

AERIAL SURVEY OF EMPEROR GEESE AND OTHER WATERBIRDS
IN SOUTHWESTERN ALASKA, SPRING 2010

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Abstract: The 30th consecutive spring aerial emperor goose survey was conducted on 27 April and from 2-3 May. An amphibious Cessna 206 (N234JB) was used, flown at 45m (150 feet) ASL and 200km/hr (110 kts). The survey was conducted over coastline and estuarine habitats from Jacksmith Bay to Canoe Bay, including the north side and western portion of the south side of the Alaska Peninsula. The total estimate of emperor geese was 64,562, down 29.8% from 2009 and down 0.9% from the long-term average (65,147, 1981-2009). The current management index (recent 3-year average) is 73,818 birds (down 5.5% from the previous 3-yr average of 78,144). Other species of emphasis included Pacific brant and Steller's eider with observed populations of 41,484 and 40,008, respectively.

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INTRODUCTION

This survey has annually monitored spring distribution, abundance and population trends of emperor geese and other waterbirds at migratory staging areas throughout southwestern Alaska since 1981. The traditional survey route included coastline and estuarine habitats from the Yukon-Kuskokwim Delta (YKD) 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. Earlier survey timing in recent years precedes the arrival of emperor geese on the YKD so the survey is now begun in southern Kuskokwim Bay. Coverage along the south side of the Alaska Peninsula emphasizes known emperor goose staging and use areas and omits areas of marginal habitat where birds have not been seen during previous surveys. A 3-year moving average of these population data, collected in accordance with the Pacific Flyway Emperor Goose Management Plan, is used as the index to establish harvest thresholds. These data also assess annual and long-term variation in seasonal migratory phenology and determine trends in distribution and habitat use for emperor geese.

METHODS

The survey was flown on 27 April and 2-3 May. Generally, survey timing during recent years has been adjusted earlier in response to climatic conditions within the survey area, including earlier break-up of sea ice. Low visibility created adverse survey conditions which interrupted flights from 28-30 April. Since cold conditions with large amounts of estuarine ice were encountered, most emperor geese remained in the central and western

Alaska Peninsula. We believe the delay did not adversely affect the survey results since arrival of emperor geese on the YKD was approximately 10 days later than in 2009.

The survey area includes a maximum of 143 shoreline/estuarine segments identified on 1:500,000 scale aeronautical and 1:63,360 topographical maps (Figures 1 and 2) (Mallek and Dau 2000). Due to safety considerations, segments along the south side of the Alaska Peninsula with marginal habitat, where no emperor geese were observed during initial surveys, have been omitted. General observations of habitat and survey conditions including wind speed and direction, temperature, sky condition, visibility and tide stage were recorded en route.

An amphibious Cessna 206 (N234JB) flown at a ground speed of approximately 200 km/hr (110 kts) and an altitude of 45m (150 feet) ASL was used. In recent years the planned route of flight has been Jacksmith Bay (Segment 14) south to Bechevin Bay on Unimak Island along the north side of the Alaska Peninsula, and then eastward along the south side of the Alaska Peninsula to Wide Bay (Segment 137). The coastal flight path was approximately 100 meters offshore with deviations, normally within 1.6 km (1 mile) of exposed shorelines, to confirm species identification and estimate numbers. In estuaries, a systematic but meandering flight path was followed to ensure complete coverage. Whenever possible, flights were conducted with <20 knots of wind and primary staging areas were flown at or near high tide as this concentrated geese near shorelines. Observations were made from both sides of the aircraft and voice recorded into two laptop computers using remote microphones. Computers received input from the aircraft Global Positioning System (GPS) saving coordinates for each observation. Specialized record and transcribe programs were used to process these data (J. Hodges, MBM-Juneau).

SURVEY CONDITIONS

Climatic conditions indicated a cold and delayed spring in 2010. Sea ice cover was slight in Kuskokwim Bay and the northern portion of Bristol Bay however, estuarine ice was extensive from Jacksmith Bay south to Ugashik Bay. Broken, floating ice covered approximately 75% of Egegik Bay and 85% of Ugashik Bay with the remainder of Alaska Peninsula estuaries west from Cinder River Lagoon essentially ice-free. Snow cover in coastal lowlands was slight (~5%) from Jacksmith Bay south to the Nushagak Peninsula and 5 to 50 percent along the lower Alaska Peninsula (Table 1).

April 27: Jacksmith Bay to Naknek (Segments 14-33). Northerly winds to 30 knots resulted in turbulence from Cape Pearce to Kukukak Bay which precluded coverage of segments 23-28. Ceilings and visibility were unrestricted and survey conditions were good. Ice cover was extensive in all estuaries in southern Kuskokwim Bay and less so in northern Bristol Bay. Sea ice coverage was slight from Kuskokwim Bay south to Cape Newenham and east to Togiak Bay. Estuarine ice cover was as follows: Jacksmith Bay 100%, Carter Bay 99%, Goodnews Bay 80 %, Chagvan Bay 85% and Nanvak Bay 99%. Freshwater ponds were ice covered throughout the area.

May 2: King Salmon to Moffet Bay (segments 34-60). Survey conditions were favorable with northerly winds of 10 knots and overcast skies from King Salmon to Seal Islands Lagoon (segments 34-47). Occasional low ceilings and visibility along exposed shorelines from Ugashik Bay to Cinder River Lagoon were the only adverse conditions encountered. From Seal Islands Lagoon south to Moffet Bay, broken to clear skies and light winds persisted. Temperatures were 32-35°F throughout the day. Broken, close-pack sea ice 2 to 6 km in width was present from Cape Chichagof to Cinder River Lagoon otherwise Bristol Bay was ice free. Tide conditions were low from Egegik Bay south to Cinder River Lagoon, mid at Port Heiden and Seal Islands Lagoon and very low in the Port Moller/Nelson Lagoon complex. Snow cover was 10-30 percent in lowland habitats from Naknek to Port Moller. Most freshwater ponds were frozen from Naknek to Port Moller and up to 50% ice-free south to Moffet Bay.

May 3: Izembek Lagoon to Bechevin Bay and Cold Bay to Canoe Bay (Segments 60-93). Survey conditions were favorable with calm to easterly winds of 10 knots, ceilings were overcast to broken and temperatures were 30-35° F. Turbulence resulted in omission of the south side of the Alaska Peninsula east of Canoe Bay. Estuaries were essentially ice free and only larger freshwater ponds were ice covered.

RESULTS/DISCUSSION

The survey was begun on 27 April and delayed until 2 May due to adverse survey conditions. Cold air temperatures and extensive estuarine ice in southern Kuskokwim Bay and northern Bristol Bay appeared to delay migration. Most emperor geese were congregated in traditional locations along the north side Alaska Peninsula. The 2010 population of emperor geese was estimated at 64,562. This total includes the 60,696 emperor geese observed (Table 2) plus an estimate of 3,866 emperor geese in segments 94-137 (based on the most recent 3-year average for these segments) along the central and eastern portions of the south side of the Alaska Peninsula which could not be flown due to high winds. Observations from Unalaska, in the eastern Aleutian Islands, suggested that migrants peaked at 1200 and the departure of all birds was on 15 April, identical to 2009 (S. Golodoff, pers. comm.). A last, single emperor goose was observed at Unalaska on 23 April. The first emperor goose sighting on the Yukon-Kuskokwim Delta was on 9 May (peak influx 16 May) at the Tutakoke River (J. Sedinger, pers. comm.), indicating arrival was up to 10 days later than in 2009.

Emperor Goose

The 2010 emperor goose count of 64,562 is 29.8% below the 2009 estimate of 91,948 (Table 2) and 0.9% below the long term average of 65,147 (1981-2009, 95% CI = 5,789). The current 3-year average management index of 73,818 decreased 5.5% from the previous average of 78,144 (2007-2009) (Table 3). Emperor goose migratory phenology was delayed by cool temperatures and extensive ice cover in northerly estuaries. Most birds were distributed in estuaries in the mid and lower portions of the north side of the Alaska Peninsula (Table 4) (95.4% of total birds in 2010; long-term average 91.6%). Very few emperor geese were observed from Jacksmith Bay to Cape Pierce (i.e. 163;

93% below average 1981-2009 average of 2,441, 95% CI = 903). Estuaries along the central and eastern portions of the south side of the Alaska Peninsula (Segments 94-137) could not be flown due to high winds so a 3-year average from most recent counts was used to estimate 3,866 birds in those areas.

Pacific Brant

We observed a total of 41,484 brant during the 2010 survey (Table 2), 40,412 (97.4%) of which were in Izembek Lagoon and adjacent areas. Distribution was comparable to previous years despite the fact that fewer birds were observed. The 2010 brant total is 49.8% below the 2009 total of 82,708 and 26.9% below the long-term average of 56,755 (1981-2009, 95% CI = 8,523). Reduced brant numbers in 2010 suggests their migratory chronology was delayed with only 700 birds north of Cape Newenham where the long-term average from this survey is 15,556 birds (1981-2009, 95% CI = 4,125). The central and eastern portions of the south side of the Alaska Peninsula could not be flown in 2010 and we did not estimate numbers present in those areas. The first brant sighting at the Tutakoke River on the Yukon-Kuskokwim Delta was on 10 May (C. Nicolai, pers. comm.), indicating arrival was up to 10 days later than in 2009. Small numbers of brant were reported in estuaries from northern California to British Columbia as late as mid May confirming a delayed migration.

Steller's Eider

We observed 40,008 Steller's eiders (Table 2), a 54.8% increase from the 2009 count of 25,841 and 19.5% below the long-term average of 49,719 (1981-2009, 95% CI = 11,289). Most Steller's eiders (26,468, 66.2% of the total) were observed from Port Heiden to Izembek Lagoon. The long-term average is 27,288 birds for those areas (1981-2009, 95% CI = 9,942) and an average of 53.8% of the total birds observed.

Steller's eider flock composition was recorded by the right seat observer and 81 of 82 (98.8%) of flocks observed were of equal ratios (i.e. adult males and brown-plumaged birds). One flock of 7 males: 1 female was the only flock of unequal sex ratio observed (1.2% of the total). Later migrating flocks are often predominated by brown-plumaged birds and their absence suggests delayed migratory chronology in 2010.

CONCLUSIONS

The spring 2010 emperor goose population estimate of 64,562 is 0.9% below the long term average of 65,147 (Figure 3) (1981-2009). The current 3-year average population of 73,818 (2008-2010) is 5.5% below the previous 3-year average of 78,144 (2005-07).

Several factors are known to impact the productivity and survival of emperor geese and limit population growth. We feel only two limiting factors offer realistic potential for positive management actions that could increase population size. High predation rates on emperor goose goslings on the Yukon-Kuskokwim Delta, primarily by glaucous gulls, has been documented (Bowman et al. 1997) however, current loss rates and trends are

unknown. Annual production could be increased by reducing egg and gosling mortality due to gull predation.

Trend in the proportion of juveniles in the fall population has declined 1.4%/year since 1985 and it is unknown if predation rates are changing as well. Juveniles averaged 17.1% of the fall population from 1995-2009 with only three years estimates above the long-term average (19.1% juveniles, 1985-2009) (USFWS-MBM file data).

Illegal and incidental take of emperor geese by hunters continues and the population impact is high as adults are believed to comprise most of the harvest. Cumulative impacts of harvest and natural mortality of emperor geese approach or exceed recruitment of breeding adults into the population (Wolfe and Paige 2002, USFWS-MBM file data). Hunting of emperor geese has been illegal since 1986 and range wide estimates of harvest in Alaska and Chukotka are incomplete, dated or lacking.

Emperor geese have exhibited their capability to respond positively when reproductive conditions are favorable and if adequate management procedures are initiated, a rapid increase in productivity and population size could be expected. Stopping or reducing human harvest and reducing the impacts of predation on nests and goslings are the most viable options available to increase emperor goose population size.

Following are what we view as the primary problems limiting recovery of the population and realistic management options to control and monitor these factors are:

- 1) **Problem:** Illegal hunting in spring, summer, fall and winter. Comprehensive harvest surveys are needed in Alaska and Russia to assess temporal and spatial distribution of harvest. **Management option:** Eliminate or greatly reduce harvest.
- 2) **Problem:** Predation during nesting and brood rearing as indicated by low productivity in recent years and chronic low survival of juveniles from pre-fledging through winter (Schmutz et al. 1997). **Management option:** Predator management of foxes and gulls on the Y-K Delta should be initiated and monitored for effectiveness in increasing recruitment of breeding birds into the population (Bowman et al.1997). Monitoring of age and season specific survival rates should be continued.
- 3) **Problem:** Wintering ecology of emperor geese is poorly understood and survival of juveniles is low. **Management option:** Marking and satellite tracking studies of emperor geese have suggested the importance of further research to quantify mortality factors and determine if manageable options exist to reduce them.

We suggest that the existing spring emperor goose survey be continued to monitor population size and trend as required by the species management plan. On average, the

majority of the emperor goose population arrives in the survey area by mid-April and departs for breeding areas in early May. A short duration survey window is faced by the survey crew resulting from the migratory chronology of the species and the challenging climatic conditions in the survey area (i.e. finding 3-5 consecutive survey days in the 3 week period). Nevertheless, we further suggest that, as conditions allow, continued consideration be given to obtaining replicate surveys of primary, high density staging sites. Replicate surveys would 1) help qualify the accuracy of the population index and 2) provide a useful measure of timing and duration of use of staging sites.

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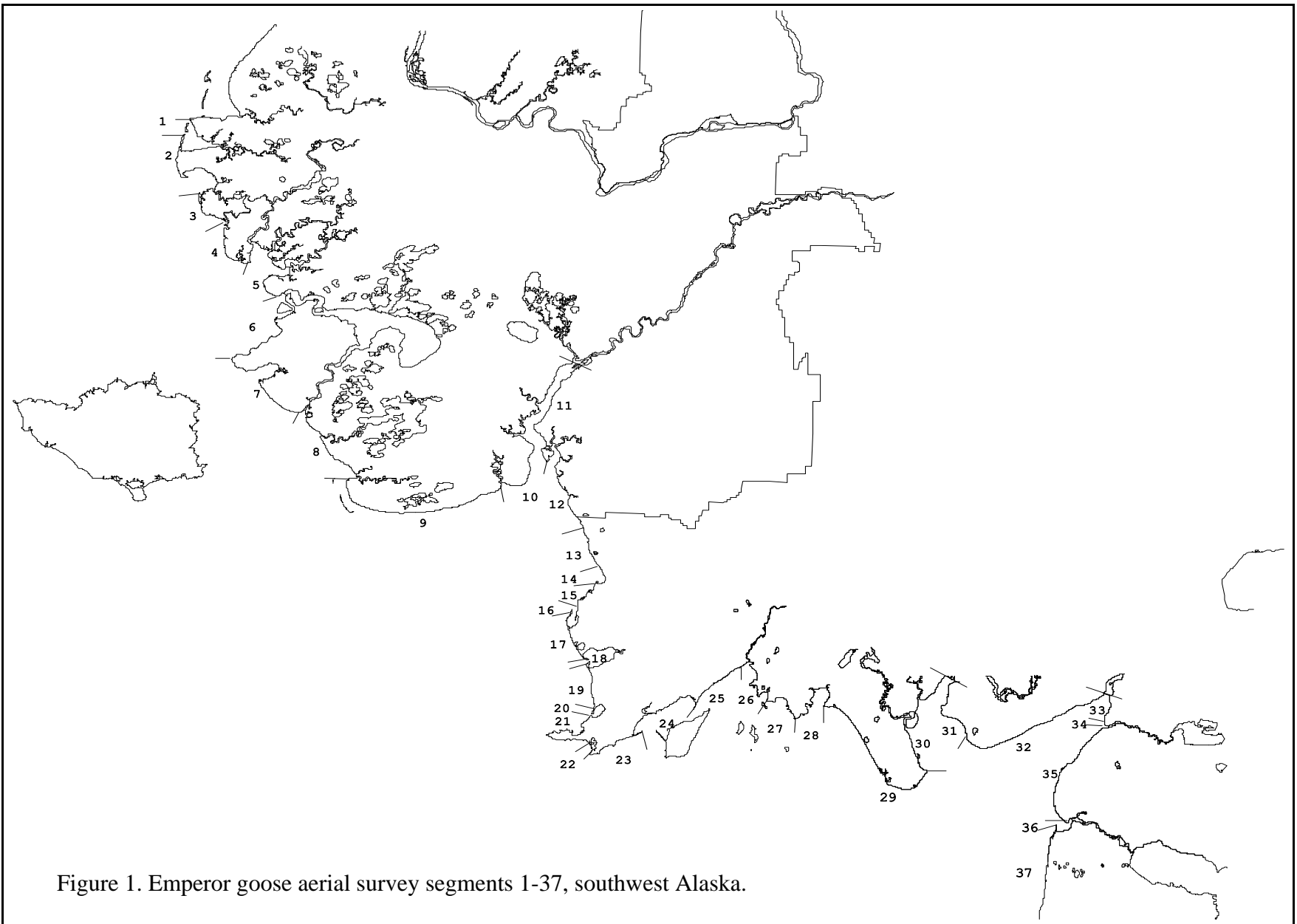


Figure 1. Emperor goose aerial survey segments 1-37, southwest Alaska.

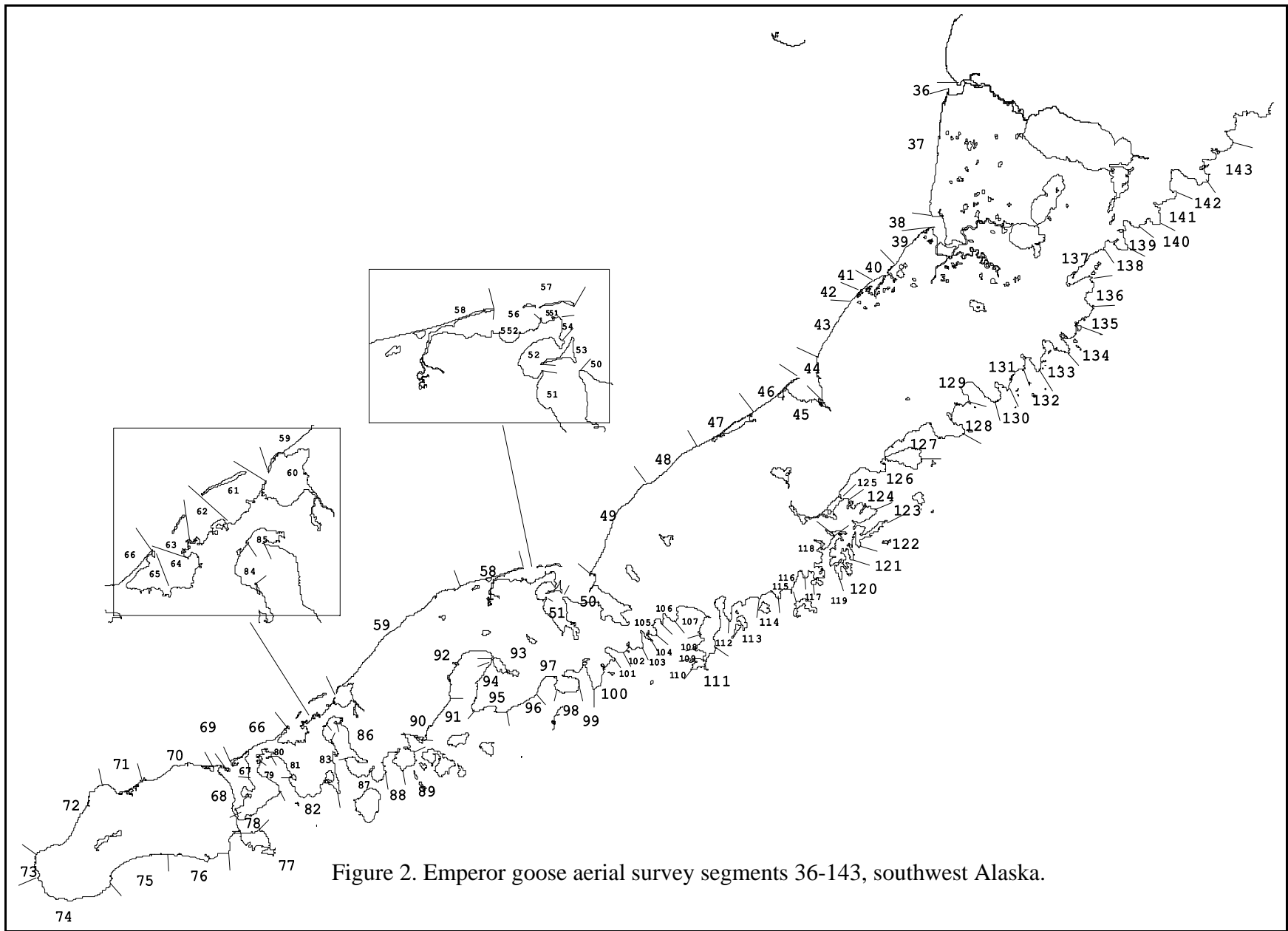


Figure 2. Emperor goose aerial survey segments 36-143, southwest Alaska.

Table 1. Snow and ice conditions during the spring emperor goose survey in southwest Alaska, 27 April 2010.

AREA	SNOW COVER ¹	MARINE ICE COVER ²
Kokechik Bay	NS	NS
Hooper Bay	NS	NS
Hazen Bay	NS	NS
Carter Bay	<5	100
Goodnews Bay	<5	80
Chagvan Bay	<5	85
Nanvak Bay	<5	99
Relative Phenology³	Late	Late

¹ Percent snow cover on near-shore freshwater marshes. NS= Not Surveyed.

² Percent of marine ice cover in estuary.

³ Subjective habitat conditions (early, average, late).

Table 2. Waterbird and mammal observations by segment, southwest Alaska, 27 April, 2-3 May 2010.

SPECIES	14	15	16	17	18	19	20	22	24	29	30	31	32	33
Bald Eagle(ad)								1		4				
Beluga Whale													26	11
Black Brant							700					25		
Black-legged Kittiwake												1		
Black Scoter										143	50	4	773	
Canada Goose											50		59	
Common Eider	2			1		6								
Common Merganser												2		
Emperor Goose							163							2
Greater Scaup	419				270					3	166	115	1109	600
Harbor Seal						35								
King Eider					2									
Large Gull	36	6	2	6	68		506		2	96	89	14	284	3
Long-tailed Duck	30				40	13	75		3	1015			52	2100
Mallard					255									
Mew Gull	10	6	20	15	50	10	95	1	2	872	47	140	185	582
Medium Shorebird												20		
Northern Pintail	195			33	300		10			30	25	92	1119	
Pelagic Cormorant					4		21							
Red-breasted Merganser		3		8			41		20	42	34	3	45	112
Red-throated Loon										44	17		9	
Sandhill Crane													2	
Small Shorebird	20											250	60	110
Steller's Eider	10				990	19	3268		18					
White-fronted Goose	75										2			
White-winged Scoter					10	3	1			47	17			

Table 2. (continued). Waterbird and mammal observations by segment, southwest Alaska, 27 April, 2-3 May 2010.

SPECIES	34	35	36	37	38	39	40	42	43	44	45	46	47	48	49
Amer. Green-winged Teal											40				
Amer. Wigeon	2														
Bald Eagle(ad)					1	1								2	1
Beluga Whale	5														
Black-legged Kittiwake					4									3427	2025
Black Scoter		138	256	10	78	3	65		465	13		826		38	73
Bufflehead	4							1							
Canada Goose					3										
Common Eider												10			
Common Merganser	13									5					
Common Murre															1
Common Raven					1	1	1						7	11	
Emperor Goose			791		1353		1368			85	12247	230	7228	344	
Goldeneye spp.	88						1								
Greater Scaup		10	110	5	919		270			3	140				
Gray Whale														3	4
Harlequin Duck								35							53
Harbor Seal	1										1201		590		
King Eider			15												
Large Shorebird							425								
Large Gull	37	84	815	4	9	4	119	48	158	122	1326	52	3570	226	152
Long-tailed Duck	2	1												7	
Mallard	16												50		
Mew Gull	2	867	601		262	71	405	60	5	171	927		500	18	
Medium Shorebird		24	150		2		10								
Northern Pintail	55		322	78	11		222	15			450		1415		
Parasitic Jaeger							1								
Pacific Loon					1				3						
Pelagic Cormorant														5	1
Red-breasted Merganser	86			15	5	4	15			108	10				
Red Fox								1							
Red-necked Grebe															2
Red-throated Loon	2		1		5					1					
Sandhill Crane								4							
Sea Otter					1						302	2	37		
Small Shorebird		10	400		200		3585	35			2000		1915		15
Steller's Eider											5555	50	2735	540	325
Tundra Swan	62														
Walrus															1
White-fronted Goose	8														
White-winged Scoter											1	21		14	51

Table 2 (continued). Waterbird and mammal observations by segment, southwest Alaska, 27 April, 2-3 May 2010.

SPECIES	50	51	52	53	54	56	57	58	59	60	61	62	63	64	65	66
Amer. Green-winged Teal										200						
Bald Eagle(ad)	5		2			2				2	3		2	1	5	1
Bald Eagle(juv)	1			2								1				
Black Brant									50	6565	6896	1010	486	6395	19060	
Black Scoter	35	126	700	20		5410	36	41	10	85	81		45			1335
Brown Bear													6			
Canvasback																4
Common Eider															10	
Common Loon										1						
Emperor Goose	4321	45	2406	63	3015	12536	135	2		5732	177	275	295		528	
Goldeneye spp.					15											
Greater Scaup			1595							880				10		
Gray Whale							7	18	47							
Gray Wolf																1
Harlequin Duck	11								87		21		32	40	60	136
Harbor Seal									1	12	8	1	60		20	
Large Gull	2583	336	280	3349	925	3420	540	17	162	2662	612	365	175	118	157	179
Long-tailed Duck										10						59
Mallard															30	
Mew Gull	1532	180	1300		100											
Medium Shorebird						300										
Northern Pintail			270							220	150	430	250	185		
Pelagic Cormorant																12
Red-breasted Merganser		60								25	93	5	73	65		127
Red-necked Grebe											3					60
Red-throated Loon										2						
Sea Otter	607			167		930	18			23	11	51	19	111	231	1
Small Shorebird			200					240	68	1000						
Steller's Eider				4000		6840				1675	5257	2415	125	2075	2668	
Steller's Sealion									1							3
Walrus																3
White-winged Scoter										8						2

Table 3. Spring Emperor Goose Survey, Southwest Alaska, 1981-2010.

YEAR	DATES	POPULATION SIZE		3-YEAR AVG.	% CHANGE	OBSERVERS
		NUMBER	% CHANGE			
1981	4/23-4/27	91267				R.King/C.Dau
1982	5/2-5/4	100643	10			"
1983	4/25-4/29	79155	-21	90355		"
1984	4/26-5/4	71217	-10	83672	-7	"
1985	5/12-5/16	58833	-17	69735	-17	"
1986	5/4-5/7	42231	-28	57427	-18	"
1987	4/30-5/4	51633	22	50899	-11	"
1988	5/2-5/6	53784	4	49216	-3	"
1989	5/3-5/6	45800	-15	50406	2	"
1990	4/28-5/4	67581	48	55722	11	"
1991	5/2-5/7	70972	5	61451	10	"
1992	4/30-5/5	71319	<1	69957	14	"
1993	4/30-5/5	52546	-26	64946	-7	"
1994	4/29, 5/2-6	57267	9	60377	-7	"
1995	5/3-5/6	54852	-5	54888	-9	"
1996	4/27-4/30	80034	46	64051	17	"
1997	4/25-4/28	57059	-29	63982	<-1	"
1998	5/4-5/7	39749	-30	58947	-8	"
1999	4/27-5/1	54600	37	50469	-14	"
2000	4/28-5/3	62565	15	52305	4	E.Mallek/C.Dau
2001	4/29-5/4	84396	35	67187	29	"
2002	5/3-5/6	58743	-30	68568	2	"
2003	4/29-5/3	71160	21	71433	4	"
2004	4/30-5/3	47352	-34	59085	-17	"
2005	4/20-4/23	53965	14	57492	-3	"
2006	4/27-5/2	76108	41	59142	3	"
2007	4/24-4/29	77541	2	69205	17	"
2008	4/29-4/30	64944	-16	72864	5	"
2009	5/1-5/3	91948	42	78144	7	"
2010	4/27, 5/2-5/3	64562	-30	73818	-6	"

Table 4. Numbers of emperor geese at primary staging sites surveyed in 2010.

Location (Segment/s)	2010	1981-2009
	Number	Average (Avg. % Total)
Yukon-Kuskokwim Delta (1-10)	NS ¹	537 (1)
Kuskokwim Bay (11-17)	0	201 (<1)
Chagvan Bay/Nanvak Bay (20, 22)	163	1178 (2)
Egegik Bay (36-37)	792	942 (2)
Ugashik Bay (38)	1353	1711 (3)
Cinder River Estuary (39-43)	1368	6414 (10)
Port Heiden (44-45)	12332	19433 (30)
Seal Islands Lagoon (46-47)	7458	8129 (12)
Port Moller/Nelson Lagoon (50-54, 56-58, 551-552)	29466	20392 (31)
Izembek Lagoon (60-65)	7007	3502 (5)
Pavlof Bay (91-92)	27	290 (<1)
Ivanof Bay (112)	NS	469 (<1)
Chignik Bay (125)	NS	221 (<1)
Wide Bay (136-137)	NS	1333 (2)

¹ NS= Not surveyed.

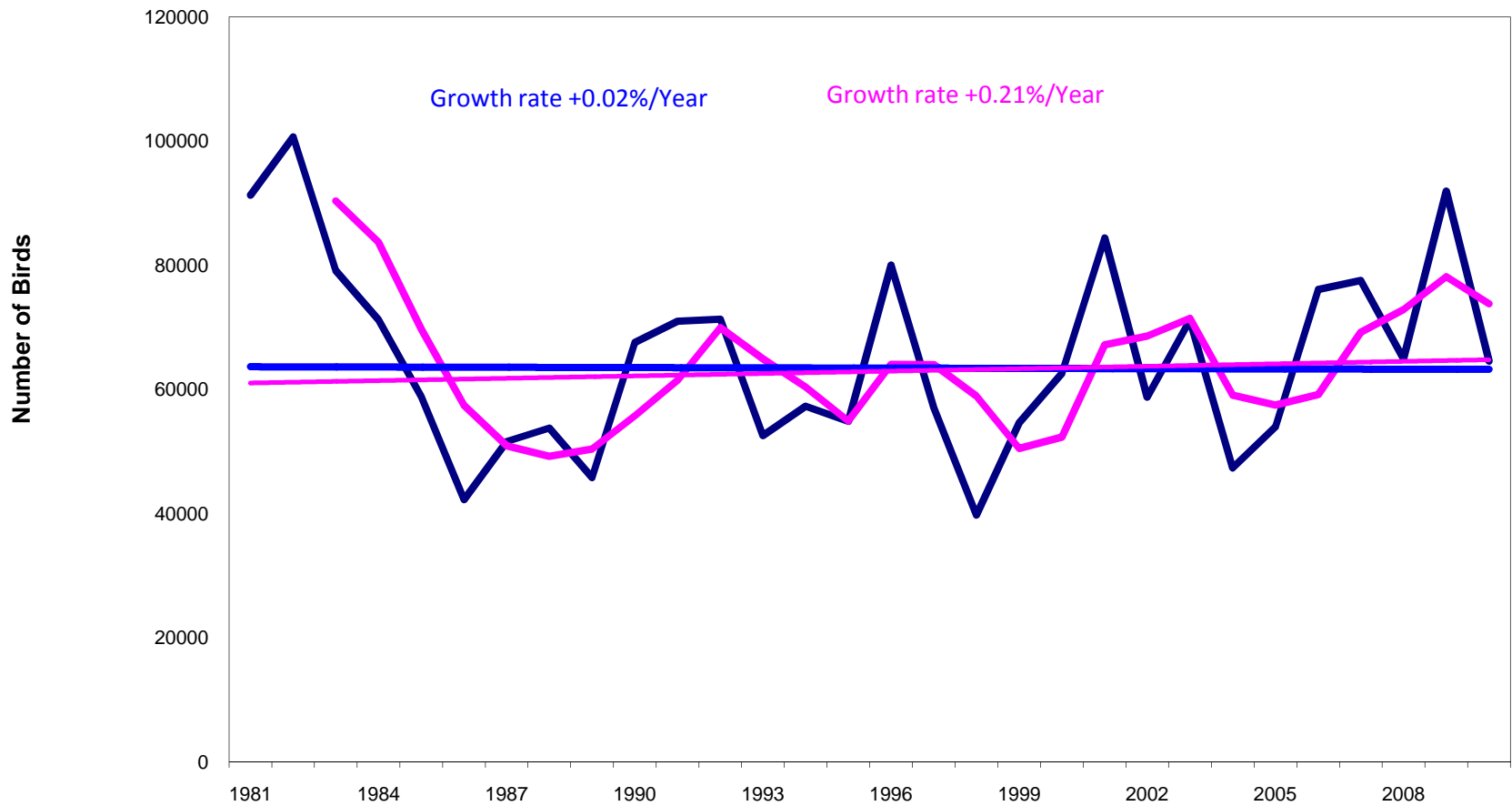


Figure 3. Trends in Spring Emperor Goose Population Counts and 3-Year Averages, 1981-2010.