Sea Duck Joint Venture
Annual Project Summary
FY 2017 – (October 1, 2016 to Sept 30, 2017)

Project Title: SDJV Project# 146: Point Barrow, Alaska, Migration Counts for King and Common Eiders

Principal Investigator(s)*:*
Dr. Rebecca Bentzen, Wildlife Conservation Society, Fairbanks, Alaska
Dr. Robert Suydam, North Slope Borough, Department of Wildlife Management, Utqiagvik, Alaska

Partners:
Migratory Bird Management, U.S. Fish and Wildlife Service, Alaska Region; Coastal Marine Institute, Bureau of Ocean Energy Management

Project Description:

Most of the king (Somateria spectabilis) and common eiders (S. mollissima v-nigra) nesting in northern Alaska and western Canada migrate during spring and fall migration past Point Barrow, Alaska. This spectacular concentration of migrating birds passes very close to shore, allowing for counts of migrating eiders which have been conducted intermittently under varied protocols since the early 1950s. By standardizing the analysis of spring migration counts conducted at Point Barrow in 1953, 1970, 1976, 1987, 1994, and 1996, we determined that the king eider population appeared to remain stable between 1953 and 1976, but declined by 53% between 1976 and 1996. Similarly, the common eider population declined 56% during the same time period. The counts were repeated in 2002-2004, at which time it appeared that since 1996 the number of common eiders passing Point Barrow had increased, but only slightly, and that the number of king eiders had remained stable, but not returned to 1970 levels. The reasons for the reported declines are unknown, and establishing current population trajectories is of critical conservation and subsistence interest. This project provides updated information on the population trajectories of king and common eiders migrating past Point Barrow, which is vital for state, local and federal managers.

In order to determine the status of the population and further explore population trends, we conducted new counts during spring migration, 2015-2016 at the same general location and using the same methods as in 1996 and 2002-2004, allowing us to directly compare our results to earlier population indices.

We conducted our counts from a site close to the edge of the shorefast ice northwest of Point Barrow, and on land south of Point Barrow as the ice degraded and became unsafe to operate on. Our observers were trained by Dr. Robert Suydam and other members of the earlier counts (Michael Knoche and Michael Wald) to ensure continuity of protocols, as well as safe and respectful operations around whalers and polar bears.

Eiders were counted by four observers, in teams of two people at a time, for up to 16 hours per day. We often received support by North Slope Borough’s local guides to help ensure our safety on the ice. Counts typically followed a pattern of two hours on, two hours off between 5 AM -1 PM and 5 PM – 1 AM. Occasionally counts ended early due to the proximity of polar bears or high winds causing unsafe ice movement or break-up. We deferred to our local guides and the North Slope Borough's Department of Wildlife Management on assessing when conditions were safe.

We determined sex, species, and age-ratio both visually by ground-based observers and by photographic sampling using a high-resolution camera with telephoto lens. For each counting period, we collected data on weather conditions (temperature, wind speed, wind direction, cloud cover, visibility). For each flock sighted, we recorded time, direction of travel, species composition, number sighted, and the ratio of males to females for each species.

A subset of flocks were photographed in 2016 to obtain correction factors for total flock size, sex ratio, species ratio, and to determine if sub-adults migrated with adults. We used the count tool in Adobe Photoshop Professional to determine total flock size and numbers of male king and common eiders, subadults, and females (lumped for both species).

In order to be able to compare our population estimates with previous years, we followed Quakenbush et al. (2009). To account for daily variation in our estimate of total population size, we treated our sample as coming from a stratified design, where each day represents a separate stratum. Within each day, we used the observed ratio of king to common eiders to assign unidentified eiders to one or the other species. We assumed a 50:50 sex ratio for flocks where sex ratio was not determined. Within each day (*d*), the average number of eiders passing ($\bar{y}_d$) is estimated using all 2-hour periods sampled (2 hours being the standard observation increment). This average was then multiplied by the total number of 2-hour sampling periods possible within each day (N_d=12). Following Thompson (2002; page 119), the index of total population was thus defined as the sum of the daily totals:

$$Total = \sum_{d=1}^{L} Nd\bar{y}d$$

where *L* is the total number of days sampled. The variance estimator for the population total accounts for the number of 2-hour periods sampled within each day (n_d) and the sampling variance within each day ($s^2{}_d$) and is defined as:

$$\text{var}\ (Total) = \sum_{d=1}^{L} Nd(N\text{d} - \text{nd})(\frac{\text{s2d}}{\text{nd}})$$

Outcomes:

- Our estimates of king and common eider populations are comparable with those from 1996 and the early 2000s and will allow us to evaluate current trends. The 2015–2016 migration counts used the same methods, locations, time periods, and some of the same observers as in 1996 and 2002-2004, providing an excellent opportunity to compare current eider population estimates with past estimates.

- We used high-resolution photography to calculate a correction factor for the visual counts. This correction factor (simple ratio) could be applied to past estimates.

- We determined the sex and age ratios of king and common eiders passing by Point Barrow through visual and photographic methods. This allows us to determine the timing of migration by the different ages and species and compare it to previous timing and use of this area.

King and common eiders, Point Barrow, AK, 2016. Photo credit: Mark Dodds

Preliminary Results*:*

Eider migration peaked May 7-8 in both years and most birds passed Point Barrow between April 30 and May 13 (Figure 1). We estimated (95% confidence intervals) that 787,277 (306,677) king and 98,121 (34,530) common eiders passed Point Barrow in 2015, and 322,292 (145,833) king and 130,027 (43,000) common eiders passed Point Barrow in 2016 (Figure 2).

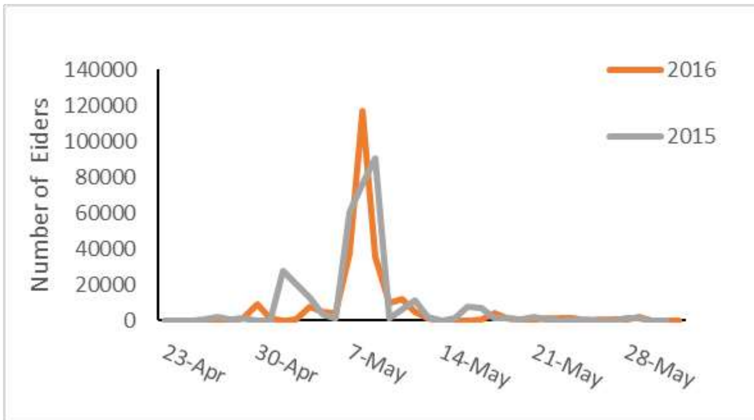

Figure 1. Number of king and common eiders observed passing Pt. Barrow, AK, on spring migration, 2015-2016.

Our estimates of the population of king eiders are very different (>50% difference) for 2015 and 2016 (Figure 2), which is likely due to the non-normal distribution of the data. Eiders pass by in big pulses, with counts ranging from zero to > 10,000 on any given day, making it difficult to adequately capture this variability. However, the difference in count estimates between the two years does not necessarily indicate that the population actually declined by 50% between the two years. Previous counts have also found very high inter-annual variability. The estimates of the numbers of king eiders in 2003 and 2004 (Quakenbush et al. 2009) varied between years (304,966 ±76,254 in 2003; 591,961 ± 172,011), but within the same ranges as we found 12 years later (Figure 2).


King Eiders, Point Barrow, AK, 2016. Photo credit: Mark Dodds

Unlike king eiders, the estimated number of common eiders passing Point Barrow in spring was similar, both between the two years of this study and to the estimates derived in

2003 and 2004 (Figure 2). Compared to our estimates, Quakenbush et al. (2009) estimated the population on spring migration at 114,998 ± 28,566 in 2003 and 110,561 ± 32,087 in 2004.

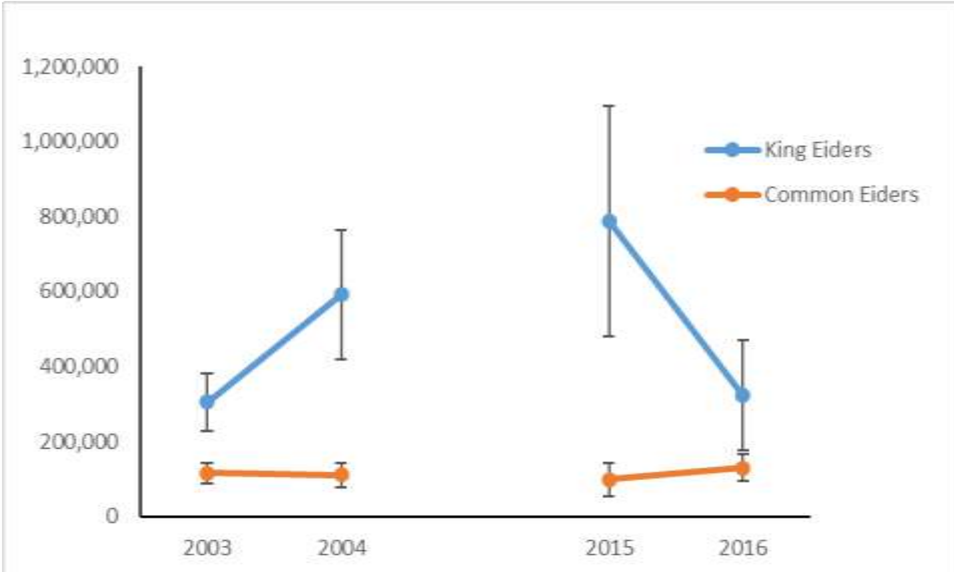

Figure 2. Estimated population size ± 95% confidence intervals for king and common eiders in 2003-2004 (Quakenbush et al. 2009) and 2015-2016 (this study) passing Point Barrow, AK on spring migration.

The photo analyses indicated that flock counts by observers were significantly lower than counts derived from photos (paired t-test; $|t| = 3.26$, df = 297, $P < 0.001$). The 298 flocks with counts from both observer and photos ranged in size from 1 to 1400 individuals (observer count). The average ratio of birds counted by observers versus those from photos was 0.96 and ranged from 0 to 2.13. Sex ratio also varied between counts by observers and photos of the same flocks; observers counted significantly fewer females than were determined from photos (paired t-test; $|t| = 7.72$, df = 171, $P < 0.001$). Fortunately, sex ratio does not affect population estimates. These observer biases are well documented elsewhere (e.g., Udevitz et al.2005).

The ratio of females to males increased across the season for both counts by observers ($F_{1,19} = 9.57$, $P = 0.006$) and photos ($F_{1,21} = 4.31$, $P = 0.05$). Species ratios (common to king eiders) did not vary between counts by observers and photos for flocks for mixed-species flocks (paired t-test; $|t| = 0.69$, df = 58, $P = 0.25$). Counting eiders in photos results in a suite of biases. For example, flocks can be bunched up and thus difficult to count; the entire flock may be larger than the frame needing multiple photos to be 'stitched together' which can lead to error; and identifying species in a photo may actually be more difficult than in the field. For example, common eider males flash white as they move and this is not seen in the photos.

With respect to age class, eight subadult male king eiders were counted in photos that were not identified by observers, confirming that some subadults migrate with adults past Pt. Barrow.

Project Status:

We successfully completed migration counts during the spring of 2015 (April 20 – June 4) and 2016 (April 24 – May31) at Point Barrow, Alaska. Some obstacles had to be overcome (polar bears, dangerous sea ice conditions, see above). Overall, the counts can be regarded as fulfilling the protocols that were set. We were also very lucky to remain right at the lead edge for the majority of the migrations. We will further analyze the data and prepare a manuscript for submission to a peer-reviewed scientific journal.

Recommendations

- Eiders pass by in big pulses where a significant proportion of the population can pass in one or two days and it is difficult to design a study that captures what is basically a rare event. We suggest that during the peak in migration, counts be done every two hours 24 hours/day, rather than every two hours 5am-1pm and 5pm-1am. This will be very tiring for the crew but peak migration is only 2-3 days most years.
- Photographic counts focused on relatively small flocks and not on the flocks that numbered over 1500 individuals and which greatly influence total counts. It would be difficult if not impossible to 'stitch' together photos from a flock that numbers in the thousands. However, we see potential in video counts and suggest that videoing large flocks be tested and possibly included in future counts.
- We recommend that another pair of spring counts be conducted in five to ten years, if the spring sea ice will allow this to happen. The ability to set up a 'perch' to count from on spring ice is becoming increasingly rare and we were very lucky to count from the ice as long as we did in 2015 and 2016. We may have to focus on fall counts in the future.

Literature Cited

Quakenbush, L.T., R. S. Suydam, R. Acker, M. Knoche, and J. Citta. 2009. Migration of King and Common Eiders Past Point Barrow, Alaska, during Summer/Fall 2002 through Spring 2004: Population Trends and Effects of Wind. Final Report to the Coastal Marine Institute.

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