The following supplement accompanies the article

Linking at-sea mortality of a pelagic shearwater to breeding colonies of origin using biogeochemical markers

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Supplement

Table S1. Summary of secondary isotopic reference materials (SIRMs) used to calibrate unknowns and measure instrument precision. Accepted values and overall values among all runs are presented as mean ± SD (n = number of duplicates). Within runs, data are presented as the range of SDs (n = number of runs where the SIRM was run more than once)

	Accepted value (‰) (mean ± SD)		Within runs (‰) (range of SDs)			Overall among runs (‰) (mean ± SD)		
SIRM	**$\delta^{13}C$**	**$\delta^{15}N$**	**$\delta^{13}C$**	**$\delta^{15}N$**	**n**	**$\delta^{13}C$**	**$\delta^{15}N$**	**n**
IAEA-CH6	–10.45±0.13	–	0.07–0.23	–	8	–10.45±0.18	–	30
IAEA-N1	–	+0.43±0.07	0.03–0.26	–	9	–	+0.45 ± 0.11	34
IAEA-N2	–	+20.32±0.09	0.02–0.19	–	9	–	+20.32±0.10	34
MUN CO_2 (calcium carbonate)	–40.11±0.15	–	0.08–0.27	–	8	–40.11±0.14	–	33
USGS 24	–16.05±0.11	–	0.03–0.37	–	8	–15.95±0.19	–	26
USGS 25	–	–30.25±0.38	0.01–0.22	–	9	–	–30.25±0.11	41

Table S2. *Puffinus carneipes*. Because metal concentrations in feathers can be variable within individuals, we analysed 2 feathers per individual, and ran 12% of individuals in duplicate. Values: relative SD of duplicate analyses

Element	Relative SD
Al	8.871
V	0.346
Mn	0.158
Co	0.120
Ni	1.124
Cu	0.865
Zn	2.638
Mo	0.188
Ag	0.048
Cd	0.127
Sb	0.025
Ba	1.853
Tl	0.002
Pb	0.400
U	0.010

Table S3. *Puffinus carneipes*. High recovery of 2 keratin-based reference materials was achieved using inductively coupled plasma mass spectrometry (ICP-MS) to measure trace element concentrations in Flesh-footed Shearwater feathers. Data are presented as the mean ± SD % recovery relative to the mean certified concentration in μg g^{-1} (ppm). CV = (SD ÷ mean) × 100

Reference material (n)	Element	Certified concentration	Measured concentration ± SD	CV	Mean % recovery
6H-09 (8)	Al	33	33 ± 5	13.92	100
	V	2.61	2.35 ± 0.29	12.26	90
	Cr	1.24	1.54 ± 0.30	19.38	124
	Mn	0.93	1.13 ± 0.14	12.10	121
	Co	0.476	0.410 ± 0.139	33.85	86
	Ni	2.67	3.44 ± 0.57	16.65	129
	Cu	107	112 ± 3	2.26	106
	Zn	101	116 ± 5	4.39	114
	As	0.19	0.224 ± 0.04	16.86	118
	Mo	26	28 ± 1	3.50	109
	Ag	0.77	0.87 ± 0.05	5.67	113
	Cd	0.24	0.24 ± 0.05	21.29	100
	Sb	0.205	0.243 ± 0.030	12.21	119
	Ba	1.48	1.77 ± 0.25	14.19	119
	Hg	4.49	4.58 ± 1.81	39.48	102
	Tl	0.45	0.46 ± 0.02	4.43	102
	Pb	14.8	14.9 ± 0.7	4.84	100
	U	0.022	0.024 ± 0.003	10.45	109
7H-09 (8)	Al	159	158 ± 7	4.35	100
	V	0.346	0.294 ± 0.112	38.22	85
	Cr	8.6	8.4 ± 0.6	6.77	97
	Mn	5.64	6.26 ± 0.25	4.06	111
	Co	6.12	6.60 ± 0.27	4.08	108
	Ni	6.6	7.4 ± 0.6	7.90	112
	Cu	132	139 ± 4	2.61	105
	Zn	179	189 ± 5	2.74	106
	As	2.64	2.66 ± 0.13	4.70	101
	Mo	0.473	0.599 ± 0.063	10.47	127
	Ag	1.67	1.90 ± 0.10	5.33	114
	Cd	1.7	1.9 ± 0.1	6.62	109
	Sb	1.54	1.70 ± 0.13	7.49	110
	Ba	13.7	14.4 ± 0.6	4.00	105
	Hg	3.78	3.38 ± 1.28	37.84	89
	Tl	0.175	0.182 ± 0.016	8.53	104
	Pb	5.28	5.92 ± 0.75	12.72	112
	U	1.73	1.86 ± 0.11	5.63	108

Fig S1. *Puffinus carneipes*. Log-transformed trace element and stable isotope values for known provenance Flesh-footed Shearwaters showing the degree of overlap of group assignments at the colony scale resolution. Bar: median; box: 25th to 75th percentiles; whiskers: 5th to 95th percentiles; circles: outliers

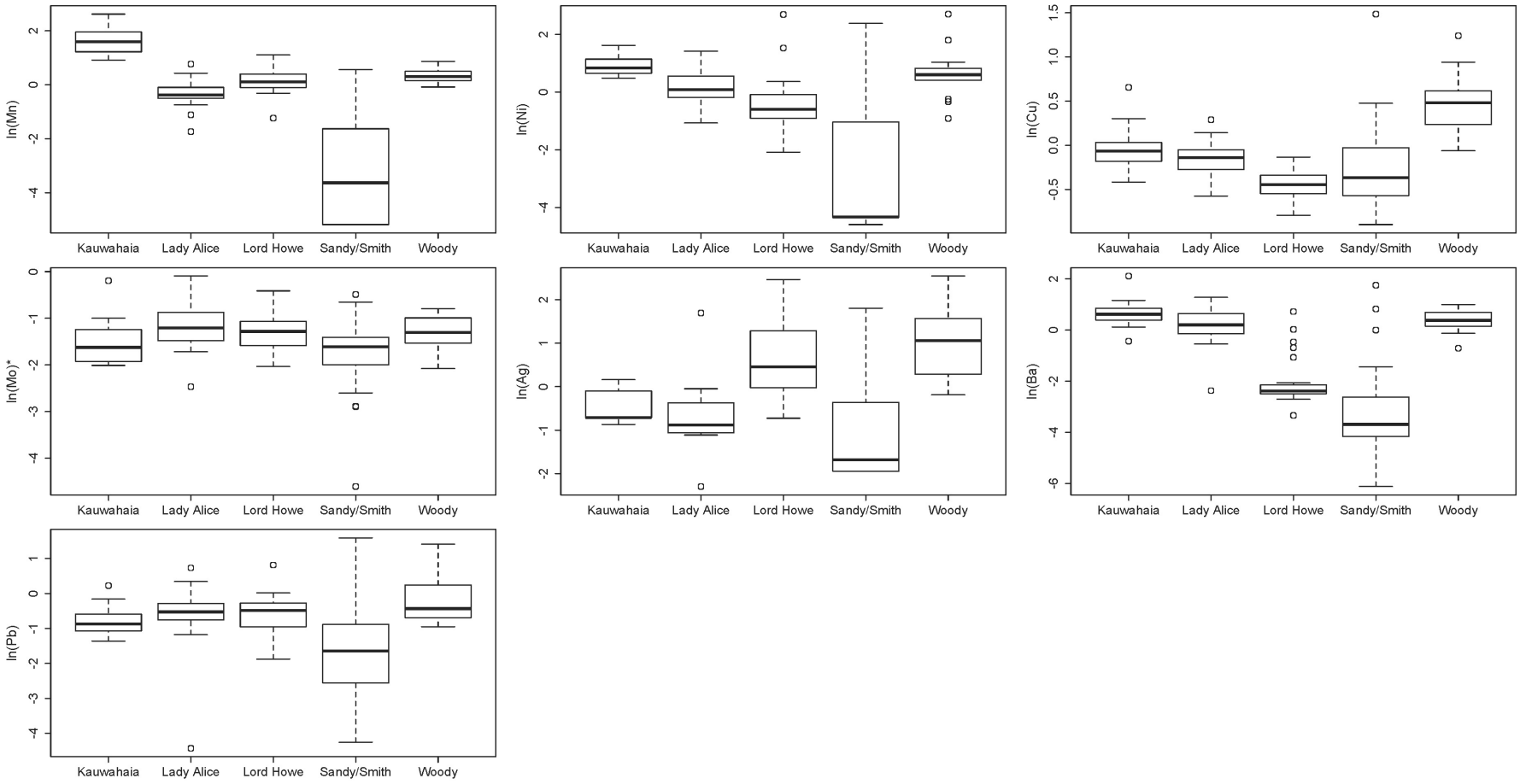

Table S4. *Puffinus carneipes*. We used the residuals from linear regressions for each log-transformed trace element and stable isotope value against year of collection (1936–2011) to account for temporal variability in trace element concentrations and stable isotope values in Flesh-footed Shearwater feathers. Results = slope (β) ± SE, with r^2 and p-values

Element/isotope	β ± SE	r^2	p
Al	–0.013 ± 0.006	0.015	0.042
Mn	–0.008 ± 0.003	0.016	0.039
Ni	–0.008 ± 0.003	0.020	0.021
Cu	–0.004 ± 0.001	0.0539	<0.001
Zn	–0.001 ± 0.001	0.003	0.358
Mo	0.001 ± 0.001	0.002	0.415
Ag	–0.012 ± 0.002	0.055	<0.001
Ba	–0.025 ± 0.004	0.117	<0.001
Pb	–0.029 ± 0.003	0.206	<0.001
U	0.002 ± 0.001	0.004	0.297
$\delta^{13}C$	–0.001 ± 0.001	0.071	<0.001
$\delta^{15}N$	–0.002 ± 0.001	0.048	<0.001