Agenda Item 5.2: **Elaboration of a recovery plan for harbour porpoises in the North Sea**

Recovery plan for the harbour porpoise (*Phocoena phocoena* L.) in the North Sea. Draft Working Paper

Submitted by: **Germany**

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Recovery plan for harbour porpoise (*Phocoena phocoena* L.) in the North Sea

Draft working paper

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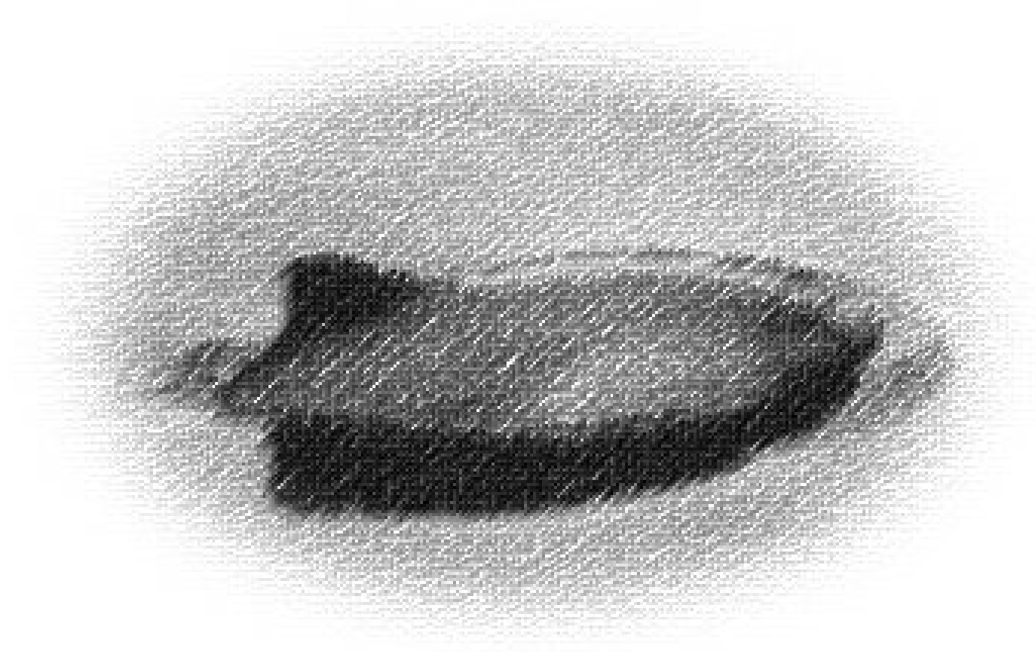

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1. Introduction

The harbour porpoise (*Phocoena phocoena*, Linnaeus 1758) is widely distributed in shelf waters of the temperate North Atlantic and North Pacific Oceans and in some semi-enclosed seas (e.g. Black and Baltic Seas), and is notably the most abundant species of cetacean in the North Sea (Hammond *et al*., 1995, 2002). At the beginning of the last century, harbour porpoises were commonly seen in large numbers throughout the North and Baltic Seas (Schulze, 1987), but in recent years the species has experienced major declines in parts of its range. Incidental mortality in fishing gear has played a major role in reducing the abundance of this small cetacean species throughout its range. In the 1990's in fact, between 7,000 and 10,000 harbour porpoises were killed annually as a result of by-catch in fishing nets (Vinther, 1999; Northridge & Hammond, 1999). Other factors impacting on population size include toxic substances at sea (Kastelein & Lavaleije, 1992), marine debris (Baird & Hooker, 2000), disease (e.g. morbillivirus), noise pollution (Richardson *et al*., 1995), shipping traffic, human disturbance and decrease in prey abundance or quality (Reijnders, 1992; Evans, 1994).

All nations bordering the North Sea operate fisheries that are (at least potentially) responsible for causing incidental entanglements in nets (Kaschner, 2001). By-catch may occur through a variety of fishing operations, including bottom-set gillnets, cod and salmon traps, herring weirs, trawls and purse seines. Set-net fisheries, including gillnets, tangle and trammel nets for demersal species such as cod, hake, turbot, plaice or sole, are considered to be particularly risky (Lankester, 2002). As such, mitigation measures concerning this type of fishery will be a major focus for this present recovery plan for the North Sea harbour porpoise.

2. Objectives

The ultimate aim of ASCOBANS is to reduce anthropogenic removals to zero within a, yet to be specified, timeframe, and "to restore and/or maintain biological management stocks of small cetaceans at a level they would reach when there is the lowest possible anthropogenic influence" (ASCOBANS, 2000). However, a suitable and practical interim objective (currently decided upon) would be to restore or maintain populations to 80% or more of their carrying capacity. In 2000, an annual by-catch of over 1.7% of the estimated harbour porpoise population size was considered unacceptable and the immediate precautionary objective of ASCOBANS was stated as “the reduction of by-catch to 1% of the best available population estimate” (ASCOBANS, 2000). In this respect, the primary objectives of the present recovery plan are:

(i) to implement management measures immediately, to reduce by-catch to 1% of the best available population estimate, and

(ii) to develop more refined recovery targets as new information becomes available on population status, by-catch and other potential threats.

3. Population status

In 1984, Gaskin identified 3 regional populations of harbour porpoise in the North Atlantic, North Pacific and Black Sea, and proposed 14 provisional sub-populations in the North Atlantic, 4 in the West and 10 in the East Atlantic. The criteria he used included migratory patterns; geographic isolation by land mass, ice or sheer distance; habitat preferences and availability; and availability of prey items. In a later report by Donovan & Bjørge (1995), 3 sub-populations were distinguished for the species in the Northwestern Atlantic, 7 in the Northeast Atlantic, and a separate population each in the Baltic Sea, Black Sea, in West Greenland, and Northwest Africa. Various studies using allozyme frequencies and microsatellite DNA (Andersen, 1993; Andersen *et al*., 2001), mitochondrial DNA (Walton, 1997; Wang & Berggren, 1997; Tolley *et al*., 1999; Tiedemann & Boysen, 2000) or morphometric techniques (Børjesson & Berggren, 1997; Huggenberger *et al*., 2000 and 2002), as well as contaminant levels (Berggren *et al*., 1999) and tooth ultra-structure (Lockyer, 1999), have attempted to ascertain the boundaries of these sub-populations, but despite all efforts, the relationships between neighbouring populations are still not completely understood.

Since the understanding of population structure is vital in evaluating the effects of threats to the harbour porpoise – and indeed for the formulation sound management procedures – the IWC-ASCOBANS *Working Group on harbour porpoise* attempted to define the boundaries of alleged sub-populations to model the impact of by-catch on individual stocks (IWC, 2000). This determination of sub-populations was primarily carried out using existing mitochondrial DNA studies, and yielded great differences among putative populations that were subsequently ascribed to potential female philopatry and the dispersal rates of females. Based on these findings, the following five stocks were proposed – their boundaries largely following the borders of ICES areas (see Kaschner, 2001 for review of the basis for the delineation of these areas):

(i) Baltic Sea

(ii) Kattegat, inner Danish waters and German Baltic Sea

(iii) Northern North Sea

(iv) Central and South North Sea

(v) Celtic Shelf.

Several surveys have been conducted in the northeast Atlantic to date to estimate the size of harbour porpoise populations. The most wide-ranging yet has been the SCANS (Small Cetacean Abundance in the North Sea) survey of 1994 (see Hammond *et al.*, 1995). This produced an estimated North Sea population of approximately 280,000 animals. Interestingly, no porpoises were seen in the English Channel or the southern North Sea during this survey although strandings are regularly reported from the Dutch and Belgium coast. In addition, Bjørge & Øien (1995) published estimates of 82,000 animals in the northern North Sea and southern Norwegian waters. These figures present the most valuable estimations of the population size in this region to date.

4. Distribution and habitat use

Confined to the Northern hemisphere, with a more or less circumpolar distribution in temperate regions (Gaskin, 1984), harbour porpoise generally inhabit coastal areas, and is typically found at depths of less than 200 metres (Carwardine, 2000); although they have been recorded in deeper waters (Reid *et al.*, 2003). Food and feeding are almost certainly the driving factors behind the distribution of the species, although breeding habitat may also be important to some extent. Northridge *et al*. (1995) have found that harbour porpoise in the North Sea aggregate into two major groupings during early spring (January to March): one in the deeper waters of the north western North Sea, and one off the west coast of Jutland. Densities in the southern North Sea are also highest in spring, which might indicate a potential third aggregation, although the species is generally quite rare in the Dutch coastal waters (Camphuysen & Leopold, 1993).

5. Threats to the harbour porpoise

5.1. Fisheries

Harbour porpoise are highly prone to incidental capture in bottom-set gillnets, probably due to their feeding behaviour on or near the seabed (Ross & Isaac, 2004). High incidences of capture have been recorded in a number of fisheries throughout their range. Various studies have been conducted since the early 1980s (e.g. Clausen & Andersen, 1988; Kinze, 1994; Vinther, 1999; Northridge & Hammond, 1999) which demonstrated that large numbers of porpoises are caught mostly in large-mesh gillnets set for cod, turbot, lumpfish, plaice and skate. Observations during the 1990s in Danish waters confirmed substantial catches in Danish gillnets with highest total porpoise mortality occurring in the turbot fishery which has long nets and soak times, but highest porpoise by-catch rate occurred in the cod wreck nets, particularly in the third quarter of the year (Vinther, 1999). In UK bottom-set gillnet and tangle-net fisheries, porpoise by-catch rates were found to be highest in the skate fishery, the estimated total porpoise mortality was greatest in the inshore cod fishery due to the very large fishing effort (Northridge & Hammond, 1999).

Gear other than set nets appear to be less hazardous for harbour porpoise. By-catches in trawls have been recorded, but in much smaller numbers (Clausen & Andersen, 1988; Northridge & Lankester, 1990; Kinze, 1994). The few studies in Danish waters suggest that the catch in trawls may represent 2 – 19% of the total by-catch (Clausen & Kinze, 1993, as cited in Lowry & Teilman, 1994).

5.2. Prey depletion

Changes in the distribution and abundance of prey species of the harbour porpoise may cause physical effects on individuals, distribution changes and abundance changes in harbour porpoise populations. The harbour porpoise generally is considered an opportunistic feeder. However, it has been suggested that its small body size, its energetically demanding reproductive schedule and its relatively cold water habitat all mean that the harbour porpoise can never go without food for more than a few days (Yashui & Gaskin, 1987).

Evans (1995) noted a marked decline in harbour porpoise numbers around the Shetland Islands during the 1980s, whilst major changes occurred in the local fisheries. Reijnders (1992) associated the decline in numbers of harbour porpoise seen in the coastal waters of the North Sea with the massive drop in herring numbers.

5.3. Pollution

5.3.1. Toxic substances - In recent years a growing concern has been expressed about the possible adverse effects pollutants may have on marine mammal populations. As top predators, harbour porpoise accumulate high concentrations of lipophilic and persistent organic compounds through their diet, due to a low metabolic capacity for degradation both in the animals themselves and components of their food chain (Law *et al*., 1998). The reported effects of PCBs and other contaminants include disruption of the immune system and physiological changes that lower the reproductive potential of marine mammals through hormone imbalance (for a summary see Hughes, 1998).

5.3.2. Marine debris – Lightweight, strength and durability are properties of plastics which make them favorable for the manufacture of certain products. It is these properties which also pose a threat to wildlife when plastics are released into the environment. Considerable quantities of plastic debris are found throughout the world's oceans and may impact a diversity of species including the harbour porpoise. Entanglement in discarded plastics and ingestion of marine debris have been shown to cause death (through injury, drowning or starvation). Findings by Kastelein & Lavaleije (1992) indicated that large debris pollution may be a more directly lethal problem to individual marine mammals than chemical pollution as the latter reduces reproductive rate and longevity to some extent, but may only rarely lead to immediate death.

5.4. Noise pollution and disturbance

Harbour porpoises have a high frequency sonar system and excellent echolocation abilities (Verboom & Kastelein, 1995). They are acoustically dependent, relying on sound to communicate, orientate, navigate and hunt for food. In an ocean which is getting steadily noisier, sending and receiving information becomes increasingly difficult for harbour porpoise. Elevated underwater noise might have a variety of deleterious effects on porpoises including behavioural changes, such as altering migration routes and feeding behaviour, physical or physiological effects, such as temporary or permanent hearing loss and noise-induced stress.

Increased boat traffic in the North Sea might also pose a problem for harbour porpoises as they are generally shy animals which tend to swim away in response to boats. In recreational areas where there are concentrations of power boats and jet skis, the increased noise level as well as the speed of these vessels might pose a threat to the porpoise as they might be unable to respond quickly enough to escape the vessels' line of travel and might get hit.

Oil and gas exploration involves conducting seismic surveys over a period of weeks. During such surveys, vessels tow either single airguns or multiple arrays which emit loud, predominantly low frequency impulsive sounds at regular intervals. Seismic exploration in inshore waters is a particular threat to the largely coastal harbour porpoise as well as to inshore fisheries. In addition to seismic and increased tanker traffic, activities such as drilling and dredging also contribute to the underwater noises produced by the industry. As the sounds of seismic surveys are low frequency, harbour porpoises might not be directly affected by the sounds. However, Goold (1996) observed that dolphins were temporarily displaced from areas of seismic activity. Harbour porpoise could also be affected indirectly as a result of the effects of seismic surveys on prey species. Loud noise over extended periods could cause temporary dispersion of aggregations of fish, resulting in a loss to the harbour porpoise.

6. Recovery recommendations

6.1. By-catch reduction

By-catch reduction should have the highest priority for a recovery plan for North Sea harbour porpoise. Measures to achieve such reduction should begin immediately. As there is no universal solution to by-catch reduction, since the suitability and efficiency of mitigation measures depends on the specific circumstances associated with a fishery, strategies should have multiple mitigation approaches as a way of dealing with the uncertainty of outcome associated with any individual measure (Read, 2000). As noted in the Jastarnia Plan (ASCOBANS, 2002), it is important that fishermen and their representatives are closely involved in the implementation process. They should be included in any discussions and decision-making that may have implications for their livelihoods. It is also important to underline that the same by-catch reduction measures might not be appropriate on the same time schedule for the whole of the North Sea – as harbour porpoise are not a homogenously distributed.

6.1.1. Reduction of fishing effort - There appears to be a direct relationship between fishing effort and the total number of animals caught in a specific type of fishery. Reduction in fishing effort in these fisheries should lead to a proportional reduction of by-catch (Read, 2000; CEC, 2002a). Bottom-set gillnets are a major source of incidental mortality. The reduction in fishing effort in the Danish gillnet fisheries in the most recent years has led to a reduction of the level of by-catch (Vinther & Larsen 2002). **It is recommended that North Sea range states should take measures to reduce all fishing effort using bottom-set gillnets in the North Sea.**

Reduction in fishing effort may include a reduction in soak time (amount of time the nets are in the water) and/or net lengths, as well as time and area fishery closures and days at sea limitations. Reduced fish catch quotas or reduced fleet sizes will not necessarily reduce by-catch, since reductions in catch quotas and/or fishing capacity are not the same as reductions in fishing effort. It is important to note that fisheries closures need to be permanent or long-term, but could be triggered by a threshold of by-catch mortality (DEFRA, 2003). Under these circumstances, a seasonal or annual harbour porpoise mortality limit could be set for a fishery that, once reached (calculated on the basis of observed by-catch), would lead to the closure of the fishery for the remainder of the year/season. This would require an extended program of scientific observation in the fishing fleet in order to come up with a statistically sound by-catch estimate.

6.1.2. Change of fishing methods - Another method by which to achieve by-catch reduction whilst maintaining a fishery would be to implement changes to fishing gear and methods considered less harmful to porpoises. The investigation of potential benefits of gear switches in the Baltic – from driftnets and bottom-set gillnets to fish traps, pods and longlines – form an important part of the Jastarnia Plan (ASCOBANS, 2002) which would be a recommended course of action for the North Sea set-net fisheries as soon as possible as well. **Any replacement or changeover to less harmful gear needs to be considered in view of potential impacts to the harbour porpoise, the target fish species, and other biota such as seabirds.**

6.1.3. Alterations to fishing gear - There are a number of modifications of fishing gear and deployment practices that have been tested in the context of by-catch mitigation. Existing modifications range from relatively minor alterations, such as changes in mesh size, twine diameter and deployment depth, to more substantial structural modifications, such as excluder grids in pelagic trawls (Northridge, 2003), and attempts to enhance the acoustic visibility of nets either through the use of nets with hollow cores or acoustic reflectors (Goodson *et al*. 1994, Silber *et al*., 1994; Koschinski & Culik, 1994), or nets impregnated with a metal compound (Larsen *et al*., 2002; Mooney *et al*., 2003; Trippel *et al*., 2003). Experiments so far have produced ambiguous results or observed by-catch reductions which have been connected to unacceptably high decreases in catch of the target species (Larsen *et al.*, 2002). Read (2000) reported, that in experiments in the Bay of Fundy with nets impregnated with Barium Sulphate by-catch was reduced significantly, while no significant difference was recorded in the take of the target species. It is not clear, however, if the observed reduction in by-catch was due to the different acoustic properties of the nets or to some other mechanical property, such as increased stiffness as a result of the metal filler (Read, 2000; DEFRA, 2003). **It is recommended that the mechanisms that resulted in the observed effectiveness are further investigated, as such modification in fishing gear might be a promising alternative to pingers (see section 5.1.4) due to its handiness and the lower costs of production and maintenance.**

6.1.4. Mandatory use of pingers - Acoustic deterrents, or pingers, have been widely demonstrated to reduce by-catch in gillnet fisheries. Read (2000) has extensively reviewed the use of pingers in US fisheries and reported that by-catch rates for certain fisheries were reduced significantly (10-fold for harbour porpoise). Work carried out by the University of St. Andrew's Sea Mammal Research Unit (SMRU) on the set net fishery in the Celtic Sea, yielded a 92% reduction in by-catch of harbour porpoise in pingered nets compared to unpingered nets (SMRU, 2001). Since August 2000, the use of pingers has been mandatory in the Danish cod wreck fishery between August and October. Here, the effect of pinger use is reported to be as close to 100% reduction in by-catch in the observed part of the wreck fishery (Larsen *et al*., 2002; Vinther & Larsen, 2002). **Since it will probably be several years before the necessary reduction in fishing effort and alterations to lower-risk fishing gear are fully implemented, it is recommended that pinger use should be made mandatory in specific high-risk areas of the bottom-set gillnet fisheries during those months with highest by-catch rates.**

Despite the obvious effectiveness in reducing by-catch in set net fisheries, however, there are a number of drawbacks and concerns about the use of pingers in the industry. Essentially, pingers are expensive, they need a high level of maintenance, are prone to failure, and may interfere with the setting and hauling of nets (reviewed by Read, 2000; Ross & Isaac, 2004). These are factors which may make them unpopular with fishermen.

Another drawback of relying on pingers is that their use does not ensure zero by-catch and does not provide a guarantee that by-catch will be brought down to the estimated target. Since it is impossible to change immediately to alternative gear, it is suggested that the rapid deployment of pingers would be considered as a better interim goal until better by-catch mitigation measures are available.

A further problem is that the effective monitoring and enforcement of pinger use may prove to be very difficult. This could only be addressed through a costly, large-scale independent observer program of sufficient scale; as it would probably be competing for funds with programs to develop alternative gear. The full implementation of a mandatory pinger program represents a major investment in terms of resources.

An additional concern is that porpoises might habituate to pingers – rendering the technology ineffective over time – or that continuous and widespread pinger use might frighten animals away from some areas and so deprive them of foraging grounds. This would have potentially negative consequences for their conservation status (CEC, 2002a). Experimental studies in Canada have demonstrated that after a period of weeks of exposure to pingers, the animals began to surface closer to the acoustic devices. This did not mean that the pingers were necessarily ignored, but simply that they reacted less severely to their presence (Cox *et al*., 2001). In 2001, Lockyer *et al.* demonstrated on captive porpoises that once the source of sound emission was removed, the animals rapidly returned to the area from which they had been displaced. On this basis, harbour porpoises in the wild could be expected to move back into areas once pingered fishery operations had been terminated.

More recent research has been directed towards interactive pingers with a deterrent device that only emits sound when triggered by the sonar clicks of an approaching porpoise (Amundin *et al.*, 2002). This approach addresses the concerns of noise pollution and habituation with the pingers transmitting sounds only when needed, thereby delaying potential habituation. Although sea trials had been scheduled for 2002, results have only been reported from trials with captive harbour porpoises at this time (CEC, 2002a). **Further trials with interactive pingers are recommended in all North Sea bottom-set gillnet fisheries.**

6.2. Marine Protected Areas or MP A's

Harbour porpoises are not equally distributed throughout the North Sea (Hammond *et al*., 1995, 2002). Surveys have demonstrated that the area west of the islands of Sylt and Amrum has very high densities of the species, as well as an exceptionally high proportion of calves (Hammond *et al.*, 1995, 2002; Heide-Jørgensen *et al.*, 1993; Sonntag *et al.*, 1999). The animals are present all year round (Koch *et al.*, 1993, as cited in Prochnow & Kock, 2000) and the area is apparently a favourable habitat as well as an important breeding ground (Sonntag *et al*., 1999). At the beginning of 2000, this area of 124,000 ha became a specially protected area for harbour porpoise (the 12 nm in front of the islands of Sylt and Amrum). Unfortunately, the protection area is unmarked on any nautical chart and, as a result, motorboats still race through the breeding and nursery grounds. Fixed fishing nets under 2 metres in height are still permitted, and a ban of higher nets has not yet been approved by the EU and is therefore only binding for German fishermen. Recent aerial surveys in the German EEZ in the North Sea indicate high densities of the species slightly further offshore than the protected area, close to the Danish border (Scheidat *et al*., 2003). In 2002, the German Federal Agency for Nature Conservation (BfN) proposed that the currently protected area and three other areas further offshore in the German EEZ – namely, Sylter Außenriff, Doggerbank and Borkum-Riffgrund – were put forward as NATURA 2000 sites under the EC Habitats and Species Directive, 1992. **Regulations in the protected area should as far as possible aim at the prohibition of all bottom-set gillnet fisheries and pelagic pair trawling operations, an enforced speed limit for all motorised boats, a general prohibition of Jet-skis and other motorised water sports equipment, a restriction (if not prohibition) of all construction work (e.g. wind parks or gravel mining), and the interdiction of military activities that might harm or threaten the porpoises.**

Although encouragement of authorities to implement management measures within protected areas, as outlined above, is strongly recommended, such measures should not be permitted to serve as substitutes for the conservation initiatives recommended elsewhere in this recovery plan.

6.3. Research and Monitoring

There are still many aspects of harbour porpoise conservation that remain uncertain, but it is obvious that further research measures are not necessary at this time in order to simply implement a sought-after by-catch reduction plan. As the Northeast Atlantic population lives perhaps in one of the most polluted and heavily fished marine environments in the world (Aguilar & Borrell, 1995), there are other potentially greater risks apart from by-catch that might prove decisive in determining whether the species in this region is able to recover or not. **Further research is needed on the possible roles of contaminants (organochlorines, organotins, heavy metals etc), marine debris (sewage, waste), diseases (e.g. morbillivirus), noise pollution (from wind parks or seismic work), shipping traffic, human disturbance (recreational and acoustic) and decrease in prey abundance or quality etc, to be able to guide decisions concerning waste management, pesticide use, energy development, management of the public, and fisheries (in a broader sense than only by-catch).**

The establishment of independent observer schemes to monitor harbour porpoise by-catch – in all European fisheries with a potential high risk of cetacean by-catch – is vital (CEC, 2002b). The SGFEN group of experts recommend that a minimum recording of marine mammal by-catch should be made mandatory, and that coverage within this scheme should be extended to obtain cetacean data at a “statistically meaningful level” (CEC, 2002a). **It is recommended that dedicated observer schemes should be established, instead of simply extending existing discard monitoring programs.**

6.4. Raising public awareness

Public awareness is essential for any kind of recovery plan. As noted in the Jastarnia plan (ASCOBANS, 2002), it is unlikely that people will support a conservation or recovery effort unless they are convinced there are porpoises in their local waters under threat and worth saving. **It is extremely important to publish reliable information about harbour porpoises in the North Sea and to actively promote their protection and recovery.**

As fishermen are the people most likely to interact directly and frequently with the harbour porpoises, they should be viewed amongst the most important contacts in this matter. In addition, members of the general public will also represent an important sector to reach. They are, afterall, consumers of the products derived from the fisheries themselves.

Authors note: *In addition to the points raised thus far, there are certainly many other considerations that will need both to be addressed and developed in view of a more complete and comprehensive recovery plan for the North Sea harbour porpoise. The report this far thus presents a first stage impression and outline of those areas reviewed and considered to date. Whilst by no means complete, the draft subsequently aims to provide a starting point for that much-needed feedback and progressive input from respected authorities and policy makers in this area.*

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