

Aerial survey of wintering Pacific brant and other waterbirds in the area of Izembek Lagoon and Sanak Islands, Alaska, February-March 2011.

**Karen S. Bollinger**, *U.S. Fish and Wildlife Service, Migratory Bird Management, Waterfowl Management Branch, 1412 Airport Way, Fairbanks, Alaska 99701, Karen\_S\_Bollinger@fws.gov*

**ABSTRACT** This report presents the results of the February-March 2011 midwinter survey of Pacific Flyway brant (*Branta bernicla*) in the Izembek National Wildlife Refuge (NWR) area and the Sanak Islands, located at the southern tip of the Alaska Peninsula. The Izembek NWR area included shorelines and estuaries from Moffet and Izembek lagoons to Bechevin Bay along the north side of the Alaska Peninsula, and Kinzarof Lagoon, Cold Bay, and Morzhovoi Bay on the south side of the peninsula. The Sanak Islands, including Sanak, Caton, and associated smaller islands, are located approximately 80 km south of the Izembek NWR. Surveys of the Izembek NWR area were flown on 27 and 28 February and 01 March. The Sanak Islands were flown only on 27 February. A Cessna 206 amphibian aircraft (N61599) served as the survey platform. The pilot and right-seat observer made observations from their respective sides of the aircraft. The 27 February survey results totaled 48,900 brant including 46,383 in the Izembek NWR area and 2,517 in the Sanak Islands. Totals for other primary species (Izembek/Sanak) were 3,524 emperor geese (905/2,619), and 14,174 Steller's eiders (13,087/1,087) on 27 February. Ice cover in both the Bering Sea and Pacific Ocean estuaries was 30-40%, while the Sanak Islands were completely ice free.

**Key Words** Alaska Peninsula, *Branta bernicla*, brant, emperor geese, Steller's eiders, waterbirds, Izembek Lagoon, Izembek National Wildlife Refuge, Sanak Islands, winter survey

April 2012

---

## INTRODUCTION

Aerial surveys of the wintering population of Pacific brant (*Branta bernicla*; hereafter brant) at the Izembek NWR area (refuge coastline and adjacent marine estuaries; hereafter Izembek) have been flown annually since 1980 and at the Sanak Islands (hereafter Sanak) since the winter of 2009-2010. Data from these surveys document distribution, abundance, population trends, and habitat use in relation to ice conditions. Because of the increasing number of wintering brant at Izembek (Ward et al. 2009), this population has been included in the annual Pacific Flyway midwinter index (PF-MWI) since winter 1985-1986. Current 3-year running averages from the PF-MWI provide population management indices for Pacific brant (Pacific Flyway Council 2002). Alaska wintering brant are an increasingly important element in this index.

## METHODS

**Study Area.** The Izembek area includes shorelines and estuaries from Moffet and Izembek lagoons to Bechevin Bay along the north side of the Alaska Peninsula, and includes Kinzarof Lagoon, Cold Bay, and Morzhovoi Bay along the south side of the Peninsula (Fig. 1). Brant have long been reported to winter in the Sanak Islands, 80 km south of Izembek, with earliest reports being ground-based estimates of approximately 2,000 birds in the 1950's (Jones 1952, 1955). The Sanak Islands includes Sanak, Caton, Elma, and Long islands and numerous smaller islands and rocks (Fig. 2).

The Izembek area has been divided into six main survey units:

(i)	St Catherine Cove	Bechevin Bay	Segment 68
(ii)	Hook Bay	Bechevin Bay	Segment 67
(iii)	Big Lagoon	Morzhovoi Bay	Segment 80
(iv)	Izembek Lagoon		Segments 60-65
(v)	Kinzarof Lagoon		Segment 85
(vi)	Cold Bay – upper western shore		Segments 83 and 84

The Izembek Lagoon has been divided into six segments:

(i)	Norma Bay	Segment 65
(ii)	Applegate Cove	Segment 64
(iii)	Grant Point	Segment 63
(iv)	Round Island	Segment 62
(v)	Blaine Point	Segment 61
(vi)	Moffet Lagoon	Segment 60

The Sanak Islands has been divided into four survey units:

(i)	Sanak North
(ii)	Sanak South
(iii)	Canton North
(iv)	Canton South

**Survey Logistics.** The 2011 winter survey of Izembek and Sanak was flown on 27 February by Migratory Bird Management (MBM) personnel in an amphibious Cessna 206 aircraft (N61599), with the author serving as pilot/observer and Paul D. Anderson, as observer. The survey was flown at a ground speed of approximately 160 km/hr (100 mph) and an altitude of 45 m (150 ft) above ground level. Observations, made from both sides of the aircraft, were voice recorded into panel-mounted computers and later transcribed using a program developed by Jack Hodges (USFWS-MBM, Juneau, Alaska). A replicate survey of Izembek was flown on 28 February. On 01 March, only brant were counted during a survey of Izembek flown at an altitude of 150 m (500 ft). All three counts are reported, but the 27 February count is used as the official count of the survey for all species.

Systematic flight paths provided coverage of all nearshore and open water areas along the shorelines and in estuaries within the survey areas. On-board, panel-mounted computers provided map displays showing position and track. This aided navigation and insured complete

coverage. Observations of habitat and survey conditions including air temperature, sky condition, visibility, wind speed and direction, and ice cover were recorded.

**Survey Conditions.** Conditions were good overall, although considerable glare was present during portions of the survey. Weather was similar during the three days that surveys were flown. Skies were clear. Visibility, although hazy, was unlimited with peaks being visible from distances of 70 km. Temperatures dipped to the upper teens overnight and ranged from 35°F to 40°F during the day. During survey flights, winds were generally north–northeast and varied from 12-20 knots. Ice cover in both the Bering Sea and Pacific Ocean estuaries was 30-40%. The ice in Izembek was gray and deteriorated over the three days of the survey. The coastal waters around Sanak Islands were completely ice-free, but ice was present on inland lakes.

## RESULTS

### Pacific Brant

We observed an overall total of 48,900 brant at Izembek (46,383) and Sanak (2,517) during the 27 February survey (Tables 1 and 2). The 27 February Izembek count for brant was also the peak count for the three surveys. Total brant counts at Izembek were 46,383; 29,145; and 45,733 for the 27 February, 28 February, and 01 March surveys, respectively (Tables 1, 3, 4a, and 4b). The 2011 Izembek peak count (46,383) represents the highest count ever recorded and was 75.4% above the February 2010 estimate of 26,443 (Dau and Bollinger 2010). Peak winter counts at Izembek have varied among years, but the long-term trend (1980-2012) indicates a 7.6% per year increase (average = 14,789 [SE = 1,959; 95% CI = 10,769-18,809;  $R^2 = 0.727$ ]; MBM/Izembek NWR files; Fig. 3).

Distribution of brant varied among survey days (Tables 4a and 4b). Izembek Lagoon had the highest number of brant for all surveys with percentages of 89%, 73%, and 50%, respectively. Additionally, almost two-thirds of the birds within Izembek Lagoon were observed in Norma Bay during all three surveys (Segment 65; Table 4a). Brant moved out of Izembek Lagoon and into Bechevin Bay, Morzhovoi Bay, and Kinzarof Lagoon during the three days of the survey. The percentage of brant observed in Kinzarof Lagoon increased from 8% on 27 February to 29% on 01 March. The large flock of brant observed in Kinzarof Lagoon on 01 March was not observed there the following morning. A ground crew based at Kinzarof Lagoon during the survey period observed flocks of brant flying into and out of the lagoon (David Ward, USGS, pers. comm.).

The 2011 count at Sanak (2,517) was less than half the 2010 Sanak count of 5,303 (Dau and Bollinger, unpubl. data) and was 17.5% below the 1991 Sanak count of 3,052 (Appendix 1).

### Emperor Goose

We observed an overall total of 3,524 emperor geese at Izembek (905) and Sanak (2,619) during the 27 February survey (Tables 1 and 2). Only 168 emperor geese were observed at Izembek on 28 February (Table 3). On both Izembek surveys, most were found in Izembek Lagoon (96% and 76% for 27 and 28 February, respectively; Segments 60-65). The 2011 Izembek count (905) is 41.6% below the 2010 average count of 1,549 (Dau and Bollinger 2010) and 65.2% below the

1984-2011 average of 2,598 (SE = 271; 95% CI = 2,041-3,155;  $R^2 = 0.0286$ ; MBM/Izembek NWR files; Fig. 4). Izembek winter counts have been highly variable, but the long-term trend shows a -1.5% growth rate per year (Fig. 4).

### **Steller's Eider**

We observed an overall total of 14,174 Steller's eiders at Izembek (13,087) and Sanak (1,087) (Tables 1 and 2) during the 27 February survey. A total of 14,608 were observed at Izembek on 28 February (Table 3). The 2011 Izembek count (13,087) is 41.1% below the 2010 average count of 22,214 (Dau and Bollinger 2010) and 39.4% below the 1980-2011 average of 21,603 (SE = 3,000; 95% CI = 17,270-25,937;  $R^2=0.0372$ , MBM/Izembek NWR files; Fig 5). The winter counts have been highly variable, but the long-term trend shows a -1.4% growth rate per year (Fig. 5). A total of 86.8% and 95.4% of the Steller's eiders observed were found in Izembek Lagoon (Segments 60-65) on 27 and 28 February, respectively.

### **Other species**

Observations of 15 species/species groups of other waterfowl, 9 species/species groups of other birds, and 5 mammal species were made on the 27 and 28 February 2011 Izembek surveys (Table 5). Estimates of birds and mammals in Izembek for the years 2009, 2010, and 2011, including consecutive survey days flown in 2010 and 2011, are presented in Table 6 for comparison. Additionally, estimates of birds and mammals observed at Sanak for the years 1970, 1991, 2010, and 2011 are presented in Appendix 1 for comparison.

Observations of these other species are peripheral to the main focus of counting the three main species: brant, emperor geese, and Steller's eiders. Comparison of relative numbers of these other species among years can be made, but differences in the tide level, ice conditions, flight track, and observer variability all affect the numbers counted. Differences in counts of individual species even exist for surveys flown on consecutive days within the same year. Variability in an observer's effort to record other species, especially in areas where large flocks of brant or Steller's eiders occur, is probably the major factor affecting these counts.

## **DISCUSSION / RECOMMENDATIONS**

The Izembek count of wintering brant has been used as part of the Pacific Flyway midwinter index (PF-MWI) since 1986 (Table 7). Currently, the Alaska MWI count (i.e., Izembek MWI count) for Pacific brant does not include estimates at Sanak Island (USFWS 2011, Pacific Flyway Data Book). Starting in 2010, the winter survey crew began surveying the Sanak Islands during the standard survey because of the increasing number of brant found at Izembek and the need to document their numbers at other known nearby wintering areas. Because we found high numbers of brant at Sanak (5,303 and 2,517 in 2010 and 2011, respectively) and the area is easily surveyed, we recommend formal expansion of the standard survey area to also include Sanak each year and that the combined totals for these areas become the Alaska MWI count. Additionally, we recommend that the 2010 and 2011 Alaska brant MWI counts be amended in future publications of the Pacific Flyway Data Book as follows to reflect the combined Izembek/Sanak totals: 2010 (31,746), 2011 (48,900) (i.e., Izembek/Sanak MWI counts, Table 7).

During the three days of the 2011 survey, we observed movement of brant out of Izembek Lagoon to nearby bays and lagoons (Bechevin, Morzhovoi, and Kinzarof). The three counts also suggested that birds temporarily moved out of the survey area on 28 February before returning by the next day, 01 March. It is possible that brant moved short distances offshore in the Bering Sea or to the middle of Cold Bay on 28 February when their estimate was much lower than the other two days of the survey.

In 2011, we flew the Izembek midwinter brant survey much later than when it had been flown in recent years. The survey was flown on 02 February in 2009 and on 01-02 February in 2010. We originally flew to Cold Bay on 06 February 2011 in anticipation of flying the survey, but weather prevented actual completion of the survey until the end of the month. Brant might typically begin making more local movements in the area in early March as compared to early February. We do not believe that our numbers were inflated by arrival of any brant returning from wintering in Mexico, however (David Ward, USGS, pers. comm.).

Historical observations at Sanak (Jones 1952, 1955; McKnight 1971; Dau and Chase 1995; MBM/Izembek NWR files) suggest regular wintering by brant, but their relationship to the Izembek population requires further study. Wintering numbers of brant in Izembek are increasing, but not enough data exists for Sanak to evaluate trends. Coordinated aerial surveys during periods of variable ice conditions could help determine whether brant occurring at these two locations are discrete or if they move between sites based on ice conditions. Additional surveys are required to better define the relationship of ice cover and brant distribution.

It is unknown to what extent eelgrass habitats are being impacted by increasing numbers of wintering brant and their concentrated foraging at sites that are also heavily utilized during fall staging. Continued research on stability and use of eelgrass habitats at Izembek will become increasingly important if milder weather conditions continue and brant grazing pressure increases. An additional concern is that south side Alaska Peninsula estuaries at Izembek are State of Alaska tidelands and currently not protected by special habitat designation. Increased use of these estuaries by brant occurs when ice prevents access to Izembek Lagoon; thus brant would benefit if Kinzarof Lagoon; Big, Middle and Little lagoons in Morzhovoi Bay; and Hook Bay and St. Catherine's Cove in Bechevin Bay were designated State Critical Habitats or additions to the Izembek State Game Refuge.

*“The findings and conclusions in this article are those of the author(s) and do not necessarily represent the views of the U.S. Fish and Wildlife Service.”*

## **ACKNOWLEDGMENTS**

I thank Paul D. Anderson (MBM-R7) for serving as observer during the survey. Thanks to the staff of the Izembek NWR for their support in not only providing lodging, hangar space, and vehicle use, but also access to data from previous surveys. Thanks to Bob Platte (MBM-R7) for his assistance in preparation of maps for Figures 1 and 2. Thanks to Lynn Denlinger who provided helpful comments on an earlier draft of this report.

## LITERATURE CITED

- Dau, C. P., and M. A. Chase. 1995. Aerial survey of wintering birds and mammals in the Sanak Islands. Unpublished report. U.S. Fish and Wildlife Service, Cold Bay, Alaska. 7 pp.
- Dau, C. P., and K. S. Bollinger. 2011. Aerial survey of wintering Pacific brant and other waterbirds on and adjacent to the Izembek NWR, Alaska, 2009-2010. Unpublished report. U.S. Fish and Wildlife Service, Anchorage, Alaska. 7 pp.
- Jones, R. D., Jr. 1952. Quarterly refuge narrative report for the Aleutian Islands National Wildlife Refuge, 1 Sept. to 31 Dec. 1952. Unpublished report. U.S. Fish and Wildlife Service, Cold Bay, Alaska. 10 pp.
- Jones, R. D., Jr. 1955. Refuge narrative report for the Aleutian Islands National Wildlife Refuge and the Izembek Bay Area, Jan. to April 1955. Unpublished report. U.S. Fish and Wildlife Service, Cold Bay, Alaska. 10 pp.
- MBM/Izembek NWR files. Multi-species database of waterbird and marine mammal surveys along the lower Alaska Peninsula. U.S. Fish and Wildlife Service, Migratory Bird Management, Anchorage; Izembek National Wildlife Refuge, Cold Bay, Alaska.
- McKnight, D. E. (ed). 1971. Report of survey and inventory activities, Part III – Waterfowl and small game. Vol. II, Annual Project Seg. Report. Federal Aid in Wildlife Restoration, Proj. W-17-3, Jobs No. 10 & 11. 76 pp.
- Pacific Flyway Council. 2002. Pacific Flyway management plan for Pacific brant. Unpublished report. Pacific Flyway Study Committee [c/o USFWS, DMBM], Portland, Oregon. 40 pp. + appendices
- U.S. Fish and Wildlife Service. 2011. Pacific Flyway Data Book: Waterfowl harvests and status, hunter participation and success in the Pacific Flyway and United States. Compiled by D. P. Collins, C. A. Palmer, and R. E. Trost. Unpublished report. Division of Migratory Bird Management, Portland, Oregon. 106 pp.
- Ward, D. H., C. P. Dau, T. Lee Tibbitts, J. S. Sedinger, B. A. Anderson, and J. E. Hines. 2009. Change in abundance of Pacific brant wintering in Alaska: Evidence of a climate warming effect? *Arctic* 62(3):301-311.



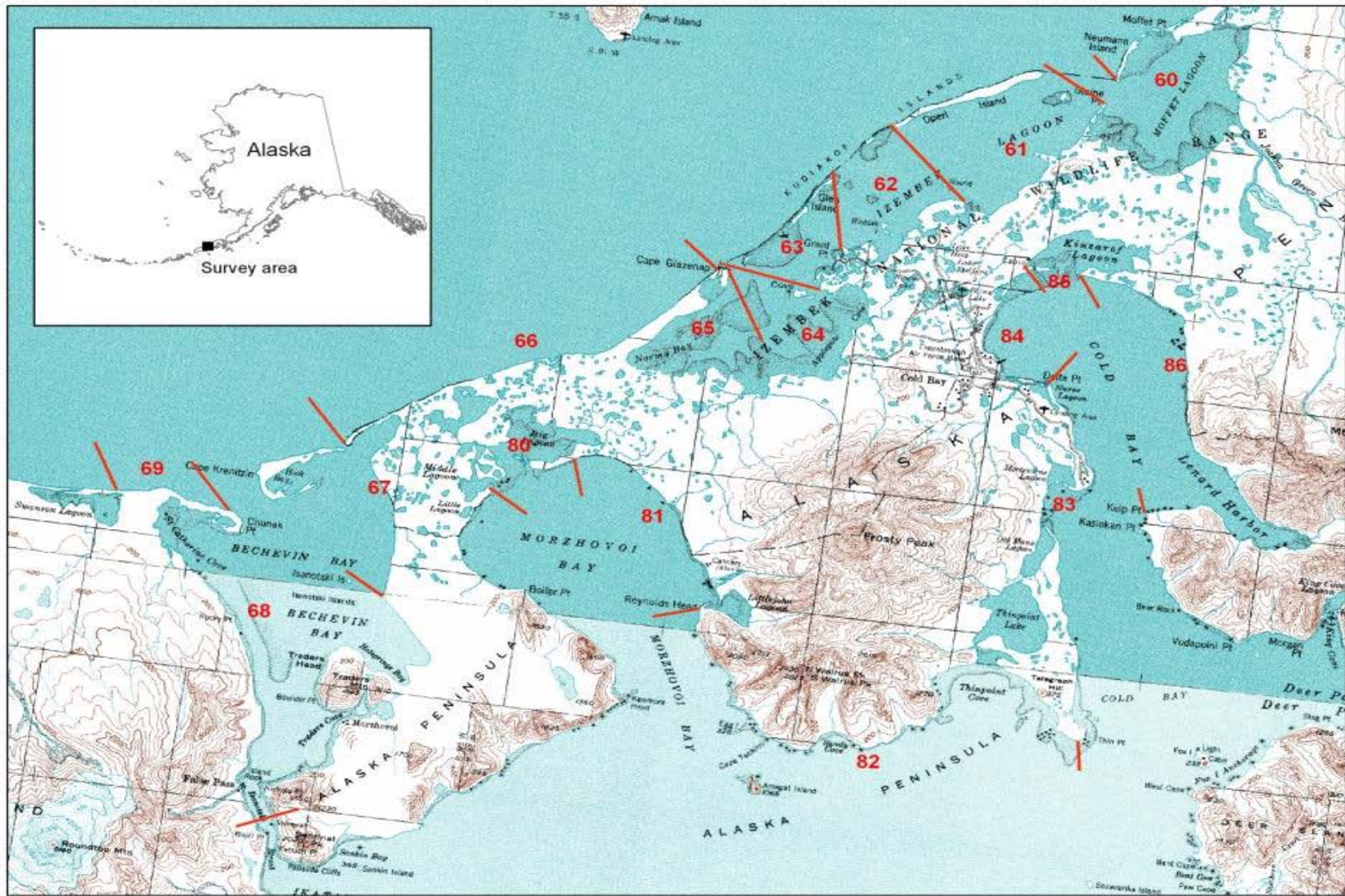


Figure 1. Map of Pacific brant survey area by segment in the Izembek National Wildlife Refuge area, Alaska.



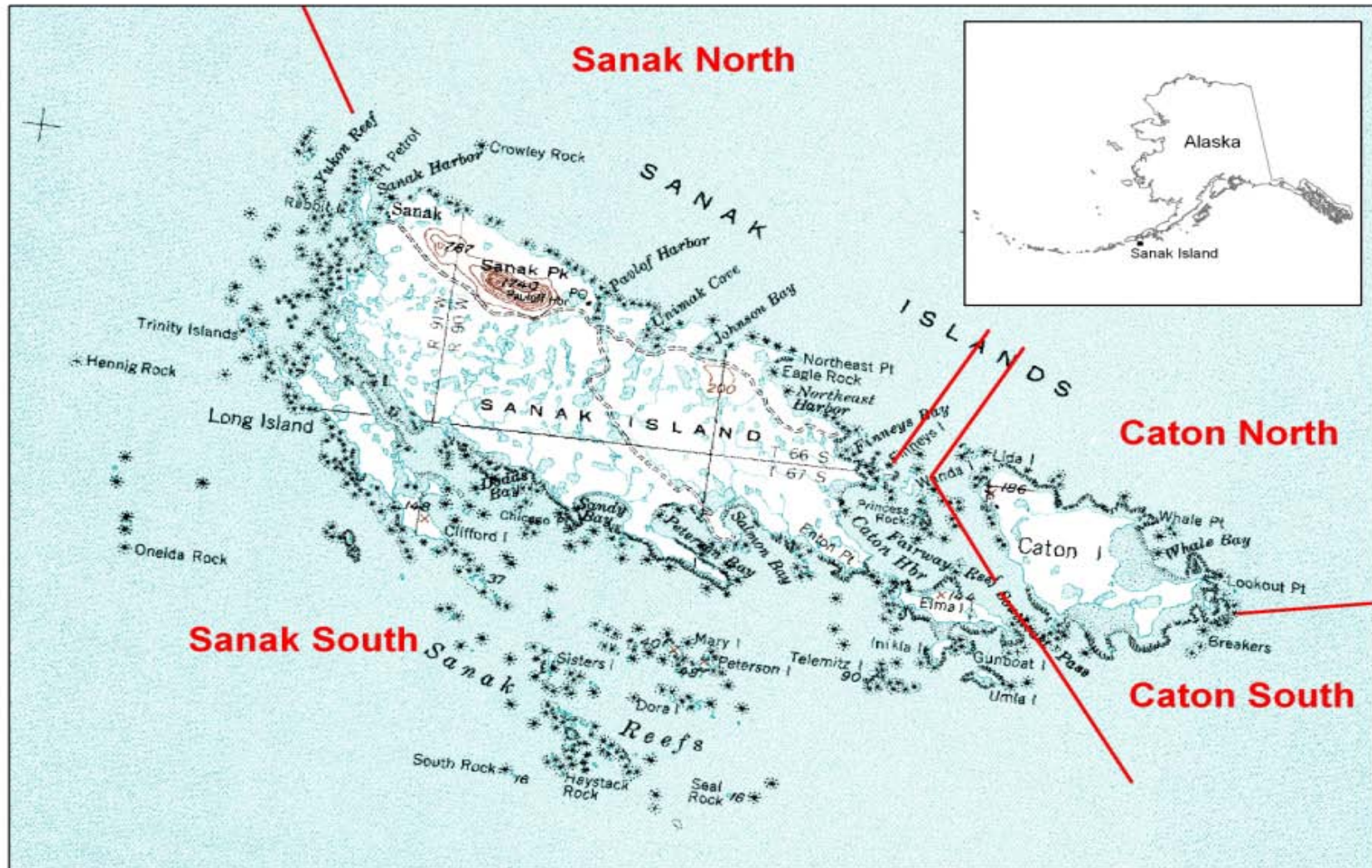
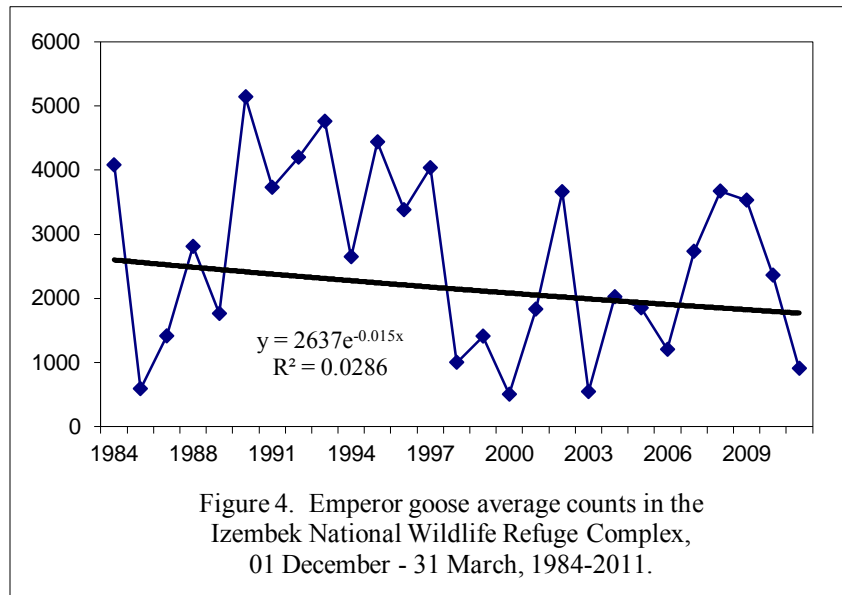
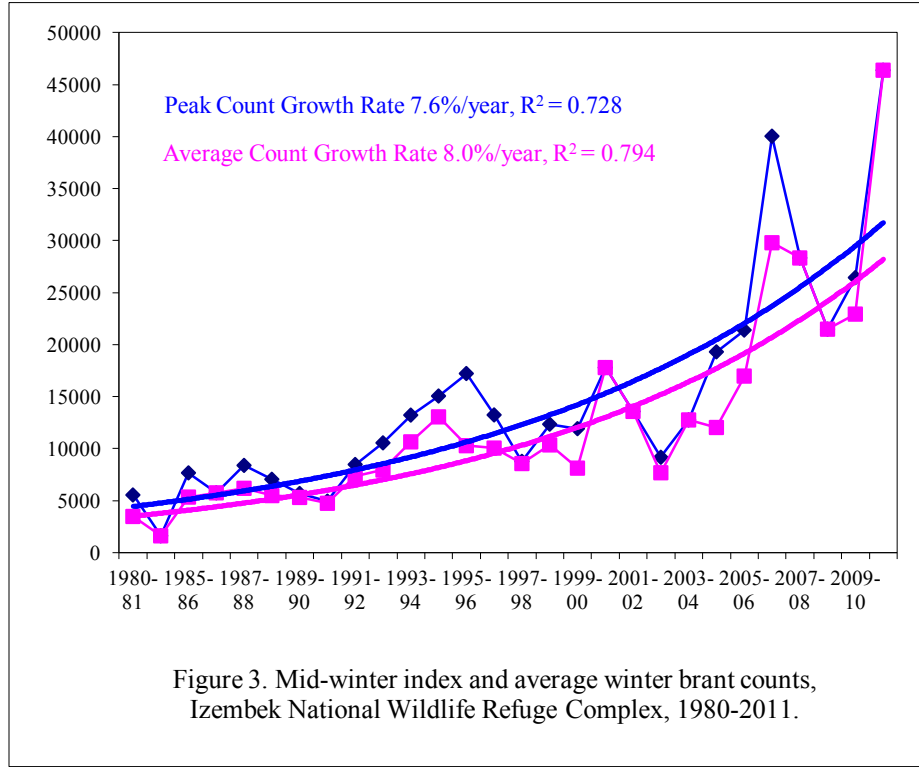


Figure 2. Map of Pacific brant survey areas, Sanak Islands, Alaska.





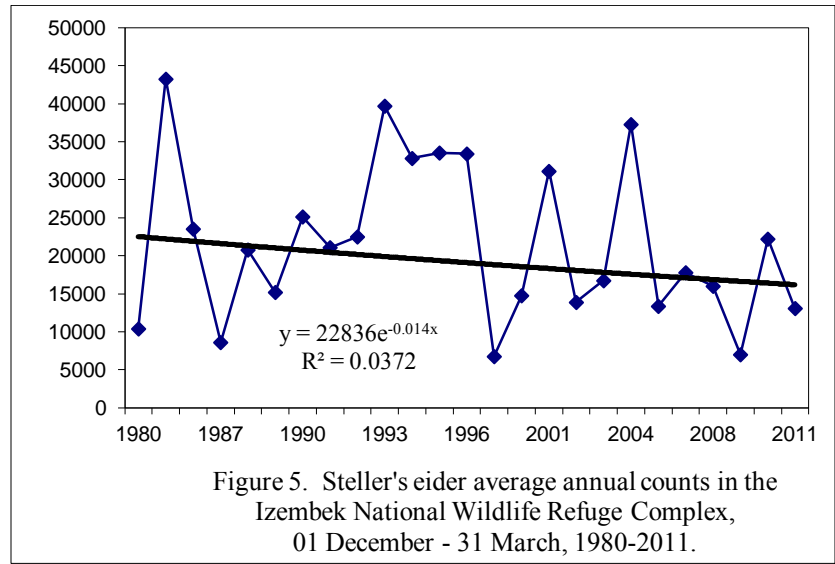


Table 1. Waterbird and mammal observations by segment, Izembek National Wildlife Refuge area, Alaska, 27 February 2011.

Species	Survey segment											Total
	60	61	62	63	64	65	67	68	80	84	85	
Tundra Swan	0	0	0	0	0	0	0	0	2	0	0	2
Canada Goose	0	0	0	0	0	14	0	0	0	0	0	14
Pacific Brant	0	1040	11700	0	736	27900	787	0	0	620	3600	46383
Emperor Goose	0	0	0	0	40	825	40	0	0	0	0	905
Mallard	0	0	0	0	0	120	0	56	30	0	50	256
Northern Pintail	0	0	0	0	0	0	6	0	60	0	0	66
Eurasian Wigeon	0	0	0	0	0	0	0	0	300	0	0	300
Greater Scaup	0	0	0	0	0	200	40	0	10	0	0	250
Common Eider	0	0	0	0	0	0	7	0	0	10	0	17
Steller's Eider	1500	1991	205	10	1956	5700	353	450	0	0	922	13087
Long-tailed Duck	3	31	27	7	207	3	93	12	0	0	0	383
Black Scoter	0	60	5	30	10	50	166	5	0	0	0	326
White-winged Scoter	0	4	0	0	0	0	4	0	0	0	0	8
Goldeneye spp.	0	0	0	0	30	0	0	0	0	0	0	30
Red-breasted Merganser	0	7	1	50	4	54	157	0	33		32	338
Common Loon	0	0	0	0	0	0	1	0	0	0	0	1
Pelagic Cormorant	0	0	0	0	0	0	4	1	0	0	0	5
Bald Eagle		2	0	0	0	1	1	0	1	0	0	5
Ptarmigan spp.	0	0	0	0	0	200	0	0	0	0	0	200
Small Shorebird	0	0	0	0	0		50	0	0	0	10	60
Large Gull	80	55	36	123	345	70	232	81	273	0	74	1369
Sea Otter	0	0	1	0	11	1	2	1	0	0	0	16

Table 2. Waterbird and mammal observations by segment, Sanak Islands, Alaska, 27 February 2011.

Species	Survey segment				Total
	Caton North	Canton South	Sanak North	Sanak South	
Tundra Swan	0	7	0	47	54
Pacific Brant	481	799	10	1227	2517
Emperor Goose	487	222	181	1729	2619
Mallard	34	50	10	86	180
Northern Pintail	300	155	0	106	561
Greater Scaup	40	24	0	140	204
Common Eider	47	117	10	72	246
Steller's Eider	346	396	73	272	1087
Harlequin Duck	54	50	10	121	235
Long-tailed Duck	4	4	29	41	78
Black Scoter	257	71	29	135	492
White-winged Scoter	6	0	0	0	6
Goldeneye spp.	0	50	3	22	75
Bufflehead	0	44	0	9	53
Red-breasted Merganser	35	3	0	32	70
Common Loon	1	0	0	3	4
Pelagic Cormorant	31	4	33	29	97
Bald Eagle	2	2	6	8	18
Small Shorebirds	0	650	100	10	760
Large Gull	16	13	7	60	96
Common Raven	0	10	0	0	10
Harbor Seal	30	0	0	0	30
Cattle	0	0	46	367	413
Horse	0	0	0	15	15

Table 3. Waterbird and mammal observations by segment, Izembek National Wildlife Refuge area, Alaska, 28 February 2011.

Species	Survey segment													Total
	60	61	62	63	64	65	66	67	68	69	80	83	85	
Tundra Swan	0	0	0	0	0	0	0	0	0	22	0	0	0	22
Pacific Brant	2386	6030	0	0	0	12941	0	2277	299	0	2897	300	2015	29145
Emperor Goose	6	0	0	0	78	43	0	20	0	0	0	13	8	168
Mallard	0	0	0	0	0	0	0	0	0	0	0	45	0	45
Greater Scaup	0	0	0	0	0	0	0	50	0	0	0	0	0	50
Common Eider	0	0	0	0	0	9	8	44	15	0	0	12	0	88
Common Eider (hen)	0	0	0	0	0	0	0	0	6	0	0	0	0	6
Steller's Eider	3756	3064	900	1570	1040	3607	5	176	396	0	0	74	20	14608
Harlequin Duck	0	0	0	0	0	0	2	0	0	0	0	12	0	14
Long-tailed Duck	266	166	1	14	15	16	92	125	183	0	0	14	0	892
Black Scoter	115	93	1	111	50	0	3	54	82	0	0	29	0	538
Surf Scoter	0	0	0	0	0	0	4	0	0	0	0	0	0	4
White-winged Scoter	0	0	0	0	20	0	1	0	0	0	0	0	0	21
Goldeneye spp.	0	0	0	10	0	0	0	4	0	0	60	0	4	78
Bufflehead	0	1	0	10	0	0	0	3	0	0	10	0	0	24
Red-breasted Merganser	0	31	0	4	20	17	0	34	23	34	60	0	23	246
Common Loon	0	0	0	0	0	0	2	0	0	0	0	1	0	3
Pelagic Cormorant	0	0	0	0	0	1	1	0	0	0	0	0	0	2
Bald Eagle	0	0	0	0	1	0	0	1	0	0	2	1	0	5
Bald Eagle (juv.)	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Small Shorebird	0	0	0	0	0	0	50	0	0	0	0	0	0	50
Large Gull	45	67	120	28	356	3	141	41	21	0	90	12	50	974
Pigeon Guillemot	0	0	0	0	0	0	2	0	0	0	0	0	0	2
Harbor Seal	0	0	0	0	0	0	0	0	0	0	0	6	0	6
Sea Otter	2	3	5	3	5	1	0	24	133	1	3	0	1	181
Steller's Sea Lion	0	0	0	0	0	0	2	0	0	0	0	0	0	2



Table 4a. Pacific brant observations by segment, Izembek National Wildlife Refuge area, 27 February, 28 February, and 01 March 2011.

Date	Survey segment											Total
	60	61	62	63	64	65	67	68	80	83	85	
27 February 2011	0	1040	11700	0	736	27900	787	0	0	620	3600	46383
28 February 2011	2386	6030	0	0	0	12941	2277	299	2897	300	2015	29145
01 March 2011	180	7130	0	0	0	15555	3898	0	5870	0	13100	45733

Table 4b. Pacific brant observations by major lagoons and bays, Izembek National Wildlife Refuge area, 27 February, 28 February, and 01 March 2011.

Date	Major lagoons and bays											Total
		Izembek Lagoon Segments 60-65	Bechevin Bay Segments 67-68	Morzhovoi Bay Segment 80	Cold Bay Segment 83	Kinzarof Lagoon Segment 85						
27 February 2011	No.	41376	787	0	620	3600	46383					
	Percent	89.2%	1.7%	0.0%	1.3%	7.8%						
28 February 2011	No.	21357	2576	2897	300	2015	29145					
	Percent	73.3%	8.9%	9.9%	1.0%	6.9%						
01 March 2011	No.	22865	3898	5870	0	13100	45733					
	Percent	50.0%	8.5%	12.8%	0.0%	28.7%						

Table 5. Waterbird and mammal observations by survey date, for Izembek National Wildlife Refuge area and Sanak Islands, Alaska, 27, 28 February and 01 March 2011.

Species	Izembek Lagoon area			Sanak Islands
	27 February	28 February	01 March <sup>1</sup>	27 February
Tundra Swan	2	22	--	54
Pacific Brant	46383	29145	45733	2517
Emperor Goose	905	168	--	2619
Mallard	256	45	--	180
Northern Pintail	66	0	--	561
Eurasian Wigeon	300	0	--	0
Greater Scaup	250	50	--	204
Common Eider	17	88	--	246
Common Eider (hen)	0	6	--	0
Steller's Eider	13087	14608	--	1087
Harlequin Duck	0	14	--	235
Long-tailed Duck	383	892	--	78
Black Scoter	326	538	--	492
Surf Scoter	0	4	--	0
White-winged Scoter	8	21	--	6
Goldeneye spp.	30	78	--	75
Bufflehead	0	24	--	53
Red-breasted Merganser	338	246	--	70
Common Loon	1	3	--	4
Pelagic Cormorant	5	2	--	97
Bald Eagle	5	5	--	18
Bald Eagle (juv)	0	1	--	0
Ptarmigan spp.	200	0	--	0
Small Shorebird	60	50	--	760
Large Gull	1369	974	--	96
Pigeon Guillemot	0	2	--	0
Common Raven	0	0	--	10
Harbor Seal	0	6	--	30
Sea Otter	16	181	--	0
Steller's Sea Lion	0	2	--	0
Cattle	--	--	--	413
Horse	--	--	--	15

<sup>1</sup> Only brant were counted on the 01 March 2011 survey flown at an altitude of 500 ft.

Table 6. Waterbird and mammal observations for Izembek National Wildlife Refuge area, Alaska, for surveys flown in 2009, 2010, and 2011.

Species	2009		2010		2011	
	02 February	01 February	02 February	27 February	28 February	
Tundra Swan	0	13	8	2	22	
Pacific Brant	21482	26443	20165	46383	29145	
Emperor Goose	3528	1695	1402	905	168	
Mallard	95	156	700	256	45	
Northern Pintail	50	1190	1365	66	0	
Eurasian Wigeon	0	125	225	300	0	
Greater Scaup	1665	295	350	250	50	
Common Eider	1245	0	0	17	88	
Common Eider (hen)	0	0	0	0	6	
King Eider	0	31	0	0	0	
Steller's Eider	7003	20330	24097	13087	14608	
Harlequin Duck	273	0	98	0	14	
Long-tailed Duck	1156	2897	3062	383	892	
Black Scoter	457	214	898	326	538	
Surf Scoter	0	4	11	0	4	
White-winged Scoter	12	40	95	8	21	
Goldeneye spp.	353	852	613	30	78	
Bufflehead	67	187	110	0	24	
Common Merganser	5	0	6	0	0	
Red-breasted Merganser	1312	793	1854	338	246	
Common Loon	0	4	4	1	3	
Pacific Loon	1	2	0	0	0	
Pelagic Cormorant	4	1	5	5	2	
Bald Eagle	28	4	9	5	5	
Bald Eagle (juv.)	1	1	1	0	1	
Ptarmigan species	0	0	0	200	0	
Small Shorebird	1650	3	455	60	50	
Small Gull	10	14	253	0	0	
Large Gull	108	655	1573	1369	974	
Pigeon Guillemot	0	0	0	0	2	
Harbor Seal	71	221	455	0	6	
Sea Otter	644	748	448	16	181	
Steller's Sea Lion	0	20	0	0	2	

Table 7. Izembek midwinter index of Pacific brant for the Izembek National Wildlife Refuge area, Alaska, 1980 - 2011; and the Izembek / Sanak midwinter index for 1991, 2010, and 2011.

Year	Izembek midwinter index count <sup>1</sup>	Number of surveys flown	Izembek / Sanak <sup>2</sup> midwinter index count
1981	5540	3	--
1984	1611	1	--
1986	7665	2	--
1987	5755	1	--
1988	8385	2	--
1989	7050	2	--
1990	5595	3	--
1991	4350	3	7402
1992	7200	5	--
1993	8008	5	--
1994	13221	6	--
1995	11978	4	--
1996	9795	6	--
1997	13147	3	--
1998	8773	2	--
1999	8255	3	--
2000	8833	3	--
2001	17790	1	--
2002	13576	1	--
2003	9168	2	--
2004	12756	1	--
2005	17240	5	--
2006	19616	3	--
2007	40041	4	--
2008	28329	1	--
2009	21482	1	--
2010	26443	2	31746
2011	46383	2	48900

<sup>1</sup> The Izembek midwinter index count has been included in the Pacific Flyway midwinter index since 1985-1986.

<sup>2</sup> We recommend the Pacific Flyway midwinter index be amended to include the Izembek / Sanak midwinter index count rather than the Izembek midwinter index count starting in 2010.

Appendix 1. Summary of the aerial survey data of the Sanak Islands, Alaska, for 1970, 1991, 2010, and 2011.

Species	1970		1991		2010			2011	
	Sanak	Sanak & Caton	Sanak	Caton	Total	Sanak	Caton	Total	
Tundra Swan	2	83	29	0	29	47	7	54	
Pacific Brant	0	3052	3871	1432	5303	1237	1280	2517	
Emperor Goose	1030	3368	5737	1638	7375	1910	709	2619	
Canada Goose	200	0	0	0	0	0	0	0	
Mallard	45	312	633	33	666	96	84	180	
Northern Pintail	0	6125	45	170	215	106	455	561	
Northern Shoveler	0	0	0	60	60	0	0	0	
Gadwall	0	140	0	0	0	0	0	0	
American Wigeon	0	0	10	0	10	0	0	0	
Puddle duck spp.	0	255	0	0	0	0	0	0	
Greater Scaup	0	0	301	65	366	140	64	204	
Common Eider	0	128	0	0	0	82	164	246	
King Eider	0	358	0	0	0	0	0	0	
Steller's Eider	0	16603	2054	3173	5227	345	742	1087	
Eider spp.	740	0	0	0	0	0	0	0	
Harlequin Duck	45	13	2778	1528	4306	131	104	235	
Long-tailed Duck	145	587	63	3	66	70	8	78	
Black Scoter	0	560	1914	676	2590	164	328	492	
Surf Scoter	0	0	0	0	0	16	0	16	
White-winged Scoter	0	64	164	4	168	0	6	6	
Scoter spp.	555	0	0	0	0	0	0	0	
Goldeneye spp.	0	0	11	45	56	25	50	75	
Bufflehead	0	0	80	61	141	9	44	53	
Common Merganser	0	0	3	0	3	0	0	0	
Red-breasted Merganser	0	231	558	187	745	32	38	70	
Common Loon	0	0	12	2	14	3	1	4	
Pacific Loon	0	0	1	0	1	0	0	0	
Red-necked Grebe	0	0	2	0	2	0	0	0	
Pelagic Cormorant	0	601	783	397	1180	62	35	97	
Bald Eagle	0	83	36	4	40	14	4	18	
Bald Eagle (juv.)	0	0	8	4	12	0	0	0	
Black Oystercatcher	0	0	729	159	888	0	0	0	
Whimbrel	0	0	10	0	10	0	0	0	
Shorebird - RockSandpiper	0	8598	1530	510	2040	110	650	760	
Large Gull spp.	0	1145	203	28	231	67	29	96	
Black-legged Kittiwake	0	143	0	0	0	0	0	0	
Common Murre	0	709	0	0	0	0	0	0	
Tufted Puffin	0	7	0	0	0	0	0	0	
Horned Puffin	0	0	0	0	0	0	0	0	
Puffin spp.	0	50	0	0	0	0	0	0	
Common Raven	0	25	0	40	40	0	10	10	
Harbor Seal	0	14	197	76	273	0	30	30	
Sea Otter	0	21	2	1	3	0	0	0	
Steller's Sea Lion	0	0	0	48	48	0	0	0	
Cattle	0	414	914	0	914	413	0	413	
Horse	0	15	53	0	53	15	0	15	



Appendix 2. Common and scientific names of species referenced in this report, Izembek midwinter Pacific Brant and other waterbirds survey, Alaska, 2011.

Family	Common name	Scientific name
Loons and grebes: (Families <i>Gaviidae</i> , <i>Podicipedidae</i> )		
	Pacific loon	<i>Gavia pacifica</i>
	Common loon	<i>G. immer</i>
	Red-necked grebe	<i>Podiceps grisegena</i>
Cormorants: (Family <i>Phalacrocoracidae</i> )		
	Pelagic cormorant	<i>Phalacrocorax pelagicus</i>
Swans, geese, ducks: (Family <i>Anatidae</i> )		
	Tundra swan	<i>Cygnus columbianus</i>
	Canada goose	<i>Branta canadensis</i>
	Pacific brant	<i>B. bernicla nigricans</i>
	Emperor goose	<i>Chen canagica</i>
	Mallard	<i>Anas platyrhynchos</i>
	Northern pintail	<i>A. acuta</i>
	Eurasian wigeon	<i>A. penelope</i>
	American wigeon	<i>A. americana</i>
	Northern shoveler	<i>A. clypeata</i>
	Greater scaup	<i>A. marila</i>
	Common eider	<i>Somateria mollissima</i>
	King eider	<i>S. spectabilis</i>
	Steller's eider	<i>Polysticta stelleri</i>
	Harlequin duck	<i>Histrionicus histrionicus</i>
	Long-tailed duck	<i>Clangula hyemalis</i>
	Surf scoter	<i>Melanitta perspicillata</i>
	Black scoter	<i>M. americana</i>
	White-winged scoter	<i>M. fusca</i>
	Goldeneye spp.	<i>Bucephala clangula</i> , <i>B. islandica</i>
	Bufflehead	<i>B. albeola</i>
	Common merganser	<i>Mergus merganser</i>
	Red-breasted merganser	<i>M. serrator</i>
Eagles: (Family <i>Accipitridae</i> )		
	Bald eagle	<i>Haliaeetus leucocephalus</i>
Oystercatchers: (Family <i>Haematopodidae</i> )		
	Black oystercatcher	<i>Haematopus bachmani</i>
Shorebirds: (Family <i>Scolopacidae</i> )		
	Whimbrel	<i>Numenius phaeopus</i>
	Rock Sandpiper	<i>Calidris ptilocnemis</i>
Gulls: (Family <i>Laridae</i> )		
	Large gull spp.	<i>Larus glaucescens</i>
	Mew gull	<i>L. canus</i>
	Black-legged kittiwake	<i>Rissa tridactyla</i>
Alcids: (Family <i>Alcidae</i> )		
	Pigeon guillemot	<i>Cephus columba</i>
	Common Murre	<i>Uria aalge</i>
	Tufted Puffin	<i>Fratercula cirrhata</i>
	Horned Puffin	<i>F. corniculata</i>
Marine Mammals		
	Harbor seal	<i>Phoca vitulina</i>
	Sea otter	<i>Enhydra lutris</i>
	Steller's Sea Lion	<i>Eumetopias jubatus</i>
Land Mammals		
	Cattle - domestic	<i>Bos primigenius</i>
	Horse	<i>Equus caballus</i>