

Interactive comment on “Seabirds as samplers of the marine environment – a case study in Northern Gannets” by Stefan Garthe et al.

Stefan Garthe et al.

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AUTHORS: Thank you very much for your time and your valuable suggestions that helped us improving our manuscript.

REVIEWER: Since the pioneering work of Jouventain, Weimerskirch and others, the fitting of seabirds with devices that record or transmit their locations and activities while at sea has provided a wealth of information as to how seabirds relate to oceanographic phenomena at spatial and temporal scales out of reach of either colony-based or ship-based studies. The present paper, by Garthe et al. continues in that vein with the tracking of northern gannets in the German Bight. They report several findings of interest- that some birds repeatedly used the same foraging location, that birds did not focus their foraging on a single location, and that overall, the gannets avoided forag-

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ing or passage through a wind farm. The last finding is perhaps good news, as many more wind farms are planned for the German Bight. Their methods seem robust and appropriate, and their analyses are adequate as far as they go.

AUTHORS: Thank you.

REVIEWER: The above notwithstanding, my feeling is that the authors could have extracted much more information from the data that they amassed. How do their results relate to optimal foraging theory, or ideas about central place foraging? They mention the one bird that flew far to the north, but what about the dispersed nature of the foraging patterns of the other birds? How did the outbound and inbound travel patterns compare? Did a given bird use the same foraging location? Did the flight patterns of high-flying birds differ from those of flight paths at low altitudes? Perhaps the sample sizes necessary for a formal evaluation of these and other questions was not sufficient, or perhaps there are plans for additional papers that will examine these and other questions.

AUTHORS: We understand this comment very well. While one paper focusing on gannets and wind farms near Helgoland – using data from 2014 – has just been published (and is referred to, now), several other papers focusing on specific aspects are under preparation. To nonetheless address your comment, we have created a whole new section, chapter 3.3, habitat analyses, for which we have comprehensively analysed the dive data shown in chapter 3.2 in relation to habitat variables. This does not only include means + standard errors for the data, but also a mixed model analysing habitat variables. Apart from the text addressing this topic, we have also created a new figure (containing three maps) and a table.

REVIEWER: How did the foraging locations of individual birds compare with those used by the group as a whole? Clearly there was one outlier, but among the others, what was the relationship of individual variability to the variability of the group as a whole. It would be good to make the most complete use possible of the available data.

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AUTHORS: A separate paper will deal with this issue based on data from 2015 and 2016. This would be far outside the scope for this manuscript but is certainly a very interesting question.

REVIEWER: Some small stuff: Page 3, line 4: There are much better references for relating foraging seabirds to prey patches and physical processes: Hunt and Harrison, 1990, MEPS; Hunt et al., 1998, MEPS; Russell et al., 1999, MEPS; Jahncke et al., 2005, Fish Oceanography; Davoren GK, many papers, some with Garthe. Haney did not understand the system in which he was working, and the Decker and hunt paper did not have solid measures of prey distributions.

AUTHORS: We have exchanged the references as suggested.

REVIEWER: Page 3, line 22: Your observations were not really experiments in the normal sense of the word.

AUTHORS: Renamed to 'field work'.

REVIEWER: Page 4, line 6: to what does "respectively refer?

AUTHORS: Reworded.

REVIEWER: Page 4, line 16: What was the time lag? Minimal is in the eye of the beholder.

AUTHORS: Details have been provided now including a reference.

REVIEWER: Page 4, line 20: It has a mass of 2.3 – 3.6 kg: : ... we do not need the goose-sized: :

AUTHORS: Sure; removed.

REVIEWER: Page 6, line 21: I believe that that should be Figure 7 that you are calling out.

AUTHORS: Yes; corrected.

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REVIEWER: Page 6, line 27: remove "actively". It adds no information.

AUTHORS: Removed.

REVIEWER: Page 7, line 8: I believe that that should be Fig. 3 that is being called out.

AUTHORS: Yes; corrected

REVIEWER: Figures 1 and 2: Both nice, but not necessary.

AUTHORS: In the context of a primarily hydrographic-oriented research program I would suggest to keep these photos to illustrate the study objects.

REVIEWER: Figure 9: Maybe add an insert to show more clearly what happens around the wind farm closest to the colony?

AUTHORS: Sure; we provide two maps now, the first focusing on the whole German Bight, the second on the three wind farms north of Helgoland only.

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