Name of indicator	4.1 Abundance index of wintering waterbird 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 single species indicator and it reflects population level at wintering season of the particular species compared to reference level (population at base year or period). Index is calculated for all species that are regularly recorded at inshore and offshore areas of the Baltic Sea during wintering period. Indicator is calculated separately for inshore and offshore areas due to different data collection schemes. Baltic-wide indicators are calculated separately for each of the following species: *Cygnus olor, Cygnus cygnus, Fulica atra, Anas platyrhynchos, Clangula hyemalis, Melanitta nigra, Melanitta fusca, Somateria mollissima, Aythya marila, Aythya fuligula, Bucephala clangula, Aythya ferina, Mergus albellus, Gavia stellata, Gavia arctica, Mergus merganser, Mergus serrator, Podiceps cristatus, Alca torda, Uria aalge, Cepphus grylle, Larus minutus, Larus ridibundus, Larus canus, Larus argentatus, Larus marinus*. Species lists for national and subbasin versions of these indicators are country and subbasin specific.
Relationship of the indicator to marine biodiversity	The indicator reflects status of important components of the marine biodiversity. This indicator (population indices for each species) is further used for calculation of other indicators (e.g. Wintering waterbird index)
Relevance of the indicator to different policy instruments	MSFD descriptors 1 (species level/population size and habitat level/condition of typical species) and 4 (abundance trends of functionally important selected species). Habitats Directive (this indicator is needed for Article 17 reporting to report status of typical species of the habitat types 1110 and 1170; Anon 2007, Aunins 2010) Birds Directive (this indicator is needed for Article 12 reporting to report long-term and short-term population trend of all regularly occurring wintering marine waterbird species. HELCOM CORESET (in collaboration with MARMONI an inshore part of this indicator developed using inshore data collected during International Waterbird Census)
Relevance to commission decision criteria and indicator	1.2. Population size 1.2.1. Population abundance and/or biomass 1.6.1. Condition of the typical species and communities
Method(s) for obtaining indicator values	Field data collection: using any of the standard methods. For inshore part of the indicator coastal ground counts (such as International Waterbird Census; methods described in Wetlands International 2010) are used. This type of data has been collected in all Baltic Sea countries for decades. Data for offshore part of the indicator need to be collected using ships or planes (Komdeur *et al.* 1992, Petersen *et al.* 2005, Camphuisen *et al*. 2006, Nilsson 2012). Indicator calculation: The index gives species population abundance relative to population at base time (period). Average wintering population during 1991 - 2000 period is suggested as base level. To obtain the population index, site and year specific counts of individuals of particular species are related to site and year effects (factors) and missing values are imputed from the data of all surveyed sites. Freeware programme TRIM is available to produce annual indices based on loglinear models (Pannekoek & van Strien 1998). In addition to annual indices, TRIM allows the estimation of trends over the whole period. To separate true time effects from other impacts such as climate change, using models that include climate specific covariate has been suggested (Aunins *et al*. in prep). The suggested model includes mean air temperature during the week preceding bird counts as a covariate in addition to site and year and used GAM (generalised additive modelling) framework. The model accounts for serial correlation and overdispersion.
Documentation of relationship between indicator and pressure	Each of the species for which the indicator is calculated respond to different pressures. Important pressures and response patterns vary among the species. The indicator (depending on species) responds to: eutrophication oil pollution/shipping hazardous substances fishing pressure bycatch

	hunting fisheries discards coastal development wind energy sand and gravel extraction climate change Latest knowledge and summary of related studies are given in Skov *et al.* 2011 Contribution of each particular pressure on a given species can be controlled by including additional explanatory variables characterising the level of the pressure as covariates in the indicator calculation model.
Geographical relevance of indicator	2. Regional 3. National waters 4. Baltic Sea wide
How Reference Conditions (target values/ thresholds) for the indicator were obtained?	Reference conditions (GES thresholds) are set at 30% on both sides from base population level (i.e. mean population during 1991 - 2000 period). Thus indicator for each particular species can be considered being at GES if it falls between 70 and 130% (ICES 2013).
Method for determining GES	Currently GES levels have been set arbitrarily at 30% on both sides from base population level (i.e. mean population during 1991 - 2000 period). More ecological studies are needed to set species specific GES thresholds as well as to choose different and species specific time periods reflecting base population levels.
References	Anon. 2007. Interpretation manual of European Union Habitats. EUR 27. European Commission DG Environment. Aunins A. (ed.) 2010. [Protected habitats of European Union in Latvia. Identification Handbook]. Latvian Fund for Nature, Riga, 320 pp. Aunins A., Clausen P., Dagys M., Garthe S., Grishanov G., Korpinen S., Kuresoo A., Lehikoinen A., Luigujoe L., Meissner W., Mikkola-Roos M., Nilsson L., Petersen I.K., Stipniece A., Wahl J. (in prep) Development of Wintering Waterbird Indicators for the Baltic Sea. 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. ICES. 2013. Report of the Joint ICES/OSPAR Ad hoc Group on Seabird Ecology (AGSE), 28-29 November 2012, Copenhagen, Denmark. ICES CM 2012/ACOM:82, 30 pp. 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. Nilsson, L. 2012. Distribution and numbers of wintering sea ducks in Swedish offshore waters. Ornis Svecica 22: 39-60. 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. Van Strien, A.J., Pannekoek, J. et Gibbons, D.W. (2001): Indexing European bird population trends using results of national monitoring schemes: a trial of a new method. Bird Study 48: 200-213. Wetlands International 2010. Guidance on waterbird monitoring methodology: Field Protocol for waterbird counting. Report prepared by Wetlands International.

Illustrative material for indicator documentation

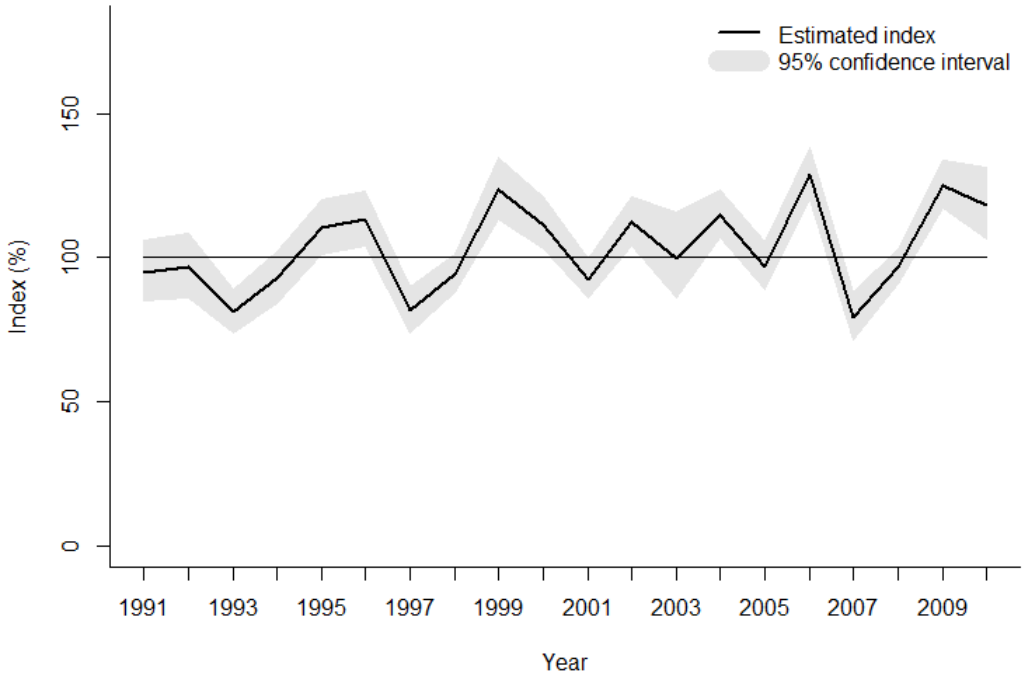

Figure 1. Example draft indicator for inshore part of the Baltic sea (currently only data from Sweden, Estonia, Latvia, Lithuania, Poland (only Gulf of Gdansk) and Germany used): Goldeneye *Bucephala clangula*

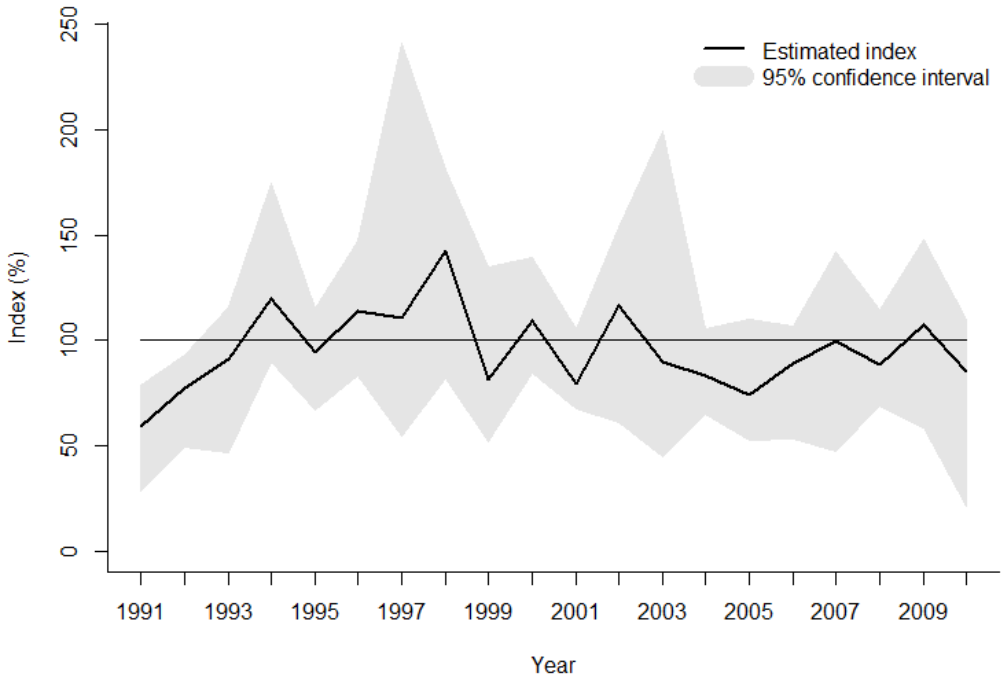

Figure 2. Example draft indicator for inshore part of the Baltic sea (currently only data from Sweden, Estonia, Latvia, Lithuania, Poland (only Gulf of Gdansk) and Germany used): Common Eider *Somateria mollissima*