Emperor Goose Photographic Age-Ratio Survey, 2014

Brad S. Shults and William W. Larned

02 February, 2017

U.S. Fish and Wildlife Service, Migratory Bird Management, 1011 E. Tudor Rd., Anchorage, AK 99503

R Markdown

This PDF was created from an R Markdown document by Erik Osnas from the original report wrtten by Brad Shults. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see http://rmarkdown.rstudio.com.

Abstract

Emperor geese (Chen canagica) were photographed between 26 September and 04 October, 2014, along the shorelines of seven lagoons on the north side of the Alaska Peninsula to estimate the annual proportion of hatching-year (HY) birds. Age classification of HY vs. adult geese was based on the gray/black head and neck plumage evident on juvenile geese. In 2014, we classified 19619 geese from 570 photographs. We counted 2839 HY birds resulting in a self-weighted ratio estimate of 0.145 (SE = 0.008). The lagoon-stratified, count-weighted proportion of young was 0.151 (SE = 0.008).

Key Words

aerial survey, Alaska, emperor goose, Chen canagica, age-ratio, photography, Alaska Peninsula

Introduction

From mid-September through October, most of the Emperor goose (Chen canagica) population congregates in 7 lagoons on the north side of the Alaska Peninsula (Petersen and Gill 1982; Fig. 1). These staging geese provide an opportunity to sample the population to determine an index of annual productivity because hatching year (HY) Emperor geese retain gray/black plumage on their head and neck that contrasts with the complete white head plumage of adult geese (Fig. 2). This plumage difference is used to age classify geese (i.e. HY vs. adult) in aerial photographs.

The primary objective of this study was to calculate an annual estimate of the proportion of HY Emperor geese in the fall staging population. These data provide an index to annual production that is defined as the number of hatched young that survive until October and is expressed as a proportion of the total birds classified. In combination with a fall population abundance survey to weight our lagoon-specific age-ratio estimates, these data are necessary to measure the progress towards meeting the management objective of a fall juvenile age ratio $\geq$ 20% as specified in the Pacific Flyway Management Plan for the Emperor Goose (Pacific Flyway Council 2006) . Age ratio of emperor geese has been monitored with this survey since 1985.

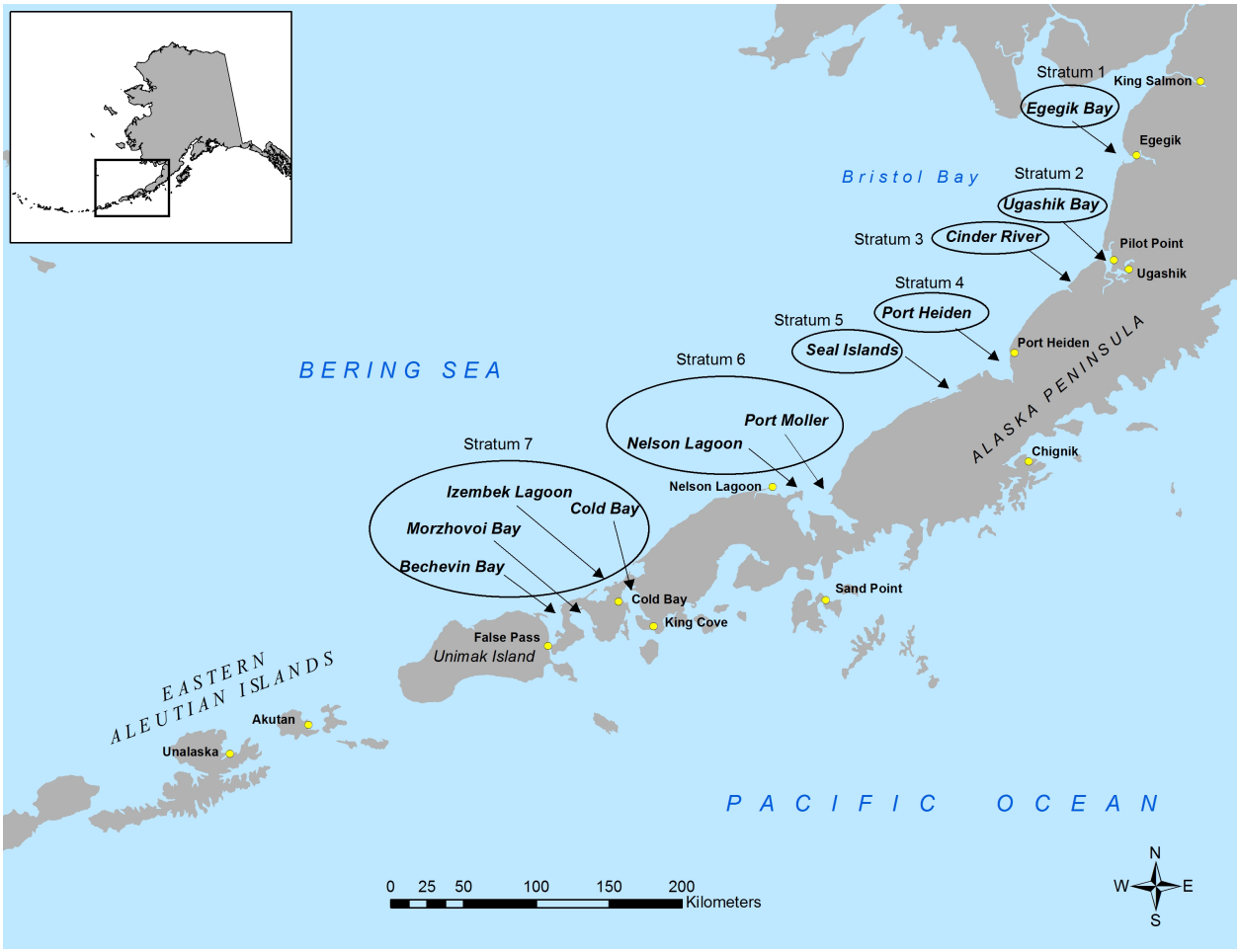

Figure 1: Seven primary fall staging areas for Emperor geese along the north side of the Alaska Peninsula.

Methods

We conducted the photographic age-ratio survey in seven primary sites along the north side of the Alaska Peninsula including Egegik Bay, Ugashik Bay, Cinder River, Port Heiden, Seal Islands, Nelson Lagoon, and Izembek Lagoon (Fig. 1). We attempted to fly the aerial photographic survey when HY geese were approximately 100 days of age to ensure that we could differentiate between the age classes before the juveniles acquire their adult plumage. In 2014 the survey was flown in an amphibious-equipped Cessna 206 (N77554). The aircraft was flown at approximately 500-1000 feet above the ground to locate geese. After spotting groups of Emperor geese on beaches or flying ahead of the aircraft, the pilot positioned the aircraft to arc around the flock while attempting to provide the best possible distance, angle, and light for the photographer who was located directly behind the pilot. Aircraft maneuvering decisions were made when a flock was first spotted and verbally coordinated with the photographer to maximize photographic opportunities. Once found, we typically descended to 300-400 feet AGL to photograph flocks. The photographer captured digital images of geese through the aircraft's window port with a hand-held digital SLR camera. Taking photographs from the left rear-seat made it easier for the pilot (also in a left seat) to appropriately position the aircraft relative to the flock.

Figure 2: Head plumage characteristics of hatch year and adult Emperor geese.

Camera Setting

We used a Canon EOS 5D Mark II camera with an image-stabilized 70-200 mm lens. The LCD display allowed for a rapid assessment of image quality. Image size was 5616 x 3744 pixels, and file size ranged from 5-12 megabytes. The photographer recorded the: Date, Time, Start Photograph #, End Photograph # , and Location (e.g., 9/27/11, 16:25 4927-4970, Egegik Bay). Camera settings for the Canon 5D were:
1. Camera set to take the highest quality JPG image 2. AF mode set to A1 Servo 4. Mode set to shutter priority (TV) and shutter speed set to 1250. 5. Metering mode set to Evaluative Metering. 6. ISO set at 800.

Photo Analysis

We viewed digital images in Adobe Photoshop©on a computer with dual 19-inch LCD monitors set at 1280 x 1024 resolution. We used a grid overlay for each photograph and magnified the image as needed to adequately distinguish the age class of each goose. We used the Count Tool to mark each counted goose as adult, juvenile, or unknown (Fig. 3). We did not classify geese on any photographs where the majority of bird images were too small or excessively blurred to reliably determine age class.

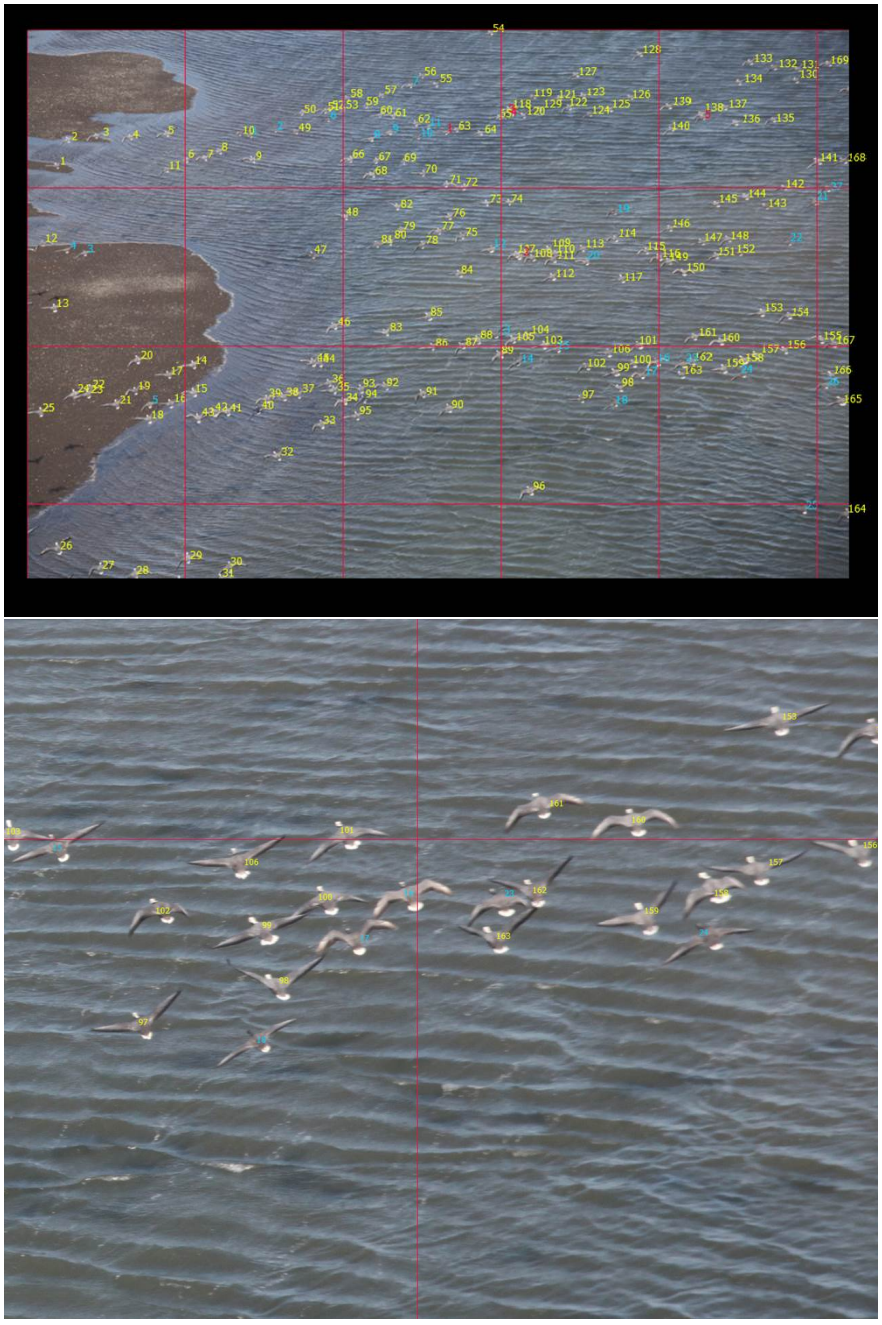

Figure 3: Typical photograph with grid overlay (top) and count tool labels (bottom).

Statistical Analysis

We calculated two estimates as described by Stehn and Wilson (2014)(i.e., count-weighted and self-weighted).

Count-Weighted Estimate
The mean ratio of juveniles/adults for each stratum was calculated from all photos in each stratum (i.e., each of seven lagoons). The resulting seven strata ratios were then weighted by the proportion of the total fall population observed in each stratum from the similarly timed, independent aerial survey count (USFWS unpubl. data). The resulting weighted stratum estimates were then summed to yield the estimate. Variances of the mean age ratio per stratum were weighted in proportion to squared population counts.

Self-Weighted Estimate
The self-weighted estimate is simply the ratio of total HY to total adults counted across all strata and is appropriate when the sampling intensity or total birds counted in photographs within each stratum is proportional to the population size estimated within each stratum from the independent, fall aerial population survey. In short, photographic survey effort should be allocated proportionally to each stratum based on the fall distribution of birds among the 7 strata.

Results

Flights were conducted 26-28 September and 4 October with pilot B. Shults and photographer W. Larned (Table 1). Survey timing was approximately 105 days after the average hatch date for emperor geese on the Yukon-Kuskokwim delta (Fischer and Stehn 2015). Total flight time to complete the survey including transit between King Salmon and Cold Bay was 15 hrs.

We classified 19619 geese on 570 photographs. We counted an average of 34.4 birds/photograph. We identified 2839 juvenile geese resulting in juvenile : adult ratios of 0.1509 and 0.145 for the count-weighted and self-weighted estimates, respectively (Fig. 4). Ratio estimates calculated for each lagoon varied between 0.059 and 0.177 (Table 2).

Conclusion

Both the count-weighted and self-weighted estimates were lower in 2014 compared to 2013 and were lower than the previous 29 year mean of 0.192 (Fig. 4) and below the Pacific Flyway goal of 0.20 (Pacific Flyway Council 2006). Although the count-weighted and self-weighted estimates are similar, we favor the count-weighted estimator when fall count data are available because the proportion of total birds classified from photographs was not guaranteed to be in proportion to abundance of geese in each lagoon (Fig. 5). For example, at 5 of 7 lagoons, we photographed a higher proportion of birds than were counted at those locations during the fall survey. Survey timing was conducive to confidently distinguish between juvenile and adult head plumage. Nonetheless, annual estimates from the two methods are nearly identical; indicating that unless photographic sampling of geese among lagoons is grossly disproportionate to the actual distribution of geese, then either estimator reliably tracks annual production of emperor geese.

Acknowledgements

Funding for this survey was provided by the U.S. Fish and Wildlife Service (USFWS). We thank the staff of the Alaska Peninsula/Becharof and Izembek National Wildlife refuges for providing essential logistic support. We also thank Bob Stehn (USFWS, retired) for his assistance in data analysis.

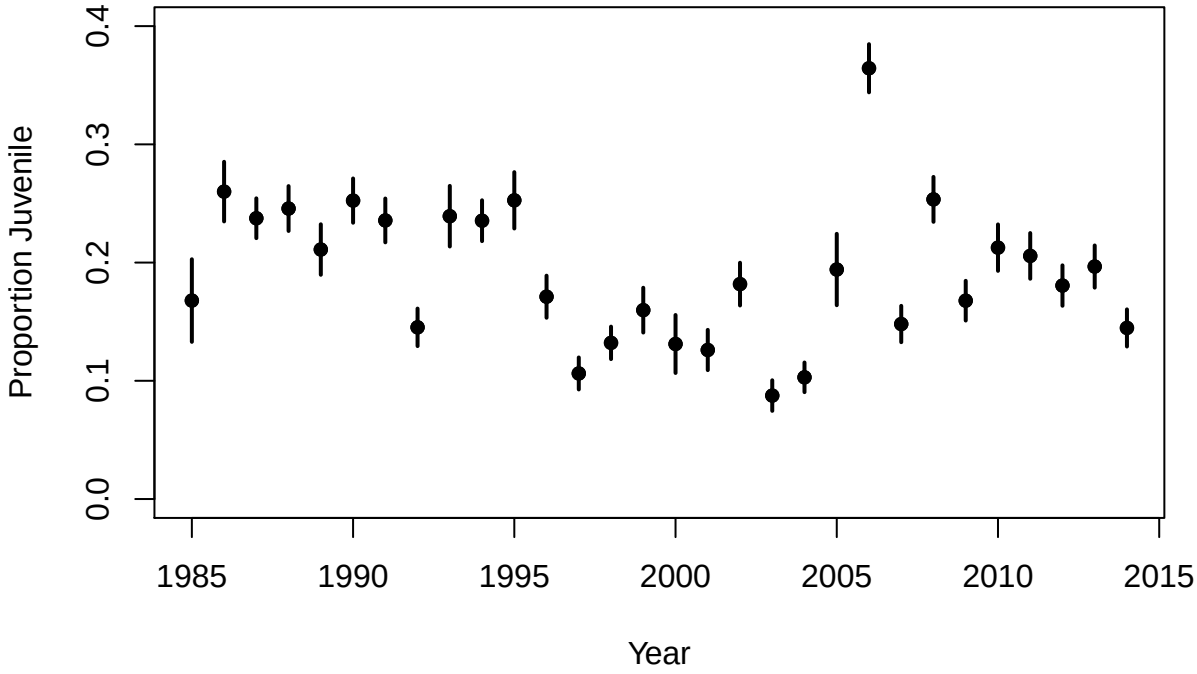

Figure 4: Estimates and standard errors of the proportion of juveniles for each year.

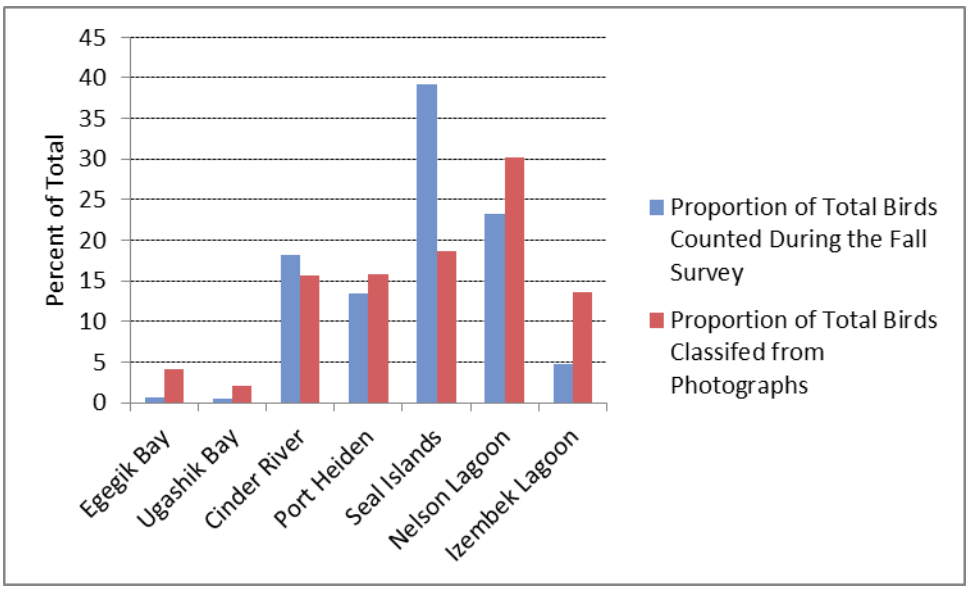

Figure 5: Proportions of birds counted during the fall survey and those classified from photographs in each stratum, 2014

References

Fischer, J. B. and R. A. Stehn. 2015. Nest population size and potential production of geese and spectacled eiders on the Yukon-Kuskokwim Delta, Alaska, 2014. Unpubl. Rep., U.S. Fish and Wildlife Service, Anchorage, AK.

Petersen, M. R. and R. E. Gill, Jr. 1982. Population and status of emperor geese along the north side of the Alaska Peninsula. Wildfowl 33: 31-38.

Stehn, R. A. and H.M. Wilson. 2014. Monitoring Emperor geese by age ratio and survey counts, 1985-2013. Unpublished Report. U.S. Fish and Wildlife Service, Anchorage, Alaska. 12pp.

Tables

Table 1: Survey timing, sample size, and average proportion of juvenile Emperor geese counted in photographs, 1985-2014, Alaska Peninsula. (continued below)

Year	Photograph Dates	Pilot	Photographer	Number of Photos	Mean DOY Photo
1985	NA	John E. Smith	Jane M. Doe	155	277
1986	NA	John E. Smith	Jane M. Doe	311	278
1987	NA	John E. Smith	Jane M. Doe	703	274
1988	NA	John E. Smith	Jane M. Doe	483	269
1989	NA	John E. Smith	Jane M. Doe	390	269
1990	NA	John E. Smith	Jane M. Doe	474	273
1991	NA	John E. Smith	Jane M. Doe	412	273
1992	NA	John E. Smith	Jane M. Doe	403	274
1993	NA	John E. Smith	Jane M. Doe	255	275
1994	NA	John E. Smith	Jane M. Doe	479	270
1995	NA	John E. Smith	Jane M. Doe	361	269
1996	NA	John E. Smith	Jane M. Doe	182	268
1997	NA	John E. Smith	Jane M. Doe	205	273
1998	NA	John E. Smith	Jane M. Doe	336	272
1999	NA	John E. Smith	Jane M. Doe	392	272
2000	NA	John E. Smith	Jane M. Doe	263	272
2001	NA	John E. Smith	Jane M. Doe	365	271
2002	NA	John E. Smith	Jane M. Doe	402	275
2003	NA	John E. Smith	Jane M. Doe	421	268
2004	NA	John E. Smith	Jane M. Doe	370	278
2005	NA	John E. Smith	Jane M. Doe	500	276
2006	NA	John E. Smith	Jane M. Doe	469	272
2007	NA	John E. Smith	Jane M. Doe	398	273
2008	NA	John E. Smith	Jane M. Doe	625	270
2009	NA	John E. Smith	Jane M. Doe	607	276
2010	NA	John E. Smith	Jane M. Doe	436	269
2011	NA	John E. Smith	Jane M. Doe	441	271
2012	NA	John E. Smith	Jane M. Doe	378	272
2013	NA	John E. Smith	Jane M. Doe	224	293
2014	NA	John E. Smith	Jane M. Doe	570	271

Mean DOY Hatch	Mean Age of young (days)	Total Juveniles	Total Geese	Count-weighted Estimate	SE	Self-weighted Estimate	SE2
NA	NA	NA	NA	NA	NA	0.168	0.017
NA	NA	NA	NA	NA	NA	0.26	0.013
NA	NA	NA	NA	NA	NA	0.237	0.008
NA	NA	NA	NA	NA	NA	0.246	0.009
NA	NA	NA	NA	NA	NA	0.211	0.011
NA	NA	NA	NA	NA	NA	0.252	0.009
NA	NA	NA	NA	NA	NA	0.236	0.009
NA	NA	NA	NA	NA	NA	0.145	0.008
NA	NA	NA	NA	NA	NA	0.239	0.013
NA	NA	NA	NA	NA	NA	0.235	0.009

Mean DOY Hatch	Mean Age of young (days)	Total Juveniles	Total Geese	Count-weighted Estimate	SE	Self-weighted Estimate	SE2
NA	NA	NA	NA	NA	NA	0.253	0.012
NA	NA	NA	NA	NA	NA	0.171	0.009
NA	NA	NA	NA	NA	NA	0.106	0.007
NA	NA	NA	NA	NA	NA	0.132	0.007
NA	NA	NA	NA	NA	NA	0.16	0.009
NA	NA	NA	NA	NA	NA	0.131	0.012
NA	NA	NA	NA	NA	NA	0.126	0.009
NA	NA	NA	NA	NA	NA	0.182	0.009
NA	NA	NA	NA	NA	NA	0.087	0.006
NA	NA	NA	NA	NA	NA	0.103	0.006
NA	NA	NA	NA	NA	NA	0.194	0.015
NA	NA	NA	NA	NA	NA	0.364	0.01
NA	NA	NA	NA	NA	NA	0.148	0.008
NA	NA	NA	NA	NA	NA	0.253	0.009
NA	NA	NA	NA	NA	NA	0.168	0.008
NA	NA	NA	NA	NA	NA	0.213	0.01
NA	NA	NA	NA	NA	NA	0.206	0.01
NA	NA	NA	NA	NA	NA	0.181	0.009
NA	NA	NA	NA	NA	NA	0.197	0.009
NA	NA	NA	NA	NA	NA	0.145	0.008

Table 2 here