Abundance of waterbirds in the breeding season

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Key message

Indicator consists of six species, four of which have increased significantly during the past 20 years.

Fish-feeding species like Great Cormorant, Sandwhich Tern, Razorbil and Common Guillemot have increased in recent years. Caspian Tern abundance has remained more or less stable. The reasons behind the increases are likely the improved prey abundance (e.g. high eutrophication status, fishing), declined contamination and protection measures.

The benthic-feeding Common Eider has declined steadily during the recent years and the reason may be a mixture of anthropogenic and natural factors.

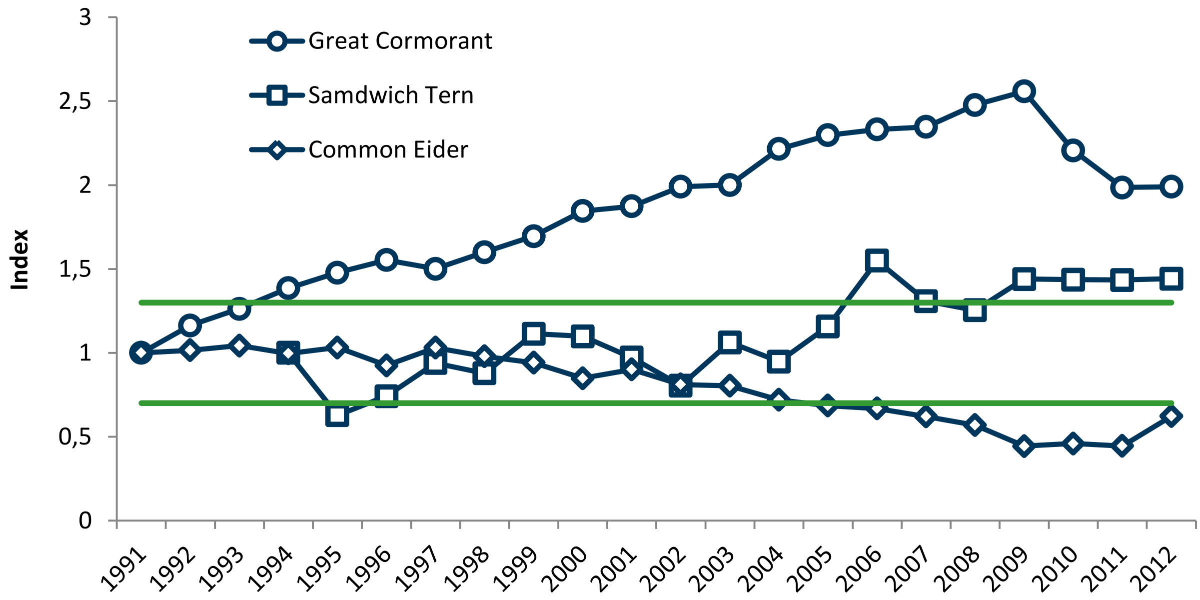

Figure 1. *State of the breeding waterbird species in the Baltic Sea. The green lines denote the 30 % deviation from the abundance of the baseline year of 1991. Population abundances outside the 30 % limits indicate change in the environmental conditions. Note that the indicator does not yet have data on Razorbill, Common Guillemot and Caspian Tern.*

What is the status of the breeding waterbirds in the Baltic Sea?

Current status and temporal trends in the Baltic Sea

The indicator consists of six species of breeding waterbirds: Common Eider, Caspian Tern, Sandwich Tern, Razorbill, Common Guillemot and Great Cormorant. At the moment there is complete data from four species (Razorbill and Common Guillemot missing), but the missing information can be filled with other data sources.

The indicator counts how many species vary >30 % in comparison to the year 1991. Too high decline or increase are seen as signs of environmental change and require more thorough investigation. Good environmental status (GES) is not reached if too many species deviate outside these limits.

Four species (Sandwich Tern, Razorbill, Common Guillemot and Great Cormorant) show high population growth (>30 %) while the abundance of Caspian Tern has remained more or less constant and Common Eider has declined (<30 %). The result suggests that the marine ecosystem is not in GES.

The increases of some of the species may be linked to higher food availability (small fish), whereas Great Cormorant may benefit also of national protection measures and Sandwich Tern has expanded its distribution range for unknown reasons.

Common Eider (*Somateria mollissima*)

Abundance of the Common Eider (Somateria mollissima) has declined steeply during the previous decade (2001–2012) as measured in the abundance of breeding pairs (Figure 2) and number of young (Ekroos et al. 2012), whereas the wintering population was found to decrease already earlier (Desholm et al. 2002). Declined breeding numbers have been also reported from Estonia (Elts et al. 2009), Finland (Hario & Rintala 2008) and Sweden (Lindström et al. 2011). Lehikoinen et al. (2008) show the change in sex ratio from female-biased to male-biased during the last 20 years and suggest sex-dependent predation during the breeding period. The decline has also been linked to a virus infection among fledglings and increased predation by White-tailed Eagles and American Mink.

Figure 2. *Index of the breeding pairs (mean, 95 %CI) of Common Eiders in (A) Baltic Sea, (B) Finland (80 000 bp), (C) Sweden (161 000 bp) and (D) Estonia (5 000 bp). The compile index is weighted by the national number of breeding pairs. Data from Denmark (25 000 bp) and Germany (1 200 bp) is lacking.*

The proportion of young Common Eiders in the Baltic population has continuously declined since 1980s'. The declined proportion of young eiders has been observed during 1982–2010 in a Danish dataset of hunted Common Eiders (Ekroos et al. 2012). The poor breeding success explains also the population decline. It has been suggested that the declined breeding success may be partly explained by increased predation pressure on adult females by White-tailed Eagle.

Great cormorant (*Phalacrocorax carbo*)

HELCOM Indicator Fact Sheet 2010 gives more detailed information of the species.

The persecution of Great Cormorant until 1960s exterminated the breeding population from the Baltic Sea. As a result of protection measures, and seemingly also due to the ban of DDT and PCB, numbers of breeding pairs started to increase during the second half of the 1970s. During the 1980s, the Cormorant started to expand its range towards the northern and eastern parts of the Baltic. Currently, the species is present in the whole Baltic Sea area, including Bothnian Bay.

In 2009, the total number of breeding pairs of Great Cormorants in the Baltic Sea riparian states was about 164 000 – 166 000 (Figure 3). The highest population densities are found around the highly eutrophic estuaries of the southern Baltic (Odra, Vistula, and Curonian lagoon).

After a decade of exponential growth, the breeding population of the species has stabilized in the south-western Baltic (Denmark and the northern Federal States of Germany - Schleswig-Holstein and Mecklenburg-Western Pomerania) in the 1990s, but breeding populations are still growing in the central and north-eastern parts of the Baltic Sea (Figure 4).

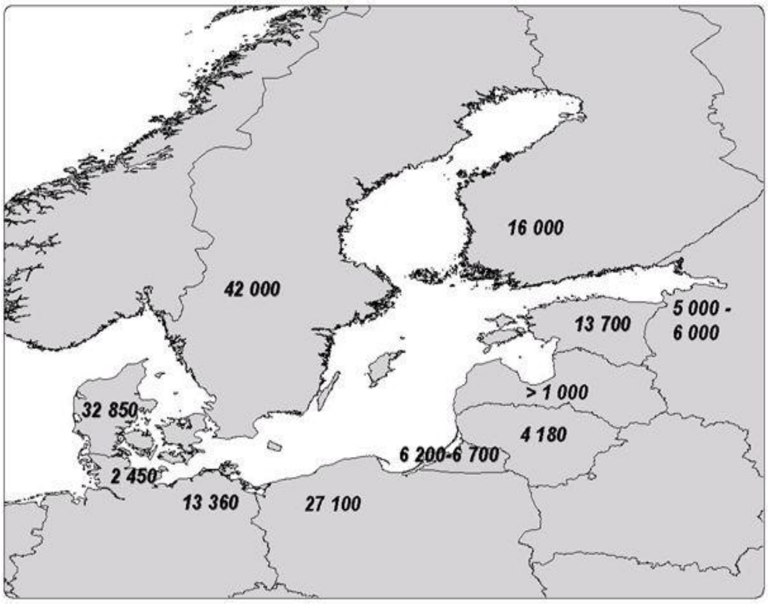

Figure 3. *Breeding pair numbers of the Great Cormorant in the Baltic Sea area in 2009.*

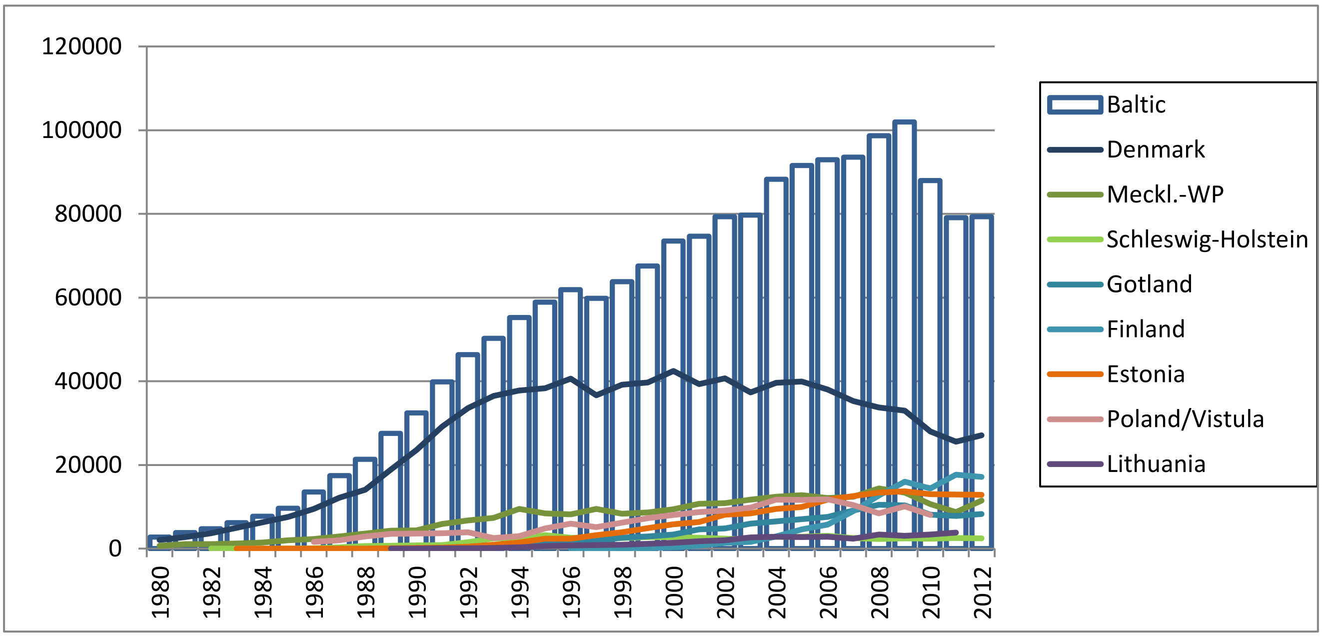

Figure 4. *Development of the Great Cormorant population in selected areas of the Baltic Sea. Note that the data does not cover all colonies.*

Sandwich tern (*Sterna sandvicensis*)

HELCOM Indicator Fact Sheet on Sandwich tern gives more detailed information of the species.

The Sandwich Tern is a typical marine bird whose breeding sites are restricted to the coast. It breeds on small islands covered by low grass vegetation, free of human disturbances and predatory mammals. The colonies of Sandwich Terns

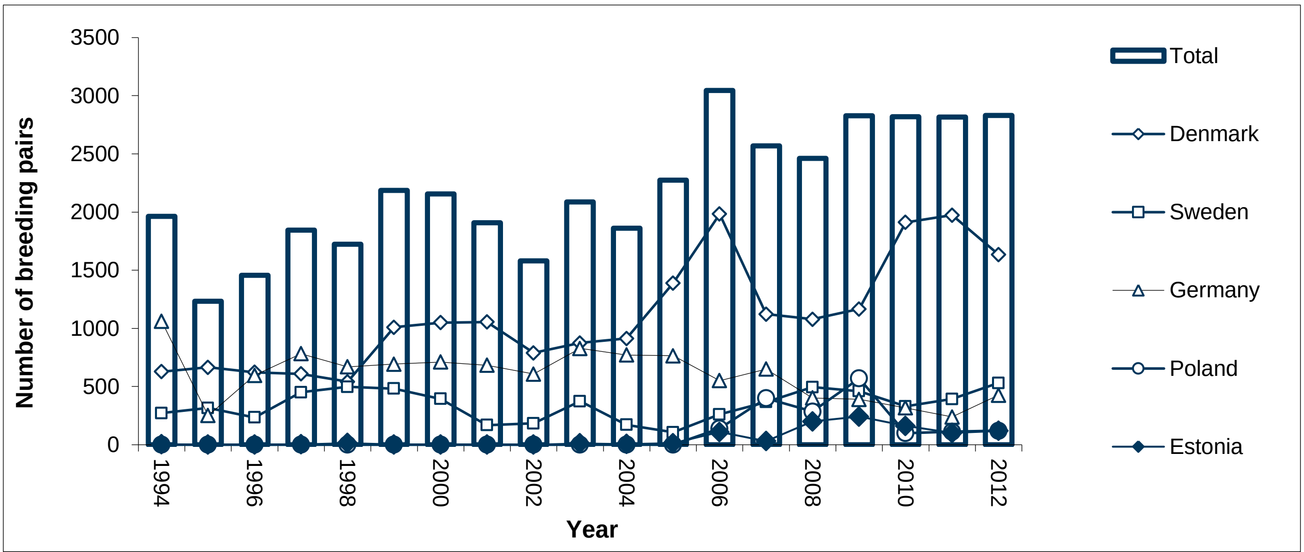

Figure 5. *The breeding population of the Sandwich Tern in the Baltic Sea area 1994-2012*

are always found within or adjacent to colonies of Black-headed Gulls (Larus ridibundus).

Sandwich terns have expanded their distribution in the Baltic Sea over the past hundred years. The current abundance fluctuates between 2000 and 3500 breeding pairs. The Danish areas of the Baltic Sea, especially the Central Kattegat and Great Belt (c. 1 400 bp in 2010), host the largest colonies and the highest number of breeding pairs. However, the colony sites are characterized by strong fluctuations.

The species can be considered as an indicator for breeding site quality for several marine and coastal bird species of the Baltic Sea area. Undisturbed small islands without or with low vegetation are the main breeding habitat not only for the Sandwich Tern, but also for other terns, gulls, some duck species, auks and others. Sandwich Tern is sensitive to environmental contamination with hazardous substances.

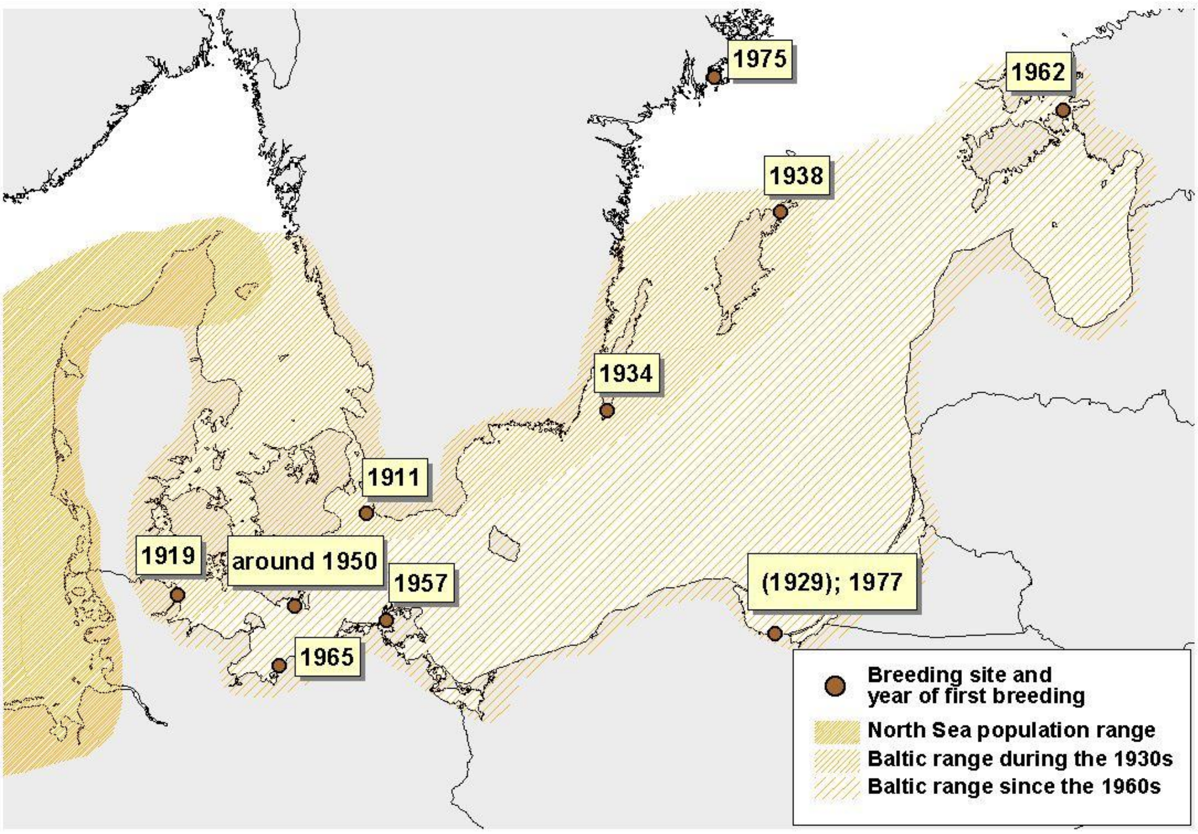

Figure 6. *The current distribution and the range expansion of the Sandwich Tern into the Baltic Sea area during the 20th century.*

Caspian tern (*Hydroprogne caspica*)

Caspian Tern has never been a numerous breeding bird in the Baltic Sea. The maximal number of breeding pairs has been documented to reach only 2500 pairs in the early 1970s, of which about 1000 pairs were counted from Finland (Bergman 1980, Hario et al. 1987). In 2012, the number of Baltic population is about 1 800 breeding pairs (Figure 7). The greatest threats to the breeding success are bad weather conditions and predation by Herring Gull, American Mink and White-tailed Eagle and to a smaller extent lack of suitable colony sites. In Finland, Caspian Tern is classified as a vulnerable species by IUCN criteria.

The brood size of Caspian Tern in Sweden and Eastern Gulf of Finland has decreased (Figure 8). The main reason is predation by White-tailed Eagle and the American Mink. In the Eastern Gulf of Finland especially the colony-breeders have great fluctuation in the breeding success (Hokkanen 2012).

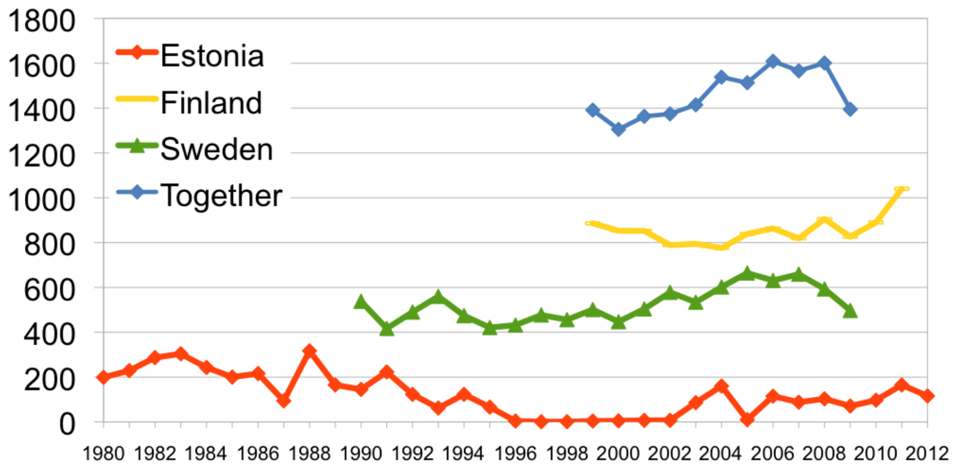

Figure 7. *Abundance and temporal changes of breeding pairs (bp) of Caspian Tern in the Baltic Sea. Data from Denmark (3 bp), Germany (0–2 bp) and Russia (10–20 bp) is lacking.*

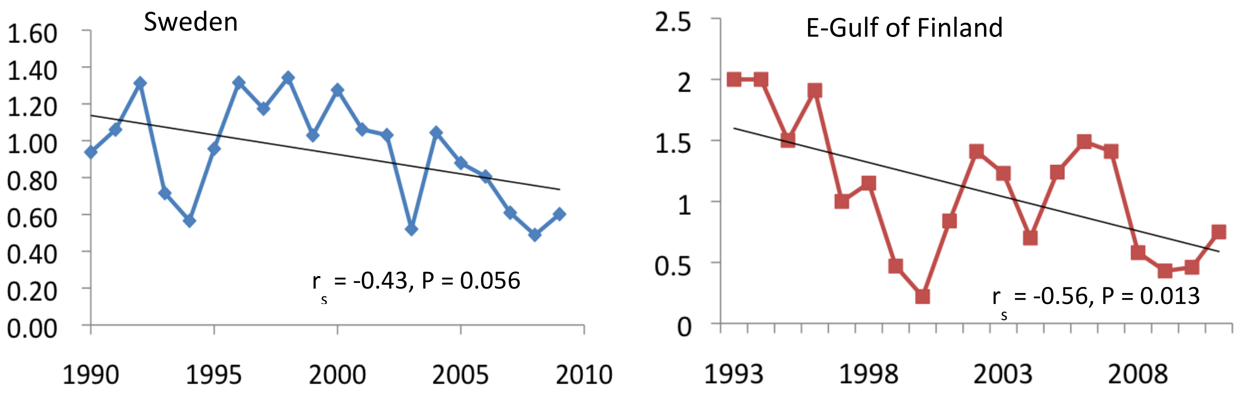

Figure 8. *Brood size and the number of nests of Caspian tern of single pairs and colony breeders in the eastern Gulf of Finland. Modified from Hokkanen (2012).*

Razorbill (*Alca torda*)

The Baltic Razorbill abundance has increased during the last 30 years (et al. 2008, Hario & Rintala 2010). The population crashed in 1940s as a result of severe winters and oil spills during the World War II. The Finnish abundance of breeding pairs in 1990s was ca 8 500 pairs (Hario 2000) and abundance of individuals in 2010 ca 18 900 (Hario & Rintala 2011).

Since 1991, the nestling production of Razorbill in the Eastern Gulf of Finland has fluctuated moderately but no clear increase or decline can be observed (Hokkanen 2012).

Greatest threats for the abundance and breeding success of Razorbill in the Eastern Gulf of Finland are most likely algal toxins (a population crash in 2000) and predation by American Mink. In 2002, a single American Mink destroyed 85 % of nests in one of the biggest colonies in the Eastern Gulf of Finland (Hokkanen 2012).

Common guillemot (*Uria aalge*)

The Baltic abundance of Common Guillemot has increased during the last 30 years (Ottvall et al. 2008, Hario & Rintala 2010, Hokkanen 2012). Common Guillemot lays one egg per breeding season. Fledging success of Baltic Sea Common Guillemot is generally high, but slightly lower in recent decades (annual averages ranging 0.88–0.95) than during the 1970's (0.94–0.97, see Hedgren 1980, Kadin et al. 2012). After the chick hatches, parent guillemots commute between the colony and the feeding areas and bring back a single fish at a time to feed their chick. Foraging trips are energy-demanding and the adults are thus limited in the number of foraging trips they can make without compromising their own survival. The size and energy content of prey items are therefore important during this period. Baltic Common guillemots mainly feed their chicks with sprat Sprattus sprattus, and fledging success is positively related to the weight-at-age of sprat (Kadin et al 2012). Similarly, the body mass of fledging chicks shows a positive relationship with sprat weight-at-age (Österblom et al. 2001, 2006). While high sprat abundance has a negative impact on sprat condition (Casini et al. 2011), there may be positive relationships between high food abundance and other Common Guillemot population parameters, such as survival. Such potentially contradictory evidence about the impacts of sprat on Common Guillemot population trends should therefore be considered when interpreting the results.

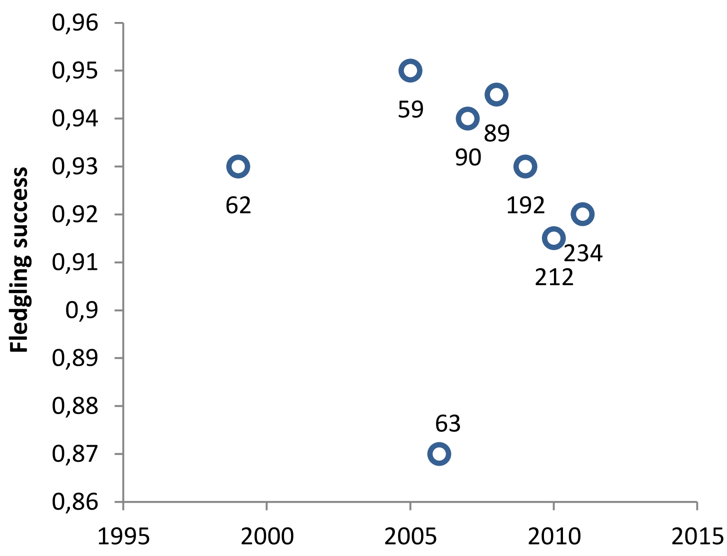

Figure 8. *Average Common Guillemot fledging success at Stora Karlsö, Baltic Sea. Sample sizes are indicated in the figure. Data source: M. Kadin, Stockholm University.*

Lesser black-backed gull (Larus fuscus fuscus)

The Lesser Black-backed Gull population fluctuation is not calculated for the entire Baltic Sea area, but only the breeding success of the species is included in this indicator report. In the island of Söderskär in the Gulf of Finland, the population has declined dramatically since 1978 when the time series starts (Figure 9). The likely reasons for the decline are organochlorines and increased predation by Herring Gulls (L. argentatus). The decline, however, leveled-off in early 2000s and has stayed at the low level since then. The breeding success – measured as nestling survival – has increased during the past 5-7 years indicating that an increase in the population abundance may occur in near future (Figure 9). A similar increase with a certain time lag was seen in early 1990s.

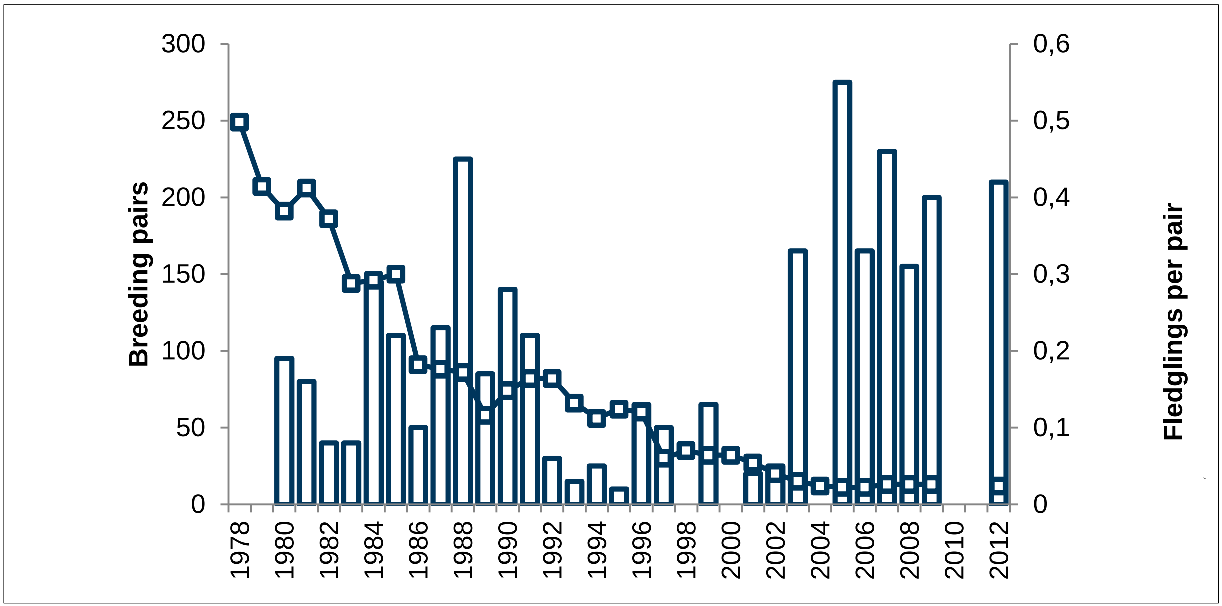

Figure 9. *Abundance of breeding pairs of Lesser Black-backed Gulls and the fledgling production on the island Söderskär, in the Gulf of Finland. Data source: Finnish Game and Fisheries Research Institute*

Description of the indicator

The proposed core indicator "Abundance of waterbirds in the breeding season" has two parameters: abundance and breeding success. The abundance parameter follows the OSPAR EcoQO[1] procedure for the status of seabirds in the North Sea (ICES 2008, 2011), whereas the breeding success parameter will be developed separately for each bird species.

The abundance indicator

The OSPAR EcoQO for abundance of seabirds was developed in the ICES WKSEQUIN workshop in 2008 (see the outcome here) and the most recent computation of the EcoQO was made by the ICES WGSE in 2011 (see outcome here).

The abundance indicator consists of a TRIM analysis[2] of selected species, their abundance estimates over time and deviation of abundance from a baseline year. In the OSPAR EcoQO, a 30 % deviation from the baseline (or 20 % for some species) was considered acceptable for a population. In the OSPAR Region II, the baseline year 2000 was chosen for the sake of simplicity as no true reference year can yet be set for bird species in that region. The Baltic indicator will be computed based on the same assumptions until better criteria can be developed. The EcoQO follows how many species meet the target range. Changes in breeding waterbird abundance should be within target levels for 75 % of species monitored in any of the assessment areas. If the trends of the one quarter of these species exceed the respective target levels in any given year, action will be triggered. In the Baltic Sea, good environmental status is tentatively being set for the above-mentioned 75 % threshold. The %-threshold is, obviously, very sensitive to the number of species included and therefore this will be discussed once the data has been compiled.

[1] The OSPAR ecological quality objective is "Changes in breeding seabird abundance should be within target levels for 75% of species monitored in any of the OSPAR regions or their subdivisions."
[2] TRIM (TRends and Indices for Monitoring data) is a free software package used to determine species' population trends. See http://www.ebcc.info/trim.html

The indicator will follow the changes in abundance over the entire sea area and include a set of selected waterbird species. There will be 4–5 assessment units in the Baltic.

The breeding success indicator

The indicator for the breeding success of selected waterbird species will not likely get any GES boundary, but the trends in the indicator value will support the assessment of the waterbird abundance.

The indicator could be included in the monitoring of Special Protected Areas (SPAs) of the Natura 2000 network. The breeding success data could be monitored in selected locations using locally representative species, such as Common Guillemots, Black Guillemots, Razorbills, Caspian Terns, Common Eiders.

Several methods can be applied, for example number of fledglings per breeding females is counted in the Gulf of Finland, Hanöbukten (SE Sweden), Gotland and Denmark.

Links to anthropogenic pressures

The Baltic waterbirds face several anthropogenic pressures during their breeding season and therefore the indicator may be difficult to link to specific management measures. Ottvall et al. (2008) list the possible pressures affecting the Swedish coastal waterbird species: oil spills in wintering areas, eutrophication, predation by American mink, recreational boating and tourism, contamination by hazardous substances, diseases, by-catch in fishing gears, habitat loss (increased vegetation), altered prey fish species composition and shortage of food.

The most impacting pressures on breeding waterbirds are oiling, hunting, removal of fish prey, drowning in fishing gears and non-indigenous species (i.e. American mink) are important pressures (HELCOM 2013). Also various pressures leading to the loss of and damage to benthic feeding habitats and coastal or offshore breeding habitats are significant.

Assesment units

The assessment units for the abundance indicator of the breeding bird populations will be firstly computed on a Baltic wide scale and secondly in 4–5 assessment units, built of the sub-basin units which have been used in the HELCOM thematic assessments. Before deciding over exact assessment units, the data should be examined in more detail.

Species lists

The indicator for the abundance of Baltic waterbirds in the breeding season includes the following species: Common Eider (Somateria mollissima), Caspian Tern (Sterna caspia), Sandwich Tern (S. sandivicensis), Great Cormorant (Phalacrocorax carbo), Common Guillemot (Uria aalge) and Razorbill (Alca torda).

In addition, the following species will be considered in next updates of the indicator: Little Tern (S. albifrons), Black Guillemot (Cepphus grille), Ruddy Turnstone (Arenaria interpres), Velvet Scoter (Melanitta fusca), Lesser Black-backed Gull (Larus fuscus fuscus), Herring Gull (L. argentatus) and Common Gull (L. canus)

Policy relevance

The waterbirds are an integral part of the Baltic marine ecosystem. They are predators of fish, macroinvertebrates and other bird species, scavengers of carcasses and fishery discards and herbivores of littoral vegetation. The HELCOM CORESET project has identified seven waterbird functional groups, which are given in the interim report of the project (HELCOM 2012).

The indicator addresses the population abundance, distribution and condition as required for assessments of the MSFD qualitative descriptor 1 (biodiversity) (Anon. 2008) and stated in the EC Decision 477/2010/EU for the MSFD

(Anon. 2010). The indicator can also be used for the assessment of the MSFD qualitative descriptor 4 (food webs) as recommended by the MSFD Task Group 4 (Rogers et al. 2010).

The indicator addresses the HELCOM ecological objective 'Viable populations of species' which is part of the biodiversity goal 'Favorable conservation status of Baltic biodiversity' (HELCOM 2007).

How the indicator describes the Baltic marine environment

Relevance of the indicator for the ecosystem

Waterbirds are a special part of the Baltic ecosystem, spending most of their time above the surface and breeding on land. Nevertheless, their role in the marine trophic web as herbivores, benthivores, piscivores or scavengers is significant. It has been estimated that globally fish-feeding seabirds consume as much fish as the global fisheries (Brooke 2004). The Common Guillemot (Uria aalge) is a good example of a Baltic waterbird that is entirely dependent on the quantity and quality of fish prey (Österblom et al. 2001). The herbivorous waterbirds can suppress the abundance of benthic plants, as shown in the Northern Baltic Proper (Idestam-Almquist 1997). The Common eider is a benthivorous species feeding mainly on blue mussels.

Responses to anthropogenic pressures

The abundance and breeding success of the waterbirds is reduced by bioaccumulated hazardous substances, particularly organochlorines, reduced prey availability, oil in the water, increased predation, human disturbance, hunting and drowning in fishing gears.

High organochlorine concentrations (e.g. DDT and PCB) have been suggested to have caused population declines of several waterbird species. The populations of Great Cormorant and White-tailed Eagle stayed low after the end of strong persecution most likely as a result of high DDT and PCB contamination (Smolen & Colborn 1997). Also exposure to toxins from harmful algal blooms has caused mass mortalities in adjacent waterbird (Edler et al. 1996).

Oil is a severe cause of death for waterbirds in the Baltic Sea. Even small amounts of oil destroy the insulation of the plumage and cause hypothermia. Even hundred thousand Long-tailed Ducks are estimated to die annually due to their exposure to oil in the areas around Gotland, where a quarter of the Baltic wintering Long-tailed Duck population is found (Larsson & Tyden 2005, Skov et al. 2011).

Recent results from the Baltic Sea (Österblom et al. 2001, 2008) and globally (Cury et al. 2011) show that altered or reduced prey availability has caused declines of chick condition or waterbird population abundance.

The increased predation by the non-native American mink has reduced the waterbird abundance in the Archipelago Sea (Nordström et al. 2003), Latvia (Viksne & Janaus 2002, Viksne et al. 2006) and Germany (Garthe et al. 2003). Likewise, increased human disturbance in breeding sites has been shown to expose the offspring to predators (REF).

Hunting is a significant mortality factor for some game species in the Baltic Sea region. Among the marine waterbirds particularly Common Eiders, Goldeneys, Tufted Ducks and Long-tailed Ducks are prized game birds and the current hunting bags are about 60 000 for the first two species and 15 000 and 10 000 for the two latter species, respectively (Skov et al. 2011). Gulls have been shot in high numbers during the 20th century with the aim to control the population number; even hundred thousand gulls (mainly Herring Gull, Great Black-backed Gull and Common Gull) are being shot annually in the Baltic Sea countries (HELCOM 2009).

Drowning of waterbirds in fishing gears in higher in the non-breeding season, when the birds are aggregated to feeding areas, than in the breeding season. Nevertheless, the by-catch of waterbirds is a significant pressure independent of the season (Dagys & Zydelis 2002, Dagys et al. 2009, Bellebaum 2011). It has been estimated that a minimum of 76 000 waterbirds are being drowned annually in the Baltic Sea (Zydelis et al. 2009, see a review in Skov et al. 2011).

Metadata

Data source and description of data

Common Eider: Estonia (1991-2012), Finland (nests counts in 48 census areas along the coast from 1986-2012 at 3-year intervals), Sweden (nest counts or adult counts on local or regional scale, 1985-2012).

Lesser Black-backed gull:

Finnish Game and Fisheries Research Institute.

Caspian Tern:

Estonia (since 1958), Finland (since 1984), Sweden (since 1990)

Sandwhich Tern:

Annual surveys of the breeding population are organized and data are collected by the following institutions or people:

Denmark: Jens Gregersen;

Germany: Staatliche Vogelschutzwarte Schleswig-Holstein; Agency for Environment, Nature Conservation and Geology;

Estonia: several inventories, mainly by Mati Martinson; inventory of breeding birds on small maritime islands in 2008-2011, on behalf of the Estonian Board of Environment;

Sweden: Rolf Larsson, Kjell Larsson;

Poland: G. Bela & A. Janczyszyn; http://www.kuling.org.pl/rybitwy/index.html.

Entire breeding range of the Baltic Sea area (Denmark, Sweden, Germany, Poland, Estonia). Temporal coverage: 1994-2010 with annual nest counts in colonies. The reliability and quality of data is high.

Razorbill:

Common Guillemot:

Reproduction of common murres Uria aalge is monitored at Stora Karlsö (57°17’N, 17°58’E), which holds the largest colony in the Baltic Sea, ~10 000 pairs (Österblom et al. 2004). Daily observations of egg-laying, hatching, chick mortality and chick absence have been conducted from early May to mid-July in 1999 and from 2005 onwards. Fledging is defined as colony departure, which occurs at night and is thus difficult to observe. Chicks that disappeared after reaching the age of 15 d are assumed to have fledged successfully, as it is the minimum age of chicks known to successfully leave the colony accompanied by the male parent, and this being the standard measure used for this species (Hedgren 1980, Harris & Wanless 1988). Fledging success is defined as the proportion of hatched chicks that later fledged. Common murres lay a single-egg-clutch and may lay a replacement egg only if losing the first egg. Reported estimates include chicks from both first-laid and replacement eggs.

Great Cormorant:

Annual surveys of the breeding population are organized and data are collected by the following institutions or people:

Denmark: Danish Centre for Environment and Energy, Aarhus University (published on the web site: http://www.dmu.dk/dyrplanter/dyr/skarv_-_udvikling_i_bestande/).

Germany: Staatliche Vogelschutzwarte Schleswig-Holstein; Agency for Environment, Nature Conservation, and Geology of Mecklenburg-Western Pomerania.

Finland: Finnish Environment Institute (SYKE; published on the web site http://www.environment.fi).

Estonia: Vilju Lilleleht (until 2008), K. Rattiste & L. Saks (2009, 2010).

Gotland (Sweden): K. Larsson, M. & B. Hjernqvist, and S. Hedgren.

Katy Rybackie (Poland): Michal Goc and Pawel Stępniewski.

Lithuania: Annual counts in of the colony Juodkrante (largest Lithuanian colony) by the Curonian Spit National Park authorities; complete surveys of all Lithuanian colonies complete survey of all Lithuanian colonies in 2005-2009 by the Institute of Ecology of the Nature Research Centre; complete survey 2011 is planned

Methodology and analyses

- Includes all locations counted at least once within time period in the breeding months of the species.
- Data is in a format to fit to the TRIM software (columns: site, year, species, abundance). If no data, abundance should be '-1'. Only one abundance value per species per year.
- Site information: (1) geographical position of the central point + polygon shapefile; (2) the area could be included in order to estimate densities (can be included at a later stage); (3) specify the method of counting.
- Raw or pre-processed count data data/indices until the latest year available.

Assessment units

- Expert judgment which colonies are included and how far inland counts are included.
- Assessment made for the entire Baltic Sea and separately for the countries.

Geographic coverage

The species followed by the indicator at the moment have different geographic distributions. As waterbird monitoring in the breeding season is maintained in all the Baltic Sea countries and the current national monitoring programmes are capable of dealing with new species distributions, species-specific monitoring areas are not further specified.

Existing monitoring of the breeding waterbirds is considered adequate in the Baltic Sea at the moment. Annex 1 gives a more detailed overview of the monitoring programmes.

Temporal coverage

- Single species assessments: all time series included.
- Composite index: starts from 1991 with a virtual baseline year (weighted mean of the time period). The TRIM software requires either annual data or data at regular intervals

Recommendation for monitoring

The monitoring of the core indicator applies to the entire Baltic Sea area for those of the selected species (see above) that breed in the area.

It is recommended that fledgling/nestling monitoring is developed in the countries for species included in this indicator or species seen as indicative for the marine ecosystem.

Methodology and data analyses

TRIM: see the web page of the European Bird Census Council (EBCC): http://www.ebcc.info/trim.html.

Indicator: see ICES 2008 and 2011.

Determination of GES boundary

The indicator follows how many species stay within the target range (<30% deviation from baseline; 20% deviation is given for species laying only 1 egg). The baseline has been tentatively set to 2000, but will be re-evaluated once the indicator has been computed.

At least 75% of the species should stay within the target range. If the trends of one quarter of these species exceed the respective target levels in any given year, action will be triggered. Good environmental status is tentatively being set for the above-mentioned 75% threshold. The %-threshold is, obviously, very sensitive to the number of species included and therefore this will be discussed once the data has been compiled.

More information can be read from the ICES Workshop on Seabird Ecological Quality Indicator (ICES 2008).

Strengths and weaknesses of data

Strengths:

The data coverage is adequate for the abundance indicator. The breeding success indicator can be followed in selected locations.

Weaknesses:

The bird species do not have equal distributions and therefore the indicator has stronger significance in areas where there are more species. There are temporal gaps in the abundance dataset. The breeding success data set is currently very limited and more sites should be monitored.

Further work required

- Baseline year should be set species-specifically based on pressures affecting the species.
- Deviation from the baseline should be confirmed for every species.
- The 75% trigger level should be further discussed and the use of other integration could be discussed.
- More sites are needed for the breeding success monitoring.

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Annex 1

Data Table 1. *Monitoring of breeding waterbirds by Baltic Sea countries*

Country	Areas covered	State financed national monitoring?	Temporal intervals	Counting method (pairs/ nests/ males)	Start of time series	Data holder	Remarks
Denmark	Entire area	Yes	1/3/6/10 years, depending on species	nest counts (+male counts of eider); pair counts of razorbill and common guillemot.	Cormorant annual since 1938, Common and Arctic tern every 6th year since 2000, Sandwhich tern every 3rd year since 2000, Black tern annually since 2000. Common eider every 10th year. Razorbill + Common guillemot almost annually.		
Estonia	From 2008, 135-220 islets in year, mostly on nature reserves	Yes	1/3/5-10, depending on archipelago (monitoring unit)	Nest counts & breeding pair counts - all species. Many parameters are estimated during a visit, for example: predation, disturbances, etc.	Continuous series since: Matsalu 1958, Vilsandi 1959, Hiiumaa 1975.	Estonia	From 2008, 135-220 islets in year, mostly on nature reserves
Finland	Entire area (40-50 routes in identified important coastal bird breeding sites)		1-3-yr intervals, annually at c. 35 sites	nest counts or breeding pair estimates in coastal bird colonies (40 monitoring areas/units of 6-164 islets);	1984-86 (for 6 core areas since 1949)	FGFRI	23 species of seaducks, larids, alcids and waders (+ Cormorant since 1996); once-a-year count of breeding birds on a total of c. 1700 islands in the outer or central archipelago (coastal bays or mainland shores not

							included)
	Caspian tern monitoring: visiting all known sites and finding new ones. In colonies, counting nests + chicks + adults	Volunteers	Annual	clutch size, rate of chick deaths, predatory indicies, collecting unhatched aggs.	since 1984 concurrently with Sweden and Estonia;		Caspian tern
Germany	Mecklenburg-Vorpommern (Bay of Mecklenburg, Southern Baltic Proper)	Volunteers/agency	Annual	nest counts or breeding pair estimates in coastal bird colonies (28 breeding sites or breeding areas)	1970 (some breeding sites even 1947)	Agency for Environment, Nature Conservation, and Geology	gulls, terns, waders, ducks, mute swans, cormorants, goosander, merganser; all breeding areas have assigned volunteers who take care of the area and count the breeding birds;
	Schleswig-Holstein: SPA		every 6th year		2000		species listed in annex I of EU Birds Directive or in the red data book of Schleswig-Holstein
Latvia	2/3 of the coast						

Lithuania	Lithuanian coastline, Nemunas river delta, Curonian's spit national park area		Twice a year		2007		Only marine species is cormorant
Poland	Almost whole coastline		Annual	nest counts	different time in different parts of the coast		
Russia							
Sweden			Annual		1975, 1997, 2010		Data requires organization
	Stora Karlsö, W Gotland Basin		Annual	nest counts, ringing, abundance, reproduction, survival, diet, movements, bycatch	1997 (older data on population size available, in some cases since the 1970-ies, annual data from 1990 in most cases)	WWF, Stockholm University	Common Guillemot, Razorbill, Cormorant, Herring gull, Lesser black-backed gull, Arctic Tern
	Entire coast	County administration	In Gulf of Bothnia annual since 2010; elsewhere varies.	Boat, Nest counts	Gulf of Bothnia: 2010 (older data available from single years back until 1975-). Elsewhere varies but often since 1975.	county-based breeding bird surveys made with different time intervals in different counties Studies in smaller areas, series over varying number of years	coastal birds (cormorants, geese, swans, ducks, waders, gulls, terns, skuas, auks) **Data need to be gathered into data-base before analysis**

	Blekinge / Sandwhich tern		Annual	Nest counts	1994	County of Blekinge	Sandwich tern; annual surveys made in the county of Blekinge but additional data from other counties collected from bird reports (no systematic monitoring effort)
	Gotland / Cormorant		Annual	Nest counts	1992		Cormorants