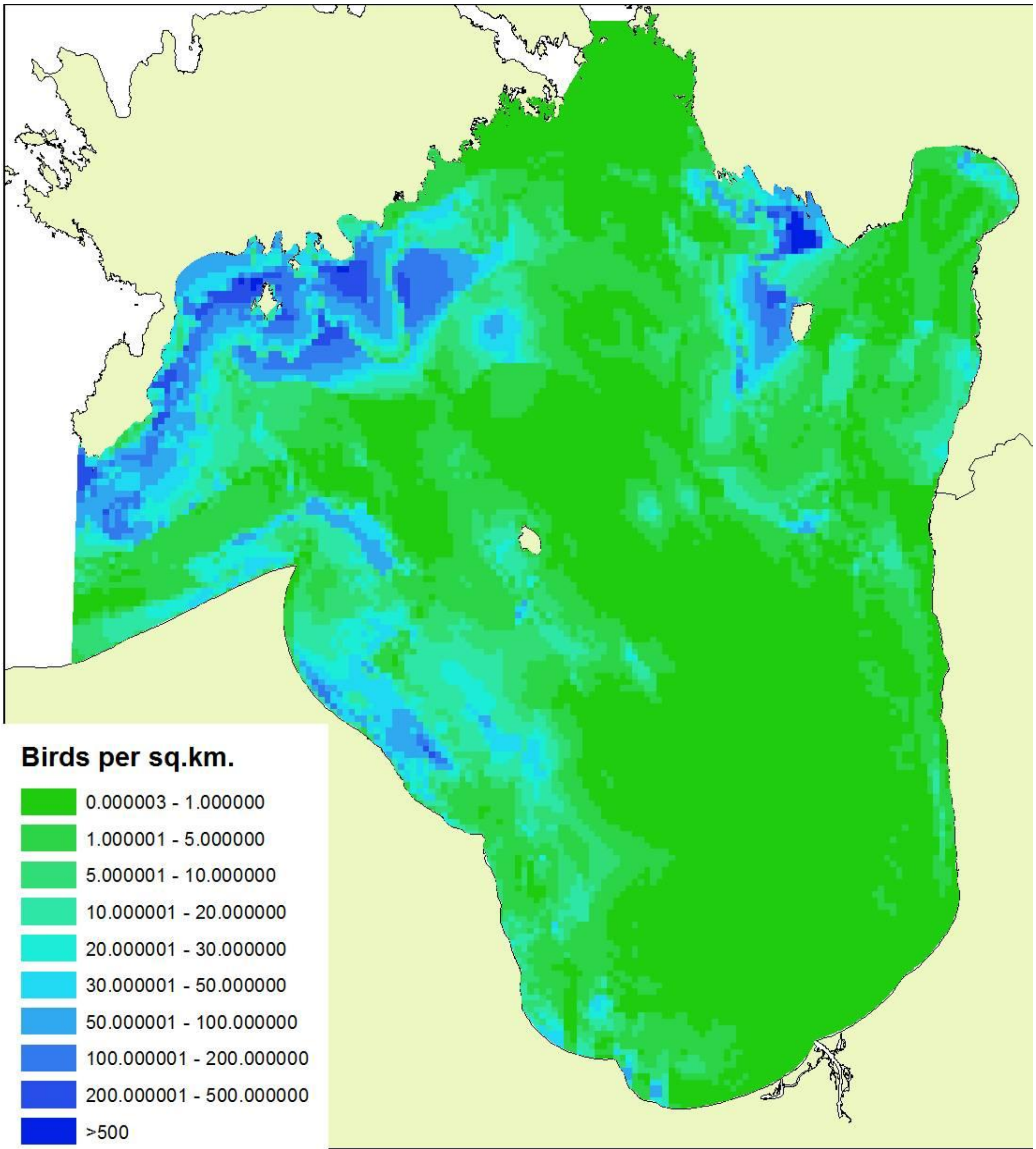
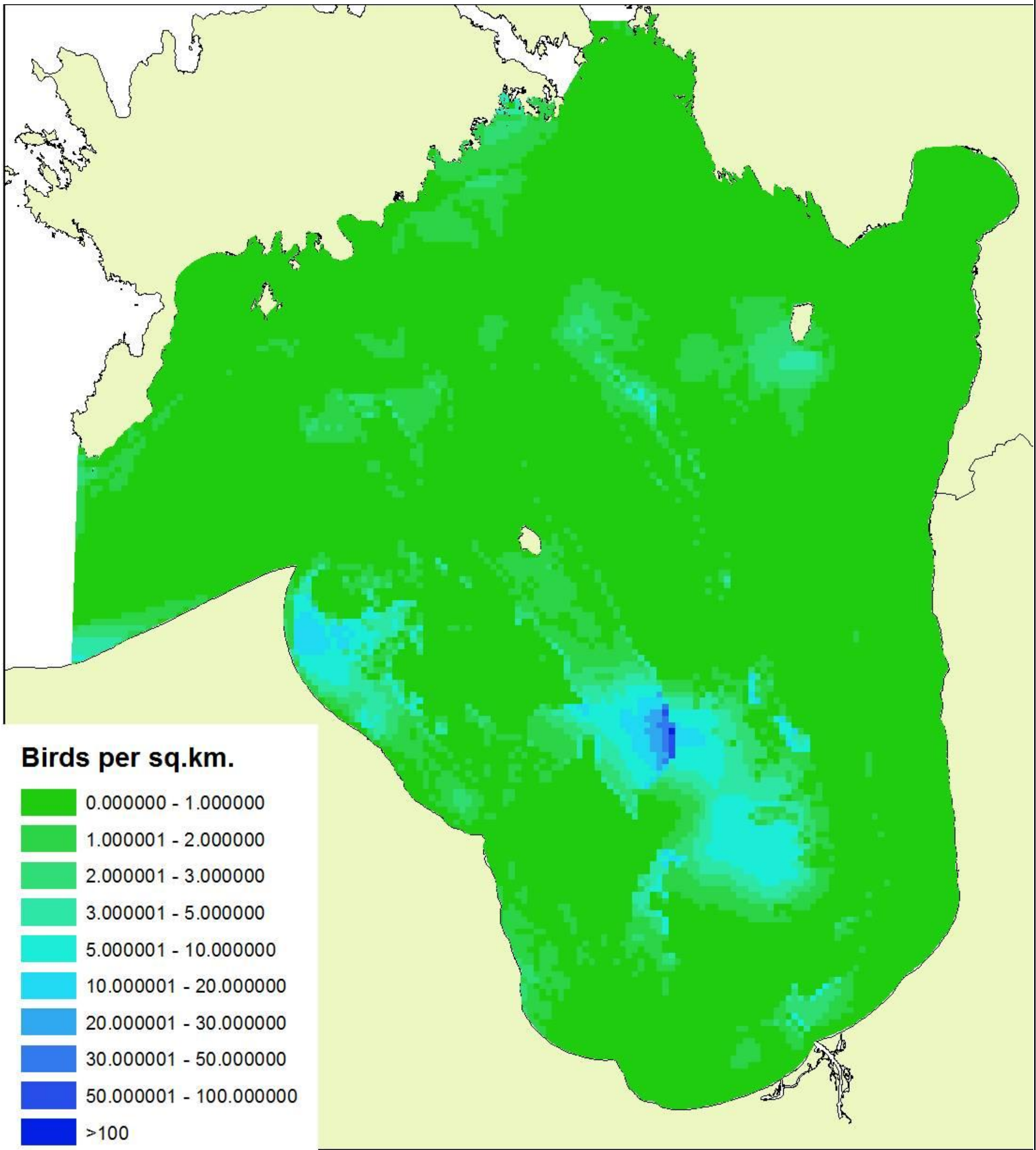
Name of indicator	4.8 Distribution of wintering waterbirds of different feeding guilds (multi-species)
Type of Indicator	State indicator
Author(s)	Ainars Auniņš, Leif Nilsson, Andres Kuresoo, Leho Luigujõe, Antra Stīpniece
Description of the indicator	This is a set of multi-species indicators reflecting distribution pattern of wintering waterfowl belonging to different feeding guilds (niches) in the Baltic Sea. This is an abundance/density based indicator similar to „Distribution of wintering waterbird species" which includes all those waterbird species belonging to a particular feeding niche in the calculation of the each indicator. The indicator is expressed as spatial grid with cell values expressing abundance or density of wintering waterbirds. Following versions of the indicator are suggested: Distribution of benthic herbivores: *Cygnus sp., Fulica atra, Anas sp, Anser sp., Branta sp.* Distribution of benthic invertebrate feeders: *Clangula hyemalis, Melanitta nigra, Melanitta fusca, Somateria mollissima, Polysticta stelleri, Aythya marila, Aythya fuligula, Bucephala clangula, Aythya ferina* Distribution of fish feeders: *Gavia stellata, Gavia arctica, Mergus merganser, Mergus serrator, Podiceps cristatus, Alca torda, Uria aalge, Cepphus grylle* Distribution of gulls*: Larus minutus, Larus ridibundus, Larus canus, Larus argentatus, Larus fuscus, Larus marinus* For the calculation of the indicators all counts of corresponding species (species groups) are pooled.
Relationship of the indicator to marine biodiversity	The indicator reflects health of marine ecosystem and importance of its different parts for components of marine biodiversity (functional groups) in spatially explicit way.
Relevance of the indicator to different policy instruments	MSFD descriptors 1 (habitat level/condition of the typical species and communities and ecosystem level/proportions of ecosystem components, condition of typical species and communities) and 4 (abundance distribution of functionally important groups of species).
Relevance to commission decision criteria and indicator	1.6.1. Condition of the typical species and communities 1.7. Ecosystem structure 1.7.1. Composition and relative proportions of ecosystem components (habitats and species)
Method(s) for obtaining indicator values	Field data collection: using any of the standard methods designed for offshore counts using ships or planes (Komdeur *et al*. 1992, Petersen *et al*. 2005, Camphuisen *et al*. 2006, Nilsson 2012). Indicator calculation: using density surface modelling approach – GAM or machine learning models based on count data from line transects and spatial covariates (Hedley, Buckland 2004, Elith *et al.* 2011, Drew *et al.* 2011). Counts of all species belonging to the particular functional (feeding niche) group are pooled. The result of the computation is a grid where each cell value represent estimated abundance/density of waterbirds of the functional group in the particular location.
Documentation of relationship between indicator and pressure	Each functional (feeding niche) group of species respond to different pressures. Being multi-species indicators each of them accumulates the impacts of pressures affecting each of the species used in indicator calculation. The indicator responds to an ensemble consisting of combinations of the following pressures: eutrophication oil pollution/shipping by-catch hazardous substances fishing pressure hunting fisheries discards coastal development wind energy sand and gravel extraction climate change

	The most pronounced are effects of eutrophication, bycatch and oil pollution Indicator is able to show local effects of these impacts. The indicator might be scale sensitive in this regard. Latest knowledge and summary of related studies are given in Skov *et al.* 2011 Contribution of each particular pressure on the indicator can be assessed by including additional explanatory variables characterising the level of the pressure as covariates in the statistical model used for the indicator calculation. Responses of this indicator to different ecogeographical variables for the Gulf of Riga are provided in Aunins *et al*. 2012.
Geographical relevance of indicator	1. Local 2. Regional 3. National waters 4. Baltic Sea wide
How Reference Conditions (target values/thresholds) for the indicator were obtained?	Reference conditions are based on proportion of occupied ecogeographically suitable grid cells. Target level is 100%. The actual GES threshold for each species still needs to be defined.
Method for determining GES	Currently GES levels have not been set. The method itself is based on proportion of ecologically, climatically and geographically suitable grid cells that are occupied by wintering waterbirds of the particular functional (feeding niche) groups. More ecological studies are needed to set GES threshold.
References	Aunins A., Kuresoo A., Luigujoe L. 2012. Distribution and numbers of birds in the Gulf of Riga 2011. Deliverable 3.3. Gulf of Riga as a resource for wind energy –GORWIND. Riga and Tartu, Latvian Fund for Nature and Estonian University of Life Sciences. Camphuysen C.J., Fox A.D., Leopold M.F. & Petersen I.K. 2004. Towards standardised seabirds at sea census techniques in connection with environmental impact assessments for offshore wind farms in the U.K.. Report commissioned by COWRIE for the Crown Estate, London. Royal Netherlands Institute for Sea Research, Texel, 38 pp. Drew C.A., Wiersma Y.F., Huettmann (eds.) F. 2011. Predictive Species and Habitat Modeling in Landscape Ecology. Concepts and applications. 1st edition. Springer, 314 p. Elith. J., Phillips S.J., Hastie T., Dudik M., Chee Y.E., Yates C.J. 2011. A statistical explanation of MaxEnt for ecologists. Diversity and Distributions 17: 43 – 57. Komdeur, J., Bertelsen, J. & Cracknell, G. (Eds.). 1992. Manual for Aeroplane and Ship Surveys of Waterfowl and Seabirds. IWRB Special Publication No. 1, Slimbridge, UK,37 p. Petersen, I.K, Fox, A.D. 2005. An aerial survey technique for sampling and mapping distributions of waterbirds at sea. Department of Wildlife Ecology and Biodiversity, National Environmental Research Institute. 24 pp. Skov. H., Heinänen S., Žydelis R., Bellebaum J., Bzoma S., Dagys M., Durinck J., Garthe S., Grishanov G., Hario M., Kieckbusch J.J., Kube J., Kuresoo A., Larsson K., Luigujõe L., Meissner W., Nehls H.W., Nilsson L., Petersen I.K., Roos M.M., Pihl S., Sonntag N., Stock A., Stipniece A., Wahl J. 2011. Waterbird Populations and Pressures in the Baltic Sea. Nordic Council of Ministers, Copenhagen, 201 pp.

Illustrative material for indicator documentation	 Figure 1. Example draft indicator for the Gulf of Riga in 2012 (from Aunins *et al.* 2012): Distribution of benthic invertebrate feeders in winter 2012

	 Figure 2. Example draft indicator for the Gulf of Riga in 2012 (from Aunins *et al.* 2012): Distribution of gulls (all *Larus* species) in winter 2012