Supplement 1: Spatial information

Table S1. Summary of tracking data obtained from adult and immature Great shearwater (*Ardenna gravis*). The period of the data corresponding to individuals using the Argentine fishing zone (including Argentine Exclusive Economic Zone and the Argentine-Uruguayan Common Fishing Zone). Dates in bold indicate the start and end of period for each data set. For more details about techniques used to capture and deployment see (Ronconi et al. 2018, Schoombie et al. 2018).

ID	Initial tracking date	Final tracking date	Sex	Capture sites	Tracking device
IMMATURES					
67644 a	04/10/2006	06/11/2006	X	Fundy	PTT
67645 a	28/09/2006	02/11/2006	X	Fundy	
67646 a	04/10/2006	**23/11/2006**	X	Fundy	
67647 a	30/09/2006	06/11/2006	X	Fundy	
67648 a	04/10/2006	01/11/2006	X	Fundy	
67649 a	**26/09/2006**	02/11/2006	X	Fundy	
67647 b	**24/09/2008**	02/10/2008	X	Fundy	PTT
67648 b	12/10/2008	14/12/2008	X	Fundy	
67649 b	22/12/2008	**01/02/2009**	X	Fundy	
84367 a	02/10/2008	05/11/2008	X	Fundy	
87508 a	26/10/2008	01/11/2008	X	Fundy	
49684 b	**26/09/2009**	09/11/2009	X	Fundy	PTT
49685 b	10/10/2009	09/11/2009	X	Fundy	
95597 a	26/09/2009	23/10/2009	X	Fundy	
95599 a	28/09/2009	01/11/2009	X	Fundy	
95965 a	03/10/2009	19/03/2010	X	Fundy	
95966 a	11/10/2009	**22/03/2010**	X	Fundy	
95967 a	23/01/2010	06/03/2010	X	Fundy	
ADULTS					
96794a	11/02/2010	31/05/2010	X	Gough	PTT
96795a	**05/10/2009**	18/04/2010	X	Gough	
96796a	22/11/2009	14/05/2010	X	Gough	
96797a	08/10/2009	17/11/2009	X	Gough	
96799a	09/03/2010	05/04/2010	X	Gough	
96800a	12/02/2010	21/02/2010	M	Inaccessible	
96801a	08/12/2009	25/11/2010*	M	Inaccessible	
96802a	16/12/2009	12/05/2010	M	Inaccessible	
96803a	26/01/2010	30/05/2010	M	Inaccessible	
96804a	14/12/2009	31/05/2010	M	Inaccessible	
96805a	05/12/2009	31/05/2010	M	Inaccessible	
96806a	27/11/2009	**19/06/2010**	X	Inaccessible	
96807a	09/01/2010	06/06/2010	X	Inaccessible	
96808a	16/12/2009	16/05/2010	F	Inaccessible	
96809a	28/01/2010	04/05/2010	F	Inaccessible	
96810a	04/01/2010	30/05/2010	X	Inaccessible	
96811a	24/12/2009	16/05/2010	F	Inaccessible	

96812a	24/01/2010	13/03/2010	F	Inaccessible	
96813a	11/01/2010	21/02/2010	X	Inaccessible	
96814a	17/01/2010	26/05/2010	F	Inaccessible	
96815a	12/01/2010	31/05/2010	X	Inaccessible	
1287	20/11/2015	01/12/2015	M	Nightingale	GPS
1286	24/01/2014	02/02/2014	M	Gough	GPS

* The ID 96801 has two periods of data in the area, one from 8 Dec 2009 to 15 May 2010 and other from 24 Sept 2010 to 26 Nov 2010. For the statisticals analysis only the first period was used.

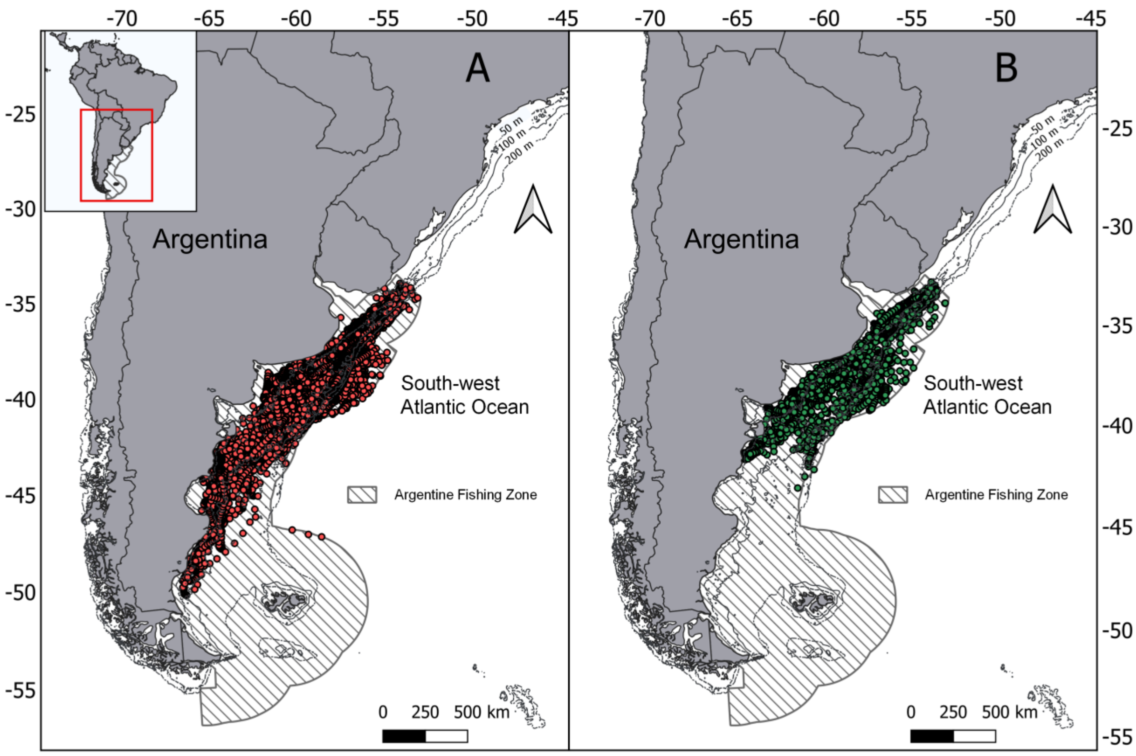
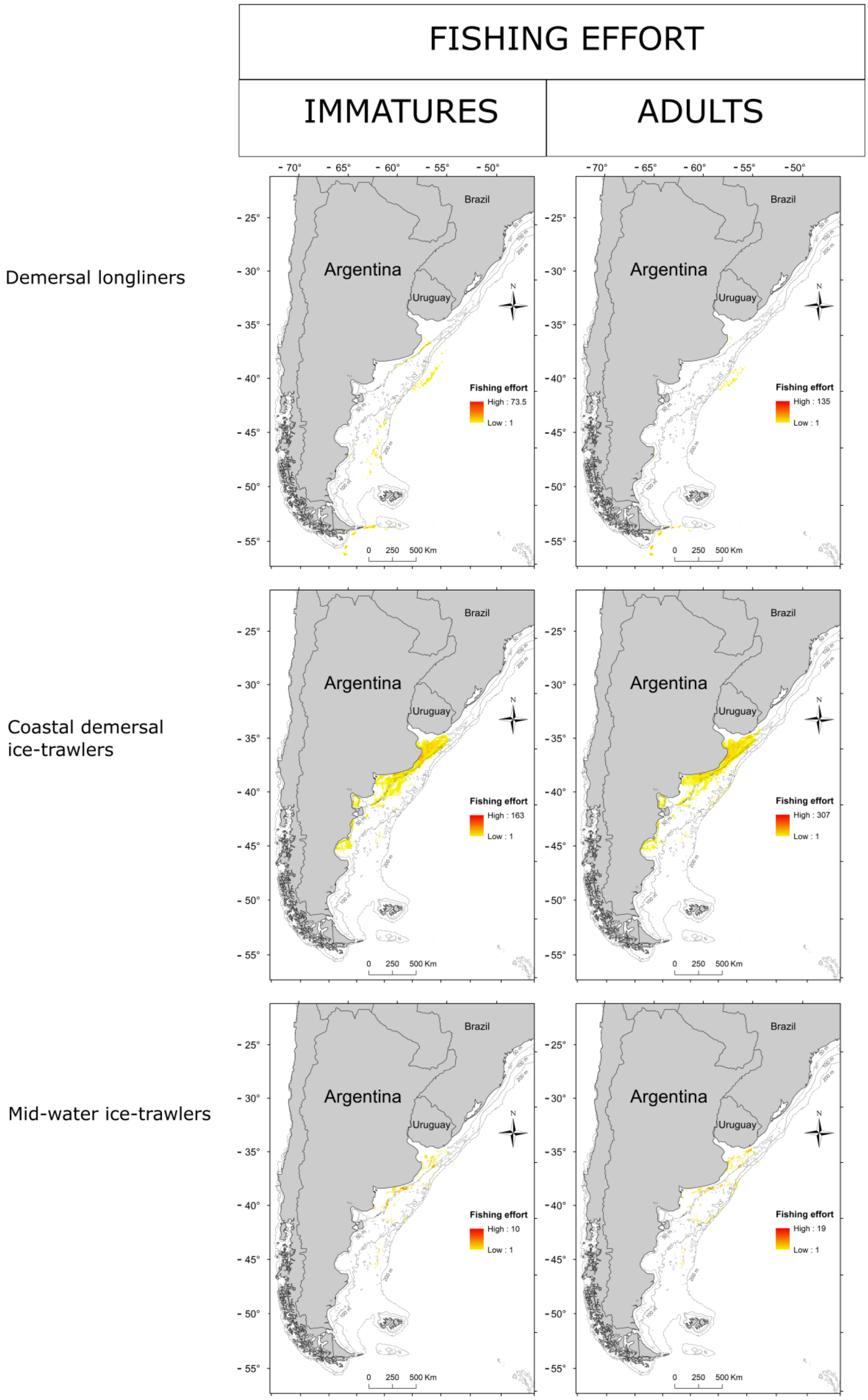


Figure S1. Location of adult (A) and immature (B) Great Shearwaters in the study area during the 2006-2015 period.


FISHING EFFORT
IMMATURES
ADULTS
Demersal longliners
Coastal demersal ice-trawlers
Mid-water ice-trawlers
- 70° - 65° - 60° - 55° - 50°
- 25° - 30° - 35° - 40° - 45° - 50° - 55°
Brazil
Argentina
Uruguay
N
Fishing effort
High : 73.5
Low : 1
High : 135
Low : 1
High : 163
Low : 1
High : 307
Low : 1
High : 10
Low : 1
High : 19
Low : 1
0 250 500 Km

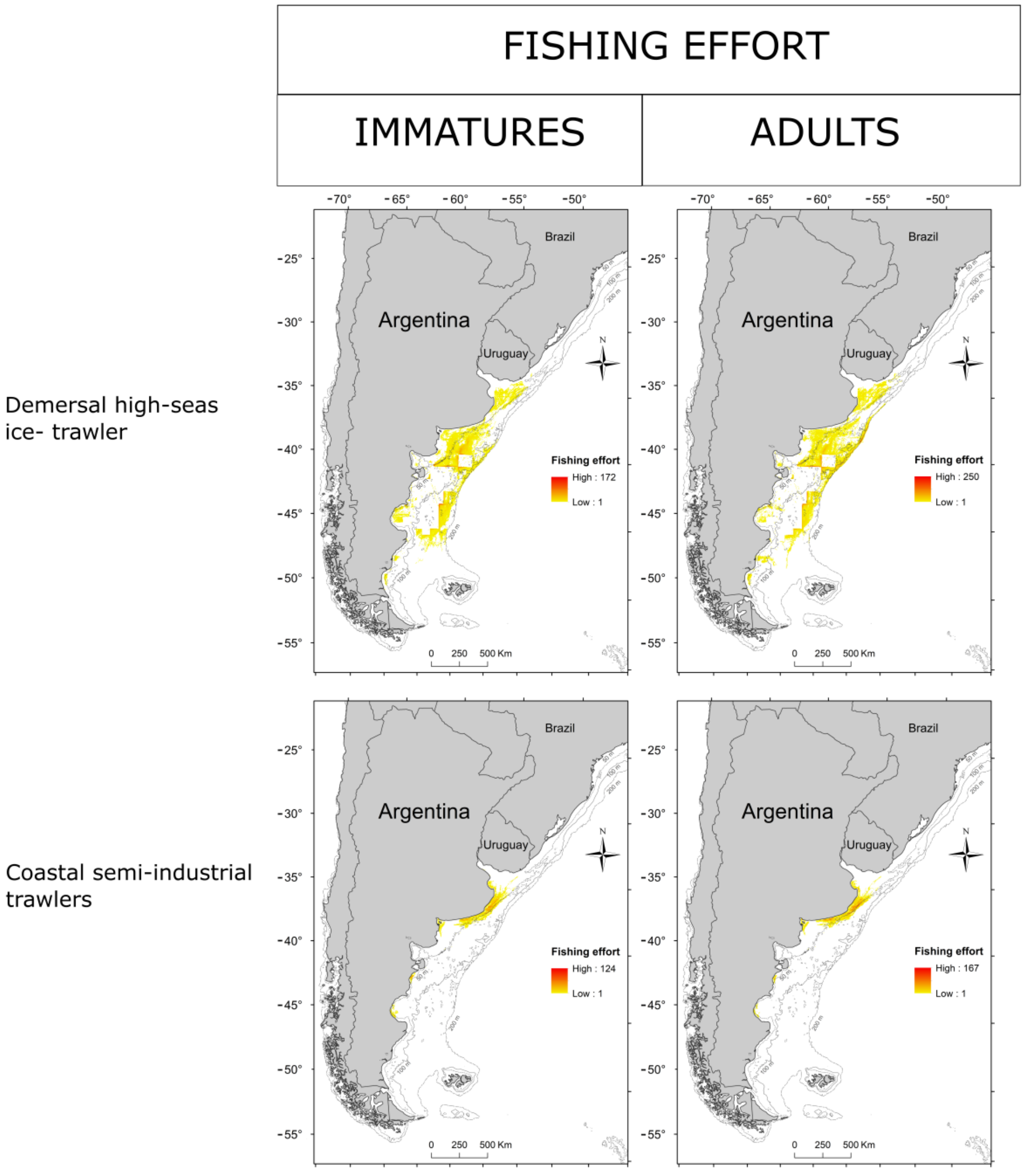


Figure S2. Argentine Fishing effort measured as the number of fishing positions per hour per cell (4 km^2) for each age class type of fleet with high overlap index (UDOI>0.2). The information was estimated from satellite monitoring data (VMS) provided by Ministerio de Agricultura, Ganadería y Pesca of Argentina.

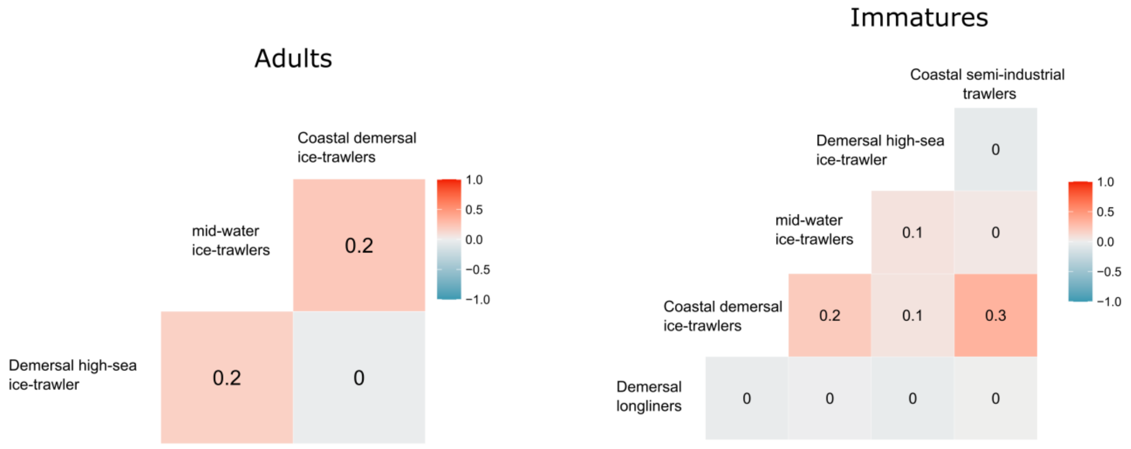


Figure S3. Correlations between fishing effort of Argentinian fleets for each group of study. Only fleets with an overlap index UDOI>0.2 were using for the correlation analysis.

Supplement 2: Isotopes information

Text S1. Stable isotopes methodological procedure

Blood samples were dried in an oven at 60°C and ground using a hand mortar (Hobson et al. 1997, Cherel et al. 2007). Sub-samples of ~0.5 mg of the tissue were packed in tin capsules for stable isotope analysis. Stable isotope ratios were determined by mass spectrometry at the Stable Isotope facility of the University of California, Davis, USA. Results are presented in the usual δ notation relative to Vienna Pee Dee Belemnite for $\delta^{13}C$ and atmospheric N^2 (Air) for $\delta^{15}N$. Raw values were normalized on a two-point scale using Glutamic acid reference materials with low and high values (USGS-40 with $\delta^{13}C$ = -28.8‰ and $\delta^{15}N$ = -4.3‰; and USGS-41 with $\delta^{13}C$ = 37.6‰ and $\delta^{15}N$ = 47.6‰). Replicate measurements of biologically relevant internal laboratory standards indicate a sample precision of 0.1‰ for $\delta^{13}C$ and 0.2‰ for $\delta^{15}N$. Isotopic ratios were compared among potential prey categories (taken from the literature, as described in Table S2) through a PERMANOVA (Anderson 2001, Anderson et al. 2008) in PRIMER 6 (Clarke & Gorley 2006) and pairwise post-hoc comparisons. To assess the importance of different prey as food sources we used the MixSIAR Bayesian stable isotope mixing model in the R environment (Stock et al. 2018). This model provides quantitative indices of food item contribution to a consumers' diet accounting for known variability in sources, fractionation, and other unquantified variability within the model. MixSIAR outputs represent true probability density functions, rather than a range of feasible solutions provided by earlier mixing models (Parnell et al. 2010). As there are no diet-tissue discrimination factors available for shearwaters, an average of fractionation factors between whole prey and bird tissue obtained from other piscivorous marine birds was used (Bearhop et al. 2002, Cherel et al. 2005): average fractionation (n = 4) 0.1 ‰ ± 0.5 ($\delta^{13}C$) and 2.53 ‰ ± 0.5 ($\delta^{15}N$). Models were set as follows: number of chains = 3; chain length = 1.000.000, burn-in = 500,000 and thin = 50. Convergences of mixing models were evaluated using the Gelman-Rubin and Geweke diagnostics (Stock et al. 2018).

The predator isotopic ratios were contained within the mixing space after application of fractionation factors; moreover, before running the isotopic mixing models, we conducted the sensitivity analysis proposed by (Smith et al. 2013), using 3000 iterations, to evaluate the feasibility of the proposed isotopic mixing polygon. Results from the isotope mixing models are expressed as mode and 95% credibility intervals (CI). Means are provided ± standard deviations unless otherwise stated.

Table S2. Mean ratios and sample size of carbon and nitrogen isotopic values of consumers and potential prey considered in the study. Standard deviation is included between brackets. Higher categories are in **bold**.

Species	^{13}C (sd)	^{15}N (sd)	n	Source
Ardenna gravis blood	–17.9 (0.2)	16.8 (0.3)	5	This study
Components of the Argentine fishing zone				
Demersal fish[1]	–17.2 (0.5)	15.9 (0.7)	21	
Merluccius hubbsi	–17.3 (0.4)	16.3 (0.4)	9	Mariano-Jelicich et al. 2014
Nototenia patagonotothen	–17.2 (0.6)	15.6 (0.8)	12	Mariano-Jelicich et al. 2014
Mid-water cephalopods[1]	–16.8 (0.7)	15.7 (0.7)	10	
Illex argentinus	–16.3 (0.3)	15.7 (0.8)	6	Mariano-Jelicich et al. 2014
Doryteuthis gahii	–17.6 (0.4)	15.7 (0.6)	4	Vales et al. 2015
Mid-water (pelagic) fish				
Engraulis anchoita	–17.9 (0.5)	15.2 (0.5)	15	Mariano-Jelicich et al. 2014
Demersal crustacea				
Pleoticus muelleri	–15.9 (0.4)	16.7 (0.3)	5	Vales et al. 2015
Zooplankton species[2]				
Calanoid copepods	–18.8 (0.01)	12.9 (0.01)	2	Gaitán 2012
Munida gregaria	–17.4 (0.7)	12.9 (0.2)	5	Funes et al. 2018

[1] Mean value for all demersal species used

[2] Mean value for each zooplankton class used

Bibliography

Anderson MJ (2001) A new method for non-parametric multivariate analysis of variance. Austral Ecol 26:32–46.

Anderson MJ, Gorley RN, Clarke KR (2008) PERMANOVA+ for PRIMER: Guide to Software and Statistical Methods. Primer-E, Plymouth

Bearhop S, Waldron S, Votier SC, Furness RW (2002) Factors That Influence Assimilation Rates and Fractionation of Nitrogen and Carbon Stable Isotopes in Avian Blood and Feathers. Physiol Biochem Zool 75:451–458.

Cherel Y, Hobson KA, Guinet C, Vanpe C (2007) Stable isotopes document seasonal changes in trophic niches and winter foraging individual specialization in diving predators from the Southern Ocean. J Anim Ecol 76:826–836.

Cherel Y, Hobson KA, Hassani S (2005) Isotopic Discrimination between Food and Blood and Feathers of Captive Penguins: Implications for Dietary Studies in the Wild. Physiol Biochem Zool 78:106–115.

Clarke KR, Gorley RN (2006) PRIMER v6: user manual/tutorial. PRIMER-E Ltd, PRIMER-E L.

Funes M, Irigoyen AJ, Trobbiani GA, Galván DE (2018) Stable isotopes reveal different dependencies on benthic and pelagic pathways between *Munida gregaria* ecotypes. Food Webs 17:e00101.

Gaitán EN (2012) Tramas tróficas en sistemas frontales del mar argentino: estructura, dinámica y complejidad analizada mediante isótopos estables. PhD dissertation. Universidad Nacional de Mar del Plata, Facultad de Ciencias Exactas y Naturales.

Hobson KA, Gloutney ML, Gibbs HL (1997) Preservation of blood and tissue samples for stable-carbon and stable-nitrogen isotope analysis. Can J Zool 75:1720–1723.

Mariano-Jelicich R, Copello S, Seco Pon JP, Favero M (2014) Contribution of fishery discards to the diet of the Black-browed albatross (*Thalassarche melanophris*) during the non-breeding season: an assessment through stable isotope analysis. Mar Biol 161:119–129.

Parnell AC, Inger R, Bearhop S, Jackson AL (2010) Source Partitioning Using Stable Isotopes: Coping with Too Much Variation. PLOS ONE 5:e9672.

Ronconi RA, Schoombie S, Westgate AJ, Wong SNP, Koopman HN, Ryan PG (2018) Effects of age, sex, colony and breeding phase on marine space use by Great Shearwaters *Ardenna gravis* in the South Atlantic. Mar Biol 165:1–13.

Schoombie S, Dilley BJ, Davies D, Ryan PG (2018) The foraging range of Great Shearwaters (Ardenna gravis) breeding on Gough Island. Polar Biol 41:2451–2458.

Smith JA, Mazumder D, Suthers IM, Taylor MD (2013) To fit or not to fit: evaluating stable isotope mixing models using simulated mixing polygons. Methods Ecol Evol 4:612–618.

Stock BC, Jackson AL, Ward EJ, Parnell AC, Phillips DL, Semmens BX (2018) Analyzing mixing systems using a new generation of Bayesian tracer mixing models. PeerJ 6:e5096.

Vales D, Cardona L, García N, Zenteno L, Crespo E (2015) Ontogenetic dietary changes in male South American fur seals Arctocephalus australis in Patagonia. Mar Ecol Prog Ser 525:245–260.