Supplemental methods

Animal handling methods, biologger specifications, and calculation of arrival and departure dates are described in Robinson, et al..[1] Satellite tracking data were filtered and processed using the R package crawl[2,3] to eliminate inaccurate location points and interpolate between locations. The resulting latitude and longitude estimates were used to calculate great circle distance (in kilometers) from the Año Nuevo breeding beach (37.1083°N, 122.3366°W) for each time-latitude-longitude point in the MATLAB function `distance()`. Across all seals, foraging trip timing (mean ± SD day-of-year) was as follows: departure 157 ± 9, turnaround 287 ± 40, and arrival 15 ± 8 (Figure 1C). Therefore, outbound trip durations were 130 ± 41 days, and inbound trip durations were 93 ± 41 days. Turnaround dates were calculated using Gaussian kernels with standard deviation 6 hours using custom functions in R. Code and data for a subset of animals are available on GitHub (link available upon review of manuscript) (NOTE: The GitHub repo will be archived on Zenodo, so cite that instead when ready.) Drift rate dates were calculated using a custom MATLAB code based on kernel density estimation of fine-scale changes in depth over time (drift rate, measured in meters/sec).[4] Dates are presented as day-of-year relative to parturition date, with negative numbers indicating dates before pupping. All analyses were carried out in R v4.0.2. A linear mixed-effects model of turnaround date (relative to pupping date) as a function of turnaround distance and buoyancy change date was run in the package lme4[5] after scaling and centering the continuous variables and including individual as a random effect.

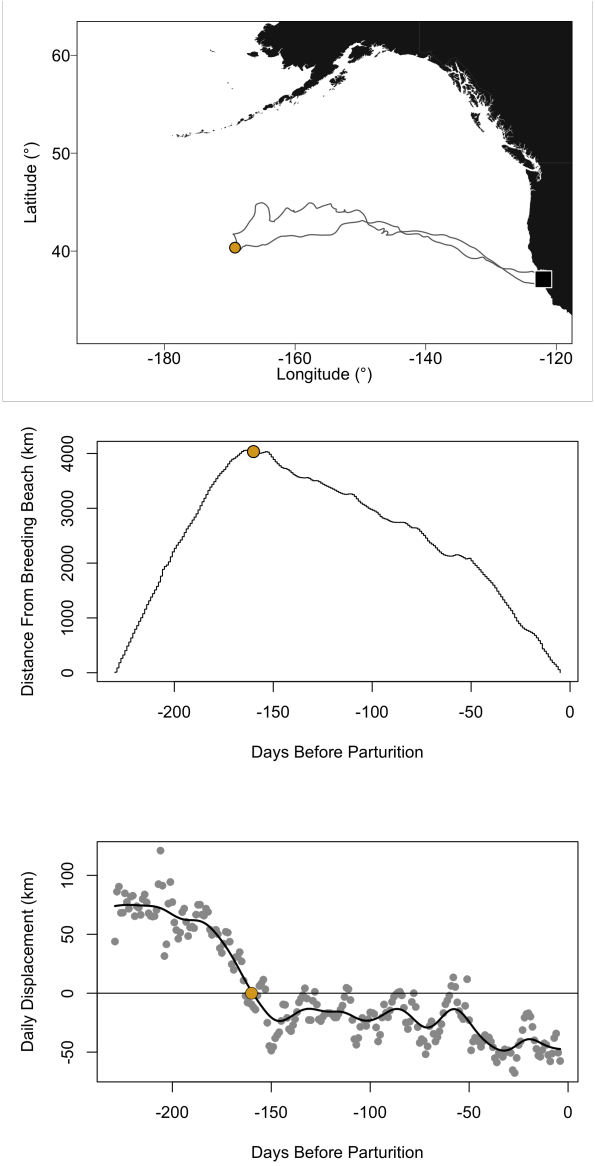

Figure S1: Tracking data (top), distance traveled from the breeding beach (middle), and daily displacement from the breeding beach (bottom) for a representative seal (#2007048). Gold points indicate turnaround locations in all panels

References

1. Robinson, P.W., Costa, D.P., Crocker, D.E., Gallo-Reynoso, J.P., Champagne, C.D., Fowler, M.A., Goetsch, C., Goetz, K.T., Hassrick, J.L., Hückstädt, L.A., et al. (2012). Foraging Behavior and Success of a Mesopelagic Predator in the Northeast Pacific Ocean: Insights from a Data-Rich Species, the Northern Elephant Seal. PLoS ONE *7*, e36728.

2. Johnson, D.S., London, J.M., Lea, M.-A., and Durban, J.W. (2008). Continuous-time correlated random walk model for animal telemetry data. Ecology *89*, 1208–1215.

3. Johnson, D., Josh M. London (NOAA), and Kenady (2016). Crawl: V2.0.

4. Robinson, P.W., Simmons, S.E., Crocker, D.E., and Costa, D.P. (2010). Measurements of foraging success in a highly pelagic marine predator, the northern elephant seal. Journal of Animal Ecology *79*, 1146–1156.

5. Bates, D., Mächler, M., Bolker, B., and Walker, S. (2015). Fitting Linear Mixed-Effects Models Usinglme4. Journal of Statistical Software *67*.