

WF-8.6.1

SPRING SURVEY OF EMPEROR GEESSE  
IN SOUTHWESTERN ALASKA,  
3-4 May, 1982

By  
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Key Words: Emperor Geese, Waterbirds  
Southwestern Alaska, Bristol Bay,  
Distribution, Abundance

U.S. Fish and Wildlife Service  
Izembek National Wildlife Refuge  
Pouch 2  
Cold Bay, Alaska

May 1982

## INTRODUCTION

The uncertain status of the emperor goose prompted the Pacific Flyway study committee, recently charged with the responsibility of drafting a management plan for the species, to call for the initiation of a spring survey effort to determine the population size. The initial effort, from 23-27 April 1981, was successful and 91,267 emperor geese were observed during an aerial survey in coastal southwestern Alaska. Ice and weather conditions apparently play a significant roll in determining the rate of movement and distribution of these birds in spring and it was not until 3 and 4 May that the survey could be successfully completed in 1982. A total of 100,643 emperor geese were observed, a 10.3 percent increase over 1981.

## METHODS

The 1982 survey was accomplished by pilot/observers and observers flying in Cessna 180 and 185 Service aircraft. Survey altitude was often dictated by weather conditions, however, from 250 to 300 feet AGL was maintained when possible to facilitate species identification. The coastline, bays, lagoons and estuaries along the survey route were surveyed and all birds and marine mammals observed were recorded. Emphasis was placed on emperor geese and other geese, hence, the numbers of other birds seen should be considered approximations and probably minimum figures. In larger bays and lagoons deviations in straight line flight routes were made to obtain a complete coverage. Start and stop times for each survey leg were recorded, as were general habitat conditions, tide level and distribution of any shore-fast or floating sea ice. Crews and aircraft used in 1982 survey are shown in Table 1. Sea ice forecast charts issued by the National Weather Service were consulted and these data were compared to actual field conditions observed to document the ice conditions encountered in 1982 (Appendix 1).

## RESULTS AND DISCUSSION

The 1982 spring emperor goose survey was initiated on 21 April from King Salmon, Alaska. Sea ice condition forecasts and pilot reports suggested that the area from Kuskokwim Bay, south to Kvichak Bay, contained essentially no open leads and that key bay areas were completely ice bound. Hence, the northern legs of the survey were not included in the 21 April effort. Vern Berns and Glenn Elison of the Alaska Peninsula NWR acted as pilot/observer and observer, respectively, and Chris Dau of the Izembek NWR was observer and recorder. The coastline, bays and lagoons along the north side of the Alaska Peninsula from Naknek to Unimak Island were surveyed. Solid shore-fast ice with very few open leads extended south to Sandy River with all estuaries north of that location fast with ice. Snow cover was light and fresh-water ponds adjacent to the shore were frozen. A total of 43,545 emperor geese were observed (Appendix 2) which suggested the bulk of the population had not left the Aleutian Islands.

Table 1. Personnel and aircraft used in the  
1982 spring emperor goose survey

Date	Aircraft Type	Personnel	Area Covered
21 April <sup>1</sup>	Cessna 180	Berns (pilot), Dau, Elison	North side Alaska Peninsula, Naknek to Unimak Island
23 April	"	Berns (pilot), Nunn, Rogers	Cold Bay
27 April	"	Berns (pilot), Dau, Elison	North side Alaska Peninsula, Cold Bay to King Salmon <sup>2</sup>
3 May	Cessna 185	Reardon (pilot), Reiswig	Bethel to Platinum
"	"	R. King (pilot), Dau	North side Alaska Peninsula, Naknek to Izembek Lagoon
"	"	"	Izembek Lagoon to Unimak Island and South side Alaska Peninsula, Unimak Island to Wide Bay
"	Cessna 180	Berns (pilot), Elison	South side Alaska Peninsula, Portage Bay to Chignik Lagoon
4 May	Cessna 185	Reardon (pilot), Reiswig	Platinum to Naknek

<sup>1</sup> Mike Nunn substituted for Glenn Elison for segments from Izembek Lagoon to Unimak Island.

<sup>2</sup> Bays, lagoons and estuaries overflowed on direct flight to King Salmon. Assessment of numbers not made.

Figure 1. Percentage distribution of emperor geese seen on survey transect legs, 3 to 4 May, 1982

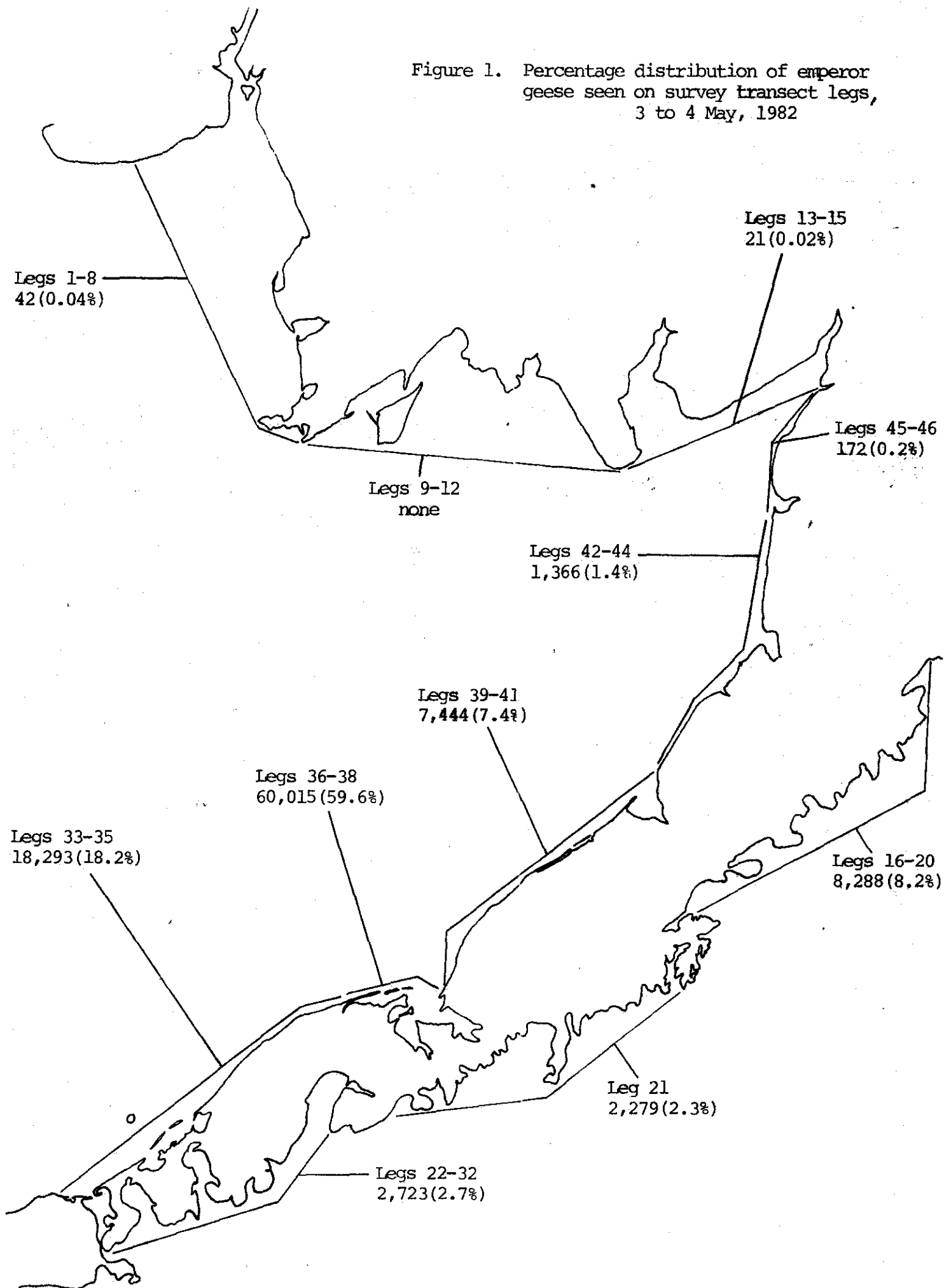


Table 2. Summary of Emperor Goose Sightings by Transect Legs  
May 3-4, 1982

Date	Survey Leg	Number of Emperor Geese	Observers
3 May	1	0	Reardon/Reiswig
"	2	0	"
"	3	0	"
"	4	0	"
"	5	7	"
"	6	0	"
4 May	7	0	"
"	8	35	"
"	9	0	"
"	10	0	"
"	11	0	"
"	12	0	"
"	13-15	21	"
"	16	918	King/Dau
"	17	930	"
"	18	Not Surveyed	"
"	19	2,305	"
"	20	4,135	"
"	21	2,279	"
"	21a	0	"
"	22	640	"
"	22a	73	"
"	23	20	"
"	24	445	"
"	25	260	"
"	26	0	"
"	27	0	"
"	28	925	"
"	29	0	"
"	30	360	"
"	31	0	"
"	32	Not Surveyed	"
"	33	0	"
"	34	8,825	"
3 May	34a	9,468	"
"	35	0	"
"	36	55,735	"
"	37	140	"
"	38	4,140	"
"	39	90	"
"	40	4,547	"
"	41	2,807	"
"	42	0	"
"	43	621	"
"	44	745	"
"	45	172	"
"	46	0	"

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100,643

Inclement weather prevented coverage of the south side of the Alaska Peninsula and on 27 April the survey crew returned to King Salmon.

The distribution of birds, sea ice and the weather patterns dominating the Alaska Peninsula during the last week of April suggested a second survey attempt in the latter part of the first week in May should catch the emperor population largely out of the Aleutian Islands but short of the Yukon Delta. Adequate weather was available on 3 and 4 May and three crews were able to completely cover the survey area. Mike Reardon (pilot/observer) and Barry Reiswig (observer) of the Yukon Delta NWR covered survey legs from Kuskokwim Bay to Naknek; Rod King (pilot/observer) with Wildlife Operations in Fairbanks and Chris Dau (observer) of the Izembek NWR surveyed the north and south sides of the Alaska Peninsula from Naknek to Unimak Island to Wide Bay; and Vern Berns (pilot/observer) and Glenn Ellison (observer) of the Alaska Peninsula NWR covered the segments from Portage Bay to Chignik Lagoon. A total of 100,643 emperor geese were observed along the survey route which adhered quite closely to the forty-six survey segments established in 1981. (Fig. 1) (Table 2)

On 3 May, broken ice held onshore by northerly winds was found from Cape Chichagof to Cape Kutuzof along the north side of the Alaska Peninsula. Estuaries in this area were likewise largely filled with ice. Kvichak Bay and areas west of Port Moller were ice-free, as were all areas along the south side of the peninsula (surveyed on 4 May).

On the northern legs of the survey on 3 May, pack ice was found south to midway between Eek and Quinkagak, then extending west, including the north half of Kuskokwim Bay. Approximately 100 to 200 yards of broken ice was along the shore from the edge of the pack ice south to Security Cove and all bays were largely ice covered, as were adjacent ponds. Coastal areas along the north side of Bristol Bay were ice free on 4 May.

Appendix 1 is a description of ice conditions observed, modified by ice charts prepared by the National Weather Service (NOAA). A summary of counts of birds and mammals by survey segment follows:

Start:	<u>May 3, 1982</u>	
Leg 1.	<u>Bethel to Kwigillingok</u>	1328
	Whistling Swan	1
	Unk. Duck	2
	Large Gull	170
Leg 2.	<u>Pek Island to Quinhagak</u>	1350
	Canada Goose	7
	Whistling Swan	5
	Unk. Duck	2
	Glaucous-winged Gull	17
	Sandhill Crane	2

Leg 3.	<u>Quinhagak to Jacksmith Bay</u>	1420	
	Unk. Duck		25
	Unk. Eider		2
	Large Gull		60
Leg 4.	<u>Jacksmith Bay to Carter Bay</u>	1435	
	Canada Goose		3,040
	Large Gull		10
Leg 5.	<u>Carter Bay</u>	1448	
	Emperor Goose		7
	Black Brant		200
	Large Gull		40
Leg 6.	<u>Carter Bay to Platinum</u>	1459	
	(including Goodnews Bay)		
	Unk. Dark Goose		6
	Pintail		24
	Unk. Eider		50

May 4, 1982

Leg 7.	<u>Platinum to Security Cove</u>	1020	
	(including Chagvan Bay)		
	Black Brant		400
	Pintail		520
	Large Gull		87
Leg 8.	<u>Security Cove to Cape Pierce</u>	1036	
	(including Nanvak Bay)		
	Emperor Goose		35
	Black Brant		115
	Unk. Eider		310
	Large Gull		180
Leg 9.	<u>Cape Pierce to Asigyupak Spit</u>	1045	
	Unk. Eider		570
	Unk. Scooter		5
	Large Gull		3
Leg 10.	<u>Asigyupak Spit to Tongue Point</u>	1055	
	Unk. Eider		5
	Large Gull		5
Leg 11.	<u>Tongue Point to Kulukak Point</u>	1115	
	(including Kulukak Bay)		
	Canada Goose		125
	Black Brant		63
	Whistling Swan		150
	Pintail		190
	Unk. Eider		327
	Unk. Duck		125
	Large Gull		869

Leg 12.	<u>Kulukak Point to Dillingham</u>	1205-1301, 1335-1355
	Unk. Dark Goose	2
	Mallard	15
	Pintail	1,390
	Unk. Eider	159
	Unk. Duck	710
	Sandhill Crane	3
	Large Gull	610
Legs 13-15.	<u>Dillingham to Naknek</u>	1355
	Emperor Goose	21
	White-fronted Goose	1,706
	Canada Goose	1,123
	Black Brant	260
	Snow Goose	75
	Unk. Dark Goose.	12
	Unk. Eider	75
	Unk. Puddle Duck	2,311
	Unk. Scoter	20
	Large Gull	795
	Sandhill Crane	75
Leg 16.	<u>Hartman Island to Coal Point</u>	1900-1915
	(including Wide Bay)	
	Emperor Goose	918
	Black Brant	599
	Black Scoter	410
	Surf Scoter	25
	Oldsquaw	30
	Red-breasted Merganser	10
	Glaucous-winged Gull	640
	Mew Gull	150
	Small Shorebird	200
Leg 17.	<u>Cape Kilokak to Hartman Island</u>	1845-1900
	Emperor Goose	930
	Black Brant	250
	Glaucous-winged Gull	555
	Sea Otter	10
Legs 18-19.	<u>Base of Cape Kumliun to Cape Kilokak</u>	1727-1845
	Emperor Goose	2,305
	Black Brant	1,050
	Whistling Swan	5
	Black Scoter	880
	Harlequin	155
	Red-breasted Merganser	180
	Steller's Eider	1,195
	Unk. Seaduck	20
	Glaucous-winged Gull	1,480
	Cormorant	3
	Parasitic Jaeger	4
	Small Sandpipers	20
	Bald Eagle 10A(2 nests), 2J	



Sea Otter	382
Brown Bear	5

Leg 20. Chignik Lagoon to Base of Cape Kumlium 1631-1650,  
1711-1727

Emperor Goose	4,135
Black Brant	6,985
Black Scoter	870
Harlequin	40
Pintail	50
Steller's Eider	370
Greater Scaup	10
Glaucous-winged Gull	350
Mew Gull	550
Cormorant	40
Pigeon Guillemot	1
Common Loon	1
Small Sandpipers	400
Bald Eagle	3A (one nest)
Sea Otter	6
Grey Whale	2

Leg 21. Dorenoi Bay to Mitrofanina 1510-1620

Emperor Goose	2,279
Black Brant	205
White-fronted Goose	10
Mallard	32
Pintail	130
Harlequin	25
Common Goldeneye	2
Black Scoter	24
Surf Scoter	150
White-winged Scoter	20
Glaucous-winged Gull	1,777
Black-legged Kittiwake	3,000
Pelaepi Cormorant	58
Small Sandpiper	100
Bald Eagle	14A(3nests), 8J
Sea Otter	2

Leg 21a. Kuiukta Bay 1620-1631

Scoter sp.	30
Harlequin	200
Glaucous-winged Gull	145

Leg 22.	<u>Canoe Bay</u>	1441-1455
	Emperor Goose	640
	Pintail	30
	Red-breasted Merganser	10
	Steller's Eider	20
	Glaucous-winged Gull	40
Leg 22a.	<u>Beaver Bay to Balboa Bay</u>	1455-1510
	Emperor Goose	73
	Black Brant	1
	Red-breasted Merganser	115
	Unk. Seaducks	50
	Glaucous-winged Gull	255
Leg 23.	<u>Jackson Lagoon to Canoe Bay</u>	1433-1441
	(including Pavlof Bay)	
	Emperor Goose	20
	Small Sandpipers	170
	Glaucous-winged Gull	220
	Bald Eagle	2A
	Common Raven	1
Leg 24.	<u>Arch Point to Jackson Lagoon</u>	1415-1433
	Emperor Goose	445
	Black Brant	265
	Glaucous-winged Gull	400
Leg 25.	<u>Volcano Bay</u>	1407-1415
	Emperor Goose	260
	Black Brant	1,510
	Harlequin	35
	Red-breasted Merganser	15
	Unk. Seaduck	10
	Bald Eagle	4A: 4J
Leg 26.	<u>Indian Head to Volcano Bay</u>	1400-1407
	Black Brant	285
	Unk. Seaduck	60
	Red-breasted Merganser	30
	Glaucous-winged Gull	80
Leg 27.	<u>Leonard Harbor</u>	1355-1400
	no birds	
Leg 28	<u>Cold Bay (town) to Leonard Harbor</u>	1341-1355
	(including Kinzarof Lagoon)	
	Emperor Goose	925
	Black Brant	915
	Snow Goose	1
	Steller's Eider	1,650
	Glaucous-winged Gull	450

Leg 29.	<u>Cold Bay (town) to Delta Point</u> 1255-1300 (including Nurse Lagoon) no birds																										
Leg 30.	<u>Big Lagoon to Delta Point</u> 1225-1255 (including Little John, Old Mans, Mortenson Lagoons) <table> <tr><td>Emperor Goose</td><td>360</td></tr> <tr><td>Whistling Swan</td><td>12</td></tr> <tr><td>Mallard</td><td>4</td></tr> <tr><td>Harlequin</td><td>9</td></tr> <tr><td>Red-breasted Merganser</td><td>40</td></tr> <tr><td>Unk. Seaduck</td><td>20</td></tr> <tr><td>Glaucous-winged Gull</td><td>662</td></tr> <tr><td>Pelagic Cormorant</td><td>125</td></tr> <tr><td>Sea Otter</td><td>4</td></tr> </table>	Emperor Goose	360	Whistling Swan	12	Mallard	4	Harlequin	9	Red-breasted Merganser	40	Unk. Seaduck	20	Glaucous-winged Gull	662	Pelagic Cormorant	125	Sea Otter	4								
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Leg 31.	<u>Boiler Point to Big Lagoon</u> 1215-1225 (including Little, Middle and Big Lagoons) <table> <tr><td>Glaucous-winged Gull</td><td>775</td></tr> <tr><td>Bald Eagle</td><td>1A</td></tr> </table>	Glaucous-winged Gull	775	Bald Eagle	1A																						
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Leg 32.	<u>Isanotski Strait to Kenmore Head</u> not surveyed																										
Leg 33.	<u>Cape Krenitzin to Swanson Lagoon</u> 1140-1210 (including Hook Bay and St. Catherine's Cove) <table> <tr><td>Black Brant</td><td>2</td></tr> <tr><td>Whistling Swan</td><td>2</td></tr> <tr><td>Mallard</td><td>52</td></tr> <tr><td>Pintail</td><td>20</td></tr> <tr><td>Harlequin</td><td>3</td></tr> <tr><td>Steller's Eider</td><td>20</td></tr> <tr><td>Unk. Seaduck</td><td>17</td></tr> <tr><td>Glaucous-winged Gull</td><td>1,025</td></tr> <tr><td>Tufted Puffin</td><td>15 (Isanotski Is.)</td></tr> <tr><td>Bald Eagle</td><td>3A, 8J</td></tr> <tr><td>Common Raven</td><td>20</td></tr> <tr><td>Sea Otter</td><td>3</td></tr> <tr><td>Grey Whale</td><td>3</td></tr> </table>	Black Brant	2	Whistling Swan	2	Mallard	52	Pintail	20	Harlequin	3	Steller's Eider	20	Unk. Seaduck	17	Glaucous-winged Gull	1,025	Tufted Puffin	15 (Isanotski Is.)	Bald Eagle	3A, 8J	Common Raven	20	Sea Otter	3	Grey Whale	3
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Leg 34.	<u>Strawberry Point to Cape Krenitzin</u> 1040-1140 (including Izembek Lagoon and Applegate Cove) <table> <tr><td>Emperor Goose</td><td>8,825</td></tr> <tr><td>Black Brant</td><td>61,645</td></tr> <tr><td>Pintail</td><td>500</td></tr> <tr><td>Steller's Eider</td><td>35,788</td></tr> <tr><td>Common Eider</td><td>50</td></tr> <tr><td>Oldsquaw</td><td>100</td></tr> <tr><td>Red-breasted Merganser</td><td>95</td></tr> <tr><td>Glaucous-winged Gull</td><td>2,475</td></tr> <tr><td>Bald Eagle</td><td>3A</td></tr> <tr><td>Common Raven</td><td>4</td></tr> <tr><td>Harbor Seal</td><td>190</td></tr> <tr><td>Grey Whale</td><td>22</td></tr> </table>	Emperor Goose	8,825	Black Brant	61,645	Pintail	500	Steller's Eider	35,788	Common Eider	50	Oldsquaw	100	Red-breasted Merganser	95	Glaucous-winged Gull	2,475	Bald Eagle	3A	Common Raven	4	Harbor Seal	190	Grey Whale	22		
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Grey Whale	22																										

May 3, 1982

Leg 34a.	<u>Moffett Point to Strawberry Point</u> 1915-1920 (including Moffett Bay)
	Emperor Goose 9,468
	Black Brant 46,365
	Black Scoter 800
	Steller's Eider 23,800
	Glaucous-winged Gull 200
	Bald Eagle 5A, 3J
	Common Raven 8
Leg 35.	<u>Sapsuk River mouth to Moffett Point</u> 1810-1840
	Black Brant 100
	Whistling Swan 2
	Common Goldeneye 3
	Oldsquaw 35
	Steller's Eider 200
	Red-breasted Merganser 30
	Unk. Seaduck 400
	Glaucous-winged Gull 733
	Small shorebirds 300
	Rough-legged Hawk 1
	Bald Eagle 22A, 11J
	Common Raven 18
	Harbor Seal 100
	Sea Lion 2 dead
	Grey Whale 15
Leg 36.	<u>Point Divide to Sapsuk River mouth</u> 1725-1810 (including Nelson Lagoon, Mud Bay and Kudobin, Deer and unnamed sand islands)
	Emperor Goose 55,735
	Pintail 35
	Black Scoter 7,500
	Scoter sp. 31,900
	Steller's Eider 25,073
	Common Eider 315
	Red-breasted Merganser 6
	Glaucous-winged Gull 5,215
	Parasitic Jaeger 1
	Small shorebirds 4,775
	Common Raven 2
	Bald Eagle 6A(1 nest), 5J
Leg 37.	<u>Herendeen Bay</u> 1635-1710
	Emperor Goose 140
	Black Scoter 10
	White-winged Scoter 85
	Scoter sp. 500
	Oldsquaw 25
	King Eider 25
	Unk. Seaduck 2,500
	Glaucous-winged Gull 50
	Common Raven 2
	Bald Eagle 3A, 1J

Leg 38.

Port Moller (town) to Point Divide 1610-1635

Emperor Goose	4,140
Mallard	150
Unk. Puddle Duck	300
Greater Scaup	150
Black Scoter	630
White-winged Scoter	94
Scoter sp.	1,750
Harlequin	25
Oldsquaw	85
Common Goldeneye	10
Red-breasted Merganser	45
Steller's Eider	570
King Eider	820
Unk. Sea Duck	470
Glaucous-winged Gull	465
Mew Gull	200
Black-legged Kittiwake	600
Small shorebirds	610
Bald Eagle	3A
Walrus	4

Leg 39.

Ilnik to Port Moller 1540-1610

Emperor Goose	90
Canada Goose	10
Black Scoter	62
Red-breasted Merganser	40
Harlequin	70
Steller's Eider	952
Unk. Sea Duck	1,275
Glaucous-winged Gull	6
Mew Gull	6
Black-legged Kittiwake	6,850
Red-faced Cormorant	200
Small shorebird	102
Bald Eagle	2A

Leg 40.

Base of Stroganof Point to Ilnik 1510-1540  
(including Seal Island Lagoon)

Emperor Goose	4,547
White-fronted Goose	10
Whistling Swan	9
Unk. Puddle Duck	100
Black Scoter	1,244
White-winged Scoter	25
Common Goldeneye	2
Steller's Eider	2,455
Red-breasted Merganser	60
Unk. Sea Duck	10
Small shorebirds	150
Glaucous-winged Gull	18
Mew Gull	20
Arctic Tern	1
Common Raven	10

1454-1510

Emperor Goose	2,807
Canada Goose	104
Whistling Swan	4
Mallard	2
Pintail	2
Unk. Puddle Ducks	100
Black Scoter	3
Scoter sp.	520
Red-breasted Merganser	5
Merganser sp.	75
Sandhill Crane	3
Large shorebird(godwits or curlews)	150
Small shorebirds	600
Glaucous-winged Gull	14
Mew Gull	2
Bald Eagle	4A, 2J

Cinder River to Port Heiden 1435-1454

Glaucous-winged Gull	5
Marsh Hawk	1(female)

Cape Meshikof to Cinder River 1405-1435  
(including Cinder River estuary and Hook Lagoon)

Emperor Goose	621
White-fronted Goose	10
Whistling Swan	5
Greater Scaup	25
Steller's Eider	20
Surf Scoter	110
White-winged Scoter	50
Scoter sp.	250
Merganser sp.	20
Unk. Seaduck	1,600
Sandhill Crane	1
Large shorebirds (Godwits or Curlews)	110
Small shorebirds:	460
Glaucous-winged Gull	54
Mew Gull	150
Common Raven	1

Goose Point to Cape Meshikof 1320-1405  
(including Ugashik)

Emperor Goose	745
Canada Goose	7
Whistling Swan	22
Black Scoter	40
Scoter sp.	210
Pintail	860
Red-breasted Merganser	320
Common Merganser	10
Unk. Seaduck	20
Glaucous-winged Gull	176

Mew Gull	119
Sandhill Crane	2
Large shorebirds (Godwits or Curlews)	50
Small shorebirds	2,625
Plover sp.	101
Common Raven	8

Leg 45. Chichagof to Goose Point 1305-1320  
(including Egegik)

Emperor Goose	172
Canada Goose	52
White-fronted Goose	67
Whistling Swan	13
Black Scoter	1,500
Greater Scaup	5
Common Eider	7
Steller's Eider	50
Unk. Puddle Duck	200
Unk. Seaduck	1,000
Glaucous-winged Gull	410
Mew Gull	10
Plover sp.	50
Small shorebirds	500

Leg 46. Naknek to Chichagof 1250-1305

White-fronted Goose	35
Whistling Swan	9
Mallard	300
Pintail	1,910
Common Goldeneye	10
Unk. Seaduck	27
Glaucous-winged Gull	280
Mew Gull	777
Common Raven	3

### CONCLUSION

Considerably more effort was required to successfully complete the 1982 survey effort. We began surveying two days earlier this year (i.e. 21 April) based on the assumption that the phenology of the spring migration of emperor geese would be similar year to year. This was not found to be the case as the bulk of the population was not found in the survey area until midway in the first week of May, nearly two weeks later than in 1981.

Valuable data on the temporal and spatial distribution of the 100,643 emperor geese observed, as well as for other species, were obtained in 1982. However, I would suggest that to expedite future efforts, close scrutiny of sea ice charts and pilot reports be maintained to establish when favorable conditions exist in the Bristol Bay area for migrating emperor geese. In a year such as 1982 when ice cover in the survey area was fairly extensive, a successful survey could possibly have been done as late as 10-15 May. With the ice free conditions found in 1981, I believe some birds would probably have been north of the survey area by 1 May.

Weather and ice conditions in the northern segments of the survey area (i.e. Kuskokwim Bay) may be the best determination of a starting date for the effort. As a comment for discussion, I would suggest initiating the 1983 effort between 25 April and 10 May, to coincide with the presence of open shore leads along Kuskokwim Bay and the availability of habitat in Chagvan and Nanvak Bay.



APPENDIX 1. Environmental conditions recorded during 1982  
emperor goose survey, 21 April - 4 May

21 April: Naknek to Sandy River

A complete pack of broken young and first year ice was shore-fast over this area with very few shore leads observed north of Cape Seniavin. Egehik Bay, Ugashik Bay, Cinder River estuary, Port Heiden and Ilnik/Seal Islands Lagoon were all 95 to 100% ice-covered. Tidal mud flats along the west side of Port Moller, supporting nearly 30,000 emperor geese in April 1981, were ice and snow covered in 1982.

The few small areas of open water present from Naknek to Sandy River did support numerous seaducks and a fair number of sea otter (<50). A few sea otter were observed along the ice or beach where no open water was available.

Sandy River to Izembek Lagoon

Approximately one-third of Port Moller and Herendeen Bay (the inland sections) were ice covered, while Mud Bay and Nelson Lagoon were ice free. Some floating ice was present near Deer Island and in the mouth of Port Moller. Shorefast sea ice was absent south of Port Moller with the exception of the east and south sides of Moffett Bay where up to one mile of shore-fast ice was present.

27 April: Cold Bay to King Salmon (including partial over-flight of bays, lagoons and estuaries)

From Moffett Point to Cape Seniavin no shore-fast ice was present, however, at the latter location, pack ice was visible approximately 50-75 miles offshore. Shore-fast ice began at Ilnik and extended north of Ugashik to the vicinity of Cape Grieg. Numerous open leads to 10-15 miles in width were present and off-shore of Port Heiden open water composed 40-60 percent of the visible area. Broken ice was common in Seal Islands Lagoon and Port Heiden was still  $\geq 90$  percent ice covered, however, an approximately one mile wide band of ice free mud flat was present along the west side of the bay. Approximately 60 percent ice cover was present on the Cinder River estuary and at Ugashik Bay. Egegik Bay was ice free with 100 to 200 yards of broken ice present along the coastline. Seaward of this line of brash was approximately 60 percent open water.

3 May: Naknek to Cape Chichagof

Open water with no shore-fast ice and fresh-water ponds opening up. Snow cover was absent.

#### Cape Chichagof to Unimak Island

Broken ice was shore-fast with numerous leads to  $\geq 50$  miles offshore of Cape Chichagof. Egegik Bay was approximately 80 percent covered with broken ice with few open leads offshore to  $\leq 75$  miles (i.e. limit of vision). Ugashik Bay and Cinder River estuary were approximately 80 percent ice covered. Port Heiden was approximately 95 percent ice covered with most near-shore ponds frozen and lightly snow covered. A coastal lead approximately 1/2 mile in width was present off Seal Islands with 60 percent ice cover in the lagoon. At Ilnik the pack ice began to disperse with large leads and open water areas to  $\geq 60$  miles offshore. Shore-fast ice terminated at Ilnik Lake with brash to  $\geq 20$  miles offshore. Brash was again pushed on-shore from Cape Kutuzof to the mouth of Port Moller with continuous ice to  $> 50$  miles offshore (i.e. limit of vision). Ponds from Port Heiden to Port Moller were mostly frozen. Bays, lagoons and estuaries from Port Moller south were ice free, as were fresh-water ponds.

#### Kwigillingok to Cape Newenham

The southern edge of the pack ice extended from mid-way between Eek Island and Quinhagak west, including the north half of Kusko-kwim Bay. A strip of shore-fast ice of  $\leq 200$  yards in width extended from the pack ice south to Security Cove. Carter Bay, Chagvan Bay, Goodnews Bay and Nanvak Bay were largely ice covered. Onshore had heavy snow cover with fresh-water ponds frozen.

4 May: Cape Newenham to Naknek

Largely ice free with heavy snow cover onshore.

#### Unimak Island to Wide Bay (i.e. south side of the Alaska Peninsula)

Ice free with no snow at lower elevations on shore and all fresh-water ponds open.

↑ FIRST YEAR ICE  
↑ SOUTHERN LIMIT OF SEA ICE:  
3 MAY

YOUNG ICE  
4/21, 4/27

ICE MARGIN: 3 MAY  
YOUNG ICE  
4/21, 4/27, 5/3

↑ SOUTHERN LIMIT OF SEA ICE: 27 APRIL

↑ SOUTHERN LIMIT OF SEA ICE: 21 APRIL

APPENDIX 2. Results of survey attempts of 21, 23 and 27 April, 1982.

21 April 1982

Leg 46.	<u>Naknek to Cape Chichagof</u>	0728	
	Raven		1
Leg 45.	<u>Cape Chachagof to Goose Point</u>	0735	
	(incl. Egegik)		
	Common Goldeneye		20
	King Eider		350
	Common Merganser		50
	Large Gull		5
Leg 44.	<u>Goose Point to Cape Meshikof</u>	0754	
	(incl. Ugashik)		
	Emperor Goose		175
	Oldsquaw		300
	King Eider		100
	Unk. Eider		15
	Unk. Scoter		5
	Unk. Diving Duck		1,400
	Large Gull		10
	Raven		8
Leg 43.	<u>Cape Meshikof to Cinder River</u>	0825	
	Oldsquaw		50
	Unk. Scoter		10
	Common Merganser		10
	Large Gull		1
	Raven		1
Leg 42.	<u>Cinder River to Port Heiden</u>	0840	
	On Port Heiden	0855	
	Emperor Goose		9
	Oldsquaw		60
	Black Scoter		58
	Common Eider		10
	Common Merganser		10
	Small shorebirds		15 (probably Rock Sandpipers)
	Large Gull		5
Leg 41.	<u>Port Heiden to Base of Stroganof Pt.</u>	0937	
	(incl. Port Heiden)		
	Emperor Goose		317
	Oldsquaw		1
	Black Scoter		205
	Common Eider		30
	King Eider		130
	Steller's Eider		100
	Common Merganser		20
	Large Gull		47
	Raven		11
	Snow Bunting		17
	Bald Eagle		1Ad. 1Juv.
	Sea Otter		9

Leg 40.

Base of Stroganof Pt. to Ilnik Village 0950  
(incl. Seal Islands)

Emperor Goose	638
Oldsquaw	5
White-winged Scoter	700
Unk. Scoter	76
Common Eider	600
King Eider	2
Steller's Eider	195
Unk. Duck	46
Large Gull	26
Raven	8
Bald Eagle	1Ad.
Sea Otter	33 (incl. 1 dead)

Leg 39.

Ilnik Village to Port Moller (town) 1012

Emperor Goose	3
Whistling Swan	2
Unk. Scoter	900
White-winged Scoter	100
King Eider	600
Steller's Eider	410
Common Merganser	36
Unk. Duck	15
Bald Eagle	5Ad.
Snow Bunting	1
Grey Whale	11
Sea Otter	4
Harbor Seal	6

Leg 38.

Port Moller (town) to Point Divide 1040

Emperor Goose	163
Greater Scaup	349
Oldsquaw	38
Black Scoter	197
White-winged Scoter	63
Unk. Scoter	520
King Eider	88
Steller's Eider	657
Common Merganser	5
Unk. Duck	100
Bald Eagle	13Ad. (incl. 2 nests) 1Juv.
Harbor Seal	10

Leg 37.

Herendeen Bay 1110

Emperor Goose	755
Black Brant	4
Common Goldeneye	10
Oldsquaw	60
Black Scoter	1,430
White-winged Scoter	155
King Eider	570
Steller's Eider	530

Bald Eagle	7Ad., 2Juv.
Large Gull	106
Raven	3

Walrus	4
Brown Bear	2

Leg 36.

Sapsuk River to Point Divide 1155  
 (incl. Nelson Lagoon, Mud Bay, Kudobin Islands,  
 Deer Island and sand islands)

Emperor Goose	25,854
Black Brant	850
Mallard	6
Greater Scaup	50
Oldsquaw	83
Black Scoter	9,140
White-winged Scoter	280
Black Scoter/	
Steller's Eider Mix	8,525
Common Eider	10
King Eider	5,200
Steller's Eider	3,670
Red-breasted Merganser	10
Bald Eagle	5Ad. (incl. 1 nest)
Small shorebirds	1,800
Raven	2
Harbor Seal	125

Leg 35.

Sapsuk River to Moffett Point 1305

Oldsquaw	2
Black Scoter	40
King Eider	2
Steller's Eider	123
Pelagic Cormorant	4
Bald Eagle	3Ad.
Large Gull	443
Raven	20
Harbor Seal	120
Sealion	15

Leg 34.

Moffett Point to Cape Krenitzin 1331-1400, 1447  
 (incl. Izembek Lagoon)

Emperor Goose	13,476
Black Brant	9,931
Mallard	270
Pintail	40
Unk. Puddle Duck	200
Greater Scaup	100
Black Scoter	500
White-winged Scoter	30
Unk. Scoter	550
Common Eider	2
King Eider	2
Steller's Eider	40,908

Red-breasted Merganser	18
Bald Eagle	13Ad. (incl. 1 nest), 6Juv.
Large Gull	1,291

Harbor Seal	247
Sea Otter	13

Leg.33.3      Cape Krenitzin to Swanson Lagoon 1600  
 (incl. Hook Bay and St. Catherine's Cove)

Whistling Swan	10
Common Goldeneye	50
Red-breasted Merganser	30
Bald Eagle	2Ad., 2Juv.
Large Gull	480

Leg 30.  
 (part)      Little John Lagoon. 1645

Emperor Goose	245
Small shorebirds	100

Leg 31.  
 (part)      Big, Middle and Little Lagoons 1630

Emperor Goose	110
Whistling Swan	2
Common Goldeneye	2
Steller's Eider	54
Large Gull	250

#### 23 April 1982

Legs 28,29,  
 30 (part)      Thinpoint to Kinzarof Lagoon 1500

Emperor Goose	1,800
Black Brant	1,700
Whistling Swan	31
Mallard	30
Pintail	80
Common Goldeneye	100
Bufflehead	122
Oldsquaw	40
Harlequin	14
Black Sooter	67
Steller's Eider	2,095
Red-breasted Merganser	2
Unk. Seaduck	30
Small shorebirds	275
Large Gull	5,000

#### 27 April 1982

Not a complete count (i.e. brief pass over primary lagoon/bay systems)

Moffett Bay 1535

Emperor Goose	515
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Nelson Lagoon

Emperor Goose	1,147
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Mud Bay

Emperor Goose	1,000
Grey Whale	1