ENERGINET

ENERGY ISLAND BORNHOLM

ENVIRONMENTAL BASELINE NOTE
WORK PACKAGE G - BIRDS

02-09-2022

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CONTENTS

Abbreviation	Explanation
AEWA	African-Eurasian Migratory Waterbird Agreement
bp	Breeding pairs
BSH	Federal Maritime and Hydrographic Agency of Germany (Bundesamt für Seeschifffahrt und Hydrographie)
CC	Overlapping area in cable corridors
CC1	Cable corridor from OWF1 to Bornholm
CC2	Cable corridor from OWF2 to Bornholm
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
Client	Energinet
CRS	Conductivity-Temperature-Depth-Optical
DAE	Danish Energy Agency
DCE	Danish Center for Environment and Energy
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIB	Energy Island Bornholm
FINO1	Research Platform N1 in the North Sea
GPS	Geopositioning System
GW	Gigawatts
HELCOM	Baltic Marine Environment Protection Commission (Helsinki Commission)
IBA	Important Bird Area
IUCN	International Union for Conservation of Nature and Natural Resources
OWF	Offshore Wind Farm
Pre-investigation area	Gross area including the two wind farm areas and the area in between in Danish waters
SAC	Special Area of Conservation
SCI	Site of Community Interest
SEA	Strategic Environmental Assessment
SPA	Special Protected Area
WP	Work Package

1 INTRODUCTION

The Energy Islands mark the beginning of a new era for the generation of energy from offshore wind, aimed at creating a renewable energy supply for Danish and foreign electricity grids. Operating as renewable energy power plants at sea, the islands are expected to play a major role in the phasing-out of fossil fuel energy sources in Denmark and Europe.

After political agreement on the energy islands has been reached, the Danish Energy Agency (DAE) plays a key role in leading the project that will transform the two energy islands from a vision to reality. The Energy Island projects are pioneer projects that will necessitate the deployment of existing knowledge into an entirely new context.

In the Baltic Sea, the electrotechnical equipment will be placed on the island of Bornholm, where electricity from offshore wind farms (OWF) will be routed to electricity grids on Zealand and neighbouring countries. The offshore wind farms will be constructed approximately 15 km south-southwest of the coast of Bornholm and have a capacity of 3 GW.

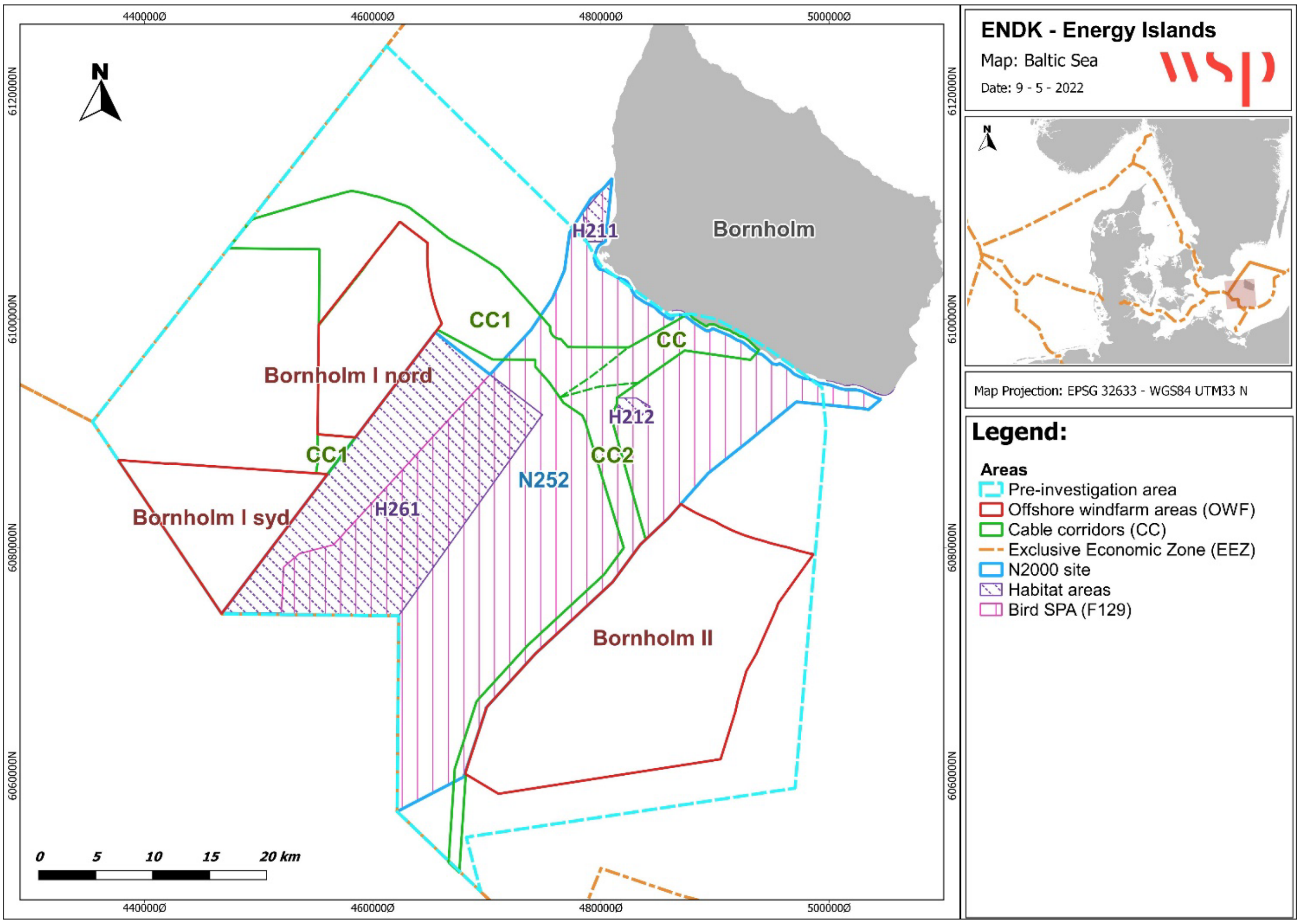

Figure 1-1. Energy Island Bornholm.

The environmental baseline note concerns the pre-investigation area, from now on referred to as Energy Islands Bornholm (EIB) which includes the two planned windfarm areas (OWF1 and OWF2) and the cable corridors from the two OWFs to Bornholm (CC, CC1 and CC2) (Figure 1-1). Furthermore, Natura 2000 sites and the new bird SPA site (Rønne Banke F129/DK00FC373) between the two wind farm areas are shown. As shown on Figure 1-1, the area of the new SPA is slightly smaller than the total area of the new Natura 2000 site N252.

Cable corridors to Zealand and neighbouring countries are not included in this environmental baseline note.

This document aims to provide an overview on the conservation status and biology together with a description of other important existing data for relevant species/species groups in the WP-G – Birds that may occur in the pre-investigation area. These include resident bird species and species that migrate through the area.

Information regarding the following issues will be summarized:

- Biology
- Distribution and abundance
- Conservation status
- Potential threats

2 METHODOLOGY

This is a desktop study which has been done by reviewing most important literature including both peer-reviewed journals as well as publicly available reports etc. A brief introduction on the potential threats of offshore wind farms on resting and migrating birds is presented first, followed by a detailed description of existing information for most relevant bird groups.

3 BIRDS AND OFFSHORE WIND FARMS

Birds potentially making use of the pre-investigation area can be roughly divided into two groups, those that are typically found within the area most of the time (resting seabirds) and those that alternate between different distant regions and may only cross the area temporarily when migrating (e.g., songbirds, birds of prey, seabirds, etc.). Seabirds include a variety of birds adapted to life at sea. These include birds that breed at the coast and on islands but forage in the sea and/or birds that overwinter, moult or stop over during migration (Dierschke & Garthe 2006).

Potentially, offshore windfarms pose a variety of direct and indirect impacts to birds, most notably:

- Risk of collision with turbines, which most often results in direct mortality
- Displacement of birds due to effective loss of habitat
- Barrier effects where the windfarm creates an obstacle to regular movements to and from breeding colonies (e.g., even if the habitat has not been lost, the bird will avoid entering it)
- Barrier effects where the windfarm creates an obstacle to migrating birds forcing birds to find alternative routes or different flight altitude
- Attraction to the offshore structures, as possibly of night-migrating passerines to light sources

The degree to which these birds may be affected by any of these potential risks associated with the installation and operation of offshore wind farms vary strongly with respect to the species, and the relevant existing data will be presented accordingly. Moreover, these effects rarely occur in isolation but are likely additive and may also co-occur with other already existing anthropogenic effects (Dwyer et al. 2018).

3.1 RESTING BIRDS

The so-called resting birds include sea and water birds that remain in a non-breeding area during some (long) periods of the year, and thus depend then on the local resources (for moulting, overwintering, feeding, etc.). They typically tend to be very long-lived and have several adaptations that allow them to exploit resources even during harsh climate conditions. In the German part of the Baltic Sea, which lies south of the pre-investigation area, around 38 species of seabirds have been encountered. Of these, about 20 species may be common or relatively abundant in offshore areas (Sonntag et al. 2006). These include divers, grebes, some species of sea ducks, cormorant, gulls, terns, and auks.

Since these birds are strongly dependent on the existing resources of the areas they remain in, their abundance and presence in a certain area is closely correlated with the presence/proximity of especially suitable (feeding and resting/wintering) habitats nearby. Close to the study site, three important shallow bank and reef areas are found: Rønne Banke (located in between both OWFs), Adlergrund (to the southwest of both OWFs), and Oderbanke (to the southeast part of the area). Rønne Banke characterizes for its shallow waters. Both Adlergrund and Rønne Banke were formed by glaciers and have depths ranging between 5 and 25 m. Various sediment types that range from sand to gravel to stones can be found, and these are often covered by mussel beds (Käppeler et al. 2012). Oderbanke, on the other hand, is distinguished by shallow waters and mostly sandy sediments (Käppeler et al. 2012). These banks provide important habitats especially for sea duck species such as common and velvet scoters, common eiders and long-tailed ducks, which prefer shallow waters and feed on mussels (Käppeler et al. 2012).

As the banks constitute important marine bird areas, some of them have been included in a protected area: SCI/SAC Natura2000 area Adler Grund and Rønne Banke (site code: DK00VA261). With a surface of 32,054 ha this protected area is located adjacent to one of the two wind farms and in between both wind farms and was designated to protect two types of habitats: sandbanks slightly covered by water all times and reefs. Even before the area was designated as a Natura2000 area, Rønne Banke was considered an important bird area in Denmark, especially for the long-tailed duck and for the black guillemot (Rasmussen et al. 2000).

In addition, further south of the pre-investigation area of this protected area and in the German EEZ, the SPA Pomeranian Bay (Site Code DE1552-401), also a Natura 2000 site, is located and extends over an area of 200,000 ha. Here, most important resting sea birds are protected; among them divers, three species of grebes, six species of gulls, four species of ducks, three species of auks and the great cormorant (all of which are expected to be occurring in the pre-investigation area).

3.2 BIRD MIGRATION

Migrating birds alternate between breeding and non-breeding regions. They can disperse very long distances twice a year in search of feeding resources and better climate conditions. Although it is a regular yearly repeating phenomenon that occurs in most bird species, the magnitude of migration can vary strongly from year to year and is subject to great variability. Moreover, some species migrate long distances, others only comparatively shorter distances, while for other species, only parts of the populations may migrate, and the rest remain in the area.

Despite the great variability, estimates suggest that about half a billion birds of about 200 species cross the western Baltic Sea during autumn, and half of this number (~ 250 million birds) crosses the area in spring (BSH 2021). The great majority of them (> 95%) are songbirds. The rest is composed of sea- and waterbirds such as divers, grebes, ducks, geese, waders, gulls, terns and auks and by thermal gliders such as birds of prey and cranes (BSH 2021).

As already mentioned, bird migration is very variable and thus hard to predict. However, birds adapt the timing of their migration to weather conditions such as temperature, precipitation, fog, wind speed and direction, because energetic costs are related to the presence and magnitude of these parameters. Thus, migration does not occur regularly but most of it takes place during certain days of the migration period (BSH 2021).

For many Scandinavian and Siberian breeding bird species, the Baltic Sea is part of their annual migration routes (Figure 3-1). Numerous night-migrating songbirds are thought to cross the Baltic offshore area in a broad front movement mostly with a south-western orientation, but local aggregations and deviating directions are also possible. Most day-migrating land birds follow landmarks from Falsterbo in Sweden over Danish islands such as Zealand and Lolland and German Fehmarn to the mainland of Europe, but fractions of those populations also directly cross the open water. Waterfowl like geese, ducks or divers mainly move through the area in an east-west direction (Bellebaum et al. 2010a).

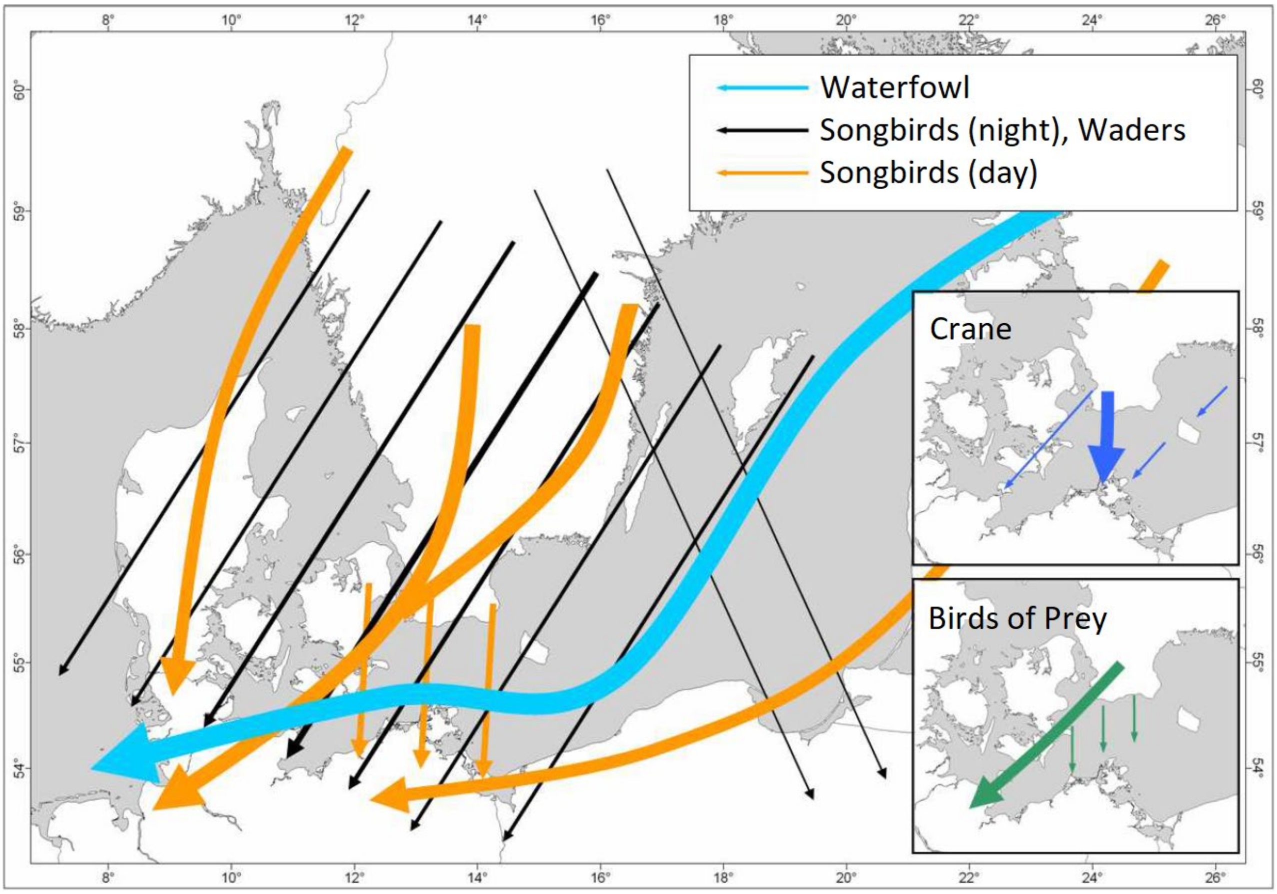

Figure 3-1. Most important migration routes in the Baltic Sea during autumn. From Bellebaum et al. (2010a).

4 RELEVANT SPECIES AND SPECIES GROUPS

In this section, existing data on the most relevant species groups of migrating and staging birds potentially present in the pre-investigation area is provided.

4.1 GEESE AND SWANS

4.1.1 BIOLOGY, ABUNDANCE AND DISTRIBUTION

At least three goose species of the *Anser* genus, two "black" *Branta* species of barnacle and brent goose, and three species of swans migrate annually through the Southern Baltic region. Most geese breed on lakes, pools, rivers and in a variety of wetland habitats and winter on farmland in open country or in swamps, lakes, saltmarshes and coastal lagoons further south than their breeding areas (Scott & Rose 1996). Moreover, the subspecies or populations of geese and swans that may be encountered in the Southwestern Baltic Sea have all increased in numbers in the last decades partly because of protection of their main wintering and staging sites in north-western Europe, and also a reduction of hunting pressure on some of these species (for example *Branta leucopsis*).

Note however, that this might not be the case for other subspecies or populations of the same species that occur further east or south in Europe/Asia where their main breeding/wintering populations are not protected (Scott & Rose 1996). Whereas the specific biology and requirements of each species mentioned here varies, mostly all of them follow the same migration pattern. Their migration towards the wintering areas, including the Pomeranian Bay and Rønne Banke starts by September, and highest densities will be reached there in January and February. For the birds being able to arrive on time for the next breeding season, the migration back to the breeding areas starts again in March (Scott & Rose 1996).

Only one of the mentioned species (*Anser anser*) breeds relatively close to the area (Southern Sweden, Northern Germany) and migrates further south in winter, whereas some of the populations of *Branta leucopsis* have recently started to establish new breeding sites in these regions (Feige et al. 2008). Details on the distribution and abundance of the species (i.e., subspecies to occur in the pre-investigation area as well as their conservation status are provided in Table 4-1.

Table 4-1. Breeding and wintering regions, together with estimates of population size and conservation status for the most common geese and swan species expected to migrate over the pre-investigation area. Population trends: INC = increasing, DEC = declining, STA = stable.

Species (subspecies/ Population) [1]	Breeding region[1]	Wintering region[1]	Most recent population estimate² (Trend) ² Pop. 1% level²	Conservation status		
				European Birds Directive	AEWA (Agreement on the Conservation of African-Eurasian Migratory Waterbirds)	Red List Birdlife 2021
Bean goose (5 subspecies) *answer fabalis fabalis*	The taiga zone from northern Scandinavia and northwest Russia to the west Siberian lowlands east of the Ural Mountains	The coasts of Poland and eastern Germany, and in southern Sweden, Denmark and the Netherlands	82,000 – 97,000 (INC?) 520	II/A	A 3c*	LC
Greater White-fronted Goose (5 ssp): *Anser albifrons albifrons* (western population)	In the Arctic tundra from the Kanin Peninsula in European Russia east to the Kolyma River	Northwest Europe from Germany to France and Britain, with the major concentrations in the Netherlands; in central Europe	1,000,000 – 1,200,000 (STA) 12,000	III/B	C1	LC
Greylag goose (2 ssp): *Anser anser* (population NW Europe/South-west Europe)	Breeds west of the Urals (Norway, Sweden, Denmark and Germany)	Throughout southern and western Europe south to North Africa (Morocco to Tunisia).	710,000 – 780,000 (2016 – 2018) (STA) 9,600	II/A, III/B	C1/B1	LC
Barnacle goose (monotypic) *Branta leucopsis*	Greenland, Svalbard and northern Russia	In northwest Europe (mainly Ireland, Britain, Germany and the Netherlands).	1,400,000 (2018) INC 12,000	I	C1	LC
Brent goose (four ssp) *Branta bernicla bernicla*	High latitudes in Eurasia	*B. b. Bernicla* migrates through the White Sea and Baltic to staging areas in the Dutch, German	211,000 (2011) INC? 2,100	II/B	B 2b	LC

		and Danish Wadden Sea and wintering areas mainly in England and France				
Whooper Swan (monotypic, but four populations) *Cygnus cygnus*	Population breeding in Fennoscania and northwest Russia	Winters in northwest continental Europe	138,500 (2015) INC 1,200	I	C1	LC
Bewick's swan (three ssp) *Cygnus columbianus bewickii*	Northwest Russia	Denmark, the Netherlands, Britain, Ireland	21,000 (2015) DEC 220	I	A2	VU
Mute swan (monotypic) *Cygnus olor*	Western and central Europe (populations largely sedentary)	Eventually in cold winters moving further south	260,000 – 300,000 INC/STA 2,000	II/B	C1	LC

[1] From Scott & Rose (1996)

[2] Columns from population sizes, trends and 1% population level taken from Wetlands International (2022, AEWA CRS 8, retrieved on 24.02.2022). INC: Increasing, STA: stable, DEC: decreasing. In cases where the trend is less certain a "?" may be appended.

[3] Categories for conservation status are explained in the appendix.

In general, the number of geese and swans migrating and passing by the western Baltic Sea and potentially through the pre-investigation area may vary considerably. A preliminary investigation of migrating birds between 2016 and 2018 in a nearby site (the site O.1-3, south of the pre-investigation area has shown that geese may comprise a large proportion of the total number of birds during the (autumn) migration. For example in 2016, comparable number of geese were observed during the spring and autumn migration (700 – 1,100) but in the year 2017, many more geese were observed during the day autumn migration (> 12,000 geese), which represented more than 50% of all registered migrating birds observed in that season (BioConsult SH et al. 2020b).

With regards to the observed migration altitudes, geese often fly at high altitudes. For example, *Branta bernicla* is known to fly at faster speeds and higher altitudes in spring than in autumn (341 m vs 215 m, Green & Alerstam 2000).

4.1.2 CONSERVATION STATUS AND POTENTIAL THREATS

As already mentioned, the populations of these species have increased in the late years. However, this increase has also resulted in some type of conflict with humans. For example, in recent years, several species of geese have increasingly turned to new food sources grazing on cultivated crops near the coast, coming into conflict with farmers, for example in Britain (Salmon & Fox 1991). As a result, and a possible solution, studies have been conducted to evaluate whether an increase of the hunting bag for some of these geese species could help on controlling their populations without representing a threat. Similar conflicts arise with many of the other species, and with the exception of the barnacle goose no other species of these waterbirds is listed under the Annex I of the Birds Directive.

Similarly due to their relative large sizes and heavy bodies, their large numbers during migration and their socially interactive nature makes them largely susceptible to collision risk with wind turbines (REES 2012). However, there is relatively little information of the collision risk for these birds and much of it is neither available nor reported (Rees 2012). Nonetheless, geese and swans do show avoidance behaviour to wind farms. For example, almost 95% of pink-footed geese (*Anser brachyrhynchus*, a species that is more often encountered in the North Sea) showed strong vertical and horizontal avoidance behaviour as a response to offshore windfarms (Plonczkier & Simms 2012). Moreover, these authors also showed that during periods of reduced visibility geese tended to fly at lower altitudes (100-150 m) compared to periods of good weather conditions when they flew higher (250-300 m). Nevertheless, they said that in their study most of the migration took place early in the afternoon under favourable conditions, thus possibly reducing the risk of collision (Plonczkier & Simms 2012).

4.2 SEA DUCKS

4.2.1 COMMON EIDER

The population of common eiders (*Somateria mollisima*) in Denmark had increased since the start of the 20th century (Lyngs 2000). The censuses indicated a population of about 23,000 eiders in the period between 1988 and 1993. The last censuses of 2000-2002 gave a similar number of eiders, indicating that the population in Denmark remained stable (Lyngs 2008). The archipelago Ertholmene northeast of Bornholm, where these ducks also breed, held the second largest colonies of these ducks in Denmark in the late 1980s (Lyngs 1992). With 2,400 females, the colony of Ertholmene was, despite a reduction in breeding pairs, still the second biggest colony in Denmark at the beginning of the 2000s (Lyngs 2008).

DCE has no indications of significant concentrations of common eider in the pre-investigation area, and the species is not considered relevant as a designated species in the new SPA Rønne Banke (Petersen et al. 2021).

Breeding birds arrive to the island from late February until late March. However, in colder winters, arrival time may be postponed. The laying of eggs starts by the beginning of April and continues until mid-June. From late May, adult males abandon the island to moult anywhere else and females swim with their ducklings to Bornholm (Lyngs 1992).

Common eiders are considered as near threatened under IUCN. However, in Europe, they are considered endangered (BirdLife International 2021). Like other sea duck species, they are also listed in the Annex IIB of the European Birds Directive (European Union 2010).

4.2.2 COMMON AND VELVET SCOTERS

In winter, most common scoters occur in the western Baltic Sea (Durinck et al. 1993). In the German Baltic Sea, they may be found during the whole year, especially in the Pomeranian Bay and surrounding area (Mendel et al. 2008). They tend to be most abundant during spring. Since the pre-investigation area lies not far from the Pomeranian Bay, common scoters and the less abundant velvet scoters may be found regularly.

DCE has no indications of significant concentrations of common or velvet scoter in the pre-investigation area, and the two species are not considered relevant as designated species in the new SPA Rønne Banke (Petersen et al. 2021).

4.2.3 LONG-TAILED DUCK

BIOLOGY, ABUNDANCE AND DISTRIBUTION

Long-tailed duck (*Clangula hyemalis*) has a circumpolar distribution range and migrate between artic breeding grounds and temperate wintering areas. They mainly breed in freshwater habitats located in the artic tundra areas, or in areas that provide similar conditions – e.g., the alpine areas of the Norwegian west coast. During the breeding season long-tailed ducks forage on a variety of organisms including insect larvae, fish spawn, crustaceans, and molluscs. During the non-breeding season, long-tailed ducks are gregarious, and often seen in flocks at temperate marine coastal areas and offshore banks, where they mainly feed on bivalves supplemented by polychaeta worms, echinoderms, and fish spawn.

The long-tailed ducks that winter in the pre-investigation area are part of the Fennoscandian-West Siberian population. They arrive from the breeding grounds from October, being most numerous during winter (January-February), and the last birds are seen in April before migrating back. Observations of long-tailed ducks in the pre-investigation area during summer would be a very rare and unlikely event.

Most long-tailed ducks of the Fennoscandian-West Siberian population winter in the central and Southern part of the Baltic Sea. It is assumed though, that a large part of the Fennoscandian population winter in the Atlantic Ocean off the Norwegian coast, and that the wintering population in the Baltic Sea is mostly consisting of individuals from the West Siberian part of the population. It is difficult to state with certainty as information on migration routes from the breeding grounds are scarce.

From the coordinated Baltic survey from 2007 to 2009, a number of roughly 1.5 million long tailed ducks was estimated to winter in the Baltic Sea. This is a 65% decline in population size from the census in 1988-1993, where it was estimated that 4.3 million long-tailed ducks wintered in the Baltic Sea. Despite the immense decline in population size there has been no obvious change in the distribution and range. The areas of the Baltic Sea where most long-tailed ducks are observed are in the Pomeranian Bay, the Gulf of Riga, and the Midsjö banks south of Gotland which are all located outside the pre-investigation area.

However, a considerable number of long-tailed ducks have also been observed at Rønne Banke within the pre-investigation area. The Danish Center for Environment and Energy (DCE) has regularly conducted aerial surveys of the area and has estimated a total of between 18,000-30,000 of wintering long-tailed ducks at Rønne Banke. A total of 5 aerial surveys have been conducted since 2004 (Petersen et al. 2016).

Table 4-2. Number and densities of long-tailed ducks in IBA Rønne Banke during the national Danish winter bird census (elaborated from Petersen et al. 2016 & Petersen et al. 2021).

Year	Estimated number	Estimated number within IBA (c. 1,200 km^2)	Percent within IBA	Density in IBA (birds/km^2)
2004	27,556	26,421	96%	22
2008	8,776 (Partial survey)	8,155 (Partial survey)	93 % (Partial survey)	7
2013	24,000-39,000	16,000-24,000	66.7% / 61.5%	13-20
2016	28,000-45,000	18,000-30,000	64.3% / 66.7%	15-25
2020	Not available (unpublished)	Not available (unpublished)	-	-

The distribution and density of wintering long-tailed ducks in the Baltic Sea between 2007 and 2009 is shown in Figure 4-1, and the average number of wintering long-tailed ducks estimated by spatial modelling for key areas of the Baltic Sea during the same period is summarized in Table 4-1.

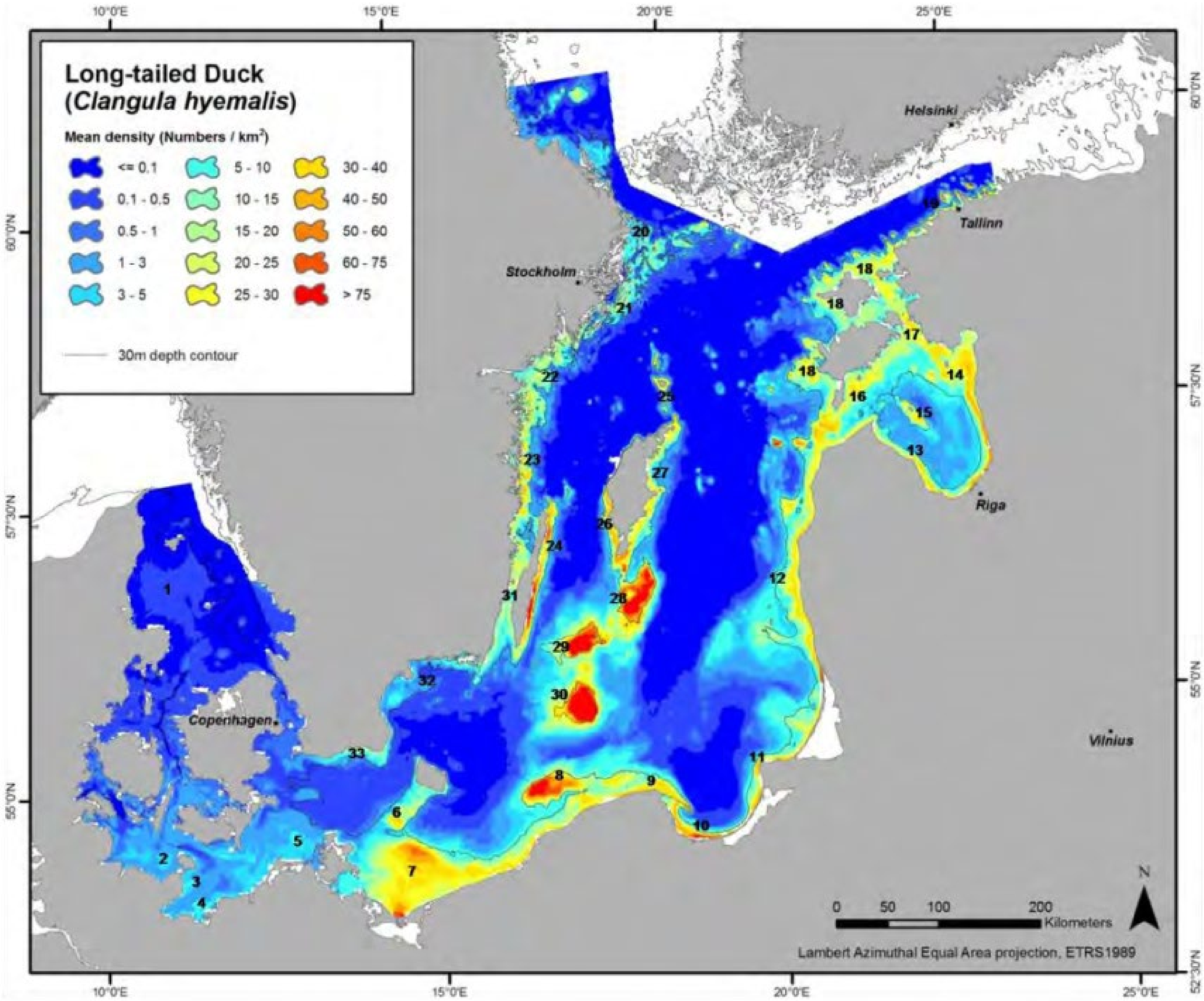

Figure 4-1. Distribution and density of wintering long-tailed ducks in the Baltic Sea from 2007 to 2009 (Skov et al. 2011).

Table 4-3. The average number of wintering long-tailed ducks *Clangula hyemalis* estimated by spatial modelling for key areas of the Baltic Sea, 2007–2009 (Skov et al. 2011).

	Locality	Area	Number	Mean density	Std density	%
1	NW Kattegat	3,353	440	0.13	0.05	0.03
2	Kiel Bay	2,537	4,970	1.96	1.12	0.33
3	Sagas Bank	267	890	3.34	1.07	0.06
4	Wismar Bay	434	1,980	4.55	1.57	0.13
5	Darss & Plantagenet Ground	1,642	5,550	3.38	1.16	0.37
6	Rønne Bank & Adler Ground	722	12,000	16.60	9.83	0.81
7	Pomeranian Bay	7,316	186,000	25.45	11.54	12.51
8	Slupsk Bank	1,402	61,200	43.67	24.16	4.12
9	Central Polish coast	2,628	51,500	19.58	10.34	3.47
10	Gulf of Gdansk	1,053	26,000	24.73	19.62	1.75
11	Kaliningrad – Lithuania S	1,314	22,900	17.44	10.58	1.54
12	Lithuania N – Latvia S	1,317	35,800	27.18	8.92	2.41
13	Gulf of Riga, southwest	1,751	30,800	17.58	11.49	2.07
14	Kihnu offshore	3,316	73,300	22.09	12.22	4.93
15	Ruhnu offshore	615	8,160	13.27	10.31	0.55
16	Gulf of Riga, northwest	2,982	60,700	20.36	12.64	4.08
17	Muhu Strait	375	9,710	25.86	7.65	0.65
18	Hiiumaa & Saaremaa coast	4,973	69,000	13.89	9.59	4.64
19	Estonia N coast	1,524	15,000	9.99	12.15	1.01
20	Stockholm archipelago N	3,349	20,700	6.18	5.06	1.39
21	Stockholm archipelago S and Södermanland Archipelago	1,248	10,700	8.57	7.51	0.72
22	Östergötland Archipelago	1,515	22,300	14.70	7.87	1.50
23	N Kalmar Archipelago	1,130	21,000	18.56	11.81	1.41
24	Öland E	1,486	43,600	29.35	22.16	2.93
25	Fårö & Gotska Sandøn	720	6,100	8.42	10.55	0.41
26	Gotland SW	630	16,000	25.47	15.36	1.08
27	Gotland E	1,896	28,000	14.95	11.27	1.88
28	Hoburgs Bank	3,198	113,800	35.58	30.60	7.66
29	N Midsjö Bank	2,767	93,600	33.81	42.25	6.30
30	S Midsjö Bank	2,428	153,900	63.38	80.96	10.35
31	Kalmar Sound	2,292	27,100	11.83	6.84	1.82
32	Hanö Bay	1,937	6,980	3.60	3.13	0.47
33	Skåne S coast	913	6,570	7.19	4.90	0.44
	Key areas		1,246,000			83.85
	Residual		240,000			16.15
	Total		**1,486,000**			**100.00**

Rønne Banke, also designated as an Important Bird Area (IBA) by BirdLife International, has been known as an important resting ground for resting long-tailed ducks for decades (Petersen et al. 2016), and most of the IBA was officially designated as a Special Protection Area (SPA) under the EU Birds Directive in 2021 by the Danish Authorities.

The distribution and the estimated number of birds in the IBA based on aerial surveys carried out by DCE (Petersen et al. 2016, 2021) appears from Figure 4-2 to Figure 4-5.

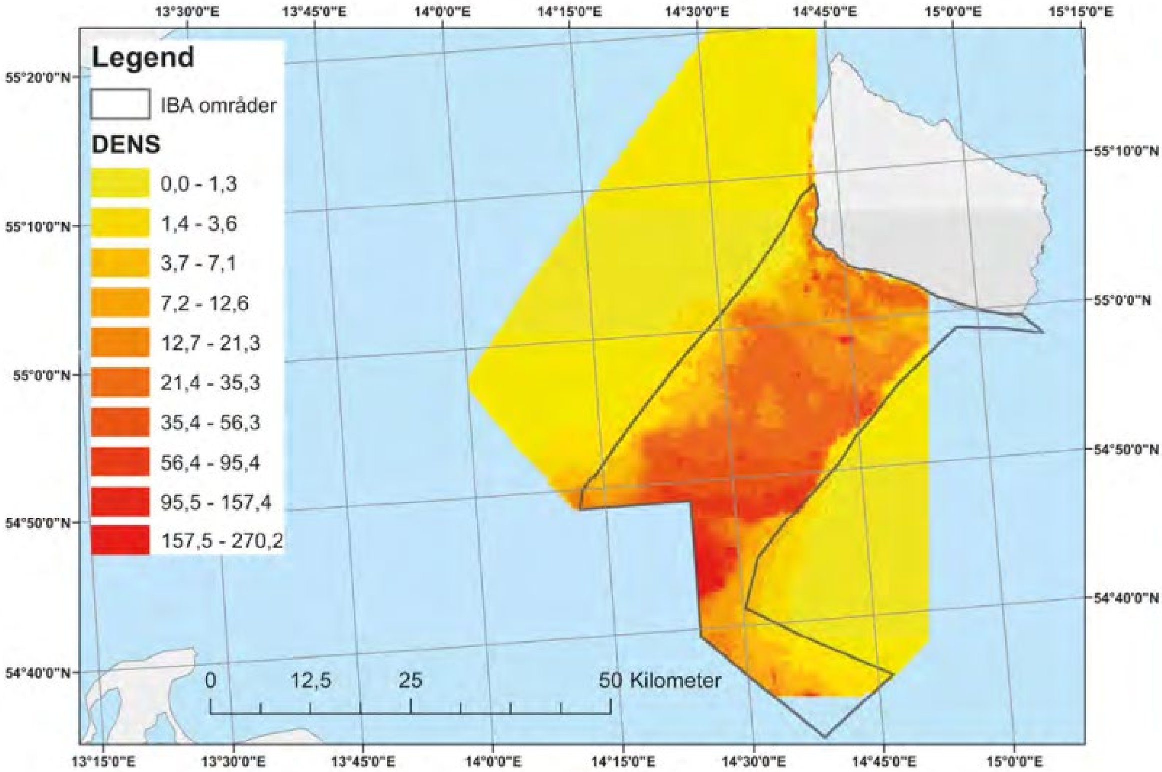

Figure 4-2. Distribution (modelled) of 27,556 long-tailed ducks in the waters west of Bornholm in the winter 2004. Of these, 26,421 (96 %) were located within the IBA (Petersen et al. 2016).

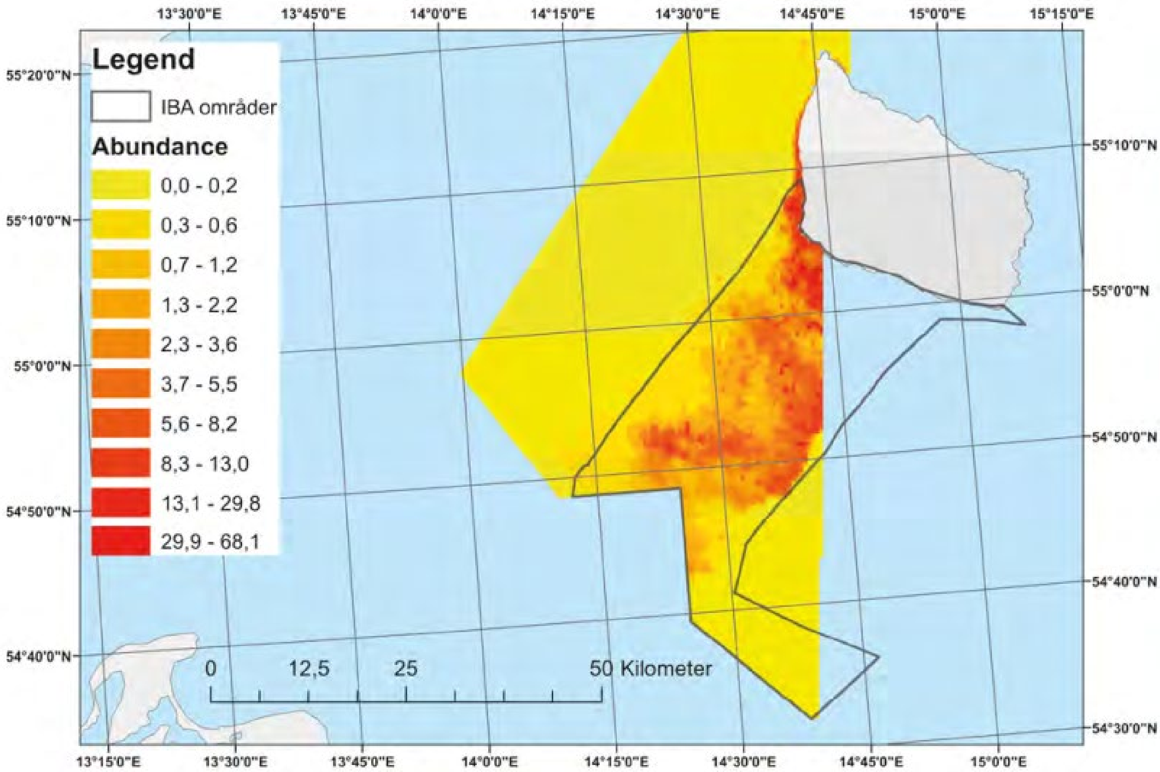

Figure 4-3. Distribution (modelled) of 8,776 long-tailed ducks in the waters west of Bornholm in the winter 2008. Of these, 8,155 (96 %) were located within the IBA (Petersen et al. 2016).

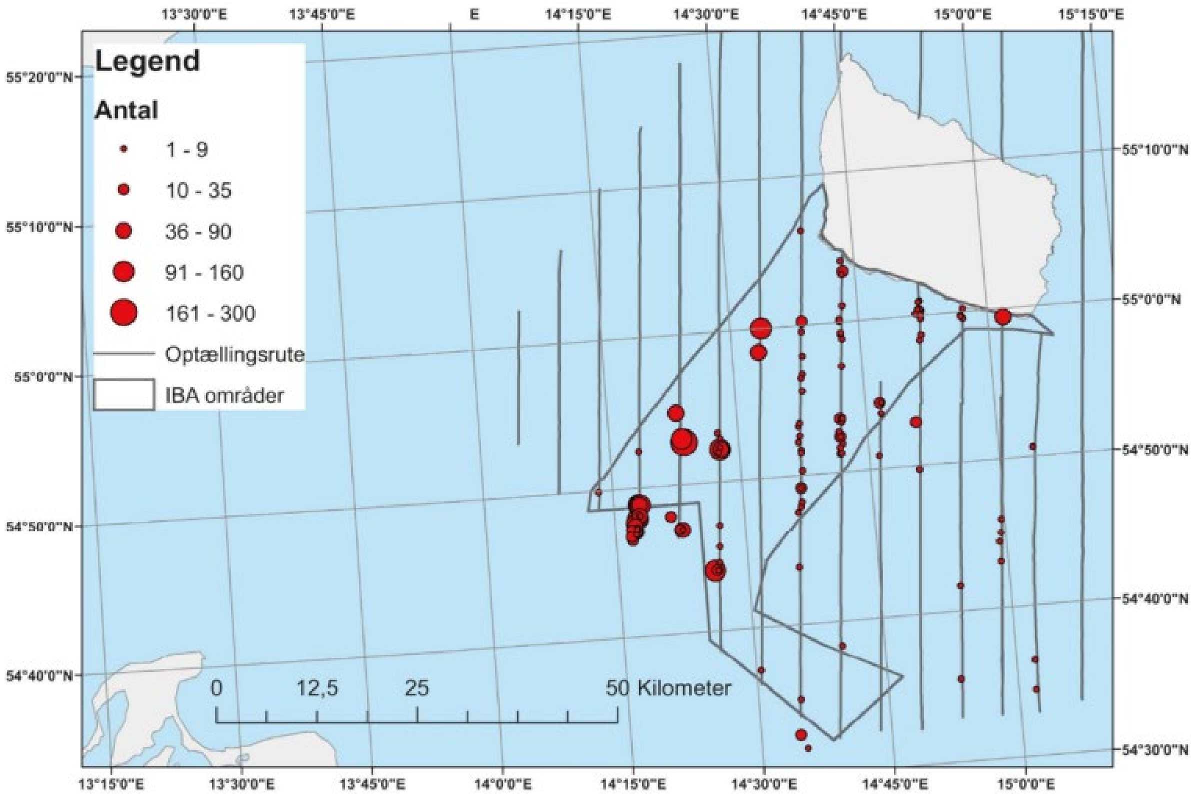

Figure 4-4. Distribution (observations) of 2,377 long-tailed ducks in the waters west of Bornholm in the winter 2013. Of these, 1,524 (64 %) were located within the IBA (Petersen et al. 2021).

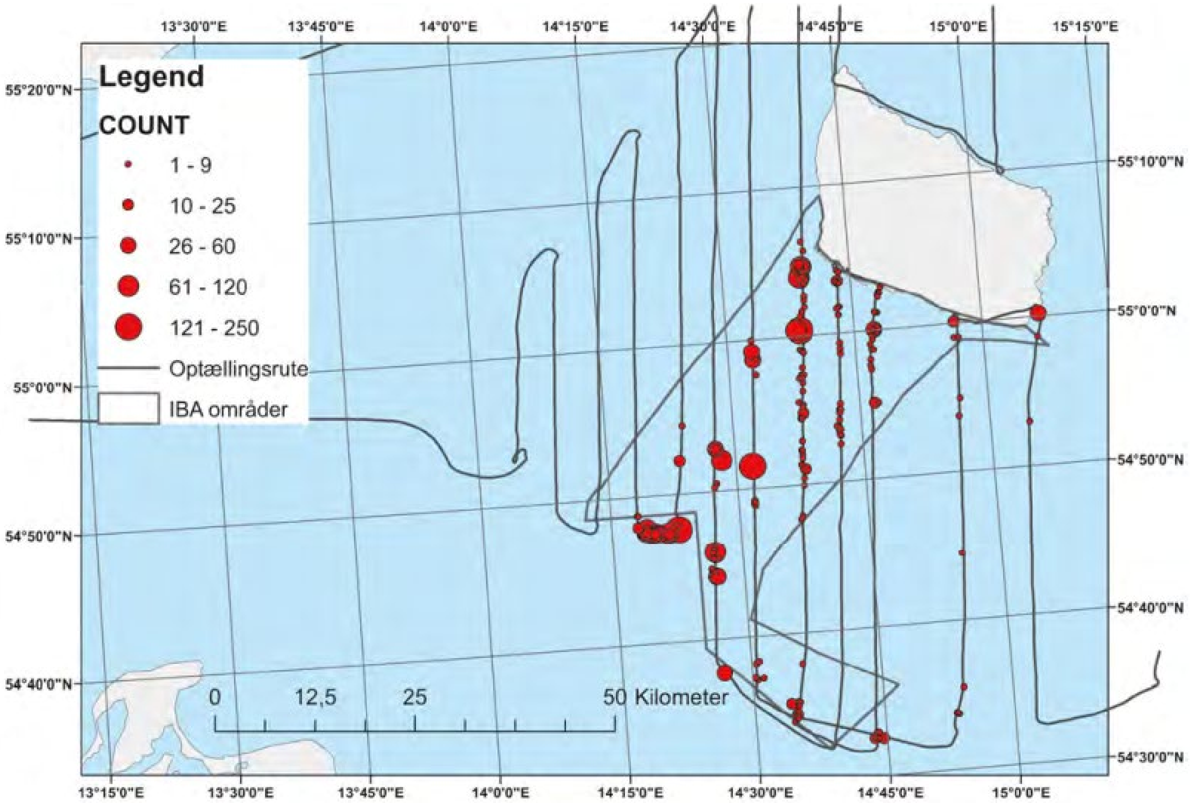

Figure 4-5. Distribution (observation) of 2,724 long-tailed ducks in the waters west of Bornholm in the winter 2016. Of these, 1,797 (66 %) were located within the IBA (Petersen et al. 2016).

The water depths within the boundary of the SPA Rønne Banke varies from 1 to 37 meters, and 65 % of the SPA has water depths between 13-20 meters. The national Danish midwinter counts have previously shown that 65 % of the resting long-tailed ducks were located at water depths between 14 and 24 meters (Petersen et al. 2006).

CONSERVATION STATUS

Of all sea duck species, long-tailed duck is the most abundant. Despite their occurrence at relatively large numbers, their populations have decreased in the last decades due to many anthropogenic factors, especially oil pollution (Skov et al. 2011; Nilsson 2016; Nilsson & Haas 2016).

Due to the strong population decline of long-tailed ducks, they are considered vulnerable under the IUCN and are listed in Appendix IIB of the European Birds Directive (European Union 2010).

In general, all sea duck species are sensitive to ship traffic reacting to it by flying off or diving. About 80% of common and velvet scoters and long-tailed ducks reacted by escaping to ship traffic mainly by flying off. Similarly, escape distances of sea ducks were high among the species of seabirds evaluated in the study of Fliessbach and colleagues, with common scoters showing the highest escape distances of all evaluated species (1,600 m, Fliessbach et al., 2019). This avoidance behaviour to ship traffic can be detrimental because of a potential loss of habitat for sea ducks when foraging and increases in energy expenditure for the escape reaction. During the operational phase of an OWF, ship traffic may increase, and this may affect sea ducks as well. The sea duck species mentioned here (except for common eiders), are likely to be slightly affected by offshore wind farms and they tend to avoid them to varying degrees according to the review by Dierschke and colleagues (2016).

4.3 DIVERS (RED-THROATED DIVER AND BLACK-THROATED DIVER)

4.3.1 BIOLOGY, DISTRIBUTION AND ABUNDANCE

Divers, also called loons, include five species of fish-eating birds strongly linked to aquatic environments that inhabit the taiga and tundra regions of the Holarctic. All divers are migratory, breeding in freshwater lakes and spending the winter season at sea (Hemmer 2020). Of the five extant species, four may occur in Europe, but only two diver species may be common in the Baltic Sea: the red-throated diver (*Gavia stellata*), and the black-throated diver (*Gavia arctica*). Both species are morphologically similar and are often difficult to distinguish from the digital images taken during digital aerial surveys, and for this reason, they are often treated together. Nevertheless, some differences in their biology exist, such as the selection of freshwater lakes for breeding. While black-throated divers and the other divers choose fish-rich inland lakes for breeding, red-throated divers prefer small fish-devoid water bodies and search for their food at larger waterbodies or at sea (Erikson 2010, Hemmer 2020) . Both species mainly breed in Scandinavia and in Russia (Durinck et al. 1994). Divers as other seabirds are top predators and mainly fish-eating birds. The diet of red-throated divers has been investigated in the Pomeranian Bay, which is one of their main wintering areas probably because of the suitability of the area as spawning, nursery and feeding ground for many fish species. Zander and herring constitute the majority of the consumed biomass of red-throated divers in winter and spring respectively (Guse et al. 2009).

In the Baltic Sea, red and black-throated divers are widely distributed. Most of them occur in the Gulf of Riga at waters less of 30 m depth (Durinck et al. 1993). Other important areas of distribution of divers are the waters off the coast of Lithuania and the Pomeranian Bay (Durinck et al. 1994). According to these authors, most divers winter offshore at waters with depth ranging between 5 and 30 m.

Estimates conducted almost two decades ago suggested an overall winter population of 150,000 – 450,000 red-throated divers and 250,000 – 500,000 black-throated divers for the population inhabiting northwest Europe (Mendel et al. 2008; Skov et al. 2011). Populations of both species show a declining trend. Newer estimates suggest lower numbers for wintering populations of red-throated divers: 210,000 – 340,000 individuals whereas for black-throated divers the population inhabiting northern and western Europe and Siberia is best estimated at 390,000 – 590,000 individuals (Wetlands International 2022, AEWA CSR 8, accessed on 23.02.2022).

4.3.2 DENSITY AND ABUNDANCE ESTIMATES IN THE PRE-INVESTIGATION AREA

Whereas the largest densities are reported for the Gulf of Riga (> 10 ind/km^2) (Durinck et al.1994), densities at Rønne Banke have been estimated as intermediate (1-2 ind./km2, Durinck et al. 1993). These divers are also often found in the Adlergrund and Oderbanke (Durinck et al. 1993). A monitoring study conducted for the preliminary site O1.3 (southwest of Bornholm I), found also that highest densities of divers occur at areas that are relatively shallow, close to the banks (BioConsult SH et al. 2020b).

During the year, divers are expected in the area from November to June. Large densities are expected in winter (January and February), whereas their numbers reduce again before the beginning of the summer season. From July to September no divers are expected to occur in the area.

4.3.3 MIGRATION

Very few black-throated divers are also present during summer in the SPA Pomeranian Bay south of Bornholm (Mendel et al. 2008). Except for these relatively few birds, red- and black-throated divers almost exclusively use the Baltic Sea as wintering and staging grounds and as a migration corridor to wintering areas further south and west, such as the North Sea or Atlantic coastal waters. These are predominantly divers breeding in northern Russia (Mendel et al. 2008; Dorsch et al. 2019) which will arrive in or cross the area from October to January, and leave again by June. Bellebaum and colleagues (2010a) report higher numbers of migrating red-throated divers near the coast than further offshore, assuming a more southward concentration of spring migration along the German coast and an autumn migration further north, with counts of 4,000 individuals passing between the Swedish Skåne coast and Bornholm. GPS tracks of about 20 red-throated divers (Dorsch et al. 2019) however, led rather evenly spread through the area without confirming these patterns.

Several sources give rather low flight heights for both species. Especially during headwind situations divers tend to fly closely above the water surface. Usually, divers will not be observed flying higher than 50 m and often just up to 10 meters (Krüger & Garthe 2001; Bellebaum et al. 2010b; BioConsult SH et al. 2020a).

4.3.4 CONSERVATION STATUS AND POTENTIAL THREATS

Both diver species are not considered threatened at a global scale. The IUCN categories and the recent Birdlife International Red List for Europe (BirdLife International 2021) considered them as species of least concern. Nevertheless, their populations have decreased and since they are among the most vulnerable seabird species to many anthropogenic factors, they are included in the Annex I of European Union (EU) Birds Directive (Council Directive 2009/147/EC on the conservation of wild birds, European Union 2010) and in the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA, 2019). Moreover, their wintering populations are considered critically endangered (CR) by HELCOM (2013).

Among the main threats that affect divers are oil spills, bycatch in fish nets and habitat degradation (Mendel et al. 2008). For example, mercury pollution in lakes may affect their reproduction (e.g., Eriksson 2015). Both ship traffic and offshore wind farms have been shown to have detrimental effects on divers. They show strong avoidance behaviour towards OWFs (Dierschke et al. 2016) and may show shifts and decrease in abundance as far as 16 km away from OWF (Mendel et al. 2019).

Sea ducks spend the non-breeding season in marine environments feeding mainly on bivalves. The Baltic Sea offers important wintering sites for sea ducks. Often these sites are coastal waters and shallow offshore banks, where they can easily dive to obtain their food. Among the most common and abundant sea ducks that may occur in the survey area are the long-tailed ducks, common eiders, common scoters and velvet scoters. In general, all sea duck populations are declining (e.g., Durinck et al. 1993; Mendel et al. 2008; Bellebaum et al. 2012; Nilsson & Haas 2016). They are subject to many anthropogenic threats including oil pollution, fishing by-catch and habitat degradation (Mendel et al. 2008; Bellebaum et al. 2012; Nilsson 2016). In addition, breeding populations may suffer predation from gulls and other raptor species, especially from introduced species (Bellebaum et al. 2012). Sea ducks react negatively towards ship traffic showing strong flight responses (Mendel et al. 2008) and to the presence of offshore wind farms (Dierschke et al. 2016). Thus, many of the sea duck species are considered under different conservation categories.

4.4 GREBES

4.4.1 BIOLOGY, DISTRIBUTION AND ABUNDANCE

Grebes occur in coastal areas with shallow waters. The most important species of grebes which may be found in the survey area are red-necked grebes, great-crested grebes, and Slavonian grebes, all of which occur in the Pomeranian Bight and might be found south and west of Bornholm (Durinck et al. 1993). Nevertheless, if they occur, they are not expected in large numbers in the survey area. Previous baseline studies on the O.1.3 site directly west of the pre-investigation area found only small numbers of grebes (BioConsult SH et al. 2020b).

An estimated total of 3,500-4,000 pairs of great-crested grebes breeds in Denmark. Many of these concentrate in lakes and coastal waters during July-September (Meltofte 1996).

4.4.2 CONSERVATION STATUS AND POTENTIAL THREATS

In general, the European populations of three species of grebes that may occur in the zone have been declining (some by about 35% in countries which account for most of their populations) and are now under categories of conservation by Birdlife (2021).

Grebes as sea ducks spend most of their time swimming in shallow waters. They are as well sensitive waterbirds that often react to ship disturbances by showing certain escape behaviour. Most grebes fly off but depending on the species, some individuals of some species choose diving. For example, 24% of red-necked grebes escape by diving while 46% of them escape by flying off and the remaining individuals do not react to ship traffic. Mean escape distances tend to be in the range between 200-400 m among the species of grebes studied (Fliessbach et al. 2019). Great crested grebes strongly avoid offshore wind farms according to the review of Dierschke et al (2016). Nonetheless, few studies existed then.

Table 4-4. Breeding and wintering regions, together with estimates of population size and conservation status for the most common grebe species that may sporadically occur in the pre-investigation area. Population trends: INC = increasing, DEC = declining, STA = stable

Species (subspecies/ Population) [1]	Most recent population estimate[1] (Trend) [1] Pop. 1% level[1]	Conservation status[2]		
		European Birds Directive	AEWA (Agreement on the Conservation of African-Eurasian Migratory Waterbirds)	Red List Birdlife 2021
Red-necked Grebe (***Podiceps grisegena***) Northwest Europe	21,000 – 33,000 (DEC) 260		B 1	VU
Great Crested Grebe (***Podiceps cristatus***) Northwest and western Europe	500,000 – 690,000 (STA) 6,300		C1	LC
Horned Grebe (***Podiceps auritus***) Northwest Europe	4,600 – 5,300 (STA/INC) 50	Annex I	A1 B1c	NT
Black-necked Grebe (***Podiceps nigricollis***) Europe South and West Europe and North Africa	110,000 – 170,000 (DEC/STA) 1,400		C1	VU

[1] Columns from population sizes, trends and 1% population level taken from Wetlands International (2022, AEWA CRS 8, retrieved on 24.02.2022). INC: Increasing, STA: stable, DEC: decreasing. In cases where the trend is less certain a "?" may be appended.
[2] Categories for conservation status are explained in the appendix.

4.5 GREAT CORMORANT

4.5.1 BIOLOGY, DISTRIBUTION AND ABUNDANCE

Two of the six subspecies of great cormorant (*Phalacrocorax carbo*) may occur in north Europe: *P. carbo carbo* and *P. carbo sinensis*, the latter is the subspecies that may occur in the pre-investigation area. Cormorants are rather coastal than oceanic species feeding on fish and small eels that they catch by diving.

Population estimates for Europe by Birdlife (BirdLife International 2021) indicate there may be between 828,000 – 1,030,000 individuals of great cormorant in Europe. In the Baltic Sea, they occur during the whole year but are mainly associated to coastal habitats. However, the construction of wind turbines and other offshore man-made structures provides them with resting sites and allows them to expand their foraging habitats further offshore. Therefore, they are strongly attracted to OWF (Dierschke et al. 2016).

4.5.2 CONSERVATION STATUS AND POTENTIAL THREATS

Great cormorants were almost exterminated during the 19th century. After protection measures established by mid-20th century, cormorant populations have increased in the Baltic Sea. Currently, a total of 190,000 – 210,000 breeding pairs are estimated in the Baltic Sea. In Denmark, there were around 27,000 breeding pairs of great cormorants in 2012 (Herrmann et al. 2014). Besides the common threats affecting most sea birds like oil spills, habitat degradation and fishing nets, great cormorants may suffer from conflicts with the fishing industry. Since their diet includes fish important to humans, they have been blamed for reducing fish stocks. Although a reduction of perch was associated to the colony size of cormorants, non-significant results were observed for other species (Östman et al. 2012). Most probably, the relationship between cormorants and fish is more complex and further research is needed (Ovegård et al. 2021).

4.6 BIRDS OF PREY

4.6.1 BIOLOGY, DISTRIBUTION AND ABUNDANCE

Birds of prey, also known as raptors, are all top predators. More than half of the known world species (at least 62% or 183 species) undertake seasonal migrations, many of them are long-distance migrants undertaking sometimes intercontinental flights (Bildstein 2006). Most birds of prey can soar, that is they are able to maintain flight without flapping their wings, making use of the rising air currents and thereby reducing energetic costs. Soaring is an efficient form of transport, both during and outside of long-distance migration (Bildstein 2017). Especially, long-distant migrants are strongly dependent on soaring flight to complete their migration routes. However, whereas many species use soaring during their migration routes, others do migrate with powered flight (flapping their wings; examples are ospreys, harriers, most accipiters and falcons). Most raptors are day migrants, but few species such as peregrine falcons, ospreys, and merlins also migrate during nights. Migrating raptors travel over well-known corridors and often in flocks (Bildstein 2006).

The most important flyway for raptors in Europe is the western European-western Africa flyway (Bildstein 2017). A comparative study of satellite tracking and ring recoveries for four common raptor species show detailed information on the routes taken by these migrants (Strandberg et al. 2009). In Europe, there are about 39 species of breeding diurnal birds of prey (Stroud 2003).

Relative close to the pre-investigation area, at Falsterbo in South Sweden, raptor autumn migration has been studied since early 1940s (Kjellén & Roos 2000) whereas standardized counts of raptors and other migratory birds have been conducted since 1973 (Kjellén 2019). It has then been estimated that an average of 46,000 migrating raptors and falcons are observed annually. The most common species there are Eurasian sparrowhawk *Accipiter nisus*, common buzzard *Buteo buteo* and the red kite *Milvus milvus* (Kjellén 2019). Species with more southerly distribution, that is that breed close to Falsterbo are more easily observed than species with northerly distribution (Kjellén 2019). Similarly, thermal migrants tend to be more concentrated than active flyers at Falsterbo and also since raptors tend to fly at lower altitudes there, the censuses at Falsterbo have been particularly important for studies of raptors (e.g., Kjellén 1997).

The numbers of most common birds of prey seem to have increased or maintained stable within the last decades of the censuses (cf. Kjellén 2019). Three species however show negative trends in their censuses numbers in Falsterbo: the European honey buzzard *Pernis apivorus,* the rough-legged buzzard *Buteo lagopus* and the northern goshawk *Accipiter gentilis* (Kjellén 2019). In comparison to a previous study on the trends of raptors from 1940s to the late 1990s in the same area, there seems to be a slight recovery in the numbers of raptors currently migrating through Falsterbo (Kjellén & Roos 2000; Kjellén 2019).

There is, however, a large variation in the number of raptors being observed during the autumn migration every year. This may not only be linked to more birds being counted under favourable weather conditions (for example, when birds fly against the wind, they tend to fly at lower altitudes, and may be easily observed and counted), but also to real changes in the populations due to changes in productivity. For example, species like the Eurasian honey buzzard *Pernis apivorus* and the rough-legged buzzard *Buteo lagopus* are known to produce varying numbers of juveniles in relation to the availability of prey during the breeding season (e.g., wasps and rodents respectively, Kjellén 2019).

Table 4-5. Population size estimates, trends, average numbers seen at Falsterbo in Sweden (between 1942-1960 and between 1973-2019) and conservation status for the most common raptor species expected to migrate over the EIB pre-investigation area. Population trends: INC = increasing, DEC = declining, STA = stable.

Species	Most recent population estimate (Trend)[1]	Annual average numbers at Falsterbo (1942-1960)[2]	Average autumn migration numbers at Falsterbo[3]	Conservation status		
				European Birds Directive	CITES	Red List Birdlife 2021
Eurasian Sparrowhawk (*Accipiter nisus*)	728,000-1,150,000 (STA)	5,944	20,364	I (only ssp *granti*)	II	LC
Common Buzzard (*Buteo buteo*)	1,760,000-2,460,000 (INC)	17,086	14,383		II	LC
European Honey Buzzard (*Pernis apivorus*)	241,000-350,000 (STA)	7,979	6,491	I	II	LC
Red Kite (*Milvus milvus*)	65,100-76,600 (INC)	51	1,305	I	II	LC
Rough-legged buzzard (*Buteo lagopus*)	57,600-11,700 (STA)	139	889		II	LC
Common Kestrel (*Falco tinnunculus*)	823,000-1,270,000 (DEC)	271	690		II	LC
Western Marsh Harrier (*Circus aeruginosus*)	303,000-485,000 (STA)	28	659	I	II	LC
Osprey (*Pandion haliaetus*)	19,200-27,100 (INC)	68	270	I	II	LC
Hen Harrier (*Circus cyaneus*)	112,000-174,000 (DEC)	46	264	I	II	LC
Merlin (*Falco columbiarius*)	40,100-83,400 (DEC)	128	236	I	II	VU

[1] Population sizes and trends taken from Birdlife International (2021). INC: Increasing, STA: stable, DEC: decreasing. In cases where the trend is less certain a "?" may be appended.
[2] Average numbers observed at Falsterbo between 1942-1960 from (Bijleveld 1974)
[3] Average numbers observed at Falsterbo between 1973-2019 from (Kjellén 2019)
[4] Conservation status categories are explained in the appendix

Bornholm is generally not known as an important migration site for migrating raptors. However, a variety of species, some of them in considerable numbers, are observed at Dueodde, the southern tip of the island during autumn. Especially, the number of rough-legged buzzard is noteworthy in some years (Table 4-5).

Table 4-6. Numbers of migrating raptors at Dueodde at Bornholm 2010-2021. The numbers are "max numbers", i.e. the highest number of raptors observed during a year in the period. Data from DOF-asen (2022).

Species	Max number 2010-2021
Eurasian sparrowhawk (*Accipiter nisus*)	202
Goshawk *(Accipiter gentilis)*	3
Common buzzard (*Buteo buteo*)	370
European honey buzzard (*Pernis apivorus*)	54
Rough-legged buzzard *(Buteo lagopus)*	211
Red kite (*Milvus milvus*)	14
Hobby *(Falco subbuteo)*	3
Red-footed falcon *(Falco vespertinus)*	2
Merlin (*Falco columbiarius*)	15
Hobby *(Falco subbuteo)*	23
Common kestrel (*Falco tinnunculus*)	128
Peregrine *(Falco peregrinus)*	2
Hen harrier (*Circus cyaneus*)	3
Marsh harrier (*Circus aerginosus*)	11
Pallid harrier *(Circus macrourus)*	1
Osprey (*Pandion haliaetus*)	9
White-tailed eagle (*Haliaeetus albicilla)*	1
Bonelli's eagle (*Aquila fasciata*)	1
Golden eagle (*Aquila chrysaetos*)	1

4.6.2 CONSERVATION STATUS AND POTENTIAL THREATS

As top predators, most birds of prey are slowly reproducing species with a relatively little annual reproduction and their young require many years to mature before breeding takes place (Dwyer et al. 2018). Thus, they have naturally low densities. In fact, the population sizes of raptor species are relatively small compared to other breeding birds. Their life-history traits and their high trophic level make them extremely susceptible to anthropogenic threats (such as land use change, direct killing, poisoning and environmental contaminants, electrocution and climate change) and are thus among the most threatened group of birds in the world (McClure et al. 2018). In Europe, the most important impacts affecting the populations of the most vulnerable diurnal raptor species include habitat loss/change, intensification of agricultural habitats, direct persecution (e.g. shooting), pesticide contamination, disturbance of nest sites, among many others (Stroud 2003).

Due to the particular vulnerability of birds of prey and the reduction of their population sizes because of the numerous threats they have already faced by the first half of the last century (Bijleveld 1974; Bildstein 2017), birds of prey are among the rarest birds in Europe: 46% of European birds with less than 1,000 breeding pairs are birds of prey (Stroud 2003). Thus, many of the species are protected by European legislation and have also been included in other conventions (see Table 4-2 for the most common species likely crossing through the Baltic Sea).

Direct mortality from collisions with wind turbines are relatively common in birds of prey. The killing of hundreds of birds of prey by wind turbines were already seen with the first large wind farms placed in Altamont Pass in California and have been documented in many other places ever since. In Germany, in March 2013, at least 37% of all reported birds collisions corresponded to birds of prey confirming that they made up a disproportionately large part of all collisions (Hötker 2017). Some species were especially susceptible, among them red kites, whose breeding populations in Germany have been rapidly declining since 1991 (Mammen et al. 2017).

Despite estimates of collision rates of birds of prey with wind turbines are very variable and the difficulty of obtaining reliable data, some overall findings and conclusions have been achieved from the German database in Brandenburg (Rasran & Dürr 2017). Most frequently killed birds were red kite and common buzzard, but other species such as white-tailed eagle, common kestrel and black kite were also often reported as victims. Most collision victims were adult birds and mainly occurred in spring and late summer (Rasran & Dürr 2017). The collision risk directly depends on the rotor swept area, thus the flight height at which the species most commonly fly. Red kites often flew at heights within the rotor swept area. In fact, it was found that up to 50% of all recorded red kite flights led into the risk area of wind turbines (Mammen et al. 2017).

Whereas collisions have been documented for at least 34 species of birds of prey, the effect they may have on population level have been explored for comparatively fewer species. For example, a modelling study of the population of red kites in Germany has predicted a further decline due to additional mortality from collisions with wind turbines (Bellebaum et al. 2013). Indirect effects such as modifying flight altitudes to avoid wind farm collision and displacement and effective habitat loss have also been studied for different species. For example, golden eagles are apparently able to detect and avoid turbines during migration after the construction of wind farms (Johnston et al. 2014) or black kites reduced the use of areas up to 674 m away from turbines with an estimated loss of 3-14% of the suitable areas at the migratory bottleneck of the Strait of Gibraltar (Marques et al. 2019). Further examples of study cases of the effects of wind turbines on different birds of prey are reviewed by Watson and colleagues (2018).

4.7 CRANES

4.7.1 BIOLOGY, DISTRIBUTION AND ABUNDANCE

The population of common cranes breeding in Northwest Europe and Scandinavia increased in size and is estimated to be 350,000 individuals (Wetlands International 2022, AEWA CSR 8, retrieved on 25.02.2022). Especially for cranes of Finland and Sweden, the Southwestern Baltic Sea is an integral part of their migration route to and from wintering quarters in Southwestern Europe. The Rügen-Bock region in Germany is an important resting area, hosting temporarily up to 40,000 cranes (BSH 2021). A huge part of these birds crosses the Arkona basin in a 1–2-hour flight. Especially in autumn, a proportion of cranes will also move in a southwestern direction over the area of Bornholm (Figure 4-6). The exact number of birds crossing the pre-investigation area is not known and will be highly dependent on the weather conditions each year.

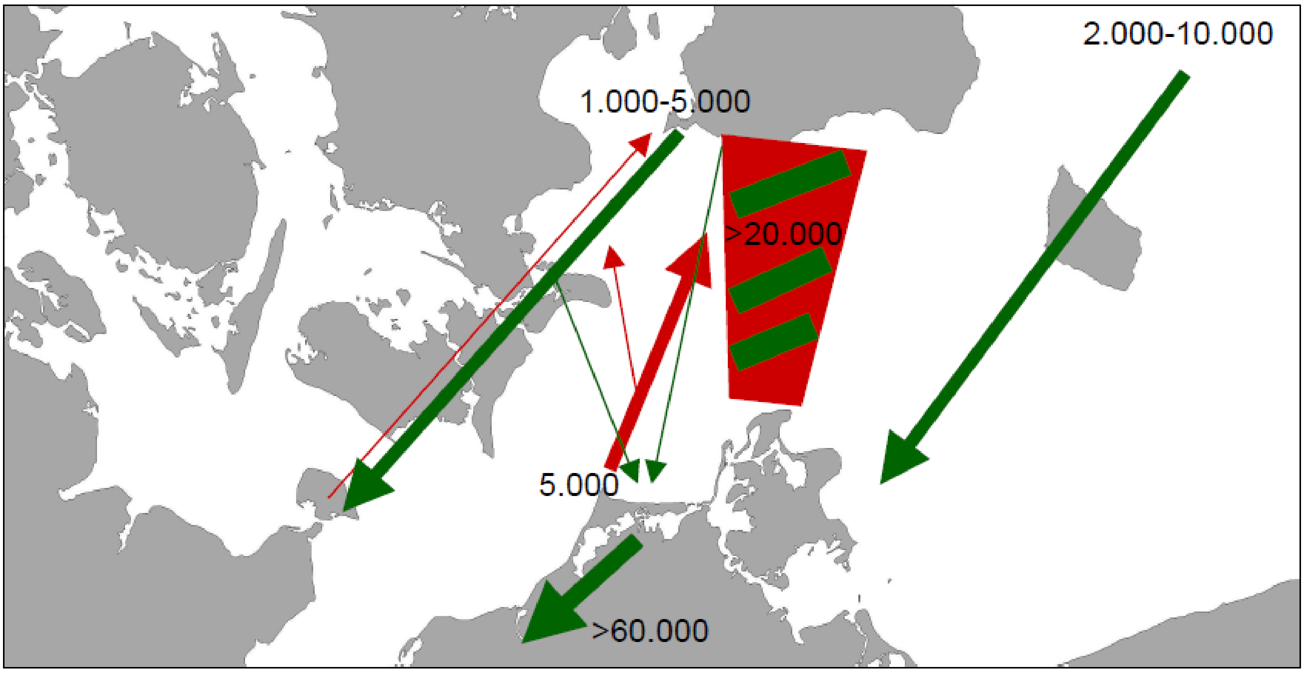

Figure 4-6. Migration routes of common cranes in the southern Baltic area (BSH 2021 based on Falsterbo, Bornholm and other observation data). Estimated numbers may be higher today due to an increasing population trend. Red arrows mark spring migration routes and green arrows autumn migration. The thickness of the lines indicates assumed magnitude of migration and, for the central route between southern Sweden and Rügen, the approximate spatial extension of this migration corridor.

At Bornholm, the common crane is a relatively common breeding bird, and the island probably holds the densest population of breeding in the country. During the latest Danish breeding bird atlas, at least 70 pairs were breeding at the island, and the population is still increasing (Vikstrøm & Moshøj 2020).

The number of migrating cranes passing Bornholm is highly dependent on wind conditions, with the highest number during periods with westerly winds and generally more birds during autumn compared to spring Table 4-6).

Table 4-7. Monthly distribution of the number of cranes observed at Bornholm 2010-2022. The numbers are "max numbers", i.e. the highest number of birds observed on a single day each month (DOFbasen 2022).

Month	Max number
January	14
February	55
March	200
April	220
May	35
June	13
July	45
August	126
September	3,814
October	8,885
November	200
December	3

4.7.2 CONSERVATION STATUS AND POTENTIAL THREATS

With its increasing population trend, the common crane currently has a Red List status of "least concern" (BirdLife International 2021). However, its susceptibility to increasing offshore wind power generation remains not completely clear. One important behavioural trait in this regard might be the flight height of cranes crossing the Baltic Sea. Cranes tend to use soaring flight over land, but due to the lack of thermal updrafts over the open water, they have to gain or hold their altitude in powered flight after leaving the coasts (Alerstam 1990). Studies of flight altitudes of cranes in the Baltic offshore region so far reveal a certain variety, with cranes observed flying clearly below 200 m height as well as far above (Schulz et al. 2013; Skov et al. 2015). Also, a dependency on wind directions was observed.

4.8 WADERS

The term waders cover a relatively high number of species of the Charadriiformes order like sandpipers, plovers and lapwings – nearly all of them are typical birds of coasts, seashores and wetlands that forage on shallowly flooded grounds for molluscs, crustaceans, insects and worms. For the pre-investigation area they are mainly of importance as migrating birds travelling through, as many of them breed in the arctic tundra and use the Wadden Sea as wintering grounds or as a food-rich stopover site on their further way to, in many cases, Atlantic tidal areas and western Africa. The Baltic Sea provides rather low numbers of resting waders (Bellebaum 2010a).

During offshore bird migration surveys directly southeast of the pre-investigation area in 2016 and 2017 (BioConsult SH et al. 2020b), 14 out of about 40 wader species reasonably to be expected were seen or heard, including dunlin (*Calidris alpina*), curlew and whimbrel (*Numenius arquata* and *phaeopus*), and golden plover (*Pluvialis apricaria*).

Overall, the species group accounted only for a small amount of at maximum 1-2 % of the observed birds, though current population size estimates of, for example, dunlin (1.3-1.4 million) or red knot (250,000, Wetlands international, retrieved on 15.06.2022) might suggest more. This probably fits with the assumption that wader migration in the area takes place primarily at night, in broad fronts and at great heights (Meltofte 2008, Bellebaum 2010a, BSH 2021).

4.8.1 CONSERVATION STATUS AND POTENTIAL THREATS

Since waders are not expected to occur in large numbers at the pre-investigation area, no further details on their conservation status will be provided. However, they do tend to fly higher than 50 m of height, making them potentially susceptible to being affected by operating OWF. Nonetheless, most of the waders expected in the area are migrating birds, which would mean they would be flying much higher than the rotor height and are thus possibly less affected by a potential OWF in the area.

4.9 GULLS

The general term ‘gulls’ groups different species of small-bodied and larger gulls (genus *Larus*). The first include two species that may occur also frequently (Black-headed gull *Chroicocephalus ridibundus* and little gull *Hydrocoloeus minutus*). While little gulls may be slightly affected by offshore wind farms, other gulls are either unaffected or attracted towards OWF (Dierschke et al. 2016). All gull species are opportunistic and omnivores. The small gulls (little and black-headed gull) feed mainly (or exclusively in case of the black-headed gulls) on insects and crustaceans whereas large gulls feed mainly on small or medium-sized fish (Mendel et al. 2008). They tend to be gregarious (except for the great black-backed gull). Most large gull species are positively affected by anthropogenic activities. They are well known ship followers as they are benefiting from fish discards and some of them are also feeding on garbage dumps (Durinck et al. 1994; Garthe & Scherp 2003; Mendel et al. 2008).

4.9.1 COMMON GULL

In the Baltic Sea, common gulls (*Larus canus*) breed along the coast mainly in Sweden and Finland. These gulls are mainly migratory, some birds winter in the northeast and southern Baltic Sea, but most do in the North Sea (Durinck et al. 1994). They feed on terrestrial and aquatic invertebrates as well as fish, but also on fish discards and garbage dumps (Durinck et al. 1994). In fact, they are typical ship followers (Walter & Becker 1997; Kubetzki 2002). They are observed in large flocks of up to 100 birds (Durinck et al. 1994).

Common gulls may occur in the area throughout all year but might be more numerous in winter.

West of Bornholm they may be found at mid to high densities (1-5 ind./km^2, Durinck et al. 1994), but south of it and in most part of the pre-investigation area they may be less numerous (BioConsult SH et al. 2020b). Common gulls may have been more numerous. Early surveys indicated they were found over most of the Baltic Sea (Durinck et al. 1993). In Graesholm, for example, there were colonies with around 5,000 pairs of common gulls by the 1920s. However, forty years later they were not breeding here anymore. The decline was probably caused by o competition with herring gulls for nesting sites (Lyngs 1992).

4.9.2 LESSER BLACK-BACKED GULL

Lesser black-backed gulls are distributed throughout Europe. Three subspecies occur: the eastern variation *Larus fuscus fuscus* which breeds from Sweden to northern Norway, eastwards to Russia. The western variation *L. f. graelssii* breeds in from SW Greenland to Iceland to Spain, whereas an intermediate form *L. f. intermedius* occurs in the Netherlands and Denmark mainly (Mendel et al. 2008). In Denmark, two of these subspecies may occur (*L. f. fuscus* and *L. f. intermedius*). Almost two decades ago, estimates suggested a population of 300,000 to 350,000 breeding pairs of lesser black-backed gulls (Mendel et al. 2008).

In the Baltic Sea, close to the pre-investigation area, comparatively fewer lesser black-backed gulls are expected than in the coasts of the North Sea. In the Pomeranian Bay, they may be seen mainly in summer and autumn (Mendel et al. 2008).

4.9.3 GREAT BLACK-BACKED GULL

The great black-backed gull *(Larus marinus*) occurs in small numbers in the Baltic Sea east of Rügen throughout the year. The highest populations are reached in winter when birds migrate southward from the more northerly sites. Great black-backed gulls feed mainly on fish and are solitary or observed in small loose flocks (Durinck et al. 1994). They also gather near fishing ships to forage for food (Durinck et al. 1994; Garthe & Scherp 2003; Mendel et al. 2008). One of the important wintering areas for this species is the Bornholm deep, located west of the island of Bornholm (Durinck et al. 1994). In the preliminary site O1.3 directly west of the pre-investigation area, densities of around 0.1 ind./km² were observed during digital aerial surveys flown in winters (BioConsult SH et al. 2020b).

4.9.4 HERRING GULL

The numbers of herring gulls increased in Denmark since the first censuses of 1920, when about 3000 pairs of herring gulls were estimated to about 87,000 pairs in 2010. Currently, however, declining population trends (Wetlands International 2022) of partially significant magnitude in the Baltic region (e.g., Finland, Hario & Rintala 2016) occur. Most of the growth of the population occurred after the 1960s and parallels the growth observed in north-western Europe, apparently linked to an increase in protection, garbage dumps and fisheries discards (Bregnballe & Lyngs 2014). The development of the population of herring gulls differed between eastern and western Denmark. Before the mid-seventies, most herring gulls bred in the eastern part of Denmark (61%, Bregnballe & Lyngs 2014), with the colony of Ertholmene being the second largest colony of herring gulls in Denmark (Lyngs 1992). However, around 1974, the government installed culling programs in the largest colonies of these gulls, which resulted in a decline of the entire breeding population and shifted the centre of the herring gulls towards the western part of the country (Bregnballe & Lyngs 2014). Nevertheless, although herring gulls breeding at Ertholmene have reduced from about 20,000 pairs in 1970s (Lyngs 1992) to about 9,000 pairs (Bregnballe & Lyngs 2014), the breeding colony there is still important.

Herring gulls arrive to the colony between mid-January and late February. The laying of eggs starts in April but peaks by late April, and gulls leave the colony from mid to late August (Lyngs 1992). Herring gulls are regarded as the most common gull species in the offshore sites of the German Baltic Sea. As ship followers, temporal and localized high densities may also be found (Garthe & Scherp 2003). In a previous study of the preliminary site O1.3, herring gulls were widely distributed over the pre-investigation area during all seasons with exception of one summer (BioConsult SH et al. 2020a). Thus, their occurrence is expected in the pre-investigation area of the OWFs of Energy Island.

4.9.5 CONSERVATION STATUS AND POTENTIAL THREATS

The gull species mentioned here have relatively wide distribution ranges and, though not all of them show stable population trends, are not listed under any category requiring special protection. As opportunistic feeders, these gulls often are attracted to ship because they benefit from the discards, thus only small proportion of individuals of these species show escape reactions toward ships (FLIESSBACH ET AL. 2019). Avoidance towards OWF may also not be expected, and they may on the other hand be weakly attracted to them (Dierschke et al., 2016). Most threats that affect gulls in general are oil pollution and by-catch (Mendel et al., 2008).

4.10 TERNS

Terns are in general not common in the Baltic Sea area around the pre-investigation area. Most common species are the sandwich tern (*Sterna sandvicensis*), arctic tern (*Sterna paradisea*) and common tern (*Sterna hirundo*). sandwich Terns were even not breeding in the Baltic Sea at the beginning of the 20th century (Herrmann et al. 2008). The Danish population of sandwich terns was estimated at 4,700 breeding pairs in 2006, but the majority bred in the North Sea (Herrmann et al. 2008). The population breeding in the Baltic Sea (mainly Kattegat area) varied from 500 to 2,000 bp between 1993-2007 (see Herrmann et al. 2008). In the Pomeranian Bay they may be observed sporadically, especially between August and October and most often near the coast (Mendel et al. 2008).

The other two tern species (arctic/common tern, which tend to be difficult to distinguish from digital images) may also be observed close to the pre-investigation area but mainly close to the coast and in the summer months.

4.10.1 CONSERVATION STATUS AND POTENTIAL THREATS

All mentioned terns are seabirds requiring protection (all species are listed in Annex I of the European Birds Directive and under the AEWA), and at least the sandwich tern seems to react negatively towards OWF (Dierschke et al. 2016). However, none of the tern species are expected to occur abundantly in the pre-investigation area.

Except a possible breeding attempt of sandwich tern in 2012, there have been no records of breeding terns at Bornholm or Ertholmene in recent time (Vikstrøm & Moshøj 2020; DOFbasen 2022).

4.11 AUKS

4.11.1 BIOLOGY, DISTRIBUTION AND ABUNDANCE

The auks consist primarily of common guillemots (*Uria aalge*) and razorbills (*Alca torda*). Occasionally, other auks such as the Atlantic puffin (*Fratercula arctica*) and the black guillemot (*Cephus grylle*) are also observed in the Baltic Sea. The black guillemot is in fact one of the species for which Rønne Banke is considered an important bird area (Rasmussen et al. 2000). Over two thirds of the population of common guillemots and 30% of the populations of razorbills breed in Störa Karlso (and Lilla Karlsö), two small islands located west of the island of Gotland, which are famous for hosting the largest fish-eating seabird colonies of the Baltic Sea (Olsson & Hentati-Sundberg 2017). There are other colonies of these two auk species in other areas of the Baltic Sea, but most are relatively small. The second largest colony of common guillemots in the Baltic Sea is in Graesholmen, a very small island north of the island of Bornholm, which hosts about 2,000-3,000 pairs (Olsson et al. 2000). Lyngs (1992), suggests that there were 2,000 pairs of common guillemot and around 450 pairs of razorbills breeding in Graesholmen in the 1980s. In the early 2000s, the breeding pairs of razorbills had increased to 780 pairs (Lyngs 2001). In fact, this archipelago (Ertholmene) is one of the Danish important bird areas and the only site in Denmark known to have breeding colonies of these two auk species (Rasmussen et al. 2000).

Guillemots reach the colonies earlier than razorbills. While the former may arrive as early as December, razorbills arrive by late February and early March. This means that guillemots occupy the breeding site earlier and breed earlier. Lyngs (1992) also mentions that chicks of guillemots leave the colony from mid to late June while razorbills chick may still remain until mid-July.

It is therefore highly possible that these birds will occur in the area, especially in deep waters. Previous digital aerial surveys conducted at the preliminary site O.1.3 south of Bornholm I found low to mid-densities of auks in the area. Especially during winter, auks were widely spread throughout the pre-investigation area (BioConsult SH et al. 2020b). Thus, auks might be expected at mid-densities in the pre-investigation area of the energy islands.

Black guillemots may also concentrate in the Rønne Banke area, although they are only observed in relatively low numbers during the national Danish midwinter surveys (Petersen et al. 2016).
An old census found areas with mid densities of black guillemots in Rønne Banke (1.6 ind./km²) during winter (Durinck et al. 1993). Even larger densities of this species may occur in the Pomeranian Bay and south of Rønne Banke (Oderbanke, Adlergrund Banke (Durinck et al. 1994; Mendel et al. 2008). Compared to the other two auk species, black guillemots prefer shallower waters (depths < 25 m, Durinck et al. 1994). During the surveys conducted for the baseline study of preliminary site O1.3, 25 and 74 individuals of black guillemots were counted on the digital aerial surveys of 2016/2017 and 2017/2018 respectively (BioConsult SH et al. 2020b).

4.11.2 CONSERVATION STATUS, THREATS AND POTENTIAL IMPACTS

While the two most common auk species have relatively stable populations or are increasing, other auk species are threatened. In general, auks and other sea bird species are long-lived, but start reproducing only after several years of life. Moreover, these species were heavily hunted by humans, and their populations almost got extinct. In fact, one species of auk has been hunted to extinction in the 19th century (the great auk). The other species of auks that may rarely occur in the zone are listed under some threat category (black guillemot or Atlantic puffin).

4.12 SONGBIRDS

4.12.1 BIOLOGY, DISTRIBUTION AND ABUNDANCE

Passerines include more than half of all described bird species in the world and are also referred to as songbirds or perching birds, due to the arrangements of their toes, which facilitates perching. Since passerines include a very large number of species, it is not surprising that they also comprise the bulk of migrating birds. One of the best studied bird migration systems is the one involving the Palearctic-African flyway.

The first estimations of the number of passerine birds migrating between Europe and Africa was estimated at 4.3 billion birds by Moreau in 1972 (Hahn et al. 2009). Newer estimations suggest that only half of this number (~ 2.1 billion birds) migrates from Europe to Africa every autumn, and almost three quarters of those birds correspond to the migration of 16 species of passerines (Hahn et al. 2009). This estimation corresponds to birds migrating from the largest parts of Europe and not only crossing the Western Baltic Sea, but it gives an impression of the magnitude of passerine migration. Moreover, European passerines show a variety of migration patterns and strategies, about which we still need to learn a lot but a good summary of them is presented by Busse (2001). European migrating passerine birds typically go from their breeding sites (often in the north of Europe) to their wintering quarters located in warmer regions (frequently southern Europe or even northern Africa). Often migration occurs in broad fronts and not through corridors (or flyways), an example of which is shown in Figure 4-7. Nevertheless, this is a simplified figure of the strategies different species have evolved. For example, there are species whose wintering quarters overlap with their breeding sites, and although they do migrate, it is not well known whether northern populations migrate further south with the middle ones being resident, or rather all the populations migrate further south.

Passerine migrants can be long-distance migrants (if the breeding sites and the wintering sites are geographically well separated by an area where the species is only on route or may only use for stopover and refuel during migration routes but does not remain there) and short-distance migrants (when the wintering grounds are close to or overlapping with the breeding sites). Moreover, it is possible that not all the individuals of a species migrate, often migration is partial. For example, there may be differential migration by sexes or age or by populations (e.g., only northern populations of European robins are migratory, southern populations are resident and populations at intermediate distributions are partially migratory). According to the review by Busse (2001) at least 63 species of European passerines are long-distance migrants whereas 69 species can be classified as short-distance migrants.

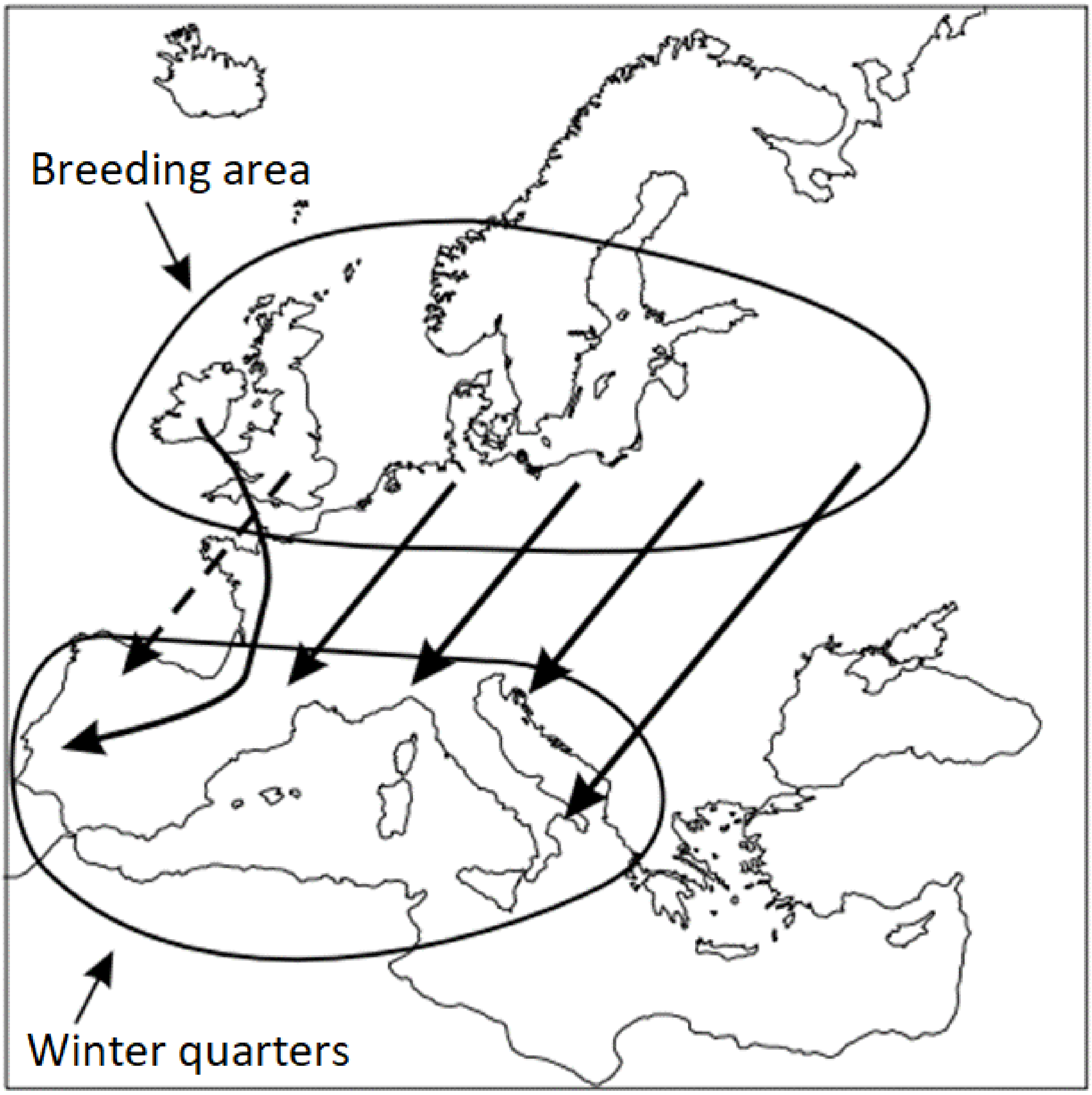

Figure 4-7. Example of broad front migration from the breeding region to the wintering quarter. Taken from Busse (2001, who modified it from Zink, 1973).

Most recent interpretations of migration studies and routes suggest that there might be four main passerine flyways in the Western Palearctic: 1) the Western/Atlantic flyway, 2) Central (Apennine flyway), 3) South-Eastern (Balkan-SE flyway) and 4) Eastern (Indian) flyway, which are shown in Figure 4-8 (Busse et al. 2014). The different lines connect breeding sites with wintering quarters (as summarized from ringing recovery studies). Most (passerine) birds do fly on their routes across broad fronts but there are some passages where there are bottlenecks, and their densities increase. Note also that species that might be observed during migration routes crossing the Baltic Sea correspond to species taking flyways numbered 1-3. Species whose wintering quarters are in Asia breed in Eastern European countries.

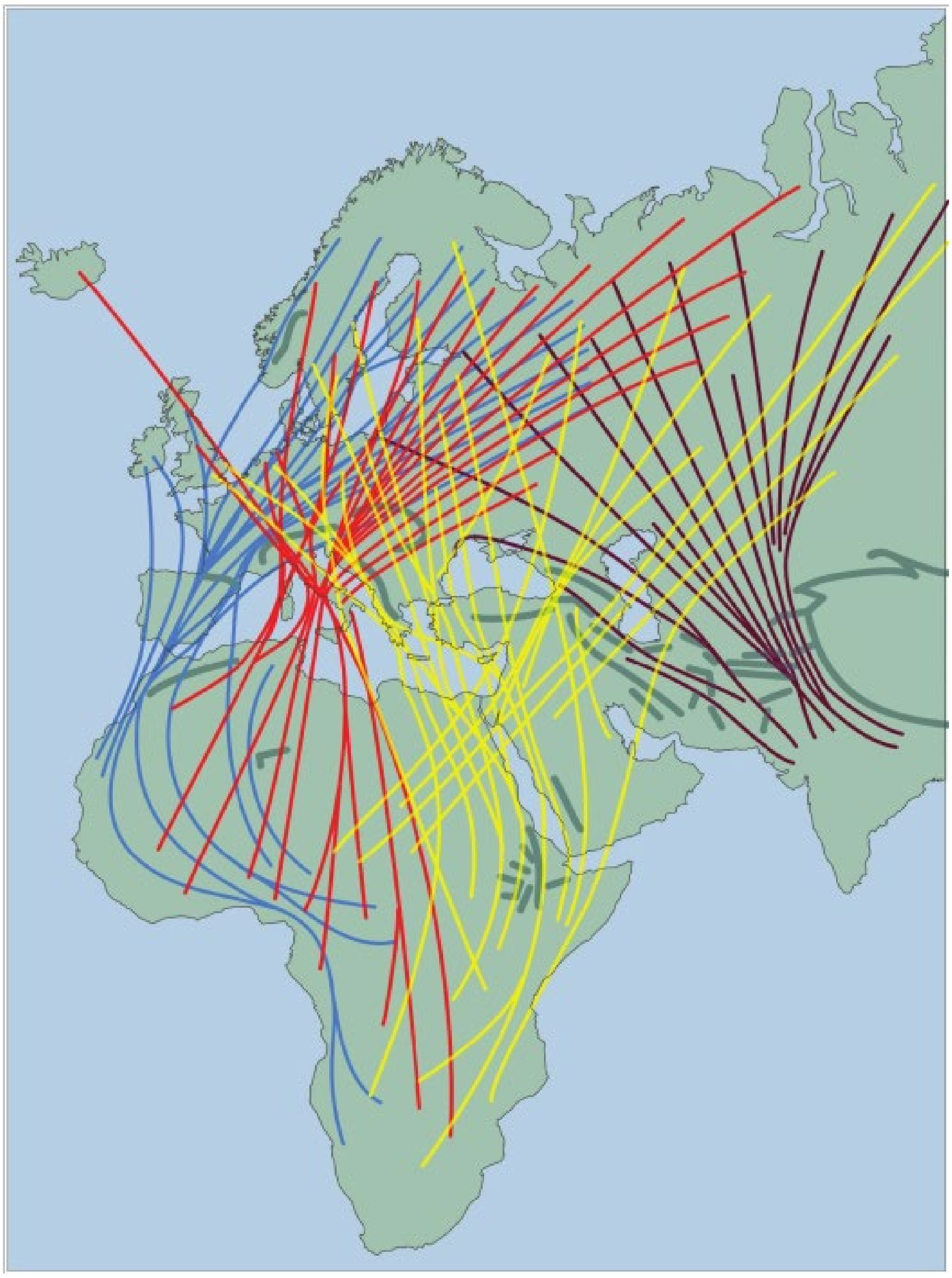

Figure 4-8. The four main fly way routes occurring in the Palearctic: 1) the western/Atlantic (in blue), 2) the Central (Apennine, in red), 3) South-Eastern (Balkan in yellow) and 4) Eastern (Indian, in brown). Taken from Busse et al., 2014.

Migration of passerine birds occurs during day and night with species having adapted to migrate at a particular time of day. Most diurnal migrating species include low and mid-distance migrants such as finches and wagtails are much more dependent on visual orientation cues. Birds migrating during night are mid-distance migrants such as thrushes and robins and long-distance migrants such as warblers often migrate in broader fronts because they depend much less on visual orientation cues (Bellebaum et al. 2010a). In Table 4-7, the most important passerine birds in terms of migrating numbers are shown.

As seen in Figure 3-1 and Figure 4-8, most common migrating passerine birds passing through the Western Baltic Sea fly in a SW direction in autumn (the flyway 1), Nevertheless there are some flying in southern direction in an SE direction (Bellebaum et al. 2010a). The yearly distribution of the migration and the number of birds migrating through the pre-investigation area is uncertain and likely to vary between years according to weather conditions.

4.12.2 CONSERVATION STATUS AND POTENTIAL THREATS

Many common species of passerine birds are not under any category of conservation because of their broad distribution ranges and their relatively large populations. However, there are less common and species with restricted ranges whose populations may also be endangered. For example, the rook (Corvus frugilegus) has experienced decline in half of its populations, mostly due to destruction of their nesting sites, and has therefore been included as a vulnerable species by the European Red List of birds (VU, Birdlife, 2021).

Table 4-8. Breeding and wintering regions, together with estimates of population size and conservation status for the most common day and night passerines potentially migrating over the pre-investigation area. Population trends: INC = increasing, DEC = declining, STA = stable.

Species (subspecies/ Population)[1]	Day/ Night (D/N)	Breeding region[1]	Wintering region[1]	Most recent population estimate (Trend) [2]	Average autumn migration numbers at Falsterbo (1973-2019)[3]	Conservation status	
						European Birds Directive	Red List Birdlife 2021
European robin (8 subspecies) *Erithacus rubecula rubecula*	N	Fennoscandia and parts of Eastern/Central Europe	Southern Spain, NW Africa. The species is resident in southern distribution	109,000,000-168,000,000 STA	Not available		LC
Willow warbler (3 races) *Phylloscopus trochilus trochilus*	N	Central Europe (another race breeds northern Fennoscandia)	South Africa	106,000,000-161,000,000 DEC	Not available		LC
Goldcrest (> 12 ssp described) *Regulus regulus regulus*	N	North Fennoscania	Southern Europe. Partially migrating (northern populations)	29,100,000-50,400,000 DEC	Not available		LC

Eurasian blackcap (5 spp) *Sylvia atricapilla atricapilla*	N	Central/Eastern Europe, South Fennoscania	NW Africa/Southern Europe	88,400,000-138,000,000 INC	Not available		LC
Eurasian Skylark (at least four ssp) *Alauda arvensis arvensis*	D/N	Fennoscandia and Eastern Europe	Southern Europe/NW Africa Southern populations are resident	87,800,000-132,000,000 DEC	1871		LC
Common chaffinch (a dozen of ssp) *Fringilla coelebs coelebs*	D	Fennoscania/East Europe / West Siberia	W/South Europe, Northern Africa	308,000,000-462,000,000 STA	844,621 (for both *Fringilla* species)		LC
Brambling (monotypic) *Fringilla montifringilla*	D/N	Taiga (north Scandinavia across Siberia)	Central Europe/North Mediterranean	14,000,000-26,000,000 DEC			LC
Song thrush (3 subspecies) *Turdus philomelos philomelos*	N	North / Central Eastern Europe	Southern Europe, northen Africa	47,300,000-77,900,000 STA	948		Lc
Redwing (2 ssp) *Turdus iliacus iliacus*	N	Northern Europe/Russia	Central Europe	16,200,000-28,100,000 DEC	4,235		LC
Yellow wagtail (numerous subspecies) *Motacilla flava flava*	D	Northern Central Europe	Tropical Africa	26,700,000-36,000,000 DEC	39,768		LC
Meadow pipit (monotypic) *Anthus pratensis*	D	Northen/East Europe/Siberia	Central/Southern Europe	22,000,000-29,800,000 DEC	10,653		LC

[1] Breeding and wintering distribution and information on subspecies from Shirihai & Svensson (2018) and Svensson & Shirihai (2018).
[2] Population sizes and trends taken from Birdlife International (2021). INC: Increasing, STA: Stable, DEC: Decreasing.
[3] Average numbers observed at Falsterbo between 1973-2019 from (Kjellén 2019).
[4] For the explanation of the categories see Appendix.

Given the huge number of (passerine) birds potentially crossing through the Baltic Sea and the pre-investigation area especially during the autumn migration (when passerine birds make up more than 95% of all migrating birds, cf. Report BSH, 2020), passerine birds are also potentially affected by wind turbines, especially during (mass) migration. Some studies have shown that a many of the species and a large proportion of the birds killed by turbines are passerines. For example, in a study of collisions of birds by turbines from 20 wind farms in South

Africa, about 30% of the reported fatalities corresponded to passerines, and fell second to raptors (Perold et al. 2020). The study area was, however, not an important passage for migrating birds and relatively few migrants typically occur there (Perold et al. 2020).

However, the proportion of migrating passerines that may be affected by direct collisions from wind turbines may also be larger (Hüppop and colleagues (2006).

Migration intensity concentrates on certain days of the whole migration period (75% of all passerines were observed during 17-33% of the migration days in the study). These results obtained from visual observations were also confirmed from the study of radar echoes. With regards to the flight altitudes during migration, it was also observed that almost half of the radar echoes (registered up to an altitude of 1,500 m) corresponded to the first 200 m of altitude (within the range at which wind turbines may be in operation).

Although the study by Hüppop and colleagues covered the German North Sea, some of the overall findings may also be relevant for the Baltic Sea.

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6 APPENDIX

EU Birds Directive:

Annex I	Annex I of the EU Birds Directive includes a total of 194 species. These are species threatened with extinction, rare due to low populations or small distribution areas or particularly in need of protection due to their habitat requirements.	
Annex II	It includes 82 species that can be hunted. However, the hunting periods are limited, and hunting is forbidden when birds are at their most vulnerable: during their return migration to nesting areas, reproduction and the raising of their chicks.	The difference between Part A and B lies in the geographical area where this hunting applies. Species listed in Part A may be hunted in the geographical sea and land area where this Directive applies, whereas species listed in Part B may be hunted only in the Member States in respect of which they are indicated.
Annex III	activities that directly threaten birds, such as their deliberate killing, capture or trade, or the destruction of their nests, are banned. Nonetheless, the Member States can allow these activities for the species listed in this annex.	Again, species listed in Part A includes species that have been legally killed or captured or otherwise legally acquired. Part B includes the same but for some of the Member States as indicated in the EU Birds Directive.

European Red List of Birds (Birdlife International, 2021)

R – Critically Endangered:	“Critically Endangered”. A taxon is Critically Endangered when, according to the best available data, there is an extremely high risk that the taxon will become extinct in the wild in the immediate future.
EN – Endangered:	“Endangered”. A taxon is Endangered when, according to the best available data, there is a very high risk that the taxon will become extinct in the wild in the immediate future.
VU – Vulnerable:	“Vulnerable”. A taxon is Vulnerable if, according to the best available data, it is is considered to be facing a high risk of extinction in the wild is a high risk that the taxon will

	become extinct in nature in the immediate future.
NT - Near Threatened	“Near Threatened”. A taxon is Near Threatened if the assessment does not result in being classified as CR, EN, or VU, but is expected to be classified in one of the categories in the near future
LC - Least Concern	“Least Concern”. A taxon is Least Concern if the assessment does not lead to its classification as CR, EN, VU or NT. Widespread species and those with large numbers of individuals are listed here.
NE - Not evaluated	“Not Evaluated”.

Population status according to the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (**AEWA**)

A 1b:	Species that are listed as “Threatened” in the current IUCN Red List
A 1c:	Populations of fewer than approx.10,000 individuals.
A 2:	Populations of approx. 10,000 to 25,000 individuals.
A 3b:	Populations of approx. 25,000 to 100,000 individuals that are considered endangered due to their reliance on a critically endangered habitat type.
A 3c:	Populations of approx. 25,000 to 100,000 individuals that are considered endangered due to a significant long-term decline.
A 4:	Species that are listed as “Near Threatened” in the IUCN Red List, but which do not meet the criteria for classification in categories A 1, A 2 or A 3,
B 1:	Populations of approx. 25,000 to 100,000 individuals that do not meet the requirements for column A.
B 2a:	Populations of more than approx. 100,000 individuals for which special attention appears to be necessary due to the concentration on a small number of sites at each stage of their annual cycle.
B 2b:	Populations of more than approx. 100,000 individuals, for

	which special attention appears to be necessary due to the reliance on a critically endangered habitat type.
B 2c:	Populations of more than approx. 100,000 individuals for which special attention appears to be necessary due to a significant long-term decline.
B 2d:	Populations of more than approx. 100,000 individuals for which special attention appears to be necessary due to large fluctuations in population size or trends.
C 1:	Populations of more than approx.100,000 individuals for which international cooperation could be of considerable benefit and that do not meet the conditions for column A or B.
( ):	Population situation unknown, endangerment status estimated.
*:	Populations marked with an asterisk may exceptionally continue to be hunted on the basis of sustainable use, provided that the hunting of these populations corresponds to a long cultural tradition (see Annex 3, paragraph 2.2.1).
[N]:	Type of AEWA agreement for which Germany is not a range state.

CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora)

Appendix I	includes all species threatened with extinction which are or may be affected by trade. Trade in specimens of these species must be subject to particularly strict regulation in order not to endanger further their survival and must only be authorized in exceptional circumstances
Appendix II/A	Includes all species which although not necessarily now threatened with extinction may become so unless trade in specimens of such species is subject to strict regulation in

	order to avoid utilization incompatible with their survival;
Appendix II/B	Includes other species which must be subject to regulation in order that trade in specimens of certain species referred to in sub-paragraph (a) of this paragraph may be brought under effective control
Appendix III	includes all species which any Party identifies as being subject to regulation within its jurisdiction for the purpose of preventing or restricting exploitation, and as needing the co-operation of other Parties in the control of trade.