Nesting Ecology of Spectacled Eiders on Kigigak Island, Yukon Delta NWR, Alaska 2004

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INTRODUCTION

As recommended by the Spectacled Eider Recovery Team (USFWS 1996), field work on Kigigak Island continued for the fourteenth consecutive nesting season. Five researchers monitored spectacled eider (SPEI) *Somateria fischeri* nesting between 13 May and 1 July. Broods were captured and banded between 19-23 July.

Study Objectives:

1. monitoring nesting chronology and productivity
2. capturing and marking adult females to estimate annual survival
3. capturing and marking ducklings to document natal fidelity, recruitment, and age of first breeding

STUDY AREA

Kigigak Island (32.5 km²) (165°50'W, 60°50'N) is on the west coast of Yukon Delta National Wildlife Refuge (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. Spring and fall storm tides regularly inundate the island except for upland areas which are flooded only during severe storm tides.

METHODS

Five researchers searched for spectacled eider nests throughout the island. Three refuge personnel concentrated on 46, 0.17 km² plots selected from approximately 9 km² of the island identified as preferred spectacled eider nesting habitat (Harwood and Moran 1993, Fig. 1). Additional nests were located by 2 University Alaska, Fairbanks personnel while searching 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 during prescribed searches.

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, marked with a white flag 3 m from the nest, and UTM coordinates were recorded. 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 grass flat). Nest site categories included: slough bank, lakeshore (>3 m wide), pool shore (<3 m wide), peninsula, island, mudflat, grass flat, displaced island, and mud island. Dominant vegetation abundance within 1 m of the nest bowl was also recorded. During each revisit, male and female presence, incubation stage, nest condition, and number of eggs were recorded. Eggs were numbered to identify partial depredation and candled (Weller 1956) and floated (Westerkov 1950) to monitor incubation and to predict hatch dates. Inviable eggs were collected and sent to the Alaska Sea Life Center, Seward, AK for analysis. Number of males observed was recorded daily to document their departure.

Bownet traps (Salyer 1962) and mist nets were used to trap spectacled eider females between 20-24 days of incubation. Hatch was predicted based on egg float angle, candling data, and a 24-day incubation period (Dau 1974). Spectacled eiders were marked with U.S. Fish and Wildlife Service metal tarsal bands (left leg) and yellow, plastic, alpha numeric tarsal bands (right leg) and nasal disks (Lokemoen and Sharp 1985). Culmen and tarsal lengths and mass were recorded for all birds. Three cc's of blood were drawn from 15 females with viable clutches and 15 females that were incubating at least one inviable egg.

Nest initiation dates were estimated by backdating clutches using 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. Program MARK (White 2000) was used to calculate a 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).

RESULTS

Nesting survey, sites, chronology

During 50 days of nest searching, 157 nests were located. Nests were initiated between 7 May and 7 June, with peak initiation occurring between 16-19 May (Fig. 2). Hatch occurred between 3 June and 1 July, with peak hatch occurring on 11-19 June (Fig. 3). Most females nested on lakeshores, poolshores, and islands (31%, 23%, and 21%, respectively)(Fig 4).

Clutch and egg size

Average and modal clutch sizes were 5 eggs (Table 1, Fig. 5). Clutches ranged from 1-7 eggs and a total of 754 eggs were laid (Table 2, Fig. 5). Eggs averaged 680 mm long and 455 mm wide with a volume of 141.3 cc (Table 3).

Nest and egg hatching success

Progam MARK nest success was 68.5% (95% C.I: 57.2-77.5% Table 4). Apparent egg hatching success was 71.4% (Table 2). Fifty (32.5%) nests had at least one egg depredated. Thirty-one (4.1%) eggs were found to be inviable (Table 2). Inviable eggs were collected and sent to the Alaska Sea Life Center for analysis.

Female/brood trapping and male departure

Of the 157 nests located, 90 were attended by marked females, 30 by unmarked females, and the marked status of 37 females was not determined. Sixty-nine (77%) of the 90 marked females were identified (44 nest trapped, 25 observed). Twelve (17%) of the identified females were originally banded as local birds (1, 4, 3, and 4 in 1995, 1999, 2000, and 2002, respectively). This was the first documented nesting for the birds banded in 2002 and for 2 of 3 banded in 2000. The remaining 2000 bird also nested in 2003. All of the 1999 birds nested in 2003 and 2 also nested in 2002. The 1995 bird was observed nesting each year beginning in 1997, except 2001 and 2003. Twenty of the 30 unmarked nesting females were trapped and color marked. One unmarked female not associated with a nest was trapped and color marked.

Thirty-four broods were captured between 19-23 July. One hundred and twenty-seven ducklings and 23 adult females were captured. An additional 7 adult females were visually identified during this period. Male ducklings (61) were banded with metal leg bands and female ducklings (66) were banded with metal and coded plastic, tarsal bands. Nineteen of the adult females were trapped or visually identified during the incubation period. The last male spectacled eider was sighted at Kigigak Island on 18 June.

Mortality

No adult females or ducklings died as a result of biological activity. One adult male was found dead and sent to the Alaska Sea Life Center for necropsy. Two nests containing 1 and 2 eggs were abandoned due to nest monitoring and 1 nest containing 5 eggs was abandoned after trapping the female on day 21 of incubation. One egg was damaged during nest trapping.

DISCUSSION

This was the earliest break up on Kigigak Island since inception of the project in 1992. Peak nest initiation date for 2004 was 9 days earlier than 2003. Because of the early spring, nest success estimates may be biased high by excluding nests initiated and destroyed prior to arrival of researchers. Compared to 2003, fox depredation appeared to have minimal impact on nest success. A fall 2003 storm tide flooded the majority of the island. This may have affected small mammal populations and subsequently, fox which depend on them for winter survival.

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

Year	n	Mean	S.D.
1992	64	5.5	0.8
1993	74	5.2	1.1
1994	70	5.4	0.9
1995	92	4.7	1.1
1996	106	5.1	0.8
1997	132	4.9	0.8
1998	104	4.5	0.8
1999	121	4.8	0.9
2000	117	5.0	1.1
2001	22	4.0	0.9
2002	143	5.2	1.1
2003	131	4.7	1.3
2004	147	5.0	1.1

Table 3. Mean length, width, and volume of spectacled eider eggs, Kigigak Island, AK.

		Length (mm)		Width (mm)		Volume (cc)[a]	
Year	n	mean	S.D.	mean	S.D.	mean	S.D.
1993	72	67.7	1.8	45.5	1.2	140.2	9.2
1994	362	67.9	4.8	45.5	2.1	140.6	16.7
1995	405	68.2	4.2	45.4	2.6	140.0	28.0
1996	470	68.2	5.6	45.4	3.0	-	-
1997	624	67.9	4.7	45.3	2.5	139.6	21.2
1998	448	67.6	5.7	45.1	2.8	137.6	17.6
1999	580	67.4	4.3	45.0	2.6	136.6	20.0
2000	593	67.4	4.1	45.2	2.4	137.7	17.0
2001	134	67.5	2.5	45.2	1.5	138.4	11.6
2002	730	68.1	4.7	45.5	3.4	142.2	16.6
2003	534	68.0	3.2	45.5	1.8	141.1	0.7
2004	736	68.0	2.6	45.5	1.2	141.3	10.4

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

Table 4. 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	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[c]	70.7	62.0-80.6
2003	131	0.968	2104	48.9	39.1	29.8-48.0
2004	154	0.986	-	81.8	68.5[d]	57.2-77.5

[a] Daily Survival Rate.

[b] Estimates do not include nests whose fates were suspected of being influenced by visitor impact, specifically trapping.

[c] n = 143.

[d] Used Program MARK to calculate MAYFIELD estimate in 2004.

Table 2. Fate of spectacled eider eggs, Kigigak Island, AK.

	Egg Fate (%)									
Year	Hatched	Depredated	Abandoned (natural cause)	Abandoned (human cause)	Inviable/ Addled	Damaged in Trapping	Collected	Unknown	Total Eggs	Total nests
1992	76.3	5.4	7.9		1.7	0.6	0.8	6.8	354	64
1993	62.3	22.6	2.1	2.1	2.8	1.0	0.0	0.1	390	75
1994	54.5	13.3	1.8	1.8	4.8	1.1	0.0	10.4	442	84
1995	52.0	25.7	0.4	0.4	7.1	2.7	0.0	12.1	479	103
1996	69.7	6.4	4.5	4.5	5.5	3.4	0.0	10.3	594	120
1997	63.0	12.8	1.3	13	9.9	0.1	0.0	7.8	690	147
1998	81.9	9.0	0.4	0.4	4.2	0.4	0.0	1.0	480	111
1999	73.8	17.9	3.2	3.2	5.5	1.0	0.0	3.5	602	134
2000	70.5	10.9	0.1	0.1	9.2	0.3	0.0	7.2	587	119
2001	7.7	88.8	3.5	3.5	0.0	0.0	0.0	0.0	143	43
2002	65.3	20.3	0.1	0.7	10.9	1.1	0.5	1.6	744	143
2003	40.9	42.4	3.0	0.2	9.5	0.3	0.0	3.7	597	135
2004	71.6	15.5	1.5	1.1	4.1	0.1	4.9	1.2	754	157

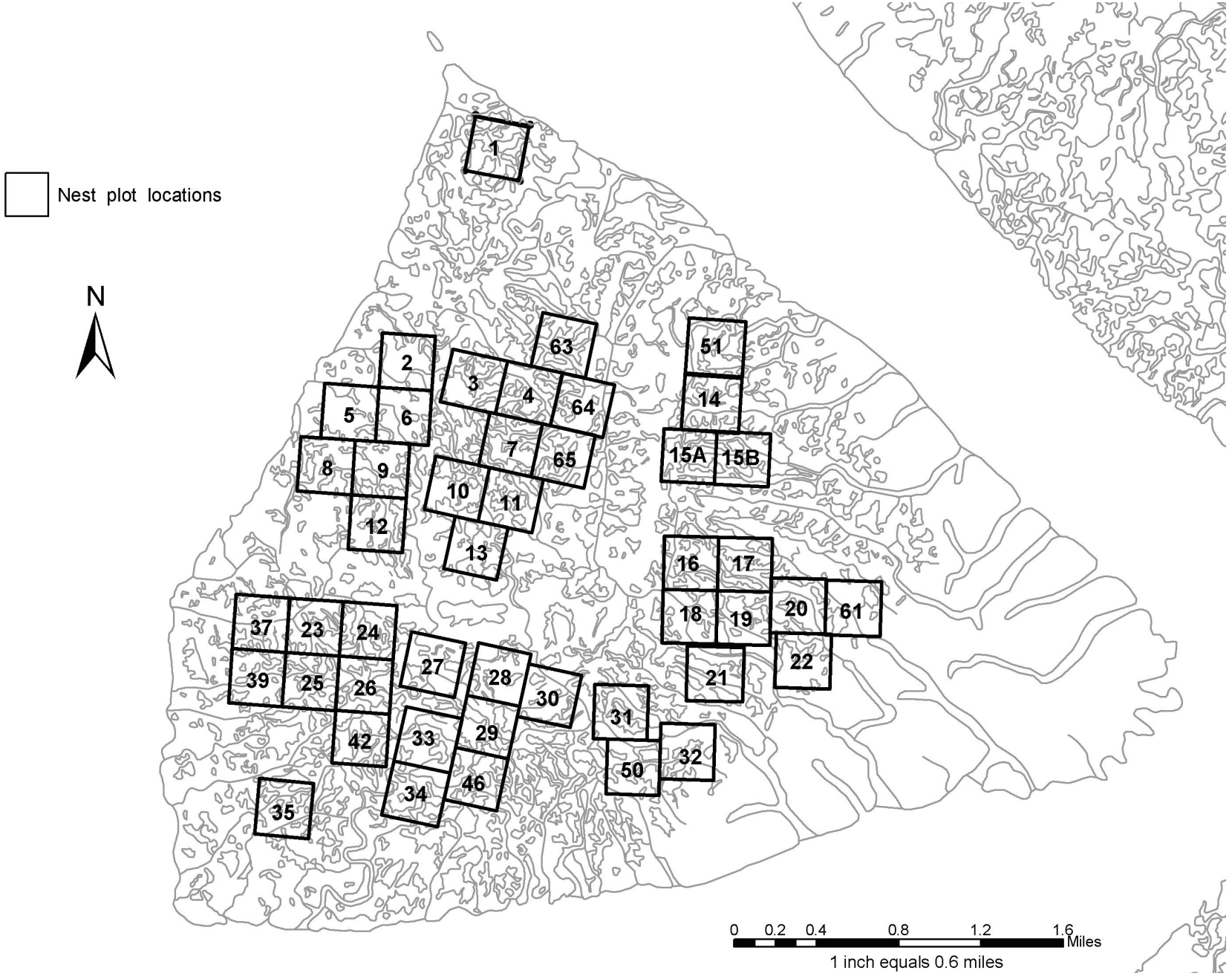

Figure 1. Kigigak Island spectacled eider nest searching plots

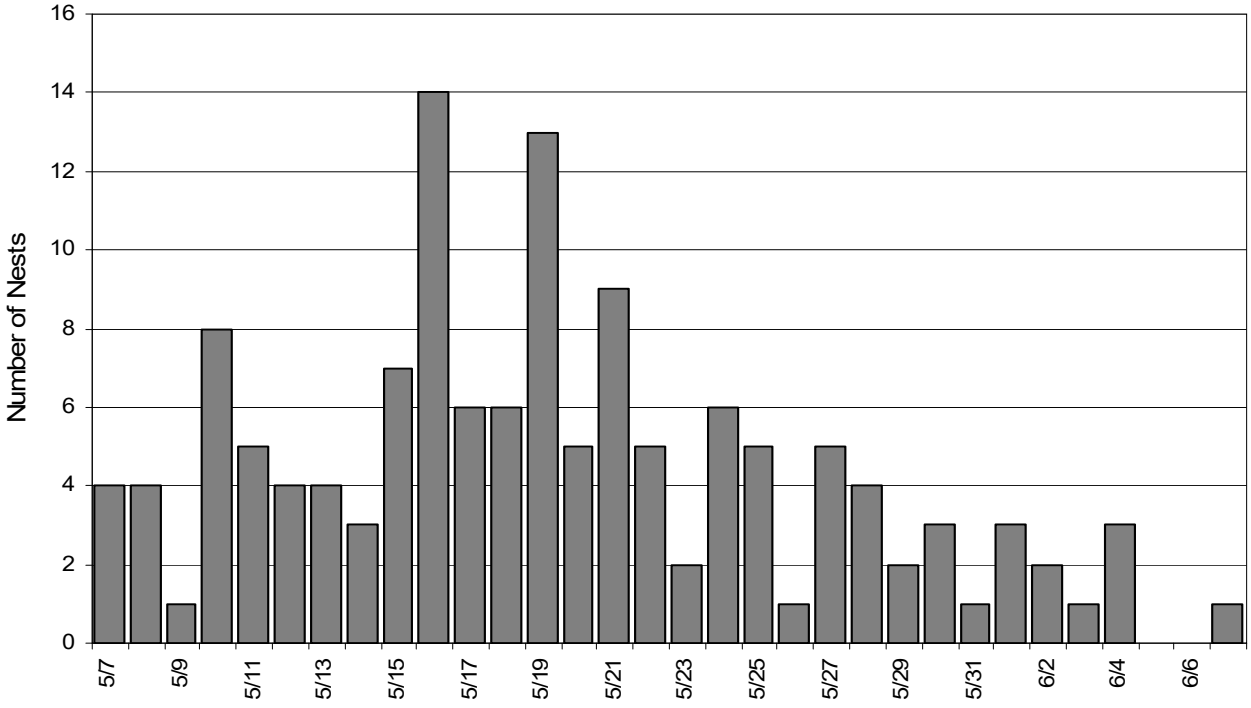

Figure 2. Spectacled eider nest initiation dates Kigigak Island, Alaska 2004.

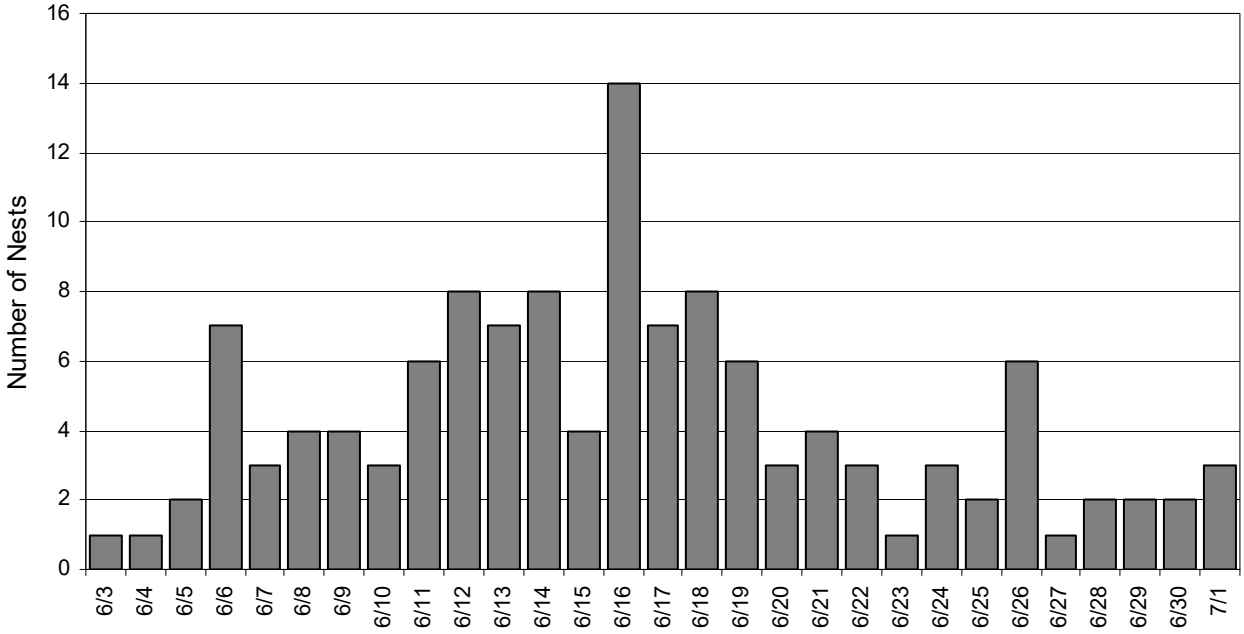

Figure 3. Spectacled eider hatch dates Kigigak Island, AK 2004.

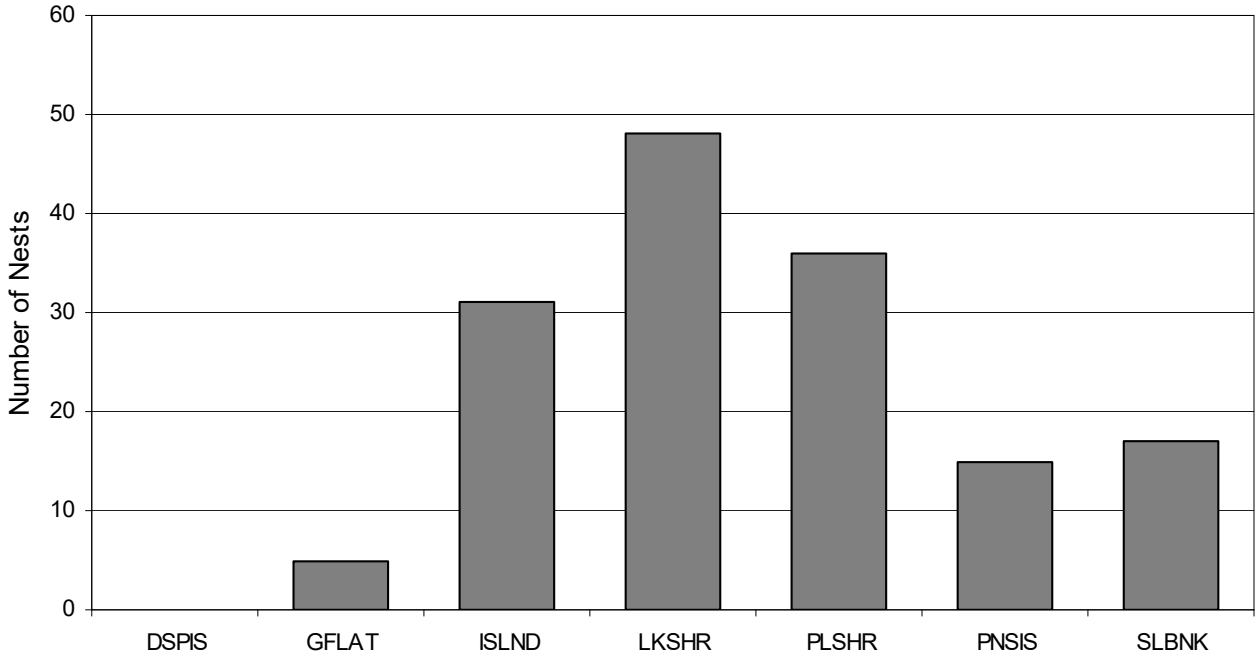

Figure 4. Spectacled eider nest site locations Kigigak Island, AK 2004.

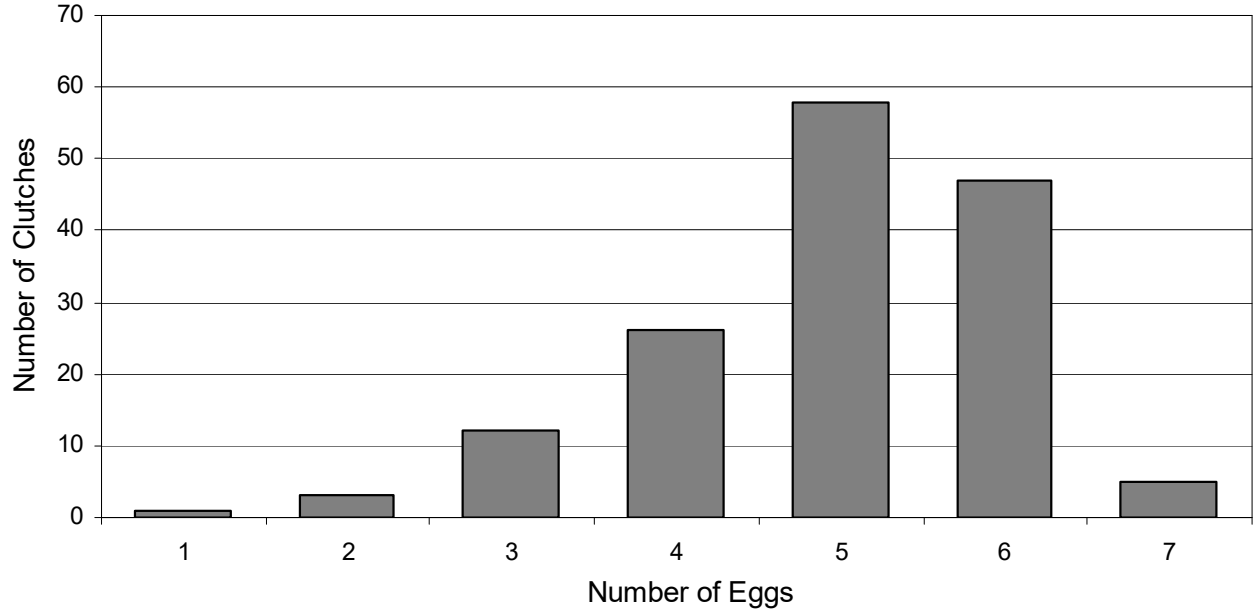

Figure 5. Clucth size frequncies of spectacled eiders Kigigak Island, AK 2004.