Supporting informations

Table S1: Environmental predictors used for habitat modelling and their source. Most variables were downloaded from Copernicus Marine Environment Monitoring Service (<http://marine.copernicus.eu/>).

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Environmental predictors** | **Units** | **Spatial resolution** | **Temporal resolution** | **Source** |
| Depth | meters | 0.0166°x0.0166° | fixed | ETOPO1 (Amante and Eakins, 2009) |
| Sea Surface Temperature (SST) | °C | 0.02°x0.02° | daily | ODYSSEA NWS SST L4 analysis product (IFREMER) from Copernicus Marine Environment Monitoring Service |
| Surface Chlorophyll a | mg.m-3 | 0.084°x 0.084° | daily | Eco3M (Baklouti et al. 2006) |
| Sea Level Anomaly | meters | 0.125°x0.125° |  | Mediterranean Sea L4 gridded MAPS NRT SLA (AVISO), from Copernicus Marine Environment Monitoring Service |
| Horizontal current from zonal and meridional velocities | m.s-1 | 0.0625°x0.0625° | daily | NEMO product MEDSEA\_REANALYSIS\_PHYS\_006\_004 from Copernicus Marine Environment Monitoring |

Table S2: Summary of model selection based on AIC at each study colony (best models appear in bold). The first 5 models are shown.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Site | model | AIC | ∆AIC | ExpDev |
| Giraglia | **OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SLA1, k = 4) + s (logCHLA28, k = 4)** | **19909** | **0** | **30.9** |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SLA7, k = 4) + s (logCHLA28, k = 4) | 19941 | 31 | 30.8 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SST28, k = 4) + s (logCHLA28, k = 4) | 19973 | 64 | 30.7 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (Var\_SST28, k = 4) + s (logCHLA28, k = 4) | 20021 | 112 | 30.5 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SST28, k = 4) + s (SLA1, k = 4) | 20028 | 119 | 30.5 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (GSST28, k = 4) + s (SLA1, k = 4) | 20122 | 213 | 30.2 |
| Lavezzi | **OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SLA7, k = 4) + s (logCHLA28, k = 4)** | **14038** | **0** | **50.3** |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SLA1, k = 4) + s (logCHLA28, k = 4) | 14039 | 2 | 50.3 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (VEL28, k = 4) + s (logCHLA28, k = 4) | 14474 | 436 | 48.8 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (SLA7, k = 4) + s (VEL28, k = 4) + s (logCHLA28, k = 4) | 14521 | 483 | 48.6 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (GSST1, k = 4) + s (logCHLA28, k = 4) | 14569 | 531 | 48.4 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (VEL7, k = 4) + s (logCHLA28, k = 4) | 14576 | 538 | 48.4 |
| Riou | **OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (SST28, k = 4) + s (Var\_SST28, k = 4) + s (VEL7, k = 4)** | **43198** | **0** | **25.6** |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (SST28, k = 4) + s (Var\_SST28, k = 4) + s (VEL1, k = 4) | 43324 | 126 | 25.3 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SST28, k = 4) + s (Var\_SST28, k = 4) | 43381 | 183 | 25.2 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (SST28, k = 4) + s (Var\_SST28, k = 4) + s (VEL28, k = 4) | 43395 | 197 | 25.2 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (SST28, k = 4) + s (Var\_SST28, k = 4) + s (logCHLA28, k = 4) | 43499 | 302 | 25 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (SST28, k = 4) + s (Var\_SST28, k = 4) + s (logCHLA7, k = 4) | 43589 | 391 | 24.9 |
| Porquerolles | **OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (Var\_SST28, k = 4) + s (logCHLA1, k = 4)** | **18494** | **0** | **44.8** |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (SST28, k = 4) + s (Var\_SST28, k = 4) + s (logCHLA1, k = 4) | 18518 | 24 | 44.7 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SST28, k = 4) + s (logCHLA1, k = 4) | 18575 | 81 | 44.5 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (Var\_SST28, k = 4) + s (logCHLA28, k = 4) | 18597 | 103 | 44.5 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (SST7, k = 4) + s (logCHLA1, k = 4) | 18603 | 109 | 44.5 |
|  | OccFo~ 1 + s (ID, bs = 're') +s (Bathy, k = 4) + s (GBathy, k = 4) + s (Var\_SST28, k = 4) + s (logCHLA7, k = 4) | 18605 | 111 | 44.5 |

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Figure S1. Timing of GPS equipment of Scopoli’s shearwaters during the chick-rearing seasons 2011 and 2012. Color-codes correspond to different foraging trips for the same individual. Solid vertical black lines show the trips kept for the GAMM analyses.

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Figure S2. Maps of the oceanographic parameters estimated on the 15th of August 2012 in the Western Mediterranean Sea. Weekly and monthly composites correspond to averaged values of the daily maps of the 7 or 30 previous days. The triangles represent the colony locations (Marseille Is. in blue, Porquerolles Is. in green, Lavezzi Is. in red and Giraglia Is. in orange).

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Figure S3 : Map of Scopoli’s shearwaters foraging trips during the chick-rearing period in 2011 (Riou Is. in blue, Porquerolles Is. in green, Lavezzi Is. in red and Giraglia Is. in orange) and the pseudo-tracks (in grey) at each colony following the method by Raymond et al. 2015. Absences were extracted from these pseudo-tracks to model the probability of foraging using binomial GAMMs.

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Figure S4. Map of Scopoli’s shearwaters foraging trips during the chick rearing period (1st August-31th August 2012) at the 4 study colonies in the Mediterranean Sea. Lines represent tracks and dots represent foraging locations estimated using state-space models and dive recorders.

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Figure S5 : Map of Scopoli’s shearwaters foraging trips during the chick-rearing period in 2012 (Riou Is. in blue, Porquerolles Is. in green, Lavezzi Is. in red and Giraglia Is. in orange) and the pseudo-tracks (in grey) at each colony following the method by Raymond et al. 2015. Absences were extracted from these pseudo-tracks to model the probability of foraging using binomial GAMMs.

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Figure S6. Daily activity patterns of Scopoli’s shearwaters at the four study colonies during the chick-rearing period in 2012 (1-day trips only). The thick black line is the light intensity showing the day/night cycle with the horizontal black line corresponding to the astronomical dusk.

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Figure S7. Maps of foraging probability standard error of Scopoli’s shearwaters for each colony during the chick-rearing period in August 2011. Black dots represent 2011 foraging locations as estimated by state space models and dive recorders. Black lines are -600m and -1800m isobaths.

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Figure S8. Prediction maps of foraging probability of Scopoli’s shearwaters for each colony during the chick-rearing period in August 2012. Black dots represent 2012 foraging locations as estimated by state space models and dive recorders. Black lines are -600m and -1800m isobaths.