AERIAL BREEDING PAIR SURVEYS OF THE ARCTIC COASTAL PLAIN OF ALASKA - 2005

U.S. Fish and Wildlife Service
Waterfowl Management
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AERIAL BREEDING PAIR SURVEYS OF THE ARCTIC COASTAL PLAIN OF ALASKA - 2005


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Abstract: An aerial breeding pair survey was conducted on the Arctic Coastal Plain of Alaska for the 20th consecutive year from 24-27 June 2005. Weather conditions during the survey were relatively normal, although early June temperatures prior to this survey may have resulted in non-typical bird concentrations and breeding effort for some species in the survey area. The total duck index (290,413) was well below the previous 19-year mean (1986-2004, 397,762) primarily caused by a decline in northern pintail observations. The northern pintail index (156,754) was down 31% from the previous 19-year mean. The scaup index (26,967) was down 19% from the 19-year mean. The long-tailed duck index (84,241) was still below the 19-year mean (109,169) by 23%. The long-term index trend for long-tailed ducks remains significantly negative. The index for white-fronted geese (129,403) was 4% above the 19-year mean. The tundra swan index (12,002) was 22% above the 19-year mean, while the tundra swan nest index (1,709) was 34% above its mean. The yellow-billed loon index (1,871) was 35% below the 19-year mean although the long-term trend for this species remains near zero.

Key Words: aerial survey, Alaska, Arctic Coastal Plain, breeding pair survey, waterfowl

INTRODUCTION

This report summarizes results from the 2005 aerial breeding pair survey on the Arctic Coastal Plain (ACP) of Alaska. Population indices for 1986-2004 were reported previously (Brackney and King 1993, 1994, 1995, 1996, King and Brackney 1997, Mallek and King 2000, Mallek 2001, Mallek et al. 2002, 2003, 2004, 2005). This survey, conducted for 20 consecutive years, monitors the majority of waterfowl populations on the ACP. Some waterfowl species (i.e., spectacled eiders) are more appropriately monitored by surveys that are timed to precede the rapid and “early” departure of males (Larned et al. 2005). Similarly, breeding waterfowl which have limited spatial distributions (i.e., Pacific brant and common eiders) are more appropriately monitored by surveys which focus efforts to specific areas (Ritchie and Shook 2005, Dau and Larned 2004). This survey provides population indices for breeding waterbird species that are found throughout the ACP, and is supplemental to continental breeding pair survey area coverage in Alaska (Conant and Groves 2005).

Several modifications of analysis techniques were initiated with the 2001 survey. Previous analyses of survey data were conducted with a non-stratified approach. The reports for the 2001-2004 surveys and this report incorporate a stratified analysis of the survey area which is described in the methods section. All waterbird population indices from previous years remain unchanged from their non-stratified approach. This stratified analysis was initiated in an attempt to decrease estimates of variance and to simplify comparisons between this survey and the survey conducted by Larned et al. 2005, which is conducted prior to this survey and samples a smaller portion of the ACP.

In an effort to standardize analysis techniques of goose observations during breeding pair surveys conducted by the U.S. Fish and Wildlife Service (USFWS) in Alaska, all lone goose observations will be doubled for analysis. The rationale for doubling lone goose observations is that an observation of a lone goose implies a pair with the unseen goose on a nest. The reports for the 2001-2004 surveys and this report incorporate this change in analysis and previous survey population indices have been updated accordingly in the tables and figures. Since the majority of geese are observed in flocks and
in pairs, this change in analysis techniques will not greatly affect previous population indices.

STUDY AREA AND METHODS
Study Area and Survey Design

The survey area (61,645.2 km²) included all contiguous waterfowl habitat north of the Brooks Range, from the northwest coast of Alaska east to the U.S.-Canada border (Figure 1). Survey design (Brackney and King 1995) was similar to that used for the North American Waterfowl Breeding Pair Survey. Survey transects were 0.4 km wide, with each observer responsible for ½ of the transect width. Transects were placed systematically from a randomly selected start in an east-west orientation and were 18.8 km apart (Figure 1). Slightly over 2% of the survey area was sampled.

Survey Procedures

Survey procedures followed U.S. Fish and Wildlife Service protocol for waterfowl breeding pair surveys (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1987). The centerline of each transect was flown in an amphibious configured Cessna 206 aircraft at 30-45 m (100-150 ft) above ground level and at 145-170 km/hr (90-105 mph). Airplane navigation and altitude were maintained with a Global Positioning System (GPS) and a radar altimeter, respectively. All waterbirds and raptors observed within 0.2 km of the transect centerline were recorded by the pilot/observer and observer for their respective sides.

Observations were recorded directly into laptop computers as sound files using a program developed by John Hodges (USFWS, Region 7, MBM-Juneau). Each laptop computer (one for each observer) was linked to the aircraft GPS unit. The program simultaneously recorded observations and their coordinates into linked sound and ASCII files, respectively. A second computer program, also developed by John Hodges, was used on the ground to replay the linked sound files and produce transcribed ASCII files. The transcribed ASCII files were then used for data analysis.

Observations of waterfowl were recorded according to established survey protocol (U.S. Fish and Wildlife Service and Canadian Wildlife Service 1987). All observations of lone male ducks (drakes) were recorded as singles. Drakes in flocks were recorded as flocked drakes. A male duck in close association with a female was recorded as a pair. Ducks in mixed-sex groupings of 3 or more of the same species which could not be separated into singles and pairs were recorded as groups (a hen and two drakes were recorded as a pair and a lone drake). All observations of lone geese were recorded as singles, two geese in close association were recorded as a pair, and geese in groups of 3 or more of the same species that could not be separated into singles and pairs were recorded as groups.

Statistical Procedures

Statistical procedures followed those reported by Smith (1995). For ducks, all observations of lone drakes, flocked drakes (<5), and pairs were doubled. Groups of ducks and observations of male scaup were not doubled. For geese, all observations of singles and pairs were doubled for analysis. Groups of geese were not doubled. For non-duck and non-goose observations, only the observations of pairs were doubled for analysis. We corrected for visibility bias (ducks present but not observed in the area sampled) by applying visibility correction factors, developed for coastal tundra habitats (Conant et al. 1991, Smith 1995), to the population indices and variances. Population indices and variances were estimated with the ratio method (Cochran 1977, Smith 1995).
Data were analyzed with computer programs developed by Bob Stehn and Bob Platte (USFWS, Region 7, MBM-Anchorage) using standard statistical techniques for strip-survey analysis. For analysis purposes the survey area was divided into 12 strata with transect placement based on a random systematic coverage of the entire survey area (Figures 1-2). Strata boundaries were based on geomorphic/aquatic features delineated from satellite imagery of the ACP. A geographic information system (GIS) was used to cut continuous transects at stratum boundaries for analysis.

RESULTS & DISCUSSION

Population Indices

The 2005 survey was conducted from 24-27 June. A total of 1,292.8 km² was sampled, which comprised 100% of the designed sample area (Figure 1). Weather conditions were normal during the survey, although low early June temperatures prior to this survey caused significant amounts of ice to remain on lakes until after mid-June. The low early June temperatures may have affected density and distribution of some waterfowl species.

Population indices are listed in Tables 1-4. Sampling effort and strata information are listed in Table 5. Numbers of observations of singles, pairs, and flocks as well as population indices and trends for all survey years are shown in Figures 3-20 and Tables 6-18 for primary species.

The total duck index for 2005 was 290,413 and was 27% below the previous 19-year (1986-2004) mean of 397,762. Northern pintails comprised the greatest proportion of ducks observed and were the primary cause for the below average total duck index. The northern pintail index of 156,754 was 31% below the long-term mean (1986-2004) and was comprised of a large proportion of singles and pairs. The group component (flocked birds) was the smallest on record during the 20 years of the survey and was the primary cause for low index in 2005. The 20-year trend for northern pintails was flat and not significant (Figure 4).

The long-tailed duck index for 2005 was 84,241 and was 23% below the previous 19-year mean of 109,169. The 20-year trend for long-tailed ducks was negative and significant (Figure 6). The major factor in this negative trend was the flock or group component. The number of grouped long-tailed ducks has decreased considerably since 1989 (Figure 5, Table 7).

The index for scaup in 2005 was 26,967 and was 19% below the 19-year mean. The long-term growth rate estimate for scaup was not significant (Figure 8).

The white-fronted goose population index was 129,403 and was 4% above the previous 19-year mean. The long-term trend for white-fronted geese was slightly positive and not significant (Figure 10). The index for Canada geese was 21,200, which was 17% above the previous 19-year mean of 18,179. Snow geese and brant are colonial breeders and this survey was not designed to accurately monitor their ACP population levels. Data presented in this report for these species are ancillary and do not indicate accurate population indices or trends.

The tundra swan population index was 12,002 and was 22% above the previous 19-year mean of 9,854. The population growth rate for tundra swans was positive and significant (Figure 12), although this growth rate estimate is primarily driven by results from the 1997-2000 surveys. A total of 36 tundra swan nests were observed on the 2005 survey. This resulted in an index of 1,709 nests, which was 34% above the 19-year mean of 1273.
The jaeger index for 2005 was 5,804 and was 17% below the previous 19-year mean. The long-term growth rate estimate for jaegers was not significant and negative (Figure 14).

Pacific loon and yellow-billed loon indices, 24,955 and 1,871, respectively, were below their previous 19-year means by 7% and 35%, respectively. The long-term growth rate estimates for these species are rather flat and not significant (Figures 15 and 17). The red-throated loon index was 3,038, and was 4% below the previous 19-year mean. While red-throated loon indices have been highly variable over the years this survey has been conducted, the long-term growth rate estimate was positive and significant (Figure 16).

Arctic tern data from 1992-2005 indicates a positive and significant growth rate for this species, (Table 16 and Figure 18). Data for glaucous gull and Sabine's gull (1992-2005) indicates non-significant growth rates for these species (Tables 17-18 and Figures 19-20).

ACKNOWLEDGMENTS

I thank Dennis Marks (Waterfowl Management - Anchorage) for his help as an observer during the survey. I thank Jack Hodges (Waterfowl Management - Juneau) for the continued development of the specialized survey software. Thanks are extended to Atqasuk Airport Manager Richard Bordeaux for his help in accommodating a safe and centralized fuel cache at the Atqasuk Airport.

Data and conclusions presented here are preliminary and are not for publication or citation in published manuscripts without permission from the authors
REFERENCES CITED


Table 1. Population indices of ducks from an aerial breeding pair survey on the Arctic Coastal Plain of Alaska, 24-27 June 2005.

<table>
<thead>
<tr>
<th>Species</th>
<th>VCF</th>
<th>Drakes&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Pairs</th>
<th>Groups</th>
<th>Indicated Birds</th>
<th>Pop. Index</th>
<th>SE</th>
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<sup>a</sup>Indicates drakes only in flocks of 4 or less. This number is doubled to estimate indicated birds, except for scaup drakes which are not doubled in value.
Survey area = 61,645.2 km², Sample area = 1,292.8 km²
Visibility correction factor = VCF, Number of transects (n) = 93
Table 2. Population indices of waterfowl and related species from an aerial breeding pair survey on the Arctic Coastal Plain of Alaska, 24-27 June 2005.

<table>
<thead>
<tr>
<th>Species</th>
<th>VCF</th>
<th>Singles</th>
<th>Pairs</th>
<th>Groups</th>
<th>Indicated Birds</th>
<th>Pop. Index</th>
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<td>14,795</td>
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<td>430</td>
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<td>199</td>
<td>299</td>
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<td>243</td>
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Survey area = 61,645.2 km², Sample area = 1,292.8 km²
Visibility correction factor = VCF, Number of transects (n) = 93

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<td>307,494</td>
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*Includes all scoters identified and unidentified
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*a* Includes all scoter identified and unidentified  
*b* Estimate based on left-observer data only  
*c* Number based on all loon observations from left and right observer
Table 5.  Stratum information from an aerial breeding pair survey of the Arctic Coastal Plain of Alaska, 24-27 June 2005.

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Figure 1. Major features of the Arctic Coastal Plain of Alaska in relation to the waterfowl breeding pair survey boundary and the 2005 transect locations (red lines).
Figure 2. Stratification of the Arctic Coastal Plain of Alaska for calculation of waterbird population indices from an aerial survey conducted in 2005.

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Figures 3 and 4. Trends of Northern Pintail observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2005. "Singles" represents the number of males in flocks of 4 or less (flocked drakes and lone drakes). Mean annual growth rate was determined by log-linear regression.
Long-tailed Duck


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Mean annual growth rate = 0.9774  Prb>Ttest = 0.0004  95% C.I. = 0.9665 to 0.9884

Figures 5 and 6. Trends of Long-tailed Duck observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2005. "Singles" represents the number of males in flocks of 4 or less (flocked drakes and lone drakes). Mean annual growth rate was determined by log-linear regression.

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Figures 7 and 8. Trends of Scaup observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2005. "Singles" represents the number of males in flocks of 4 or less (flocked drakes and lone drakes). Mean annual growth rate was determined by log-linear regression.
# Greater White-fronted Goose


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**Figures 9 and 10.** Trends of Greater White-fronted Goose observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2005. Mean annual growth rate was determined by log-linear regression.

Mean annual growth rate = 1.0160  Prob>Ttest = 0.0693  
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### Tundra Swan


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Figures 11 and 12. Trends of Tundra Swan observations and population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2005. Mean annual growth rate was determined by log-linear regression.
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Figures 13 and 14. Trends of Tundra Swan Nest and Jaeger population indices from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2005. Mean annual growth rate was determined by log-linear regression.
Pacific Loon

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Red-throated Loon

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Yellow-billed Loon

Table 15. Population indices for Yellow-billed Loon from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1986-2005.

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Arctic Tern


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Glaucous Gull

Table 17. Population indices for Glaucous Gull from aerial breeding pair surveys on the Arctic Coastal Plain of Alaska, 1992-2005.

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Sabine's Gull


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### Appendix 1. Scientific names of species listed in text, figures or tables.

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<td>Red-throated Loon</td>
<td><em>Gavia stellata</em></td>
<td>Goldeneye (Com. &amp; Barrows)</td>
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<tr>
<td>Pacific Loon</td>
<td><em>Gavia pacifica</em></td>
<td>Scaup (Greater &amp; Lesser)</td>
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<tr>
<td>Yellow-billed Loon</td>
<td><em>Gavia adamsii</em></td>
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<td>Tundra swan</td>
<td><em>Cygnus columbianus</em></td>
<td>Sandhill Crane</td>
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<tr>
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<td>Lesser Snow Goose</td>
<td><em>Chen caerulescens</em></td>
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<td>Small Canada Goose</td>
<td><em>Branta canadensis</em></td>
<td>Pomarine Jaeger</td>
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<td><em>Anas crecca</em></td>
<td>Long-tailed Jaeger</td>
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<td><em>Anas platyrhynchos</em></td>
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<td><em>Anas acuta</em></td>
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<td><em>Anas clypeata</em></td>
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<td><em>Anas strepera</em></td>
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<td><em>Polysticta stelleri</em></td>
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