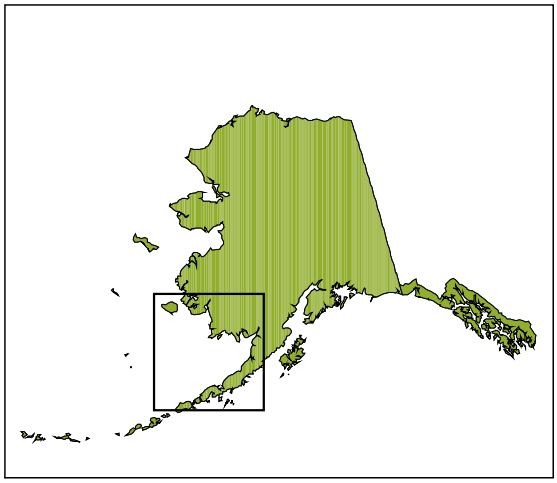
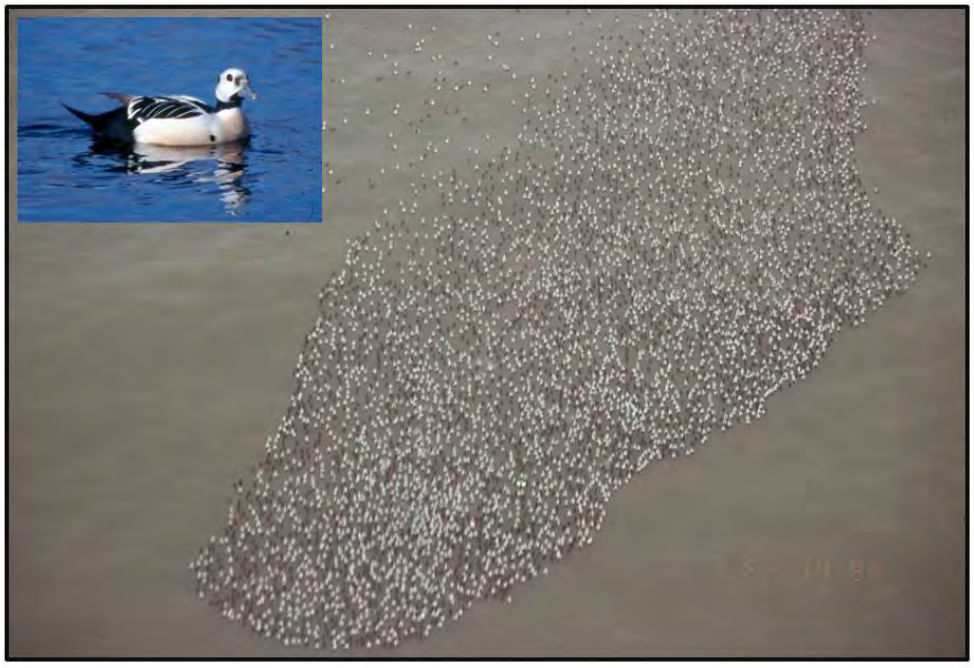
# STELLER'S EIDER SPRING MIGRATION SURVEYS
# SOUTHWEST ALASKA
# 2012





**Spring flock of Steller's eiders in Port Heiden Lagoon:**
**3,765 males counted, plus estimated 2800 females.**

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September 27, 2012

# STELLER'S EIDER SPRING MIGRATION SURVEYS SOUTHWEST ALASKA, 2012

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**Abstract.** Spring aerial surveys were conducted most years from 1992 to 2012 to monitor abundance and habitat associations of the Pacific population of Steller's eiders (*Polysticta stelleri*), which stages for spring migration in southwestern Alaska. We recorded visual estimates of Steller's eiders and all other identifiable water birds and marine mammals along shorelines and within estuaries and shoals where Steller's eiders and other sea ducks were known to congregate during migration. Two to four replicates were conducted per survey year from 1992-1997, with the highest annual count used to describe peak numbers of eiders staging within the survey area prior to their departure to arctic nesting grounds. Since 1997, funding cuts precluded replication in all but one year (2008), and timing of the single annual surveys was based on satellite imagery of sea ice, information from local contacts, and occasionally concurrent telemetry studies. Annual Steller's eider estimates ranged from 54,888 (year 2010) to 137,904 (year 1992), and averaged 81,453. The 2012 survey was completed 16-22 April. We retrospectively judged that the survey was timed phenologically early based on extensive sea ice covering major portions of eider habitat beyond mid-April; an unusual condition that may have resulted in a lower than normal proportion of the target population within the survey area during the survey. In 2012, the Steller's eider estimate (59,638) was 27% below the 1992-2011 mean, and 20% below the 2011 estimate of 74,369. The long-term trend (1992-2012) indicates an annual decline of 2.4 percent per year ($R^2$=0.45). We suspect a slight negative trend bias resulted from a higher frequency of optimally-timed counts in early years due to selection of the highest counts from survey replicates in 1992-1997, compared to the single annual counts in subsequent years. We present maps illustrating the 2012 survey flight path and observed distribution of Steller's eiders and other selected species. A persistent pattern of habitat use by Steller's eiders and most other sea duck species among years provides evidence of relative importance among southwestern Alaskan habitats to staging and migrating waterfowl. An experimental aerial photographic molting Steller's eider survey was initiated in September 2012 as a possible alternative to the Spring Migration Survey to monitor the Pacific Steller's eider population, with results not yet available.

**Key Words:** Steller's eider, *Polysticta stelleri*, king eider, *Somateria spectabilis*, migration, population, aerial, survey, waterfowl, Bering Sea, Bristol Bay

## INTRODUCTION

The majority of the Pacific population of Steller's eiders migrates along the Bristol Bay coast of the Alaska Peninsula in the spring, crosses Bristol Bay toward Cape Pierce, then continues northward along the Bering Sea coast. Most then cross the Bering Strait to their breeding grounds in Siberia, with a smaller number continuing north to the Alaska North Slope to breed (U. S. Fish and Wildlife Service 2002, Gill et al. 1978). During migration the eiders linger to feed at the mouths of lagoons and other productive habitats. Concern over apparent declines of eiders prompted the U.S. Fish and Wildlife Service to initiate a special spring migration survey in 1992 to monitor the population of Steller's eiders that winters in Alaska waters. A comprehensive winter survey of the species is not feasible over the eider's extensive and remote winter range, which includes the Aleutian Islands, the Alaska Peninsula, and the western Gulf of Alaska including Kodiak and lower Cook Inlet; thus we estimate their numbers as they stage during spring migration in Bristol Bay and Kuskokwim Bay. Objectives of the survey are:

1. Obtain an annual index of the pre-breeding population of Steller's eiders that winter in Alaskan waters.

2. Document distribution of and habitats used by Steller's eiders during migration.

3. Describe populations and distributions of other migrating water birds and marine mammals, to the extent that doing so does not compromise the Steller's eider objectives.

This report summarizes results from the 2012 Steller's eider surveys, with comparisons to data from previous surveys.

## STUDY AREA AND METHODS

The survey area includes estuarine and near shore habitats along the coast of southwestern Alaska, from the Yukon-Kuskokwim Delta (Y-K Delta) to the west end of the Alaska Peninsula. Steller's eiders are normally found feeding and resting in and near lagoons and shoals rich in benthic invertebrate prey and generally less than 10 meters in depth (U. S. Fish and Wildlife Service 2002). We sought to search all such habitats within the survey area to estimate numbers of Steller's eiders as well as waterbirds in other important habitats along the route. Beginning in 2011 we flew a Quest Kodiak single-engine turbine-powered amphibious airplane at 90 to 100 knots (166 to 185 km/hr) airspeed and 150 to 250 feet (46 to 76 m) altitude, while in all other years we flew similar flight parameters in a Cessna 206 amphibian. The crew did not detect a difference in behavior of the eiders or discrimination of bird species with change in aircraft. However, the superior reliability record of the Kodiak's PT-6 turbine engine increased the crew's confidence in the safety of the aerial surveys over the piston-powered Cessna. Habitats within lagoons and bays were searched using an adaptive contiguous pattern, varying relative to tides, ice cover, and bird distribution. We surveyed exposed shorelines using a single track parallel to the coast within 1 km of the shoreline, but deviated for flocks sighted at greater distances offshore to the extent consistent with the project safety plan, and crew

safety in general. Nearly all past surveys were piloted by pilot/biologist Bill Larned (Appendix 1). Alternate pilot/observers had served previously as observer on this project, thus were thoroughly familiar with routes and procedures, and were provided with past reports, recorded flight paths, safety plans and all other relevant information. In 2012 pilot/observers Bill Larned and Heather Wilson alternated pilot duties among survey flights.

For geographic reference, the shoreline was initially divided into 126 numbered segments (Larned et al. 1994), identical to those used for the annual spring emperor goose survey conducted by the U.S. Fish and Wildlife Service, Fairbanks. However, in 1997 we began using a global positioning system (GPS)/laptop computer data collection system (developed by John Hodges, U.S. Fish and Wildlife Service, Migratory Bird Management, Juneau, AK) which enabled us to electronically record our flight path and the precise location of each observation, so geographic segments were no longer used. The more recent procedure allowed each observer to record observations vocally into his/her computer that was automatically linked GPS coordinates. Recorded observations were later transcribed using an associated program, also created by Hodges, which produced ASCII data files in which each line contained a single observation, including species, numerical count or estimate, geographic coordinates, date, and time. We also recorded auxiliary data, including observers' initials and position in aircraft, tide stage (high, medium, low, and unknown), ice cover in tenths, sea condition (Beaufort scale), wind and sky condition. The latter environmental data have been archived, but thus far used only anecdotally.

The survey was designed to correspond to the specific spatial and temporal distribution of Steller's eiders during the spring staging period, and therefore was not necessarily optimal for other species in coverage or timing. As such, data for other species are useful primarily to indicate habitat associations persistent among years, and as an "early warning" of major spatial and/or temporal population changes to signal the need for, and help direct, specific investigations. This document and other annual survey reports contain brief discussions of results for other sea ducks, brant and emperor geese while a more detailed interpretation for other selected species is contained in Larned (1998).

The Steller's eider survey total is considered a minimal population estimate because some birds may escape detection by the survey crew by moving northward during the periods between survey flights, while others may be outside the survey area (north or south) during the survey, or simply overlooked. While we strive to minimize such errors, we have not incorporated a method for detecting or measuring bird movements that may occur during the survey, other than comparing concurrent satellite telemetry data from small numbers of eiders during some years. No such data from instrumented birds were available for 2012. For these reasons, the reported estimates for Steller's eider can be considered a population index.

Since 2000, offshore shoal areas in Kuskokwim and Kvichak bays that were too extensive to cover contiguously within budget and safety parameters, were surveyed using a "saw tooth" array of sample strips, 400 to 600m wide, using the widest strip compatible with surface conditions (Fig. 4). We calculated population indices for these areas by extrapolating the average density of each species within the samples to the sampled area (Table 1). In 2012 (and some prior years) we used the sampling procedure only in eastern Kuskokwim Bay (Fig. 4), as conditions in other locations permitted

detection and estimation of all flocks. The annual extrapolated estimates of total observed Steller's eiders recorded within all sampled areas as a percentage of the survey total ranged from 0 to 7.5 percent. Thus differences between Steller's eider estimates from shoreline counts prior to 2000 vs. those made later using the "saw tooth" sampling and extrapolation procedure were inconsequential in the total survey context.

To produce a consistent annual estimate of the target component of the Pacific Steller's eider population, it is critical to conduct the survey when all or most of that population is within the defined survey area between the western end of the Alaska Peninsula and Nunivak Island. The original design strategy developed in 1992 was to bracket the assumed migration period with up to 3 or 4 replicate surveys per year, and use the highest annual count as that year's Steller's eider estimate. This was accomplished to varying degrees prior to 1998. However, due to funding limitations and extended periods of inclement weather, from 1998 to 2012 only one survey per year was flown, with the exception of 2008 when two surveys were conducted. During those recent years, optimal timing was estimated using a combination of near-real-time satellite imagery (NASA MODIS Rapid Response System) depicting sea ice coverage of favored staging habitats and migration routes (important habitats on the lower Alaska Peninsula should be mostly ice-free), information from cooperators located within the survey area, and current forecasts of large-scale wind patterns (eiders and other waterfowl tend to take advantage of tailwinds and avoid headwinds during migration, thus we favor periods of northerly winds when eider distribution would likely be stable, minimizing double or under counting on surveys. Myres 1958, Woodby and Divoky 1982). In the absence of appropriate and consistent survey timing, population indices would be biased.

In addition to suboptimal survey timing, another source of error is flock estimation bias. We have attempted to measure and correct for this bias using a representative double sample of oblique aerial photographs of flocks which were also estimated visually. In 1998, visual estimates made by Larned of 17 Steller's eider flocks ranging in size from 94 to 2194 birds, were variable and averaged 35 percent lower than counts made from photographs of the same flocks. The small sample was inadequate for generating a ratio useful for adjusting for observer bias, but suggests that my flock estimates may be low-biased – a tendency common among aerial observers, especially with large dense flocks that are characteristic of wintering and migrating Steller's eiders (Joensen 1974). Unfortunately, attempts to obtain paired photo/visual counts to better understand, and perhaps correct for, estimation bias, have been discouraged by the frequent, mostly synchronous diving behavior of Steller's eiders, and the penchant for flock aggregations to split and join frequently during photographic attempts. Our experience suggests that at best, successful photographic double-sampling would require substantial additional maneuvering flying, which would complicate visual flock estimation, and exacerbate fuel reserve issues which are often already critical. If there is potential in this method it probably lies in use of a second aerial crew dedicated to obtaining comprehensive photo coverage of all eiders in each of a subset of surveyed aggregations, such as those within the lagoons along the Alaska Peninsula. This would greatly increase, possibly double, survey costs.

For all survey years since the survey's inception in 1992, with the exception of 2009, the survey crew has consisted of Bill Larned as pilot and port observer, with various starboard observers (Table 3). We further minimized inconsistency of observer bias by using only experienced aerial observers, and by

the pilot/observer (Larned) intentionally maneuvering the aircraft so that the majority of eider flocks were on his side for estimation. Observers practiced flock estimation within one week prior to each survey, using a computer simulation program (Wildlife Counts by John Hodges, USFWS, Juneau, AK), and reviewing aerial photographs of eider and other sea duck flocks of known size.

## RESULTS

### Habitat and survey conditions

In 2012, nearly continuous cold stormy weather left extensive ice cover in estuaries throughout the survey area through the end of the survey (21 April), even in the lower Alaska Peninsula lagoons which historically contained the largest numbers of Steller's eiders. The latter are rarely frozen in April (Fig. 1). Persistent northerly winds moved sea ice away from south-facing shorelines of Nunivak Island, the Yukon-Kuskokwim Delta and Bristol Bay, and forced ice tightly against the lower portion of Alaska Peninsula's Bristol Bay shoreline (Fig. 2). We initiated the survey on 17 April not yet fully aware of the impact of the late arrival of spring on the lagoon ice cover, and retrospectively suspect that some eiders may not have arrived in the survey area, thereby reducing our count. However, the northerly winds likely kept the eiders that were in the survey area from avoiding detection by moving northward during the survey.

Our recorded flight paths for the survey are displayed in Fig 4. Total flight time of 33.1 hour includes transit flights (Appendix 1).

### Itinerary for 2012:

4/16 2.8-hr flight to ferry survey aircraft Anchorage to Bethel. Overnight at FWS bunkhouse.

4/17 3.6-hr survey flight, Kipnuk to Kuskokwim River mouth (Kuskokwim Shoals area). Water mostly open south of extensive shore-fast ice. Survey coverage abbreviated to single shoreline transect in central portion due to excessive wind and abundant whitecaps. Overnight at Bethel bunkhouse.

4/18 Weather delay in AM, then 1PM departure for 4.2-hr survey flight covering offshore Kuskokwim R. mouth to Chagvan Bay, including Goodnews Bay. Some offshore portions abbreviated slightly due to fog patches. Less than 10% ice coverage of offshore survey polygon, but 100% ice cover of Chagvan Bay, and 95% ice cover of Goodnews Bay. Overnight at Bethel bunkhouse.

4/19 Weather delay due to low visibility, then 5.9-hr survey flight, Bethel to King Salmon with fuel stop in Dillingham. Nanvak Bay 100% ice-covered, but rest of route mostly ice-free. Strong winds and whitecaps prevalent Nanvak Bay to Togiak Village, light winds and excellent survey conditions Togiak to King Salmon. Overnight at King Salmon, FWS bunkhouse.

4/20 Weather delay due to low ceilings and visibility. Departed 2:30 PM for 4.3-hr survey flight, lagoons and shoreline King Salmon to Seal Islands, then returned to King Salmon. Overnight at King Salmon, FWS bunkhouse.

4/21 Departure delay due to notification of exhaust problem. Performed required inspection and alteration, then departed at 10:15 AM. Surveyed lagoons and shorelines Seal Islands to Cold Bay. Refueled, surveyed lagoons in Cold Bay area, refueled again and flew to King Salmon

to avoid storm moving into Cold Bay. Flight time 10 hrs (crew alternated pilot duties). Overnight at King Salmon, FWS bunkhouse.

4/22 Weather delay in AM, then 2.3 hr ferry flight to Anchorage. End of survey.

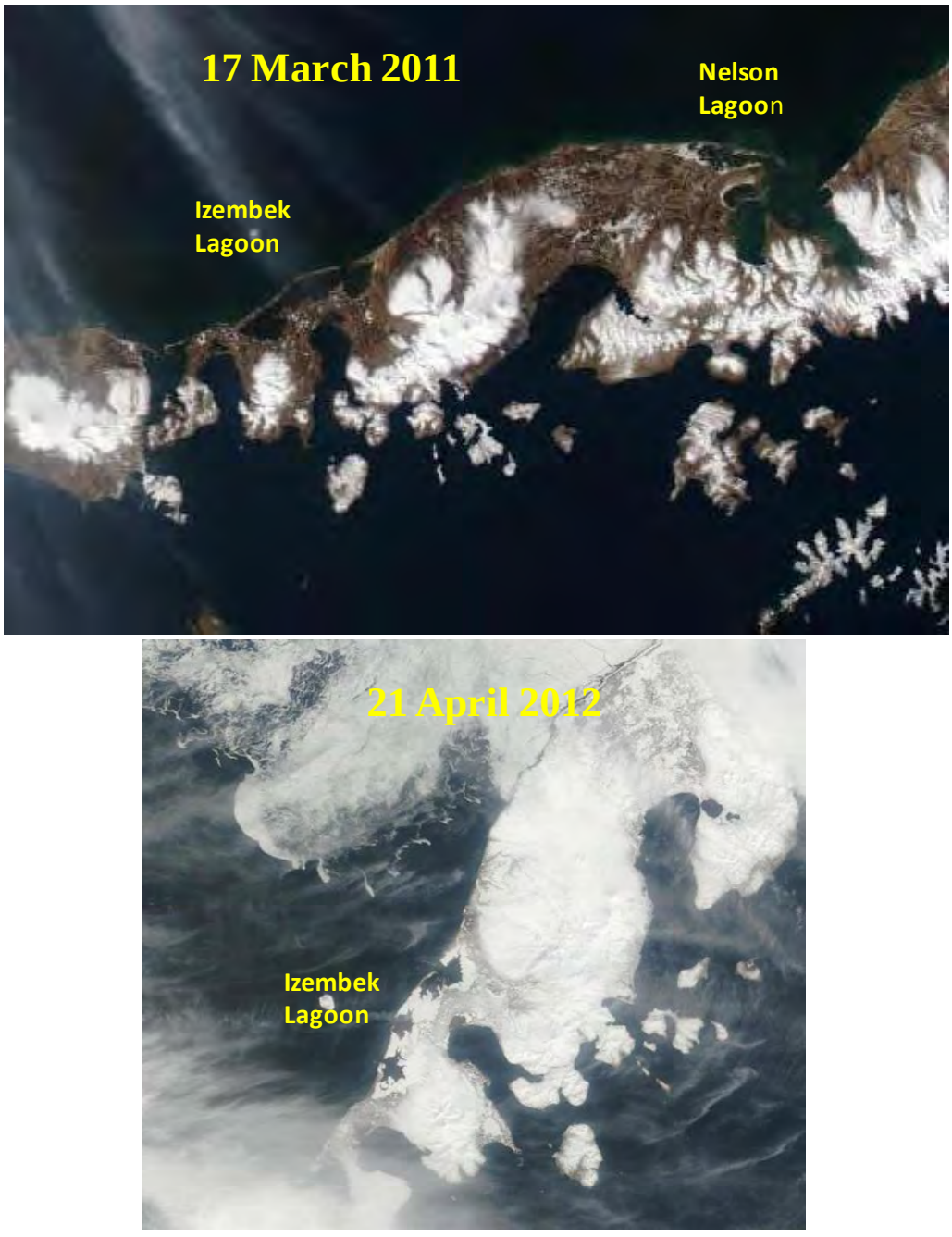


Figure 1. April 2011 and 2012 satellite images of lower Alaska Peninsula showing differences among years in lagoon ice extent. Images from http://rapidfire.sci.gsfc.nasa.gov/realtime/.

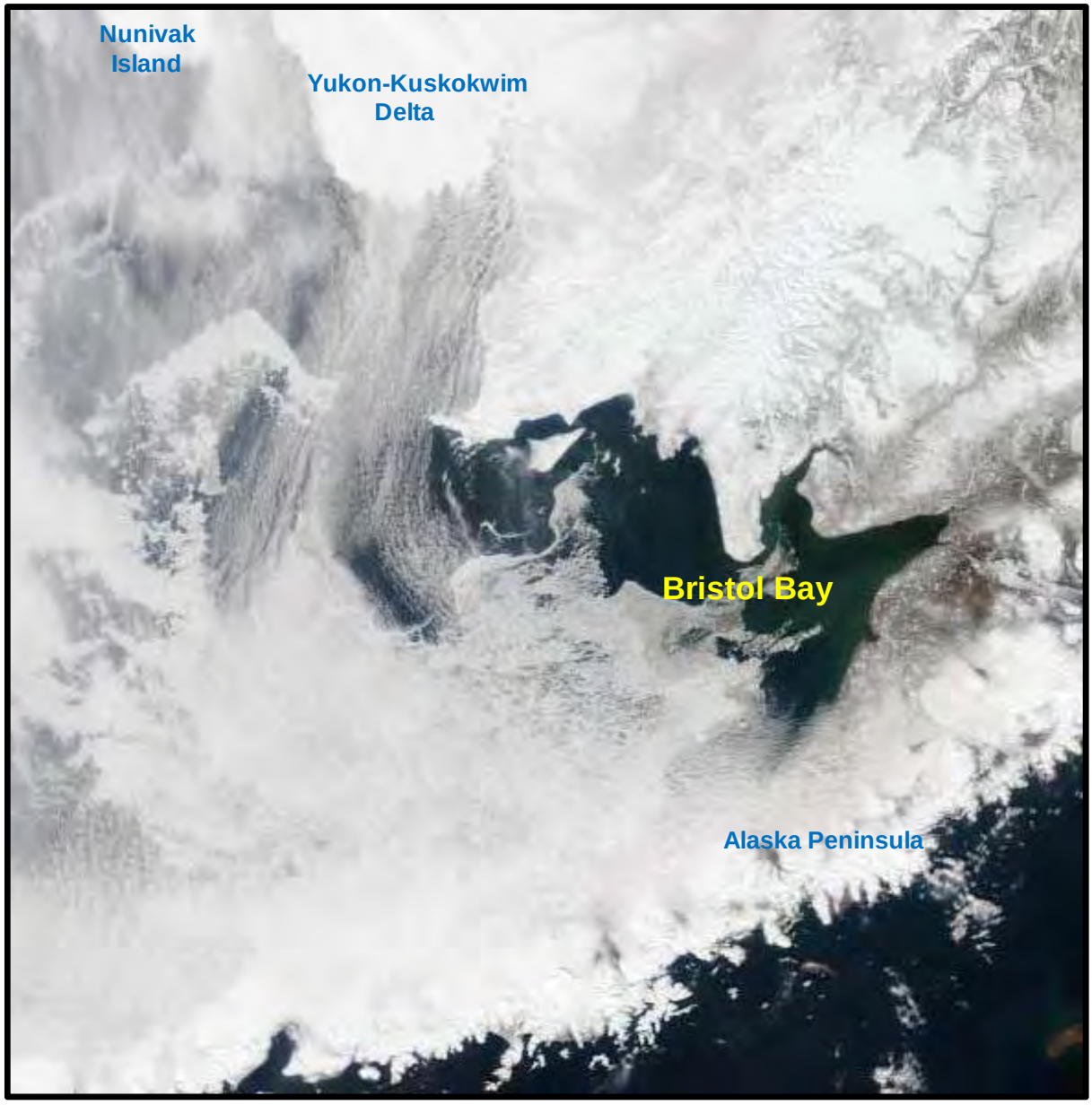


Fig. 2. Satellite image of southwest Alaska, showing sea ice extent, 20 April 2012.

**Steller's eider results**

The 2012 Steller's eider estimate of 59,638 was 27% below the 1992-2011 average (81,453), and 20% below the 2011 estimate (74,369, Table 2). Calendar timing of the survey was about average, but as mentioned above sea ice dispersal was relatively late, which appeared to delay migration (based on our interpretation of eider distribution, especially in lower Alaska Peninsula lagoons). For example, we observed only 27 Steller's eiders in the Kuskokwim Shoals area, where they have often been abundant by mid-April, and only 3,408 (6% of the total) were recorded north of the Alaska Peninsula (Table 1). With the late spring and low eider numbers in the northern areas we expected to see large numbers in

the lower Alaska Peninsula habitats, including Nelson and Izembek lagoons, but our estimates there were below most years for early or mid April. Due to unfavorable weather, we were not able to survey Sanak Islands or other habitats south of the Alaska Peninsula, so we could not determine if late migrants were staging in those locations due to the large amount of residual ice in Bristol Bay estuaries.

The exponential trend line of our 1992-2012 estimates indicates an annual 2.4% decline ($R^2$=0.45), while the annual decline during the 2003 to 2012 period is 3.1% ($R^2$=0.41, Fig. 3).

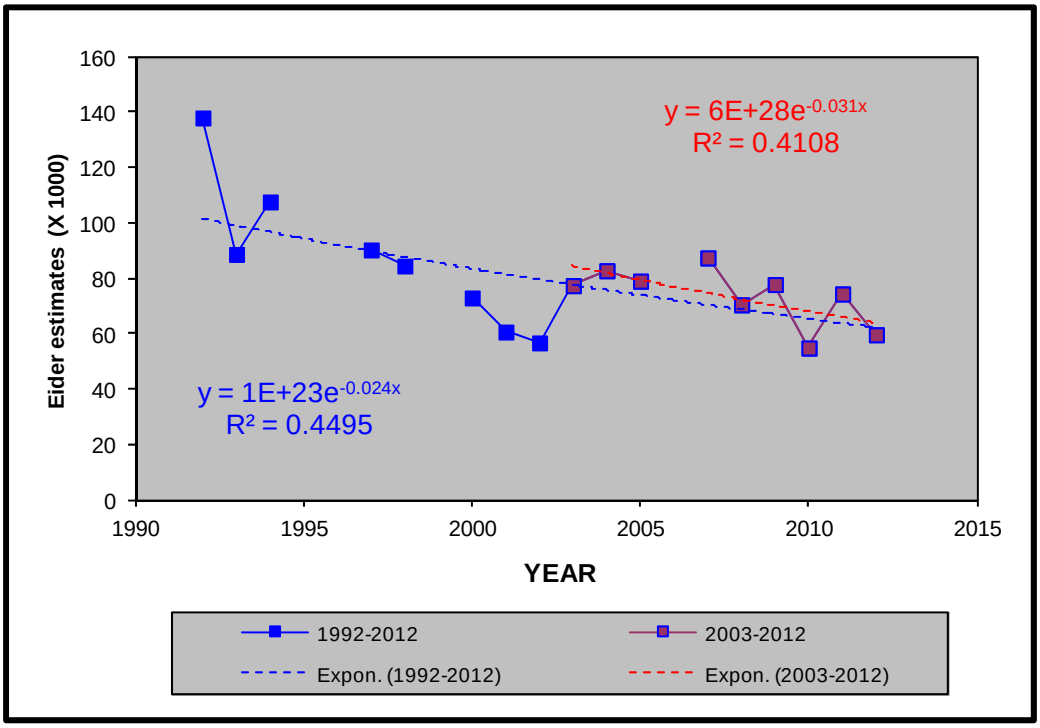


Fig. 3. Trend in Steller's eider estimates from aerial surveys, southwest Alaska, April and May, 1992-2012.

**Other Waterfowl**

While this survey was not designed to produce high-confidence estimates for species other than Steller's eiders, we have consistently recorded data on non-target sea ducks, geese and other waterbirds to help characterize general staging patterns and relative abundance over the long term, to identify large scale changes, and anticipate problems associated with proposed projects or changes in marine habitats. In past years we have noted common and king eiders migrating ahead of most Steller's eiders and moving offshore in northbound flocks in the northernmost portions of the survey area. Thus, we suspect we often record only a portion of those that migrate through the survey area. This year the

*common eider* estimate was 1,896, 70% below the 1992-2011 average and one-half of which were north of Chagvan Bay (Table 1, Fig. 5). The 2012 total estimate of *king eiders* was 133,738, 16% below the long term average of 161,251 (Table 2). As is typical in early to mid-April, most of the king eiders were staging in the Kvichak shoals of upper Bristol Bay (Table 1, Fig. 6), but conditions of lighting and bird dispersal were rather poor, so we felt we likely underestimated this population. The 2012 l*ong-tailed duck* total (17,886) was similar to that of 2011 (18,192), but 14% below the 1992-2011 average (20,694, Table 2). Long-tailed ducks were widely dispersed as usual, but the largest concentrations were among the shoals in northern Kuskokwim Bay, the shoreline between Nanvak Bay and Togiak village, Kvichak Bay and the lower Alaska Peninsula between Port Heiden and Nelson Lagoon (Table 1, Fig. 6). The *Black scoter* survey total (34,178) was up 11% from 2011 (30,894), but 9% below the 1992-2011 average (37,608, Table 2). Most black scoters were concentrated along shorelines and in lagoons on the lower Alaska Peninsula, and in Kvichak Bay (Table 1, Fig. 8). *White-winged scoter* estimates totaled 6,139, nearly 3 times the 2011 estimate and 130% above the long-term average of 2,664 (Table 2). The largest concentrations were recorded along the outer shoreline between Port Heiden and Moffett Bay, and particularly near the walrus haulout at Cape Seniavin, (Table 1, Fig. 9). We also estimated 402 individuals offshore between the Kuskokwim River and Chagvan Bay (Table 1). Consistent with other recent years with late springs, there was a complete absence of *brant* and *emperor geese* north of the Alaska Peninsula during the mid-April survey (Table 1, Figs. 10, 11). The 2012 black brant estimate (85,635) was 25% greater than that of 2011 (68,693), and 67% higher than the 1992-2011 average (51,398). The Emperor goose estimate (35,930) was close to average (1992-2011 average: 35,078), but 128% higher than that of 2011 (15,728) (Table 2).

## CONCLUSIONS AND RECOMMENDATIONS

The 2012 Steller's eider estimate (59,638) is the third lowest in the 1992-2012 history of the survey, contributing to the persistent downward trend for this species (Fig. 3). However, we suspect this estimate was biased low due to the late spring as demonstrated by extraordinarily extensive sea ice in southwest Alaska.

Timing and spatial design of this survey is based on aerial and ground-based observational data indicating that the majority of the Pacific population of Steller's eiders stage each year in early spring in estuaries in southwest Alaska, first along the Alaska Peninsula, then in northern Kuskokwim Bay and smaller bays along its perimeter, before continuing north to breeding grounds in Arctic Russia and Alaska (U. S. Fish and Wildlife Service 2002). This annual staging event has provided an opportunity for an annual comprehensive assessment of the population status of the Pacific Steller's eider population, as well as a picture of the relative importance among spring staging habitats. However, it has become apparent that the precision of these annual estimates is highly dependent on weather and numerous other variables that are difficult or impossible to predict or quantify, so we and members of the Steller's Eider Recovery Team have been searching for a more reliable method of monitoring this population. One method under consideration is an early autumn aerial survey in which all eider flocks in the primary molting estuaries along the lower Alaska Peninsula will be photographed and counted, providing a nearly-comprehensive annual index to the Pacific population. In August 2012, a pilot survey was conducted to test the feasibility and potential of this technique to track the abundance of

this rather elusive target population. Results of the initial aerial photography survey conducted in August 2012 look promising. I recommend continuation of the current spring survey until the above described or other alternative protocol is evaluated as superior.

*The findings and conclusions in this document are those of the author and do not necessarily represent the views of the U.S. Fish and Wildlife Service.*

## ACKNOWLEDGMENTS

Heather Wilson (US Fish and Wildlife Service, Waterfowl Management Branch, Anchorage) did an outstanding job as observer and alternate pilot. We gratefully acknowledge the assistance of the managers and staffs of Alaska Peninsula/Becharof, Izembek, and Yukon Delta National Wildlife Refuges, who provided for the logistic needs of the survey crew. Thanks also to members of the Steller's Eider Recovery Team for their continued support of this project.

## LITERATURE CITED

Gill, R. Jr., C. Handel, and M. Petersen. 1978. Migration of birds in Alaska Marine Habitats. U.S. Fish and Wildlife Service, Off. of Biol. Serv., Coastal Ecosystems. Unpub. Rept. 41pp.

Joensen, A. H. 1974. Waterfowl populations in Denmark 1965-1973. Danish Review of Game Biology. 9(1) 206pp.

Larned, W. W. 1998. Steller's eider spring migration survey, southwest Alaska, 1998. U. S. Fish and Wildlife Service, Unpub. rept. 41pp.

Larned, W. W., W. I. Butler, and G. R. Balogh. 1994. Steller's eider spring migration surveys, 1992-93. U. S. Fish and Wildlife Service, Unpub. progress rept. 52pp.

Myres, M. T. 1958. Preliminary studies of the behavior, migration, and distributional ecology of eider ducks in northern Alaska, 1958. Interim Prog. Rep. to the Arctic Inst. of North America. McGill Univ. Montreal.

U.S. Fish and Wildlife Service. 2002. Steller’s Eider Recovery Plan. Fairbanks, Alaska.

Woodby, D. A. and G. J. Divoky. 1982. Spring migration of eiders and other waterbirds at Point Barrow, Alaska. Arctic 35:403-410.

Table 1. Sea duck and goose estimates for geographic aerial survey units, spring Steller's eider survey, southwest Alaska, April 16-22, 2012.

| Survey Unit | Date surveyed | Elapsed Time | Expansion Factor | Common eider | King eider | Steller's eider | Harlequin duck | Long-tailed duck | Surf scoter | Black scoter | White-winged scoter | Goldeneyes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Nunivak Island | | not surveyed | | | | | | | | | | |
| Toksook Bay to Kuskokwim R. | 4/17 | 2:16 | 1.00 | 459 | | 27 | | 1,168 | | | 3 | |
| Kuskokwim R. to Chagvan Bay [1] | 4/18 | 2:26 | 3.69 | 421 | 14,361 | 576 | | 2,996 | | 140 | 402 | |
| Goodnews Bay[2] | 4/18 | 0:06 | 1.00 | | | 922 | | 6 | | | | |
| Chagvan Bay[3] | | not surveyed | | | | | | | | | | |
| Nanvak Bay[4] | 4/19 | 0:01 | 1.00 | | | | | 170 | | | | |
| Nanvak Bay to Togiak Village | 4/19 | 0:49 | 1.00 | 214 | 4 | 1,508 | 6 | 3,802 | 1 | 4 | 26 | 6 |
| Togiak Vilage to Kulukak Bay | 4/19 | 0:38 | 1.00 | 145 | 46 | 367 | 5 | 442 | | | 6 | 28 |
| Kulukak Bay to Cape Constantine | 4/19 | 0:25 | 1.00 | 43 | | 8 | 6 | 144 | 10 | | 8 | 12 |
| Cape Constantine | 4/19 | 0:18 | 1.00 | 25 | 8,220 | | | 65 | | 4 | 6 | |
| Kvichak Bay | 4/19 | 2:00 | 1.00 | 1 | 106,208 | | | 5,804 | | 1,236 | 7 | |
| Naknek River to Port Heiden | 4/20 | 1:08 | 1.00 | 10 | | 272 | 16 | 48 | | 659 | 41 | 46 |
| Egegik Lagoon | 4/20 | 0:18 | 1.00 | 2 | | 14 | | 10 | | 5 | | |
| Ugashik Lagoon | 4/20 | 0:16 | 1.00 | | | | | 3 | | 4 | | |
| Cinder River Sanctuary | 4/20 | 0:12 | 1.00 | | | 307 | | 10 | | 60 | 4 | |
| Port Heiden | 4/20 | 0:27 | 1.00 | 11 | 32 | 6,127 | | 307 | | 97 | | 5 |
| Port Heiden to Port Moller | 4/20,21 | 0:51 | 1.00 | 247 | 616 | 5,548 | | 1,226 | | 14,288 | 3,758 | |
| Seal Islands Lagoon | 4/20 | 0:11 | 1.00 | | | 5,960 | | 140 | | 134 | 2 | 15 |
| Port Moller/Herendeen Bay | 4/21 | 0:39 | 1.00 | 6 | 30 | 1,777 | | 441 | | 1,392 | 116 | |
| Nelson Lagoon | 4/21 | 0:18 | 1.00 | 120 | 20 | 5,767 | | 35 | | 1,392 | 400 | |
| Nelson Lagoon to Izembek Lagoon | 4/21 | 0:41 | 1.00 | 189 | 4,201 | 2,139 | 13 | 941 | 40 | 14,124 | 1,313 | |
| Izembek Lagoons | 4/21 | 1:23 | 1.00 | 3 | | 24,108 | 17 | 98 | | 445 | 12 | 42 |
| Kinzerof Lagoon | 4/21 | 0:06 | 1.00 | | | 3,467 | 35 | | | 3 | | 20 |
| Morzhovoi Bay Lagoons | 4/21 | 0:15 | 1.00 | | | 43 | 12 | | | | | 220 |
| Bechevin Bay | 4/21 | 0:28 | 1.00 | | | 701 | 37 | 30 | | 191 | 35 | 34 |
| **Totals** | | | | **1,896** | **133,738** | **59,638** | **147** | **17,886** | **51** | **34,178** | **6,139** | **428** |

1. Estimates reported herein for these survey units are expanded using a factor calculated as: area of survey unit/(transect length x transect width). Survey area extrapolated to is illustrated in figures 4-11.
2. Goodnews Bay 95% ice-covered. 3. Chagvan Bay 100 percent ice-covered. 4. Nanvak Bay 100 percent ice-covered.

Table 1. Continued

| Survey Unit | Date surveyed | Elapsed Time | Expansion Factor | Bufflehead | Mergansers | Black brant | Emperor goose |
|---|---|---|---|---|---|---|---|
| Nunivak Island | 4/13 | not surveyed | 1.00 | | | | |
| Toksook Bay to Kuskokwim R. | 4/15 | 2:16 | 1.00 | | 1 | | |
| Kuskokwim R. to Chagvan Bay [1] | 4/16 | 2:26 | 3.69 | | | | |
| Goodnews Bay[2] | 4/16 | 0:06 | 1.00 | | | | |
| Chagvan Bay[3] | 4/16 | not surveyed | 1.00 | | | | |
| Nanvak Bay[4] | 4/16 | 0:01 | 1.00 | | | | |
| Nanvak Bay to Togiak Village | 4/16 | 0:49 | 1.00 | | 35 | | |
| Togiak Vilage to Kulukak Bay | 4/16 | 0:38 | 1.00 | | 282 | | |
| Kulukak Bay to Cape Constantine | 4/16 | 0:25 | 1.00 | | 60 | | |
| Cape Constantine | 4/16 | 0:18 | 1.00 | | | | |
| Kvichak Bay | 4/16 | 2:00 | 1.00 | | 6 | | |
| Naknek River to Port Heiden | 4/17 | 1:08 | 1.00 | | 102 | | 10 |
| Egegik Lagoon | 4/17 | 0:18 | 1.00 | | 78 | | 337 |
| Ugashik Lagoon | 4/17 | 0:16 | 1.00 | | 318 | | |
| Cinder River Sanctuary | 4/17 | 0:12 | 1.00 | 3 | 94 | | 1,918 |
| Port Heiden | 4/17 | 0:27 | 1.00 | | 21 | | 562 |
| Port Heiden to Port Moller | 4/17 | 0:51 | 1.00 | | 57 | | 30 |
| Seal Islands Lagoon | 4/17 | 0:11 | 1.00 | | 12 | | 3,360 |
| Port Moller/Herendeen Bay | 4/17-18 | 0:39 | 1.00 | | 62 | | 1,238 |
| Nelson Lagoon | 4/18 | 0:18 | 1.00 | | 1 | | 5,108 |
| Nelson Lagoon to Izembek Lagoon | 4/18 | 0:41 | 1.00 | | 34 | | 1,718 |
| Izembek Lagoons | 4/19 | 1:23 | 1.00 | | 124 | 81,016 | 11,073 |
| Kinzerof Lagoon | 4/19 | 0:06 | 1.00 | | | 1,977 | 913 |
| Morzhovoi Bay Lagoons | 4/19 | 0:15 | 1.00 | | 21 | 1,030 | 3,563 |
| Bechevin Bay | 4/19 | 0:28 | 1.00 | 5 | 106 | 1,612 | 6,100 |
| **Totals** | | | | **8** | **1,414** | **85,635** | **35,930** |

1. Estimates reported herein for this survey unit are expanded using a factor calculated as: area of survey unit/(transect length x transect width). Survey area extrapolated to is illustrated in figures 4-11.

2. Goodnews Bay 95% ice-covered. 3. chagvan Bay 100% ice-covered. 4. Nanvak Bay 100% ice-covered.

Table 2. Survey totals for all species, Spring Steller's eider surveys, southwest Alaska, 1992-2012. For years with multiple surveys, only results from the survey with the highest Steller's eider count are shown.

| SURVEY DATES: | 5/2-6/1992 | 4/10-13/1993 | 5/6-12/1994 | 4/15-19/1997 | 4/22-29/1998 | 4/17-23/2000 | 4/22-5/1/2001 | 4/21-29/2002 | 3/29-4/11/2003 |
|---|---|---|---|---|---|---|---|---|---|
| **Birds:** | | | | | | | | | |
| Pacific loon | 2 | 30 | 34 | 45 | 23 | 5 | 3 | 0 | 7 |
| Red-throated loon | 78 | 51 | 270 | 11 | 97 | 61 | 188 | 64 | 2 |
| Common loon | 5 | 13 | 13 | 8 | 0 | 0 | 0 | 5 | 1 |
| Yellow-billed loon | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| Unident. loon | 0 | 0 | 85 | 7 | 24 | 3 | 137 | 23 | 4 |
| Red-necked grebe | 32 | 793 | 221 | 178 | 29 | 114 | 316 | 186 | 54 |
| Horned grebe | 0 | 0 | 3 | 0 | 0 | 2 | 0 | 0 | 0 |
| Cormorants | 979 | 1,082 | 1,618 | 829 | 653 | 335 | 674 | 483 | 217 |
| Tundra swan | 2 | 9 | 2 | 24 | 46 | 0 | 7 | 0 | 2 |
| Canada goose | 169 | 28 | 34 | 57 | 210 | 26 | 97 | 2 | 15 |
| Brant | 5,289 | 81,743 | 71,551 | 80,099 | 34,045 | 58,212 | 74,837 | 35,610 | 29,293 |
| Gr. white-fronted goose | 0 | 430 | 30 | 80 | 54 | 0 | 94 | 0 | 0 |
| Emperor goose | 27,876 | 28,542 | 25,816 | 41,279 | 53,926 | 32,562 | 41,800 | 43,014 | 35,288 |
| Mallard | 88 | 27 | 39 | 107 | 2 | 97 | 15 | 20 | 6 |
| Gadwall | 5 | 2 | 15 | 0 | 10 | 2 | 0 | 0 | 7 |
| Northern pintail | 5,325 | 1,792 | 1,760 | 1,414 | 893 | 857 | 618 | 1,431 | 1,250 |
| Wigeons | 4 | 0 | 8 | 2 | 79 | 2 | 0 | 0 | 10 |
| Northern shoveler | 28 | 2 | 14 | 0 | 3 | 0 | 4 | 0 | 0 |
| Am. Green-winged teal | 0 | 0 | 75 | 2 | 1 | 0 | 0 | 35 | 0 |
| Canvasback | 0 | 3 | 57 | 0 | 2 | 0 | 0 | 0 | 0 |
| Scaups | 11,106 | 5,316 | 6,598 | 3,072 | 2,289 | 1,864 | 1,188 | 1,465 | 3,557 |
| Common eider | 5,941 | 5,069 | 6,997 | 21,916 | 3,862 | 8,570 | 5,779 | 669 | 3,862 |
| King eider | 87,954 | 62,544 | 69,638 | 241,992 | 71,438 | 219,403 | 58,128 | 48,077 | 109,627 |
| Spectacled eider | 40 | 26 | 35 | 20 | 16 | 0 | 4 | 0 | 0 |
| **Steller's eider** | **137,904** | **88,636** | **107,589** | **90,269** | **84,459** | **72,953** | **60,656** | **56,704** | **77,369** |
| Harlequin duck | 757 | 608 | 838 | 328 | 243 | 373 | 946 | 438 | 176 |
| Long-tailed duck | 20,512 | 13,184 | 22,987 | 25,548 | 22,025 | 48,112 | 18,948 | 18,551 | 25,883 |
| Surf scoter | 23 | 347 | 48 | 359 | 8 | 17 | 17 | 114 | 13 |
| Black scoter | 42,382 | 37,985 | 35,672 | 31,750 | 45,312 | 55,538 | 33,586 | 29,250 | 42,698 |
| White-winged scoter | 1,331 | 432 | 484 | 2,080 | 2,520 | 8,484 | 4,399 | 2,706 | 818 |
| Unident. scoter | 361 | 0 | 0 | 1,474 | 136 | 0 | 0 | 3,962 | 4 |
| Goldeneyes | 711 | 177 | 263 | 365 | 136 | 319 | 181 | 222 | 610 |
| Bufflehead | 36 | 66 | 400 | 0 | 0 | 2 | 0 | 0 | 29 |
| Mergansers | 2,103 | 1,176 | 2,766 | 670 | 1,395 | 214 | 211 | 648 | 947 |
| Bald eagle | 24 | 78 | 29 | 23 | 22 | 17 | 24 | 19 | 16 |
| Sandhill crane | 4 | 21 | 10 | 0 | 2 | 0 | 0 | 0 | 0 |
| Shorebirds | 0 | 0 | 9,784 | 40,540 | 10,012 | 13,990 | 456 | 5,262 | 770 |
| Gulls | 18,072 | 49,544 | 25,038 | 27,738 | 25,779 | 7,991 | 9,249 | 15,622 | 16,356 |
| Black-legged kittiwake | 68,888 | 26,579 | 6,614 | 41,957 | 28,333 | 2,624 | 479 | 10,845 | 710 |
| Guillemots | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Marine mammals:** | | | | | | | | | |
| Sea otter | 1,736 | 981 | 809 | 1,554 | 1,068 | 809 | 523 | 442 | 1,090 |
| Pacific walrus | 229 | 315 | 1,030 | 143 | 136 | 110 | 1 | 0 | 1 |
| Seal | 588 | 1,976 | 2,130 | 1,156 | 620 | 438 | 1,617 | 4,191 | 1,076 |
| Steller's sea lion | 314 | 902 | 833 | 934 | 1,033 | 42 | 8 | 13 | 1 |
| Harbor porpoise | 17 | 9 | 5 | 8 | 1 | 12 | 0 | 6 | 0 |
| Belukha whale | 80 | 10 | 67 | 100 | 0 | 62 | 0 | 0 | 0 |
| Orca whale | 1 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 |
| Humpback whale | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Grey whale | 92 | 114 | 94 | 102 | 57 | 37 | 14 | 30 | 38 |

Table 2. Continued

| SURVEY DATES: | 4/1-11/2004 | 4/2-4/8/2005 | 4/11-16/2007 | 4/24-29/2008 | 4/15-21/2009 | 4/18-21/2010 | 4/13-19/2011 | 4/17-21/2012 | 1992-2011 avg |
|---|---|---|---|---|---|---|---|---|---|
| **Birds:** | | | | | | | | | |
| Pacific loon | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 19 | 10 |
| Red-throated loon | 0 | 1 | 1 | 4 | 3 | 8 | 2 | 20 | 53 |
| Common loon | 1 | 0 | 1 | 0 | 3 | 43 | 1 | 7 | 6 |
| Yellow-billed loon | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unident. loon | 10 | 8 | 57 | 26 | 9 | 3 | 23 | 36 | 26 |
| Red-necked grebe | 0 | 4 | 5 | 25 | 7 | 5 | 8 | 4 | 124 |
| Horned grebe | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 1 |
| Cormorants | 33 | 1,110 | 966 | 283 | 252 | 133 | 548 | 249 | 637 |
| Tundra swan | 4 | 1 | 4 | 3 | 28 | 0 | 0 | 17 | 8 |
| Canada goose | 0 | 0 | 0 | 0 | 5 | 0 | 15 | 8 | 41 |
| Brant | 32,875 | 28,365 | 45,047 | 60,124 | 75,628 | 40,964 | 68,693 | 85,635 | 51,398 |
| Gr. white-fronted goose | 0 | 0 | 0 | 64 | 7 | 0 | 0 | 467 | 47 |
| Emperor goose | 53,614 | 30,681 | 37,501 | 37,794 | 17,394 | 38,438 | 15,728 | 35,930 | 35,078 |
| Mallard | 225 | 179 | 251 | 130 | 335 | 168 | 106 | 121 | 112 |
| Gadwall | 8 | 15 | 0 | 3 | 0 | 10 | 0 | 42 | 5 |
| Northern pintail | 1,875 | 3,528 | 2,126 | 4,438 | 1,963 | 470 | 410 | 1,294 | 1,884 |
| Wigeons | 85 | 25 | 145 | 15 | 113 | 95 | 0 | 55 | 36 |
| Northern shoveler | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 2 | 3 |
| Am. Green-winged teal | 0 | 3 | 6 | 0 | 0 | 0 | 0 | 0 | 8 |
| Canvasback | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Scaups | 3,310 | 5,618 | 3,832 | 1,749 | 1,865 | 1,750 | 2,465 | 3,786 | 3,565 |
| Common eider | 3,841 | 13,514 | 3,220 | 3332 | 5,934 | 2,325 | 1,084 | 1,896 | 6,172 |
| King eider | 195,841 | 146,512 | 575,376 | 285832 | 197,302 | 251,942 | 82,995 | 133,738 | 161,251 |
| Spectacled eider | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 9 |
| **Steller's eider** | **82,772** | **79,022** | **87,400** | **70,480** | **77,777** | **54,888** | **74,369** | **59,638** | **81,453** |
| Harlequin duck | 381 | 378 | 1,774 | 341 | 1,230 | 128 | 118 | 147 | 566 |
| Long-tailed duck | 9,876 | 32,273 | 9,244 | 21,279 | 7,351 | 17,134 | 18,192 | 17,886 | 20,694 |
| Surf scoter | 8 | 0 | 52 | 6 | 25 | 0 | 6 | 51 | 65 |
| Black scoter | 16,980 | 48,040 | 49,392 | 41,223 | 27,910 | 33,108 | 30,894 | 34,178 | 37,608 |
| White-winged scoter | 102 | 10,623 | 995 | 3,787 | 1,847 | 362 | 1,648 | 6,139 | 2,664 |
| Unident. scoter | 32 | 1,400 | 0 | 8,000 | 15 | 0 | 181 | 50 | 973 |
| Goldeneyes | 1,175 | 1,079 | 848 | 255 | 29 | 278 | 422 | 428 | 442 |
| Bufflehead | 22 | 8 | 123 | 2 | 119 | 51 | 37 | 8 | 56 |
| Mergansers | 383 | 1793 | 2156 | 962 | 1022 | 584 | 986 | 1,414 | 1,126 |
| Bald eagle | 32 | 53 | 145 | 63 | 67 | 16 | 0 | 12 | 39 |
| Sandhill crane | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 |
| Shorebirds | 842 | 2,900 | 4,842 | 10,305 | 10,014 | 13,827 | 6,480 | 14,714 | 8,127 |
| Gulls | 13,927 | 999 | 20,701 | 21,226 | 10,102 | 14,926 | 21,939 | 44,626 | 18,701 |
| Black-legged kittiwake | 200 | 756 | 168 | 3,600 | 1,502 | 2,606 | 90 | not recorded | 12,247 |
| Guillemots | 0 | 0 | 56 | 0 | 7 | 5 | 1 | 7 | 4 |
| **Marine mammals:** | | | | | | | | | |
| Sea otter | 1,414 | 1,917 | 266 | 1,629 | 918 | 1,573 | 2,163 | 686 | 1,181 |
| Pacific walrus | 0 | 1 | 1 | 0 | 0 | 14 | 0 | 1 | 124 |
| Seal | 1,283 | 978 | 756 | 620 | 203 | 101 | 1,042 | 35 | 1,173 |
| Steller's sea lion | 0 | 22 | 9 | 38 | 40 | 30 | 1 | 3 | 264 |
| Harbor porpoise | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 0 | 4 |
| Belukha whale | 2 | 34 | 0 | 0 | 0 | 3 | 0 | 54 | 22 |
| Orca whale | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Humpback whale | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 1 |
| Gray whale | 39 | 20 | 23 | 26 | 8 | 75 | 17 | 61 | 49 |

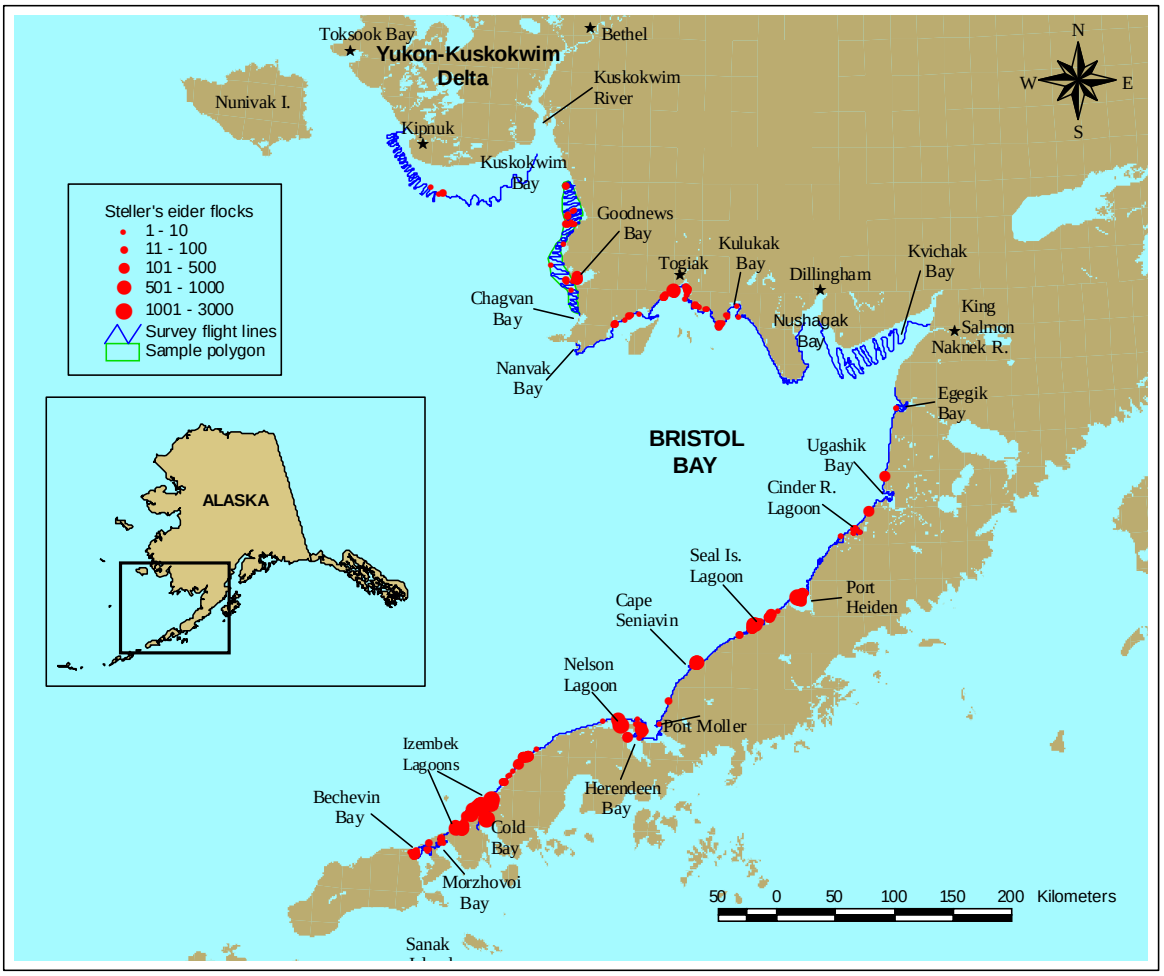


Figure 4. Survey sample areas, flight lines, and Steller's eider flock locations and relative size, Steller's eider spring migration survey, 16-22 April 2012.

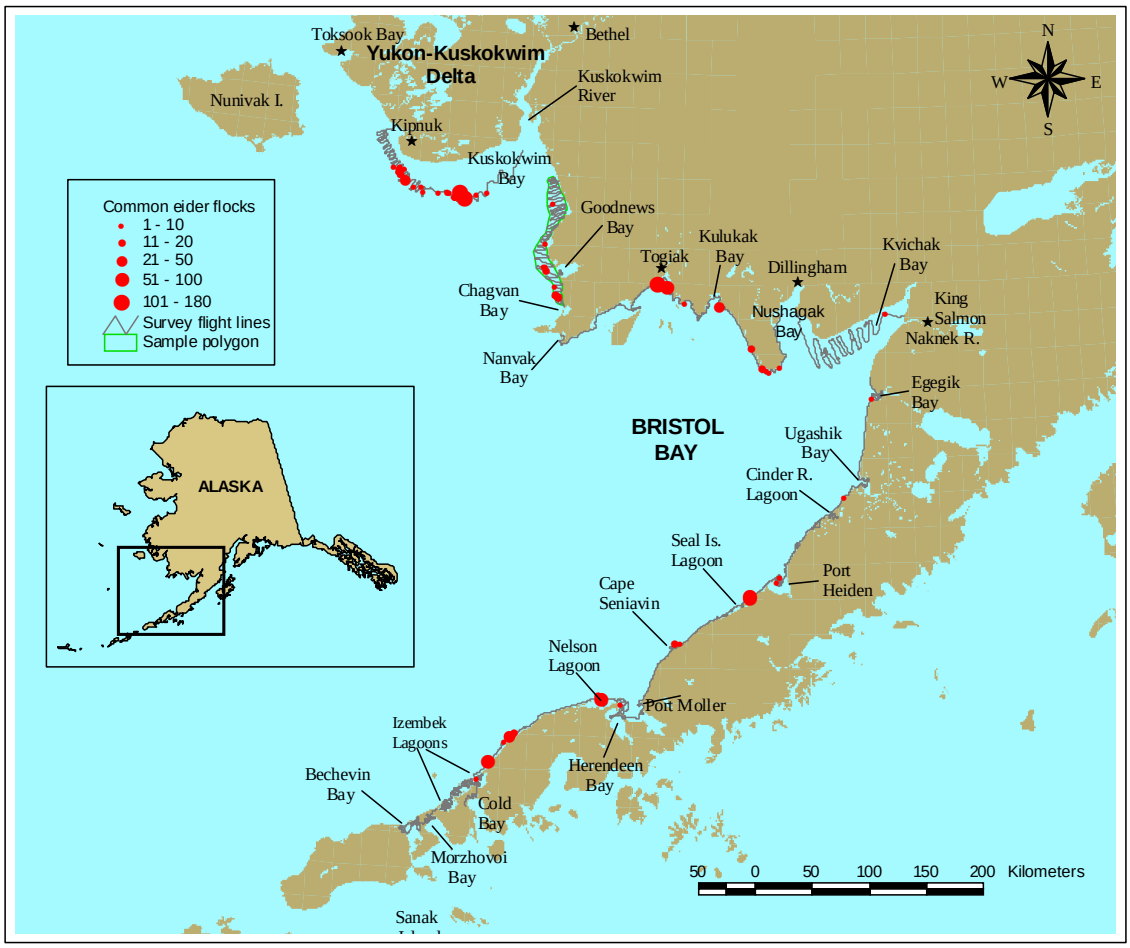


Figure 5. Location and relative size of common eider flocks recorded during Steller's eiders migration surveys, southwest Alaska, 16-22 April 2012.

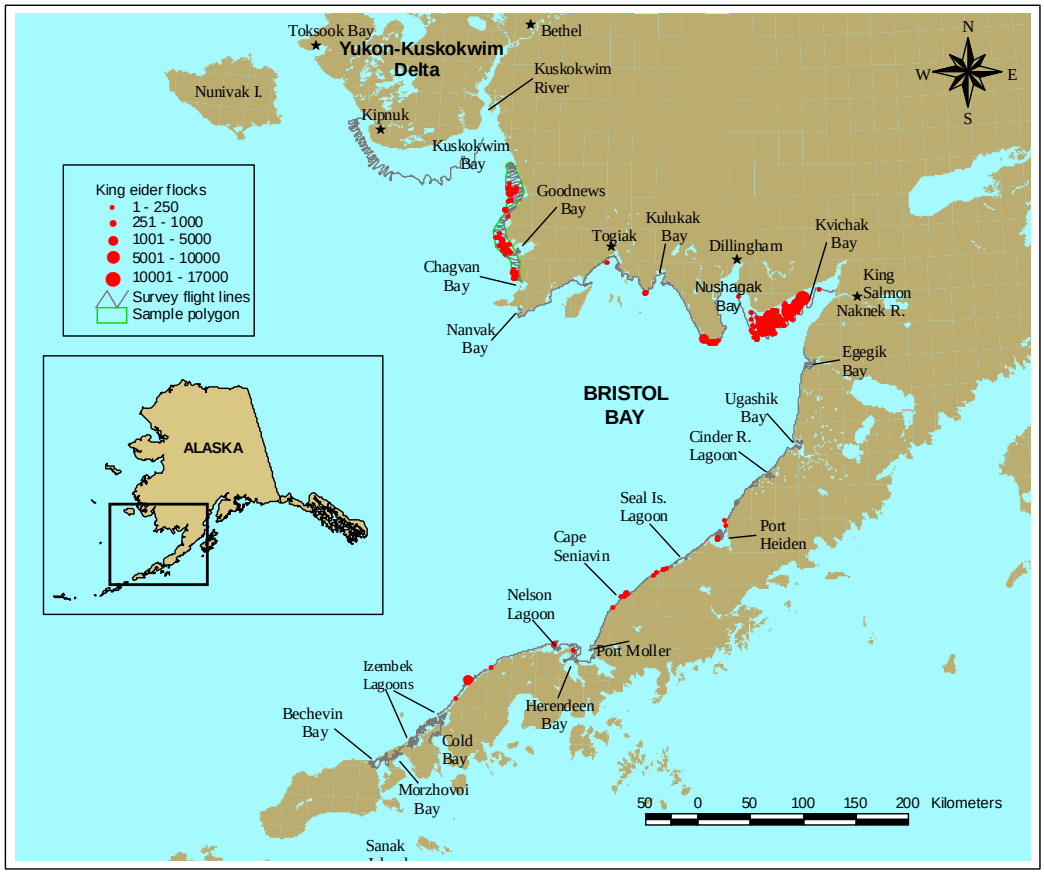


Figure 6. Location and relative size of king eider flocks recorded during Steller's eiders migration surveys, southwest Alaska, 16-22 April 2012.

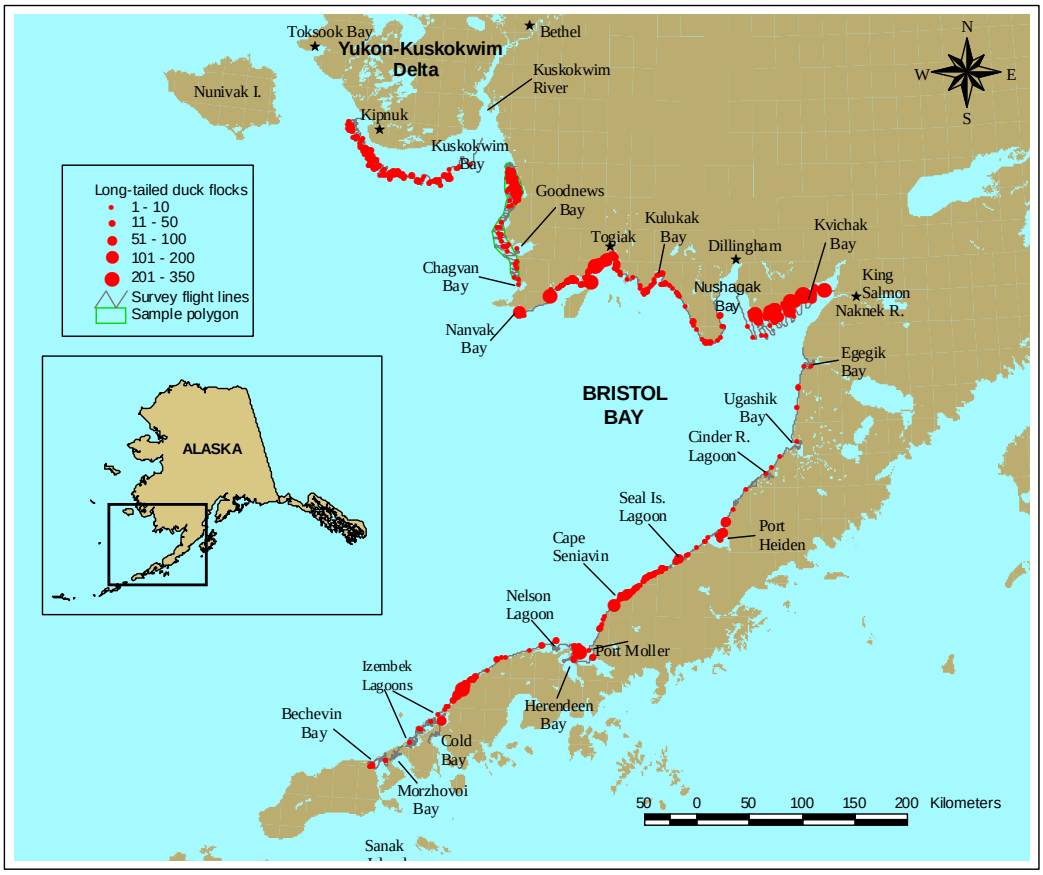


Figure 7. Location and relative size of long-tailed duck flocks recorded during Steller's eiders migration surveys, 16-22 April 2012.

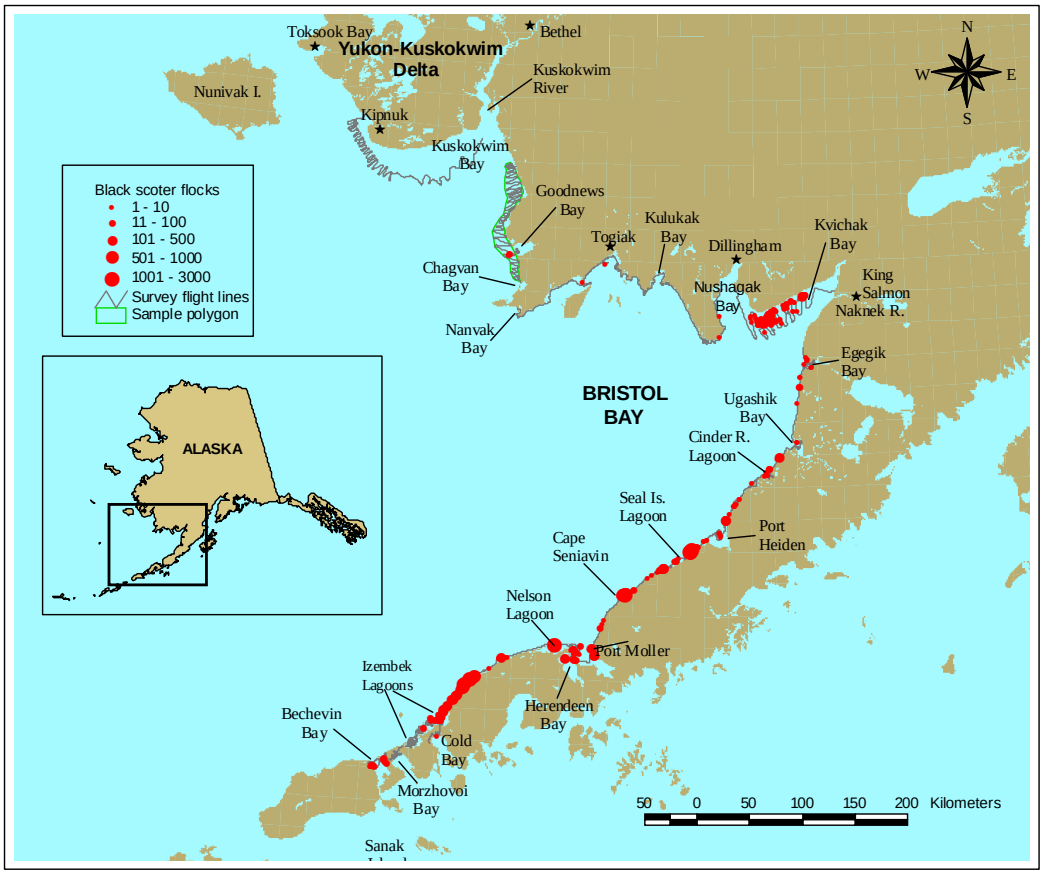


Figure 8. Location and relative size of black scoter flocks recorded during Steller's eiders migration surveys, southwest Alaska, 16-22 April 2012.

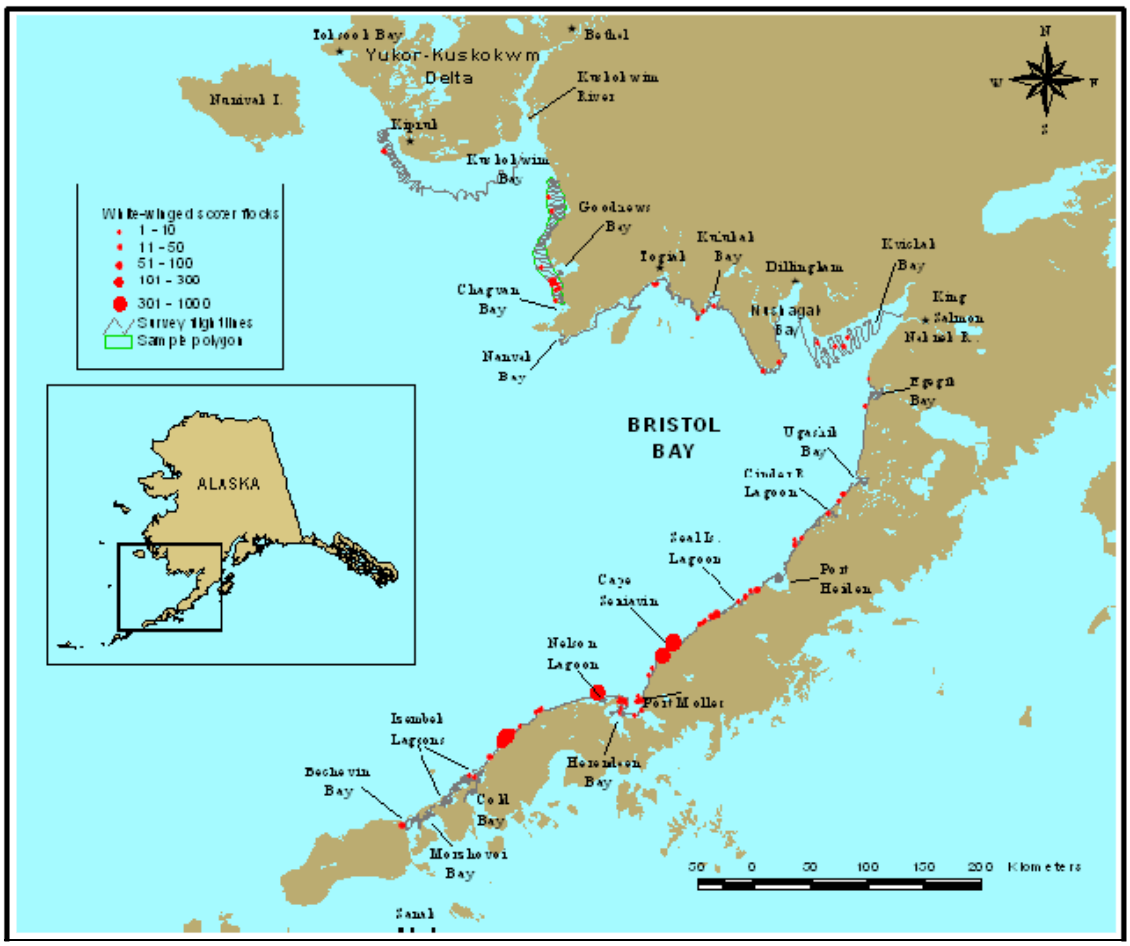


Figure 9. Location and relative size of white-winged scoter flocks recorded during Steller's eiders migration surveys, southwest Alaska, 16-22 April 2012.

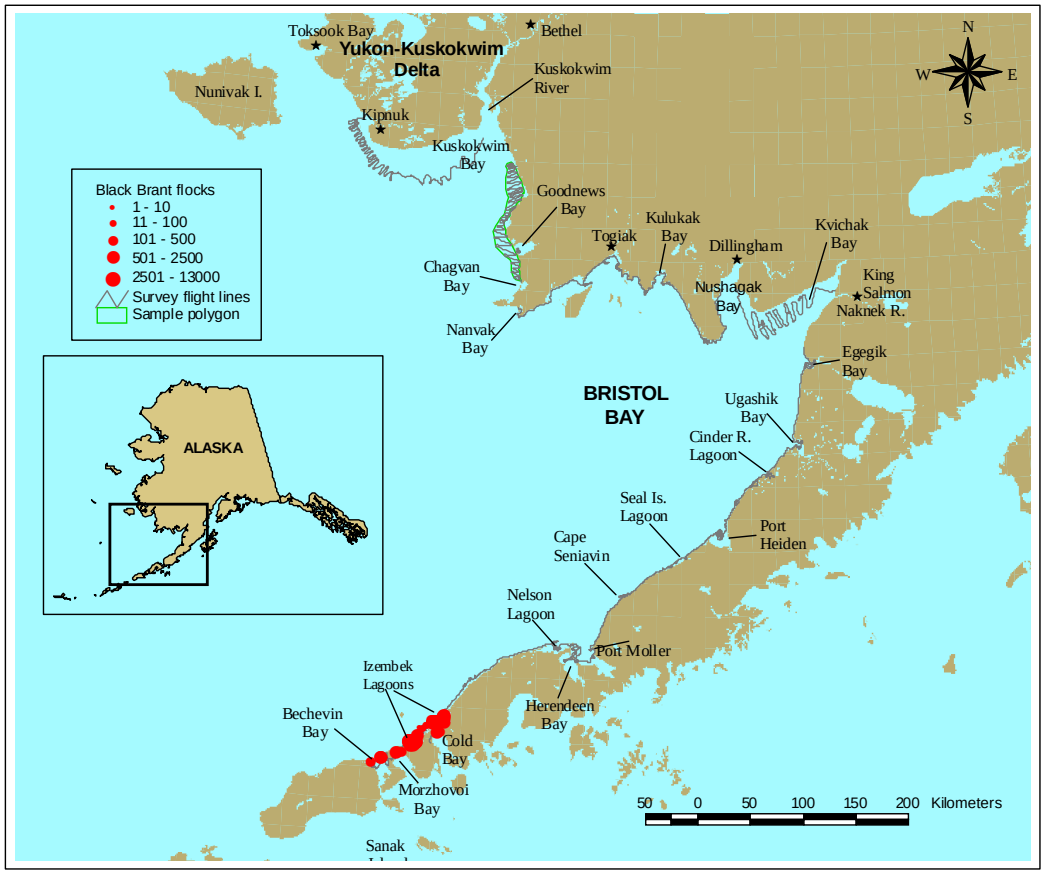


Figure 10. Location and relative size of black brant flocks recorded during Steller's eiders migration surveys, southwest Alaska, 16-22 April 2012.

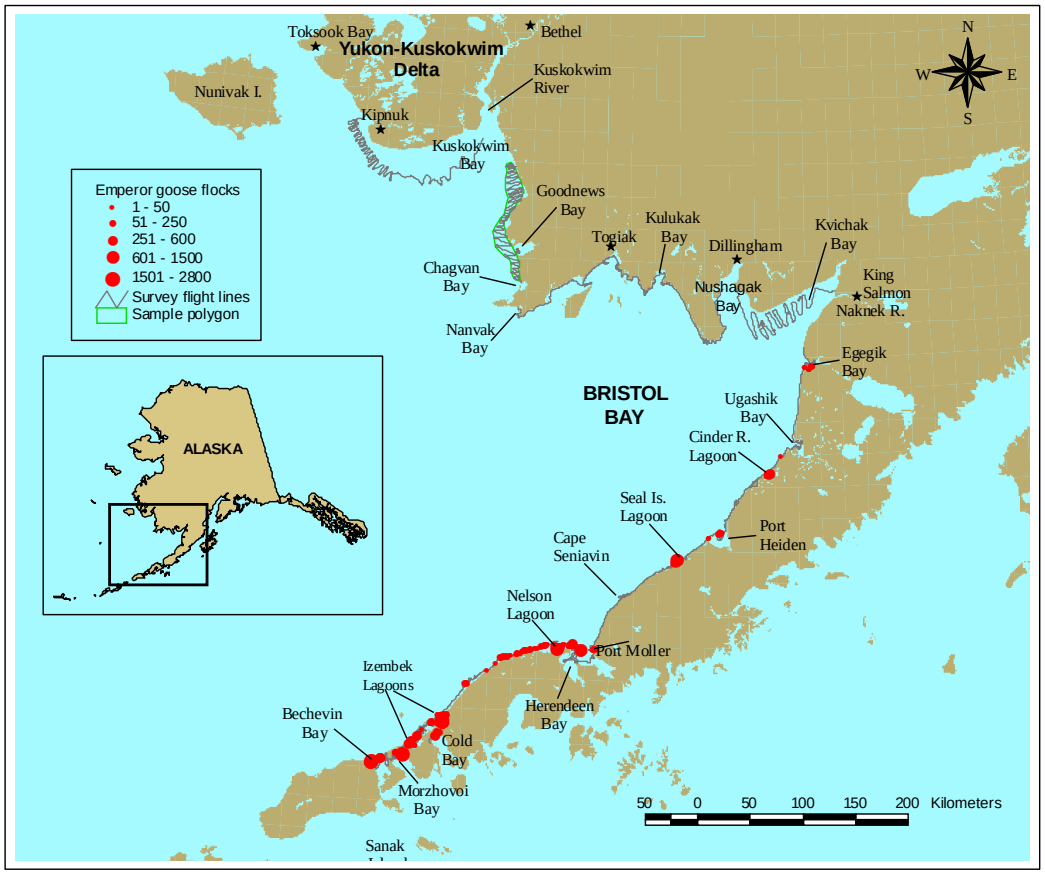


Figure 11. Location and relative size of emperor goose flocks recorded during Steller's eiders migration surveys, southwest Alaska, 16-22 April 2012.

Appendix 1. Inclusive dates, flight hours, and personnel, Steller's eider spring aerial migration surveys, southwest Alaska, 1992-2012. Pilots are in bold font, observers in normal.

| | SURVEY 1 | | | SURVEY 2 | | | SURVEY 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| Year | Dates | Flight hours | Personnel* | Dates | Flight hours | Personnel* | Dates | Flight hours | Personnel* |
| 1992 | 4/9-13 | 39.1 | **W Larned**, W Eldridge | 4/23-27 | 32.1 | **W Larned**, M Petersen, **W Butler**, M Wege B McCaffery | 5/2-6 | 31.3 | **W Larned**, J King |
| 1993 | 4/6-9 | 35.8 | **W Larned**, K Boden **W Butler**, M Wege | 4/25-27 | 40.4 | **W Larned**, K Laing **W Butler**, M Wege | 5/3-8 | 34.3 | **W Larned**, J King |
| 1994 | 4/24-5/1 | 40.2 | **W Larned**, J Pearce | 5/6-12 | 25.0 | **W Larned**, K Laing | | | |
| 1997 | 4/15-19 | 36.4 | **W Larned**, T Bowman | 4/26-30 | 34.4 | **W Larned**, T Tiplady | | | |
| 1998 | 4/22-29 | 35.5 | **W Larned**, R Platte | | | | | | |
| 2000 | 4/17-23 | 36.9 | **W Larned**, T Eskelin | | | | | | |
| 2001 | 4/22-5/01 | 41.8 | **W Larned**, P Anderson | | | | | | |
| 2002 | 4/21-29 | 42.6 | **W Larned**, P Anderson | | | | | | |
| 2003 | 3/29-4/10 | 38.1 | **W Larned**, J Fischer | | | | | | |
| 2004 | 4/1-11 | 35.8 | **W Larned**, P Anderson H Wilson | | | | | | |
| 2005 | 4/2-8 | 33.0 | **W Larned**, T Bowman | | | | | | |
| 2007 | 4/11-16 | 37.5 | **W Larned**, K Bollinger | | | | | | |
| 2008 | 4/8-11 | 29.8 | **W Larned**, K Bollinger | 4/24-29 | 25.9 | **W Larned**, T Bowman | | | |
| 2009 | 4/15-20 | 44.0 | **W Larned, K Bollinger,** S Savage | | | | | | |
| 2010 | 4/18-21 | 30.8 | **W Larned**, K Bollinger | | | | | | |
| 2011 | 4/13-19 | 34.3 | **W Larned**, R Platte | | | | | | |
| 2012 | 4/16-22 | 33.1 | **W Larned, H Wilson** | | | | | | |

* Pilot/port observer in bold print

APPENDIX 2. Common and scientific names of species mentioned in this report.

| **Common Name** | **Scientific Name** |
|---|---|
| Loons and grebes: (Families *Gaviidae, Podicipedidae*) | |
| Pacific loon | *Gavia pacifica* |
| Red-throated loon | G. *stellata* |
| Common loon | *G. immer* |
| Yellow-billed loon | *G. adamsii* |
| Red-necked grebe | *Podiceps grisegena* |
| Horned grebe | *P. auritus* |
| Cormorants: (Family *Phalacrocoracidae*) | |
| Cormorants | *Phalacrocorax auritus, P. pelagicus, P. urile* |
| Swans, geese, ducks: (Family *Anatidae*) | |
| Tundra swan | *Cygnus columbianus* |
| Canada goose | *Branta canadensis* |
| Brant | *B. bernicla* |
| Greater white-fronted goose | *Anser albifrons* |
| Emperor goose | *Chen canagica* |
| Mallard | *Anas platyrhynchos* |
| Gadwall | *A. strepera* |
| Northern pintail | *A. acuta* |
| Wigeons | *A.americana, A. penelope* |
| Northern shoveler | *A. clypeata* |
| Am. Green-winged teal | *A. crecca* |
| Canvasback | *Aythya valisineria* |

| | |
|---|---|
| Scaups | *A. marila, A. affinis* |
| Common eider | *Somateria mollissima* |
| King eider | *S. spectabilis* |

APPENDIX 2. Continued.

| **Common Name** | **Scientific Name** |
|---|---|
| Spectacled eider | *S. fischeri* |
| Steller's eider | *Polysticta stelleri* |
| Harlequin duck | *Histrionicus histrionicus* |
| Long-tailed duck | *Clangula hyemalis* |
| Surf scoter | *Melanitta perspicillata* |
| Black scoter | *M. nigra* |
| White-winged scoter | *M. fusca* |
| Goldeneyes | *Bucephala clangula, B. islandica* |
| Bufflehead | *B. albeola* |
| Common merganser | *Mergus merganser* |
| Red-breasted merganser | *M. serrator* |
| Eagles: (Family *Accipitridae*) | |
| Bald eagle | *Haliaeetus leucocephalus* |
| Cranes: (*Gruidae*) | |
| Sandhill crane | *Grus canadensis* |
| Shorebirds: (Families *Scolopacidae, Charadriidae, Haematopodidae*) | |
| Gulls: (Family *Laridae*) | |
| Gulls | *Xema sabini, Larus spp.* |
| Black-legged kittiwake | *Rissa tridactyla* |
| Alcids: (Family *Alcidae*) | |
| Guillemots | *Cepphus spp.* |
| | |
| Marine mammals: | |
| Sea otter | *Enhydra lutris* |
| Pacific walrus | *Odobenus rosmarus* |
| Seal | *Phoca spp., esp. Phoca vitulina* |
| Steller's sea lion | *Eumetopias jubatus* |
| Harbor porpoise | *Phocoena phocoena* |
| Belukha whale | *Delphinapterus leucas* |
| Orca whale | *Orcinus orca* |
| Gray whale | *Eschrichtius robustus* |