

AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS
IN
SOUTHWESTERN ALASKA, FALL 1999

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Abstract: A fall aerial emperor goose survey was conducted on the Alaska Peninsula for the 21st consecutive year in 1999. Replicate aerial surveys of the north side of the Alaska Peninsula were flown on 1-2 and 4-5 October 1999. An amphibious Cessna 206 (N736), with a left seat pilot/observer and right seat observer, was flown at 150 feet ASL and 110 knots along the coastline and over estuaries to determine species composition and numbers of birds. Emphases were on emperor geese, Pacific brant, Canada geese and Steller's eiders with estimated populations of 60,226, 131,264, 54,436 and 80,928, respectively.

Key words: aerial survey, emperor geese, southwest Alaska, waterbirds, waterfowl

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INTRODUCTION

This annual survey is designed to provide data on the distribution and abundance of emperor geese and other waterbirds during fall migratory staging in southwestern Alaska. These data are used to expand photographic estimates of emperor goose productivity (i.e., percent juveniles) at various fall staging locations based on the proportional distribution of the population. Normally this survey includes coastline and estuarine habitats from the Yukon-Kuskokwim Delta south and west along the north side of the Alaska Peninsula to Unimak Island, and the south side of the Alaska Peninsula east to Wide Bay. In 1999 we flew 2 replicate surveys of the north side of the Alaska Peninsula, survey segments north of the Alaska Peninsula (Yukon-Kuskokwim Delta to Kvichak) and along the peninsula's south side were not flown.

We flew an additional survey of Izembek Lagoon and adjacent estuaries on 3 October and data from similar efforts on 27 September (Izembek refuge staff) and 1 October (Bill Larned, Migratory Bird Management-Soldotna) were used in conjunction with portions of our two replicate surveys to estimate fall Pacific brant and Canada goose populations which concentrate in Izembek Lagoon and adjacent estuaries.

METHODS

Replicate surveys were flown using an amphibious Cessna 206 (N736) at a ground speed of approximately 110 knots and an altitude of 150 feet ASL along coastline and estuarine survey segments from Naknek to False Pass. Observations were made from both sides of the aircraft (left-pilot/observer; right-observer). Observations were voice recorded into two laptop computers, one for each observer, using remote microphones. The computers received input from the aircraft Global Positioning System (GPS) which saved coordinates for each observation using a program designed by Jack Hodges (USFWS-Migratory Bird Management, Juneau).

The coastal flight path was usually 100 meters offshore with deviations to confirm species identification and numbers, normally within 1 mile of exposed shorelines. In estuaries, a systematic but meandering flight path developed during previous years surveys was followed to ensure complete coverage. Surveys were conducted with ambient surface winds less than 20 knots and when possible, primary staging areas were flown at or near high tide.

The survey area includes 143 shoreline/estuarine segments identified on 1:500,000 scale aeronautical maps (Figures 1 & 2, Appendix 1). Segments 35-68 and 80-85 were flown during the 1-2 October survey and segments 35-68, 80, 84, and 85 were flown during the 4-5 October survey. General observations of habitat and survey conditions including wind speed and direction, temperature, sky condition and visibility, and tide stage were recorded at the start of a days flight and whenever changes occurred. Navigation and the notification of segment start and stop times were the responsibility of the pilot/observer.

All species observed and their totals for each survey are summarized in Table 1. Numbers of emperor geese and other species are summarized by segment in Appendix 2. Previous estimates of emperor geese (1979-1998) are summarized in Appendix 3. We estimated populations of target species (i.e., emperor geese, Pacific brant, Canada geese and Steller's eiders) by averaging the sums of the replicated segments (35-68, 80, 84, 85) for each survey, adding observations from segments 81-83 (2 October) and observations from the south side of the Alaska Peninsula from fall 1998. The 1998 fall survey did not include segments north of the Alaska Peninsula, but previous surveys suggest that few individuals of these species remain in these areas into October.

SURVEY CONDITIONS

1-2 October: Calm to light winds (<15kts) persisted on 1 October. Ceilings were generally less than 800 feet and visibility was greater than 5 statute miles. Light rain diminished from Naknek to Port Heiden. Low tides occurred in Egegik and Ugashik bays, Cinder River Lagoon, Port Heiden and Seal Islands Lagoon and high tides occurred in Port Moller, Herendeen Bay and Nelson Lagoon on 1 October. During completion of the survey on 2 October, low tides were encountered in Izembek Lagoon and conditions throughout the day were clear with unlimited visibility and light winds (<5kts).

4-5 October: Calm to light winds (<5kts), high overcast ceilings and good visibility occurred both days. High tides occurred in Egegik and Ugashik bays, Cinder River Lagoon, Port Heiden and low tides in Izembek Lagoon, Port Moller, Herendeen Bay, Nelson Lagoon and Seal Islands Lagoon.

RESULTS/DISCUSSION

Emperor Goose

The two replicate surveys (segments 35-68, 80, 84, 85) provided emperor goose counts of 61,366 and 44,850 ($\bar{x} = 53,108$, $SE = 8,258$). We estimated the 1999 population at 60,226 emperor geese by expanding the average of these replicate counts by 7,118 [1,751 (segments 81-83 surveyed on 2 October) + 5,367 (1998 fall survey count from the south side of the Alaska Peninsula)]. The 1999

population estimate (60,226) is 11% below the 1998 estimate of 67,744, 16% below the 3-year average (1997-1999) of 71,546, and 21% below the 20-year average (1979-98) of 76,150. Average numbers and proportions of emperor geese at primary staging sites were as follows: Egegik Bay 826 (2%), Ugashik Bay 1,533 (3%), Cinder River Estuary 2,749 (5%), Port Heiden 10,691 (20%), Seal Islands 7,432 (14%), Nelson Lagoon 23,158 (43%), and Izembek Lagoon 2,209 (4%).

Pacific brant

Izembek Lagoon and adjacent estuaries accounted for 99.9 (99,179) and 100% (137,928) of the brant observed during the 1999 emperor goose survey replicates (1-2 and 4-5 October, respectively). We observed a total of 99,231 and 137,928 brant during the 1-2 and 4-5 October replicate surveys. Additional counts of Izembek Lagoon and adjacent estuaries, obtained on 27 September and 1 and 3 October totaled 129,566, 118,865 and 170,731, respectively, providing an average of 131,264 (SE = 11,800) brant for the five surveys. No brant were observed on segments 81-83 on 2 October or on the south side of the Alaska Peninsula in fall 1998, therefore we did not expand our 1999 estimate. The 1999 estimate (131,264) is 12% above the 1998 fall average for the Izembek area (117,223) and 1% below the 24-year average (1975-98) for the Izembek area (132,746).

Canada Goose

We observed a total of 48,254 and 58,808 (\bar{x} = 53,531, SE = 5,277) Canada geese during the 1-2 and 4-5 October replicate surveys (segments 35-68, 84, 85). We estimate the population of Canada geese for the Alaska Peninsula at 54,436, which is the sum of our averaged replicate observations, 650 geese observed in segments 81-83 (2 October), and the 1998 estimate (255) for segments not surveyed in 1999 (south side of the Alaska Peninsula). Izembek Lagoon and adjacent estuaries accounted for approximately 97% (46,792 and 57,283) of Canada goose totals during the 1999 emperor goose survey. Additional counts of Canada geese of 44,574, 44,175 and 41,728 were obtained for Izembek Lagoon and adjacent estuaries on 27 September and 1 and 3 October, respectively. The average count for the five replicates of the Izembek Lagoon area is 46,910 (SE = 2,715) Canada geese, which is 9% below the 1998 average (51,665) and is 4% above the 24-year average (44,960, 1975-98) for that area.

Steller's Eider

We observed a total of 78,761 and 80,906 (\bar{x} = 79,834, SE = 1,073) Steller's eiders during the 1-2 and 4-5 October replicated segments and estimated the expanded population for the Alaska Peninsula at 80,928. Totals for Izembek Lagoon and adjacent estuaries were 6,638 and 10,500 birds for the two replicates. Additional counts of 20,726, 8,094 and 11,366 birds were obtained for the Izembek Lagoon area on 27 September and 1 and 3 October, respectively, providing an average of 11,465 (SE = 2,463) Steller's eiders for the five surveys. The average October population size for the Izembek Lagoon area is 23,069 (range 4,500-78,645) from 1975-98 (Dau, USFWS, unpubl. data).

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- Appendix 3. Emperor goose fall survey data, southwest Alaska, 1979-1999.



Figure 1. Map of emperor goose aerial survey transects 1- 36 in southwest Alaska, 1992-1999.

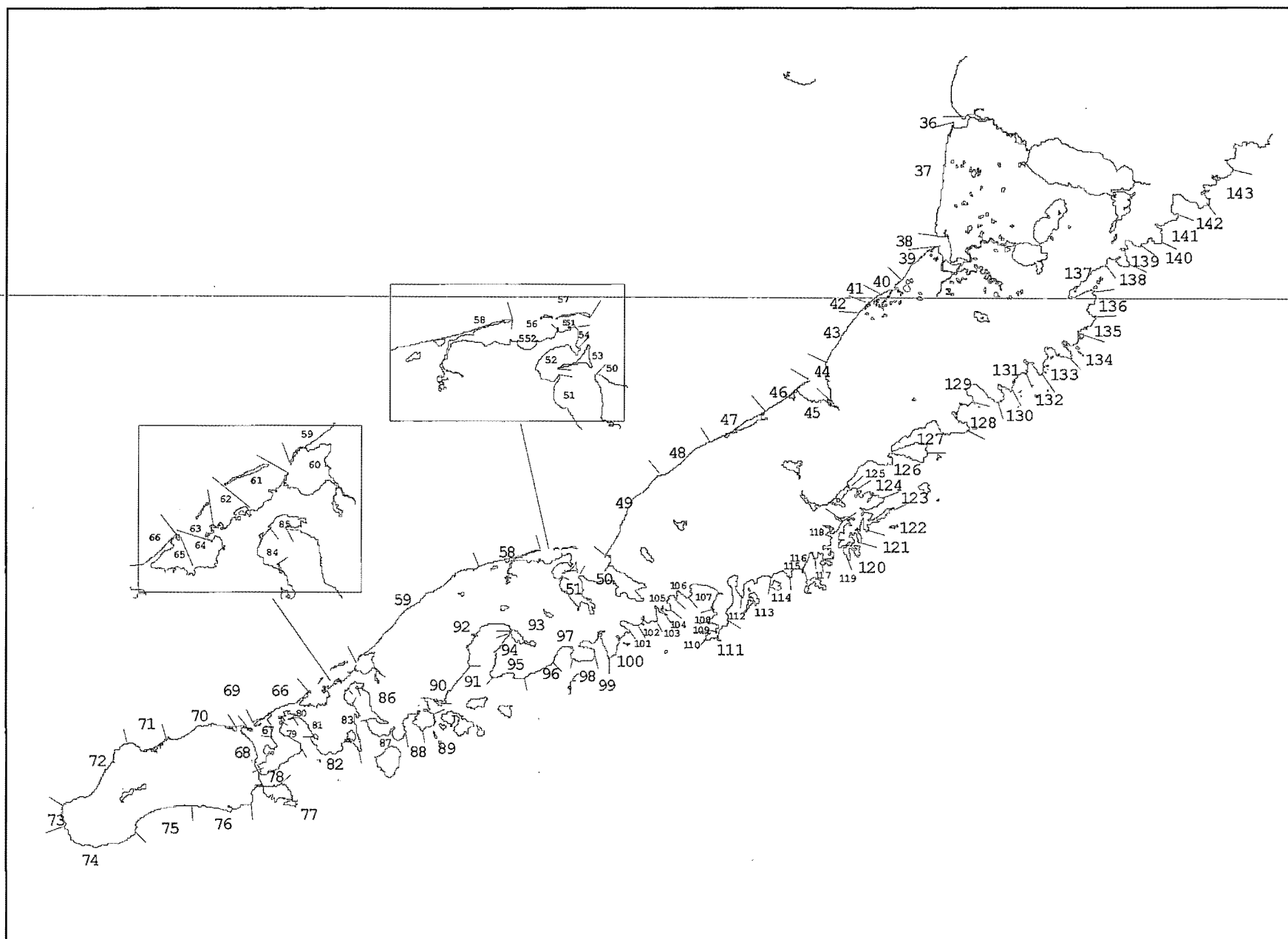


Figure 2. Map of emperor goose aerial survey transects 36-143 in southwest Alaska, 1992-1999.

Table 1. Survey totals for all species observed along the north side of the Alaska Peninsula, October, 1999.

SPECIES	1-2 October	4-5 October	Average ¹	Exp. ²
Common Loon		11		
Pacific Loon		4		
Red-throated Loon	112	3		
Red-necked Grebe	94	240		
Cormorant spp.	130	30		
Tundra Swan	32	44		
Canada Goose	48,904	58,808	53,531	54,436
Pacific Brant	99,231	137,928	131,264 ³	131,264
Emperor Goose	63,117	44,850	53,108	60,226
Snow Goose		1		
Mallard	4,863	2,876		
Northern Pintail	38,017	26,605		
American Green-winged Teal	1,470	2,140		
Northern Shoveler	722			
American Wigeon	205	132		
Greater Scaup	72	871		
Goldeneye spp.	50			
Harlequin Duck	487	286		
Common Eider	832	39		
King Eider	1,253	17		
Steller's Eider	78,796	80,906	79,834	80,928
White-winged Scoter	694	849		
Surf Scoter	344	575		
Black Scoter	32,276	35,585		
Unidentified scoter	100			
Red-breasted Merganser	1,383	428		
Bald Eagle	37	24		
American Golden Plover		5		
Unidentified large shorebird	84			
Godwit spp.	1,070	1,575		
Unidentified medium shorebird	1,369	800		
Unidentified small shorebird	98,752	67,056		
Mew Gull	5,037	4,640		
Glaucous-winged Gull	22,851	44,838		
Unidentified gull	50			
Black-legged Kittiwake	2,581	50		
Common Raven	15	6		
Harbor Seal	1,577	1,484		
Killer Whale	10			
Sea Otter	412	837		
Sea Lion	2			
Walrus	1,210	1,100		

¹ Average = average for replicated segments only (35-68, 84, 85).

² Expanded population = Average of 1999 replicated counts + segments 81-83 + 1998 estimate for the south side of the Alaska Peninsula.

³ Pacific brant average includes 9/27, 10/1, and 10/3 counts of 129,566, 118,865 and 170,731, respectively, for Izembek Lagoon and adjacent areas.

Appendix 1. Survey segment descriptions, emperor goose survey, southwest Alaska.

SEGMENT	DESCRIPTION
1	Cape Romanzof to the north end of Panowat Spit (Kokechik Bay)
2	North end of Panowat to south shore of Hooper Bay
3	South shore of Hooper Bay to Kashunuk River mouth
4	Kashunuk River mouth to mouth of Aphrewn River
5	Mouth of Aphrewn River to south shore Naskonat Peninsula
6	South shore Naskonat Peninsula to Cape Vancouver
7	Cape Vancouver to mouth of Kolavinarak River
8	Mouth of Kolavinarak River to south shore Kinak Bay
9	South shore Kinak Bay to Ishkowik River (Kongiganak)
10	Ishkowik River to Johnson River
11	Johnson River to south end Eek Island
12	South end Eek Island to Kanektok River (Quinhagak)
13	Kanektok River to start Jacksmith Bay
14	Jacksmith Bay
15	Jacksmith Bay to start Carter Bay
16	Carter Bay
17	Tip of Carter Spit to north spit Goodnews Bay
18	Goodnews Bay
19	Tip of Platinum Spit to north spit Chagvan Bay
20	Chagvan Bay
21	Chagvan Bay to north spit Nanvak Bay
22	Nanvak Bay
23	Cape Pierce to Asigyugpak Spit
24	Asigyugpak Spit to Tongue Point
25	Tongue Point to Togiak
26	Togiak to point opposite Summit Island
27	Point opposite Summit Island to Right Hand Pt
28	Right Hand Pt to Kulukak Point
29	Kulukak Point to Protection Pt

Appendix 1 (continued). Survey segment descriptions, emperor goose survey, southwest Alaska.

SEGMENT	DESCRIPTION	
30	Protection Pt to Dillingham	
31	Dillingham to Etolin Pt	
32	Etolin Pt to Nakeen	
33	Nakeen to mouth of Naknek River	
34	Naknek River to King Salmon	
35	Mouth of Naknek River to Coffee Pt	
36	Egegik Bay	
37	Goose Point to Smoky Pt	
38	Ugashik Bay	
39	Cape Menshikof to Cinder River Estuary	
40	Cinder River Estuary	
41	Cinder River Estuary to Hook Lagoon	
42	Hook Lagoon	
43	Hook Lagoon to Port Heiden	
44	Port Heiden to mouth of Meshik River (Port Heiden East)	
45	Mouth of Meshik River to Stroganof Pt (Port Heiden West)	
46	Stroganof Pt to Seals Islands Estuary	
47	Seals Islands Estuary	
48	Ilnik to Cape Seniavin	
49	Cape Seniavin to Port Moller village	
50	Port Moller village to Point Divide	
51	Herendeen Bay	
52	Mud Bay	
53	East side Deer Island and sand islands	
54	East shore Cape Rozhnof and sand islands	
55(1)	Cape Rozhnof to Kust Point (south shore Nelson Lagoon)	
55(2)	Kust Point to east end Lagoon Point (west third Nelson Lagoon)	
56	Lagoon Point to east end Walrus Island (north shore Nelson Lagoon)	
57	East end Walrus Island to Lagoon Point (Bering Sea side Kudobin Islands)	

Appendix 1 (continued). Survey segment descriptions, emperor goose survey, southwest Alaska.

SEGMENT	DESCRIPTION
58	Lagoon Point to David River airstrip
59	David River airstrip to Moffet Point
60	Moffet Bay
61	Strawberry Point to Round Island (incl. Neumann Island)
62	Round Island to Tern Island
63	Tern Island to Banding Islands west of Grant Point (incl. Operl Island)
64	Applegate Cove
65	Norma Bay
66	Cape Glazenap to Cape Krenitzin
67	Cape Krenitzin to Isanotski Islands (incl. Hook Bay)
68	Isanotski Islands to False Pass and Chunak Point (incl. Hot Springs Bay and St. Catherine's Cove)
69	Chunak Point to Swanson Lagoon
70	Swanson Lagoon to Cape Lapin
71	Cape Lapin to Cape Mordvinof
72	Cape Mordvinof to Cape Sarichef
73	Cape Sarichef to Sennett Point
74	Sennett Point to Cape Lutke
75	Cape Lutke to Red Conical Hill
76	Red Conical Hill to Cape Aksit
77	Cape Aksit to Ikatan Point
78	Ikatan Point to Kenmore Head
79	Kenmore Head to Little Lagoon
80	Little, Middle and Big lagoons
81	Big Lagoon to Littlejohn Lagoon (incl. Littlejohn Lagoon)
82	Littlejohn Lagoon to Thin Point
83	Thin Point to Stapp Creek (incl. Old Man's, Mortensen and Nurse lagoons)
84	Stapp Creek to Kinzarof Lagoon
85	Kinzarof Lagoon
86	Kinzarof Lagoon to Kelp Point

Appendix 1 (continued). Survey segment descriptions, emperor goose survey, southwest Alaska.

SEGMENT	DESCRIPTION	
87	Kelp Point to Indian Head	
88	Indian Head to Belkofski	
89	Belkofski to Volcano Bay	
90	Volcano Bay	
91	Arch Point to west entrance Pavlof Bay	
92	West entrance Pavlof Bay to Canoe Bay mouth	
93	Canoe Bay	
94	Canoe Bay mouth to Cape Tolstoi	
95	Cape Tolstoi to Seal Cape	
96	Seal Cape to west entrance Beaver Bay	
97	Beaver Bay	
98	Cape Aliaksin to west entrance Balboa Bay	
99	Balboa Bay	
100	East entrance Balboa Bay to west entrance Dorenoi Bay	
101	Dorenoi Bay	
102	Dorenoi Bay to American Bay	
103	American Bay	
104	Orzinski Bay	
105	Clark Bay	
106	Grub Gulch	
107	Stepovak Bay	
108	Island Bay	
109	Fox Bay	
110	Boulder Bay	
111	Bluff Point to Fox Cape	
112	Ivanof Bay	
113	Alexander Pt to Star Pt	
114	Star Pt to Coal Cape	
115	Coal Cape to Stirni Pt	

Appendix 1 (continued). Survey segment descriptions, emperor goose survey, southwest Alaska.

SEGMENT	DESCRIPTION
116	Ivan Bay
117	Mitrofanina Bay
118	Mitrofanina Bay to head of Portage Bay
119	Head of Portage Bay to Cape Ikki
120	Cape Ikki to end of Devils Bay
121	End of Devils Bay to Ship Mountain
122	Ship Mountain to Castle Cape
123	Castle Bay
124	End of Devils Bay to Chignik Lagoon
125	Chignik Lagoon
126	Chignik Lagoon to Cape Kumliun
127	Cape Kumliun to Kumlik Island (incl. Kujulik Bay)
128	Kumlik Island to Cape Ayutka (incl. Aniakchak Bay)
129	Cape Ayutka to Cape Kunmik (incl. Amber Bay)
130	Cape Kunmik to end Yantarni Bay
131	End of Yantarni Bay to start Nakalilok Bay
132	Nakalilok Bay
133	Cape Kuyukukak to Cape Providence
134	Cape Providence to Ashiiak Is.
135	Ashiiak Is. to Cape Kilokak
136	Cape Kilokak to Cape Kayakliut
137	Wide Bay
138	Coal Pt to Cape Igvak
139	Cape Igvak to Cape Kanatak (incl. Portage Bay)
140	Cape Kanatak to Cape Unalishagvak
141	Cape Unalishagvak to Cape Aklek
142	Cape Aklek to Cape Kekurnoi
143	Cape Kekurnoi to Cape Kubugakli

Appendix 2. Waterbird and mammal observations by segment from southwest Alaska, 1-2 October, 1999.

SPECIES	35	36	37	38	39	40	41	42	43	44	45	46	47	48
American GW Teal	0	0	250	0	0	0	0	500	0	0	1	0	0	0
American Wigeon	0	0	0	0	0	0	0	5	0	0	200	0	0	0
Bald Eagle	0	0	0	1	0	1	0	1	0	0	4	1	0	2
Brown Bear	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Pacific Brant	0	0	0	0	0	0	0	0	2	0	0	0	0	0
Black-legged	0	0	0	0	0	1	0	0	2	0	0	0	0	828
Black Scoter	89	20	580	112	615	0	0	0	20	2,878	14,043	1,000	0	631
Canada Goose	0	150	685	170	0	0	0	160	0	12	32	0	0	3
Common Eider	0	0	0	0	0	0	0	0	0	0	376	0	356	0
Common Raven	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cormorant	1	0	0	0	2	0	0	0	0	0	1	0	0	0
Emperor Goose	0	1,324	0	1,568	4	2,396	0	1,059	35	2,937	10,885	74	6,985	0
Glaucous Gull	298	0	0	0	0	0	0	0	0	0	0	0	0	0
Godwit	0	1,000	0	0	0	0	0	0	0	0	0	0	0	0
Golden eye	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glaucous-winged Gull	720	334	396	286	194	223	6	155	72	25	620	139	1,175	87
Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	115	0	0	0	0	0	451	0	0	0	0
King Eider	0	0	202	3	1	0	0	0	126	0	0	0	0	920
Large Shorebird	2	0	0	0	0	0	0	2	0	0	80	0	0	0
Mallard	41	380	3	580	0	245	0	1,013	0	195	945	0	307	0
Mew Gull	679	34	150	1,048	43	190	0	200	5	0	1,557	0	155	0
Medium Shorebird	0	15	0	50	0	170	0	500	0	0	525	0	100	0
Northern Pintail	44	3,370	1,310	975	50	612	15	235	0	125	9,010	0	2,185	450
Northern Shoveler	0	650	0	0	0	0	0	0	0	0	0	0	0	40
Orca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-breasted	6	0	0	0	8	300	20	10	0	0	125	0	250	0
Red-necked Grebe	3	0	0	1	2	0	0	0	45	0	0	0	0	0
Red-throated Loon	0	0	86	1	3	0	0	0	7	0	0	3	0	4
Scaup	0	0	0	0	0	0	0	0	0	0	35	0	0	0
Sea Otter	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Small Shorebird	890	152	40	370	0	150	210	985	0	0	1,680	0	780	0
Steller's Eider	0	0	0	0	0	400	0	0	0	4,500	8,000	0	8,400	65
Surf Scoter	0	0	54	0	0	0	0	0	11	162	0	0	0	0
Tundra Swan	0	2	6	0	0	0	0	0	0	0	0	0	9	0
Walrus	0	0	0	0	0	0	0	0	0	0	0	0	0	1,210
Wolverine	0	0	0	0	0	0	0	0	0	0	0	1	0	0
White-winged Scoter	1	0	110	0	0	0	0	0	0	11	250	10	0	0

Appendix 2 (continued). Waterbird and mammal observations by segment from southwest Alaska, 1-2 October, 1999.

SPECIES	49	50	51	52	53	54	55(1)	55(2)	56	57	58	59	60	61
American GW Teal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bald Eagle	5	1	1	1	2	0	0	1	0	1	0	0	0	0
Brown Bear	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific Brant	0	0	0	0	0	0	0	50	0	0	0	0	2,977	29,065
Black-legged	950	0	0	0	0	0	0	0	800	0	0	0	0	0
Black Scoter	533	0	1,574	505	3,933	4,935	0	0	408	0	307	30	0	0
Canada Goose	0	0	0	0	250	0	0	0	0	0	0	0	11,635	8,737
Common Eider	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Raven	0	0	0	0	0	0	0	0	0	0	0	0	0	2
Cormorant	1	6	7	0	0	0	0	0	0	0	0	0	0	0
Emperor Goose	10	831	990	1,495	338	0	2,434	2,861	3,457	17,173	788	0	1,711	198
Glaucous Gull	3	0	0	0	0	0	0	0	0	0	0	0	0	0
Godwit	0	0	0	70	0	0	0	0	0	0	0	0	0	0
Golden eye	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glaucous-winged Gull	156	450	525	1,329	0	0	0	0	3,900	1,535	48	0	1,540	844
Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	785	5
King Eider	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Large Shorebird	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard	0	0	0	2	0	0	0	0	0	0	0	0	0	1,000
Mew Gull	85	48	0	98	0	0	0	0	100	0	0	0	145	9
Medium Shorebird	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Pintail	0	20	0	1,700	10	0	28	7,055	0	0	0	0	2,315	5,950
Northern Shoveler	0	0	0	0	0	0	0	0	0	0	0	0	12	0
Orca	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-breasted	0	3	0	0	0	0	0	0	320	0	0	0	0	0
Red-necked Grebe	0	0	0	2	0	0	0	0	0	0	0	0	0	0
Red-throated Loon	2	1	0	0	0	0	0	0	0	0	1	3	0	0
Scaup	0	30	0	0	0	0	0	0	0	0	0	0	0	0
Sea Otter	0	12	149	5	19	2	0	0	1	0	0	0	23	83
Small Shorebird	0	0	0	82,250	0	0	0	60	500	5,500	0	0	4,520	645
Steller's Eider	0	2,000	0	700	150	8,500	8,043	2,870	28,445	0	50	0	1,245	2,800
Surf Scoter	0	0	36	0	81	0	0	0	0	0	0	0	0	0
Tundra Swan	0	0	0	0	0	0	2	0	0	0	0	0	7	0
Walrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Wolverine	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White-winged Scoter	0	75	3	0	1	110	0	0	0	0	50	50	0	0

Appendix 2 (continued). Waterbird and mammal observations by segment from southwest Alaska, 1-2 October, 1999.

SPECIES	62-63	64	65	66	67	68	80	81	82	83	84	85	Total
American GW Teal	0	0	0	0	0	0	420	0	0	0	0	0	1,470
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	0	205
Bald Eagle	0	1	0	0	0	3	1	0	3	7	0	0	37
Brown Bear	0	1	0	0	0	1	0	0	0	0	0	0	5
Pacific Brant	12,145	23,250	18,461	0	3,946	1,527	4,168	0	0	0	0	3,640	99,231
Black-legged	0	0	0	0	0	0	0	0	0	0	0	0	2,581
Black Scoter	0	0	0	55	0	8	0	0	0	0	0	0	32,276
Canada Goose	3,875	6,475	13,095	0	75	2,000	0	0	0	650	0	900	48,904
Common Eider	0	0	0	0	0	0	0	0	0	25	0	75	832
Common Raven	0	0	0	2	7	0	0	0	2	2	0	0	15
Cormorant	0	0	0	0	0	35	0	20	57	0	0	0	130
Emperor Goose	238	10	0	16	100	305	653	1,006	51	694	50	247	63,117
Glaucous Gull	0	0	0	0	0	0	0	0	0	0	0	0	301
Godwit	0	0	0	0	0	0	0	0	0	0	0	0	1,070
Golden eye	0	0	0	0	0	0	50	0	0	0	0	0	50
Glaucous-winged Gull	1,035	230	500	560	75	1,220	880	167	1,655	1,033	22	373	22,550
Harlequin Duck	0	0	0	0	0	0	0	10	17	75	60	325	487
Harbor Seal	36	17	0	0	0	0	2	0	8	0	0	158	1,577
King Eider	0	0	0	0	0	0	0	0	0	0	0	0	1,253
Large Shorebird	0	0	0	0	0	0	0	0	0	0	0	0	840
Mallard	0	0	0	0	0	0	30	0	0	2	0	120	4,863
Mew Gull	0	40	0	0	0	55	0	75	321	0	0	0	5,037
Medium Shorebird	9	0	0	0	0	0	0	0	0	0	0	0	1,369
Northern Pintail	0	70	1,200	0	0	508	550	0	0	0	0	30	38,017
Northern Shoveler	0	0	0	0	0	0	20	0	0	0	0	0	722
Orca	0	0	0	0	0	0	0	0	0	0	0	10	10
Red-breasted	0	0	0	0	0	0	4	0	0	337	0	0	1,383
Red-necked Grebe	0	0	0	0	0	40	0	0	0	0	0	0	94
Red-throated Loon	0	0	0	1	0	0	0	0	0	0	0	0	112
Scaup	0	0	0	0	0	0	0	7	0	0	0	0	72
Sea Otter	8	7	0	3	75	7	5	1	0	1	0	10	412
Small Shorebird	19	0	0	0	0	0	1	0	0	0	0	0	98,752
Steller's Eider	0	0	2,435	70	0	25	8	0	0	35	20	35	78,796
Surf Scoter	0	0	0	0	0	0	0	0	0	0	0	0	344
Tundra Swan	0	0	0	0	0	0	4	0	0	0	0	0	32
Walrus	0	0	0	0	0	0	0	0	0	0	0	0	1,210
Wolverine	0	0	0	0	0	0	0	0	0	0	0	0	1
White-winged Scoter	0	0	0	0	0	0	0	0	0	3	20	0	694

Appendix 2 (continued). Waterbird and mammal observations by segment from southwest Alaska, 4-5 October, 1999.

SPECIES	35	36	37	38	39	40	41	42	43	44	45	46	47	48
American GW Teal	725	925	0	0	0	0	0	0	0	0	0	0	0	0
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Bald Eagle	1	0	0	1	0	2	0	1	0	0	0	0	2	0
Brown Bear	0	0	0	0	0	0	0	0	0	0	0	0	2	0
Pacific Brant	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black-legged	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Scoter	40	0	429	14	215	500	0	50	0	0	0	5	0	675
Canada Goose	25	485	0	655	0	0	0	0	0	0	0	55	305	0
Common Eider	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Loon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Common Raven	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Cormorant	0	0	0	0	0	0	0	1	0	0	0	0	0	0
Emperor Goose	334	134	1,635	1,498	5	3,102	0	1,012	62	3,144	4,276	140	7,878	0
Godwit	950	500	125	0	0	0	0	0	0	0	0	0	0	0
Golden Plover	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Glaucous-winged Gull	7,447	620	4,601	1,826	611	1,418	0	381	512	957	925	25	6,106	85
Harlequin Duck	0	0	0	0	25	0	0	0	0	0	0	0	0	0
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
King Eider	0	0	0	0	5	0	0	0	0	0	12	0	0	0
Mallard	41	225	2	1,097	0	60	0	150	0	0	0	0	15	0
Mew Gull	1,817	25	1,801	154	375	65	0	0	0	0	10	13	25	2
Medium Shorebird	0	0	0	800	0	0	0	0	0	0	0	0	0	0
Northern Pintail	145	7,575	20	2,395	0	1000	0	185	0	410	1750	0	200	0
Pacific Loon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-breasted	25	0	55	18	0	0	0	0	0	0	0	0	0	0
Red Fox	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-necked Grebe	0	0	20	0	2	0	0	0	0	0	0	0	0	0
Red-throated Loon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scaup	50	781	0	0	0	0	0	0	0	0	0	0	0	0
Sea Otter	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small Shorebird	6,130	12,500	125	2,382	0	2,275	0	1,075	0	0	15,950	0	12,783	0
Snow Goose	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Steller's Eider	10	0	0	0	0	1,500	0	0	0	0	6,500	0	6,595	0
Surf Scoter	0	0	0	0	50	0	0	0	0	0	0	0	0	0
Tundra Swan	0	0	5	0	0	0	0	0	0	4	0	0	3	3
Walrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White-winged Scoter	0	0	0	0	0	0	0	0	0	0	0	0	0	3

Appendix 2 (continued). Waterbird and mammal observations by segment from southwest Alaska, 4-5 October, 1999.

SPECIES	49	50	51	52	53	54	55(1)	55(2)	56	57	58	60	61	62
American GW Teal	0	0	0	0	0	0	0	0	0	0	0	0	0	0
American Wigeon	0	0	0	0	0	0	0	0	0	0	0	0	100	0
Bald Eagle	1	2	0	0	3	0	0	0	0	0	0	0	0	0
Brown Bear	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pacific Brant	0	0	0	0	0	0	0	0	0	0	0	885	41,910	14,324
Black-legged	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Black Scoter	2,439	6	33	0	10,346	3,708	14	0	0	16,975	0	0	0	0
Canada Goose	0	0	0	0	0	0	0	0	0	0	0	9,720	11,175	3,550
Common Eider	0	0	0	0	0	0	15	0	12	0	0	0	0	0
Common Loon	0	3	0	0	0	0	0	0	0	0	0	0	0	0
Common Raven	0	0	0	4	0	0	0	0	0	0	1	0	0	0
Cormorant	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Emperor Goose	110	1,124	272	50	588	0	4,434	4,866	3,540	1,074	4	1,852	14	166
Godwit	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Golden Plover	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Glaucous-winged Gull	605	1,318	0	120	0	341	40	825	5,624	4,720	11	347	566	401
Harlequin Duck	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Harbor Seal	0	35	0	0	0	0	0	0	120	0	0	290	3	475
King Eider	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mallard	0	0	0	45	0	0	0	10	3	0	0	350	0	0
Mew Gull	0	0	0	0	0	0	0	0	0	0	0	8	0	0
Medium Shorebird	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Northern Pintail	0	0	0	140	0	0	0	1,750	550	0	0	1,330	5,900	800
Pacific Loon	0	2	0	0	0	0	0	0	0	0	0	0	0	0
Red-breasted	0	5	0	0	0	0	0	0	0	0	0	0	0	0
Red Fox	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Red-necked Grebe	0	0	0	0	7	0	0	0	0	0	0	0	0	0
Red-throated Loon	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scaup	0	0	0	0	0	0	15	0	0	0	0	0	0	0
Sea Otter	0	14	18	0	3	392	0	0	0	0	0	17	49	70
Small Shorebird	0	220	0	1,866	0	0	0	3,360	2,400	3,500	0	1,415	250	0
Snow Goose	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Steller's Eider	0	6,700	2,380	2,450	800	3,000	7,035	12,540	7,896	13,000	0	3,850	3,260	175
Surf Scoter	0	0	0	0	0	300	0	0	0	195	0	0	0	0
Tundra Swan	27	0	0	0	2	0	0	0	0	0	0	0	0	0
Walrus	0	0	0	0	0	0	0	0	0	0	0	0	0	0
White-winged Scoter	0	11	20	0	15	800	0	0	0	0	0	0	0	0

Appendix 2 (continued). Waterbird and mammal observations by segment from southwest Alaska, 4-5 October, 1999.

SPECIES	63	64	65	66	67	68	80	84	85	TOTAL
American GW Teal	0	0	0	0	0	40	50	0	400	2,140
American Wigeon	0	0	30	0	0	0	2	0	0	132
Bald Eagle	0	0	0	0	0	7	4	0	0	24
Brown Bear	0	0	0	0	0	0	0	0	0	2
Pacific Brant	6,000	24,400	31,663	0	6,411	1,163	7,427	0	3,741	137,928
Black-legged	0	0	0	0	0	50	0	0	0	50
Black Scoter	0	0	0	86	0	15	5	30	0	35,585
Canada Goose	50	11,725	15,600	0	0	3,635	358	0	1,470	58,808
Common Eider	0	0	0	12	0	0	0	0	0	39
Common Loon	0	0	0	0	0	0	8	0	0	11
Common Raven	0	0	0	0	0	0	0	0	0	6
Cormorant	0	0	0	4	0	25	0	0	0	30
Emperor Goose	4	224	0	35	362	1,490	776	195	450	44,850
Godwit	0	0	0	0	0	0	0	0	0	1,575
Golden Plover	0	0	0	0	0	0	0	0	0	5
Glaucous-winged Gull	747	95	400	174	79	480	724	0	1,707	44,838
Harlequin Duck	0	0	0	125	0	21	40	5	70	286
Harbor Seal	0	0	492	30	0	9	0	0	30	1,484
King Eider	0	0	0	0	0	0	0	0	0	17
Mallard	0	93	325	0	0	50	260	0	150	2,876
Mew Gull	0	0	0	15	0	225	105	0	0	4,640
Medium Shorebird	0	0	0	0	0	0	0	0	0	800
Northern Pintail	0	100	1,325	0	0	225	305	0	500	26,605
Pacific Loon	0	0	0	0	0	2	0	0	0	4
Red-breasted	0	0	0	0	0	25	250	0	50	428
Red Fox	0	0	0	0	0	0	1	0	0	1
Red-necked Grebe	0	0	0	184	4	15	0	8	0	240
Red-throated Loon	0	0	0	3	0	0	0	0	0	3
Scaup	0	0	0	0	0	0	0	0	25	871
Sea Otter	6	0	81	26	127	28	0	0	4	837
Small Shorebird	500	0	0	0	0	0	70	0	0	67,056
Snow Goose	0	0	0	0	0	0	0	0	0	1
Steller's Eider	400	0	2,285	358	60	35	35	0	42	80,906
Surf Scoter	0	0	0	0	0	0	5	0	25	575
Tundra Swan	0	0	0	0	0	0	0	0	0	44
Walrus	0	0	0	0	0	0	0	0	0	1,115
White-winged Scoter	0	0	0	0	0	0	0	0	0	849

Appendix 3. Emperor goose fall survey data, southwest Alaska, 1979-1999.

YEAR	TOTAL*	3YR. MEAN*	DATES	OBSERVERS	REMARKS
1979	59,800	NA	10/1-4	B.Conant/R.E.Gill, Jr.	South Alaska Peninsula missing
1980	66,000	NA	10/4-8	R.J. King/R.E. Gill, Jr.	North Alaska Peninsula only
1981	63,100	63,000	10/3-8	R.J. King/R.E. Gill, Jr./D.V. Derksen	All
1982	80,600	69,900	10/6-10	R.J. King/K.S. Bollinger	All
1983	72,600	72,100	10/10-16	R.J. King/D.V. Derksen	All
1984	82,800	78,700	10/3-8	R.J. King/D.V. Derksen	All
1985	59,800	71,700	10/10-14	R.J. King/W.D. Eldridge	All
1986	68,100	70,200	10/5-11	R.J. King/W.D. Eldridge	All
1987	65,700	64,500	10/2-5	R.J. King/W.D. Eldridge	All
1988	76,200	70,000	10/7-12	R.J. King/W.D. Eldridge	All
1989	70,700	70,900	10/7-12	R.J. King/L. Denlinger	All
1990	109,500	85,500	10/17-19	R.J. King/A.W. Brackney	All
1991	75,300	85,200	10/3-8	R.J. King/A.W. Brackney	All
1992	82,300	89,000	10/10-17	R.J. King/A.W. Brackney	All
1993	71,100	76,200	10/23-26	R.J. King/D.A. Dewhurst	Alaska Peninsula only
1994	87,100	80,200	10/8-14	R.J. King/K. Laing	All
1995	91,000	83,100	10/14-20	R.J. King/K.S. Bollinger	All
1996	87,000	88,400	9/28-29	R.J. King/W.D. Eldridge	North Alaska Peninsula only [#]
1997	86,700	88,200	10/3-5	R.J. King/C.P. Dau	North Alaska Peninsula only [#]
1998	67,700	80,500	10/7-9	R.J. King/E.J. Mallek	Alaska Peninsula only
1999	60,200	71,500	10/1-5	C.P. Dau/E.J. Mallek	North Alaska Peninsula only [#]

*Numbers rounded to the nearest 100.

[#] Previous south side Alaska Peninsula data used in estimate.

Range = 59,800 - 109,500