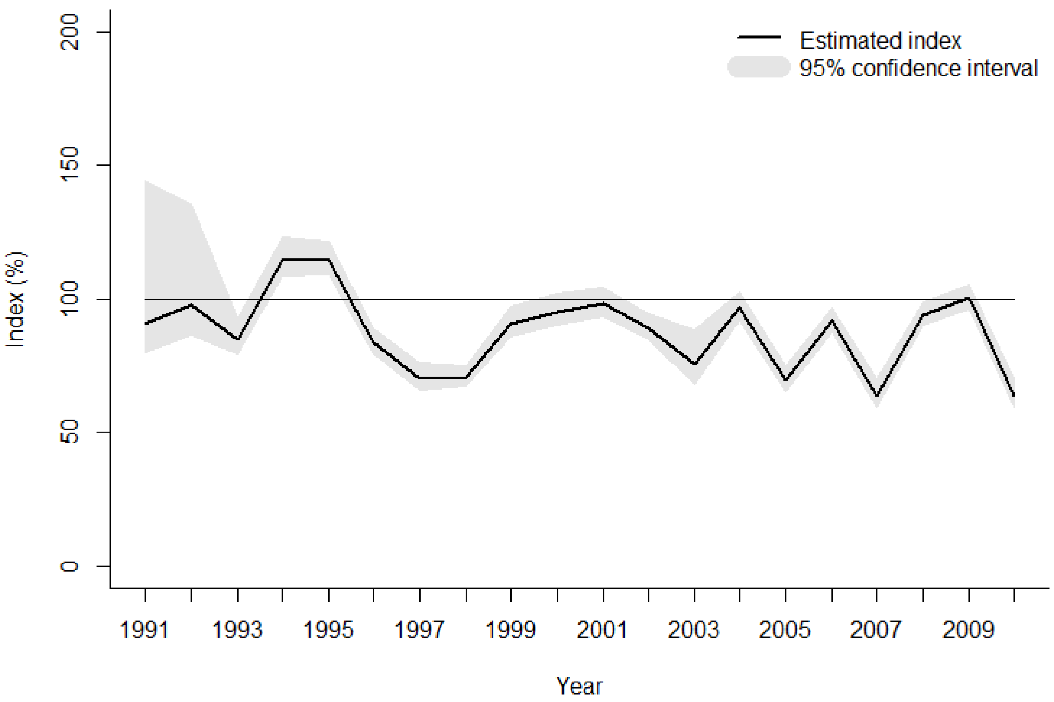
Name of indicator	4.2 Wintering waterbird index (WWBI)
Type of Indicator	State indicator
Author(s)	Ainars Auniņš, Leif Nilsson, Andres Kuresoo, Leho Luigujõe, Antra Stīpniece
Description of the indicator	This is a multi-species indicator and it reflects status of wintering waterbird community compared to base (reference) level. All regularly occurring species at inshore and offshore areas of the Baltic Sea during wintering period are included in calculation of the indicator. Indicator is calculated separately for inshore and offshore areas due to different data collection schemes. Computationally this indicator is similar to farmland bird index (one of the EU Sustainable development indicators) and other wild bird indices that are calculated for breeding land birds (Gregory *et al.* 2005, Gregory, van Strien 2010). The multi-species index is calculated from single species indices (the indicator "Abundance index of wintering waterbird species"). Species to be included in the calculation of the Baltic-wide version of this indicator are: *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*. For subbasin or national versions of the indicator species lists are country and subbasin specific.
Relationship of the indicator to marine biodiversity	The indicator reflects health of waterbird communities of marine environment. In this type of single multi-species indicator (geometric mean of the single species indices) both abundance and diversity of its forming species is taken into account (Gregory, van Strien 2010).
Relevance of the indicator to different policy instruments	MSFD descriptors 1 (ecosystem level) and 4 (abundance trends of functionally important selected 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	1.6.1. 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. 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 indicator is calculated from single species indices (see Abundance index of wintering waterbird species) using geometric mean. Every species is treated equally (no weighting). Standard errors are calculated using formula $\mathrm{var}(\bar{I}) \approx \left(\frac{\bar{I}}{T}\right)^2 \sum_t \left(\frac{\mathrm{var}(I_t)}{I_t^2}\right)$, where Ī – multi-species index value, T – number of indices (species), It – species abundance index value
Documentation of relationship between indicator and pressure	This multispecies indicator is affected by all pressures acting on species forming the indicator. Thus the indicator responds to ensemble of following pressures: 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 on response of marine waterbird species to important pressures are given in Skov *et al.* 2011 Contribution of each particular pressure 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 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 (ICES 2013). More ecological studies are needed to set more precise and better justified GES thresholds or to choose different time period to serve as base level.
References	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. Gregory R.D., van Strien A.J., Vorisek P., Gmelig Meyling A.W., Noble D.G., Foppen R.P.B. et Gibbons D.W. (2005): Developing indicators for European birds. Philosophical Transactions of the Royal Society B 360: 269-288. Gregory, R.D., van Strien, A. (2010): Wild bird indicators: using composite population trends of birds as measures of environmental health. Ornithological Science 9 (1): 3-22. 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. 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. Wetlands International 2010. Guidance on waterbird monitoring methodology: Field Protocol for waterbird counting. Report prepared by Wetlands International.

Illustrative material for indicator documentation	Example draft indicator for inshore part of the Baltic Sea (data from all Baltic Sea countries except Russia used):  Figure 1. Wintering Waterbird Index (Aunins *et al*. in prep) Included species: *Gavia stellata, Gavia arctica, Podiceps cristatus, Phalacrocorax carbo, Cygnus olor, Anas platyrhynchos, Aythya ferina, Aythya fuligula, Aythya marila, Somateria mollissima, Clangula hyemalis, Melanitta nigra, Melanitta fusca, Bucephala clangula, Mergus albellus, Mergus serrator, Mergus albellus, Fulica atra*