



ENERGY ISLAND BORNHOLM SCOPE OF WORK WP-G – BIRDS

ENERGINET

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Abbreviation	Explanation
BSH	Bundesamt für Seeschifffahrt und Hydrographie.
Client	Energinet
Contractor	WSP
Investigation area	Gross area for the aerial survey including the two project areas and the surrounding area and the two German wind farms Wikinger + Arkona
HSE	Health, Safety and Environment
mob/demob	Mobilization/demobilization
Project area	Area within which the Energy Island Bornholm and planned turbines may be placed. There are two possible project areas, which are investigated
RAMS	Risk assessment and method statement
SEA	Strategic Environmental Assessment
SPA	Special Protection Area (for birds)
StUK4	Standard Investigation of the Impacts of Offshore Wind Turbines on the Marine Environment

1. SUMMARY

The energy islands mark the beginning of a new era for the generation of energy from offshore wind. The islands are expected to play a major role in the phasing-out of fossil fuel energy sources in Denmark and Europe. In the Baltic Sea, the offshore wind farms will be constructed approximately 15 km south-southwest of the Danish island Bornholm, and electricity will be routed from the island to electricity grids on Zealand and neighbouring countries.

This report defines the scope of work for Work Package (WP) G Birds. The report presents the scope of work of the work package, the area of investigation, applied methodologies, outputs and expected milestones.

The aim of WP G Birds is to assess the spatial and seasonal presence of resting birds in the study area and the magnitude and height distribution of the bird migration during spring and autumn.

The surveys and the applied methodologies will make it possible to assess the ecological importance of the project areas and to recognize and highlight potential conflicts by constructing and operating wind turbines in this area.

Data will be collected by combining different survey techniques to ensure a comprehensive recording of migratory activity within the Western Baltic Sea between southern Sweden, Bornholm and northern Germany and the project areas, as well as knowledge about species composition, bird densities and phenology of resting birds in the project areas themselves.

Additionally, a survey dedicated specifically to resting long-tailed ducks in and near the project areas will be conducted to assess whether there are local movements of long-tailed ducks between the project areas and a newly designated SPA site west of Bornholm.

2. INTRODUCTION

Potentially, offshore windfarms pose a variety of impacts to birds, most notably: 1) risk of collision with turbines, 2) displacement of birds due to effective loss of habitat; and 3) barrier effects where the windfarm creates an obstacle to regular movements to and from breeding colonies.

The aim of WP G is to collect and analyze data to assess the spatial and seasonal presence of resting birds and the magnitude and height distribution of the bird migration during spring and autumn. The activities will make it possible to assess the ecological importance of the project area and to recognize and highlight potential conflicts by constructing and operating wind turbines in the two project areas.

A combination of survey techniques ensures a comprehensive recording of the migratory activity within the Western Baltic Sea between southern Sweden, Bornholm and northern Germany and the project areas, gathering relevant baseline data on the species spectrum, migration intensity as well as flight heights and directions and provides information of species composition and densities to assess the effects of the two planned offshore wind farms on birds.

To assess the collision rate for migrating birds passing through the project area, a land-based survey program has been designed. The program will compile data on species composition, phenology, migration altitude and -direction of migrating birds, as they leave the coast of Bornholm, and Rügen in March to May and Bornholm and Blekinge in August to November plus passes through the Offshore Windfarm of Bornholm Energy Island.

At land, the survey includes a combination of two methods 1) A radar-based monitoring program and 2) Visual observations, including the use of a laser rangefinder binocular. At sea, digital aerial surveys of resting birds will be carried out in an area which completely covers the proposed study area for both wind farms, including the area of the two operating offshore wind farms Wikingen and Arkona directly west of the Danish/German border.

3. AREA OF INVESTIGATION

The aim of WP G is to collect and analyze data to assess the spatial and seasonal presence of resting birds and the magnitude and height distribution of the bird migration during spring and autumn.

The activities will make it possible to assess the ecological importance of the project area and to recognize and highlight potential conflicts by constructing and operating wind turbines in the two project areas.

A combination of survey techniques will be applied at several sites in Denmark, Sweden, Germany, at land as well in the marine environment.

WSP and BioConsult SH will carry out surveys at the sites indicated in Figure 1. Additionally, digital aerial surveys of resting birds and surveys of long-tailed ducks will be carried out in the area indicated in Figure 2 and 3 respectively.

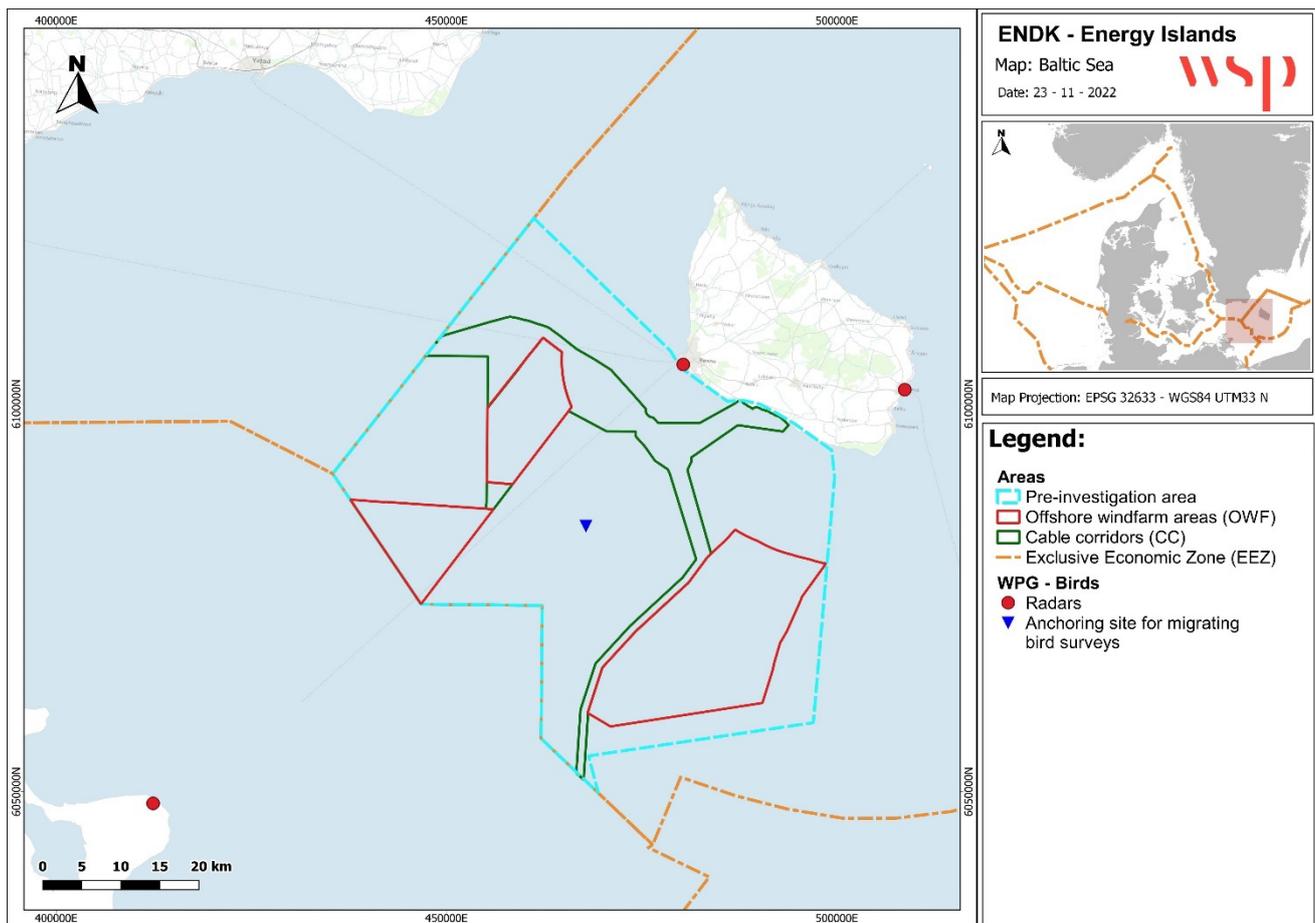


Figure 1. Area of investigation near Bornholm. Red dots: radars at Bornholm, Rügen and Sweden. Blue triangle: anchoring site for migrating bird surveys. Additionally, digital aerial surveys and vessel-based surveys of long-tailed ducks will be carried out as indicated in Figure 2 and 3 respectively.

4. METHODOLOGY

4.1 RESTING BIRDS

Data on the species composition, phenology and density of resting birds in the project areas will be collected by digital aerial surveys using the HiDef technique.

Next to a relatively higher safety in offshore areas for digital surveys, data collected by this method can always be subjected to any subsequent quality control, which leads to a much higher data quality. Additionally, a comparison of baseline data with the data collected during the construction or operational phase of the planned windfarms may no longer be possible if planes are not given permission to fly through the ultimately built wind farms at these low altitudes.

This was one of the main arguments changing to digital flights in Germany back in 2014 but meanwhile also followed in several European countries like UK, France, and most recently the Netherlands. Main argument for the Bornholm area with respect to resting birds is the much higher flight altitude (549 m) compared with conventional flights (76 m). Especially sea ducks like long-tailed ducks or common scoters are very sensitive to low-flying aircraft and react by flying up or diving down, which causes a considerable bias when calculating absolute densities.

During HiDef surveys, such sensitive species will not react to the aircraft. Another important advantage is that the HiDef-method covers a 544 m wide strip completely, so that the study area considering the proposed transect design with 5 km distance between transects is covered by 11 %, which guarantees a much higher sighting rate also for rare but important species like divers compared to conventional surveys with an effective strip width of only appr. 100 m (coverage of less than 5%). Thus, the method gives a much higher precision when calculating absolute densities compared to conventional surveys. Additionally, all surveys focusing on marine mammals using the same digital method can be used directly to also include all sightings of birds into this program.

Since January 2014 BioConsult SH uses a high-definition aerial video surveying technique developed by HiDef Aerial Surveying Ltd. to monitor seabirds and marine mammals (<https://www.hidefsurveying.co.uk/>).

The HiDef system, specifically designed for this type of work, follows a methodology that is widely accepted in the industry and by permitting authorities. Since 2014, BioConsult SH has conducted more than 600 survey missions in the North Sea and the Baltic Sea, most of them in relation to offshore wind farms, gaining images of several hundred thousand birds and some thousand marine mammals. Digital aerial surveys have been developed and established in the UK only a few years ago and became in 2014 the standard method for offshore wind farm studies in Germany [10]. The method has proven to be highly suitable for offshore surveys and to consolidate the basis for consenting offshore wind farms.

Digital aerial line transect surveys are proposed as the best method for monitoring resting birds in the investigation area, as the method provides the best possible data from a scientific point of view and due to safety reasons. A high-resolution video system (HiDef) is used to film (6 pictures/sec) the sea surface from an airplane.

The applied airplane, a Partenavia P68, is equipped with a rig of four HiDef cameras. At a survey altitude of 549 m, the four cameras (A, B, C, D) record a combined strip width of 544 m at a ground sampling resolution of approx. 2 cm. With the standard settings, there is a gap of 20 m between camera strips to avoid double counts.

The proposed transect design with 13 transect lines directed north-south in order to cross depth gradients perpendicular and with a spacing of 5 km between transects results in a 11 % coverage of the survey area. The thirteen transects are defined by 26 turning waypoints (Table 1).

Table 1. Waypoints for digital aerial surveys (from east to west).

Waypoint number	Latitude	Longitude
1	54° 44.61' N	14° 02.48' E
2	54° 59.69' N	14° 02.12' E
3	55° 03.17' N	14° 06.73' E
4	54° 44.64' N	14° 07.14' E
5	54° 44.67' N	14° 11.80' E
6	55° 06.65' N	14° 11.36' E
7	55° 10.12' N	14° 16.00' E
8	54° 49.02' N	14° 16.38' E
9	54° 49.02' N	14° 21.05' E
10	55° 13.59' N	14° 20.65' E
11	55° 14.55' N	14° 25.35' E
12	54° 38.87' N	14° 25.86' E
13	54° 38.48' N	14° 30.52' E
14	55° 11.93' N	14° 30.11' E
15	55° 09.31' N	14° 34.85' E
16	54° 38.71' N	14° 35.16' E
17	54° 39.12' N	14° 39.81' E
18	55° 06.69' N	14° 39.58' E
19	55° 03.83' N	14° 44.30' E
20	54° 39.53' N	14° 44.45' E
21	54° 39.94' N	14° 49.10' E
22	55° 02.65' N	14° 49.00' E
23	55° 01.49' N	14° 53.70' E
24	54° 40.35' N	14° 53.75' E
25	54° 41.24' N	14° 58.40' E
26	55° 00.13' N	14° 58.39' E

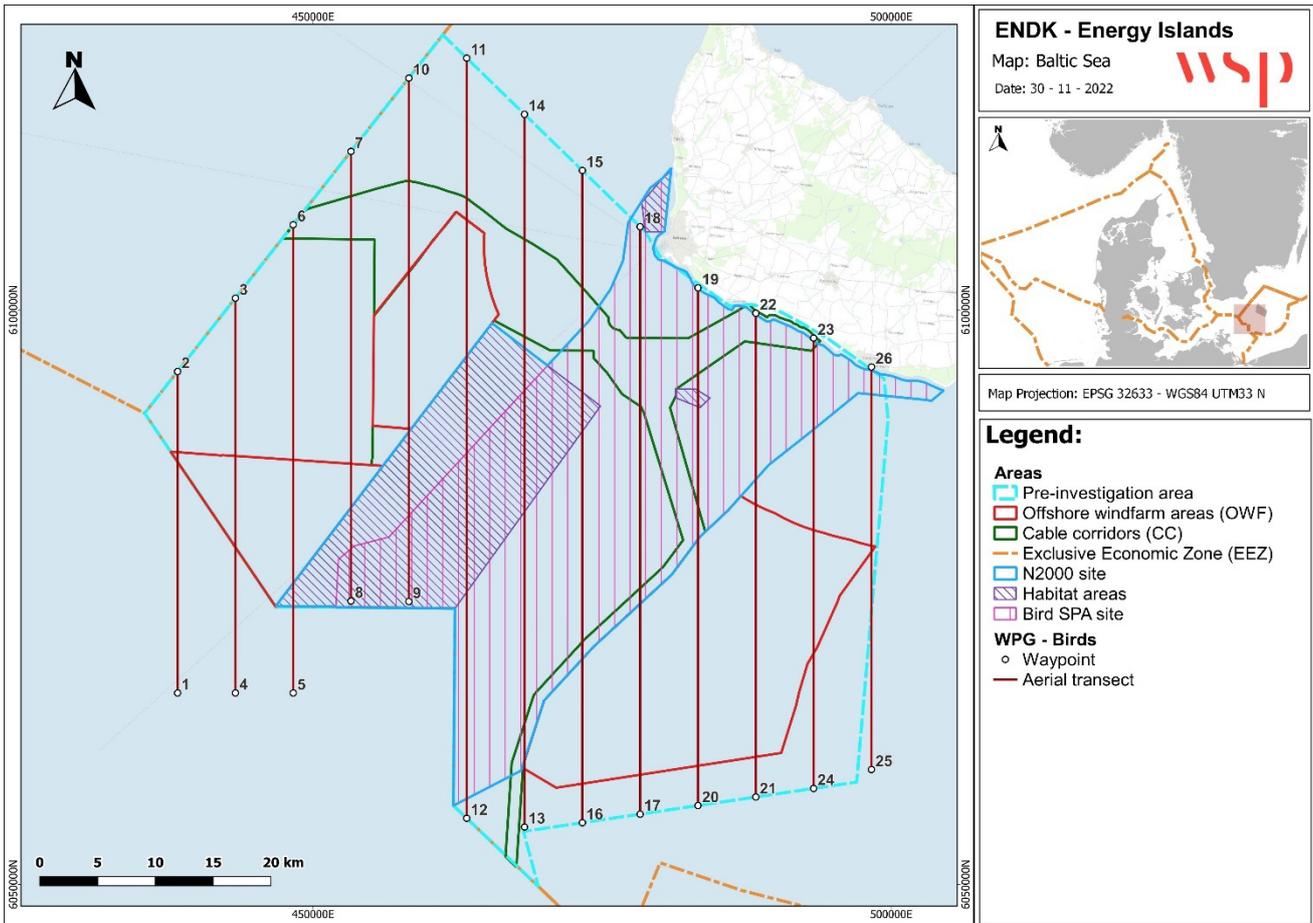


Figure 2 Proposed transect design for the Baltic Sea Investigation area.

The position of the airplane (with 1 m precision) will be logged with a Garmin GPSMap 296 receiver with differential GPS, recording the location every second, for later matching with marine mammal and bird observations. AIS signals of vessels within the survey area will be recorded by an AIS receiver. All airplanes for digital surveys are equipped with a PowerFLARM collision warning system.

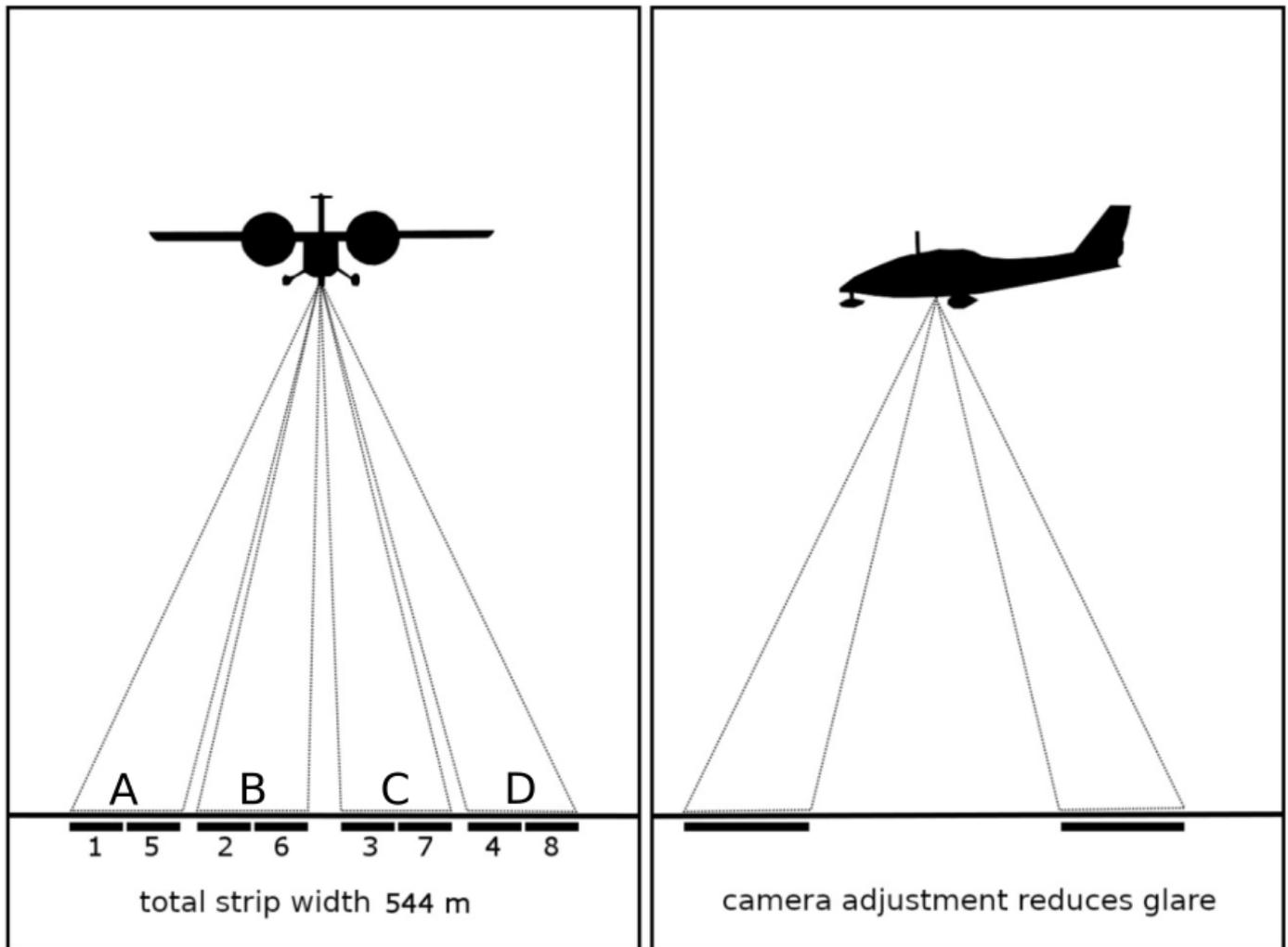


Figure 3. Digital-aerial survey using HiDef-System. A four camera (A, B, C, D) approach for surveying birds and marine mammals.

Two airplanes are equipped with camera systems and are constantly on stand-by at the airport of Roskilde. BioFlight A/S ensures that trained pilots and operator for the camera systems are available continuously. If weather conditions, restrictions due to military activities or other reasons mean that only a few time windows are available for coverage, additional aircraft from the UK equipped with HiDef camera systems may be used.

Surveys are flown along parallel transects at a flight height of 1.800 ft and can cover large areas within a short time. This method can thus provide information on abundance and distribution of resting birds. As compared to observer-based flights, no distance correction is needed.

Digital aerial surveys are suggested to be preferred over observer-based methods, due to several advantages. Although species identification rates were similar between methods overall, observer-based surveys have been shown to underestimate the abundance of several species. Furthermore, as already stated, several species of resting birds react sensitive to low-flying (250 ft) planes (e.g., sea ducks, divers), while digital surveys are flown at much higher altitude (1800 ft) causing almost no disturbance.

Due to the quality assurance during analysis of video material, any observer-bias can be ruled out, and video material can be stored for potential re-analyses in the future.

Also, for comparability with potential future aerial surveys, digital surveys are to be preferred already during baseline monitoring. After construction of wind farms in an area, the use of digital surveys is more suitable due to the high flight-altitude, allowing fly-over of OWFs. Using a similar survey method for baseline and construction/operation monitoring allows for an improved analysis of possible effects of the project on resting birds. For digital aerial surveys, the same number of seven surveys per year as for observer-based surveys are suggested, to sufficiently cover the occurrence of resting birds during all seasons.

The program has been carefully designed to cover the occurrence of potentially sensitive species groups as divers by including the most important months and applying a method that minimizes the risk of disturbance of resting birds at the sea.

4.1.1 FORAGING ECOLOGY

The proposed methods above provide only limited information on the foraging ecology of resting birds. To get more insight into this topic, it is planned to integrate information from benthic and fish surveys to identify important foraging areas (e.g., reefs or mussel banks) within the study area. Also, existing literature will be used to estimate the importance of the area for certain species. Many studies have already investigated seabird diet, although some knowledge gaps also still exist.

The results from the aerial surveys of resting birds, combined with the surveys of benthic flora and fauna (WPE, WP-I fish) and the knowledge of the individual species foraging behavior obtained from the literature will make it possible to identify especially important resting sites within the investigation area.

4.1.2 ANALYSIS

The collected data from the digital aerial surveys will be screened by an experienced team of 20 reviewers, who mark any objects in the footage that require further analysis. For Quality Assurance, an additional 'blind' review of 20% of the raw data will be carried out and the results compared with those of the original review. The QA process is passed, only if 90% agreement is achieved between both review results, otherwise data are re-reviewed.

Along with the object detection, it is marked, whether transects or parts of transects were flown under valid conditions. Transect parts with adverse survey conditions will not be analyzed, such as clouds or dust between the aircraft and the sea surface, which hinder object detection. In addition, environmental parameters are logged every 500 frames along the transect lines. These parameters include sea state, water turbidity, haze and glare and will be used for data analysis and quality assessment.

Objects marked as requiring further analysis will be identified to lowest possible taxonomic level by experienced zoologists and ornithologists; 20 % of objects are chosen randomly and identified independently by a second person. If both persons disagree on the identification of more than 10 % of all objects, all data are re-identified by a third person. Along with species identification age, sex and behavior are recorded where possible.

Each individual sighting (birds and marine mammals) will be geo-referenced and considers the offset from the transect line of the cameras and compiled into a single output spreadsheet for further analysis. This approach makes it possible to correlate sightings with e.g., data on benthic flora and fauna.

The data collected for each relevant species or species group will be used to calculate the monthly and seasonal population densities. Furthermore, for the most common bird species and species groups, the spatial distribution of seasonal densities will be shown using grid density maps, thus identifying especially important areas for the individual species. Relevant species/species groups are defined as those species listed in Annex I of the EU Birds Directive, together with species that occur frequently in the survey area and/or are typical of the habitat.

4.1.3 VESSEL-BASED SURVEYS OF LONG-TAILED DUCK

The Danish Environmental Agency has appointed a new Special Protection Area for birds (SPA) in the vicinity of the investigation area and the two project areas. The new bird SPA is not yet approved and final, but the designation of the SPAs is already juridically binding and must be addressed in the EIA. The SPA (F129) is located in the middle of the investigation area of this project and between the two project areas. This SPA is appointed to protect one bird species - long-tailed duck.

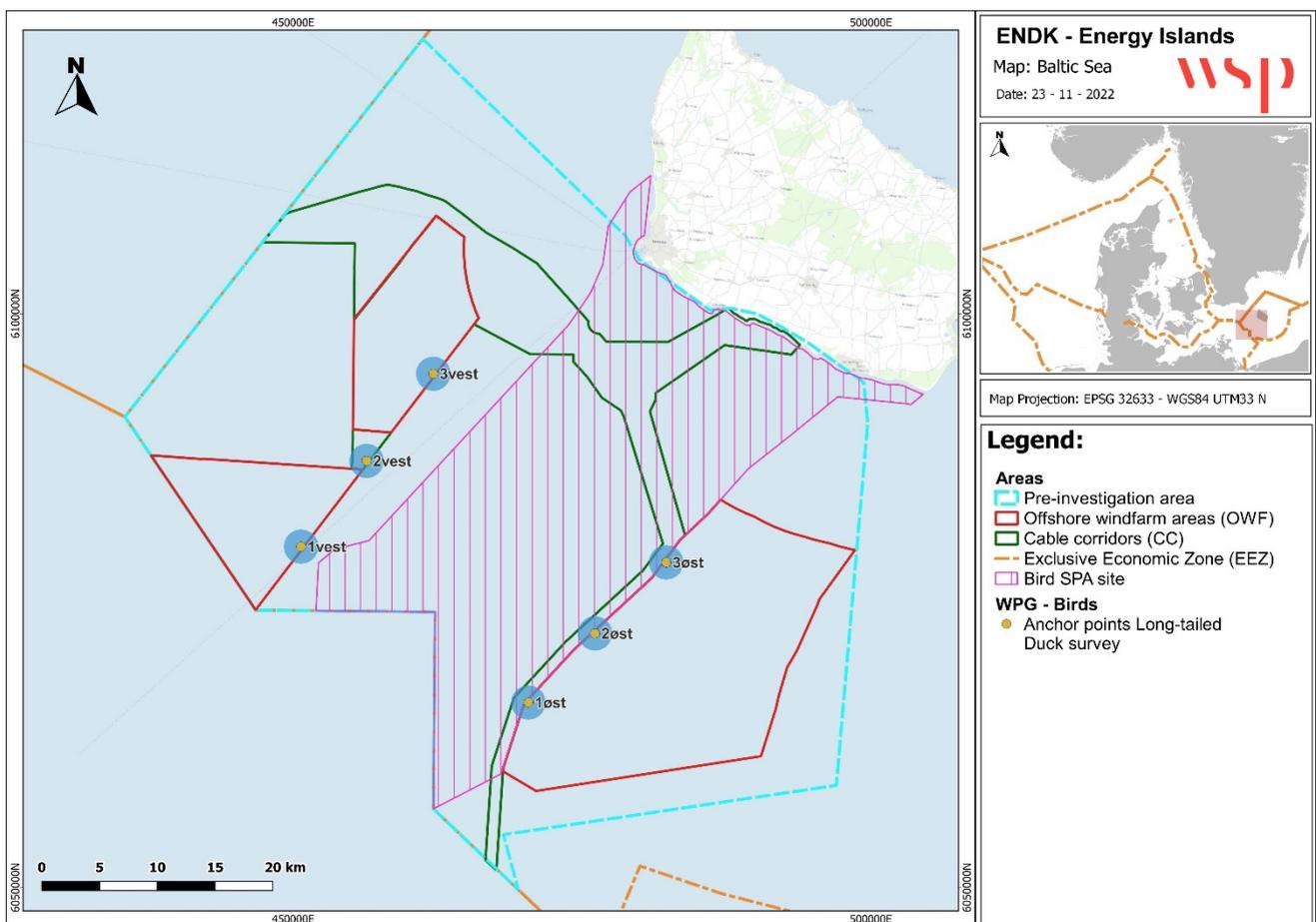


Figure 4 Anchoring sites in the Baltic Sea for observations of local movements of long-tailed ducks between the new Special Protection Area (SPA) and the two project areas.

Therefore, the subsequent EIA will have to address the possible impact from the project on the designated species (Long-Tailed Duck) in the adjacent SPA F129. In order to accommodate to this requirement, a pre-assessment on whether the two project areas function as possible night-resting areas for long-tailed ducks from the SPA will be carried out.

Two surveys will be carried out 2021-2022 (November-December) and January-February at 2 x 3 anchoring points between the boundary of the SPA and the two project areas. At each anchoring point, locally moving long-tailed ducks and other species of sea ducks will be registered, including number of individuals, flight altitude and flight direction. Observations will be carried out by two experienced observers at each anchoring point 3 hours at sunrise and 3 hours at sunset.

4.2 MIGRATING BIRDS

Depending on the exact location, size of turbines etc. offshore wind farms potentially poses a variety of impacts to migrating birds, including risk of collision and barrier effects.

It is known from literature, that a variety of migrating birds are passing the project areas each spring and autumn on their flight between wintering and breeding grounds. The migrants include a variety of sea birds, passerines, ducks, geese, waders. Species like raptors and Common Cranes are of particular importance at this area.

A combination of observation techniques listed below ensures a comprehensive recording of the migratory activity within the project area, gathering relevant baseline data on the species spectrum, migration intensity as well as flight heights and directions.

4.2.1 LAND-BASED RADAR SURVEY AND RANGEFINDER

To assess the species composition and potential risk of collision for migrating birds passing through the project area, a land-based survey program has been designed. The program will compile data on species composition, phenology, migration altitude and -direction of migrating birds, as they leave the coast of Bornholm, and Rügen in March to May and Bornholm and Blekinge in August to November and possibly passes through the project areas of Bornholm Energy Island.

At land, the survey includes a combination of two methods 1) A radar-based monitoring program and 2) Visual observations, including the use of a laser rangefinder binocular.

Radar survey at land

At land, tracking of migrating birds will be done with horizontally as well as vertical mounted radars, and the collected data will be combined with rangefinder recordings.

The vertical radar surveys will provide information on the intensity, phenology and altitude distribution of bird migration night and day. The horizontal radar provides information on flight direction of migrating birds, and the visual observations provide information about species. Two X-band Marine surveillance radar will be used at each site.

Previous studies have shown, that e.g., migrating Cranes, when crossing the sea, in general leave the coast in high altitudes, loose heights along the route and arrive at the target coastline at low altitudes.

Radars on Rügen will be recording during the spring migration (March to May), and the radars in Blekinge will record during the autumn migration (August to November). Radars at Bornholm will record spring as well as autumn.

Visual observations at land (range finder)

To supplement the radar survey and to provide species specific data, manual observation is carried out by two observers the first 8 hours after sunrise on selected days and at the same locations as the radars. Two observers will cover the full period. Manual observations will cover 20x2 days in spring and 20x2 days in autumn and will be carried out in “blocks” of 3-5 days. The manual observation surveys are flexible and will be targeted to cover days where bird migration is likely to occur and with special focus on bird species of concern, such as Cranes and other species included in the Birds Directive Annex 1.

The manual observations will be accompanied by a digital laser type rangefinder with magnetic compass built into a pair of binoculars with 7 x magnification (Vectronix 21 Aero) to track the migrating birds. The rangefinder collects precision data on the positions of the migrating birds and the birds' altitude. Multiple registrations of positions allow reconstruction of flight tracks and analyzing the data in relation to e.g., weather data.

The migrating birds will be tracked for as long as possible to get the most accurate picture of the migration direction and altitudinal profile. Small raptors (such as Sparrowhawk and falcons) can typically be tracked by rangefinder up to 1.5 km from the observer, while larger birds (Cranes, geese, Buzzard, eagles etc.) can be tracked for up to 5 km.

Whereas one observer is responsible for data acquisition in connection with the horizontal radar, the other observer continuously switches between data acquisition based on visual observations and laser range finder. The optimized mixture between the methods is dependent on bird species crossing the area and migration intensity and will be decided on spot.

4.2.2 VESSEL-BASED SURVEYS

To verify and support the findings from the land-based surveys, vessel-based surveys will be carried out in the project area during spring and autumn.

At the vessel, a survey day comprises 24 hours. The survey should cover full, uninterrupted 24-hours cycles. The aim is to record bird migration and migration behavior as evenly as possible during a day (day- and night-time). To determine the species spectrum, parallel daytime visual observations and recording of flight calls at night will be carried out (day/night according to civil twilight). Meteorological, GPS position and heading must be recorded in defined time intervals, e.g., approx. half an hour. Additionally, data of weather radar stations surrounding the southern Baltic Sea as well as available literature data can be used to compare and set the acquired data in context.

At the vessel, migratory birds will be registered by means of standardized vertical radar surveys (24 hours a day), visual observations and recording of nocturnal flight calls. Investigations will be conducted from ships at anchor at a consistent position in the center of the investigation area. In addition to the methods stated below,

the review of available literature data is intended to broaden the scope of the study regarding migratory pathways in the Baltic Sea area.

Radar at the vessel

The vertical radar settings and the used methodology at the vessel will be the same as on land to keep data comparable between land-based and vessel-based radar surveys.

Also, at the vessel, the vertical radar surveys will provide information on the intensity, phenology and altitude distribution of bird migration night and day. The horizontal radar provides information on flight direction of migrating birds.

Visual observations at the vessel

At the vessel also visual observations provide important information on the species spectrum during daytime, and therefore especially overall as well as species-specific information on migration intensities, flight altitudes and directions.

During the observations, two observers register all flying birds within 360° of the anchored vessel. For all observations, species or (if undetermined) taxa, number of individuals, distance to the vessel, direction of flight and estimated flight height are recorded. Both observers need to be in contact to each other to avoid double registration of birds crossing from one side to the other. The observers enter the observation data directly via tablet, the data is therefore stored directly in a database. The observations will be carried out from civil morning twilight to civil evening twilight. Two observation units of 15 minutes each will be conducted per hour.

Recording of flight calls

Recording of flight calls provides information on the species composition of nocturnal migrants and the intensity of nocturnal bird migration of calling species – mainly songbird species like thrushes, european robin or winter wren as well as wader species. Bird calls will either automatically be registered and identified afterwards or recorded directly by the observers on the vessel using two 15-minute blocks per hour.

Weather radar data

The Baltic Sea is surrounded by a network of weather radar stations of which continuous data also contains information on bird migration. Further availability of high-quality raw data provided, Bornholm weather radar data can be analyzed with respect to bird migration movements and be used to validate the specific bird migration radar results. Analysis of a broader network of weather radar stations (e.g., Hamburg region and Rostock, Germany; Karlskrona and Gotland, Sweden) can also add spatial information on bird migration in the area and provide better forecast of the intensity of bird migration.

Assessment methodology

Analysis of vertical radar recordings will deliver specific MTR values (migration traffic rate, birds/(h*km)) throughout night and day, visual observations will provide migration rates as birds per hour. The data will be a sufficient base to generate individual bird flux rates via Band models and provide the opportunity for before-after comparisons on species-group level to analyze effects of later wind farm construction and operation. By comparing field data and weather radar data, valuable information on bird migration in the Baltic Sea can be obtained, enabling an excellent assessment of the project area in terms of bird migration.

4.2.3 CRANE STUDIES AND SURVEYS

As the common crane (*Grus grus*) is listed at the EU Bird Directive's Annex 1, much concern is given to this species regarding the risk of collision with offshore wind turbines. And since more than 50.000 cranes are crossing the Baltic Sea twice every year, proposed wind farms in the main migration routes of cranes are especially in focus by the approval authorities.

Little is known about the effects of offshore wind farms on migratory behaviour of cranes and the potential impact is therefore mostly based on assumptions and modelling. Therefore, to assess the possible impact of wind farms on migratory cranes, both at the individual and population level (e.g., collision risk, barrier effects), detailed empirical evidence on flight / avoidance behaviour is needed. For example, collision risk models are very sensitive to implemented avoidance rates. Thus, increased knowledge about avoidance behaviour will allow for much better predictions of collision risks with offshore wind farms.

The overall objectives of the crane studies under WPG Birds are:

- To evaluate cranes' macro and meso response when approaching offshore windfarms.
- To map the main migration routes under different weather conditions.
- To assess flight height profiles of crane migration across the open sea for collision risk modelling.

The crane studies and surveys carried out under WP-G Birds consists of two sub programmes:

- Capturing of juvenile cranes at Swedish breeding grounds for GPS-tagging and subsequent monitoring of migration routes.

The field work within each tagging area will consist of two parts. First a survey and mapping of territory holding crane pairs with offspring, followed by the actual tagging efforts. The survey and mapping of territories is carried out just before the tagging. It is done opportunistically by driving around and observing areas with reasonably access and chances of success. Observations from this survey are used to plan the tagging efforts. When a juvenile crane is singled out, an approach is made. As the juvenile cranes are not yet able to fly, it is possible to catch them by hand after a short sprint.

After capture, the juvenile crane will be leg-fitted with a OrniTrack-R19 4G transmitter that uploads data to a database through the GSM/GPRS network.

- Using vessel-based surveys, the flight height distributions (FHD) and avoidance behaviour of cranes near offshore wind farms (OWF) during their migration over the Baltic Sea will be studied.

By combining radar and laser rangefinder methods, it will be possible to specify avoidance behaviour on different scales. Radar allows tracking of common cranes at distances of up to 20 km and thus to observe large distance (macro-) avoidance. By using rangefinder, three-dimensional data on flying birds close to or even within the OWF can be obtained, allowing to capture meso- and possible micro avoidance of flocks and individuals of migrating cranes. The vessel-based surveys will be carried in or near an off-shore wind farm in the Baltic Sea under weather conditions that are expected to be optimal for crane migration. It is proposed to start the survey of the migrating cranes the fall 2022, and again in spring 2023.

5. DELIVERABLES

The deliverables under WP-G Birds will include:

- A bird survey scope report
- Operational reports for the aerial surveys, vessel-based surveys for bird migration and long-tailed duck movements and migratory bird campaigns at land
- An environmental status report presenting the baseline based on existing knowledge and data
- A two-year technical report presenting the results from data collected in the field over two years.
- Data from field investigations of birds

5.1 BIRD SURVEY SCOPE REPORT

This document constitutes the bird survey scope report. First draft is delivered to Energinet in week 38, second draft will be delivered after a meeting and acceptance of the program by Energinet before the end of 2021. This report describes in detail the planned program and explains the applied methods.

5.2 OPERATIONAL REPORTS

During vessel-based field work, daily updates will be sent from the cruise leader by e-mail to the Client. The reports will contain information regarding:

- Name of OWF site that is surveyed:
- Date:
- Name of company performing:
- Survey number:
- Purpose of survey:
- Name of ship:
- Name of harbour of departure:
- Date and time leaving / returning:
- Vessel master:
- Names of other crew members:
- Name of observers:
- Observation start / end:
- Anchoring point
- Weather information: wind speed, wind direction, sea state, precipitation, visibility etc.
- Information about whether the survey was done completely in accordance with the methods outlined in the tender:
- Material used for bird data collection
- Experienced limitations and/or special events – description
- Specific incidents – description
- Other relevant information – description
- HSE reporting

After each survey has been completed, the information from the daily updates is combined in an operational report which summarises the above information.

Survey reports for land-based bird observations will be issued after each migrating bird campaign (spring or autumn) including all relevant information such as dates, weather conditions, incidents, equipment recovery and data coverage and according to the mandatory specifications given in the tender documents and agreed upon with the client.

After each aerial survey a survey completion report will be sent by e-mail to the Client a few days after the survey was conducted. The reports will contain information regarding:

- HiDef lead
- Project name
- Project reference Zone
- Survey date:
- HSE reporting
- Survey mobilization
- Survey demobilization
- Hours in flight
- Souls on Board
- Meteorological conditions
- Comments and remarks to the survey
- Activity Log of the airplane

5.3 ENVIRONMENTAL STATUS REPORT

WSP intends to deliver an environmental status report to Energinet no later than 1st of February 2022. This report will present the existing data for resting and migrating birds in the investigation area based on baseline mappings from other projects in the area on similar substrate types. This report is an internal document that will support the writing of the Strategic Environmental Assessment (SEA).

5.4 TECHNICAL REPORT

The technical report will be delivered as a final and approved version to Energinet (in English) including a review process. The report includes all field data from the two years of survey and will describe the distribution and abundance of birds in the study area as well as all collected information on migrating birds crossing the planning area. The area's importance as a resting area and as a migration corridor for different bird species will also be investigated and analysed.

6. MILESTONES

A summary of the reporting and time schedules for WP G is shown in Table 2. A Client Review period of 15 days has been incorporated into the schedule to review the 1st Draft Version of the Technical report (M37). For the second Client Review, a period of 10 days has been incorporated to review the Final Draft Version of the Technical report (M38).

Table 2 Overview of WP G milestones.

WP G			
Milestone No.	Milestone	Deadline	Predecessors
M33	Scope Report, 1 st Draft, Birds (Including proposal for bird surveys)	Week 36 - 2021	-
M34	Scope Report, Final Version	Week 50 - 2021	-
M35	Environmental status report, 1 st Draft, Bird Report	Week 05 - 2022	-
M36	Environmental status report, Final version, Birds	Week 06 - 2022	-
M37	Technical report, 1 st Draft, Bird Report (both years)	Q4 – 2023	-
M38	Technical report, Final draft, Birds (including appendices and data both years survey)	Q4 – 2023	-
M39	Technical report, Final version, Birds (both years)	Q1 - 2024	-

At the commencement of the contract, BioConsult SH and WSP will begin collecting existing data on resting and migrating bird distribution and abundance in the investigation area. The data will be combined with other relevant available data from monitoring programs in the greater Baltic Sea area. As our team has extensive experience in the field of resting and migratory bird surveys in the high seas of the Baltic Sea (Germany, Denmark, Sweden) literature data can be effectively evaluated accordingly and put into the context of an assessment basis (e.g. NOVANA 2018-2019).

Special attention will be paid to occurrence of wintering long-tailed duck (*Clangula hyemalis*), black guillemot (*Cephus grylle*) and migrating common crane (*Grus grus*) in the project areas southwest of Bornholm.

The evaluation of existing literature includes a study of modelling of distributions of wintering black guillemot and modelling of common crane collisions with wind turbines, that is expected to be made available for the consultants by Energinet. The total field program is summarized in Table 3.

Table 3. Data Matrix of the proposed program for WP G. *Visual observations = 8 hours a day. Two sites will be covered each season with the indicated effort. *Radars are running 24 hours/day, providing data at least 75% of the time.

Investigation area	Visual land-based surveys	Vessel surveys	Radar days*	Aerial surveys
Sep 2021	5 days	2 days	23 days	585 km Digital aerial survey (1 survey)
Oct 2021	5 days	2 days	23 days	
Nov 2021	5 days		23 days	
Dec 2021				2925 km Digital aerial survey (5 surveys)
Jan 2022				
Feb 2022				
March 2022	7 days		23 days	
April 2022	7 days	2 days	23 days	
May 2022	6 days	2 days	23 days	585 km Digital aerial survey (1 survey)
June 2022				
July 2022				
August 2022	5 days		23 days	585 km Digital aerial survey (1 survey)
Sep 2022	5 days	2 days	23 days	
Oct 2022	5 days	2 days	23 days	
Nov 2022	5 days		23 days	2925 km Digital aerial survey (5 surveys)
Dec 2023				
Jan 2023				
Feb 2023				
Mar 2023	7 days		23 days	
Apr 2023	7 days	2 days	23 days	585 km Digital aerial survey (1 survey)
May 2023	6 days	2 days	23 days	
Jun 2023				
Jul 2023				585 km Digital aerial survey (1 survey)
Aug 2023	5 days		23 days	
Total	75 days	16 days	322 days	

The first processing and quality assurance will take place right after each resting bird survey. As the whole survey period (e.g., 7 aerial surveys per year) must be considered, a final analysis can only take place after the last survey in summer (1 survey planned from June to August) of 2022 has taken place. Migratory bird data will be captured in a suitable digital format which only depends on a brief phase of processing data. Therefore, data analysis can be conducted soon after the proposed end of the monitoring period in the first year in August 2022.

With deadline as proposed in above table (Table 1) for milestones M37, the schedule for the final report (M39) will be met. The proposed review round is incorporated in this schedule (M38).

WSP has an availability statement for M/S Skoven that is unlimited, to provide a buffer contingency, which is adequate for the Baltic Sea. Additionally, WSP has a back-up agreement with FOGA in case it becomes

necessary. The M/S Skoven as well as the vessels provided by FOGA are suitable for bird surveys and will be or are already equipped with the necessary radar equipment for migrating bird surveys.

All proposed methods and techniques are according to an implemented HSE-system and will be carried out by experienced staff.



Figure 4: Research vessel M/S Skoven.

7. PERMITS – IF RELEVANT

The use of radar for land-based bird migration surveys will have to be approved by the relevant authorities in Denmark, Sweden and Germany.

GPS tagging of common cranes at Swedish breeding grounds will have to be approved by the Swedish authorities.

The need for permits, identification of relevant authorities and the submission of applications will be carried out by WSP and BioConsult SH.