Nesting Ecology of Spectacled Eiders on Kigigak Island, Yukon Delta NWR, 2003

by

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I. Introduction

Field work at Kigigak Island, Yukon Delta NWR (YDNWR), Alaska continued for the thirteenth consecutive year as recommended by the Spectacled Eider Recovery Team. Spectacled eiders (*Somateria fisheri*) were listed as threatened in May 1993. Nesting was monitored by six personnel collecting productivity information from 24 May- 2 July and conducting brood trapping from 21-25 July. Study objectives included:

1) monitoring nesting chronology and productivity.
2) capturing and marking adult females to estimate annual survival.
3) capturing and marking ducklings to document natal philopatry.

II. Study Area

Kigigak Island (32.5 km²) (165°50'W, 60°50'N) is on the west coast of YDNWR near the mouth of Baird Inlet. The island, bordered by the Ninglick River and the Bering Sea, contains many shallow ponds, lakes, and a network of tidal sloughs. Habitat consists of low coastal tundra, sedges, and grasses and is affected by spring and fall storm tides.

III. Methods

A. Nest Searches

Four personnel searched for spectacled eider nests throughout the island, concentrating on 43, 0.17 km² plots selected from approximately 9 km² of the island identified as preffered spectacled eider nesting habitat (Harwood and Moran 1993, Fig. 1). Additional nests were located by the remaining two field crew members who searched areas outside of identified plots as part of a study documenting common eider nest success and adult female survival. Nests were revisited every 7 days and nests found incidentally during daily activities were treated the same as those found on plots.

Data were recorded according to guidelines for spectacled eider research used by the USGS-BRD, Alaska Science Center (Grand 1993). Nests were mapped on aerial photos, UTM coordinates recorded, and marked with a white flag placed 3m from the nest. Data recorded for each nest included nest number, egg length and width, male and female presence, incubation stage, down abundance (none, some, abundant), nest condition (laying, incubating, depredated, abandoned, hatched), and habitat type (upland, intermediate, and grassflat). Nest site categories included: sloughbank, lakeshore (>3m wide), pool shore (<3m wide), peninsula, island, mudflat, grassflat, and mud island. Dominant vegetation abundance within 1m of the nest bowl were also recorded. During

each revisit, male and female presence, incubation stage, nest condition, and number of eggs were recorded. Eggs were numbered to monitor partial predation and candled (Weller 1956) and floated (Westerkov 1950) to monitor incubation and to predict hatch dates. Number of males observed was recorded daily to document departure date.

B. Trapping and Marking

Bownet traps (Salyer 1962) and mist nets were used to trap spectacled eider females 1-7 days before hatch. Hatch was predicted based on egg laying sequence, float angle, candling data, and a 24-day incubation period (Dau 1974). Eiders were banded with U.S. Fish and Wildlife Service metal leg bands (left leg) and alpha numerically coded, yellow plastic, tarsal bands (right leg) and fitted with alpha numerically coded, yellow plastic, nasal disks (Lokemoen and Sharp 1985). We also recorded wing, culmen, and tarsas measurements and mass for each bird. Three cc's of blood were drawn from each eider for subsequent lead contamination and DNA analyses.

C. Analyses

Nest initiation dates were estimated by backdating clutches using egg laying sequence, float angle, candling, or hatch date information. Only nests that survived to incubation were used to calculate clutch sizes. Clutch size was defined as the total number of eggs laid in a nest, partial depredation as the number of eggs missing from nests that remained active, and successful nests as those for which at least one egg hatched. Mean values were reported for egg widths and lengths and egg volume was calculated by multiplying egg length by the square of egg width and dividing the product by one thousand (Petrula 1994). Egg hatching success (apparent) was determined for all nests with known fates.

MAYDATES program (Grand and Flint 1993) was used to calculate Mayfield nest success estimate and 95% confidence interval. Data entry and analysis were modified to accommodate successful nests visited after hatch. When exact hatch date was unknown, probable exposure of the final interval was 50% of that interval. Nests visited after failure were treated similarly. Constant daily mortality was assumed and overall exposure period for spectacled eiders was 29 days (Harwood and Moran 1993). Female return rates were calculated by multiplying survival rate, estimated using capture-recapture methods (Grand et al. 1998), by the number resighted in year $\geq i+1$, then divided by number of birds marked or sighted in year *i.*

Results

A. Nest Survey

Nest searches began 24 May and ended 14 June. A total of 135 spectacled eider nests were located, including 108 on the 43 plots.

B. Nesting Chronology

Spectacled eider nest initiation occurred between 15 May-13 June ($\bar{0}$ = 27 May, n =131), and peaked between 21-26 May (Fig. 2). Hatch occurred between 9-30 June ($\bar{0}$ = 19 June, n = 64) and peaked between 16-23 June (Fig 3).

C. Nest Sites

Most spectacled eiders nested on lakeshores (41%, n = 55), islands (26%, n = 35), and peninsulas (15%, n = 20) (Fig. 4). Mean distance from nest to water was 1m (n = 135). Additional information regarding nest site distribution is available upon request.

D. Clutch Size and Egg Size

Spectacled eider modal clutch size was 5 eggs and mean clutch size was 4.7 eggs (range = 1-7 eggs, n = 131 (Fig 5, Table 1). Mean egg dimensions and volume were: length = 68mm, width = 45.5mm, and volume = 142.1cc (Table 2).

E. Nest and Egg hatching Success

Mayfield nest success estimate for spectacled eiders was 39.1% (95% C.I.: 29.8-48.0%; Table 3). Apparent egg hatching success was 40.9% (Table 4). Eighty-six (64%) nests sustained partial depredation and lost a mean of 2.5 eggs. Thirty-three nests contained at least 1 inviable egg and 5 clutches were completely inviable. Inviable clutches were collected for analysis by Tuula Hollmen of the Alaska SeaLife Center.

F. Trapping and Marking

We nest trapped, marked, and measured 63 female spectacled eiders between 5 June –1 July (24 new captures, 39 recaptures). Approximately 30 days posthatch, we captured 20 spectacled eider broods, including 17 adult females, 35 juvenile females, and 26 juvenile males.

G. Post-breeding Male Departure

The last male was observed on 19 June.

H. Mortality

One adult female spectacled eider was found dead on the island. The carcass was collected and sent to the National Wildlife Health Center where gunshot trauma was determined to be the cause of death. In addition, 2 eggs were destroyed during nest trapping, and 1 nest containing 1 egg was abandoned after attempting to trap the female.

Discussion

Low levels of snow and mild spring temperatures resulted in an early break-up for 2003. As in 2002, arrival of personnel after break-up meant nest initiation was already underway. As a result, initiation dates may be skewed due to a lack of information for early nests which failed or were abandoned before nests searching began. Nest initiation in 2003 occurred 3 days earlier than 2002 but mean dates were the same. Clutch size of 4.7 eggs is close to the long-term mean of 4.9 eggs but 0.5 eggs lower than in 2002. Nest success in 2003 decreased significantly compared to 2002 due to Fox and avian predation. Similar decreases in nest success occurred for most waterfowl species within the coastal fringe due primarily to fox predation.

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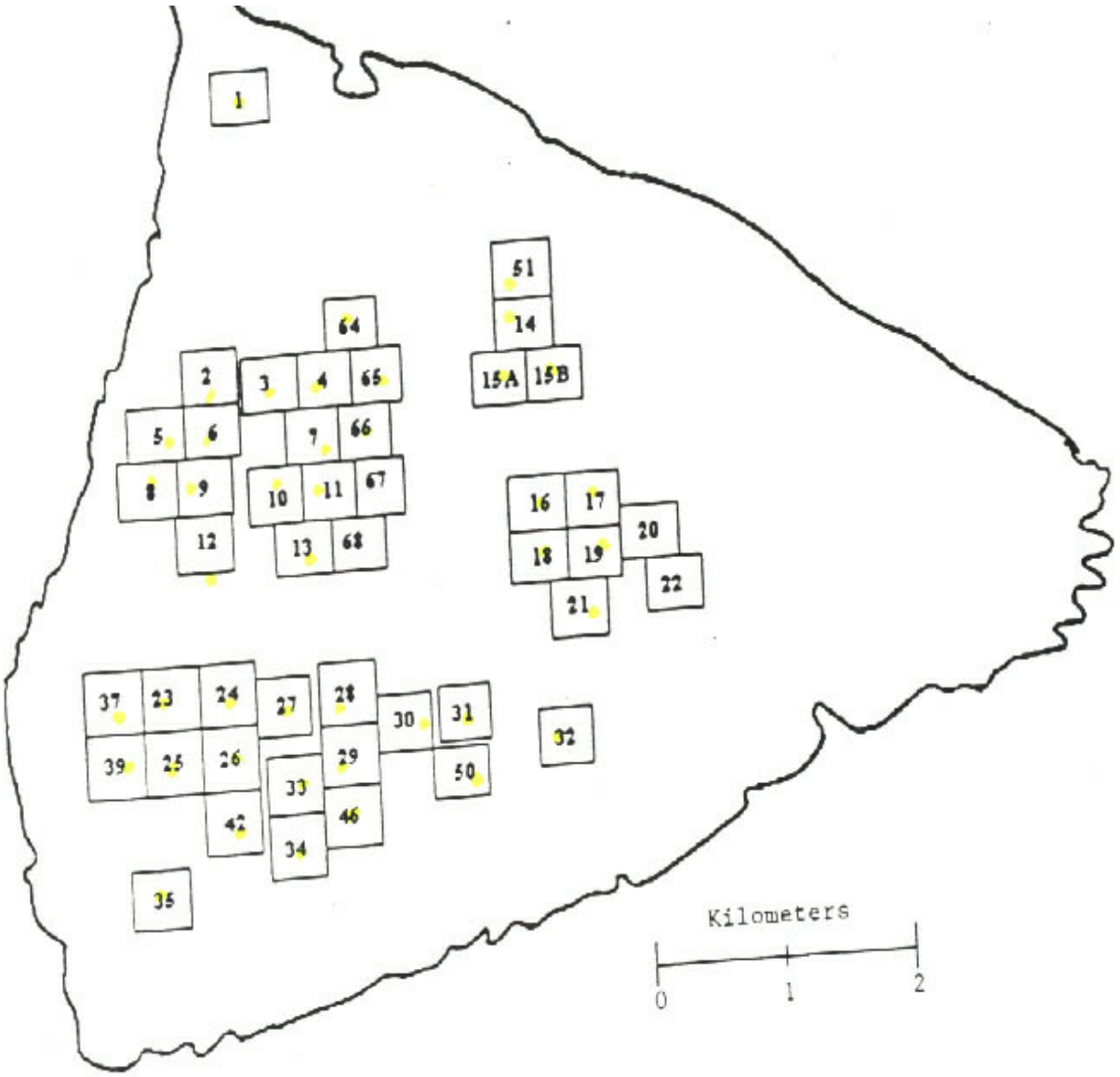

Figure 1. Distribution of spectacled eider nest plots, Kigigak Island, AK, 2003.

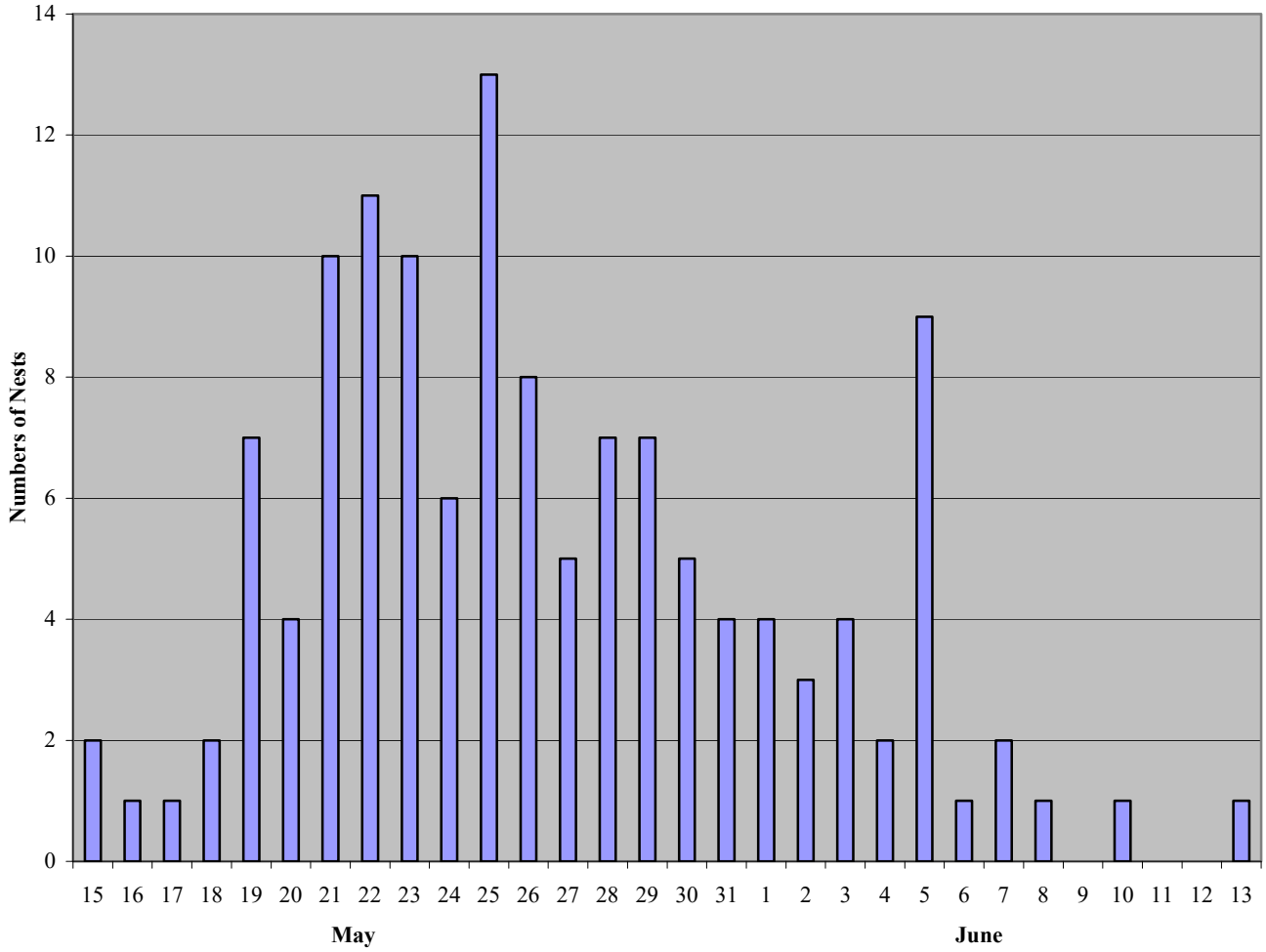

Figure 2. Spectacled eider nest initiation dates, Kigigak Island, AK, 2003.

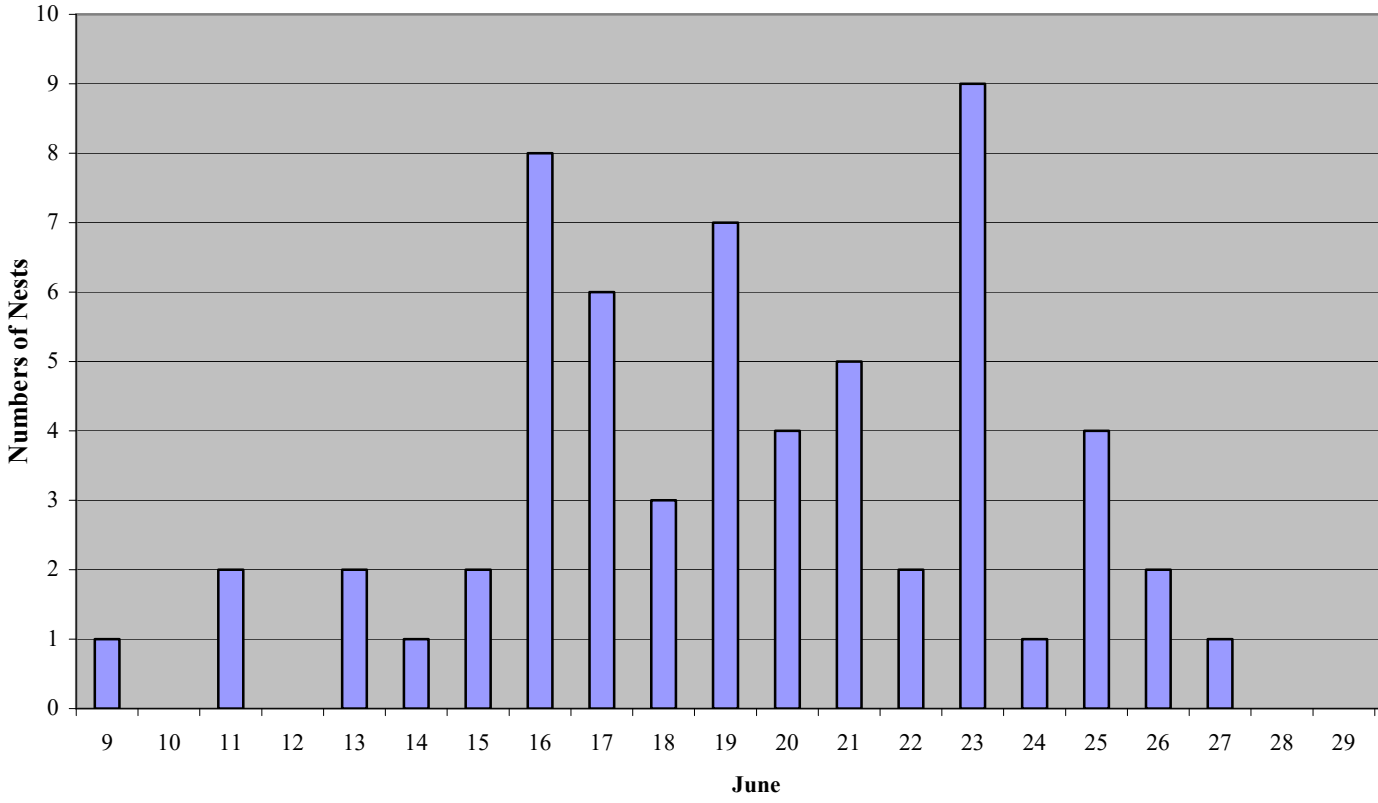

Figure 3. Spectacled eider hatch dates, Kigigak Island, AK, 2003

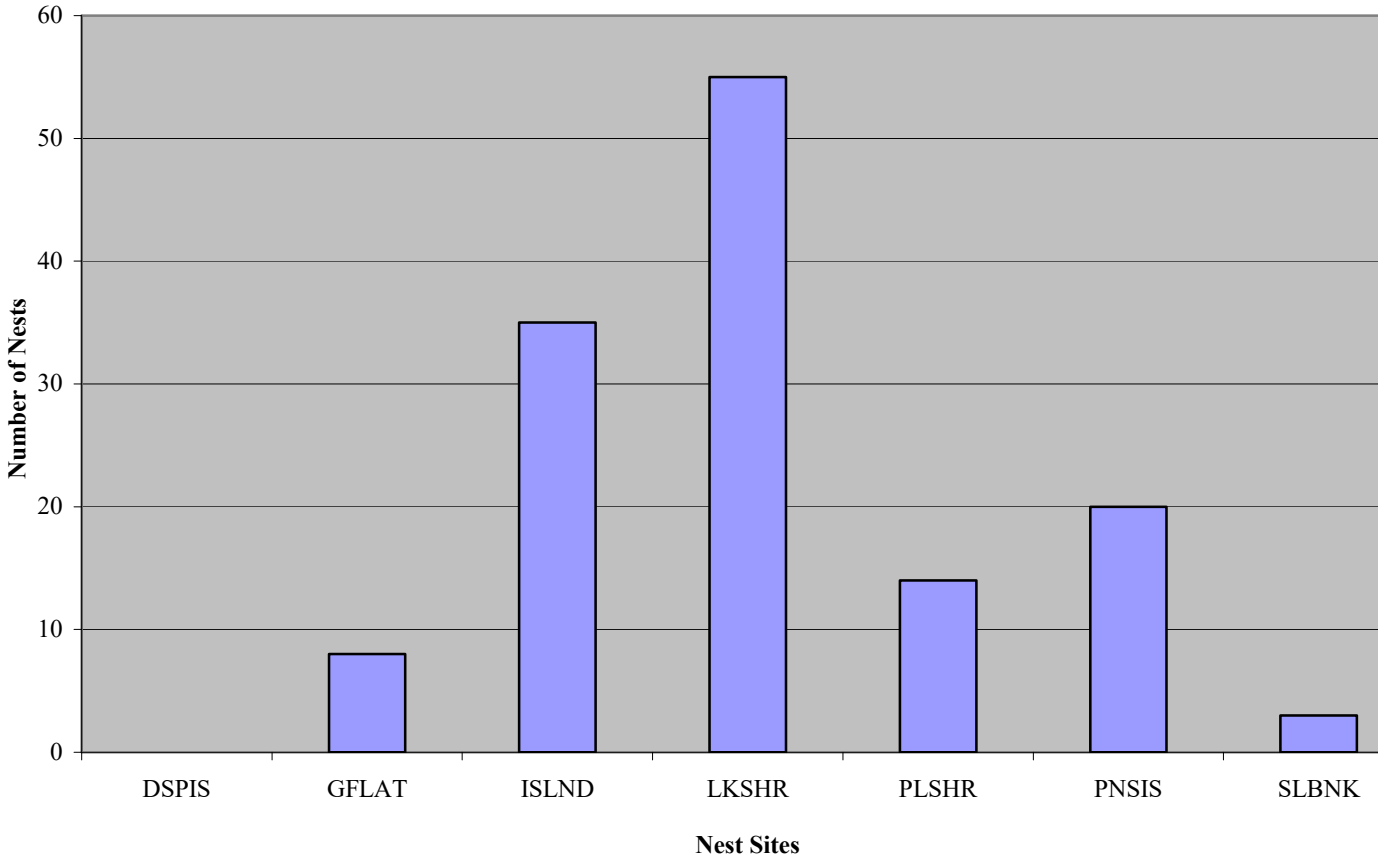

Figure 4. Spectacled eider nest site locations, Kigigak Island, AK, 2003.

Figure 5. Spectacled eider clutch size frequencies, Kigigak Isalnd, AK, 2003.

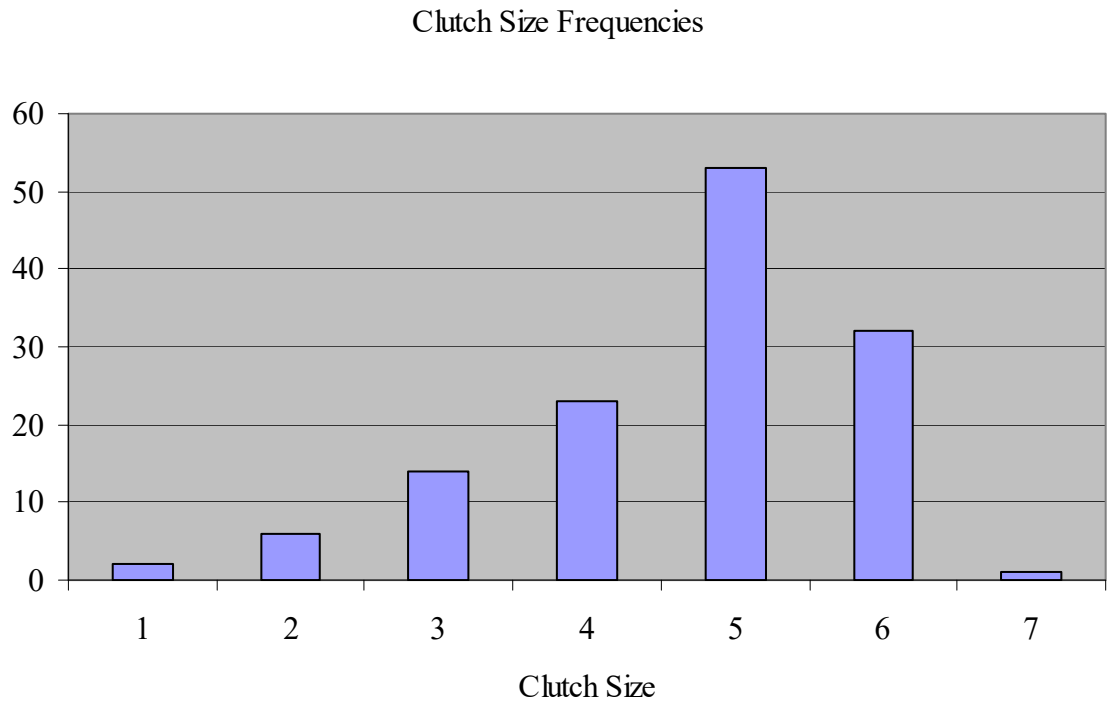

Table 1. Mean clutch sizes for spectacled eider, Kigigak Island, AK.

Year	n	0	SE
1992	64	5.5	0.1
1993	74	5.2	0.13
1994	70	5.4	0.11
1995	92	4.7	0.11
1996	106	5.1	0.08
1997	132	4.9	0.07
1998	104	4.5	0.08
1999	121	4.8	0.08
2000	117	5.0	0.1
2001	22	4.0	0.21
2002	143	5.2	0.09
2003	131	4.7	0.11

Table 2. Mean length, width, and volume of spectacled eider eggs, Kigigak Island, AK.

		Length (mm)		Width (mm)		Volume (cc)[a]	
Year	n	0	SE	0	SE	0	SE
1993	72[b]	67.7	0.21	45.5	0.14	140.2	1.08
1994	362	67.9	0.25	45.5	0.11	140.6	0.88
1995	405	68.2	0.21	45.4	0.13	140.0	1.39
1996	470	68.2	0.26	45.4	0.14	-	-
1997	624	67.9	0.19	45.3	0.10	139.6	0.85
1998	448	67.6	0.27	45.1	0.13	137.6	0.83
1999	580	67.4	0.18	45.0	0.11	136.6	0.83
2000	593	67.4	0.17	45.2	0.10	137.7	0.70
2001	134	67.5	0.22	45.2	0.13	138.4	1.00
2002	730	68.1	0.173	45.5	0.126	142.2	0.614
2003	534	68.0	0.138	45.5	0.078	142.1	0.029

[a] Volume = length x width^2/1000 (Petrula 1994).

[b] Number of nests

Table 3. Nest success for spectacled eiders, Kigigak Island, AK.

Year	n	DSR[a]	Exposure Days	Apparent Success%	Mayfield Success%[b]	95% Mayfield C.I.
1992	64[c]	0.997	1043	95.0	92.0	83.5-101.2
1993	74	0.984	1025	78.4	63.4	50.4-79.5
1994	73	0.986	1099	79.5	67.1	54.6-82.4
1995	95	0.985	1451	76.8	64.2	53.1-77.5
1996	113	0.993	1969	87.6	81.3	72.8-90.8
1997	138	0.992	2429	86.2	79.6	71.7-88.4
1998	111	0.994	1770	90.1	83.5	74.8-93.1
1999	127	0.986	2102	77.2	66.8	57.5-77.6
2000	118	0.99	2038	83.1	75.1	66.0-85.4
2001	39	0.909	295.5	7.7	6.3	2.5-15.6
2002	136	0.988	2356	76.2[d]	70.7	62.0-80.6
2003	131	0.968	2104	48.9	39.1	29.8-48.0

[a] Daily survival rate

[b] Estimates do not include nests whose fates were suspected of being influenced

by visitor impact, specifically trapping.

[c] Number or nests

[d] n=143

Table 4. Fates of spectacled eider eggs, Kigigak Island, AK.

Egg Fate (%)	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Hatched	76.3	62.3	54.5	52	69.7	63	81.9	73.8	70.5	7.7	65.3
Depredated	5.4	22.6	13.3	25.7	6.4	12.8	9.0	17.9	10.9	88.8	20.3
Abandoned (natural causes)	7.9	2.1	1.8	0.4	4.5	1.3	0.4	3.2	0.1	3.5	0.1
Abandoned (human induced)	0.6	0.0	9.3	2.9	3.5	5.1	2.7	2.2	0.0	0.0	0.7
Addled/Dead Embryo	1.7	2.8	4.8	7.1	5.5	9.9	4.2	5.5	9.2	0.0	10.9
Damaged From Trap	0.6	1.0	1.1	2.7	3.4	0.1	0.4	1.0	0.3	0.0	1.1
Collected	0.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
Unknown	6.8	0.1	10.4	12.1	10.3	7.8	1.0	3.5	7.2	0.0	1.6
Total Eggs Laid	354	390	442	479	594	690	480	602	587	143	744
Total Nests	64	75	84	103	120	147	111	134	119	43	143