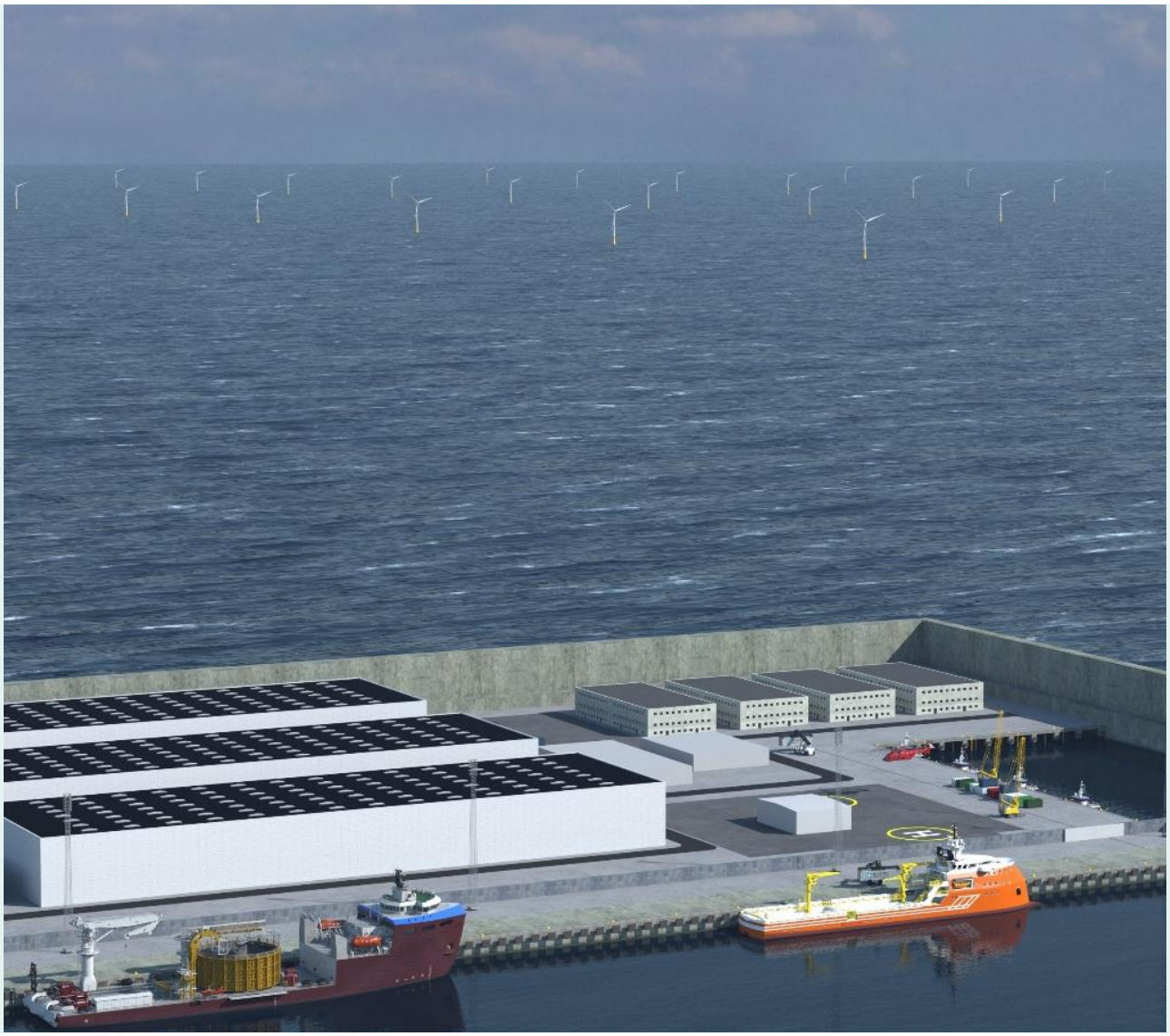


Energy Island North Sea

Scope Report – Marine Mammal Field Surveys

Energinet

Date: 26 January 2022

Contents

1 Project introduction and background

With the Climate Agreement for Energy and Industry of the 22nd of June 2020, the majority of the Danish Parliament decided that Denmark will become the first country in the world to develop two energy islands with a capacity to cater for the grid connection of a total of 5 GW offshore wind. One of the islands will be located in the North Sea ("Energioe Nordsoen") with a capacity of 3 GW offshore wind surrounding the island. This island can be further scaled up to allow for grid connection of up to 10 GW offshore wind on the island. It is expected that Energioe Nordsoen will be in full operation by 2033.

The Danish Energy Agency (DEA) has initiated the Strategical Environmental Assessment (SEA) and associated technical reports based on field studies including field studies of marine mammals within the investigation area for the planned energy island area and export cables as well as the area around the island. The field studies will be the foundation in the baseline descriptions of presence and densities of marine mammals in the following marine mammal impact assessment as part of the EIA for Energioe Nordsoen.

This report includes a detailed description of the planned marine mammal field surveys including aerial field surveys for cetaceans, harbour and grey seals and passive acoustic monitoring (PAM) within and around the investigation area for Energoe Nordsoen.

2 Expected marine mammals in the project area for Energy Island North Sea

Harbour porpoise (*Phocoena phocoena*) is the most common cetacean species in the North Sea, followed by white-beaked dolphins (*Lagenorhyncus albirostris*) and minke whales (*Balaenoptera acutorostrata)*. Several other species occur irregularly (*Hammond et al. 2013, Biological Conservation*).

Harbour porpoises are common in the North Sea; however, their annual use of the investigation area is unknown. Aarhus University has tagged 37 harbour porpoises near Skagen since 2000 (Sveegaard et al. 2011, Marine Mammal Science) (2000-2003: n=25, 2014-2015: n= 10 and 2019: n=2) (Figure 1), which showed that these animals preferred the southern slope of the Norwegian Trench, but may also explore the areas to the south, including the investigation area. The location of the tagging site (e.g. the distance to it) affects the apparent habitat preference of an individual, and animals tagged further south along the coast of Jutland (closer to the investigation area) may have a different home range/habitat use than porpoises tagged at Skagen.

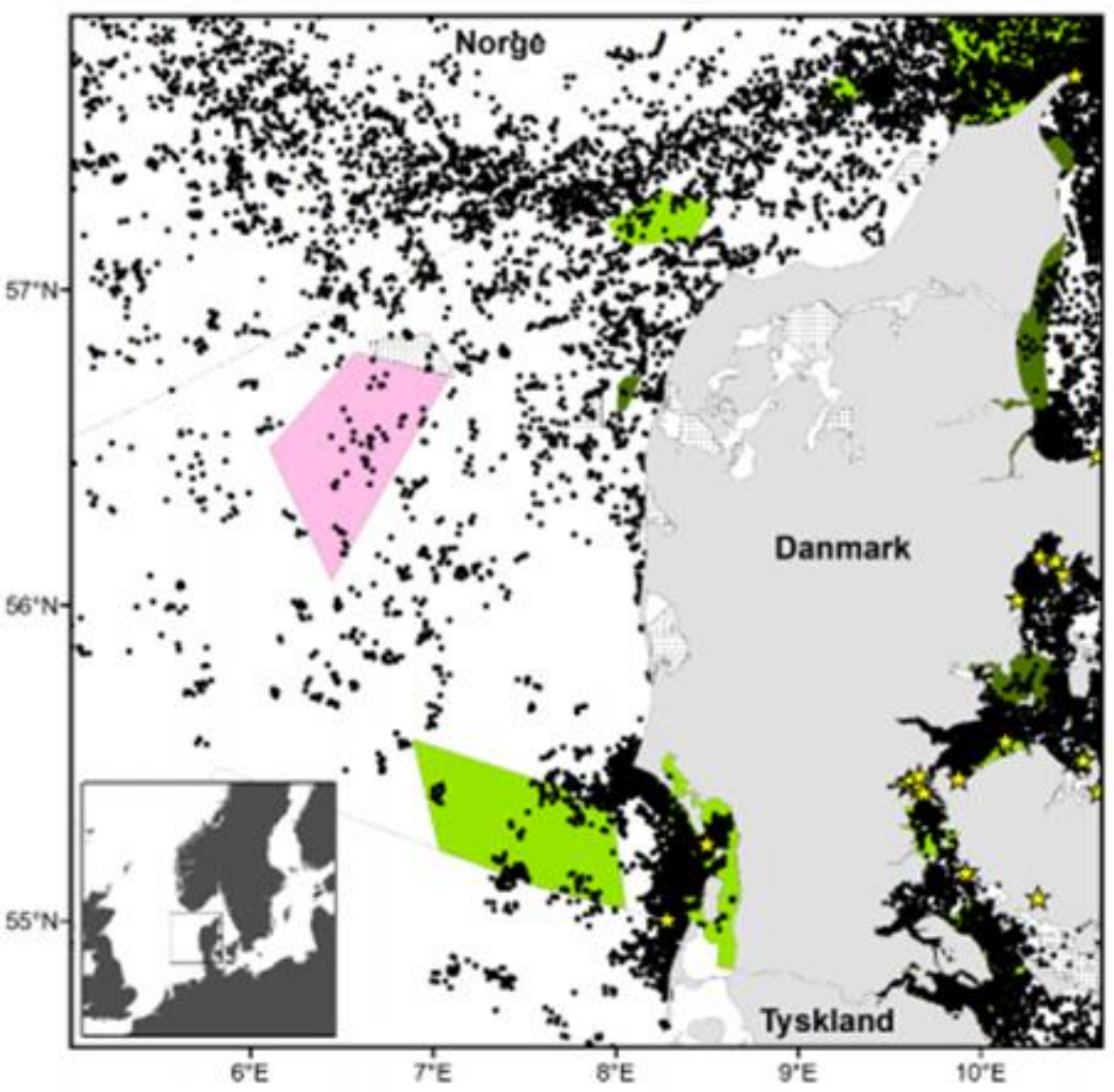


Figure 1: Positions from harbour porpoises tagged at Skagen, inner Danish waters and the Wadden Sea. The investigation area is shown in pink and Natura 2000 areas appointed to protect marine mammals in green. Other Natura 2000 areas are shown in grey striped.. The yellow stars show tagging sites of harbour porpoises (Kyhn et al. 2021).

White-beaked dolphins are commonly observed in the proposed region of the investigation area (Atlas of Cetacean distribution in north-west European waters) and it may even be the most important area for white-beaked dolphins in Danish waters (e.g. Hammond et al. 2007, Biological Conservation; Østrin, P. 1994. Hvalerne i Orions Bælte. Naturens Verden 102.) (Figure 2). There are no migration or movement data for white-beaked dolphins in the North Sea, and their annual presence or migration through the investigation area is therefore unknown.

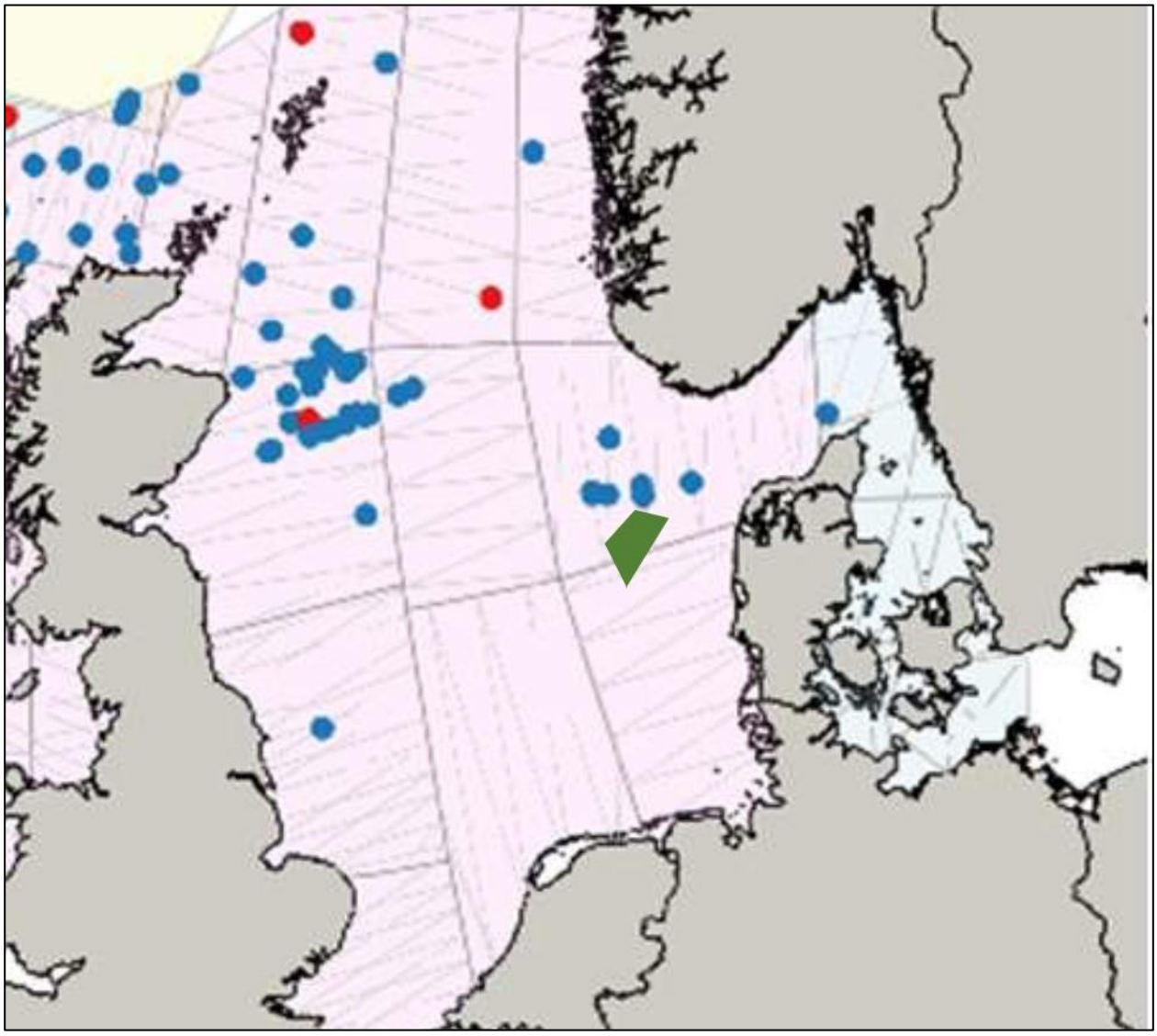
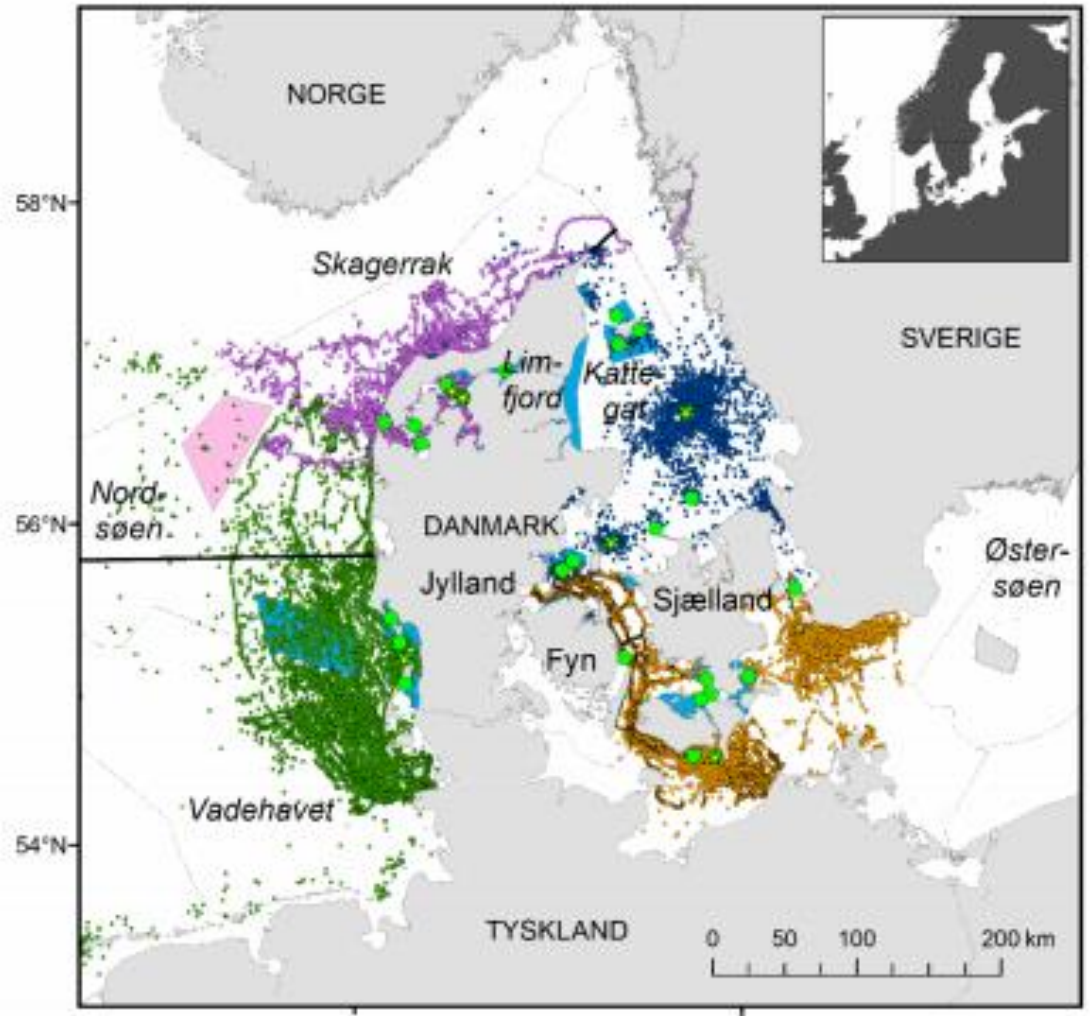


Figure 2: Observations of white-beaked dolphins (blue dots) during the SCANS III survey in 2016 in the North Sea (Hammond et al. 2017, report). The investigation area is shown in green.

Minke whales are common in the North Sea (Hammond et al. 2002, 2017, SCANS I & III) and are for example observed in the Danish Oil and gas sector. Four minke whales have been incidentally caught in a large pound net at Skagen, and two of these were equipped with satellite tags before release. They travelled across the North Sea to England before turning south. Minke whales are likely to use the investigation area. Minke whales emit a special sound, which can be recorded by wideband dataloggers, such as SoundTraps. SoundTraps may therefore inform on their presence in the investigation area.

Harbour seals (*Phoca vitulina*) and grey seals (*Halichoerus grypus*) are the only common seal species in the North Sea. Harbour seals are observed as far offshore as in the Danish oil and gas sector (approximately 170-200 km from the Danish west coast) and grey seals are known to traverse the North Sea both from the UK as well as from the Wadden Sea. The investigation area is located approximately 60-135 km from two very important seal haul out areas, namely the

western mouth of the Limfjord near Thyborøn and the Wadden Sea. Both locations hold important resting and moulting grounds for both seal species. The Wadden Sea is an important breeding area for harbour seals, and grey seals have within the last decade, begun to use the Danish part of the Wadden Sea for pupping (Fast-Jensen et al. 2015, Mar.Biodiv. Rec.). In January 2021, 650 grey seals were born on Helgoland (Van Neer pers. Comm). Satellite tagging of eleven harbour seals at Thyborøn in 2020 showed that they use the investigation area (Figure 3, top). Only two grey seals have been tagged at Thyborøn and one visited the investigation area (Figure 3, bottom), so it is important to collect further information on their use of this area.



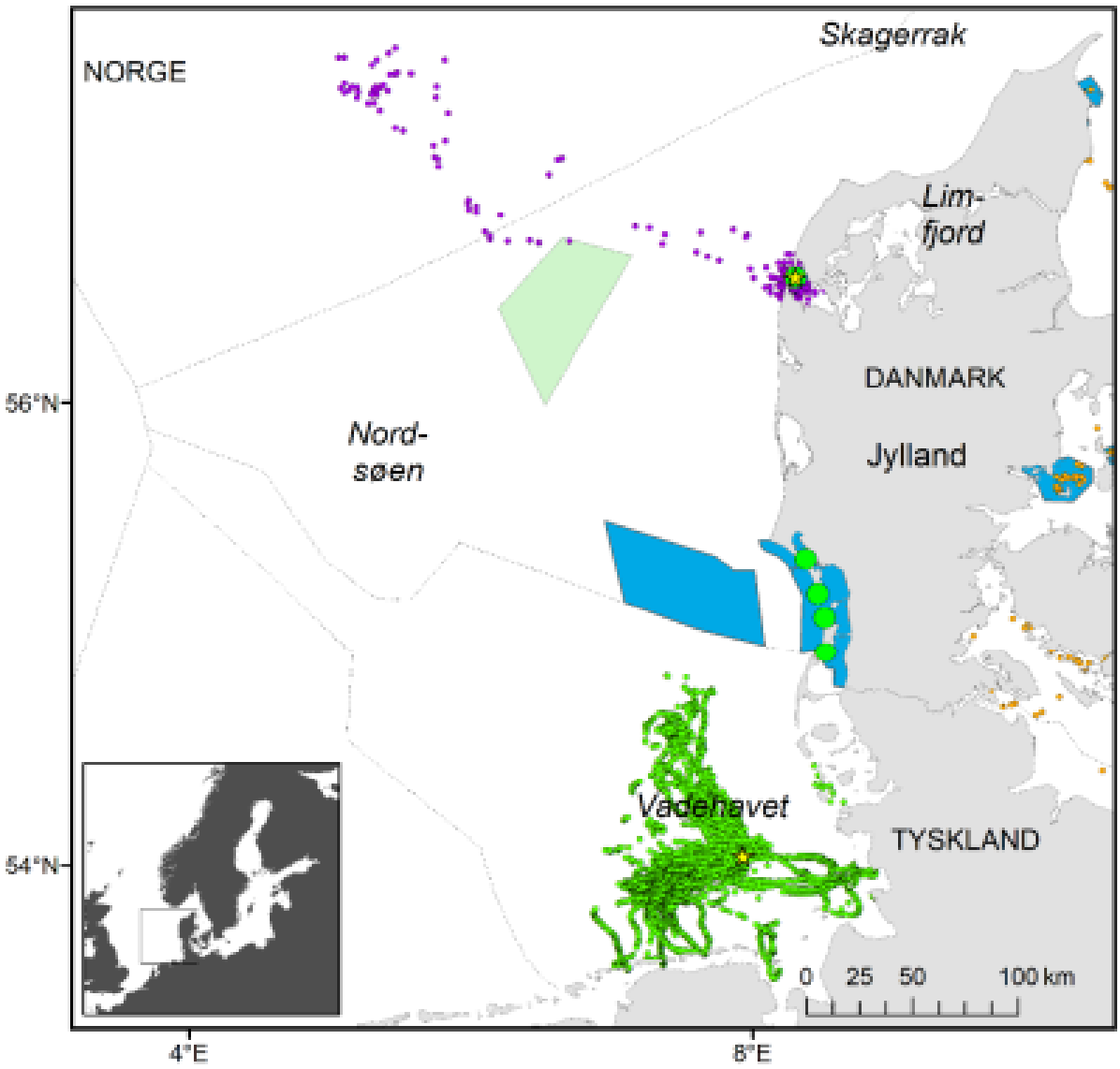


Figure 3: Map of positions from tagged harbour seals (top map) and grey seals (bottom map). The investigation area is shown in pink on the map at the top and green on the map at the bottom. The blue areas show Natura 2000 areas appointed to protect harbour seals and grey seals. The green circles show the seal tagging sites (Kyhn et al. 2021, pre-investigation report for LOT1).

3 Surveys, data collation and analysis design - Cetacean

The data collection for cetaceans is divided in to two parts:

- Deployment of passive acoustic monitoring (PAM) systems within the investigation area for two years with at least one month of data collection for each season to study the detailed temporal presence of harbour porpoises and other cetaceans (see section 2.2.1.1).

- Four aerial annual offshore marine mammal surveys is suggested to be conducted from March to November in 2022 and 2023 to determine the abundance and density of harbour porpoises as well as the presence of other cetacean species in the investigation area. The aerial survey will cover the investigation area (see section 2.2.1.2).

3.1 Passive acoustic monitoring (PAM) of Cetaceans

As the harbour porpoise is the most common cetacean species in Danish waters, FPODs will be used as main PAM system (14 stations), since the currently used version, the CPOD, is no longer manufactured for use in new areas. The FPOD is therefore preferred to have enough units in case of loss due to trawling. The FPOD is the next generation CPOD and specifically developed for detecting porpoise echolocation signals. Aarhus University is presently conducting a calibration study to transfer from the CPOD to the FPOD, which will allow the use of FPOD data for comparison with the results from former PAM studies of porpoises in Danish waters e.g. the recent monitoring at Thor OWF and the NOVANA data.

Besides porpoises, there are several other cetacean species occurring frequently in the investigation area, with white-beaked dolphins and minke whales as the most frequent. These species are also Habitat Directive appendix IV species and protected at the same level as harbour porpoises are, and we expect that the Danish Energy Agency will require that also white-beaked dolphin and minke whales are assessed when the guidelines on impacts from piling noise are updated (Tougaard 2021, *Marine mammal species of relevance for assessment of impulsive noise sources in Danish waters - Background note to revision of guidelines from the Danish Energy Agency*. Tougaard 2021, *Thresholds for noise induced hearing loss in marine mammals - Background note to revision of guidelines from the Danish Energy Agency*). However, these species are unlikely to be detected or accurately determined to species with FPODs. Therefore, in addition to the FPODs, wideband recorders (SoundTraps, Ocean Instruments, New Zealand) will be deployed along with FPODs at every second station. Scripts for analysis of the files are available at Aarhus University.

The stations will be deployed in a grid covering the depth contour (25-56 m) and will be placed randomly within the project area in a so called stratified random design in order for the results to be representative for the covered area with respect to the environment (including fish density represented by fisheries, bathymetry and so on) and to avoid introducing bias in the data. A 6 m surface buoy (type: 225_3 approved by the Danish Maritime Authority) will be used to guard the FPOD at each monitoring station by informing trawling vessels of their presence. All surface buoys and PAMs will be equipped with a satellite transmitter allowing us to monitor their continuous presence, or potential occurrence at the surface for dataloggers. In case the buoy is removed by trawlers, we can follow its where-about and regain it. Each datalogger will be deployed as close to a surface buoy as possible (< 20 m), using acoustic releasers for reducing handling time.. Figure 4 show the PAM setup.

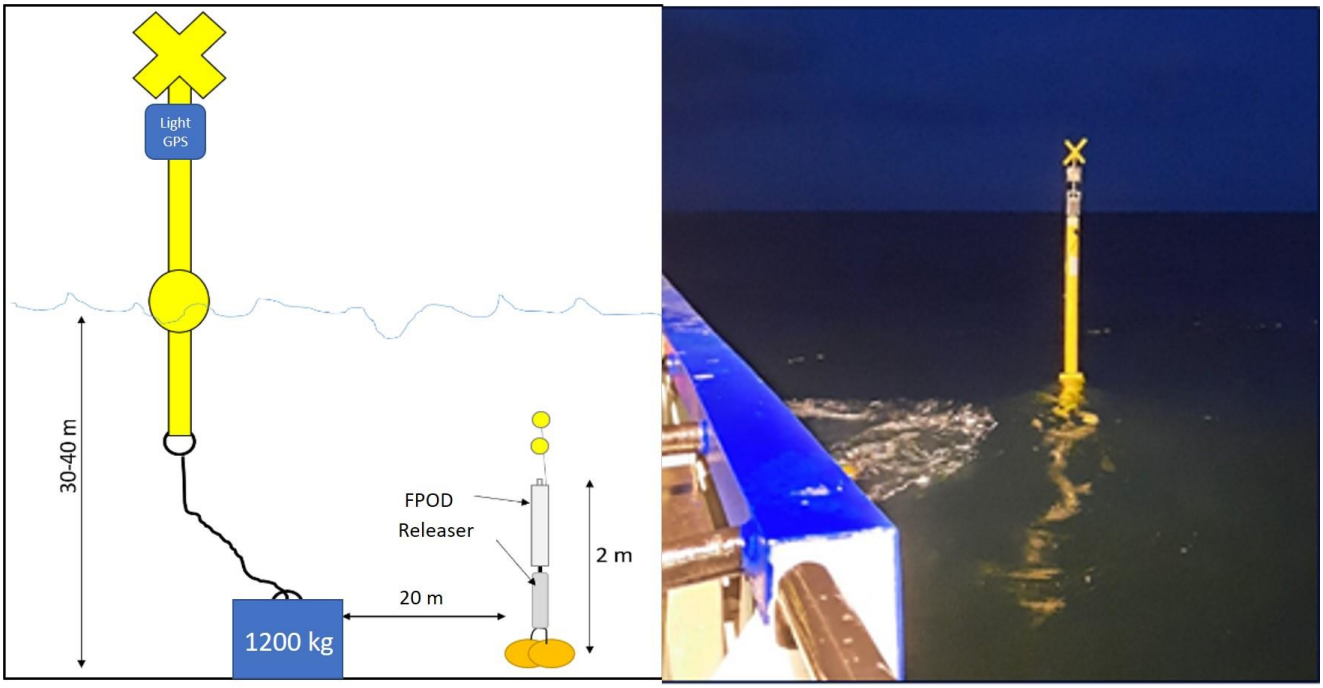


Figure 4: PAM setup station with yellow bouy and FPOD (left) and photo of deployed bouy at the surface (right). Half of the PAM stations will in addition to the FPOD also include a sound trap (not shown on the picture.)

The PAM stations will be deployed as soon as the HSE-plan, IMCA/CMID certification and scope report are approved by the client and equipment is available. FPOD service will be conducted every 3rd month for two years, where batteries will be replaced, and data will be offloaded and analyzed. Final retrieval of the FPODs will be two years following first deployment. The PAM programme will provide data on yearly pattern of presence cetaceans in the investigation- and project area.

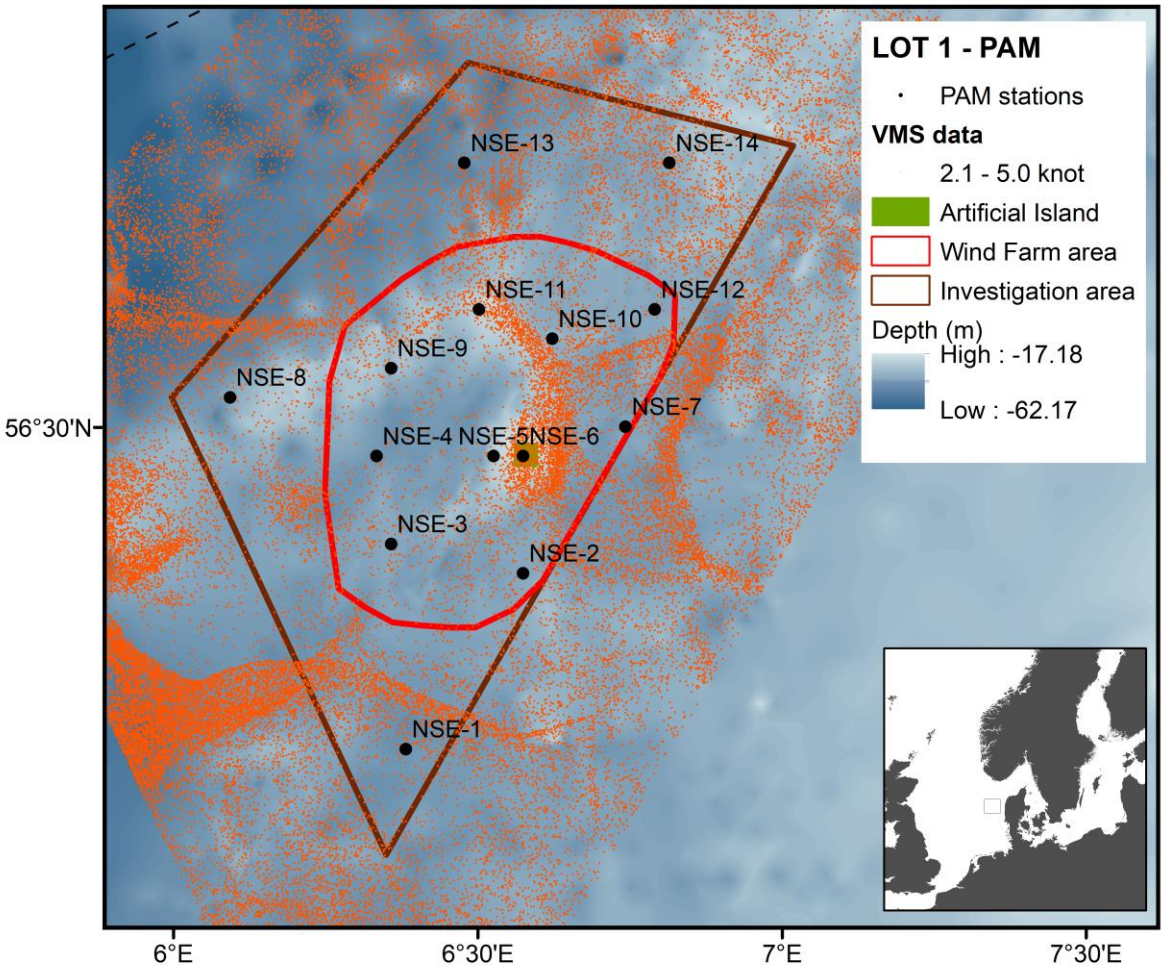


Figure 5: Overview of the suggested PAM program with eight stations in the project area and four stations in the investigation area. The map shows bathymetry and Danish and foreign VMS data (2018-2020) from vessels moving with 2-5 knots (estimated speed for trawling activity. As can be seen, especially the shallow area is at risk for trawling of equipment.

A total of 14 PAM stations will be placed in the investigation area with ten PAM stations in the project area and four stations in the investigation area, but outside the project area in order to determine the presence of harbor porpoises and other cetaceans outside the project area as a reference. As the existing knowledge of cetaceans and their use of the project area as well as the surrounding area is very limited, it is important to have PAM stations both within and outside the project area, to be able to determine the relative importance of the project area compared to surrounding areas. It is especially important with the wider picture, as this is the first-time presence of other species than harbor porpoises are especially examined in order to perform an sensitivity analysis for the investigation area.

To cover the possible placement of the energy island, one of the 14 PAM stations will be placed inside the appointed potential energy island area, and one close by and in water depths < 30 m. All stations inside the project area, except

the one inside the potential location of the energy island, has been placed with a random stratified design (see Figure 4). This means nine randomly placed stations in the project area. The four stations in the investigation area will also be placed in a random stratified design.

3.2 Aerial Surveys of Cetaceans

Four annual aerial surveys in March, May/June, July/August and October/November in 2022 and 2023 will be conducted to get a good temporal coverage of the density of porpoises and if possible other cetaceans in the area across the year. The aerial surveys of cetaceans will follow pre-designed transect lines (parallel design and equal spacing of 5 km) that ensure equal coverage probability within one full day's survey. After the survey, the collected data will be analyzed to estimate abundance and density of all species where enough data is collected. Distribution of porpoises and presence of porpoise calves will be used to examine if the investigation area is a potential calving ground.

The aerial surveys will be conducted by three experienced observers on board the aircraft (Partenavia with bubble windows): two observers positioned at the bubble windows and one data collector. During line transect distance sampling, the perpendicular distance of a porpoise sighting to the track line is measured with a clinometer. The distances are used in the abundance analyses to estimate the effective strip width covered by the plane. To measure the distance, the plane flies at a constant height (183m) and at a constant speed of 100 knots. Transect lines are defined in a parallel design of north-south lines (Figure 1.4). For this method, it is generally recommended that transects are designed perpendicular to the depth contours, but as there is no clear depth gradient in this area, and the north-south transects are beneficial with regard to avoiding glare during observations, they have been chosen over other possible transect orientations. The purpose of the aerial survey is to get a density estimate of porpoises in the investigation area to be able to estimate number of animals potentially affected by the establishment of Energy Island North Sea. Especially underwater noise from pile driving of foundations for the wind farm rubies as well as foundations for the artificial island can potentially cause relatively long impact ranges outside the project area. Experience from other offshore wind farm projects have shown that deterrent effect of pile driving can be abated with bubble curtains, and double bubble curtains can reduce the deterrent range to some app. ten kilometers based on other offshore wind farm projects in the North Sea (Dähne, Tougaard, Carstensen, Rose, & Nabe-Nielsen, 2017; Rose, et al., 2019). Therefore, the aerial survey will cover the project area and a 10 km buffer zone. The actual deterrence range may be reduced even further in combination with for example hydrosound dampeners so the ten km buffer zone is expected to be a worst-case scenario. The 11 transect lines will have a 5 km spacing and total 519 km. This design will enable us to survey the entire core area in a single day. Analysis of abundance will be conducted in the software R using a special script developed during SCANS III. The analyses take variables such as weather and sea state into account and the result will be abundance estimates and densities covering the observation period.

During the aerial surveys, all detected marine mammals will be included and depending on final number of observations per species, density can be estimated for the different species, including seals.

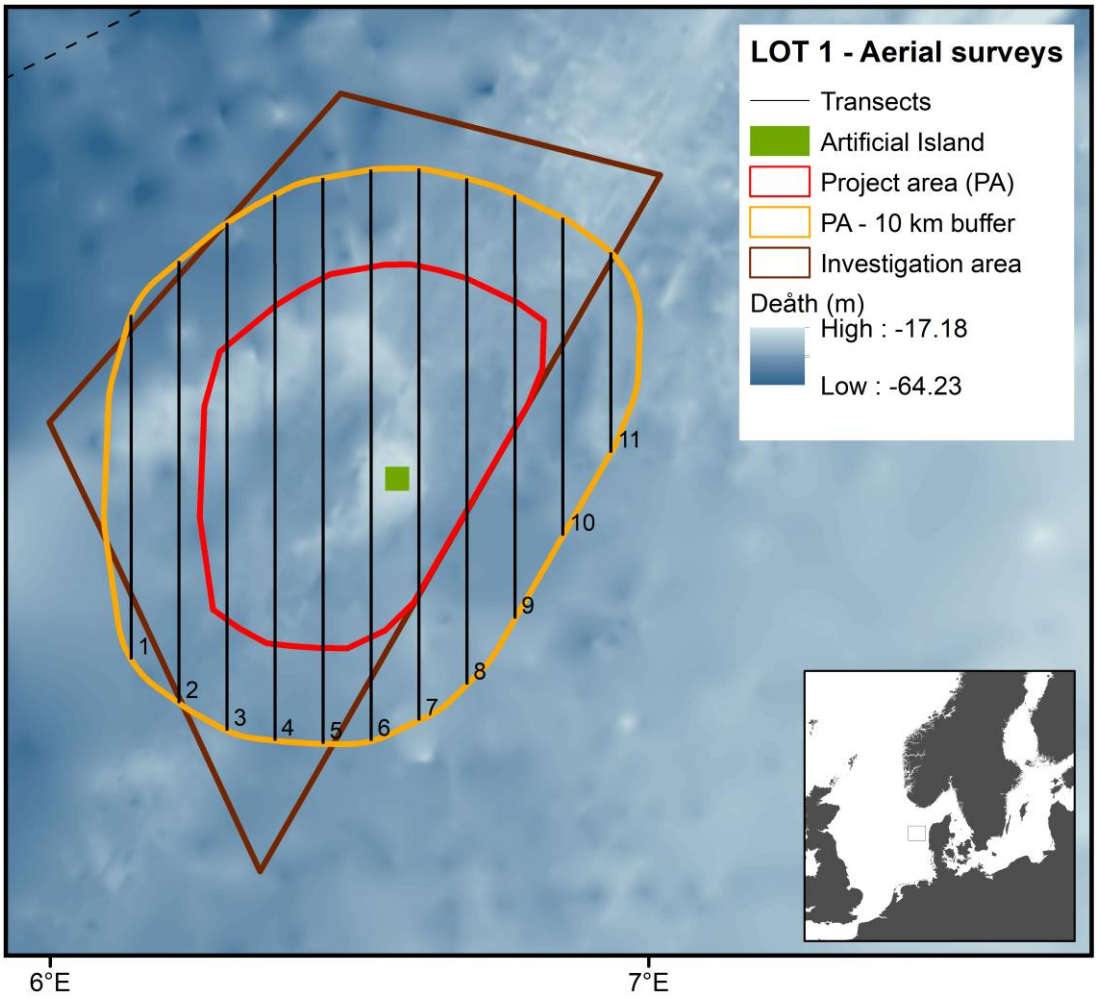


Figure 6: Overview of the aerial survey program for marine mammals in the investigation area. The transect lines are placed with a distance of 5 km as requested, and the program can be conducted in a single day.

4 Surveys, data collection and analysis design - Seals

The data collection for seals is divided in to two parts:

- Digital Aerial annual offshore seal surveys (see section 2.1.3.1)
- Analysis of unpublished tagging data from TiHo from grey seals (see section 2.1.3.2)

4.1 Digital Aerial Surveys of Seals

Eight aerial surveys are already conducted by DCE, Aarhus University in the Wadden Sea in, November/December (2021), March/April (2022), June (2022) and August (2022) and three in the Limfjord in June (2022) and August (2022). Data from these aerial surveys will be included in the baseline description. In addition, we will expand this program with one April survey and one December survey covering the Limfjord and two additional surveys of both areas, one in February and one in October, to get round-the-year coverage of haul-out use for both species, as the investigation area may be of importance for seals at both haul-outs. Thus, beside from the already planned surveys, the following surveys will be conducted:

- Limfjord: February (2022), April (2022), October (2022), December (2022).
- Wadden Sea: February (2022) and October (2022).

Aerial seal surveys will be conducted using high-wing single engine aircraft (e.g., Cessna 172) with opening window on the passenger side. Two observers will take overlapping pictures with high quality DSLR cameras with 100-200 mm lenses at 600'-700' altitude. To minimize variation in the data, surveys will be conducted under a specified range of conditions: no precipitation during the survey and the preceding 6 hours, observations conducted between 9 am and 15 pm, winds below 10 ms^{-1}.

Seals will be counted from the two series of photographs by two independent observers. If the discrepancy between the two counts exceeds 5 %, a third, independent count is conducted.

4.2 Analysis of Grey Seal tagging Data

Data from eight young grey seals tagged in German waters will be obtained from the University of Veterinary Medicine Hannover, Foundation (TiHo) and analyzed for use of the investigation area. Previous data from grey seals tagged at the same haul-out show that the seals primarily swim north and appear to use the investigation area. The data will therefore supplement the tagging data maintained by the national Data Center at DCE, and will aid the sensitivity analyses for grey seals.

5 Technical report

The technical report on marine mammals will comprise the following information:

- Non.technical summary
- A thorough method description including a description of all relevant plan and model assumptions (specification of wind turbines/foundations, Energy island size, installation methods for turbine and island foundations as well as other relevant parameters).
- Description of baseline situation for marine mammals in and near the plan area based on aerial the aerial surveys and PAM investigations as well as existing knowledge.
- Sensitivity analysis of the plan's potential impact on marine mammals, including impacts from potential exposure to underwater noise.
- Sensitivity analysis of possible cumulative and transboundary impacts on marine mammals.
- Proposals for measures to mitigate adverse impacts, if needed.

- Identification of possible data gaps and insufficiencies of importance for the environmental sensitivity analysis.
- Proposal for a monitoring programme, as appropriate.