

Ecography

ECOG-03561

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Supplementary material

APPENDIX 1

TABLE A1. Summary of multinomial logistic regression models examined for variation in stranding types (shark bite, neurological disease, ELS/emaciation, trauma, and other) related to year and region. Model comparison is based on Akaike's information criteria, corrected for small-sample size (AICc, Δ AICc); likelihood given the data $L(g_i/x)$; Akaike weight (w_i); and evidence ratio (ER).

Model factors	AICc	Δ_i	$L(g_i/x)$	w_i	ER
Year + Region	1092.0	0	1	0.99	
Year x Region	1102.2	10.2	6.1E-03	6.0E-03	164.0
Region	1125.5	33.5	5.3E-08	5.3E-08	1.9E+07
Year	1186.0	94.0	3.9E-21	3.9E-21	2.6E+20

Table A2. Summary of multinomial logistic regression models examined for variation in demographic categories (reproductive females, dependent pups, and all others) related to year and region. Model comparison is based on Akaike’s information criteria, corrected for small-sample size (AICc, Δ AICc); likelihood given the data $L(g_i/x)$; Akaike weight (w_i); and evidence ratio (ER).

Model factors	AICc	Δ_i	$L(g_i/x)$	w_i	ER
Year x Region	1356.3	0	1	0.71	
Year + Region	1358.1	1.8	0.41	0.29	2.5
Region	1371.9	15.6	4.1E-04	2.9E-04	2.4E+03
Year	1413.5	57.2	3.8E-13	2.7E-13	2.6E+12

Table A3. Summary of multinomial logistic regression models examined for variation in stranding types related to year, kelp canopy cover (5 linear-km spatial scale) and sea otter population density. Model comparison is based on Akaike's information criteria, corrected for small-sample size (AICc, ΔAICc); likelihood given the data $L(g_i/x)$; Akaike weight (w_i); and evidence ratio (ER).

Model factors	AICc	Δ_i	$L(g_i/x)$	w_i	ER
Year + population density + kelp cover	1060.6	0	1	0.89	
Year x population density + kelp cover	1064.7	4.1	0.13	0.11	7.8
Year x population density	1078.3	17.7	1.4E-04	1.3E-04	6.9E+3
Year + population density	1079.9	19.3	6.4E-05	5.7E-05	1.6E+04
Population density + kelp cover	1089.2	28.6	6.2E-07	5.5E-07	1.6E+06
Population density x kelp cover	1094.3	33.7	4.8E-08	4.3E-08	2.1E+07
Year + kelp cover	1094.1	33.5	5.3E-08	4.7E-08	1.9E+07
Year x kelp cover	1098.7	38.1	5.3E-09	4.7E-08	1.9E+08

Table A4. Summary of multinomial logistic regression models examined for variation in stranding types related to population density, and kelp canopy cover at varying spatial scales (0.5 to 15 linear-km). Model comparison is based on Akaike’s information criteria, corrected for small-sample size (AICc, Δ AICc); likelihood given the data $L(g_i/x)$; Akaike weight (w_i); and evidence ratio (ER).

Model factors	AIC	Δ_i	$L(g_i/x)$	w_i	ER
Year + Population density + Kelp cover (10km)	1060.4	0	1	0.44	
Year + Population density + Kelp cover (5km)	1060.6	0.2	0.91	0.41	1.1
Year + Population density + Kelp cover (15km)	1063.7	3.3	0.19	8.5E-02	5.2
Year + Population density + Kelp cover (3km)	1064.4	4.0	0.14	6.0E-02	7.4
Year + Population density + Kelp cover (1km)	1073.6	13.2	1.4E-03	6.0E-04	7.4E+02
Year + Population density + Kelp cover (0.5km)	1076.6	16.2	3.0E-04	1.3E-04	3.3E+03

Table A5. Best fit multinomial logistic regression models indicating the odds of a particular stranding type (shark bite, neurological diseases, ELS/emaciation, and trauma) with respect to time and region. Reference demographic is 'Other', and reference region is R3, the range center.

Stranding Type	Factor	β	β SE	<i>P</i>	OR
Shark bite	intercept	-2.888	0.916	0.00162	0.056
	Year	0.084	0.031	0.00592	1.088
	Region 5	2.704	0.977	0.00566	14.943
	Region 4	0.833	0.639	0.19235	2.299
	Region 2	1.261	0.720	0.07976	3.529
	Region 1	1.758	0.766	0.02178	5.798
Neurological diseases	intercept	-1.927	1.154	0.09509	0.146
	Year	-0.024	0.025	0.33879	0.976
	Region 5	3.494	1.327	0.00846	32.918
	Region 4	2.721	1.072	0.01113	15.197
	Region 2	3.437	1.118	0.00211	31.083
	Region 1	3.452	1.161	0.00295	31.572
ELS/emaciation	intercept	1.101	0.654	0.09216	3.008
	Year	0.007	0.027	0.80469	1.007
	Region 5	-1.240	1.057	0.24089	0.289
	Region 4	-1.829	0.448	0.00004	0.161
	Region 2	-1.627	0.613	0.00798	0.197
	Region 1	-1.968	0.799	0.01379	0.140
Trauma	intercept	1.280	0.662	0.05327	3.596
	Year	-0.091	0.026	0.00045	0.913
	Region 5	0.267	1.129	0.81331	1.306
	Region 4	0.578	0.547	0.29088	1.782
	Region 2	0.532	0.710	0.45323	1.703
	Region 1	0.231	0.877	0.79183	1.260

Table A6. Best fit multinomial logistic regression models indicating the odds of a particular stranding demographic (reproductive female or dependent pup) with respect to time and region. Reference demographic is 'Other', and reference region is R3, the range center.

Stranding demographics	Factor	β	β SE	<i>P</i>	OR
Reproductive females	Intercept	0.574	0.613	0.3485	1.776
	Year	-0.009	0.028	0.7374	0.991
	Region 5	-2.954	1.627	0.0695	0.052
	Region 4	-1.992	0.824	0.0156	0.136
	Region 2	-4.895	1.989	0.0139	0.007
	Region1	-2.403	1.609	0.1354	0.090
	Year x region 5	0.089	0.068	0.1947	1.093
	Year x region 4	0.017	0.036	0.6331	1.017
	Year x region 2	0.125	0.076	0.0984	1.133
	Year x region 1	0.036	0.064	0.5685	1.037
Dependent pups	Intercept	1.943	0.563	0.0006	6.979
	Year	-0.075	0.028	0.0069	0.474
	Region 5	-2.852	1.180	0.0156	0.058
	Region 4	-1.425	0.679	0.0359	0.241
	Region 2	-1.788	1.035	0.0841	0.167
	Region1	-3.742	1.248	0.0027	0.024
	Year x region 5	0.118	0.054	0.0277	1.125
	Year x region 4	0.009	0.033	0.7743	1.009
	Year x region 2	0.069	0.044	0.1210	1.071
	Year x region 1	0.149	0.050	0.0031	1.161

Table A7. Best fit multinomial logistic regression models indicating the odds (OR) of a particular stranding type with respect to time, population density, and kelp canopy cover at a 5 linear-km spatial scale. Reference stranding type is 'Other'.

Stranding Type	Factor	β	β SE	<i>P</i>	OR
Shark bite	Intercept	-0.983	0.796	0.21682	0.374
	Year	0.055	0.031	0.07367	1.057
	Population density	0.147	0.072	0.04186	1.158
	Kelp cover (5km)	-0.441	0.126	0.00046	0.643
Neurological diseases	Intercept	1.486	0.641	0.02036	4.420
	Year	-0.023	0.026	0.36388	0.977
	Population density	-0.132	0.086	0.12545	0.876
	Kelp cover (5km)	-0.111	0.062	0.07358	0.895
ELS/emaciation	Intercept	-0.450	0.692	0.51534	0.638
	Year	-0.035	0.027	0.19697	0.966
	Population density	0.249	0.059	0.00003	1.283
	Kelp cover (5km)	-0.033	0.032	0.29960	0.967
Trauma	Intercept	2.117	0.634	0.00084	8.306
	Year	-0.108	0.027	0.00006	0.898
	Population density	0.062	0.074	0.40145	1.064
	Kelp cover (5km)	-0.084	0.046	0.06942	0.919

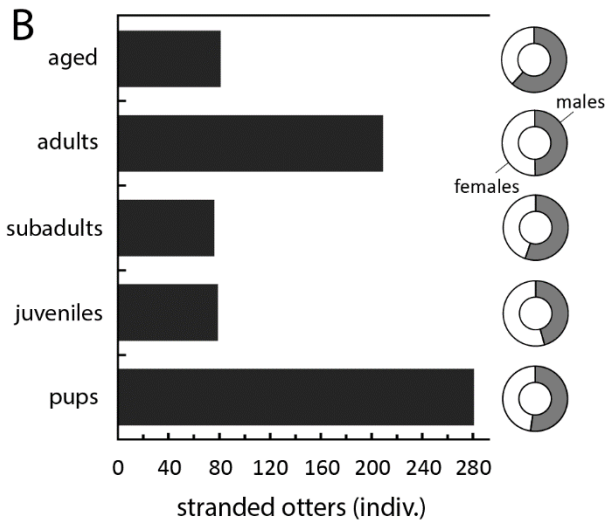
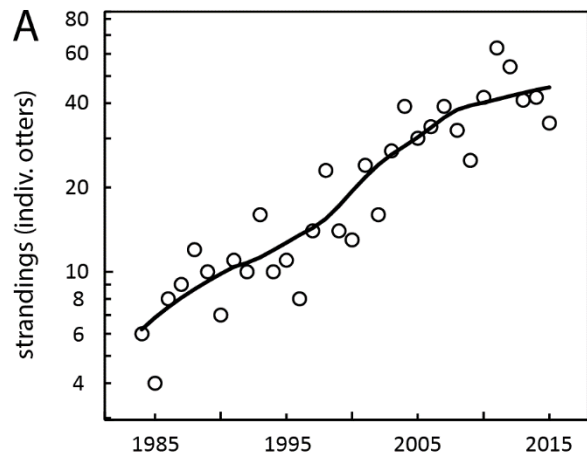


Figure A1. Trends and demographics from 30 years (1984–2015) of sea otter live strandings. A) Annual totals of sea otter strandings (open circles) and LOESS trend (line) show an overall increase that declined slightly after 2009. Note *y*-axis is log scaled. B) Age frequency of strandings over the period (bars) shows that most strandings were dependent pups and adults, and most age classes had equal sex ratios (circle plots). Males were the most disproportionately represented in subadult and aged adult classes, perhaps representing increased hazards faced during these more transient-stage demographics.