PROGRESS REPORT

on

THE CONSERVATION PLAN FOR THE HARBOUR PORPOISE IN THE NORTH SEA

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October 2025

CONTENTS

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Summary of Progress in 2024-2025

Summarised here are the status and progress since the last report was published, under each main action point of the new Conservation Plan. Priority recommendations are also given for each main action point.

Identify the priority bycatch issues and relevant stakeholders (RES-01)

Around 7,000 vessels from nine nations operate in the Greater North Sea ecoregion, with the largest numbers coming from the UK, France, Norway, Denmark, and the Netherlands. Total landings peaked in the early 1970s and have since declined (c. 2 million tonnes from 2005-2019; since 2020, a further decline to c. 1.6 million tonnes). Use of static gear (trammel nets and gillnets), thought to be one of the main sources of harbour porpoise bycatch, has varied rather little in the last ten years, with effort concentrated in the south-west Skagerrak and west of Denmark in the eastern North Sea, in the central west sector off eastern England, and in the Dover Strait and Channel.

Improve estimates of bycatch rates to support development of conservation strategy (RES-02)

Bycatch remains under-recorded although some gears within some fleets, have better data on by-catch particularly where remote electronic monitoring has been used. Total annual estimated bycatch of porpoises between 2017-23 was 389 in trammel nets (GTR) from 638 days at sea of monitoring (out of 10,554 days at sea), ad 24 in bottom otter trawls (OTB) from 4,710 days at sea of monitoring (out of 110,959 days at sea) (ICES 2024).

Overall annual bycatch for harbour porpoise in the Greater North Sea was estimated by OSPAR's Marine Mammal Expert Group for their Quality Status Review, at 5,974 porpoises (95% CI: 3,176-10,739) for the year 2020 (OSPAR 2023). This represents 1.73% of an estimated North Sea population size of 345,000 (from SCANS-III, July 2016), and exceeds the RLA threshold value of 1,622 porpoise anthropogenic removals (OSPAR OMMEG Assessment, Taylor *et al.* 2023).

Implement and assess pinger and other mitigation measures to reduce bycatch (MIT-01)

The use of pingers on static gear (gillnets, trammel nets) has been widely demonstrated to significantly reduce bycatch so long as they are deployed appropriately, are in good working order, and there is suitable spacing. Trials continue to assess the effectiveness of different brands of pinger under different circumstances and in different gears. Some pingers (Future Ocean and banana pingers) have higher source levels than others which would enable few pingers to be attached to gear. Some EU-funded international projects such as CIBBRiNA, MARINE BEACON and REDUCE are currently examining these in various fisheries. Trials have also been conducted in the Baltic as well as in Iceland on the PAL-CE system by Germany with variable results, and are continuing with various refinements.

Modifications to nets such as the use of reflective pearl nets that are more acoustically detectable, have been applied and tested, with further modifications made to improve their effectiveness and practical use (see, for example STELLA-2 Project).

Alternative gears such as different types of traps and fyke nets, hand lines and jigging machines have also been investigated and some show promise as they can be more selective in terms of catch. To date, most of these studies have been undertaken outside of the North Sea.

Implement a wide-scale surveillance programme to monitor trends in distribution and abundance in the Greater North Sea (MON-01)

In summer 2022, the SCANS-IV survey programme was undertaken, resulting in an abundance estimate of 350,275 (CV: 0.17; 95% CI: 246,560-494,176) harbour porpoise in the Greater North Sea Assessment Unit (revised estimate A. Gilles *pers. comm.*; Gilles *et al*. 2023).

A mini-SCANS winter survey was undertaken in the southern North Sea between January and March 2024 (Ramirez-Martinez *et al*. 2024). Coverage was 45% of the total area of the North Sea blocks surveyed in SCANS-IV, and was concentrated in the southern and central part of the North Sea and a small part of the Channel in the east. Overall abundance was 132,564 porpoises (CV: 0.195; 95% CI: 89,642-152,169).

In addition, national aerial surveys have been conducted at varying intervals (some, such as in German waters, in different seasons of the year on an annual basis; others, such as the Netherlands, at intervals of a few years). Emphasis in coverage has tended to be upon marine protected areas and offshore renewable energy installations.

Improve understanding of causes of seasonal and annual variation in abundance and distribution, particularly in relation to human activities and environmental change, to facilitate consideration of the species within marine spatial plans (RES-03)

Several analyses of seasonal and annual variation have been undertaken over the last five years. Regular surveys have indicated porpoise declines in the Sylt Outer Reef area of German waters between 2002 and 2019 (Nachtsheim *et al*. 2021) and in Danish waters in the SW Skagerrak between 2017 and 2023 (Hansen *et al*. 2025).

Seasonal variation has been observed in various sectors of the North Sea. In the eastern Channel and Dover Strait, porpoise numbers are highest between January and March as revealed consistently from surveys in Belgian waters. In the UK sector of the North Sea, numbers are also highest off South-east England between January and March, and then show a general northwards expansion between April and July, before contracting again southwards during winter. The SCANS-IV survey in summer 2022 showed highest densities in the central North Sea (Gilles *et al*., 2023) whereas in the winter SCANS survey these were highest in the southern North Sea in the first three months of 2024, although the northern sector of the North Sea was not surveyed (Ramirez-Martinez *et al*. 2025).

Further our understanding of population structure (RES-04)

Our understanding of porpoise population structure in the North Sea has advanced rather little in the last few years. Telemetry studies of animals captured in fyke nets in Danish waters of the North Sea suggested that, in the Wadden Sea, animals may be relatively sedentary, which would support some earlier genetic studies that indicated there may be population sub-structuring here. Initial tagging of animals in Dutch waters of the Wadden Sea is yet to show any clear pattern but sample sizes are very small.

In the UK, a study has been launched to use whole genomic analysis of samples from stranded porpoises to investigate further population structure (Davison & Morin 2025).

Monitoring of health and nutritional status, diet, life history parameters, and causes of mortality (MON-02)

Samples continue to be collected from fresh strandings within all of the national strandings schemes operating around the North Sea. These are used to determine cause of death, and on occasions when sufficient sample sizes have been obtained, diet and life history parameters are assessed. The latest findings are summarised by country from the national reports.

There have been no North Sea-wide analyses since IJsseldijk *et al.* (2020, 2022). The main new information provided was an analysis of long-term trends in porpoise strandings and causes of death in the UK. In East England, causes of death were examined in three different regions (Northumberland-Humber, Humber-Essex, Kent-Hampshire) (Deaville *et al*. 2025). These showed a marked reduction in bycatch as a cause of death since 2000 in the Northumberland-Humber region, a smaller reduction in the Humber-Essex region but an increase in the eastern Channel (Kent-Hampshire), peaking in 2010-14, but declining since then. Since 2015, the latter region has also seen an increase in bottlenose dolphin kills. In East Scotland, peak mortality occurs in March and April involving mainly juveniles. Necropsy findings indicated 35.5% of porpoises were the result of bottlenose dolphin attacks (declining between 1992 and 2025), followed by starvation/hypothermia (11.5%), parasitic pneumonia (8%), and bycatch (6%) (Lennon *et al.* 2025).

An analysis of porpoise strandings in Sweden from 2019-2023 compared with 2014-2018 was undertaken and showed a generally increasing trend with most strandings reported in summer, and bycatch being the main cause of death (Ulfsson *et al*., 2024).

Improve understanding of and develop mitigation for the risks of anthropogenic sound (MIT-02)

Most countries bordering the North Sea have developed regulations relating to reducing the impacts of underwater noise particularly from impulsive noise sources. All countries have been implementing MSFD through its noise descriptor 11. Several projects monitoring underwater noise and the effects of different noise sources have been undertaken, some involving the collaborative efforts of different countries. These include the SATURN project examining the effects of ship noise (Denmark), studies of the pathological effects of underwater explosions for munitions clearance (Germany), Energy Island acoustic monitoring (Denmark), ENS screening project involving soundscape mapping (Denmark), C-POD and noise stations deployed (Denmark, Sweden), and the OWEAP Project (Offshore Wind Enabling Actions Programme) (UK), setting noise limits and testing noise reduction technologies for offshore wind pile driving, and impulsive noise monitoring in the Southern North Sea SAC (2015-2020). The UK has also undertaken an evidence review of harbour porpoise disturbance ranges for impulsive noise, update mitigation guidelines for use of explosives.

The Netherlands has also continued being active in a number of projects on underwater noise, including the DEMASK Project bringing together policymakers, NGOs and the maritime industry to manage the North Sea's underwater soundscape. It aims to develop policy scenarios and methods to measure their effectiveness in reducing noise pollution and protecting marine life (Basan et al., 2024).

Ensure screening and assessment of the occurrence and effects of hazardous substances (MON-03)

Several North Sea countries are routinely monitoring the occurrents and effects of hazardous substances, with the results informing Good Environmental Status within MSFD through its contaminants descriptors 5 and 9. In the UK, Williams *et al.* (2023) have assessed trends in blubber

∑PCBs in harbour porpoises, concluding that whereas they have declined in all the UK regions assessed, levels in many cases remain above those considered of toxicological concern. Similarly, in the Netherlands, PFAS levels measured in porpoises and other marine biota are believed to be too high (van den Heuvel-Greve et al., 2021).

Monitor for potential increases in anthropogenic activities that lead to incidences of death, injury or adverse health effects (MON-04)

Several countries are collecting data on human activities although those data are not necessarily all readily available. Trends in ship traffic and possible effects on cetaceans including porpoises have been studied and analysed in a few recent peer-reviewed publications (e.g. Robbins *et al*., 2022; Pigeault *et al.,* 2024; Possenti et al., 2024). The underwater noise register held by ICES collates data from participating countries on impulsive noise sources (e.g. seismic, sonar, piling, and explosions). These data are expressed in a standardised way, for example as the number of pulse block days in which underwater noise from a particular source is emitted. Continuous noise levels are also monitored. Underwater noise sources may also be aggregated within frequency bands. Similarly, ICES collates data on fishing activities, calculating fishing effort by gear type and spatiotemporal trends are presented at regular intervals in ICES fisheries overviews by ecoregion, one of which is the Greater North Sea. Estimates of mortality from bycatch by gear type and area are calculated by ICES WGBYC and presented in annual reports (see, for example, ICES WGBYC, 2022, 2023, 2024). As noted in other sections, indicators on bycatch, contaminants, and noise have been or are being developed within the Marine Strategy Framework Directive, whilst at a regional level, OSPAR publishes Quality Status Reviews at intervals.

Monitor habitat quality, including protected sites, to ensure management is effective and that the ecological functions are maintained (MON-05)

The EU Marine Strategy Framework Directive also aims to assess Good Environmental Status through 11 descriptors. Descriptor 1 (D1): Biodiversity - includes species distribution, population status, and habitat condition for species including the harbour porpoise. Assessments fall under D1C4 and D1C5, which focus on: D1C4: Habitat for the species - ensuring the habitat's extent and condition are appropriate for maintaining the species population; and D1C5: Habitat quality - maintaining environmental conditions that support the species' health, reproduction, and behaviour. Within the EU Habitats Directive, the Natura 2000 network of protected sites include Special Areas of Conservation for harbour porpoise, where member states are expected to take appropriate site-specific conservation measures to maintain favourable conservation status that will lead to a viable population.

On the horizon are a number of pressures that could have ecosystem level impacts. The rapid development of offshore renewable energy sources for energy security and to address climate change could itself have impacts on the local climate altering atmospheric circulation. Deep sea mining may impact benthic faunas and thus affect the foraging ecology of marine mammals including porpoise. Developments in CO_2 storage and hydrogen could affect porpoises. At a more species level, the increasing trend in vessel traffic operating at ever faster speeds may lead to increased noise disturbance and threat of physical strikes, whilst the rise in recreational activities with personal watercraft poses monitoring challenges.

Background and History

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

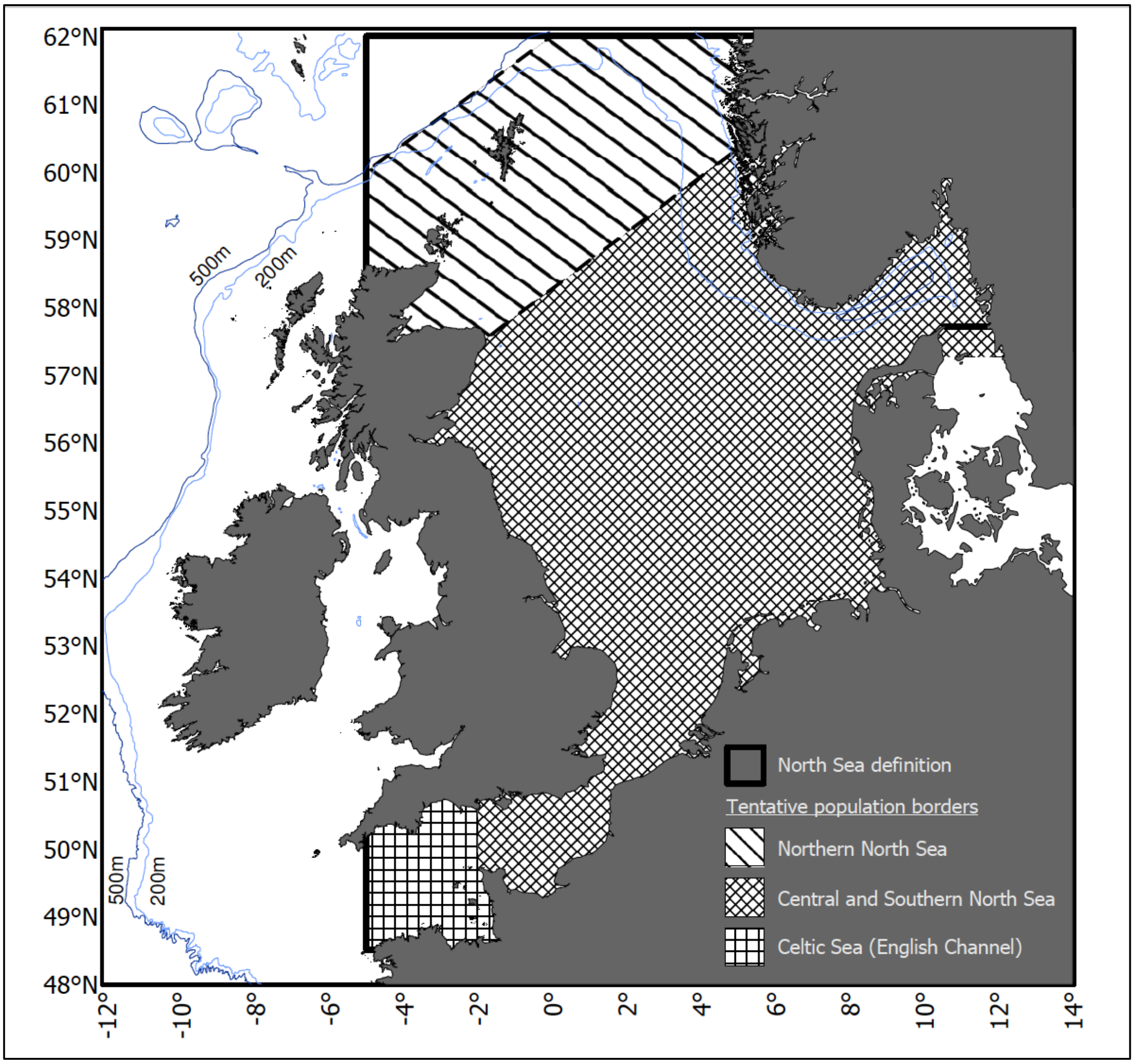


Figure 1. Area covered by the North Sea Conservation Plan (as defined at the 5th International Conference on the Protection of the North Sea in Bergen, Norway, 20 – 21 March 2002) showing the tentative harbour porpoise population borders (Source: ASCOBANS, 2009a)

Following production of a background document (Eisfeld and Koch, 2006), a conservation plan was presented at the 16th Advisory Committee meeting of ASCOBANS in Brugge, Belgium in April 2009 (ASCOBANS, 2009a) and adopted at the 6th Meeting of the Parties in Bonn, Germany in September 2009 (ASCOBANS, 2009b).

Figure 1 shows the area under consideration which included all of the North Sea, the Skagerrak, and the English Channel, with tentative population borders set.

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 North Sea 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). Actions proposed as of 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).

The North Sea Group has focused on the eight priority actions since 2011, but has also briefly reviewed progress on the remaining four actions through an Implementation Table. In 2021, Actions 9-11 were moved to high priority, whilst Action 12 remained an on-going action with both national and international outputs presented when available. The original Conservation Plan was reviewed and updated by Sinead Murphy and Eunice Pinn during 2023-24, and presented for adoption at the 10th Meeting of the Parties in Odense in September 2024.

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.

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. In January 2019, ASCOBANS again asked for Expressions of Interest to fill the role as Coordinator of the ASCOBANS harbour porpoise action plans, and Coalition Clean Baltic received the contract for the task in March 2019. Since 2020, coordination of the action plans was divided between Coalition Clean Baltic and the Sea Watch Foundation with the Jastarnia Plan coordinated by Coalition Clean Baltic and the North Sea Plan by Sea Watch Foundation.

Identify the priority bycatch issues and relevant stakeholders (RES-01)

For many years, the main regulation on bycatch affecting harbour porpoise in the North Sea has been Council Regulation (EC) 812/2004) which required at-sea observer schemes to monitor bycatch rates for vessels 15 m or over and mitigation using acoustic deterrent devices ‘pingers’ for vessels exceeding 12 m, for specific fisheries (see Action 5 for further details). EU Member States were required to submit a report to the European Commission annually, documenting how they had implemented this regulation.

Regulation (EU) 2019/1241 of the European Parliament and of the Council on the conservation of fisheries resources and the protection of marine ecosystems through technical measures (Technical Conservation Measures Regulation) came into force in June 2019, repealing Regulation 812/2004. The main elements of the Regulation are regionalised management with obligations to monitor, manage and mitigate bycatches of sensitive marine species; minimising and where possible eliminating incidental catches of those species and other negative environmental impact of fishing on marine habitats and to put in place management measures for the purposes of complying with the Habitats, Birds, Water Framework and Marine Strategy Framework Directives. The new technical measures should contribute to ensuring that bycatches of marine mammals, marine reptiles, seabirds, and other non-commercially exploited species do not exceed levels in Union legislation and international agreements. Specific provisions existing in Regulation 812/2004 concerning vessel sizes, areas and fishing gears where pingers are required or where monitoring of bycatches of cetaceans is mandatory are retained but are complemented with general and more wide-ranging obligations concerning incidental catches of all sensitive species in all areas. The technical specification of the pingers to be used has been carried over in Commission Implementing Regulation 2020/967. Triennial reports for presentation to Parliament and Council are now made from 2020 onwards. Table 1 summarises the extent of compliance from 2019-2023 in terms of report submissions from countries with EEZs within the North Sea region under consideration (ICES WGBYC, 2024). When compared with the corresponding table for 2017-20, reporting has improved greatly.

Table 1. Summary table of countries providing data submissions to ICES WGBYC with data on fishing effort, observer effort (either days at sea or other measurement, e.g. effort per haul or set), and bycatch records. Green = Data submission received with year received recorded, White = no data received (Source: ICES WGBYC, 2024).

	Fishing Effort					Monitoring Effort					Bycatch Events				
Country	**2019**	**2020**	**2021**	**2022**	**2023**	**2019**	**2020**	**2021**	**2022**	**2023**	**2019**	**2020**	**2021**	**2022**	**2023**
Belgium (BE)	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024			2022	2023	2024
Denmark (DK)	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024
France (FR)	2023	2023	2023	2023	2024	2023	2023	2023	2023	2024	2023	2023	2023	2023	2024
Germany (DE)	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024	2021		2022	2023	2024
Netherlands (NL)	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024
Norway (NO)	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024
Sweden (SE)	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024
UK (GB)	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024	2021	2021	2022	2023	2024

Data for 2024 consisted of monitoring information collected by several different methods (at-sea observers, electronic monitoring, port observers, vessel crew observers, and logbooks). Overall, there has been a temporal change in the proportions of ‘monitoring method’ data reported to WGBYC, from primarily at-sea-observers in 2017, to vessel crew observers in 2019, and to logbook data in 2021, 2022, and 2023 (ICES WGBYC, 2024). This change in monitoring methods reported is country-specific and appears in part to be linked to changes in available technologies such as electronic monitoring which was reported by Denmark, Sweden and France in 2023.

In 2024 (2023 data), most submitted data (DaS monitoring effort) was reported as logbook data followed by port-observers and at-sea-observers. Marine mammal bycatch records have come from a variety of sources over the years but are increasingly primarily coming from at-sea-observers and electronic monitoring programmes. Data from 2023 submitted through the 2024 WGBYC data call consisted of information from multiple monitoring programmes (DCF, Reg 812, DCF/Reg 812, EU-MAP, Research Programmes, and other).

In 2022 and 2023, ICES WGBYC developed a new approach, a 'Bycatch Evaluation and Assessment Matrix' (BEAM v.1) to provide improved information to underpin the various requirements of the new ICES/DGMARE agreement (ICES WGBYC, 2022; ICES WGBYC, 2023). The main objective of BEAM is to provide a systematic methodology using standardised fishing effort data, monitoring effort data, and bycatch data obtained through annual ICES data calls (stored in the WGBYC and RDB databases which are maintained by the ICES Data Centre. For the Greater North Sea, porpoise bycatch estimates were obtained for just two gear types at metier level four: trammel nets (GTR) and bottom otter trawls (OTB). Between 2017 and 2023, of 638 days at sea monitoring effort for trammel netting, 13 harbour porpoises were recorded bycaught. Overall fishing effort was calculated to be 10,554 days at sea in 2023, and the bycatch rate per unit effort was calculated at 0.0368 (95% CI: 0.0061-0.2237), yielding a total bycatch for 2023 of 389 porpoises (95% CI: 63.9-2,361.5). Over the same time period, of 4,701 days at sea monitoring effort for bottom otter trawls, one harbour porpoise was recorded bycaught. Overall fishing effort was calculated to be 110,959 days at sea in 2023, and the bycatch rate per unit effort was calculated at 0.0002 (95% CI: 0.0000-0.0015), yielding a total bycatch for 2023 of 24 porpoises (95% CI: 3.3-167.5) (ICES WGBYC, 2024).

There is still significant heterogeneity in bycatch events to be able to produce overall robust total bycatch estimates. ICES WGBYC has long stated that significant gaps remain in data collection efforts and in data resolution, that limits the Working Group's ability to provide useful assessments of the likely impacts of fishing activity across a wide range of protected species and areas. WGBYC has noted that broad-scale low level monitoring programmes may be insufficient to highlight very rare bycatch occurrences for populations at low abundance and/or low susceptibility to by-catch, but which could have significant population levels impacts.

Most countries rely on the Data Collection Framework (DCF) sampling programme to monitor marine mammal and other protected species bycatch; however, the UK has a dedicated protected species bycatch monitoring programme (PSBMP). 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 for protected species data collection under the EU-MAP that has been expressed repeatedly (ICES WGBYC 2019, 2020, 2021) following the repeal of the Reg. 812/2004 which has been replaced by Regulation EU 2019/1241 (hereafter the "technical measures regulation") on 14 August 2019.

EU 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 *All North Sea Range States (within and outside of the EU) are now submitting annual reports to ICES on fishing and sampling effort, and bycatch observations. For EU member states, these are undertaken within the DCF sampling programme under the EU-MAP, where the emphasis inevitably is upon fish bycatch. Although attempts continue to be made to pay particular attention to protected species bycatch, concerns remain that the methods used and the experience of observers may be insufficient to adequately monitor bycatch of species such as harbour porpoise. This was reflected in the reported bycatch for 2021 where >80% of porpoises bycaught were documented through the Danish scientific programme of electronic monitoring, which other countries have yet to adopt for this purpose in this ecoregion. Furthermore, sampling effort has not particularly targeted the high-risk areas and fisheries required to monitor cetacean bycatch in a robust manner, and greater attention is needed to monitor fishing effort and bycatch from small vessels (<12 m length) that currently are not adequately covered. North Sea Range States have obligations both nationally and internationally to protect species such as the harbour porpoise through commitments to OSPAR, ASCOBANS, and EU directives such as the Marine Strategy Framework Directive and the Habitats Directive. The resolutions adopted by Parties to ASCOBANS should be fully implemented.*

The section below is largely a summary of the latest published ICES fisheries overview for the Greater North Sea (ICES 2024). ICES data on fishing effort comes from VMS (Vessel Monitoring System). A separate section has been included below analysing in further detail the fishing effort by ASCOBANS Parties using AIS data, along with a comparison of the two approaches.

ICES Summaries of Fishing Effort by Country from VMS
Fishing effort in the North Sea has varied a great deal over the last 50 years, with total landings peaking in the early 1970s and declining thereafter. ICES (2024) estimate that, currently, around 7,000 fishing vessels from nine nations are active in the Greater North Sea (see Figure 3, for map of defined area) with an annual landing of about 1.6 million tonnes of fish compared with more twice that amount in the early 1970s (see Figure 4). Largest numbers of vessels come from the UK, Norway, Denmark, the Netherlands, and France.

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, 2020). Total landings fluctuated around about 2 million tonnes from 2005 to 2019 (ICES, 2024). But, since 2020, fishing effort for most countries operating in the North Sea has declined further (ICES, 2024). Confidentiality rules were introduced by STECF in relation to landings and effort tables by country resulting in ICES being unable to show these statistics since 2017.

Denmark, Norway and the United Kingdom account for a high proportion of landings (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 (ICES, 2024). Overall landings increased slightly from 2011 after a rise in herring landings and again, since 2015, from increased catches of anchovy, sardine, and hake (ICES, 2021), but have declined again since then (ICES, 2024).

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 (2021, 2024).

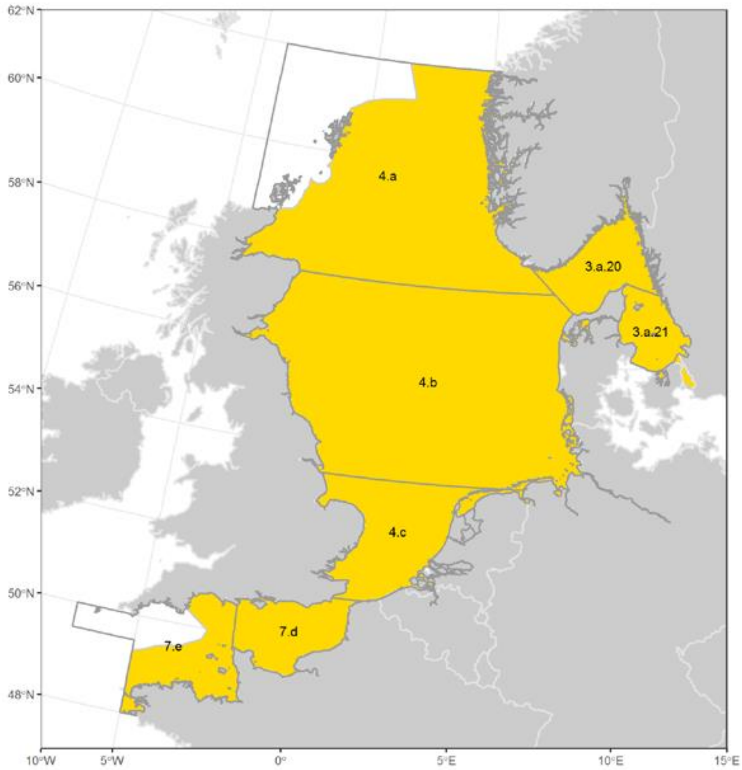


Figure 3. The Greater North Sea ecoregion (in yellow) as defined by ICES. The relevant ICES statistical areas are shown (Source: ICES 2018b)

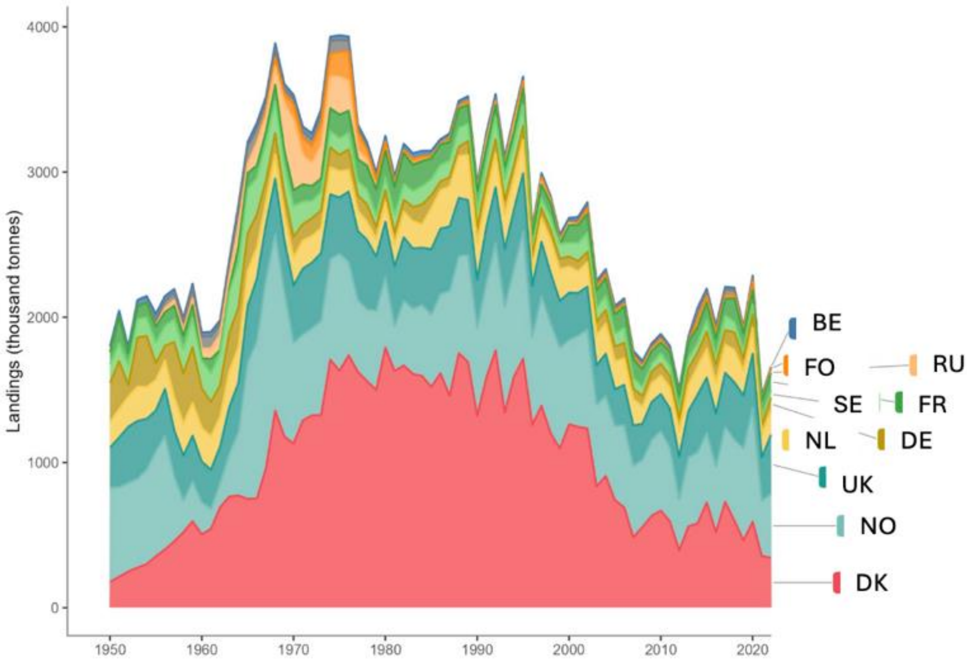


Figure 4. Landings (thousand tonnes) from the Greater North Sea in 1950–2022, by country. The nine countries having the highest landings are displayed separately and the remaining countries are aggregated and displayed as "other" (Source: ICES 2024)

In 2022 (the latest year reviewed by ICES), the **English** fleet in the Greater North Sea had 1,352 registered vessels, part of a general declining trend since 2009 particularly affecting small vessels of less than 10 m (ICES, 2024). Vessels across the fleet target a wide range of different species, with around 39% of landings over the last five years being shellfish, 35% pelagic species, and the remaining 26% demersal or benthic species.

The small vessel (< 10 m) sector is the largest part of the English North Sea fleet, with 1,110 registered vessels in 2022, down from 1 271 in 2018. The fleet uses a wide range of gears, but the most important is pots, which are used to target whelks, crabs, and lobsters.

Catches by the 10–15 m sector are almost exclusively shellfish with the major fisheries being pot fisheries for whelk, crabs, and lobsters, dredge fisheries for cockles and scallops, and trawl fisheries for Norway lobster. The number of vessels in this sector has remained relatively stable in recent years, with 183 in 2022.

Vessels between 15 and 40 m in length mostly use demersal trawls and seines to fish for demersal species, primarily gadoids and plaice. A few vessels also participate in the pot and dredge fisheries, primarily targeting crabs and scallops. The number of vessels in this sector has shown a gradual decline over recent years, with 50 registered in 2022.

The > 40 m sector comprised nine vessels in 2022: three pelagic trawlers fishing for herring, mackerel, and horse mackerel, four beam trawlers targeting plaice, and two demersal trawlers, one of which mainly fished for saithe.

The **Scottish** North Sea fleet comprises around 1,109 vessels in 2022, of which approximately 70% were < 10 m. Pelagic species (96% from pelagic trawls) made up 70% of all landings by tonnage; demersal species comprised 20% (80% from demersal trawls) and shellfish species 10% (25% using creels/pots, 41% using Norway lobster otter trawls, and 31% using dredges). Main target species include mixed gadoids (cod, haddock, whiting, saithe, and hake), anglerfish, megrim, herring, mackerel, Norway lobster, scallops, and various crab species.

In 2022, 76 demersal trawlers (> 10 m) fished for mixed gadoids (cod, haddock, whiting, saithe, and hake) and benthic species such as anglerfish and megrim. Since 2012, there has been a reduction in vessel numbers of 30%. Fishing grounds are focused mostly on the northern North Sea.

A fleet of 156 trawlers fished mainly for Norway lobster in the North Sea using otter trawls, the number of vessels fluctuating by up to 23% since 2012 but without any clear trend. In 2022, 37 of these vessels (< 10 m) operated on the inshore grounds, while 119 (> 10 m) operated over various offshore grounds.

Pot or creel fishing was conducted by 577 vessels in 2022 (mostly < 10 m) targeting lobsters and various crab species on harder inshore grounds. Vessel numbers have decreased by 12% since 2019.

Scallop fishing was carried out by around 60 dredgers (mostly > 10 m) focused mostly on the east coast of Scotland and northern England but also in the Channel. The number of vessels in this fleet has decreased by 21% since 2017.

Limited longlining and gillnetting activities were conducted by 176 Scottish vessels in 2022. The number of vessels in this fleet has increased by 45% since 2012. Of the vessels fishing in 2022, 41 operated along the shelf edge targeting benthic/demersal species such as anglerfish, hake, and ling. Meanwhile, 135 vessels (< 10 m) targeted pelagic species (mostly mackerel) in inshore areas.

Substantial catches of pelagic species (mackerel and herring) were taken by 22 large vessels (21 of which are ≥ 40 m), primarily using pelagic trawls. Vessel numbers have been relatively stable since 2012.

The **French** commercial fleet in the North Sea during 2023 comprises 1,357 active vessels, although the number has decreased from 1,796 vessels in 2010. The small vessel (< 12 m) sector is the largest part of the fleet, with 963 active vessels using a wide range of gears such as pots, which are used to target whelks, crabs, and lobsters. Dredge fisheries for king scallops are also important for this sector. Gill and trammel nets are also used to catch sole, plaice, lesser spotted dogfish, and starry smooth-hound. Catches by the 12–24 m sector (332 vessels) mostly target sole and vessel using demersal trawls and seines to fish for demersal species such as lesser-spotted dogfish, thornback ray, plaice, sole, squids, and horse mackerel. Vessels 24–40 m in length (52 vessels) mostly use demersal trawls and seines to fish for demersal species such as squids, whiting, and plaice but also mackerel and herring. The > 40 m sector comprised 10 vessels in 2023, demersal trawlers mainly fishing for saithe, and pelagic trawlers fishing for herring or mackerel.

The **Belgian** fishing fleet is composed of 59 active vessels in 2023, 58 of which were active in the North Sea. The number of vessels has been gradually decreasing since 2014 when there were 76 active vessels. The fleet consists primarily of beam trawlers (43 vessels), most of which are large (> 24 m 27 vessels), followed by medium-sized (12–24 m, 16 vessels). The remainder of the fleet consists of demersal trawlers and seines (> 24 m, seven vessels; 18–24 m, seven vessels), and one vessel using fixed nets. The most important target species by weight are plaice, cuttlefish, sole, cod, tub gurnard, squid, Norway lobster, scallops, haddock, and lesser-spotted dogfish.

The beam-trawl fleet has experienced notable changes over the past decade, with a steep decline in the quantity of plaice and sole landed, whilst cuttlefish have become the most important species in terms of weight for this fleet.

Total landings of the Belgian fleet in the North Sea ecoregion have decreased by more than 50% since 2016, concurrent with a 34% decrease in fishing effort, with larger vessels reallocating to the Celtic Seas.

The **Dutch** fleet in the Greater North Sea comprises around 600 vessels, landing mainly blue whiting, herring, mackerel, plaice, sole and brown shrimp. Large beam trawlers (> 24 m, 35 vessels) mainly target sole and plaice with fishing effort concentrated in the southern and central North Sea, although effort and landings have both declined in recent years. Small beam trawlers (< 24 m, known as "eurocutters"; 180 vessels) operate mainly in the southern and central North Sea targeting brown shrimp and seasonally switch to sole and plaice. The brown shrimp fishery takes place particularly close to the coast, with decreased landings in recent years.

Pelagic (freezer) trawlers (> 40 m, eight vessels) target herring, mackerel, and horse mackerel, with fishing effort mainly in the eastern English Channel and northern North Sea, where herring is the main target species.

Demersal mobile gears (24–40 m, 40 vessels, of which around 20 use flyshoot gear [also known as Scottish seine]). The number of such vessels has increased since 2010; they operate in the central and southern North Sea in summer but often move to the English Channel in autumn and winter. Demersal fish such as gurnards and striped red mullet as well as mackerel, squid and cuttlefish, are mainly targeted. Around 20 vessels use bottom otter boards and target flatfish such as plaice and seasonally target Norway lobster in the southern and central North Sea. In recent years there has been a substantial increase in squid landings by this fleet in winter.

Small-scale and coastal fleet vessels (< 12 m; 223 vessels) mainly target sea bass and sole using gillnets. Many are semi-commercial operations, fishing only seasonally and representing a very small share of landings.

The **German** North Sea fishing fleet comprises around 190 vessels. Small beam trawlers of 12–24 m length constitute the largest fleet component (146 vessels in 2023) almost exclusively targeting brown shrimp in the southern North Sea (Wadden Sea area). In addition, some medium- and large-sized beam trawlers (three vessels, 24–40 m length; three vessels > 40 m length) target demersal fish such as sole and plaice, and farm and harvest mussels. Few otter trawlers (18–24 m length) target Norway lobster and plaice in the North Sea. Medium-sized otter trawlers (nine vessels, 24–40 m length) mainly target saithe in the northern North Sea but also catch plaice, cod, hake, and haddock. Five large (> 40 m length) pelagic trawlers primarily target herring, but also catch mackerel, sprat, and sandeel.

With the exception of the large pelagic trawlers, the number of vessels has declined in all fleets in the German North Sea fishery over the last decade. The greatest declines have been in the number of smaller beam trawlers (12–18 m length) and demersal otter trawlers (18–24 m length).

The **Danish** fleet had about 800 active vessels primarily operating in the Greater North Sea in 2023. Over the last decade, the size of the fleet has decreased substantially in number. Most vessels are small (< 12 m, 529 vessels), followed by medium-sized (12–24 m, 225 vessels), and large vessels (> 24 m, 51 vessels). The largest vessels use only active gears, with passive gears used predominantly by smaller vessels. Three-quarters of the total landings comprised sandeel, sprat, herring, and Norway pout.

The main fisheries include catches of sandeel, sprat and Norway pout for production of fishmeal and oil, using predominantly small-meshed trawls. All three species are taken mainly by the larger vessels. Fisheries for herring and mackerel are almost entirely taken by the largest vessels with pelagic gears.

Demersal fisheries with mobile gears target species like cod, plaice, saithe, and anglerfish using predominantly bottom trawls with some seine activity. Some demersal fisheries, especially in the Skagerrak and Kattegat, also target Norway lobster. Demersal fisheries with static gears, mainly set-nets with mesh size determined by the target species, take largely plaice, cod, turbot, sole, and hake. Bottom trawls target northern shrimp.

The **Swedish** fleet in the Greater North Sea in 2023 comprised more than 400 vessels. Most vessels operate in the Skagerrak and Kattegat, but a few also fish in the North Sea. Within the fleet, 324 vessels are small (<12 m), 84 are between 12-40 m length, and six are longer than 40 m.

The pelagic fishery comprises mostly large vessels (> 40 m) operating pelagic and sandeel trawls and operates almost exclusively within the North Sea (99% in 2023). In the last 10 years, the number of vessels has decreased from 25 to 12. The main landed species in terms of quantity are sandeel, herring, sprat, and mackerel.

The fishery for northern shrimp in Skagerrak, Kattegat, and North Sea comprises mostly medium-sized vessels (12–40 m) operating shrimp trawls with a grid, and with or without a fish tunnel. In the last 10 years the number of vessels has decreased from 62 to 52. The majority (80%) of the landings of this fleet in 2023 come from Skagerrak.

The bottom-trawl fishery targeting Norway lobster and fish in Skagerrak and Kattegat comprises mostly medium-sized vessels (12–40 m) operating bottom trawls. Around 115 vessels fish in this sector, and the number of vessels has been relatively stable in the last 10 years. Around 77% of the landings of this fleet in 2023 came from the Skagerrak. The main landed species in terms of quantities are Norway lobster, cod, haddock, and saithe.

The bottom-trawl fishery targeting fish in the North Sea comprises only medium-sized vessels (12–40 m) operating mostly fish trawls with mesh sizes larger than 120 mm. In the last 10 years, the number of vessels has decreased from nine to five. The main landed species in terms of quantity are saithe, cod, anglerfish, and haddock.

The fleet using mainly passive gears consists of around 300 vessels (mostly small-sized vessels < 12 m). Most of these use pots to target Norway lobster, lobster, and edible crab, while others use gillnets and lines to target both demersal and pelagic species. The Swedish passive gear fisheries are almost exclusively located in the Skagerrak and Kattegat.

The **Norwegian** fleet in 2023 comprised 1,190 active vessels, of which 931 were < 11 m, 130 were 11–15 m, 34 were 15–28 m, and 95 were > 28 m. The number of vessels with licences has been fairly stable over the last decade. Pelagic (herring and mackerel), industrial (Norway pout, blue whiting, greater argentine, and sandeel), and saithe are the dominant species landed in terms of volume. The number of vessels has been relatively stable in the past decade.

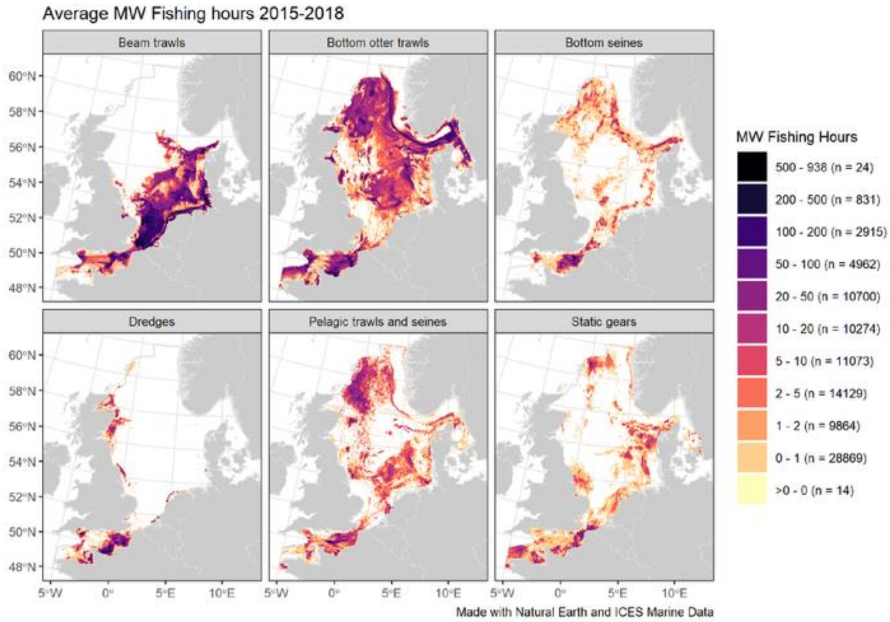
The pelagic fishery for mackerel and herring with purse-seine and trawl, consists of vessels > 15 m. Most vessels are allowed to use both gears. 35 vessels had purse-seine licences in 2023. The industrial fishery operates small-mesh trawls catching Norway pout, blue whiting and greater argentine in a mixed fishery, while a sandeel fishery is conducted separately. A northern shrimp trawl fishery takes place in Skagerrak only, with landings showing a declining trend in recent years. About 15 large vessels have licences although vessels of all sizes take part here. There is a small-scale fishery involving mainly coastal vessels < 11 m using gillnets and pots. These vessels fish on crabs, lobster, Norway lobster and various fish (including cleaner-fish for aquaculture using pots). Large vessels are used in the demersal trawl fishery, mainly for saithe and cod. The gillnet fishery, involving vessels of all sizes, targets saithe and cod.

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

The spatial distribution of different fishing gear from vessels (>12m length) using VMS, varies (Figure 5). Static gear is used most frequently in shallower areas of the southern North Sea, the eastern English Channel, in the Skagerrak, and in the waters east of Shetland. Bottom trawls are used throughout the North Sea, with lower use in the southern North Sea where beam trawls are most commonly used. Pelagic trawls and seines are used throughout most parts of the North Sea, except in the eastern portion of the central North Sea. The small-meshed (<32 mm codend) pelagic trawl fishery targets sandeel, Norway pout, sprat, and blue whiting for reduction purposes. The pelagic trawl fishery for human consumption is operated by refrigerated seawater trawlers (>40 m) and freezer trawlers (>60 m) and targets herring, mackerel, and horse mackerel. Some blue whiting is taken by these vessels in the northern North Sea.

A comparison between fishing effort (measured by VMS) for the period 2015-18 (ICES, 2019) with the latest period available, 2018-2021 (ICES, 2022) shows broadly the same areas used by the different fisheries but with an overall reduction in effort across most gear types, in some areas particularly for static gears, bottom otter trawls and bottom seines (Figure 5).

a)



b)

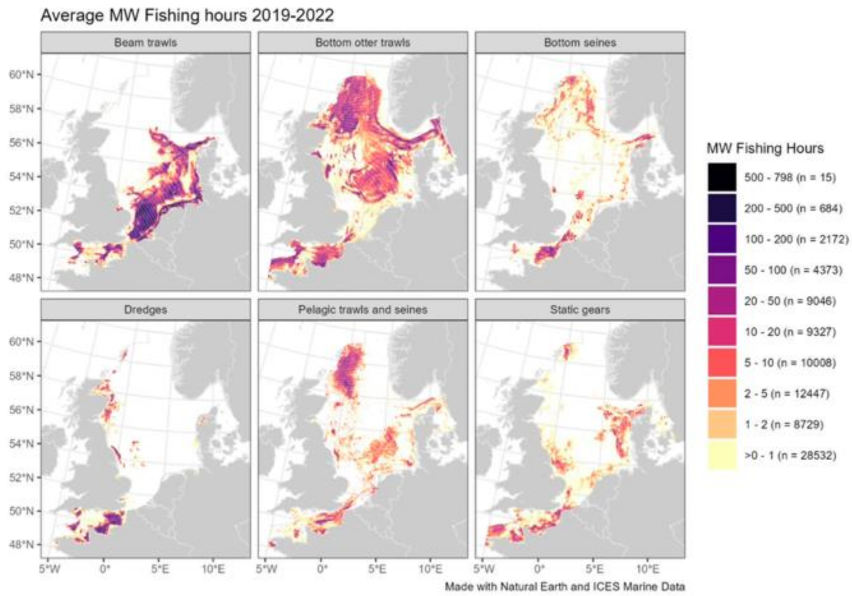


Figure 5. Spatial distribution of average annual fishing effort (MW fishing hours) in the Greater North Sea during a) 2015–18 and b) 2019-22, by gear type. Fishing effort data are only shown for vessels >12 m having vessel monitoring systems (VMS) (Source: ICES, 2022, 2024)

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. Total fishing effort using static gear in the North Sea appears to have remained rather constant for the 2015-2023, for which data have been published (Figure 6). Small and medium-sized boats using static gear target flatfish and demersal fish, depending on the gear used. Only otter trawls and seines have shown an increase in fishing effort over the same period.

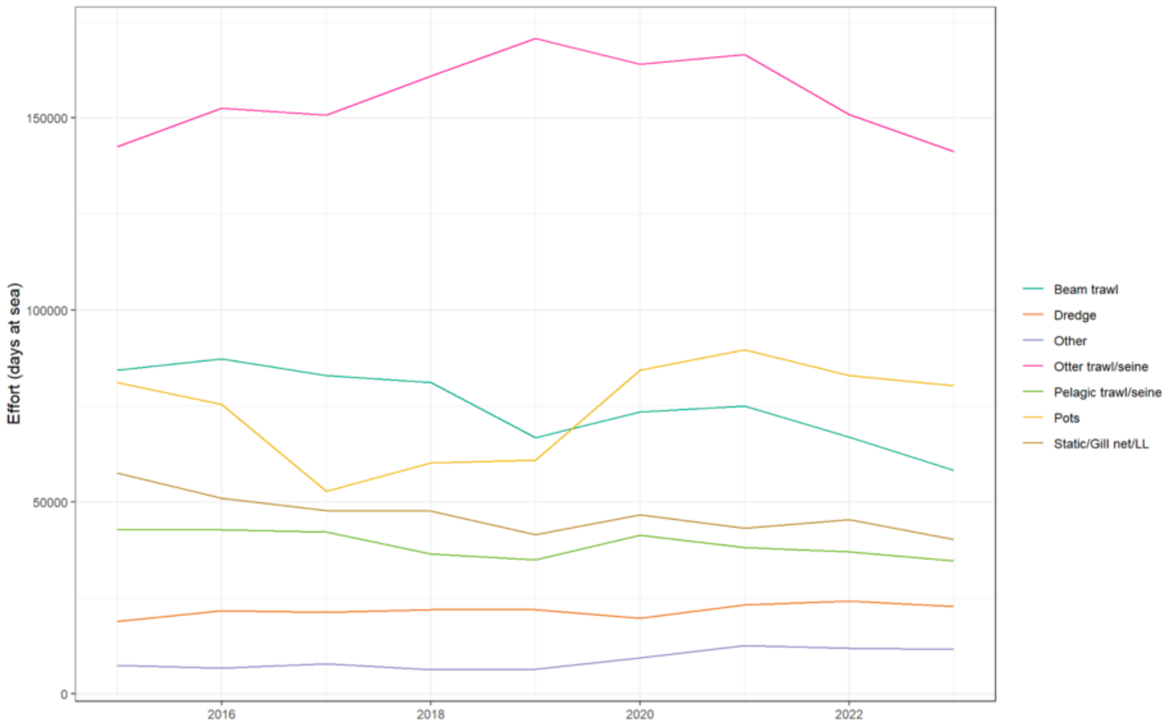


Figure 6. Greater North Sea fishing effort (in days at sea) in 2015–2023, by gear type (LL = longlines). (Source: ICES, 2024)

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

Fishing vessels less than 12 m length are not required to carry VMS, making monitoring of their effort not possible. As fishing fleets increasingly move to smaller vessels, this has resulted in a significant portion of some fleets being unmonitored. In the UK, recently, iVMS (inshore VMS) has been trialled successfully on segments of the inshore English fishing fleet and were due to become mandatory throughout England & Wales in 2024; however, this has been delayed until 2025. Non-UK vessels under 12 m length fishing in English or Welsh waters will also be required to carry iVMS.

In the same way as with normal VMS, iVMS records the location, speed and heading of a vessel using a secure, tamper-resistant system on board. Using a secure line, in England it sends this information to the Marine Management Organisation's UK VMS Hub, using GPRS mobile telephone technology. When a device is located outside GPRS range, the device will continue to store the positional information and submit the data once GPRS coverage next becomes available. This is different to the VMS devices used by larger vessels, which transmit data via satellite and can become expensive.

Once the iVMS device is fitted, it works automatically when powered, meaning that fishers do not have to spend time turning it on and setting it up each time they put to sea. Two device types have been approved – Fulcrum NEMO and Succorfish SC2, however, the latter announced in September 2025 that Succorfish (supplier of SC2 devices) was no longer forwarding I-VMS data to the UK VMS Hub. Discussions are in place to resolve this. EMFF funding support for fishers In England has been provided to secure a suitable I-VMS device; the device is available for free to Welsh fishers.

Further Analysis of Fishing Effort Using AIS

Fishing vessels over 12 metres overall length within the European Union are legally required to carry a vessel monitoring system (VMS), a form of satellite tracking which transmits the vessel's identity, position, course and speed at least every two hours. There are reciprocal agreements with non-EU countries, such as Norway and Faroes as well as Regional Fisheries Management Organisations. When linked to the vessel's log book, these provide important information not only on fishing effort but also the gear used and catches. During transmission, the VMS information is encrypted so that confidentiality is maintained with data transfer certified. Flag states control and protect the data, deciding when and with whom to share it.

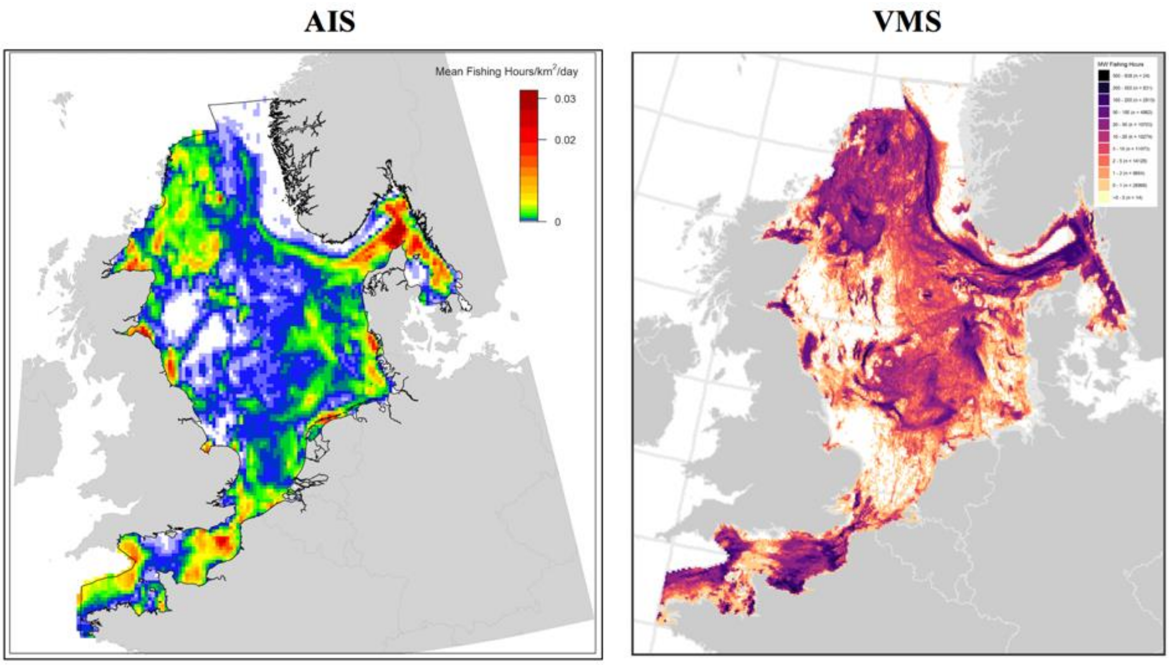
Automatic Identification Systems (AIS), another form of vessel tracking, was introduced by the International Maritime Organisation (IMO) to improve maritime safety and avoid ship collisions in the 1990s. AIS is a very high frequency (VHF) radio-based tool which automatically transfers information about the ship to other ships and coastal authorities. More recently, it has been identified as a useful tool to contribute to fisheries research and enforcement efforts since the data are publicly available. In 2014, all fishing vessels above 15 metres overall length within the European Union were required to carry AIS. In addition, an increasing number of fishing vessels (including those of 10-15m length) use AIS voluntarily as an aid to navigation, and as an operational and safety tool.

AIS was initially designed to communicate with vessels in line of sight which therefore limited coverage from land-based receivers. Since 2018, however, AIS receivers have been placed on low-earth orbit satellites. This has greatly increased coverage and means that AIS signals can be detected from vessels operating beyond the 40nm range of land-based AIS receivers. Global Fishing Watch have used two core machine learning algorithms, one to identify vessels and the other to determine fishing activity.

Using AIS data provided by Global Fishing Watch, maps were prepared of fishing effort for ten gear type groupings (pelagic trawls, pelagic seines, demersal trawls, demersal seines, driftnets, static gillnets, trammel nets, set longlines, drifting longlines, pots & traps) for the Atlantic area from southern Norway to Portugal including all of the Greater North Sea covering the years 2015 to 2018 (Evans *et al.,* 2021). A comparison with VMS maps produced by ICES, was made for the same period for the Greater North Sea), and shows good correspondence in terms of relative levels of fishing effort (Figure 7). AIS maps of fishing effort by gear type were then prepared by season, by year (2015-18), and by country. Full details are provided in Evans *et al.* (2021).

Figure 8 presents maps of overall mean fishing effort by country, bearing in mind that for the most part this includes vessels exceeding 15 metres length and small vessels will be greatly under-represented. Summarising the results, they indicate most fishing effort from **Swedish** vessels is restricted to the Skagerrak but there is some effort particularly pelagic seining in the central North Sea. **Denmark** also fishes heavily in the Skagerrak but with a lot of trawling and some gillnetting in the North Sea west of Denmark. Gillnetting by **German** vessels is concentrated relatively close to the coast not only in German waters but also NW of Denmark. Demersal trawling is widespread in the North Sea whilst pelagic trawling is mainly in the northern North Sea. **Dutch** demersal trawling and seining occur all along the southern North Sea coasts and in the Channel. Pelagic trawling is concentrated in the Channel and the northern North Sea. There is very little gillnetting by Dutch vessels of >15 m length. The **Belgian** fleet involves mainly demersal trawling and seining in the Channel but with some effort also in the central North Sea. Demersal trawling and seining by **French** vessels occurs in French, English and Belgian waters of the Channel**,** with gillnetting in coastal areas of France and Belgium. Both trawling and seining by **UK** vessels are concentrated particularly in the north-western North Sea although there is some demersal trawling and seining in the central North Sea and the Channel. Gillnetting is concentrated around the coasts of southern and South-east England.

a) Bottom Otter trawls



b) Demersal Seines

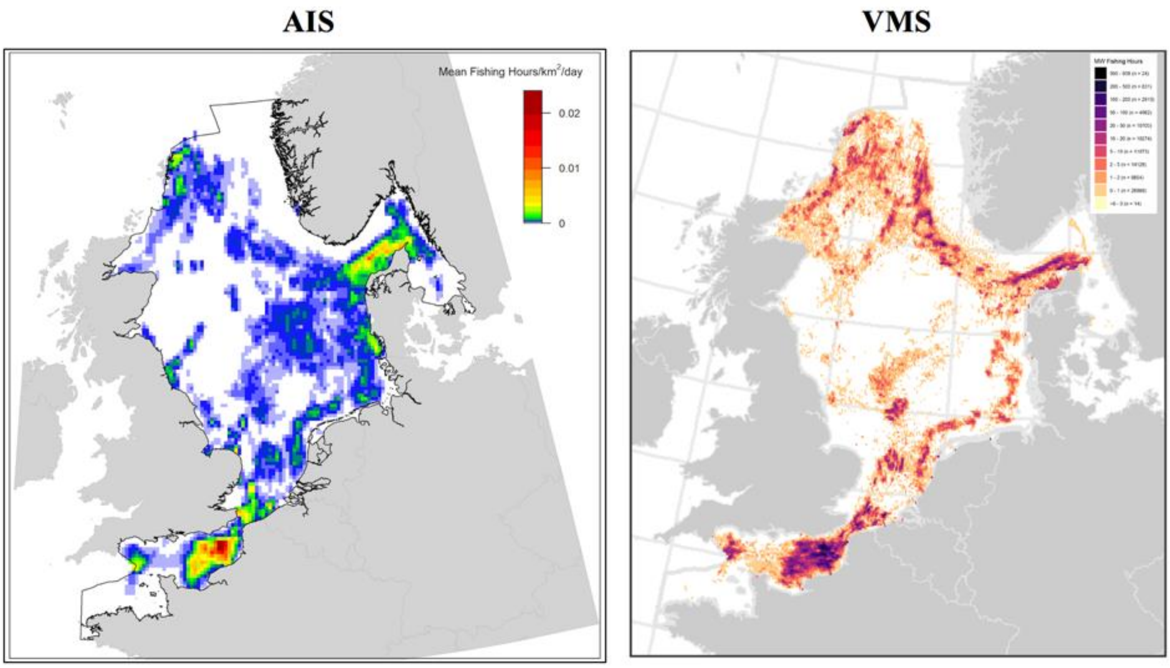
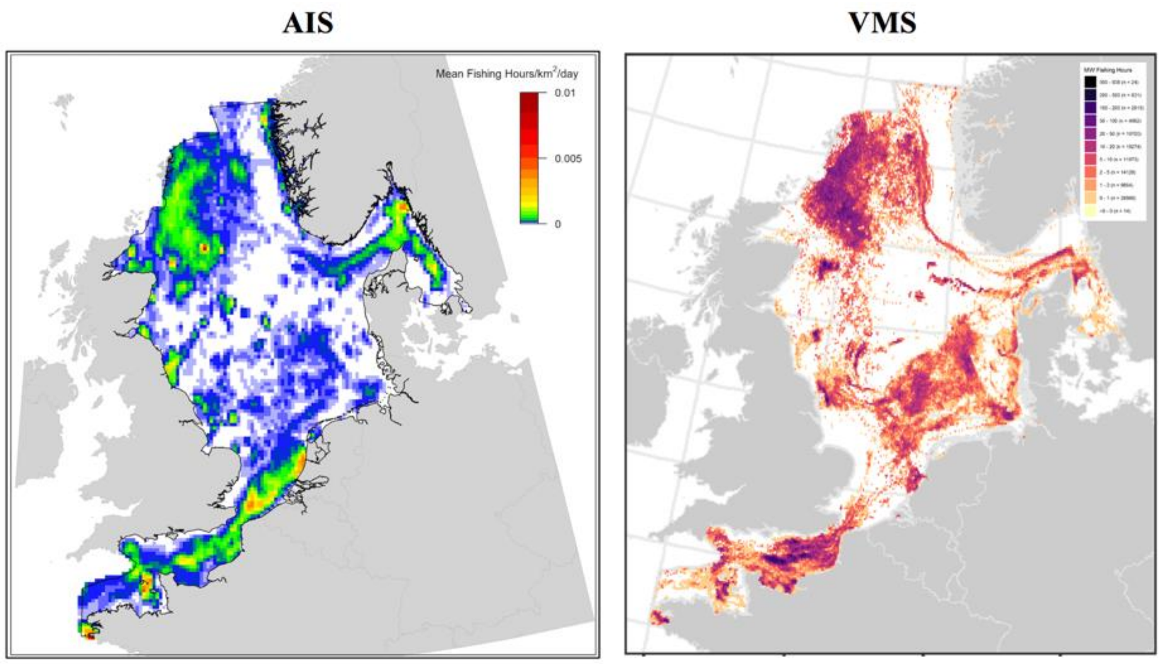


Figure 7. Comparison of Fishing Effort determined by AIS vs VMS (mean fishing hours, 2015-18)

c) Pelagic Trawls & Seines



d) Static Gear

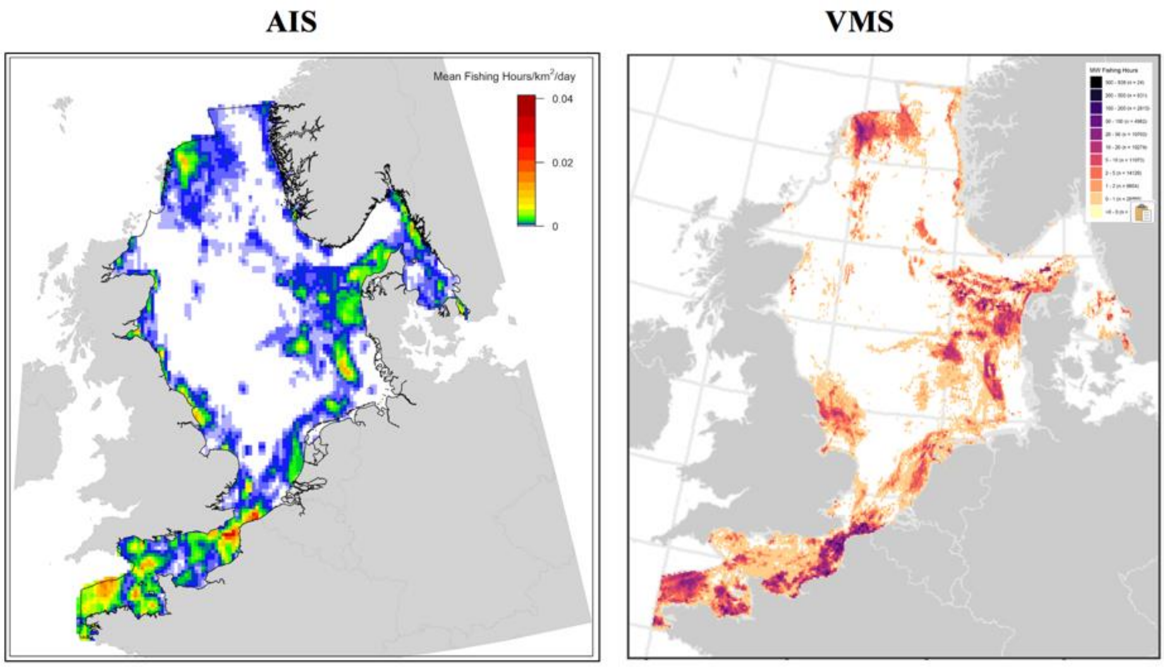


Figure 7 (cont.). Comparison of Fishing Effort determined by AIS vs VMS
(mean fishing hours, 2015-18)

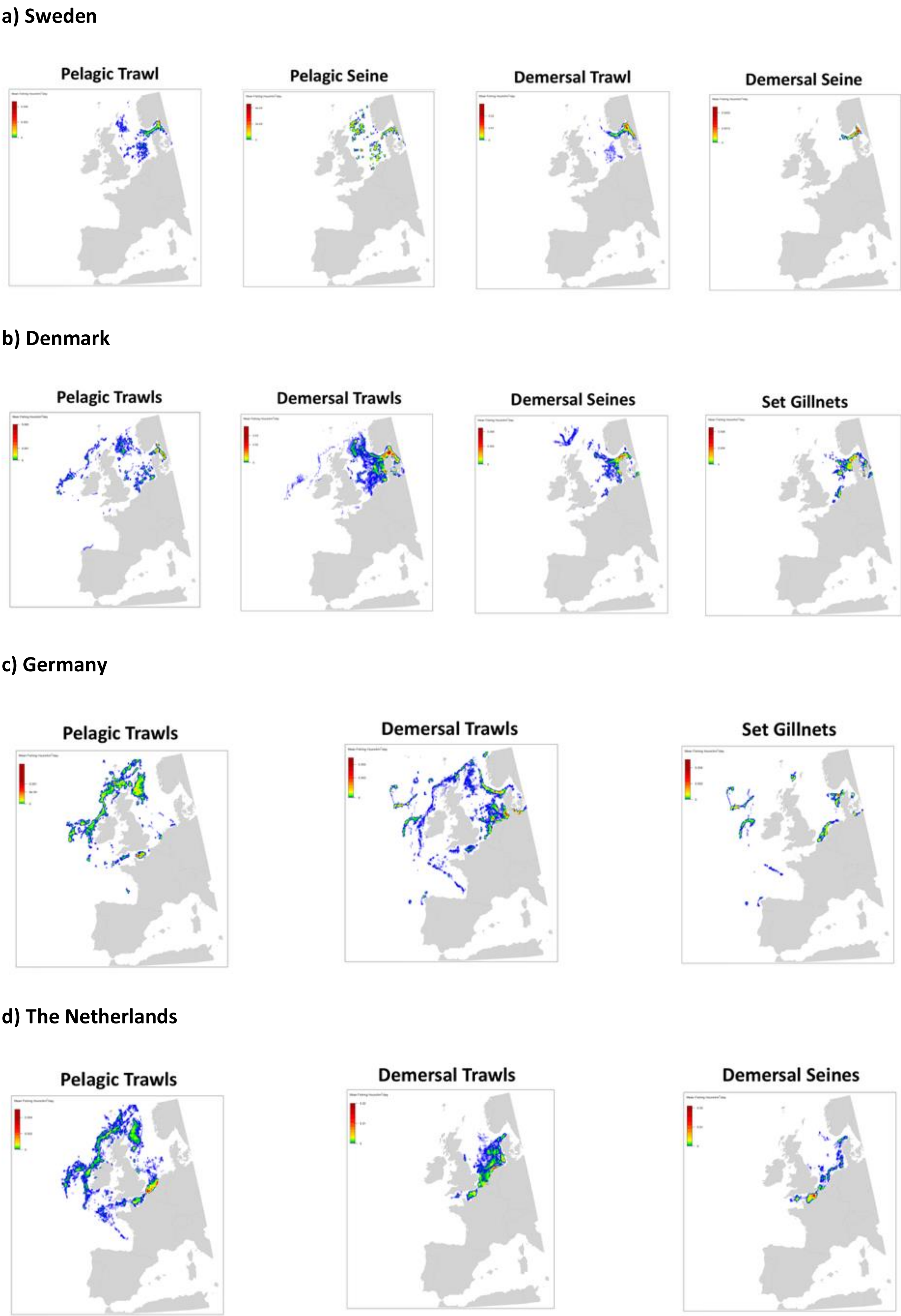
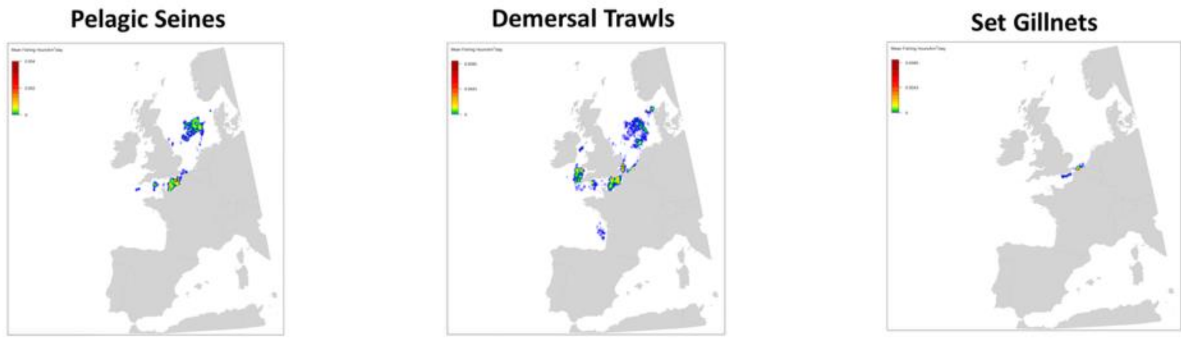
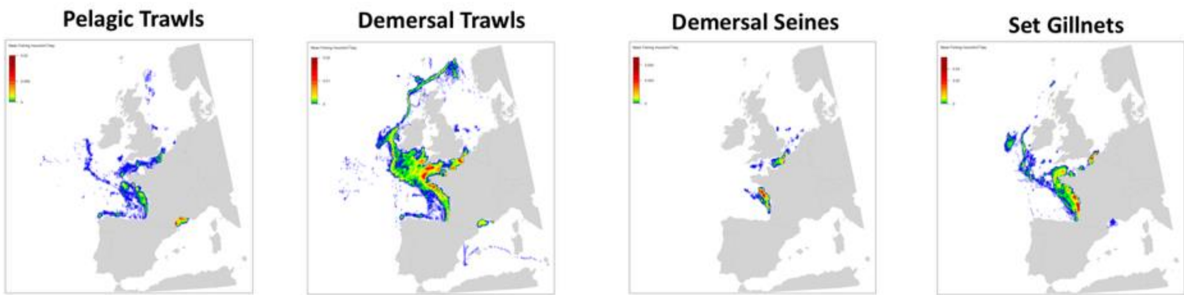


Figure 8. Fishing Effort (mean fishing hours/km2/day)
by Gear Type and by Country, 2015-18

e) Belgium



f) France



g) UK

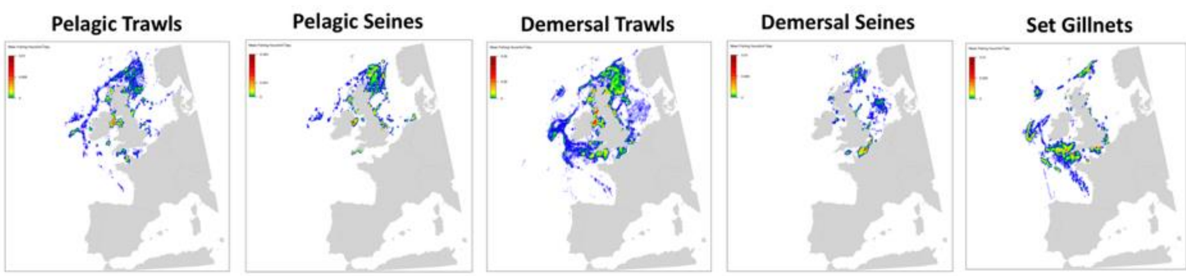


Figure 8 (cont.). Fishing Effort (mean fishing hours/km2/day)
by Gear Type and by Country, 2015-18

Improve estimates of bycatch rates to support development of conservation strategy (RES-02)

In the past, a detailed review of the implementation of Reg. 812/2004, and assessment of the bycatch issue has been undertaken annually by the ICES Working Group on Bycatch of Protected Species (see, for example, ICES WGBYC 2016, 2017, 2018, 2019). With the repeal of Reg 812/2004, this is now undertaken by ICES WGBYC within the Data Collection Framework (DCF) (ICES WGBYC 2020, 2021, 2022, 2023, 2024).

Within the annual ICES data calls, WGBYC last made an overall bycatch estimate for the Greater North Sea of between 1,175 and 2,126 porpoises for the year 2017 (ICES WGBYC, 2019).

In September 2021, an ICES workshop took place by correspondence to estimate mortality of marine mammals due to bycatch (ICES WKMOMA, 2021). Data from 2015-2020 were examined (although no data were provided from Norway). As shown previously, gillnets generally had the highest bycatch rates of harbour porpoises, with the highest frequencies being recorded in large vessels using GNS in the Greater North Sea (ICES areas 27.3 and 27.4). However, there was non-random sampling with one country selecting several large vessels with high bycatch rates to participate in an REM trial, and this formed a very high proportion of the observed effort. Without that country, the rates were much lower for ICES Subarea 27.4. Small vessels using GNS also had relatively high rates in subareas 27.4 and in 27.3.

The average number of porpoises/bycatch event over 2015-2020 was generally between 1 and 1.5 individuals in most métiers and areas, apart from large vessels using GNS in ICES Subarea 27.4 where 2.5 individuals were observed on average per bycatch event if the non-random sampling observer effort is included. Removing the non-random sampling lowers that estimate down to 1.33 individuals/bycatch event.

In the North Sea, two estimates were presented, one higher estimate including submitted data from all countries (except Norway), but heavily skewed due to very frequent bycatch observations from a few targeted large vessels, and one estimate where the monitoring effort data from this country was removed. The two estimates for the North Sea were 5,929 (95% CI 3,176-10,739) porpoises and 1,627 (95% CI 922-3,325; not including the unrepresentative data) porpoises. The majority of the by-catch was estimated to be from GNS/GND in both cases (1,306/5,327 individuals), followed by GTR (198/479 individuals) and to lesser extent from OTB/OTT (123/123 individuals).

The assessments were subject to various potential biases: 1) they did not include data from all fleets fishing within the Greater North Sea, with data from vessels <12m length almost certainly under-represented, and fishing effort from Norway and the Faroes not included; 2) fishing effort was only poorly represented by the metric, days at sea, information on area swept for trawls and soak time and net length for gillnets being lacking; and 3) sampling of vessels for bycatch monitoring was non-representative (of both fishing effort across metiers and the density distribution of the porpoise population), and where monitoring does take place, it is usually DCF monitoring which has already been shown to under-record cetacean bycatch. The extent of bias from these sources is unknown.

Since then, OSPAR's Marine Mammal Expert Group has estimated harbour porpoise annual bycatch levels in the Greater North Sea for 2020 at 5,974 porpoises (OSPAR, 2023).

Below is a summary of monitoring effort by country, unless otherwise stated, taken from ICES WGBYC (2022) since national reports are no longer submitted to WGBYC on an annual basis. It is hoped that that individual countries will update the relevant sections with new national information.

United Kingdom has a dedicated protected species bycatch monitoring programme (PSBMP), originally established for the purposes of meeting requirements of Reg. 812/2004 and the EU Habitats Directive.

In 2018, 172 dedicated bycatch monitoring days were conducted during 150 trips on board static net vessels and 129 dedicated bycatch monitoring days during 36 trips on pelagic trawlers. A further 25 dedicated bycatch monitoring days were achieved in longline fisheries and 13 dedicated days in ring net fisheries. Over 100 days of non-dedicated sampling in static net fisheries was also conducted under other English, Welsh and Northern Irish fishery monitoring programmes, and roughly 600 days of non-dedicated sampling was undertaken under those same programmes mainly in a variety of demersal trawl fisheries. Observations of cetacean bycatch from all sampling (dedicated & non-dedicated) included one harbour porpoise reported from the southern North Sea (Division 4c), reported during dedicated monitoring in static net gears (large mesh tangle net) (Northridge *et al*., 2019).

In 2019, 173 dedicated bycatch monitoring days were conducted during 116 trips on board static net vessels and 5 dedicated bycatch monitoring days during 5 trips on pelagic trawlers. A further 23 dedicated bycatch monitoring days were achieved in longline fisheries and 14 dedicated days in ring net fisheries (Kingston et al., 2021). However, there was little monitoring in the North Sea, with only two days at sea on gillnetters, all in SubArea 4c, two days at sea on longliners in SubArea 4a, and one day at sea on longliners in SubArea 4c. No porpoises were recorded bycaught. (Kingston *et al*., 2021).

To estimate total bycatch in the UK static net fleet, key assumptions were made in the treatment of the underlying fishing effort and observed monitoring data. Therefore, bycatch estimates are likely biased, and may underestimate bycatch for larger offshore vessels and overestimate for smaller inshore vessels. However, with this caveat in mind, the “best” estimate of harbour porpoise bycatch for 2018 in all UK gillnet fisheries in the absence of pingers was between 845 and 1,633 animals (best estimate 1,150; CV=0.087), and if all over 12 m boats used pingers in relevant areas, the estimate was between 660 and 1,464 animals (best estimate 948 CV=0.108) (Northridge *et al*., 2019). The equivalent figures in 2017 in the absence of pingers was 1,282 animals (range:718 - 2402; CV=0.08), and if all over 12 m boats used pingers in relevant areas the estimate was 1,098 animals (range: 587-2615; CV=0.10) (Northridge *et al*., 2018).

The point estimate for harbour porpoise bycatch in 2019, assuming full compliance by the over 12m fleet with the ADD requirements of Regulations 812/2004 and 2019/1241 (both of which applied during 2019), was 833 (95% CL range 502-1560), and the point estimate assuming no ADD use is 1061 (95% CL range 599-1922) (Kingston *et al*., 2021). This suggests that full ADD compliance in 2019 would have reduced total mortality in UK net fisheries by in the region of 228 harbour porpoises. The largest metier specific reduction (185 to 25 porpoises per year) associated with ADD use is seen in the Gill Hake metier which mostly involves vessels over 12m operating in areas where ADDs are required. The potential reduction associated with fully compliant ADD use under the regulations applying in 2019 was 22% of total estimated mortality.

The collaborative Cetacean Strandings Investigation Programme (CSIP) in the United Kingdom is a consortium of partner organizations (Zoological Society of London, Scottish Rural University College (Inverness), the London Natural History Museum and Marine Environmental Monitoring in Wales) funded by Defra and the UK Devolved Governments of Scotland and Wales. The CSIP is collectively tasked with recording information on all cetaceans, marine turtles and basking sharks that strand around UK shores each year and with the routine investigation of causes of mortality through necropsy of suitable strandings. Harbour porpoises are the most commonly discovered species, as stranding levels were close to 400 carcasses both in 2019 and 2020. A few dozen animals were examined, and the proportion of bycaught porpoises was below 7%. Unfortunately, the numbers stranding or % bycaught in the Greater North Sea have not been differentiated from the rest of the UK.

In **France,** the programme OBSMER manages all the observations at sea as required by various fishery regulations. During 2017, a total of 701 fishing trips and 855 days at sea were monitored by observers. A total of 197 trips and 158 days at sea were dedicated to set nets in areas requiring pingers under the Regulation (Subareas 4 and 7). A total of eight harbour porpoises were recorded bycaught in 2017, however none within the North Sea region: three in towed gears in Divisions 27.8b, 27.7g and 27.8a, and five in trammel nets in 27.8a and b. The low coverage of metiers (1.5% for towed gears and <1% for static gears) by at sea observers did not allow production of estimates of total cetacean bycatch (ICES WGBYC 2019). During 2018, a total of 867 fishing trips and 1,991 days at sea were monitored by observers. For towed gears in subareas 7 and 8 and in the Mediterranean**,** the sampling covered 206 fishing trips (115 in the Mediterranean and 91 in subareas 7 and 8), representing 254 days at sea. For passive gear in ICES subarea 8, the sampling covered 274 fishing trips, representing 321 days at sea. In addition, for set nets, there were 176 fishing trips, representing 180 days at sea, in the areas covered by pingers (subareas 4 and 7**).** Incidental catches of cetaceans across all the samples taken at sea during 2018 totalled two harbour porpoises. Since then, there has been improved monitoring effort in the Bay of Biscay mainly to investigate common dolphin bycatch. However, dedicated bycatch monitoring of French vessels in the Greater North Sea (i.e. the Channel) has not been undertaken, and no porpoise bycatch has been reported. OBSCAMe is a French scientific programme based on REM observations, coordinated by the French biodiversity agency (OFB) in partnership with others. The first experimental phase involving five voluntary gillnetting vessels (10-18m length) started from January to May 2021 and recorded a single harbour porpoise bycatch, with the second phase involving twenty voluntary vessels (7-25m length) from October 2021 to July 2022, with a further 13 porpoises recorded bycaught up to April 2022 (866 trips involving 7,000 fishing hours hauling). However, the focus was again for vessels operating in the Bay of Biscay.

The French stranding network is co-ordinated by the Joint Service Unit *Observatoire Pelagis*, UMS 3462 University of La Rochelle/CNRS, dedicated to monitoring marine mammal and seabird populations, and funded by the Ministry in charge of the environment and the French Agency for Biodiversity. It consists of around 400 trained volunteers distributed along the French coast who collect data according to a standardised observation and dissection protocol. More than one thousand small cetaceans were recorded along the French coasts in 2018 (mostly common dolphins in the Bay of Biscay). 1,142 strandings were collected in 2019, and 1,289 in 2020 (ICES WGBYC, 2021). Between 64 and 72% of examined dolphins were attributed a cause of death as bycatch. Harbour porpoises were the second most frequent species found stranded (279 in 2019, 215 in 2020 and 244 in 2021); in 2021, bycatch evidence was detected on more than half of examined porpoises (70/138) in the Bay of Biscay and the Channel (ICES WGBYC, 2022).

Along the French coasts the use of a drift prediction model has allowed an estimate of the proportion of dead cetaceans at sea that sink or that would never get stranded according to the dominating winds and tides (Peltier et al., 2016). This has highlighted that the strandings recovered are probably only a fraction of dead cetaceans at sea.

In **Belgium,** no observer scheme was in place in 2018-2020 to monitor bycatch of marine mammals. Fishing trips were only observed on board vessels with towed gear to fulfil other monitoring requirements. No bycatch of marine mammals was observed during fishing operations. Due to the small number of vessels affected, Belgium states that commercial fishing practices in the country have a limited impact on the marine mammal populations.

Along the coast, a stranding network is organised and centralised by the Royal Belgian Institute of Natural Sciences (RBINS), maintaining, in cooperation with the University of Liège, a single database which can partly be consulted online. 89 strandings of harbour porpoises were recorded in 2018, and 10% of examined carcasses presented evidence of death in fishing gears. This compares with 93 stranded harbour porpoises (ICES area 4.c) in 2017 (ICES WGBYC 2019). Of 34 animals examined, 9 were found to have been caught incidentally in fishing operations (26.5%), although it is not possible to be sure in what type of fishing gear. In 2019, 2020 & 2021 respectively, 52, 67, and 79 harbour porpoises were recorded stranded along Belgian coasts. 14% of examined carcasses presented evidence of death in fishing gears in 2019 (Haelters *et al.,* 2020), and 7% (2/30) in 2021 (ICES WGBYC, 2022).

In the **Netherlands**, EU Council Regulation 2019/1241 requires observer coverage in ICES areas 6, 7 and 8 in pelagic trawling fisheries for the period of 1 December – 31 March (fleet segment NLD003) and outside this area in all areas year round (fleet segment NLD004). The Netherlands reported for 2018 that, during 11 fishing trips, 63 days and 170 hauls were observed in fleet segment NLD003, and 121 days and 304 hauls were observed in fleet segment NLD004. With a total number of fleet days of 456 in fleet segment NLD003 and 922 in fleet segment NLD004, the coverage was 13.8% and 13.1%, respectively. Thus, the target of the Pilot Monitoring Scheme (PMS) of 10% for NLD003 and 5% for NLD004 was fulfilled. In addition to these trips, one observer trip was carried out on board a foreign flagged trawler which makes the total number of monitored trips by the Netherlands twelve. The observer effort onboard the foreign trawler consisted of 12 days (46 hauls), covering approximately 6.5% of the total Dutch monitoring effort. The observed bycatch rate of 0.00 dolphins per day in the pelagic fishery in 2018 is in line with the findings in 2006 -2017 when the observed bycatch rate was 0.00-0.01 dolphins per day. In 2021, 10 observer trips were carried on demersal fisheries and 12 observer trips on pelagic fisheries.

The Dutch strandings network consists of a consortium of a large number of organisations and volunteers. The observation effort is unequal along Dutch coasts (approaching 100% in western coasts, but very low in uninhabited Frisian islands and Wadden Sea). Post-mortem research has been carried out on a selection of strandings (approximately 10-20% of all stranded individuals) since 2008 at the Faculty of Veterinary Medicine of Utrecht University. A total of 476 harbour porpoise carcasses were detected along Dutch coasts in 2018 rising to 713 in 2021 (ICES WGBYC, 2021, 2022); these are the highest numbers registered for any country along the coasts of the North Sea. According to the decomposition status of carcasses, necropsies were performed on 12% of them in 2018 and 8% of them in 2021. The proportion of porpoises with bycatch evidence related to the number of examinations reached a maximum of 12% in the North Sea in the Netherlands. In 2019, 2020, and 2021, 429, 508 and 713 harbour porpoises respectively were recovered, with the percentage of carcasses examined considered bycaught rising from 2% to 13% (ICES WGBYC, 2021, 2022).

Germany monitored bycatch under the DCF observer programme for the 2018 reporting period. Fishing effort was only recorded for vessels >10 m in overall length (North Sea), since data on the fishing gear and mesh sizes used are unavailable for smaller vessels. The sampling intensity required under the Regulation 2019/1241 was not possible in some fleet segments for technical reasons or owing to a lack of capacity in the sampling programme tailored to the requirements of the EU fisheries data collection programme. Sampling effort in pelagic trawls in subareas 6, 7 and 8 was 22 out of a total fishing effort of 237 days (9.3%). There was no sampling in static nets ≥80 mm in divisions 6a, 7a,b, 8a,b,c and 9a (total fishing effort 189 days). No bycatches of marine mammals were observed during sampling. Information for 2020 and 2021 was not available to ICES (ICES WGBYC, 2021, 2022).

National Park Rangers patrol the coastline regularly throughout the year, ensuring a constant observation effort. Marine mammal carcasses that can be retrieved are collected and submitted for investigations at the University of Veterinary Medicine in Hannover and are usually kept in a deep-freeze storage until necropsies can be carried out by official veterinarians. The advanced decomposed status of strandings recovered along the eastern coasts of the North Sea (according to prevailing winds) reduces the possible necropsies and examinations, and therefore the determination of cause of death. For the year 2018, 116 strandings of harbour porpoises were recorded. Only one out of 25 porpoises examined presented evidence of bycatch. In 2019 and 2020, only around forty carcasses were examined whereas more than 200 porpoises were recovered. In 2021, 89 porpoises were recorded stranding in Schleswig-Holstein and 50 in Lower Saxony (where only opportunistic reporting occurs). Very few individuals in 2019-21 presented bycatch evidence, with none in 2021 (ICES WGBYC, 2020, 2021, 2022).

Denmark reported no specific monitoring programs for incidental bycatch of marine mammals during 2018 in the Danish pelagic trawl fishery (ICES WGBYC 2020). The reason for not continuing previous monitoring programmes from 2006-2008 was that the observer schemes, with a coverage of up to 7%, had no records of incidental bycatch of cetaceans. A much higher coverage would be needed to detect any bycaught cetaceans and other marine mammals in the Danish pelagic trawl fishery but this was also considered to be a very expensive task compared to the likely outcome. Also, no dedicated monitoring according to the Regulation No. 812/2004 took place in the Danish gillnet fishery. Instead, observer data on incidental catches of marine mammal in gillnets was collected under the national Data Collection Regulation scheme (DCR). As the DCR programme's main purpose is to monitor discards of fish, the observer coverage of gillnet vessels was in general very low, except in Subarea 27.4. Gillnetters usually have a low discard and therefore observer hours to monitor these fisheries have not been prioritised. However, video monitoring on-board gillnet vessels was continued in 2018 by DTU Aqua (Technical University of Denmark) on board 8 vessels, all less than 15 metres length. The data from 2018 have not yet been fully analysed. DTU Aqua undertook a consolidated analysis of all REM data from 2010-19, and this was published in 2021 (Larsen et al., 2021).

The stranding network is run by the Danish Nature Agency in collaboration with the Fisheries and Maritime Museum and the Zoological Museum, Natural History Museum of Denmark. Post mortems on stranded marine mammals are conducted by the National Veterinary Institute. Twenty-five harbour porpoises were recorded stranded dead along the coasts of Denmark (all Danish seas) in 2018. Examinations were performed on two individuals, and one of them presented evidence of bycatch. The increasing number of carcass examinations by the Danish network suggested that in 2019 and 2020, 21% of examined carcasses died in fishing gears. In 2021, 33 of 268 strandings were examined, of which 55% (18/33) had evidence of bycatch (ICES WGBYC, 2022). The number of strandings was much higher than in previous years due largely to increased effort. Note that the figures include both North Sea and Inner Danish waters; the two areas have not been differentiated.

Sweden has no dedicated national 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 bottom otter trawl fisheries and also pot fisheries for crayfish. In addition, in 2017, Sweden started a pilot project monitoring bycatch of marine mammals and birds in gillnet and trammel net fisheries targeting cod and lumpfish in the south of Sweden with dedicated onboard observers. The project continued in 2018. This survey was part of a pilot project with the aim of collecting information on bycatch in fisheries for DCMAP. In the report, Sweden has included data from this survey along with monitored effort which is part of the standard EU Data Collection Framework. In 2018, a total of 32 trips/DaS were carried out with onboard observers. However, when summarizing the total number of trips/DaS per métier, it adds up to 43 observed trips. This is due to the fact that data are presented per métier and since fishermen can fish with two different gears on the same trip, the number of observed trips/observed DaS can exceed the total number of observed trips/DaS. The dedicated observer scheme along the Swedish coast gave valuable information regarding bycatches of harbour porpoises in gillnet fisheries; two harbour porpoises have been reported bycaught. No harbour porpoises were reported bycaught in bottom otter trawls or pot fisheries reported through the EU Data Collection Framework.

Reports of observations of both live and dead harbour porpoises are collected through a web-based system by the Swedish Museum of Natural History (SMNH), funded by the Swedish Agency for Marine and Water Management (SwAM). A limited number of carcasses are collected for necropsy and sampling (sine 2020, approximately 30 per year) by SMNH in collaboration with the National Veterinary Institute, funded by SwAM. Neimane *et al*. (2020) compiled data from necropsies of 89 stranded and 11 bycaught (handed over by fishermen) harbour porpoises, collected from 2006 to 2019. In addition, during this period, a total of 460 encountered dead harbour porpoises were reported by the public. This can be regarded as a minimum number of strandings as Sweden has a long coastline with archipelagos, and the reporting system is voluntary and opportunistic. Of all reported dead animals, 27% were from the summer management range of the North Sea population (as defined by Sveegaard *et al*. 2015), 69% from the summer management range of the Belt Sea population (as defined by Sveegaard *et al.* 2015), 3% from the area west of this in the southern Baltic Sea, and none within the summer management area of the Baltic Proper population (as defined by Carlén *et al.* 2018). The collected carcasses were examined for health status, reproductive status, cause of death etc. Bycatch and likely bycatch were the most common causes of death (36%) for the collected stranded animals for which cause of death could be determined (n=61). From 2006-2020, 140 porpoises were examined. Twelve of these were found entangled in fishing gear (known by-catch). The remaining 128 animals had stranded. Of the stranded animals, 13 (10%) were determined to have died in a fishery interaction and an additional 20 (16%) were diagnosed as probable bycatch.

In 2022, 41 porpoises were examined by necropsy (15 from Skagerrak, 6 from Kattegat, 14 from The Sound, and 6 from the Baltic Sea). Of those 41, 22 were found stranded (3 of which were diagnosed as by-caught) and 19 were submitted by fishers as by-caught between March and May, and July and October (K. Owen, SMNH, pers. comm.).

Bycatch Risk Mapping

For bycatch risk mapping, maps of porpoise density distributions were first prepared by season using a modelling approach that incorporated environmental variables applying to a northern oceanographic domain from southern Scandinavia to NW France based upon 1.25 million kilometres of dedicated survey effort, provided by 44 research groups, with surveys undertaken across the period 2005 to 2020. The number of research groups surveying in the North Sea is much smaller, however.

To create maps of relative risk of bycatch, standardised AIS effort rasters and animal density rasters were multiplied to create new rasters of relative bycatch risk. Values approaching 1 would indicate that the highest densities of animals correspond with the highest density of fishing pressure, representing the greatest risk; those approaching 0 would indicate that the lowest densities of animals correspond with the lowest density of fishing pressure, representing the lowest risk. Intermediate scores could represent high densities but low effort or the converse. Overlap for every species-gear type combination was mapped separately for northern and southern domains on a seasonal basis, and with overlays of protected areas. Pelagic trawls and seines were combined, as were set gillnets, trammel nets and drift nets; this was because of uncertainties revealed in the fishing effort data as to whether they had been correctly ascribed across the entire region, due largely to the polyvalent nature of fishing gear registered in some areas. Static gear is well known to be a particular cause of bycatch for porpoises. Seasonal bycatch risk maps for gillnetting indicate potential hotspots occurring in the southwest Skagerrak, just west of the Sylt Outer Reef in the German Bight, and in Dutch and Belgian waters including the Dover Strait (Figure 9). Seasonally, bycatch risk in most parts appears to be greatest between April and September.

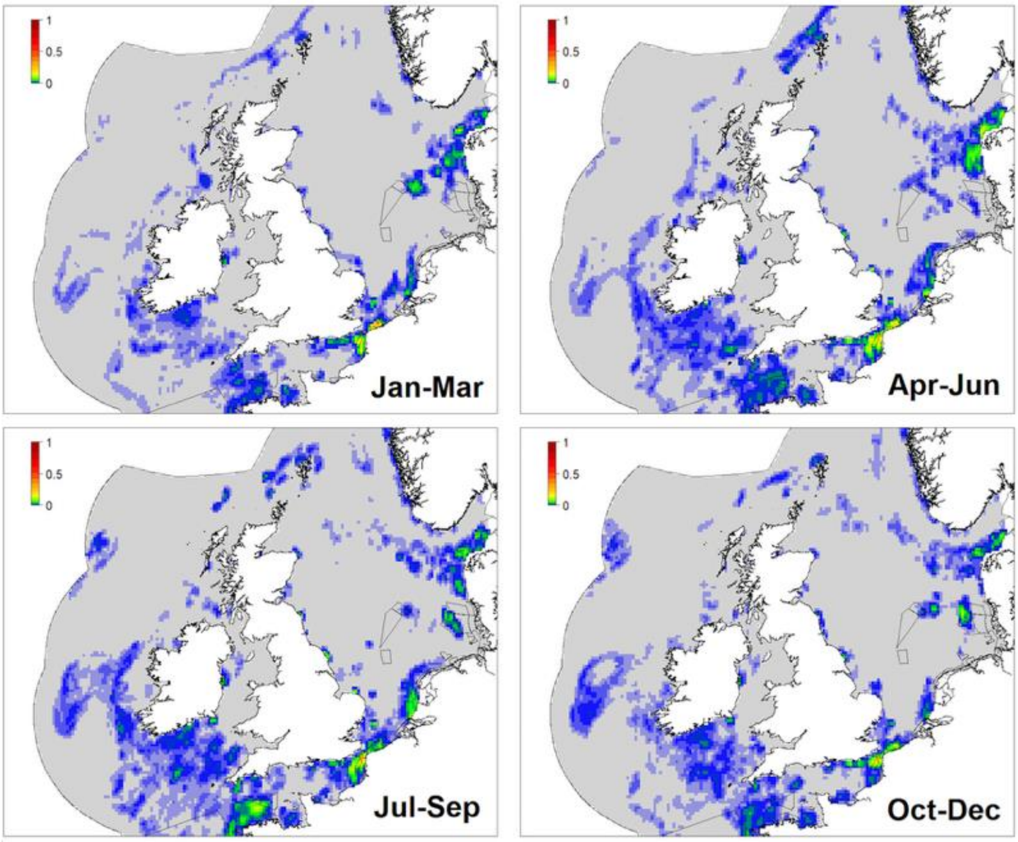


Figure 9. Harbour Porpoise Seasonal Bycatch Risk Maps for Static Gillnetting (Evans et al., 2021)

Key Conclusions and Recommendations *The conclusions and recommendations from the previous Progress Reports remain relevant. Bycatch rates continue to be derived from sampling of a small number of vessels and even smaller number of trips (mainly by visual observers but in a few cases experimentally also by remote electronic monitoring) and then extrapolation to entire fleets according to gear type. Often, those bycatch rate estimates are carried over to subsequent years with the estimates altered simply on the basis of changes in fishing effort. This takes no account of spatiotemporal changes in risk of bycatch due to varying overlap in porpoise occurrence and numbers and the presence and number of fishing vessels. Furthermore, the traditional metric for fishing effort, mandatory for vessels over 15 m length, is days at sea which is a poor representation of actual fishing effort. 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 was demonstrated for static nets and midwater trawls by ICES WGBYC (2018).*

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 spatiotemporal 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 by any country.

Countries should take full-account of the necessary sampling protocols for cetaceans and other protected, endangered and threatened species, and carry out bycatch monitoring in the relevant métiers with sufficient observer coverage, at least 5-10% of total fleet effort for those fisheries representing a moderate or high risk of bycatch. Given that both porpoises and fishing activity vary in *space and time, this should be taken into account for more targeted monitoring Parties are urged to ensure there is a significant improvement in the consistency of bycatch data at a regional scale through the EU-MAP.*

Implement and assess pinger and other mitigation measures to reduce bycatch (MIT-01)

Despite the repeal of Reg. 812/2004, acoustic deterrent devices such as pingers remain a required mitigation measure under the new Technical Conservation Measures Regulation (2019/1241) for vessels of 12 m length or more operating relevant gillnet fisheries in any part of the North Sea (Table 2, Figure 9).

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 established under Council Regulation (EC) 812/2004 in the North Sea

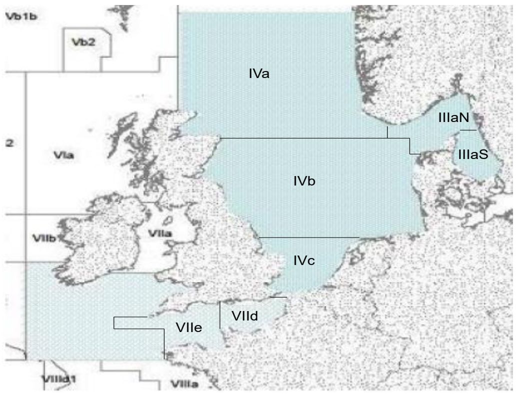


Figure 9. Pinger use - areas and gears regulated under CR (EC) 812/2004 in the North Sea, Skagerrak and Kattegat, and the Channel and Celtic Sea (ICES WGBYC, 2011), and maintained through CR (EC) 2019/1241

Below is a summary of each country's progress in usage of pingers within their fleets. Unless stated otherwise, it has been compiled from the latest reports of the ICES Working Group on Bycatch (ICES WGBYC 2021, 2022).

In 2018, of 26 **United Kingdom** registered vessels of ≥12 m using nets, 22 fished in Divisions 7defghj and thus required pingers (ICES WGBYC, 2020). Three vessels fished in subarea 4 and are assumed to have been required to use pingers (as all reported using meshes >220mm). One of these vessels fished in both Subareas 4 and 7, while two of the 26 over 12m vessels did not fish in any areas requiring the use of pingers under Reg. 812/2004. Overall, it was concluded that during 2018, 24 ≥12 m UK registered vessels fished in areas and with gears that require the use of pingers. In 2018, there were no records of vessels over 12 m using encircling gillnets (Northridge *et al*., 2019).

During 2018, eight trips where pingers were used were monitored, amounting to 77 observed hauls. Porpoise bycatch rates overall remain substantially (83%) lower when pingers are used according to the UK Government guidelines compared with when pingers are not being used, and there is no evidence of any change in pinger efficacy over time. The guidelines on pinger use which were produced in 2012 and agreed with industry, state that DDD pingers should be placed no more than 4 km apart, either to the buoy ropes at each end of a net fleet, or if net fleets more than 4 km are used, pingers should be attached to the floatline and/or buoy ropes so that no part of the net fleet is more than 2 km from an active pinger (Northridge *et al*., 2019).

In 2019, 18 UK registered vessels ≥12m worked in areas where use of ADDs is required. Sixteen of these vessels worked in relevant Divisions within Subarea 7 and four vessels worked in Subarea 4. Two vessels worked in both areas. Thirty-three days monitoring were carried out in fisheries where ADD use is mandatory, and a further 26 days were carried out on an over 12m netter in ICES Division 7c (Porcupine Bank) where ADDs are not mandatory, but it was not clear when the observer joined at the start of the trip in what exact area the boat would operate. In those 33 sampled days on relevant vessels (≥12m) in areas where ADDs are mandatory, 74 out of 78 (95%) monitored hauls had ADDs attached, although on a few hauls with ADDs (n=7) the spacing was not optimal. One harbour porpoise was caught in the 74 hauls with ADDs. No cetacean bycatch was recorded in 4 monitored hauls without ADDs (Kingston *et al*., 2021).

Fishing vessel compliance with the ADD requirements of Regulation 812/2004 and 2019/1241 are carried out by the Marine Management Organisation (MMO) in English and Welsh waters and by Marine Scotland (MS) in Scottish waters.

The MMO carried out 30 shore-side inspections of over 12m netting vessels. All vessels were UK registered. No mention of ADDs was provided in the port inspection reports. Eight at-sea inspections were carried on over 12 m netting vessels involving one UK registered vessel, six French vessels and one German vessel. Three of the eight inspections involved assessment of ADD compliance. One French vessel received a verbal warning for insufficient number of ADDs onboard. ADDs were tested and found to be charged and working in an inspection of a second French vessel. ADDs were tested and found to be working in an inspection of a UK vessel (Kingston *et al*., 2021). In Scottish waters, Marine Scotland's Marine Protection Vessels (MPVs) completed five at-sea inspections on five different gill netters in ICES Division 4a (northern North Sea) during 2019 (Kingston *et al*., 2019).

No infringements were detected during these inspections. Pingers were specifically noted to be in use during one inspection and were recorded as STM DD03C type. The other four inspections refer to pingers being compliant but do not specify the type in use. Marine Scotland received no intelligence regarding lack of pinger use during 2019 (Kingston *et al*., 2019).

There were no reports of any cetaceans being bycaught during the inspections, which included periods aboard the fishing vessels while nets were being hauled.

The main concentration of netting effort in Scottish waters continues to be along the continental shelf edge west of the Shetland Islands, with increasing netting activity taking place on the continental shelf and up to the 6-mile limit west of Shetland. Compliance operational priorities during 2019 did not focus on this sector and Marine Scotland will continue to base at-sea inspection activities on a risk assessed basis.

In **Belgium**, the two vessels operating set nets do not meet the basic conditions, namely the length of the ship, to have this obligation imposed. As in recent years, there has therefore been no scientific monitoring of the use of pingers on vessels.

In **France**, a total of nine netters (GNS-GTR) fishing in Subarea 7 were equipped with STM DDD03L pingers in 2018 in accordance with Reg. 812/2004 (and then CR (EC) 2019/1241). No infringements were found in 2018 during the checks conducted in the areas and on the vessels covered by Regulation (EC) No 812/2004.The decree of 15 April 2014 permits the use of STM DDD03L acoustic deterrent devices by French fishing vessels. The LICADO Project has been running since 2019 until 2022, comparing the efficiency of DDD and Cetasaver (updated with a new acoustic signal) pingers on 4 pairs of midwater trawlers in the Bay of Biscay (ICES WGBYC, 2022). These have been primarily to address common dolphin bycatch. No significant difference in efficacy was found between the two pinger types.

The **Netherlands** reports that according to Reg. 2019/1241, the Dutch fishery does not include fleet segments in which pingers are mandatory. The use of pingers is obligatory in ICES subarea 4 for vessels larger than 12m for the period 1 August until 31 October, using nets that do not exceed 400m length (the regulation intends to cover set nets fishery at wrecks, where relatively short net lengths are being used). Most of the Dutch set gillnet fleet fishing in this period for sole use much longer nets. Thereby, no acoustic deterrents are in use by Dutch gillnet fishers.

In recent years, **Germany** has had fisheries operating in some of the areas listed in Annex I to Reg. 2019/1241 where the use of pingers is mandatory. Fishing vessels use analogue and digital pingers commercially available. No data are available on the number of vessels equipped with pingers. Compliance monitoring was done by competent authorities using Pinger Detector Amplifiers (Etec PD1102) when nets were in place. Due to masking of pinger signals by the inspection vessel noise, the relevant equipment is difficult to use. The relevant provision of Regulation (EC) No 2019/1241 merely requires pingers to be operational when setting the gear. Thus, no penalties could be imposed for any infringements found using the current procedure. The legal framework for the detection and prosecution of infringements needs to be further improved. In 2018, federal fishing protection vessels inspected a total of three fishing vessels obliged to use pingers. No violations were found.

Since 2017, fishers in Germany have been using PALs (“Porpoise ALerting” devices) in set net fisheries in Schleswig Holstein (Baltic Sea) following a project called “STELLA” (Development of alternative management approaches and fishing techniques to minimise conflicts between conservation objectives and gillnet fisheries), and now in its second phase (STELLA 2, Nov 2021-Oct 2024). The overall aim of this project is to minimize bycatch of harbour porpoises. The project comprised the following: 1) estimating fishing effort of the local gillnet fisheries and identifying behaviour patterns of different fisherman groups, 2) development of gillnet modifications to minimize bycatch of marine mammals and seabirds, 3) development of alternative fishing gears, 4) analyse motives of fishermen and identify incentives that may lead to enhanced acceptance of mitigation methods. Thünen Institute of Baltic Sea Fisheries had found PALs to be effective at reducing porpoise bycatch. However, it is not clear yet whether those effects persist over a longer period of time or if porpoises become habituated to the warning signal. A new project “PAL-CE” (Nov 2021-Nov 2024) has started comparing the reaction of naïve porpoises inhabiting the Danish Belt Sea with the behaviour and reactions to PALs of porpoises in Schleswig Holstein that already know the warning signal (ICES WGBYC, 2022).

Field experiments to determine reaction of porpoise to pearl nets have also been started. Pearl nets were tested in the turbot fishery in the Black Sea (Turkey) with promising, but not yet statistically significant results (in 10 hauls 5 individuals were bycaught in the standard net, 2 in pearl nets). The pearl net has also been tested in the Swedish lumpsucker fishery with F-PODs attached to both ends of the string in order to examine the porpoise echolocation behaviour around the nets.

In a systematic study, the acoustic reflectivity of a variety of objects in different shapes, sizes and bulk characteristics (e.g. Young’s Modulus, density) were simulated and experimentally verified in a water tank. First simulation results indicated that commercially available acrylic glass spheres of less than 10mm diameter exhibited promising characteristics with up to -42dB target strength at 130 kHz (the peak frequency used by harbour porpoise). Echograms taken with the sonar of FRV “Clupea” revealed that the net with spheres was highly visible at 120 kHz compared to a standard gillnet.

In **Denmark**, a total of 17 Danish vessels (57% of the total number of vessels) engaged in fishing activities in ICES areas 3a and 4 in fleet segments FPN, GN, GNS, and GTR with mesh sizes above 220 mm, were obliged to use pingers.

The pinger type “AQUAmark100” has previously been used in the Danish gillnet fisheries, where the use of pingers is mandatory. However, this pinger model is no longer available in Denmark, so other types are now being used. The Danish Fishermen’s Association report that a 10 kHz pinger is now the most widely used pinger in Danish commercial fisheries because batteries can easily be changed. The 10 kHz pinger, however, does not have the same effectiveness as the AquaMark 100, so the distance between these is mandated to be 200 m. The latest derogation applies not only to the AQUAmark100, but to also other acoustic deterrent devices, which scientifically are proven to be as effective.

Monitoring of pingers is a mandatory part of the general inspection of gillnet vessels in Denmark. When a gear inspection is conducted, the fisheries inspector registers whether there is a requirement for use of pingers on the gear. If there is a requirement, the activity and distance between pingers is checked. In 2018, the Danish fisheries inspection did not conduct any inspections on vessels with an overall length of 12 metres or above, due to a large organizational change and transfer of responsibility to another ministry (formerly the Ministry of Food and Agriculture, now the Ministry of Foreign Affairs). Similarly, no inspections were carried out for foreign vessels in 2018. It was expected that the Danish Fisheries Agency would conduct inspections again from 2019 onwards. This has yet to be officially confirmed.

Denmark is continuing trials of both pingers and lights as a means to mitigate bycatch of harbour porpoises and seabirds, as well as conducting research on the behaviour of porpoises around pingers. It is also continuing the development and testing of small-scale Danish seines and baited pots as alternatives to gillnets primarily for catching cod and flatfish. From studies by DTU Aqua, pinger trials have shown that adopting a spacing of 200m between pingers is more effective than a 500m spacing.

An analysis of predicted porpoise bycatch with and without pingers in the Danish North Sea has been made by Kindt-Larsen *et al.* (2023) (Figure 10),

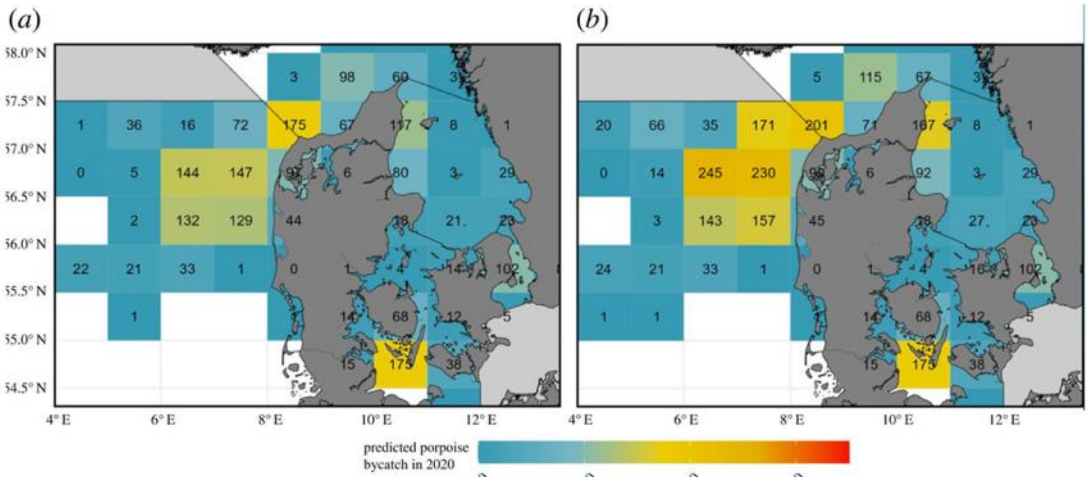


Figure 10. Predicted yearly porpoise bycatch per ICES statistical rectangle for the Danish and Swedish commercial gillnet fleets. Map (a): pinger usage following EU regulation 2019/1241 and assuming 100% pinger efficacy; map (b): ignoring potential bycatch reduction from pinger usage. Data from 2020. (Kindt-Larsen *et al*., 2023)

Sweden remains unsure whether pingers have been implemented on boats and in fisheries where they are mandatory. Back in 2007, fishermen conducting fisheries in areas where pingers were mandatory, were given pingers. Pingers have a lifetime of two years so one must assume that those pingers are not working anymore. There is limited enforcement to control the use of pingers, and no equipment to be able to see if the pingers are functioning. However, there has been increased pinger use in southern Swedish waters and along the west coast.

In 2018, 13 fishermen voluntarily used pingers (Banana Fish tech and Future Oceans) in the lumpfish and cod fisheries in subdivisions 21 and 23 (Kattegat and Belt Seas). Pingers are lent to the fishermen from year to year. Seven fishermen were using pingers in the lumpfish fishery and three fishermen in the cod gillnet fishery. Fishermen reported their fishing effort and use of pingers to the Swedish University of Agriculture Science. In the area where pingers have been used in the commercial lumpfish fisheries in southern Sweden, a study investigating the distribution of harbour porpoises in relation to a commercial fishery with pingers has been taking place in recent years. Results showed that harbour porpoise detections in the area were low when fisheries with pingers were deployed. However, when the fishery ceased, harbour porpoise detections increased and were at the same levels as areas where no fishing with pingers had been carried out. The study continued through to 2020. There has also been a project implementing cod pots as an alternative to gillnet fisheries for cod, and a small-scale seine net for coastal fisheries has been developed as an alternative to gillnet fisheries.

Key Conclusions and Recommendations *Pingers are mandatory in certain gillnet fisheries in the North Sea for EU Member States. However, their use is not implemented by all countries, and the level of enforcement varies greatly 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 and recent trials for ways to improve their effectiveness in particular gears have been promising. However, more effort is needed to develop alternative gears which may be the most desirable long-term solution to porpoise bycatch. Other approaches also need further investigation, such as move-on procedures when groups of animals are seen at the start of active fishing.*

Implement a wide-scale surveillance programme to monitor trends in distribution and abundance in the Greater North Sea (MON-01)

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*. 2021; see Figure 11); 2) SCANS IV undertaken in a similar manner in July-September 2022 (Gilles *et al.,* 2023; see Figure 12); 3) a winter SCANS survey undertaken in the southern and central North Sea in Jan-Mar 2024 (Martinez-Ramirez *et al*., 2025; see Figure 13); and 4) aerial surveys undertaken seasonally in the southern North Sea across the EEZs of Belgium, the Netherlands, Germany, and Denmark (Gilles *et al*. 2016, Peschko *et al*. 2016; Nachtsheim *et al.* 2020).

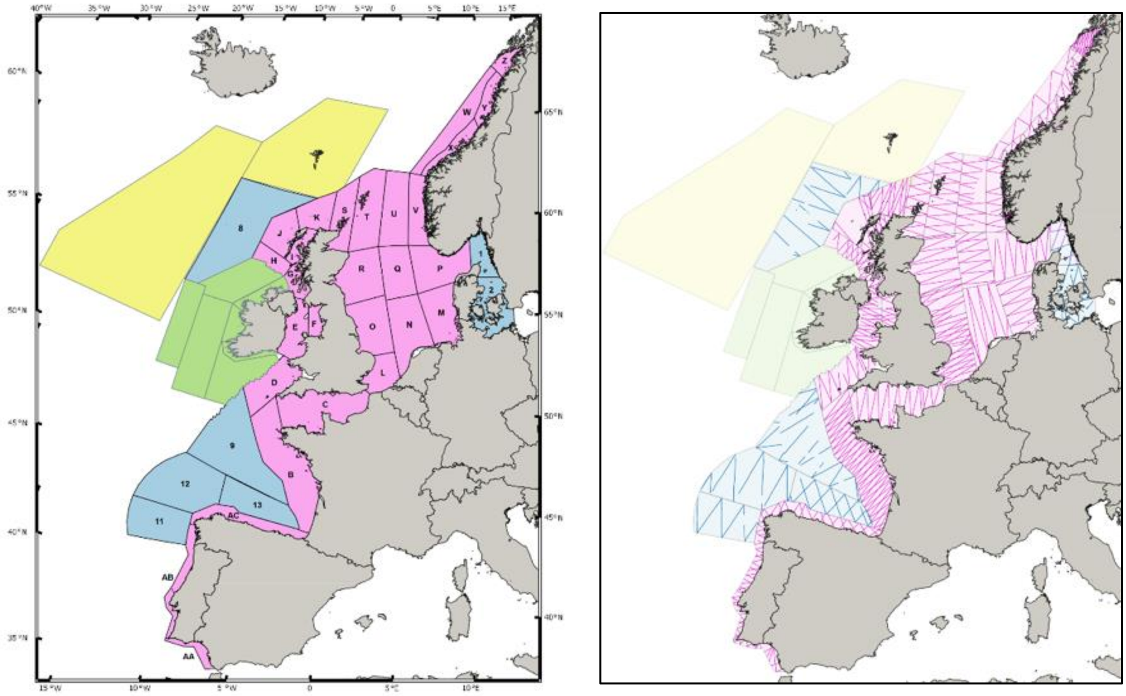


Figure 11. Area covered by SCANS-III and adjacent surveys. SCANS-III: pink lettered blocks were surveyed by air; blue numbered blocks were surveyed by ship. Blocks coloured green to the south and west of Ireland were surveyed by the Irish ObSERVE project. Blocks coloured yellow were surveyed by the Faroe Islands as part of the North Atlantic Sightings Survey in 2015 (Source: Hammond *et al*. 2021)

The SCANS III survey in July 2016 yielded an abundance estimate of 345,373 porpoises (CV=0.18; 95%CI: 239,000-483,000) in the North Sea (Hammond *et al.* 2021). 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).

In summer 2022, the SCANS-IV survey gave an abundance estimate of 350,275 porpoises (CV: 0.17; 95%CI: 246,560-494,176) in the Greater North Sea Assessment Unit (revised estimate, A. Gilles *pers. comm.*; Gilles *et al*. 2023). A trend analysis showed no significant change between 1994 and 2022 (Gilles *et al*. 2023; see Figure 13).

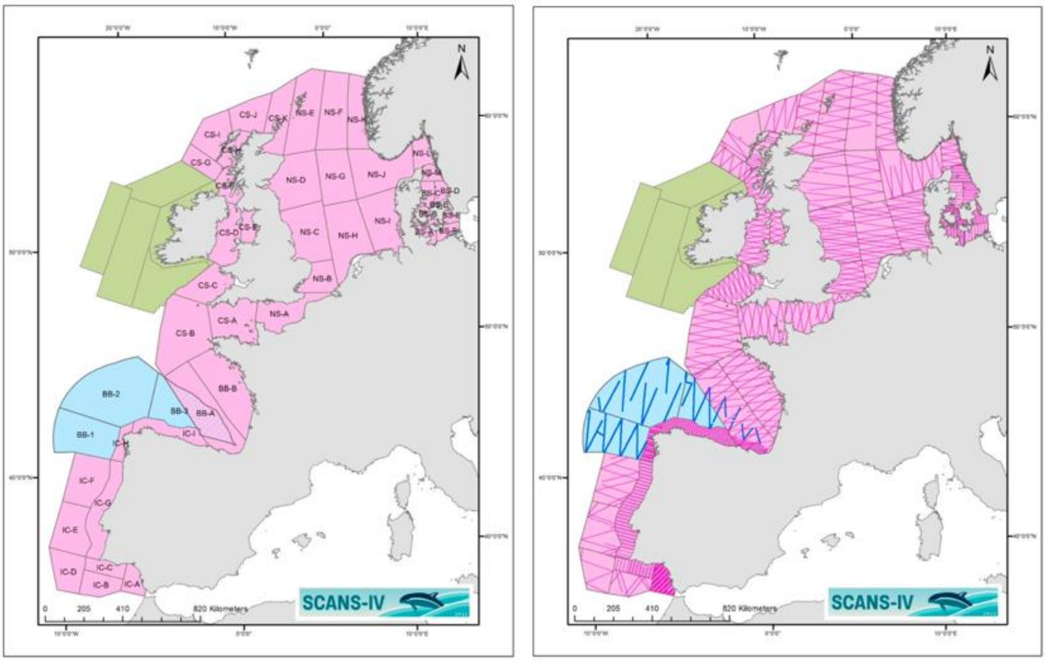


Figure 12. Area covered by SCANS-IV and adjacent surveys. SCANS-IV: pink lettered blocks were surveyed by air; blue numbered blocks were surveyed by ship. Blocks coloured green to the south and west of Ireland were surveyed by the Irish ObSERVE-II project (Source: Gilles *et al*. 2023)

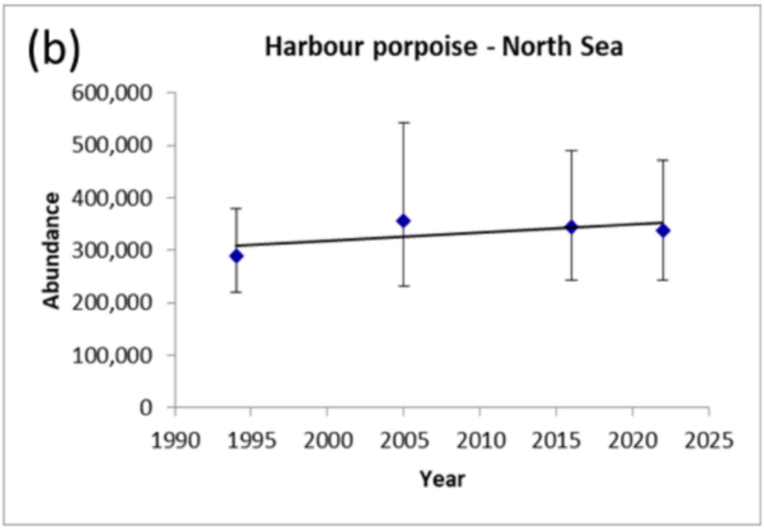


Figure 13. Trend lines fitted to time series of abundance estimates for harbour porpoise in the North Sea Assessment Unit. Estimated rate of annual change = 0.51% (95%CI: -1.14; 2.20%), p = 0.32. Error bars are log-normal 95% confidence intervals (Source: Hammond *et al.* 2021; Gilles *et al.* 2023)

Improve understanding of causes of seasonal and annual variation in abundance and distribution, particularly in relation to human activities and environmental change, to facilitate consideration of the species within marine spatial plans (RES-03)

In the past, SCANS surveys have been undertaken every 6-11 years, generally in the month of July, in order to obtain overall abundance estimates of harbour porpoise and other regularly occurring cetacean species.

For a seasonal comparison, a mini-SCANS winter survey was undertaken in the southern North Sea between January and March 2024 (Ramirez-Martinez *et al*. 2025). Coverage was 45% of the total area of the North Sea blocks surveyed in SCANS-IV, and was concentrated in the southern and central part of the North Sea and a small part of the Channel in the east (Figure 14). Overall abundance was 132,564 porpoises (CV: 0.195; 95% CI: 89,642-152,169).

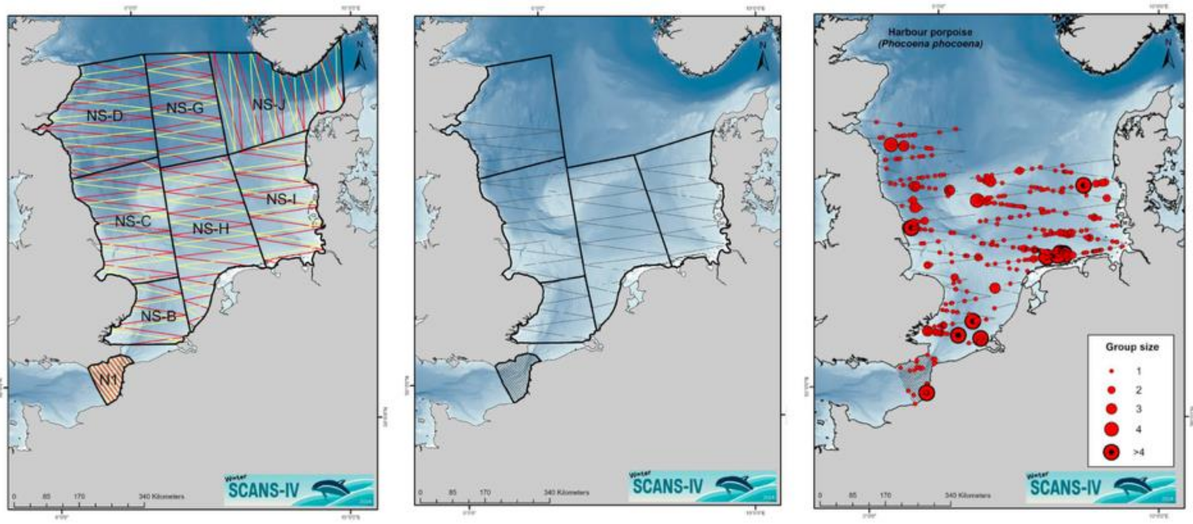


Figure 14. Left: The planned study area and survey design of winterSCANS and MAMO (N1). Transects are depicted in yellow (replicate 1) and red (replicate 2). **Middle:** Total search effort achieved under good and moderate conditions. Only blocks with realised effort are shown. **Right:** Distribution of harbour porpoise sightings. Underlying effort is that used in the analysis: i.e., under good and moderate sighting conditions (Ramirez-Martinez *et al*. 2025)

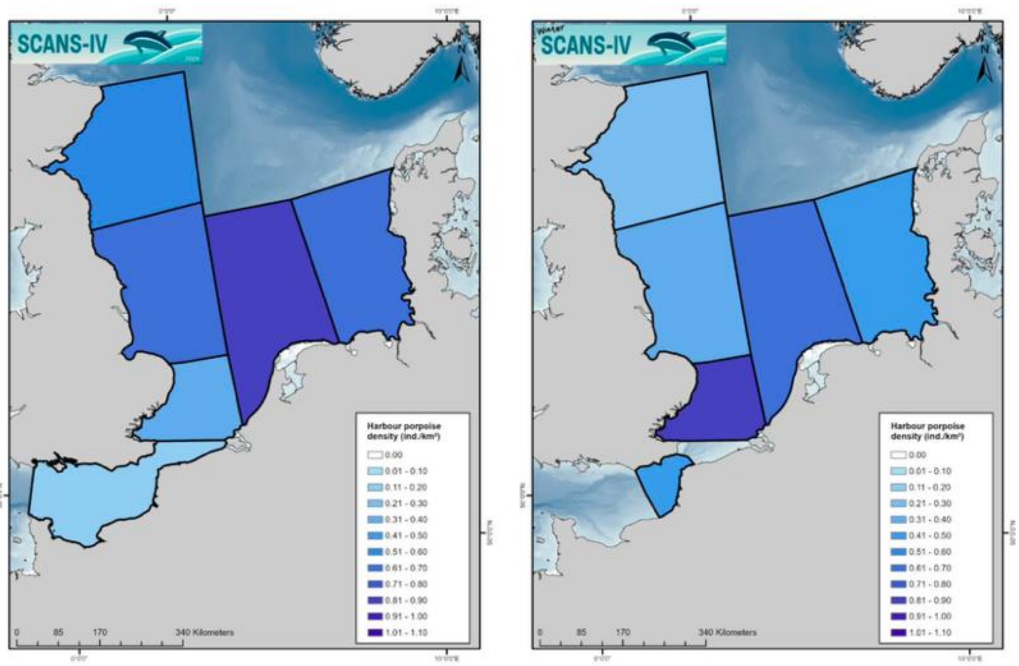


Figure 15. Estimated winter densities in each survey block for harbour porpoise, compared with summer SCANS-IV densities (left panel; from Gilles *et al*. 2023); right panel, from Ramirez-Martinez *et al*. 2025).

Densities in the south-western block of the North Sea (east of east Anglia, UK) was the highest in the area surveyed during the winter SCANS survey (Figure 15).

National Surveys

Unlike several other countries bordering the North Sea, the **UK** has never attempted national surveys across its EEZ. However, over the last 25 years, several intensive surveys have been conducted (often on a monthly basis) as environmental impact assessments (EIAs) in relation to regional offshore windfarm developments. Those surveys and other dedicated line transect surveys by research groups have been complied into a single database, analysed, and density surfaces modelled for different cetacean (and seabird) species (Waggitt *et al.* 2020). These have provided useful information on spatiotemporal variation in harbour porpoise densities on a seasonal and longer-term basis. The latest results (Paxton *et al*., 2025) are shown in Figure 16, as part of the UK POSEIDON Project, concerned with risk mapping for offshore renewable energy licensing. These maps are based upon 1.95 million km^2 of survey effort (by vessel, aerial, and digital aerial) undertaken within the UK EEZ in all months between 2001 and 2024.

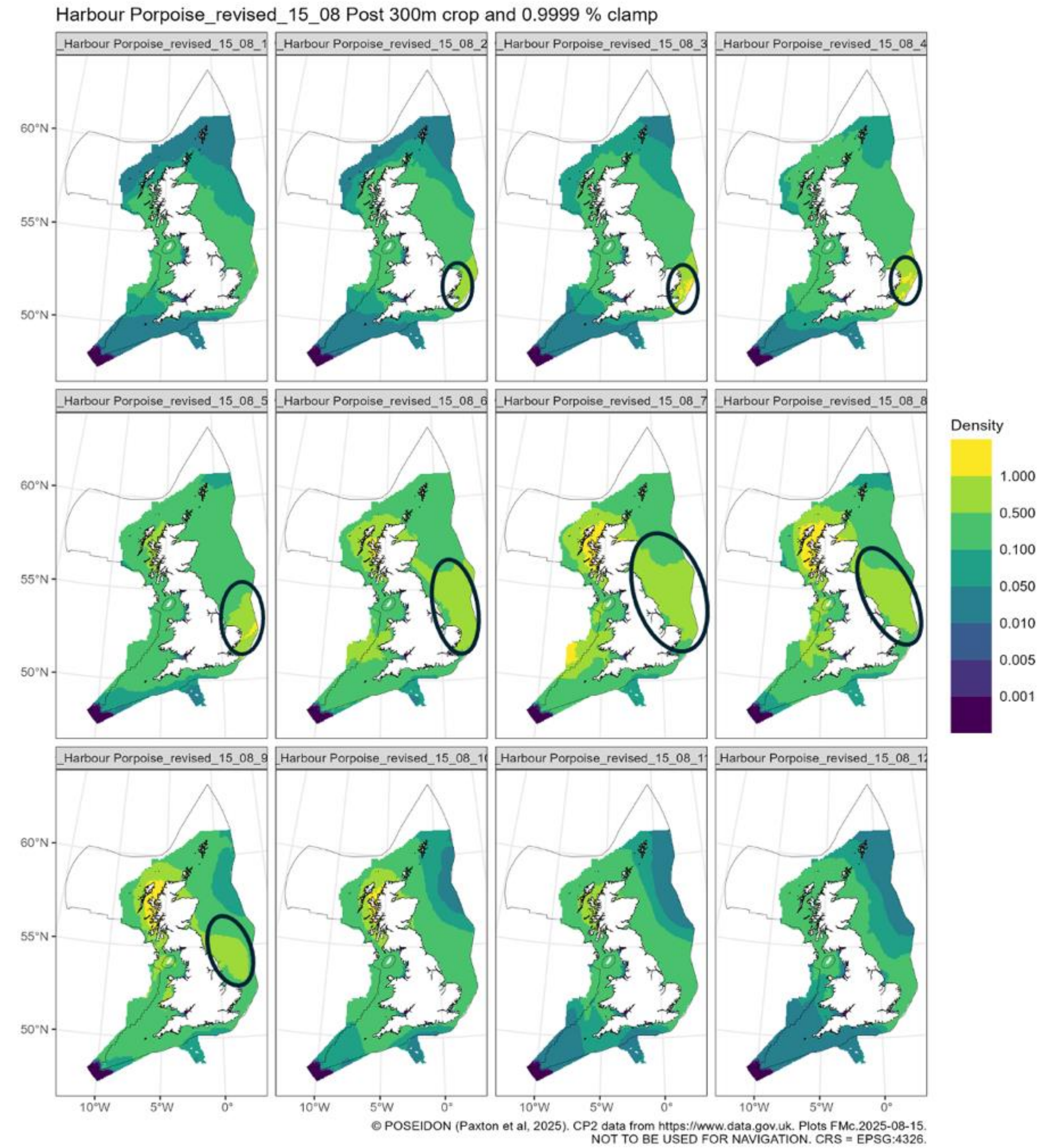


Figure 16. Modelled density distributions of harbour porpoise by month across the UK EEZ (Paxton *et al*., 2025)

The results indicate a repeated seasonal trend in the western North Sea with highest densities off the south-east of England in the springtime, extending northwards through the summer into eastern Scotland in July – September, before retreating southwards again in the winter (Paxton *et al*., 2025; Figure 16).

Belgium, **Germany** and **Denmark** have undertaken national monitoring with aerial surveys of the southern North Sea on an annual basis, whilst the Netherlands conducted aerial surveys annually from 2012-19 and then planned to survey every three years. However, those surveys became delayed until summer 2024, the results of which have yet to be made available. 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, and repeated aerial surveys of the Channel (and Bay of Biscay) in 2021 and 2022.

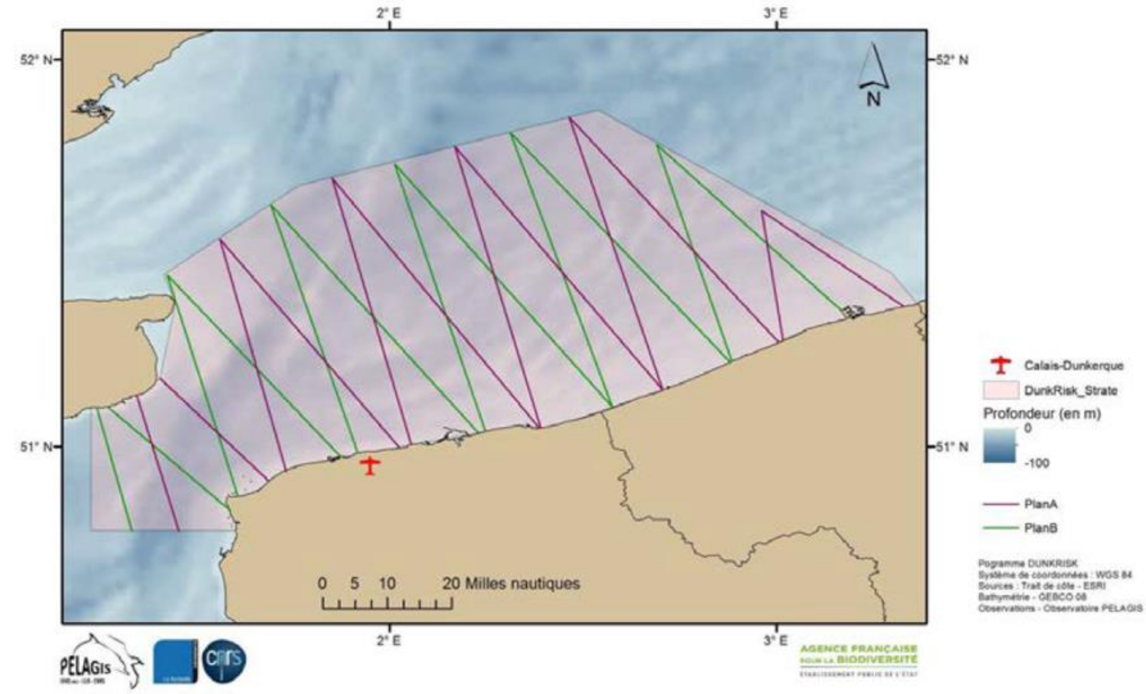


Figure 17. PELAGIS Project Aerial Surveys undertaken by France during 2017-2018
(Source: ICES WGMME, 2018)

During 2017–2018, a **French** survey (PELAGIS) was dedicated to estimate marine mammal and seabird relative abundance and distribution in the area of Dunkirk before construction of an offshore windfarm (Virgili et al., 2018; Figure 17). The survey effort covered 9400 km^2 distributed as follows: 37% in France, 37% in Belgium and 26% in UK. Observations were collected following a standardised aerial survey protocol (Laran et al., 2017). Four sessions were realised on 6–7 April (1526 km), 13–14 June (1534 km), 7–8 August (1532 km) and 4–5 December (1463 km). In 2018, two sessions were realised on 6–7 March (1256 km) and 4–5 May (1526 km).

The most sighted marine mammal species was the harbour porpoise and the number of observations reflected a high seasonality for this species (Table 3). Harbour porpoise distribution also differed between the sessions (Figure 18). The results showed the importance of the eastern part of the Channel for porpoises, although there were strong seasonal differences both in distribution and relative abundance (Figure 18, ICES WGMME, 2018).

Table 3. Number of sightings (on effort) of harbour porpoises during the aerial survey (Virgili *et al*. 2018)

	April 2017	June 2017	Aug 2017	Dec 2017	Mar 2018	May 2018
Harbour porpoise	315	100	35	202	147	321

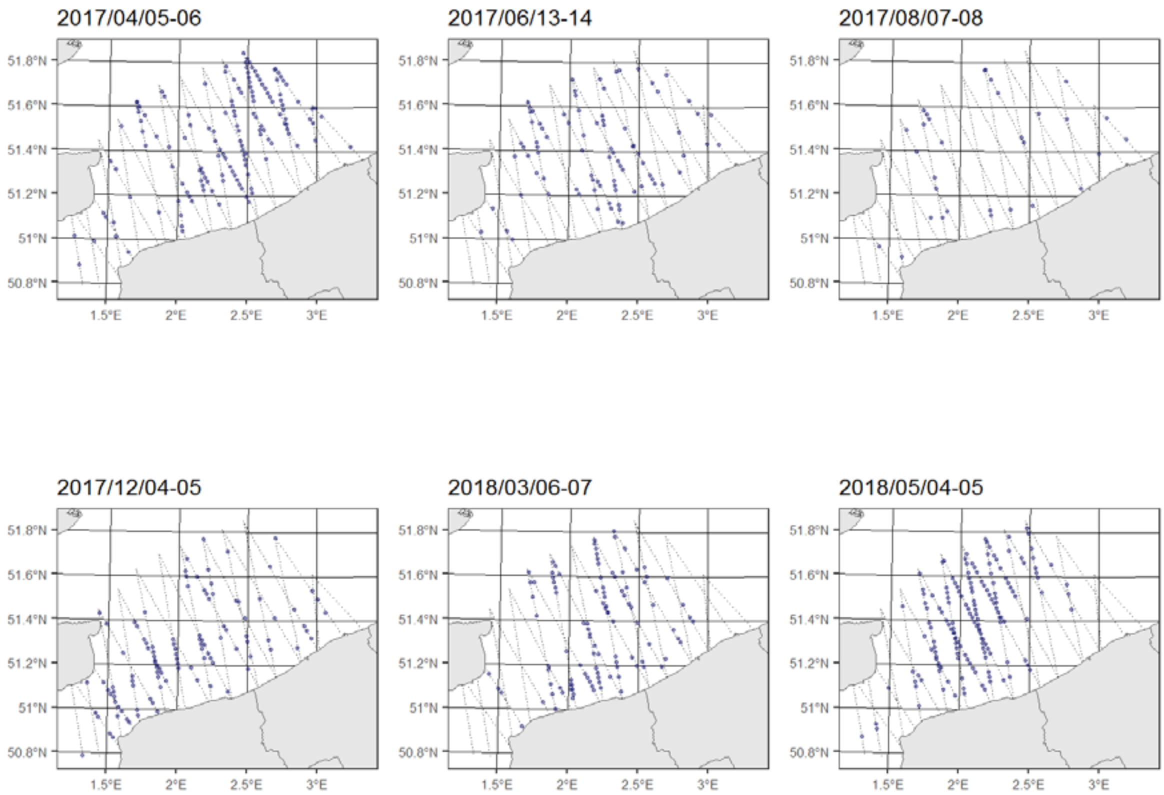


Figure 18. Observations of harbour porpoises from the PELAGIS Project Aerial Surveys undertaken by France in the eastern Channel during 2017–2018. Dotted lines are the transect lines, and blue dots are the detections of harbour porpoises. (Source: ICES WGMME 2019)

This was followed by SAMM-II multi-target (cetaceans, seabirds, shark, fish, turtles, litter, shipping) aerial surveys conducted from January to March 2021 across the Bay of Biscay, in the Channel, and the western end of the southern North Sea (Figure 19). 20.000 km of effort was undertaken, of which about 30% were completed with an aircraft fitted with high-definition cameras allowing the 200m wide band on each side of the track to be recorded. Pictures were used to confirm and refine species identification and group size estimates recorded by observers. Figure 20 shows the distribution of porpoise sightings. Aerial surveys in summer 2022 were integrated within the SCANS-IV international survey (Gilles *et al*., 2023).

In 2023, the French Survey programme MAMO started in the eastern Channel with aerial surveys conducted in Spring and Summer 2023, Winter, Spring, Summer, and Autumn 2024, and Winter 2025 (Figures 21-25).

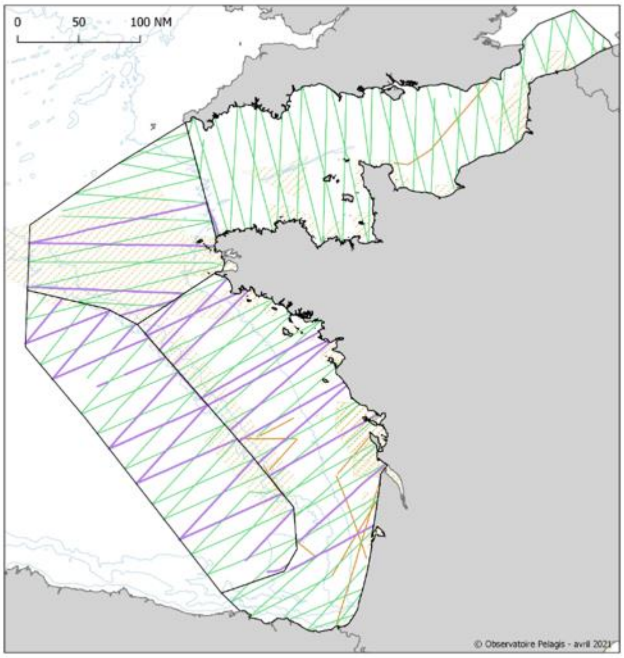


Figure 19. Effort of the SAMM-II survey conducted from January to March 2021; 20.000 km of effort, of which 30% conducted with high-definition cameras fitted under the aircraft (STORMM protocol; purple lines). Orange lines are transit off-effort flights.

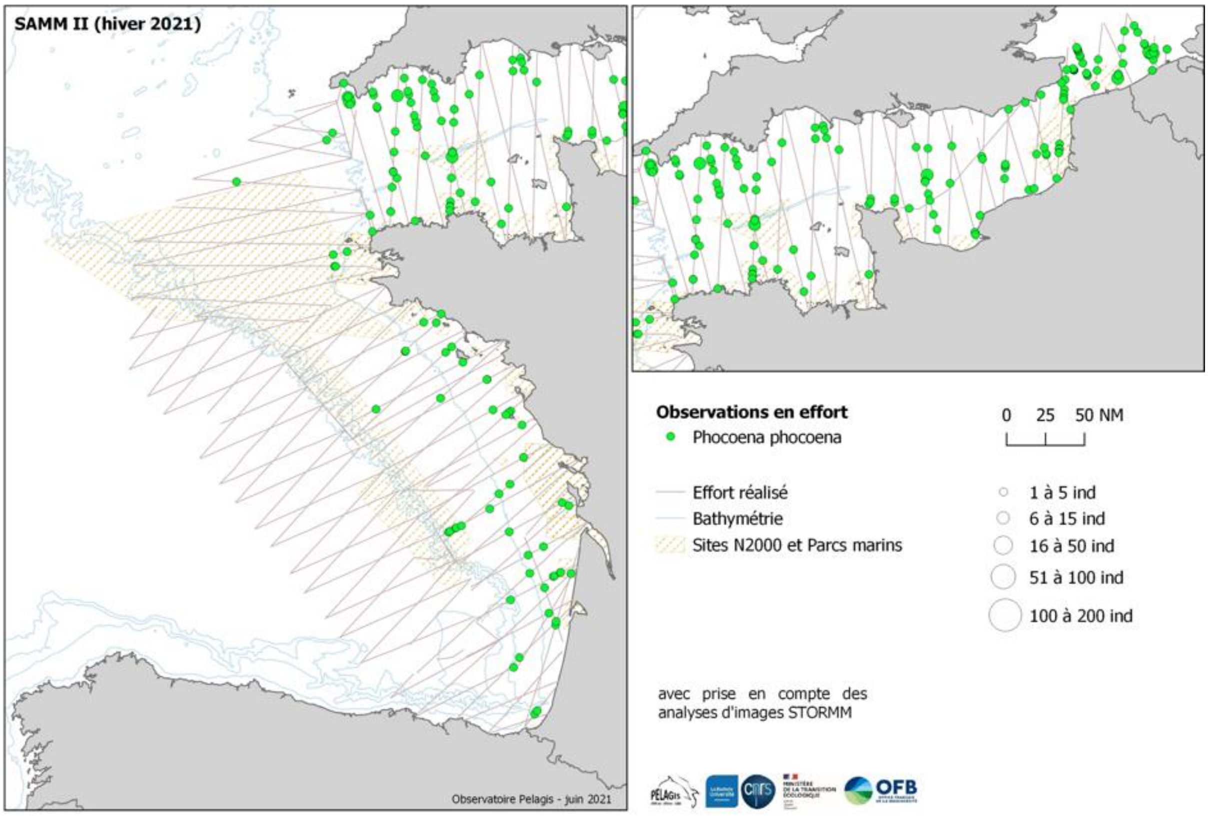
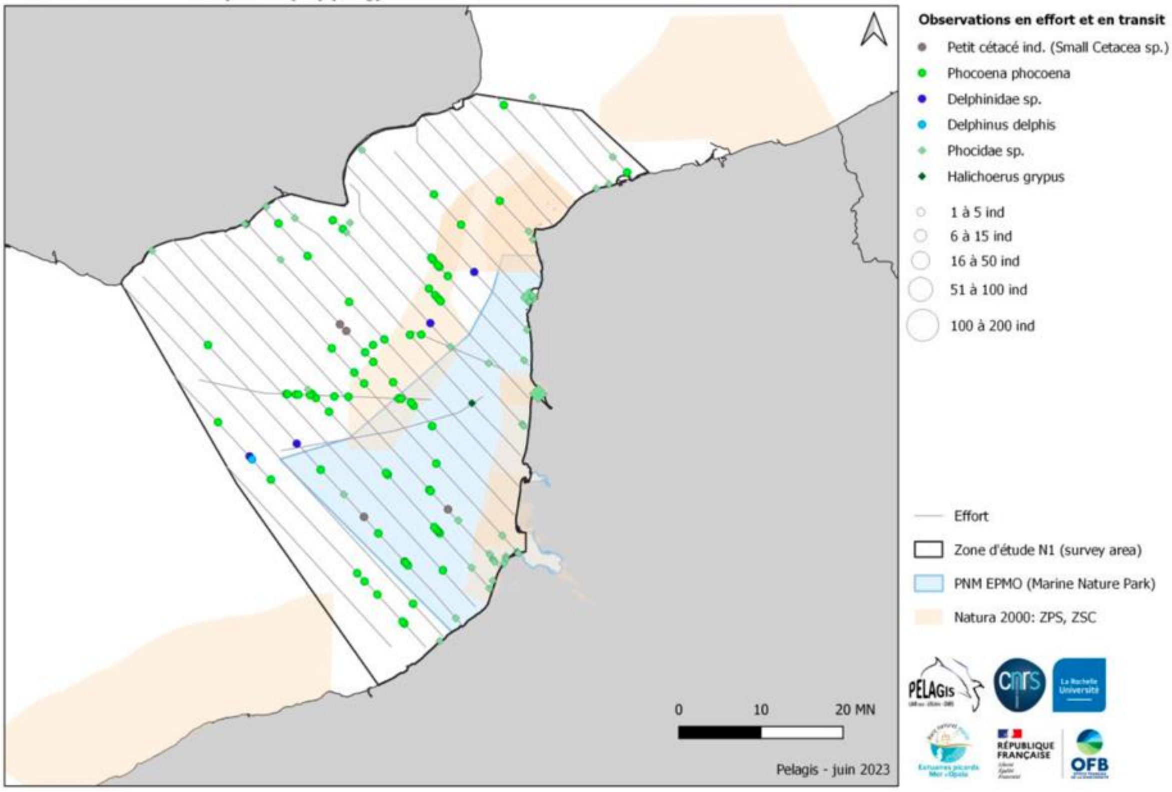


Figure 20: Distribution of harbour porpoise on-effort sightings during the SAMM-II winter survey conducted from January to March 2021.

Spring 2023



Summer 2023

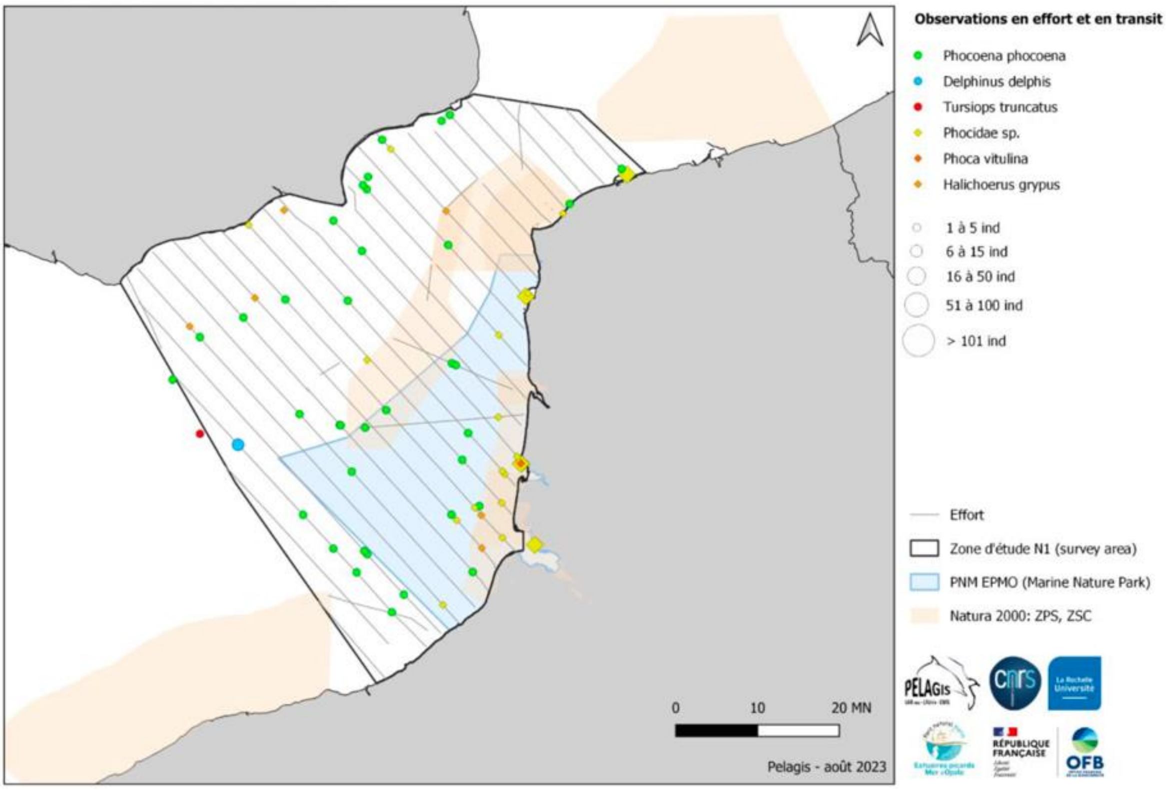
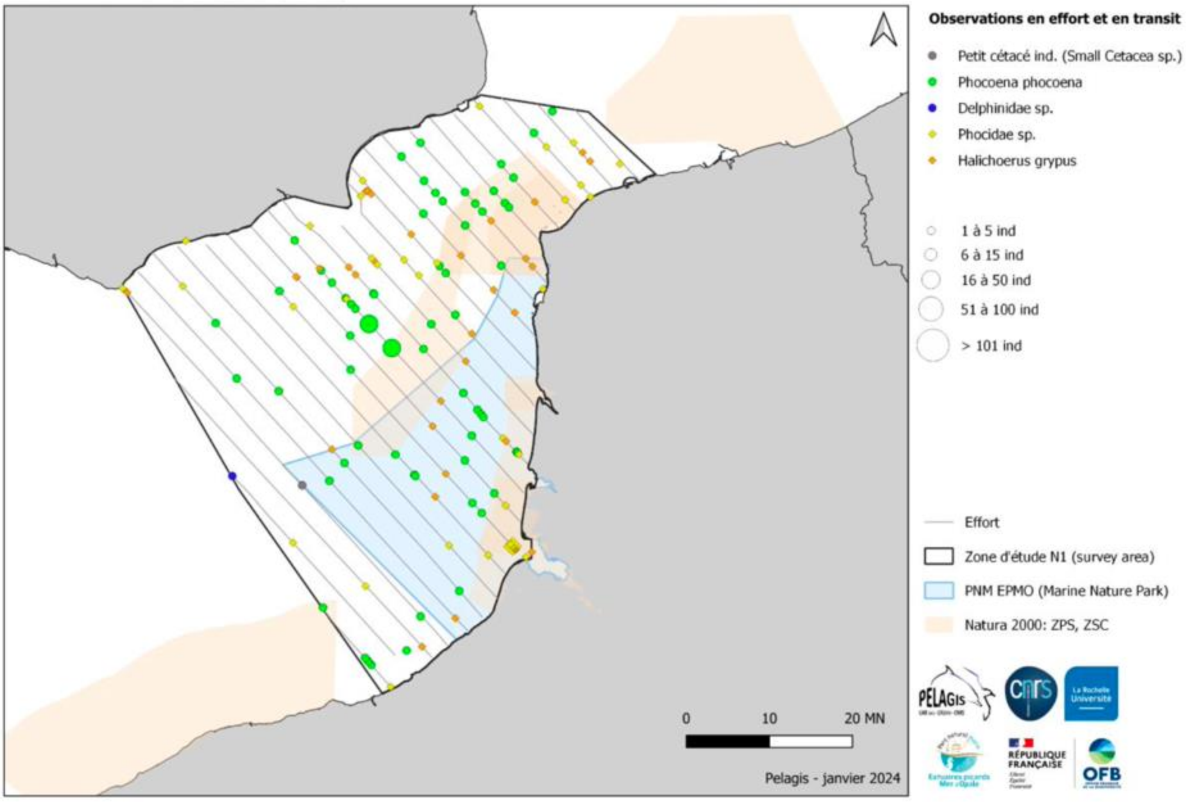


Figure 21. Map showing harbour porpoise sightings from the French MAMA Surveys in Spring & Summer 2023 (Blanchard *et al.*, 2023a, b)

Winter 2024



Spring 2024

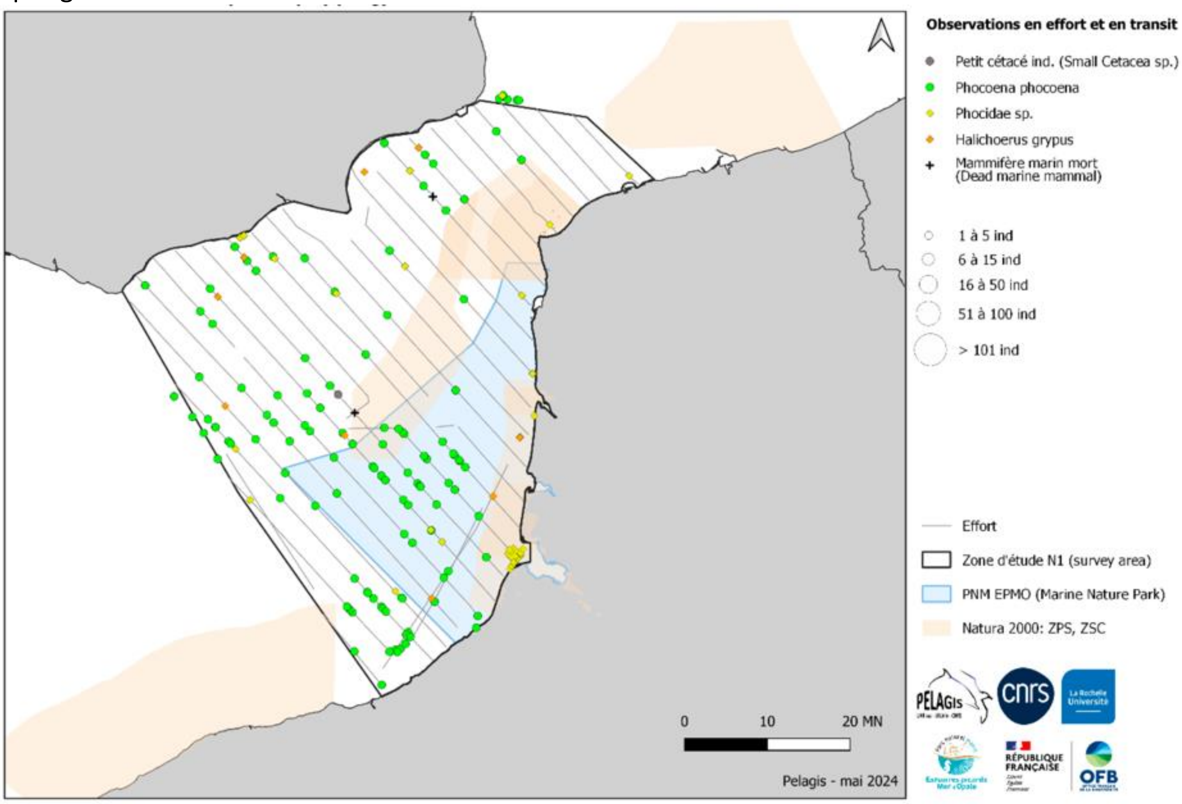
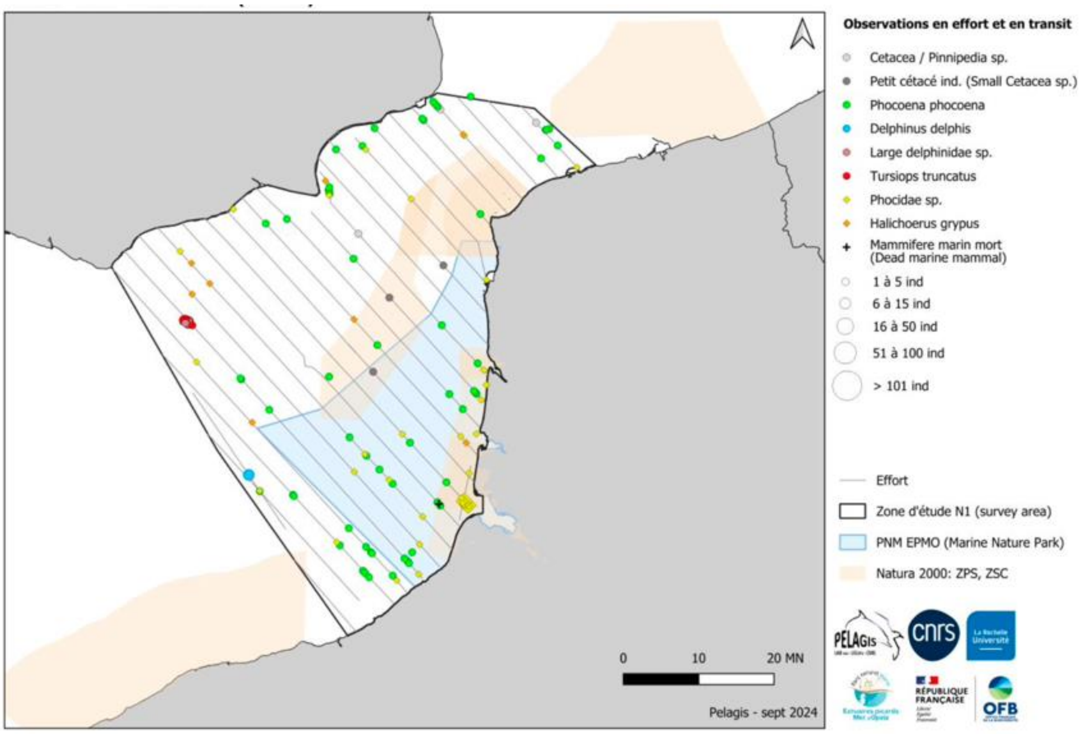


Figure 22. Map showing harbour porpoise sightings from the French MAMA Surveys in Winter & Spring 2024 (Blanchard *et al.*, 2024a, b)

Summer 2024



Autumn 2024

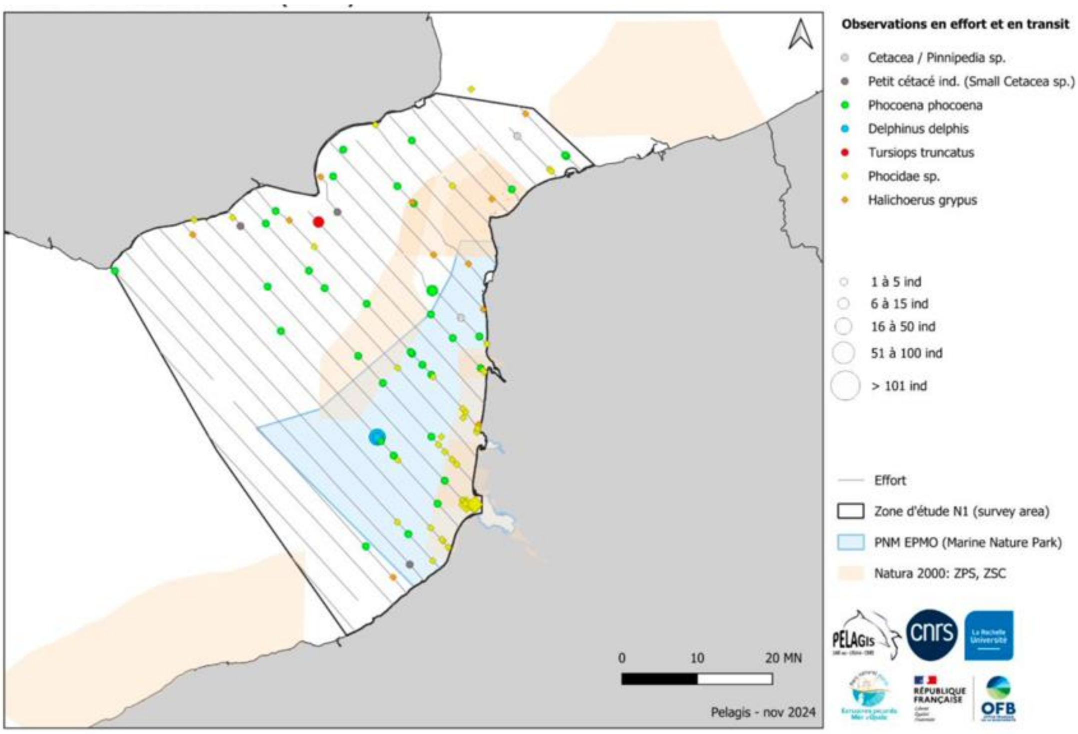


Figure 23. Map showing harbour porpoise sightings from the French MAMA Surveys in Summer & Autumn 2024 (Blanchard *et al.*, 2024c, d)

Winter 2025

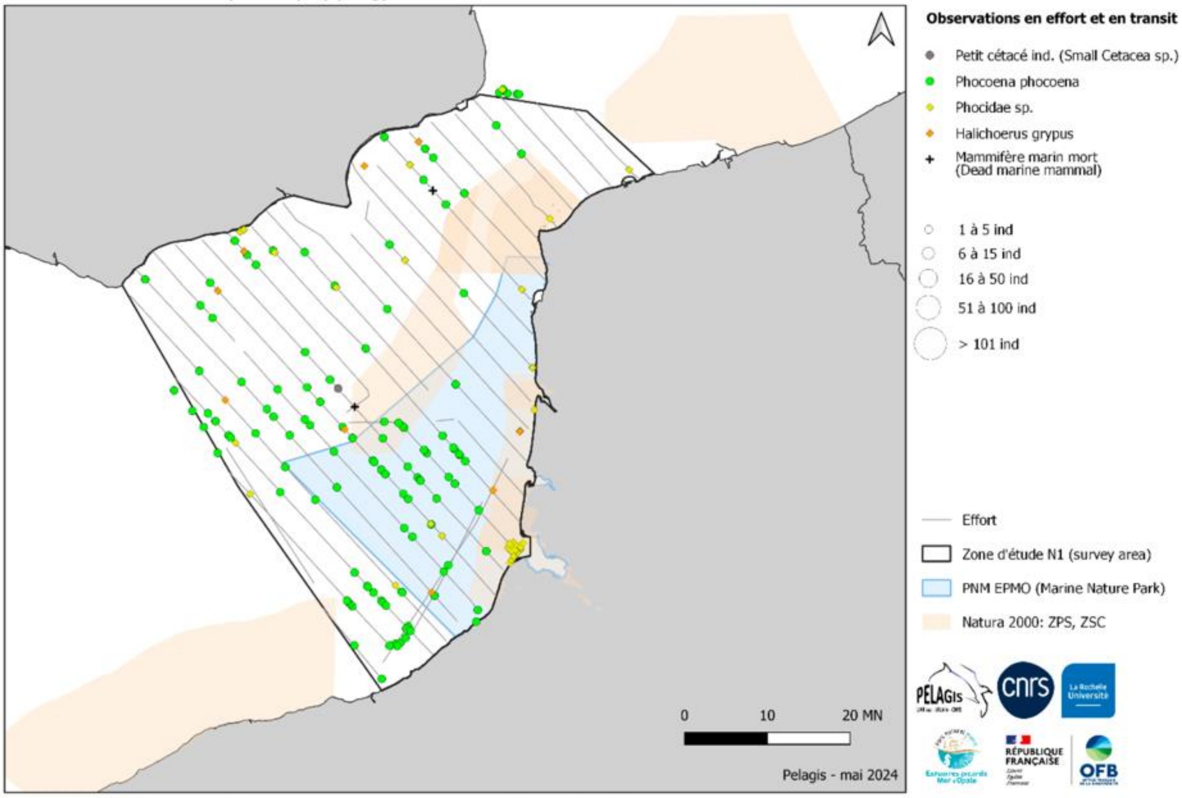


Figure 24. Map showing harbour porpoise sightings from the French MAMA Surveys in Winter 2025 (Blanchard *et al.*, 2025a)

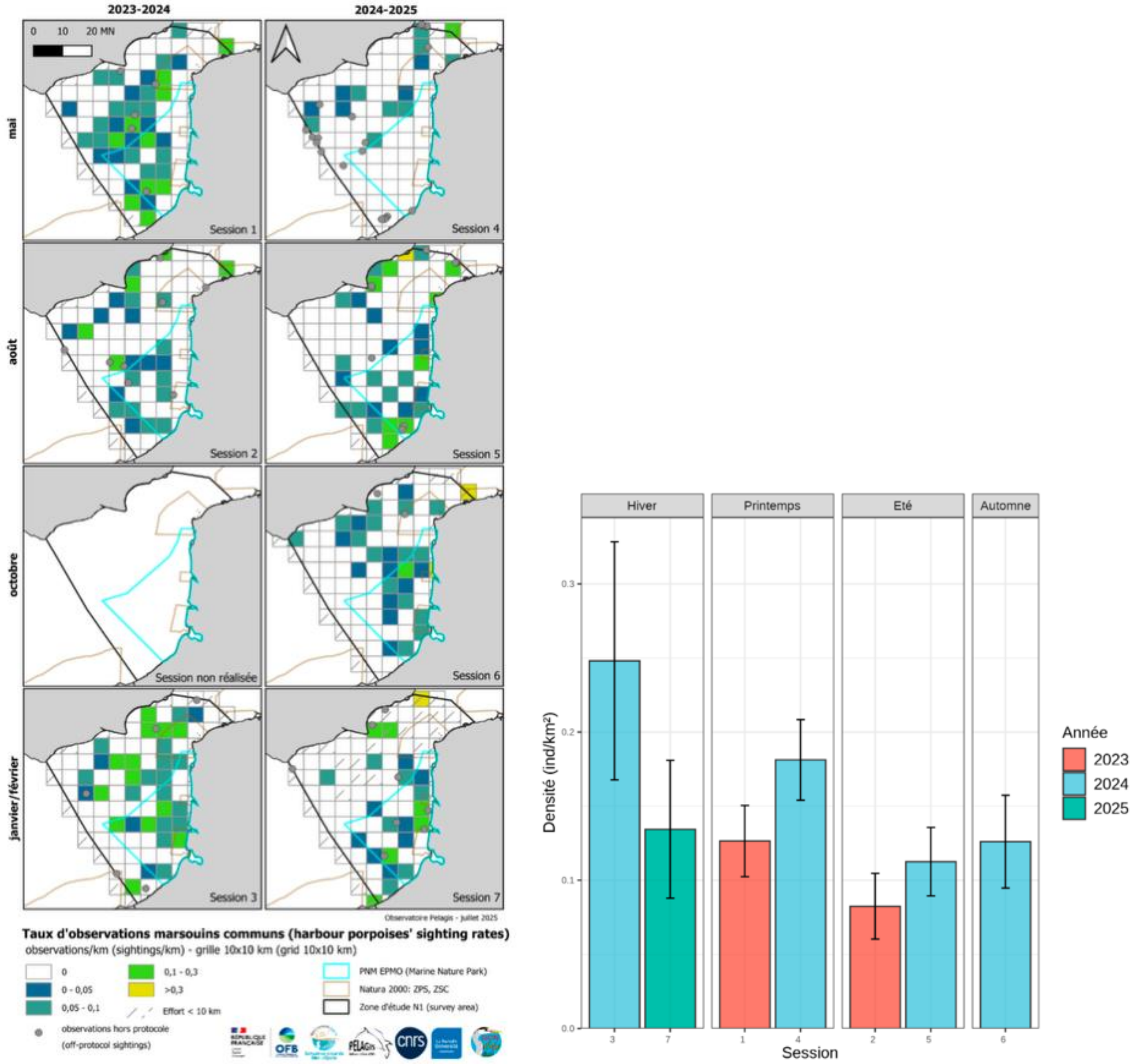


Figure 25. Harbour porpoise seasonal density variation from the MAMA aerial surveys in the eastern Channel, 2023-2025 (Blanchard *et al*., 2025b)

In **Belgium**, the Royal Belgian institute for Natural Sciences (RBINS) have undertaken two to three aerial surveys annually within their EEZ (Figure 26). Three aerial surveys were completed in 2018. Densities in July and October were in line with previous surveys, with on average 0.7 and 0.6 animals/km² respectively. The survey in April yielded a remarkably high average density (5.7 animals/km² in the survey area) with 404 animals sighted during the survey that lasted 3h44' (on effort). The animals were not evenly distributed, with very high densities (over 15 animals/km²) between the Westhinder anchorage area and the Northinder Traffic Separation System, a zone that is proposed as an offshore windfarm area (to be confirmed in the new marine spatial plan 2020–2026) (ICES WGMME 2019). Two aerial surveys were completed in 2019. Observed harbour porpoise densities in June and August were normal, with on average 0.72 and 0.62 animals/km² respectively (Haelters *et al.* 2020). Two aerial surveys were completed in 2020, with 34 porpoises observed during June, yielding an average estimate of 0.56 (0.37–0.77) animals/km² in Belgian waters. During the survey on 1–2 September, 37 porpoises were observed, yielding a similar average density of 0.55 (0.36–0.78) animals/km² (Haelters *et al*., 2021).

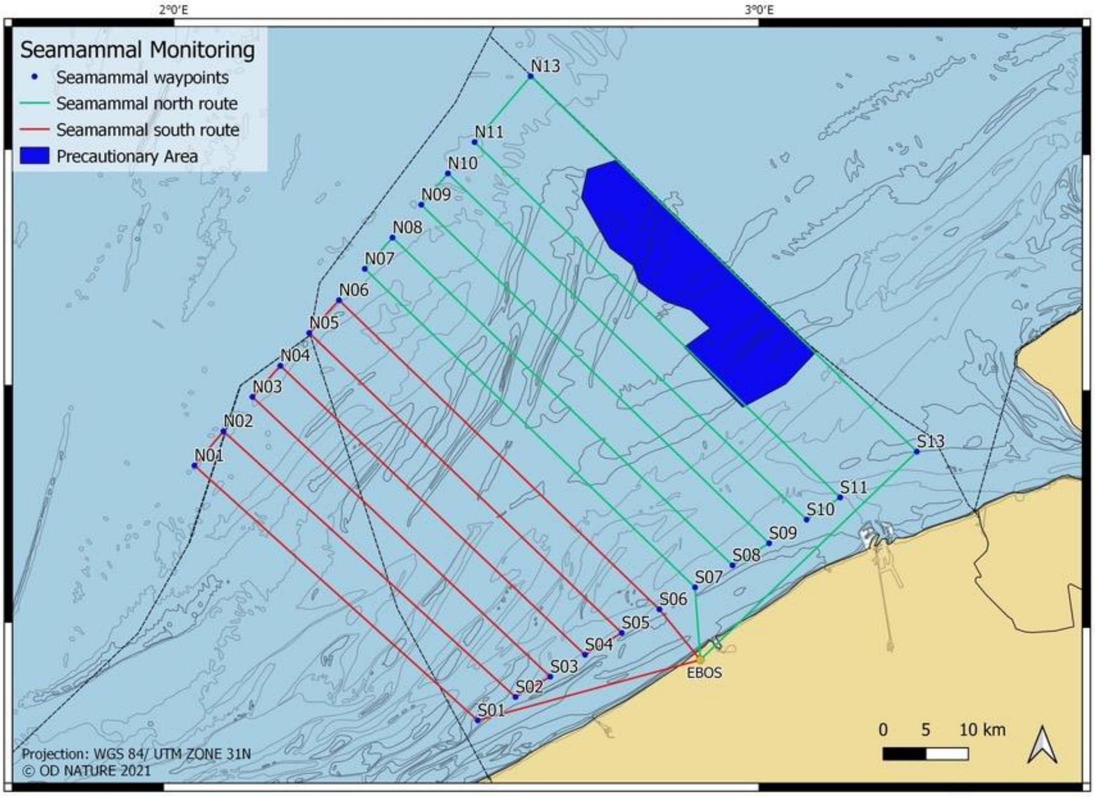


Figure 26. Aerial survey flight-lines are shown in red and green. The wind farm area (polygon) is shown in blue (RBINS data from Haelters *et al*., 2020)

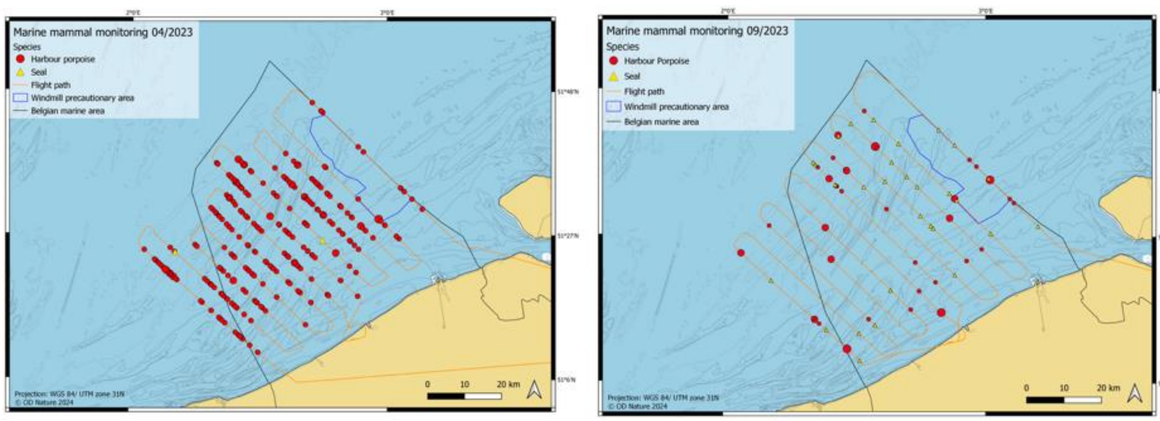


Figure 27. Observations during the survey in April (left) and September (right) 2023: porpoises (red) and seals (yellow); the flight lines and wind farm area (polygons) are shown in grey (RBINS data from Haelters *et al*., 2024)

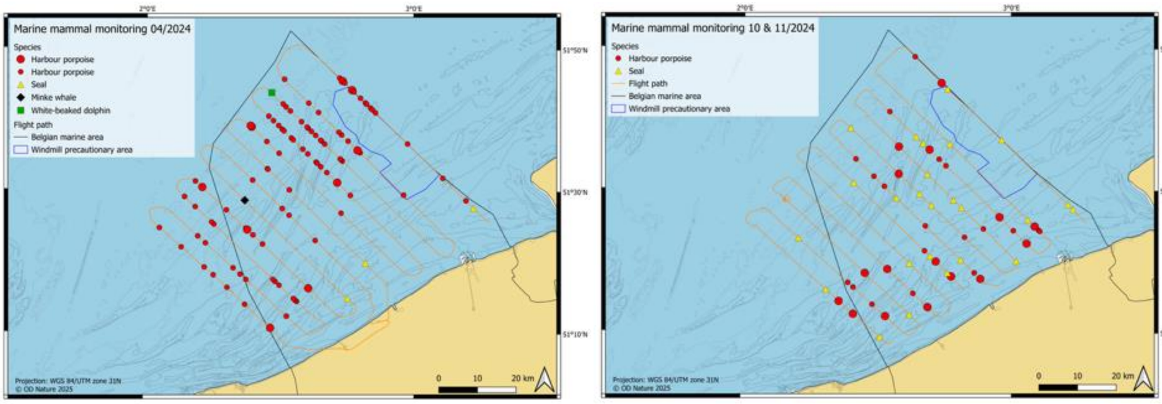


Figure 28. Observations during the survey in April (left) and October-November (right) 2024: porpoises (red) and seals (green); the flight lines and wind farm area (polygons) are shown in grey (RBINS data from Haelters *et al.*, 2025)

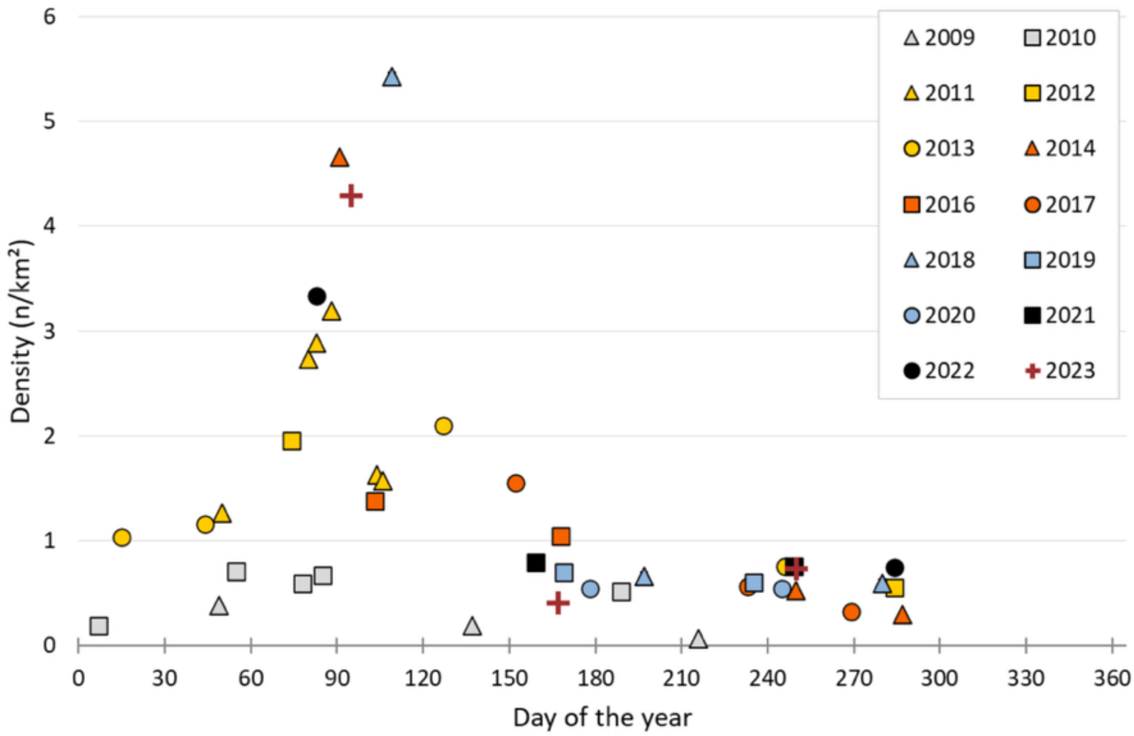


Figure 29. Seasonal Variation in Harbour Porpoise densities in Belgian waters (RBINS data from Haelters *et al.*, 2024)

Aerial surveys have continued annually since then (Figures 27-28), with consistently higher densities recorded in spring (Figures 29-30) (Haelters *et al.*, 2024).

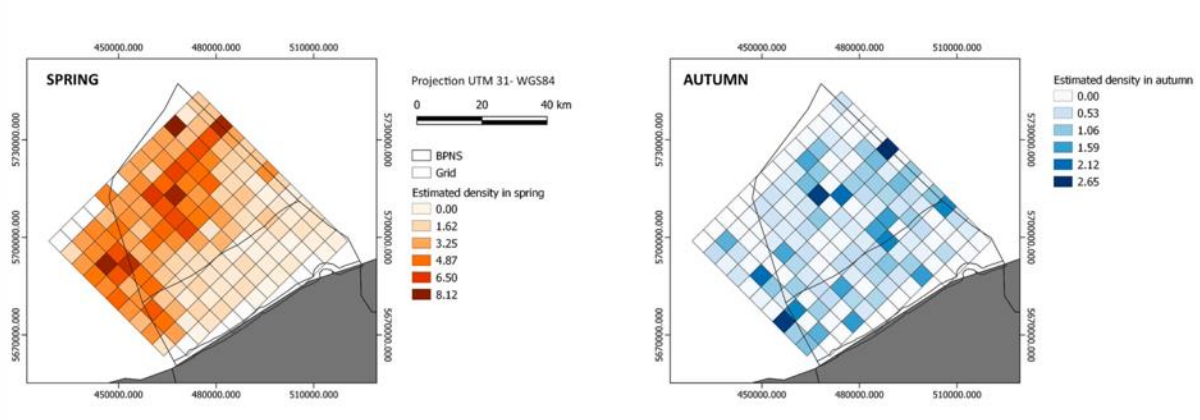


Figure 30. Variation in seasonal distributions of Harbour Porpoise in Belgian waters (RBINS data from Haelters *et al*., 2024)

In the **Netherlands**, Geelhoed & Scheidat (2018) analysed the results of their aerial surveys across the Dutch EEZ (Figure 31) for the years 2012-2017. Maps of porpoise distributions for each of those years are shown in Figure 32. 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 Sea Islands 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 as 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.

Between 13–18 July 2018, and between 16 July-4 August 2019, the entire Dutch Continental Shelf was again surveyed along the same pre-determined track lines, resulting in a total distance of 5182.0 km (3039.8 km in 2018 and 2142.2 in 2019) of effort. The resulting total number of harbour porpoises on the Dutch Continental Shelf was estimated at 63 514 animals (CI = 34 276–119 734) and 38,911 individuals (CI = 20,791-76,822) respectively. Neither the DCS abundance estimates, nor the abundance estimates per subarea showed a trend (Geelhoed *et al*. 2020). The harbour porpoise distribution from this survey is shown in Figure 33. The next series of aerial surveys will be in 2023, following the decision to run surveys in spring and summer every three years (Ministry of Agriculture, Nature and Food Quality, 2020).

In 2020, the Netherlands opted to have aerials every three years. However, in 2023, this was prevented by bad weather, and the only national survey since 2019 was in summer 2024, the results of which are expected late in 2025 (S. Geelhoed*, pers. comm*.)

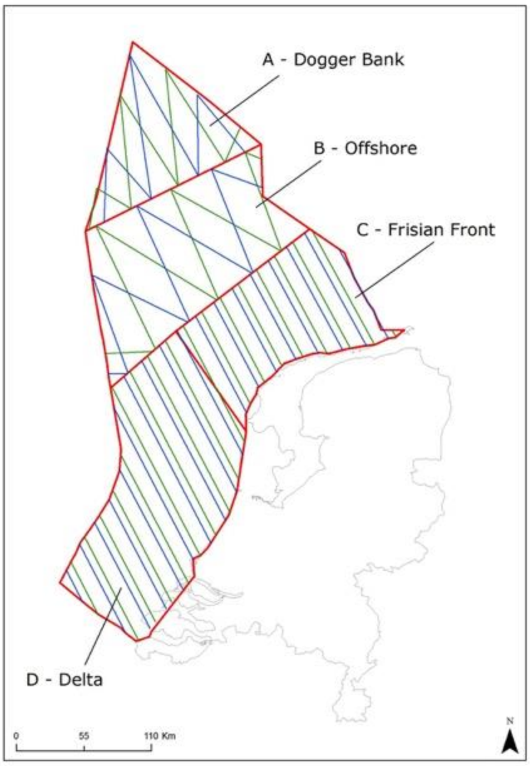


Figure 31. Map of the Dutch Continental Shelf with the planned track lines in study areas A – Dogger Bank, B – Offshore, C – Frisian Front and D – Delta. Colours indicate sets of track lines (Source: Geelhoed & Scheidat, 2018)

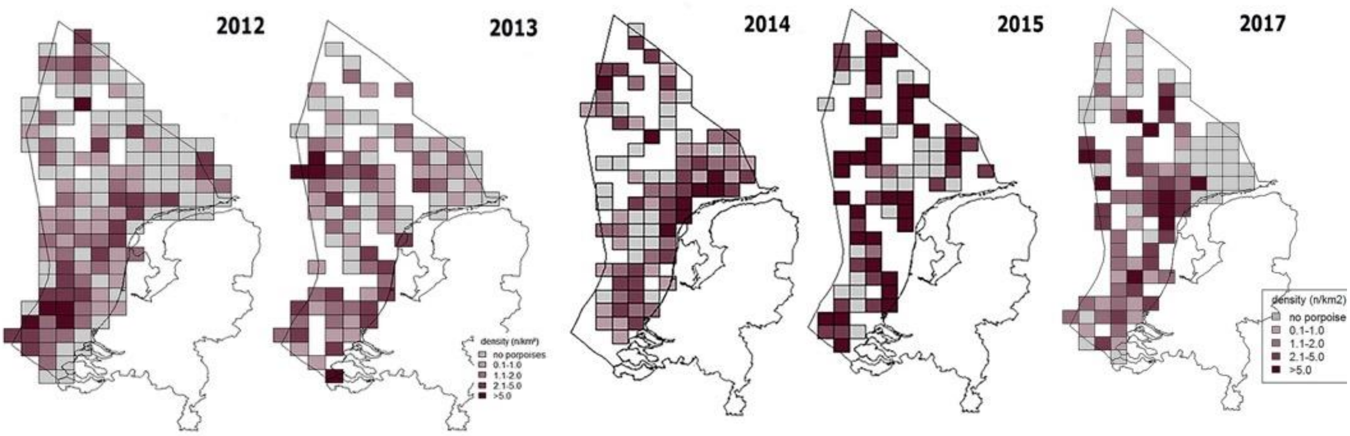
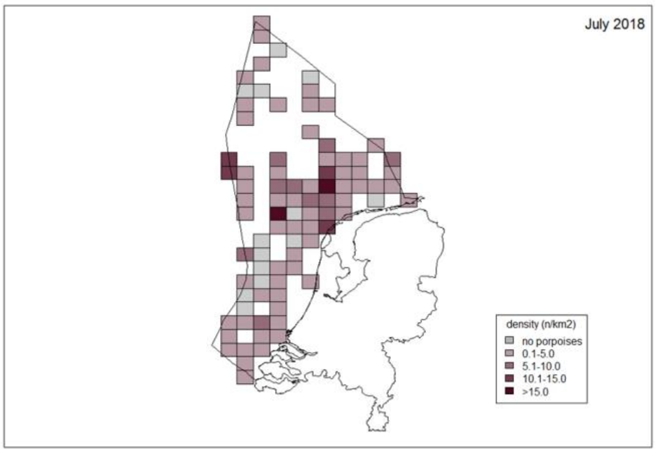


Figure 32. Density distribution of harbour porpoises (animals/km²) per 1/9 ICES grid cell, spring 2012 to 2017. Grid cells with low effort (<1 km²) are omitted (Source: Geelhoed & Scheidat 2018)



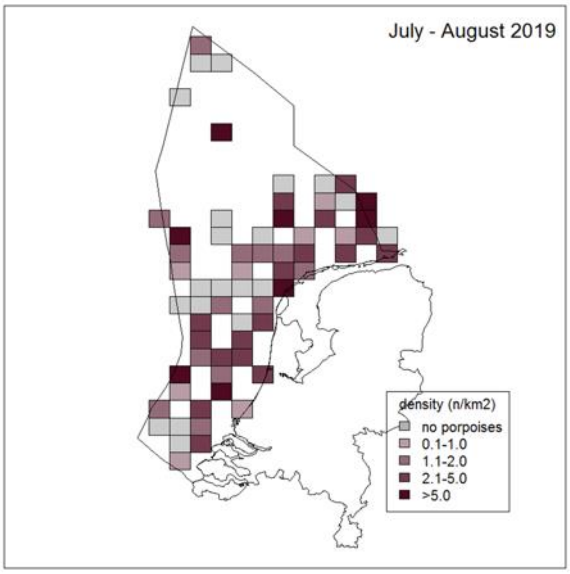


Figure 33. Density distribution of harbour porpoises (animals/km²) per 1/9 ICES grid cell, July 2018 and July-Aug 2019. Grid cells with low effort (<1 km²) are omitted (Source: ICES WGMME 2019, Geelhoed *et al*. 2020)

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 was made. In 2017, the strata and transect design for the visual monitoring of harbour porpoises was revised in an effort to harmonise the national monitoring efforts for cetaceans and seabirds and to provide a survey design for potential future digital surveys. This resulted in the design of new study areas for the aerial line transect surveys in the German North Sea and Baltic Sea (ICES WGMME 2019; Figure 34).

In spring 2017, one aerial line transect survey was conducted near Borkum Reef Ground and a total of 18 harbour porpoise groups (23 animals, incl. two calves) were sighted along 559 km of effort. Due to logistical reasons and bad weather, no surveys could be conducted in the North and Baltic Sea during summer 2017. In spring 2018, a total of 163 harbour porpoise groups (179 animals, no calves) were recorded along 1459 km of effort in three areas in the North Sea (Borkum Reef Ground, Weser-Elbe estuary and Dogger Bank. In summer 2018, a total of 166 groups (200 animals, incl. 14 calves) were observed under 2077 km of effort in four study areas in the North Sea (Weser-Elbe estuary, Sylt Outer

Reef West and East, and Dogger Bank. In spring 2019, a total of 145 harbour porpoise groups (172 animals, seven calves) were recorded along 1516 km of effort in three aerial survey strata in the North Sea. In summer 2019, a total of 245 harbour porpoise groups (318 animals, including 12 calves) were observed along 3694 km of effort in all eight study areas in the North Sea.

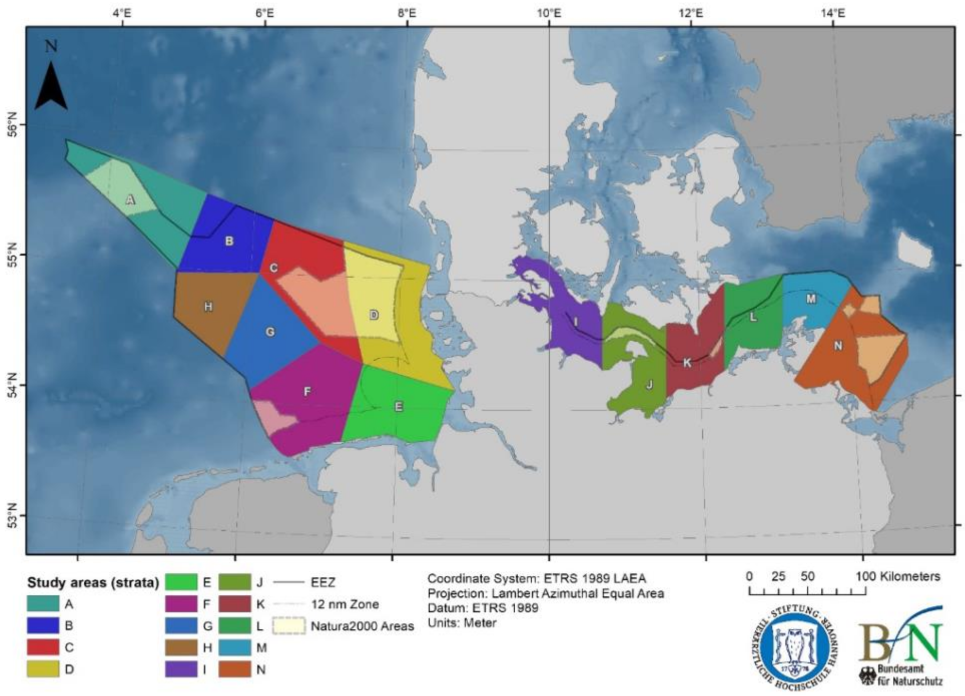


Figure 34. Designated study areas for the visual monitoring of harbour porpoises in the German North and Baltic Sea

Effort corrected density and abundance estimates were generated using a bootstrapping approach, also correcting for availability and perception bias. In spring 2017, the abundance for Borkum Reef Ground in the North Sea was estimated to be 2,862 (95%CI: 1175–4656) animals, at 0.44 (0.19–0.76) animals/km². In spring and summer 2018, and spring 2019, the German North Sea was not entirely covered, allowing abundance and density estimates only for the individual areas (ICES WGMME 2019, 2020; Figure 35). For spring 2019, abundance estimates by survey block were: 'Dogger Bank (A)' with 7,707 (95% CI: 4005–12 405), at 1.36 (0.71–2.20) animals/km²; 'Borkum Reef Ground (F)' with 3,315 (95% CI: 1605–6150) animals, at 0.54 (0.26–1.01) animals/km² and 'Weser-Elbe estuary (E)' with 887 (95% CI: 296–1981) animals, at 0.20 (0.05–0.45) animals/km² (ICES WGMME 2020).

In spring 2020, a total of 432 harbour porpoise groups (561 animals, 71 calves) were recorded along 2,641 km of effort in five areas in the North Sea (Dogger Bank, Area B, Sylt Outer Reef West, Sylt Outer Reef East, Weser-Elbe estuary, Figure 36a). In summer 2020, a total of 245 harbour porpoise groups (320 animals, incl. 25 calves) were observed under 2,237 km of effort in four areas in the North Sea (Sylt Outer Reef West, Sylt Outer Reef East, Weser-Elbe estuary, Borkum Reef Ground, Figure 36b). In spring 2020, the German North Sea was largely covered (areas A–E). The total abundance for these areas was estimated to be 44,554 (95%CI: 33 189–59 552) animals, at 1.66 (1.24–2.22) animals/km² (Table 3). In summer 2020, the German North Sea was covered in four of the eight areas (C–F). The total abundance for these areas was estimated of 25,480 (17 855–35 986) harbour porpoises and an average density of 1.09 (0.76–1.54) animals/km² (Table 4; ICES WGMME, 2021).

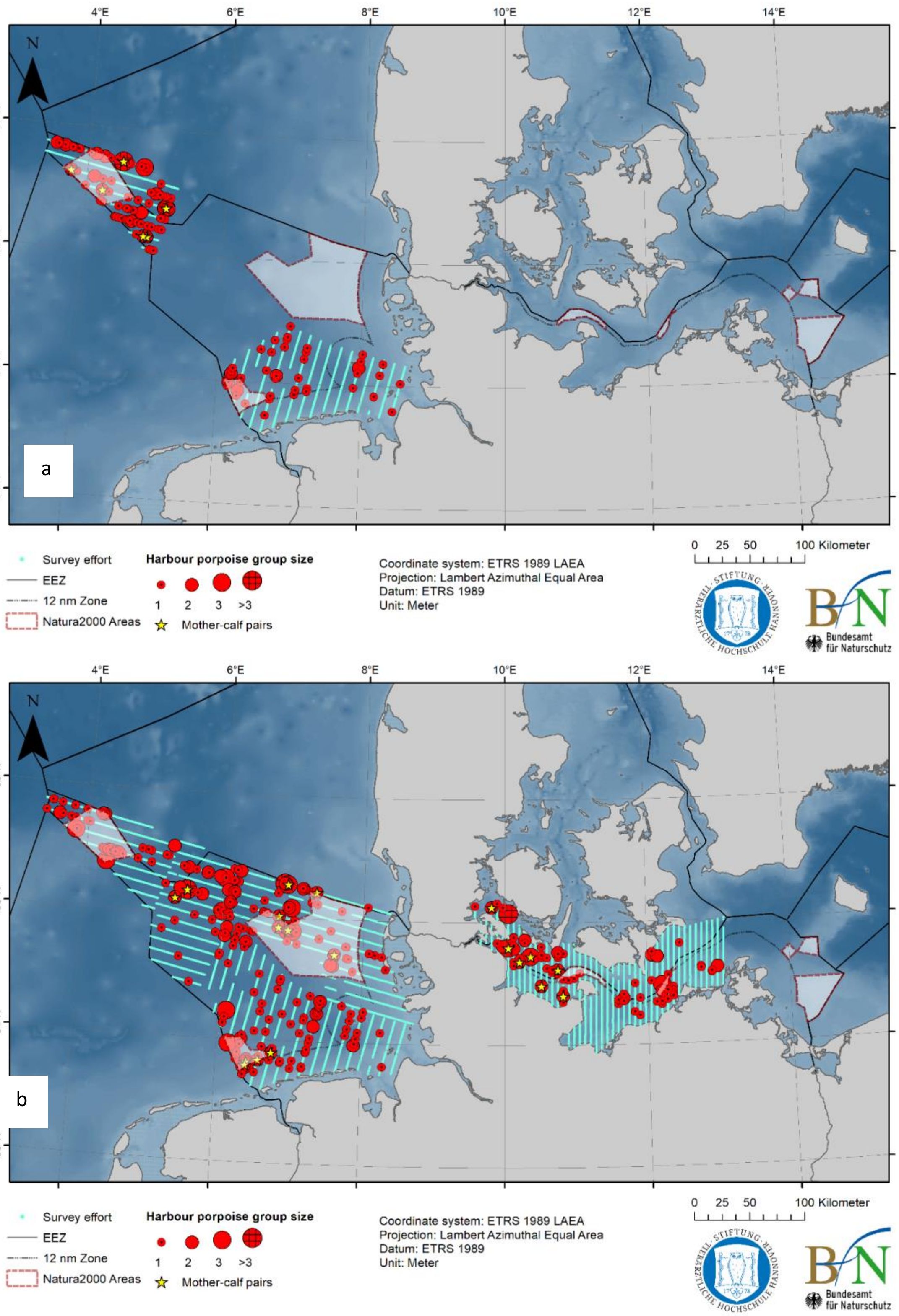
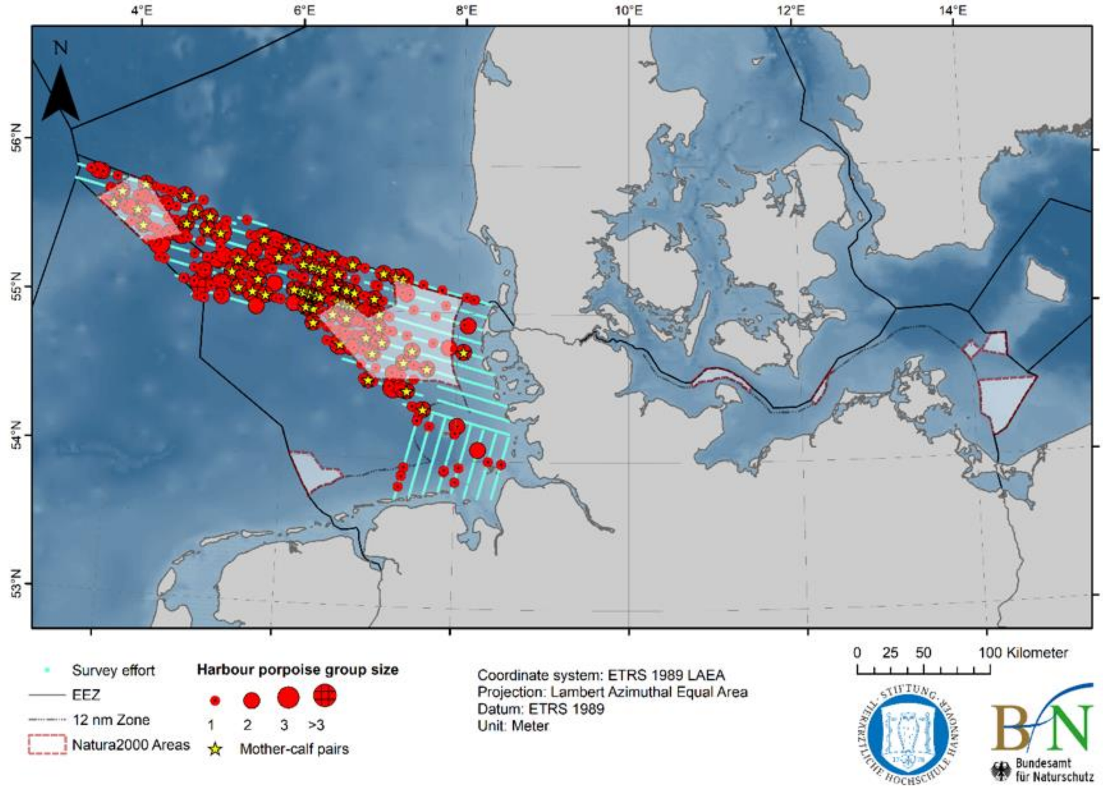


Figure 35. Survey effort and harbour porpoise sightings during aerial surveys in the German North and Baltic Sea during a) spring 2019 and b) summer 2019. Harbour porpoise group sizes are indicated using group size dependent red circles; yellow stars indicate mother-calf pairs; blue lines indicate covered transect lines (i.e. survey effort). (Source: ICES WGMME 2020)



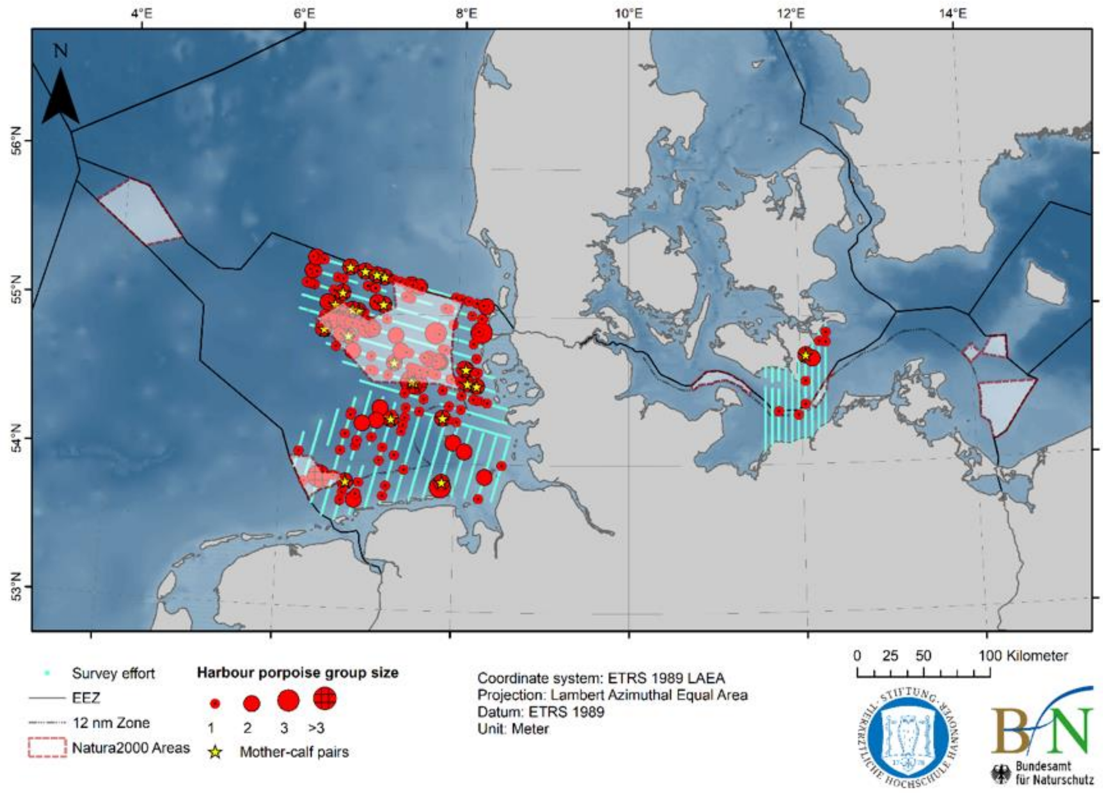


Figure 36. Survey effort and harbour porpoise sightings during aerial surveys in the German North and Baltic Sea during a) spring 2020 and b) summer 2020. Harbour porpoise group sizes are indicated using group size dependent red circles; yellow stars indicate mother-calf pairs; blue lines indicate covered transect lines (i.e. survey effort). (Source: ICES WGMME, 2021)

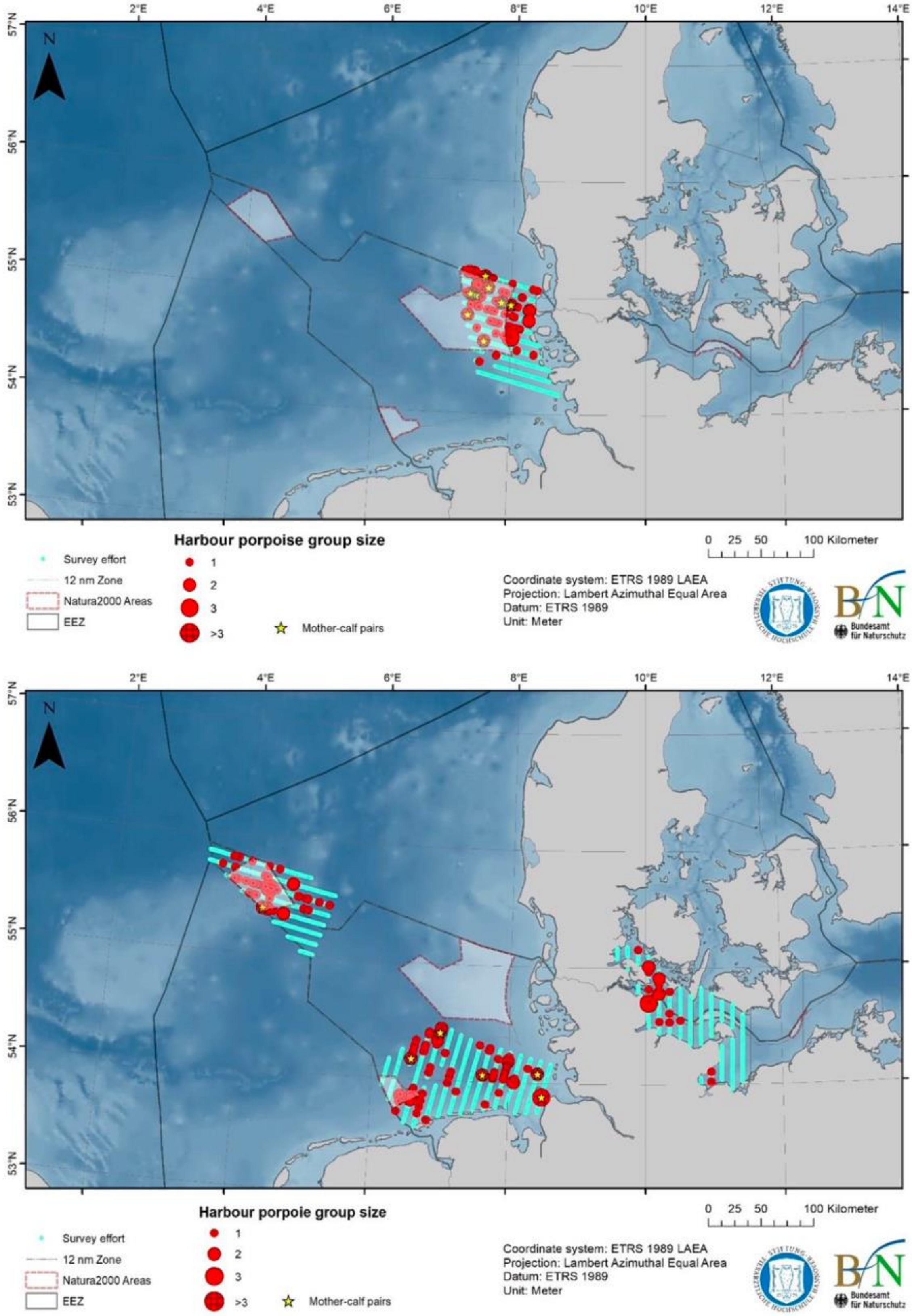


Figure 37. Survey effort and harbour porpoise sightings during aerial surveys in the German North Sea during a) spring 2021 and b) summer 2021. Harbour porpoise group sizes are indicated using group size dependent red circles; yellow stars indicate mother-calf pairs; blue lines indicate covered transect lines (i.e. survey effort). (Source: ITAW/BfN, courtesy of P. Brtnik)

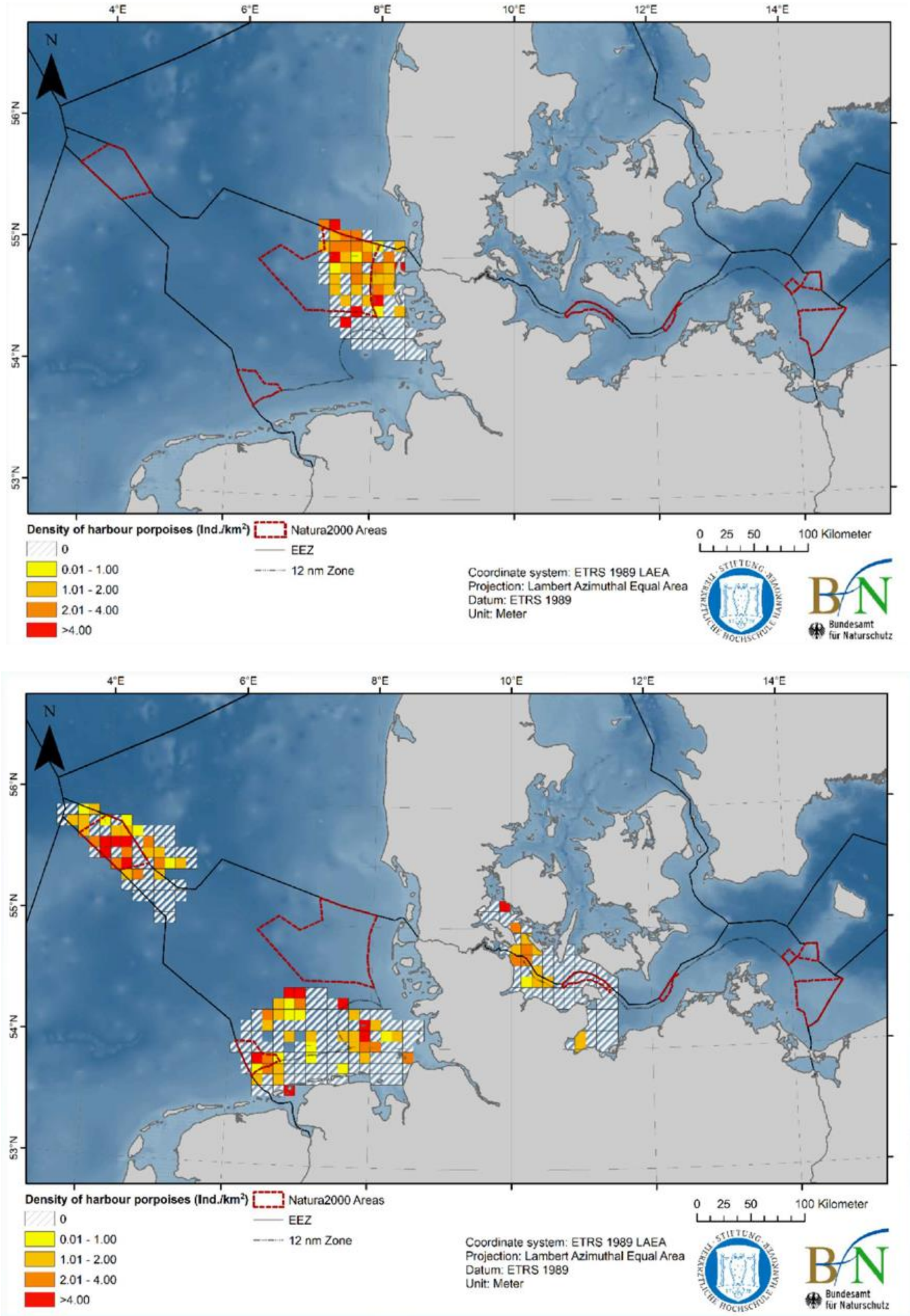


Figure 38. Harbour porpoise densities during aerial surveys in the German North and Baltic Sea during a) spring 2021 and b) summer 2021. Harbour porpoise group sizes are indicated using group size dependent red circles; yellow stars indicate mother-calf pairs; blue lines indicate covered transect lines (i.e. survey effort). (Source: ITAW/BfN, courtesy of P. Brtnik)

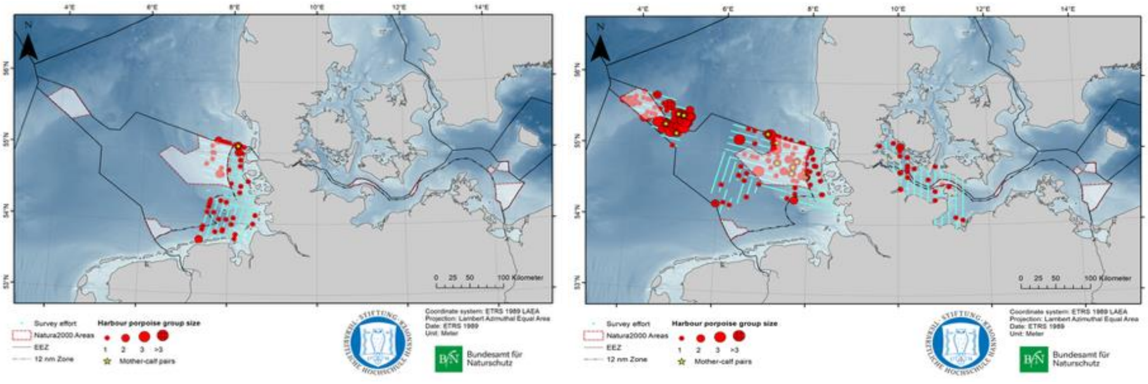


Figure 39. Survey effort and harbour porpoise sightings during aerial surveys in the German North and Baltic Sea during a) spring 2023 and b) summer 2023. Harbour porpoise group sizes are indicated using group size dependent red circles; yellow stars mark mother–calf pairs; blue lines indicate covered transect lines (i.e. survey effort). Source: (Nachtsheim *et al.,* 2024)

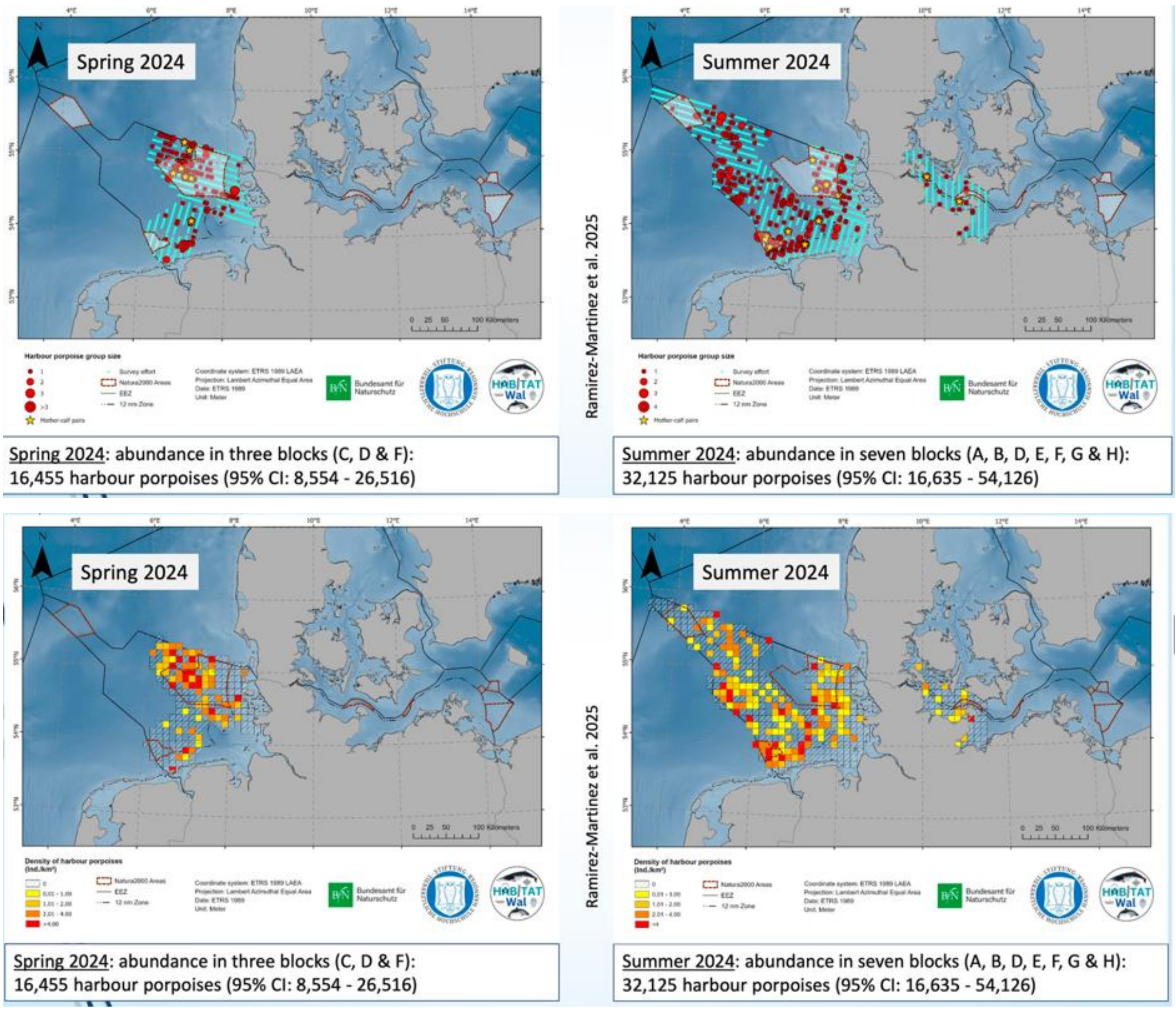


Figure 40. Survey effort and harbour porpoise sightings (above) and densities (below) during aerial surveys in the German North and Baltic Sea during a) spring 2024 and b) summer 2024. Harbour porpoise group sizes are indicated using group size dependent red circles; yellow stars mark mother–calf pairs; blue lines indicate covered transect lines (i.e. survey effort). Source: (Nachtsheim *et al.,* 2024)

Table 4. Summary of effort corrected, bootstrapped density and abundance estimates for spring 2020 and summer 2020 in the German EEZ of the North Sea. N = estimated abundance of harbour porpoises; $N_{95\%CI}$ = 95% confidence interval around N; D = density estimate of harbour porpoises in indiv./km²; $D_{95\%CI}$=95% CI around D; s = average group size (Source: ICES WGMME, 2021)

Area	Season	N	$N_{95\% CI}$	D	$D_{95\% CI}$	$\hat{s}$
Dogger Bank (A)	spring 2020	11 425	8011–16 093	2.02	1.42–2.85	1.25
(B)	spring 2020	9209	6149–13 075	2.33	1.56–3.31	1.40
Sylt Outer Reef West (C)	spring 2020	18 677	12 139–27 808	3.12	2.03–4.64	1.34
Sylt Outer Reef East (D)	spring 2020	3318	1819–5111	0.48	0.26–0.74	1.31
Weser-Elbe estuary (E)	spring 2020	1925	916–3298	0.44	0.21–0.75	1.10
North Sea Areas: Dogger Bank (A) (B) Sylt Outer Reef West (C) Sylt Outer Reef East (D) Weser-Elbe estuary (E)	spring 2020	44 554	33 189–59 552	1.66	1.24–2.22	1.31
Sylt Outer Reef West (C)	summer 2020	9929	6249–14 850	1.66	1.04–2.48	1.29
Sylt Outer Reef East (D)	summer 2020	9991	5806–15 550	1.45	0.84–2.25	1.30
Weser-Elbe estuary (E)	summer 2020	1467	279–3785	0.34	0.06–0.86	1.60
Borkum Reef Ground (F)	summer 2020	4092	2657–5914	0.67	0.44–0.97	1.28
North Sea Areas: Sylt Outer Reef West (C) Sylt Outer Reef East (D) Weser-Elbe estuary (E) Borkum Reef Ground (F)	summer 2020	25 480	17 855–35 986	1.09	0.76–1.54	1.31

In spring 2021, just one area (Sylt Outer Reef East) was covered in the North Sea (Figure 27a), whereas in summer 2021, three areas (Dogger Bank, Weser-Elbe estuary, and Borkum Reef Ground) (Figure 27b). The total abundance for Sylt Outer Reef East in spring 2021 was estimated to be 7,836 (95%CI: 4,144–12,838) porpoises, at an average density of 1.14 (0.6–1.86) animals/km² (Table 5). In summer 2021, the total abundance was estimated at 5,305 (95%CI: 2,142-9,401) for Dogger Bank at an average density of 0.94 (95%CI: 0.38-1.66), for Weser-Elbe estuary it was estimated at 4,571 (95%CI: 1,391–10,152) porpoises at an average density of 1.04 (0.32-2.32) animals/km² (Table 5), and for Borkum Reef Ground, it was estimated at 3,986 (95%CI: 1,438-7,465) porpoises and an average density of 0.65 (0.24–1.23) animals/km² (Table 5).

Table 5. Summary of effort corrected, bootstrapped density and abundance estimates for spring 2021 and summer 2021 in the German EEZ of the North Sea and Baltic Sea. N = estimated abundance of harbour porpoises; $N_{95\%CI}$ = 95% confidence interval around N; D = density estimate of harbour porpoises in indiv./km²; $D_{95\%CI}$=95% CI around D; s = average group size (Source: ITAW/BfN, courtesy of P. Brtnik)

Area	Area size [km²]	Abundance (95% CI)	Density (95% CI)
D	6,897	7,836 (4,144 – 12,838)	1.14 (0.6 - 1.86)
Σ Surveyed North Sea areas spring	*6,897*	*7,836 (4,144 – 12,838)*	*1.14 (0.6 - 1.86)*
A	5,647	5,305 (2,142 – 9,401)	0.94 (0.38 - 1.66)
E	4,377	4,571 (1,391 – 10,152)	1.04 (0.32 - 2.32)
F	6,092	3,986 (1,438 – 7,465)	0.65 (0.24 - 1.23)
Σ Surveyed North Sea areas summer	*16,116*	*13,862 (7,338 – 22,037)*	*0.86 (0.46 - 1.37)*
I	3,116	2,063 (645 – 3,458)	0.66 (0.21 – 1.11)
J	3,575	*145 (0 - 496)*	*0.04 (0 - 0.14)*
Σ Surveyed Baltic Sea areas summer	*6,691*	*2,209 (773 – 3,653)*	*0.33 (0.12 - 0.55)*

Nachtsheim *et al.* (2020) analysed harbour porpoise trends in abundance within the German North Sea, and particularly within three Natura 2000 sites (Sylt Outer Reef, Borkum Reef, and Dogger Bank) from aerial surveys undertaken between 2002 and 2019. Trends were estimated for each SAC and two seasons (spring and summer) as well as the complete area of the German North Sea. For the trend analysis, a Bayesian framework was applied to a series of replicated visual surveys, in order to address spatio-temporal heterogeneity and other sources of uncertainty in the surveys. In general, harbour porpoise abundance decreased in northern areas and increased in the south, such as in the SAC Borkum Reef Ground. A particularly strong decline with a high probability (94.9%) was detected in the core area and main reproduction site in summer, the SAC Sylt Outer Reef (-3.79% per year) (Figure 41). The overall trend for the German North Sea revealed a decrease in harbour porpoise abundance over the whole study period (-1.79% per year) with high probability (95.1%).

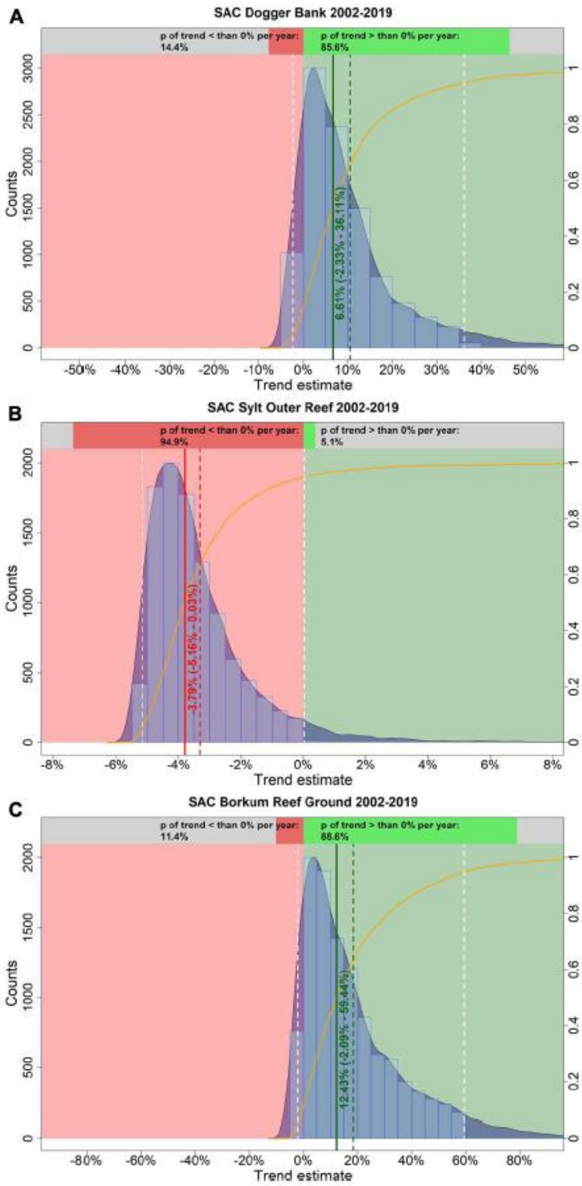


Figure 41. Estimated trends in harbour porpoise abundance in the three SACs Dogger Bank (A), Sylt Outer Reef (B), and Borkum Reef Ground (C) in summer, between 2002 and 2019. The light blue histogram and the blue shaded density curve show the distribution of the trend estimates (relative change in abundance) between 2002 and 2019 (x-axis); the median is indicated by the solid red vertical line. The mean is shown by the vertical red dashed line, while the white dashed lines represent the upper and lower 95% credibility intervals of the trend estimate. The red coloured area corresponds to an area with a negative trend, whereas the green coloured area represents a positive trend. The orange solid line illustrates the empirical cumulative distribution function of the trend estimates, giving the probability of a trend estimate at a specified value (e.g. 0%). The upper bar chart hence indicates how likely it is that the trend is either negative (i.e., p < 0%; red) or positive (i.e., p > 0%; green). (Source: Nachtsheim *et al.*, 2021)

In **Denmark**, monitoring of harbour porpoises is carried out through the national monitoring programme NOVANA. Every year in July/August aerial surveys are conducted in the southern Danish North Sea and Skagerrak, covering the five Natura 2000 areas for harbour porpoises in this region. In the Skagerrak area in 2019 (Figure 39a), a total of 47 porpoises were observed in groups of up to 4 individuals. The average group size was 1.5. In the North Sea area (Figure 39b) 41 porpoises were observed, with an average group size of 1.08. Calves were observed in both survey areas. In 2020, a total of 22 porpoises were observed in groups of up to two individuals. The average group size was 1.22.

In the Skagerrak, the total abundance in 2018 was estimated to be 5,323 individuals (95% CI: 2,415-9,233). 40% of the observations were within the large Natura 2000 site 'Skagens Gren og Skagerrak' (Figure 42a). The Skagerrak area was previously monitored using a slightly different method and comparable estimates are thus not possible prior to 2017. The abundance estimate in 2018 is lower than in 2017, whilst in 2019, the total abundance in the Danish Skagerrak was estimated to be 2,674 individuals (95% CI: 1,513-4,216). This is lower than any previous surveys and indicates a generally declining trend (Hansen & Høgslund 2021; Figure 46).

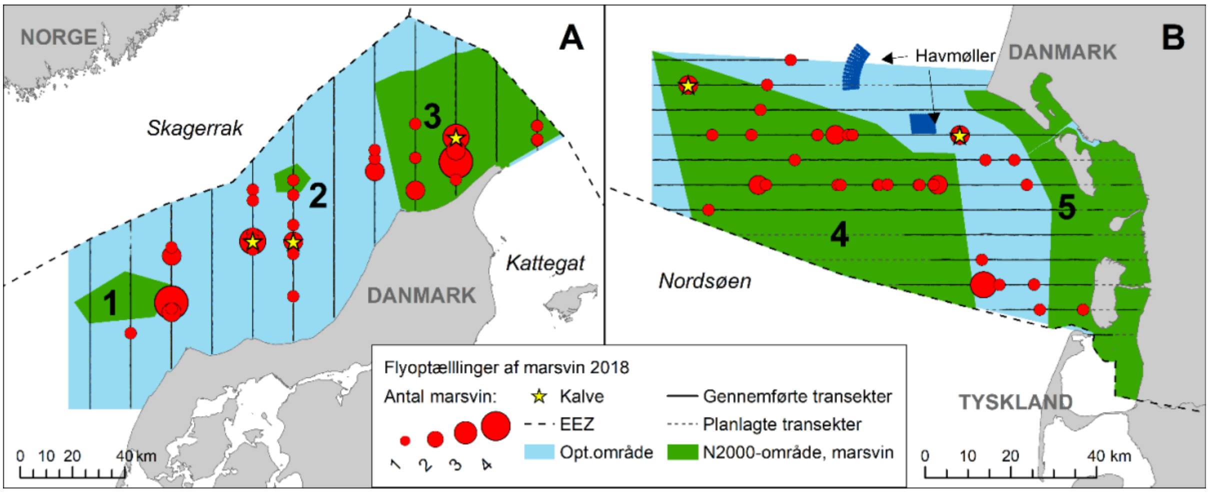


Figure 42. Aerial surveys of harbour porpoises in A) Skagerrak on 29 July 2018 and B) the North Sea on 2 August 2018. The green areas indicate Natura 2000 areas 1) Gule Rev, 2) Store Rev, 3) Skagens Gren and Skagerrak, 4) Sydlige Nordsø and 5) The Wadden Sea with Ribe Å, Tved Å and Varde Å west of Varde. No. of porpoises observed shown by the size of red dots and yellow stars indicate that calves were seen. Blue areas indicate offshore windfarms.

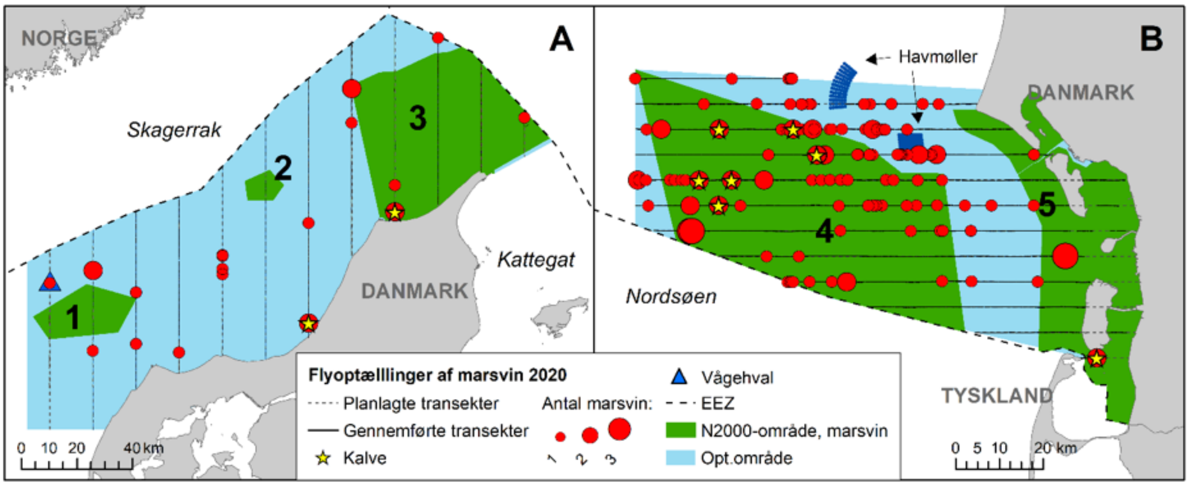


Figure 43. Aerial surveys of harbour porpoises in A) Skagerrak on 10 July 2020 and B) the North Sea on 7. August 2020. The green areas indicate Natura 2000 sites: 1) Gule Rev, 2) Store Rev, 3) Skagens Gren og Skagerrak, 4) Sydlige Nordsø og 5) Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde. No. of porpoises observed shown by the size of red dots and yellow stars indicate that calves were seen. Dark blue areas indicate offshore windfarms and light blue areas indicate the survey area. Blue triangle indicates a minke whale observation. (Source: Hansen & Høgslund, 2021)

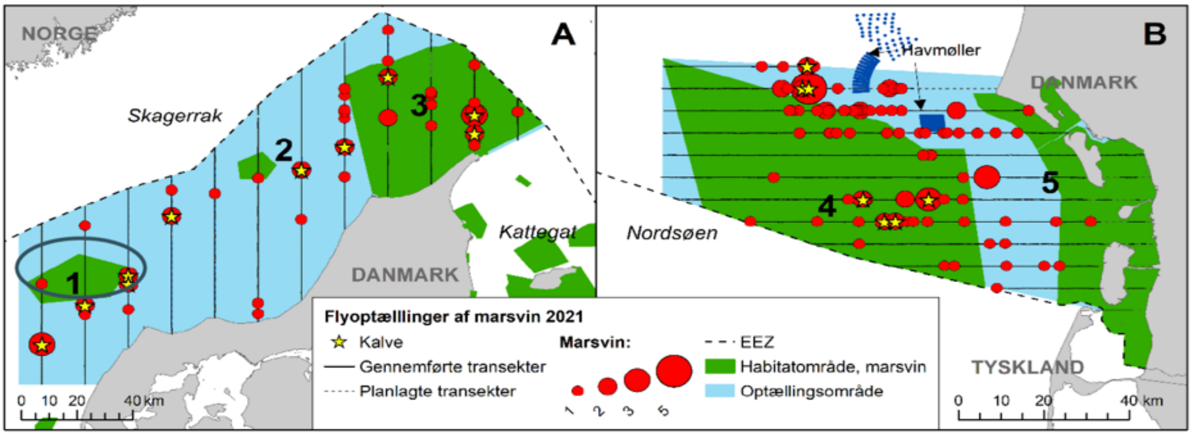


Figure 44. Aerial surveys of harbour porpoises in A) Skagerrak in July 2021 and B) the North Sea in August 2021. The green areas indicate Natura 2000 sites: 1) Gule Rev, 2) Store Rev, 3) Skagens Gren and Skagerrak, 4) Sydlige Nordsø and 5) Vadehavet med Ribe Å, Tved Å and Varde Å west of Varde. No. of porpoises observed shown by the size of red dots and yellow stars indicate that calves were seen. Dark blue areas indicate offshore windfarms and light blue areas indicate the survey area. (courtesy of S. Sveegaard).

The total abundance in the North Sea survey area in 2018 was estimated to be 2,013 individuals (95% CI: 954-3,186). In the North Sea area during surveys in 2019 (Figure 42b), 147 porpoises were observed, with an average group size of 1.20. In the southern North Sea, the total abundance was estimated to 5,929 individuals (95% CI: 3,895-8,310). Most observations were again detected in or near the large Natura 2000 site "Sydlige Nordsø", with rather few observed within the Wadden Sea. A similar distribution was observed during surveys in 2020 (Figure 43) and 2021 (Figure 44).

During 2022, no national surveys in Danish waters were undertaken since efforts were focused upon the wide scale SCANS-IV survey, but these were resumed in 2023 (Figure 45). The North Sea and Skagerrak were not surveyed during 2024 due to a mixture of bad weather and budget cuts.

The number of porpoises in the entire survey area in the southern North Sea during 2023 was estimated at 1,244 animals (95% CI: 484-2,361) with a density of 0.23 porpoises/km^2. This is lower than the previous counts in 2011-2022, except for 2015 (Figure 46), and in general there is great variation between surveys. Based on an expectation of a linear development in the number of porpoises in the southern North Sea from 2011-2023, around 4,000 porpoises live in the area.

There are relatively large variations in abundance estimates between years, which may reflect actual differences in abundance (a possible decline in Skagerrak), but may also be a result of the method, which only gives a snapshot of the distribution and abundance. Furthermore, annual differences in temperature, currents, timing of prey migrations and so on will influence the annual estimates. Consequently, long time series are essential to monitor the long-term trend within an area.

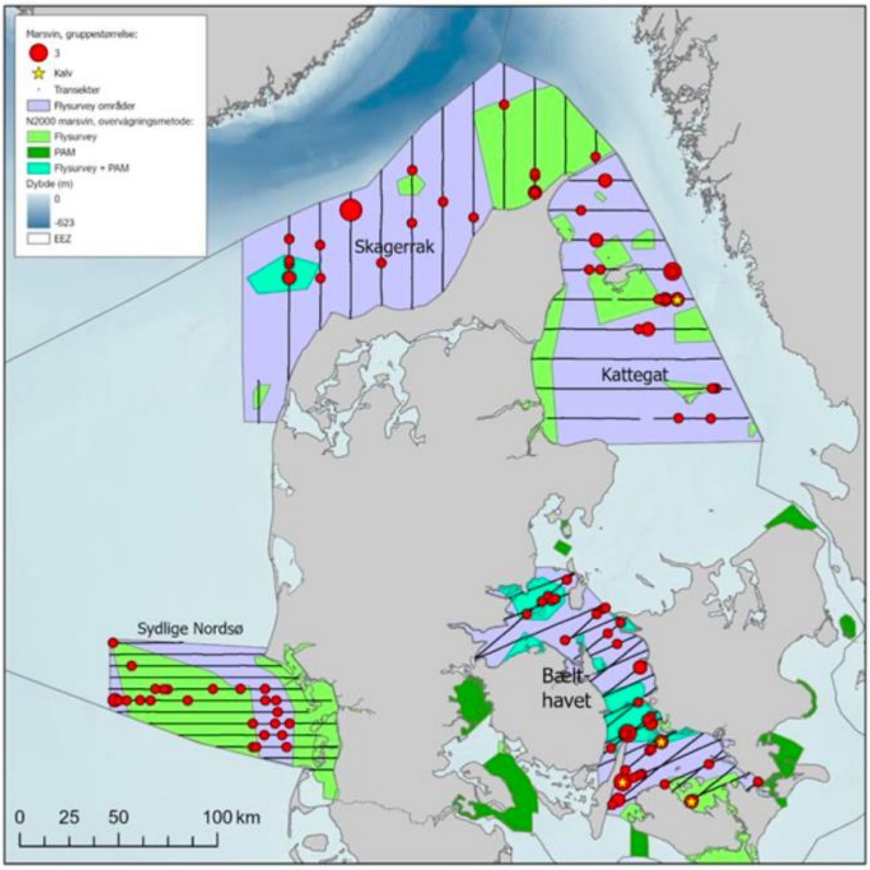


Figure 45. Counts of porpoises from aircraft in Skagerrak on 1 September 2023, Southern North Sea on 5 August 2023, Kattegat on 17 August 2023 and the Baltic Sea on 14 August 2023. The green areas indicate the Natura 2000 areas. EEZ (Exclusive Economic Zone, dashed line) indicates the demarcation of the Danish waters.

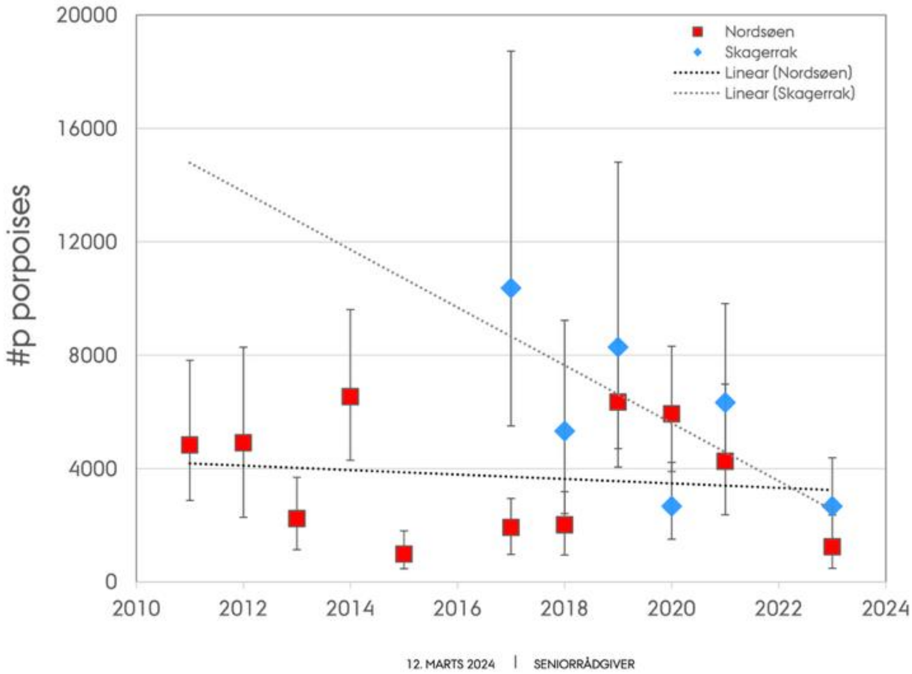


Figure 46. Estimated abundance of harbour porpoises in the Danish North Sea (2011-2023) and Skagerrak (2017-2023), respectively. Vertical lines indicate the 95% confidence interval. Dashed lines indicate the trend for the North Sea population (Source: Hansen & Høgslund, 2021, Hansen *et al*., 2025; S. Sveegaard, pers. comm.)

A large offshore windfarm area has been planned in the Danish North Sea. The original plan was to have an artificial island – a so-called 'Energy Island' to produce 3-12 GW wind in 2033 and 2-40 GW more at later stages. In preparation for this Energy Island development project, aerial surveys were undertaken in the area in April and July of 2022 (Figure 47). These highlighted the importance of this area for porpoises, with highest densities during summer and a high mother-calf ratio of 16% (Figure 48). These results were supported also by passive acoustic monitoring. The survey on 27 April 2022 yielded an abundance estimate of 2,642 porpoises (95% CI: 1,362-4,431) with a mean density of 0.74 (95% CI: 0.38-1.24). A repeat survey on 29 July 2022 gave an abundance estimate of 7,011 porpoises (95% CI: 3,728-11,327) with a mean density of 1.96 (95% CI: 1.04-3.16).

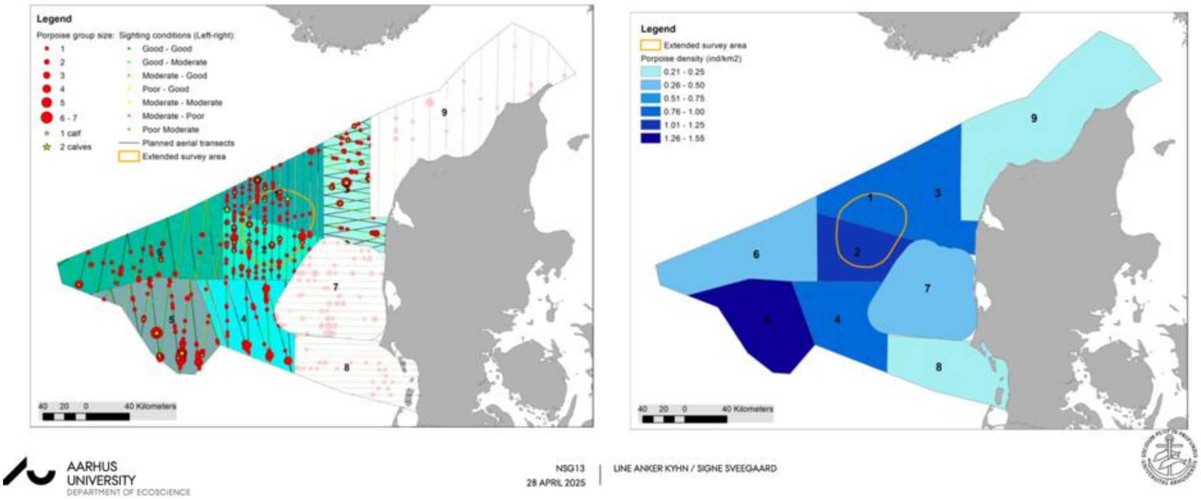


Figure 47. Aerial surveys of harbour porpoise in the Danish North Sea indicating relatively high densities in the area of the Energy Island, Denmark (courtesy of S. Sveegaard)

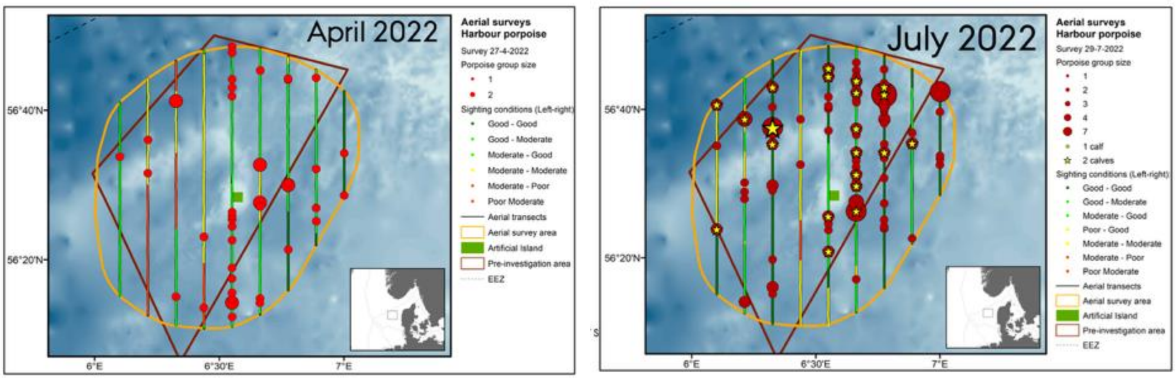


Figure 48. Aerial surveys of harbour porpoise in the North Sea Energy Island, Denmark in April and July 2022 (courtesy of S. Sveegaard)

Modelled density distributions integrating survey data across countries

Since 2014, the UK-based 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. The project has collated around three million km of cetacean survey effort from more than fifty research groups in Northwest European seas covering the period 1978–2018 (Waggitt *et al.*, 2020). Collectively, these surveys are being used to test ecological questions/hypotheses using a variety of modelling approaches, and to generate potentially useful data products. Using hurdle models that incorporate a range of environmental parameters believed to influence prey distributions and prey capture availability for different cetacean species, integrating the probability of encountering the species and its abundance, density maps of the 12 most common species have been produced at monthly temporal and 10 km spatial resolution across the past three decades. Monthly summaries of harbour porpoise distribution are shown in Figure 49. These highlight the importance of the North Sea for harbour porpoise in the context of NW European shelf seas. Further analyses suggest that there has been a westwards shift in distribution in the southern North Sea, with the Dogger Bank area increasing in relative importance and the Outer Sylt Reef decreasing in importance.

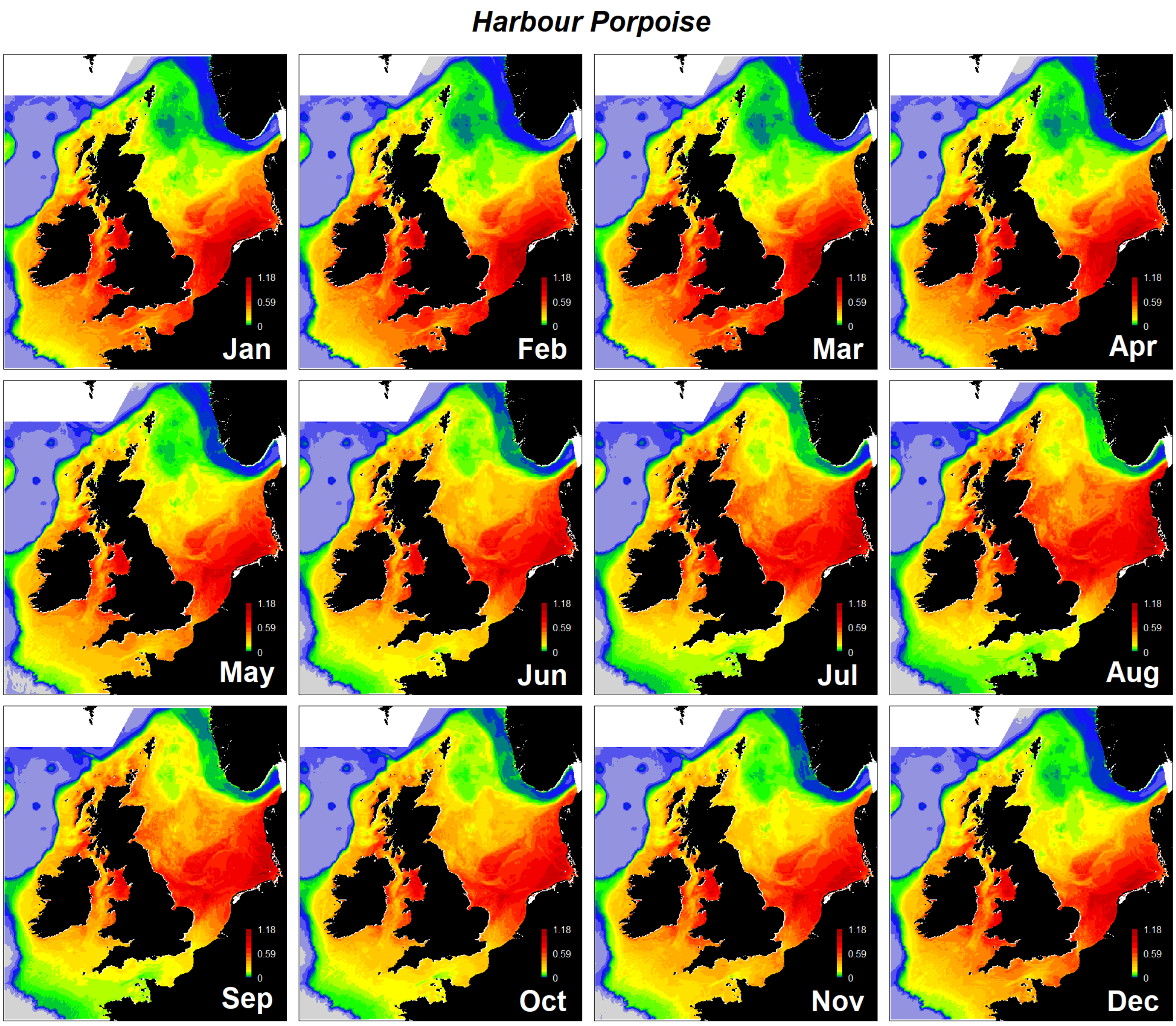


Figure 49. Monthly modelled density distributions of harbour porpoise averaged over the period 2005-2018 (Source: Waggitt *et al.,* Marine Ecosystems Research Programme)

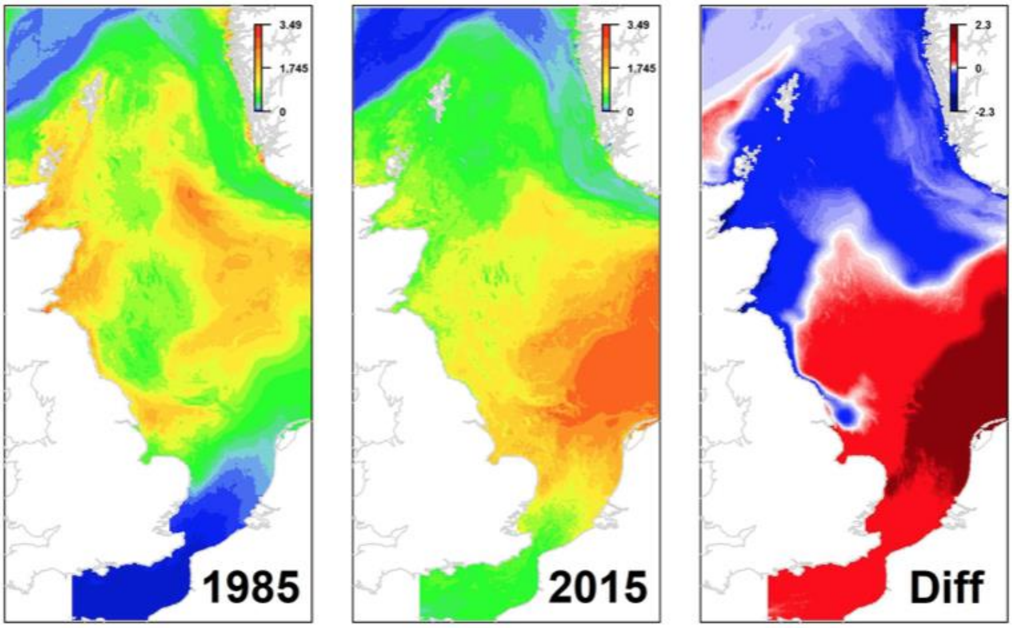


Figure 50. Long-term changes in modelled density distributions of harbour porpoise between 1985 and 2015. Red = increase in density; blue = decrease in density (Source: Waggitt & Evans, Marine Ecosystems Research Programme)

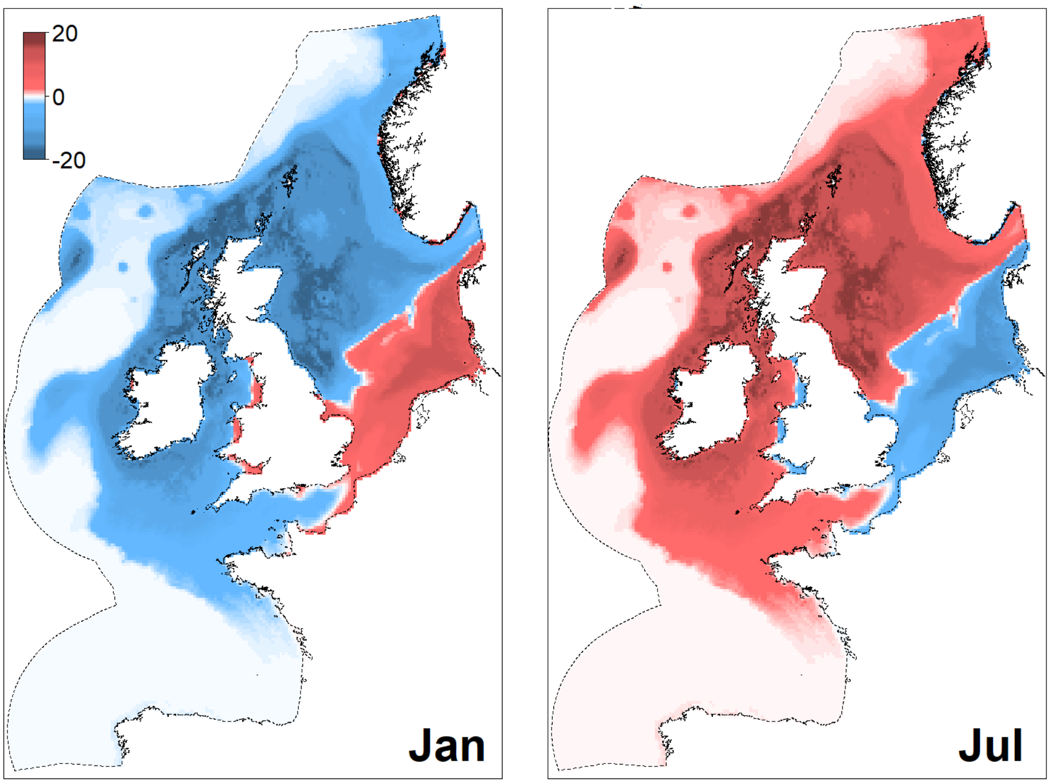


Figure 51. Seasonal change in modelled density distributions of harbour porpoise in the North Sea, 2005-2016 (Source: Waggitt & Evans, Marine Ecosystems Research Programme)

Figure 50 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).

Modelled density distributions for porpoises in the North Sea for January and July indicate greater densities in the southernmost parts in winter (Figure 51). Further work is needed to establish whether any potential seasonal trends have been sustained over the long-term or have changed more recently.

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 Netherlands**, **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; The Netherlands: Scheidat *et al*., 2024; 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) in summer 2022 was estimated in the region of 350,000 animals, with no significant change in overall abundance since the mid 1990s. However, there is some evidence for a decline in abundance in the South-west Skagerrak, and possibly elsewhere in certain localities (Wadden Sea, eastern Channel) which may be compensated for by increases in the central west North Sea. Some seasonal variations in abundance have also been identified with densities highest in the southwestern part of the North Sea and eastern Channel in the spring, extending northwards through the summer, with peak numbers in the central North Sea in late summer although densities remain relatively high in that region year-round. Northern parts of the North Sea have not been sampled well outside the summer period.

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

Further our understanding of population structure (RES-04)

Currently, for ICES, 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 (ICES WGMME 2013; Figure 52). 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. A joint NAMMCO & IMR workshop on the status of harbour porpoises in the North Atlantic (NAMMCO & IMR 2019) discussed assessment units of harbour porpoises in the North Atlantic, and decided to keep intact most of the borders for the North Sea assessment unit from ICES WGMME 2013 , with the exception that the border between the Belt Sea and North Sea assessment units was moved south into the Kattegat Sea, in accordance with Sveegaard *et al.* 2015 (Figure 53, detail in Figure 54).

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 Teilmann, 2009). The lines of evidence suggesting sub-structuring 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. Recent telemetry studies of porpoises in the Wadden Sea area of the south-eastern North Sea indicate that porpoises in this region may be sedentary (Vrooman *et al.*, 2022; Scheidat *et al*., 2024; see also Figure 51), and may therefore represent a separate population to those in the western North Sea.

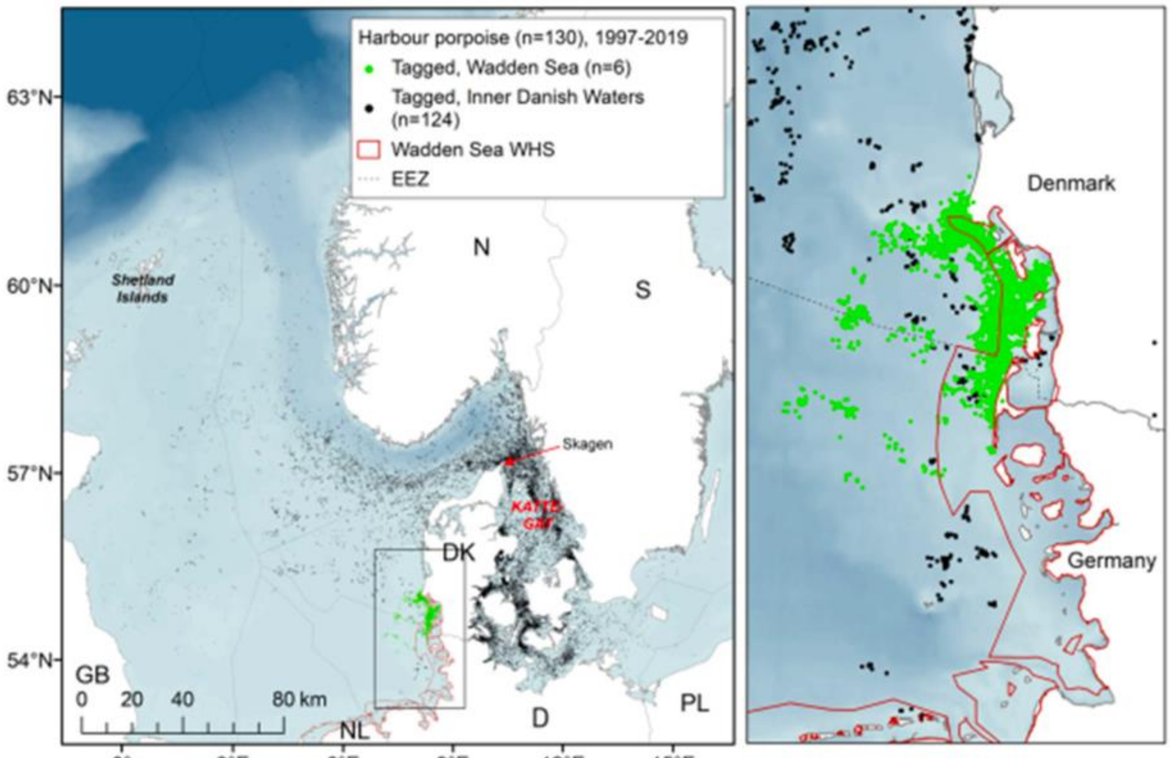


Figure 51. Telemetry studies of harbour porpoise comparing tracks in the Wadden Sea area with those from the Kattegat and Inner Belt Seas (Source: Sveegaard *et al*., 2011; Scheidat *et al*., 2024)

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 sub-structuring between the Danish North Sea and Norway. Thus, the presence of three Management Units might also be considered (Desportes, 2014).

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 54). It was therefore agreed that from 2021 this should form the south-eastern boundary for the North Sea Porpoise Conservation Plan.

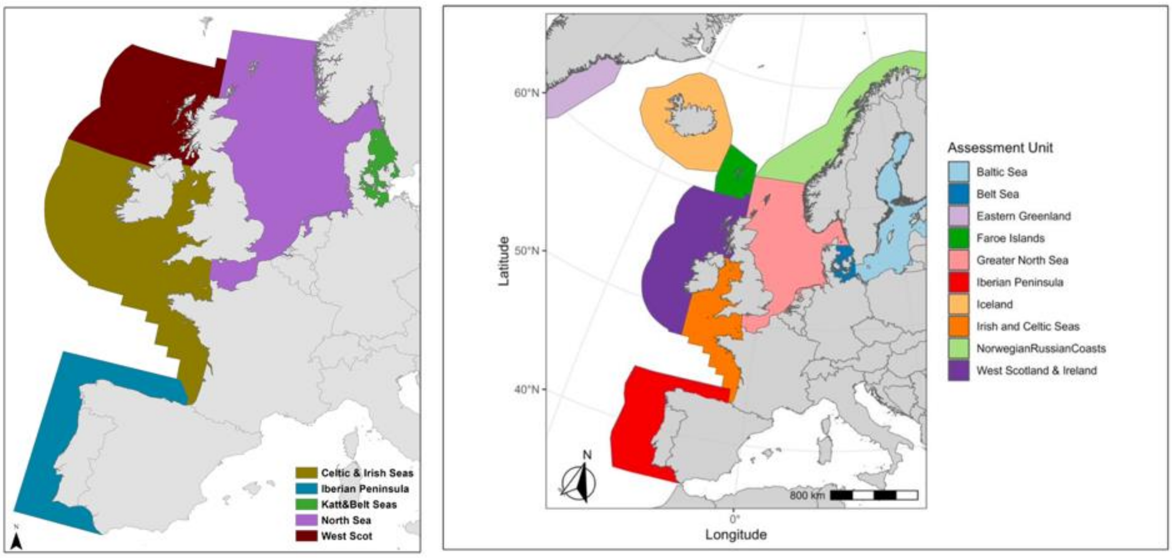


Figure 52. Assessment Units for the Harbour Porpoise a) as proposed by ICES WGMME (2013), and b) as used by SCANS-IV Survey, summer 2022, based upon NAMMCO & IMR (2019)

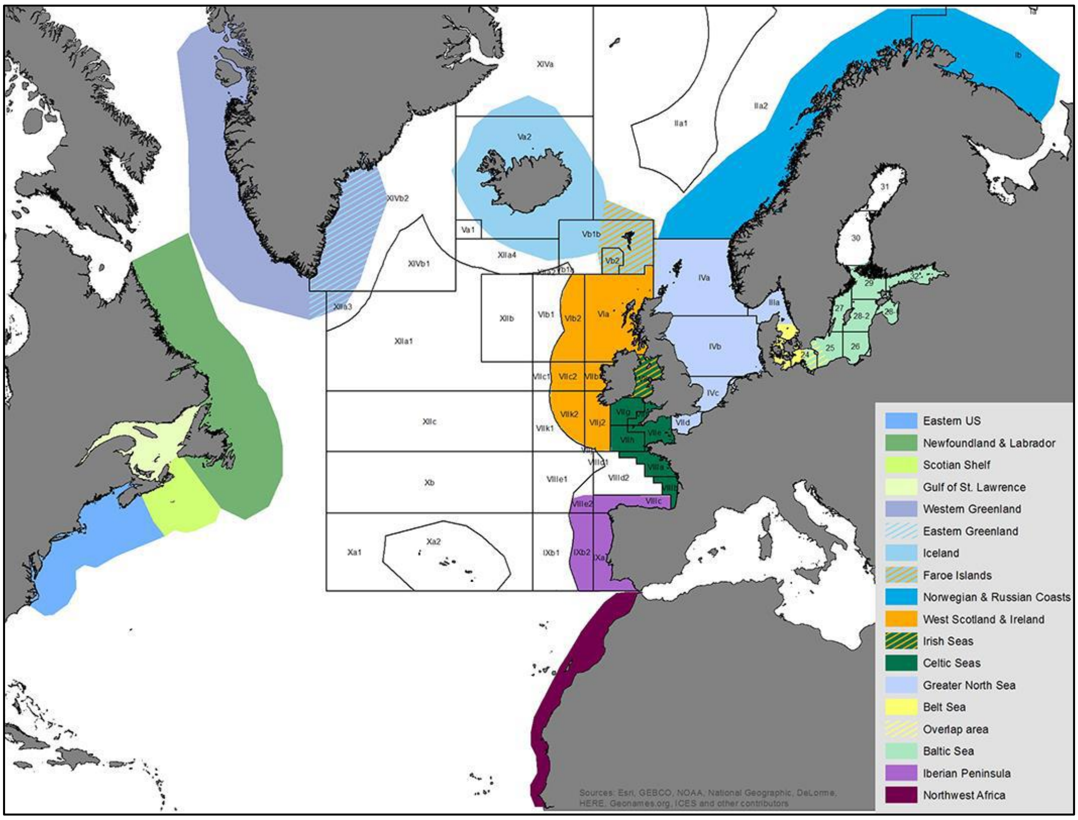


Figure 53. Assessment units for harbour porpoise in the North Atlantic as proposed and used during the joint NAMMCO/IMR workshop, with the ICES fishing areas superimposed. (Source: NAMMCO & IMR 2019).

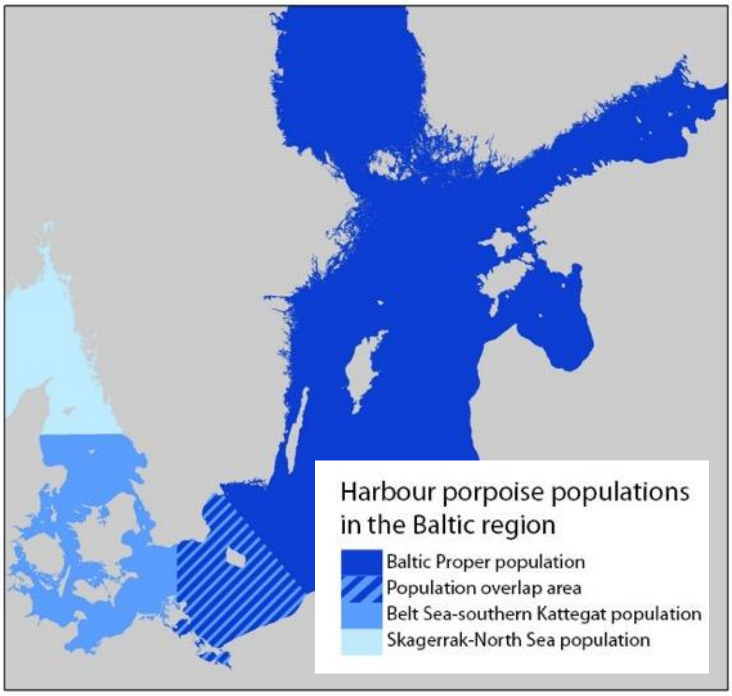


Figure 54. Harbour porpoise populations in the Baltic region. Blue shading indicates the borders proposed for the management unit of the Belt Sea population by Sveegaard *et al.* (2015) and for the Baltic Proper population by Carlén *et al*. (2018). All borders are for the summer half-year only.

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.

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 sub-structuring 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 sub-structuring 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. Telemetry studies from tagged individuals may provide useful supplementary information.

Monitoring of health and nutritional status, diet, life history parameters, and causes of mortality (MON-02)

All the countries bordering the North Sea have national stranding schemes and undertake necropsies on a sample of specimens to determine cause of death, whilst health and nutritional status, stomach contents and life history parameters are analysed at intervals once sufficient sample sizes have been collected.

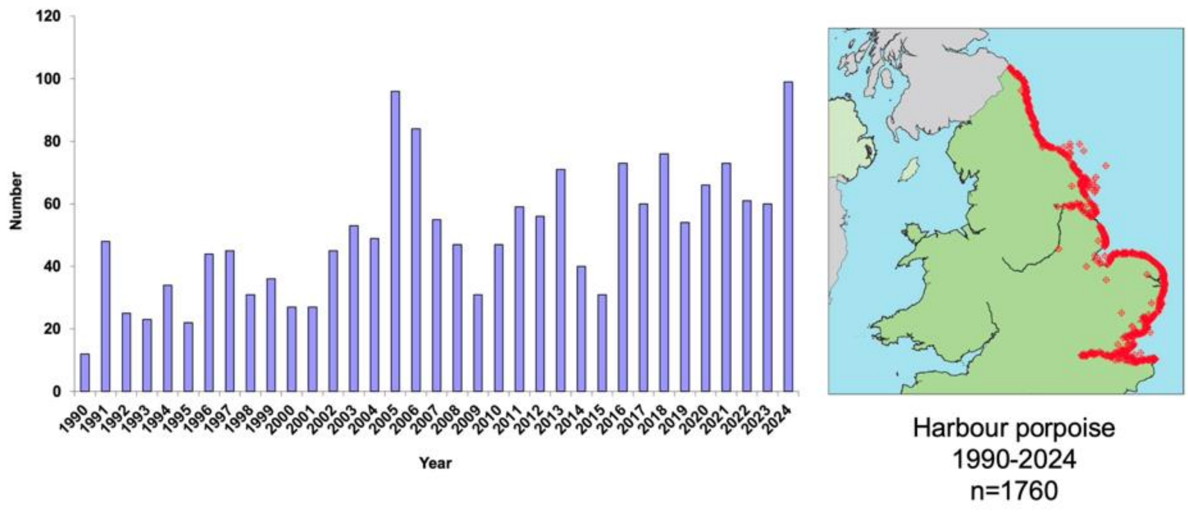


Figure 55. Number of strandings recorded annually along the English North Sea Coast between 1990 and 2024 (Deaville *et al.* 2025)

The UK has two strandings schemes operating in its North Sea waters, one in England (Cetacean Strandings investigation Programme, CSIP) and the other in Scotland (Scottish Marine Animals Strandings Scheme, SMASS).

In East England, a total of 1,760 porpoises has been recorded stranded between 1990 and 2024, with a general increasing trend but with much annual variation (Figure 55). There are also regional differences in the trends observed, with an increase in the north-east (Northumberland to Humber) from around 2015, an increase much earlier from the late 1990s in the south-east (Humber to Essex), and a marked increase in the eastern Channel (Kent to Hampshire) also from the late 1990s (Figure 56).

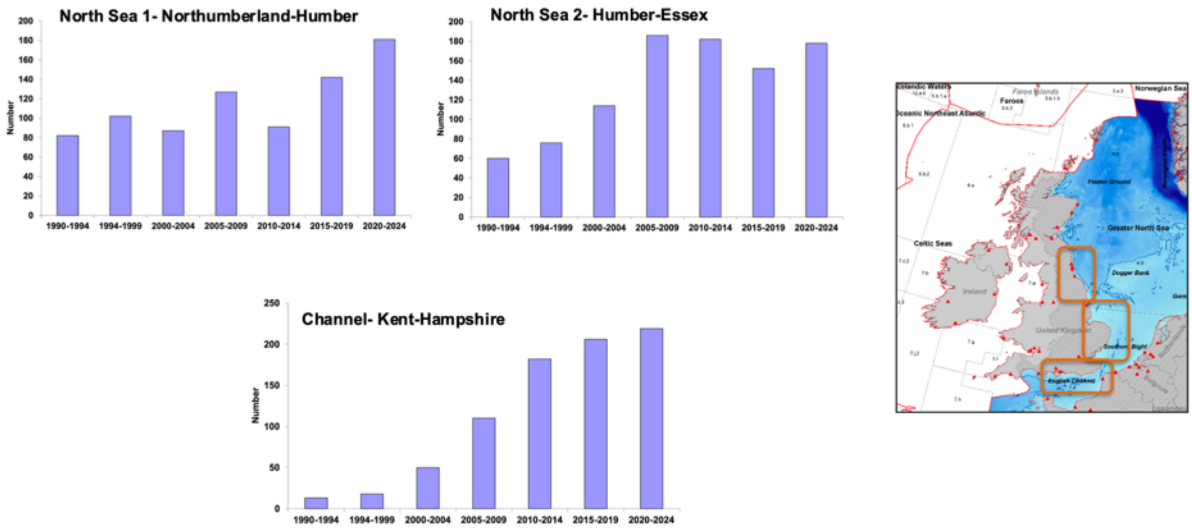


Figure 56. Trends in strandings of porpoises in three different regions along the English North Sea Coast (Deaville *et al*., 2025)

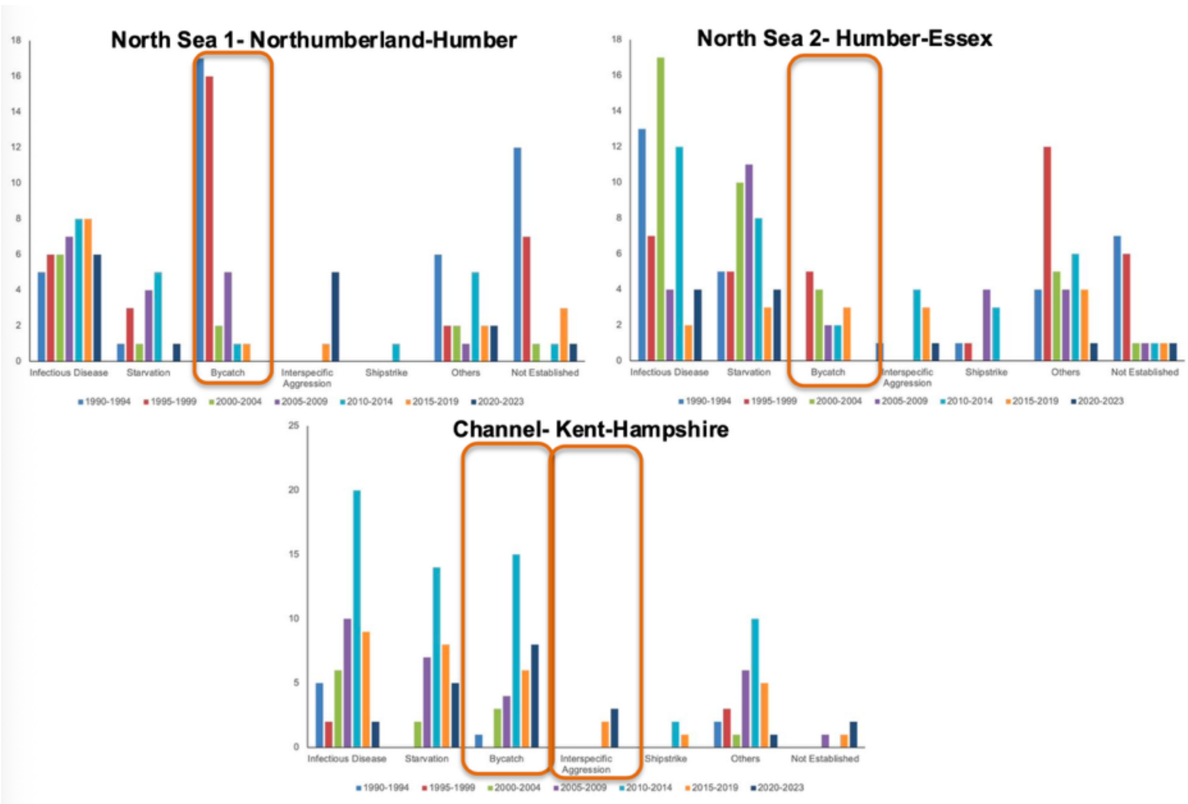


Figure 57. Trends in cause of death in harbour porpoises within three different regions on the east coast of England (Deaville *et al*., 2025)

Causes of death were also examined in the three different regions (Northumberland-Humber, Humber-Essex, Kent-Hampshire) (Deaville *et al*. 2025). These showed a marked reduction in bycatch as a cause of death since 2000 in the Northumberland-Humber region, a smaller reduction in the Humber-Essex region but an increase in the eastern Channel (Kent-Hampshire), peaking in 2010-14, but declining since then (Figure 57). Since 2015, the latter region has also seen an increase in bottlenose dolphin kills which corresponds with the increased occurrence of bottlenose dolphin in the eastern Channel. In a total of 524 porpoises necropsied between 1990 and 2024, 159 were thought to have died of infectious disease, 101 of starvation, 95 from bycatch, 32 were live strandings, 28 from interspecific aggression (likely bottlenose dolphin kills), 25 of physical trauma (unknown source), 13 from ship strike, 3 from neoplasia, 19 from other miscellaneous causes, and for 49 individuals, cause of death could not be established.

The Scottish stranding scheme has recorded 1,848 porpoises between 1992 and April 2025 along North Sea coasts from the Scottish Borders to Shetland (Lennon *et al*. 2025). Of those, 721 have been necropsied. Between 60 and 80 porpoises are reported stranded each year, the ten-year average being 69 (range 39-106). Peak numbers reported stranding occurred in 2018 and 2024.

In East Scotland, peak mortality occurs in March and April involving mainly juveniles. Fewer than 15% were neonates, all in the summer breeding period. Adult mortality is relatively constant throughout the year. Necropsy findings indicated 35.5% of porpoises were the result of bottlenose dolphin attacks (declining between 1992 and 2025), followed by starvation/hypothermia (11.5%), parasitic pneumonia (8%), and bycatch (6%) (Lennon *et al.* 2025).

As in the UK, in **Belgium**, porpoises are the most common cetacean species recorded stranding. However, the number of stranding each year has varied considerably over the period 1990 to 2025. These was a steady increase between the early 2000s reaching a peak in 2013, but since around 2016 there has been a steady decline (Figure 58).

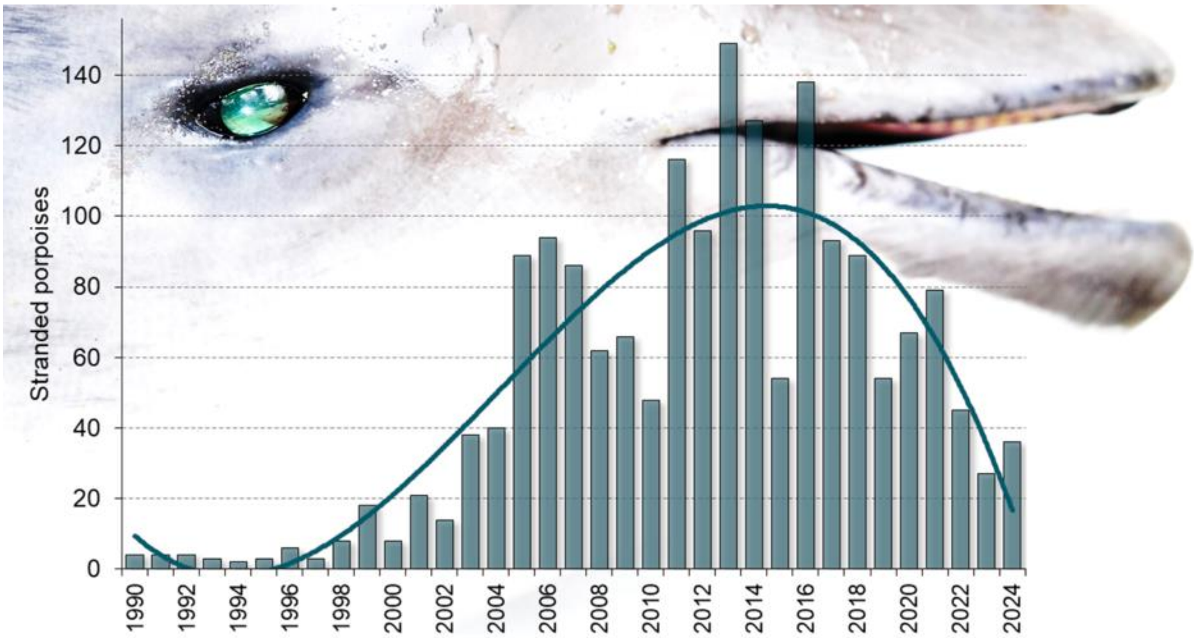


Figure 58. Numbers of porpoises reported stranding along Belgian coasts between 1990 and 2024 (Haelters *et al*., 2025)

Seal predation was identified as a major cause of death and increasing trend from the late 2000s, peaking in 2016 but since 2021, has declined again. Bycatch has shown a general decline since the late 2000s and has been very low since 2017 (Figure 59).

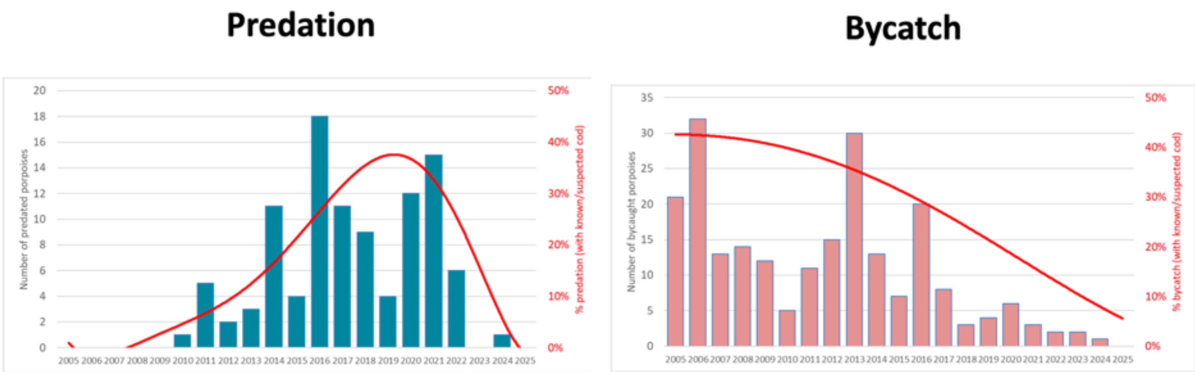


Figure 59. Trends for two main causes of death (seal predation and bycatch) identified from harbour porpoise strandings (Haelters *et al*., 2025)

The **Netherlands** has a long history of recording cetacean strandings along its coast. As with other countries bordering the southern North Sea, annual numbers of porpoises reported stranding increased in the early 2000s, reaching a peak between 2011 and 2013, a very similar pattern to that observed in neighbouring Belgium (Keijl *et al.*, 2024; see Figure 60). There is some indication of a decline since then but interpretation is hindered by potential variation in the percentage of strandings actually reported.

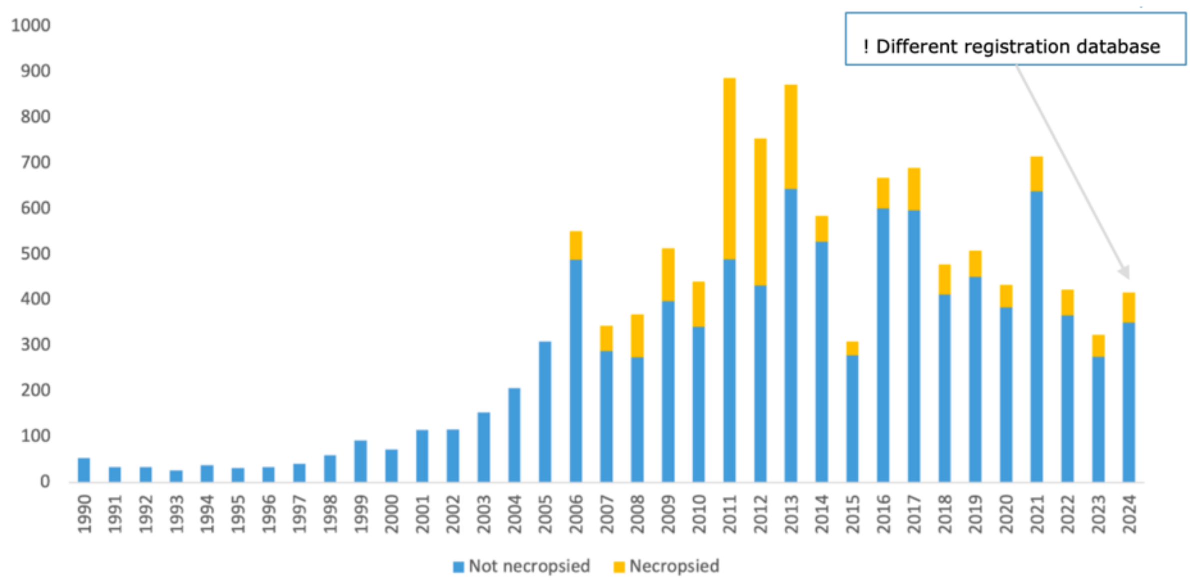


Figure 60. Number of harbour porpoise strandings recorded along the Dutch coast between 1990 and 2024 (Keijl *et al*., 2024)

Sixty-five individuals were necropsied to determine likely cause of death. The most common cause was infectious disease (c. 36%), followed by bycatch (c. 15.4%) (Keijl *et al*., 2024; Figure 61).

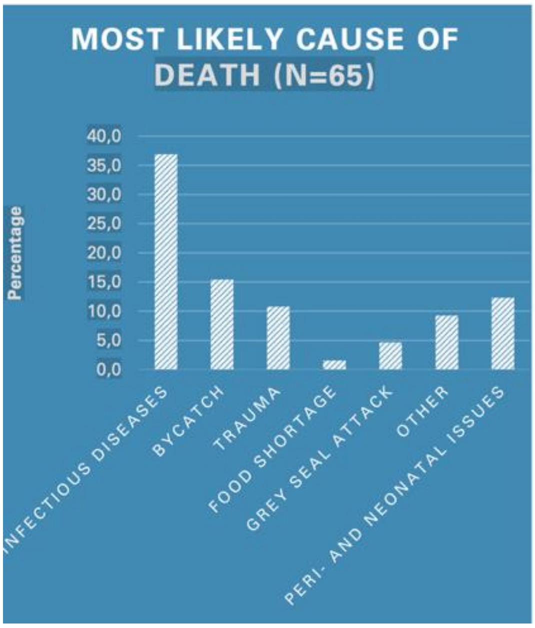


Figure 61. Most likely cause of death in 65 harbour porpoises necropsied along the Dutch coast (Keijl *et al.*, 2024)

Unusually, six porpoises were found with liver abnormalities. They were strandings relatively close in space and time and may indicate some form of intoxication.

The most often diagnosed pathogen found in porpoises is herpesvirus. Of zoonoses diagnosed, *Brucella* sp. was found in harbour porpoise in 2024. Two porpoises were tested for avian influenza, and found to be negative.

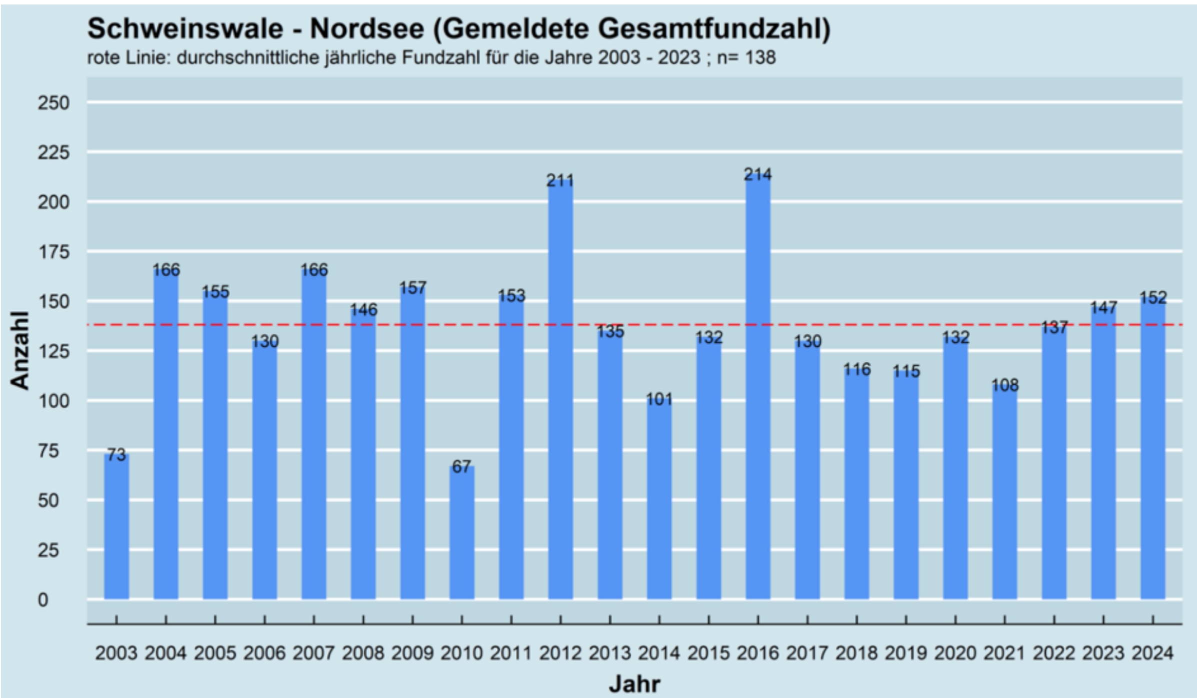


Figure 62. Trends in harbour porpoise strandings from the German North Sea coasts, 2003-2024. The red hatched line indicates long-term mean (Gross & Siebert, 2024)

Strandings are collected systematically from only a portion of the coast of **Germany**, that of Schleswig-Holstein. Health status, nutritional status and diet have been examined and monitoring reports are published annually (https://www.schleswig-holstein.de/DE/fachinhalte/A/artenschutz/meeressaeuger). There has been no clear trend in numbers stranding from this region since 2003, with a long-term annual mean of 137 porpoises stranding on the North Sea coast (Gross & Siebert, 2024).

The pathological findings in the latest report (Gross & Siebert, 2024) indicated bronchopneumonia and gastritis as the main causes of death. Anthropogenic induced causes of death e.g. by bycatch or trauma were only found in few cases. Most animals died at a young age and were under 10 years.

In **Denmark,** 191 porpoises were found stranded, with peak numbers between April and September (Figure 63). Of those numbers, 145 were from Danish Belt Seas, four from Bornholm, and 42 from the Danish North Sea (Thøstesen & Kristensen, 2024).

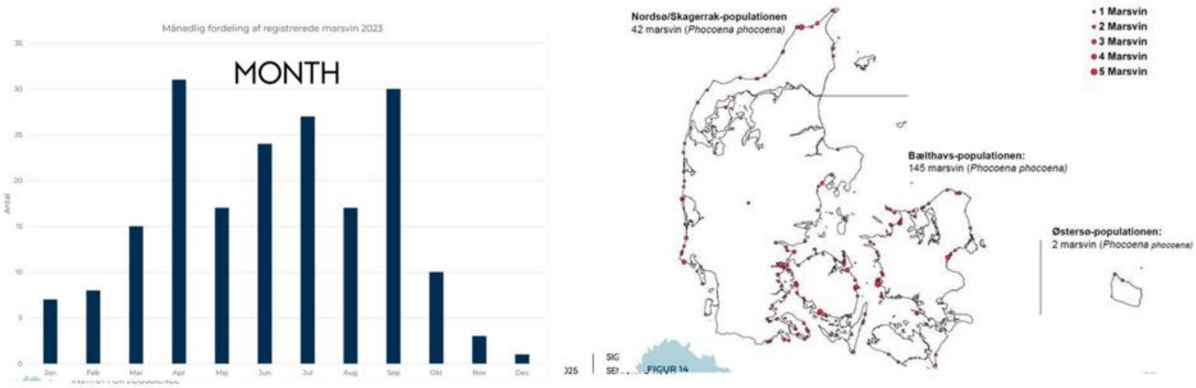


Figure 63. Seasonal variation in numbers of strandings along the coast of Denmark

Differences have been observed in growth and body condition in porpoises from the North Sea compared with the Danish Belt Sea, with average blubber thickness being significantly lower in North Sea animals (Galatius *et al*., submitted; Figure 64). In the North Sea, bycaught animals had higher blubber thickness compared with live strandings and dead strandings had the lowest average values. No differences were seen between females and males, whilst blubber thickness decreased slightly during summer months but not as strongly as in Belt Sea animals (Figure 65).

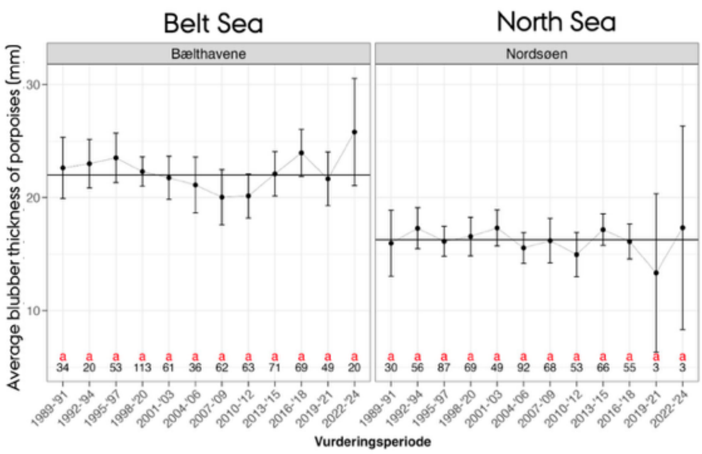


Figure 64. Average blubber thickness in porpoises from the North Sea compared with the Belt Seas (Galatius *et al*., submitted)

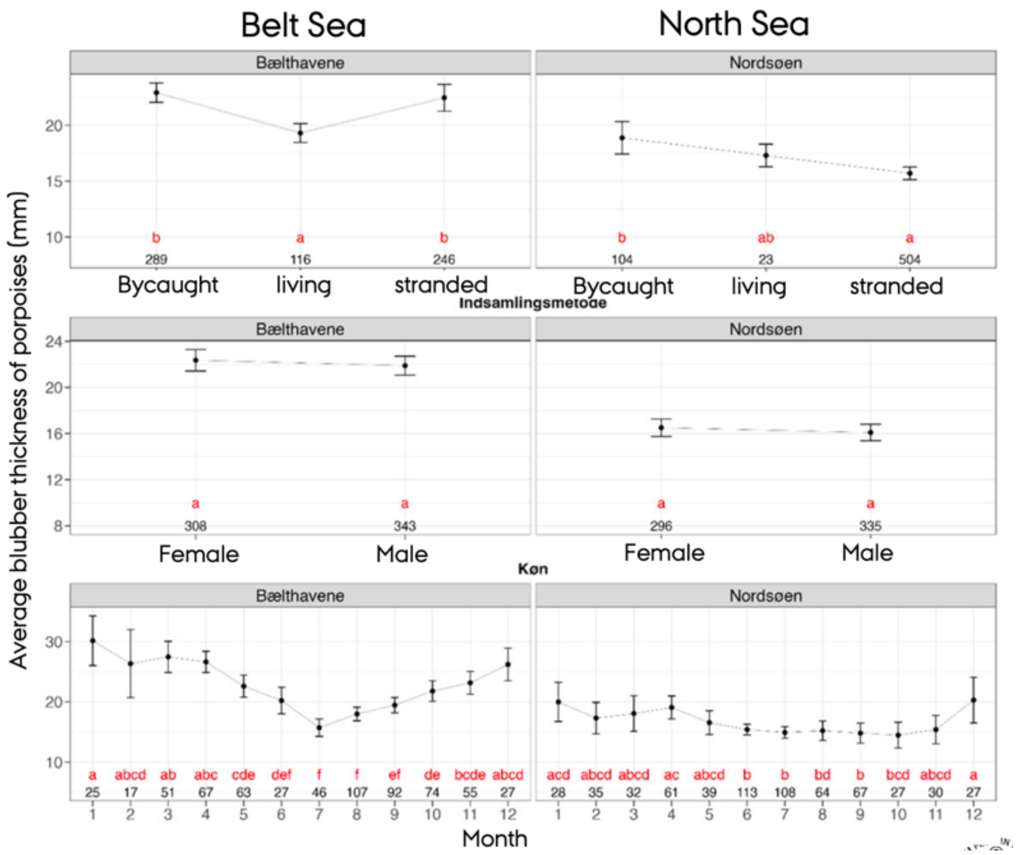


Figure 65. Trends in average blubber thickness between porpoises in the North Sea and the Belt Seas (Galatius *et al*., submitted)

Sweden collects data on strandings within its national health and disease surveillance programme. In 2024, 118 individual porpoises were examined although most were outside the North Sea area (Figure 66). Of those, 26 (15 females, 11 males) were necropsied (17 strandings, 9 submitted by fishers as bycatch). Ulfsson et al. (2024) have recently compared strandings between two five-year time periods (Figure 66) and observed a generally increasing trend (Figure 67), with most occurring between July and September (Figure 68).

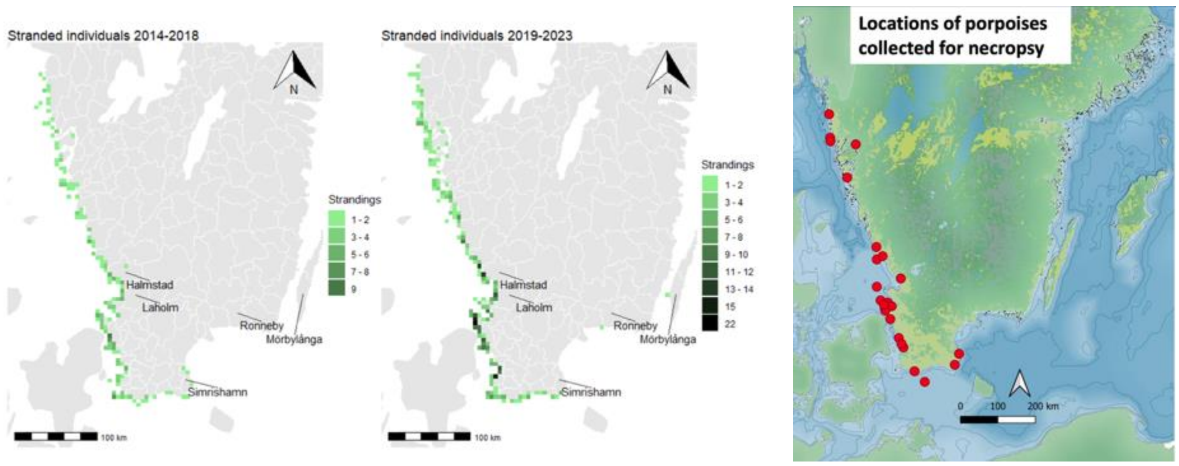


Figure 66. Distribution of strandings in 2019-2023 compared with 2014-2018, along the Swedish coast (left) (Ulfsson et al., 2024); strandings reported in 2024 (Swedish stranding scheme, 2025)

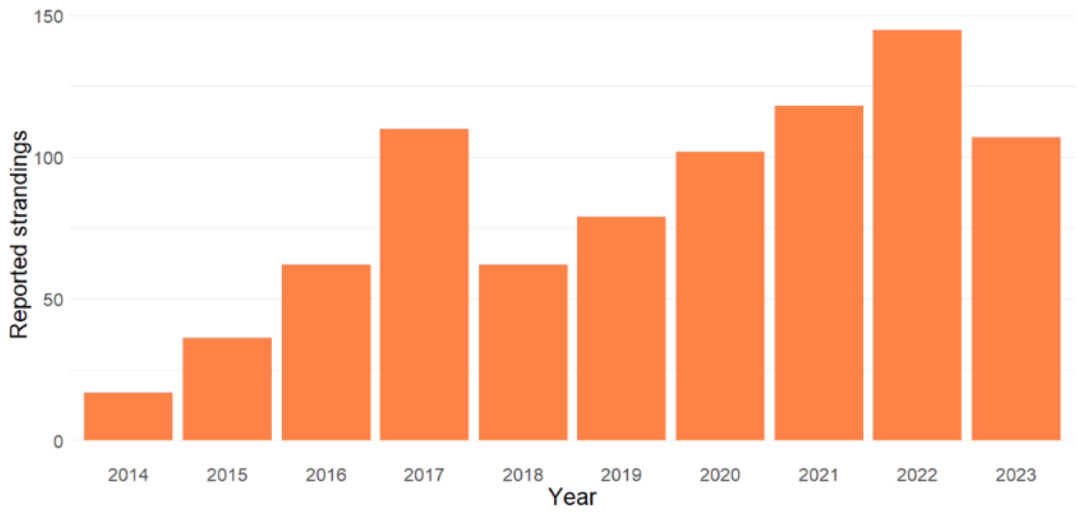


Figure 67. Trend in reported strandings of harbour porpoise in Sweden, 2014-2023 (Ulfsson et al., 2024)

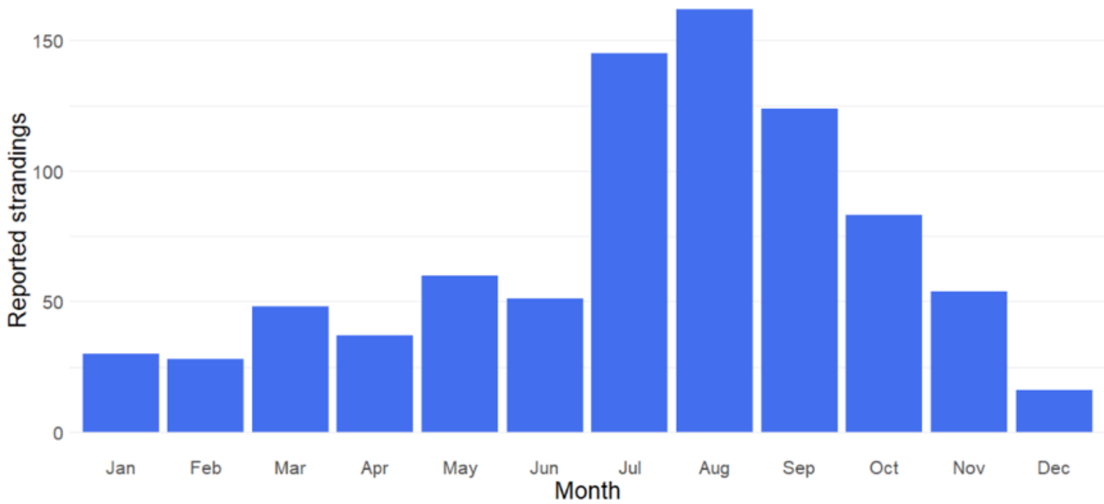


Figure 68. Seasonal trend in reported strandings of harbour porpoise in Sweden (Ulfsson et al., 2024)

Causes of death for the 26 animals necropsied in 2024 were assessed, with bycatch predominating (Figure 69). Bycaught animals, including those submitted by fishers as bycatch, continue to show other health findings, including skin lesions and pneumonia. Pathology and whole genome sequencing of skin lesions is continuing. Six cases of complications during birth have been documented, five between 2020-2023, and one in 2024.

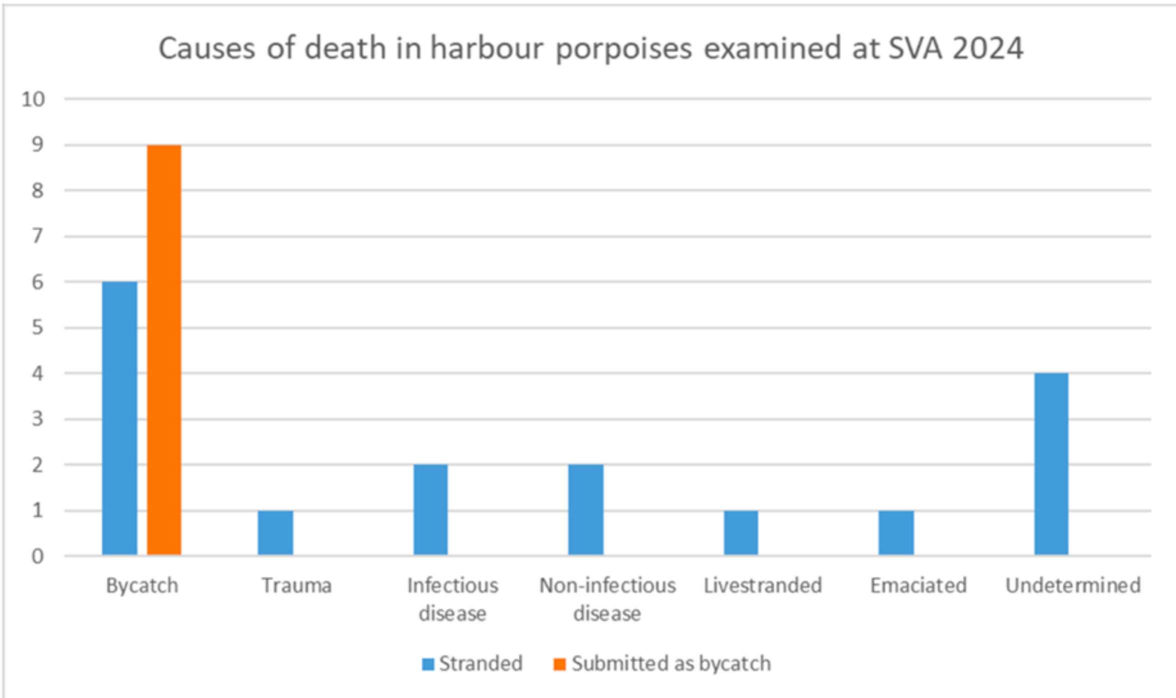


Figure 69. Causes of death in 26 harbour porpoises necropsied in Sweden in 2024 (Swedish stranding scheme, 2025)

In all the countries bordering the North Sea, analyses of harbour porpoise stomach contents to indicate recent diet and analyses of life history parameters (growth, age at sexual maturity, longevity, juvenile and adult mortality rates) are usually undertaken only occasionally once reasonable sample sizes have been collected. Both dietary and life history information for harbour porpoise were reviewed in Appendices within previous Progress Reports, and have also been compiled in NAMMCO/IMR (2019). Those two Appendices are reproduced again in this report, updated with some new information.

Improve understanding of and develop mitigation for the risks of anthropogenic sound (MIT-02)

Most countries bordering the North Sea have developed regulations relating to reducing the impacts of underwater noise particularly from impulsive noise sources. All countries have been implementing MSFD through its noise descriptor 11.

In **France** there are no legally binding noise criteria. Based on the existing legal framework, industries must manage the estimated impact of their projects following the so-called Mitigation Hierarchy: avoid the impacts, minimize those impacts that cannot be avoided, and eventually compensate the residual impacts if they are not sufficiently reduced. The Mitigation Hierarchy approach is applied also to industry-related activities generating underwater noise and the basis for its application is the Environmental Impact Assessment (EIA). The need for mitigation measures is based on the results of the assessment of physiological impacts which is generally carried out using the same PTS and TTS criteria from Southall et al. (2019). Behavioural impact criteria may also be used to complete the assessment. PTS and TTS are also used for the monitoring programs carried out for the construction and exploitation phases. As a general rule (still, not legally-binding), the TTS is taken as the reference for acceptability. For example, if noise levels exceed TTS, the noise source can be stopped.

The only noise limit currently enforced in UK waters applies exclusively to harbour porpoise SACs. These limits employ spatiotemporal thresholds for activities emitting impulsive noise and requires that: "noise disturbance is considered significant if it excludes harbour porpoises from more than 20% of the relevant area in any given day or an average of 10% over a season". This is not an absolute noise limit (unlike the German Sound Concept Approach). Instead, impulsive noise activities are logged in the Marine Noise Registry and Pulse Block Days are calculated as areas (or blocks) where harbour porpoises would be excluded due to impulsive noise. This approach requires different industries and companies to coordinate their activities to prevent the threshold being exceeded, particularly in the Southern North Sea SAC, where most windfarm construction is occurring. However, in Autumn 2025, the UK Government is expected to consult on implementation of noise thresholds for pile driving, following a similar approach to the German Sound Concept. The Government commissioned reports evaluating achievable noise limits in UK waters based on projections of the industry over the next decade and the noise reductions available with current Noise Abatement Systems (NAS). It is anticipated that the proposed threshold will not be as strict as the German limit due to increasing pile diameters over the next ten years.

From 2025, **Belgium** pledged that the level of anthropogenic impulsive sound sources will not be higher than 162 dB re 1µPa^{2}s (expressed in SELs), normalised at 750 m from the source. A repetitive impulsive sound exceeding this threshold is permitted up to a maximum of 168 dB re 1µPa2s, normalized at 750 m DELs from the source, for 5% of the time of a repetitive impulsive sound-generating event.

The **Netherlands** has regulations applied to wind farms, with an underwater noise threshold of 160 dB (from the North Sea Agreement). However, since achieving a maximum of 160 dB noise exposure is not feasible with the current mitigation options, a transitional threshold of 164 dB is used (at 750 meters from the noise source). Techniques for further reduction/mitigation are being further developed. With regard to the mitigation around UXO explosions, the Ministry of Defence currently works with ADDs as standard, which should be activated 30 minutes before detonation. In the latest KEC 5.0 it is advised to activate the ADDs a longer period, but this has not yet been implemented. ADDs must also be used for geophysical and geotechnical surveys, but the specific terms of use differ per permit application.

Germany has developed a Sound Protection Concept (BMU, 2013) which it implements. Basically, it sets thresholds with a 750 m exclusion / observation zone around industrial developments, and sound levels of 160 dB SEL / 190 dB PK. Before permits are issued, an EIA has to be undertaken involving modelling and a plan to reduce impact, acoustic monitoring should be conducted throughout installation, with ADDs mandatory along with other mitigation measures. These include consideration of cumulative effects of noise so that within the German EEZ, <10% can be exposed above disturbance levels, including in SAC area. For sites that are known breeding areas for porpoises, such as the Sylt Outer Reef and Eastern German Bay SAC, the threshold for exposure drops to <1% between 1st May – 31st August. Elsewhere, some marine national parks (e.g. Wadden Sea Sanctuary) require shipping and water sports to be regulated, including speed limits of 16 knots above ground and the crossing of protected areas.

In **Denmark**, the Danish Energy Agency updated its guidelines in 2023, following Southall *et al.* (2019) with frequency weighted exposure limits established based on the cumulative sound exposure levels received by different animals. The cumulated sound exposure levels (SELcum) over a maximum of 24 hours were not to exceed the threshold for onset of PTS, as specified by Southall *et al.* (2019).

In **Sweden**, the Swedish Defence Research Agency (FOI) provides the technical support for developing national EIA guidelines on underwater noise from pile driving, reviewing thresholds, sound propagation, and monitoring parameters, and making recommendations on acoustic metrics and control programme content (Andersson *et al*., 2025).

Ensure screening and assessment of the occurrence and effects of hazardous substances (MON-03)

At intervals, analysis of tissue or organ samples from mainly stranded porpoises has been undertaken to establish levels of contaminants thought to be harmful to marine mammals. whilst OSPAR has an ongoing initiative on hazardous substances. A candidate OSPAR indicator (M7) on persistent chemicals in marine mammals is under development for potential adoption in the 2029 Intermediate Assessment.

The **UK** continued pollutant monitoring in small cetaceans through a collaboration between CSIP (Cetacean Strandings Investigation Programme), SMASS (Scottish Marine Animal Strandings Scheme) and Cefas (Centre for Environment, Fisheries and Aquaculture Science). PCB data in harbour porpoises are assessed under the UK's 25-Year Environment Plan (H4 Indicator). The ongoing ChemPOP project explores the impacts of legacy and emerging pollutants on cetacean populations and ecosystems. In the Greater North Sea, PCB concentrations (the sum of 25 chlorobiphenyl congeners (∑25CBs) (mg/kg lipid)) in the blubber of porpoises have declined between 1990 and 2017 (Williams *et al*., 2023). Overall mean values are higher in the southern North Sea compared with the northern North Sea and the decline has been more marked, having started from a higher level. Nevertheless, a high proportion of animals remain exposed to concentrations deemed to be of toxicological threat.

In the **Netherlands,** a study by van den Heuvel-Greve *et al.* (2024) on PFAS contamination in the Western Scheldt and its impact on harbour porpoises found that while concentrations have declined over time, levels remain elevated compared to other regions such as the Wadden Sea. Standard screening continues to include PCBs, and a new publication will be published in due course comparing recent (2023) and earlier levels (2006–2008). Results also show higher PFAS levels in seals than in porpoises, with the position in the food web influencing exposure.

Germany has also continued work on indicators under the MSFD, specifically the development of a monitoring and assessment concept for pollutant loads in marine mammals of the North Sea and Baltic Sea. The project, completed in 2023, has identified significant data gaps for many pollutants listed as substances of concern under OSPAR and HELCOM. Pollutant data will be continuously added to a new compartment of the German environmental database, with a report (in German) expected to be publicly available in June 2025.

Monitor for potential increases in anthropogenic activities that lead to incidences of death, injury or adverse health effects (MON-04)

In the **UK**, The Cetacean Strandings Investigation Programme (CSIP) and the Scottish Marine Animals Strandings Scheme (SMASS) extract samples from stranded animals to assess potential noise impacts, although opportunities are often limited by timing and sample viability. The Marine Noise Registry (MNR), managed by the Joint Nature Conservation Committee (JNCC), compiles spatiotemporal data on impulsive noise generating activities. PAM programmes, including through the ECOMASS project, are currently investigating potential displacement of harbour porpoises and dolphins due to offshore wind construction on Scotland's east coast.

The Netherlands register noise-emitting activities (e.g. seismic surveys, UXO detonations) also in a national noise register. As with other countries, they contribute relevant information, including offshore wind development update to international organisations and working groups, including

OSPAR, CBD, ASCOBANS, and VMR. Emerging pressures, such as CO_2 storage and hydrogen development have been identified as potential issues of concern whicj should be kept under review and included in future monitoring efforts.

Germany has a CREATE project (2024–2027), which aims to develop indicators to assess the health of marine mammals and the impacts of anthropogenic pressures on marine ecosystems and biodiversity. The project is led by the Institute for Terrestrial and Aquatic Wildlife Research (ITAW) in Hanover, in collaboration with a consortium of partners.

In the **Danish** North Sea, a multi-year study on the proposed North Sea Energy Island has been undertaken, assessing the area's importance for harbour porpoises, dolphins, and seals. Using aerial surveys, acoustic monitoring, noise monitoring, and seal tagging, the study found high summer porpoise densities and a 16% calf to adult ratio, suggesting the area may serve as calving ground. PAM data confirmed peak summer presence. White-beaked dolphins were also observed, with interannual variation. Seal presence in the area was limited, indicating the area is not critical habitat for them. The site is used year-round, with summer identified as ecologically significant, warranting careful consideration in planning and mitigation. Further modelling is planned in a follow-up project.

Monitor habitat quality, including protected sites, to ensure management is effective and that the ecological functions are maintained (MON-05)

In the **UK**, habitat monitoring has continued under the UK Marine Strategy and the UK Cetacean Conservation Strategy, with a focus on prey availability and habitat condition for harbour porpoises. Natural England and NatureScot oversee MPA monitoring in the North Sea. The Offshore Wind Environmental Evidence Register is identifying knowledge gaps related to porpoise habitats, such as prey effects and seabed impacts. Several national data portals track indicators such as habitat change, vessel traffic, and fishing effort. While these provide valuable data, they are not yet structured for long-term trend analysis.

The Netherlands has also been conducting monitoring where modifications of habitat quality have taken place. This was primarily conducted under the MSFD, particularly Descriptor 1, which covers biodiversity, species distribution, population status, and habitat condition. For harbour porpoises, specific measures are not yet in place, and expert judgement is used in assessments. A new project is planned to assess food web changes linked to offshore wind and fisheries, using prey availability as a proxy for habitat quality. They also expressed interest in how other countries are reporting on this issue.

Germany has recently addressed four aspects of its monitoring efforts: habitat and species monitoring under the EU Habitats and Birds Directives; synergies with other programmes such as MSFD and offshore wind expansion; integration of Natura 2000 site monitoring into management plans; and development of area-specific monitoring approaches.

Sweden has undertaken a recent study on the relocation of a major shipping lane between the North Sea and the Baltic Sea (Pigeault *et al*., 2024). The study, conducted in collaboration with Aarhus University in Denmark and others, assessed the impact of changed ship traffic on harbour porpoises within and nearby to designated SACs. Despite significant changes in vessel routes and traffic volumes, no clear differences were observed in porpoise presence or detection rates before and after the relocation. This was attributed to minimal changes in underwater noise levels at monitoring station and the importance of the area as a feeding habitat, suggesting that porpoises may remain despite increased disturbance. The findings highlight the complexity of interpreting porpoise responses to shipping and the potential limitations of using ship traffic as a sole proxy for noise-related impacts.

Summary of Progress in Implementation of the Plan

Table 6 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 vessels less than 15 m length, and the implementation of effective mitigation measures to reduce bycatch) have made less progress.

Draft criteria for assessment of progress in implementation actions under the harbour porpoise conservation plan are proposed below.

Status Assessment Criteria for Progress of the Implementation of the Actions of the North Sea Conservation Plan

1. **Implementation of the CP: co-ordinator and Steering Committee**
   Yes/No

2. **ımplementation of existing regulations on bycatch of cetaceans**

   Enforcement of Technical Conservation Regulations (or national equivalent)
   N.A. – Not applicable
   0 – No activity
   1 – Some enforcement of high-risk fisheries (defined as static gears and pelagic trawls & seines)
   2 – Full enforcement of some high-risk fisheries
   3 – Full enforcement of all high-risk fisheries

   Protected Species Observer Programmes
   N.A. – Not applicable
   0 – No activity
   1 – Data Collection Framework (DCF) Sampling Programme only
   2 – Research or Pilot project to improve bycatch estimates from monitoring (under Reg. 2019/1241 or equivalent) with <10% of high-risk fisheries covered
   3 – Regular Dedicated Bycatch monitoring of >10% of high-risk fisheries (under Reg. 2019/1241 or equivalent) resulting in a robust estimate of bycatch rates

   Regulating fishing activities in Marine Protected Areas (including Natura 2000 sites)
   N.A. – Not applicable
   0 – No regulation of fishing
   1 – Some regulation of high-risk fisheries within MPAs
   2 – High-risk fisheries not permitted within MPAs
   3 – No fishing allowed

3. **Establishment of bycatch observation programmes on vessels smaller than 12 m length, including both professional and recreational fisheries**
   N.A. – Not applicable
   0 – No activity
   1 – Research project on bycatch monitoring of vessels <12 m length in high-risk fisheries
   2 – Bycatch monitoring of part of high-risk fisheries resulting in a robust estimate of bycatch rates

3 – Bycatch monitoring in all high-risk fisheries resulting in a robust estimate of bycatch rates fishing gear

4. Regular evaluation of relevant fisheries, extent of harbour porpoise bycatch

N.A. – Not applicable
0 – No estimates available
1 – Estimate of bycatch available from research project, for part of the fisheries
2 – Estimate of bycatch available for >50% of relevant fisheries resulting in a robust estimate of bycatch rates
3 – Estimate of bycatch available for all relevant fisheries resulting in a robust estimate of bycatch rates

5. Bycatch mitigation measures: ADDs (pingers etc) in use, development of alternative ADDs, gear modifications, fisheries closures/effort reduction, ghost netting removal

Deployment of working ADDs (regularly checked for compliance)
N.A. – Not applicable
0 – No mitigation measures in place
1 – Research projects ongoing using ADDs
2 – Working ADDs deployed routinely on high-risk fisheries in accordance with delegated acts, i.e. a risk management procedure is in place but noting that no bycatch at all may not be achieved

Development of alternative ADDs (tested in active fisheries)
N.A. – Not applicable
0 – No activity
1 – Research projects on developing & testing alternative ADDs
2 – Fully field-tested alternative ADDs deployed on appropriate fisheries, i.e. a risk management procedure is in place but noting that no bycatch at all may not be achieved

Modification of fishing gear (e.g. acoustically reflective nets, other less damaging gears)
N.A. – Not applicable
0 – No activity
1 – Research projects ongoing on alternative gear
2 – Fully field-tested gear modification deployed on appropriate fisheries, i.e. a risk management procedure is in place but noting that no bycatch at all may not be achieved

Fisheries effort reduction or closures
N.A. – Not applicable
0 – No activity
1 – Research projects ongoing on fisheries closures, effort reduction, or partial closures for other reasons (stock protection, or seabed protection)
2 – Fisheries effort reduction/closures where appropriate in high-risk areas and/or MPAs, i.e. a risk management procedure is in place but noting that no bycatch at all may not be achieved
3 – complete closures in these areas

Removal of ghost netting

N.A. – Not applicable

0 – No activity

1 – Ghost net removal carried out in some parts of the country's EEZ within the Greater North Sea

2 – Ghost net removal carried out throughout the country's EEZ within the Greater North Sea, i.e. a risk management procedure is in place but noting that no bycatch at all may not be achieved

6. **Review of management procedure approach for determining maximum allowable bycatch limits**

N.A. – Not applicable

0 – No activity

1 – Some research into developing a management procedure approach for national application

2 – Maximum allowable bycatch limits established and applied nationally

7. **Monitoring trends in distribution and abundance of harbour porpoise in the North Sea**

Large-scale

N.A. – Not applicable

0 – No activity

1 – Surveys carried out every 10-12 years, results with CVs for abundance estimates of above 0.4

2 – Surveys carried out every 10-12 years, with CVs for abundance estimates of between 0.2 and 0.4, maps of harbour porpoise density

3 – Surveys carried out every 6 years, with CVs for abundance estimates of 0.2 or less, maps of harbour porpoise density

Regional/surveys

N.A. – Not applicable

0 – No activity

1 – Some monitoring at local/national scale, not continuously

2 – Seasonal (at least 2 seasons) monitoring for at least two years every six years

3 – Seasonal (at least 2 seasons) monitoring annually

Regional/modelling

N.A. – Not applicable

0 – No activity

1 – Some density modelling at local/national scale, not continuously

2 – Seasonal (at least 2 seasons) density modelling for at least two years every six years

3 – Seasonal (at least 2 seasons) density modelling annually

8. **Review of the stock structure of harbour porpoise in the North Sea**

N.A. – Not applicable

0 – No activity

1 – Samples collected from some carcasses found within the Greater North Sea, but no analysis in last year

2 – Samples collected from some carcasses found within the Greater North Sea, some analysis completed relevant to stock structure (genetics, morphometrics etc.) in the last year
3 – Samples collected from over 75% of carcasses (in suitable condition) found within the Greater North Sea, and all possible analyses completed relevant to stock structure (genetics, morphometrics, etc.) in the last year

9. Collection of incidental harbour porpoise data through stranding networks

Life history parameters
N.A. – Not applicable
0 – No activity, no plan or guidance on how to act in case of a stranding
1 – At least ten samples suitable for life history determination collected from some carcasses from within the Greater North Sea, no analysis carried out within last year
2 – Some analysis and assessments completed on appropriate material for at least 20 carcasses within last 3 years (or all carcasses available)
3 – Analysis and assessments completed on appropriate material for at least 30 carcasses (or all carcasses available) within last 3 years

Contaminant Levels
N.A. – Not applicable
0 – No activity, no plan or guidance on how to act in case of a stranding
1 – Samples suitable for contaminants analysis (PCBs, PAHs, Cd, Hg, Pb, emerging chemicals) collected from some carcasses from within the Greater North Sea, no analysis carried out
2 – Some analysis and assessments completed on appropriate material
3 – Analysis and assessments completed on appropriate material for at least 30 carcasses (or all carcasses available) within last 3 years

10. Investigation of the cause of death, health/nutritional status and diet of harbour porpoise in the North Sea

Cause of Death
N.A. – Not applicable
0 – No activity, no plan or guidance on how to act in case of a stranding
1 – Samples collected from some carcasses from within the Greater North Sea, no analysis carried out
2 – Some analysis and assessments completed on appropriate material
3 – Full necropsies (according to ASCOBANS protocol) conducted for at least 30 carcasses (or all carcasses available) in good enough condition, and samples analysed within last 3 years for cause of death. Regular (at least every 6 years) assessments of results

Health/Nutritional Status
N.A. – Not applicable
0 – No activity, no plan or guidance on how to act in case of a stranding
1 – Samples collected from some carcasses from within the Greater North Sea, no analysis carried out
2 – Some analysis and assessments completed on appropriate material
3 – Full examination conducted for at least 30 carcasses (or all carcasses available) in good enough condition, and samples analysed within last 3 years, for health/nutritional status. Regular (at least every 6 years) assessments of results

Diet
N.A. – Not applicable

0 – No activity, no plan or guidance on how to act in case of a stranding
1 – Samples collected from some carcasses from within the Greater North Sea, no analysis carried out
2 – Some analysis and assessments completed on appropriate material
3 –Full examination conducted for at least 30 carcasses (or all carcasses available) in good enough condition, and samples analysed within last 3 years, for diet. Regular (at least every 6 years) assessments of results

11. Investigation of the effects of anthropogenic sounds on harbour porpoise

Monitoring Levels and Impacts of continuous noise (shipping)
N.A. – Not applicable
0 – No activity
1 – Research projects in place to improve knowledge
2 – Modelling of continuous underwater noise levels & potential impacts across country's EEZ within Greater North Sea
3 – Direct annual measurements of continuous underwater noise & potential impacts at sampling sites with good coverage across country's EEZ within Greater North Sea

Monitoring Levels and Impacts of Impulsive noise (seismic, sonar, explosions, piling)
N.A. – Not applicable
0 – No activity
1 – Research projects in place to improve knowledge
2 – Direct measurements of some sources of impulsive underwater noise & potential impacts across country's EEZ within Greater North Sea
3 – Direct measurements of all sources of impulsive underwater noise & potential impacts across country's EEZ within Greater North Sea

Mitigating effects of continuous noise (shipping)
N.A. – Not applicable
0 – No activity
1 – Mitigation measures (quieting technologies, speed restrictions, re-routing vessels) under development or being tested
2 – Mitigation measures (quieting technologies, speed restrictions, re-routing vessels) in place to some extent, to reduce continuous noise
3 – Mitigation measures (quieting technologies, speed restrictions, re-routing vessels) routinely in place to reduce continuous noise, i.e. that a risk management procedure is in place, noting that the potential impact of continuous noise cannot be completely addressed

Mitigating effects of impulsive noise (seismic, sonar, explosions, piling)
N.A. – Not applicable
0 – No activity
1 – Mitigation measures (soft starts, bubble curtains, insulation casings) under development or being tested, available mitigation methods used to some extent
2 – Mitigation measures (soft starts, bubble curtains, insulation casings) in place to some extent, to reduce impulsive noise
3 – Mitigation measures (soft starts, bubble curtains, insulation casings) routinely in place, to reduce impulsive noise, i.e. a risk management procedure is in place, noting that the potential impact of all impulsive noise cannot be completely addressed

12. Collection and archiving of data on anthropogenic activities and development of GIS

N.A. – Not applicable
0 – No activity
1 – Some collection of data on some anthropogenic activities potentially impacting porpoises
2 – Regular collection of data on all anthropogenic activities potentially impacting porpoises
3 – Development of an integrated cumulative effects mapping framework

Table 5. Qualitative Assessment of Progress in the Implementation of the ASCOBANS North Sea Conservation Plan for the Harbour Porpoise (undertaken in 2025)

	Actions from the North Sea Conservation Plan for HP		SE	DK	DE	NL	BE	FR	UK
1	Implementation of the CP: co-ordinator and Steering Committee		Coordinator currently in place						
2	Implementation of existing regulations on bycatch of cetaceans - e.g. EC 2019/1241 & Habitats Directive (HD)	Vessels requiring pingers	na	17	na	na	na	9	18
		No. of vessels using pingers	na	17	na	na	na	9	18
		Enforcement policy	na	3	0	na	na	3	3
		Protected Species observer programme	2	2	0	1	1	2	2
		Regulating fisheries in N2K sites	1	1	1	1	1	1	1
3	Establishment of BYC observation programmes on vessel smaller than 12m long, professional and recreational fisheries	Professional	2	1	0	1	na	1	1
		Recreational	0	1	na	0	na	0	na
4	Regular evaluation of relevant fisheries, extent of HP BYC:	Overall assessment	1	1	0	1	na	1	1
	Gillnet fisheries =>15m vessels, dedicated, % DaS observed		na	1*	0	na	na	?	?
	Gillnet fisheries <15m vessels, dedicated, % DaS observed		5-10	?	0	1	na	?	?
	Cetacean scheme appended to DCF / DCR schemes		yes	yes	yes	yes	no	yes	yes
	DCF observations in NS, % DAS observed		yes	yes	no	10-15	na	?	?
5	Bycatch Mitigation Measures	Deployment of working ADDs	1	2	1	1	na	1?	2
		Development of alternative ADDs	1	1	1	0	na	1	1
		Modification of Fishing Gear	1	1	1	0	0	1	1
		Fisheries effort reduction/closures	2	0***	2	1	1	1	2
		Removal of Ghost Netting	1***	1**	1*	1**	1**	0	1*
6	Review of management procedure approach for determining maximum allowable byctch limits		Progress ICES WGBYC, OSPAR (MSFD), ASCOBANS						
			2	2	2	2	2	2	2
7	Monitoring trends in distribution and abundance of HP in NS	Large scale	SCANS IV undertaken in 2022						
		Reg/survey	0	2	3	2	3	2	1
		Reg/modelling	0	2*	3	2	3	2	1
8	Review of the stock structure of HP in NS		1	1	1	1	1	1	1
9	Collection of incidental porpoise data through stranding networks	Life History	3	2	3	2	2	2	3
		Contaminants	2	2	3	3	2	2	3
10	Investigation of the health, nutritional status and diet of HP in NS	Cause of death	3	2	3	3	3	3	3
		Health/Nutritional Status	3	2	3	3	3	3	3
		Diet	3	2	3	3	3	2	1
11	Investigation of the effects of anthropogenic sounds on HP	Monitoring continuous noise	2	3	2	2	2	2	2
		Monitoring impulsive noise	2	2	2	2	2	1	2
		Mitigation of continuous noise	2	0	1	0	0	0	1
		Mitigation of impulsive noise	2	3	3	3	2	1	2
12	Collection and archiving of data on anthropogenic activities and development of a GIS		1	1	1	1	1	1	1

Notes (from April 2025 meeting)

Vessels requiring pingers: for NL, vessels are required to enter some N2K sites

No. of vessels using pingers: NL needs to check number

Regulating fisheries in N2K sites: suggestion to split exclusion of fishing from other mitigation measures (pingers etc). Identify the different levels of regulation implemented

BYC observation programmes for recreational fisheries: suggestion to include information from questionnaire surveys

Overall assessment of extent of HP bycatch: DE has very little gillnetting in North Sea

Regular evaluation of extent of HP bycatch - Gillnet fisheries =>15m vessels, dedicated, % DaS observed: % depends on rate of bycatch observed – c. 5%?

Regular evaluation of extent of HP bycatch - Gillnet fisheries <15m vessels, dedicated, % DaS observed: % depends on rate of bycatch observed

DCF observations in the North Sea, % DaS observed: for NL, 10-15% for pelagic fisheries, <1% for demersal fisheries

Removal of ghost netting: *Private sector, **Some government initiatives, ***Dive clubs/ community initiatives

Monitoring trends in HP distribution and abundance – regional surveys: DK, possibly rate as 3 if applying to two seasons

Monitoring trends in HP distribution and abundance – regional modelling: *monitoring annually, but only one season

Review of stock structure of HP: DE/DK/NL, tagging studies

Investigation of HP diet in North Sea: check with France; DK, new dietary paper

Priority Recommendations

NSG13 /Rec #	Recommendation	Long-/short-term + Deadline if possible	Priority (High / Medium / Low)
Evaluation on fisheries with respect to extent of porpoise bycatch			
1.	Parties and Non-Party Range States to focus monitoring and mitigation effort on suspected high-risk fisheries and areas, bearing in mind that the latest bycatch estimates for porpoises in the North Sea indicate the annual numbers bycaught likely exceed thresholds from RLA analysis. There still remains great uncertainty around all bycatch estimates in the region due to a stratified random sampling approach not yet having been implemented, where appropriate. (NSG10/Rec1*)	Ongoing, review annually	High
2.	Parties are encouraged to share training resources with each other to automate bycatch detection in electronic monitoring.	Ongoing, review annually	High
3.	Parties are encouraged to further develop and implement fishing effort monitoring such as inshore VMS for small vessel fisheries (less than 12 metres), following the example of the UK.	Ongoing, review annually	High
4.	Parties are encouraged to incorporate metrics such as soak time, net length, mesh size in fishing effort reporting	Ongoing, review annually	High
5.	Given that the OSPAR threshold for bycatch has already been exceeded, Parties and Non-Party Range States are urged to take mitigation action (e.g. fisheries restrictions, ADDs, etc.) to reduce bycatch levels.	Ongoing, review annually	High
Finalise a management procedure approach for determining target limits of anthropogenic removals including bycatch in the region			
6.	Attention is needed to revise the current ASCOBANS conservation objectives to i) take account of the long-term objective to drive anthropogenic removals (i.e., including all pressures) towards zero (NSG10/Rec2*); ii) appraise their effectiveness, and iii) to operationalize the objective with a timeframe and agreed-upon risks of failing as in all management procedure approaches. (NSG11/Rec5)	NSG14	High
7.	Parties, Non-Party Range States, and relevant national bodies to engage and take into regard stakeholder interests, in addition to the fishing industry, to reach common solutions to fulfil conservation aims. (NSG10/Rec3*)	Long-term, review annually	High
Development of alternative mitigation measures to reduce bycatch			
8.	Parties to support further investigations of approaches to mitigate harbour porpoise bycatch taking into account potential adverse impacts on other taxa such as birds and seals. (NSG10/Rec4)	Ongoing, review annually	High
9.	Parties to support the testing of bycatch mitigation actions at a fleet level and implement those that have proved to be effective and practical. (NSG10/Rec5)	Ongoing, review annually	High

1

NSG13 /Rec #	Recommendation	Long-/short-term + Deadline if possible	Priority (High / Medium / Low)
10.	Parties to support more research on the behaviour of harbour porpoises in the wild around fishing gear, especially static nets, including their sensory capabilities and auditory health, for a better understanding of factors leading to bycatch. (NSG10/Rec6*)	Ongoing, review annually	High
Monitoring trends in distribution and abundance			
11.	In addition to SCANS surveys, Parties are encouraged to collaborate on conducting surveys and analyses of regional trends by season (at least two) and year in porpoise distribution and abundance at a North Sea-wide scale, and examine potential explanations for any observed changes. (NSG10/Rec7*)	Long-term, review annually	High
12.	The North Sea Group to note any information on trends in abundance and distribution from the most recent intermediate assessments and QSRs by OSPAR, Habitats Directive etc., and consider the implications of the findings. (NSG10/Rec.8*)	Ongoing, review annually	Medium
Investigation of the health, nutritional status and diet			
13.	Parties are encouraged to do collaborative research on the extent and seasonality of grey seal predation on harbour porpoises. (NSG10/Rec9*)	Ongoing, review annually	Medium (in some regions)
14.	Parties to facilitate rapid collaboration with stranding networks in the event of an unusual mortality event to identify potential causes of death. These should also include new potential sources such as bacterial infections, e.g. *Erysipelothrix rhusiopathiae*, and other pathogens such as avian influenza. (NSG10/Rec10*)	Ongoing, review annually	High
15.	Parties are strongly encouraged to further support North Sea-wide monitoring of life history parameters and nutritional status (diet, body condition) through the collection and analysis of stranded and bycaught animals in order to assess evidence of temporal changes in those parameters and explore links to anthropogenic drivers. (NSG10/Rec11*)	Ongoing, review annually	High
16.	Parties are encouraged to collect and analyse a sufficient number of stranded and/or bycaught harbour porpoises for assessing trends and status of persistent chemicals and other pollutants, with particular attention to emerging chemicals in the Greater North Sea. (NSG11/Rec15)	Ongoing, review annually	High
17.	Parties and Non-Party Range States to encourage research investigating the impacts of chemical contaminants from discarded munition material and unexploded ordnance on harbour porpoises and their prey. (NSG12/Rec18)	Ongoing	Medium
Investigation of the effects of anthropogenic sounds on harbour porpoises			
18.	Parties to make every effort to monitor and mitigate the effects on porpoises of activities involving explosions (including ordinance clearance in preparation for offshore wind developments). (NSG10/Rec13*)	Ongoing, review annually	High
19.	Collaborative studies are encouraged to quantify the impact of impulsive, continuous, and other noise sources on individual harbour porpoises, considering their different sound characteristics. (NSG10/Rec14*)	Ongoing, review annually	High
20.	Parties and Non-Party Range States to encourage research to establish the population level impacts of noise levels and exposure duration. (NSG10/Rec15)	Ongoing, review annually	Medium

NSG13 /Rec #	Recommendation	Long-/short-term + Deadline if possible	Priority (High / Medium / Low)
21.	Parties and Non-Party Range States to encourage international harmonisation of noise exposure criteria for regulatory purposes. (NSG10/Rec16*)	Ongoing, review annually	High
22.	In the light of projected wide-scale developments of offshore renewable energy, Parties and Non-Party Range States are urged to better understand and mitigate, where appropriate, short-term, long-term, and cumulative impacts upon porpoises during all phases at the sites and at broader basin-wide scales. (NSG12/Rec25*)	Ongoing, review annually	High
23.	Parties and Non-Party Range States are encouraged to take mitigating action to minimise impacts to porpoises from continuous, impulsive and other sources of noise. (NSG12/Rec6*)	Ongoing, review annually	High
Other			
24.	Parties and Non-Party Range States are urged to consider the cumulative effects upon porpoises of human activities including offshore industrial development so that they are incorporated into spatial planning.	Ongoing, review annually	High
25.	The ASCOBANS Marine Spatial Planning Working Group is requested to focus on the Greater North Sea as their first case study. The work should collate MSPs within the region, and review consistencies in approaches for their development and whether they have incorporated plans and decisions made by neighbouring Parties, taking account of porpoise movements, MPAs and IMMAs.	AC29	High
26.	Parties and Non-Party Range States are encouraged to work with international fora to establish a joint industry programme to pool and make publicly available relevant data collated during EIAs and continuous monitoring of sites.	Ongoing, review annually	High

* Wording added/edited.

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APPENDIX I Life history parameters of the harbour porpoise

Here, life history parameters of harbour porpoises in the North Sea and the greater north Atlantic has been summarised, largely based on reviews by Graham Pierce (presentation to the ASCOBANS North Sea group in 2018), Fiona Read (2016) and Sinead Murphy and others at the NAMMCO & IMR harbour porpoise workshop (2019).

In general, female harbour porpoises grow to be larger than males, and some differences in size seem to occur between areas/subpopulations, most notably porpoises off the Iberian Peninsula are larger than their conspecifics further north. Sexual maturity generally occurs between 2-5 years of age, but differs between sub-populations with ASM being lower in northern areas (for example Iceland and Greenland) than in the southern North Sea.

Harbour porpoises reproduce seasonally, with calving taking place during summer, in general between May and August but often with a peak in June or July, and conception soon after that, supporting the gestation period of between 10-11 months. The female lactates for 7-12 months, and can be simultaneously pregnant and lactating, sometimes giving birth to one calf each year. However, the pregnancy rate varies between areas, from around 0.4 in the northern North Sea and around Ireland to almost 1 in eastern Canada and Iceland. The seasonality of calving and lactation means that special attention should be paid to important areas for harbour porpoises during summer, when calving and mating takes place, as well as during autumn and winter when young calves are entirely dependent on their mothers for survival. During these times populations are likely extra sensitive to any disturbances which may influence the interaction between male and female during mating, and possibly even more important, the interaction between mother and calf during lactation.

Harbour porpoises have a rather short lifespan compared to many other cetacean species. They can live to be over 20 years old, but many do not live past the age of 12 (Lockyer and Kinze, 2003). In the German North Sea, females reach sexual maturity at around 4.95 years of age, and it is estimated that only approximately 55% of females live long enough to participate in reproduction (Kesselring et al., 2018, 2017). Given that the fertility of female harbour porpoises seem to be negatively impacted by PCBs (Murphy *et al*., 2015) and females often do not give birth to one calf each year, the overall reproduction rate may be cause for concern.

Concerning annual adult mortality, which has recently been discussed in relation to the MSFD bycatch indicator under D1, there are a few relevant studies available. For UK waters, Lockyer (1995) found the annual adult mortality to be 0.20 for males and 0.18 for females. Kinze (1990) estimated total annual adult mortality to 0.13 in Danish waters. Hammond *et al*. (2019) estimated annual natural mortality to 0.15 for age 0, 0.13 for age 1 and 0.09 for age 2+ years, based on Winship (2009).

In summary, we see a need for continued collection of samples and analysis of life history parameters in harbour porpoises in European waters, to increase sample sizes and follow any changes occurring. Also, assessments of life history parameters in relation to pollutant levels should be undertaken, for example, it should be investigated if the lower pregnancy rates found in some areas may partly be due to higher contaminant loads in those areas.

Table A1a. Variation in life history parameters for harbour porpoise across its North Atlantic range, males.

Area (years)	Maximum length (cm)	Mean adult length (cm)	Mean adult weight (kg)	Maximum age (years)	Length at sexual maturity (cm)	Age at sexual maturity (years)	Length at physical maturity (cm)	Asymptotic length at physical maturity ± SE/SD (cm)*	Asymptotic weight at physical maturity ± SE/SD (cm)*	Age at physical maturity (years)	**Males**
NWIP	189 (N=136)			19 (N=77)	151 (154-171) (N=47)	3.8 (N=47)	162 (N=47)			10 (N=47)	Read (2016)
Galicia, NW Spain	176 (N=27)			9	155	5					Lens (1997), Lopez (2003)
Portugal (1981-1994)	175 (N=15)										Sequeira (1996)
Scotland, northern North Sea (1992-2004)	170 (N=252)			20 (N=138)	132.2 (N=145)	5.0 (N=64)	151 (147-155)	147.2		~5	Learmonth et al. (2014)
Northern North Sea (2001-2003)	160			12	130-138	3.5-6					Pierce et al. (2005)
UK (1985-1994)	163 (N=114)	145		24 (N=114)	130-135 (N=114)	>3 (N=114)	145	145	50		Lockyer (1995; 2003)
Ireland (2001-2003)	157 (N=19)				4-8	131-146					Pierce et al. (2005)
Denmark (1938-1998)	167	145	50	23	130-135.5 (N=96)	3-4	145				Lockyer & Kinze (2003)
Kattegat/ Skagerrak (1988-1991)	163	141.6						142 (n=201)			Hedlund (2008)
Belt Sea								>130			Karstad et al. (1993)
The Netherlands	147 (N=5)			12.5 (N=2)							Pierce et al. (2005)
France (2001-2003)	165 (N=17)			14 (N=12)							Pierce et al. (2005)

West Greenland (1988-1989, 1995)	158 (N=91)	141.5		17 (N=91)	127 (123-130)(N=91)	2-2.45 (N=94)	141.5 ± 1.4	141.5 ± 1.4	51.177 ± 1.824		Lockyer et al. (2003)
Greenland				17? (sex not mentioned)		2.7 (1995, SE=0.03) 3.1 (2009, SE=0.08)					NAMMCO (2013)
Iceland (1991-1997)	165 (N=794)			16 (N=615)	135.6/135	1.9/2.6 /2.9	150	149.6	51.7		Ólafsdóttir et al. (2003)
Gulf of Maine (1989-93)	157			15*		>3 (3-4) (N=31)	143 ± 1.25			~5*	Read & Hohn (1995)
Canada, Bay of Fundy				17				144			Read & Hohn (1995), Read & Gaskin (1990)
Canada, eastern Newfoundland (1990-1991)	155.5				135.1 (SE=0.02)	3		142.9 (SE=1.2)			Richardson et al. (2003)
Southern North Sea (1955-~1975)	151					~5		~130-135			Van Utrecht (1978)
Faroe Islands				>10		5					NAMMCO & IMR (2019)

Table A1b. Variation in life history parameters for harbour porpoise across its North Atlantic range, females.

Area	Maximum length (cm)	Mean adult length (cm)	Mean adult weight (kg)	Maximum age (years)	Length at sexual maturity (cm)	Age at sexual maturity (years)	Length at physical maturity (cm)	Asymptotic length at physical maturity ± SE/SD (cm)*	Asymptotic weight at physical maturity ± SE/SD (cm)*	Age at physical maturity (years)	**Females**
NWIP	202 (n = 127)			18 (n = 71)	169 (161-202) (n = 60)	5.5 (n = 60)	185 (n = 60)			10 (n = 60)	Read (2016)
Galicia, NW Spain	202 (n = 38)			9	166 (n = 35)	3					Lopez (2003)
Portugal (1981-1994)	208 (n = 22)										Sequeira (1996)
Scotland, northern North Sea (1992-2004)	173 (n = 227)			20 (n = 132)	138.8 (n = 190)	4.35 (n = 111)	164 (157-171)	158.4		~5	Learmonth et al. (2014)
Northern North Sea (2001-2003)					>140	4.5 (CL ± 0.2886)					Pierce et al. (2005)
UK (1985-1994)	189 (n = 96)	160		22 (n = 96)	140-145	3	160	160	55		Lockyer (1995; 2003)
UK (1990-2012)						4.92					Murphy et al. (2015)
Ireland (2001-2003)	175 (N=27)			11 (N=21)	>140/>150	3.67 (CL±0.33) (Irish Sea)					Pierce et al. (2005)
Denmark (1938-1998)	189	160	65	23	143 (136-151) (n = 59)	3.5 (n=25)	160				Lockyer & Kinze (2003)
Kattegat/ Skagerrak (1988-1991)	171 (n = 232)	156.7				4.32 (3.76-4.87)		156 (n=201)			Hedlund (2008)
German North Sea and German Baltic Sea				19		4.95 (±0.6)					Kesselring et al (2017)
Belt Sea							153	152.4 (±5.5)			Karstad et al. (1993)
The Netherlands	160 (N=19)			12 (N=14)							Pierce et al. (2005)
France (2001-2003)	192 (N=14)			24 (N=9)							Pierce et al. (2005)

West Greenland (1988-1989, 1995)	166 (n = 85)	154		12 (n = 85)	138-142 (n = 85)	2.95-3.63 (n = 84)	154 ± 2.6	154.0 ± 2.6	64.391 ± 1.960		Lockyer et al. (2001, 2003)
Greenland				17? (sex not mentioned)		3.7 (1995, SE=0.03) 3.5 (2009, SE=0.03					NAMMCO (2013)
Iceland (1991-1997)	174 (n = 474)			20 (n = 354)	138/147.6 /146	2.1/2.8/ 3.2/4.4	160	160.1	77.5 (including pregnant)		Ólafsdóttir et al. (2003)
Gulf of Maine (1989-93)	168			17*		3.36/3.15/3.27 (n=99)	158 ± 1.56			~7	Read & Hohn (1995)
Canada, Bay of Fundy				17		3.15-3.44		155			Read & Hohn (1995), Read & Gaskin (1990)
Canada, eastern Newfoundland	162				146.4 (SE=0.03)	3.1 (SE=0.07		156.3 (SE=2.9)			Richardson et al. (2003)
Southern North Sea (1955-~1975)	186					~6			~150		Van Utrecht (1978)
Southern North Sea (2001-2003)					>130	~5					Pierce et al. (2005)
Faroe Islands				>9		3					NAMMCO & IMR workshop (2019)

Table A1c. Variation in life history parameters for harbour porpoise across its North Atlantic range, calving and seasonality

Area	Annual Pregnancy rate	Ovulation rate/year	Gestation period (months)	Lactation period	Calving interval (years)	Calving season	Mean birth date	Mating season – Activity of mature males	Mating season – Ovulation/ conception period in females	Mean conception date in females	Newborn weight (kg)	Newborn length (cm)	Sex ratio in foetuses males: females	Calving and season-ality
NWIP	0.54 (n = 13)				1.89	May-Aug						85 (84.5-90)		Read (2016)
Scotland, northern North Sea (1992-2005)	0.34-0.4 0.42 (n = 33)		10-11 months	June-Nov			end May - end June	Apr-Jul		end July - early August	6.84	76.4		Learmonth et al. (2014)
UK (1985-1994)						June (May-Aug)					~5kg	65-70		Lockyer (1995; 2003)
UK (1990-2012)	0.50													Murphy et al. (2015)
Ireland (2001-2003)	0.4													Pierce et al. (2005)
Denmark (1938-1998)		0.61	10 months	>8 months	1.5	June (Mar-Aug)		June (May-Aug)/July -Sept		August	4.5-6.7	65-75 cm	1.1:1	Lockyer & Kinze (2003), Lockyer (2003)
Kattegat/ Skagerrak (1988-1991)	0.57	0.91 (0.65-1.18)												Hedlund (2008)
Belt Sea			10-11 months											Karstad et al. (1993)
West Greenland (1988-1989, 1995)		0.73/0.76 -1.38				late summer		Aug	Aug			70?		Lockyer et al. (2003)
Greenland					1 year									NAMMCO (2013)

Iceland (1991-1997)	0.98	0.98		≤7 months	1 year	June (May-July)	Mid June	Summer	June-Aug?	June-Aug?		75-80	1.2:1	Ólafsdóttir et al. (2003)
Gulf of Maine (1989-93)	0.93		10.6 months	8-12 months	~1 year	June-July		late June - early July	late June - early July			108 (SE=1.4)	0.93 (n = 14)	Read & Hohn (1995)
Canada, Bay of Fundy						May		late June						Read (1989)
Canada, eastern Newfoundland	0.83		10.8 months			Early June	Early June	July	Early July	July				Richardson et al. (2003) + unpublished data
Southern North Sea						May-Aug						74.3		Lockyer (2003)/Addink et al. (1995)/Pierce et al. (2005)
Northern North Sea (2001-2003)						June-July				July-Aug				Pierce et al. (2005)
German North Sea (1990-2000)							27 June (6 June - 16 July)							Hasselmeier et al (2004)
Southern North Sea (1955-~1975)			~11 months			peak in June							67-90 (n = 10)	Van Utrecht (1978)

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APPENDIX 2

Diet of the harbour porpoise

The harbour porpoise in the North Atlantic feeds mainly on small shoaling fish from pelagic and demersal habitats, and in general it seems porpoises in any one area tend to feed on two-four main species of prey. There seems to have been a shift from clupeid fish species to sandeels and gadoids in some areas, which may be related to a decline in herring stocks during the 1960s (Santos and Pierce, 2003). While herring and sprat are rather high in energy, gadoids are less so, and such shifts in diet may influence the time that individuals have to spend foraging. Based on analyses of $\delta^{13}C$ and $\delta^{15}N$, Das and colleagues (Das *et al*., 2003) found that harbour porpoise in the southern North Sea has a slightly lower trophic position than harbour seal, grey seal, white beaked dolphin and cod, reflecting a higher proportion of zoo-planktivorous fishes in their diet compared to that of other top predators.

The table below summarises diet studies of harbour porpoises, mainly from the northeast Atlantic, but with some examples from other areas. Frequency of occurrence of prey species are ranked from 1-5 where 1 is the most important prey species in the respective study. In the northern North Sea (Scotland), the main prey species are whiting, sandeel, clupeids such as herring and sprat, as well as cephalopods. *Trisopterus* spp. and other gadoids also occur quite frequently, as well as mackerel in some cases. In the UK and southern North Sea, gobids are generally the most frequently occurring prey, together with sandeel and gadoids. Clupeids and cephalopods are also rather frequent.

In contrast, harbour porpoises further north, such as the Norwegian coast, Iceland and Greenland, have a rather large proportion of capelin in their diet, while porpoises in the Black Sea feed on gobids but also on flatfish such as flounder and dab, as well as whiting. Off the northwest Iberian Peninsula, gadiods such as *Trisopteru*s spp, silvery pout and blue whiting seem to make up most of the prey together with gobids and sardines.

Dietary studies continue in all countries with results published at intervals. There is increased use now of metabarcoding to complement stomach content analysis. Researchers in the Netherlands have recently compared porpoise diet in Dutch waters across time periods from stomach contents of stranded animals, as well as metabarcoding. Latest findings, for example, indicate an increase in whiting in the diet in 2024 compared with 2023 (Leopold *et al.*, in preparation).

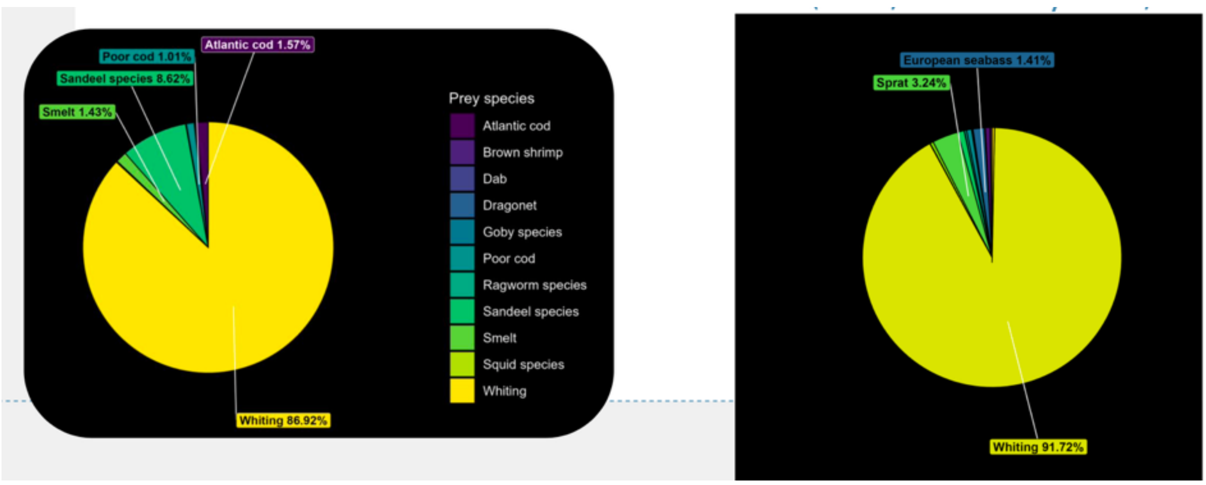

Figure A1 Proportion of fish occurring in harbour porpoise diet in 2023 (left) and 2024 (right).

Table A4. Summary of diet studies for harbour porpoises. Frequency of occurrence of prey species are ranked from 1-5 where 1 is the most important prey species in the respective study

Area (sampling years)	**Sea area**	**n**	**Capelin** *Mallotus villosus*	*Clupeidae*	**Herring** *Clupea harrengus*	**Sprat** *Sprattus sprattus*	**Greater Argentine** *Argentina silus*	**Sardine** *Sardina pilchardus*	*Gadidae*	**Cod** *Gadus morhua*	**Whiting** *Merlangius merlangus*	**Haddock** *Melanogrammus*	**Blue whiting** *Micromesistius*	**Silver hake** *Merlucius bilinearis*	**Silvery pout** *Gadiculus argentus thori*	**Saithe**	**Scad** *Trachurus trachurus*	*Trisopterus spp.*	**Sandeel** *Ammodytidae sp.*	**Gobies** *Gobidae*	**Sand smelt** *Atherina presbyter*	**Sardines** *Sardina pilchardus*	**Hagfish** *Myxine glutinosa*	**Poorcod** *Trisopterus*	**Norway pout** *Trispoterus esmarkii*	**Pearlsides** *Maurolicus spp.*	**Sole** *Solea solea*	**Dab** *Limanda limanda*	**Flounder**	**Mackrel** *Scomber scumbrus*	**Redfish** *Sebastes*	**Atlantic horse mackerel** *Trachurus trachurus*	*Trachurus spp.*	**Snailfishes** *Liparidae*	*Zoarcidae*	*Urophysis spp.*	**Cephalopods**	**Reference**
Eastern Canada (1969-1972)	North Atlantic	81			1					3				4																2								Smith & Gaskin 1974
Bay of Fundy, Canada (1985-1987)	North Atlantic	127			1					3				2																								Recchia & Read 1989
Bay of Fundy, Gulf of Maine, Canada	North Atlantic				1									2												4										3		Gannon et al. 1998
Skjálfandi Bay, Iceland (2011-2012)	North Atlantic	28	1							2																								3				Koponen 2013
Iceland (1991-1997)	North Atlantic	1047	1		5				3										2												4							Víkingsson et al. 2003

UK	Scotland (1992-2010)	Scotland (1992-2003)	Scotland (1992-1996)	Scotland (1965-1971)	Scotland (1959-1965)	Irish waters (1989-1994)	Ireland (1992-2013)	Norway (1985-1990)
North Sea	North Sea/ North Atlantic	North Sea/ North Atlantic	North Sea/ North Atlantic	North Sea/ North Atlantic	North Sea/ North Atlantic	Celtic Sea/ Atlantic	Celtic Sea/ Atlantic	North Sea/ North Atlantic
		188	72	41	52	26		109
								3
							4	
			2	2	1	2		1
			4	4	2			
								5
1	x	4				1		
	x			4	3			
	1	1	1	1	1	1	2	
	x		4					
								2
		5	3			1	1	
2	2	2	1	3				
3								
								4
				4				
				5	3			
	x	3	2				3	
Martin 1996	Read et al. 2014	Santos et al. 2004	Santos 1998	Rae 1973	Rae 1965	Rogan & Berrow 1996	data from Emer Rogan	Aarefjord et al. 1995

France	Southern North Sea (2010-2013)	Belgium (1997-2011)	Netherlands (2003-2014)	Netherlands (1989-1995)	Netherlands (2006-2014)	Netherlands (2005-2012)	German North Sea
North Sea	North Sea	North Sea	North Sea	North Sea	North Sea	North Sea	North Sea
17	52	64	600	62	829	74	34
		4	4		4	2	
	2						
	5	3	3		3	3	
				1			
1							
2							
				5			
	3	2	2	4	2	4	1
	1	1	1	2	1	1	
	4						
							2
				3	5		
Desportes 1985	Mahfouz et al. 2017	Haelters et al. 2012	Schelling et al. 2014	Santos 1998	Leopold 2015	Leopold et al. 2015	Benke et al. 1998

Western Baltic (1980-2011)	The Sound, Baltic Sea	Denmark	Denmark/ Sweden (1985-1990)	Kattegat/ Skagerrak (1989-1996)	Germany	Bay of Biscay, Channel, France (1988-2003)
Western Baltic	Kattegat/ Belt Sea	Skagerrak/ Kattegat/ Belt Sea	Skagerrak/ Kattegat/ Belt Sea	Skagerrak/ Kattegat/	North Sea/ Baltic Sea	Channel/ Bay of Biscay
339	53		138	112		29
4	2		1	1 juv		
5	5		5	juv		
	4			x juv	3	
1	1	1				
2	5	1	2			
						1
						2
5	5		4	juv	1	
3	3		3	4 juv		5
						3
				2		
				3		
					2	
					4	
						4
						x
Andreasen et al. 2017	Sveegaard et al. 2012	Källquist 1974	Aarefjord et al. 1995	Börjesson et al. 2003	Lick 1991 Lick 1993	Spitz et al. 2006

Black Sea	Galicia (1991-1995)	NWIP (1990-2010)	Denmark (1989-1992)	Poland (1986-	Baltic Proper (1960-1961)	Western Baltic (2006-2008)	German Baltic Sea
Black Sea	Bay of Biscay/ Iberian Peninsula	Bay of Biscay/ Iberian Peninsula	North Sea/ Skagerrak/ Kattegat/ Belt Sea	Baltic Sea	Baltic Sea	Western Baltic	Western Baltic
4000	6		58	27	50	75	27
			3	1	2	4	2
				2	1	5	
	2						
		x					
			5		3	1	3
4			1			3	
		2					
	2						
	1	x					
	3	1					
	3				5		
1	3	x	4	3	4	2	1
3							
2							
		3					
			2				
Tsalkin, 1940, quoted from Tomilin 1957	Santos 1998	Read et al. 2014	Santos 1998	Malinga et al. 1997	Lindroth 1962	Ross et al. 2016	Benke et al. 1998

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