Temporal patterns in offshore bird abundance during the breeding season at the Dutch North Sea coast

Jens A. van Erp, E. Emiel van Loon, Kees J. Camphuysen
Judy Shamoun-Baranes

ESM 3; Accounting for detection bias caused by dynamic radar filtering

The dynamic filter activity in each radar image directly affected detection probability of birds by increasing the threshold at which objects are detected. The filter is always online, ranging from 0 (no filtering) to 1 (complete filtering). Observation hours in which the filter activity was so high that no birds were recorded could have been misinterpreted as hours in which bird abundance was zero (false negative observations, Fig. 1a). To prevent this data from being analysed, we excluded hours with an average filter activity that resulted in more hours without bird observations than "regular" hours with at least a single observation. To find the threshold of filter activity where this was the case, average hourly filter activity and bird abundance (birds h^{-1}) was calculated for the whole study period. For each incremental filter activity step (step size=0.005) the number of hours with that average activity was counted, differentiating between hours in which birds were measured ("Normal hours") and hours without a single bird measurement ("0-track hours", Fig. 1b). The threshold for data exclusion was set on the first filter activity bin (moving from 0 to 1) at which there were more hours without bird measurements. This threshold was 0.240 (orange vertical line, Fig. 1); observation hours in which filter activity was higher than the threshold were excluded from further analysis. Due to the high correlation between wind speed / sea state and filter activity this means generally only data from low wind / sea state is included in the research.
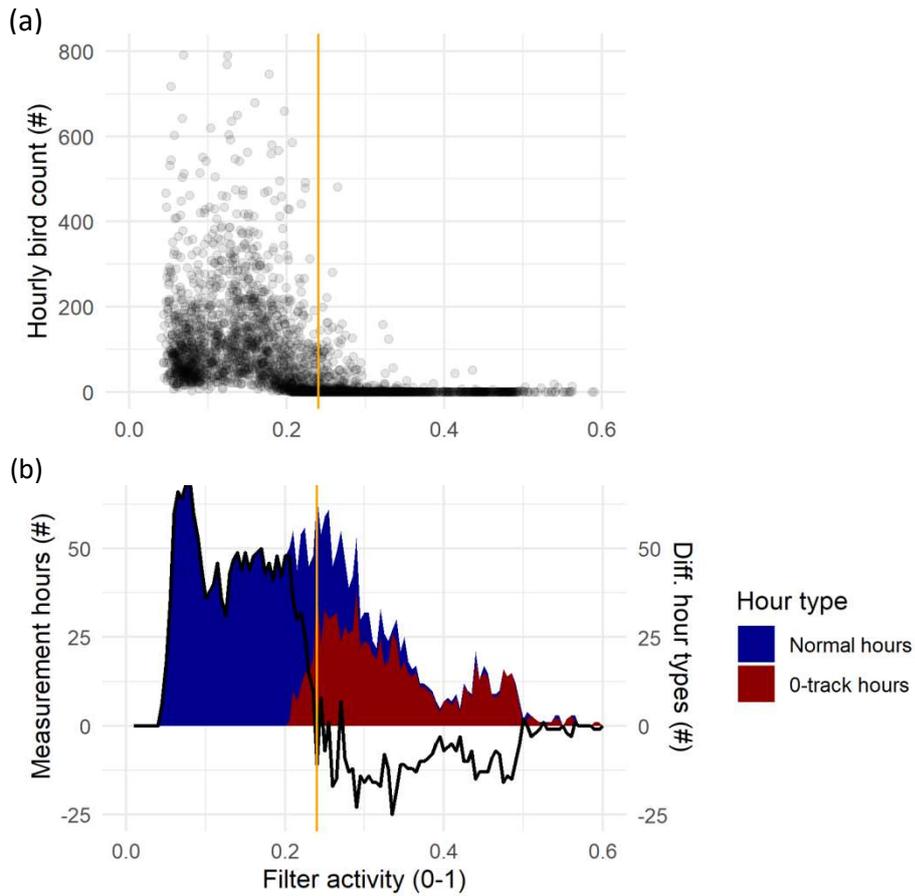
Fig. 1 The relation between hourly bird counts and radar filter activity. (a) Hourly bird counts (y-axis) at different filter activities (x-axis). The orange horizontal line shows the filter activity exclusion threshold (see text). (b) Number of measurement hours (y-axis) for different filter activity intensities (x-axis, 0.005 bins), hour types are stacked. Blue shows the number of hours with bird observations ("Normal hours"), red shows number of hours without a single observation ("0-track hours"). The black line shows the difference between the two types (Normal hours – 0-track hours), the exclusion threshold was set at the point the difference becomes negative (orange horizontal line, filter activity = 0.240)