Nest Population Size and Potential Production of Geese and Spectacled Eiders on the Yukon-Kuskokwim Delta, Alaska, 2007

Julian B. Fischer[1], Robert A. Stehn[1], and George Walters[2]

[1] U.S. Fish and Wildlife Service, Migratory Bird Management, Waterfowl Management Branch, 1011 E. Tudor Rd., Anchorage, AK 99503
[2] U.S. Fish and Wildlife Service, Yukon Delta National Wildlife Refuge, P.O. Box 346, Bethel, AK 99559

SUMMARY: In general, 2007 was a year of very good potential production for geese and eiders. Depredation and nest abandonment rates were low for all species. Recent 10-year trends in nests populations are positive for all waterfowl except cackling geese and brant, whose numbers have generally declined since 1998. We estimated 4,399 spectacled eider nests (corrected for nest detection rate) on the Yukon-Kuskokwim Delta coastal zone in 2007. While the estimate of nests was 9% below the 1985-2006 average, high nest success resulted in egg production slightly higher than the 1985-2006 average. Unlike 2006, spring arrived early on the YKD in 2007, resulting in most species nesting a week earlier than average.

INTRODUCTION:


Photo by R.M. Anthony

Annual assessment of nest population size and egg production of geese and eiders on the Yukon-Kuskokwim Delta (YKD) provides information for the Spectacled and Steller's Eider Recovery Team, the Pacific Flyway Technical Committee, participants in cooperative goose management plans, and biologists interested in waterfowl status and trends in western Alaska. A ground-based sampling procedure has been used since 1985 to estimate the number of nests and eggs for cackling geese (*Branta hutchinsii minima*), emperor geese (*Chen canagica*), greater white-fronted geese (*Anser albifrons frontalis*), spectacled eiders (*Somateria fischeri*), and other nesting waterbirds on the YKD. The ground-based nest survey provides an estimate of nest population size and potential production. The ground survey is conducted coincident with an aerial breeding pair survey (Bollinger et al. 2007, Platte and Stehn 2007) that provides an index to population size. Together, these surveys contribute long-term data needed to understand goose and eider population status.

Starting in 2006 we improved analysis methods by incorporating nest detection rates (Bowman and Stehn *manuscipt in prep.*), reducing sampling error in expansion factors, and restricting analyses of historical data to plots within the current survey area. These changes resulted population estimates that differ from those reported in previous annual reports (Fischer et al. 2006).

METHODS:

We used a ground-based sampling procedure to monitor goose and eider nest populations and potential production on the YKD coastal zone from 1985 to 2007 (Fig. 1). Boundaries of the survey area included all lands on the Yukon Delta National Wildlife Refuge (YDNWR) containing medium and high nest densities of spectacled eiders (based on aerial and ground observations 1985-1993, USFWS unpubl. data). We excluded privately owned high density nesting habitat near Kokechik Bay, two patches on south Nelson Island, and several tracts near Hazen Bay because annual access could not be assured. From 1994-1997, and 2000-2007, the ground sampled area included 716 km^2, or 5.6% of the total coastal zone. In 1998, 1999, and prior to 1994, the size of the ground sampled area varied. In this report, estimates of nest population size and egg production are

based only on plots within the core 716 km^2, whereas estimates of clutch size and hatch date use data from ground plots within and beyond the core area.

We used GIS and custom-written TrueBASIC computer programs to randomly select 85 plots within the core 716 km^2 ground sampled area in 2007 (Fig. 2). Areas sampled during the preceding five years were excluded from the random selection process. We transferred plot boundaries to digital color infrared aerial photographs (1:15,000 or 1:10,000) for field use. We included plots regardless of juxtaposition to lakes and rivers. Plot size was 402 m by 805 m (0.32 km^2) in 1986-1994 and 1997-2007. Plot size was variable in 1985, 0.45 km^2 in 1995, and 0.36 km^2 in 1996.

Plots were searched by 2-4 biologists who were transported either by Cessna 185 float-equipped aircraft or by motorboat. One boat crew originated from the YDNWR Kanagayak field station and worked plots accessible from the Aphrewn River. A second boat crew worked plots on the Naskonat Peninsula, north of Kigigak Island. Research biologists on Kigigak Island and the Manokinak River searched plots near their camps. Plots were generally within 2 km of a river or lake suitable for landing a float-equipped aircraft. All sites dry enough for a nest were examined for active and destroyed waterfowl, crane, loon, and gull nests. Nests of other species were recorded as encountered, but most shorebird and passerine nests were likely missed.

At each nest we recorded species, nest status, nest habitat, and stage of incubation. Species was determined by visual confirmation of an adult at the nest or by comparing down and contour feathers in the nest bowl with a photographic field guide (Bowman 2004). Red-throated (*Gavia stellata*) and Pacific loon (*Gavia pacifica*) nests are essentially indistinguishable from each other (Bowman 2004), so we applied the 2007 ratio of aerial observations of each loon species (Platte and Stehn 2007) to determine the relative numbers of loon nests for the two species. To reduce fluctuation in the ratio of loon species caused by sampling error in aerial indices, we used a localized 7-year average (from the current year, 3 prior years, and 3 following years data as available) of the annual ratios of loon species determined from aerial observations from the plot sampled area. We determined stage of incubation for all species by measuring float angles of eggs from active nests (Westerskov 1950). Hatch dates were estimated from incubation stage of eggs found on plots. Hatch date estimates prior to 1985 were derived from plots established by Butler (1983).

The mean and variance of the number of nests and eggs per plot was based on a simple random sample of plots. The estimates of nests and eggs were expanded to the ground sampled area (716 km^2) based on the size (0.32 km^2) and number of plots (79). Nest population estimates were corrected for detection rate using a model that considers species, nest activity status, observer experience, and nest site (Bowman and Stehn *manuscript in prep.*).

The corrected estimates for nests and eggs in the ground sampled area were expanded to the entire coastal zone of the YKD based on a stratified analysis of an aerial survey of the entire coastal zone of the YKD (12,832 km^2; Butler et al. 1988, Bollinger et

al. 2007, Platte and Stehn 2007). To expand the ground-based estimates, we annually calculated the ratio of the aerial breeding population index outside the ground-sampled area ("OUT") to the aerial index within the ground-sampled area ("IN"). We used the localized 7-year average of 1+ Out/In ratio as an expansion factor for a given year. Variance estimates of nest populations expanded to the entire coastal zone incorporate the variance of the Out/In ratio. The aerial breeding population index for most species was based on twice the number of singles plus the number of birds in pairs observed, because single geese, cranes, and ducks observed are assumed to be the mates of unobserved females on nests. Flocks of these species were not included in the aerial index, except with brant. For swans, the number of single birds observed was not doubled. For loons and gulls, the total number of birds observed was used as the index.

The estimated total number of nests is a direct measure of effective breeding population size and an index to the size of the population of adults that are potential nesters. The estimated total number of eggs is a measure of the number of young that could potentially augment the fall population if they survive through summer. The proportion of nests that are active when the plots were searched is an index to nest success; the actual proportion of nests that produced young is lower because some nests are lost after plots are searched. Data were tabulated, edited, and sorted using Excel, and nest population, hatch date, and clutch size estimates were calculated using customized TrueBASIC programs.

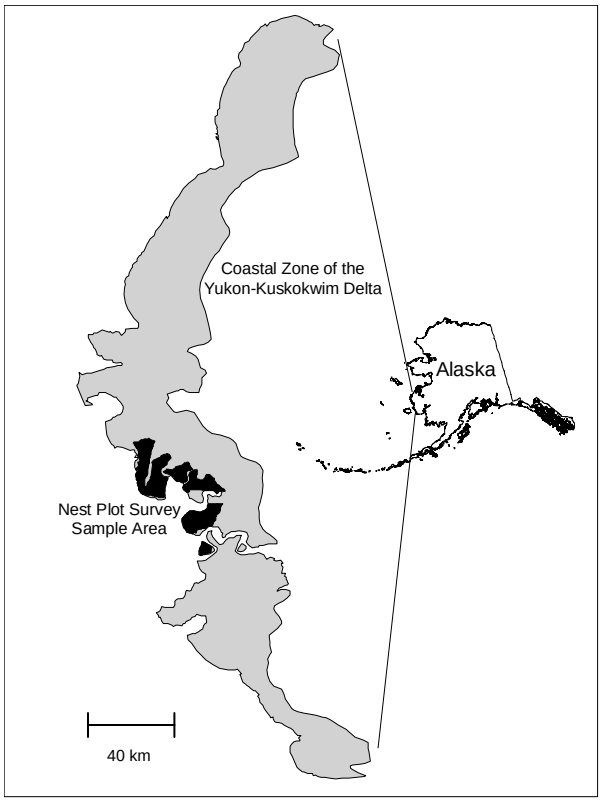


Figure 1. Location of the ground nest plot survey area relative to the coastal zone of the Yukon-Kuskokwim Delta, Alaska, 2007.

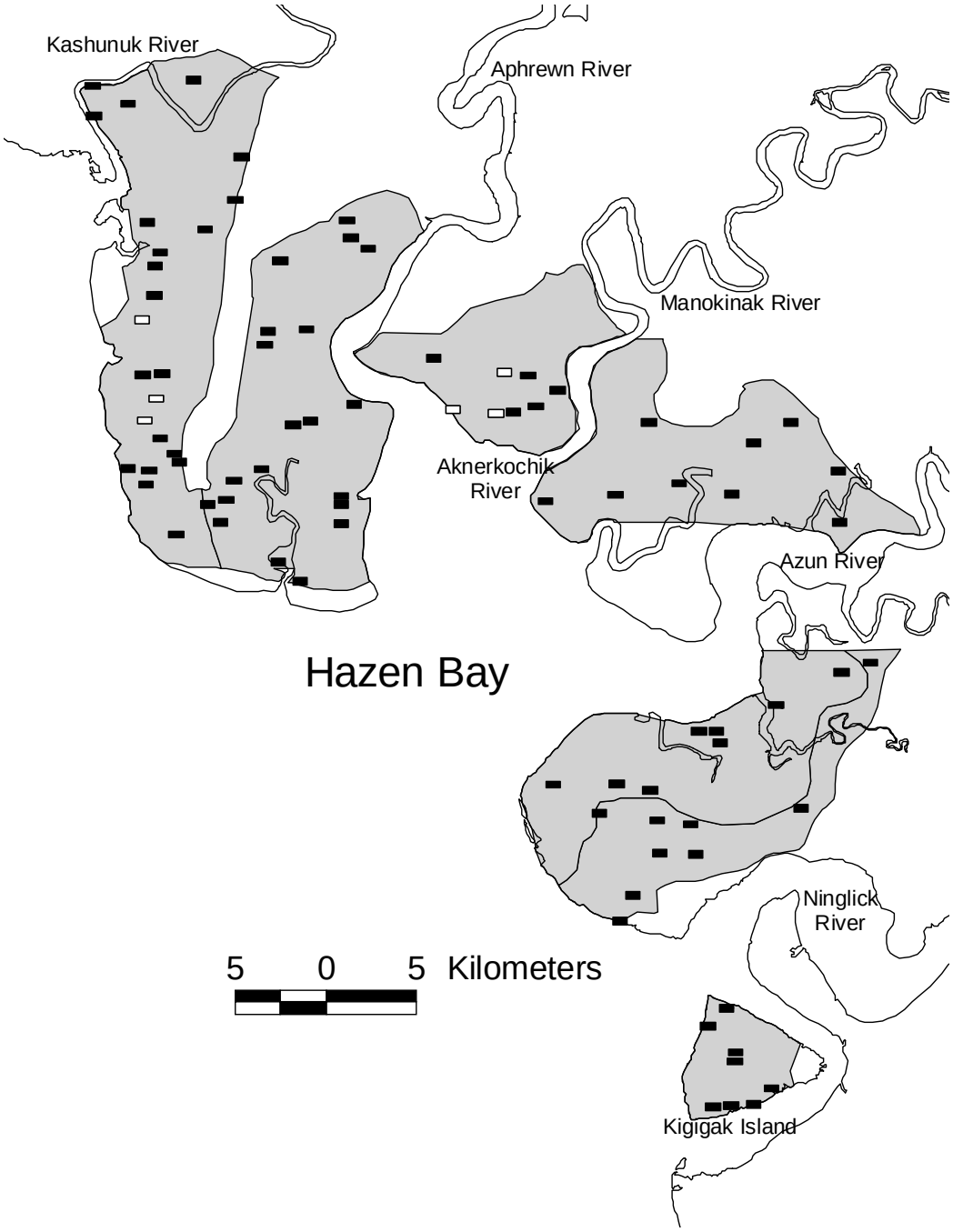


Figure 2. Locations of 79 sampled plots in 2007 (solid rectangles). Six additional plots were selected but not sampled (open rectangles).

RESULTS:

We searched 79 plots from 29 May to 12 June (Fig. 2). Crews based at the Kanagayak field station searched 46 plots, boat-based crews searched 25 plots, a Yukon Delta NWR crew at Kigigak Island searched 5 plots, and a USGS-BRD crew at the Manokinak River searched 3 plots. Six of the 85 randomly selected plots were not sampled due to poor access and weather delays that prevented completion of plots prior to onset of hatch. Crews located 4,038 nests in 2007, comprised of 1,679 cackling goose, 381 emperor goose, 701 greater white-fronted goose, 95 spectacled eider, and 1,182 nests of other species. We present nest population, egg production, and nest success estimates in figures with accompanying tabulated data for each species (Fig. 3). Estimated hatch date for each species is presented in Table 1. The following section presents general descriptive results for each species.

Cackling Geese (*Branta hutchinsii minima*)

Potential production of cackling geese was excellent in 2007. Total numbers of nests and eggs were up from 2006 (Fig. 3) and were 55% and 83% above the long-term average, respectively. The estimate of number of nests was the fourth highest since 1985; but owing to high nest success and high clutch size, the estimate of number of eggs was second only to 1998. Despite strong growth in the 1990s, the nest population declined at an average rate of 2.6% per year over the last decade. Average hatch date for cacklers in 2007 was eight days earlier than 2006 and five days earlier than the long-term average (Table 1).

Emperor Geese (*Chen canagica*)

Potential production of emperor geese was good in 2007. The number of nests and eggs were up from 2006 (Fig. 3) and were 10% and 18% above the long-term average, respectively. Nest success was high and egg loss low. Nest population growth rates have been variable over the course of this survey. The number of emperor goose nests increased 2.1% per year since 1998. Similar to other waterfowl species, estimated hatch date for emperors in 2007 was five days earlier than 2006 and three days earlier than the long-term average (Table 1).

Greater White-fronted Geese (*Anser albifrons frontalis*)

Potential production of greater white-fronted geese was very good in 2007. The number of nests and eggs were up from 2006 (Fig. 3) and were 86% and 96% above the long-term average, respectively. Nest success was high, reflecting good conditions on the nesting grounds with little egg loss. Growth in the nest population of white-fronts has been high throughout the duration of the survey and an increase of 5.2% per year during

the last decade (Fig. 3). Estimated mean hatch of white-fronts was seven days earlier than 2006 and four days earlier than the long-term average (Table 1).

Black Brant (*Branta bernicla nigricans*)

The nest plot survey was not designed to monitor colonial nesting birds such as black brant, and we excluded primary colonies from the sample area. The primary brant colonies are monitored annually by digital photographic surveys (see Anthony 2006). The nest plot survey, however, does provide an estimate of nests from non-colonial brant and small satellite colonies on the YKD. In these areas, potential production of brant in 2007 was good. The number of nests and eggs were up from 2006 (Fig. 3) and were 13% and 59% above the long-term average, respectively. Nest success was higher than 2006 and above the long-term average. The nest population of brant declined 7.1% annually during the last ten years, however this trend is influenced heavily by high estimates in 1998; thus next year the 10-year trend will likely be flat. Estimated hatch was six days earlier than in 2006 and three days earlier than the long-term average (Table 1).

Tundra Swans (*Cygnus columbianus*)

Potential production of tundra swans was good in 2007. The number of nests and eggs were up from 2006 (Fig. 3) and were 4% and 2% above the long-term average, respectively. Nest success was up from 2006 and slightly above the long-term average (Table 2). Growth of the tundra swan nest population has fluctuated over the course of the survey but has generally been positive. Over the last decade nest population growth was 1.2% per year. Estimated mean hatch date was one week earlier than 2006 and 2 days earlier than the long-term average (Table 1).

Sandhill Cranes (*Grus canadensis*)

Potential production of sandhill cranes was fair in 2007. The number of crane nests and eggs were up slightly from 2006 (Fig. 3) but 23% and 11% below the long-term average, respectively. Nest success was nearly the same as in 2006 and the long-term average. Sandhill crane nest populations have been highly variable among years with a 1.2% decline per year over the last decade (Fig. 3). The estimated hatch date of sandhill cranes was eleven days earlier than 2006 and eight days earlier than the long-term average (Table 1).

Spectacled Eiders (*Somateria fischeri*)

Potential production of spectacled eiders was good in 2007. Numbers of spectacled eider nests were down substantially from 2006 and 2005- years of particularly high estimates, and was 9% below the long-term average (Fig. 3). Egg production also was down from 2006 but remained 1% above the long-term average. Nest success was higher than 2006 and above the long-term average. Starting in the early 1990s there has been positive growth in the spectacled eider nest population. The annual growth rate within the last 10 years is 2.7%. Like other waterfowl species, spectacled eiders initiated nests six days earlier than in 2006, and three days earlier than the long-term mean (Table 1).

Common Eiders (*Somateria mollissima*)

Potential production of common eiders was excellent in 2007. The nest population estimate in 2007 was the highest in the 23 years of data collection, continuing a three-year run of high nesting effort. Numbers of nests and eggs in 2007 were 180% and 231% higher than the long-term average, respectively (Fig. 3). High estimates of egg production were driven by above average nest success and clutch size. During the most recent 10 years, the common eider nest population has grown 8.2% per year. Estimated hatch date of common eiders was 11 days earlier than 2006 and seven days earlier than the long-term average (Table 1).

Loons

Potential production of Pacific loons (*Gavia pacifica*) and red-throated loons (*Gavia stellata*) was very good in 2007. Estimates of nests and eggs for both species were substantially higher than in 2006 (Fig. 3). Nests and eggs of Pacific loons were 19%, and 18% above the long-term average, respectively. Nests and eggs of red-throated loons were 37%, and 36% above the long-term average, respectively. Nest success for both species also up from 2006 and above the long-term average. Nest population indices for both species have been highly variable among years. Within the most recent decade, the Pacific loon nest population declined 5.4% per year; however, the trend is highly influenced by high estimates in 1998 and 1999. The red-throated loon nest population declined 1.2% annually during the same period, and like Pacific loons, the trend was influenced by estimates in 1998 and 1999. Estimated hatch date of loons was eight days earlier than in 2006 and five days earlier than the long-term average (Table 1).

Gulls and Terns

Colonial nesting species such as gulls and terns are not monitored with precision by the nest plot survey. Nonetheless, the survey does provide a measure of potential production for these species. In 2007, potential production was generally good for gulls and terns (Fig. 3). Numbers of nests and eggs was higher in 2007 than 2006 for glaucous gulls (*Larus hyperboreus*) and Sabine's gulls (*Xema sabini)*, but down for mew gulls (*Larus*

canus) and slightly below the long-term average**.** Nests of arctic tern (*Sterna paradisaea*) were down 20% from 2006, but remain 35% above the long-term mean. Nest success for all gulls and terns was higher than the long-term average. Trends in nest populations of gulls and terns are highly variable over the course of the survey; however, positive growth in the nest populations of glaucous gulls, mew gulls and arctic terns is apparent during the most recent decade. Estimated hatch date of gulls and terns in 2007 was up to 10 days earlier than 2006 and up to six days earlier than the long-term average (Table 1).

DISCUSSION:

The nest plot survey was designed to provide estimates of nest population size and trend, and potential production (active eggs) for nesting geese (cackling geese, emperor geese, greater white-fronted geese) and eiders on the Yukon-Kuskokwim Delta coastal zone. In general, 2007 was a year of very good potential production for geese and eiders. Incidence of nest desertion and depredation was low, and similar to long-term averages. Potential production of other species was also generally good.

Spring arrived earlier in 2007 than in 2006. Spring weather conditions in 2007 were similar to recent years with earlier than average snow melt and river breakup. The Kuskokwim River at Bethel broke-up on May 23, in 2007, nearly three weeks earlier than the previous year, and a week earlier than the 23-year average (mean 1985-2007 = May 11; NOAA 2007). Following a winter of relatively low snow cover, little snow remained on the nesting grounds by May.

Timing of waterfowl nest initiation is correlated with spring breakup (Raveling 1978). Coinciding with an early breakup in 2007, waterfowl nests hatched approximately a week earlier than in 2006. Waterfowl on average, are initiating nests earlier each year (Fig. 4). Based on nesting data for cackling geese, for which we have the most data, we estimate that hatch has occurred nearly one half a day earlier per year since 1982.

In general, waterfowl nest population trends parallel indicated paired bird trends observed in the aerial breeding pair survey (Bollinger et al. 2007, Platte and Stehn 2007). Estimates of cackling goose nests were at record lows in the mid 1980s prior to adoption of the cooperative Yukon-Kuskokwim Delta Goose Management Plan that provided much needed protection for nesting and wintering populations of geese (Pamplin 1986). Data from this nest plot survey show that by the late 1980s, the population of nests began to increase rapidly, peaking in the late 1990s. Since 1998, the trend in cackling goose nests has been negative with an average loss of over 2.6% per year (Fig. 3). Aerial surveys on the breeding grounds reveal a similar trend (Bollinger et al. 2007), whereby indicated breeding pairs increased rapidly between

the mid-1980s and mid-1990s, after which time the population leveled off or declined slightly. Unlike the other goose species, populations of emperor geese did not show a marked change associated with the Yukon Delta Goose Management Plan. Nonetheless, a slow annual increase in the long-term trends from ground and air surveys is apparent (Bollinger et al. 2007). The population of greater white-fronted goose nests has increased dramatically on the coastal zone of the YKD since the mid-1980s. Similar to cacklers, increases in the nest population of white-fronts began to slow in the late 1990s, but the nest population continues to grow. A similar pattern is apparent in aerial estimates of white-front breeding populations (Bollinger et al. 2007). The number of spectacled eider nests has varied widely since the beginning of the survey in the mid-1980s. Since 1992, the nest population has grown steadily. Within the last decade, the nest population increased an average of 2.7% per year. Aerial surveys in the coastal zone of the YKD show a similar trend, with population estimates growing 6.7% annually since 1988 (Platte and Stehn 2007) although this trend estimate is affected strongly by very low counts in the early years of the survey. Further, the aerial survey growth rate is based on estimates that are not corrected for survey timing. When aerial estimates of breeding eiders are adjusted for survey timing the growth rate is similar to the rate of change in nest populations (Fischer et al. 2004).

The reliability of the nest population estimate for brant is limited by accuracy of the aerial Out:In ratio because brant are difficult to count, particularly over colonies. Sampling error for both the aerial transect and ground plot survey was larger than for other species due to the clumped distribution of brant. A separate survey effort was initiated in the 1990s to monitor the nest population of brant in major colonies on the coastal zone of the YKD using aerial photographic methods (Anthony 2006). Estimates of brant nests derived from ground plot and photographic surveys indicate a slow decline in nest populations. A comparison of estimates from these surveys suggests that a large portion of brant nest outside of the primary colonies (Fig. 5).

Spectacled eider nest success is variable among years and generally reflects varying levels of nest predation. Plots are visited one time, so the measure of nest success is an overestimation of actual success because some nests will fail after the plot is searched. Nonetheless, the pattern in nest success measured from the nest plot survey (active nests at time of search/total nests) generally matches nest success at Kigigak Island (successful hatched nests/total nests) where nests are visited every seven days until hatch (Lake 2007). The largest difference between these measures of nest success was noted in 2001 and 2003 (Fig. 6), years of very poor production, where perhaps many nest

failures occurred late in nesting. Alternatively, a localized factor may have caused low success on Kigigak Island during those years.

The population sizes of goose and eider nests should not be interpreted as a direct estimate of population size. For example, a year of poor nesting conditions may result in a decline of nests due to a reduction in the proportion of pairs initiating nests, but does not represent a loss of adults from the breeding population. Instead, the lower number of nests and eggs in a poor nesting year will likely contribute to a reduction in total population size in future years as a result of lower recruitment; although, additional biological factors affect fledgling, juvenile, and 1st year survival rates.

This nest plot survey does not have enough plots to overcome the greater sampling error associated with species that occur in low densities, such as loons, cranes, and swans, or those with clumped distributions, such as brant, common eiders, and gulls. Consequently, poor precision in annual estimates of population size and trend for these species is likely, although long-term averages should be accurate.

A primary advantage of the random nest plot sampling procedure over intensive local studies is that it assures applicability of estimates to the entire coastal zone not just the immediate areas around intensive biological study camps. Moreover, the single brief visit to scattered plots ensures that the monitoring of populations occurs with minimum disturbance. The expansion of estimated nests and eggs from the ground sampled area to the entire coastal zone is based the assumption that breeding indices obtained from aerial surveys provide an accurate linear relationship of nesting within versus outside of the ground sampled area. By using a 7-year localized average ratio, the variation in aerial estimates due to sampling error is moderated.

Annual changes in nest population size are less informative than long-term trends because of sampling error, changes in observers, distribution of plots, and small sample size for less common species. Only several years of consistent declines or increases are likely to indicate a true change in the number of nests and eggs produced on the Yukon-Kuskokwim coastal zone. We believe that a graphical presentation (Fig. 3) enables better interpretation of data than analysis of year-to-year changes in population size. Large annual changes in nest population size probably reflect sampling error or result from extremes in nesting effort and success, rather than real population change.

ACKNOWLEDGMENTS

The nest plot survey is a cooperative project between Migratory Bird Management (MBM) and the Yukon Delta National Wildlife Refuge (YDNWR). Special thanks go to Mike Rearden (YDNWR), Doug Staller (YDNWR), and Thomas Doolittle (YDNWR) for aerial support and logistical coordination, and Josh Spice (YDNWR) for preparation of photomaps. We also thank Jim Sedinger, Patrick Lemons, and Amanda Walker (University of Nevada-Reno) for boat transportation and logistical support. We are particularly indebted to George Walters (YDNWR) for safe and superb flying during the course of the survey. We thank Greg Balogh (Anchorage Fish and Wildlife Field Office), Tom Doolittle (YDNWR), Bryce Lake (YDNWR), and Joel Schmutz (USGS-BRD), for providing personnel. We also thank Paul Anderson (MBM-Anchorage) for air support of personnel and supplies, and Bill Eldridge (MBM-Anchorage), Karen Bollinger (MBM-Fairbanks), and Bob Platte (MBM-Anchorage) for aerial survey data. Bob Platte also provided invaluable GIS data processing and plot delineation. The following individuals collected data in 2006: Uiññiq Ahgeak, Anna Anderson, Mike Anthony, Tim Bowman, Fred Broerman, Chris Dau, Mike Denega, Phil Doerr, Julian Fischer, Justyn Foth, Trenton Haffley, Jeremiah Lambrecht, Bryce Lake, Ellen Lance, Meg Laws, Dennis Marks, Sarah McCloskey, Otter the Dog, Anthony Pagano, Dan Rizzolo, Todd Sanders, Michelle Sopaliga, Declan Troy, Neesha Wendling, Heather Wilson, Jamison Winter, Joshua White, and Ken Wright.

LITERATURE CITED

Anthony, R. M. 2006. Aerial surveys of brant colonies on Yukon Delta NWR in 2006. USGS-BRD field report, Anchorage.

Bollinger, K. S., W. D. Eldridge, and J. I. Hodges. 2007. Report to the Pacific Flyway Committee on the 1985-2007 Coastal Zone Yukon-Kuskokwim Delta Goose Survey of geese, swans and sandhill cranes. Memo. USFWS, Fairbanks, AK.

Bowman, T. D. 2004. Field guide to bird nests and eggs of Alaska's coastal tundra. Alaska Sea Grant College Program, University of Alaska, Fairbanks.

Butler, W. I. Jr. 1983. U.S. Fish and Wildlife Service Memorandum, July 19, 1983. Cackling Canada goose nesting population. Yukon Delta NWR.

Butler, W. I., Jr., R. A. Stehn, and W. D. Eldridge. 1988. Development of an aerial breeding pair survey for geese nesting in the coastal zone of the Yukon Delta. Annual progress report, U.S. Fish and Wildlife Service, Anchorage.

Fischer, J. B., R. A. Stehn, and G. Walters. 2006. Nest populations and potential production of geese and eiders on the Yukon-Kuskokwim Delta, Alaska, 2006. Unpubl. Rep., U.S. Fish and Wildlife Service, Anchorage, AK.

Fischer, J. B., R. A. Stehn, and R. M. Platte. 2004. Analysis of trend estimates derived from aerial and ground surveys of Spectacled Eiders on the Yukon-Kuskokwim Delta, Alaska. Oral presentation to the Spectacled and Steller's Eider Recovery Team, November 16, 2004, Alaska SeaLife Center, Seward Alaska.

Lake, B. C. 2007. Nesting Ecology of Spectacled and Common Eiders on Kigigak Island, Yukon Delta NWR, Alaska, 2007. Unpubl. Rep. Yukon Delta NWR, Bethel, AK.

NOAA. 2007. National Weather Service, Alaska-Pacific, River Forecast Center Home Page. <http://aprfc.arh.noaa.gov/data/breakup.html>.

Pamplin, W. L. Jr. 1986. Cooperative efforts to halt population declines of geese nesting on Alaska's Yukon-Kuskokwim Delta. Trans. N. Am. Wildl. Nat. Resour. Conf. 51:487-506.

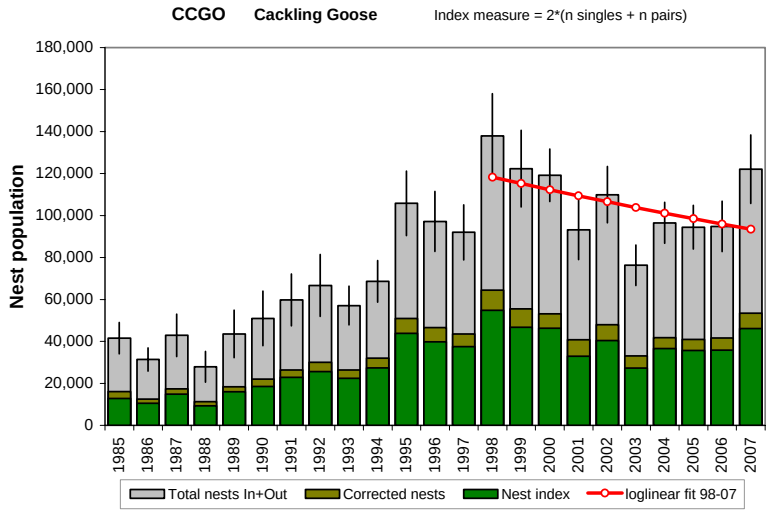
Platte, R. M., and R. A. Stehn. 2007. Abundance and Trend of Waterbirds on Alaska's Yukon-Kuskokwim Delta Coast based on 1988 to 2007 Aerial Surveys. Unpub. Rep., U.S. Fish and Wildlife Service, Anchorage, AK.

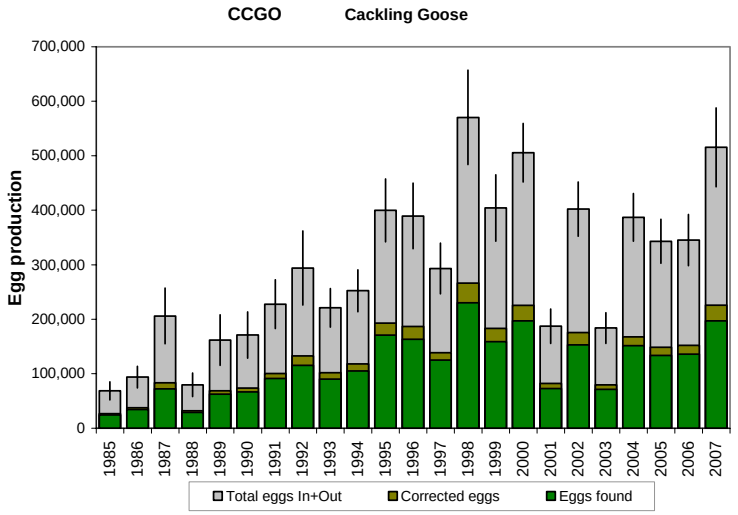
Bowman, T. D. and R. A. Stehn. *Manuscript in prep*. Nest detection rate on plots searched to monitor Yukon-Kuskokwim Delta waterbird populations.

Westerkov, K. 1950. Methods for determining the age of game bird eggs. J. Wildl. Manage. 14:56-67.

Figure 3 (Subsequent pages). Population size (± 90% CI) and trends of waterbird nests and egg production on the Yukon-Kuskokwim Delta Alaska, 1985-2007, with accompanying tabulated data. Column heading definitions follow:

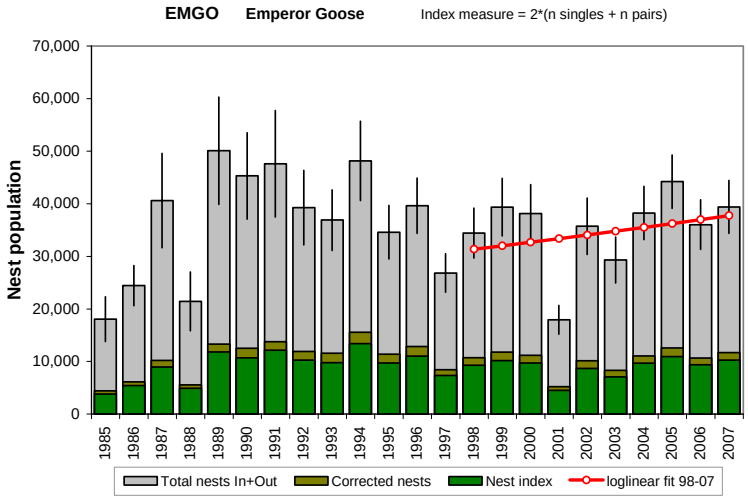
Year = survey year;
N plots = number of ground sampled plots used in the analysis;
Ground plot sampled area km^2 = total area searched (N plots*plot size);
Nest index = number of nests within the core 716 km^2 ground sampled area uncorrected for nest detection;
SE nest index = standard error for nest index;
Corrected nest IN = Nest index corrected for nest detection;
Avg of nest detection rates = annual proportion of nests detected based on predictive model (Bowman and Stehn *manuscript in prep*);
7 yr avg aerial Out:In = the seven-year localized average ratio of aerial observations seen out of the ground sampled area vs. within the ground sampled area (seven years are based on from the current year, 3 prior years, and 3 following years data as available);
Corrected nests OUT = number of nests extrapolated beyond the ground sampled area based on the 7-yr localized average Out:In ratio, corrected for nest detection rate;
Total nests In+Out = total number of nests in the YKD coastal zone, corrected for nest detection rate;
SE total nests = standard error for total nest estimate;
Total eggs In+Out = total number of viable eggs at time of plot search in the YKD coastal zone, corrected for detection rate;
SE total eggs = standard error for total egg estimate;
Active eggs/total nests (clutch size) = total eggs in+out divided by the total nests in+out, corrected for detection rate ;
Apparent nest success = number of active nests divided by total nests times 100%, uncorrected for detection rate;
Corrected nest success = number of active nests divided by total nests times 100%, corrected for detection rate.

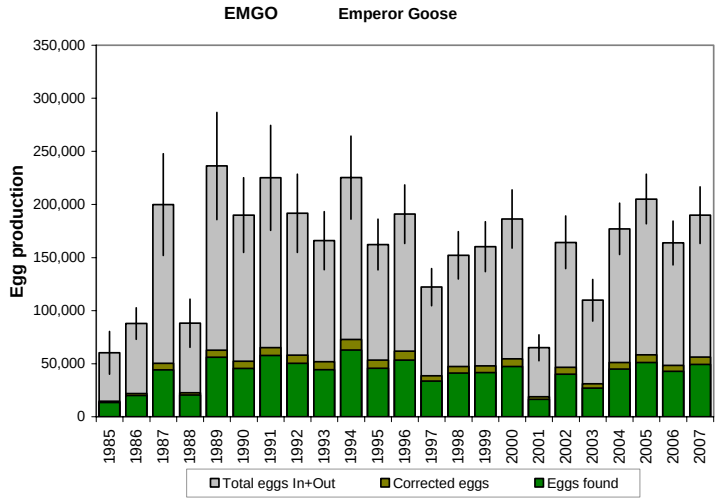




1998-2007 average annual growth rate = 0.974 (90%c.i. = 0.941 - 1.008)

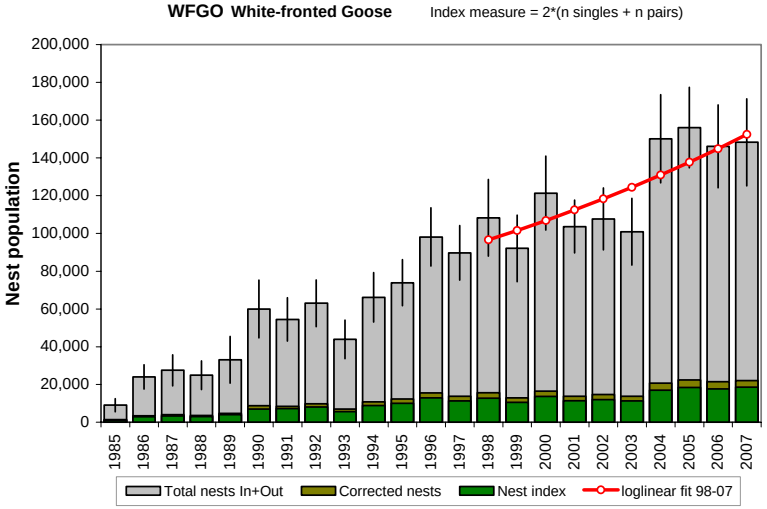
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
CCGO	Cackling Goose						Aerial index measure =2*(n singles + n pairs)								
1985	49	24.57	**12788**	1625	16149	0.792	1.575	25429	**41578**	4527	**68577**	10128	1.649	0.487	0.422
1986	46	22.16	**10594**	1406	12467	0.850	1.519	18932	**31399**	3347	**93836**	12022	2.989	0.665	0.611
1987	37	12.67	**14909**	2693	17319	0.861	1.476	25566	**42885**	6150	**206057**	31176	4.805	0.947	0.938
1988	31	10.04	**9342**	1957	11224	0.832	1.487	16692	**27916**	4463	**79497**	13055	2.848	0.687	0.629
1989	23	7.45	**16053**	3536	18390	0.873	1.370	25187	**43577**	6870	**161833**	28106	3.714	0.802	0.766
1990	33	10.70	**18465**	3890	21997	0.839	1.317	28975	**50972**	7912	**171067**	25823	3.356	0.790	0.737
1991	36	11.66	**22840**	3763	26414	0.865	1.264	33386	**59801**	7483	**227526**	27305	3.805	0.858	0.821
1992	42	13.39	**25662**	4554	30098	0.853	1.216	36586	**66684**	8983	**293973**	41285	4.408	0.929	0.914
1993	47	15.23	**22469**	2877	26323	0.854	1.168	30757	**57080**	5622	**221079**	21489	3.873	0.887	0.859
1994	41	13.27	**27391**	3099	32051	0.855	1.141	36560	**68611**	6024	**252251**	23308	3.677	0.837	0.803
1995	50	22.56	**43839**	5413	51015	0.859	1.074	54804	**105819**	9303	**399944**	35055	3.780	0.873	0.848
1996	54	19.44	**39761**	4827	46617	0.853	1.084	50554	**97171**	8675	**389599**	36568	4.009	0.912	0.892
1997	72	23.31	**37516**	4527	43550	0.861	1.112	48439	**91990**	7947	**293019**	28270	3.185	0.826	0.790
1998	64	20.71	**54802**	6330	64403	0.851	1.142	73561	**137963**	12199	**570310**	52641	4.134	0.937	0.924
1999	53	16.97	**46698**	5561	55508	0.841	1.204	66831	**122339**	11092	**404092**	36942	3.303	0.869	0.849
2000	80	25.86	**46279**	3884	53165	0.870	1.243	66058	**119223**	7594	**505614**	32675	4.241	0.950	0.942
2001	81	26.23	**32937**	3999	40799	0.807	1.283	52358	**93157**	8606	**187188**	19151	2.009	0.606	0.552
2002	84	27.15	**40438**	3989	47948	0.843	1.293	61973	**109922**	8121	**402248**	30175	3.659	0.853	0.828
2003	83	26.87	**27323**	2905	33071	0.826	1.307	43232	**76303**	5831	**183772**	17127	2.408	0.659	0.608
2004	81	26.22	**36574**	3024	41818	0.875	1.308	54682	**96501**	5939	**387100**	26534	4.011	0.875	0.850
2005	83	26.87	**35666**	3192	40898	0.872	1.309	53535	**94434**	6332	**342980**	24483	3.632	0.878	0.851
2006	75	24.28	**35842**	3708	41706	0.859	1.272	53070	**94775**	7295	**345226**	28485	3.643	0.854	0.822
2007	79	25.58	**46112**	4684	53492	0.862	1.282	68593	**122085**	9904	**515473**	43828	4.222	0.928	0.917

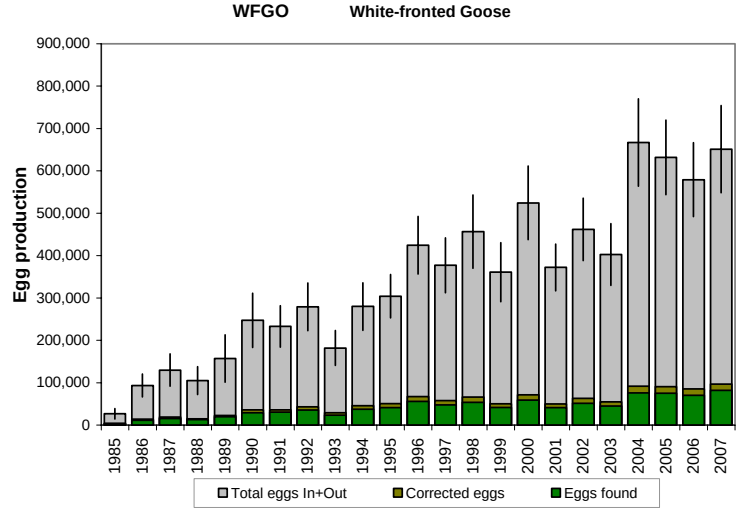




1998-2007 average annual growth rate = 1.021 (90%c.i. = 0.967 - 1.075)

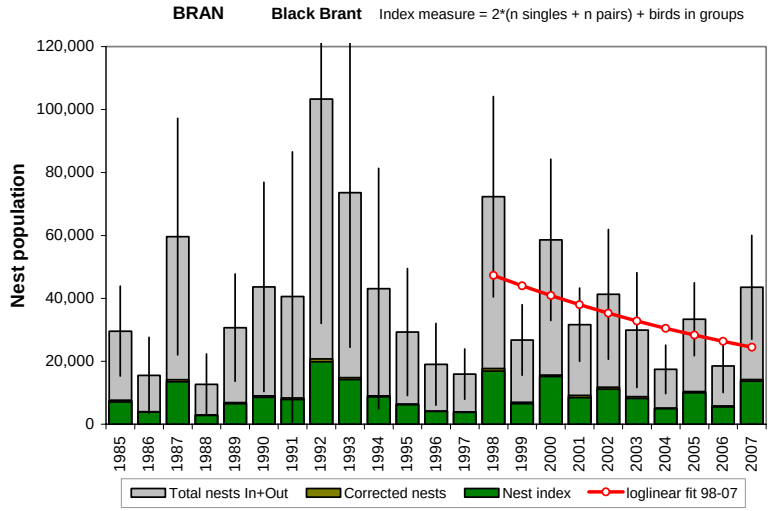
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
EMGO	Emperor Goose						Aerial index measure =2*(n singles + n pairs)								
1985	49	24.57	**3816**	685	4411	0.865	3.093	13643	**18054**	2595	**60315**	12180	3.341	0.626	0.589
1986	46	22.16	**5426**	620	6096	0.890	3.010	18350	**24445**	2320	**87932**	8978	3.597	0.750	0.730
1987	37	12.67	**8979**	1477	10218	0.879	2.974	30387	**40605**	5446	**199872**	29186	4.922	0.962	0.961
1988	31	10.04	**4920**	965	5530	0.890	2.874	15894	**21424**	3390	**88202**	13819	4.117	0.899	0.889
1989	23	7.45	**11824**	1769	13306	0.889	2.765	36793	**50099**	6197	**236242**	30659	4.716	0.927	0.921
1990	33	10.70	**10704**	1299	12490	0.857	2.628	32818	**45307**	4995	**190013**	21296	4.194	0.869	0.853
1991	36	11.66	**12157**	1812	13758	0.884	2.460	33839	**47597**	6156	**225117**	30056	4.730	0.970	0.967
1992	42	13.39	**10265**	1372	11906	0.862	2.298	27362	**39267**	4316	**191712**	22376	4.882	0.964	0.963
1993	47	15.23	**9777**	1116	11571	0.845	2.190	25336	**36907**	3504	**166039**	16626	4.499	0.947	0.942
1994	41	13.27	**13372**	1647	15561	0.859	2.094	32589	**48150**	4574	**225310**	23773	4.679	0.944	0.939
1995	50	22.56	**9738**	1127	11389	0.855	2.038	23207	**34597**	3090	**162246**	14475	4.690	0.967	0.964
1996	54	19.44	**11008**	1105	12866	0.856	2.081	26774	**39640**	3202	**190865**	16769	4.815	0.943	0.937
1997	72	23.31	**7368**	736	8461	0.871	2.171	18371	**26832**	2229	**122179**	10597	4.553	0.958	0.952
1998	64	20.71	**9295**	964	10719	0.867	2.211	23702	**34422**	2886	**152110**	13528	4.419	0.955	0.952
1999	53	16.97	**10166**	875	11794	0.862	2.338	27576	**39370**	3326	**160278**	14290	4.071	0.921	0.916
2000	80	25.86	**9715**	929	11185	0.869	2.411	26970	**38155**	3342	**186307**	16656	4.883	0.983	0.981
2001	81	26.23	**4503**	478	5209	0.864	2.442	12722	**17931**	1655	**65042**	7473	3.627	0.770	0.754
2002	84	27.15	**8699**	942	10142	0.858	2.523	25589	**35731**	3263	**164282**	15043	4.598	0.930	0.924
2003	83	26.87	**7057**	768	8311	0.849	2.526	20997	**29308**	2650	**109844**	11887	3.748	0.800	0.783
2004	81	26.22	**9690**	909	11051	0.877	2.460	27188	**38239**	3073	**177072**	14731	4.631	0.952	0.949
2005	83	26.87	**10948**	812	12588	0.870	2.512	31620	**44208**	3088	**205139**	14182	4.640	0.942	0.934
2006	75	24.28	**9373**	957	10648	0.880	2.384	25382	**36030**	2868	**163824**	12504	4.547	0.956	0.951
2007	79	25.58	**10241**	976	11688	0.876	2.372	27721	**39409**	3059	**189956**	16214	4.820	0.970	0.968

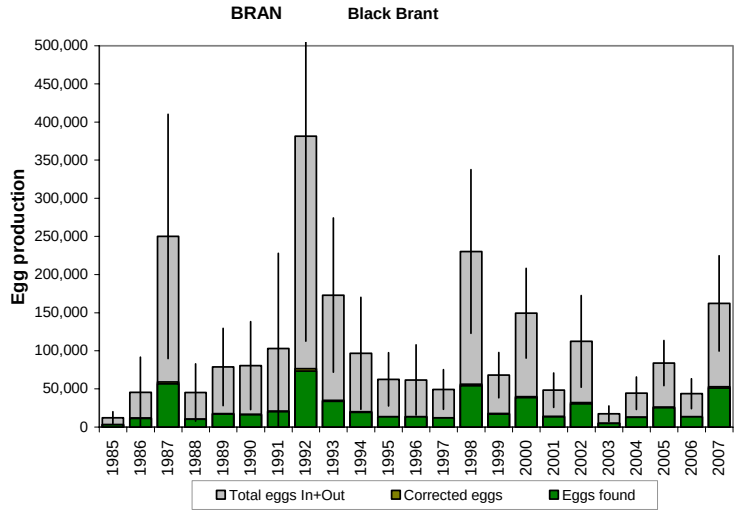




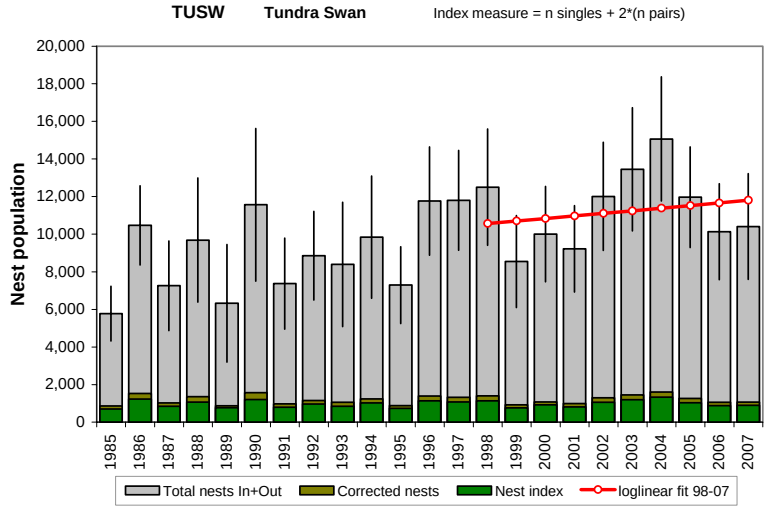
1998-2007 average annual growth rate = 1.052 (90%c.i. = 1.024 - 1.080)

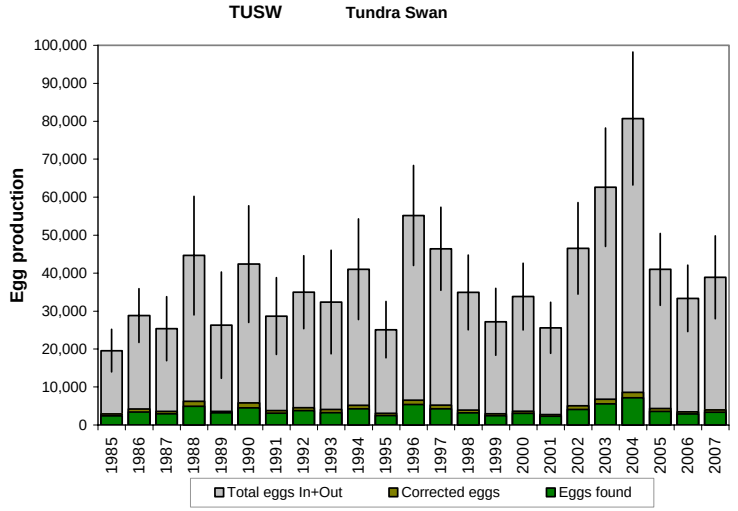
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
WFGO White-fronted Goose							Aerial index measure =2*(n singles + n pairs)								
1985	49	24.57	**1078**	257	1331	0.810	5.784	7700	**9031**	2136	**26681**	7380	2.954	0.730	0.703
1986	46	22.16	**2907**	463	3493	0.832	5.870	20501	**23994**	3911	**93393**	16363	3.892	0.900	0.891
1987	37	12.67	**3275**	629	4026	0.814	5.839	23509	**27535**	5010	**129611**	23117	4.707	0.966	0.961
1988	31	10.04	**2995**	599	3568	0.839	5.987	21361	**24929**	4574	**105053**	19841	4.214	0.976	0.975
1989	23	7.45	**4037**	1004	4753	0.849	5.964	28346	**33099**	7540	**157063**	33869	4.745	0.952	0.948
1990	33	10.70	**7025**	1108	8674	0.810	5.910	51265	**59939**	9288	**247409**	38908	4.128	0.933	0.928
1991	36	11.66	**7184**	1009	8345	0.861	5.521	46070	**54416**	6975	**232854**	29675	4.279	0.949	0.945
1992	42	13.39	**8019**	1001	9710	0.826	5.490	53313	**63023**	7475	**278878**	34278	4.425	0.980	0.978
1993	47	15.23	**5641**	853	7015	0.804	5.251	36835	**43849**	6203	**181952**	24958	4.150	0.975	0.971
1994	41	13.27	**8789**	1097	10813	0.813	5.120	55365	**66177**	7962	**279850**	34085	4.229	0.975	0.973
1995	50	22.56	**9992**	1093	12340	0.810	4.990	61572	**73912**	7412	**303893**	31092	4.112	0.968	0.965
1996	54	19.44	**12849**	1303	15558	0.826	5.309	82601	**98159**	9388	**424407**	41485	4.324	0.966	0.962
1997	72	23.31	**11298**	1145	13823	0.817	5.494	75942	**89764**	8789	**377195**	39288	4.202	0.984	0.982
1998	64	20.71	**12785**	1320	15657	0.817	5.915	92609	**108266**	12325	**456670**	52666	4.218	0.976	0.974
1999	53	16.97	**10588**	1157	12853	0.824	6.164	79231	**92084**	10685	**360879**	42209	3.919	0.944	0.941
2000	80	25.86	**13646**	1258	16461	0.829	6.373	104898	**121359**	11869	**524426**	52674	4.321	0.974	0.971
2001	81	26.23	**11407**	935	13775	0.828	6.525	89887	**103663**	8496	**371949**	33434	3.588	0.935	0.931
2002	84	27.15	**11994**	1001	14694	0.816	6.328	92976	**107670**	9961	**461774**	44779	4.289	0.978	0.977
2003	83	26.87	**11265**	1151	13773	0.818	6.326	87124	**100897**	10708	**402506**	44277	3.989	0.941	0.938
2004	81	26.22	**17059**	1465	20638	0.827	6.275	129512	**150150**	14193	**666821**	62577	4.441	0.971	0.968
2005	83	26.87	**18432**	1472	22421	0.822	5.959	133615	**156037**	12924	**631787**	53535	4.049	0.960	0.956
2006	75	24.28	**17685**	1571	21537	0.821	5.786	124611	**146148**	13323	**579103**	52999	3.962	0.960	0.955
2007	79	25.58	**18579**	1518	22017	0.844	5.734	126250	**148267**	14013	**651429**	62496	4.394	0.985	0.983





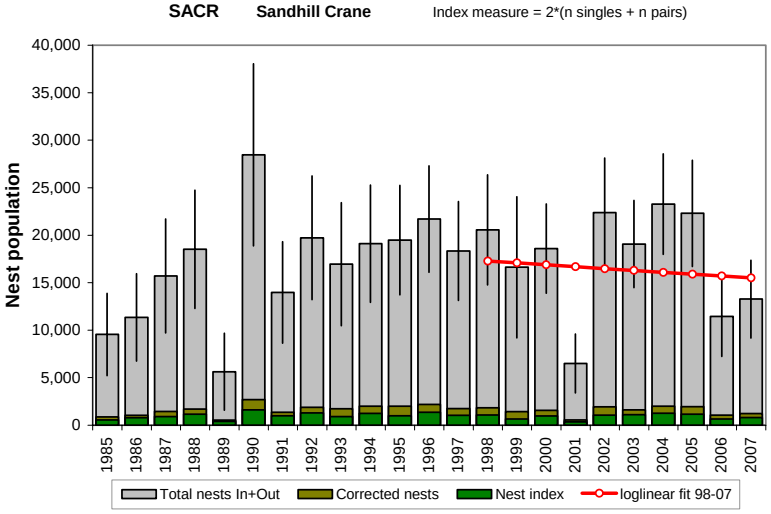
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
BRAN	Black Brant						Aerial index measure =2*(n singles + n pairs) + birds in groups								
1985	49	24.57	**7107**	2569	7675	0.926	2.857	21926	**29600**	8704	**12370**	4677	0.418	0.143	0.135
1986	46	22.16	**3844**	2304	4017	0.957	2.857	11477	**15494**	7367	**45571**	27930	2.941	0.748	0.737
1987	37	12.67	**13497**	6158	14117	0.956	3.225	45527	**59644**	22850	**249942**	97215	4.191	0.983	0.983
1988	31	10.04	**2852**	1620	2973	0.959	3.262	9697	**12671**	5884	**45112**	22808	3.560	0.900	0.895
1989	23	7.45	**6537**	2701	6893	0.948	3.453	23798	**30691**	10355	**78692**	30758	2.564	0.750	0.735
1990	33	10.70	**8563**	4710	9047	0.947	3.825	34609	**43656**	20191	**80384**	35076	1.841	0.602	0.584
1991	36	11.66	**7859**	6513	8335	0.943	3.870	32254	**40589**	27913	**103071**	75839	2.539	0.703	0.695
1992	42	13.39	**19835**	9859	20742	0.956	3.980	82559	**103301**	43294	**381497**	163325	3.693	0.957	0.955
1993	47	15.23	**14196**	6832	14838	0.957	3.961	58769	**73607**	29844	**172956**	61407	2.350	0.738	0.728
1994	41	13.27	**8681**	5693	9047	0.960	3.765	34062	**43109**	23222	**96655**	44584	2.242	0.932	0.927
1995	50	22.56	**6186**	3119	6410	0.965	3.571	22891	**29301**	12261	**62618**	21257	2.137	0.723	0.717
1996	54	19.44	**4050**	2022	4235	0.956	3.499	14820	**19055**	7894	**61747**	28054	3.240	0.873	0.865
1997	72	23.31	**3807**	1423	3938	0.967	3.039	11968	**15906**	4864	**49223**	15802	3.095	0.935	0.931
1998	64	20.71	**16862**	5452	17702	0.953	3.084	54599	**72301**	19342	**230196**	65161	3.184	0.873	0.868
1999	53	16.97	**6581**	2064	6991	0.941	2.828	19768	**26759**	6803	**68238**	18042	2.550	0.814	0.807
2000	80	25.86	**15140**	5069	15679	0.966	2.739	42942	**58620**	15574	**149356**	35717	2.548	0.892	0.887
2001	81	26.23	**8487**	2391	9156	0.927	2.454	22467	**31622**	7066	**48359**	13634	1.529	0.531	0.518
2002	84	27.15	**11177**	4344	11792	0.948	2.501	29490	**41282**	12518	**112299**	36501	2.720	0.877	0.872
2003	83	26.87	**8229**	4048	8741	0.941	2.423	21181	**29922**	11083	**17478**	6095	0.584	0.485	0.468
2004	81	26.22	**4968**	1710	5192	0.957	2.360	12252	**17444**	4689	**44318**	12977	2.541	0.786	0.775
2005	83	26.87	**10015**	2732	10385	0.964	2.213	22978	**33363**	7044	**83930**	17938	2.516	0.840	0.833
2006	75	24.28	**5541**	1993	5810	0.954	2.186	12702	**18512**	5117	**43856**	11948	2.369	0.702	0.688
2007	79	25.58	**13711**	4083	14214	0.965	2.062	29313	**43527**	10047	**162045**	37962	3.723	0.947	0.945

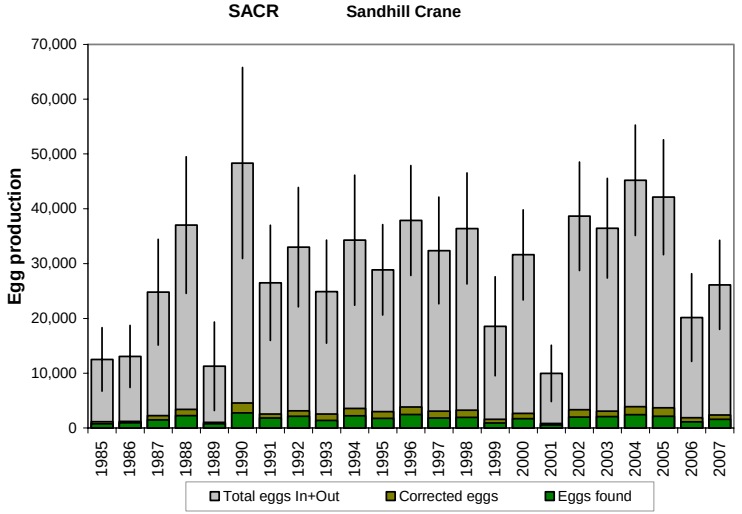




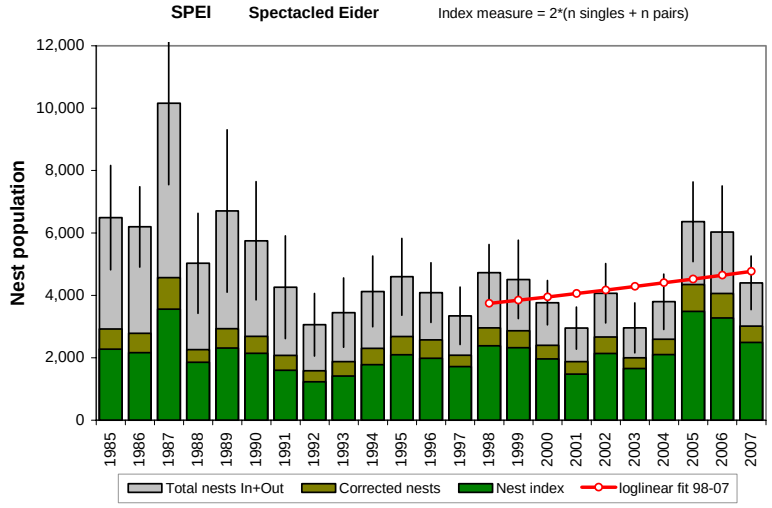
1998-2007 average annual growth rate = 1.012 (90%c.i. = 0.974 - 1.050)

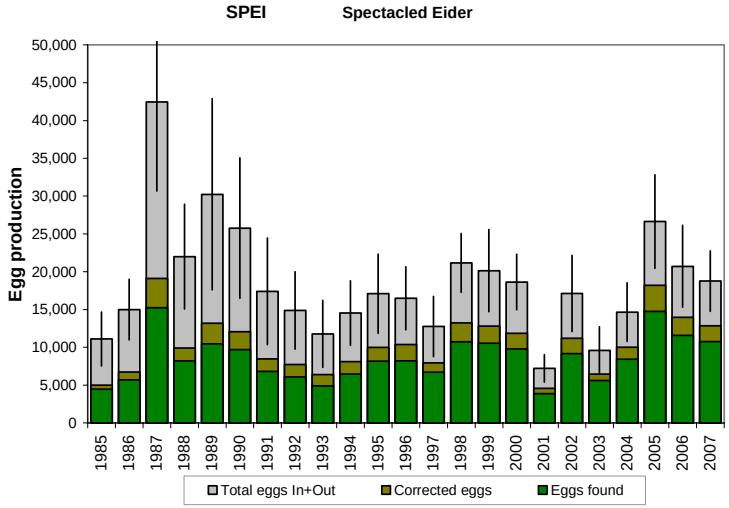
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
TUSW	Tundra Swan						Aerial index measure =n singles + 2*(n pairs)								
1985	49	24.57	**699**	119	863	0.810	5.694	4911	**5774**	883	**19589**	3412	3.393	0.875	0.862
1986	46	22.16	**1227**	166	1527	0.804	5.861	8948	**10475**	1280	**28825**	4298	2.752	0.868	0.857
1987	37	12.67	**847**	189	1027	0.825	6.064	6228	**7255**	1449	**25369**	5101	3.497	1.000	1.000
1988	31	10.04	**1070**	247	1355	0.789	6.149	8333	**9689**	2006	**44632**	9484	4.607	1.000	1.000
1989	23	7.45	**769**	263	869	0.885	6.278	5458	**6327**	1902	**26286**	8502	4.154	1.000	1.000
1990	33	10.70	**1204**	288	1579	0.763	6.323	9985	**11564**	2466	**42385**	9332	3.665	0.944	0.935
1991	36	11.66	**798**	178	976	0.818	6.554	6398	**7374**	1469	**28670**	6132	3.888	0.923	0.916
1992	42	13.39	**962**	174	1152	0.835	6.684	7701	**8854**	1429	**34975**	5842	3.950	1.000	1.000
1993	47	15.23	**846**	226	1063	0.796	6.899	7331	**8393**	2008	**32384**	8268	3.858	0.944	0.949
1994	41	13.27	**1024**	231	1237	0.828	6.959	8608	**9845**	1973	**40996**	8055	4.164	1.000	1.000
1995	50	22.56	**730**	135	889	0.821	7.203	6401	**7290**	1240	**25107**	4510	3.444	0.913	0.909
1996	54	19.44	**1141**	177	1389	0.822	7.474	10378	**11767**	1751	**55202**	8003	4.691	0.968	0.959
1997	72	23.31	**1074**	155	1326	0.810	7.901	10476	**11802**	1612	**46434**	6633	3.934	0.943	0.937
1998	64	20.71	**1140**	182	1396	0.817	7.952	11103	**12499**	1881	**34919**	5978	2.794	0.909	0.900
1999	53	16.97	**759**	145	924	0.822	8.249	7621	**8545**	1488	**27202**	5348	3.183	0.889	0.878
2000	80	25.86	**913**	153	1085	0.842	8.225	8922	**10007**	1541	**33823**	5336	3.380	0.939	0.934
2001	81	26.23	**819**	134	986	0.831	8.359	8238	**9224**	1394	**25613**	4083	2.777	0.833	0.822
2002	84	27.15	**1054**	166	1303	0.809	8.212	10704	**12007**	1747	**46525**	7331	3.875	0.900	0.891
2003	83	26.87	**1198**	187	1449	0.827	8.285	12001	**13450**	1990	**62622**	9480	4.656	0.978	0.972
2004	81	26.22	**1337**	189	1608	0.832	8.370	13457	**15065**	2009	**80726**	10642	5.359	0.980	0.978
2005	83	26.87	**1039**	150	1259	0.825	8.508	10711	**11970**	1624	**40992**	5741	3.424	0.949	0.944
2006	75	24.28	**884**	143	1062	0.833	8.544	9072	**10134**	1550	**33356**	5292	3.291	0.933	0.929
2007	79	25.58	**895**	154	1071	0.836	8.712	9333	**10404**	1709	**38909**	6637	3.740	0.969	0.966





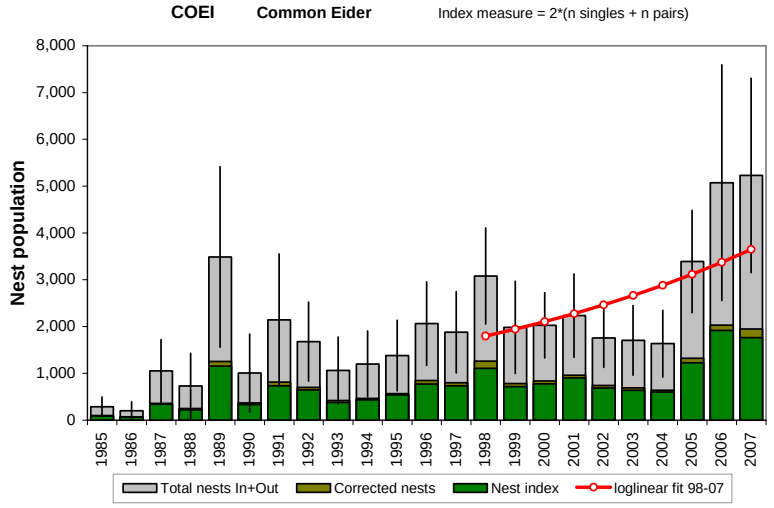
Year	N plots	Total sampled area km2	Nest index	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	Total nests In+Out	SE total nests	Total eggs In+Out	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
SACR	Sandhill Crane						Aerial index measure =2*(n singles + n pairs)								
1985	49	24.57	**553**	145	875	0.633	9.918	8676	**9551**	2628	**12521**	3510	1.311	0.842	0.802
1986	46	22.16	**775**	188	1040	0.745	9.918	10317	**11357**	2790	**13063**	3439	1.150	0.833	0.776
1987	37	12.67	**904**	192	1439	0.628	9.918	14269	**15708**	3643	**24792**	5873	1.578	1.000	1.000
1988	31	10.04	**1141**	225	1699	0.672	9.902	16823	**18522**	3783	**37044**	7566	2.000	0.937	0.936
1989	23	7.45	**385**	178	526	0.732	9.722	5110	**5635**	2455	**11271**	4909	2.000	1.000	1.000
1990	33	10.70	**1606**	305	2696	0.595	9.557	25770	**28466**	5813	**48348**	10584	1.698	0.958	0.948
1991	36	11.66	**982**	222	1350	0.728	9.354	12630	**13980**	3239	**26481**	6379	1.894	1.000	1.000
1992	42	13.39	**1283**	267	1881	0.682	9.484	17842	**19723**	3962	**33003**	6616	1.673	0.958	0.955
1993	47	15.23	**893**	227	1723	0.518	8.837	15226	**16949**	3934	**24894**	5706	1.469	0.947	0.879
1994	41	13.27	**1240**	254	2001	0.620	8.549	17109	**19110**	3747	**34285**	7207	1.794	1.000	1.000
1995	50	22.56	**983**	154	2003	0.491	8.728	17479	**19482**	3500	**28874**	5006	1.482	0.935	0.773
1996	54	19.44	**1362**	213	2191	0.622	8.905	19511	**21702**	3393	**37858**	6089	1.744	0.973	0.928
1997	72	23.31	**1044**	187	1746	0.598	9.505	16597	**18343**	3159	**32386**	5913	1.766	1.000	1.000
1998	64	20.71	**1071**	175	1839	0.582	10.181	18724	**20563**	3514	**36412**	6150	1.771	1.000	1.000
1999	53	16.97	**633**	162	1416	0.447	10.744	15212	**16628**	4517	**18551**	5482	1.116	0.867	0.660
2000	80	25.86	**969**	139	1563	0.620	10.893	17025	**18588**	2854	**31598**	4989	1.700	0.971	0.924
2001	81	26.23	**355**	111	542	0.654	11.000	5964	**6506**	1882	**9964**	3123	1.531	0.923	0.900
2002	84	27.15	**1054**	149	1933	0.546	10.577	20441	**22373**	3493	**38644**	6001	1.727	0.950	0.864
2003	83	26.87	**1092**	155	1608	0.679	10.856	17455	**19062**	2793	**36446**	5525	1.912	0.976	0.975
2004	81	26.22	**1256**	161	2003	0.627	10.620	21270	**23273**	3209	**45196**	6121	1.942	1.000	1.000
2005	83	26.87	**1145**	164	1962	0.584	10.365	20338	**22300**	3403	**42121**	6377	1.889	1.000	1.000
2006	75	24.28	**648**	141	1052	0.616	9.887	10399	**11451**	2553	**20164**	4861	1.761	1.000	1.000
2007	79	25.58	**811**	147	1215	0.668	9.920	12054	**13270**	2487	**26119**	4937	1.968	1.000	1.000

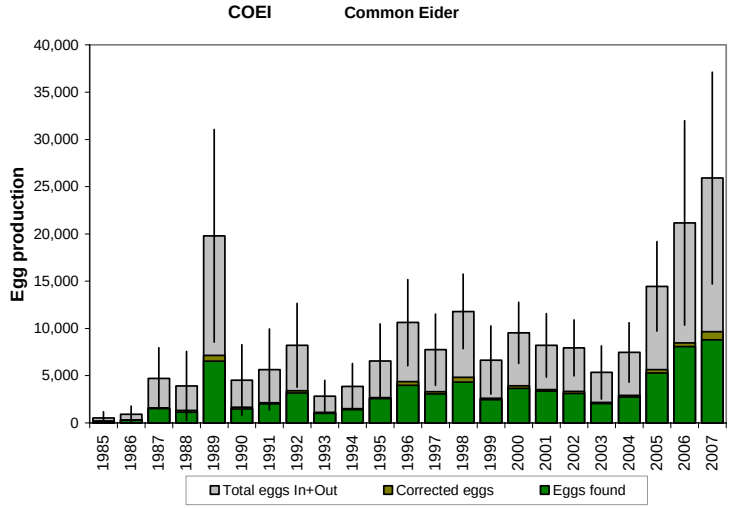




1998-2007 average annual growth rate = 1.027 (90%c.i. = 0.973 - 1.082)

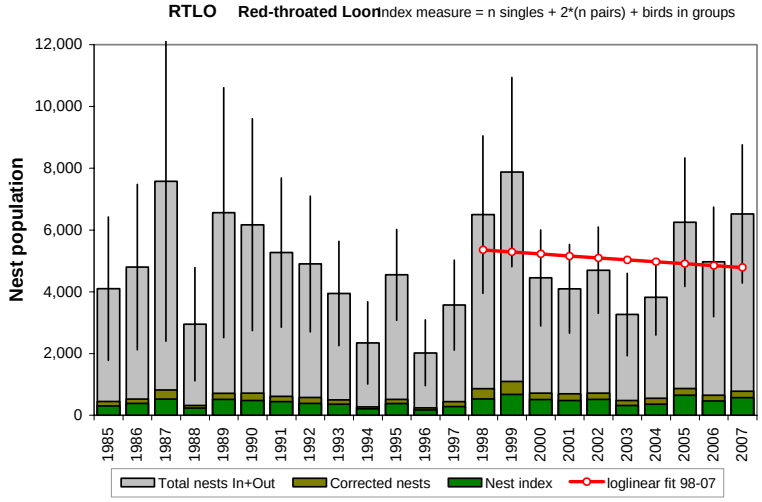
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
SPEI	Spectacled Eider						Aerial index measure =2*(n singles + n pairs)								
1985	49	24.57	**2272**	489	2919	0.778	1.224	3572	**6491**	1015	**11107**	2171	1.711	0.513	0.446
1986	46	22.16	**2164**	366	2786	0.777	1.224	3409	**6194**	782	**14988**	2444	2.420	0.597	0.549
1987	37	12.67	**3558**	758	4568	0.779	1.224	5589	**10157**	1585	**42468**	7174	4.181	0.841	0.826
1988	31	10.04	**1854**	500	2261	0.820	1.224	2767	**5028**	974	**21990**	4208	4.373	0.923	0.909
1989	23	7.45	**2307**	751	2927	0.788	1.291	3778	**6705**	1580	**30242**	7684	4.510	0.917	0.903
1990	33	10.70	**2141**	552	2689	0.796	1.138	3060	**5749**	1151	**25781**	5633	4.484	0.906	0.892
1991	36	11.66	**1596**	491	2075	0.769	1.052	2184	**4259**	1002	**17400**	4282	4.085	0.808	0.775
1992	42	13.39	**1230**	308	1587	0.775	0.926	1470	**3057**	609	**14877**	3105	4.866	0.913	0.896
1993	47	15.23	**1410**	348	1874	0.753	0.838	1571	**3445**	673	**11769**	2691	3.417	0.833	0.800
1994	41	13.27	**1779**	344	2300	0.774	0.792	1823	**4123**	689	**14529**	2586	3.524	0.788	0.758
1995	50	22.56	**2094**	417	2684	0.780	0.712	1910	**4594**	748	**17097**	3175	3.722	0.803	0.762
1996	54	19.44	**1988**	377	2573	0.773	0.589	1516	**4088**	583	**16489**	2529	4.033	0.815	0.796
1997	72	23.31	**1719**	404	2079	0.827	0.608	1265	**3344**	558	**12760**	2430	3.815	0.893	0.872
1998	64	20.71	**2384**	374	2956	0.806	0.599	1771	**4727**	549	**21156**	2366	4.475	0.928	0.919
1999	53	16.97	**2320**	532	2864	0.810	0.575	1646	**4510**	765	**20149**	3303	4.468	0.909	0.901
2000	80	25.86	**1965**	295	2398	0.820	0.569	1365	**3762**	431	**18622**	2233	4.949	0.930	0.926
2001	81	26.23	**1474**	275	1873	0.787	0.575	1078	**2951**	409	**7229**	1107	2.450	0.630	0.587
2002	84	27.15	**2135**	407	2664	0.801	0.526	1402	**4066**	577	**17118**	3063	4.210	0.815	0.800
2003	83	26.87	**1651**	350	1998	0.827	0.482	962	**2960**	486	**9578**	1911	3.236	0.774	0.734
2004	81	26.22	**2102**	387	2590	0.811	0.465	1204	**3794**	538	**14656**	2357	3.862	0.805	0.777
2005	83	26.87	**3489**	538	4346	0.803	0.464	2015	**6361**	776	**26643**	3755	4.188	0.908	0.893
2006	75	24.28	**3272**	641	4061	0.806	0.485	1968	**6028**	898	**20719**	3298	3.437	0.784	0.763
2007	79	25.58	**2490**	340	3013	0.827	0.460	1386	**4399**	522	**18760**	2430	4.265	0.854	0.843

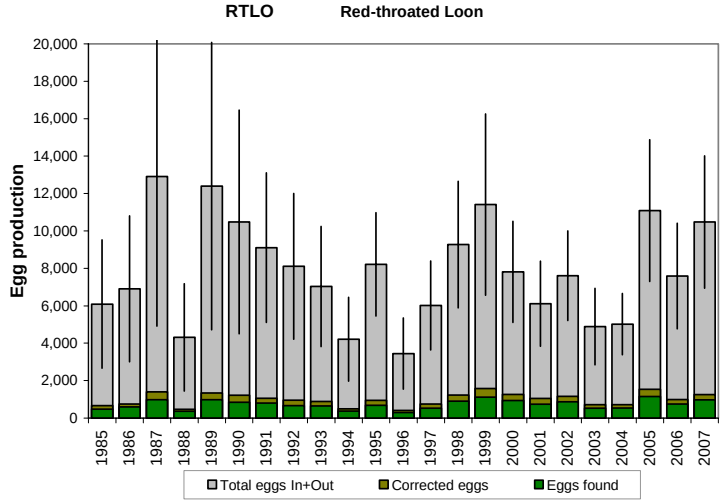




1998-2007 average annual growth rate = 1.082 (90%c.i. = 0.995 - 1.169)

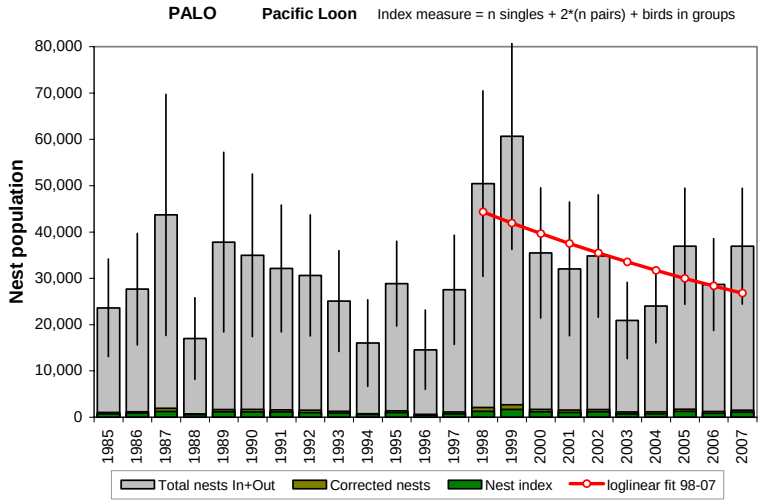
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
COEI	Common Eider						Aerial index measure =2*(n singles + n pairs)								
1985	49	24.57	**87**	47	97	0.902	1.947	189	**286**	129	**525**	404	1.838	0.333	0.306
1986	46	22.16	**65**	45	69	0.942	1.947	134	**202**	113	**914**	517	4.516	1.000	1.000
1987	37	12.67	**339**	152	358	0.947	1.947	697	**1054**	408	**4718**	1968	4.475	0.833	0.828
1988	31	10.04	**214**	156	248	0.863	1.947	483	**730**	424	**3909**	2227	5.352	1.000	1.000
1989	23	7.45	**1154**	456	1256	0.919	1.776	2230	**3485**	1171	**19806**	6835	5.682	1.000	1.000
1990	33	10.70	**335**	216	367	0.912	1.745	640	**1007**	505	**4537**	2276	4.504	1.000	1.000
1991	36	11.66	**737**	381	814	0.906	1.632	1328	**2142**	856	**5649**	2608	2.638	0.583	0.555
1992	42	13.39	**642**	254	698	0.919	1.402	979	**1678**	514	**8216**	2693	4.897	0.917	0.911
1993	47	15.23	**376**	203	420	0.895	1.524	640	**1061**	435	**2823**	1025	2.661	0.625	0.600
1994	41	13.27	**431**	205	465	0.927	1.580	735	**1201**	428	**3870**	1462	3.223	0.875	0.864
1995	50	22.56	**539**	247	567	0.951	1.435	813	**1380**	460	**6549**	2388	4.745	0.941	0.935
1996	54	19.44	**773**	271	846	0.914	1.436	1215	**2061**	542	**10618**	2772	5.151	0.952	0.947
1997	72	23.31	**737**	285	800	0.921	1.348	1078	**1878**	529	**7752**	2289	4.128	0.917	0.912
1998	64	20.71	**1106**	299	1261	0.877	1.442	1819	**3080**	624	**11792**	2397	3.829	0.781	0.764
1999	53	16.97	**717**	296	782	0.917	1.535	1200	**1982**	599	**6650**	2194	3.354	0.765	0.751
2000	80	25.86	**775**	212	837	0.926	1.420	1189	**2026**	424	**9528**	1964	4.703	0.964	0.960
2001	81	26.23	**900**	292	962	0.936	1.322	1271	**2233**	541	**8209**	2038	3.677	0.909	0.898
2002	84	27.15	**685**	191	740	0.926	1.370	1014	**1754**	381	**7945**	1794	4.529	0.962	0.960
2003	83	26.87	**639**	225	688	0.929	1.479	1017	**1705**	451	**5336**	1713	3.130	0.750	0.732
2004	81	26.22	**600**	212	637	0.943	1.567	998	**1634**	434	**7465**	1909	4.568	0.955	0.952
2005	83	26.87	**1225**	298	1325	0.924	1.559	2067	**3392**	664	**14445**	2874	4.259	0.870	0.863
2006	75	24.28	**1916**	751	2030	0.944	1.499	3044	**5074**	1529	**21170**	6569	4.172	0.877	0.868
2007	79	25.58	**1763**	540	1948	0.905	1.685	3282	**5231**	1262	**25913**	6807	4.954	0.952	0.948

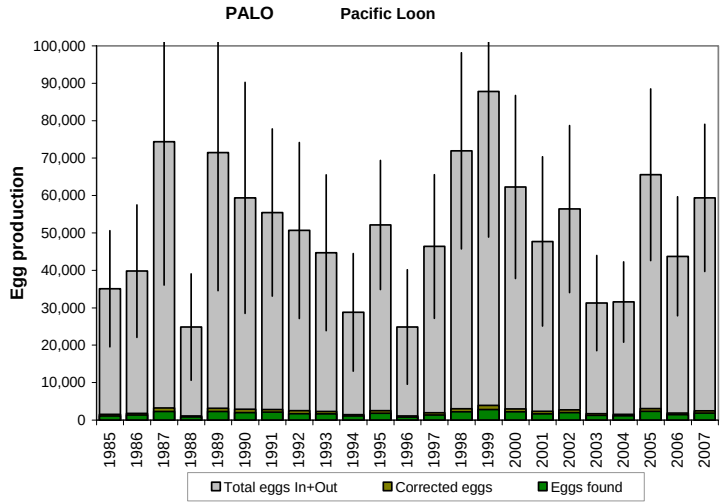




1998-2007 average annual growth rate = 0.988 (90%c.i. = 0.928 - 1.047)

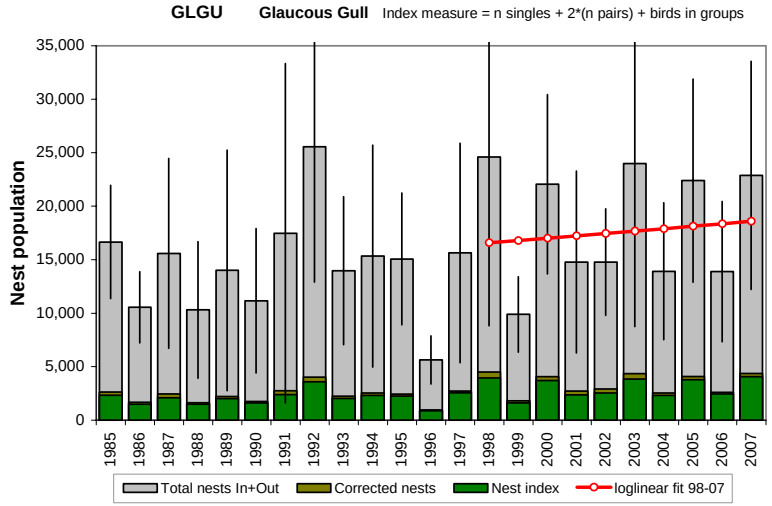
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
RTLO	Red-throated Loon						Aerial index measure =n singles + 2*(n pairs) + birds in groups								
1985	49	24.57	**306**	68	445	0.687	8.208	3655	**4100**	1411	**6090**	2083	1.485	0.943	0.904
1986	46	22.16	**388**	86	521	0.744	8.208	4277	**4798**	1626	**6903**	2371	1.439	0.925	0.876
1987	37	12.67	**525**	144	823	0.639	8.208	6754	**7577**	3147	**12910**	4853	1.704	0.968	0.875
1988	31	10.04	**235**	68	320	0.735	8.208	2630	**2951**	1113	**4314**	1741	1.462	0.909	0.882
1989	23	7.45	**519**	155	713	0.729	8.208	5849	**6562**	2458	**12400**	4667	1.890	1.000	1.000
1990	33	10.70	**478**	128	718	0.666	7.593	5454	**6172**	2081	**10481**	3632	1.698	0.958	0.932
1991	36	11.66	**439**	105	610	0.719	7.636	4659	**5270**	1467	**9102**	2429	1.727	0.962	0.928
1992	42	13.39	**387**	96	579	0.668	7.457	4320	**4899**	1334	**8107**	2364	1.655	0.923	0.892
1993	47	15.23	**356**	96	496	0.718	6.955	3446	**3942**	1026	**7028**	1949	1.783	0.963	0.931
1994	41	13.27	**209**	78	270	0.772	7.669	2072	**2342**	808	**4207**	1362	1.797	1.000	1.000
1995	50	22.56	**380**	76	520	0.730	7.744	4028	**4548**	894	**8215**	1679	1.806	1.000	1.000
1996	54	19.44	**173**	57	242	0.716	7.369	1781	**2022**	646	**3448**	1156	1.705	1.000	1.000
1997	72	23.31	**282**	67	442	0.637	7.066	3126	**3568**	886	**6018**	1444	1.687	0.970	0.883
1998	64	20.71	**529**	100	859	0.615	6.563	5639	**6498**	1549	**9267**	2052	1.426	0.906	0.763
1999	53	16.97	**676**	131	1094	0.618	6.199	6782	**7876**	1861	**11410**	2947	1.449	0.929	0.802
2000	80	25.86	**511**	89	717	0.712	5.204	3733	**4450**	943	**7813**	1641	1.756	0.968	0.928
2001	81	26.23	**478**	98	698	0.684	4.866	3397	**4096**	872	**6108**	1385	1.491	0.947	0.918
2002	84	27.15	**514**	79	717	0.717	5.551	3980	**4697**	849	**7609**	1454	1.620	0.969	0.944
2003	83	26.87	**317**	71	478	0.664	5.831	2786	**3264**	810	**4887**	1240	1.497	0.950	0.865
2004	81	26.22	**357**	64	549	0.649	5.952	3268	**3818**	740	**5014**	996	1.313	0.878	0.763
2005	83	26.87	**647**	118	866	0.748	6.223	5386	**6252**	1263	**11094**	2301	1.774	0.986	0.981
2006	75	24.28	**465**	95	645	0.720	6.700	4322	**4967**	1078	**7585**	1714	1.527	0.935	0.887
2007	79	25.58	**574**	112	781	0.734	7.344	5737	**6518**	1361	**10477**	2149	1.607	0.967	0.925

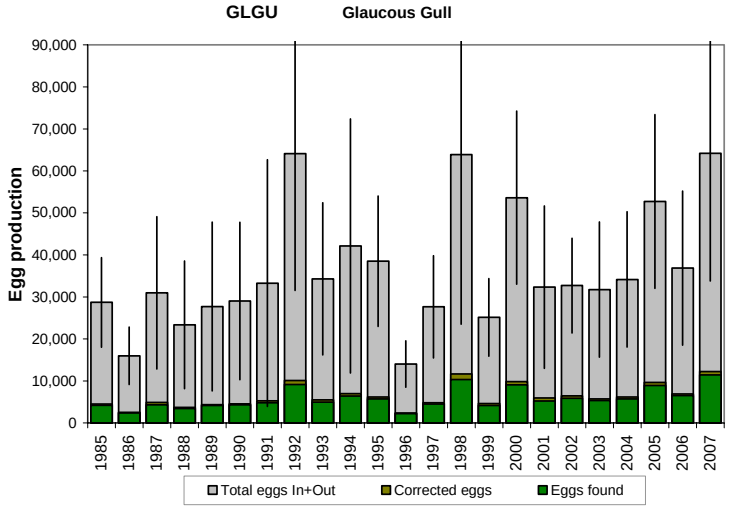




1998-2007 average annual growth rate = 0.946 (90%c.i. = 0.891 - 1.000)

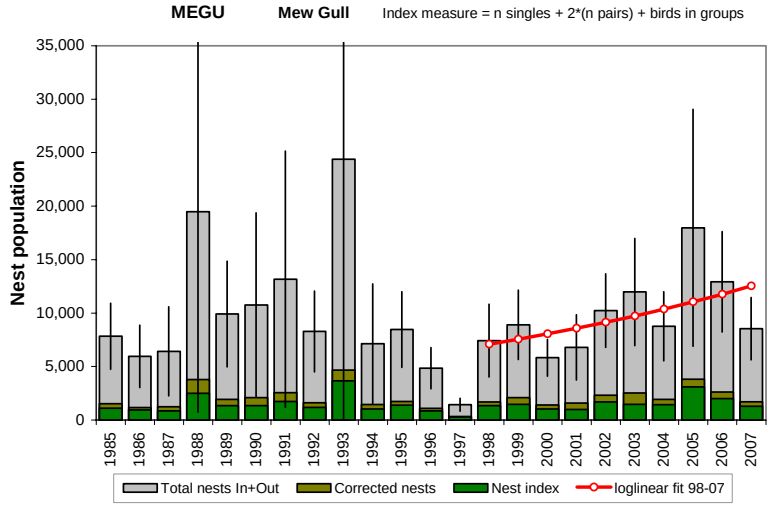
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
PALO	Pacific Loon						Aerial index measure =n singles + 2*(n pairs) + birds in groups								
1985	49	24.57	**713**	151	1038	0.687	21.771	22599	**23637**	6412	**35108**	9425	1.485	0.943	0.904
1986	46	22.16	**904**	190	1215	0.744	21.771	26445	**27660**	7308	**39795**	10752	1.439	0.925	0.876
1987	37	12.67	**1225**	326	1918	0.639	21.771	41763	**43682**	15818	**74429**	23287	1.704	0.968	0.875
1988	31	10.04	**549**	153	747	0.735	21.771	16265	**17012**	5353	**24869**	8642	1.462	0.909	0.882
1989	23	7.45	**1211**	351	1661	0.729	21.771	36167	**37829**	11773	**71490**	22403	1.890	1.000	1.000
1990	33	10.70	**1127**	295	1693	0.666	19.649	33272	**34965**	10659	**59376**	18771	1.698	0.958	0.932
1991	36	11.66	**1158**	254	1610	0.719	18.946	30502	**32112**	8309	**55465**	13592	1.727	0.962	0.928
1992	42	13.39	**1003**	236	1500	0.668	19.411	29125	**30626**	7943	**50678**	14289	1.655	0.923	0.892
1993	47	15.23	**913**	235	1272	0.718	18.705	23798	**25070**	6612	**44698**	12646	1.783	0.963	0.931
1994	41	13.27	**600**	219	778	0.772	19.608	15247	**16024**	5678	**28791**	9529	1.797	1.000	1.000
1995	50	22.56	**1016**	178	1392	0.730	19.737	27477	**28869**	5548	**52141**	10483	1.806	1.000	1.000
1996	54	19.44	**453**	141	632	0.716	22.082	13956	**14589**	5217	**24875**	9299	1.705	1.000	1.000
1997	72	23.31	**731**	158	1147	0.637	22.983	26372	**27519**	7170	**46413**	11660	1.687	0.970	0.883
1998	64	20.71	**1303**	225	2117	0.615	22.829	48341	**50459**	12165	**71954**	15926	1.426	0.906	0.763
1999	53	16.97	**1686**	298	2727	0.618	21.236	57906	**60633**	14802	**87841**	23640	1.449	0.929	0.802
2000	80	25.86	**1205**	187	1692	0.712	19.960	33776	**35468**	8531	**62273**	14859	1.756	0.968	0.928
2001	81	26.23	**1078**	211	1574	0.684	19.333	30439	**32013**	8767	**47745**	13740	1.491	0.947	0.918
2002	84	27.15	**1200**	172	1674	0.717	19.802	33154	**34828**	8024	**56419**	13562	1.620	0.969	0.944
2003	83	26.87	**748**	163	1127	0.664	17.527	19761	**20888**	5019	**31276**	7726	1.497	0.950	0.865
2004	81	26.22	**763**	123	1174	0.649	19.454	22846	**24021**	4822	**31550**	6502	1.313	0.878	0.763
2005	83	26.87	**1297**	218	1734	0.748	20.305	35211	**36945**	7631	**65558**	13947	1.774	0.986	0.981
2006	75	24.28	**891**	168	1238	0.720	22.157	27423	**28660**	6019	**43767**	9656	1.527	0.935	0.887
2007	79	25.58	**1105**	186	1505	0.734	23.544	35430	**36935**	7590	**59370**	11949	1.607	0.967	0.925

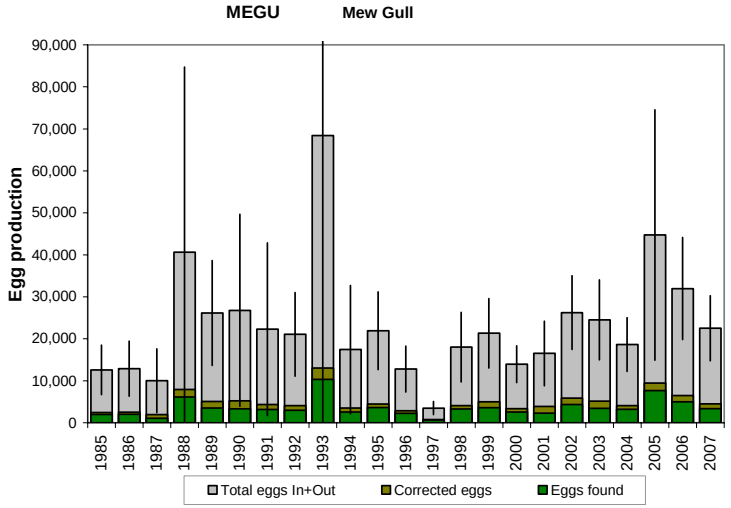




1998-2007 average annual growth rate = 1.013 (90%c.i. = 0.944 - 1.082)

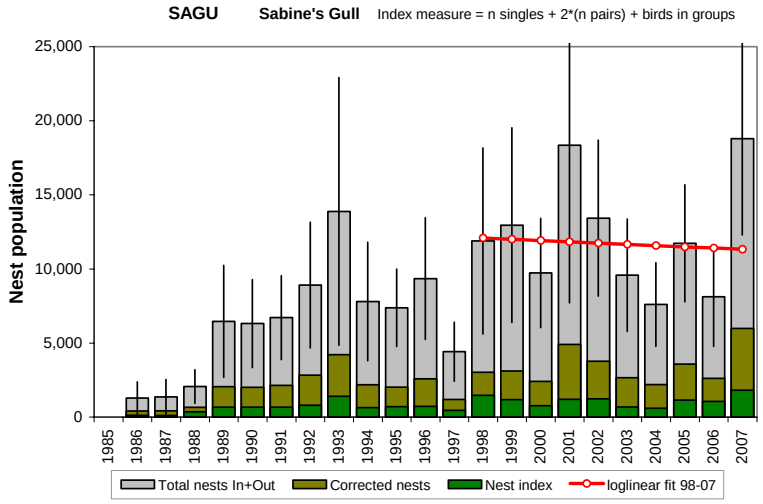
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
GLGU	Glaucous Gull						Aerial index measure =n singles + 2*(n pairs) + birds in groups								
1985	49	24.57	**2330**	487	2625	0.888	5.344	14029	**16654**	3219	**28702**	6489	1.723	0.863	0.829
1986	46	22.16	**1486**	316	1663	0.893	5.344	8890	**10553**	2021	**15983**	4147	1.514	0.739	0.704
1987	37	12.67	**2089**	766	2457	0.850	5.344	13131	**15589**	5386	**30983**	11015	1.988	0.973	0.926
1988	31	10.04	**1498**	647	1624	0.922	5.344	8682	**10306**	3878	**23350**	9236	2.266	0.905	0.895
1989	23	7.45	**2019**	1106	2208	0.914	5.344	11798	**14006**	6832	**27713**	12207	1.979	0.905	0.872
1990	33	10.70	**1606**	689	1758	0.913	5.344	9395	**11153**	4101	**29032**	11383	2.603	0.917	0.896
1991	36	11.66	**2395**	1501	2754	0.869	5.344	14719	**17473**	9635	**33293**	17835	1.905	0.667	0.638
1992	42	13.39	**3582**	1211	4027	0.889	5.344	21521	**25548**	7673	**64115**	19801	2.510	0.940	0.925
1993	47	15.23	**2021**	703	2228	0.907	5.268	11740	**13968**	4201	**34290**	11006	2.455	0.977	0.972
1994	41	13.27	**2319**	1103	2532	0.916	5.061	12815	**15347**	6301	**42130**	18380	2.745	0.977	0.971
1995	50	22.56	**2252**	643	2428	0.928	5.204	12633	**15061**	3744	**38488**	9425	2.555	1.000	1.000
1996	54	19.44	**884**	241	940	0.940	4.990	4689	**5629**	1373	**14030**	3345	2.492	1.000	1.000
1997	72	23.31	**2548**	1188	2716	0.938	4.757	12918	**15633**	6235	**27652**	7407	1.769	0.988	0.986
1998	64	20.71	**3939**	1749	4495	0.876	4.474	20109	**24604**	9579	**63911**	24558	2.598	0.982	0.973
1999	53	16.97	**1603**	387	1804	0.889	4.479	8080	**9884**	2143	**25127**	5607	2.542	0.947	0.935
2000	80	25.86	**3709**	974	4054	0.915	4.442	18008	**22061**	5092	**53618**	12513	2.430	0.978	0.971
2001	81	26.23	**2347**	955	2718	0.863	4.436	12058	**14776**	5165	**32336**	11744	2.188	0.942	0.926
2002	84	27.15	**2531**	580	2917	0.867	4.066	11860	**14778**	3028	**32702**	6859	2.213	0.896	0.853
2003	83	26.87	**3835**	1748	4338	0.884	4.527	19640	**23978**	9258	**31761**	9789	1.325	0.847	0.809
2004	81	26.22	**2320**	717	2534	0.915	4.493	11387	**13921**	3891	**34150**	9778	2.453	0.988	0.985
2005	83	26.87	**3782**	1049	4084	0.926	4.482	18308	**22392**	5768	**52718**	12569	2.354	0.979	0.975
2006	75	24.28	**2446**	742	2600	0.941	4.341	11287	**13887**	3987	**36858**	11138	2.654	0.988	0.986
2007	79	25.58	**4057**	1101	4360	0.930	4.249	18527	**22888**	6476	**64199**	18456	2.805	0.993	0.992

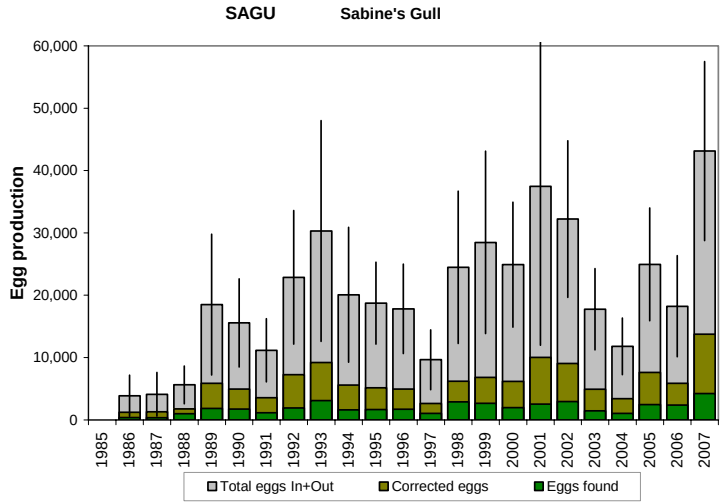




1998-2007 average annual growth rate = 1.065 (90%c.i. = 1.002 - 1.128)

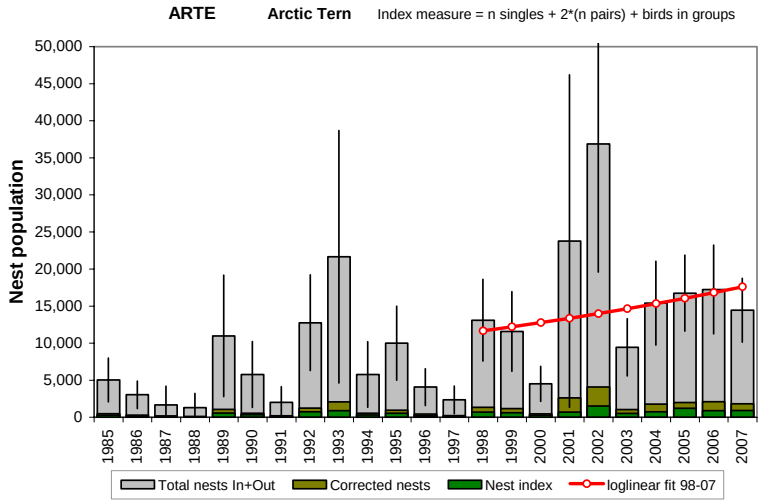
Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
MEGU	Mew Gull						Aerial index measure =n singles + 2*(n pairs) + birds in groups								
1985	49	24.57	**1107**	270	1525	0.726	4.140	6311	**7836**	1875	**12602**	3585	1.608	0.921	0.823
1986	46	22.16	**937**	286	1157	0.809	4.140	4791	**5949**	1773	**12891**	3979	2.167	0.965	0.948
1987	37	12.67	**847**	385	1249	0.678	4.140	5170	**6419**	2536	**10022**	4620	1.561	1.000	1.000
1988	31	10.04	**2496**	1871	3789	0.659	4.140	15686	**19476**	11391	**40663**	26755	2.088	0.971	0.846
1989	23	7.45	**1346**	385	1930	0.697	4.140	7987	**9917**	3004	**26168**	7581	2.639	1.000	1.000
1990	33	10.70	**1338**	814	2095	0.639	4.140	8670	**10765**	5233	**26798**	13878	2.489	0.950	0.928
1991	36	11.66	**1719**	1037	2562	0.671	4.140	10607	**13170**	7281	**22310**	12487	1.694	0.786	0.716
1992	42	13.39	**1176**	323	1612	0.729	4.140	6675	**8287**	2294	**21067**	6056	2.542	0.955	0.947
1993	47	15.23	**3667**	2931	4661	0.787	4.231	19720	**24380**	15551	**68392**	44018	2.805	1.000	1.000
1994	41	13.27	**1024**	547	1450	0.707	3.928	5694	**7144**	3396	**17438**	9288	2.441	0.947	0.920
1995	50	22.56	**1396**	403	1719	0.812	3.923	6746	**8465**	2152	**21906**	5627	2.588	1.000	1.000
1996	54	19.44	**847**	241	1083	0.782	3.473	3763	**4846**	1177	**12787**	3331	2.639	1.000	1.000
1997	72	23.31	**276**	85	323	0.856	3.418	1104	**1427**	372	**3501**	955	2.454	1.000	1.000
1998	64	20.71	**1348**	446	1685	0.800	3.405	5739	**7424**	2071	**18011**	5040	2.426	1.000	1.000
1999	53	16.97	**1476**	399	2089	0.707	3.261	6813	**8903**	1970	**21335**	5018	2.396	0.971	0.968
2000	80	25.86	**1024**	189	1414	0.724	3.120	4412	**5826**	1043	**13968**	2656	2.398	0.946	0.927
2001	81	26.23	**982**	300	1588	0.618	3.275	5202	**6791**	1855	**16526**	4684	2.433	1.000	1.000
2002	84	27.15	**1687**	378	2305	0.732	3.438	7926	**10231**	2086	**26215**	5332	2.562	0.969	0.955
2003	83	26.87	**1465**	387	2535	0.578	3.725	9443	**11978**	3048	**24543**	5785	2.049	0.909	0.795
2004	81	26.22	**1419**	326	1934	0.734	3.531	6829	**8763**	1968	**18640**	3891	2.127	0.942	0.869
2005	83	26.87	**3090**	1366	3813	0.810	3.715	14167	**17980**	6729	**44726**	18112	2.488	1.000	1.000
2006	75	24.28	**2004**	507	2623	0.764	3.929	10308	**12932**	2860	**31965**	7381	2.472	1.000	1.000
2007	79	25.58	**1287**	252	1705	0.755	4.008	6835	**8541**	1770	**22501**	4712	2.635	1.000	1.000

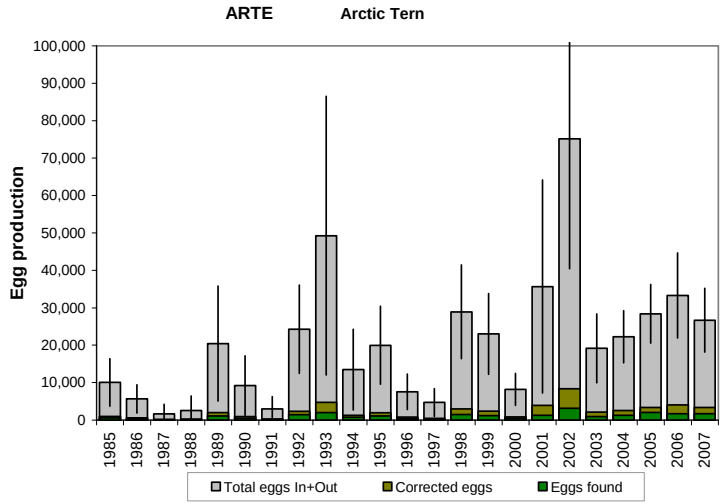




1998-2007 average annual growth rate = 0.993 (90%c.i. = 0.927 - 1.059)

Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
SAGU	Sabine's Gull						Aerial index measure =n singles + 2*(n pairs) + birds in groups								
1985	49	24.57	**0**	0	0		2.146	0	**0**	0	**0**	0			
1986	46	22.16	**129**	78	410	0.315	2.146	880	**1290**	669	**3869**	2006	3.000	1.000	1.000
1987	37	12.67	**113**	76	436	0.259	2.146	935	**1371**	709	**4112**	2129	3.000	1.000	1.000
1988	31	10.04	**357**	147	656	0.543	2.146	1408	**2064**	689	**5619**	1842	2.723	1.000	1.000
1989	23	7.45	**673**	291	2053	0.328	2.146	4406	**6459**	2294	**18503**	6861	2.865	1.000	1.000
1990	33	10.70	**669**	223	2007	0.333	2.146	4306	**6313**	1802	**15569**	4293	2.466	1.000	1.000
1991	36	11.66	**675**	192	2134	0.316	2.146	4579	**6714**	1722	**11176**	3084	1.665	1.000	1.000
1992	42	13.39	**802**	291	2833	0.283	2.146	6078	**8911**	2574	**22854**	6510	2.565	1.000	1.000
1993	47	15.23	**1410**	724	4225	0.334	2.286	9656	**13880**	5487	**30295**	10759	2.183	0.967	0.906
1994	41	13.27	**647**	220	2179	0.297	2.580	5622	**7800**	2430	**20062**	6577	2.572	1.000	1.000
1995	50	22.56	**698**	185	2024	0.345	2.646	5356	**7380**	1590	**18731**	3988	2.538	1.000	1.000
1996	54	19.44	**736**	216	2591	0.284	2.609	6760	**9351**	2496	**17811**	4359	1.905	0.950	0.787
1997	72	23.31	**460**	136	1196	0.385	2.694	3223	**4419**	1209	**9656**	2913	2.185	1.000	1.000
1998	64	20.71	**1486**	720	3026	0.491	2.930	8866	**11893**	3812	**24471**	7427	2.058	1.000	1.000
1999	53	16.97	**1181**	560	3113	0.379	3.163	9846	**12958**	3988	**28470**	8882	2.197	1.000	1.000
2000	80	25.86	**775**	182	2408	0.322	3.040	7322	**9730**	2237	**24903**	6086	2.559	1.000	1.000
2001	81	26.23	**1201**	423	4915	0.244	2.732	13430	**18345**	6462	**37461**	15477	2.042	0.977	0.887
2002	84	27.15	**1239**	404	3774	0.328	2.559	9658	**13432**	3198	**32211**	7631	2.398	1.000	1.000
2003	83	26.87	**692**	186	2656	0.261	2.606	6922	**9578**	2301	**17754**	3966	1.854	0.962	0.849
2004	81	26.22	**600**	148	2199	0.273	2.459	5407	**7606**	1711	**11806**	2761	1.552	0.909	0.782
2005	83	26.87	**1145**	256	3579	0.320	2.277	8147	**11726**	2399	**24936**	5492	2.127	1.000	1.000
2006	75	24.28	**1061**	372	2616	0.406	2.107	5512	**8128**	2045	**18241**	4931	2.244	1.000	1.000
2007	79	25.58	**1819**	398	5992	0.304	2.137	12804	**18796**	3946	**43126**	8710	2.294	1.000	1.000





1998-2007 average annual growth rate = 1.047 (90%c.i. = 0.925 - 1.169)

Year	N plots	Ground sampled area km2	**Nest index**	SE nest index	Corrected nests IN	Avg nest detect-ion rate	7yr avg aerial Out:In	Corrected nests OUT	**Total nests In+Out**	SE total nests	**Total eggs In+Out**	SE total eggs	Active eggs / total nests	Apparent nest success	Corrected nest success
ARTE	Arctic Tern						Aerial index measure =n singles + 2*(n pairs) + birds in groups								
1985	49	24.57	**291**	110	483	0.603	9.414	4544	**5027**	1797	**10053**	3859	2.000	1.000	1.000
1986	46	22.16	**194**	77	291	0.666	9.414	2741	**3032**	1131	**5662**	2297	1.867	1.000	1.000
1987	37	12.67	**113**	112	161	0.701	9.414	1516	**1677**	1529	**1677**	1529	1.000	1.000	1.000
1988	31	10.04	**71**	71	123	0.579	9.414	1159	**1282**	1169	**2564**	2339	2.000	1.000	1.000
1989	23	7.45	**577**	284	1054	0.547	9.414	9919	**10972**	4981	**20442**	9350	1.863	1.000	1.000
1990	33	10.70	**335**	168	554	0.603	9.414	5218	**5773**	2711	**9236**	4840	1.600	1.000	1.000
1991	36	11.66	**123**	85	194	0.633	9.414	1826	**2020**	1291	**2980**	1983	1.475	1.000	1.000
1992	42	13.39	**748**	235	1225	0.611	9.414	11530	**12754**	3917	**24272**	7162	1.903	1.000	1.000
1993	47	15.23	**893**	482	2066	0.432	9.484	19592	**21658**	10350	**49280**	22614	2.275	1.000	1.000
1994	41	13.27	**323**	163	544	0.595	9.638	5238	**5782**	2683	**13464**	6568	2.329	1.000	1.000
1995	50	22.56	**539**	165	961	0.561	9.406	9035	**9996**	3030	**19991**	6342	2.000	1.000	1.000
1996	54	19.44	**221**	85	421	0.525	8.673	3647	**4068**	1508	**7546**	2892	1.855	1.000	1.000
1997	72	23.31	**154**	78	238	0.646	8.915	2118	**2355**	1131	**4710**	2261	2.000	1.000	1.000
1998	64	20.71	**691**	193	1348	0.513	8.717	11747	**13095**	3353	**28925**	7621	2.209	1.000	1.000
1999	53	16.97	**591**	170	1190	0.496	8.732	10390	**11580**	3267	**23034**	6548	1.989	1.000	1.000
2000	80	25.86	**277**	90	473	0.586	8.524	4028	**4500**	1431	**8198**	2591	1.822	1.000	1.000
2001	81	26.23	**682**	269	2623	0.260	8.064	21149	**23772**	13624	**35683**	17294	1.501	0.960	0.783
2002	84	27.15	**1529**	434	4091	0.374	8.011	32773	**36864**	10503	**75133**	21057	2.038	1.000	1.000
2003	83	26.87	**506**	136	1028	0.492	8.180	8408	**9436**	2351	**19178**	5604	2.033	1.000	1.000
2004	81	26.22	**737**	137	1789	0.412	7.606	13608	**15397**	3441	**22246**	4232	1.445	0.963	0.817
2005	83	26.87	**1199**	258	1985	0.604	7.439	14768	**16753**	3114	**28370**	4765	1.693	1.000	1.000
2006	75	24.28	**884**	175	2087	0.424	7.261	15152	**17238**	3640	**33272**	6901	1.930	1.000	1.000
2007	79	25.58	**923**	169	1806	0.511	6.999	12639	**14444**	2611	**26686**	5183	1.847	1.000	1.000

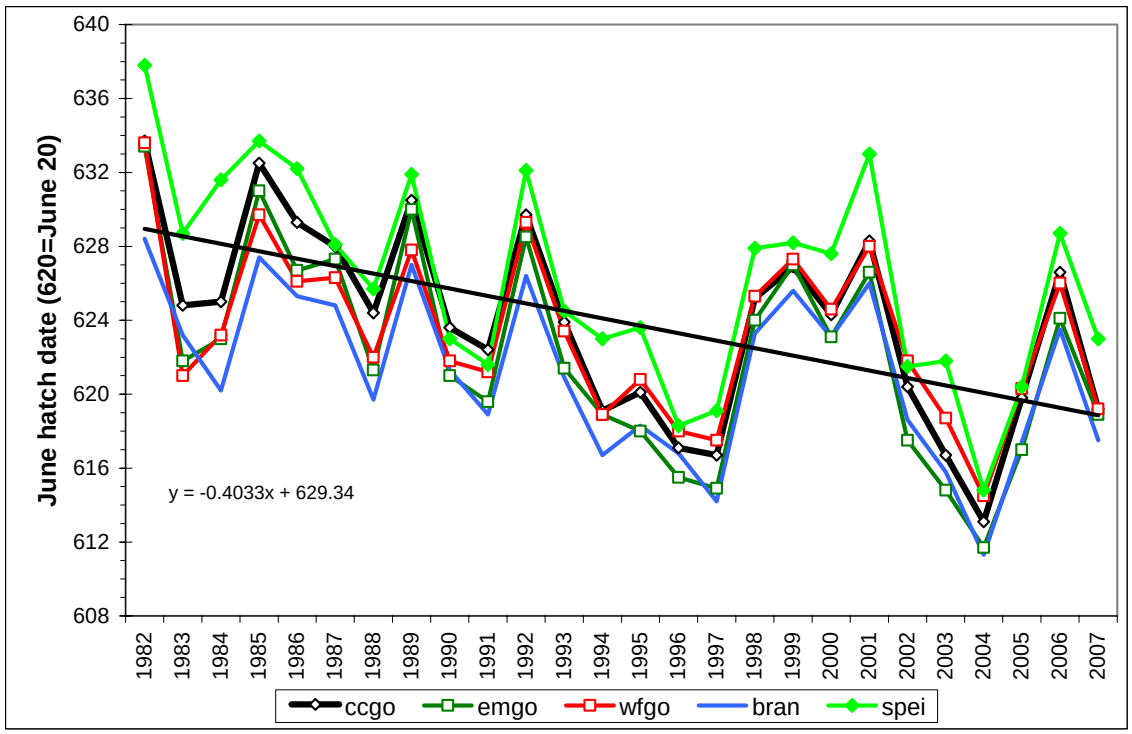


Figure 4. Estimated average hatch date based on egg float angles, 1982-2007. Linear regression on cackling goose hatch date indicate an average change of 0.4 days earlier per year.

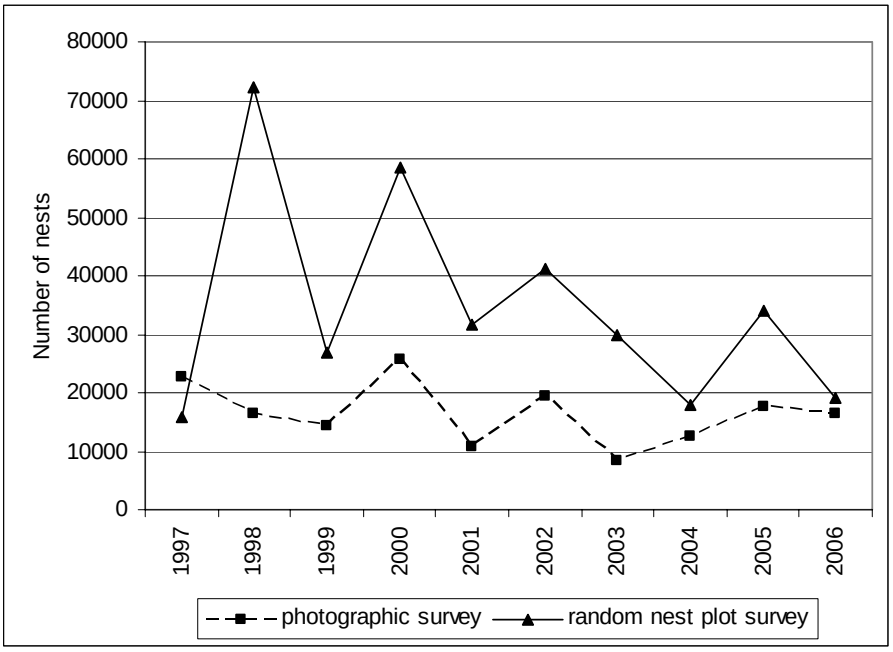


Figure 5. Comparison of black brant nest population estimates within major colonies (aerial photographic colony survey, Anthony 2006) vs. major colonies plus satellite colonies (Yukon Delta nest plot survey).

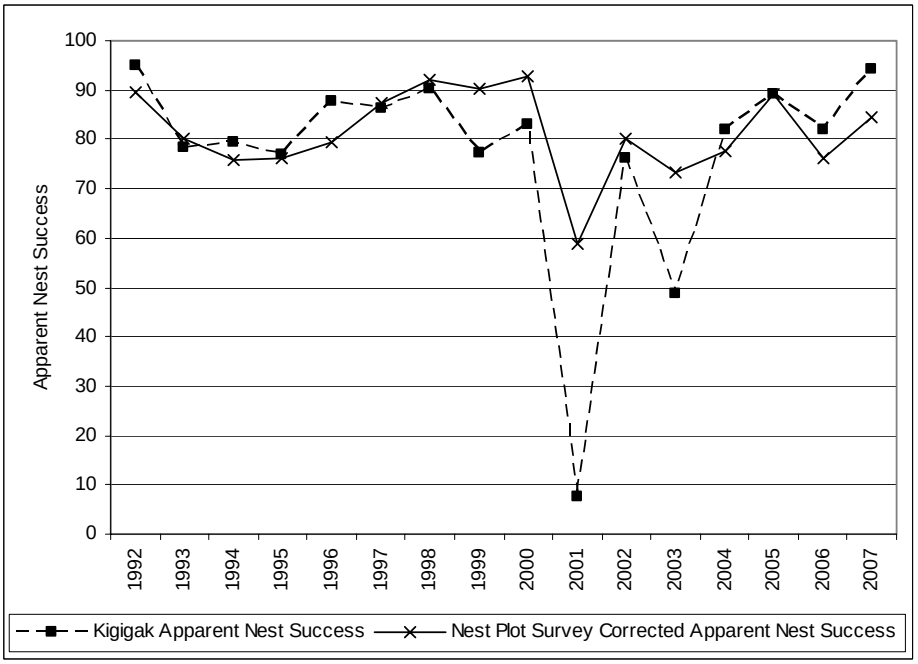


Figure 6. Comparison of spectacled eider apparent nest success measures at Kigigak Island (successful hatched nests/total nests; Lake 2007) and the Yukon-Kuskokwim Delta nest plot survey (active nests at time of search/total nests, corrected for nest detection rate).

Table 1. Estimated hatch date based on egg float angles. Means calculated using nest as sample unit.

Year	Mean	Min	Max	N
Cackling Goose				
1982	4-Jul	25-Jun	18-Jul	170
1983	25-Jun	15-Jun	14-Jul	284
1984	25-Jun	16-Jun	11-Jul	92
1985	3-Jul	24-Jun	15-Jul	278
1986	29-Jun	13-Jun	15-Jul	346
1987	28-Jun	20-Jun	18-Jul	204
1988	24-Jun	15-Jun	8-Jul	66
1989	1-Jul	22-Jun	10-Jul	55
1990	24-Jun	13-Jun	6-Jul	194
1991	22-Jun	12-Jun	3-Jul	352
1992	30-Jun	20-Jun	21-Jul	391
1993	24-Jun	9-Jun	6-Jul	358
1994	19-Jun	8-Jun	9-Jul	409
1995	20-Jun	11-Jun	5-Jul	725
1996	17-Jun	7-Jun	5-Jul	755
1997	17-Jun	3-Jun	4-Jul	812
1998	25-Jun	12-Jun	9-Jul	889
1999	27-Jun	17-Jun	16-Jul	772
2000	24-Jun	14-Jun	10-Jul	1014
2001	28-Jun	15-Jun	9-Jul	522
2002	20-Jun	10-Jun	4-Jul	930
2003	17-Jun	3-Jun	4-Jul	562
2004	13-Jun	4-Jun	1-Jul	964
2005	20-Jun	9-Jun	7-Jul	957
2006	27-Jun	15-Jun	8-Jul	849
2007	19-Jun	9-Jun	5-Jul	1027
Mean	**24-Jun**	**13-Jun**	**9-Jul**	**538**

Year	Average	Min	Max	N
Emperor Goose				
1982	3-Jul	16-Jun	11-Jul	71
1983	22-Jun	14-Jun	6-Jul	100
1984	23-Jun	16-Jun	2-Jul	43
1985	1-Jul	23-Jun	11-Jul	107
1986	27-Jun	18-Jun	9-Jul	196
1987	27-Jun	18-Jun	7-Jul	141
1988	21-Jun	16-Jun	4-Jul	67
1989	30-Jun	18-Jun	7-Jul	63
1990	21-Jun	11-Jun	6-Jul	99
1991	20-Jun	10-Jun	2-Jul	256
1992	29-Jun	21-Jun	9-Jul	182
1993	21-Jun	11-Jun	4-Jul	139
1994	19-Jun	12-Jun	30-Jun	192
1995	18-Jun	10-Jun	6-Jul	188
1996	16-Jun	4-Jun	23-Jun	185
1997	15-Jun	6-Jun	30-Jun	153
1998	24-Jun	16-Jun	3-Jul	215
1999	27-Jun	17-Jun	6-Jul	188
2000	23-Jun	13-Jun	8-Jul	280
2001	27-Jun	19-Jun	2-Jul	104
2002	18-Jun	9-Jun	29-Jun	249
2003	15-Jun	5-Jun	26-Jun	153
2004	12-Jun	4-Jun	24-Jun	253
2005	17-Jun	7-Jun	29-Jun	303
2006	24-Jun	16-Jun	4-Jul	253
2007	19-Jun	7-Jun	28-Jun	275
Mean	**22-Jun**	**13-Jun**	**4-Jul**	**171**

Year	Average	Min	Max	N
White-fronted Goose				
1982	4-Jul	26-Jun	12-Jul	14
1983	21-Jun	13-Jun	19-Jul	25
1984	23-Jun	16-Jun	1-Jul	25
1985	30-Jun	23-Jun	7-Jul	42
1986	26-Jun	17-Jun	12-Jul	102
1987	26-Jun	19-Jun	3-Jul	60
1988	22-Jun	15-Jun	3-Jul	32
1989	28-Jun	22-Jun	4-Jul	21
1990	22-Jun	11-Jun	29-Jun	52
1991	21-Jun	12-Jun	3-Jul	138
1992	29-Jun	19-Jun	24-Jul	110
1993	23-Jun	17-Jun	5-Jul	84
1994	19-Jun	11-Jun	28-Jun	129
1995	21-Jun	9-Jun	1-Jul	178
1996	18-Jun	7-Jun	30-Jun	144
1997	18-Jun	7-Jun	29-Jun	184
1998	25-Jun	17-Jun	6-Jul	261
1999	27-Jun	19-Jun	10-Jul	208
2000	25-Jun	14-Jun	9-Jul	334
2001	28-Jun	19-Jun	7-Jul	311
2002	22-Jun	14-Jun	30-Jun	306
2003	19-Jun	6-Jun	1-Jul	272
2004	15-Jun	4-Jun	27-Jun	364
2005	20-Jun	12-Jun	1-Jul	438
2006	26-Jun	16-Jun	10-Jul	370
2007	19-Jun	8-Jun	2-Jul	446
Mean	**23-Jun**	**15-Jun**	**5-Jul**	**179**

Year	Average	Min	Max	N
Black Brant				
1982	--	--	--	--
1983	23-Jun	15-Jun	3-Jul	11
1984	20-Jun	19-Jun	20-Jun	4
1985	27-Jun	23-Jun	8-Jul	29
1986	25-Jun	19-Jun	6-Jul	126
1987	25-Jun	22-Jun	3-Jul	167
1988	20-Jun	14-Jun	3-Jul	38
1989	27-Jun	19-Jun	6-Jul	40
1990	21-Jun	15-Jun	1-Jul	119
1991	19-Jun	12-Jun	1-Jul	183
1992	26-Jun	19-Jun	6-Jul	152
1993	21-Jun	12-Jun	27-Jun	107
1994	17-Jun	10-Jun	27-Jun	93
1995	18-Jun	12-Jun	1-Jul	41
1996	17-Jun	11-Jun	26-Jun	44
1997	14-Jun	3-Jun	24-Jun	100
1998	23-Jun	16-Jun	4-Jul	260
1999	26-Jun	17-Jun	7-Jul	108
2000	23-Jun	16-Jun	3-Jul	216
2001	26-Jun	19-Jun	5-Jul	77
2002	19-Jun	6-Jun	3-Jul	163
2003	16-Jun	7-Jun	26-Jun	56
2004	11-Jun	4-Jun	24-Jun	101
2005	17-Jun	6-Jun	26-Jun	148
2006	24-Jun	16-Jun	9-Jul	123
2007	18-Jun	9-Jun	29-Jun	147
Mean	**21-Jun**	**14-Jun**	**1-Jul**	**106**

Table 1. Estimated hatch date continued.

Year	Average	Min	Max	N
Tundra Swan				
1982	5-Jul	23-Jun	14-Jul	11
1983	24-Jun	15-Jun	30-Jun	6
1984	27-Jun	20-Jun	5-Jul	6
1985	4-Jul	26-Jun	10-Jul	14
1986	28-Jun	19-Jun	10-Jul	23
1987	30-Jun	23-Jun	6-Jul	12
1988	27-Jun	17-Jun	4-Jul	4
1989	1-Jul	29-Jun	3-Jul	4
1990	25-Jun	21-Jun	27-Jun	4
1991	24-Jun	17-Jun	8-Jul	12
1992	30-Jun	24-Jun	7-Jul	8
1993	26-Jun	19-Jun	1-Jul	6
1994	22-Jun	13-Jun	30-Jun	9
1995	25-Jun	21-Jun	2-Jul	9
1996	19-Jun	10-Jun	28-Jun	9
1997	21-Jun	14-Jun	25-Jun	13
1998	30-Jun	23-Jun	12-Jul	20
1999	1-Jul	24-Jun	9-Jul	14
2000	26-Jun	18-Jun	5-Jul	22
2001	30-Jun	19-Jun	9-Jul	16
2002	26-Jun	20-Jun	1-Jul	10
2003	18-Jun	11-Jun	24-Jun	21
2004	19-Jun	10-Jun	27-Jun	16
2005	23-Jun	16-Jun	29-Jun	18
2006	1-Jul	22-Jun	8-Jul	14
2007	24-Jun	16-Jun	2-Jul	19
Mean	**26-Jun**	**19-Jun**	**4-Jul**	**12**

Year	Average	Min	Max	N
Sandhill Crane				
1982	24-Jun	22-Jun	25-Jun	4
1983	26-Jun	17-Jun	11-Jul	14
1984	19-Jun	15-Jun	21-Jun	6
1985	30-Jun	19-Jun	4-Jul	13
1986	27-Jun	16-Jun	9-Jul	25
1987	25-Jun	18-Jun	10-Jul	16
1988	19-Jun	17-Jun	25-Jun	6
1989	--	--	--	--
1990	18-Jun	15-Jun	22-Jun	9
1991	16-Jun	10-Jun	26-Jun	25
1992	30-Jun	24-Jun	5-Jul	9
1993	19-Jun	15-Jun	27-Jun	14
1994	14-Jun	11-Jun	16-Jun	5
1995	18-Jun	12-Jun	30-Jun	10
1996	14-Jun	10-Jun	25-Jun	14
1997	15-Jun	11-Jun	24-Jun	8
1998	21-Jun	15-Jun	26-Jun	19
1999	23-Jun	19-Jun	28-Jun	12
2000	19-Jun	13-Jun	29-Jun	22
2001	21-Jun	19-Jun	23-Jun	7
2002	19-Jun	8-Jun	3-Jul	12
2003	14-Jun	7-Jun	25-Jun	13
2004	15-Jun	9-Jun	22-Jun	10
2005	15-Jun	10-Jun	26-Jun	23
2006	23-Jun	17-Jun	8-Jul	19
2007	12-Jun	7-Jun	24-Jun	16
Mean	**20-Jun**	**15-Jun**	**8-Jul**	**13**

Year	Average	Min	Max	N
Spectacled Eider				
1982	8-Jul	30-Jun	22-Jul	18
1983	29-Jun	20-Jun	6-Jul	22
1984	2-Jul	25-Jun	5-Jul	3
1985	4-Jul	26-Jun	18-Jul	20
1986	2-Jul	22-Jun	20-Jul	38
1987	28-Jun	17-Jun	9-Jul	27
1988	26-Jun	20-Jun	2-Jul	19
1989	2-Jul	22-Jun	7-Jul	5
1990	23-Jun	18-Jun	27-Jun	15
1991	22-Jun	16-Jun	10-Jul	25
1992	2-Jul	26-Jun	14-Jul	17
1993	25-Jun	17-Jun	9-Jul	18
1994	23-Jun	12-Jun	6-Jul	15
1995	24-Jun	14-Jun	4-Jul	44
1996	18-Jun	12-Jun	2-Jul	33
1997	19-Jun	11-Jun	30-Jun	39
1998	28-Jun	17-Jun	7-Jul	52
1999	28-Jun	18-Jun	9-Jul	51
2000	28-Jun	18-Jun	9-Jul	52
2001	3-Jul	25-Jun	16-Jul	32
2002	22-Jun	15-Jun	2-Jul	59
2003	22-Jun	9-Jun	2-Jul	36
2004	15-Jun	5-Jun	30-Jun	57
2005	20-Jun	9-Jun	4-Jul	101
2006	29-Jun	19-Jun	12-Jul	79
2007	23-Jun	10-Jun	4-Jul	68
Mean	**26-Jun**	**18-Jun**	**8-Jul**	**36**

Year	Average	Min	Max	N
Common Eider				
1982	9-Jul	8-Jul	10-Jul	4
1983	26-Jun	21-Jun	30-Jun	3
1984	--	--	--	--
1985	--	--	--	--
1986	--	--	--	--
1987	29-Jun	25-Jun	8-Jul	10
1988	--	--	--	--
1989	2-Jul	29-Jun	8-Jul	4
1990	22-Jun	21-Jun	24-Jun	3
1991	26-Jun	19-Jun	5-Jul	27
1992	2-Jul	26-Jun	6-Jul	12
1993	24-Jun	18-Jun	27-Jun	5
1994	24-Jun	16-Jun	4-Jul	9
1995	23-Jun	14-Jun	2-Jul	13
1996	19-Jun	10-Jun	2-Jul	14
1997	19-Jun	10-Jun	1-Jul	15
1998	28-Jun	20-Jun	4-Jul	18
1999	30-Jun	22-Jun	9-Jul	12
2000	29-Jun	24-Jun	5-Jul	23
2001	30-Jun	20-Jun	8-Jul	23
2002	24-Jun	15-Jun	30-Jun	17
2003	22-Jun	14-Jun	4-Jul	16
2004	17-Jun	6-Jun	26-Jun	18
2005	19-Jun	5-Jun	1-Jul	34
2006	1-Jul	24-Jun	11-Jul	52
2007	20-Jun	15-Jun	30-Jun	50
Mean	**27-Jun**	**20-Jun**	**4-Jul**	**17**

Table 1. Estimated hatch date continued.

Year	Average	Min	Max	N
Pacific Loon, Red-throated Loon				
1982	8-Jul	3-Jul	24-Jul	25
1983	29-Jun	21-Jun	29-Jul	15
1984	2-Jul	26-Jun	8-Jul	5
1985	7-Jul	25-Jun	21-Jul	15
1986	5-Jul	26-Jun	25-Jul	37
1987	3-Jul	27-Jun	12-Jul	34
1988	27-Jun	16-Jun	5-Jul	5
1989	2-Jul	22-Jun	15-Jul	5
1990	1-Jul	25-Jun	9-Jul	11
1991	26-Jun	18-Jun	5-Jul	21
1992	5-Jul	29-Jun	18-Jul	12
1993	26-Jun	18-Jun	5-Jul	12
1994	24-Jun	19-Jun	29-Jun	6
1995	26-Jun	21-Jun	1-Jul	10
1996	22-Jun	15-Jun	1-Jul	9
1997	22-Jun	15-Jun	29-Jun	17
1998	1-Jul	20-Jun	14-Jul	37
1999	3-Jul	22-Jun	14-Jul	48
2000	30-Jun	15-Jun	9-Jul	40
2001	4-Jul	27-Jun	15-Jul	27
2002	25-Jun	12-Jun	3-Jul	42
2003	24-Jun	12-Jun	3-Jul	14
2004	23-Jun	13-Jun	30-Jun	10
2005	27-Jun	11-Jun	7-Jul	42
2006	2-Jul	27-Jun	7-Jul	22
2007	24-Jun	15-Jun	2-Jul	31
Mean	**29-Jun**	**21-Jun**	**10-Jul**	**21**

Year	Average	Min	Max	N
Glaucous Gull				
1982	5-Jul	29-Jun	22-Jul	23
1983	22-Jun	13-Jun	4-Jul	14
1984	23-Jun	18-Jun	26-Jun	5
1985	3-Jul	23-Jun	12-Jul	23
1986	27-Jun	22-Jun	5-Jul	18
1987	28-Jun	20-Jun	10-Jul	19
1988	22-Jun	15-Jun	3-Jul	9
1989	22-Jun	22-Jun	22-Jun	3
1990	--	--	--	--
1991	18-Jun	12-Jun	3-Jul	26
1992	27-Jun	22-Jun	4-Jul	23
1993	20-Jun	15-Jun	7-Jul	11
1994	17-Jun	10-Jun	27-Jun	17
1995	17-Jun	14-Jun	26-Jun	17
1996	14-Jun	11-Jun	20-Jun	15
1997	17-Jun	10-Jun	29-Jun	19
1998	22-Jun	15-Jun	9-Jul	64
1999	27-Jun	19-Jun	7-Jul	25
2000	22-Jun	12-Jun	9-Jul	72
2001	24-Jun	17-Jun	7-Jul	50
2002	17-Jun	6-Jun	4-Jul	56
2003	13-Jun	4-Jun	26-Jun	58
2004	10-Jun	3-Jun	19-Jun	21
2005	14-Jun	6-Jun	27-Jun	69
2006	25-Jun	17-Jun	9-Jul	46
2007	15-Jun	8-Jun	29-Jun	76
Mean	**21-Jun**	**15-Jun**	**2-Jul**	**31**

Year	Average	Min	Max	N
Mew Gull				
1982	10-Jul	7-Jul	22-Jul	11
1983	26-Jun	17-Jun	3-Jul	6
1984	--	--	--	--
1985	4-Jul	27-Jun	12-Jul	8
1986	2-Jul	21-Jun	12-Jul	18
1987	26-Jun	21-Jun	4-Jul	8
1988	18-Jun	14-Jun	24-Jun	4
1989	--	--	--	--
1990	--	--	--	--
1991	20-Jun	14-Jun	2-Jul	8
1992	27-Jun	23-Jun	4-Jul	10
1993	24-Jun	17-Jun	2-Jul	7
1994	15-Jun	11-Jun	21-Jun	8
1995	18-Jun	15-Jun	22-Jun	16
1996	14-Jun	8-Jun	20-Jun	10
1997	19-Jun	16-Jun	27-Jun	8
1998	24-Jun	19-Jun	4-Jul	19
1999	25-Jun	21-Jun	9-Jul	25
2000	25-Jun	17-Jun	5-Jul	17
2001	26-Jun	19-Jun	7-Jul	18
2002	16-Jun	6-Jun	3-Jul	40
2003	17-Jun	8-Jun	27-Jun	20
2004	13-Jun	9-Jun	19-Jun	19
2005	19-Jun	10-Jun	1-Jul	32
2006	26-Jun	18-Jun	9-Jul	45
2007	18-Jun	7-Jun	3-Jul	32
Mean	**23-Jun**	**17-Jun**	**2-Jul**	**17**

Year	Average	Min	Max	N
Sabine's Gull				
1982	--	--	--	--
1983	21-Jun	14-Jun	2-Jul	3
1984	--	--	--	--
1985	2-Jul	26-Jun	18-Jul	3
1986	24-Jun	15-Jun	7-Jul	7
1987	21-Jun	15-Jun	4-Jul	7
1988	24-Jun	18-Jun	8-Jul	7
1989	--	--	--	--
1990	--	--	--	--
1991	15-Jun	9-Jun	22-Jun	9
1992	--	--	--	--
1993	17-Jun	14-Jun	23-Jun	8
1994	11-Jun	9-Jun	16-Jun	6
1995	18-Jun	12-Jun	28-Jun	6
1996	11-Jun	7-Jun	14-Jun	3
1997	14-Jun	8-Jun	22-Jun	8
1998	21-Jun	15-Jun	6-Jul	11
1999	21-Jun	16-Jun	3-Jul	20
2000	22-Jun	14-Jun	2-Jul	7
2001	27-Jun	19-Jun	4-Jul	10
2002	14-Jun	8-Jun	26-Jun	28
2003	12-Jun	6-Jun	17-Jun	5
2004	9-Jun	3-Jun	19-Jun	3
2005	16-Jun	8-Jun	29-Jun	30
2006	22-Jun	18-Jun	27-Jun	23
2007	17-Jun	9-Jun	29-Jun	30
Mean	**20-Jun**	**14-Jun**	**29-Jun**	**11**

Table 1. Estimated hatch date continued.

Year	Average	Min	Max	N
Arctic Tern				
1982	--	--	--	--
1983	--	--	--	--
1984	--	--	--	--
1985	29-Jun	22-Jun	4-Jul	8
1986	26-Jun	16-Jun	24-Jul	6
1987	24-Jun	20-Jun	26-Jun	3
1988	--	--	--	--
1989	--	--	--	--
1990	--	--	--	--
1991	17-Jun	12-Jun	20-Jun	4
1992	1-Jul	25-Jun	10-Jul	6
1993	17-Jun	15-Jun	20-Jun	3
1994	--	--	--	--
1995	16-Jun	13-Jun	20-Jun	3
1996	--	--	--	--
1997	--	--	--	--
1998	26-Jun	19-Jun	5-Jul	5
1999	25-Jun	21-Jun	2-Jul	8
2000	26-Jun	23-Jun	1-Jul	5
2001	22-Jun	15-Jun	29-Jun	5
2002	18-Jun	8-Jun	26-Jun	37
2003	13-Jun	8-Jun	21-Jun	5
2004	17-Jun	9-Jun	29-Jun	9
2005	21-Jun	14-Jun	29-Jun	15
2006	23-Jun	17-Jun	29-Jun	17
2007	16-Jun	8-Jun	24-Jun	18
Mean	**21-Jun**	**17-Jun**	**27-Jun**	**9**

Year	Average	Min	Max	N
Greater Scaup, Long-tailed Duck				
1982	10-Jul	13-Jul	22-Jul	5
1983	--	--	--	--
1984	--	--	--	--
1985	--	--	--	--
1986	8-Jul	1-Jul	11-Jul	4
1987	7-Jul	2-Jul	11-Jul	4
1988	--	--	--	--
1989	--	--	--	--
1990	--	--	--	--
1991	--	--	--	--
1992	6-Jul	30-Jun	22-Jul	19
1993	2-Jul	29-Jun	8-Jul	18
1994	2-Jul	30-Jun	3-Jul	7
1995	3-Jul	20-Jun	10-Jul	14
1996	28-Jun	17-Jun	5-Jul	7
1997	27-Jun	17-Jun	4-Jul	10
1998	4-Jul	26-Jun	10-Jul	14
1999	8-Jul	1-Jul	13-Jul	10
2000	6-Jul	28-Jun	11-Jul	26
2001	7-Jul	4-Jul	17-Jul	6
2002	1-Jul	29-Jun	4-Jul	8
2003	30-Jun	29-Jun	1-Jul	3
2004	--	--	--	--
2005	1-Jul	24-Jun	8-Jul	9
2006	5-Jul	29-Jun	8-Jul	5
2007	2-Jul	1-Jul	5-Jul	5
Mean	**3-Jul**	**29-Jun**	**9-Jul**	**10**

Year	Average	Min	Max	N
Pintail, Shoveler, Mallard, Teal				
1982	--	--	--	--
1983	--	--	--	--
1984	--	--	--	--
1985	--	--	--	--
1986	3-Jul	22-Jun	17-Jul	13
1987	3-Jul	18-Jun	14-Jul	12
1988	--	--	--	--
1989	6-Jul	3-Jul	11-Jul	4
1990	28-Jun	24-Jun	3-Jul	4
1991	24-Jun	12-Jun	4-Jul	13
1992	4-Jul	21-Jun	13-Jul	16
1993	28-Jun	24-Jun	1-Jul	16
1994	28-Jun	26-Jun	29-Jun	5
1995	27-Jun	18-Jun	6-Jul	11
1996	25-Jun	13-Jun	2-Jul	10
1997	17-Jun	13-Jun	21-Jun	4
1998	1-Jul	18-Jun	10-Jul	39
1999	2-Jul	20-Jun	12-Jul	17
2000	30-Jun	21-Jun	8-Jul	28
2001	2-Jul	27-Jun	8-Jul	13
2002	24-Jun	13-Jun	3-Jul	21
2003	20-Jun	10-Jun	29-Jun	8
2004	18-Jun	5-Jun	28-Jun	19
2005	23-Jun	11-Jun	4-Jul	24
2006	1-Jul	23-Jun	8-Jul	15
2007	22-Jun	13-Jun	28-Jun	17
Mean	**29-Jun**	**21-Jun**	**5-Jul**	**15**

Year	Average	Min	Max	N
Small Shorebird				
1982	--	--	--	--
1983	--	--	--	--
1984	--	--	--	--
1985	3-Jul	22-Jun	17-Jul	4
1986	27-Jun	16-Jun	11-Jul	23
1987	21-Jun	15-Jun	25-Jun	7
1988	--	--	--	--
1989	24-Jun	18-Jun	4-Jul	3
1990	--	--	--	--
1991	22-Jun	8-Jun	6-Jul	21
1992	26-Jun	22-Jun	29-Jun	8
1993	21-Jun	14-Jun	29-Jun	15
1994	--	--	--	--
1995	19-Jun	10-Jun	25-Jun	6
1996	20-Jun	8-Jun	2-Jul	10
1997	12-Jun	9-Jun	14-Jun	3
1998	22-Jun	14-Jun	28-Jun	8
1999	25-Jun	16-Jun	5-Jul	17
2000	23-Jun	14-Jun	27-Jun	13
2001	27-Jun	18-Jun	4-Jul	22
2002	19-Jun	12-Jun	25-Jun	21
2003	16-Jun	13-Jun	17-Jun	3
2004	12-Jun	8-Jun	20-Jun	10
2005	20-Jun	9-Jun	29-Jun	30
2006	27-Jun	19-Jun	8-Jul	29
2007	18-Jun	5-Jun	28-Jun	33
Mean	**22-Jun**	**15-Jun**	**29-Jun**	**14**