locate groups when the population is small.) The proportion of large porbeagle in landings has decreased since 1993. ICES has advised a zero TAC since 2006. Fishing currently continues under TAC management (436 t in 2009). ICES and ICCAT concluded from exploratory stock assessments that sustained reductions in fishing mortality would be required if there was to be any stock recovery. If fishing mortality is zero, recovery to B_{MSY} (the biomass at which a maximum sustainable yield would be possible) would take about 15–34 years, (ICES WGEF 2009, ICCAT SCRS 2009, Figure 2).

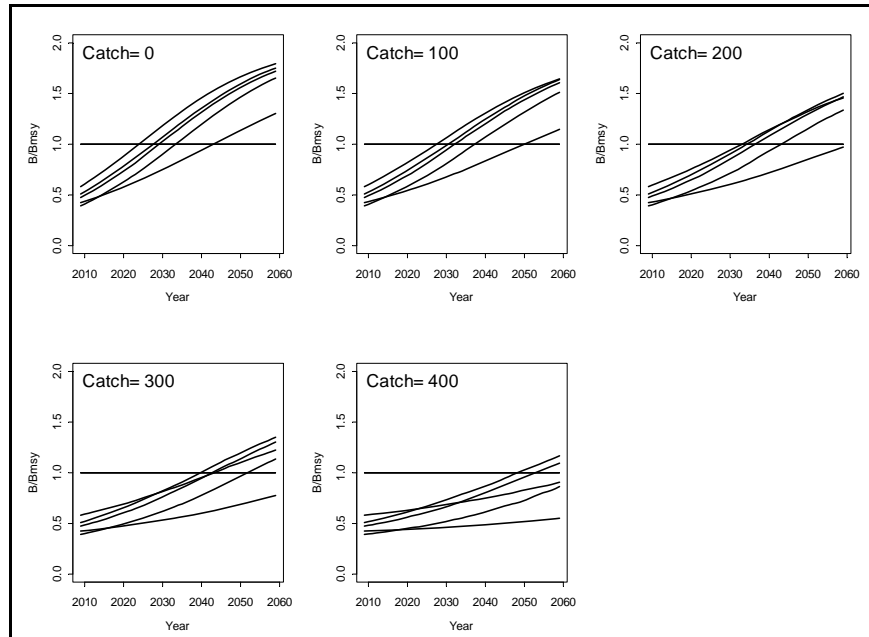
Condition (current/trends/future prospects)

L. nasus is seriously depleted in the OSPAR Area as a result of unsustainable removal in fisheries. It is assessed as “Critically Endangered” in the North-East Atlantic on the IUCN Red List of Threatened Species (Stevens *et al.* 2005). Although large-scale target fisheries collapsed decades ago, this valuable species is still vulnerable to localised, seasonal fisheries because of its aggregating behaviour and unregulated and largely unreported catches are being taken on the High Seas. Recovery will require fishing pressure on this stock to be minimised. ICES has advised a zero TAC since 2006 and this advice includes the 2010 TAC. Recovery of this stock is unlikely to take place while fisheries continue. Recovery following complete closure of fisheries, if this takes place, will still likely take 15–34 years (Figure 2).

Figure 2: Median trajectories of B/B_{MSY} for each total catch strategy

Each line is one of the five credible BSP model runs.

Source: ICCAT SCRS 2009



Limitations in knowledge

L. nasus is very well studied in the North-West Atlantic. North Atlantic stocks are genetically indistinguishable and life history characteristics are similar, although North-East Atlantic Porbeagle have been found to be slower growing than those in the Northwest (ICES WGEF 2009). Although vessels are required to submit species-specific catch data, reporting of Porbeagle catches and landings is irregular and incomplete. Different regional fisheries bodies receive different data from the same fleets. Catches by High Seas fleets and some EU fleets are under-reported (e.g. ICES WGEF 2008, Campana and Gibson 2008). Discard data are not available (ICES WGEF 2009). Bycatch survival rates appear to be good in some fisheries, but additional studies in partnership with industry would confirm this and help to justify live discard of by-catch, particularly of large females.

4. Evaluation of threats and impacts

The greatest threat to *L. nasus* is mortality in target fisheries (commercial and sports angling) and by-catch. While as of today targeted fisheries in the OSPAR Maritime Area is limited to a relatively small fleet and remains well below the TAC, the species continues to be taken as by-catch in coastal, shelf and High Seas longline fisheries, also in some trawl and set nets. This species is very vulnerable to fisheries because of its aggregating nature. Habitat damage is probably not important for this largely pelagic species. Prey depletion is not considered to be a threat, since the status of stocks of some important prey species is good.

Table 2: Summary of key threats and impacts to Porbeagle shark (*Lamna nasus*)

Type of impact	Cause of threat	Comment
Fisheries	Unsustainable mortality in target and by-catch fisheries.	See above.

5. Existing management measures

Sweden legally protects porbeagle. Norway has adopted ICES Advice and prohibited target fisheries for *Lamna nasus* in Norwegian waters and ICES divisions I–XIV (by-caught fish must be landed).

The EU Porbeagle shark fishery entered TAC management in 2008. The initial restrictive quota was further reduced by 25% to 436 t in 2009 and a maximum landing size (210 cm fork length) introduced to protect large females. All *L. nasus* must be released once the quota has been filled. ICES has recommended a zero TAC since 2006.

EC Regulation 1185/2003 prohibits the removal of shark fins and subsequent discarding of the body. This regulation is binding on EC vessels in all waters and non-EC vessels in Community waters. Apart from this measure, there is no management of Porbeagle shark fisheries in international waters.

L. nasus was listed in Appendix II of the Convention on the Conservation of Migratory Species (CMS) in 2008. CMS is currently developing a Memorandum of Understanding and Action Plan for the conservation of migratory sharks. This may stimulate additional conservation action for listed species.

Measures already adopted in European waters and by European vessels may be further supplemented by management measures proposed under the European Community Action Plan for the Conservation and Management of Sharks (CPOA, EU COM(2009) 40 final), adopted in 2009. The CPOA sets out to rebuild depleted shark stocks fished by the Community fleet within and outside Community waters, and the Commission's Shark Assessment Report that accompanies the CPOA pays particular attention to *Lamna nasus*, stating: "Given the state of the stock, no targeted fishing for porbeagle should be permitted and by-catch should be limited. Landings of Porbeagle should not be allowed."

Measures outlined in the CPOA include the establishment of catch limits for shark stocks in conformity with advice provided by ICES and relevant RFMOs, release of live unwanted bycatch, increased selectivity of fishing gear, establishment of by-catch reduction programmes for "Critically Endangered" and "Endangered" shark species, and international cooperation in CMS and CITES with a view to controlling shark fishing and trading. These measures will be implemented at Community and Member State level and the Community will seek their endorsement by all relevant RFMOs.

Pelagic shark management likely falls within the remit of the International Commission for the Conservation of Atlantic Tunas (ICCAT, the pelagic fishery management body), although most porbeagle landings come from non-ICCAT fisheries on the continental shelf and national and regional management measures must be coordinated across the range of the stock. The North-West Atlantic Fisheries Organisation (NAFO) urged ICCAT in 2008 to adopt management measures for Porbeagles, after NAFO had considered (but declined to adopt) a proposal to prohibit retention of porbeagles in international waters. Large unreported High Seas catches are undermining management in Canadian waters and are likely to result in the collapse of this stock (Campana and Gibson 2008). ICCAT will consider management at its meeting in November 2009.

A proposal to list *L. nasus* in Appendix II of the Convention on International Trade in Endangered Species (CITES) would, if adopted in 2010, require non-detriment findings for the import of specimens from international waters or between countries. This would not affect catches made within EU waters and landed in the EU, or internal trade between EU Member States.

6. Conclusion on overall status

L. nasus has been seriously depleted by fisheries throughout the OSPAR Area and is assessed on the IUCN Red List of Threatened Species as "Critically Endangered" in the North-East Atlantic. ICES has advised a zero TAC since 2006. It is protected or target fisheries have been closed in some territorial

waters. A restrictive TAC and a maximum landing size have recently been introduced for EU waters and EU fleets, but the current TAC may only allow the stock to remain stable at its current depleted biomass. Large unregulated and unreported pelagic fisheries are also harvesting this stock in international waters. Existing management measures are unlikely to enable the stock to recover while these fisheries continue. ICES WGEF and ICCAT SCRS (2009) advised that sustained reductions in fishing mortality are required if there is to be any stock recovery.

7. Action to be taken by OSPAR

Scientific advice on the management of this species is already available from ICES. ICCAT SCRS (2009) recommended following this advice within waters under national jurisdiction. Based on current ICES and ICCAT SCRS advice, the conservation objectives for *L. nasus* should be to enable the stock to recover to B_{MSY} by closing all target fisheries within the OSPAR Area; mandating the release unharmed of all by-catch; identifying and protecting critical areas (e.g. nursery grounds and aggregations of pregnant females); and promoting collaborative management of shared stocks by Range States and fishing States. The proposed CMS Memorandum of Understanding and Action Plan for the Conservation and Management of Migratory Sharks might include conservation measures for this species, when finalised in 2009. OSPAR should be able to support the implementation of these measures, particularly with respect to the protection of critical areas.

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. However where the Commission considers that action is desirable in relation to such a question, it shall draw that question to the attention of the authority or international body competent for that question. 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.

It is proposed that OSPAR should recommend that Contracting Parties take into account the Critically Endangered status of Porbeagle sharks in the OSPAR Area when reviewing, updating, developing, adopting and/or implementing the following:

1. national, European and regional (ICCAT, NEAFC) fisheries conservation and management measures, including provisions within the Community Plan of Action on Sharks;
2. national, European and international protected species legislation (including the Bern Convention on the Conservation of European Wildlife and Natural Habitats, the Bonn Convention on the Conservation of Migratory Species of Wild Animals and CMS Migratory Sharks Instrument, and Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora);
3. marine protected areas for aggregations and nursery grounds; and
4. marine species and fisheries research.

It is proposed that OSPAR should draw to the attention of Contracting Parties the conservation measures for this species currently proposed by ICES and adopted by the Council of Ministers and other Parties, and recommend that CPs disseminate this information to their commercial and recreational fishers, encourage fishers to report details (including date and location) of landings and released bycatch, and incorporate this information in their reports to OSPAR.

It is proposed that OSPAR should encourage relevant Contracting Parties (Range States and those whose flag vessels are engaged in fisheries that capture *L. nasus*) to adopt or support the adoption of scientific advice and other proposed conservation or management measures that may be proposed

through the European Commission, Regional Fisheries Organisations (ICES, ICCAT, NEAFC) or other entities.

It is proposed that OSPAR should urge Contracting Parties and the European Commission to consider carefully how zero quotas, mandatory release and protected species regulations may be adopted that do not prevent sports anglers from engaging in the voluntary tag and release programmes that can provide important scientific data on this species.

To complement the above, the OSPAR Commission should communicate to ICES and other relevant scientific and research funding bodies the need for more data on the life history, survival rates after release, distribution and habitat requirements of *L. nasus*, with a view to obtaining improved management advice and identifying critical areas for protection.

Table 3: Summary of key priority actions and measures which could be taken for Porbeagle shark (*Lamna nasus*). 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.

Key threats	Fisheries mortality (target and bycatch) in unsustainable fisheries	
Other responsible authorities	EC and Council of Fisheries Ministers (Common Fisheries Policy, Regulations, TACs) OSPAR Contracting Parties ICCAT, ICES	
Already protected? Measures adequate?	EC Regulation No. 1185/2003 on the removal of shark fins on board fishing vessels Appendix II of CMS EU: TAC, Maximum landing size	- Impact unknown, but <i>L. nasus</i> is generally retained for its valuable meat, except in some high seas fisheries. - A new listing. Migratory Shark Memorandum of Understanding and Action Plan for listed species are not yet available. - TACs are restrictive, but scientific advice is a reduction to zero - Maximum landing size should protect mature females
Recommended Actions and Measures	OSPAR Commission Contracting Parties Research needs	- Monitor information and advice of the ICES Working Group on Elasmobranch Fisheries and the ICCAT Shark Working Group and bring this to the attention of CPs. - Support ICES, ICCAT and Commission recommendations in the Council of Ministers. - Life history and trend data, discard survival studies, modelling impact of maximum landing sizes upon stock recovery

Brief summary of proposed monitoring system (see annex 2)

Fishery-independent tagging and tracking surveys and an observer programme are undertaking some monitoring of this species. Landings are recorded, primarily at species level, but reporting is very incomplete. ICES WGEF (2008) recommended that “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.”

Relevant Contracting Parties should be encouraged to report to OSPAR on:

- Historic records (location, dates and abundance)

- Current location, dates and number of by-catch (returned to the sea) and sea angling records (including tag and release).

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 or information provided)	National reports References or web links
Belgium	Y	N	
Denmark	Y	Y – Review of Draft	
France	Y	Y – Review of Draft	
Germany	Y	Y – Review of Draft	
Iceland	Y	N	
Ireland	Y	N	
Netherlands	Y	N	
Norway	Y	N	
Portugal	Y	N	
Spain	Y	Y – Review of Draft	
Sweden	Y	Y – Review of Draft	
United Kingdom	Y	Y – Review of Draft	

Summaries of country-specific information provided

Sweden: Occurs regularly in Swedish waters

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

Rationale for the proposed monitoring

Continued monitoring is essential to provide management advice and to evaluate future trends, including by-catch and stock recovery following cessation of target fisheries.

Use of existing monitoring programmes

Regular fishery independent surveys are undertaken by research vessels and chartered vessels in the OSPAR Area, and landings data are collected at species level. A new observer programme initiated in 2008, EPPARTIY (Etude de la Pêche Palangrière au Requin Taupe de l'Île d'Yeu), is collecting biological data on catches in the French target longline fishery. The ICES Working Group on Elasmobranch Fishes and ICCAT Shark Working Group use these and all other available sources to report regularly on the status of this species in the OSPAR Area.

Voluntary tag and release programmes and records of catches by anglers can produce some important data on distribution, migration and abundance trends at low/no cost to researchers and managers. Genuine, well-conducted tagging programmes should be permitted under license.

Synergies with monitoring of other species or habitats

n/a.

Assessment criteria

It is not considered necessary to develop assessment criteria or triggers for additional monitoring of this species at the present time.

Techniques/approaches

As already underway, with the addition of discard survival studies.

Selection of monitoring locations

Known seasonal aggregation sites will be important monitoring locations.

Timing and Frequency of monitoring

Existing fishery-independent research surveys (which are already undertaken according to timetable) combined with voluntary tag and release efforts by anglers are likely to form the basis for monitoring across the entire OSPAR Area and within known population centres, respectively. It is difficult to control the timing and frequency of the latter, but it is essential to ensure that effort and seasonality are quantified and recorded accurately if these activities are to be valuable (and justify licenses).

Data collection and reporting

Already well structured for fishery-independent research surveys. Licensing of anglers undertaking tag and release programmes should be accompanied by clear requirements for data collection and reporting, possibly under guidance from ICES and ICCAT.

Annex 3: References

- BfN, 2009. German proposal to include *Lamna nasus* in CITES Appendix II, prepared by the German Federal Agency for Nature Conservation (BfN), on behalf of the German Government.
- Biseau, A. 2006 Chapter Taupe Catch data of porbeagle in French artisanal fishery on porbeagle. Working Document cited in ICES WGEF 2007.
- Campana S. and J. Gibson. 2008. Catch and Stock Status of Porbeagle Shark (*Lamna nasus*) in the Northwest Atlantic to 2007, NAFO Doc. 08/36.
- Clark, M. 2005. Jaws in trouble? ICES CIEM Newsletter, 42, Sep. 2005: 10-14.
- Compagno, L.J.V. 2001. *An annotated and illustrated catalogue of shark species known to date. Volume 2 Bullhead, mackerel and carpet sharks (Heterodontiformes, Lamniformes and Orectolobiformes)*. FAO Species Catalogue for Fishery Purposes. No. 1, Vol. 2. Rome, FAO. 2001. p.269.
- Compagno, L.J.V., Dando, D., and Fowler, S. 2005. *Field Guide to Sharks of the World*. HarperCollins, London.
- DFO. 2005. Recovery assessment report on NAFO Subareas 3–6 porbeagle shark. Canadian Science Advisory Secretariat, *Science Advisory Report* 2005/043: 11 pp. www.dfo-mpo.gc.ca/csas/Csas/status/2005/SAR-AS2005_043_e.pdf.
- FAO 2007. Second FAO ad hoc expert advisory panel for the assessment of proposals to amend appendices I and II of CITES concerning commercially-exploited aquatic species *FAO Fisheries Report* No. 833. Rome. 140 pp.
- FAO FIGIS. 2007. *Lamna nasus*. In: A world overview of species of interest to fisheries. SIDP - Species Identification and Data Programme, FIGIS Species Fact Sheets FAO–FIGIS.
- Fisheries and Oceans Canada. 2006. Potential Socio-economic Implications of Adding Porbeagle Shark to the List of Wildlife Species at Risk in the Species at Risk Act (SARA). Policy and Economics Branch – Maritimes Region, Dartmouth, Nova Scotia, Canada.
- Francis, M.P., Natanson, L.J. and Campana, S.E. 2008. Porbeagle (*Lamna nasus*). In: E.K. Pikitch, & M. Camhi (eds). *Sharks of the open ocean*. Blackwell Scientific Publications.
- Fricke, R. 2007. HELCOM Red List of Threatened and Declining Species of Fishes and Lampreys of the Baltic Sea. Helsinki (HELCOM).
- Fricke, R., Bilecenoglu, M., Sari, H.M. & Kaya, M. (2007). Annotated checklist of fish and lamprey species of Turkey, including a Red List of threatened and declining species. *Stuttgarter Beiträge zur Naturkunde (A)* 706: 1-169.
- Froese, R. and D. Pauly. Editors. 2006. FishBase. World Wide Web electronic publication. www.fishbase.org , version (05/2006).
- ICCAT SCRS. 2009. Report of the 2009 Porbeagle Stock Assessments Meeting. (*Copenhagen, Denmark, June 22 to 27, 2009*). SCRS/2009/014 – Sharks Stock Assessment SCI-032/2009.
- ICES ACFM, 2005. Report of the ICES Advisory Committee on Fishery Management, Advisory Committee on the Marine Environment and Advisory Committee on Ecosystems, ICES Advice. Volumes 1 - 11. 1,403 pp. <http://www.ices.dk/>

- ICES SGEF 2004. Report of the Study Group on Elasmobranch Fishes (SGEF). ICES Living Resources Committee ICES CM 2004/G:11. International Council for the Exploration of the Sea, Denmark.
- ICES WGEF, 2005. Report of the Working Group on Elasmobranch Fishes, ICES Headquarters 6-10 May 2002, ICES CM 2002/G:08.
- ICES WGEF. 2006. Report of the Working Group of the Elasmobranch Fishes (WGEF). 14–21 June 2006, ICES, Copenhagen. ICES CM 2006/ACFM:31 Ref. LRC.
- ICES WGEF. 2007. Report of the Working Group of the Elasmobranch Fishes (WGEF). 22–28 June 2007, ICES CM 2007 /ACFM:27
- ICES WGEF. 2008. Report of the Working Group of the Elasmobranch Fishes (WGEF). 3–6 March 2008, ICES, Copenhagen, Denmark. ICES CM 2008/ACOM:16.
- ICES WGEF. 2009. Report of the Joint Meeting between ICES Working Group on Elasmobranch Fishes and ICCAT Shark Subgroup. 22–29 June 2009. Copenhagen, Denmark. ICES CM 2009/ACOM:16
- ICES WGFE. 2006. Report of the Working Group on Fish Ecology (WGFE), 13–17 March 2006, ICES, Copenhagen. ICES CM 2006/LRC:06, 154 pp.
- Joyce, W., S.E. Campana, L.J. Natanson, N.E. Kohler, H.L. Pratt, and C.F. Jensen. 2002. Analysis of stomach contents of the porbeagle shark (*Lamna nasus*) in the northwest Atlantic. *ICES J. Mar. Sci.* **59**:1263–1269.
- Matsumoto, H. 2005. Report of observer program for Japanese tuna longline fishery in the Atlantic Ocean from August 2004 to January 2005. *Col. Vol. Sci. Rap. ICCAT*, 59(2): 663–681.
- Matsunaga, H. and H. Nakano 2002. Preliminary results of standardized CPUE for porbeagle caught by Japanese longline fishery in the Atlantic Ocean. *Col. Vol. Sci. Pap. ICCAT*, 54(4); 1381–1385. Available at http://www.iccat.es/Documents/CVSP/CV054_2002/no_4/CV054041381.pdf
- Matsunaga, H. and H., Nakano 2005. Estimation of shark catches by Japanese tuna longline vessels in the Atlantic Ocean. *Col. Vol. Sci. Pap. ICCAT* 58(3): 1096–1105. http://www.iccat.es/Documents/CVSP/CV058_2005/no_3/CV058031096.pdf.
- Pade, N.G., N. Queiroz, N.E. Humphries, M.J. Witt, C.S. Jones, L.R. Noble, D.W. Sims. 2009. First results from satellite-linked archival tagging of porbeagle shark, *Lamna nasus*: Area fidelity, wider-scale movements and plasticity in diel depth changes. *Journal of Experimental Marine Biology and Ecology*. 370, 64–74.
- Pade, N., Sarginson, J., Antsalo, M., Graham, S., Campana, S., Francis, M., Jones, C., Sims, D., and Noble, L. 2006. Spatial ecology and population structure of the porbeagle (*Lamna nasus*) in the Atlantic: an integrated approach to shark conservation. Poster presented at 10th European Elasmobranch Association Science Conference. 11–12 November 2006. Hamburg, Germany.
- Pade, N.G., N. Queiroz, N.E. Humphries, M.J. Witt, C.S. Jones, L.R. Noble, D.W. Sims. 2009. First results from satellite-linked archival tagging of porbeagle shark, *Lamna nasus*: Area fidelity, wider-scale movements and plasticity in diel depth changes. *Journal of Experimental Marine Biology and Ecology*, **370**, 64–74.
- STECF. 2003. Commission Working Paper. Report of the *ad hoc* Working Group on Elasmobranch Fisheries. SEC(2003)1427.

STECF, 2006. Report of the STECF working group on deep-sea gillnet fisheries. Commission Staff Working Paper. 52 pp.

Stevens, J., Fowler, S.L., Soldo, A., McCord, M., Baum, J., Acuña, E., Domingo, A. & Francis, M. 2006. *Lamna nasus*. In: IUCN 2006. 2006 IUCN Red List of Threatened Species. <http://www.iucnredlist.org> .

Stevens, J.D., Bonfil, R., Dulvy, N.K. and Walker, P.A. 2000. The effects of fishing on sharks, rays, and chimaeras (chondrichthyans), and the implications for marine ecosystems. *ICES Journal of Marine Science*, Volume 57, Issue 3, 476–494 pp.



New Court
48 Carey Street
London WC2A 2JQ
United Kingdom

t: +44 (0)20 7430 5200
f: +44 (0)20 7430 5225
e: secretariat@ospar.org
www.ospar.org

**OSPAR's vision is of a clean, healthy and biologically diverse
North-East Atlantic used sustainably**

ISBN 978-1-907390-15-9
Publication Number: 474/2010

© OSPAR Commission, 2010. Permission may be granted by the publishers for the report to be wholly or partly reproduced in publications provided that the source of the extract is clearly indicated.

© Commission OSPAR, 2010. La reproduction de tout ou partie de ce rapport dans une publication peut être autorisée par l'Editeur, sous réserve que l'origine de l'extrait soit clairement mentionnée.