Agenda Item 3

Species Action Plan

Conservation Plan for Harbour Porpoises in the North Sea

Document 3.2.b

Progress Report on the Conservation Plan for Harbour Porpoises in the North Sea

Action Requested

- Take note

Submitted by

Sea Watch Foundation
(Harbour Porpoise Coordinator)

NOTE:
DELEGATES ARE KINDLY REMINDED
TO BRING THEIR OWN COPIES OF DOCUMENTS TO THE MEETING

Secretariat's Note

The Rules of Procedure adopted at the ASCOBANS 8th Meeting of Parties remain in force until and unless an amendment is called for and adopted.

PROGRESS REPORT

on

THE CONSERVATION PLAN FOR THE HARBOUR PORPOISE

IN THE NORTH SEA

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The views and recommendations expressed in this report are the author's own

PROGRESS REPORT ON
THE CONSERVATION PLAN FOR THE HARBOUR PORPOISE IN THE NORTH SEA

Background and History

The 5th International Conference for the Protection of the North Sea (Bergen, Norway, 20-21 March 2002) called for a recovery plan for harbour porpoises in the North Sea to be developed and adopted (Paragraph 30, Bergen Declaration). Germany volunteered in 2003 to draft a recovery plan within the framework of ASCOBANS, and in association with Range State Norway.

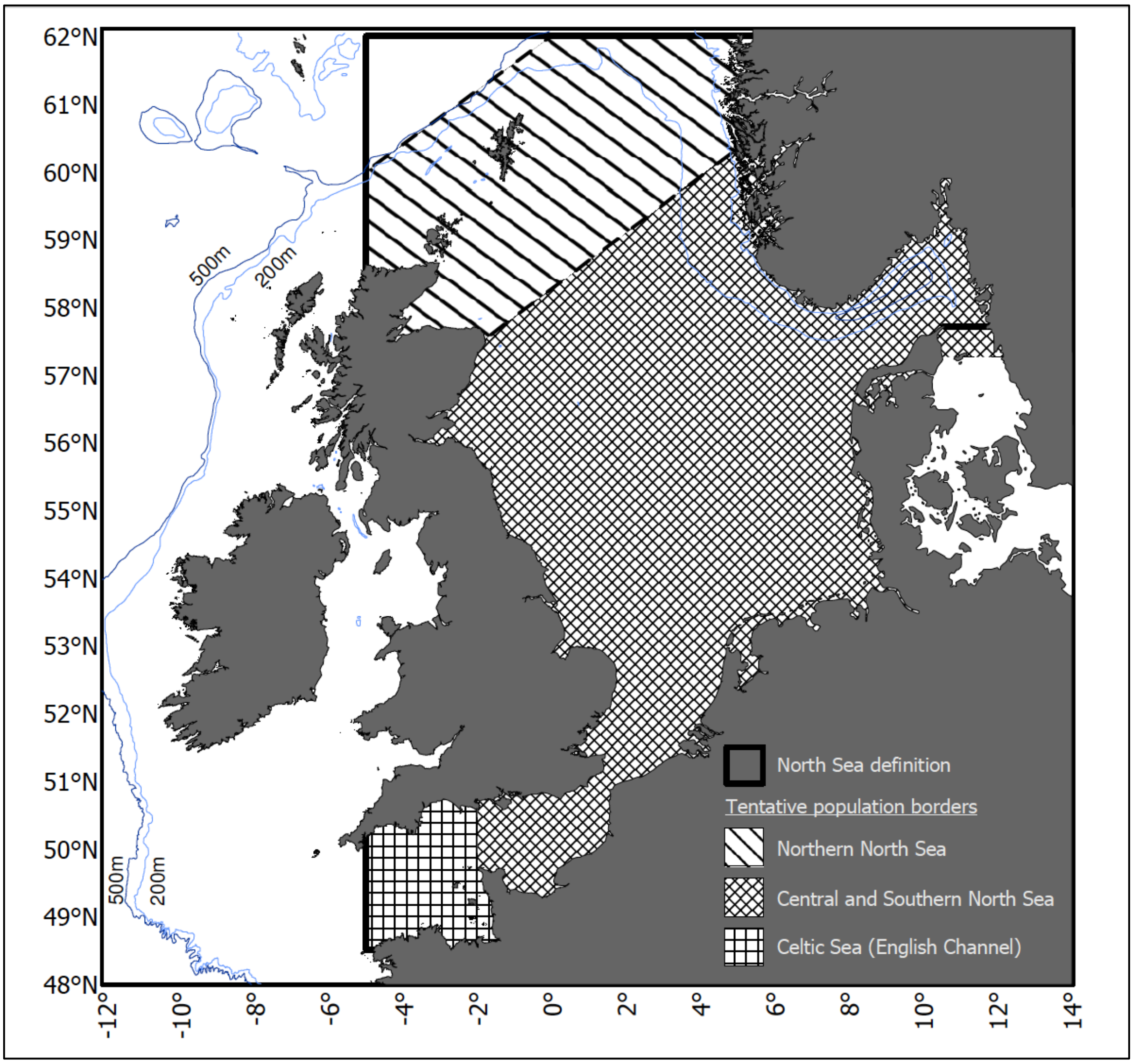

Figure 1. Area covered by the North Sea Conservation Plan (as defined at the 5th International Conference on the Protection of the North Sea in Bergen, Norway, 20 – 21 March 2002) showing the tentative harbour porpoise population borders (Source: ASCOBANS, 2009a)

A recovery plan for the harbour porpoise in the North Sea was developed and submitted to the 13th Advisory Committee meeting of ASCOBANS in Tampere, Finland in April 2006 (ASCOBANS, 2006) along with a background document on the porpoise population structure, distribution, abundance and threats in the region, prepared by Eisfeld and Koch (2006). From this, a conservation plan was drafted and presented at the 16th Advisory Committee meeting of ASCOBANS in Brugge, Belgium in April 2009 (ASCOBANS, 2009a). The change in name from a recovery plan to a conservation plan resulted from the fact that wide-scale surveys of the region in July 1994 and July 2005 indicated little change in overall population size for the species in the North Sea. The area under consideration included all of the North Sea, the Skagerrak, and the English Channel, with some tentative population borders set (Figure 1). The conservation plan was formally adopted at the 6th Meeting of the Parties in Bonn, Germany in September 2009 (ASCOBANS, 2009b).

During the 17th Advisory Committee meeting of ASCOBANS in Bonn, Germany in October 2010, terms of reference for a Steering Group were developed (ASCOBANS, 2010b, 2011a). The first meeting of the Steering Group took place in Bonn, Germany, in May 2011 (ASCOBANS, 2012a). Since then, meetings of the Steering Group were held annually prior to each Advisory Committee meeting between 2012 and 2015 (ASCOBANS, 2013, 2014, 2015a, 2016). There was no Advisory Committee meeting between September 2015 and September 2017, so the 6th meeting of the North Sea Group was held intersessionally at Wilhelmshaven, Germany in June 2017.

Between 2009 and 2010, two part-time consultants were contracted for the initial coordination of the conservation plan (Leaper & Papastavrou, 2009, 2010). In 2011, a new part-time coordinator was appointed, and continued in this role until 2014 (Desportes, 2012, 2013a, b, 2014).

The Conservation Plan initially proposed 12 actions (ASCOBANS, 2009a). Action 1 was the implementation of the plan through establishment of a co-ordinator and a Steering Committee. Seven of the remaining eleven actions were rated as high priority, centred around the most pressing conservation issue, that of bycatch (Actions 2-6), but including also monitoring trends in distribution and abundance (Action 7), and reviewing stock structure (Action 8). The three other actions rated as medium priority included the collection of incidental data on porpoises through stranding networks (Action 9), investigation of the health, nutritional status and diet of porpoises in the region (Action 10), investigation of the effects of anthropogenic sounds (Action 11), and collection and archiving of data on anthropogenic activities within a GIS (Action 12). Since 2011, the North Sea Group has focused on the eight priority actions, whilst also briefly reviewing progress on the other actions in the form of an Implementation Table.

ACTION 1 Implementation of the Plan through establishment of a Coordinator and a Steering Committee

A Steering Group was established in 2011 and has been maintained ever since. Its work has been undertaken mainly through annual meetings but there has also been exchanges by e-mail intersessionally. At each meeting, one or more representative of each range state usually attends, along with interested parties from NGO groups or other marine stakeholders. Between ten and twenty-one persons have participated in each of the meetings. Peter Evans (Sea Watch Foundation) has chaired the group since 2014 and has been re-elected at the 6th Meeting of the North Sea Group.

After a gap of three years, funding was agreed upon for a part-time coordinator (to cover all three conservation plans) at the 23rd Advisory Committee meeting of ASCOBANS in Le Conquet, France in September 2017. It was agreed that the Sea Watch Foundation (UK) would take on the coordination of the three action plans for 2018. The Sea Watch Foundation created a position for a part-time coordinator to take on the bulk of the coordination work. The post was advertised in December 2017, and following a selection process, short-listed candidates were interviewed in January 2018. Once a contract had been signed in February 2018, Dr Tiu Similå from Norway was appointed.

With the Jastarnia Group meeting in Copenhagen due to take place in March 2018, the coordinator focused her attention upon the Jastarnia Recovery Plan and the Western Baltic, the Belt Sea and the Kattegat (WBBK) Conservation Plan, attending that meeting, and then following up on various actions that had been discussed and reviewed through correspondence with key individuals from the range states. A number of meetings and teleconferences were held with the Chair of the Jastarnia Group, the Chair of the North Sea Group (who was overseeing the coordinator's contract), the ASCOBANS Secretariat, and the HELCOM Secretariat in Helsinki. The Coordinator also travelled to Reykjavik in Iceland to participate in the annual meeting of the ICES Working Group on Bycatch of Protected Species, in May 2018. Unfortunately, in July 2018, the coordinator was forced to resign due to ill health, and the Director of the Sea Watch Foundation took over the role to fulfil commitments on the production of progress reports for the three conservation plans.

ACTION 2 Implementation of existing regulations on bycatch of cetaceans

The main regulation on bycatch affecting harbour porpoise in the North Sea is Council Regulation (EC) 812/2004 (hereafter Reg. 812/2004) which requires at-sea observer schemes to monitor bycatch rates for vessels 15m or over and mitigation using acoustic deterrent devices 'pingers' for vessels exceeding 12m, for specific fisheries (see Action 5 for further details). EU Member States are required to submit a report to the European Commission annually, documenting how they have implemented this regulation. Table 1 summarises the extent of compliance from 2006-2016 in terms of report submissions from countries with EEZs within the North Sea region under consideration.

Table 1. Summary table of coastal EU Member States (MS) regarding the status of Reg. 812/2004 report submissions to the European Commission (Green = Yes for report with data on observer effort (either days at sea or other measurement, e.g. effort per haul or set); Grey = Yes for report but no data on observer effort (either days at sea or other measurement); Orange = no report submitted; *Provided reports on observations and cetacean bycatch made under DCF to the Commission which include information on cetacean bycatch. Some of this information was made available at the WGBYC meeting; **Data made available at the WGBYC meeting in 2018 (Source: ICES WGBYC in prep).

Coastal Member State of the EU	Monitoring (Art. 4-5)	Annual Report Reg. 812 & effort data provided										
	Fishing in areas affected	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Germany DE	Yes		*							*		
France FR	Yes								**			
Ireland IE	Yes											
The Netherlands NL	Yes											**
United Kingdom UK	Yes											
Belgium BE	Yes											
Denmark DK	Yes											
Sweden SE	Yes								**	**		**

Generally, range states submit national reports to the European Commission on the implementation of reg. 812/2004 in June, summarising data collected in the previous year (Jan-Dec). The reports are available on request to the ICES WGBYC meeting in the following year; hence the 2018 WGBYC meeting reviewed reports summarising 2016 data. In some cases (e.g. Sweden and the Netherlands), the report had been made available to the ICES WGBYC meeting but not yet formally submitted to the EC. As noted by ICES WGBYC (2018 in prep), the quality and scope of the information provided in the annual reports continues to be variable, with some member states simply repeating the information provided in previous years. Most countries rely on the Data Collection Framework (DCF) sampling programme to monitor marine mammal and other protected species bycatch; the exception is the UK, which is the only EU country to have a dedicated protected species bycatch monitoring programme (PSBMP) for the purposes of meeting the requirements of Reg. 812/2004 and the EU Habitats Directive. Relying only on observations carried out under the DCF may lead to under estimation of bycatch events as some bycatches may be missed by the observers who focus mostly on other tasks (e.g. fish sampling). This is a concern moving forward to protected species data collection under the EU-MAP and the eventual likely repeal of the Reg. 812/2004 (ICES WGBYC in prep).

Member States also have obligations under Article 12 of the EU Habitats Directive: "Member States shall establish a system to monitor the incidental capture and killing of the animal species listed in Annex IV (a). In the light of the information gathered, Member States 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."

Within the EU, there are initiatives currently to improve synergies in general monitoring and reporting (see, for example, ICES, 2018; ICES WKDIVAGG, 2018).

Key Conclusions and Recommendations *Although most EU Member States are submitting annual reports in relation to Reg. 812/2004, there is often a time delay and the content does not fulfil the objectives of providing reliable estimates of bycatch and instigating adequate mitigation measures to reduce bycatch. National reports should be consistent across countries with a comparable level of detail, and sufficient information on vessel numbers of all sizes actively operating different gears, and fully monitored vessels; the reports should be of easier access to the wider community which would allow greater scrutiny and should ultimately lead to improvements. Member States should also observe fully their obligations under the EU Habitats Directive. The resolutions adopted by Parties to ASCOBANS should be fully implemented.*

ACTION 3 Establishment of bycatch observation programmes on small vessel (<15 m) and recreational fisheries

Small vessels

Establishing bycatch observation programmes on small vessels is important to gain a more complete picture of the scale of the problem. However, scaling up bycatch rate estimates to fleet level estimates requires information on fisheries effort. Most countries do not have fisheries effort data for vessels below 10m, although this segment represents a non-negligible segment of the fleet. As an example, **Germany** has no effort data for vessels <=10m, which are not required to keep a logbook and have to record their catches only in monthly landing declarations (DE, AR 812/2004 2013) and part-time fishermen do not have to report effort. The German gillnet fleet in the North Sea was composed in 2008 of 30 vessels <7.5 m, 20 vessels between 7.5-15m, and only a single one >15 m (Kock, 2010). In 2012, the German fleet (across all gear types and all areas fished) was estimated to total 1,551 vessels, of which 74% (1,150) were 10 m or less length (Masters, 2014).

The same is true for **Denmark**, where vessels <=10 m and part-time fishers do not have to report fishing effort. In 2012, the Danish fleet was estimated to amount to 2,743 vessels, of which 78% (2,150) were 10 m or less in length (Masters, 2014). In **Sweden,** the fleet was estimated to total 1,394 vessels in 2012, of which 70% (975) were 10 m or less in length (Masters, 2014).

In the **UK**, only vessels greater than 10 m are obliged to fill out logbooks. Some smaller vessels fill in logbooks on a voluntary basis, and port officials the record the number of days at sea by these boats. In 2010, of the 622 registered UK fishing vessels using gillnets in VIIefghj, only 22 of these were over 12 m (S. Northridge in Desportes, 2014). And in 2014, of 6,406 fishing vessels, 79% (5,032) were 10 m or less in length (Masters, 2014). In 2016, there were 6,191 fishing vessels recorded active with the same percentage, 79% (4,876) 10 m or less in length (Marine Management Organisation, 2017).

In **France,** of 7,143 vessels in 2012, 73% (73% (5,196) were 10 m or less in length whereas **Belgium**'s small fleet of 212 vessels were all above 10 m, and mainly above 15 m length (Masters, 2014). In the **Netherlands**, of 850 vessels in 2012, 36% (308) were 10 m or less in length (Masters, 2014).

Clearly, in all countries the great majority of the fleet is composed of vessels below 10m length and their fishing effort may be substantial. In the case of the **UK**, data from Masters (2014) indicate that the effort by vessels 10 m and below constitutes 53% of the total drift and fixed net effort, while the value of their landings represents 40% (Masters, 2014). There is monitoring of small vessels by some countries, for example the UK and Denmark (the latter by REM), and this should be extended to others.

Observer data on incidental catches from **Danish** gillnets have been collected under the Data Collection Regulation scheme (DCR). Monitoring was carried out on vessels <15 m in area 27.3.a (5 fishing days; 2.0% coverage; two bycaught harbour porpoises), and vessels <15 m in area 27.4 (4 days; 2.2% coverage; zero porpoise bycatch) (ICES WGBYC, in prep). By comparison, with REM deployed, a bycatch of around 30 porpoises was recorded, highlighting the failings of a reliance upon a DCF scheme for monitoring porpoise bycatch

Recreational fishing

Member States have given little attention to their recreational fisheries, in term of bycatch monitoring and mitigation, although bycatch is known to occur in several countries (e.g., Denmark, Belgium, Netherlands). In all Member States, except Germany, fishing with static nets is allowed with some restriction in terms of platform or length of nets (Desportes 2013). Good estimates of recreational effort are not available for any Member State in the North Sea (Desportes, 2014).

The **Danish** AgriFish Agency launched in 2012 an initiative for assessing bycatch of harbour porpoise in recreational fisheries (AgriFish 2012, 2013). Fisheries inspectors checking the legality of the used equipment must report the bycatch if any and a mandatory field has been included for this purpose in their reporting scheme. A total of 1,840 checks of recreational fishing gear was conducted in 2012 but no harbour porpoise was reported bycaught (AgriFish 2013). However, the report does not indicate the inspection strategy.

In 2013, the **Netherlands** conducted an impact assessment of the effects of set net fisheries on the conservation of harbour porpoises in the Natura 2000 area Noordzeekustzone. For this assessment, existing data on bycatch in set nets, both commercial and recreational were analysed (AC21/Inf.12.1.g). The report of the study is in Dutch and the results on recreational fisheries were not communicated further. The 2018 Dutch National Report to ASCOBANS does not indicate whether the programme for collecting effort and bycatch data in recreational fisheries has been implemented.

Belgium is the only country annually reporting bycatch in recreational fisheries (and as such, known to the EU). Although Member States have not formally reported any initiatives towards the mitigation of harbour porpoise bycatch in recreational fisheries since the adoption of the Conservation Plan (Desportes, 2014), Belgium twice implemented mitigation methods in recreational fisheries. In 2001, Belgium banned recreational fishing with gill nets below the low water line as a measure to protect marine mammals and particularly porpoises. Further measures were taken in 2006, limiting the kind of nets, their height and length (ASCOBANS AC14/Doc.19pp).

Reg. 812/2004 requires Member States to establish pilot/scientific studies of the <15 m sector of their fleet but this is largely ignored. Furthermore, as noted earlier, there is overall limited compliance to the EU Habitats Directive requirements amongst Member States with regards to monitoring and assessment of the impact of bycatch on harbour porpoise populations.

Key Conclusions and Recommendations *Small vessel (<15 m) and recreational net fisheries are known to cause porpoise bycatch in and around the North Sea (see, for example, Bjørge & Moan, 2016), and yet are inadequately monitored (Desportes, 2014). Although there are challenges in terms of placing observers aboard these small vessels, remote electronic monitoring has proven successful in Denmark (Kindt-Larsen et al., 2016) and the Netherlands (Dutch 2017 National Report to ASCOBANS). Attention needs to be paid across the region to more effective bycatch monitoring of these fisheries that, although required under Reg. 812/2004, is rarely implemented.*

ACTION 4 Regular evaluation of all fisheries with respect to extent of harbour porpoise bycatch

Fishing effort in the North Sea has varied a great deal over the last 50 years. ICES (2017) estimate that, currently, around 6,600 fishing vessels from nine nations are active in the Greater North Sea (see Figure 2, for map of defined area) with an annual landing of about two million tonnes of fish compared with twice that amount in the 1970s (see Figure 3).

Since 2003, total fishing effort has declined (Figure 4). However, profitability of many of the commercial fleets has actually increased in recent years due to the improved status of many fish stocks, reduced fleet sizes, lower fuel prices, and more efficient fishing gears (ICES, 2017).

Denmark, Norway and the United Kingdom account for a high proportion of landings (Figure 3) although fishing effort is highest in the UK fleet (Figure 4). Herring and mackerel, caught using pelagic trawls and seines, account for the largest portion of the pelagic landings, while sandeel and haddock, caught using otter trawls/seines, account for the largest fraction of the demersal landings. In order to provide a better understanding of the current nature of each country's fishing fleets in the North Sea, how they are comprised by vessel size, fishing gear and target species, the following descriptions have been summarised from ICES (2017).

The **English** fleet in the Greater North Sea has more than 1,120 vessels. Medium-size demersal trawlers (80 vessels, 18–24 m and 24–40 m) primarily target *Nephrops*, cod, and whiting. The small vessel (< 10 m) fleet (around 1,000 active vessels) operates in the eastern English Channel and coastal North Sea and catches a diversity of fish and shellfish species. Medium and large beam trawlers (about 40 vessels) account for the major share of the plaice landings. Three vessels (>50 m) operate in the pelagic fishery targeting mackerel, herring, and horse mackerel.

The **Scottish** North Sea fleet comprises around 1,000 vessels. More than 120 demersal trawlers (almost all >10 m) fish for mixed gadoids (cod, haddock, whiting, saithe, and hake,) and for groundfish such as anglerfish and megrim. A fleet of 116 trawlers fish mainly for *Nephrops* in the North Sea: 37 of these vessels (<10 m) operate on the inshore grounds, while 79 (>10 m) operate over various offshore grounds. Pot or creel fishing is prosecuted by over 500 vessels (mostly <10 m) targeting lobsters and various crab species on harder inshore grounds. Scallop fishing is carried out by around 70 dredgers (mostly >10 m). Limited amounts of longlining and gill netting are also conducted by

Scottish vessels. Significant catches of pelagic species are harvested by 20 large vessels, primarily using pelagic trawls.

The **French** fleet in the North Sea is composed of more than 600 vessels. The demersal fisheries operate mainly in the eastern English Channel and southern North Sea and catch a variety of finfish and shellfish species. The largest fleet segments are gill- and trammel netters (10–18 m) targeting sole, demersal trawlers (12–24 m) catching a great diversity of fish and cephalopod species, and dredgers catching scallops. Smaller boats operate different gears throughout the year and target different species assemblages. There is also a fleet of six large demersal trawlers (>40 m) that target saithe in the northern North Sea and to the west of Scotland. The pelagic fishery is prosecuted by three active vessels catching herring, mackerel, and horse-mackerel.

The **Belgian** fishing fleet is composed of about 75 vessels, primarily beam trawlers both above and below 24 m in length. Few vessels are smaller than 12 m. Most of the catch is demersal species: sole and plaice in particular, but also lemon sole, turbot, anglerfish, rays, cod, shrimp, and scallops.

The **Dutch** fleet in the Greater North Sea consists of about 500 vessels. The main demersal fleet is the beam trawl fleet (275 vessels, of which 85 are >24 m and 190 are < 24 m) that operates in the southern and central North Sea, targeting sole and plaice as well as other flatfish species. Most of the smaller beam trawlers seasonally target shrimp or flatfish. Pelagic freezer trawlers (7 vessels, >60 m) target pelagic species, mainly herring, mackerel, and horse mackerel.

The **German** North Sea fishing fleet comprises more than 200 vessels. Beam trawlers constitute the largest fleet component (around 180 vessels, 12–24 m) and target brown shrimp in the southern North Sea. Six large demersal trawlers (>40 m) target saithe in the northern North Sea (and in waters to the north of the North Sea). Several mid-sized otter trawlers and beam trawlers (24-40 m) target saithe, cod, sole, and plaice. Less than 10 vessels (mainly >40 m) operate in the North Sea pelagic and industrial fisheries that primarily target herring, but also catch horse mackerel, mackerel, sprat, and sandeel.

The **Danish** fleet comprises 1,400 vessels, of which 600 vessels operate in the Greater North Sea demersal fisheries. Smaller vessels (<12 m) constitute the greatest proportion of the fleet hence the importance for monitoring their potential bycatch impact upon harbour porpoise. The most important demersal fisheries target cod, plaice, saithe, northern shrimp, and *Nephrops* using bottom trawls and seines. The most important industrial and pelagic fisheries are prosecuted by around 30 large vessels (>40 m) and around 200 smaller (12–40 m) vessels, targeting herring and mackerel for human consumption, and sandeel, sprat, and Norway pout for fish meal and oils.

The **Swedish** fleet in the Greater North Sea comprises more than 500 vessels. The demersal fleet is highly diversified, catching several species in the Kattegat and Skagerrak, mainly *Nephrops*, northern shrimp, cod, witch, flounder, and saithe. The passive gear fleet is composed of around 400 vessels, of which 100 vessels (30 vessels of 10–18 m, 70 vessels <10 m) target *Nephrops*. The 16 vessels in the pelagic fleet target sprat, herring, and sandeel.

The **Norwegian** North Sea fleet is composed of about 1,585 vessels. 85% of these catch demersal species, including fish, crustaceans, cephalopods, and elasmobranchs, and 30% catch pelagic species, including herring, blue whiting, mackerel, and sprat. Approximately 60% of the fleet targeting demersal species are small vessels (<10 m) that operate near the Norwegian coast using traps, pots, and gillnets, catching crabs, squid, and several fish species. Medium-sized vessels (10–24 m) mainly target *Nephrops* and crabs using pots and traps, shrimp using trawls, and cod, saithe, ling, and monkfish using gillnets. The industrial fleet (5 vessels of 24–40 m; 25 vessels >40 m) target Norway pout and sandeel for fish meal and oils. The offshore fleet (>40 m) is predominantly otter trawlers, but also includes seiners and longliners. Larger vessels (>24 m) account for most of the landings of saithe, ling, cod, tusk, hake, haddock, herring, blue whiting, mackerel, and sprat.

The **Faroe Islands** also fish in the Greater North Sea, but information is lacking on this fleet (ICES, 2017).

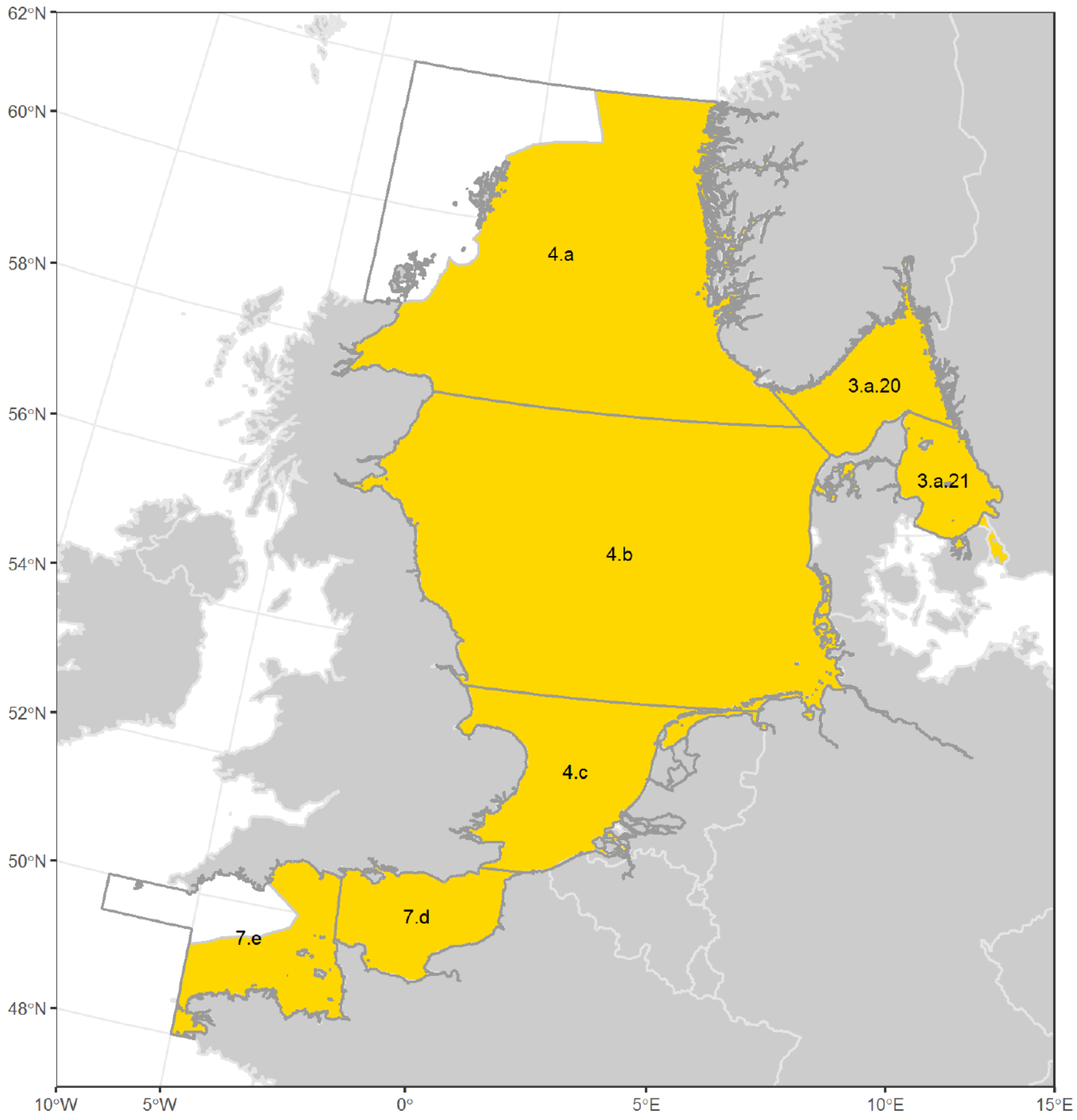

Figure 2. The Greater North Sea ecoregion (in yellow) as defined by ICES.
The relevant ICES statistical areas are shown (Source: ICES, 2017)

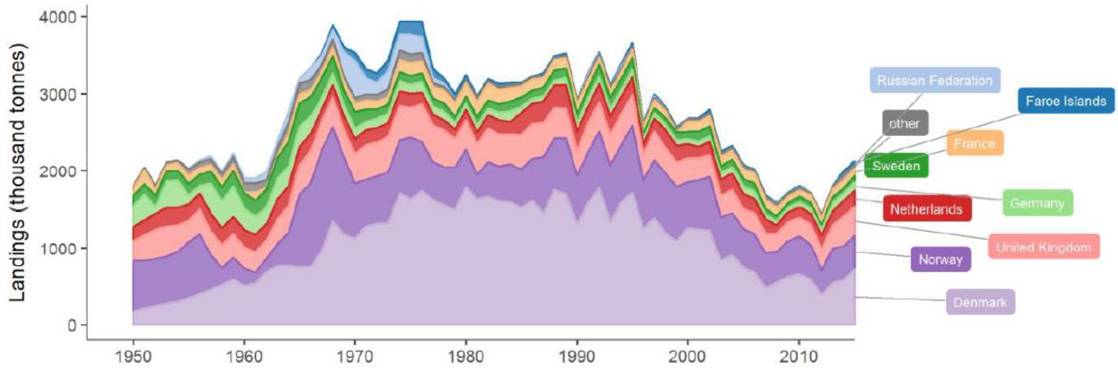

Figure 3. Landings (thousand tonnes) from the Greater North Sea in 1950–2015, by country. The nine countries having the highest landings are displayed separately and the remaining countries are aggregated and displayed as "other" (Source: ICES, 2017)

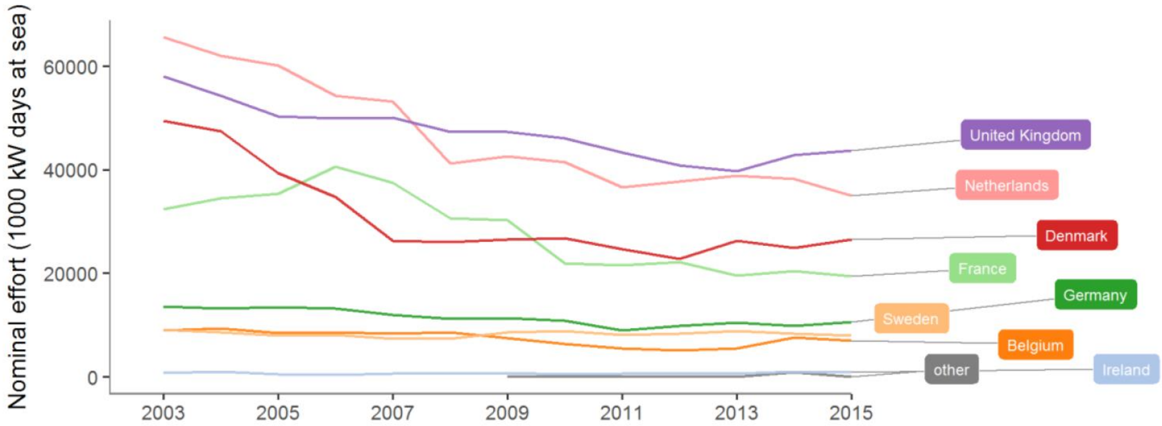

Figure 4. Greater North Sea fishing effort (thousand kW days at sea) in 2003–2015, by EU nation (Source: ICES, 2017)

The spatial distribution of fishing gear varies (Figure 5). Static gear is used most frequently in the English Channel, the eastern part of the Southern Bight, the Danish banks, and in the waters east of Shetland. Bottom trawls are used throughout the North Sea, with lower use in the shallower southern North Sea where beam trawls are most commonly used. Pelagic gears are used throughout the North Sea.

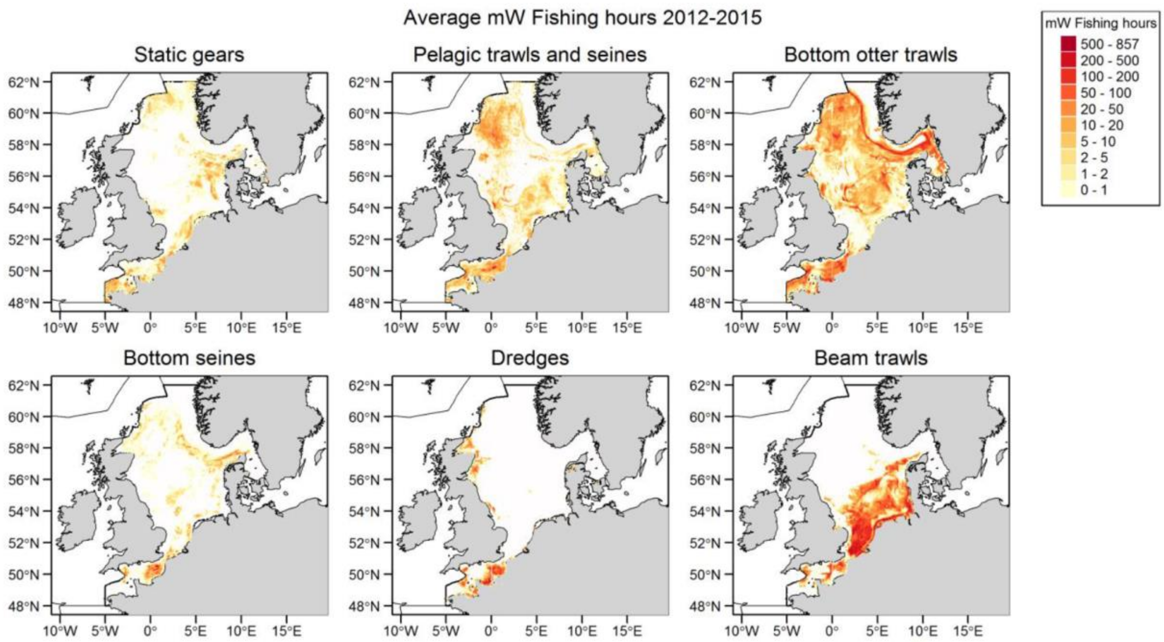

Figure 5. Spatial distribution of average annual fishing effort (mW fishing hours) in the Greater North Sea during 2012–2015, by gear type. Fishing effort data are only shown for vessels >12 m having vessel monitoring systems (VMS) (Source: ICES, 2017)

Static gears such as set gillnets are widely recognised to be the gear type posing the highest risk of bycatch to porpoises in the region. Landings from static gear in the North Sea have remained rather constant over the last ten years in contrast to pelagic trawling which has increased markedly recently (Figure 6). Small and medium-sized boats using static gear target flatfish and demersal fish.

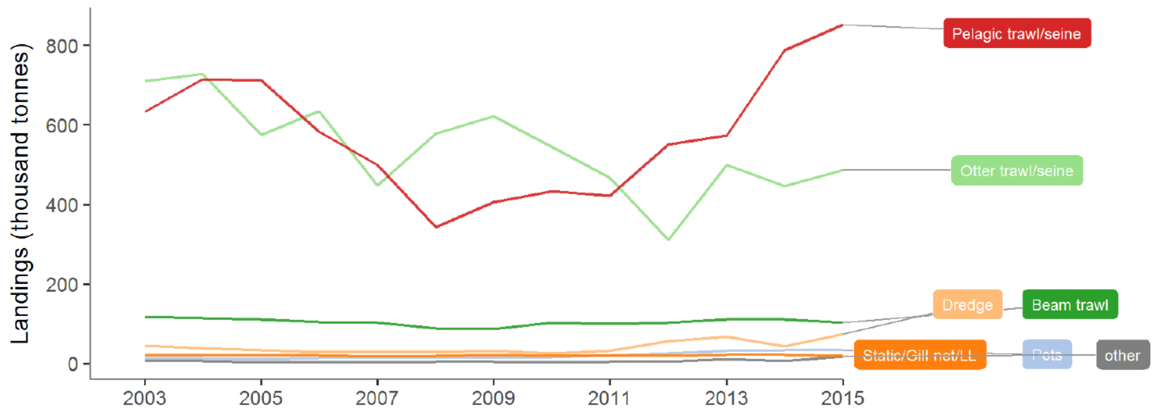

Figure 6. Commercial landings (thousand tonnes) from the Greater North Sea in 2003–2015, by gear type (LL = longline) (Source: ICES, 2017)

Recreational fisheries also occur in the North Sea targeting a wide range of species, but few of these fisheries are monitored or evaluated.

A detailed review of the implementation of Reg. 812/2004, and assessment of the bycatch issue is undertaken annually by the ICES Working Group on Bycatch of Protected Species (see, for example, ICES WGBYC, 2016, 2017, 2018 in prep). The last annual bycatch estimate, overall, for the North Sea were between 1,235 and 1,990 porpoises in 2013 (ICES, 2015). The summaries below are drawn from the latest ICES WGBYC report (in prep).

*"**United Kingdom** has a dedicated protected species bycatch monitoring programme (PSBMP) for the purposes of meeting requirements of Reg. 812/2004 and the EU Habitats Directive. In 2016, the PSBMP conducted 315 dedicated bycatch monitoring days during 177 trips on board static net vessels. Additional monitoring data were also summarised from DCF fish sampling programmes, including 79 days in static net fisheries. Total observations of cetacean bycatch from dedicated bycatch sampling in 2016 included ten harbour porpoises, all taken in static net gears (mainly large meshed tangle and trammel net fisheries) in Subarea 7."* (ICES WGBYC in prep).

During 2017, five harbour porpoises were reported bycaught from demersal gillnets with 402 days at sea sampled in Subarea 7efh (UK National Report to ASCOBANS). It is not clear how many of these, if any, were within the boundary of the North Sea assessment area that includes ICES Subarea 7e.

"The current best estimate of porpoise bycatch in all UK gillnet fisheries ranges from 771 to 2,994 animals (best estimate 1,482; CV=0.09) in the absence of pingers, and from 606 to 3,114 animals (best estimate 1,250; CV=0.11) if all over 12 m boats used pingers in relevant areas. These estimates are derived from extrapolation to fleet level of multi-annual bycatch rates calculated over the period 2000-2016 (full details of the methodology used are provided in the UK report), although the estimates include several assumptions, the most important of which is the assumption that net fleet lengths are the same within a metier regardless of vessel size. This causes positive bias in bycatch rates for smaller inshore vessels and negative bias for larger offshore vessels." (ICES WGBYC in prep).

In **France,** the program OBSMER manages all the observations at sea required by various fishery regulations. Five percent of fishing effort is monitored by fisheries observers (France 2017 National Report to ASCOBANS).

"During 2016, the effort dedicated to observation on board vessels represented 767 trips and 933 fishing days. A total of 244 trips and 224 days at sea were dedicated to set nets in areas concerned with pingers (Subareas 4 and 7). Four harbour porpoises were recorded as bycatch during 2016. Total bycatch estimates were not provided." (ICES WGBYC in prep).

*"In **Belgium,** no observer scheme was in place in 2016 to monitor bycatch of marine mammals. However, observers conducting other studies (biological monitoring, etc.) were frequently on-board vessels with towed fishing gear. No bycatch of marine mammals was observed or reported by fishermen. It is considered that the small number of fishing vessels in the Belgian fleet means that they are likely to have a limited impact."* (ICES WGBYC in prep).

In 2017, eight porpoises necropsied from strandings were found to have signs of bycatch within ICES Subarea 4c; this represented 6% of the total number of porpoises necropsied in that year (Belgium 2017 National Report to ASCOBANS).

*"In the **Netherlands,** bycatch monitoring is integrated with the collection of catch data under the EC Data Collection Regulation 199/2008 and Decision 93/2010, with a focus on pelagic trawlers fishing from December to March in ICES Subareas 6-8. Estimates of observer coverage in relation to relevant fleet size for 2017 were 10% with dedicated observer schemes, 1% with fisheries observers, and 1.5%*

by remote electronic monitoring. No porpoises were reported as bycatch in the North Sea." (ICES WGBYC in prep).

Ten percent of 53 porpoises necropsied in 2017 along the Dutch coast had cause of death attributed to bycatch (Netherlands 2017 National Report to ASCOBANS).

"***Germany*** *monitored under the DCF observer programme, attempting to follow the requirements of Reg. 812/2004 as much as possible. No porpoises were reported as bycatch in the North Sea.*

Denmark *reported no specific monitoring programmes for incidental bycatch according to the Reg. 812/2004 in the Danish gillnet fishery. Instead, observer data on incidental catches of marine mammals from gillnets were collected under the Data Collection Regulation scheme (DCR). Monitoring was carried out on vessels <15m in area 27.3.a (5 fishing days; 2.0% coverage; two bycaught harbour porpoises), vessels <15m in area 27.4 (4 days; 2.2% coverage; zero porpoise bycatch), and vessels >15m in area 27.4 (30 days; 9.4% coverage; zero porpoise bycatch). Denmark uses remote electronic monitoring on a portion of the fleet, in which further bycatch of porpoises was recorded.*

Sweden *has no dedicated marine mammal at-sea observer schemes focusing on the bycatch of marine mammals. The monitoring effort conducted and provided by Sweden is part of the EU Data Collection Framework where on-board observer data are mainly from trawl fisheries but also pot fisheries for crayfish, largely in the Baltic. The reason for this is due to Reg. 812/2004 articles 4 and 5 not effectively serving its purpose to estimate bycatch in waters around Sweden given that harbour porpoises are bycaught in gillnets and not in pelagic trawls.*" (ICES WGBYC in prep).

Key Conclusions and Recommendations *Estimates of bycatch rates require extrapolation from sampling of a limited number of vessels (by visual observers or remote electronic monitoring) to entire fleets according to gear type. Besides issues of low sampling rate, there are problems over determining fishing effort in a way that will yield meaningful overall estimates. Days at sea have been the traditional metric for effort. For vessels above 15 m length, data on days at sea are mandatory; although not mandatory for vessels below this length, those data are often also available. Databases are also maintained by ICES and apply to all fishing vessels, with effort expressed in days at sea. Fishing effort in the form of hours fished can also be derived from VMS data and is available for fishing vessels over 12 m, whilst vessels >10m record effort in their logbooks in terms of days fished. These different measures are not easily equated with one another, as demonstrated clearly for static nets and midwater trawls by ICES WGBYC (2018 in prep).*

Obtaining estimates that reflect the true amount of fishing effort by gear type is fundamental to the assessment of bycatch. We are currently far from obtaining spatio-temporal measures of net length and soak time for static gear but this should be a target to aim for. The other part of the equation is a sampling procedure that adequately reflects the actual number of porpoises bycaught per unit effort across all vessels causing bycatch. Currently, this is far from being met.

ACTION 5 Review of current pingers, development of alternative pingers and gear modifications

Acoustic deterrent devices such as pingers are a required mitigation measure for vessels of 12 m length or more operating relevant gillnet fisheries in any part of the North Sea (Table 2, Figure 7).

Area	Gear	Period
ICES sub area IV and division IIIa	Any bottom-set gillnet or entangling net, or combination of these nets, the total length of which does not exceed 400 meters	1 August – 31 October
ICES sub area IV and division IIIa	Any bottom-set gillnet or entangling net with mesh sizes ≥ 220 mm	All year
ICES divisions VIId and VIIe	Any bottom-set gillnet or entangling net	All year

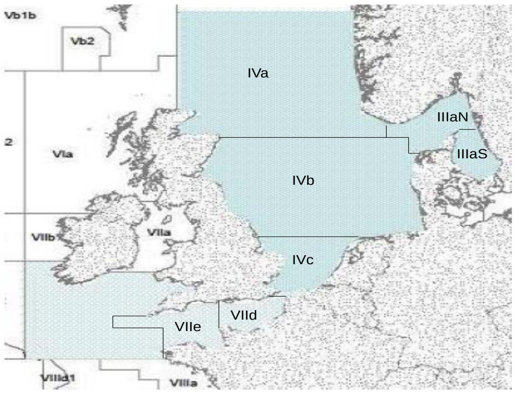

Table 2. Requirement for pinger use under Council Regulation (EC) 812/2004 in the North Sea
Figure 7. Pinger use - areas and gears regulated under CR (EC) 812/2004 in the North Sea, Skagerrak and Kattegat, and the Channel and Celtic Sea (ICES WGBYC, 2011**)**

Below is a summary of each country's progress in usage of pingers within their fleets. It has been compiled from the latest report of the ICES Working Group on Bycatch (ICES WGBYC, in prep) and the national reports to ASCOBANS.

*"In 2016, the **United Kingdom** official fishing effort and landings statistics indicated that there were 23 UK registered vessels of 12 m or more that fished with specified gear types and in specific areas where pingers are required under Reg. 812/2004. All relevant skippers are aware of the requirements of the regulation, and inspections at sea by UK authorities indicate a high level of compliance. Static net vessels over 12 m account for only 2% of the UK static net fleet in terms of vessel numbers but are responsible for 45% of the total landings by the netting sector.*

UK-based vessels appear to be mainly using the DDD-03L acoustic deterrent device which is authorised for use by the UK government under derogation contained in Article 3(2) of Reg. 812/2004. A key requirement for the permitted use of these devices is that they should be positioned along each net fleet so that no part of the fleet is more than 2,000 m from the nearest device. The Marine Management Organisation (MMO) has provided full guidance on the implementation of the Regulation and the use of acoustic deterrent devices (pingers), which is available at:
http://www.marinemanagement.org.uk/fisheries/monitoring/regulations_cetaceans.htm

In 2016, ten trips covering 117 sea days and 320 monitored net fleet hauls were observed on board over 12 m vessels for the purposes of monitoring pinger efficiency (this was out of a total of 315 dedicated monitoring days). Observed porpoise bycatch rates were consistent with previously observed rates in nets properly equipped with pingers, with no evidence of habituation thus far. Limited sample sizes restrict our ability to say with any confidence whether pingers influence seal or dolphin bycatch rates. The effects of pingers, in terms of the number of porpoise deaths avoided by their use to comply with Reg. 812/2004, was explored: the current best estimate of porpoise bycatch in all UK gillnet fisheries ranges between 771 and 2,994 animals (best estimate 1,482; CV=0.09) in the absence of pingers, and between 606 and 3,114 animals (best estimate 1,250 CV=0.11) if all over 12 m boats used pingers in relevant areas" (ICES WGBYC, in prep).

A project funded by Defra and undertaken by the Sea Mammal Research Unit has been investigating whether pingers and closed areas are useful tools to mitigate porpoise bycatch in Special Areas of Conservation (SACs). The aim is to better understand the impacts of pinger deployment within porpoise SACs and explore the value of closed areas as a measure to reduce harbour porpoise bycatch. Rather than advocating the widespread use of pingers across the SACs, which could result in acoustic disturbance, this work aims to inform where the deployment of pingers would likely be of most benefit by evaluating the area of disturbance from pingers deployed under various scenarios within the SACs. Additionally, given that rates of bycatch are thought to be greater outside the SACs, the value of closed areas within the SACs will be evaluated in order to consider the implications of displacing fishing effort to areas of potentially higher bycatch. The outputs will be used by the Statutory Nature Conservation Bodies to inform fisheries management options for the SACs (UK 2018 National Report to ASCOBANS).

"*In **France,** in 2016, nine vessels using GNS-GTR gears deployed pingers STM DDD03L, fishing in Subarea 7. No studies were carried out by France to estimate the effect of pingers on cetacean bycatch*.

*The **Netherlands** reports that the use of pingers is obligatory in ICES Subarea 4 for vessels ≥12m in the period 1 August till 31 October, using nets that do not exceed 400 m length (the regulation intends to cover set nets worked on wrecks, where relatively short net lengths are being used). The vast majority of the Dutch set gillnet fleet fishes in this period for sole with much longer net fleets and meshes below 220mm.*

If some vessels are required to use pingers, this is not registered and therefore not known by government authorities, nor are the fishermen aware that they should use pingers. Most likely, no acoustic deterrents are in use by Dutch gillnet fishers. However, the number of vessels >12m fishing on wrecks (that is with nets that not exceed 400 m) is very low, if not zero.

*In 2016, **Germany** had fisheries operating in some of the areas listed in Annex I to Reg. 812/2004 where the use of pingers is mandatory. Fishing vessels use analog and digital pingers commercially available. In order to carry out compliance monitoring, the personnel of the competent federal and state authorities were equipped with Pinger Detector Amplifiers (Etec model PD1102) and trained accordingly. The detectors determine whether a pinger in the water actually emits its ultrasonic signals. The use of such detectors proves difficult in practice, since pinger signals can be masked by engine noise from control vessels. The relevant legal norm (Article 2, paragraph 2, Reg. 812/2004) requires that the pingers only have to function at the time of deployment. It is therefore irrelevant to check nets already set, as possible violations could not be punished. The legal framework for the detection and prosecution of violations should therefore be further optimised.*

In 2016, federal fishing protection vessels carried out a total of five inspections on fishing vessels obliged to use pingers. No violations were found. In the state of Mecklenburg-West Pomerania (Baltic Sea), no inspections of acoustic deterrent devices were carried out in 2016. The four gillnetters ≥12 m registered in Mecklenburg-West Pomerania were not encountered in ICES Division 3.24 during the setting of gillnets in the course of sea inspections. The fishing gear listed in Annex I to Reg. 812/2004 was not used in the territories of the Länder of Lower Saxony and Bremen (North Sea) during the periods described in the Regulation and therefore no controls were carried out. During 2016, no activities of vessels requiring deterrent devices was seen in the coastal waters of Schleswig-Holstein in the North Sea." (ICES WGBYC in prep).

The project to develop and test a new type of acoustic deterrent device (Porpoise Alert, PAL), carried out by the Thünen Institute of Baltic Sea Fisheries (Rostock) and F³:Forschung.Fakten.Fantasie (Kiel), was continued in 2016. To test their effectiveness, PAL devices were deployed on a small number of German and Danish commercial gillnet vessels while carrying out their normal fishing activities in the Baltic Sea. PALs operate by replicating the sounds of porpoises (synthesising aggressive click trains at 133 kHz) and were designed to serve as an alerting device rather than as a deterrent, by increasing their rate of echolocation (Culik et al., 2015a, b). Trials in a Danish fishery using REM to monitor bycatch rates had indicated a 70% reduction when PALs were deployed (Culik et al., 2017), although the size of the effect was much less than with pingers. The device has also been tested in a Danish North Sea fishery but was found to have no positive effect there. Reasons for the different results are unclear but it is possible the two different porpoise populations are responding differently to the signals. To date, there is no clear evidence that PAL operates as an alerting device, Karin Tübbert (who identified the signal) actually describing it as causing the animals to move away,

In the whale sanctuary within the National Park Schleswig-Holstein Wadden Sea all kinds of gillnet fishery are prohibited within the 3nm zone (according to the "Landesverordnung zur Änderung der Landesverordnung über die Ausübung der Fischerei in den Küstengewässern vom 4. Dezember 2013"). Beyond the 3nm zone gillnet fishery in the whale sanctuary with nets exceeding a special height and mesh size (nets with a stretched span between bottomline and floatline higher than 1.30 m and a mesh size above 150 mm) is prohibited for German fishermen. It is envisaged that within the Wadden Sea sanctuary, there will be a total exclusion of set gillnet and trammel net fisheries within the 12 nm zone that shall be applied to all EU fishing vessels with access to waters under German sovereignty or jurisdiction (Germany 2017 National Report to ASCOBANS).

*"In **Denmark,** a total of 24 Danish vessels were obliged to use pingers in 2016. In 3.d.24/3.c.22, only a few vessels are required to use pingers (4%), compared to 56% of the vessels operating in 3.a & 4. The pinger type "AQUAmark100" is generally used in gillnet fisheries, where the use of pingers is mandatory. No projects on monitoring of pinger use in Danish seas have been conducted in 2016. However, the Danish fisheries inspection vessels, which are equipped with hydrophones, check for active pingers as part of their at-sea inspections. In 2016, there were seven inspections on vessels of ≥12 metres and 59 inspections on vessels ≤12 metres. No violations have been reported from these inspections. In 2016, four inspections were carried out for foreign vessels (two Polish, one German and one Swedish) but these were all in the Baltic. Denmark recommends that Member States indicate infringements in relation to national fishing vessels as well as other Member States fishing vessels. Thereby, all infringement cases will be reported to the Commission.*

Furthermore, Denmark presented two mitigation trials. One tested if lower net height could reduce bycatch of harbour porpoises. A controlled experiment was conducted in the turbot fishery in the North Sea. The normal net height (14.5 meshes) was reduced to 9.5 meshes in 50% of the used nets. The results showed no differences in turbot catches but also no differences in porpoise bycatches. Unfortunately, the actual net height when deployed was not measured; it is possible that the reduction in meshes simply reduced the bagging effect of the net and not the actual net height.

The second trial tested if light (ProGlow) could reduce the amount of seabird bycatch. A trial was conducted in the cod fishery. 50% of the nets were deployed with flashing ProGlow and 50% were standard cod nets. The lights were deployed with 20m spacing both on the lead and bottom line, however in a zigzag setup creating lights every 10m. The results showed no differences in bycatches of birds, however, cod catches increased by 50% in the ProGlow nets.

***Sweden** reported that the implementation of pingers as laid down in Reg. 812/2004, most likely are not being implemented in regulated fisheries in Sweden. However, in 2015 a project started with the purpose of implementing pingers on a voluntary basis. After discussions with fishermen, Banana pingers were chosen for the project. The fishermen consider the Banana pinger to be practical to use and that the bycatch of harbour porpoises decreased. The fishermen report their catch, effort and bycatch. The voluntary pinger use has continued in 2016 and during that year, seven fishermen used pingers voluntarily in the cod and gillnet fisheries in the Öresund Sound, ICES Divisions 3.21 and 3.23.*
In the area where pingers have been used in the commercial lumpfish fisheries in southern Sweden, a study looking at the distribution of harbour porpoises in relation to commercial fisheries with pingers is currently taking place. Preliminary results show that harbour porpoise detections in the area are low when fisheries with pingers are carried out. However, when fisheries have stopped, the harbour

porpoise detections do increase and are at the same levels as areas where no fishing with pingers has been carried out. The study continues in 2018.

Since 2014, there have been funding opportunities for fishermen to put forward their ideas for selective fishing gear to the "Secretariat for selective fishing gear" funded by the Swedish Agency for Water Management. The purpose of the Secretariat was to enable the fishing industry to develop selective fishing gear to help the transition to the new landing obligation. Projects were carried out by the Swedish University of Agriculture Science in cooperation with the involved fishermen, though largely on size and species selectivity in benthic trawl fisheries for cod, shrimp and crayfish, a project developing multifunctional pots for fishing for cod and lobster, a project developing pots for shrimp fisheries and a project regarding trap net fisheries for mackerel, cod and herring (Nilsson, 2018). Developing selectivity grids in trawls prevent bycatch of certain fish species as well as birds and marine mammals. Pot and trap-net fisheries are fisheries with high selectivity with regard to marine mammals, birds and undersized fish. Developing these fisheries prevents an increase in, for example, gillnet fisheries which can have high bycatch rates for both birds and marine mammals.

An alternative to both trawl and gillnet fisheries is bottom seine netting, such as Danish Bottom Seine. Bottom seines are generally considered less damaging than bottom trawls (ICES, 2006) and well-managed seine fisheries generally have minor ecosystem impacts (Morgan and Chuenpagdee, 2003). In 2016, the Swedish University of Agriculture Science has continued to develop a seine net modified for small open boats and tried it for pelagic and demersal species as a possible alternative to gillnet fisheries. The development is still under progress and in the upcoming years, there will be a focus on evaluating the seine's environmental impact on the benthic habitat." (ICES WGBYC in prep).

Key Conclusions and Recommendations *Pingers are mandatory in certain gillnet fisheries in the North Sea for EU Member States. However, not all countries are using them whilst the level of enforcement is very variable between countries.*

More research is needed to find mitigation measures that are both practical and effective. Pingers have the potential to temporarily deter porpoises from foraging areas whilst alternatives like PAL systems as developed in Germany need further investigation to establish their effectiveness in different situations and to check whether they too may have a deterrent rather than alerting effect. Development of alternative gears may be the most desirable long-term solution to porpoise bycatch.

ACTION 6 Finalise a management procedure approach for determining maximum allowable bycatch limits in the region

Whereas the ultimate goal should be for zero bycatch, the intermediate conservation objective under ASCOBANS has remained 'to restore and/or maintain stocks/populations to 80% or more of their carrying capacity'. The ASCOBANS Meeting of the Parties in 2000 (MOP3) had concluded that a total anthropogenic removal rate of more than 1.7% of the population had to be considered unacceptable, and an interim measure should be to ensure that overall mortality is reduced to a level that will allow recovery of populations. Several different criteria have been proposed as limits to anthropogenic mortality that may still allow conservation objectives to be met. These criteria include simple percentages of the best population abundance estimate and more complex procedures that account for uncertainty and other information about the population. Scheidat *et al*. (2013) reported new estimates of abundance for porpoises in **Dutch** waters, and applied several methods to calculate maximum anthropogenic mortality limits from these estimates. They considered whether these mortality limits would meet the objective of the ASCOBANS agreement and other international obligations, and how these limits might be applied at a national level rather than the biological population level. They recommend the use of management procedures for setting mortality limits that take into account available data including associated uncertainties and biases, and whose performance has been extensively tested through simulation.

In July 2015, an ASCOBANS workshop (ASCOBANS, 2015b) was held in London to consider further development of management procedures for defining the threshold of 'unacceptable Interactions'. From a societal perspective, environmental limits and triggers for action were considered as 1) intermediate steps to help drive progress towards achieving the ASCOBANS aim of zero bycatch; 2) they should be based on clearly defined conservation objectives which reflect broad societal views and have been developed and agreed with managers, scientists and stakeholders; 3) they should be used as a tool to help make decisions on the conservation and sustainable use of the marine environment and balance competing priorities; 4) they should be developed to take into account total anthropogenic removals; 5) they should be used to indicate a 'critical' or 'unacceptable' point in the environment that should not be exceeded without endorsing that any removals are 'acceptable'; 6) they should be used to 'trigger' more urgent and stronger management action where levels of bycatch have been identified as being of a high level of concern (e.g. likely to lead to population extinction or which will fail to meet conservation objectives); 7) they should be used to prioritise the targeting of effective management measures, ensuring the investment of effort/financial resources into reducing, or quantifying more precisely, bycatch levels is proportionate to the scale of the problem i.e. different management responses may be appropriate for fisheries with close to zero bycatch, with levels close to but below the environmental limit/trigger, and for those above; 8) they should be 'tuned' to help managers determine whether conservation objectives are being achieved and to target management measures effectively; and 9) they should be accompanied by a clear guidance on how they should be applied and interpreted, including clarity on the nature of appropriate management action.

Since then, the **UK** has been working on developing a Removals Limit Algorithm (RLA) to set limits to anthropogenic mortality of small cetaceans to meet specific conservation objectives, with an example implementation for bycatch of harbour porpoise in the North Sea (Phil Hammond, SMRU). An RLA has been developed to set limits to anthropogenic mortality of small cetaceans that allow specified conservation objectives to be met. This development picks up from previous work of a similar nature presented to the IWC in 2005-2009 as part of the SCANS-II project that became stalled until recently.

The RLA is very similar in concept to the Catch Limit Algorithm (CLA) of the IWC's Revised Management Procedure. The RLA comprises a simple one-line population model which is fitted to a time series of estimates of abundance to estimate population growth rate and depletion, which are then used in a removals calculation. The RLA is tuned through computer simulation of a more complex population model that is assumed to represent reality to set limits to anthropogenic mortality that allow the specified conservation objects to be met. The robustness of the RLA is determined by assessing its performance in a range of computer simulation tests describing uncertainty in our knowledge of population dynamics, the data, and the wider environment.

As an example, the RLA was applied to bycatch of harbour porpoise in the North Sea using estimates of abundance from SCANS surveys (1994, 2005, 2016) and a time series of bycatch estimates constructed by making a number of strong assumptions about effort for most fleets and appropriate bycatch rates. Using a particular tuning level that reflects a conservation approach and that is appropriate if maximum net productivity is 2%, the removal limit was 1,856 animals per year for a six-year period until a new survey estimate is assumed to become available in 2022. The analysis indicated that there was little support for the population of harbour porpoises in the North Sea being heavily depleted or for the current carrying capacity to be less than 350,000 animals. Using a tuning level that led to slightly less robust results and that is appropriate if a maximum net productivity is 2%, the removal limit was 4,641. However, the RLA developed is entirely dependent on the conservation objectives; further work would be needed if the conservation objectives were different from those assumed (UK 2018 National Report to ASCOBANS).

Other countries have not yet developed a similar management procedure approach for determining maximum allowable bycatch limits in the region. **Denmark** has focused upon implementing monitoring to show whether there was a bycatch problem. They consider environmental limits as important steps towards achieving zero bycatch, but they had to be understandable and achievable within a realistic time frame to help managers implement appropriate bycatch mitigation measures. They believe that the need for improved population estimates and better bycatch data are priorities, along with a consideration for whether marine protected areas were the best approach to protecting highly mobile species like the porpoise.

Key Conclusions and Recommendations *There remains a debate as to what society should set as conservation objectives. The RLA approach developed within the UK sets some numerical parameters to establish an environmental limit and potential trigger for action for harbour porpoises experiencing bycatch in the North Sea. A number of assumptions have to be made including the accuracy of the annual bycatch estimate, the overall population size, demographic trend and structure, reproductive and mortality rates, carrying capacity, and the impact levels of other anthropogenic activities. Bearing in mind those caveats, it is believed that current levels of bycatch in the North Sea are insufficient to cause serious depletion of the harbour porpoise population.*

A continuing discussion should take place amongst Member States to attempt to arrive at consistent and well-defined conservation objectives across the region, and the setting of environmental limits and triggers over a practical time scale, with further consideration of the utility of the RLA approach bearing in mind a number of uncertainties.

ACTION 7 Monitoring trends in distribution and abundance of harbour porpoises in the region

Coordinated efforts to monitor harbour porpoise abundance in the North Sea in recent times have involved 1) SCANS III where the entire region was surveyed by a combination of aerial and vessel surveys in July 2016 (Hammond *et al*., 2017; see Figure 8), and 2) the DEPONS Project where aerial surveys were undertaken annually in spring, summer and autumn in the southern North Sea across the EEZs of Belgium, the Netherlands, Germany, and Denmark (Gilles *et al*., 2016; Peschko *et al*., 2016).

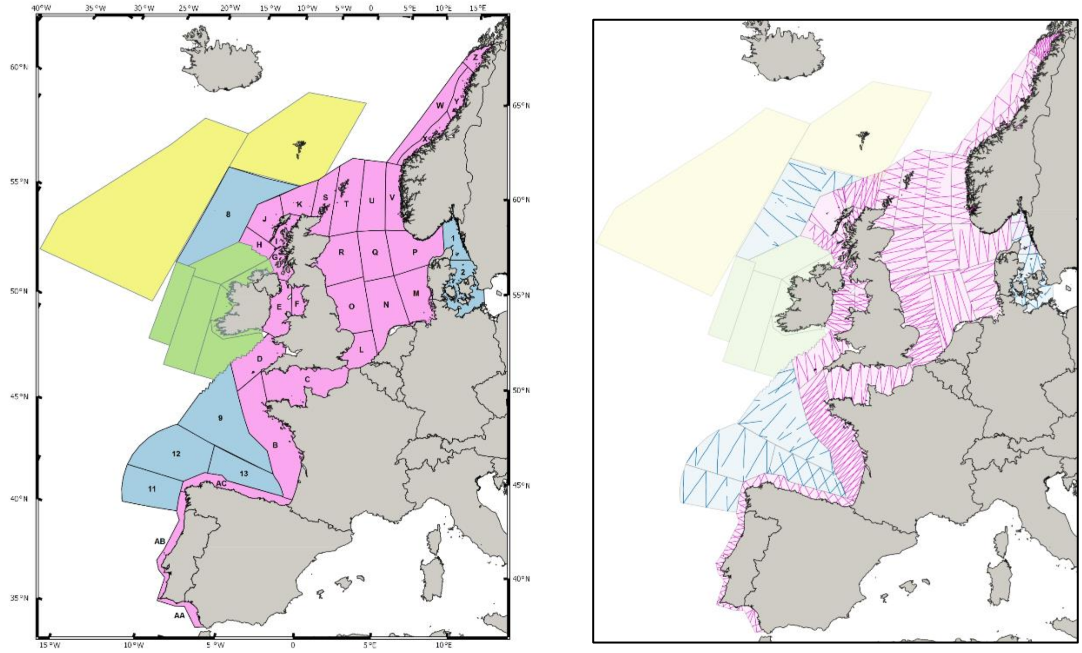

Figure 8. Area covered by SCANS-III and adjacent surveys. SCANS-III: pink lettered blocks were surveyed by air; blue numbered blocks were surveyed by ship. Blocks coloured green to the south and west of Ireland were surveyed by the Irish ObSERVE project. Blocks coloured yellow were surveyed by the Faroe Islands as part of the North Atlantic Sightings Survey in 2015 (Source: Hammond *et al*., 2017)

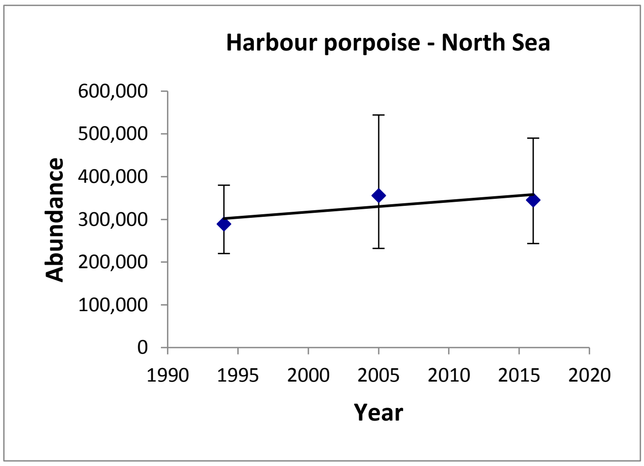

Figure 9. Estimates of abundance (error bars are log-normal 95% confidence intervals) for harbour porpoise in the North Sea Assessment Unit Trend lines are fitted to time series of more than two abundance estimates (Source: Hammond *et al.*, 2017)

The SCANS III survey in July 2016 yielded an abundance estimate of 345,373 porpoises (CV=0.18) in the North Sea (Hammond *et al*., 2017). The equivalent estimate for July 2005 was 355,408 (CV=0.22) (Hammond *et al*., 2013) and for July 1994 was 289,150 (CV=0.14) (Hammond *et al*., 2002). A trend analysis showed no significant change between 1994 and 2016 (Figure 9).

For the period 2005-2013, Gilles *et al.* (2016) produced model-based average estimates for porpoise numbers in all of the North Sea extending to the Dover Strait (but not further west), for three seasons, Spring (Mar-May), Summer (Jun-Aug), and Autumn (Sep-Nov). These were 372,167 (CV=0.18) (Spring), 361,146 (CV=0.20) (Summer), and 223,913 (CV=0.19) (Autumn).

Belgium, the **Netherlands**, **Germany** and **Denmark** have continued national monitoring with aerial surveys of the southern North Sea on an annual basis, but other Range States (**Norway, Sweden, France** and **UK)** have not been undertaking regular wide scale surveys of their waters, although **France** has conducted surveys in relation to marine renewable energy development.

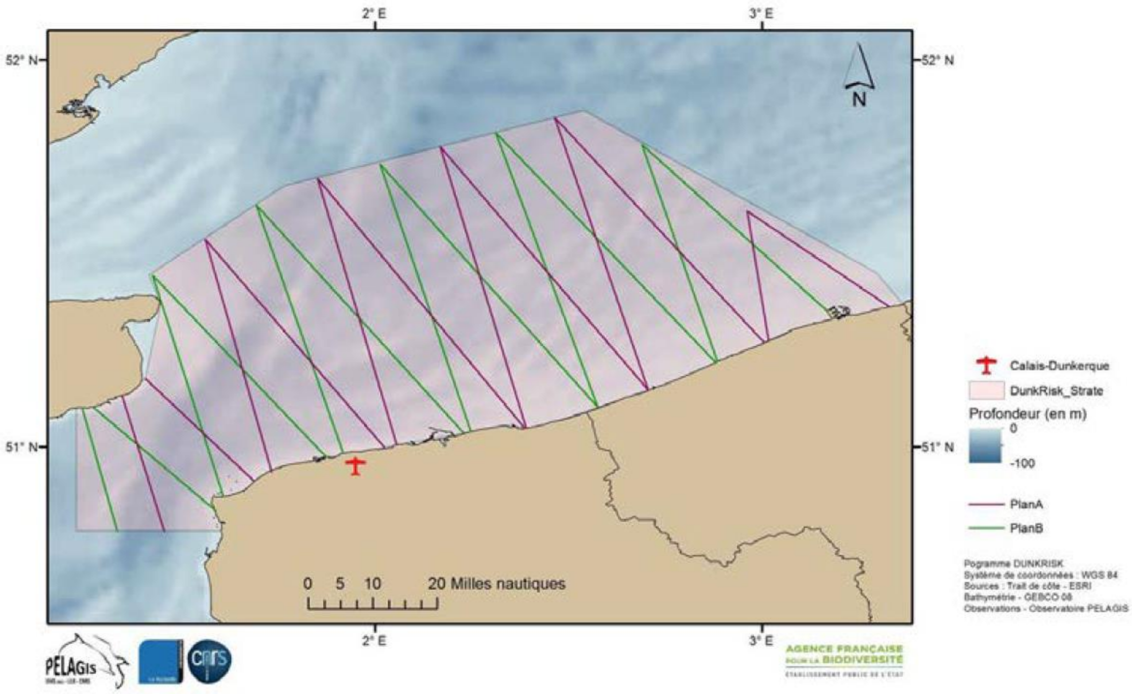

Figure 10. PELAGIS Project Aerial Surveys undertaken by France during 2017
(Sources: ICES WGMME, 2018)

During 2017, a dedicated **French** survey was undertaken to estimate marine mammal and seabird relative abundance and distribution in the area of Dunkerque before construction of an offshore windfarm. The survey effort covered 9,400 km^2, distributed as follows: 37% in France, 37% in Belgium and 26% in UK (Figure 10). Observations were conducted following a standardised protocol designed for aerial surveys (Laran *et al*., 2017). Four sessions were realised on 6–7 April (1,526 km), 13–14 June (1,534 km), 7–8 August (1,532 km) and 4–5 December (1,463 km). Two more sessions are planned in 2018 (ICES WGMME, 2018). The results show the importance of the eastern part of the Channel for porpoises, although there were strong seasonal differences both in distribution and relative abundance (Figure 11). During session 1 (April), the species was present particularly offshore Dunkerque in Belgium waters and at the frontier between Belgium and French waters, with 315 sightings totalling 373 individuals. The number of observations was more evenly distributed during session 2 (June), when there were 100 sightings of 128 individuals. During this session, numbers were higher offshore Dunkerque and in more offshore UK waters. In session 3 (August), numbers were much reduced, with only 35 sightings of 42 individuals. By Session 4 (December), numbers had increased again to 202 sightings of 239 individuals (ICES WGMME, 2018).

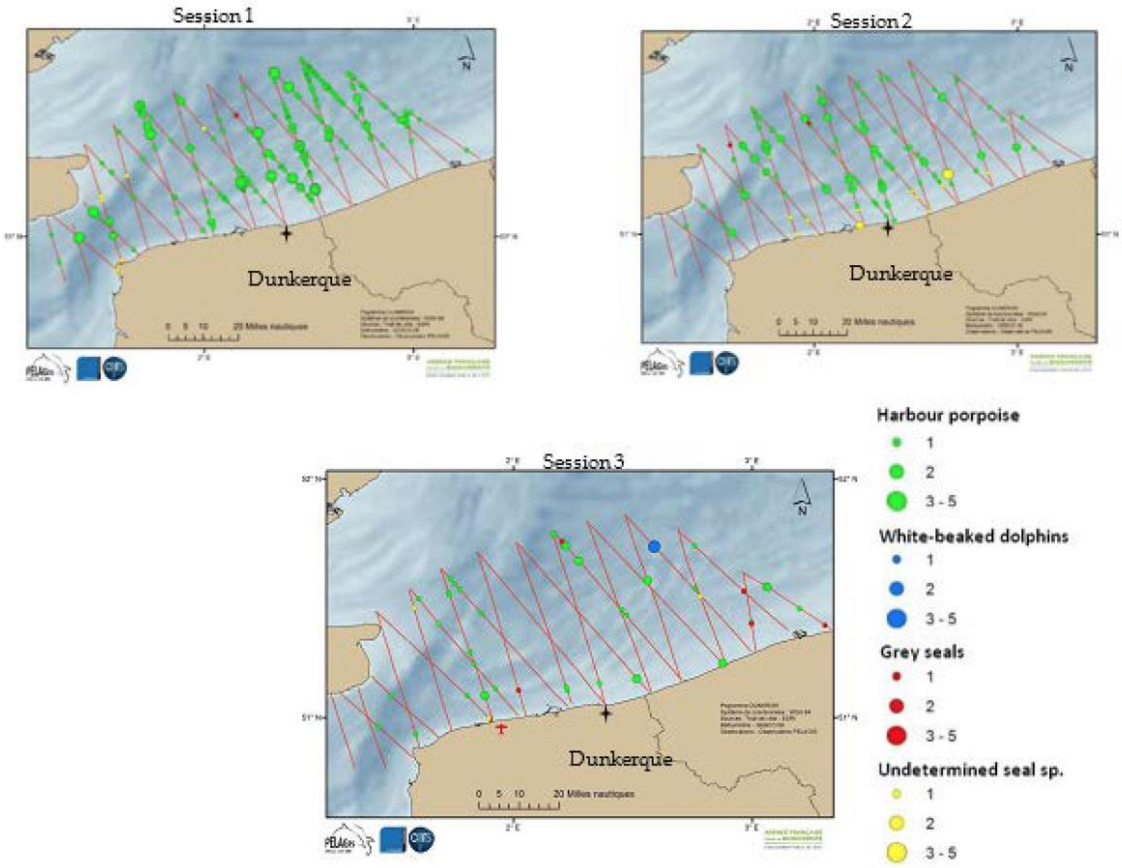

Figure 11. Sightings of Harbour Porpoise and other marine mammals from PELAGIS Project Aerial Surveys undertaken by France. Session 1 = 6-7 April 2017; Session 2 = 13-14 June 2017; Session 3 = 7-8 August 2017. Map for Session 4 (4-4 December 2017) (Source: ICES WGMME, 2018)

In the **Netherlands**, Geelhoed & Scheidat (2018 in press) analysed the results of their aerial surveys across the Dutch EEZ (Figure 12) for the years 2012-2017. Maps of porpoise distributions for each of those years are shown in Figure 13.

Distribution patterns of porpoises differed between seasons and years, although a band of higher densities from the southern part of the Dutch Continental Shelf to the area north of the western Wadden Isles was visible in all seasons (Geelhoed & Scheidat, 2017). Calves were only seen in July. The abundance estimates in spring (*n*=63,408-66,685) were in the same order of magnitude as summer (*n*=41,299-76,773). The total abundance estimates in spring and summer correspond to a maximum of 17-21% and 7-23% of the southern North Sea population respectively. The abundance estimates are not strictly comparable to those given above from SCANS surveys and the DEPONS Project different Effective Strip Widths (ESWs) were used in the analysis. However, they do highlight the fact that, in recent years for at least part of the year, a substantial proportion of the porpoise population in the southern North Sea and the eastern Channel utilises the Dutch Continental Shelf.

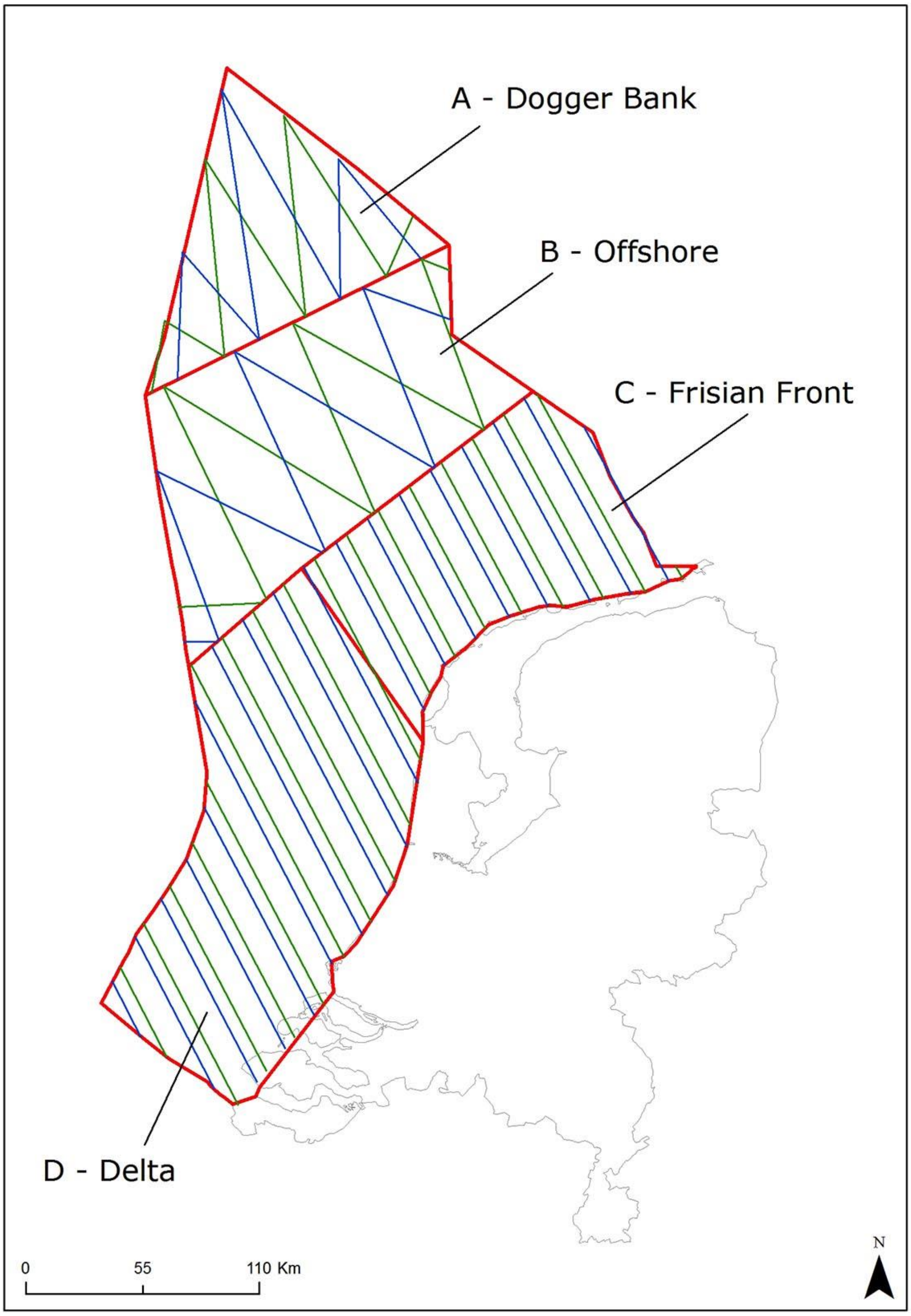

Figure 12. Map of the Dutch Continental Shelf with the planned track lines in study areas A – Dogger Bank, B – Offshore, C – Frisian Front and D – Delta. Colours indicate sets of track lines (Source: Geelhoed & Scheidat, 2018 in press)

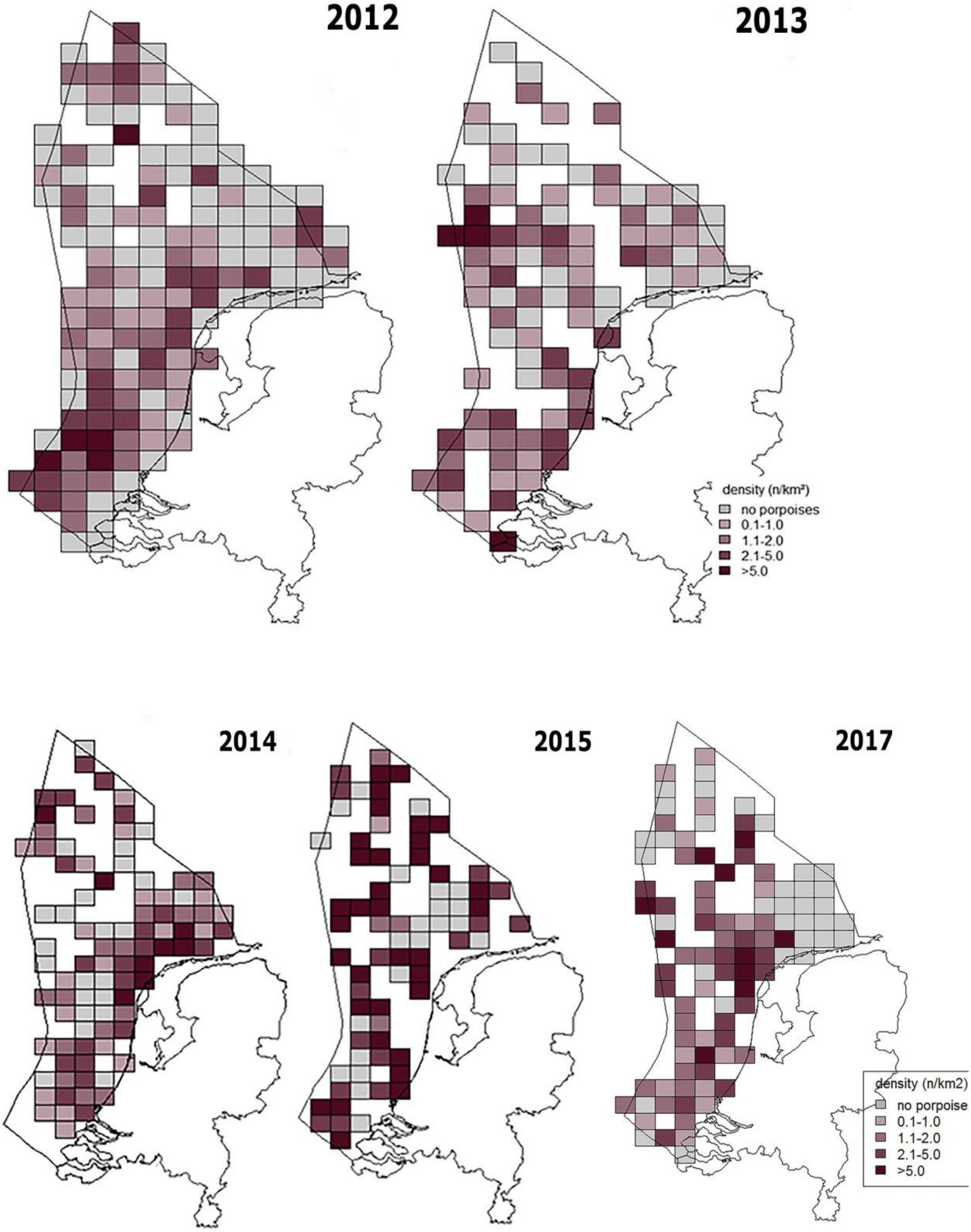

Figure 13. Density distribution of harbour porpoises (animals/km²) per 1/9 ICES grid cell, spring 2012 to 2017. Grid cells with low effort (<1 km²) are omitted (Source: Geelhoed & Scheidat, 2018 in press)

In **Germany**, with funding from BfN (Federal Agency for Nature Conservation), aerial surveys are undertaken every year in spring and summer in the area of three NATURA 2000 areas (Dogger Bank, Borkum, Sylt Outer Reef), whilst every two years, complete coverage of the German EEZ and 12 nm zone is made (Figure 14). Between March and August 2016. Using aerial line transect surveys, a total of 114 harbour porpoise groups (129 animals) were recorded along 973 km of effort (during the spring months March to May near Borkum Reef Ground), and a total of 139 groups (175 animals) were recorded across the North Sea during summer (June-August) along 2,456 km.

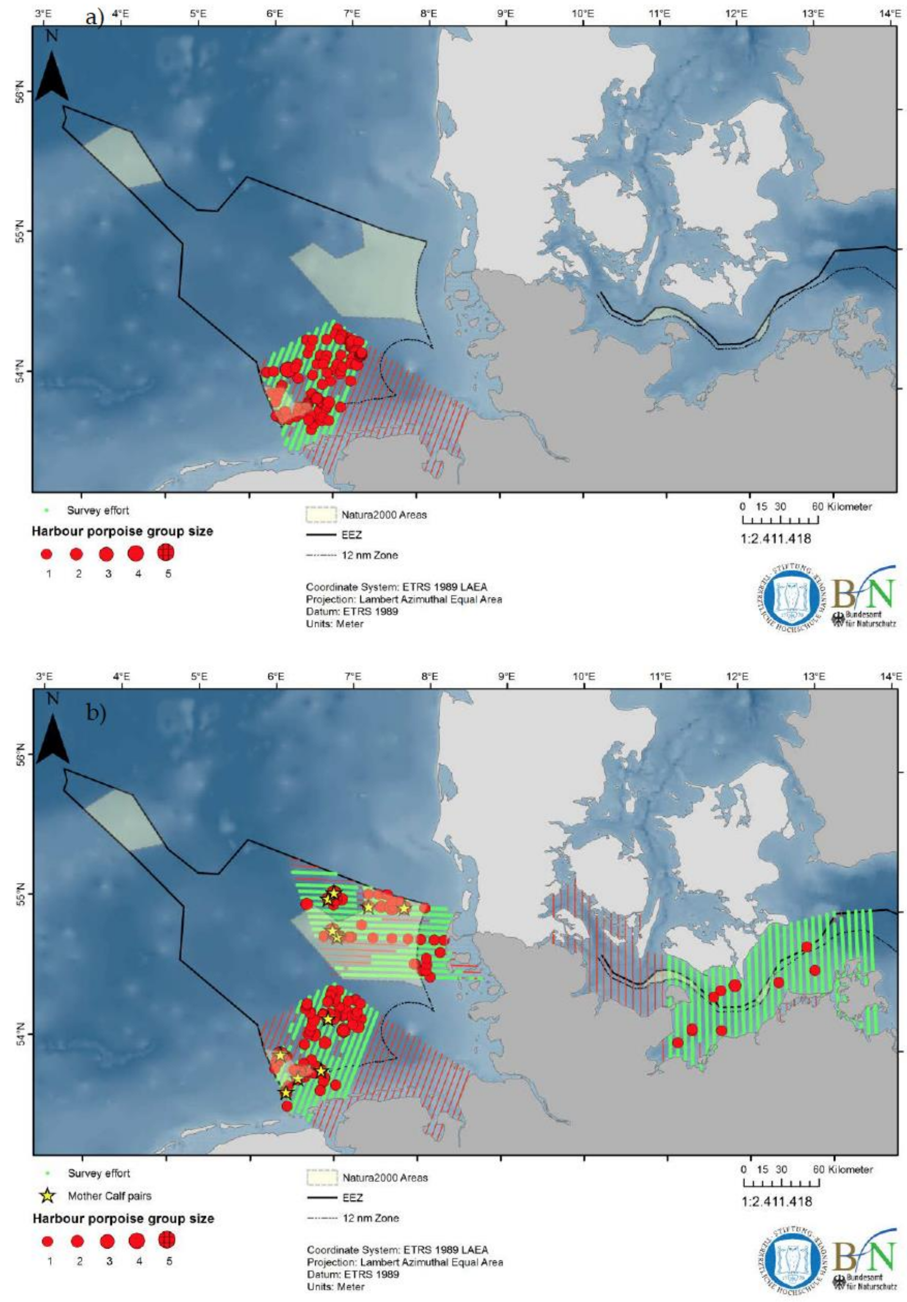

Figure 14. Survey effort and harbour porpoise sightings during aerial surveys in the German North Sea during a) spring 2016 and b) summer 2016. Harbour porpoise group sizes are indicated using group size dependent red circles; stars mark mother calf pairs; red lines indicate transect lines that were not covered though planned; green lines indicate covered transect lines (Source: ICES WGMME, 2018)

Effort corrected density and abundance estimates were generated using a bootstrapping approach. The spring abundance for the Borkum area, southwest of the German Bight, was 6,366 (95%CI: 3,582–10,970) animals at 0.91 (0.51–1.56) animals / km². The same area yielded 6,651 (3,343–12,587) animals and 0.95 (0.48–1.79) animals / km² in summer. The area of Sylt Outer Reef, northeast of the German Bight, was estimated at 5,779 (1,535–13,439) animals and 0.72 (0.19–1.68) animals / km² during the summer of 2016 (ICES WGMME, 2018).

In **Denmark**, aerial surveys are conducted every year in summer in the southern Danish North Sea and Skagerrak.

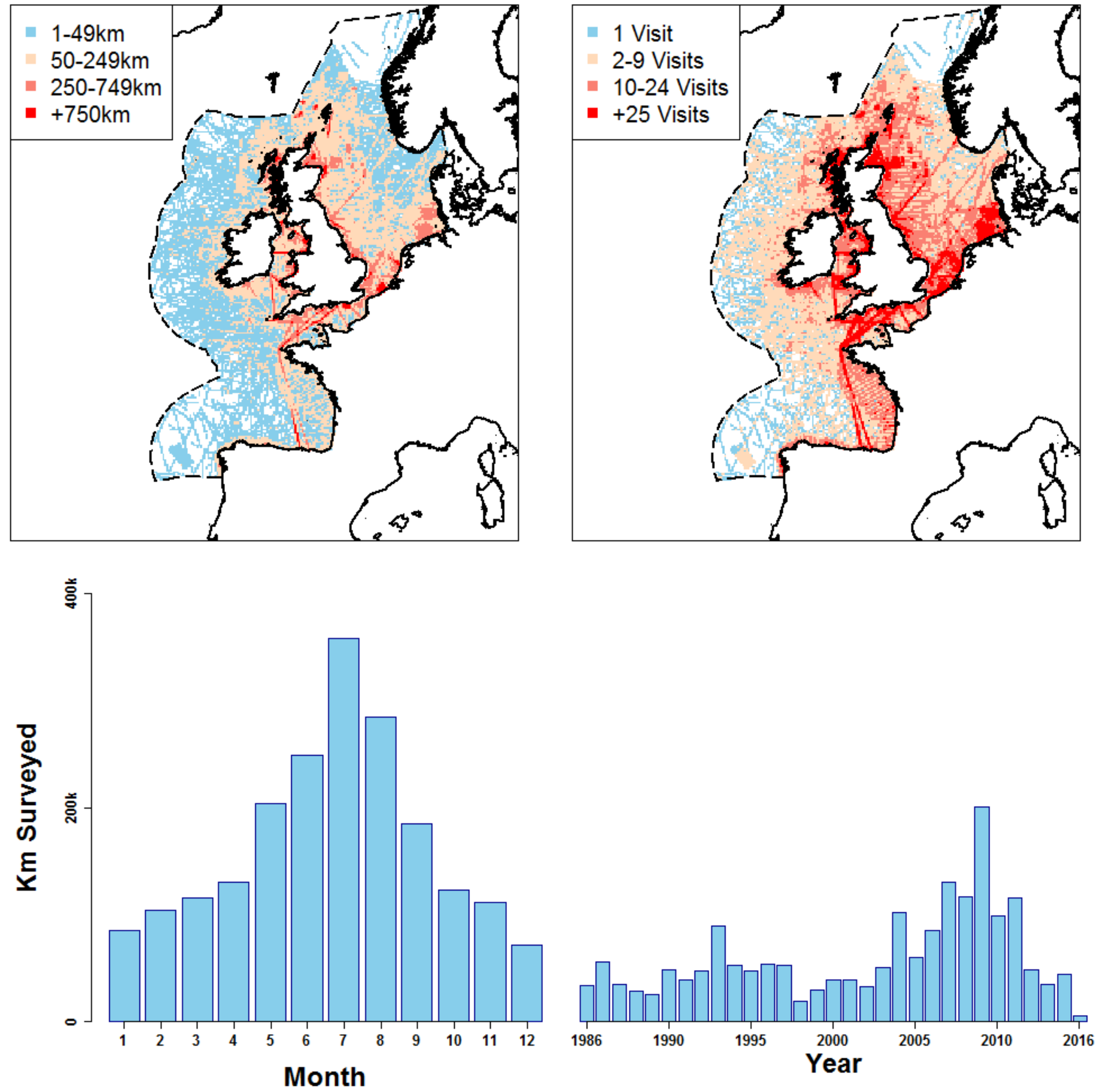

Figure 15. Distribution of survey effort spatially, by month and by year
(Source: Marine Ecosystems Research Programme)

Since 2014, the joint NERC-Defra funded Marine Ecosystems Research Programme has been collating dedicated survey data and undertaking modelling to derive abundance estimates and distribution patterns for all cetacean and seabird species occurring regularly in NW European seas. Altogether, 2.19 million kilometres of cetacean surveys have been collated from 40 main sources from 11 countries, spanning the period 1985-2017. These included SCANS, SCANS II, PELGAS & DEPONS Project surveys as well as many other surveys, both national and regional. Two years were spent in the data collation and cleaning process, and then another two years developing hurdle models (using GAMM's and GEE's) to cater for spatial and temporal gaps in coverage, and produce model-based density and abundance estimates, along with species distribution maps, and to determine trends. Survey effort was best in coastal regions, summer months, and over the last ten years (Figure 15). For each of the twelve commoner species, maps (and abundance estimates) were produced by month, by season, and by year. Monthly maps of porpoise average densities (averaged across years) are shown in Figure 16. These highlight the importance of the North Sea for harbour porpoise in the context of NW European shelf seas.

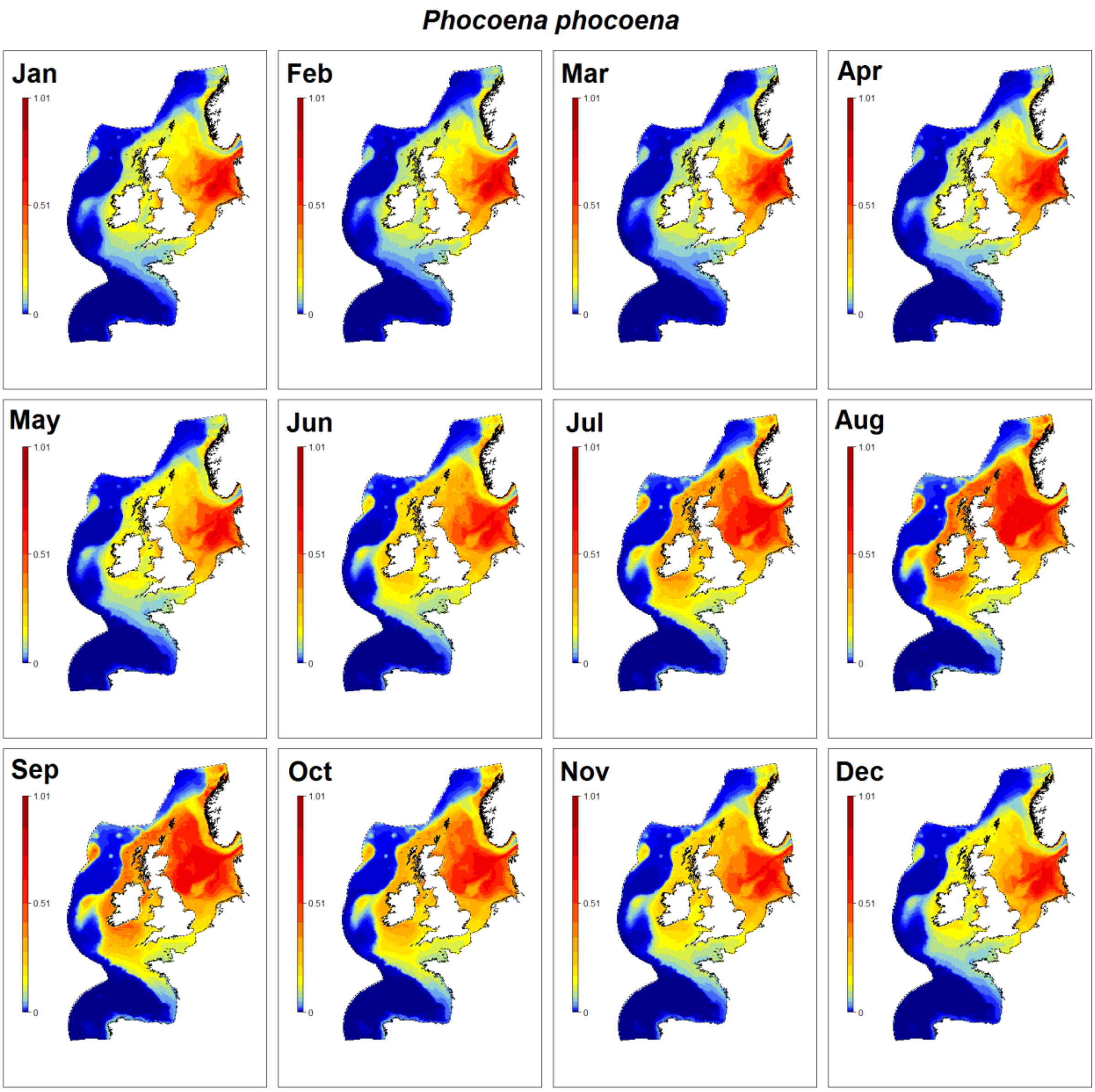

Figure 16. Modelled average density distributions of harbour porpoise by month (Source: Marine Ecosystems Research Programme)

Figure 17 shows clearly the general southward shift in density distributions away from the northern North Sea since the 1990s, already established from earlier studies (Camphuysen, 1994, 2004; Evans *et al*., 2003*;* Kiszka *et al*., 2004, 2007; Hammond *et al*., 2013).

Model based abundance estimates for the North Sea indicated a general declining trend between the mid-1980s and mid-2000s but more widely varying values since then with no obvious trend (Figure 18). These results are preliminary and further refinements continue.

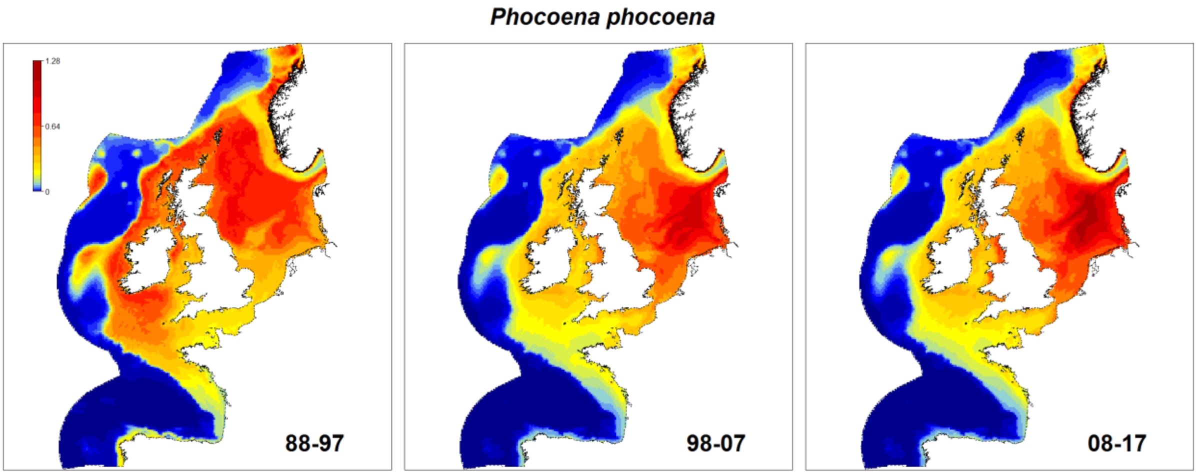

Figure 17. Modelled average density distributions of harbour porpoise by time period (Source: Marine Ecosystems Research Programme)

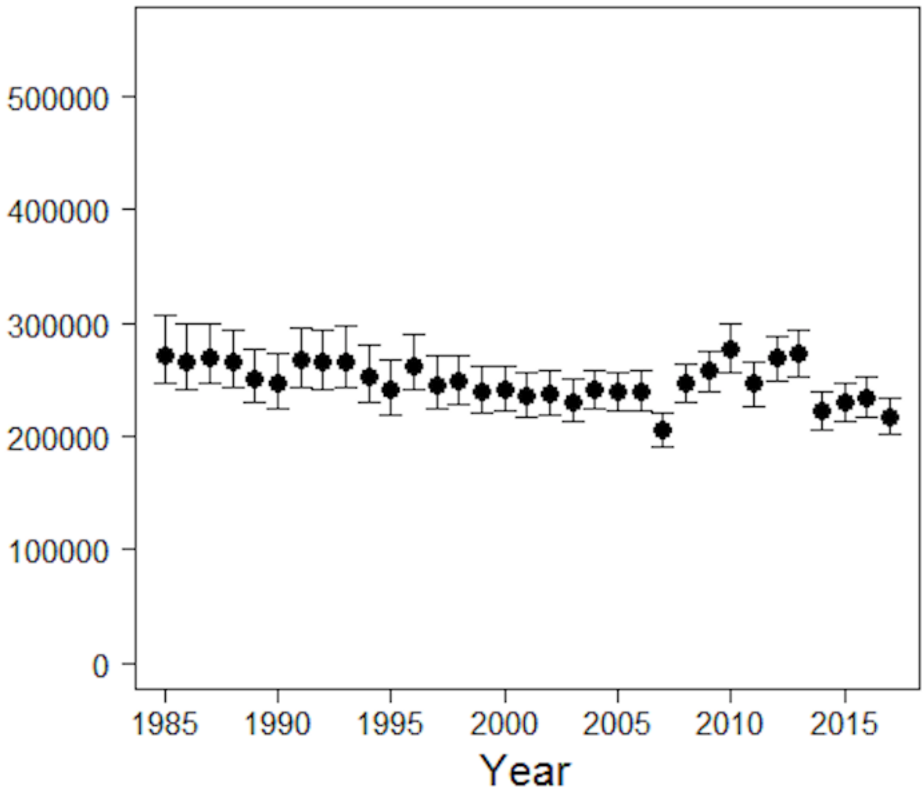

Figure 18. Estimated harbour porpoise population sizes in the North Sea, averaged across months, for each year from 1985-2017 (Source: Marine Ecosystems Research Programme)

In addition to visual surveys, acoustic monitoring (largely using C PODs) continues to be undertaken at a number of coastal locations in the **UK**, the **Netherland**s, **Germany** and **Denmark**, often in association with marine renewable energy developments. These have led to a series of publications in recent years (UK: Williamson *et al*., 2016, 2017; Germany: Dähne *et al*., 2017; Denmark: Nabe-Nielsen *et al.*, 2018).

Key Conclusions & Recommendations *The harbour porpoise population within the North Sea (including the eastern half of the English Channel) is estimated in the region of 250,000-350,000 animals. There has been no significant change in abundance since the mid 1990s.*

Regular visual monitoring by aerial survey is now being undertaken on a seasonal and annual basis in the southern North Sea involving a number of countries. Winter months remain less well covered, and areas in the central and northern North Sea are largely unmonitored except by decadal wide-scale surveys and some local windfarm-related visual and/or acoustic monitoring. The northernmost part of the North Sea is relatively poorly monitored. It is recommended that these gaps are filled and that every Member State has a regular programme of monitoring across its entire EEZ.

ACTION 8 Review of the stock structure of harbour porpoises in the region

Currently, harbour porpoises in the North Sea are considered within a single assessment unit equivalent to ICES Areas 4.a, 4.b, 4.c, 7.d, and 3.a.20 (Figure 19). This encompasses all of the Skagerrak, the North Sea up to a line parallel with the Faroe Islands, and the eastern half of the English Channel.

Earlier, the ASCOBANS Population Structure workshop when reviewing multiple lines of evidence had proposed two management units within the North Sea divided by an arbitrary line separating the northern and eastern sector from the southern and western sector (Evans and Tiedemann, 2009). The lines of evidence suggesting substructuring within the North Sea included skeletal and tooth ultrastructure variation (Kinze, 1985, 1990; Lockyer, 1999; De Luna *et al*., 2012), genetic analyses (Walton, 1997; Tolley *et al*., 1999; Andersen *et al*., 2001; De Luna *et al*., 2012), dietary studies (Aarefjord *et al*., 1995; Bjørge, 2003), stable isotope studies (Das *et al.*, 2003), contaminant loads (Das *et al*., 2004; Lahaye *et al*., 2007), and telemetry studies (Teilmann *et al*., 2008; Sveegaard *et al*., 2011). Details of their findings are given in Desportes (2014).

A number of authors allude to differences in ecology between animals from the north-eastern and southern/western North Sea, particularly with respect to feeding. There are obvious differences in the bathymetry and oceanography of these two regions, being much deeper in the north-east than in the southernmost North Sea. If porpoises in the north-eastern North Sea are feeding mainly upon pelagic prey (for which skull characteristics, particularly of the buccal cavity, have developed – see De Luna *et al*., 2012) whilst those in the southernmost North Sea are taking fish primarily off the bottom (with equivalent changes to the size of the buccal cavity), then these may represent separate management units with a potential boundary following bathymetric and oceanographic changes.

De Luna *et al*. (2012) and Andersen *et al.* (2001) found significant differences between porpoises from the British North Sea and those from the Danish North Sea, as well as differences between porpoises from Norway and both the Danish North Sea and the British North Sea. Wiemann *et al.* (2010) also showed significant substructuring between the Danish North Sea and Norway. Thus, the presence of three Management Units might also be considered (Desportes, 2014).

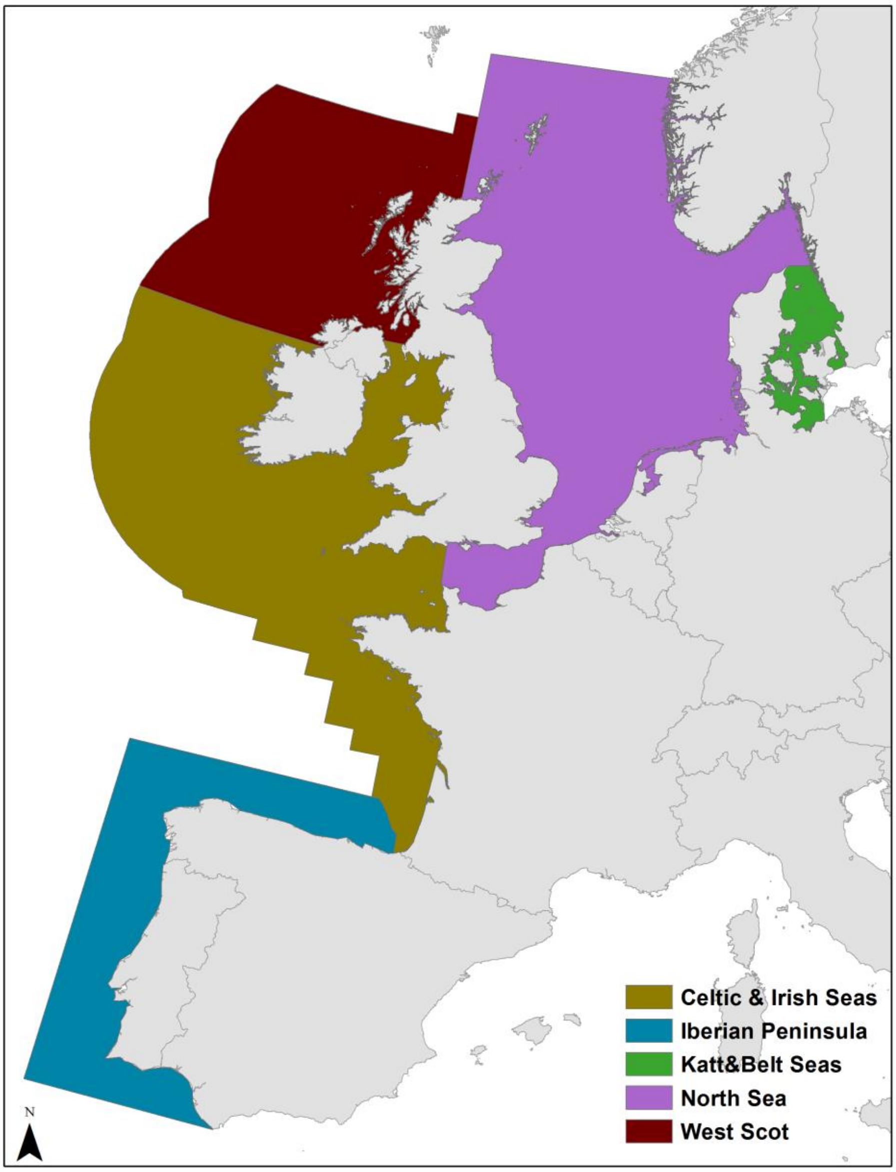

Figure 19. Assessment Units for the Harbour Porpoise
as proposed by ICES WGMME (2013)

Sveegaard *et al*. (2015) reviewed harbour porpoise management areas in the Baltic, Belt Seas and Kattegat combining information from genetics, morphology, acoustics and satellite tracking. They concluded that porpoises in the Western Baltic, Belt Seas and Kattegat represented a separate management unit to those in the Baltic Proper and recommended a northern boundary halfway down into the Kattegat (along an east-west line drawn at 56.95°N) (see Figure 20).

At the south-western end of the ICES WGMME North Sea assessment unit area, Fontaine *et al* (2017) analysed the fine-scale genetic and morphological variation in harbour porpoises around the UK by genotyping 591 stranded animals at nine microsatellite loci. The data were integrated with a prior study to map at high resolution the contact zone between two previously identified ecotypes meeting in the northern Bay of Biscay. Clustering and spatial analyses revealed that UK porpoises are derived from two genetic pools with porpoises from the southwestern UK being genetically differentiated, and having larger body sizes compared to those from other UK areas.

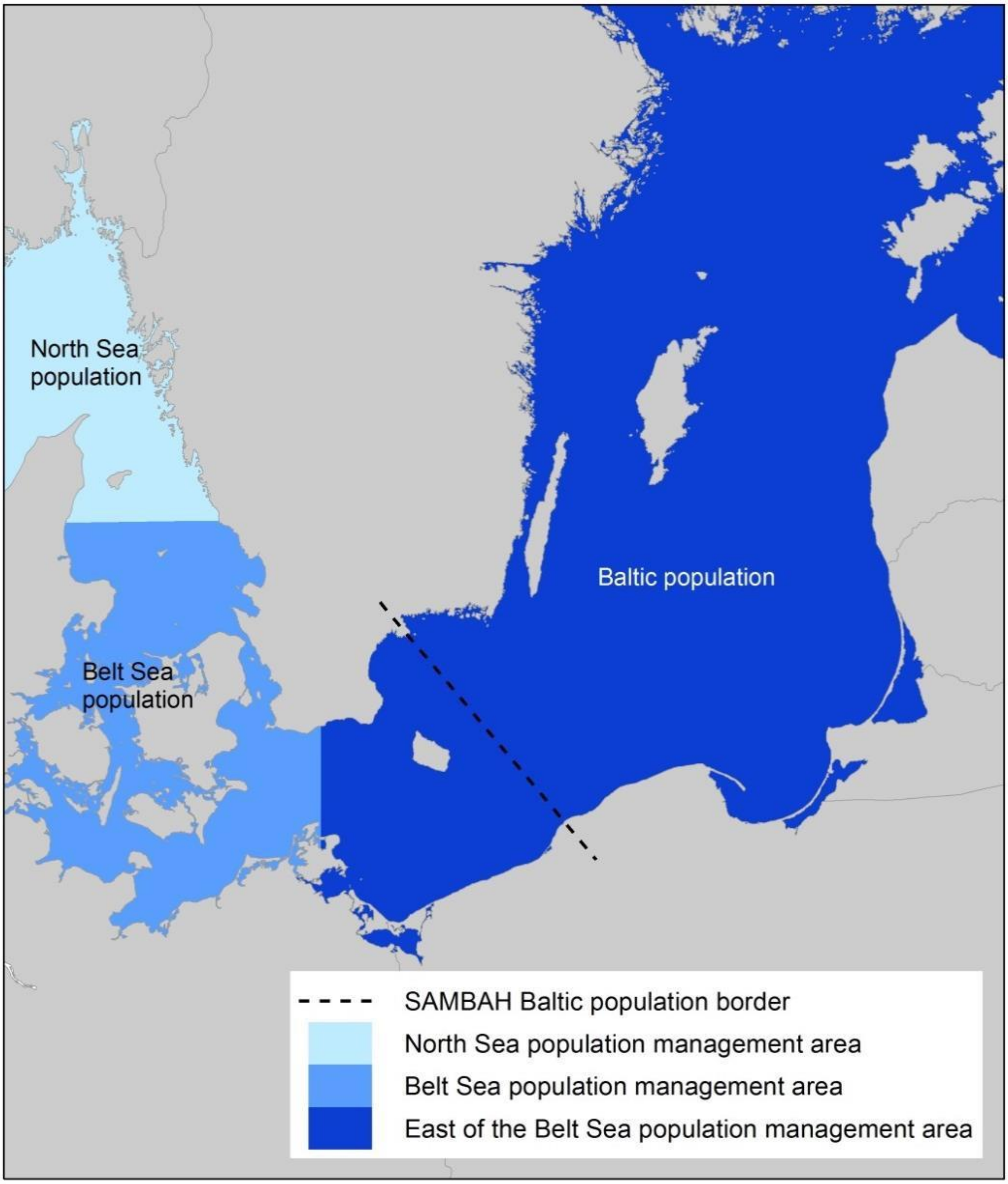

Figure 20. Harbour porpoise populations in the Baltic region. Blue shading indicates the borders proposed for the management unit of the Belt Sea population by Sveegaard *et al.* (2015), the dotted black line the spatial separation during May-Oct of the Belt & Baltic populations by Carlén *et al*. (2018). All borders are for the summer half-year only

South-western UK porpoises showed admixed ancestry between southern and northern ecotypes with a contact zone extending from the northern Bay of Biscay to the Celtic Sea and Channel (Fontaine *et al*., 2017). Around the UK, ancestry blends from one genetic group to the other along a southwest–northeast axis, correlating with body size variation, consistent with previously reported morphological differences between the two ecotypes. They also detected isolation by distance among juveniles but not in adults, suggesting that stranded juveniles display reduced intergenerational dispersal. This would be expected if adults show some philopatry and faithfulness to particular breeding areas, as suggested in harbour porpoises, especially in females (mtDNA and satellite tagging studies both indicate greater philopatry for females than males), and then disperse again the rest of the year (e.g. for foraging). Identifying where a boundary might exist in the English Channel between porpoises from a southwestern ecotype and those from the North Sea is difficult given the distribution of samples from along the south coast of England and lack of knowledge of their exact origins (due to passive drift). For the time being, there seems no reason to recommend a change to the western boundary to the North Sea assessment unit proposed by ICES WGMME (2013).

The challenge in determining where management boundaries should lie is that different authors have used different sampling divisions, there are geographical gaps in sampling, sample sizes in these have varied a lot, and the precise origins of the samples are rarely known. Some of the key areas of potential management unit boundaries that have been poorly sampled include the north-eastern North Sea south and west of Norway and the central English Channel.

Key Conclusions & Recommendations *There is still some uncertainty over the extent to which there is substructuring of harbour porpoise populations in the North Sea, with one, two, or three areas suggested as Management Units. It would be useful to obtain further samples for some of the boundary areas – Danish vs Norwegian Skagerrak, northern Kattegat, southern vs western Norway, Shetland vs Orkney/Scottish mainland, for analysis using a range of approaches (skull morphology, genetics, etc).*

The possibility of further substructuring should be explored in the central North Sea from the Danish and north German coasts across to eastern Britain since there are signals of differentiation on an east-west as well as north-south axis. Analyses are best conducted on samples where the precise original location is known. This is obviously not possible with most stranded animals sampled, but even with individuals that have been bycaught, care needs to be taken to ensure that the precise location of that bycaught animal is recorded.

Summary of Progress in Implementation of the Plan

Table 3 provides a qualitative assessment of progress by each of the Member States on the various actions identified as high and medium priorities. Progress has been variable since the adoption of the plan in 2009. Some aspects (e.g. the monitoring of distribution and abundance, at least in the southern North Sea) have received a lot of attention, whereas others (e.g. adequate monitoring to derive robust bycatch estimates particularly of recreational fisheries and vessels less than 15 m length, and the implementation of effective mitigation measures to reduce bycatch) have made less progress.

Priority Recommendations

1) Improve quality and availability of fishing effort data for the region, by gear type, vessel size category, season, and country
2) Investigate options for more cost-effective bycatch monitoring, particularly to include vessels less than 15 metres length
3) Investigate gear specific solutions to mitigate bycatch, including alternative fishing methods to static gillnetting
4) Improve the information provided by countries relevant to the Conservation Plan

Table 3. Qualitative Assessment of Progress in the Implementation of the ASCOBANS North Sea Conservation Plan for the Harbour Porpoise

Qualitative Assessment of Progress in the implementation of the ASCOBANS North Sea Conservation Plan (CP) for HP
(update Aug 2018)

Except for Action 2, ref. pinger use: na = non applicable; -1, situation is less good than at the adoption of the plan in 2009, **0** = no progress, **1** = small progress or at experimental level; **2**, steady progress; **3**, fully implemented.

	Actions form the North Sea Conservation Plan for HP	Priority		SE	DK	DE	NL	BE	FR	UK
1	Implementation of the CP: co-ordinator and Steering Committee	High		Coordinator currently in place						
2	Implementation of existing regulations on bycatch of cetaceans - e.g. EC 812/2004 & Habitat Directive (HD)	High	Vessels requiring pingers	?	14	yes	yes	0	90	6-8
			No. of vessels using pingers	?	?	?	0	na	9	6-8
			Enforcement policy	0	?	1	?	na	na	3
			Dedicated observer prog	0	0	0	0	0	(yes)	3
			Monitoring under HD	0	0	0	0	yes	yes	yes
3	Establishment of BYC observation programmes on vessel smaller than 15m long, professional and recreational fisheries	High	Professional	1	1	0	2	0	2	2
			Recreational	0	1	na	0	0	1?	na
4	Regular evaluation of relevant fisheries, extent of HP BYC:	High		0	0	0	0	0	0	1
	Gillnet fisheries =>15m vessels, dedicated, % DAS observed			0	0	0	0	0	14%	18%
	Gillnet fisheries <15m vessels, dedicated, % DAS observed			0	0.2	0	REM	0	0.7	0.33
	Cetacean scheme appended to DCF / DCR schemes			no	yes	yes	yes	no	yes	yes
	DCF observations in 2016 in NS, % DAS observed			0	0.76	0	0	0	na	9.4
5	Review of current pingers, dev. of altern.pingers and gear modif.	High		2	2	2	1	na	1	2
6	Finalise a management procedure approach for determining maximum allowable byctch limits	High		General progress ICES WGMME, WGBYC, OSPAR (MSFD)						
				0	0	0	1	0	0	2
7	Monitoring trends in distribution and abundance of HP in NS	High	Large scale	SCANS III undertaken in 2016						
			Reg/survey	1	2	3	3	3	1	1
			Reg/modelling	0	2	2	2	2	3	3
8	Review of the stock structure of HP in NS	High		1	1	1	1	1	1	1
9	Collection of incidental HP data through stranding networks	Medium		1	0	3	3	3	2	3
10	Investigation of the health, nutritional status and diet of HP in NS	Medium		1	2	2	2	1	1	2
11	Investigation of the effects of anthropogenic sounds on HP	Medium		0	2	2	2	2	1	2
12	Collection and archiving of data on anthropogenic activities and development of a GIS	Medium		1	2	2	2	1	1	2

References

Aarefjord, H., Bjørge, A., Kinze, C.C., & Lindstedt, I. 1995. Diet of the harbour porpoise (*Phocoena phocoena*) in Scandinavian waters. *Reports of the International Whaling Commission* (Special Issue 16): 211-222.

Andersen, L.W., Ruzzante, D.E., Walton, M., Berggren, P., Bjørge, A., & Lockyer, C. 2001. Conservation genetics of the harbour porpoise, *Phocoena phocoena*, in eastern and central North Atlantic. *Conservation Genetics*, 2: 309-324.

ASCOBANS. 2009a. ASCOBANS Conservation Plan for Harbour Porpoises (*Phocoena phocoena* L.) in the North Sea. http://www.ascobans.org/pdf/ASCOBANS_NorthSeaPlan_MOP6.pdf.

ASCOBANS. 2009b. Report of the 6th Meeting of the Parties to ASCOBANS. UN Campus, Bonn, Germany 16-18 September 2009. http://www.ascobans.org/pdf/mops/MOP6_Report_inclAnnexes_final.pdf.

ASCOBANS. 2010a. Report of the 17th meeting of the ASCOBANS Advisory Committee. 72pp.
http://www.ascobans.org/pdf/ac17/AC17_Report_withAnnexes.pdf.

ASCOBANS. 2010b. Terms of Reference for the Steering Group for the ASCOBANS Conservation Plan for Harbour Porpoises in the North Sea. Annex 7, pages 61-62. In Report of the 17th Meeting of the ASCOBANS Advisory Committee.
http://www.ascobans.org/pdf/ac17/AC17_Report_withAnnexes.pdf.

ASCOBANS. 2011a. Activity report of the Steering Group for the Conservation Plan for the Harbour Porpoise in the North Sea: October 2010 – April 2011. ASCOBANS AC18/Doc.4-05. 4pp.
http://www.ascobans.org/pdf/ac18/AC18_4-05_ReportNorthSeaGroup.pdf.

ASCOBANS. 2011b. Report of the 18th meeting of the ASCOBANS Advisory Committee. 72pp.
http://www.ascobans.org/pdf/ac18/ASCOBANS_AC18_Report_inclAnnexes.pdf.

ASCOBANS. 2012a. Report of the 1st meeting of the Steering Group for the Conservation Plan for the Harbour Porpoise in the North Sea. ASCOBANS AC19/Doc. 4-04 (S). 6pp.
http://www.ascobans.org/pdf/ac19/AC19_4-04_Report_NorthSeaGroup1.pdf.

ASCOBANS. 2012b. Report of the 6th Meeting of the Parties to ASCOBANS. Brighton, United Kingdom 22-24 October 2012. 106pp.
http://www.ascobans.org/pdf/mops/MOP7_Report_inclAnnexes.pdf.

ASCOBANS. 2013. Report of the 2nd Meeting of the Steering Group for the Conservation Plan for the Harbour Porpoise in the North Sea. ASCOBANS AC20/Doc.2.2.1.a. 15pp.
http://www.ascobans.org/pdf/ac20/AC20_2.2.1.a_Report_NorthSeaGroup2.pdf.

ASCOBANS. 2014. Report of the 3rd Meeting of the Steering Group for the Conservation Plan for the Harbour Porpoise in the North Sea. ASCOBANS AC21/Doc.2.2.1.a. 86pp.

ASCOBANS. 2015a. Report of the 4th Meeting of the North Sea Group. ASCOBANS AC22/Doc.2.2. 61pp.

ASCOBANS. 2015b. Report of the Workshop on Further Development of Management Procedures for Defining the Threshold of 'Unacceptable Interactions' – Part I: Developing a Shared Understanding on the Use of Thresholds / Environmental Limits. AC22/Inf.4.1.c. 15pp.

ASCOBANS. 2016. Report of the 5th Meeting of the North Sea Group. ASCOBANS AC23/Doc.2.2. 23pp.

ASCOBANS. 2017. Report of the 6th Meeting of the ASCOBANS North Sea Group. ASCOBANS AC23/Doc.2.2.a. 23pp.

Bjørge, A. 2003. The harbour porpoise (*Phocoena phocoena*) in the North Atlantic: Variability in habitat use, trophic ecology and contaminant exposure. *NAMMCO Scientific Publications*, 5:223-228.

Bjørge, A., & Moan, A. 2016. Revised estimates of harbour porpoise (*Phocoena phocoena*) by-catches in two Norwegian coastal gillnet fisheries. Report to the Scientific Committee of the International Whaling Commission, Bled, Slovenia, June 2016. SC/66b/SM/03. 16pp.

Camphuysen, C.J. 1994. The harbour porpoise *Phocoena phocoena* in the southern North Sea, II: a come-back in Dutch coastal waters? *Lutra*, 37(1): 54-61.

Camphuysen, C.J. 2004. The return of the harbour porpoise (*Phocoena phocoena*) in Dutch coastal waters. *Lutra*, 47: 113-122.

Carlén, I. Thomas, L., Carlström, J., Amundin, M., Teilmann, J., Tregenza, N., Tougaard, J., Jens C. Koblitz, J.C., Sveegaard, S., Wennerberg, D., Loisa, O., Dähne, M., Brundiers, K. Kosecka, M., Kyhn, L.A., Ljungqvist, C.T., Pawliczkai, I., Kozai, R., Arciszewskii, B., Galatius, A., Jabbusch, M., Laaksonlaita, J., Niemi, J., Lyytinen, S., Gallus, A., Benke, H., Blankett, P., Skórai, K.E., & Acevedo-Gutiérrezk, A. 2018. Basin-scale distribution of harbour porpoises in the Baltic Sea provides basis for effective conservation actions. *Biological Conservation*, 226: 42-53.

Culik, B., Conrad, M., & Chladek, J. 2017. Acoustic protection for marine mammals: new warning device PAL. DAGA Proceedings, Kiel 2017, pp. 387–390. *http://www.fh3.de/fachartikel.html*

Culik, B., Conrad, M., Tobias Schaffeld, T., Christian von Dorrien, C., & Lotte Kindt-Larsen, L. 2015a. Deploying porpoise alerting device (PAL) in Baltic and North Sea gillnet fisheries. In: Wright, A.J., and Robertson, F.C. (eds). New mitigation methods and evolving acoustics exposure guidelines. Report from the European Cetacean Society Conference Workshop, St Julian, Malta, European Cetacean Society Special Publication Series No. 59, 74pp.

Culik, B., von Dorrien, C., & Müller, C. 2015b. Synthetic communication signals influence wild harbour porpoise (*Phocoena phocoena*) behaviour. *Bioacoustics*, 24 (3): 201–21.

Dähne, M., Tougaard, J., Carstensen, J., Rose, A., & Nabe-Nielsen, J. 2017. Bubble curtains attenuate noise from offshore wind farm construction and reduce temporary habitat loss for harbour porpoises. *Marine Ecology Progress Series*, 580: 221–237.

Das, K. Lepoint, G., Leroy, Y., & Bouquegneau, J.M. 2003. Marine mammals from the southern North Sea: feeding ecology data from $\delta^{13}C$ and $\delta^{15}N$ measurements. *Marine Ecology Progress Series*, 263: 287-298.

Das, K., Siebert, U., Fontaine, M., Jauniaux, T., Holsbeek, L., & Bouquegneau, J.M. 2004. Ecological and pathological factors related to trace metal concentrations in harbour porpoises *Phocoena phocoena* from the North Sea and adjacent waters. *Marine Ecology Progress Series*, 281: 283-295.

De Luna, C.J., Goodman, S.J., Thatcher, O., Jepson, P.D., Tolley, K., & Hoelzel, A.R. 2012. Phenotypic and genetic divergence among harbour porpoise populations associated with habitat regions in the North Sea and adjacent seas. *Journal of Evolutionary Biology*, 25: 674-681.

Desportes, G. 2012. Interim report on the implementation of the ASCOBANS North Sea Conservation Plan for Harbor Porpoises - 3. ASCOBANS AC19/Doc. 4-05 (S). 46pp. http://www.ascobans.org/pdf/ac19/AC19_4-05_Report_NorthSeaCoordinator.pdf.

Desportes, G. 2013a. Interim report on the implementation of the ASCOBANS North Sea Conservation Plan for Harbor Porpoises – 4, with focus on bycatch situation and population monitoring. ASCOBANS AC20/Doc.2.2.1.b. 44pp.
http://www.ascobans.org/pdf/ac20/AC20_2.2.1.b_Report_NorthSeaCoordinator.pdf.

Desportes, G. 2013b. Interim report on the implementation of the ASCOBANS North Sea Conservation Plan for Harbor Porpoises – 5, with focus on progress in implementation of Actions 1,3,4,7 & 8 and attempt of characterizing recreational fisheries in the CPHPNS area (ICES areas IIIaN, IV, VIIed). 70pp. in Anon 2014 (AC21_2.2.1.a).
http://www.ascobans.org/sites/default/files/document/AC21_2.2.1.a_Report_NorthSeaGroup3.pdf

Desportes, G. 2014. Interim report on the ASCOBANS North Sea Conservation Plan for Harbor Porpoises – 5, with focus on progress in implementation of Actions 2 and 4. ASCOBANS AC21_2.2.1.b rev1. 38pp.
http://www.ascobans.org/sites/default/files/document/AC21_2.2.1.b_Report_ImplementationNSP_2014.pdf

Eisfeld, S. & Koch, K.-H. 2006. Expert Paper to the ASCOBANS Conservation Plan for Harbour Porpoises (*Phocoena phocoena* L.) in the North Sea. 93pp. Document AC13/Doc. 18(S). 116pp.

Evans, P.G.H., & Teilmann, J. (editors) 2009. *Report of ASCOBANS/HELCOM Small Cetacean Population Structure Workshop*. ASCOBANS/UNEP Secretariat, Bonn, Germany. 140pp.

Evans, P.G.H., Anderwald, P. & Baines, M.E. 2003. *UK Cetacean Status Review*. Report to English Nature and the Countryside Council for Wales. Sea Watch Foundation, Oxford. 160pp.

Fontaine, M.C., Thatcher, O., Ray, N., Piry, S., Brownlow, A., Davison, N.J., Jepson, P., Deaville, R., & Goodman, S.J. 2017. Mixing of porpoise ecotypes in southwestern UK waters revealed by genetic profiling. *Royal Society Open Science* 4, 160992.

Gilles, A, Viquerat, S., Becker, E.A., Forney, K.A., Geelhoed, S.C.V., Haelters, J., Nabe-Nielsen, J., Scheidat, M., Sveegaard, S., van Beest, F.M., van Bemmelen, R., & Aarts, G. 2016. Seasonal habitat-based density models for a marine top predator, the harbour porpoise, in a dynamic environment. *Ecosphere*, 7(6): e01367. 10.1002/ecs2.1367.

Geelhoed, S.C.V., & Scheidat, M. 2018. Abundance of harbour porpoises (*Phocoena phocoena*) on the Dutch Continental Shelf, aerial surveys 2012-2017. *Lutra* (in press).

Hammond, P.S., Berggren, P., Benke, H., Borchers, D.L., Collet, A., Heide-Jørgensen, M.P., Heimlich, S., Hiby, A.R., Leopold, M.F., & Øien, N. 2002. Abundance of harbour porpoise and other cetaceans in the North Sea and adjacent waters. *Journal of Applied Ecology*, 39: 361-376.

Hammond, P.S., Macleod, K., Berggren, P., Borchers, D.L., Burt, M.L., Cañadas, A., Desportes, G., Donovan, G.P., Gilles, A., Gillespie, D., Gordon, J., Hiby, L., Kuklik, I., Leaper, R., Lehnert, K., Leopold, M., Lovell, P., Øien, N., Paxton, C.G.M., Ridoux, V., Rogan, E., Samarra, F., Scheidat, M., Sequeira, M., Siebert, U., Skov, H., Swift, R., Tasker, M.L., Teilmann, J., Van Canneyt, O., & Vázquez, J.A. 2013. Cetacean abundance and distribution in European Atlantic shelf waters to inform conservation and management. *Biological Conservation,* 164**:** 107–122.

Hammond, P.S., Lacey, C., Gilles, A., Viquerat, S., Borjesson, P., Herr, H., Macleod, K., Ridoux, V., Santos, M.B., Scheidat, M., Teilmann, J., Vingada, J., & Øien, N. 2017. Estimates of cetacean abundance in European Atlantic waters in summer 2016 from the SCANS-III aerial and shipboard surveys. Available at https://synergy.standrews.ac.uk/scans3/files/2017/05/SCANS-III-design-based-estimates-2017-05-12-final-revised.pdf.

ICES. 2015. 1.6.1.1 Bycatch of small cetaceans and other marine animals – Review of national reports under Council Regulation (EC) No. 812/2004 and other published documents. ICES Advice 2015, Book 1. Northeast Atlantic and adjacent seas. 5pp.
http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2015/2015/Bycatch_of_PETS_Advice_2015.pdf

ICES. 2017. 9.2. Greater North Sea Ecoregion – Fisheries overview. ICES, Copenhagen. Published 4 July 2017. DOI: 10.17895/ices.pub.3116.

ICES. 2018. EU request for guidance on an appropriate method to integrate criteria, species, species group to higher groups of birds, mammals, reptiles, fish and cephalopods for a Good Environmental Status assessment. ICES Special Request Advice. Azores, Baltic sea, Bay of Biscay and Iberian Coast, Celtic Seas, Greater North Sea Ecoregions.
http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2018/Special_requests/eu.2018.12.pdf

ICES WGBYC. 2016. Report of the Working Group on Bycatch of Protected Species (WGBYC), 1-5 February 2016, ICES HQ, Copenhagen, Denmark. ICES CM 2016/ACOM: 27. 77pp.

ICES WGBYC. 2017. Report of the Working Group on Bycatch of Protected Species (WGBYC), 12-15 June 2017, Woods Hole, Massachusetts, USA. ICES CM 2017/ACOM: 24. 82pp.

ICES WGBYC. 2018. Report of the Working Group on Bycatch of Protected Species (WGBYC), 1-4 May 2018, Reykjavik, Iceland. ICES CM 2018/ACOM: 25. 106pp.

ICES WGMME. 2013. Report of the Working Group on Marine Mammal Ecology (WGMME), 4–7 February 2013, Paris, France. ICES CM 2013/ACOM:26. 115pp.

ICES WGMME. 2017. Report of the Working Group on Marine Mammal Ecology (WGMME), 6–9 February 2017, St Andrews, Scotland, UK. ICES CM 2017/ACOM:27. 102pp.

ICES WGMME. 2018. Report of the Working Group on Marine Mammal Ecology (WGMME), 19–22 February 2018, La Rochelle, France. ICES CM 2018/ACOM:28. 116pp.

ICES WKDIVAGG. 2018. Report of the Workshop on MSFD biodiversity of species D1 aggregation (WKDIVAGG), 1-4 May 2018, ICES HQ, Copenhagen, Denmark. ICS CM 2018/ACOM:47. 49pp.

Kindt-Larsen, L., Dalskov, J., Stage, B., & Larsen, F. 2012. Observing incidental harbour porpoise *Phocoena phocoena* bycatch by remote electronic sensing. *Endangered Species Research*, 19: 75–83.

Kinze, C.C. 1985. Intraspecific variation in Baltic and North Sea harbour porpoises (*Phocoena phocoena* L. 1758)). *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening* 146: 63-74.

Kinze, C.C. 1990. *The harbour porpoise Phocoena phocoena, (L. 1758)): stock identification and migration patterns in Danish and adjacent waters*. PhD thesis, University of Copenhagen, Denmark.

Kiszka, J.J., Hassani, S., & Pezeril, S. 2004. Distribution and status of small cetaceans along the French Channel coasts: using opportunistic records for a preliminary assessment. *Lutra*, 47: 33–46.

Kiszka, J., Macleod, K., Van Canneyt, O, Walker, D., & Ridoux, V. 2007. Distribution, encounter rates, and habitat characteristics of toothed cetaceans in the Bay of Biscay and adjacent waters from platform of opportunity data. *ICES Journal of Marine Science*, 64: 1033-1043.

Kock, H.O. 2010. Natura 2000 and the Common Fishery Policy – Note. EP – IP/B/PECH/IC/2009-88. PE 438.602. 106pp.
http://www.europarl.europa.eu/committees/de/pech/studiesdownload.html?languageDocument=EN&file=32391.

Kyhn, L.A., Jørgensen, P.B., Carstensen, J., Bech, N.I., Tougaard, J., Dabelsteen, T., & Teilmann, J. 2015. Pingers cause temporary habitat displacement in the harbour porpoise *Phocoena phocoena*. *Marine Ecology Progress Series*, 526: 253-265.

Lahaye, V., Bustamante, P., Law, R.J., Learmonth, J.A., Santos, M.B., Boon, J.P., Rogan, E., Dabin, W., Addink, M.J., López, A., Zuur, A.F., Pierce, G.J., & Caurant, F. 2007. Biological and ecological factors related to trace element levels in harbour porpoises (*Phocoena phocoena*) from European waters *Marine Environmental Research*, 64: 247-266.

Laran, S., Authier, M., Blanck, A., Doremus, G., Falchetto, H., Monestiez, P., Pettex, E., Stephan, E., Van Canneyt. O., & Ridoux, V. 2017. Seasonal distribution and abundance of cetaceans within French waters: Part II: The Bay of Biscay and the English Channel. *Deep Sea Research II*, 141: 31–40.

Leaper, R., & Papastavrou, V. 2009. Interim Report on Progress to develop further the ASCOBANS Conservation Plan for Harbour Porpoise in the North Sea. ASCOBANS AC17/Doc.4-05 (S). 13pp.

Leaper, R., & Papastavrou, V. 2010. Interim Report on Progress to develop further the ASCOBANS Conservation Plan for Harbour Porpoise in the North Sea. ASCOBANS AC17/Doc.4-05 (S) rev. 1. 13pp.

Lockyer, C. 1999. Application of a new method to investigate population structure in the harbour porpoise, *Phocoena phocoena*, with special reference to the North and Baltic Seas. *Journal of Cetacean Research and Management*, 1(3): 297-304.

Marine Management Organisation. 2017. *UK Sea Fisheries Statistics 2016*. Marine Management Organisation, London. 156pp.

Masters, J. 2014. *Report on the current state of driftnet fisheries in the UK*. Sea Fish, SR673, 100pp.

Nabe-Nielsen, J., van Beest, F., Grimm, V., Sibly, R., Teilmann, J., & Thompson, P.M. 2018. Predicting the impacts of anthropogenic disturbances on marine populations. *Conservation Letters*, 2018;e12563. https://doi.org/10.1111/conl.12563.

Peschko, V., Ronnenberg, K., Siebert, U., & Gilles, A. 2016. Trends of harbour porpoise (*Phocoena phocoena*) density in the southern North Sea. *Ecological Indicators*, 60: 174-183.

Scheidat, M., Leaper, R., Van Den Heuvel-Greve, & Winship, A. 2013. Setting maximum mortality limits for harbour porpoisesin Dutch waters to achieve conservation objectives. Open Journal of Marine Science, 2013, 3: 133-139. http://dx.doi.org/10.4236/ojms.2013.33014

Sveegaard, S., Galatius, A., Dietz, R., Kyhn, L., Koblitz, J.C., Amundin, M., Nabe-Nielsen, J., Sinding, M.-H.S., Andersen, L.W., & Teilmann, J., 2015. Defining management units for cetaceans by combining genetics, morphology, acoustics and satellite tracking. *Global Ecology and Conservation*, 3: 839–850. doi:10.1016/j.gecco.2015.04.002.

Sveegaard, S., Teilmann, J., Tougaard, J., Dietz, R., Mouritsen, K.N., Desportes, G., & Siebert, U. 2011. High density areas for harbour porpoises (*Phocoena phocoena*) identified by satellite tracking. *Marine Mammal Science*, 27: 230-246.

Teilmann, J., Sveegaard, S., Dietz, R., Petersen, I.K., Berggren, P., & Desportes, G. 2008. *High density areas for harbour porpoises in Danish waters*. National Environmental Research Institute, University of Aarhus. 84pp. NERI Technical Report No. 657. http://www.dmu.dk/Pub/FR657.pdf

Tolley, K.A., Rosel, P.E., Walton, M., Bjørge, A., & Øien, N. 1999. Genetic population structure of harbour porpoises (*Phocoena phocoena*) in the North Sea and Norwegian waters. *Journal of Cetacean Research and Management*, 1: 265-274.

van Beest, F.M., Kindt-Larsen, L., Bastardie, F., Bartolino, V., & Nabe-Nielsen, J. 2017. Predicting the population-level impact of mitigating harbor porpoise bycatch with pingers and time-area fishing closures. *Ecosphere*, 8(4): e01785.10.1002/ecs2.1785.

Walton, M.J. 1997. Population structure of harbour porpoises *Phocoena phocoena* in the seas around the UK and adjacent waters. *Proceedings of the Royal Society of London* Series B, 264: 89-94.

Wiemann, A., Andersen, L.W., Berggren, P., Siebert, U., Benke, H., Teilmann, J., Lockyer, C., Pawliczka, I., Skóra, K., Roos, A., Lyrholm, T., Paulus, K.B., Ketmaier, V., & Tiedemann, R. 2010. Mitochondrial Control Region and microsatellite analyses on harbour porpoise (*Phocoena phocoena*) unravel population differentiation in the Baltic Sea and adjacent waters. *Conservation Genetics*, 11: 195-211.

Williamson, L. D., Brookes, K.L., Scott, B.E., Graham, I.M., Bradbury, G., Hammond, P.S., & Thompson, P.M. 2016. Echolocation detections and digital video surveys provide reliable estimates of the relative density of harbour porpoises. *Methods in Ecology and Evolution*, 7: 762–769.

Williamson, L.D., Brookes, K.L., Scott, B.E., Graham, I.M., & Thompson, P.M. 2017. Diurnal variation in harbour porpoise detection–potential implications for management. *Marine Ecology Progress Series*, 570: 223–232.