

Supplementary material

Appendix 1

Table A1. Timing of arctic fox introduction and eradication and observations of common eiders from islands within the Central and Western Aleutian Archipelago. We include only information cited in other publications or refuge reports available through interlibrary loan from the Alaska Resources Library and Information Services (ARLIS), Anchorage, Alaska, or on file with the Alaska Maritime National Wildlife Refuge, Homer, Alaska. M = male, F = female, crèche = group of ducklings and adults.

Island	Size of island ¹ , ha	Latitude, longitude ¹²	Years foxes introduced	Year reported fox free	Observations of birds near or on islands	
					Year	Status
Near Islands						
Group						
Attu	90,577	52°55'N, 172°55'E	1750 ³	2000 ⁴	1884 ⁵	Nest on grassy ledges near water ^{***6}
					1936-1937 ⁶	Nesting on rocky islets ^{***6}
					1979 ⁷	8740 M, 1930 F, 230 ducklings ^{**7}
Agattu	22,475	52°35'N, 173°25'E	1880 ³ , 1924 ³	1977 ⁴	1906 ⁸	Common, nest on beach ^{***8}

					1936-1937 ⁶	Preparing to nest ^{***6}
					1975 ⁹	Nests with eggs
					1979 ⁷	970 M, 1170 F, 320 ducklings ^{**7}
Nizki/Alaid	1285	52°34'N, 173°54'E	1911 ³	1976 ⁴	1936-1937 ⁶	Nesting on islets in a lake ^{***6}
					1975 ¹⁰	108 birds, no nests ^{***10}
					1975-1976 ¹¹	250-500 birds ^{**11}
					1979 ⁷	510 M, 500 F, 280 ducklings, many females with broods ^{**7}
					1979 ⁷	Nearby small island with no foxes introduced: 10 nests; ^{***7}
					1983 ¹¹	1800–1984 birds ^{**11}
					1992 ¹¹	>200 nests ^{***11}
Shemya	1425	52°43'N, 177°07'E	1911 ³	No removal ³	1936-1937 ⁶	Nesting on islets in lake ^{***6}
					1979 ⁷	250 M, 210 F, 5 ducklings ^{**7}
Rat Islands group						

Buldir	2000	52°21'N, 175°57'E	None introduced		1936-1937 ⁶	Nesting on the beach* ⁶
					1972-1984 ¹²	10-15 nests in vegetation near beach*** ¹²
					1979 ⁷	70 M, 7 F** ⁷
Amchitka	29,553	51°32'N, 179°00'E	1921 ³	1961 ⁴	1936-1937 ⁶	Nesting offshore rocks*** ⁶
					1952 ¹³	Offshore rocks and islands*** ¹³
					1955-1957, 1959 ¹⁴	Nesting offshore rocks, few widely separated nests on main island*** ¹⁴
					2004 ¹⁵	1390 birds counted, 48 crèches ** ¹⁵
Kiska	28,166	51°58'N, 177°30'E	1835 ³	1989 ⁴	1911 ¹⁶	2 nests with eggs* ¹⁶
					1978 ¹⁷	19 birds** ¹⁷
					2004 ¹⁵	36 crèches, 1756 f, 626 m flightless ** ¹⁵
Little Kiska	740	51°57'N, 177°39'E	1924 ³	No foxes ¹⁴	1911 ⁶	Nesting reported by Wetmore* ⁶

					1978 ¹⁷	37 birds ^{**17}
					2004 ¹⁵	166 mostly F, a few ducklings ^{**15}
Segula	3315	52°01'N, 178°07'E	1920 ³	1995 ⁴	1911 ⁶	Nesting reported by Wetmore ^{*6}
					1979 ⁷	No eiders found ^{**7}
					2004 ¹⁵	26 birds, flocks of 12 F and 12 M, each ^{**15}
Little Sitkin	6354	51°57'N, 178°31'E	1923 ³	2000 ⁴	1982 ¹⁵	3 birds ^{**15}
					2004 ¹⁵	Brood of 3, plus 1 M, 6 F ^{**15}
Rat	2777	51°48'N, 178°19'E	1922 ²	1984 ⁴	1982 ¹⁵	50 birds ^{**15}
					2004 ¹⁵	765 birds, flocks all F or all M (flightless) no crèches ^{**15}
Semisopchnoi	22,668	51°55'N, 179°66'E	1922 ³	1997 ⁴	2004 ¹⁵	1 eclipse M ^{**15}
Andreanof Islands Group						
Adak	73,000	51°45'N, 176°45'W	1921 ³	? ⁴	1936-1937 ⁶	Nesting ^{***6}

Tanaga	51,802	51°38'N, 176°06'W	1922 ³	2005 ⁴	1940 ¹⁷	8 nests on single rocky point ^{***17}
Atka	104,000	52°07'N, 174°30'W	1790 ³	No removal ³	1936-1937 ⁶	Nesting ^{***6}
Ogliuga	318	51°36'N, 178°39'W	1897 ³	Disappeared ³	1936-1937 ⁶	Many young birds ^{*6}
Chugul	1740	51°56'N, 175°48'W	1922 ³	Disappeared ³	1911 ⁶	Reported nesting by Wetmore ^{*6}

*Unknown survey type, **boat surveys, *** ground observations.

¹ Sekora 1973.

² Gibson and Byrd 2007.

³ Bailey 1993.

⁴ *In. lit.* Alaska Maritime National Wildlife Refuge, Homer, Alaska.

⁵ Turner 1885.

⁶ Murie 1959.

⁷ U.S. Fish and Wildlife Service 1980.

⁸ Clark 1911.

⁹Trapp 1975a.

¹⁰Trapp 1975b.

¹¹Byrd, Trapp, and Zeillemaker 1984.

¹²Byrd and Day 1986.

¹³Krog 1953.

¹⁴Kenyon 1961.

¹⁵Byrd et al. 2004.

¹⁶Bent 1912.

¹⁷Day et al. 1979.

¹⁸Gabrielson 1944.

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Table A2. Numbers of nesting adult female common eiders (*Somateria mollissima*) implanted with satellite transmitters by island and island group then subsequently located at wintering and breeding areas. Sample sizes vary among periods due to premature transmitter failure, death of individuals, or too few locations within a time period to determine wintering or breeding area. First breeding is the first known breeding area and the year common eiders were captured and marked with satellite transmitters.¹

Island group	Island	First breeding	First winter	Second breeding	Second winter	Third breeding	Third winter
Near Islands	Nizki	6	6	3	0	0	0
	Alaid	13	11	6	3	1	0
	Attu	1	1	1	0	0	0
	Agattu	6	6	4	1	0	0
	Total	26	24	14	4	1	0
Rat Islands	Amchitka	26	22	18	12	6	3
Andreanof Islands	Adak	4	4	3	2	0	0
Total		56	50	35	18	7	3

¹The number of breeding seasons prior to capture is unknown.

Table A3. Summarization of culmen1 and total tarsus (Dzuben and Cooch 1992) measurements of adult female common eiders (*Somateria mollissima*) captured (2006, 2008) and collected (1993) at the Near, Fox, and Andreanof Island groups, Aleutian Archipelago, Alaska, USA. Significance levels for measurements of culmen1 and total tarsus among and within island groups are tested with ANOVA¹. All measurements were taken by a single observer.

Island group	Year	Measurement	n	Mean (mm)	SE (mm)	95% CI	
						Lower	Upper
Near Islands ²	2006	culmen1	26	47.3	0.4	46.5	48.1
Near Islands ²	1993	culmen1	10	49.2	0.6	47.9	50.6
Rat Islands ³	2008	culmen1	26	50.5	0.5	49.5	51.5
Andreanof Islands ⁴	2008	culmen1	4	48.3	1.0	45.1	51.4
Near Islands ²	2006	total tarsus	26	62.3	0.5	61.2	63.3
Near Islands ²	1993	total tarsus	10	63.5	0.4	62.6	64.5
Rat Islands ³	2008	total tarsus	26	65.9	0.5	64.9	66.9
Andreanof Islands ⁴	2008	total tarsus	4	66.1	1.5	61.2	71.0

¹Between Near and Rat islands groups: culman1 measurements (ANOVA: $F_{1,50} = 26.244$, $p < 0.001$, $n = 52$) and total tarsus measurements (ANOVA: $F_{1,50} = 25.560$, $p < 0.001$, $n = 52$). Within the Near Islands group between 1993 and 2006: culmen1 measurements (ANOVA: $F_{1,34} = 7.434$, $p = 0.01$, $n = 36$); total tarsus measurements (ANOVA: $F_{1,34} = 2.04$, $p = 0.16$, $n = 36$).

²Data from Agattu, Attu, Nizki, and Alaid islands.

³Data from Amchitka Island.

⁴Data from Adak Island. Due to small sample size, data not included in analyses.

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Table A4. Results of pairwise tests for population differentiation among common eider populations breeding on the Aleutian Islands, Alaska, (2006, 2008) including F_{ST} and R_{ST} for microsatellite data, Φ_{ST} and F_{ST} for mtDNA data. Significant values ($\alpha < 0.05$) are in bold text.

Populations	Microsatellites		mtDNA	
	F_{ST}	R_{ST}	Φ_{ST}	F_{ST}
Adak				
— Amchitka	0.012	-0.044	-0.010	-0.010
— Agattu	0.040	-0.036	1.000	1.000
— Nizki	0.023	-0.040	0.491	0.478
— Alaid	0.040	-0.038	0.627	0.591
— Attu	0.030	-0.030	1.000	1.000
Amchitka				
— Agattu	0.007	-0.009	0.912	0.833
— Nizki	0.006	0.002	0.509	0.435
— Alaid	0.010	-0.001	0.542	0.475
— Attu	0.005	0.006	0.904	0.821
Agattu				

— Nizki	0.001	-0.001	0.285	0.349
— Alaid	-0.003	-0.009	0.764	0.751
— Attu	-0.003	0.008	0.000	0.000
Nizki				
— Alaid	-0.007	-0.010	0.093	0.135
— Attu	0.000	-0.017	0.264	0.326
Alaid				
— Attu	-0.001	0.002	0.744	0.730