Bilaga 3

Survey Report Mareld

Resting Birds and Marine Mammals

Surveys August - October 2023

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V1.0

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1 INTRODUCTION

On behalf of Freja Offshore AB, BioConsult SH conducted digital aerial surveys between August and November 2023, using data acquisition and analysis methods of the HiDef method explicitly designed for this issue. The goal was to determine the abundance and spatial distribution of resting seabirds and marine mammals in an area within the exclusive economic zone (EEZ) of Sweden, where the development of the Mareld OWF is planned. This report presents the results of the first three surveys (August to October).

1.1 Description of the project area

Freja Offshore has applied for a permit to build the Mareld wind farm in the North Sea, in Sweden's economic zone between the mainland at Lysekil and Skagen/Denmark. The windfarm's distance to Orust on the Swedish coast is about 40 km, its planed size is about 500 km² and water depths in the area vary between 150 and 300 m (Figure 1.1). The wind turbines are planned on anchored floating foundations and aim to achieve an annual electricity production of 9 - 12 TWh. There are two large Natura 2000 areas either directly or almost directly bordering the limits of the planned OWF. The SAC/SCI Skagens Gren og Skagerak (Natura 2000 site DK00FX112) is located towards the southwest of the OWF. This Natura 2000 site of 2690 km² names Harbour Porpoises (*Phocoena Phocoena*) and Harbour Seals (*Phoca vitulina*) as protected species and 12 habitats in its standard data form. To the north of the OWF there is another Natura 2000 area: SCI Bratten (SE0520189, 1208 km²), established to protect two types of habitats. There are four other smaller SCI Natura 2000 sites close to the Swedish coast that also name the Harbour Seal as protected species in its areas: Malmöfjord (SE0520057), Gullmarsfjorden (SE0520171), Måseskär (SE0520058) and Pater Noster-skärgården (SE0520176).

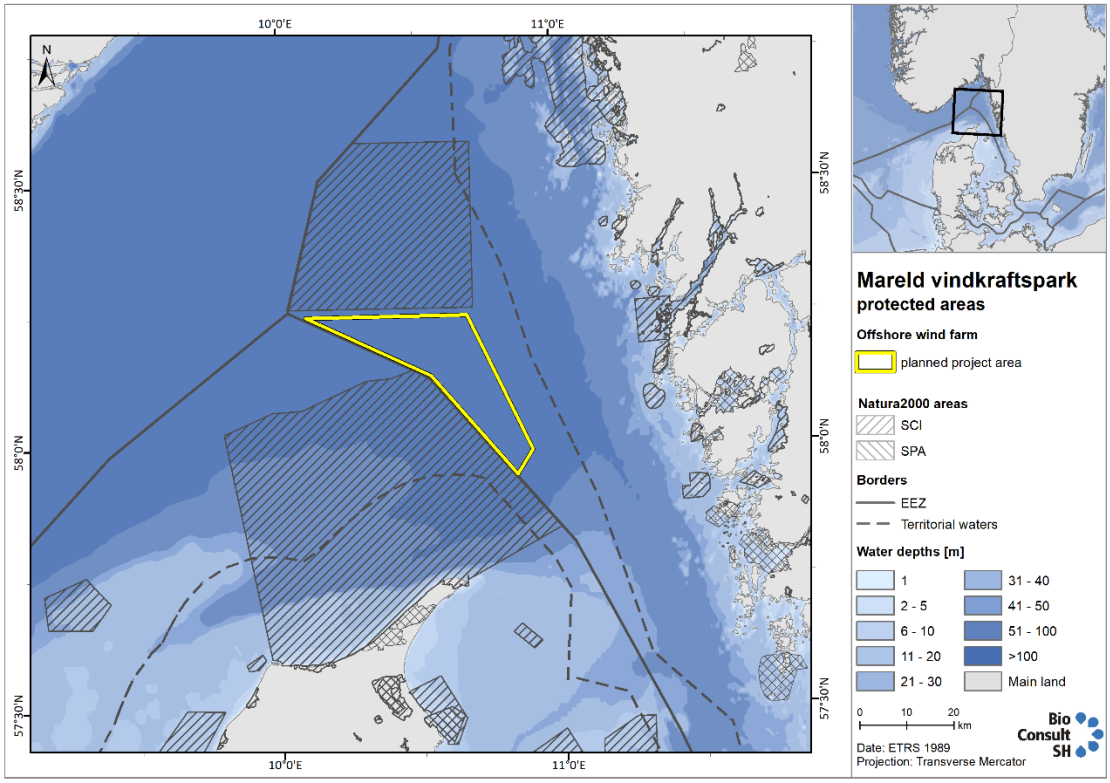

Figure 1.1 Overview of the study area showing the location of protected areas around it.

2 METHODS

2.1 Digital aerial surveys using digital videos (HiDef)

2.1.1 Description of the survey transects

This report shows preliminary results on abundances and distributions of seabirds and marine mammals obtained from three monthly digital aerial surveys conducted between August and October 2023 (Table 2.1). The survey area is referred to as the study site and corresponds to the area covered by the transects (e.g., Figure 2.1).

The transect design consists of 16 parallel transects with transect lengths ranging between 24.9 and 67.6 km separated by 5 km. In total, a transect length of 766.2 km was reached. The total area covered is 3,492.9 km² (Table 2.2, Figure 2.1).

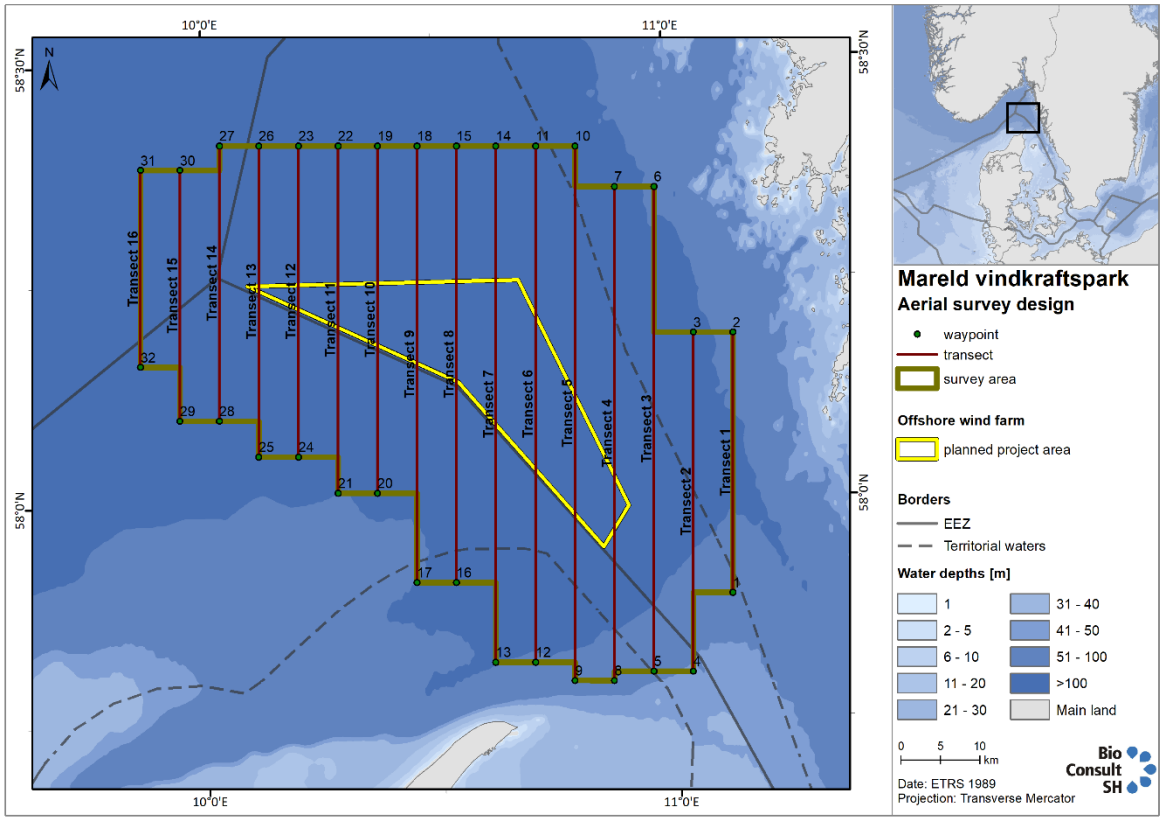

Figure 2.1 Aerial survey transect design for the survey area used for the three flights. The figure includes the planned wind farm area (in yellow). The total survey area covers 3,493 km².

Table 2.1 Overview of the digital aerial surveys carried out in the study area between August and October 2023.

Date of the aerial survey	Distance (km)	Effort (km²)	Coverage (%)
06.08.2023	767.71	407.84	11.7
09.09.2023	767.82	416.98	11.9
05.10.2023	765.84	414.82	11.9
Sum	Total: 2,301.37	Total: 1,239.64	Average: 11.8

Table 2.2 Geographical coordinates and length of aerial survey transects in the study area.

Transect	Waypoint	Latitude	Longitude	Transect length (km)
1	1	57° 53.46' N	11° 07.26' E	32.9
	2	58° 11.18' N	11° 08.32' E	
2	3	58° 11.27' N	11° 03.22' E	42.9
	4	57° 48.17' N	11° 01.90' E	
3	5	57° 48.25' N	10° 56.86' E	61.3
	6	58° 21.27' N	10° 58.67' E	
4	7	58° 21.35' N	10° 53.55' E	62.5
	8	57° 47.70' N	10° 51.78' E	
5	9	57° 47.77' N	10° 46.74' E	67.6
	10	58° 24.18' N	10° 48.57' E	
6	11	58° 24.25' N	10° 43.44' E	65.3
	12	57° 49.09' N	10° 41.75' E	
7	13	57° 49.15' N	10° 36.70' E	65.3
	14	58° 24.32' N	10° 38.31' E	
8	15	58° 24.38' N	10° 33.17' E	55.2
	16	57° 54.64' N	10° 31.89' E	
9	17	57° 54.69' N	10° 26.83' E	55.2
	18	58° 24.44' N	10° 28.04' E	
10	19	58° 24.50' N	10° 22.91' E	43.9
	20	58° 00.84' N	10° 22.00' E	
11	21	58° 00.89' N	10° 16.92' E	43.9
	22	58° 24.55' N	10° 17.78' E	
12	23	58° 24.60' N	10° 12.64' E	39.3
	24	58° 03.41' N	10° 11.93' E	
13	25	58° 03.45' N	10° 06.84' E	39.3
	26	58° 24.65' N	10° 07.51' E	
14	27	58° 24.69' N	10° 02.38' E	34.8
	28	58° 05.93' N	10° 01.83' E	
15	29	58° 05.97' N	9° 56.74' E	31.7
	30	58° 23.06' N	9° 57.20' E	

Transect	Waypoint	Latitude	Longitude	Transect length (km)
16	31	58° 23.10' N	9° 52.07' E	24.9
	32	58° 09.67' N	9° 51.74' E	

2.1.2 Data collection

The recording of resting birds and marine mammals was performed simultaneously using the digital video technology developed by the company HiDef (https://www.hidefsurveying.co.uk), explained in detail in Weiß et al. (2016), and summarized in the following paragraphs.

A twin-engined, high-wing propeller-driven aircraft (Partenavia P 68) was used for the acquisition of digital videos. This aircraft is equipped with four high-resolution video camera systems which take approximately seven images per second and can achieve a resolution of two cm at sea surface. Since the camera system is not directed vertically downwards (depending on the sun position, it can be slightly inclined or even set against the flight direction), interferences arising from solar reflections (glare) can be effectively reduced. The external cameras (indicated by A and D, Figure 2.2) cover a strip of 143 m width while the internal ones cover a width of 129 m each, resulting in 544 m effectively covered. There is however about 20 m distance between each strip to avoid double counting of individuals detected by the cameras. Thus, the total recorded strip of 544 m is distributed over a width of 604 m (see Figure 2.2).

The aircraft flew at a speed of approx. 220 km/h (120 knots) at an altitude of more than 500 m. A GPS device (Garmin GPSMap 296) recorded the position every second which permits to geographically assign a location to the images and the birds registered on them. The collected data were stored on mobile hard disks for subsequent review and analysis.

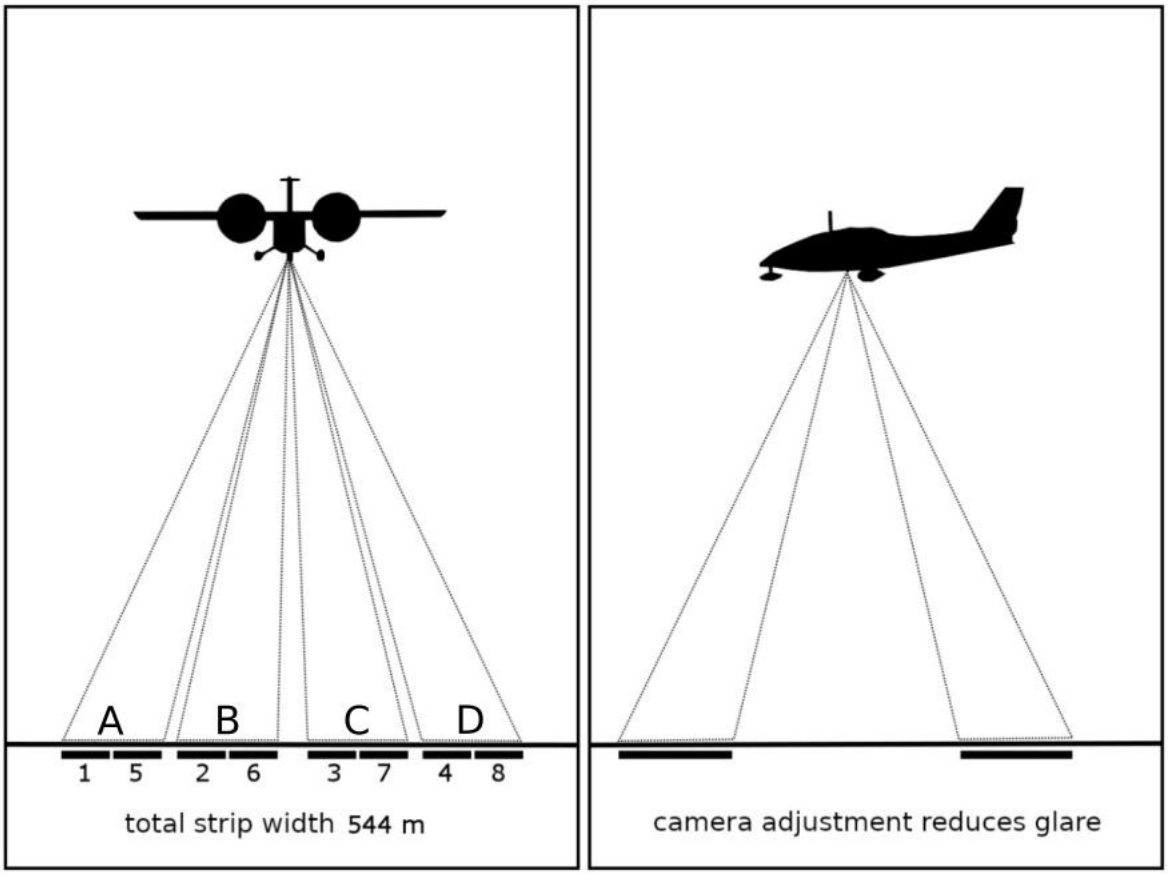

Figure 2.2 *The HiDef Camera-System. The four cameras (A to D) cover an effective strip width of 544 m of the sea surface at a flight altitude of 549 m (left: frontal view; right: side view). The numbering indicates the camera images as they are used in the evaluation (the images from each camera are divided into two halves).*

2.1.3 Data processing

To facilitate the detection of objects, the video sequences taken from each camera were split into two halves so that each half of the picture fitted the width of a large monitor. The video files were then processed, using an image capture and management software (StreamPix) for analysis. First, the images were examined and all the detected objects (birds, mammals, ships, etc.) were marked and pre-sorted for subsequent identification. To guarantee a consistently high quality, 20% of each film was randomly selected and processed again by another reviewer. If both reviewers agreed over 90% of the cases in that film, any discrepancy was rechecked, and the film approved for the next analysis step. If not, the film was reanalysed from scratch. Sections of the footage that could not be assessed due to backlight or the presence of clouds were not considered for further analysis.

The next step involved the identification of the previously marked objects (birds, mammals). This was done by experienced observers. All marked objects were classified to the highest degree of species specificity as possible by an experienced expert. Due to similarities of certain species (e.g. Common Guillemot and Razorbill, Red and Black-throated Divers or Harbour Seal and Grey Seal), as well as the relatively small part of the animal that is visible at the surface of the water (for marine mammals), it is sometimes impossible to classify the animals at species level. However, it is usually possible to identify individuals as belonging to a species group formed by two (or few) closely

related species. In addition to the identification, other information such as position, age, behaviour (swimming or flying) and flight/swimming direction were determined whenever possible.

Environmental parameters (air turbidity, sea state, solar reflection, and water turbidity) were recorded every 500 images (approx. 4 km). In a second step for quality control, 20% of the objects identified were re-assessed by a second reviewer. All discrepancies between the first and second identification process were checked again by a third expert. If there was agreement by at least 90%, the data collected was released for further analysis. If agreement was lower than 90%, systematic errors (e.g., problems in determining specific species groups) were corrected and all objects viewed in the film concerned were re-identified.

2.1.4 Data analysis

All detected animals were either assigned a species or species group category (see below). Among these, relevant species/species groups were defined based on the frequency of occurrence in the survey area and the importance of the area as habitat for species according to reference literature. A list of all recorded species and their abundances is provided in the appendix A.1.

The individuals not identified to species level in the aerial surveys were initially grouped into a larger taxonomic group of very similar species. Examples of these are Common Guillemot/Razorbill and unidentified divers (red-throated and Black-throated Diver). These “two species” species groups include a large proportion of the resting birds not identified to species level. Other resting birds, that could not be assigned to any of the previously mentioned or other two-species group, are in most cases identified to family level. A similar grouping is done for marine mammals, in which seals that cannot be told apart are grouped (e.g., Harbour Seal/Grey Seal).

2.1.5 Calculation of densities

Densities (ind./km²) were calculated for all relevant species and species groups. To calculate densities the number of detected individuals of each species/taxon in each survey is divided by the area covered by the transects (“effort”). As the effect of the aircraft on any flight behaviour of the birds is negligible, no correction factors are applied to the abundances of species from aerial surveys. Therefore, it is assumed that all individuals are captured by the images.

To illustrate the spatial distribution, a grid was laid across the survey area, and the grid cells were aligned with the EEA grid (EEA 2019). The edge length of the single cells consists of squares with 5 km edge lengths.

For resting birds seasons were defined according to the species-specific classification by GARTHE et al. (2007) whereas for marine mammals seasons are defined as follows: spring from 1st of March to 31st of May, summer from 1st of June to 31st of August, autumn from 1st of September to 30th of November, and winter from 1st of December to 28th/29th of February.

2.1.6 Correction of densities of marine mammals

Certain correction factors are included in the calculation and analysis since marine mammals located more than about 2 m below the water surface may escape detection from the air. To correct for this so-called availability error (BORCHERS 2003), the number of animals sighted can be multiplied by a factor that takes into account the probability of Harbour Porpoises being present in the upper level of the water column (0-2 m, TEILMANN ET AL. 2013). This likelihood was determined by means of tagged animals in the North and Baltic Sea while considering seasonal fluctuations. Thus, the submerged animals could also be taken into account to determine abundance and densities.

The literature does not provide any information about the proportion of pinnipeds in the upper 2 m of the water column. Telemetry studies show that the animals mainly remain close to the seafloor and only briefly come to the surface to breathe (ADELUNG ET AL. 2004). Consequently, the density of pinnipeds presented here can only be taken as a minimum density and not as an average.

3 RESULTS

A total of four surveys were conducted between August and November 2023 (see Table 2.1). This report includes results from the three first surveys (06.08.2023, 09.09.2023, 05.10.2023). Results of the survey of November will be included in the final report.

3.1 Abundance and distribution of resting birds

During the three digital aerial surveys between August and October 2023, 16,224 birds belonging to 16 species were recorded, of which 16,092 were resting birds belonging to 13 species (Table 3.1, Figure 3.1). There were 838 resting birds which could not be identified to species level (5.2%).

Table 3.1 Bird counts and percentages of all resting bird species during the three digital aerial surveys in the survey area between August and October 2023. In the results section, species that represent at least 0.5% of abundance (highlighted) are further described.

Species	Scientific name	Aerial Surveys	
		N° ind.	%
Red-throated Diver	*Gavia stellata*	16	0.1
Great Northern Diver	*Gavia immer*	1	0.01
unidentified diver	*Gavia sp.*	1	0.01
Northern Fulmar	*Fulmarus glacialis*	7,325	**45.52**
Northern Gannet	*Morus bassanus*	187	**1.16**
Common Scoter	*Melanitta nigra*	8	0.05
Great Skua	*Stercorarius skua*	7	0.04
unidentified skua	*Stercorarius sp.*	1	0.01
Common Gull	*Larus canus*	8	0.05
unidentified small gull	*Larus small sp.*	4	0.02
Lesser Black-backed Gull	*Larus fuscus*	867	**5.39**
Herring Gull	*Larus argentatus*	396	**2.46**
Great Black-backed Gull	*Larus marinus*	936	**5.82**
unidentified large gull	*Larus (magnus) sp.*	109	0.68
Great / Lesser Black-backed Gull	*Larus fuscus/Larus marinus*	77	0.48
Black-legged Kittiwake	*Rissa tridactyla*	8	0.05
fulmar/gull	*Fulmarus/Larus*	301	1.87
unidentified gull	*Laridae sp.*	18	0.11
Common/Arctic Tern	*Sterna hirundo/Sterna paradisaea*	1	0.01
tern/small gull	*Sterna spp / Larus spp.*	1	0.01
Common Guillemot	*Uria aalge*	5,432	**33.76**

Species	Scientific name	Aerial Surveys	
		N° ind.	%
Common Guillemot/Razorbill	*Uria aalge / Alca torda*	63	0.39
Razorbill	*Alca torda*	288	**1.79**
unidentified auk	Alcidae sp.	37	0.23
Total		**16,092**	**100**

Monthly densities of the most common species and groups differed (Table 3.2).

Table 3.2 Monthly mean densities (ind./km²) of selected species/species groups recorded in the survey area during digital aerial surveys from August to October 2023 (November survey still to be completed). The indication "0" means that no individual of this species was found in that month.

Survey Method	Digital aerial surveys				
Species/Species-group	**Aug 23**	**Sep 23**	**Oct 23**	**Nov 23**	**Max**
Red-throated Diver	0	0.01	0.029		**0.03**
Northern Fulmar	**9.70**	2.132	5.978		**9.70**
Northern Gannet	0.017	0.012	**0.422**		**0.42**
Common Scoter	0	0	**0.019**		**0.02**
Great Skua	**0.012**	0.005	0		**0.01**
Common Gull	0.002	0	**0.017**		**0.02**
Lesser Black-backed Gull	**1.922**	0.175	0.024		**1.92**
Herring Gull	**0.689**	0.086	0.19		**0.69**
Great Black-backed Gull	**1.336**	0.556	0.383		**1.34**
Black-legged Kittiwake	0.007	0.002	**0.01**		**0.01**
Arctic/Common Tern	0	0.002	0		**0.00**
Common Guillemot	**4.578**	4.259	4.313		**4.58**
Razorbill	0.01	0.01	**0.133**		**0.13**
Divers	0	0.01	**0.034**		**0.03**
Ducks	0	0	**0.019**		**0.02**
Gulls	**4.134**	0.863	0.651		**4.13**
Auks	4.87	4.338	**4.882**		**4.88**
No. of surveys	**1**	**1**	**1**	**1**	

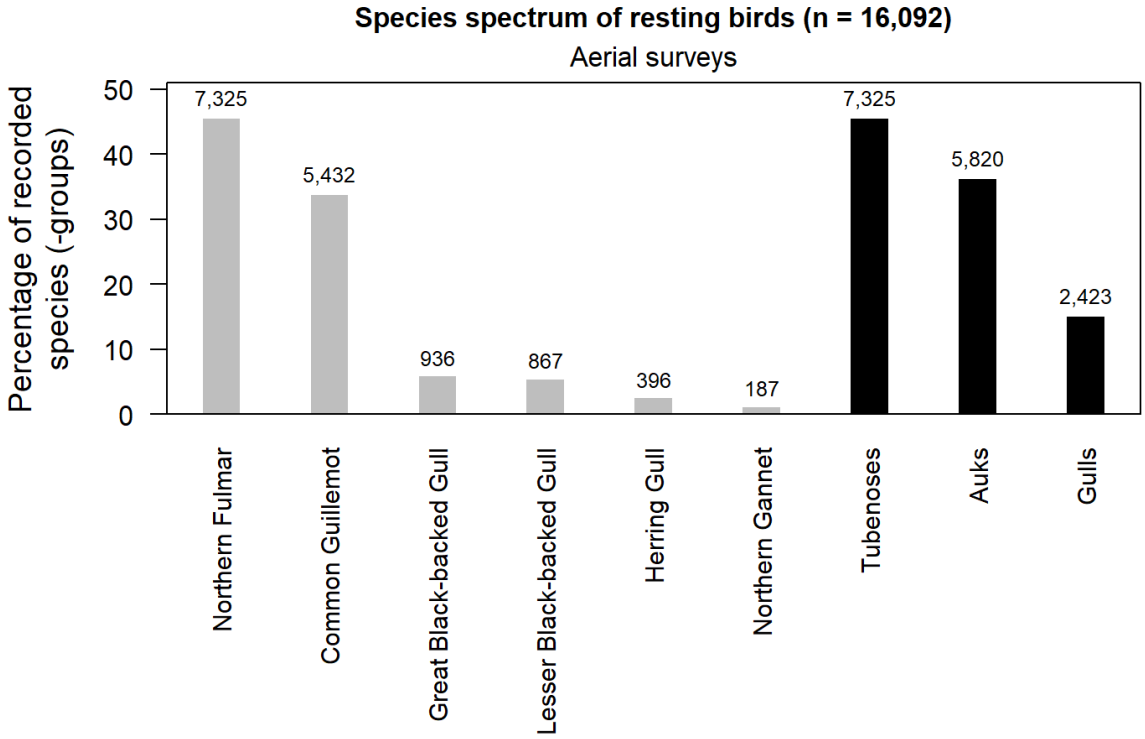

Figure 3.1 *Percentage of the most common species or species groups representing at least 0.5% of the total number of resting birds recorded during aerial surveys in the survey area between August and October 2023 (number of individuals shown above each bar). Species are depicted in grey, species groups in black.*

Tubenoses (Northern Fulmars) dominated the resting bird community, representing 45.5% of all species. Auks and gulls represented 36.2% and 15.1% respectively. Divers (mainly Red-throated Divers) contributed only to 0.1% to birds observed in the survey period and thus are not shown in Figure 3.1. After Northern Fulmars, the second most abundant species was the Common Guillemot, whose abundance made up 33.8% of the total resting birds. Other representative species included the Great Black-backed and Lesser Black-backed Gulls (5.8% and 5.4%, respectively). Herring Gull and Northern Gannet contributed with less than 5% of resting birds (see Table 3.1 and Figure 3.1). Other gulls such as the Common Gull and the Black-legged Kittiwake just occurred very unfrequently and in too low numbers. Ducks were just represented by Common Scoters, but they also occurred only rarely (just 8 individuals during the whole survey period).

In this chapter, all resting bird species that represented at least 0.5% of the total number of birds surveyed are further described. Each species description is followed by a distribution map of their densities in each survey and averaged for each season. In addition, a full list of maps of all surveys can be found in the appendix for these species (A.2). The species' ranges and population sizes are obtained when available from the most recent data (AEWA CSR 8) of species factsheets from Wetlands International (http://wpe.wetlands.org, accessed on 06.02.2024). Their conservation status is based on Birdlife International (BIRDLIFE INTERNATIONAL 2017), IUCN Red List Europe (http://www.iucnredlist.org, accessed 02.02.2024) and Annex I of the EU Bird Directive (EUROPEAN UNION 2010).

3.1.1 Northern Fulmar

Northern Fulmar – *Fulmarus glacialis*	***NO*: Havhest; SE: stormfågel**
Conservation status:	EU Birds Directive, Annex I: not listed EU SPEC Category: SPEC 3 IUCN Red List Category, Global LC & Europe: VU
Key food: fish	

The Northern Fulmar (*Fulmarus glacialis*) is a species occurring within the Skagerrak in larger numbers (SKOV ET AL. 1995; SKOV & DURINCK 2000). Fulmars are a widely ranging and very abundant species in the North Atlantic. The breeding population in the North Sea was estimated at about 310,000 pairs (SKOV ET AL. 1995), the great majority of which breed in Shetland, Orkney and northern Scotland.

Fulmars only start breeding at an age between 6 and 12 years, only lay one egg per year, and the breeding season starts between May and June (MENDEL ET AL. 2008a). The natural food of Fulmars consists of mainly small fish like sandeel and Gadidae as well as some squid, crustacean and macrozooplankton (MENDEL ET AL. 2008a). They may dive up to 2.6 m, but their diving abilities are clearly limited, and most of the food is taken from the sea surface. They also follow fishing vessels and take fisheries discards (MENDEL ET AL. 2008a).

Density and distribution of Northern Fulmars in the survey area

Northern Fulmars were the most common species of all resting birds. A total number of 7,325 individuals were counted during the three surveys. The maximum number was seen in August 2023 (9.7 ind./km²), whereas the lowest density was in September (2.13 ind./km², Table 3.2). In each season, relatively similar numbers were observed but the average density was larger in summer (Table 3.3).

Spatially, the species was distributed across the whole survey area, being present almost in all grid cells and with large densities also within the borders of the planned OWF, where local densities larger than 5 ind./km² were often determined both at individual surveys and averaged for seasonal distributions (Figure 3.2 and Figure 3.3).

Table 3.3 Average seasonal density of Northern Fulmars in the survey area for summer and autumn from three surveys (August to October 2023).

Northern fulmar	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Summer	3,956	9.70	9.70	9.70	1
Autumn	3,369	4.05	2.13	5.98	2

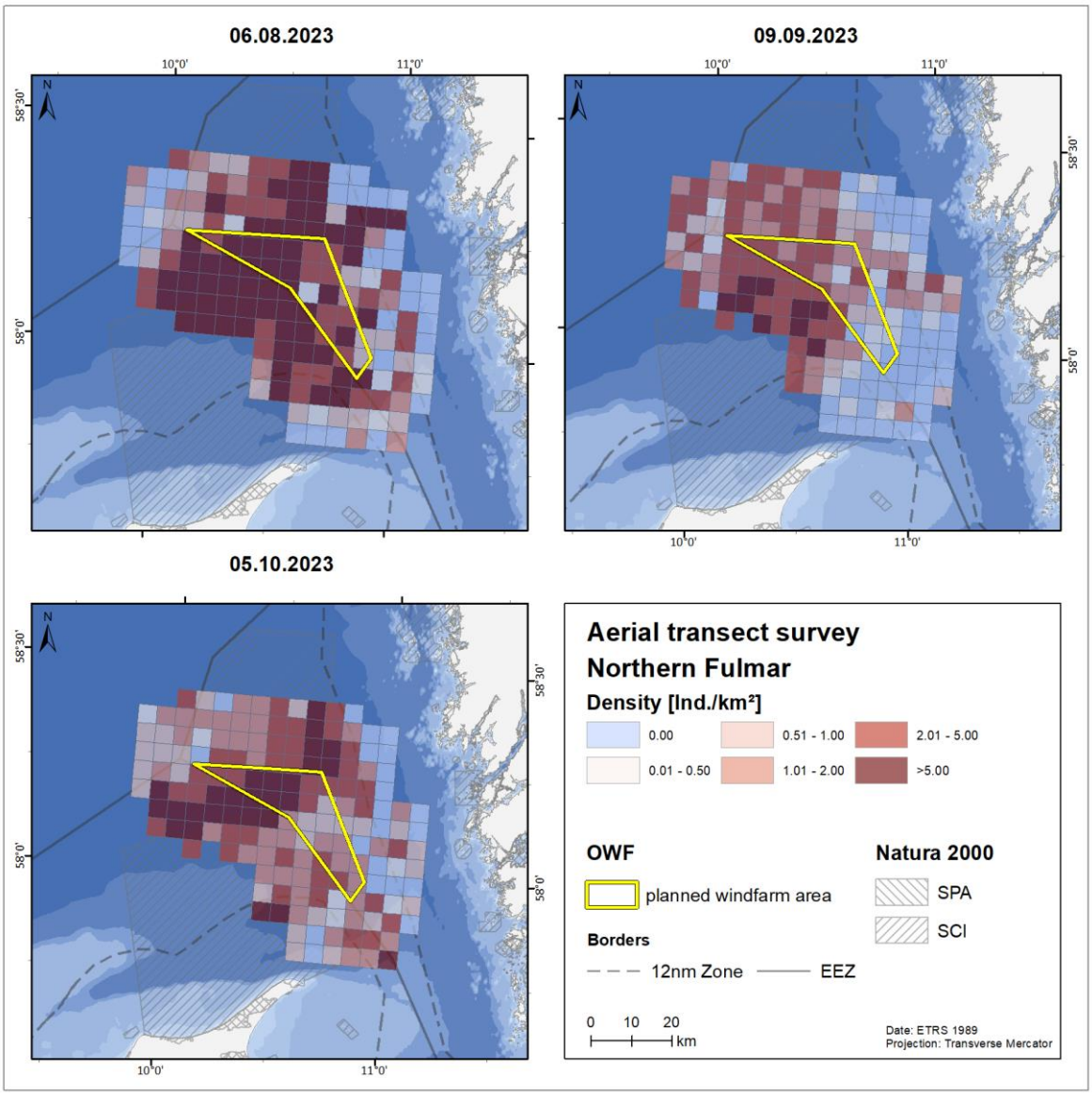

Figure 3.2 Distribution of Northern Fulmars in the survey area per season during the digital aerial surveys between August and October 2023.

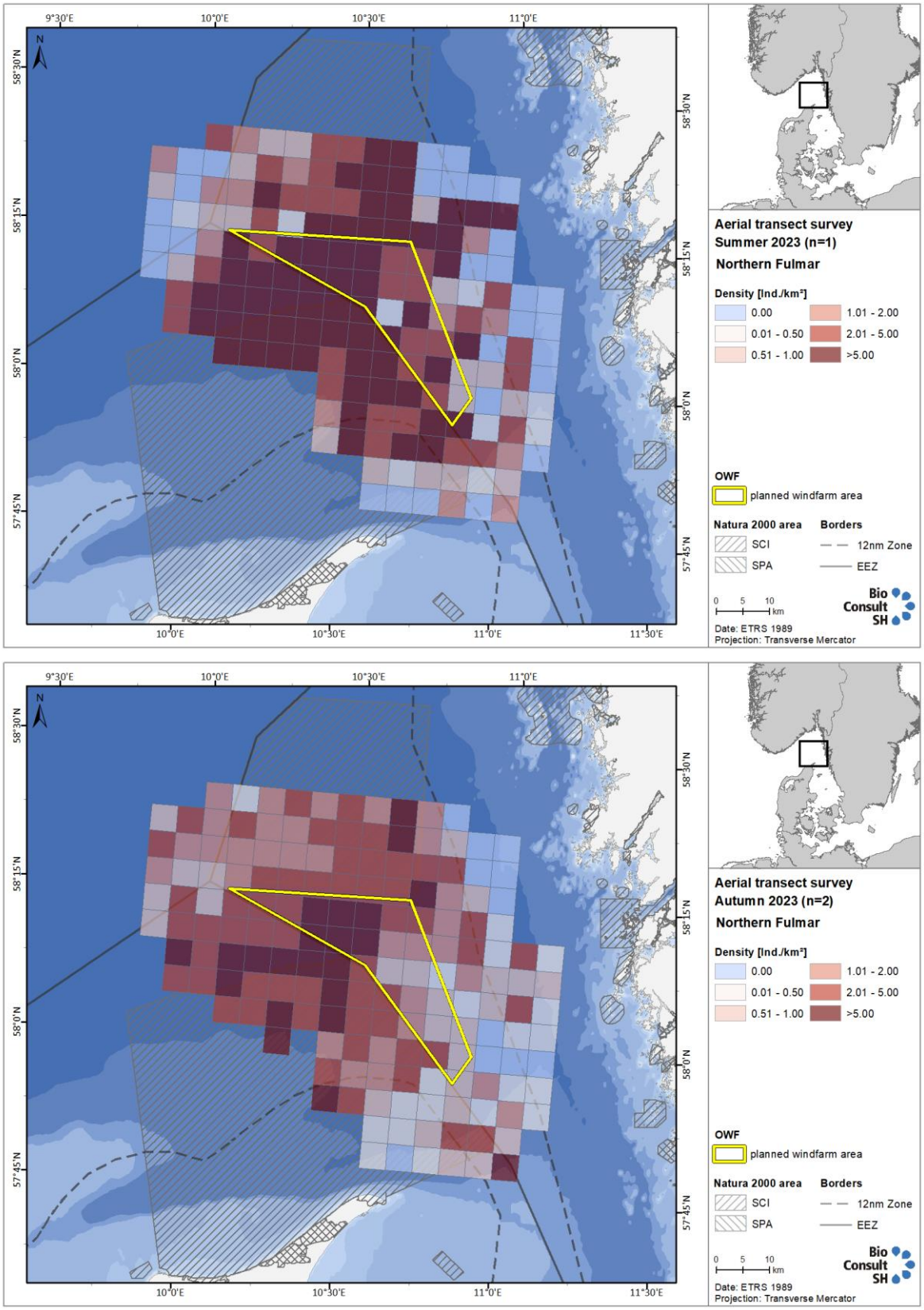

Figure 3.3 Distribution of Northern Fulmars in the survey area in summer (top) and autumn (bottom) during the digital aerial surveys between August and October 2023.

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3.1.2 Northern Gannet

Northern Gannet – *Morus bassanus*…….	**NO: Havsule; SE: havssula**
Biogeographic population: North Atlantic;	
Breeding range: -	
Non-breeding range: -	
Population size: 1,600,000	
1% value: 16,000	
Conservation status:	EU Birds Directive: Annex I: not listed EU SPEC Category: Non-SPEC IUCN Red List Category, Global & Europe: Least Concern
Trend: INC	Trend quality: Good
Key food: fish	

Northern Gannets are the only species of the family Sulidae which occurs in northern Europe. Gannets feed almost exclusively on fish, in Europe this was found to be mainly herring, mackerel, sandeel and sprat, and at times also some Clupeidae (e.g., HAMER ET AL. 2001). Gannets were also found to follow fishing vessels offshore and take discards (GARTHE & HÜPPOP 1994). Gannets usually start breeding at the age of 5-6 years. They breed on islands near the coast or ledges of steep rocky coasts of the mainland.

Density and distribution of Northern Gannets in the survey area

A total of 187 individuals of Northen Gannet were surveyed during the three months. The highest number of individuals was observed in October 2023 (175 individuals), which resulted in a density of 0.42 ind./km² (Table 3.2). The two last surveys took place during the autumn period for the species and in this case the average density for the season (averaged between the two surveys of that season) was 0.22 ind./km², but there was a large variation (0.012 ind./km² in September 2023 and 0.42 ind./km² in October 2023 (Table 3.4).

Spatially, Northern Gannets were present at low numbers and in few grid cells during the first two survey months (Figure 3.2). However, the last survey shows that these birds were less frequent towards the center of the survey area and were more abundant to the east and the southwest of the survey area. There were however some grid cells with low densities of this species within the borders of the planned OWF (Figure 3.5).

Table 3.4 Average seasonal density of Northern Gannets in the survey area for summer and autumn from three surveys (August to October 2023).

Northern Gannet	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Summer	7	0.017	0.017	0.017	1
Autumn	180	0.216	0.012	0.422	2

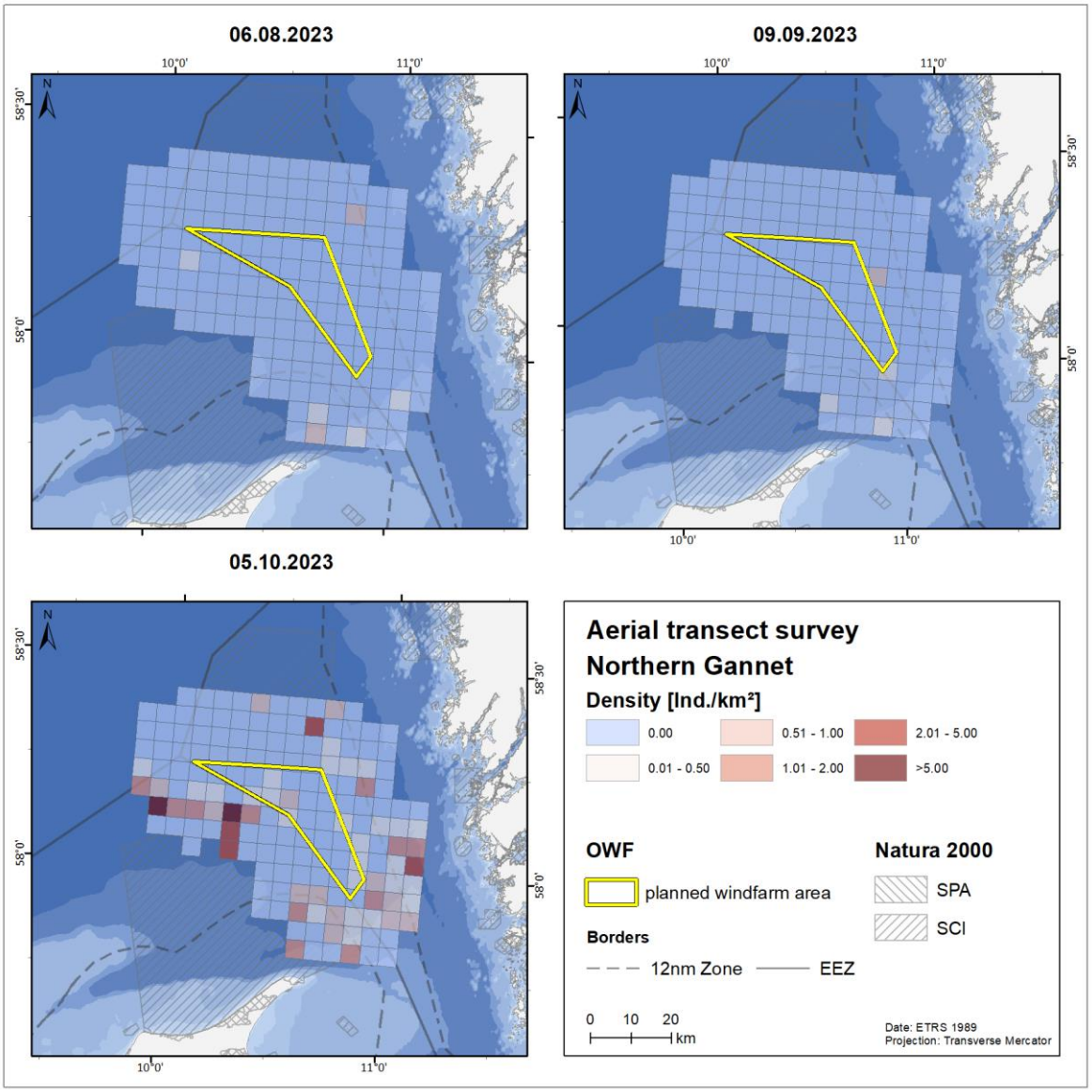

Figure 3.4 Distribution of Northern Gannets in the survey area during each digital aerial surveys between August and October 2023.

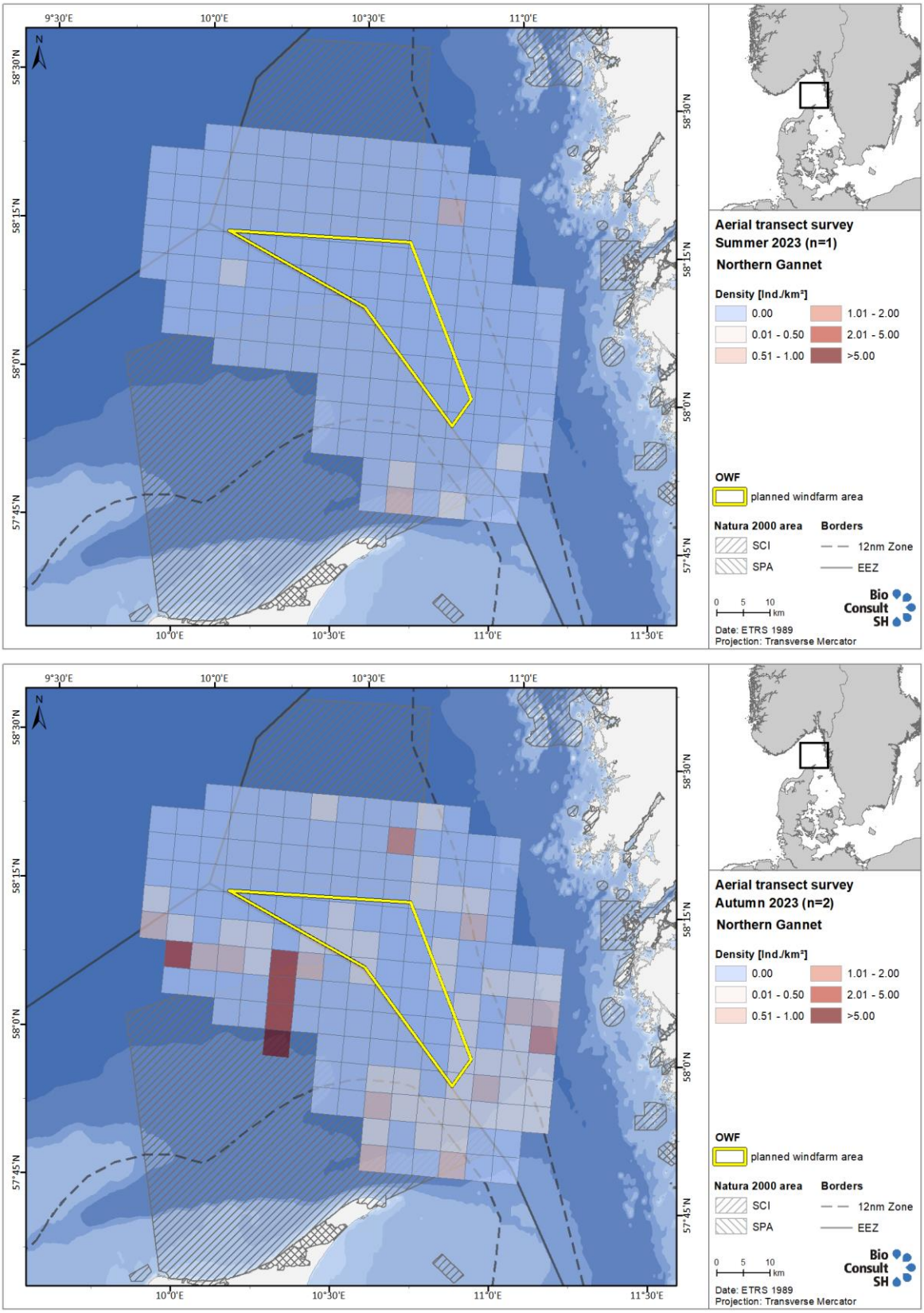

Figure 3.5 Distribution of Northern Gannets in the survey area per season: summer (top) and autumn (bottom) during the digital aerial surveys between August and October 2023.

3.1.3 Lesser Black-backed Gull

Lesser Black-backed Gull – *Larus fuscus*	**NO: Sildemåke; SE: silltrut**
Biogeographic population: *fuscus, NE Europe/Black Sea, SW Asia & Eastern Africa*	
Breeding range: N Norway, E Sweden, E Denmark, Finland, Estonia, W Russia E to White	
Wintering / core non-breeding range: E Africa S to Tanzania (+ few SW Asia)	
Population size:40,000 - 73,000	
1% value: 540	
Conservation status:	EU Birds Directive, Annex I: not listed EU SPEC Category: Non-SPEC[E] IUCN Red List Category: LC (Global & Europe)
Trend: DEC	Trend quality: Reasonable
Key food: omnivores: fish, insects, molluscs, seeds, small mammals, carrion, etc.	

The Lesser Black-backed Gull is distributed from West Europe (Iceland to Spain) up to Northwest Europe. Wetlands International recognizes five subspecies, but only the nominate form *L. f. fuscus* breeds from northern Norway, Sweden and Finland and eastwards to the White Sea and is the main subspecies expected to occur in the survey area. The subspecies is a long-distance migrant and spends the winter in equatorial Africa reaching even Tanzania. *L. f. fuscus* breeds in colonies on coasts or lakes but also as solitary pairs, especially on inland waters. The population has experienced a long-term decline over its entire range and the population size is estimated to range now between 40,000 and 73,000 individuals. The species is omnivorous but eats predominantly fish. As other gulls, they are also ship-followers and are very successful at getting their food from fishing ships (MENDEL ET AL. 2008a). The Lesser Black-backed Gull is less sensitive to anthropogenic factors. Nonetheless, they may be affected by oil spills and by the reduction of food due to fisheries, and getting trapped in nets (MENDEL ET AL. 2008a).

Density and distribution of Lesser Black-backed Gulls in the survey area

A total of 867 individuals of Lesser Black-backed Gulls were observed during the three surveys (Table 3.1). Most of them (784 individuals) were surveyed in August 2023. The density of this month was thus 1.92 ind./km² (Table 3.2). The lowest density was in October (0.024 ind./km²). The three surveys corresponded to the autumn season of the species. The average density in the season was then 0.70 ind/km² (Table 3.5).

The spatial distribution of this gull species from these three surveys suggests the species is more frequent and abundant towards the eastern and western parts of the survey area. The species occurred at low densities (up to 0.5 ind./km²) within the limits of the planned wind farm (Figure 3.6 and Figure 3.7).

Table 3.5 Average seasonal density of Lesser Black-backed Gulls in the survey area for autumn from three surveys (August to October 2023).

Lesser Black-backed Gull	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Summer	0	0	0	0	0
Autumn	867	0.70	0.02	1.92	3

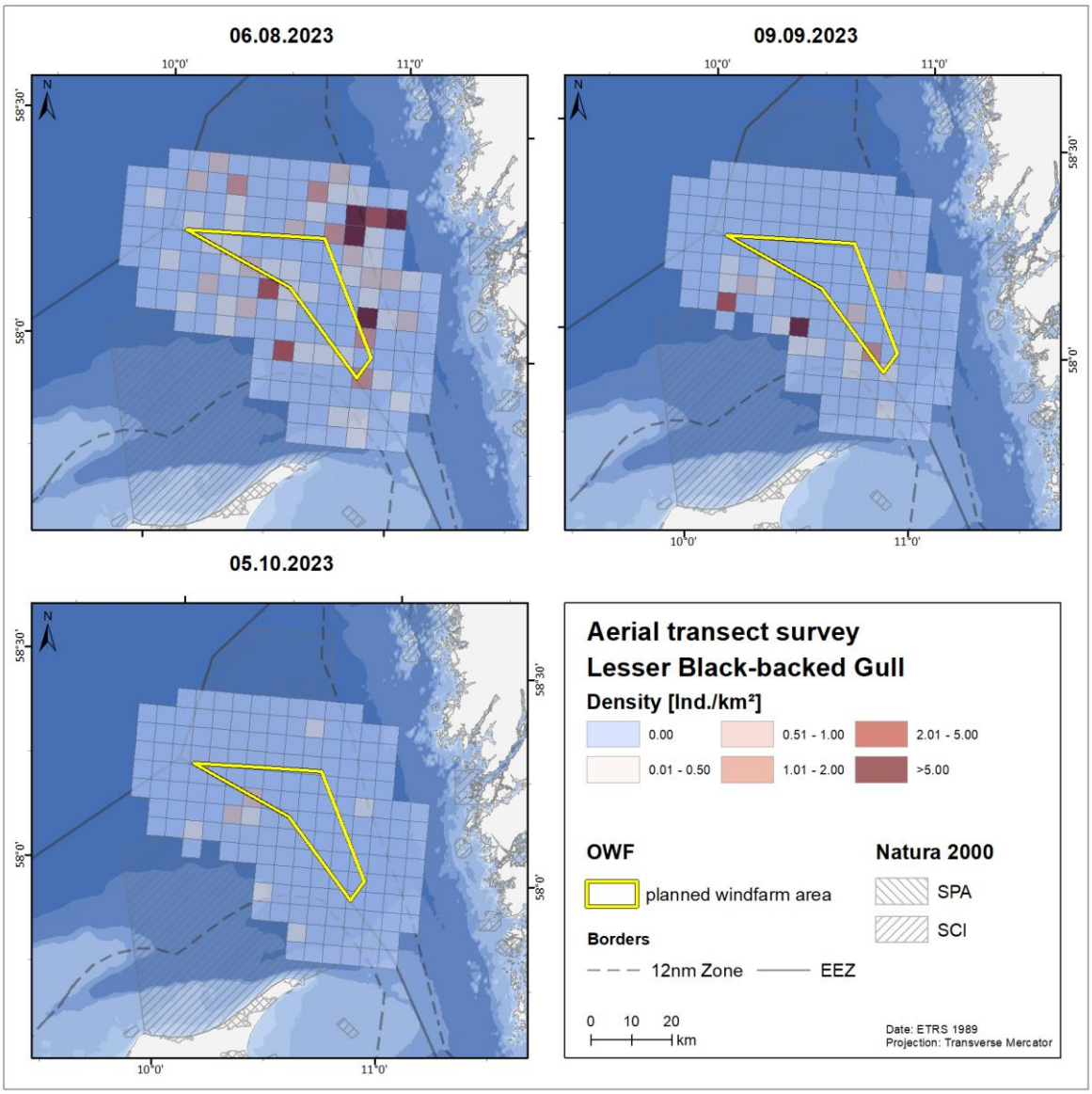

Figure 3.6 Distribution of Lesser Black-backed Gulls in the survey area during each digital aerial survey between August and October 2023.

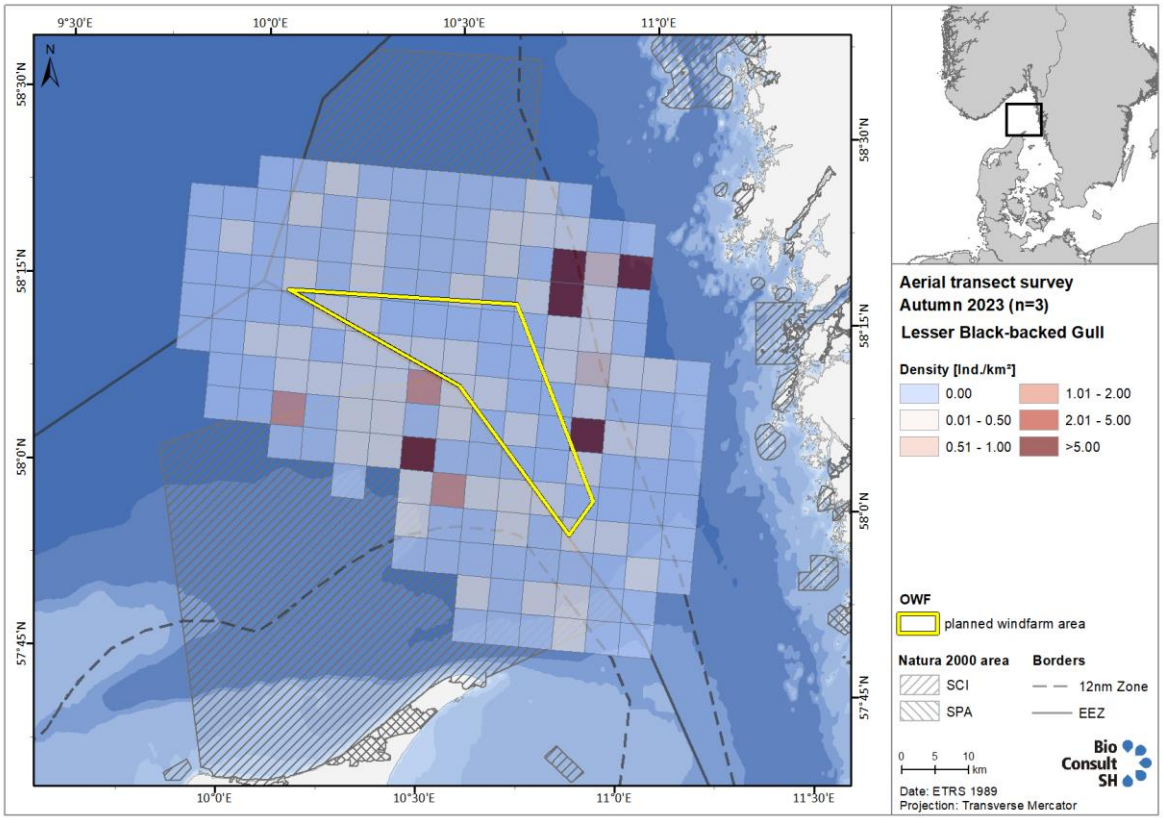

Figure 3.7 Distribution of Lesser Black-backed Gulls in the survey area during autumn.

3.1.4 Herring Gull

Herring Gull – *Larus argentatus*	**NO: Gråmåke; SE: Gråtrut**
Biogeographic population: *argentatus*, North & North-west Europe*	
Breeding range: Denmark & Fenno-Scandia to E Kola Peninsula	
Non-breeding range: N & W Europe	
Population size: 860,000 – 1,000,000	
1% value: 9,300	
Conservation status:	EU Birds Directive, Annex I: not listed EU SPEC Category: SPEC 2 IUCN Red List Category: LC (Global & Europe)
Trend: DEC	Trend quality: Reasonable
Key food: various different food sources	

The Herring Gull is a very widespread species in the northern hemisphere. There are two subspecies and the nominate form is the one occurring in the survey area. It breeds from Fennoscandia and Denmark to Svalbard. The other subspecies is distributed west from *L. a. argentatus* and can be found until Iceland. The species is partly migratory with birds occurring further north migrating and birds occurring further south being resident. Their diet is opportunistic and diverse, but their main prey are invertebrates. They are also ship-followers feeding on fish discards (MENDEL ET AL. 2008a). The population size has been decreasing in the recent years and is currently estimated at 860,000 to 1 million individuals.

Density and distribution of Herring Gulls in the survey area

A total of 396 individuals of Herring Gulls were surveyed during the three months. Most of them (284 individuals) were observed in the first survey of August. Monthly densities of this species varied between 0.09 ind./km² (September) and 0.69 ind./km² (August). The three surveys belonged to the autumn season of the species. The autumn density was then the average of the densities of the three surveys and reached 0.32 ind./km² (Table 3.6).

Spatially, the distribution of Herring Gulls was similar to that of the other gulls, with the largest densities occurring towards the edges of the survey area, both to the east and west (Figure 3.8). Whereas the birds were also spotted within the limits of the planned OWF, higher local abundances occurred outside its limits (Figure 3.9).

Table 3.6 Average seasonal density of Herring Gulls in the survey area for summer and autumn from three surveys (August to October 2023).

Herring gulls	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Summer	0	0	0	0	0
Autumn	396	0.32	0.09	0.69	3

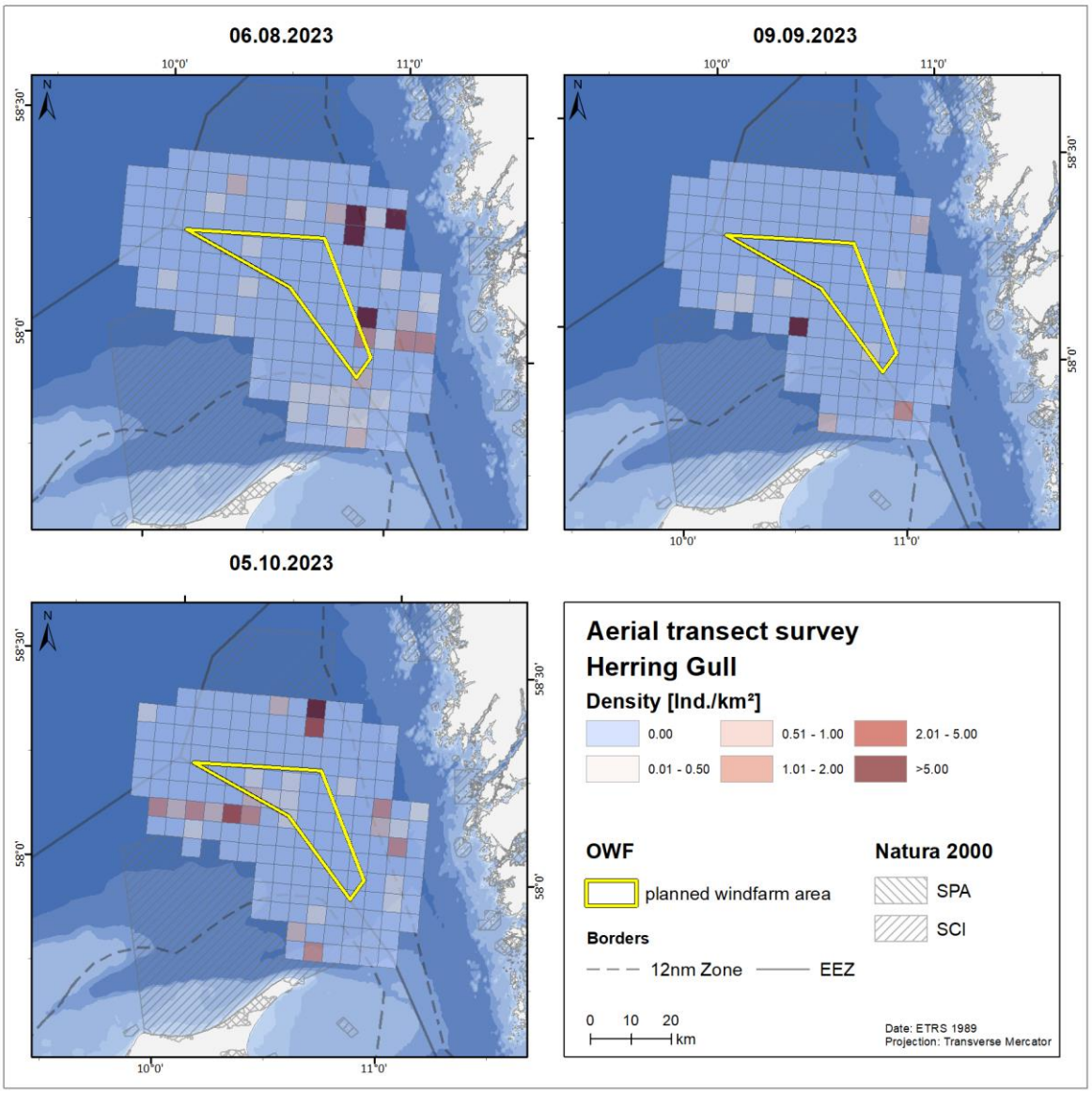

Figure 3.8 Distribution of Herring Gulls in the survey area during each digital aerial surveys between August and October 2023.

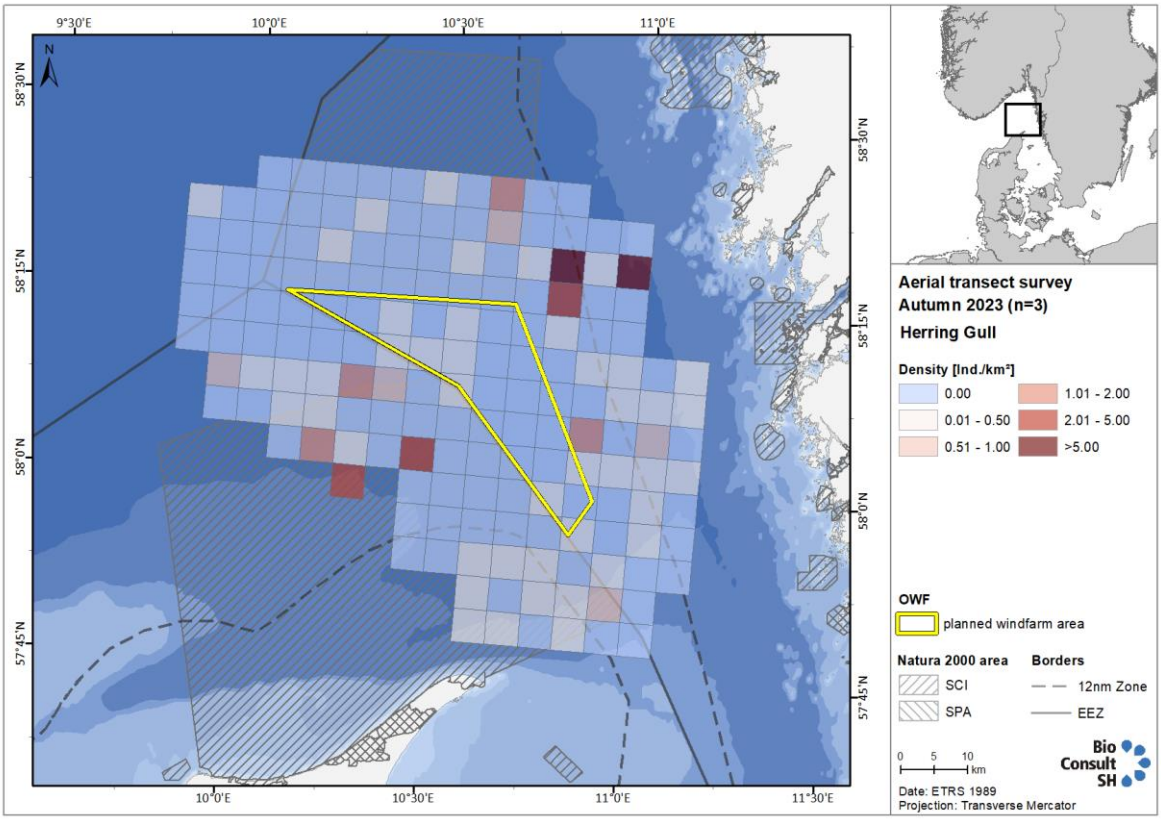

Figure 3.9 Distribution of Herring Gulls in the survey area per season: summer (top) and autumn (bottom) during the digital aerial surveys between August and October 2023.

3.1.5 Great Black-backed Gull

Common Gull – *Larus marinus*	**NO: Svartbak; SE: havstrut**
Biogeographic population: North & West Europe	
Breeding range: Coasts NW France, Ireland, Britain, Iceland E to Scandinavia, White Sea	
Wintering / core non-breeding range: E Atlantic coast S to Iberia	
Population size: 240,000 – 310,000	
1% value: 2,700	
Conservation status:	EU Birds Directive, Annex I: not listed EU SPEC Category: Non-SPEC[E] IUCN Red List Category: LC (Global & Europe)
Trend: STA	Trend quality: Good
Key food: opportunistic	

Great black-backed gulls breed in Denmark and on the coast of Sweden (DURINCK ET AL. 1994). The highest numbers along the coast and offshore are however reached during winter, when also birds from more northerly breeding populations migrate southwards into the southern Baltic Sea. The species has shown relatively large fluctuations in winter resting populations over the last 20 years (MENDEL ET AL. 2008b; MARKONES ET AL. 2014). Great black-backed gulls frequently make use of areas with deeper water (SORDYL ET AL. 2005) and sometimes also gather near fishing ships to forage on discards (GARTHE & SCHERP 2003; MENDEL ET AL. 2008b).

Density and distribution of Great Black-backed Gulls in the survey area

Great Black-backed Gulls were frequent and recorded during all surveys. A total of 936 of this species were recorded over the three aerial surveys. The highest monthly density was recorded in August 2023 with 1.34 ind./km² and the lowest in October 2023 (0.38 ind./km², Table 3.2). The three surveys belonged to the autumn season of the species, and the seasonal density of autumn was then 0.76 ind./km² (Table 3.7).

Spatially, these gulls were distributed quite evenly across the aerial survey area, with relatively mid to high local densities occurring also within the limits of the planned OWF (Figure 3.10). Nonetheless, when looking at average autumn densities, the highest concentrations of this species were observed also toward the eastern and western parts of the survey area (Figure 3.11).

Table 3.7 Average seasonal density of Great Black-backed Gulls in the survey area for summer and autumn from three surveys (August to October 2023).

Great black-backed gulls	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Summer	0	0	0	0	0
Autumn	936	0.76	0.38	1.34	3

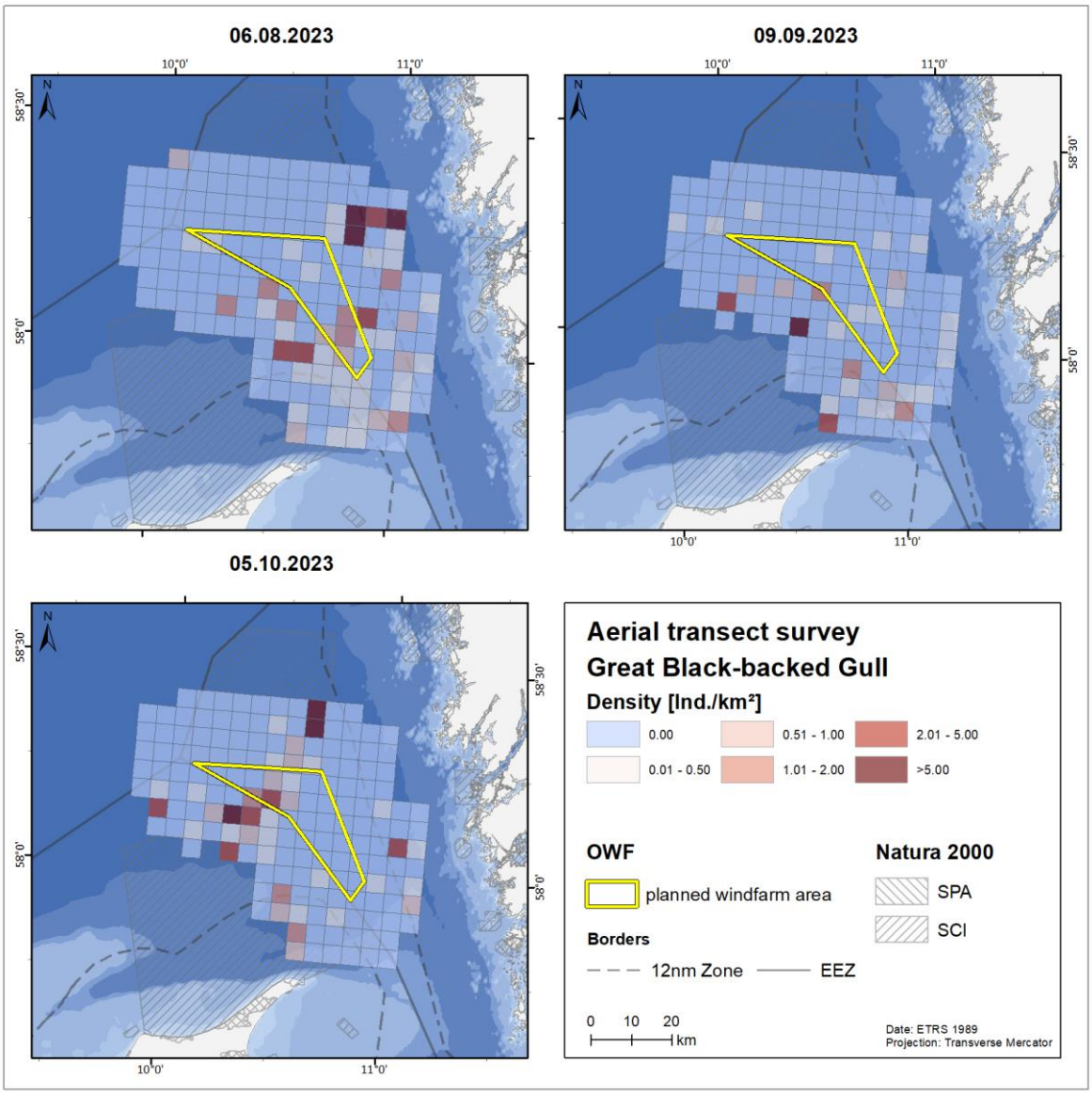

Figure 3.10 Distribution of Great Black-backed Gulls in the survey area in each digital aerial survey between August and October 2023.

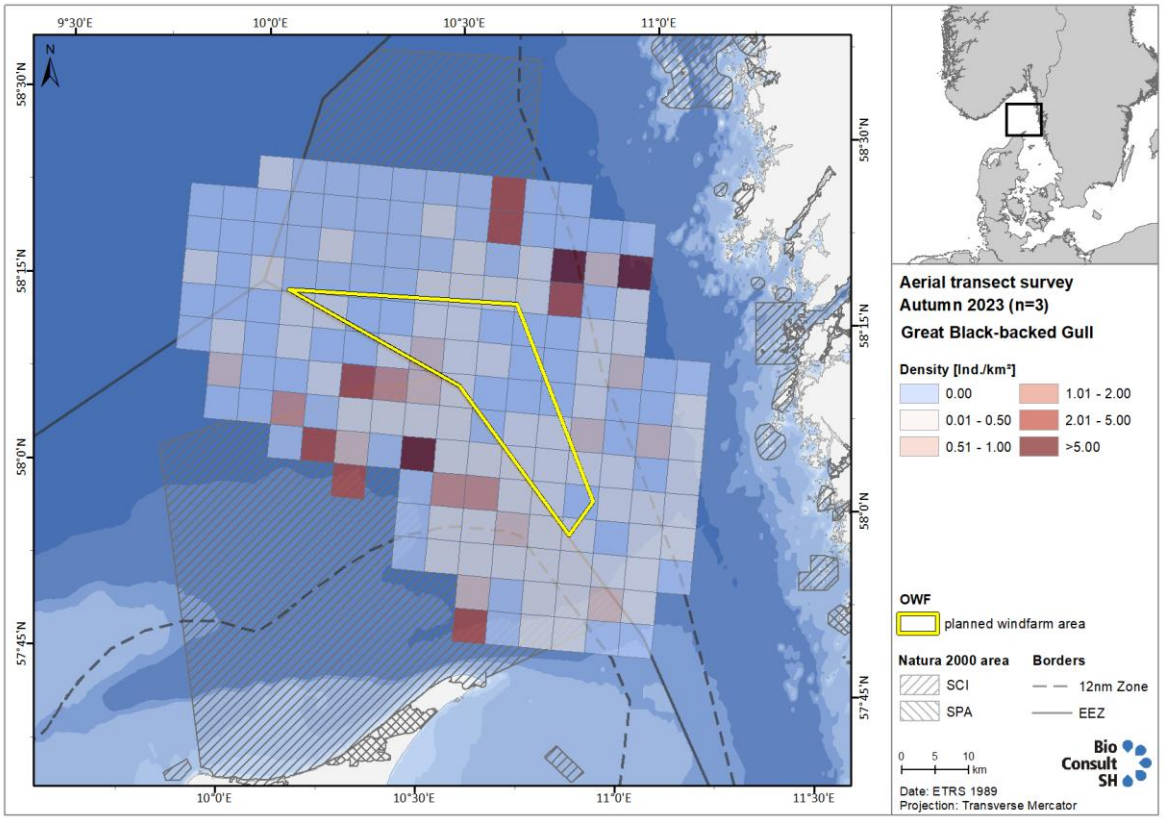

Figure 3.11 Distribution of Great Black-backed Gulls in the survey area in autumn during the digital aerial surveys between August and October 2023.

3.1.6 Common Guillemot

Common Guillemot – *Uria aalge*	**NO: Lomvi; SE: sillgrissla**
Biogeographic population: aalge, Baltic Sea*	
Breeding range: Sweden, Denmark, Finland	
Non-breeding range: Baltic Sea	
Population size: 77,000 – 100,000	
1% value: 880	
Conservation status:	EU Birds Directive, Annex I: not listed EU SPEC Category: SPEC 3 IUCN Red List Category: LC (Global & Europe)
Trend: INC	Trend quality: Good
Key food: fish	

For Common Guillemots it is somewhat unclear to which extent, the North Atlantic flyway populations can be divided into sub-populations. MENDEL et al. (2008a) used an estimate for the Baltic Sea breeding population of 50,000 individuals. During winter, the highest densities in the Danish Baltic Sea are found in the central Kattegat (PETERSEN & NIELSEN 2011) with about 76,500 individuals for the year 2008. These birds are assumed to mostly originate from breeding colonies in the North Sea or Atlantic (MENDEL ET AL. 2008a). Common Guillemots have been found to avoid OWF, but responses varied from weak avoidance to strong avoidance in some cases (DIERSCHKE ET AL. 2016; PESCHKO ET AL. 2020).

Density and distribution of Common Guillemots in the survey area

Common Guillemots were the second most abundant species. During the three aerial surveys between August and October 2023, a total of 5,432 individuals of Common Guillemots were recorded (Table 3.1). During aerial surveys, there were also 100 birds that were unidentified auks (i.e., Common Guillemot/Razorbill), which could at least partially add up to that number.

The numbers of birds observed in each survey were very similar, with the monthly densities varying between 4.26 ind./km² (September) and 4.58 ind./km² (in August 2023, Table 3.2). This resulted in very similar seasonal densities for this species in autumn and winter (Table 3.8).

Spatially, Common Guillemots were widely distributed and equally abundant across the study area, both in individual surveys and when grouped by seasons (Figure 3.12, Figure 3.13). Nonetheless, in autumn, the highest numbers appeared to concentrate towards the west of the study area in which local grid cells with densities over 5 ind./km² were observed (Figure 3.13).

Table 3.8 Average seasonal density of Common Guillemots in the survey area for summer and autumn from three surveys (August to October 2023).

Common Guillemot	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Autumn	3,643	4.42	4.3	4.6	2
Winter	1,789	4.3	4.3	4.3	1

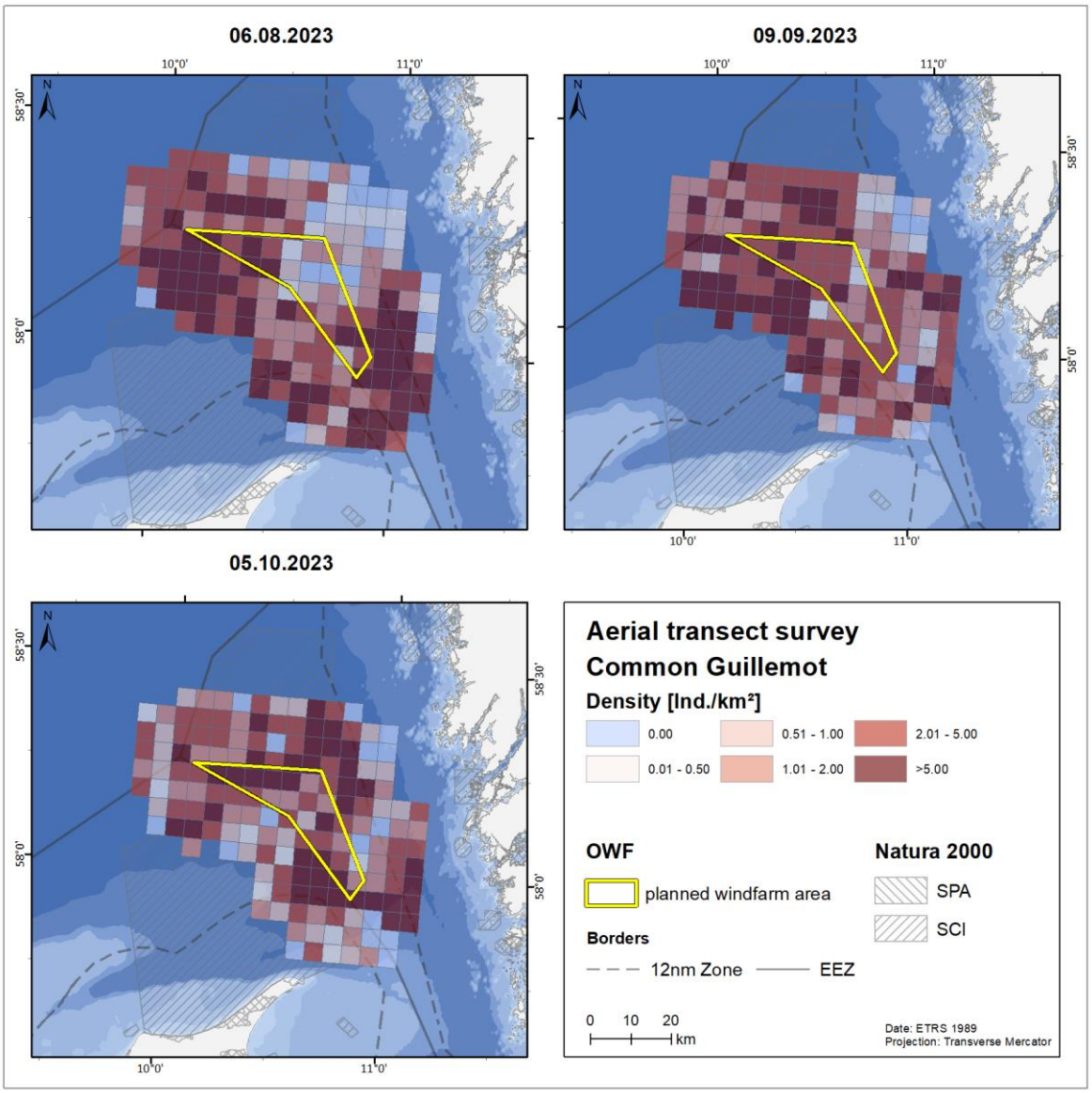

Figure 3.12 Distribution of Common Guillemots in the survey area during each digital aerial surveys between August and October 2023.

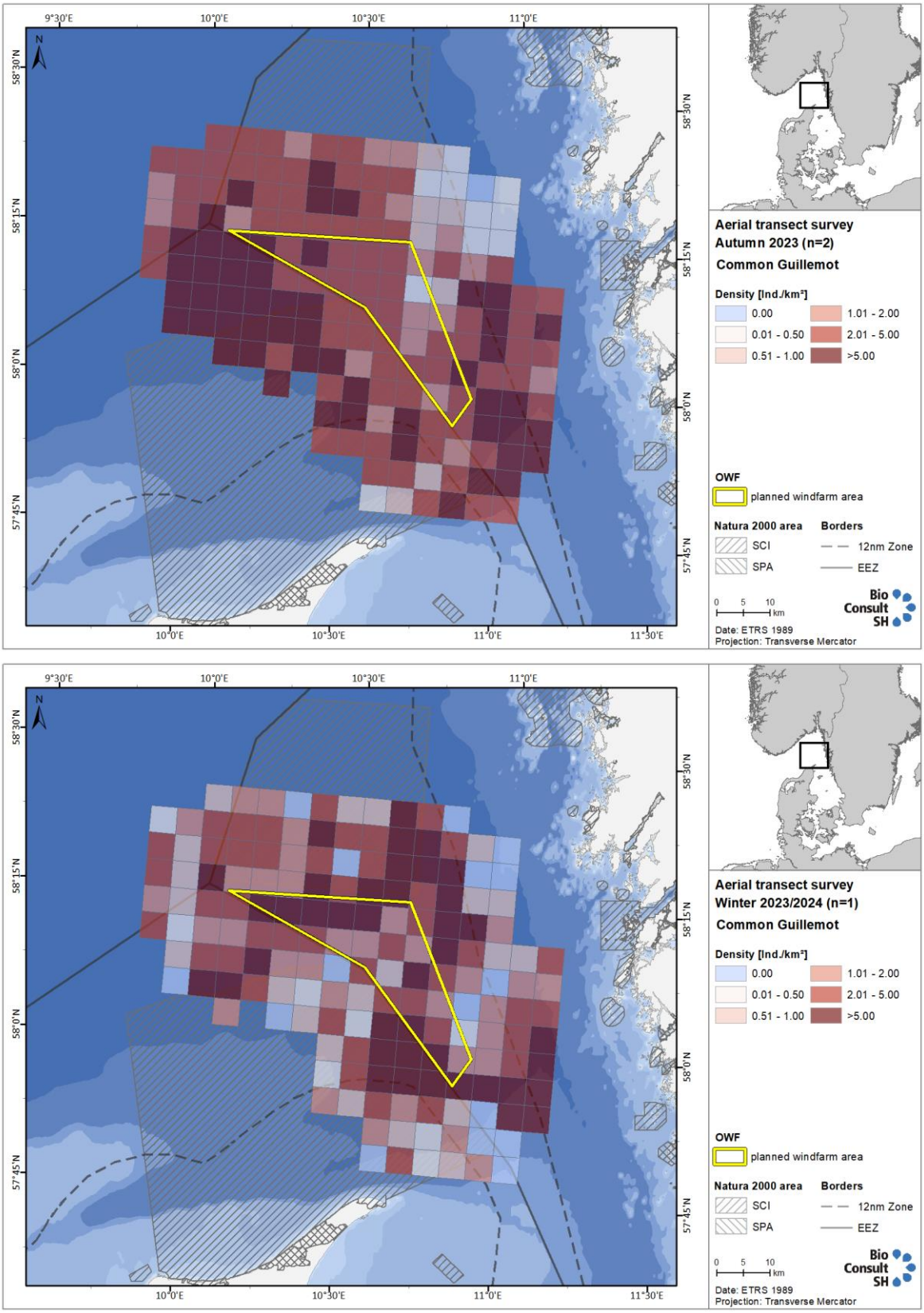

Figure 3.13 Distribution of Common Guillemots in the survey area per season: autumn (top) and winter (bottom) during the digital aerial surveys between August and October 2023.

3.1.7 Razorbill

Razorbill – *Alca torda*	**NO: Alke; SE: tordmule**
Biogeographic population: *torda,* E Atlantic	
Breeding range: -	
Wintering / core non-breeding range: -	
Population size: 290,000 – 350,000	
1% value: 13,800-	
Conservation status:	EU Birds Directive, Annex I: not listed EU SPEC Category: 1 IUCN Red List Category: LC (Global & Europe)
Trend: INC	Trend quality: Reasonable
Key food: mainly fish	

Razorbills are distributed in the Holarctic from North Europe to the East and West coasts of the Atlantic. They are adapted to life at sea and spend their whole life in the marine environment (like the Common Guillemot). They breed mainly on edges of steep cliffs or on small isolated islands and most often in large colonies (MENDEL ET AL. 2008a). There are two subspecies of Razorbills and three populations. The subspecies *Alca torda torda*, is the one that occurs in the survey area. The size of the breeding 'East Atlantic' biogeographical population is estimated at 290,000-350,000 individuals for the period between 2008 and 2018. In total, however, the European population might range between 519,000 - 1,070,000 individuals according to BirdLife International (BIRDLIFE INTERNATIONAL 2021). The diet of Razorbills is dominated by fish, especially sprats which also constitutes the major component of the diet of its chicks (LYNGS 2001). Like Common Guillemots, Razorbills have been found to avoid OWF, but the extent of avoidance varied (DIERSCHKE ET AL. 2016).

Density and distribution of Razorbill in the survey area

In comparison to the abundant Common Guillemot, Razorbills occurred in low numbers. Only 63 individuals of this species were recorded during the three surveys, most of them (55 individuals) during the last survey. The monthly densities varied between 0. 01 ind./km² (August and September 2023) and 0.13 ind./km² (October 2023). In summer, the seasonal density was very low (0.01 ind./km²) and autumn density was the same as the density of October (only one survey for the season, Table 3.9).

Since the species was relatively uncommon, it is difficult to infer a spatial pattern from the few individuals that were observed. However, since they occurred across all the survey area and since they are as Common Guillemots, pelagic feeders, they are expected to occur all over the survey area (Figure 3.14, Figure 3.15).

Table 3.9 Average seasonal density of Razorbills in the survey area for summer and autumn from three surveys (August to October 2023).

Razorbill	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Summer	8	0.01	0.01	0.01	2
Autumn	55	0.13	0.13	0.13	1

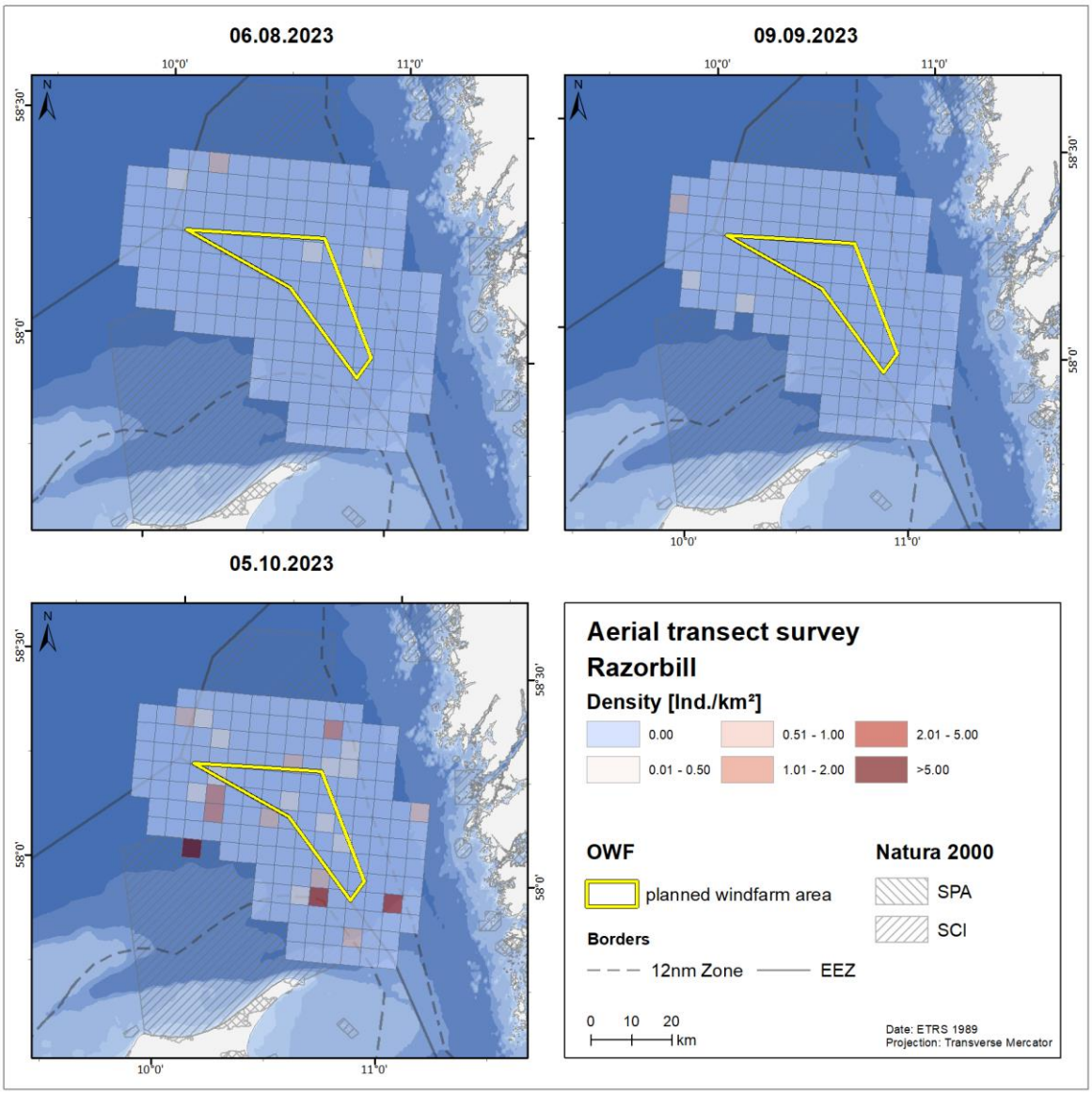

Figure 3.14 Distribution of Razorbills in the survey area during each digital aerial surveys between August and October 2023.

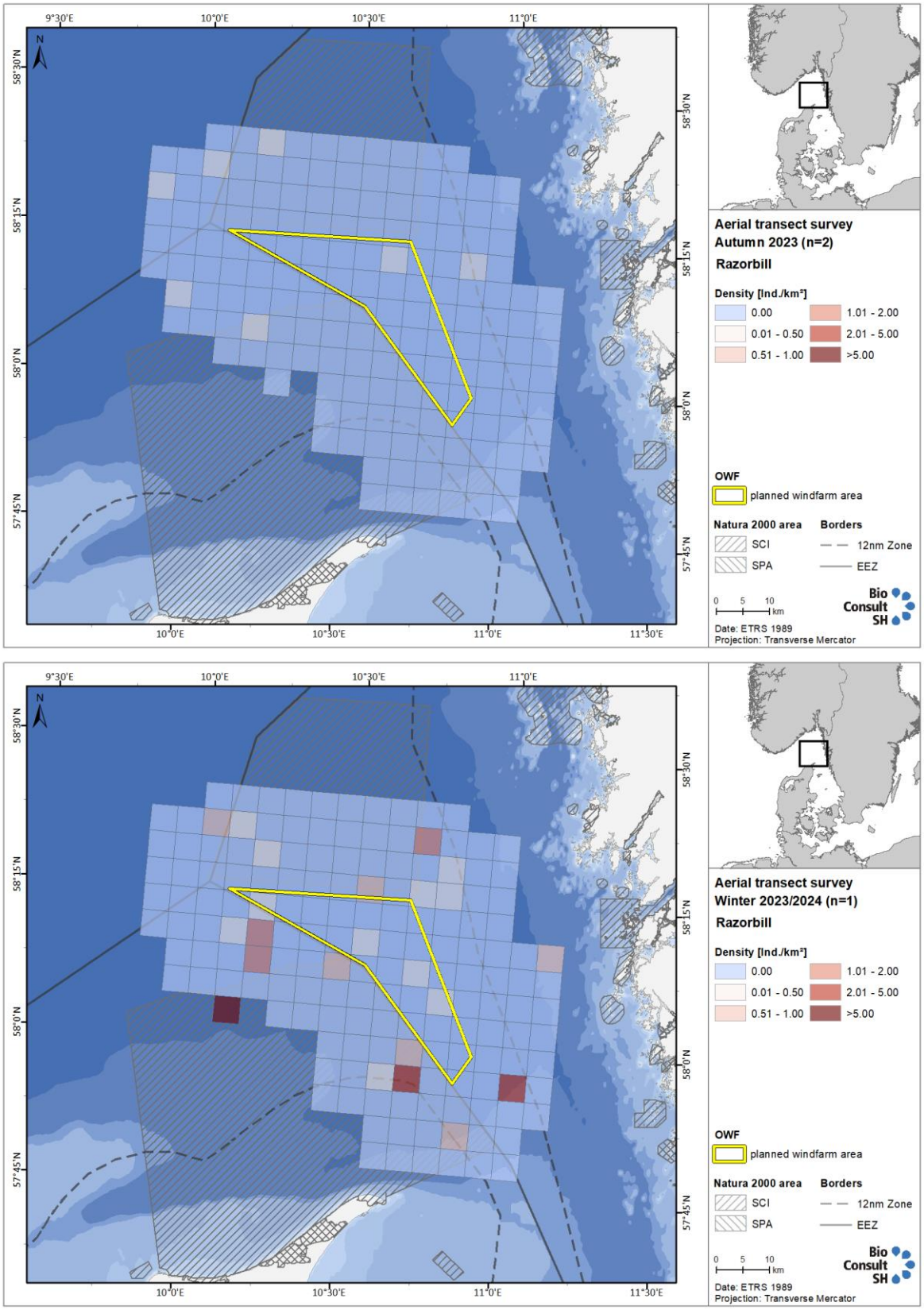

Figure 3.15 Distribution of Razorbills in the survey area per season: autumn (top) and winter (bottom) during the digital aerial surveys between August and October 2023.

3.2 Abundance and distribution of marine mammals

A total of 153 Harbour Porpoises, 1 Harbour Seal, 11 unidentified pinniped (Grey/Harbour Seal) and two unidentified small cetaceans or seals were recorded during the three surveys.

The only species that was surveyed relatively frequently was thus the Harbour Porpoise, which is further described, and its spatial distribution mapped in the following pages.

Table 3.10 Marine mammal observations during the three digital aerial survey flights in the survey area Densities of Harbour Porpoises have been corrected according to TEILMANN et al (2013).

Survey	Harbour porpoise (n)	Harbour porpoise density (ind./km²)	Harbour seals (n)	unidentified pinniped (n)	Density of seals	Unidentified small cetacean/seal (n)
06.08.2023	34	0.161	0	1	0.002	1
09.09.2023	82	0.436	0	7	0.017	1
05.10.2023	37	0.196	1	3	0.010	

3.2.1 Harbour Porpoise

The Harbour Porpoise (*Phocoena phocoena*) is widely distributed throughout the entire Northern Hemisphere. It is the only cetacean species reproducing in the Baltic Sea. Harbour porpoises occurring in the Baltic Sea are thought to belong to three different populations (Skagerrak/North Sea, Belt Sea and Baltic Proper). Genetic and morphological evidence suggest that Harbour Porpoises inhabiting the Baltic Proper belong to a different population than Harbour Porpoises in the Skagerrak (which probably belong to the North Sea population of Harbour Porpoises) and Harbour Porpoises from the Belt Sea population, inhabiting the Kattegat, Sound, Belt Sea and western Baltic Sea (WIEMANN ET AL. 2010; BENKE ET AL. 2014; LAH ET AL. 2016; TIEDEMANN ET AL. 2017).

Harbour porpoises are the smallest cetacean species in central Europe (BENKE ET AL. 1998). They reach an average length of between 140 and 180 cm and a weight of between 40 and 60 kg. The life span of Harbour Porpoises is relatively short compared to other toothed whales, with few animals reaching an age of over 12 years (LOCKYER 2003). Females reach sexual maturity at an age of around 5 years (KESSELRING ET AL. 2017). The mating and reproductive season may differ between regions. The main reproductive season of Harbour Porpoises lasts from June to August in the North Sea and Baltic Sea (BENKE ET AL. 1998). Females give birth to a single calf almost every year between May and July which is suckled for 8 to 10 months (SCHULZE 1996). With a gestation period of approx. 8 to 10 months (SCHULZE 1996) and the mating season taking place between June and August, most females are pregnant and lactating at the same time, which requires a high energetic demand during this period.

Harbour porpoises are opportunistic feeders and prey on a wide range of benthic as well as pelagic fish species. In the western part of the Baltic Sea, the food spectrum of Harbour Porpoises has been found to mainly consist of Atlantic herring (*Clupea harengus*) and cod (*Gadus morhua*). Immature animals feed on gobies (Gobiidae) for a large proportion. Further fish species like sprat (*Sprattus sprattus*), whiting (*Merlangius merlangus*) and sand laces (Ammodytidae) complement the diet on

a regular basis depending on season and location (AAREFJORD et al. 1995; BENKE et al. 1998; BÖRJESSON et al. 2003, ANDREASEN et al. 2017).

The species is listed in the EU habitats directive, annexes II and IV (92/43/EEG). Article 12 of the EU habitat directive prohibits the "deliberate capture or killing of this species as well as the deliberate disturbance especially during the period of breeding, rearing and migration" of species listed in its annex IV. It also prohibits the "deterioration or destruction of breeding and resting habitats". Furthermore the Baltic proper management unit (see below) is listed as "Critically endangered" by the International Union for Conservation of Nature, IUCN (BECKER ET AL. 2013).

Density and distribution of Harbour Porpoises in the survey area

Numbers of Harbour Porpoises in the survey area were not low, compared to other densities for the Baltic Sea region, varying between 0.16 and 0.44 ind./km² in all survey months. The autumn density was double as high as the summer density (0.32 vs. 0.16 ind./km²). Spatially, the species was present throughout all the survey area with high local densities within the limits of the planned OWF.

Table 3.11 Average seasonal density of Harbour Porpoises in the survey area for summer and autumn from three surveys (August to October 2023).

Harbour porpoise	Total N° of ind (n)	Density (Ind./km²)	Min	Max	N° surveys
Summer	34	0.161	0.161	0.161	1
Autumn	119	0.317	0.197	0.437	2

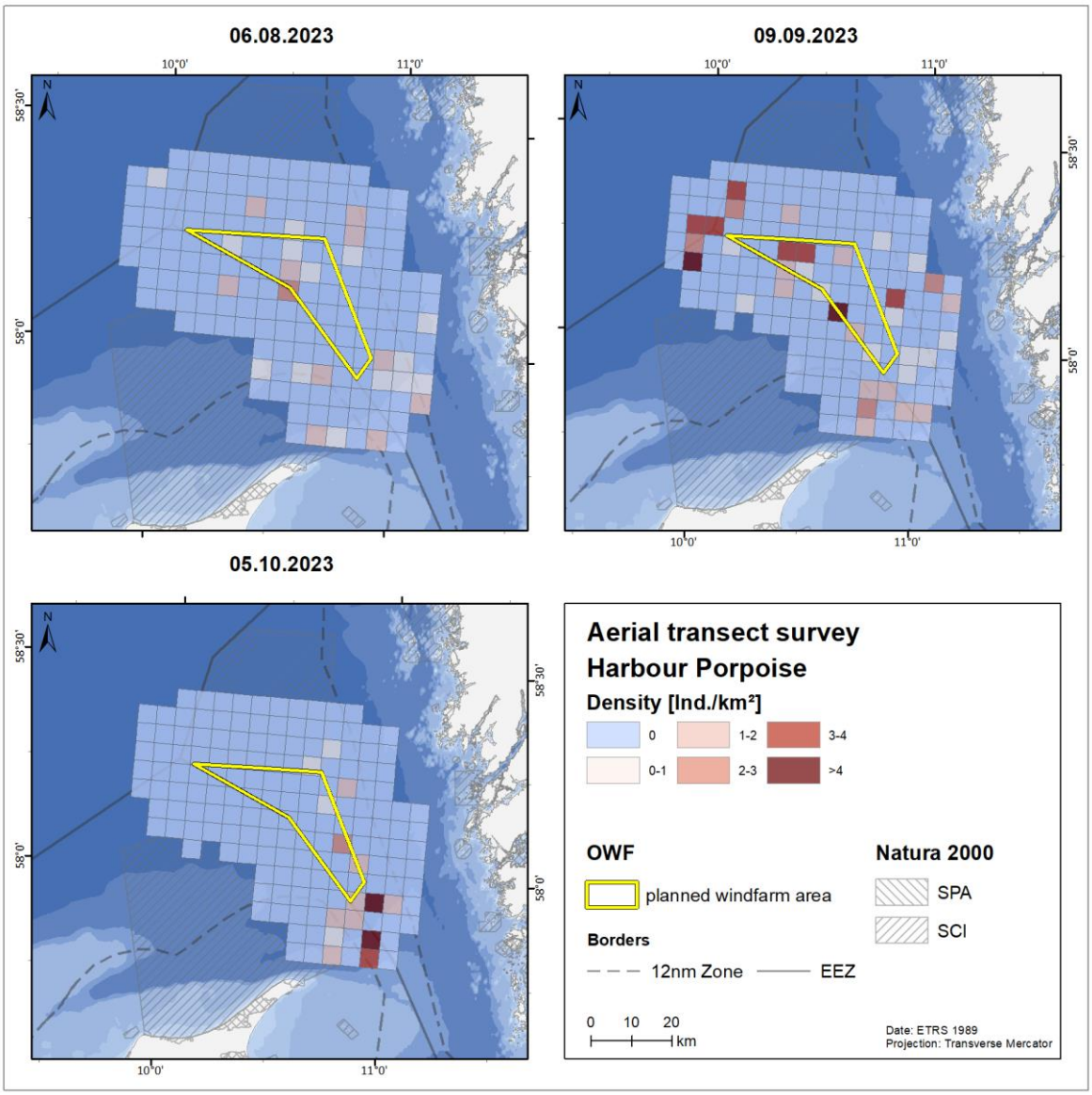

Figure 3.16 Distribution of Harbour Porpoises in the survey area in each digital aerial survey between August and October 2023.

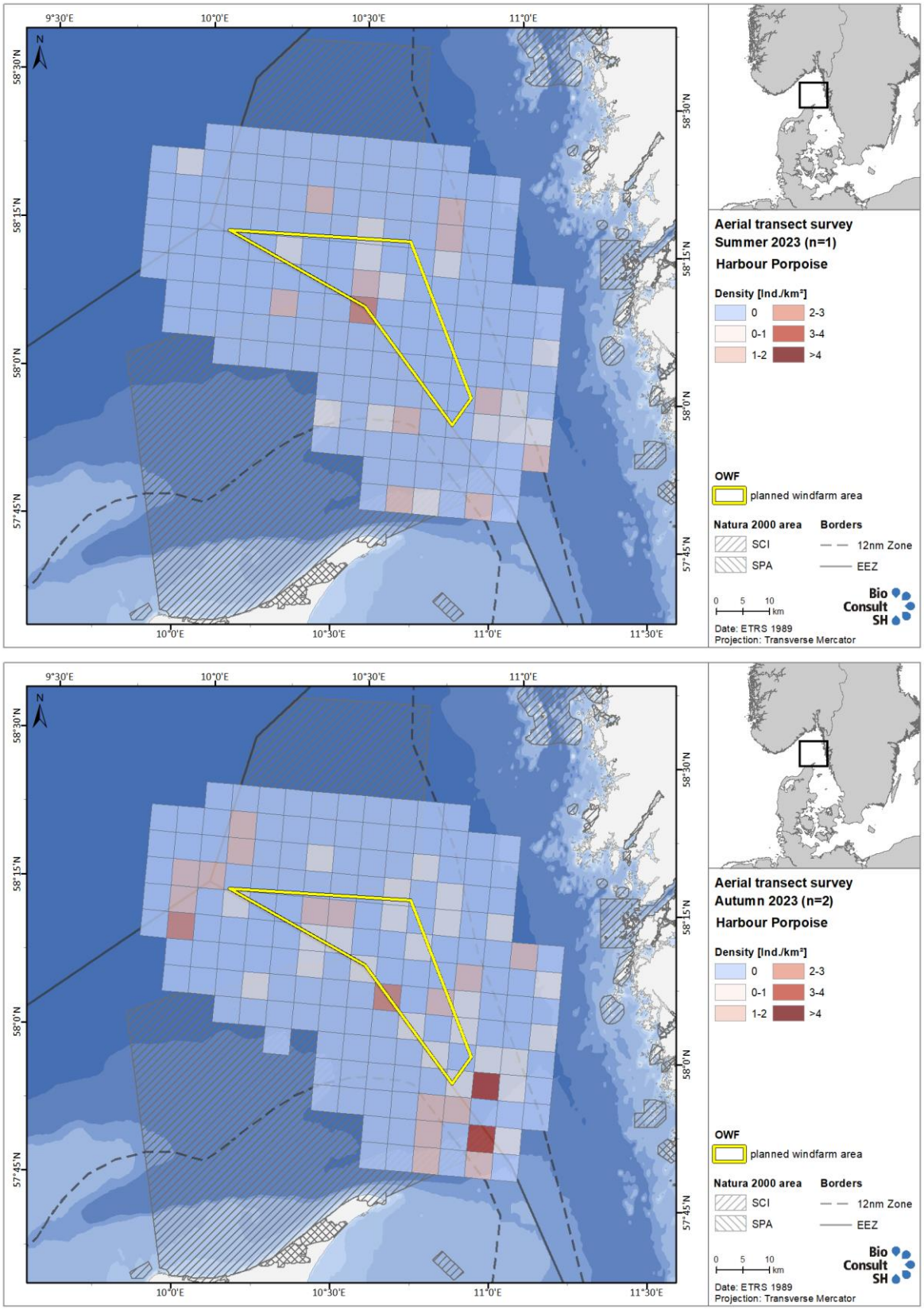

Figure 3.17 Distribution of Harbour Porpoises in the survey area in summer (top) and autumn (bottom) during the digital aerial surveys between August and October 2023.

4 DISCUSSION

4.1 Critique of method

Digital aerial surveys offer a number of advantages in comparison to ship surveys: a very large area can be covered with a uniform collection effort, while animal movement and deterrence effects can be neglected, since disturbance to birds from a high-flying airplane is minimal (ŽYDELIS ET AL. 2019).

However, there are several factors that can influence the distribution and the seasonal occurrence of animals. These include environmental factors such as season, local weather conditions during the collection date and preceding days, feeding resources and anthropogenic factors such as fishing and shipping. Furthermore, each survey is conducted over a short period of time and over a relatively small area. Thus, it only represents a snapshot of what is happening, and a high degree of temporal and spatial variability is expected. Consequently, any short-term population shift away from or into the survey area can lead to considerable fluctuations in the number estimates of the species under consideration.

It is therefore important to consider these issues when looking at the results provided in this report.

4.2 Species abundance and distribution of resting birds

Of the 13 species of resting birds surveyed during the three months of this study, Northern Fulmars were by far the most abundant species (45.5% of all resting birds surveyed belonged to this species). As predicted and mentioned in the desktop study (BIOCONSULT SH 2021), this species is widespread and was expected to occur in large numbers. SKOV ET AL. (1995) had predicted a density of 6.99 ind./km² for the same period of this study, which coincides with the range of density values that has been found in the current analysis (2.13 – 9.70 ind./km²). In fact, the area of the OWF Mareld lies within upwelling areas south of the Norwegian Trench, that were found to be preferred by this species according to SKOV & DURINCK (2000). The latter found that the species dominated the bird community in September 1990, coinciding with the timing of the surveys conducted here. As mentioned in the desktop study, this species may not be particularly affected by shipping traffic, because they show only a small flight distance to approaching vessels (GARTHE ET AL. 2004). However, they may be vulnerable to collisions, because of their restricted manoeuvrability (DIERSCHKE & GARTHE 2006), especially during full moult. Given that this species was the predominant resting bird during the study period, and also because of its status of vulnerability at European level (IUCN Red list), it may be one species that may be taken into account for further measurements.

There are four species of **divers** in Europe, with red and Black-throated Divers being the most common ones. They are considered winter visitors and migrants in the Baltic Sea (MENDEL ET AL. 2008a). The largest concentrations of these species are often found however in the North Sea. The desktop study suggested low densities of divers to be expected close to the planning area, especially between autumn and spring (October to May, 0.15 – 0.25 ind./km²). In the current period of study, very few individuals were observed, with most of them being surveyed in the last October period (0.03 ind./km² in October), coincident with the arrival of the birds in the area. One individual of Great Northern Diver was also recorded. Despite the low densities, divers are very sensitive to

anthropogenic disturbances like ships or OWF, with displacement distances of up to 10-15 km in some studies (DIERSCHKE ET AL. 2016; MENDEL ET AL. 2019; HEINÄNEN ET AL. 2020).

Northern Gannets were not particularly abundant but have been suggested to be occurring all year long. The densities found in this study agree more or less with densities suggested by SKOV ET AL. (1995). They suggested densities of < 0.1 ind./km² up to 0.15 ind./km² between May-August. Here, the highest density occurred in the survey of October (0.42 ind./km²), but the other surveys were in the range of what is expected for the area. Gannets as Northern Fulmars, are not particularly sensitive to shipping traffic, however they have been classified as a species strongly avoiding offshore wind farms by DIERSCHKE ET AL. (2016), and they are considered sensitive towards collision with wind turbines (FURNESS ET AL. 2013) too.

Very few sea ducks were registered during the period of surveys. Only eight individuals of Common Scoters were recorded only during the last aerial survey of October with a density of 0.02 ind./km². This was somehow expected, because the planned OWF and the survey area includes waters that are too deep (> 30 m depth and much deeper) to offer either an attractive option as a resting or foraging site.

Skuas were also very infrequent in the surveys. Only 7 individuals of Great Skua were registered during the whole period, with the largest numbers in August. The densities were very low and these results are somehow in agreement with the predicted densities for these species group. Skuas are not to be expected between November and June, but still according to SKOV ET AL. (1995), up to 0.11 ind./km² may occur in the period between July-August, which is one degree of magnitude larger than the numbers found in the surveys of August (0.01 ind./km²).

Gulls were the third most important species group, representing 15.1% of all resting birds observed. The most abundant species were the Great Black-backed Gull, the Lesser Black-backed Gull and the Herring Gull. Other species were much less frequent (Common Gull and Black-legged Kittiwake). Numbers and densities of these species during the survey period agree with densities observed in the study by SKOV ET AL. (1995), that has been reviewed in detail in the desktop study (BIOCONSULT SH 2021). Densities of Kittiwakes were low as expected, since the species has a predicted density of 0.1 ind./km² between April and September, and the area may be of importance only between October and March in which the densities might reach 7.2 ind./km². On the other hand, Lesser Black-backed Gulls were less abundant in winter but densities of 1.37 and of 0.91 ind./km² have been predicted for the area between July-August and September-October respectively (SKOV ET AL. 1995). Densities found in the area in August (1.9 ind./km²) and in September and October (< 0.2 ind./km²) are thus in agreement with previous findings by SKOV ET AL. (1995). Similarly, densities of the other two gull species are within the same order of magnitude of predicted densities that are further described in the desktop study (BIOCONSULT SH 2021).

Terns were extremely rare, only one unidentified tern was seen during the whole survey period. The survey area has also not been suggested by SKOV ET AL. (1995) to hold larger densities than 0.1 ind./km² of any tern at any time during the year.

Finally, auks were the second most common species group with **Common Guillemots** being more often recorded in the study area at much higher numbers than **Razorbills**. In fact, Common Guillemots represented 33.8% of all resting birds. The distribution of densities across the surveyed

months for both species is in agreement with predictions made by SKOV ET AL. (1995) for the area. In August, densities of Common Guillemots have been suggested to vary between 5.05 and 35.61 ind./km², whereas between September and October, average densities ranged between 2.5 and 9.7 ind./km² (depending on the exact location, SKOV ET AL. (1995). Here, densities of 4.3 to 4.6 ind./km² were found. Razorbills on the other hand, showed very low densities (0.01 ind./km²) in August and September, and its numbers started to increase in October (0.13 ind./km²). This also agrees with findings of Skov et al. (1995), who mentions densities of < 0.1 ind./km² for the period between March and September and increasing densities for central and southern Skagerrak between 0.41 and 1.92 ind./km² for the period between October and November. As both species show avoidance of OWF, with varying distances, birds are expected to be displaced from the area of the planned OWF.

4.3 Species abundance and distribution of marine mammals

Of all marine mammals, Harbour Porpoises were the only one that were surveyed regularly along all three surveys. Densities of this species ranged between 0.16 and 0.44 ind./km², which are not low densities for the species. For instance, HEIDE-JORGENSEN ET AL. (1993) reports densities of 0.156 ind./km² for the North Sea and 0.147 ind./km² for the Great Belt region. Later satellite tagging studies and acoustic surveys have identified a high-density core area in the Skagerrak coinciding with the location of the planned OWF (SVEEGAARD ET AL. 2011; SVEEGARD ET AL. 2011). Moreover, the Natura 2000 site Skagens Gren og Skagerak located just to the west of the planned OWF, is known to contain one of the most significant occurrences of Harbour Porpoises in the Atlantic region. This area is a high-density area for Harbour Porpoises along the year, however, since the species conducts small migratory movements, there might be also some seasonal changes to be expected in the area with the population at Skagerrak probably moving towards the west from spring/summer to autumn/winter (SVEEGAARD ET AL. 2011; SVEEGARD ET AL. 2011).

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A APPENDIX

A.1 Species Lists

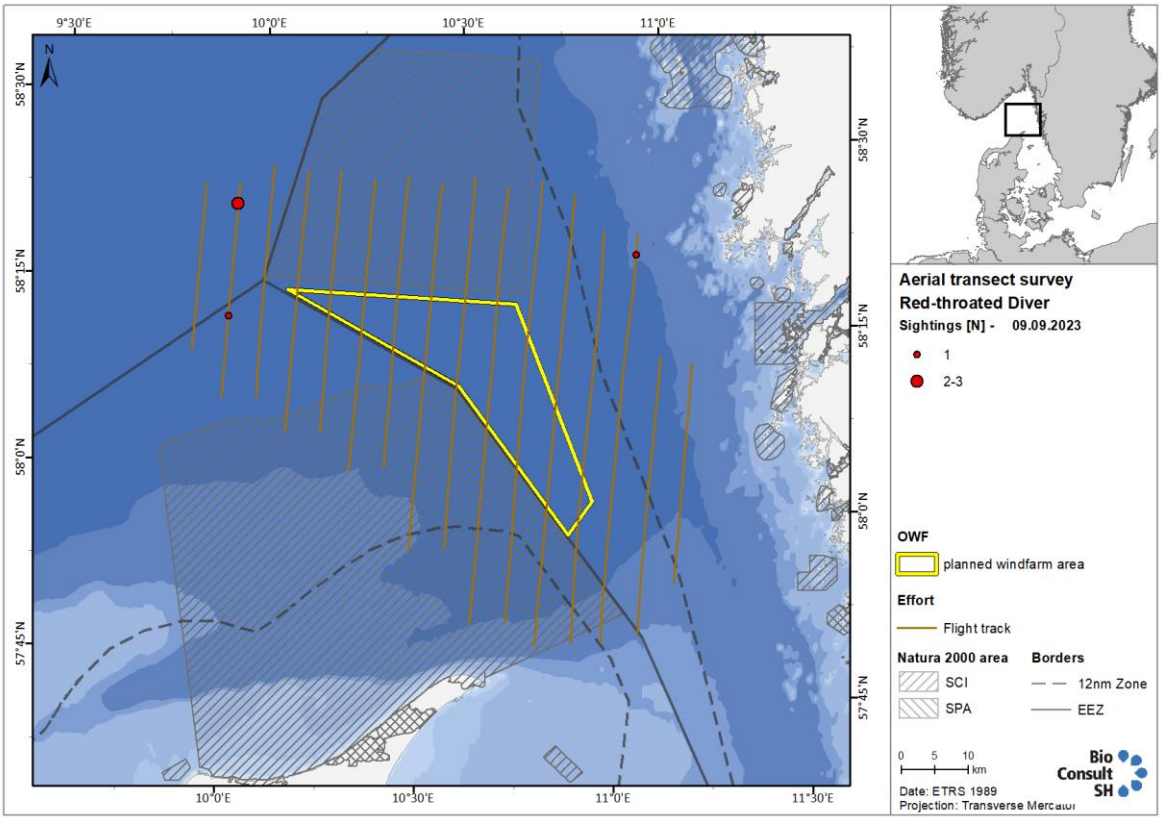
Table A. 1 *Overview of the total number of registered species of birds in the aerial survey area from August to October 2023 , including number of individuals and indications of the status of the species in the area (Resting/Migration [R/M]: Species that can occur as resting and migrating birds in the survey area; Migration [M]: Species, that occur as migrating birds only) as well as conservation or hazard categories (VSchRL: EU Bird Directive, Annex I; EUR-Gef: European Red List Category; EU27-Gef.: EU27 Red List Category (Status: 2017); AEWA: Categories of the Agreement on the Conservation of African-Eurasian Migrants (Status: 2022).*

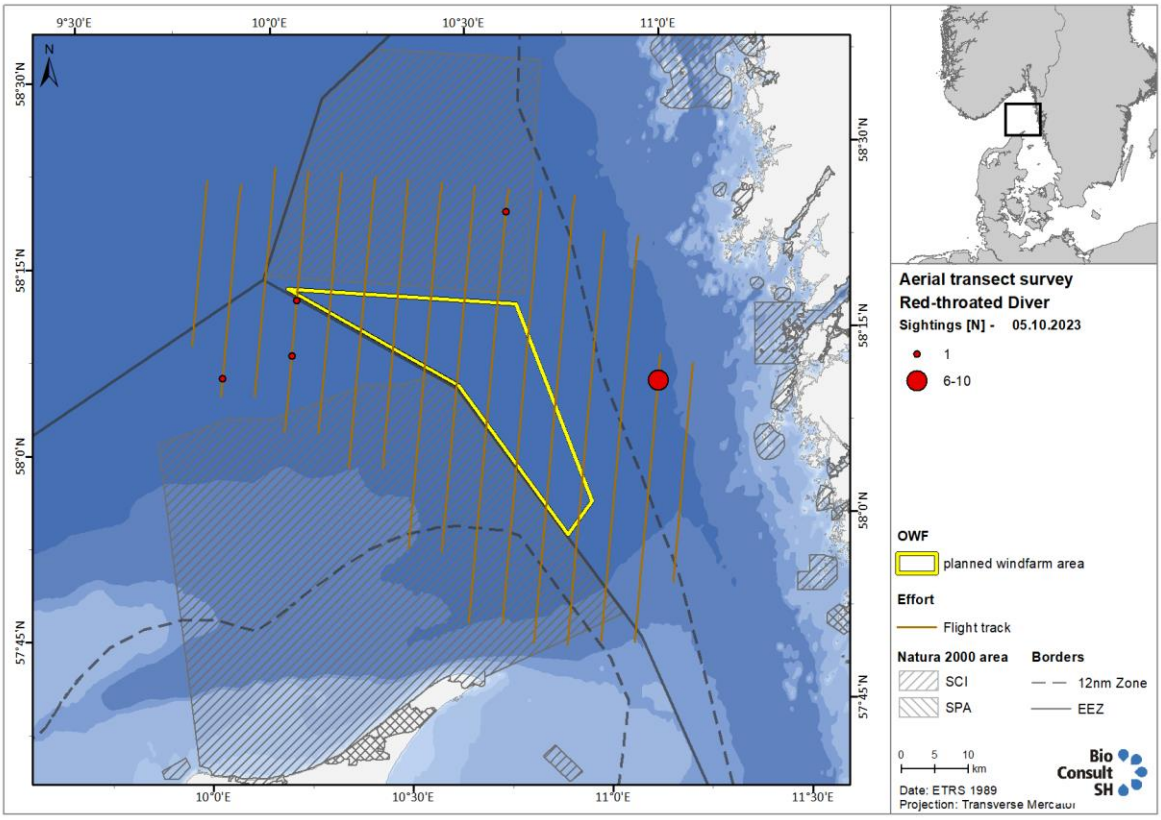
Species	Common name in Norwegian	Common name in Swedish	Status	Ind. ∑	EU Directive	EUR Cat.	EU28-Cat.	AEWA
Red-throated Diver	Smålom	smålom	R/M	16	Annex I	LC	LC	B 2e
Great Northern Diver	Islom	svartnäbbad islom	R/M	1	Annex I	LC	LC	A 1c
unidentified diver			R/M	1				
Northern Fulmar	Havhest	stormfågel	R/M	7,325		VU	EN	
Northern Gannet	Havsule	havssula	R/M	187		LC	LC	C 1
Eurasian Teal	Krikkand	kricka/amerikansk kricka	M	7		LC	LC	C 1
Common Scoter	Svartand	sjöorre	R/M	8		LC	N/A	B 2a
Hen Harrier	Myrhauk	blå kärrhök	M	1	Annex I	LC	VU	
European Golden Plover	Heilo	ljungpipare	M	12	Annex I	LC	LC	C 1
unidentified wader			M	37				
Great Skua	Storjo	storlabb	R/M	7		LC	LC	B 1
unidentified skua			R/M	1				
Common Gull	Fiskemåke	Fiskmås	R/M	8		LC	LC	B 2c
unidentified small gull			R/M	4				
Lesser Black-backed Gull	Sildemåke	silltrut	R/M	867		LC	LC	A 3c / B 2e / C1
Herring Gull	Gråmåke	Gråtrut	R/M	396		LC	VU	B 2c 2e /C1
Great Black-backed Gull	Svartbak	havstrut	R/M	936		LC	NT	B 2c
unidentified large gull			R/M	109				
Great / Lesser Black-backed Gull			R/M	77				
Black-legged Kittiwake	Krykkje	tretåig mås	R/M	8		VU	EN	A 1b
fulmar/gull			R/M	301				
unidentified gull			R/M	18	Annex I			
Common/Arctic Tern			R/M	1	Annex I			C 1
tern/small gull			R/M	1				
Common Guillemot	Lomvi	sillgrissla	R/M	5,432		LC	LC	C 1 / B 1

Species	Common name in Norwegian	Common name in Swedish	Status	Ind. ∑	EU Directive	EUR Cat.	EU28-Cat.	AEWA
Common Guillemot/Razorbill	Lomvi/Alke	Sillgrissla/tordmule	R/M	288				
Razorbill	Alke	tordmule	R/M	63		LC	LC	C 1
unidentified auk			R/M	37				
unidentified songbird			M	65				
Unidentified bird								
Total				**16,224**				

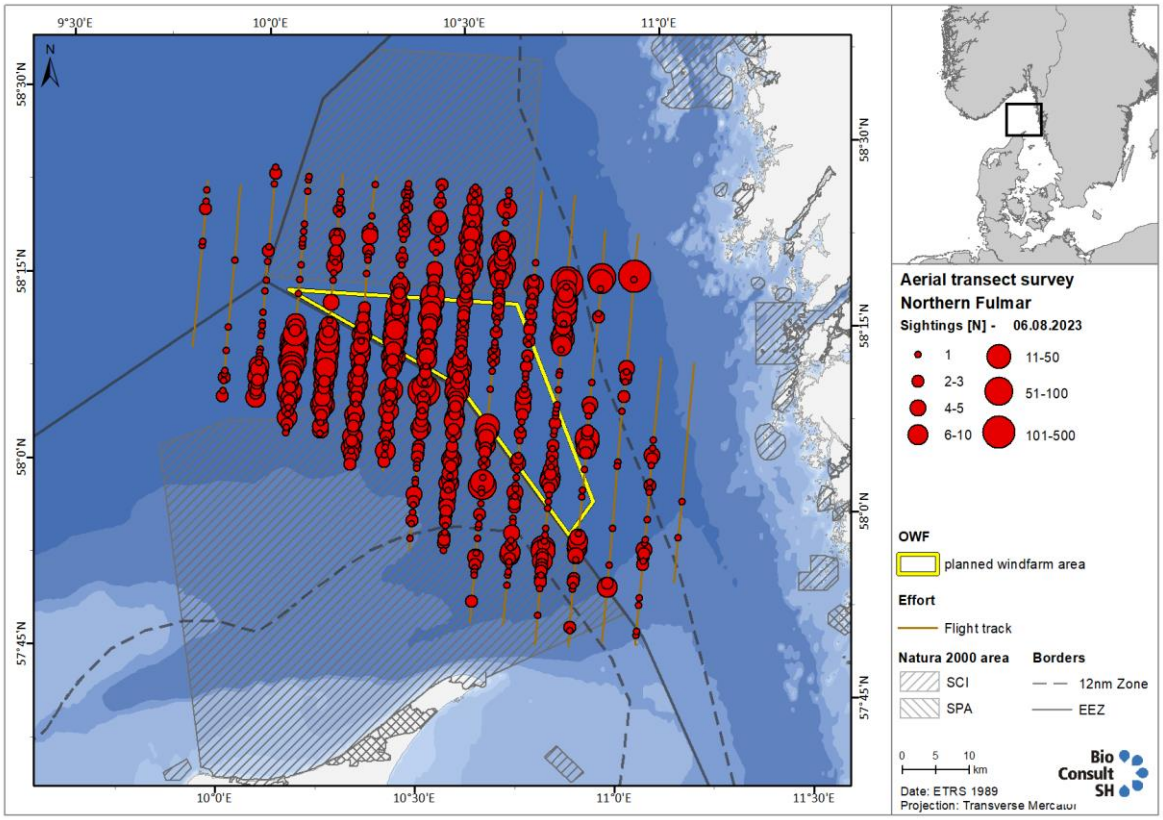
A.2 Species distribution maps of resting birds

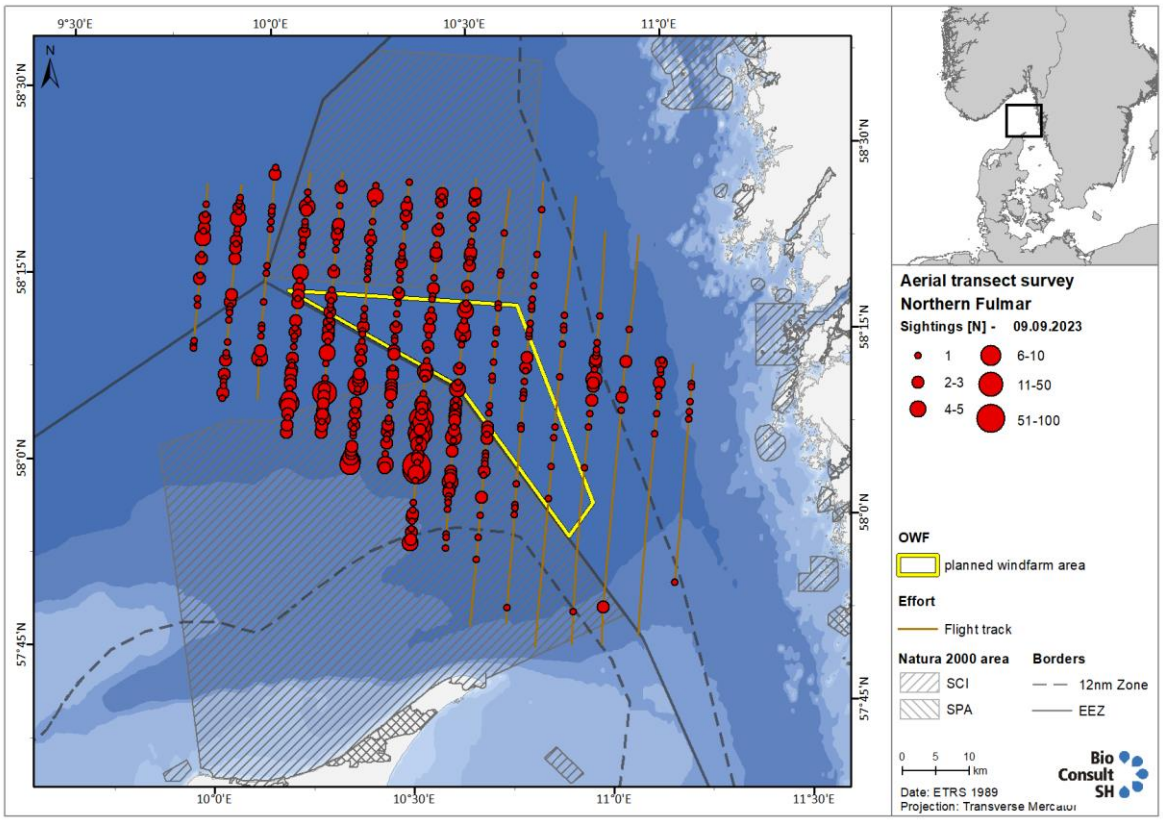
A.2.1 Red-throated Diver (*Gavia stellata)*

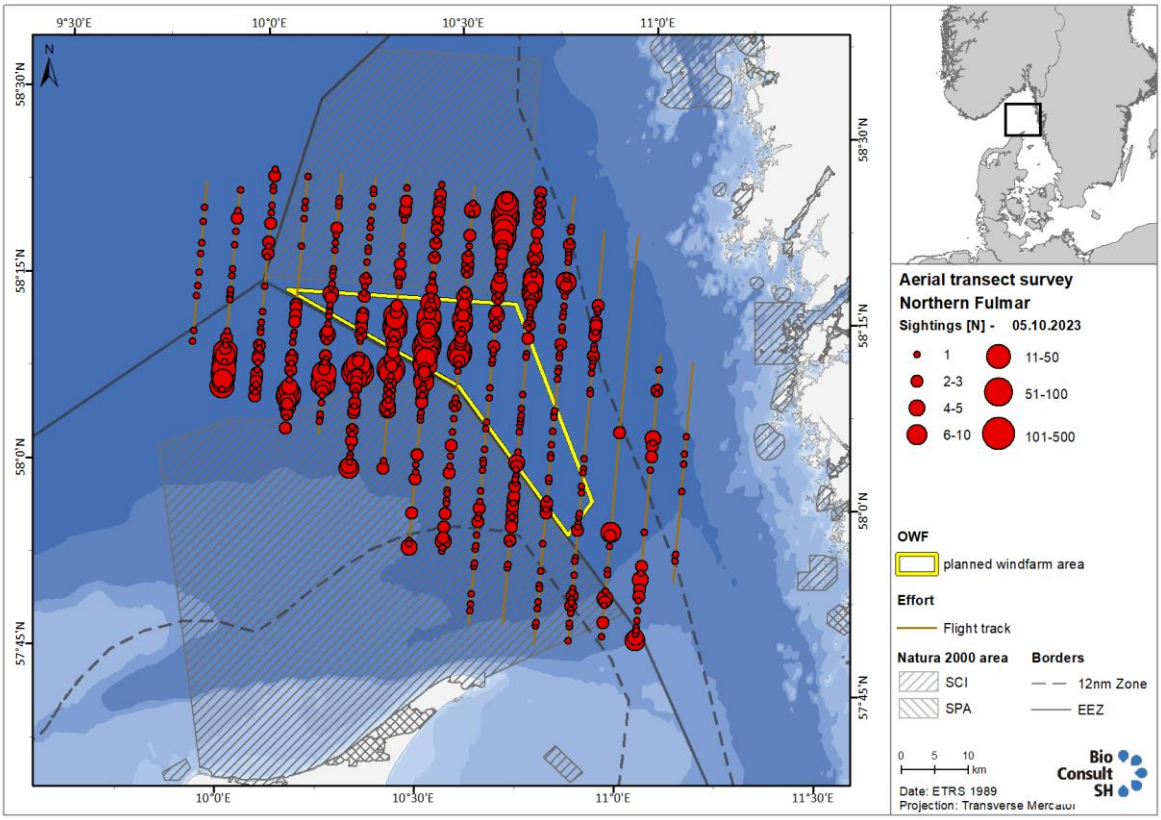




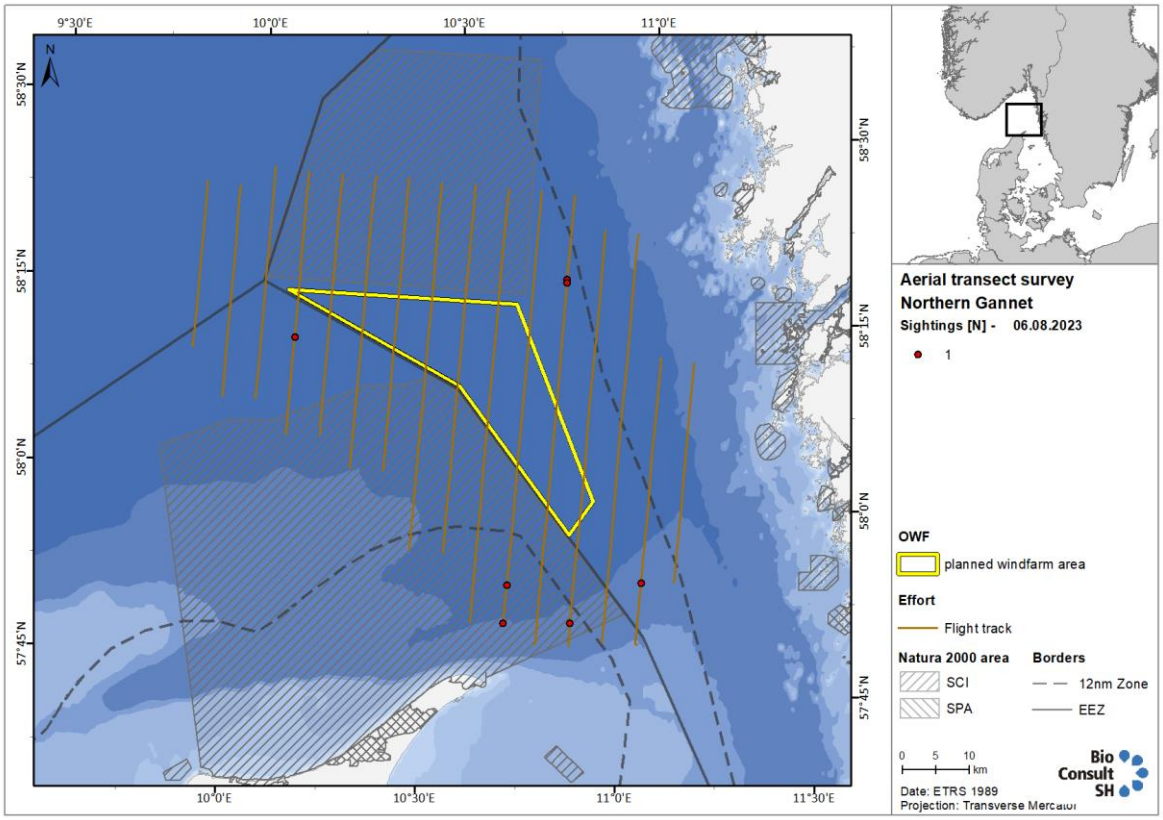
A.2.2 Northern Fulmar (*Fulmarus glacialis)*

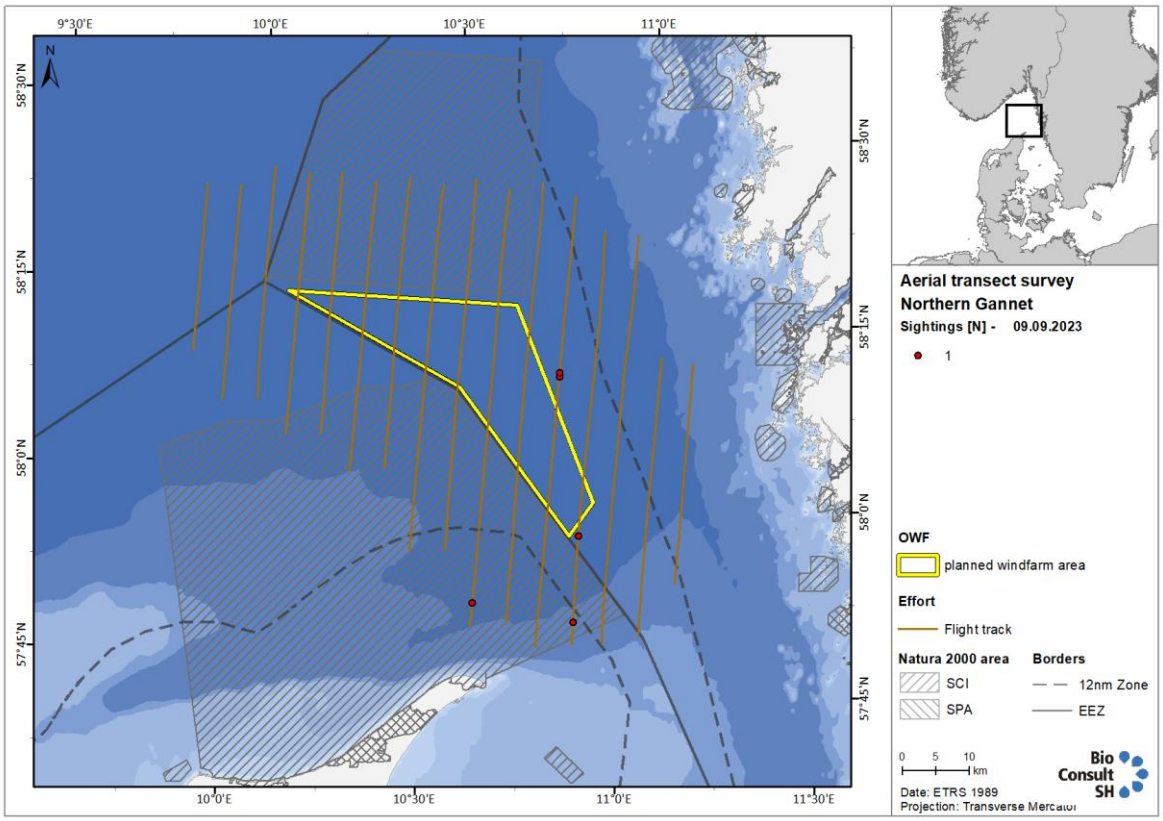


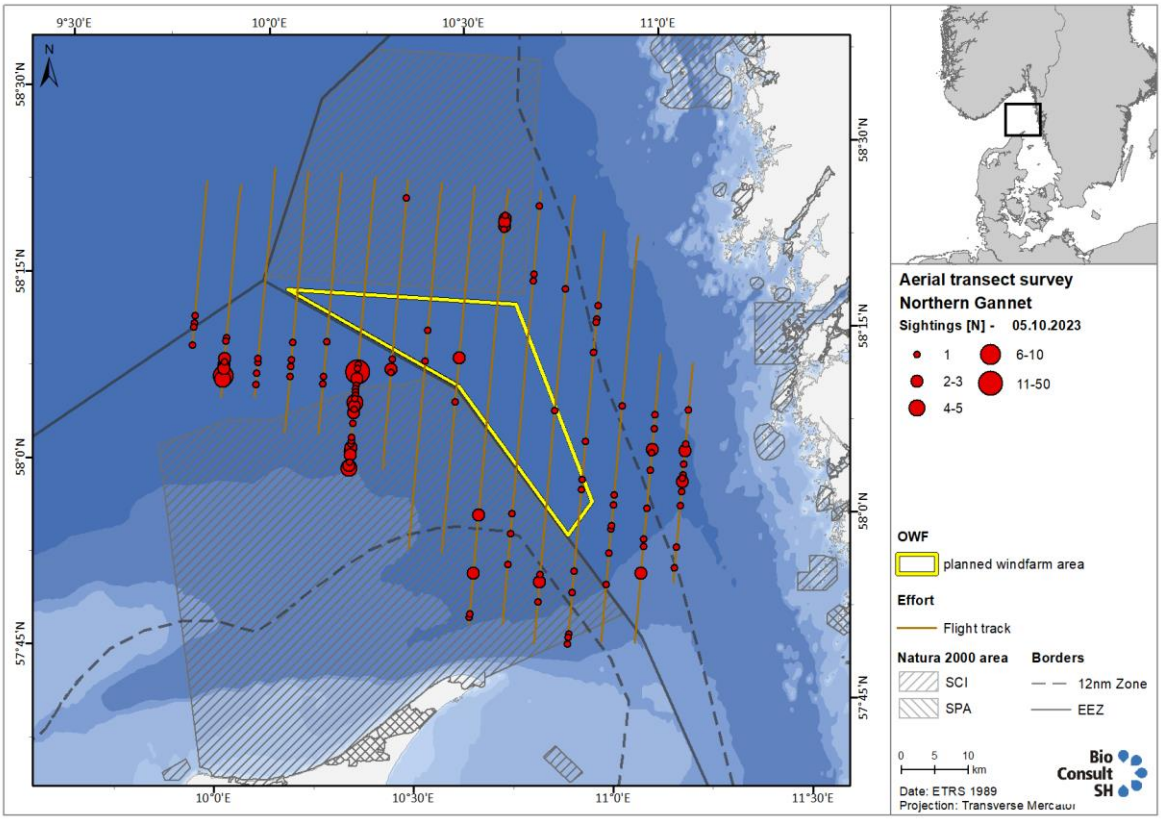



9°30'E
10°0'E
10°30'E
11°0'E
11°30'E
58°30'N
58°15'N
58°0'N
57°45'N
N
Aerial transect survey
Northern Fulmar
Sightings [N] - 05.10.2023
1
2-3
4-5
6-10
11-50
51-100
101-500
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Bio Consult SH
Date: ETRS 1989
Projection: Transverse Mercator

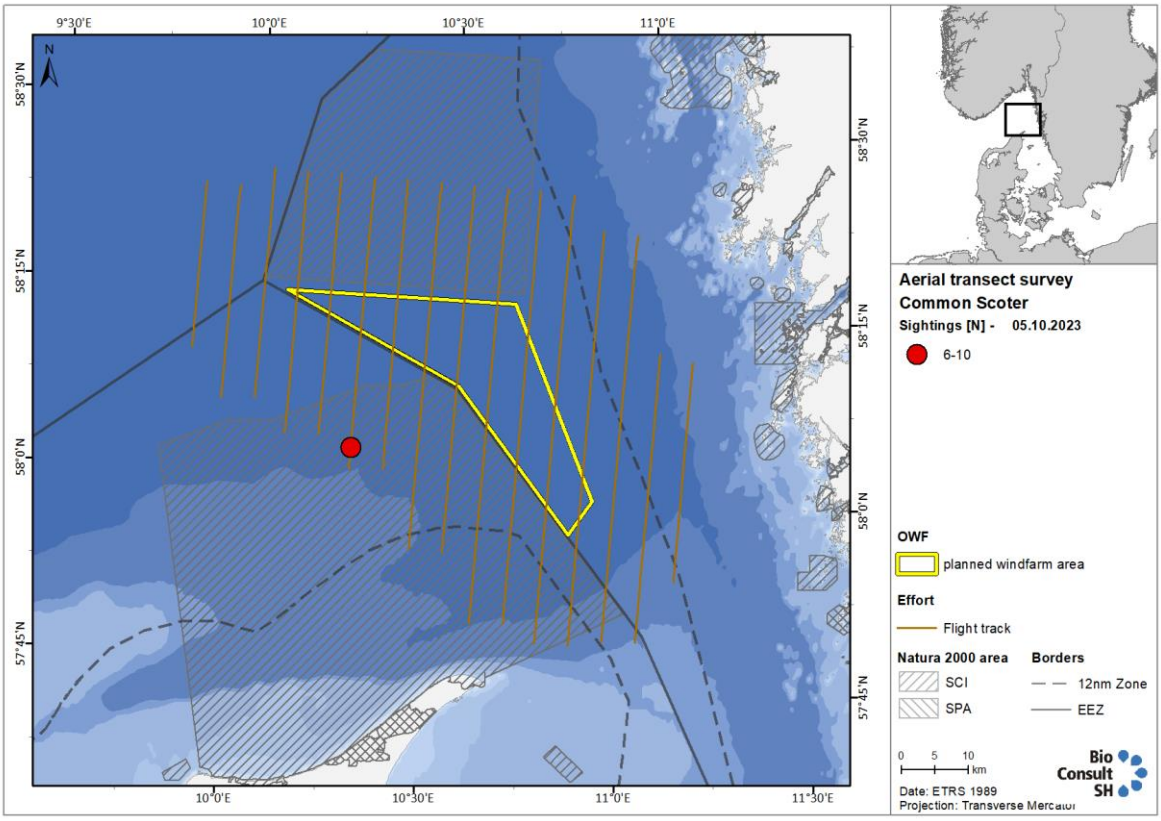
A.2.3 Northern Gannet (*Morus bassanus)*



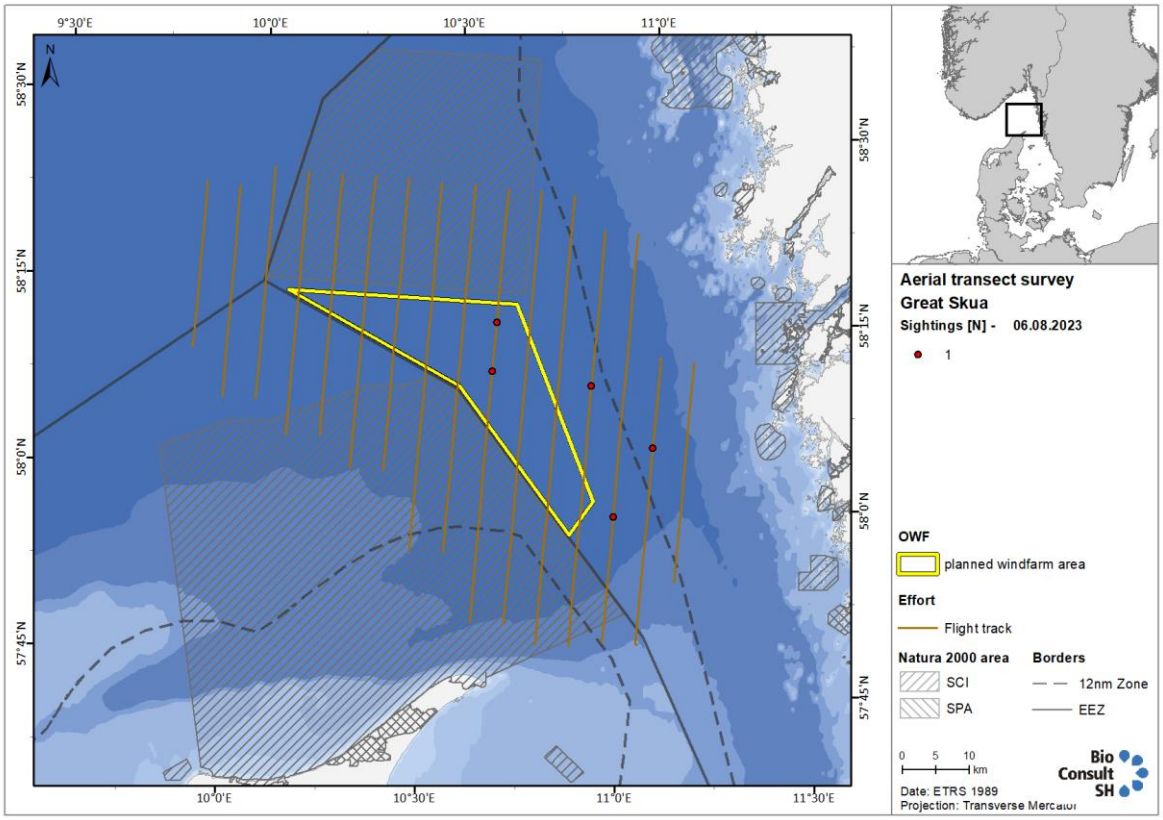


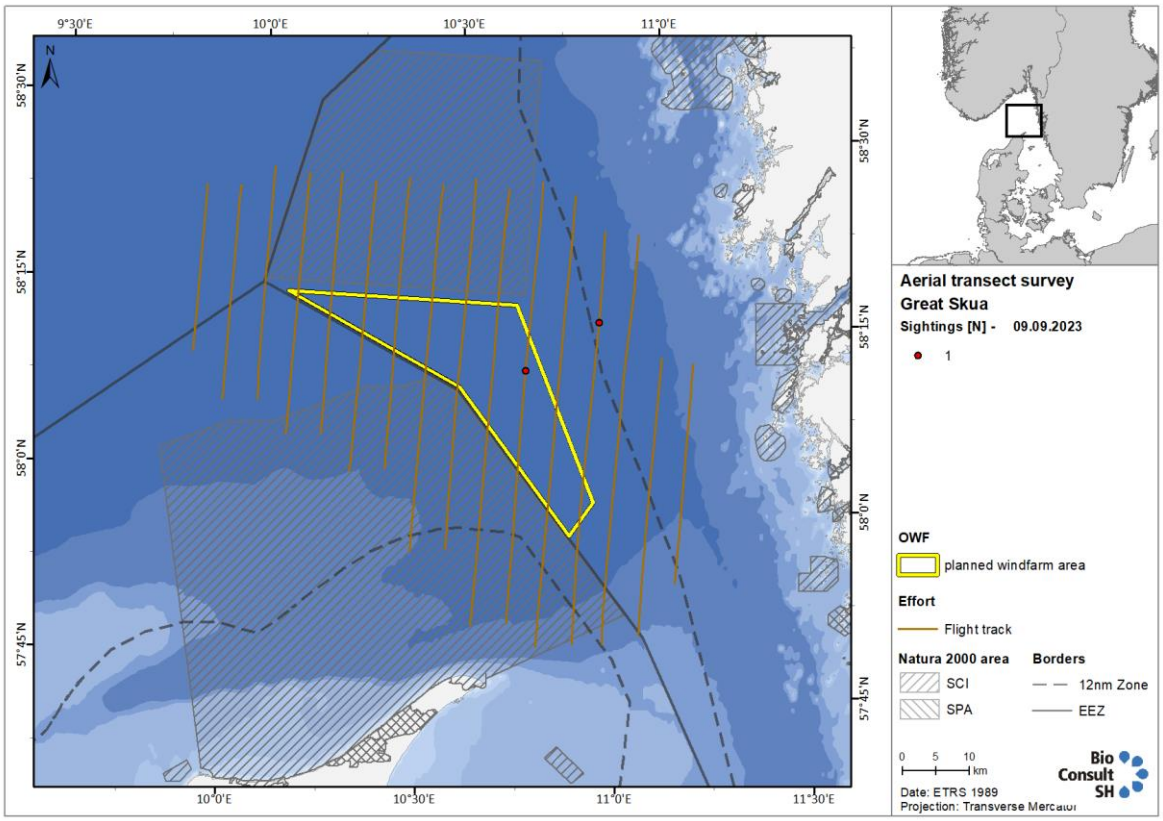


A.2.4 Common Scoter (*Somateria mollisima)*

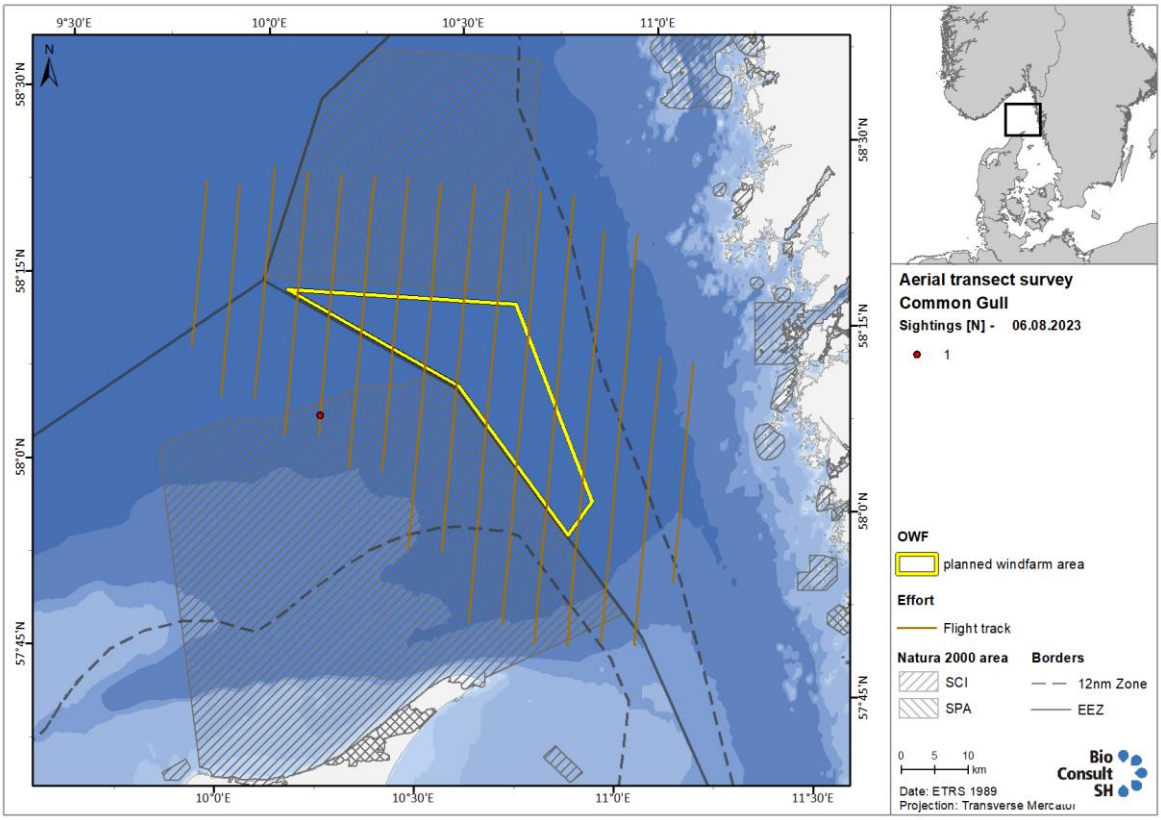


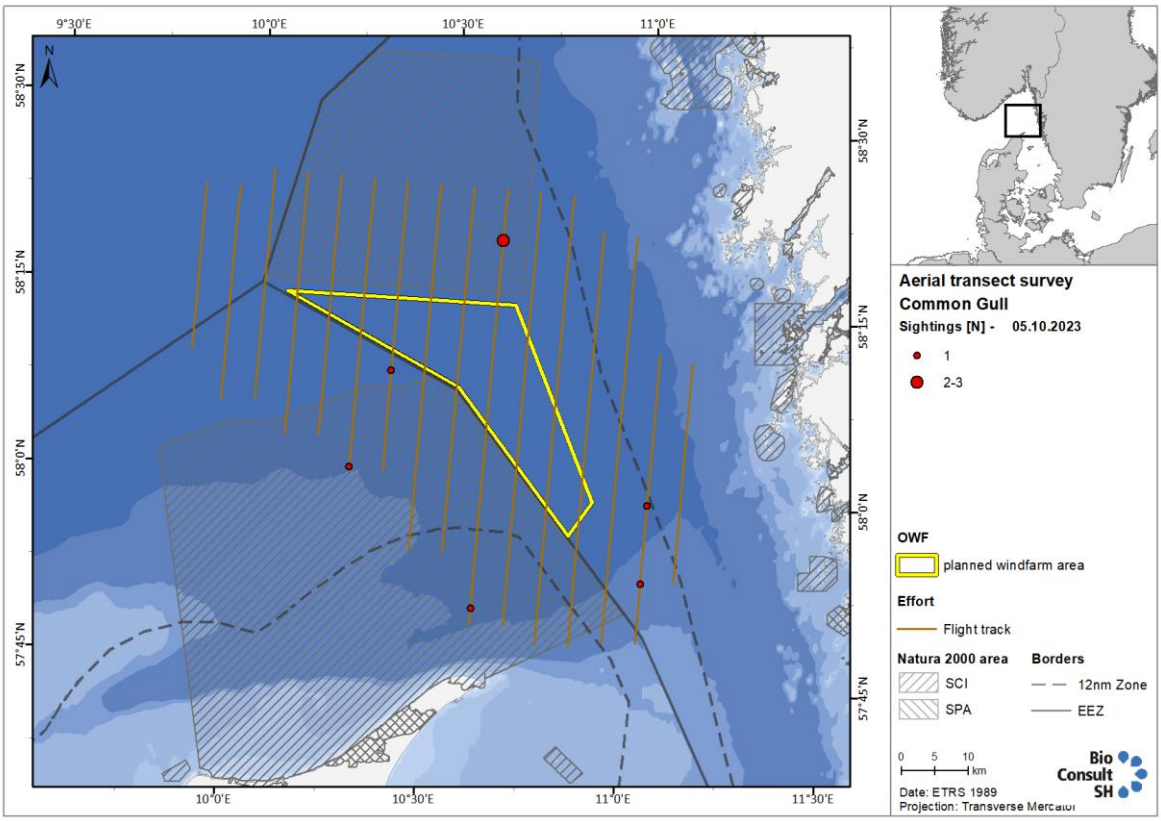
A.2.5 Great Skua (*Stercorarius skua)*



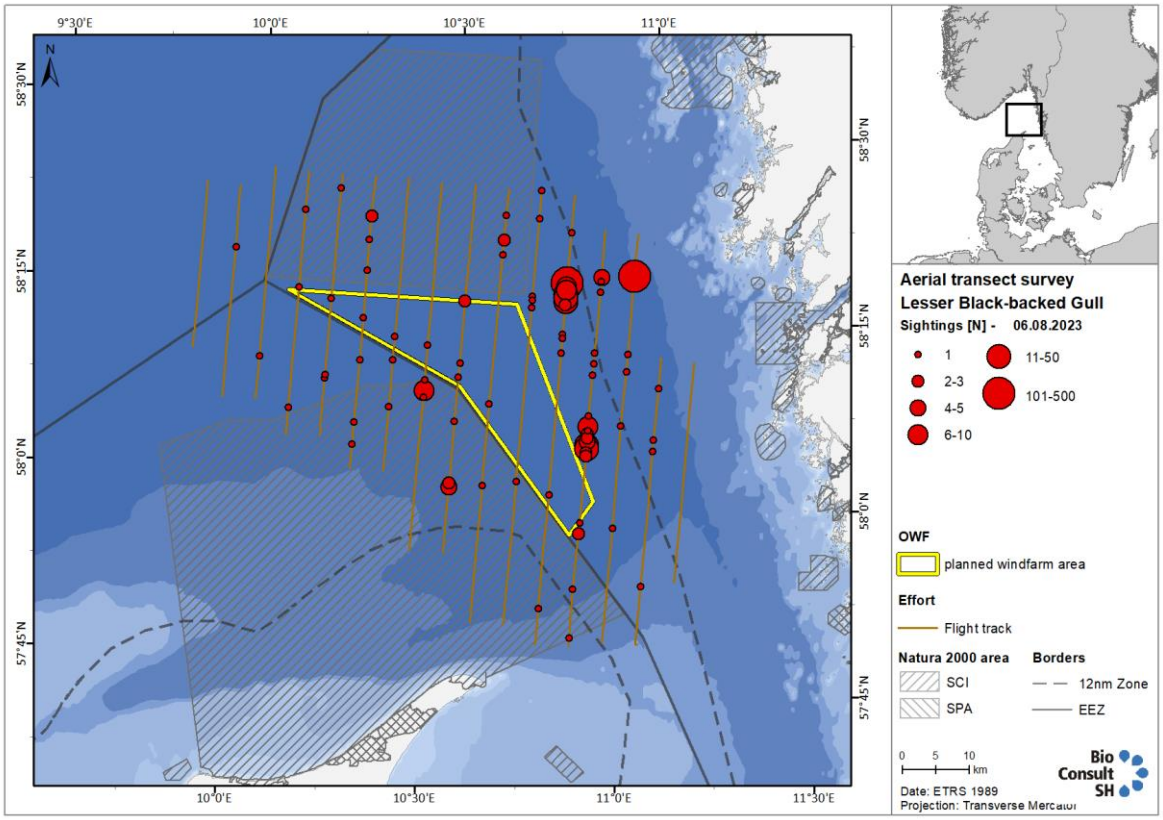


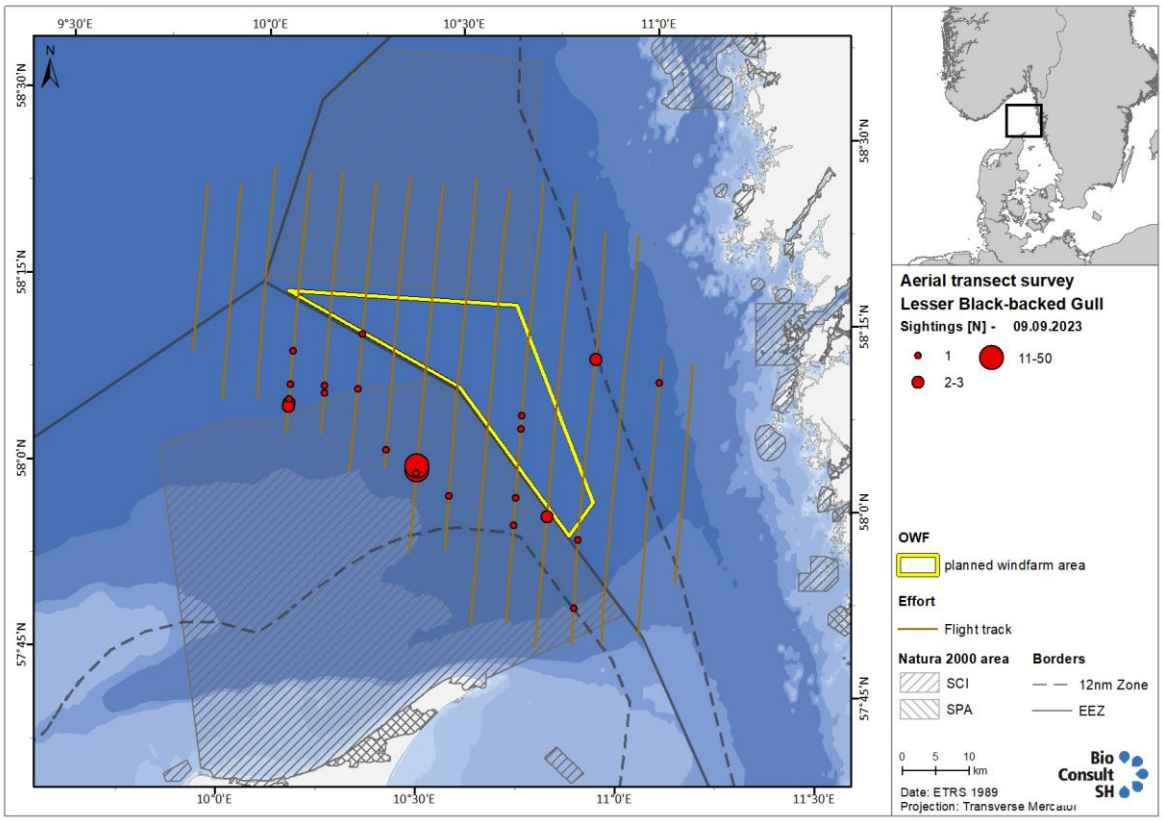
A.2.6 Common Gull (*Larus canus)*

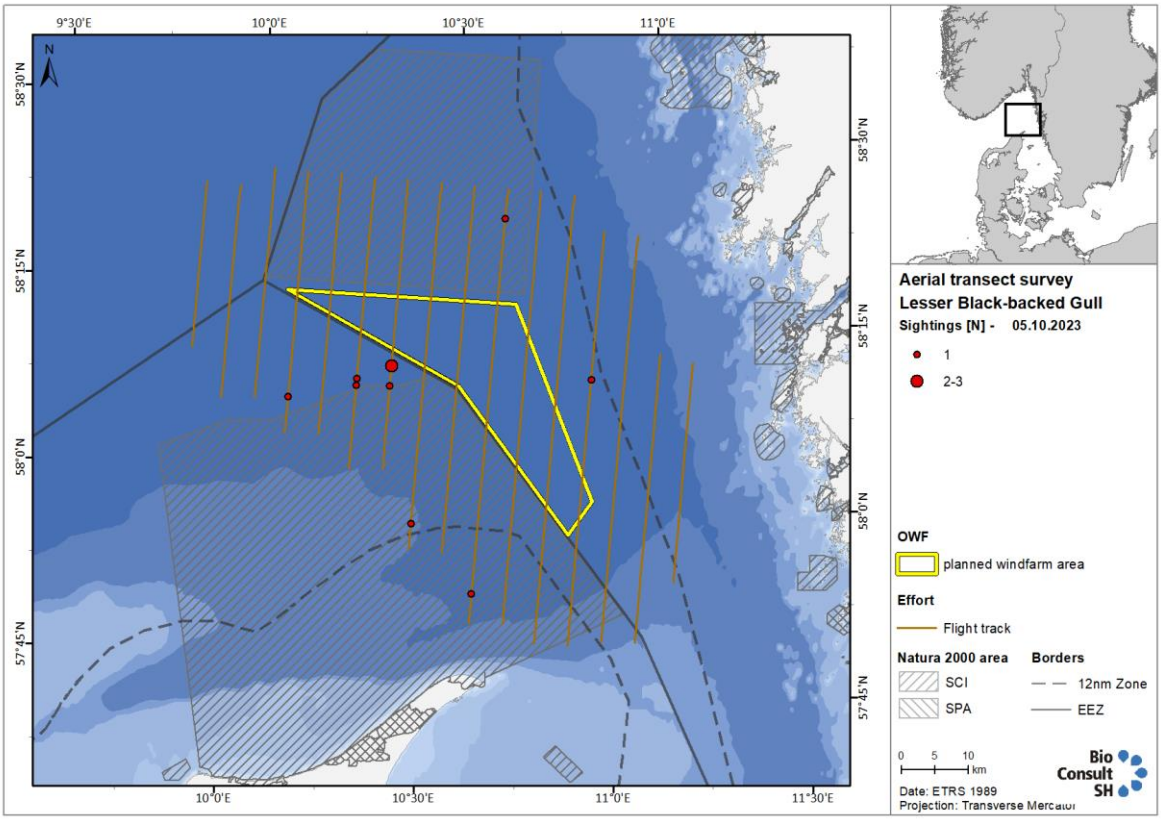




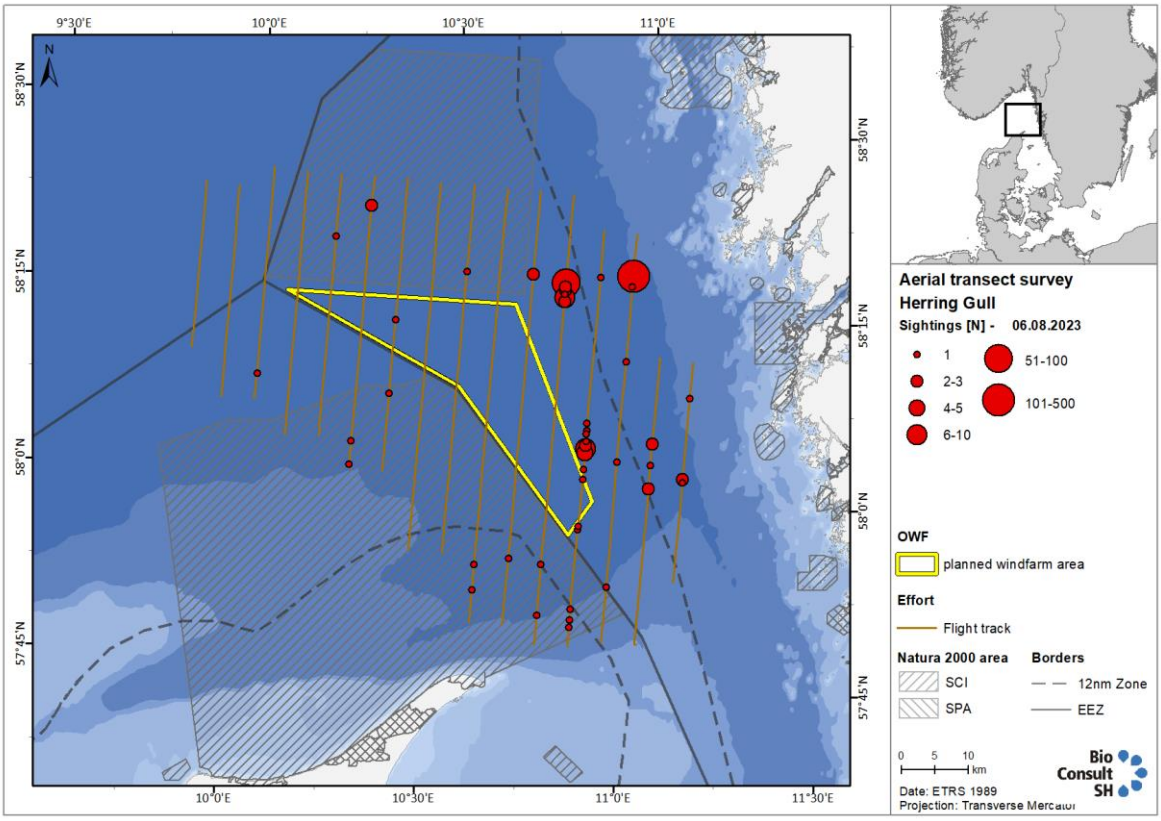
A.2.7 Lesser Black-backed Gull (*Larus fuscus*)

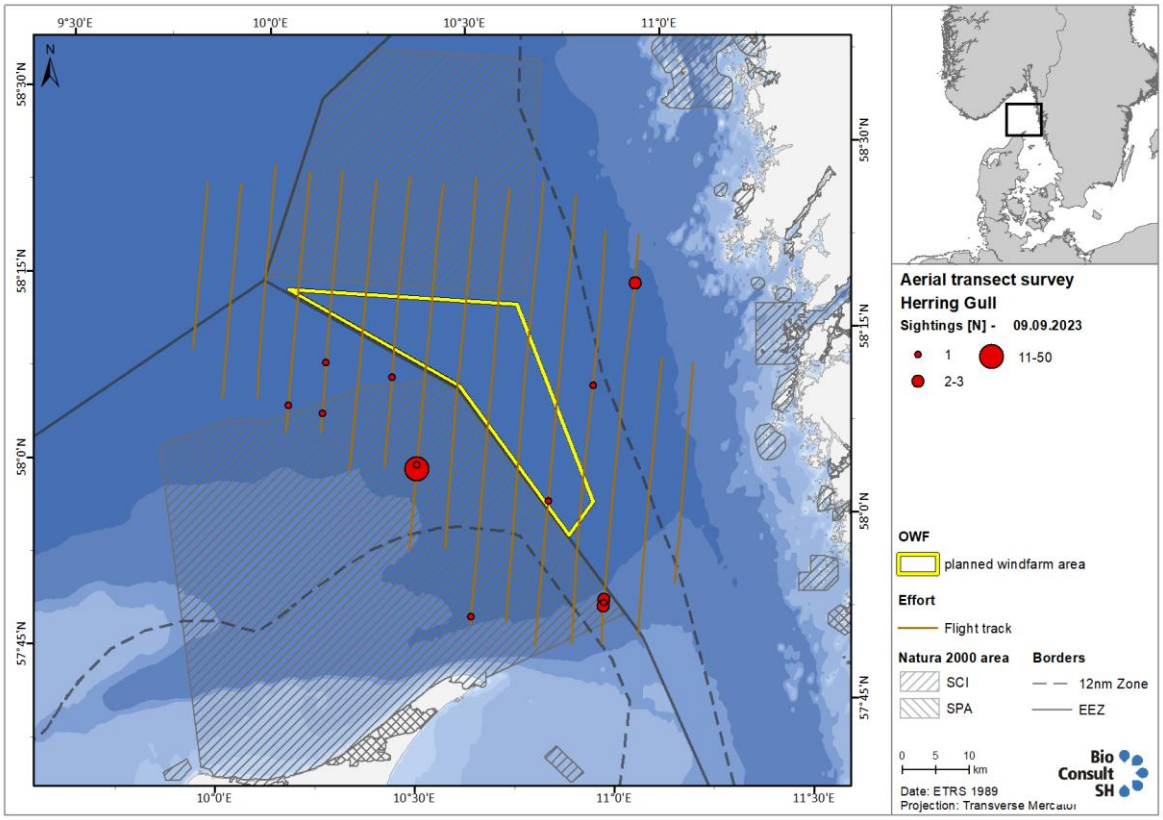


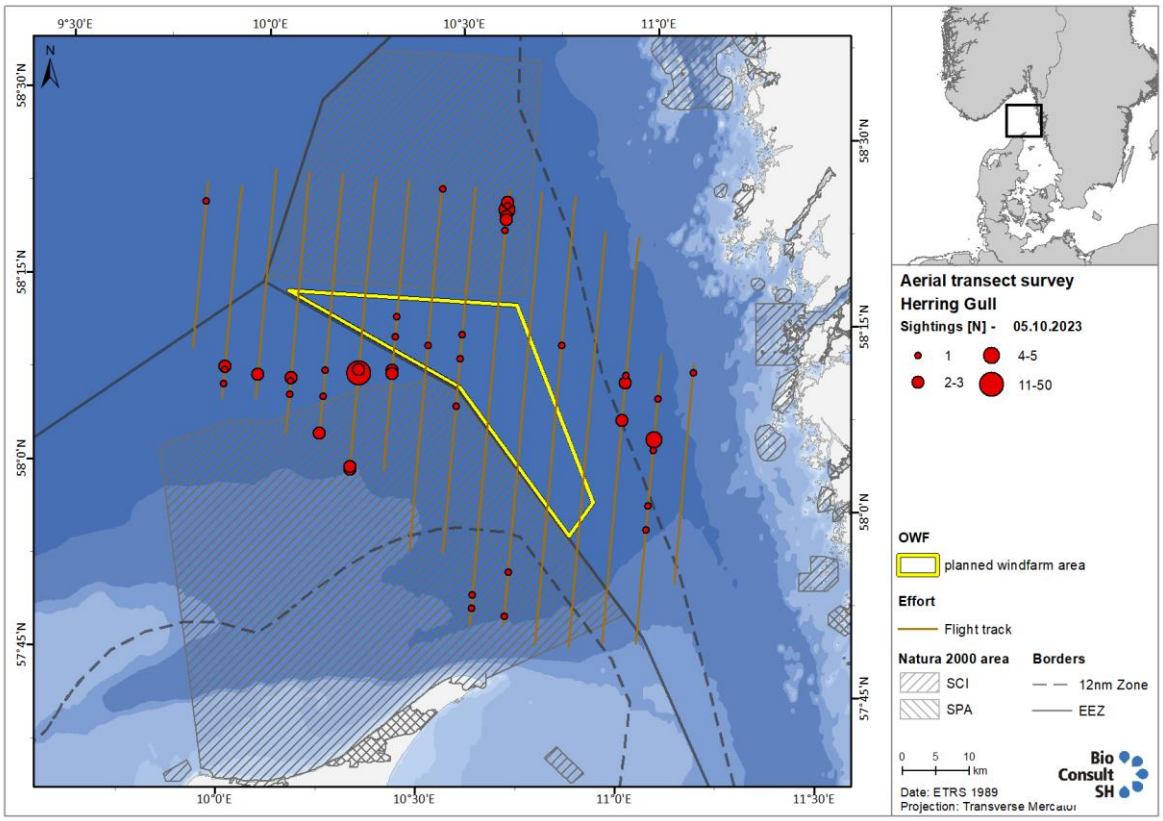




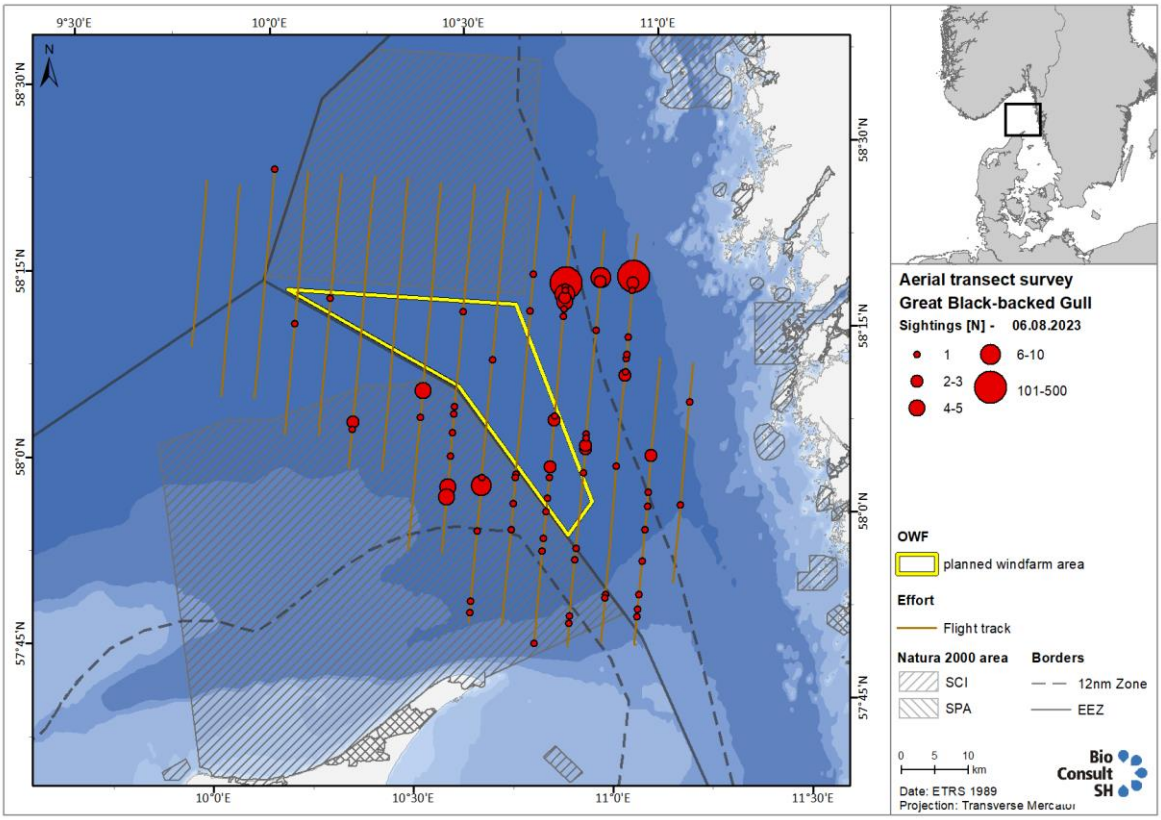
A.2.8 Herring Gull (*Larus argentatus*)

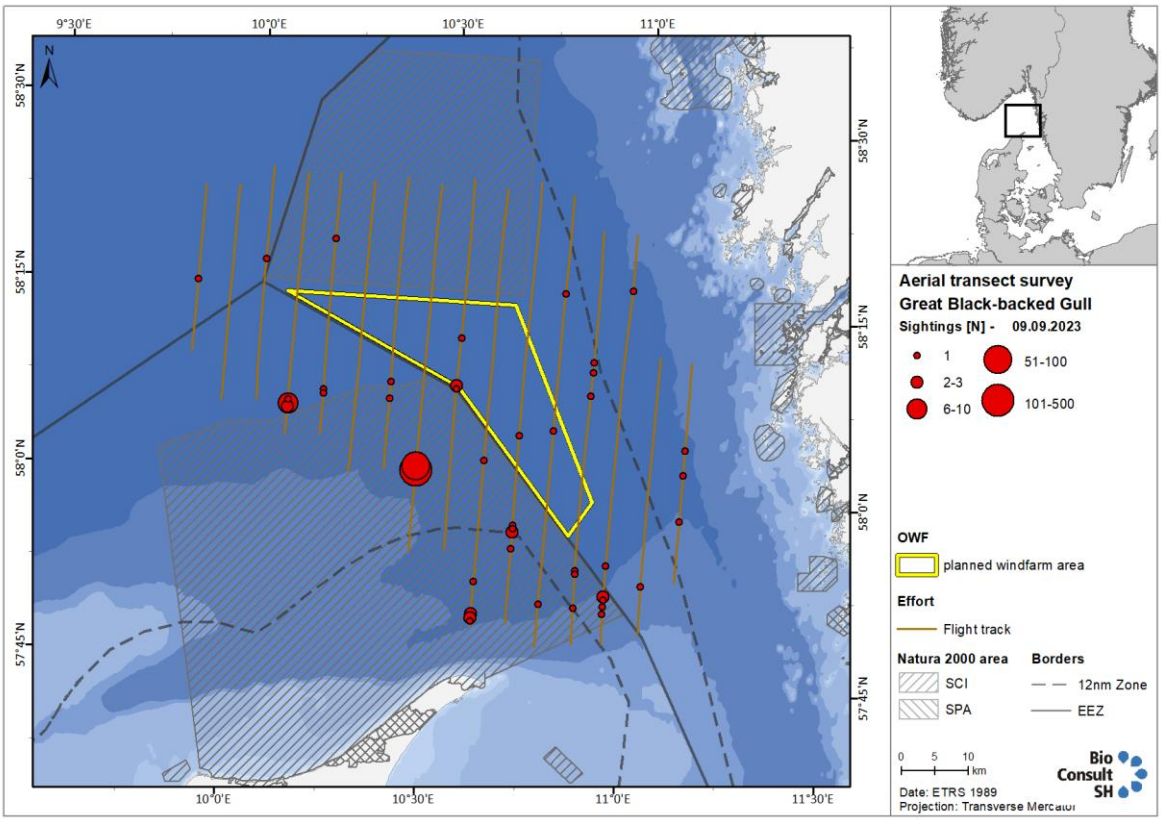


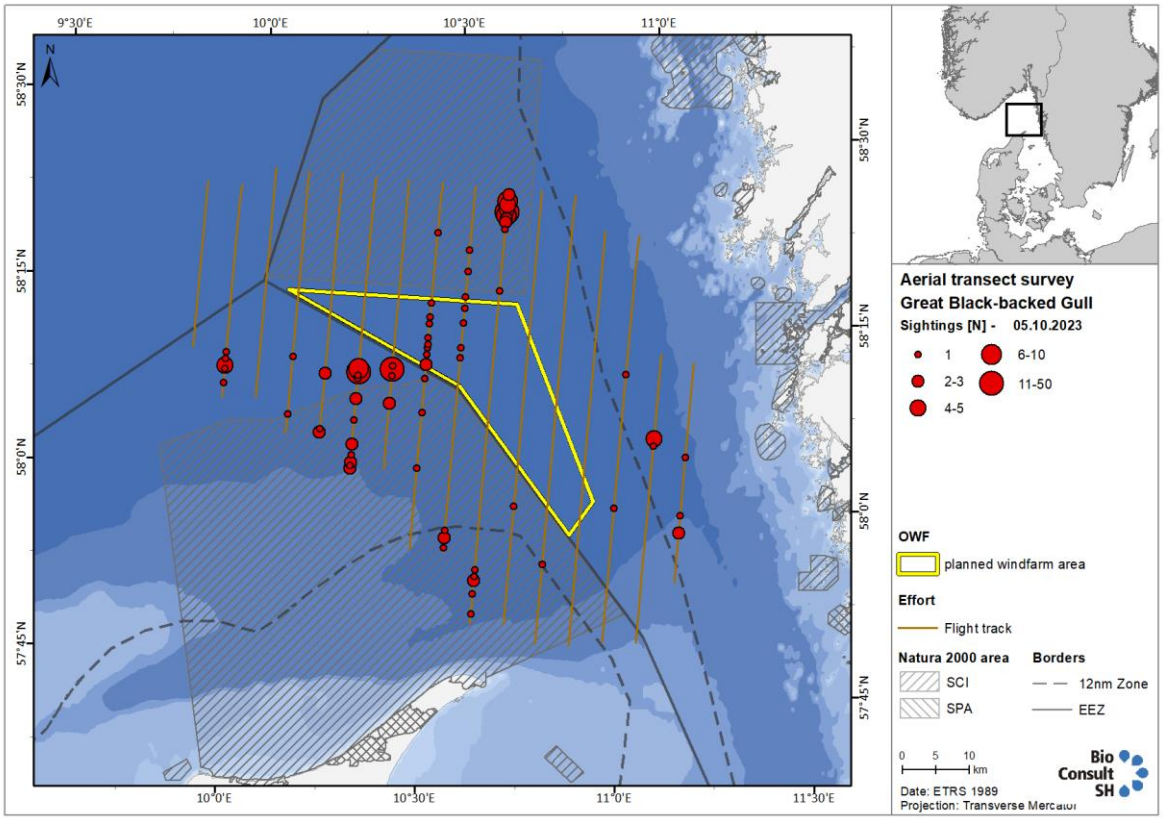

9°30'E
10°0'E
10°30'E
11°0'E
58°30'N
58°15'N
58°0'N
57°45'N
N
10°0'E
10°30'E
11°0'E
11°30'E
Aerial transect survey
Herring Gull
Sightings [N] - 09.09.2023
1
2-3
11-50
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH


9°30'E
10°0'E
10°30'E
11°0'E
58°30'N
58°15'N
58°0'N
57°45'N
N
10°0'E
10°30'E
11°0'E
11°30'E
Aerial transect survey
Herring Gull
Sightings [N] - 05.10.2023
1
2-3
4-5
11-50
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH

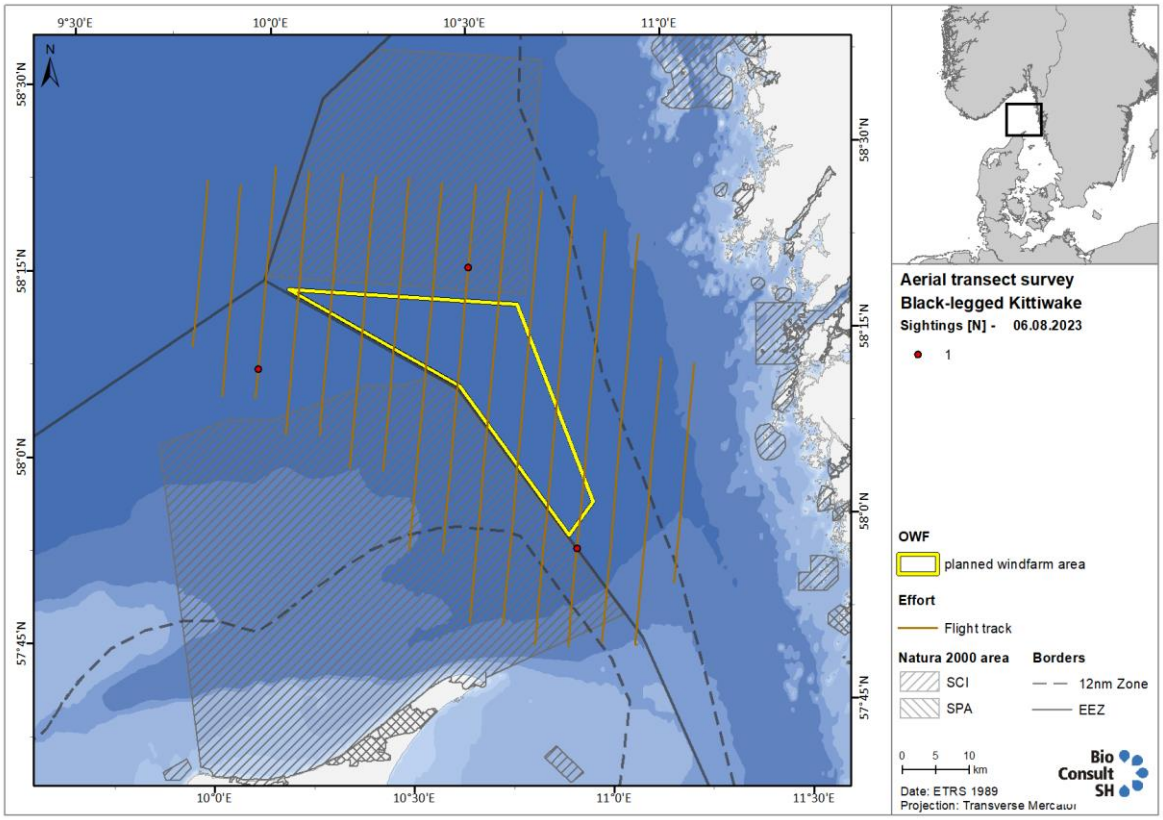
A.2.9 Great Black-backed Gull (*Larus marinus*)

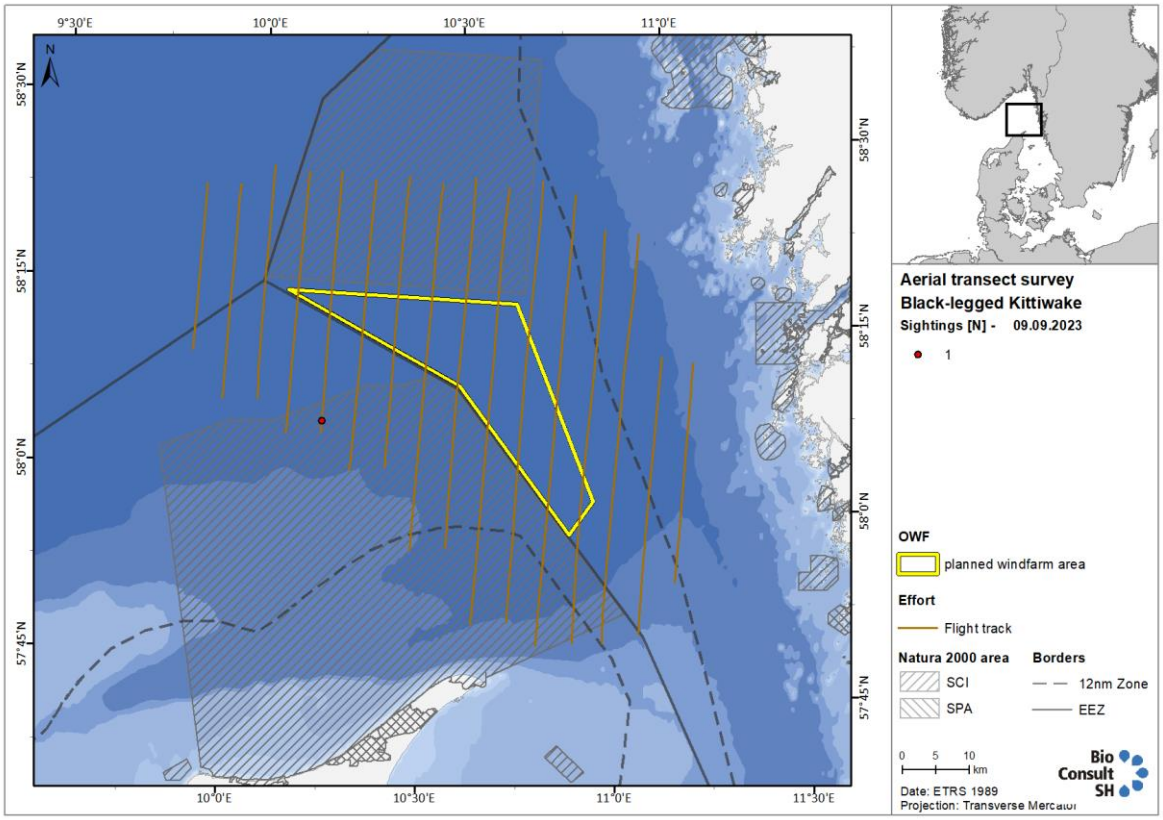


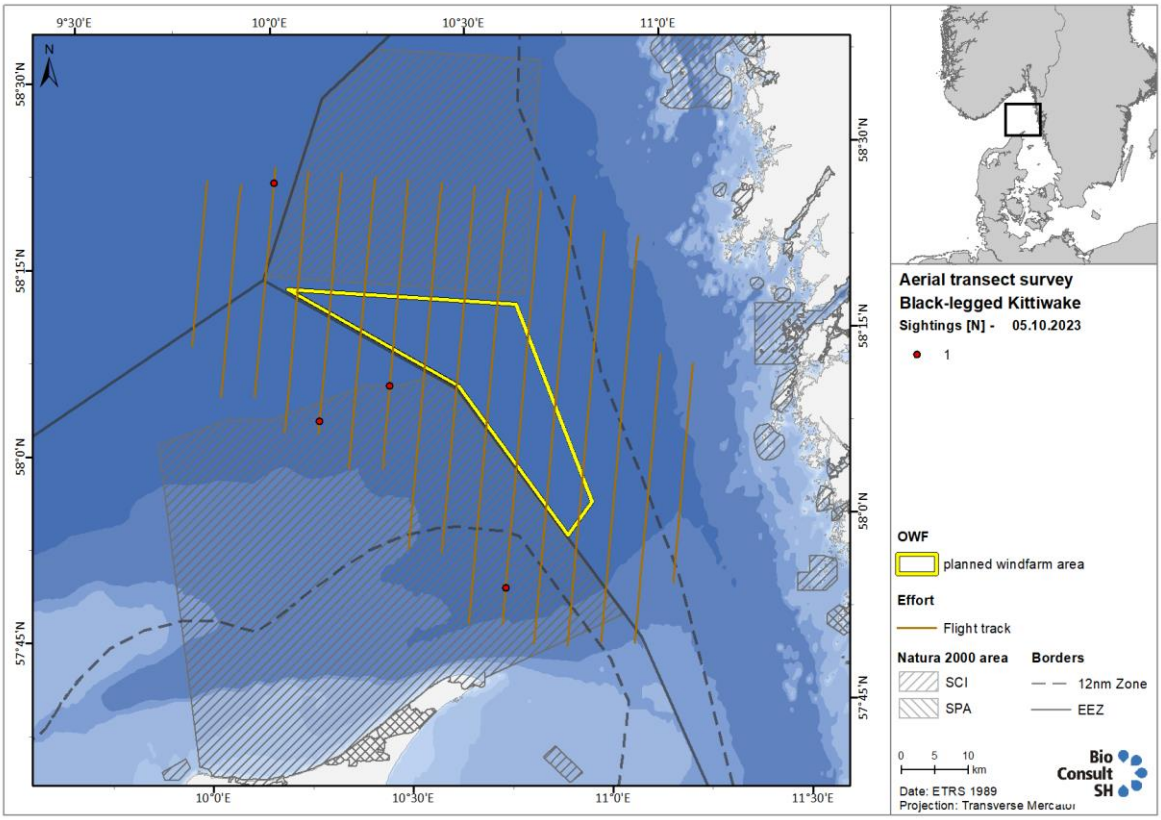



9°30'E
10°0'E
10°30'E
11°0'E
58°30'N
58°15'N
58°0'N
57°45'N
N
Aerial transect survey
Great Black-backed Gull
Sightings [N] - 05.10.2023
1
2-3
4-5
6-10
11-50
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH

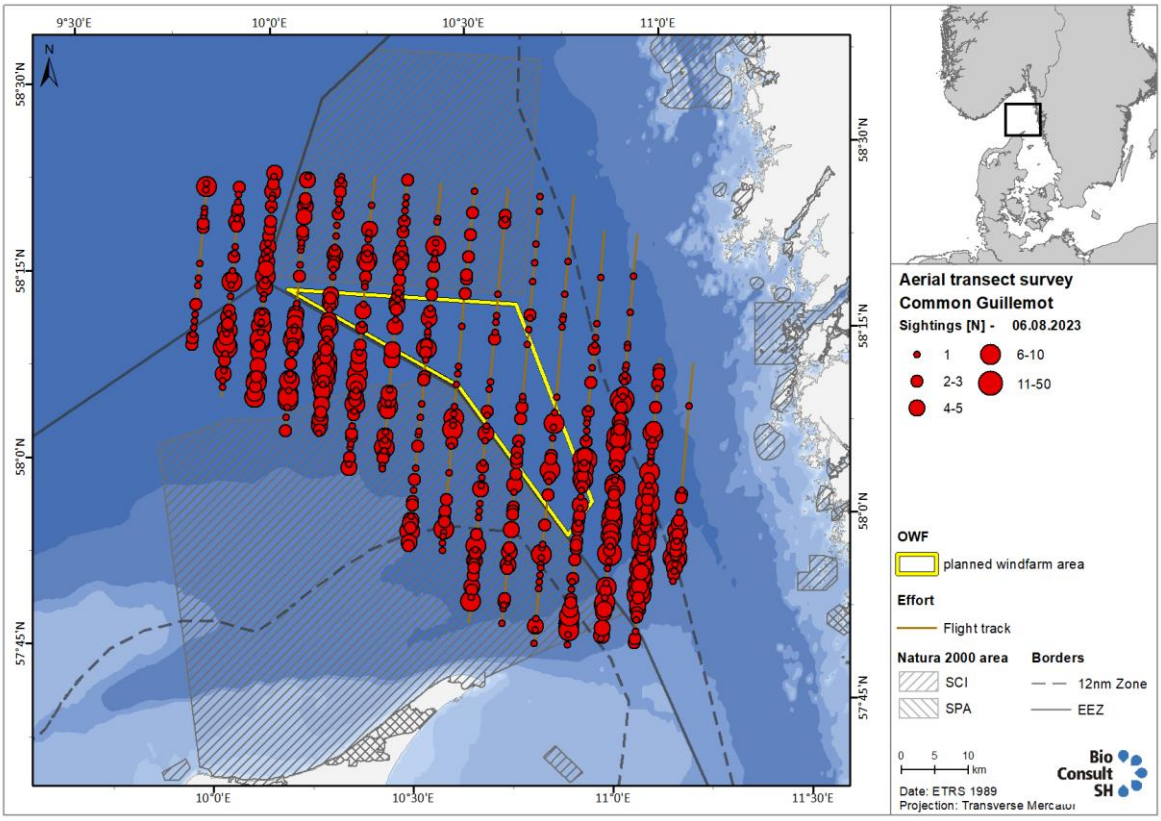
A.2.10 Black-legged Kittiwake (*Rissa tridactyla*)

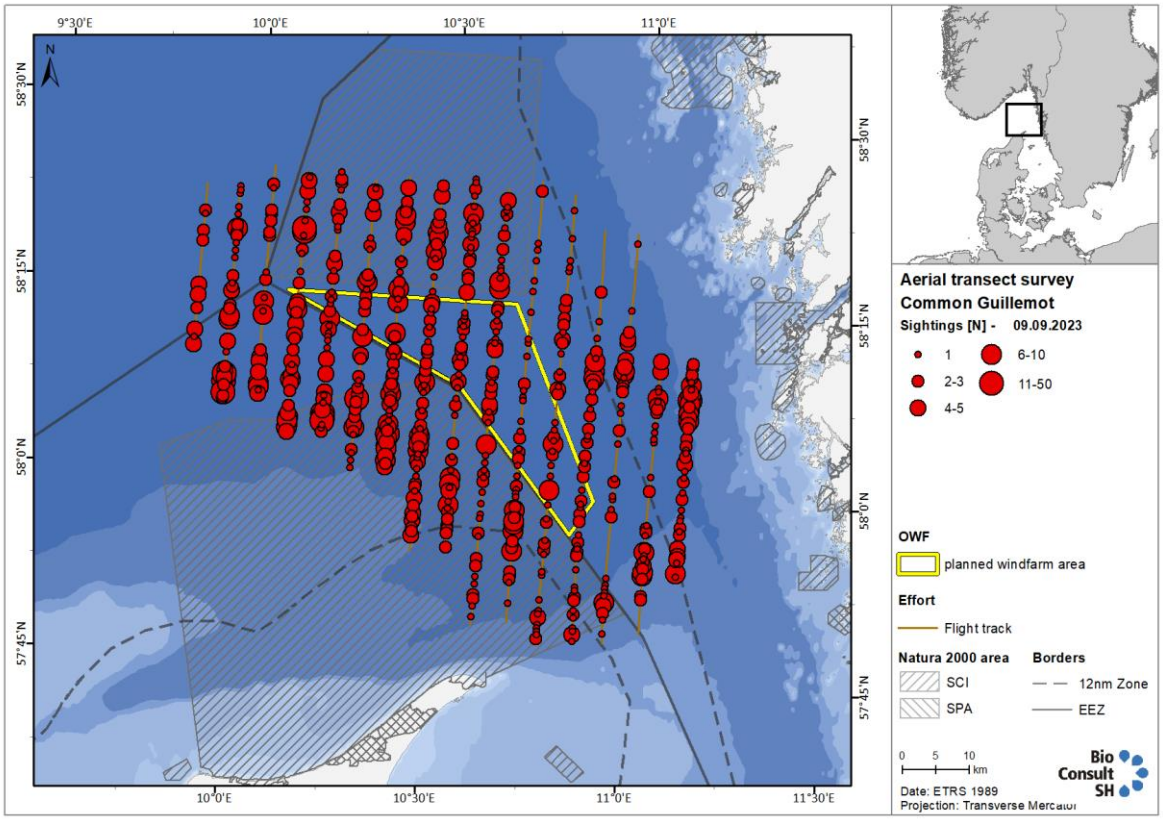

9°30'E
10°0'E
10°30'E
11°0'E
11°30'E
58°30'N
58°15'N
58°0'N
57°45'N
N
Aerial transect survey
Black-legged Kittiwake
Sightings [N] - 06.08.2023
1
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH

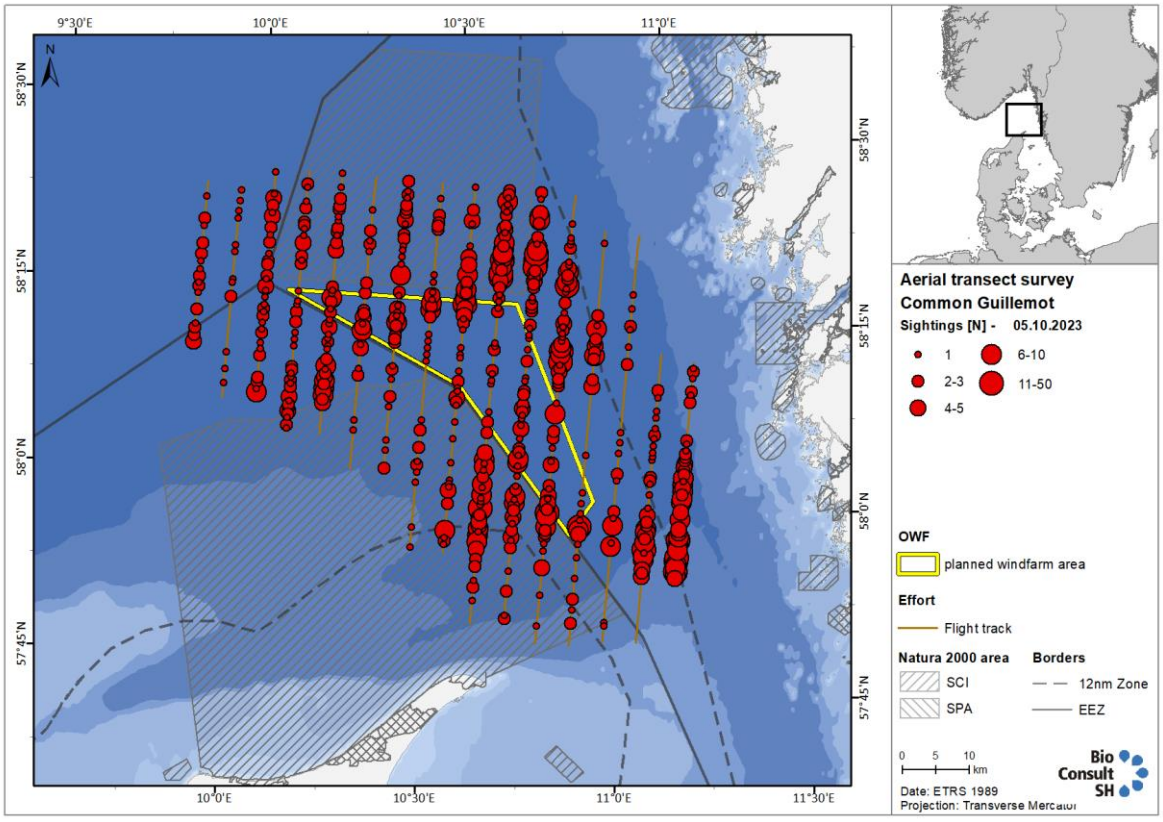

9°30'E
10°0'E
10°30'E
11°0'E
11°30'E
58°30'N
58°15'N
58°0'N
57°45'N
N
Aerial transect survey
Black-legged Kittiwake
Sightings [N] - 09.09.2023
1
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH



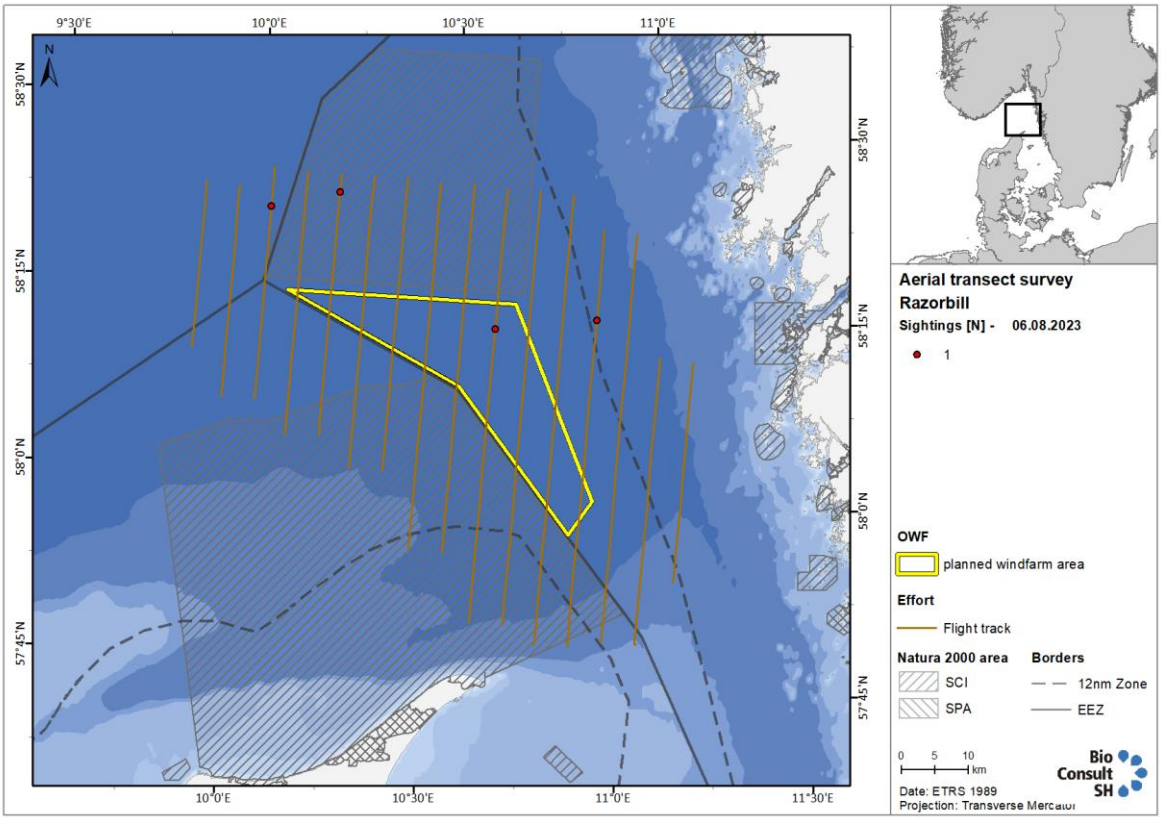
A.2.11 Common Guillemot (*Uria aalge*)

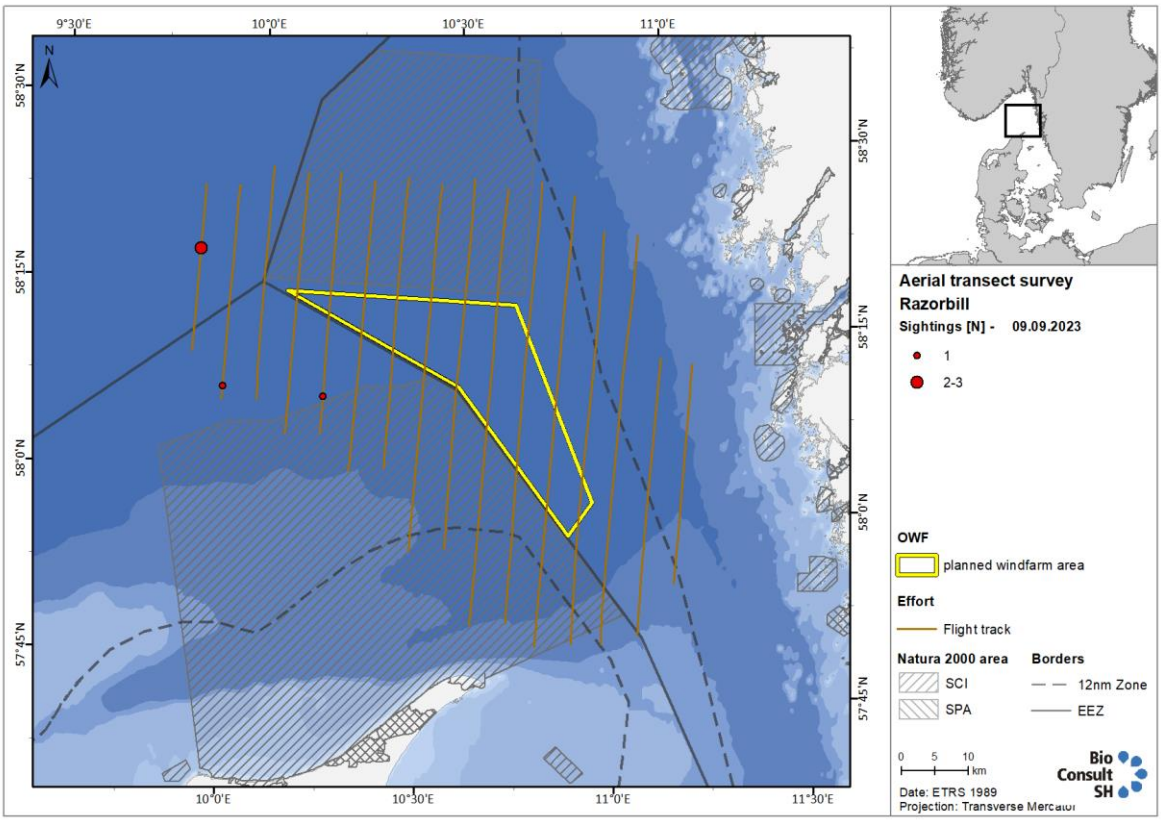


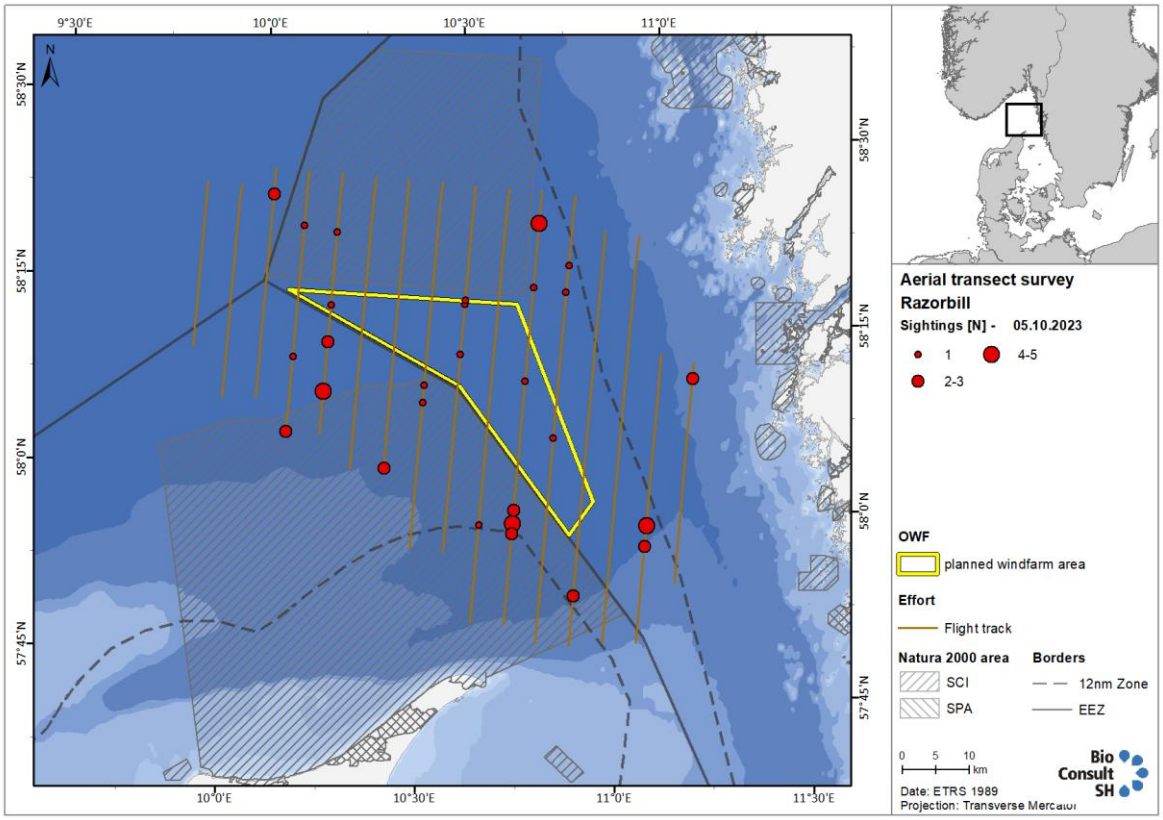

9°30'E
10°0'E
10°30'E
11°0'E
58°30'N
58°15'N
58°0'N
57°45'N
N
10°0'E
10°30'E
11°0'E
11°30'E
Aerial transect survey
Common Guillemot
Sightings [N] - 09.09.2023
1
2-3
4-5
6-10
11-50
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH


9°30'E
10°0'E
10°30'E
11°0'E
58°30'N
58°15'N
58°0'N
57°45'N
N
10°0'E
10°30'E
11°0'E
11°30'E
Aerial transect survey
Common Guillemot
Sightings [N] - 05.10.2023
1
2-3
4-5
6-10
11-50
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH

A.2.12 Razorbill (*Alca torda*)

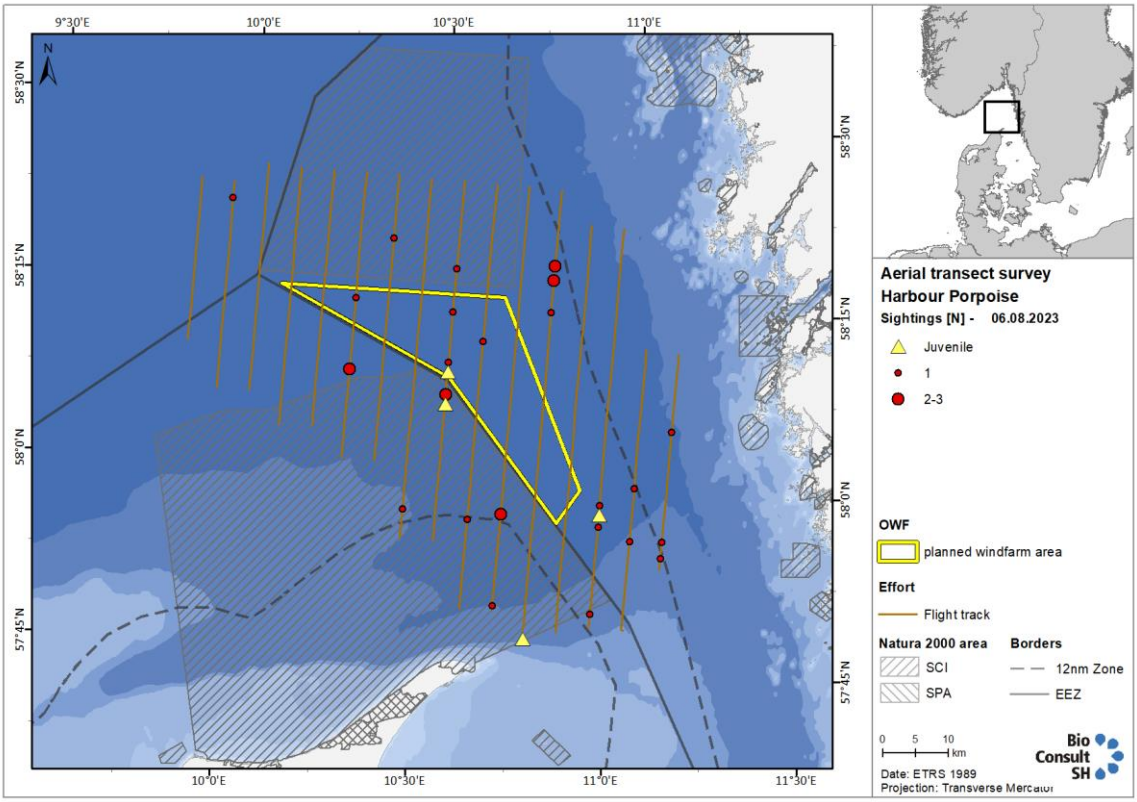


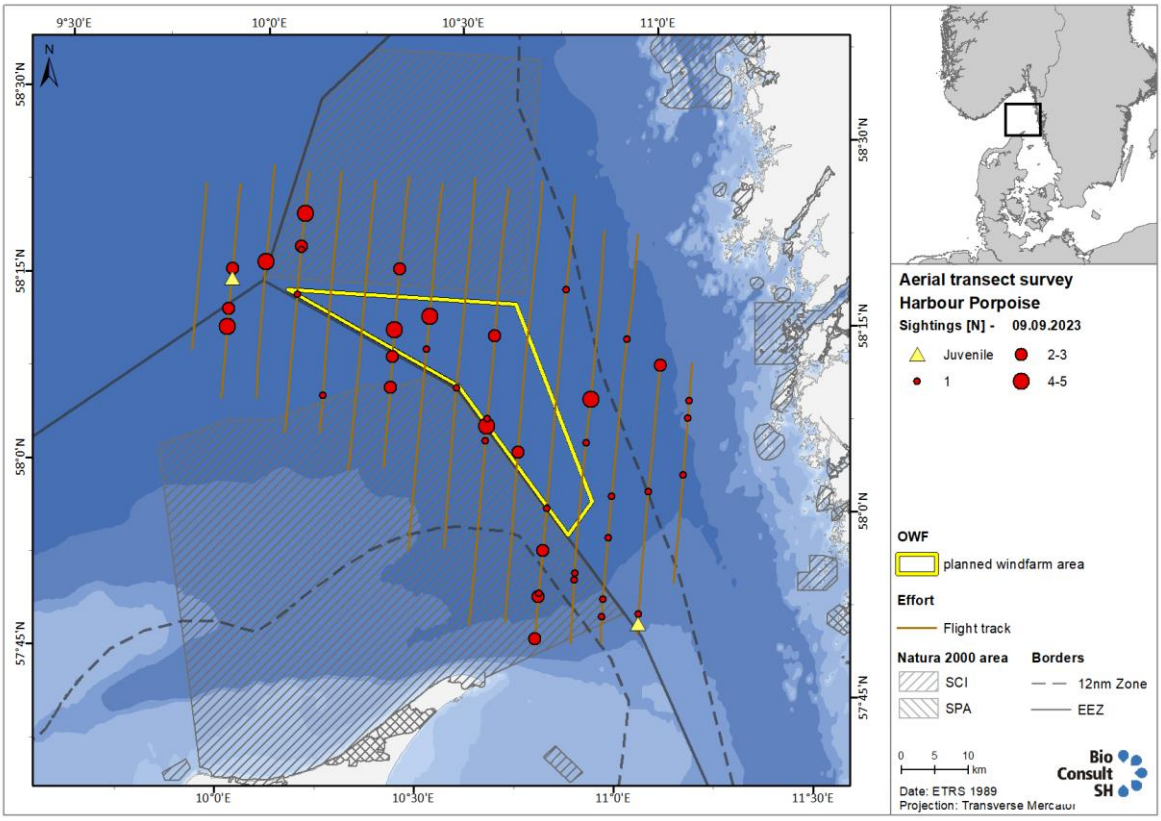


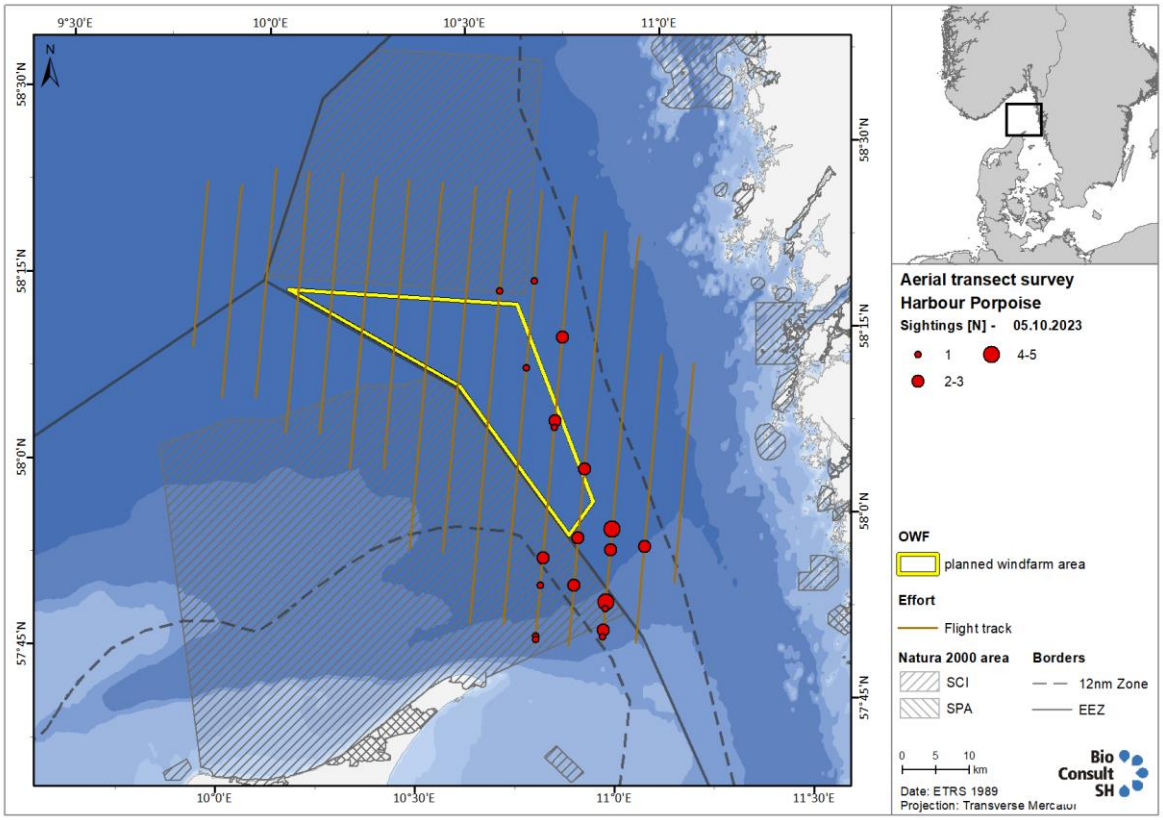

9°30'E
10°0'E
10°30'E
11°0'E
58°30'N
58°15'N
58°0'N
57°45'N
N
Aerial transect survey
Razorbill
Sightings [N] - 05.10.2023
1
2-3
4-5
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH

A.3 Species distribution maps of marine mammals

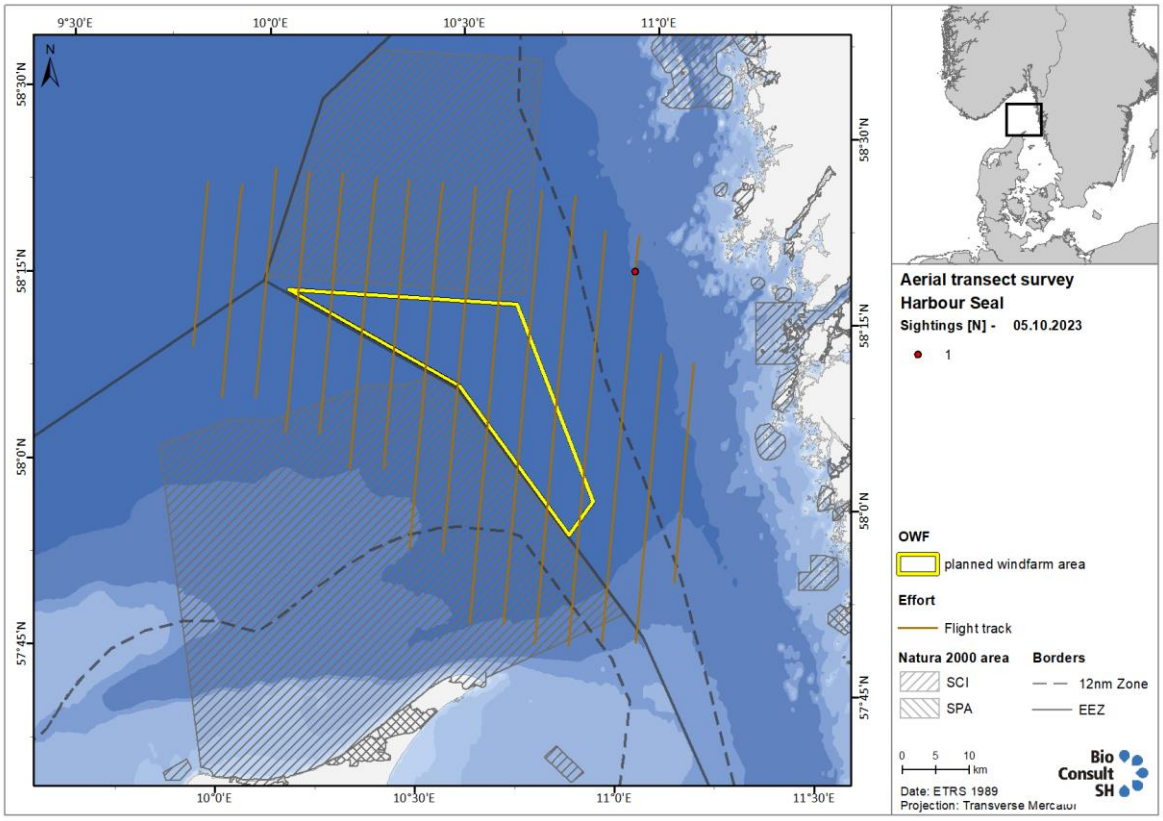
A.3.1 Harbour porpoise (*Phocoena phocoena)*



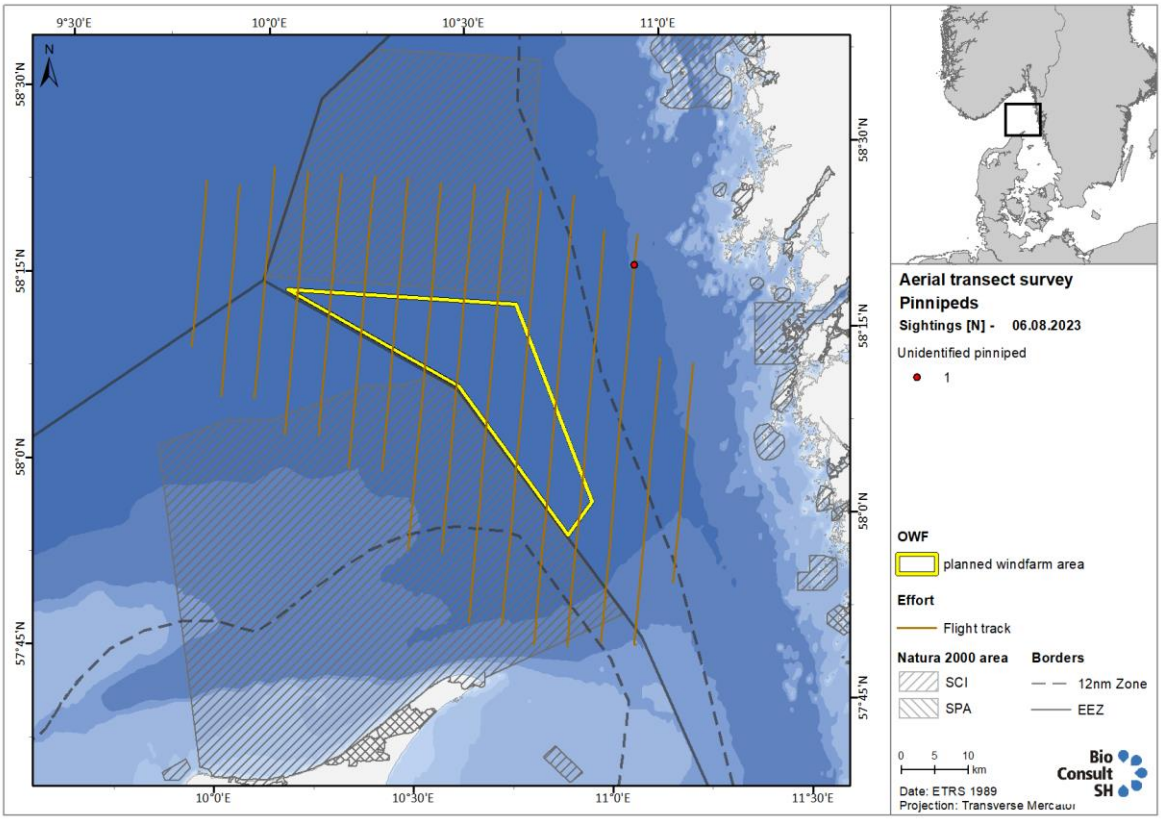


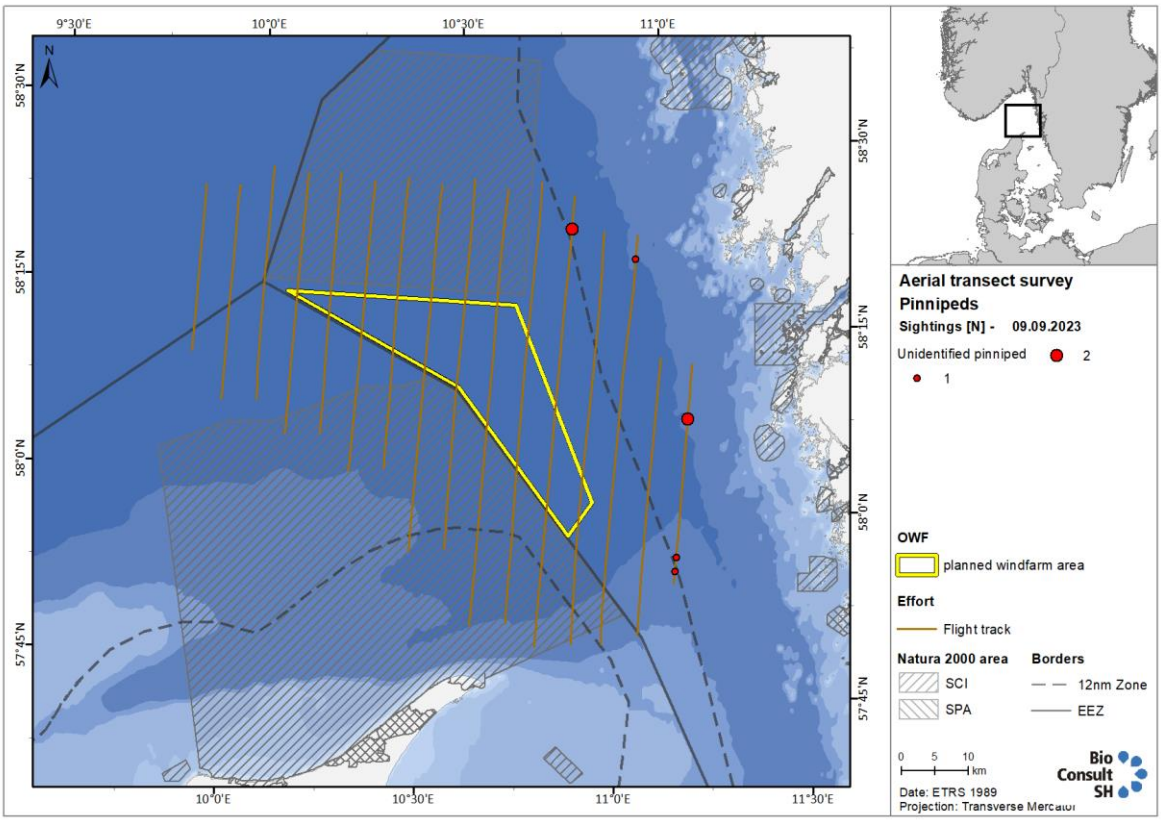


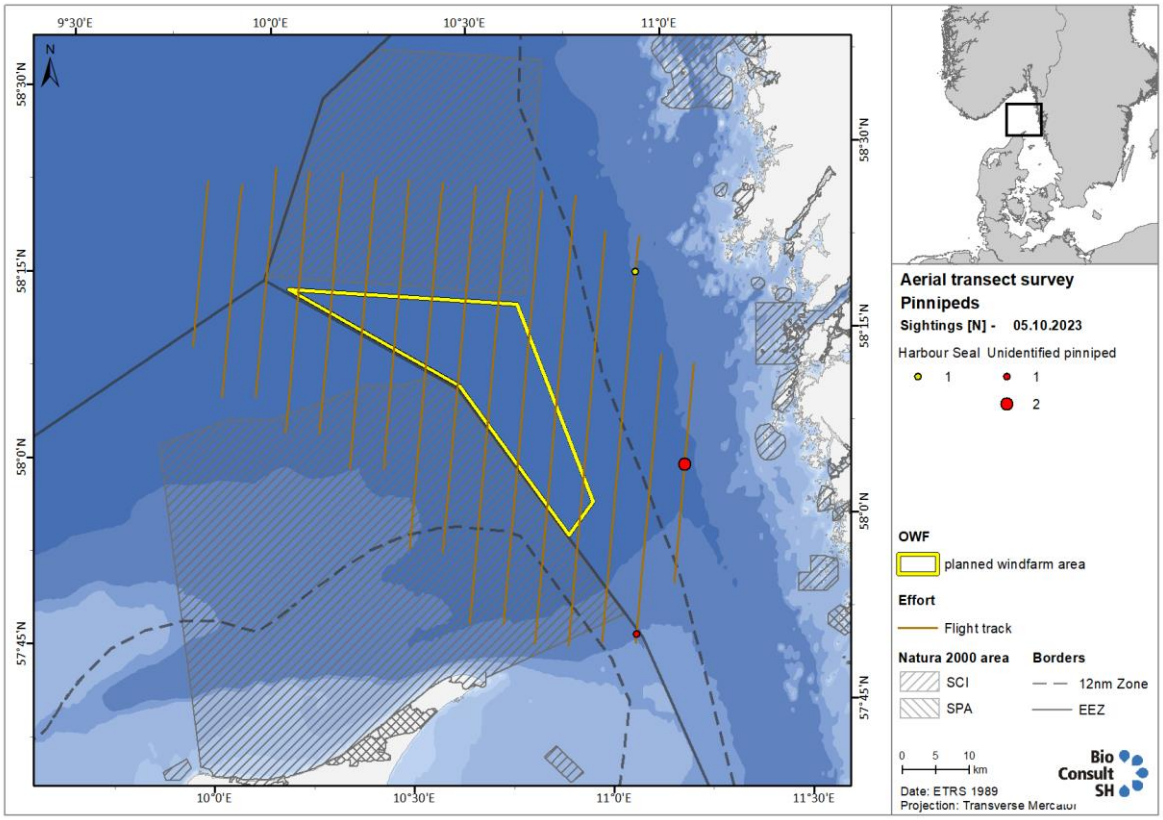
A.3.2 Harbour seal (*Phoca vitulina*)



A.3.3 Pinnipeds






9°30'E
10°0'E
10°30'E
11°0'E
58°30'N
58°15'N
58°0'N
57°45'N
N
Aerial transect survey
Pinnipeds
Sightings [N] - 05.10.2023
Harbour Seal Unidentified pinniped
1
1
2
OWF
planned windfarm area
Effort
Flight track
Natura 2000 area
SCI
SPA
Borders
12nm Zone
EEZ
0 5 10
km
Date: ETRS 1989
Projection: Transverse Mercator
Bio Consult SH