Agenda Item 5.1	Implementation of the Triennium Work Plan (2010-2012) Review of New Information on Population Size, Distribution, Structure and Causes of Any Changes
Document 5-04	**OSPAR Biodiversity Committee Background Document on *Phocoena phocoena* (Harbour porpoise)**
Action Requested	• Take note of the report
Submitted by	AC Chair

NOTE:
IN THE INTERESTS OF ECONOMY, DELEGATES ARE KINDLY REMINDED TO BRING THEIR OWN COPIES OF DOCUMENTS TO THE MEETING

OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic

Meeting of the Biodiversity Committee (BDC)

Stockholm: 23-27 February 2009

Background Document on *Phocoena phocoena* (Harbour porpoise)

Presented by Germany

BDC is invited to examine the Background Document on *Phocoena phocoena*, and to agree that it should be recommended to OSPAR 2009 for publication on the OSPAR website.

Background

1. The harbour porpoise (*Phocoena phocoena)* was nominated in 2001 by Belgium, The Netherlands, Portugal, UK and WWF to be included in the initial OSPAR List of threatened and/or declining species and habitats. This species was included in the List with particular reference to decline and sensitivity, with information also provided on threat.

2. This Background Document is based upon and aims to summarize the following sources of information:

- Case Study, BDC 05/04/02-E;
- Case Report supporting its Listing in OSPAR Publication, 2006/276;
- Draft Concept for Monitoring Harbour Porpoise Populations in the OSPAR Maritime Area, MASH 06/06/03-E;
- Draft Monitoring and Assessment Strategy, MASH 07/03/03 Add.4. (as revised after MASH 2007);
- Management Measures for the Protection of Species and Habitats on the Initial OSPAR List; Interim Compilation of Proposals for Actions and Measures, BDC 08/04/02 Add.1-E;
- Comments received on the above document from Ireland and the UK in response to an email request sent out by Germany to all CP Contact Points on 19 Dec. 2007;
- Comments received on a final draft version of this document from the UK and The Netherlands in response to an email request sent out to the Wadden Sea Trilateral Seal Expert Group (TSEG) and all CP Contact Points on 18 August 2008.

3. Since MASH 08, concerns of WWF regarding the wording in the document linking the measures under EU regulation 812/2004 to achievement of the ASCOBANS target/OSPAR EcoQO has been addressed, as well as concerns raised by Ireland on specific values used for as criteria to assess the status of harbour porpoise populations. Likewise, efforts have been made to the extent possible to incorporate concerns raised by the UK on a number of issues, particularly related to the proposed monitoring strategy.

Action requested

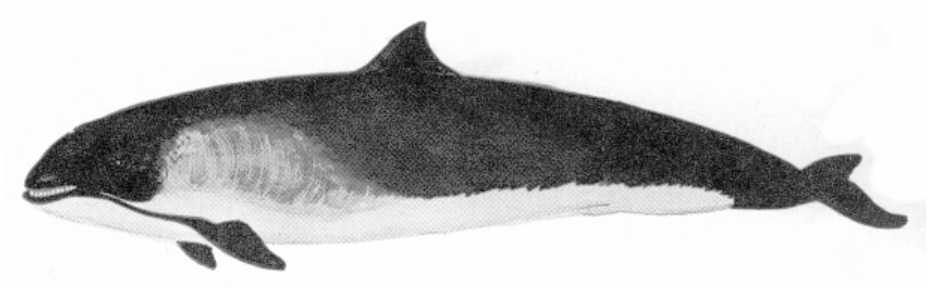
4. Actions are set out in BDC 09/5/2

OSPAR Background Document

PHOCOENA PHOCOENA

1. Background Information

Phocoena phocoena (Linnaeus, 1767); Harbour Porpoise, also known as Common Porpoise; Marsouin Commun (Fr), Marsopa Común (Es), Schweinswal (De)



The harbour porpoise is generally a continental shelf species distributed in cold temperate and subarctic waters in the Northern Hemisphere (Klinowska, 1991). They are characterized by a blunt short-beaked head and a low wide-based triangular dorsal fin. Adults are usually less than 1.8 m long and weigh from 45 to 70 kg. Generally, harbour porpoises occur singly or in small groups of less than eight individuals. Occasionally, larger schools of up to several hundred animals have been reported (ASCOBANS nd). Their prey consists of a wide variety of fish and cephalopods, with regional variation of their main prey items. Although small schooling fish (e.g. herring) are important, demersal foraging is characteristic in many areas (Hammond et al., 2008).

In the eastern North Atlantic, *Phocoena phocoena* is common and widely distributed on the continental shelf from the Barents Sea and Iceland south to the coasts of France and Spain. It is the most abundant cetacean species in north-western European shelf waters and extends southward along the African coast to Mauritania (Boisseau et al., 2007).

Nominated in 2001 by Belgium, Netherlands, Portugal, UK and WWF

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- Fatima Brito, Direcção Geral do Ambiente, Rua Murgueira-Zambujal, 2720-865 Amadora, Portugal;
- Sabine Christiansen, WWF North East Atlantic Marine Ecoregion, Hongkong Str. 7, 20457 Hamburg, Germany
- Jan Haelters & Francis Kerckhof, Management Unit of the North Sea Mathematical Models, 3e en 23e Linieregimentsplein, 8400 Oostende, Belgium;
- Mark Tasker, Joint Nature Conservation Committee, Monkstone House, Peterborough, PE1 1UA, UK.

2. Original Evaluation against the Texel-Faial Selection Criteria

2.1 OSPAR Regions and Dinter Biogeographic Provinces where the feature occurs

OSPAR Regions: All

Dinter Biogeographic Provinces: 1-9, 11-15

2.2 OSPAR Regions and Dinter Biogeographic Provinces where the feature is under threat and/or in decline

Decline in Regions: II, III and IV

Decline in Dinter Biogeographic Provinces: 1-5, 8-14, 18-19, 22-23

Threat in all OSPAR Regions

2.3 Original Evaluation against the Texel-Faial criteria for which the feature was included on the Initial OSPAR List

There were five nominations for *P. phocoena* to be included in the OSPAR (Initial) List of Threatened Species and Habitats. The criteria common to all of these were *decline* and *sensitivity*, with information also provided on *threat*.

***Global/Regional* Importance**

The OSPAR Maritime Area in general and the North Sea in particular host the largest number of *P. phocoena* individuals in their global distribution pattern across temperate and subarctic waters.

Decline

Declines in abundance have been reported since the 1940's as well as in more recent studies in various parts of the range of *P. phocoena*. The harbour porpoise has become scarce in the southernmost North Sea, English Channel and Bay of Biscay for example (Evans, 2000), and has declined in the Skagerrak & Kattegat (Berggren & Arrhenius, 1995 a & b). It was considered to be one of the most common cetaceans in Region IV of the OSPAR Maritime Area but sightings and strandings are now only common in certain areas e.g. western Galician and northern Portuguese coasts (OSPAR, 2000).

Since the case report (OSPAR Publication 2006/276), some results from the 2005 SCANS II surveys have become available. They indicate increased abundances in the southern North Sea, the English Channel and the Celtic Shelf. The apparent increases in the southern North Sea are apparently offset by decreases in the northern North Sea.

In the 1994 SCANS survey, high density distributions of harbour porpoises were observed off the SE coast of Scotland and NE England, but in 2005 SCANS II survey these had apparently shifted further south. Additionally, higher densities were seen in the Celtic Sea than had been reported in 1994. The densities of porpoises that had occurred off the North and West coasts of Denmark in 1994 appeared to have shifted offshore in 2005. Although supporting evidence is lacking at present, a change in prey distribution is considered the most likely, though not necessarily the only, reason behind these changes in distribution.

For the Kattegat, Belt Seas and western Baltic Sea, the abundance estimate was 22,127 (CV=0.28) in 1994 and 13,600 (CV=0.33) in 2005 using density surface modelling (DSM, Teilmann unpublished data). When Skagerrak is added to this area (area I in Hammond et al., 2002) the DSM abundance estimates for 1994 is 31,715 (CV=0.25) porpoises and for 2005 15,557 (CV=0.30) porpoises (Hammond et al., in prep). Due to large confidence intervals in line transect surveys, this 38-51 % decline was however, not statistically significant, but should give reason for concern (Teilmann et al., 2008).

The harbour porpoise is listed on Appendix II of the Bern Convention and Annexes II and IV of the Bonn Convention. In 2008, IUCN has assessed the global status of the harbour porpoise as being of *Least Concern* [Ver 3.1] (Hammond et al., 2008).

Sensitivity

The harbour porpoise is known to be sensitive to poor water quality, including toxic contaminants which bio-accumulate over time. It has been shown that organochlorines impair the immune system and endocrinium (Beineke et al., 2005; Jepson et al., 2005; Das et al., 2006). A strong increase in infectious disease mortality was shown in British harbour porpoises to correlate with PCB levels above 17 mg/kg lipid (Jepson et al., 2005). Beineke et al. (2005) also found indications for contaminant-induced immunosuppression in stranded harbour porpoises at the German Baltic coast.

Like all odontocetes they use sound for navigation, finding food, and communication and are therefore sensitive to acoustic pollution. Harbour porpoises are amongst the fastest reproducing cetaceans but depleted populations are nevertheless likely to take decades rather than years to recover (Read & Hohn, 1995).

Porpoises as relatively small marine mammals have a tight energy budget and need to feed very frequently. They are therefore highly sensitive to changes in food availability, e.g. caused by overfishing or other changes in environmental conditions (Read & Hohn, 1995).

Threats

Small cetaceans, including the harbour porpoise were taken for human consumption from the OSPAR Maritime Area until this was made illegal in 1970 (Klinowska, 1991).

The main threat to this species in the OSPAR Maritime Area today is incidental capture and drowning in fishing nets. For example, the Danish gill net fishery has been estimated to take more than 4,600 animals a year (IWC, 1996); in the Celtic Sea, by-catch rates have been estimated at more than 6 % of the population per year (Tregenza et al., 1997), while in the Swedish Kattegat surveys in 1996 & 1997 calculated by-catch levels of 1.2 % and 2.4 % of the population in the set net fishery for cod and pollock. The International Whaling Commission (IWC)/ASCOBANS working group on harbour porpoise advised a maximum annual anthropogenic removal (including by-catch), assuming no uncertainty in any parameter, of 1.7 % of the population size per year if the population is to be non-declining (ASCOBANS, 2000). This has subsequently been developed as an OSPAR EcoQO, which is currently being assessed.

EU Regulation 812/2004 lays down measures concerning incidental catches of cetaceans in fisheries without making reference to quantitative by-catch levels. In 2008, ICES provided additional advice with regard to the status of small cetaceans and by-catch, including a proposed format for national reporting under Regulation 812/2004.

Other threats to this species are marine pollution, for example from toxic substances that bio-accumulate and are known to reduce reproductive fitness (Jepson et al., 1999; Siebert et al. 1999; Das et al. 2004; Jepson et al., 2005), as well as acoustic disturbance (from shipping traffic, oil exploration, military activities, etc.) that may reduce available habitat. Single or multiple exposures to intense sound, especially from seismic surveys, pile driving and underwater explosions, may also lead directly to acoustical impairment.

A reduction in prey species may also be a threat as the diet of harbour porpoises include herring, mackerel and sand eel that are also targeted by commercial fisheries in the North Sea.

Furthermore, all these threats mentioned may impact harbour porpoises singularly or may lead to cumulative effects and thus need to be studied accordingly.

2.4 Relevant additional considerations

Sufficiency of Data

Data on the status and trends of the harbour porpoise have come from sighting programmes and from observers at sea. This includes information on by-catch that has been used to estimate the impact on the population of harbour porpoises in the Greater North Sea, Region II of the OSPAR Maritime Area. However, for many parts insufficient information is available to adequately assess the extent of porpoise by-catch.

An increasing source of information is expected through national reports on incidental capture and killing of cetaceans in fisheries under EU Regulation 812/2004. In a recent assessment of these reports, however, ICES SGBYC (2008) found that the wide variety of report structures combined with a lack of European integration meant that it was not possible to estimate the proportion of the harbour porpoise population that was subject to by-catch.

The 1994 SCANS survey (Hammond et al., 2002) yielded the first reliable abundance estimate of harbour porpoises in the North Sea and adjacent waters. The survey was repeated as SCANS II in 2005, covering a larger geographic area. These estimates are a good basis for assessing the threat imposed by the by-catch rates in the region and in the long run to detect changes in abundance by repeating the survey.

Changes in Relation to Natural Variability

Little is known about the natural variability of harbour porpoise populations or whether such variability has played a role in the decline of this species in particular areas.

Expert Judgement

There is a good understanding of the potential and actual threats to harbour porpoises throughout the OSPAR Maritime Area but less comprehensive information on their impacts on the population status. The most comprehensive studies have been in OSPAR Region II where there is good evidence for a change in distribution in recent years. There is least information on population trends in Region I with the result that this Region has only been cited as an area where this species is threatened.

ICES Evaluation

The harbour porpoise occurs in all regions but the core of the range is Regions II and III. The population structure in the OSPAR Maritime Area is complex and not yet fully understood. The ICES Advisory Committee on Ecosystems concluded in 2003 that there is good evidence of a decline in the past in the Channel and southern North Sea[1] and, more recently, in the Baltic and good evidence that the main threat is by-catch, particularly bottom-set gillnets. The by-catch is likely to be unsustainable on the Celtic shelf, in the Baltic, and in some parts of the North Sea.

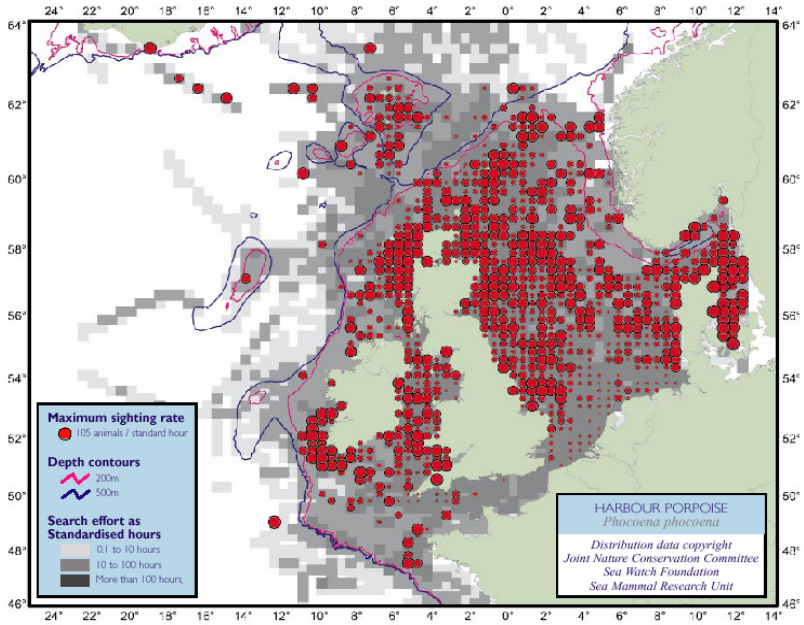
3. Current Status of the Species

3.1 Distribution in the OSPAR Maritime Area

The harbour porpoise occurs in all OSPAR Regions. The *Atlas of Cetacean distribution in north-west European waters* (Reid et al., 2003) shows the occurrence in part of the OSPAR Maritime Area.

Figure 1: Occurrence of *Phocoena phocoena* in part of the OSPAR Maritime Area (Source: Reid et al., 2003)

[1] The SCANS survey in 2005 rather indicated a southerly shift and not a decline of the population within the North Sea.



There is no comprehensive information available on the distribution of the harbour porpoise for the entire OSPAR Maritime Area.

However, in the eastern North Atlantic, *Phocoena phocoena* is common and widely distributed on the continental shelf from the Barents Sea and Iceland south to the coasts of France and Spain. It is the most abundant cetacean species in north-western European shelf waters and extends southward along the African coast to Mauritania (Boisseau et al., 2007).

3.2 Population (current/trends/future prospects)

There has been much debate regarding the genetic structuring of harbour porpoises in the eastern North Atlantic. In general, there are thought to be a number of subpopulations in the Atlantic and possibly also in the North Sea and adjacent waters, with separate populations occurring in the Irish Sea, northern North Sea and southern North Sea (Kinze, 1990; IWC, 1996; Walton, 1997; Lockyer, 1999; Andersen et al., 1999; Rosel et al., 1999). However, exchange of these populations is very well possible. More recently, harbour porpoises within the eastern North Atlantic have been demonstrated to show geographic structuring as a consequence of limited gene flow along parts of the coast (Tolley & Rosel, 2006). Similarly, genetic analyses by Fontaine et al (2007) indicated that the harbour porpoises of the eastern North Atlantic behave as a 'continuous' population that extends from the French coasts of the Bay of Biscay northwards to the arctic waters of Norway and Iceland. The ASCOBANS/HELCOM population structure workshop held in 2007, concluded that for the North Sea there is some population structure, but the evidence was currently insufficient to define boundaries between any (sub-) populations (ASCOBANS, 2008).

A number of surveys covering different parts of the OSPAR Maritime Area have been carried out to determine the size and trends in the population of the harbour porpoise.

The most wide-ranging surveys for estimating harbour porpoise abundance in the region were conducted in 1994 covering the North Sea, the English Channel and the Celtic Sea [SCANS] and in 2005 [SCANS II] covering the North Sea and the European Atlantic continental shelf waters. Based upon the 1994 SCANS survey, the North Sea population was estimated at about 280,000 animals with a further 36,000 in the Skagerrak and Belt Seas and another 36,000 over the Celtic shelf between Ireland and Brittany (Hammond et al., 2002). Abundance estimates from the 2005 SCANS II surveys did not show any significant change in the overall population sizes (approximately 335,000 individuals); however, there have been marked differences in their distribution. While in 1994, porpoises favoured areas off the north-eastern coast of the UK and waters around Denmark, in 2005 the main concentration had shifted to the southern North Sea (SCANS-II, 2008). The reasons for this shift in distribution are not clear, though changes in the availability of preferred prey may be the most likely.

Within the scope of the MINOS and MINOS^{plus} projects, the Research and Technology Centre Westcoast (FTZ) conducted aerial line transect sighting surveys that covered waters in the German Exclusive Economic Zone (EEZ) and the 12 nautical mile zone of the North Sea from May 2002 to June 2006. The estimated abundance in the German North Sea was highest in April/May 2005 with an estimate of 38,089 individuals (95%CI = 19,628-81,126; CV=0,38) and in May/June 2006 with an estimate of 51,551 ind. (95%CI = 27,879-98,910; CV=0,32). Porpoise density was found to be highest in late spring to early summer. Lower numbers were estimated in autumn, e.g. 10,849 ind. (95%CI = 5,544-22,202; CV=0,34) in Oct./Nov. 2005. Area use of harbour porpoises was heterogeneous, with the animals showing clear preferences for several discrete areas, suggesting that these may be important foraging grounds. The preference was most clear in spring and summer, where hot spots were detected in the north-east of the German EEZ (area of *Sylt Outer Reef*; spring and summer) and in the south-west (*Borkum Reef Ground*; spring only), and less evident in autumn (Gilles et al., 2008).

Previous surveys carried out in 1988/89 estimated harbour porpoise numbers of 11,000 in the Lofoten-Barents Sea area and 82,000 in the northern North Sea and southern Norwegian waters although these may be underestimates (Bjørge & Øien, 1995; IWC, 1990).

The harbour porpoise is believed to have been common in waters off the coast of The Netherlands and Belgium in the 19th and first half of the 20th century with data suggesting a decline in the southern North Sea between the 1970s-1990s. Since the mid-1970s there has been an increase in the number of sightings and strandings in Belgian waters and the Netherlands (Camphuysen, 1994 and 2004; Witte et al., 1998; Haelters et al., 2000). With the more recent findings from the SCANS surveys, however, it is generally agreed that this increase could well be explained by the shift of densities to the southern North Sea.

Future populations' trends are currently unclear. A comparison of the two SCANS surveys (1994 and 2005) only allows a (geographically) limited trend analysis for the summer distribution and abundance under far-reaching assumptions: Differences between the two July snap-shots could equally be explained by a change in habitat use and/or movement patterns (e.g. following migratory prey).

3.3 Condition (current/trends/future prospects)

Although the health aspects have been noted by some OSPAR Contracting Parties (see §6 d, from MASH 06/6/3 rev.1), this information has not yet been compiled into a single database. ASCOBANS has been asking its CPs to provide annual information on population status including health aspects.

3.4 Limitations in Knowledge

Supporting evidence to explain the changes in distribution and density detected in SCANS II is lacking at present, a change in prey distribution is considered the most likely, though not necessarily the only reason behind these changes in distribution. Trend data on the population sizes are only available from Germany, Iceland, Netherlands, and Spain. Baseline (incidentally collected) data on health aspects are available from Belgium, Germany, UK, Iceland, Netherlands (only coastal waters), and Spain; not however, from Ireland, Portugal, and Sweden. Human threats have generally been poorly monitored, although a greater understanding of by-catch is developing. It has to be noted that not all of these data have been made available to OSPAR during the preparation of assessments in this Background Document.

4. Evaluation of Threats and Impacts

Threat and link to Human Activities

Relevant human activity: fishing (by-catch); military activity; research.

Category of effect of human activity: physical – noise; biological – removal as non-target species.

The causes of lowered harbour porpoise population abundances may be diverse, but they are primarily related to human activities.

The most significant threat to the species at the present time is fishing due to the large numbers of animals taken as by-catch by a variety of fisheries. Porpoises are taken incidentally in several different gear types (driftnets, pelagic trawls, etc.), but bottom-set gillnets appear the most deadly (Read, 1999). By-catch rates are investigated related to the estimated abundance (ASCOBANS) and to stranded porpoises: e.g. annual by-catch in the Skagerrak probably exceeds 4 % of the total population (www.ascobans.org). In the UK, by-catch was the cause of death in 24.8 % of stranded porpoises (Pinn, 2008), in the Netherlands it was over 50 % (Leopold & Camphuysen 2006), and in Germany 46 % (Siebert et al., 2001).

The influence of the possible depletion of prey resources is less clear. Considering that many fish species consumed by harbour porpoises (Santos, 1998) have commercial value and that many of these fish stocks in OSPAR waters are overfished, this could have a negative influence if, e.g., animals would have to switch to fish of lesser quality where the preferred type is not available.

Another threat to this species is marine pollution, for example from toxic substances that bio-accumulate and are known to reduce reproductive fitness (Jepson et al., 1999; Siebert et al. 1999; Das et al. 2004; Jepson et al., 2005). Persistent organic pollutants (POPs), bio-accumulating in lipid-rich tissues (blubber) of porpoises include the more familiar polychlorinated biphenyls (PCBs) and dichlorodiphenyltrichloroethane (DDT) as well as "new" pollutants such as the so-called brominated flame retardants. A recent, as yet unpublished, EU study found the highest PCB levels in porpoises from the southern North Sea (Dutch and Belgian) animals; these also had the lowest reproductive rate of the stocks studied (M. Addink, *pers. comm.*).

Acoustic disturbances (from shipping traffic, oil exploration, military activities, etc.) may increase stress and therefore lead to detrimental effects on marine mammals' immune system or reproductive behaviour. It can also reduce available habitat and lead to displacement of harbour porpoises (e.g. from breeding or feeding grounds) (Tougaard, 2003; Thomsen, 2006). Single or multiple exposures to intense sound, especially from seismic surveys, pile driving and underwater explosions, may also lead directly to acoustical impairment. Latest results from a TTS experiment revealed reduced tolerance levels as compared to other odontocete species so far (Lucke et al., 2008).

Furthermore, all these threats may impact harbour porpoises singularly or may lead to cumulative effects and thus need to be studied accordingly.

These main threats are clearly linked to human activities and could therefore be addressed through respective management actions.

5. Existing Management Measures

Conservation Measures

The harbour porpoise is one of the protected species listed in the Annexes of the European Habitats Directive (Natura 2000). Apart from OSPAR, there are several other treaties which have been signed by many of the countries who also are members of OSPAR (ASCOBANS, NAMMCO, Bern Convention, Bonn Convention, 5th Conference on the Protection of the North Sea – Bergen, etc.), each with its own emphasis though generally giving strict protection to cetaceans including the harbour porpoise. Many of the useful potential measures fall within the remit of fisheries organisations or ASCOBANS.

Table 1: Competent Authorities for Management/Protection of Harbour Porpoises[2]

AUTHORITY/TREATY	ROLE IN MANAGEMENT/PROTECTION
ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas)	Obliges signatories to apply the conservation, research and management measures prescribed in the ASCOBANS annex. Those involve by-catch reduction, pollution control, research, monitoring, and PR.

[2] For further information on authorities and treaties please refer to Annex 4.

Bern Convention	Is concerned with the protection of endangered natural habitats in Europe; appendix II of this treaty accords strict protection to the harbour porpoise.
Bonn Convention	The convention on the conservation of migratory species; appendix II lists species thought to have an unfavourable conservation status including all cetaceans (e.g. the harbour porpoise); not listed on appendix I.
EU Habitats and Species Directive	Council Directive 92/43/EEC, lists the porpoise in annex II and IV; this means that favourable conservation status of this species has to be achieved and Special Areas of Conservation (SACs) are to be designated for this species where needed; the Directive also obliges members to monitor and prevent by-catch.
European Commission and Common Fisheries Policy	3 articles of European fisheries legislation concern by-catch (EC regulations 345/92, 1239/98, 973/2001) whilst cetacean by-catch is specifically covered by EU Regulation 812/2004. This came into force in January 2005 which lays down measures to: reduce incidental catches (by-catch) of cetaceans in fisheries through the mandatory introduction of acoustic devices (pingers) on vessels over 12 m; monitoring of vessels (over 15 m) in fisheries where by-catch of cetaceans has been implicated; phase out and eventually ban fishing with drift nets in the Baltic Sea. The first phase of the pinger requirements is to be implemented in certain North Sea fisheries by June 2005.
Bergen Conference (5th North Sea Conference)	Reduction of by-catch of harbour porpoises below 1,7 % of the population
NAMMCO (North Atlantic Marine Mammal Commission)	Provides scientific advice and conservation/management recommendations for all species of cetaceans and pinnipeds relevant to member countries (Norway, Iceland, Faroe Islands and Greenland). Includes stock assessment, sustainable harvest levels, by-catch and marine mammal – fisheries interactions.

Directed fishing/hunting of harbour porpoises is prohibited in the OSPAR Maritime Area. However, by-catch which causes death by drowning remains an issue. Currently there are no conservation plans in place for harbour porpoise in the OSPAR Maritime Area though ASCOBANS is in the process of finalising a conservation plan for the harbour porpoise in the North Sea.

It should be emphasized that regional differences in e.g. population density, ecology and types of fishery in the various OSPAR regions means that conservation measures need to be conceptualized in such a way that they can be "tailored" for a specific area.

In several countries, the uses of pingers (devices that warn porpoises for the presence of nets) have contributed to a decline in by-catch (UK study, www.ascobans.org). Vinther and Larsen (2003) clearly show this for the Danish gillnet fishery. It should be realised though that these devices could also drive porpoises away from favourable areas that they need for foraging and breeding. The EU by-catch legislation (812/2004) requires all fishing vessels over 12 m long using certain gear types to use pingers. ICES BGBYC (2008) found that many of the fisheries covered by this legislation do not have a significant porpoise by-catch and concluded that the legislation needs reviewing. Forcing fishermen to use pingers without clear knowledge of which fishery causes significant by-catch may be counter-productive and may damage future cooperation with the fishing industry.

Tests of alternative fishing gear – e.g. long-lines instead of bottom-set gill nets - are conducted by Swedish fishermen (ASCOBANS, 2008). In Germany, a research project is being undertaken by the Federal Agency for Nature Conservation (BfN) to study the applicability of ecologically sound fish traps as an alternative to gill nets.

Sweden introduced the Swedish Harbour Porpoise Action Plan, including a number of measures such as reduction of by-catch, distribution of information on harbour porpoise, or setting up of a reporting system.

Monitoring Measures

There are several projects in the OSPAR area that monitor various aspects of the harbour porpoise and there will be a regular EU monitoring for the EU Habitats Directive. Field studies monitor for example:

- presence and occurrence of porpoises in certain areas;
- migratory routes (Danish Environmental Research institute);
- impact of pelagic trawling (NECESSITY, EU programme);
- by-catches in some types of fisheries (Greenpeace and UK studies), and
- stranded animals and the occurrence of carcasses on certain coasts.

Post-mortem examination are carried out on strandings and by-catches by veterinarians assessing the health status, reproduction and other aspects of life history and preserve samples for a large number of study of pollutants and genetics. Monitoring through post-mortem examinations of individuals takes place within the UK and German Cetaceans Stranding Investigation programme, government funded projects that started in 1990 (Benke et al., 1998; Siebert et al., 2001; Deaville & Jepson, 2008). A shorter EU project (BIOCET, 2001-2003), involved Scotland, Ireland, the Netherlands (and Belgium), France and Galicia (Spain). The SCANS II focussed on counting porpoises by boat and airplane in most western European waters, in order to estimate the numbers of animals in the area. Tagging studies have also been a source of information on the range and behaviour of harbour porpoise in Danish Waters (Teilmann et al., 2008). In Denmark, at the Fjord & Belt Centre, a unique project has studied four captive porpoises since 1997; likewise at the Dolfinarium in Harderwijk in The Netherlands individuals are kept and studied in captivity.

A new project, Cetacean Offshore Distribution and Abundance (CODA) began in January 2007. This project undertook surveys of offshore waters (beyond the continental shelf edge) west of UK, Ireland, France and Spain. The key objectives were: (a) to map summer distribution of common dolphins, bottlenose dolphins, deep diving whales and other cetaceans in offshore waters of the European Atlantic; (b) to estimate abundance of common dolphins, bottlenose dolphins, sperm whales and other species, as data allow, in offshore waters of the European Atlantic; (c) to develop further the management framework developed under project SCANS-II to assess the impact of by-catch on small cetaceans and to calculate safe by-catch limits for common dolphins; and (d) to investigate habitat preferences of common dolphin and other species, as data allow, in offshore waters of the European Atlantic. The preliminary results were recently presented at the 2008 IWC meeting. Although harbour porpoises were observed during CODA, there were insufficient numbers to enable an abundance estimate to be made.

The North Atlantic Sightings Surveys (NASS) are joint international cetacean surveys in the northeast and central Atlantic with participation from Norway, Iceland and the Faroes that have been carried out on four occasions since 1987 (most recently in 2001). Although harbour porpoises are not the target species, the surveys give general information on distribution and relative abundance (NAMMCO 2003). TNASS was undertaken concurrently with CODA in 2007, matching its boarders to SCANS and CODA areas and extended across the North Atlantic to the USA and Canada. Results are not expected until 2009.

6. Overall Status

There is no comprehensive and detailed analysis of the genetic structure of harbour porpoise populations and their respective sizes which encompass the entire OSPAR Maritime Area. Abundance estimates, however, have been derived by research and monitoring programmes for selected portions of their distribution range. Yet, no reliable statements regarding the overall status of harbour porpoise populations and future trends can be made.

Monitoring takes place in some of the OSPAR countries, on a country by country basis (e.g. Belgium, France, Germany, Norway, The Netherlands, UK) or during EU-funded or supported projects such as the recently completed BIOCET project, the BYCARE projects or the SCANS surveys. A coordinated and

continuous international monitoring programme and corresponding database for the harbour porpoise on a European footing does not exist.

Enhanced surveys are necessary for an improved understanding and evaluation of e. g. the seasonal variations in abundance or the shifts in distribution of harbour porpoises as shown in the SCANS result.

The effectiveness of all the treaties for practical protection of the harbour porpoise, including the funding of studies to get more information about the species, often seems limited.

A more cooperative approach among the coordinators of the treaties protecting the harbour porpoise together with good contact with the coordinators in a country may help to harmonize monitoring and research as well as conservation measures.

7. Action to be taken at an OSPAR Level

OSPAR List	Protection measures through other authorities	Other competent authorities and stakeholders	Actions and measures proposed	Actions taken so far and next Steps
Phocoena phocoena Harbour porpoise (Germany)	EC Habitats Directive Annex II, IV; CMS Appendix II and ASCOBANS	ASCOBANS, ACCOBAMS IWC, EC- Habitats Dir Annex II, IV CMS Appendix 1 EC – CFP NEAFC, N and IS fisheries admin. NAMMCO	1. Communication: In the North Sea the harbour porpoise is covered by the terms of the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS), a regional agreement under the Bonn Convention. Many of the useful potential measures fall within the remit of fisheries organisations or ASCOBANS. OSPAR should communicate its concern about this species to the relevant bodies and introduce any relevant supporting measures that fall within its own remit if such measures exist or are introduced in the future. OSPAR should work with these organisations to identify any complementary measures 2. The top priority for management to improve the status of this species must be aimed at reducing the incidental capture of harbour porpoise. This may include technical measures, such as acoustic deterrents, closed areas or closed seasons. More general measures concerned with fisheries management such as effort control may also be required. However, it has to be noted that the CFP has competency for fisheries measures outside 12 nautical miles in EU countries so it is not possible for individual EU CPs to implement fisheries measures. 3. Existing work under the OSPAR Hazardous Substances and Eutrophication Strategies and its interface with EC measures in these areas continues to be important for improving coastal water quality (e.g. by reducing the discharge of substances that are toxic, persistent and liable to bio-accumulate) The implementation of the EC Marine Strategy Framework Directive will also be important in this regard. 4. Monitoring. In this context, a comprehensive and coordinated	Action so far: MPAs: The following MPAs reported to the MPA database include *P. phocoena:* SPA-Eastern German Bight, National Park "Lower Saxony Wadden Sea; Islas Atlanticas (Sp)*;* Estuaire de la Seine (Fr); Fladen (Sw); Koster-Väderö archipelago (Sw); Gullmarn fjord (Sw) Possible Next steps 1. Preparation of Communication to other competent authorities (EC; ASCOBANS) 2. Monitoring. [ICG-COBAM to consider monitoring needs and as necessary develop a monitoring methodology]

[4] OSPAR EIHA is currently developing a 'Comprehensive Overview of the Impacts of Anthropogenic Underwater Sound in the Marine Environment' which will provide a baseline from which to consider the impact of noise on harbour porpoises.

7. Action to be taken at an OSPAR Level

			monitoring approach should be established addressing the following issues: a. Regional differences in abundance and overall trends of the population in the OSPAR Maritime Area; b. Fisheries by-catch rates; c. Effects of other human-induced pressures, in particular pollutants (e.g. POPs, brominated flame retardants)[3] and noise disturbances[4]. 5. Ideally, all monitoring should be linked to human activities such that management recommendations can be made, as necessary. For example, the study of changes in (regional) diets can indicate prey depletion which may indicate human-induced factors such as fisheries and/or climate change. 6. It is therefore suggested that OSPAR should work collaboratively with ASCOBANS and relevant fisheries organisations in developing recommendations on possible protective management measures and that at the same time a monitoring approach for the harbour porpoise should be developed as part of the ICG-COBAM work and implemented as part of a revised JAMP.	

Annex 1 Overview of Data and Information provided by Contracting Parties

Table 1: Data provided by Contracting Parties (CPs)

Contracting Party	Feature occurs in CPs Maritime Area	Contribution made to the assessment (e.g. data /information provided)	National reports References or web links
Belgium	Yes		
Denmark	Yes		High density areas for harbour porpoises in Danish waters. Teilmann, J., Sveegaard, S., Dietz, R., Petersen, I.K., Berggren, P. & Desportes, G. 2008: National Environmental Research Institute, University of Aarhus. 84 pp. – NERI Technical Report No. 657. http://www2.dmu.dk/pub/FR657.pdf
France	Yes		
Germany	Yes		Research report EMSON (in German) http://www.habitatmare.de/de/downloads/berichte/EMSON_Meeressaeugetiere_Nordsee-Ostsee_2006.pdf Info on MINOS projects including download of reports: http://www.minos-info.org/ Gilles, A., Herr, H., Lehnert, K., Scheidat, M., Siebert, U. (2008). Harbour porpoises - abundance estimates and distribution. Chapter 2 in: Wollny-Goerke, K., Eskildsen, K. (eds). Marine mammals and seabirds in front of offshore wind energy. Teubner Verlag, Wiesbaden: 19-36 Current monitoring programme soon to be seen on: http://www.habitatmare.de/de/monitoring-programm.php
Iceland	Yes		
Ireland	Yes		Berrow, S., O'Brien, J.,O'Connor, I., McGrath, D. 2007. Abundance estimate and acoustic monitoring of harbour porpoise Phocoena phocoena in the Blasket Islands candidate Special Area of Conservation. Report to the National Parks and Wildlife Service. Leeney, R., (2007) Distribution and abundance of Harbour Porpoises and other cetaceans in Roaringwater Bay, Co Cork. Unpublished report to National Parks & Wildlife Service, Ireland. Berrow et al., (2008) Harbour Porpoise Survey 2008. Unpublished report to National Parks & Wildlife Service, Ireland. Berrow et al., (2008) Small Cetacean Survey 2008. Unpublished report to National Parks & Wildlife Service, Ireland.

Netherlands	Yes		
Norway	Yes		
Portugal	Yes		
Spain	Yes		
Sweden	Yes		
UK	Regions II and III	Summary of current understanding provided in audit trail document for recent FCS report required under the Habitats Directive. Conservation status considered favourable.	<www.jncc.gov.uk/article17>.

Annex 2 Description of the recommended Monitoring and Assessment Strategy

1. Rationale for the proposed Monitoring

So far, monitoring has been undertaken only in some of the OSPAR Contracting Parties, on a country by country basis (e.g. Belgium, France, Germany, Norway, The Netherlands, and UK) or during EU-funded or supported projects such as BIOCET, BYCARE or the SCANS surveys.

In order to obtain a more comprehensive assessment of the genetic structure of harbour porpoise populations and their respective sizes encompassing the entire OSPAR Maritime Area, and to understand better the observed general shifts and seasonal variations in their distribution in the North East Atlantic, a coordinated and continuous monitoring programme and corresponding database has to be established jointly by OSPAR Contracting Parties.

2. Use of existing Monitoring Programmes

Considering the results and findings of the SCANS surveys, cooperation with ASCOBANS to develop agreed-upon monitoring protocols is recommended.

3. Synergies with Monitoring of other Species

Most harbour porpoise monitoring can also detect other marine mammals such as whales, dolphins, as well as seals and sea lions. For example, the 2005 SCANS II survey focused on harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*) and common dolphin (*Delphinus delphis*) inhabiting shelf waters of the Atlantic margin, the North Sea and adjacent waters but also provided abundance estimates for minke whale and white sided dolphins.

The two SCANS surveys in 1994 and 2005 have been the only broad-scale monitoring programmes. At a two-day workshop in October 2006, best survey practices were discussed, including a comparison of visual and acoustic survey methods and a cost-benefit analysis.

4. Assessment Criteria

According to a number of criteria, the status of the harbour porpoise populations can be evaluated to fall within one of three criteria: favourable, unfavourable-inadequate, or unfavourable-bad; thus requiring different degrees of conservation efforts.

The criteria and the threshold levels for up- or downgrading conservation activities are summarised in Table 2.

It has to be noted that many of these criteria are not part of the recommended monitoring programme. However, they are listed such that assessments can still be carried out using these criteria, should they be monitored.

Table 2: Criteria to assess the Status of Harbour Porpoise Populations

	Favourable	**Unfavourable-Inadequate**	**Unfavourable- Bad**
Occurrence / Distribution	in > 90 % of known historic area (or similar baseline)	in 70-90 % of known historic area (or similar baseline)	in < 70 % of known historic area (or similar baseline)
Population Estimate and Trend [national average]	stable or increasing with respect to historic or other baseline reference value	decreasing with respect to historic or other baseline reference value	large decline with respect to historic or other baseline reference value

Porpoise Density [national average]	high (> 1.0 animal per km^2) *	medium (0.3-1.0 animal per km^2) *	low or decreasing (< 0.3 animal per km^2) *
Population Structure [national average]	Reproduction, mortality and age structure not deviating from normal (if data available)	Reproduction, mortality and age structure deviating from normal (if data available)	Reproduction, mortality and age structure strongly deviating from normal (if data available)
Habitat Quality [including prey availability]	Sufficiently large area of good quality habitat suitable for the long term survival of the species.	Habitat quality deteriorating and/or being reduced in area	Habitat quality is poor and/or insufficiently large enough, and clearly not allowing the long term survival of the species
Health Status - Toxin loading [POPs and metals]	< 17 mg/kg lipid total PCBs ** [targets for metal concentration to be determined]	> 17 mg/kg lipid total PCBs ** [targets for metal concentration to be determined]	(not yet determined) [targets for metal concentration to be determined]
Anthropogenic mortality [including by-catch]	< 1.0% of estimated population size	1.0-1.7% of estimated population size	> 1.7 % of estimated population size
Fisheries Monitoring and Reporting of By-Catch [to support mortality values as above]	Appropriate monitoring and reporting of harbour porpoise by-catch for all affected fisheries	Monitoring and reporting conforming to the minimum requirements of EU Reg 812/2004 *** (or equivalent for Non-EU Member States)	Incomplete monitoring and reporting of harbour porpoise by-catch
Anthropogenic Disturbances / Displacement [relative ranking ****]	little or no: ship traffic, motorised tourism, military sonar, seismic testing, other noise, or extraction activities	some: ship traffic, motorised tourism, military sonar, seismic testing, other noise, or extraction activities	extensive: ship traffic, motorised tourism, military sonar, seismic testing, other noise, or extraction activities

* Tentative working values in OSPAR Region II, subject to change when more data are available; a thorough understanding of long-term and seasonal variability is prerequisite.

** Tentative working values, subject to change when more data are available

*** Or superseding legislation

**** Relative ranking approach needs to be elaborated

It is suggested that the approach similar to that being taken by the EC Habitats Committee be considered. However, it should be pointed out that in the EC Habitats Committee general species evaluation matrix (EC DocHab 04-03/03-rev.3, Annex C) there are some differences with Table 2.

In the EC table, the following decision-criteria are applied:

(a) favourable: all in this column, or one unknown;

(b) inadequate: one or more in this column, but none in the *bad* column;

(c) bad: one or more noted in this column.

Each population status triggers a management response:

Favourable: requires only continued baseline monitoring;

Inadequate: requires intensified enhanced monitoring also of the threats, and an investigation of management measures, leading to recommendations on how to improve the status;

Unfavourable-bad: requires immediate interim management measures while further investigation (as per inadequate status, above) is undertaken.

5. Techniques/Approaches

Considering the results and findings of the SCANS surveys, cooperation with ASCOBANS to develop agreed-upon monitoring protocols is recommended. A centralized database for the collection and calibration of all the survey results and corresponding data should be established.

However, in the meantime, the following recommendations are designed to outline what is thought to constitute basic and enhanced monitoring programmes.

As a basis, relevant current and historical data should be collected into a national database from each CP and be made available to OSPAR.

Baseline Monitoring

- By-catch reporting according to 812/2004
- Reporting of strandings and by-catches;
- Baseline aerial surveys (or SCANS type survey using distance sampling from suitable platforms) of national waters at least every six years, preferably every three years; these should follow standard line transect protocols such as in use by SCANS or MINOS;
- Annual acoustic surveys of areas known or suspected to host high densities of harbour porpoise populations or to be breeding, birthing, or rearing grounds; e.g. in SCIs/SACs/MPAs developed for harbour porpoises.

Enhanced Monitoring

In addition to the recommended baseline monitoring above, enhanced methods should be used when a population is considered to be endangered, or when a population has shown statistically significant declines over the course of five years, or in the absence of good population data, when there is a reasonable cause to suspect that the population is in decline:

- By-catch reporting on all vessels (including small vessels);
- Aerial surveys of national areas at least every three years, preferably every year[5]; these should follow standard line transect such as in use by SCANS or MINOS;
- Collection of tissue samples of by-caught specimen;
- Collection of tissue samples of dead animals washed ashore;
- Necropsies (post-mortem examinations) of a sample of animals involved in beach strandings and by-catches, particularly if they are of an unusual nature, such as mass stranding events; this should include the examination of all organs including brain, the inner ear, analysis of pollutants in tissues, and immune function tests;
- Increased sighting surveys in areas of known or suspected problems, semi-annually or quarterly as well as the use of passive acoustic monitoring.

6. Selection of Monitoring Locations

[5] It is recommended to carry out a power analysis to determine the minimum required frequency

Considering the results and findings of the SCANS surveys, cooperation with ASCOBANS to develop agreed-upon monitoring protocols is recommended.

Harbour porpoises are known to frequent waters less than 200 m deep and to favour comparatively shallow waters. Furthermore, at least in some locations there appears to be a seasonality indicating seasonal inshore-offshore movements, e.g. into the southern German Bight as well as Dutch and Belgian coastal waters especially in late winter and early spring. Therefore, spatial and temporal factors need to be considered when selecting monitoring locations.

7. Timing and Frequency of Monitoring

Considering the results and findings of the SCANS surveys, cooperation with ASCOBANS to develop agreed-upon monitoring protocols is recommended. However, in the meantime, the following recommendations are designed to outline what is thought to constitute a basic and enhanced monitoring programme.

Baseline Monitoring

- National waters should be broadly surveyed at least once every six years, preferably every three years;
- Surveys should preferably occur during times calves are still dependant (a critical link in the life history, and also providing information on calf proportions indicating production);
- For all areas, ongoing by-catch and stranding (or dead animals found on beaches) monitoring and reporting is required.

Enhanced Monitoring

- National waters should be broadly surveyed at least once every three years, preferably every year.
- Annual surveys that cover broader areas than the baseline surveys will be required to (a) better provide overall population data, and (b) indicate spatial shifts in distributions. This should include – to the extent possible - offshore waters.
- Surveys to be performed in all affected coastal and near-shore shelf waters on at least a semi-annual, preferably on a quarterly, basis to obtain seasonal data.

8. Data Collection and Reporting

Considering the results and findings of the SCANS surveys, cooperation with ASCOBANS to develop agreed-upon monitoring protocols is recommended. A centralized database for the collection and calibration of all the survey results and corresponding data should be established.

In the meantime, the following discussion outlines some considerations in baseline and enhanced monitoring.

Baseline Monitoring

During all surveys, data should be collected on used and unused porpoise habitat (i.e. presence/absence data) as well as on the proportion of calves observed (as a proxy for birth rate). Such data can tie into enhanced monitoring (below).

A variety of survey methods are likely to be employed (see Annex 2). This is acceptable as long as results are adjusted (standardized) to account for different methods and so that numbers are comparable.

Dedicated survey platforms with trained observers are always preferable, but for more distant areas offshore a platform of opportunity may provide useful results as long as they are corrected for effort. For coastal and

shelf waters, as generally frequented by harbour porpoise, aerial surveys can produce better data (more homogeneous over a large area and less likely to influence the behaviour of the porpoises during the survey) and may be cheaper, especially over large areas when compared to larger survey vessels. Furthermore, it may be only possible to visit offshore areas every few years by ship, whereas inshore areas can be surveyed quarterly (or as required) by airplane thus providing a better level of surveying intensity.

Visual ship-borne surveys could be augmented by towed acoustical hydrophone arrays. Their effectiveness, however, appears to be still unclear due to ship noise and shyness of the species to vessels.

Aerial and/or ship-borne surveys, and towed hydrophone acoustic surveys, should provide data on:

- Distribution and density;
- Group structure;
- Proportion of calves;
- Habitat quality (ship only);
- (Inter- or intra-annual) Population shifts.

Moored acoustic monitoring devices (such as the T-POD) should provide data on:

- Seasonality (changes in relative density);
- Occurrence of migrations through geographical bottlenecks;
- Fine-scale habitat use (e.g. different vocal activities with different behaviours);
- Delineation of marine protected areas for harbour porpoises.

Moored acoustic monitoring devices can be used up to two months at a time while left recording under water, but usually cover only a radius of 100-200 m around the instrument. Therefore, they appear to be ideal for monitoring restricted areas such as marine protected areas or special areas of conservation. Moored acoustic monitoring devices should be used in nearshore waters to record temporal and spatial porpoise distribution and fine-scale habitat use.

Enhanced Monitoring

For successful porpoise conservation, particularly when a population is believed to be endangered or in decline, the monitoring of biological population descriptors is important. A healthy population with a positive population growth in a preferable habitat is more likely to thrive in the long term than a larger population with little successful recruitment or a high mortality of reproductive females. Several parties to OSPAR already have in place veterinary or toxicological monitoring schemes for by-caught or beach-cast porpoises. While dead animals are an excellent source for information on population health, reproductive status and age structure as well as for tissue samples to investigate toxic loading, the use of beach-cast animals (of unknown origin) may not always provide a picture representative of the living population. Ideally, of course, by-catch of the harbour porpoise would be eliminated completely; however in the meantime, by-caught individuals will likely remain the preferable sample group, though it may still be biased towards certain behaviours and age structure. Such sampling also provides an opportunity to collect information on the genetic population composition in OSPAR waters.

Necropsies of by-caught individuals should provide data on:

- Pathological findings in all organs including brain, ear
- Stock structure;
- Food preferences;
- Toxin loadings (e.g. contamination with heavy metals, organochlorines and other persistent organic pollutants, algae);
- Age composition.

By-caught porpoises (usually out of bottom-set gillnets) are likely to present the least biased sample of the living population. In beach-cast animals, the cause of death is frequently related to their health status thus presenting a highly biased sample with regard to animal health. (There may be however, a reverse bias when determining the age structure of a given population using by-caught individuals, as independent (recently weaned) healthy young individuals appear to be more susceptible to being by-caught in fishing nets.) Agreements such as ASCOBANS, the EU Habitats Directive, and European Council Regulation (EC) 812/2004 already require most CPs to collect information on by-caught individuals.

However it should be stressed that countries should seek to avoid all by-catch or reduce it to as close to zero as possible.

Without photo-identification, which is impractical for harbour porpoises on a larger scale due to their general vessel shyness and lack of obvious individual characteristics, the proportion of observed calves will have to serve as proxy for the recruitment. Habitat selection and any movements in between preferred habitats can lead to a better understanding of seasonality and site fidelity. Recent research suggests that this may be relevant in the southern North Sea (e.g. Van der Meij and Camphuysen, 2006). These biological parameters are likely to be of importance when delineating any protected areas for porpoises.

Enhanced monitoring activities could also benefit from research programmes providing data on:

- Genetic composition of porpoise populations;
- Habitat preferences;
- Food preferences and prey availability;
- Movements;
- Anthropogenic mortality.

These research activities would certainly increase our understanding of the species and its populations, and thereby improve future monitoring concepts as well as conservation measures.

9. Quality Assurance

Parameters measured by numerical values will express some natural variability. Coefficients of variation thus could be used as indicators for sufficient sample sizes. However, realistic and achievable threshold values for acceptable CVs need to be developed.

Table 2: Options for Monitoring Harbour Populations and their Evaluation

Monitoring objective	Method	Data quality	Benefits - Disadvantages
Group I: Quantitative Monitoring			
1. Presence	1. acoustic: stationary detectors (e.g. T-PODs, sonar buoys, bottom-mounted hydrophone arrays) or towed hydrophones	reliable for positive records, but not for absence (vocal activity, geographical coverage etc.)	long-term, weather independent
	2. opportunistic sightings	reliability of species identification depends on observer training, poor spatial coverage	low cost, weather dependent
2. Distribution	effort related opportunistic and dedicated ship-borne and aerial sightings; [possibly moored acoustic detectors?]	If sightings are effort related, then absence is detected. Appropriate statistical techniques can be used to take avoidance etc into account.	high cost, coastal (airplane) or slow (ship, unless several vessels simultaneously at very high costs) coverage, weather-dependent
Buckland et al. 2004; Garner et al. 1999			
3. Density	distance sampling: dedicated ship-borne and aerial surveys	potential over- or under-estimation	high cost, coastal (airplane) or slow (ship) coverage, weather-dependent
Buckland et al. 2004; Garner et al. 1999			
4. Trend (changes in absolute abundance)	1. repeated distance sampling under comparable conditions (e.g., month, weather, sea state, observers etc.); [possibly relative abundance measurements locally, e.g. by moored acoustic detectors?]	potential over- or under-estimation	very high costs especially for narrow confidence limits, weather dependent
Buckland et al. 2004; Garner et	2. locally dedicated surveys from platforms of opportunity or from land	reliability of species identification depends on observer training, poor spatial coverage	low cost, weather dependent

Monitoring objective	Method	Data quality	Benefits - Disadvantages
al. 1999			
Group II: Biological Aspects			
5. Seasonality	1. stationary acoustic detectors (e.g. T-PODs, bottom-mounted hydrophone arrays)	reliable for positive records, but not for absence (vocal activity, geographical coverage, oceanographic features etc.)	low cost, long-term, weather-independent
	2. locally dedicated surveys from platforms of opportunity or from land	reliability of species identification depends on observer training, poor spatial coverage	low cost, weather dependent
6. Movements (inc. site faithfulness)	radio-tracking via satellite transmitter (PTT)	possibly difficult to generalize due to small sample size and altered behaviour of individuals fitted with a tracking collar	high cost, small sample sizes, but high conservation value (e.g. for MPA boundaries verification)
7. Habitat use	ship-borne surveys (for abiotic *in situ*-measurements) together with GIS; [possibly also with radio-tracking or moored acoustic detectors, if behaviour can be recognised]	reliable for positive records in direct comparison with 'unused' sites	high cost, but high conservation value (e.g. to model distribution)
8. Proportion of calves	dedicated ship-borne and aerial surveys	inter-annual comparison possible for same area and month	high cost, weather-dependent
9. Recruitment			
10. Stock structure	Tissue samples of by-caught and beach-cast individuals; (or of live animals if already collecting biopsy [see 12.2])	Functioning and comprehensive stranding network is required	Sample size might be limited and origin of stranded animals may be unclear

Monitoring objective	Method	Data quality	Benefits - Disadvantages
Group III: Aspects of Population Health			
11. Age structure *Dierauf & Gulland 2001*	composition of by-caught and beach-cast individuals (GLG counts from tooth cuttings)	potentially biased by cause of death (e.g. more immatures are by-caught shortly after weaning)	slow coverage due to small sample size, significant changes difficult to detect; only for odontocetes (toothed whales inc. porpoises and dolphins)
12. Health status *Dierauf & Gulland 2001*	1. Disease prevalence in necropsies; 2. Antibody prevalence & immuno-competence in live tissue samples (remote biopsying); 3. possibly indirectly: through change in distribution (anthropogenic impact)	possibly difficult to generalize due to small sample size; potentially biased by cause of death; cause-effect relationship possibly difficult to prove	high cost, slow coverage due to small sample size, significant changes difficult to detect, but high conservation value
13. Reproductive status *Dierauf & Gulland 2001*	reproductive tissue samples of by-caught and beach-cast individuals; [possibly hormone measurements of live cetaceans]	potentially biased by cause of death	slow coverage due to small sample size, significant changes difficult to detect
14. Toxin loads *Vos et al. 2003*	tissue samples of by-caught and beach-cast individuals and strandings or remote biopsying	potentially biased by cause of death; cause-effect relationship possibly difficult to prove and sources may be difficult to determine	high cost, slow coverage due to small sample size, significant changes difficult to detect, but high conservation value

15. Genetical population structure	tissue samples of by-caught and beach-cast individuals or remote biopsying	potentially biased by location of corpse recovery			biopsy sampling: high cost, slow coverage due to small sample size

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Annex 4 Existing Management Measures

ASCOBANS (Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas) is an autonomous agreement of the Convention on Migratory Species under the immediate auspices of UNEP/CMS. There is no harbour porpoise conservation plan yet in place. However, resolutions regarding by-catch have been passed, indicating 1.7% as an "interim" limit (in 2000) and 1.0% as a "precautionary" limit (ASCOBANS 2000).

Habitats Directive: In the waters of EU Member States, Article 12.4 of Council Directive 92/43/EEC (the Habitats Directive) requires States to establish a system to monitor the incidental capture and killing of all cetaceans, and that in the light of the information gathered they shall take further research or conservation measures as required to ensure that incidental capture and killing does not have a significant negative impact on the species concerned.[6] However, the Commission considered that this requirement of the Habitats Directive was not adequately implemented, and in December 2005 it sent eight Member States a first written warning - first step in the legal procedure - that they are breaching the Habitats Directive and need to take corrective action to ensure full protection of these marine mammals[7] (EC 2005a). However, this warning has in the meantime been dropped against the UK.

The EC advice is that any decline in abundance greater than 1% per year constitutes a "large decline" and thus unfavourable-bad conservation status for a given Annex species[8] (EC 2005b).

European Council Regulation (EC) 812/2004: Observer monitoring of specified fisheries (Annex III) is now required under European Council Regulation (EC) 812/2004, which lays down measures concerning incidental catches of cetaceans in fisheries (by-catch). It came into force on 1 July 2004, with various areas phased in through to January 2008. The Regulation sets out measures in specific fisheries to deter cetaceans away from fishing nets and requires monitoring of by-catch in certain fisheries. However, no numerical target for by-catch reduction is specified. The requirements of the Regulation include:

- the mandatory use of acoustic devices ("pingers") for vessels over 12 m involved in specified fixed gear fisheries (bottom-set gillnet or entangling net (Annex I);
- the monitoring of by-catch, by on board observers, of vessels 15 m or over in specified fisheries (Annex III);
- the annual reporting by Member States on the use of pingers and the implementation of the on-board observer programmes, including all information collected on the incidental capture and killing of cetaceans in fisheries.

Exemption for small boats: note that the above requirements exempt smaller vessels. However, smaller vessels are more likely to frequent the shallower nearshore harbour porpoise habitat, particularly when using bottom-set gillnets. BDC 2004 noted that although several types of fisheries may occasionally catch harbour porpoises, those that pose the greatest risk to harbour porpoise populations are bottom-set gill-nets. Such fisheries are relatively common throughout the shallower parts of the North Sea (BDC04/02/07, §10).

Scientific studies: While vessels of less than 15 m are exempt from the general requirement to carry on-board observers, Member States are still supposed to collect, by means of scientific studies or pilot projects, data

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6 In addition, the directive requires member states to designate special conservation areas for the bottlenose dolphin (*Tursiops truncatus*) and harbour porpoise (*Phocoena phocoena*).

7 The Commission considered that Belgium, France, Greece, Italy, the Netherlands, Portugal, Spain and the UK had not established sufficiently effective surveillance systems.

8 The full text reads: "Large decline: equivalent to a loss of more than 1% per year (indicative value MS may deviate from if duly justified) within period specified by MS AND below 'favourable reference population' OR More than 25% below favourable reference population OR Reproduction, mortality and age structure strongly deviating from normal (if data available)"

on cetacean catches by these small vessels in the fisheries defined in Annex III. However, the regulation provides no specification for the detail, timeframe or extent of these studies.

The requirement for data collection on small vessels does not apply to fisheries that are not included in Annex III, notably those listed in Annex I, which are instead subject to pinger requirements, but only for vessels larger than 12 m. Thus, currently, Annex I small vessels are not studied nor are they required to use pingers, and as such represent a regulatory as well as a data gap. The UK, however, has regularly been covering small vessels under 812/2004.

North Sea Ministerial Declarations: In the 2002 Ministerial Declaration of the Fifth International Conference on the Protection of the North Sea of 20-21 March 2002 (The Bergen Declaration), Ministers agreed to numbers that reflected the 2000 ASCOBANS resolution, above:

> *As an interim objective, the Ministers agree to aim at reducing the by-catch of harbour porpoises below 1.7% of the best population estimate. On the same basis the Ministers agree on a precautionary objective to reduce by-catches of marine mammals to less than 1% of the best available population estimate, and urge the competent authorities to develop specific limits for the relevant species. (§29)*

The Bergen Declaration also called for "*the development and adoption, as soon as possible and in cooperation with the competent authorities, of a recovery plan for harbour porpoises in the North Sea*."[9] (§30)

In 2006, this 1% by-catch threshold (but not the 1.7% interim objective) was again stated. The Declaration of the North Sea Ministerial Meeting on the Environmental Impact of Shipping and Fisheries, also known as the Gothenburg Declaration, stated that:

> *Special attention should also be given to the development of fishing gear and fishing methods that will help minimise physical disturbance of the seabed and incidental by-catches of non-target fish, seabirds and other marine organisms and reduce by-catches of marine mammals to less than 1% of the best population estimate.* (§3, Gothenburg, Sweden, 4 & 5 May 2006)

OSPAR's North Sea EcoQO for Harbour Porpoises currently sets its by-catch limit to 1.7%.

In 2007, Germany brought to the attention of OSPAR the 1% precautionary limit as stated in the 2006 Gothenburg declaration (BDC 2007 SR, §2.6; OSPAR 2007 SR, §6.4). It was therefore agreed at OSPAR 2007 that the EcoQO should be reviewed by ICG-EcoQO.

Initial findings of an assessment of this EcoQO by ICES SGBYC and WGMME (ICES WGMME 2008 Report) state however, that with the way in which data is currently collected, it is not possible to assess accurately the proportion of the population being effected.

[9] While ASCOBANS has adopted a *basis* for a North Sea Conservation Plan (ASCOBANS resolution 1, MOP-5, 2006), it does not actually yet have a conservation plan written or in place (§6.2, Report of the 14th meeting of the Advisory Committee of ASCOBANS, San Sebastián, Spain, 19 - 21 April 2007).