1.7.1 The impact of offshore wind farms on the density and distribution of seabirds

Nicolas Vanermen*, Eric W.M. Stienen, Wouter Courtens, Marc Van de walle & Hilbran Verstraete (Research Institute for Nature and Forest)

*Contact: nicolas.vanermen@inbo.be

Objectives

The seabird monitoring program executed by the Research Institute for Nature and Forest (INBO) is designed to determine local changes in seabird densities following the construction of offshore wind farms (OWFs). The main objective of the 'seabirds at sea' (SAS) monitoring is thus the assessment of displacement effects on local seabirds, and a tailored data modelling process assures statistical founding of the obtained results. The observed densities can also serve as input for collision risk modelling, aiming to estimate the number of collision victims among flying and migrating birds. Ideally, for the latter, visual censuses are complemented with radar research. While SAS surveying offers a high taxonomic resolution of bird densities and flying heights during limited time frames, radar research provides continuous data collection yet low taxonomic resolution.
SAS monitoring further allows to collect information on the (foraging) behaviour of individual seabirds. As such, INBO also aims to provide an answer to the question *why* certain seabirds occur in lower or higher densities. To gain true insight in the ecological incentives behind the interaction between seabirds & OWFs however, monitoring should not be limited to above-water observations, but also needs to include research on the seabirds' pelagic prey communities.

Methods

Seabird surveys

Seabird surveys are conducted according to the standardised and internationally applied 'European seabirds at sea' (ESAS) method (Tasker et al. 1984). The focus is on a 300 m wide transect along one side of the ship's track. While steaming, all birds in touch with the water (swimming, foraging) located within this transect are counted ('transect counts'). In contrast, flying birds are counted by 'snapshot counts': right at the start of each minute all birds flying within a quadrant of 300 by 300 m inside the transect are counted. As the ship covers a distance of approximately 300 m per minute (when sailing the prescribed speed of 10 knots), the full transect length is covered by means of these subsequent 'snapshots'. Taking in account the transect width and distance travelled, the combined count result can be transformed to seabird density.

In practice, we count all birds observed while surveying, but those not satisfying above conditions are not included in density analyses afterwards. We also note down as much information as possible regarding the birds' age, plumage, behaviour, flight direction, association with objects, vessels, other birds and so on. The distance of the observed bird(s) to the ship is estimated, allowing to correct for decreasing detectability with increasing distance ('distance correction'). To this purpose the transect is divided in four distance categories (A = 0–50 m, B = 50–100 m, C = 100–200 m & D = 200–300 m). During data processing, observation time is linked to the corresponding GPS coordinates saved by the ship's board computer, and data are aggregated in two-minute bouts.

BACI monitoring

When 'before' data are available and the inclusion of a suitable 'control' is possible, before–after control–impact (BACI) monitoring is the suggested approach for environmental impact assessments. The inclusion of a control area allows to account for temporal variability other than that caused by the investigated impact (Stewart-Oaten & Bence, 2001; Drewitt & Langston, 2006). The 'impact area' is considered to be the zone where effects of turbine presence can be expected, which was delineated by surrounding the wind farms with a buffer zone of 3 km. This buffer distance is based on the avoidance distances as found for scoters and long-tailed ducks during the Danish research project at the Nysted OWF (Petersen et al., 2006). Next, a control area was delineated, this area harbouring comparable numbers of seabirds and showing similar environmental conditions. Considering the large day-to-day variation in observation conditions and seabird densities, the distance from the control to the impact area was chosen to be small enough to be able to count both areas on the same day by means of a research vessel.

Data collected

Throughout 2013 & 2014, INBO performed 33 SAS monitoring surveys, mainly in the reference and impact areas of the OWFs at the Bligh Bank (14 visits) and Thorntonbank (18 visits). In contrast, due to construction activities and limited access, effort was low in the Lodewijckbank site (5 visits).

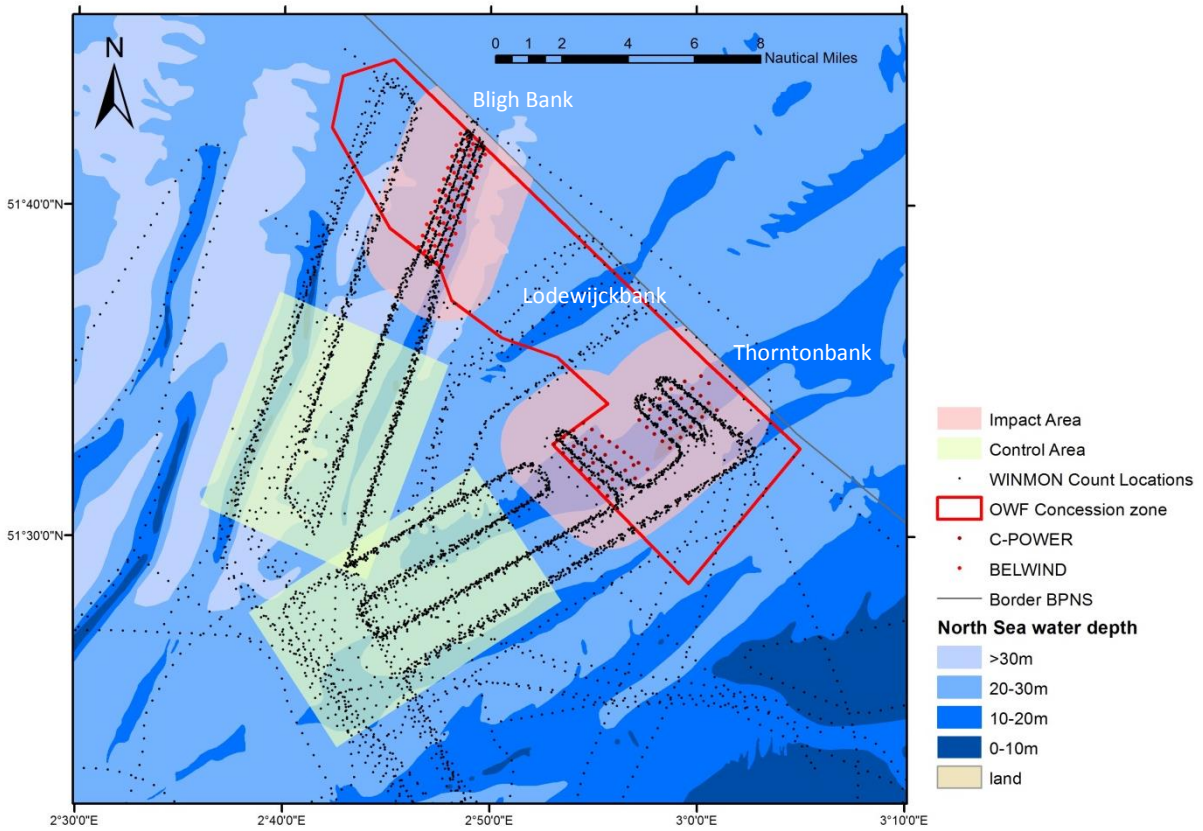

Figure 4.1. BACI monitoring set-up for the Thorntonbank & Bligh Bank OWF sites, and location of the seabird counts performed throughout 2013 & 2014.

Table 4.1 Overview of the monitoring surveys performed in 2013 & 2014 (BB=Bligh Bank, TTB=Thorntonbank, LB=Lodewijckbank).

Year	Month	Date	Monitoring	Research vessel
2013	January	25/01/2013	LB	RV Simon Stevin
		28/01/2013	TTB	RV Belgica
	February	27/02/2013	TTB	RV Simon Stevin
		28/02/2013	BB	RV Simon Stevin
	March	27/03/2013	BB	RV Belgica
		29/03/2013	TTB & LB	RV Belgica
	April	15/04/2013	BB	RV Belgica
		16/04/2013	TTB & LB	RV Belgica
	May	7/05/2013	BB & LB	RV Belgica
		8/05/2013	TTB	RV Belgica
	June	-	-	-
	July	2/07/2013	BB	RV Belgica
		3/07/2013	TTB	RV Belgica
	August	22/08/2013	TTB & BB	RV Belgica
	September	30/09/2013	TTB	RV Simon Stevin
	October	-	-	-
	November	28/11/2013	BB	RV Simon Stevin
	December	10/12/2013	TTB	RV Belgica
		11/12/2013	BB	RV Belgica
		12/12/2013	BB	RV Belgica
2014	January	30/01/2014	BB	RV Simon Stevin
	February	4/02/2014	TTB	RV Simon Stevin
	March	20/03/2014	TTB	RV Simon Stevin
	April	2/04/2014	TTB	RV Belgica
		3/04/2014	BB	RV Belgica
		4/04/2014	LB	RV Belgica
	May	-	-	-
	June	26/06/2014	TTB	RV Simon Stevin
	July	-	-	-
	August	26/08/2014	TTB	RV Simon Stevin
	September	9/09/2014	TTB	RV Belgica
		10/09/2014	BB	RV Belgica
	October	29/10/2014	TTB	RV Simon Stevin
		30/10/2014	BB	RV Simon Stevin
	November	18/11/2014	TTB	RV Belgica
		19/11/2014	BB	RV Belgica
	December	15/12/2014	TTB	RV Belgica

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