Sea Duck Joint Venture
Final Project Report August 10, 2017

Project Title: SDJV Project #140: Aerial surveys of Pacific Common Eiders in the central Canadian Arctic

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Partners:
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Project Description:

A large proportion of the Pacific Common Eider population nests in central and western Canada in the Bathurst Inlet, Dolphin and Union Strait, Coronation Gulf, and Queen Maud Gulf areas. These eiders migrate through the Beaufort Sea during spring and fall migration, and winter in ice-free regions of the Bering Sea and Gulf of Alaska. Pacific Common Eiders are inadequately monitored throughout their range. The population estimates and trends for Canada are currently based on counts obtained about every 10 years during spring migration at Point Barrow, Alaska. The Canadian Wildlife Service conducted breeding surveys for common eiders in Bathurst Inlet, Nunavut in 2006-2008, but there is currently no regular survey to monitor population trends in Canada (Fig 1). Discovery of off-shore oil and gas reserves in two key spring staging areas, as well as increasing resource development in Canadian Arctic breeding areas, will likely result in increased human activity and may have potential adverse effects on this population. We are proposing to expand the surveys into the offshore islands of the Queen Maud Gulf region (Fig 1) in order to provide more complete coverage of the breeding area and establish a long-term operational monitoring program to address the lack of current information on population trends.

In the first year of our study (2014), helicopter surveys using a Long Ranger were conducted in late June in the Queen Maud Gulf, Nunavut. Surveys were flown at a speed of 80-90 mph at a height of 150-300 feet. The flight path followed open water along the coast, islands and sea ice. With the exception of Grant Point (at the eastern edge of the study area), each area was surveyed once and it took about 4 full days to cover the core study area and shorelines east and west of Cambridge Bay. The helicopter flew at a higher altitude and a slower speed when a large group of eiders was present to avoid disturbing birds and get a total count of the flock. We also attempted to photograph large flocks to allow for determination of flock estimation error. However, in the few instances where we saw flocks of appropriate size,

birds flushed before we could obtain any viable photos. Repeated surveys were conducted over a segment of the survey area. To better spot birds on the water, the surveys were conducted during mid-day hours and when winds were calm or light. Two observers were used during the surveys, one in the front left seat (responsible for counting birds on the left side of helicopter) and the other in the rear right seat of the helicopter (responsible for the right side of helicopter). Observers recorded the type and number of all birds seen, as well as the time of observation. The flight path of the aircraft was tracked and based on the time of observation, the approximate location of each observation was determined.

In 2015 and 2016, we extended the survey area to Bathurst Inlet, NU and we experimented with additional approaches to address detection issues. Our objective for the experimental detection aspect of the project was to develop approaches to address perception bias (i.e. the probability to detect birds present and observable) and availability bias (i.e. birds that are temporarily unavailable for detection but associated with the survey area). Extending the surveys to Bathurst Inlet provided added opportunities to test methodological approaches on a larger number of birds and in different conditions.

The general methodology was similar to that used in 2014 with the following differences: First, we increased survey height to 500-1000ft to reduce flushing of birds. We found this flight altitude to be a good compromise between reduced disturbance and sightability. Secondly we employed a double-dependent observer approach with the observer in the front left of the helicopter acting as the primary observer and the one in the rear right as the secondary observer. Both observers were responsible for making observations from all visible areas, with the secondary observer recording birds missed by the primary observer. Observers switched positions regularly so that observer-specific detection probabilities could be determined. This approach will allow us to assess perception bias issues. Thirdly, all large flocks encountered were counted independently by both observers as well as photographed. This approach will allow estimation of observer variation in flock estimation as well as overall count bias, allowing us to evaluate the effect of these factors in perception bias. Finally, we conducted repeated surveys in some areas of Bathurst Inlet, which will provide an indication of effects of timing of survey on population estimates, changes in ice conditions and distribution of birds, as well as allow an estimation of availability bias.
In 2015, Bathurst Inlet was surveyed over four days and an additional day for the repeat counts was completed one week after the original survey in that area. A small area in the western part of the area, along the Jameson and Hapburn Islands, could not be surveyed due to weather –related issues. In 2016, Bathurst Inlet was surveyed over 5 days. Queen Maud Gulf was covered in two days in 2015, and three days in 2016.

Objectives:

The objective of this project is to determine key breeding areas for common eiders in the Queen Maud Gulf region and to develop an operational, long-term monitoring program. Expanding surveys into this area will provide more complete coverage of the breeding range and better estimates of population size and trends to aid wildlife conservation and management decisions for the Pacific Common Eider in Canada. This addresses the SDJV priority to continue to develop survey techniques for effective monitoring of abundance and distribution of sea duck species and support exploratory surveys to fill gaps in our knowledge of sea duck distributions and relative abundance.

Results *(include maps, photos, figures/tables as appropriate):*

Helicopter surveys for Pacific Common Eiders in the Queen Maud Gulf area occurred June 23-29, 2014. Spring was late in 2014; Cambridge Bay residents commented that spring was about 2 weeks later than normal. In the Queen Maud Gulf, there was very little open water around islands and the leads in the ice pack were very narrow. On June 26, we resurveyed the same area that had been surveyed on June 23, and noticed a bit more open water, as well as 50% more eiders than had been observed during the initial survey. Preliminary results suggest that approximately 3,550 eiders were present in the Queen Maud Gulf study area in 2014, which is less than half the numbers observed in the same area in 1995, however, due to the late spring conditions, it is possible that not all of the eiders had arrived on the study area. During the surveys, 19 different species of birds were observed. The three most abundant species were Common Eiders (50% of all birds observed), Long-tailed ducks (30%), and King Eiders (6%).

Surveys in the Queen Maud Gulf area occurred June 27-29, 2015. Spring phenology appeared to be average in 2015 in the Cambridge Bay area but ice cover in the Queen Maud Gulf was extensive. There was little open water around islands and few leads in the ice pack. The leads that were observed were narrow. The ice cover appeared to be more extensive than in 2014. Few eiders were present in the study area and the ones observed tended to aggregate in the narrow leads. We observed 1,191 Common Eiders in the Queen Maud Gulf study area in 2015 (raw count, not adjusted for detection probabilities), which is less than half of that observed in 2014.

Surveys of eiders in the Bathurst Inlet area occurred June 21-26 and June 30, 2015. Ice conditions in Bathurst Inlet were ideal for surveying (i.e., many leads and open water around islands and shorelines, without massive expanses of open water that can make detecting/counting birds difficult). Ice break-up phenology appeared to be normal, which was in sharp contrast to the situation observed in the Queen Maud Gulf area. We observed 8, 470 eiders in Bathurst Inlet in 2015 (raw count, not adjusted for detection probabilities), which is comparable to numbers observed during the last two surveys in 2007 and 2008, but lower than those for the 1995 survey. During the surveys, 24 different species of birds were observed. We surveyed one part of the Bathurst Inlet study area twice, once on June 21 and then again on June 30. Large expanses of open water were starting to form on the June 30 surveys, indicating that the survey timing in this area was optimal.

Surveys in the Queen Maud Gulf area occurred June 29 – July 1, 2016. Ice conditions were considerably better for surveying in comparison with 2015. Break-up was earlier, with several large leads and areas of open water, resulting in easy visibility of waterfowl. We observed 1,529 Common eiders in the Queen Maud Gulf study area in 2016 (raw count, not adjusted for detection probabilities). This is similar to the 2015 count but much less than the number of eiders observed in 2014. During the surveys, 10 different species of birds were observed.

Surveys of eiders in the Bathurst Inlet area occurred on June 23, and June 25 – 28, 2016. Ice break-up appeared to be earlier than in 2015. By the end of surveys, large areas of open water were present, indicating that the survey was appropriately timed. During the surveys, 20 different species of birds were identified and recorded. We observed 10,729 Common

eiders in Bathurst Inlet in 2016 (raw count, not adjusted for detection probabilities). This represents an increase from the 2015 count but is still lower than the 1995 survey count.

Detection probabilities were consistent between 2015 and 2016 and were higher in Bathurst Inlet than in Queen Maud Gulf (95% vs 90% detection probability respectively). This result is likely due to the fact that detection probability varied as a function of flock size, with larger flocks being more likely to be detected than single birds, and smaller groups / single birds occurring in a greater proportion in Queen Maud Gulf. An earlier study using double-independent helicopter counts resulted in detection probabilities of 0.89 and 0.84 for Bathurst Inlet in 2007 and 2008. The dependent double-counting approach was easy to implement.

Adjusted population size estimates for Queen Maud Gulf were 3,553 eiders in 2014, 1,355 in 2015 and 1,696 in 2016. This represents a decline of at least 50% between 1995 and 2016 (Fig 2).

Adjusted population size estimates for Bathurst Inlet were 8,471 eiders in 2015 and 11,079 in 2016. This represents a decline of at least 44% between 1995 and 2016, but a stabilization of the population since 2008 (Fig 3).

Project Status

The importance of ice cover in Queen Maud Gulf, evident in 2015 relative to 2014 and 2016, could be indicative of poor survey timing. However, Dickson (1997, unpublished data) observed several Common Eider nests on Islands of Queen Maud Gulf on June 30 and July 1, several of which contained more than one egg (range: 1-11 eggs/nest), suggesting that egg laying was well under way on the dates on which the survey was conducted. Ice conditions were similar in Bathurst Inlet and in Queen Maud Gulf in 2016 and the timing of the survey appeared to be optimal for Eiders. More work is needed to determine whether differences in ice conditions between the two sites (observed in 2015) are driven by local weather/oceanic conditions or reflect recurrent differences in habitat suitability or nesting phenology for eiders. In effect, local conditions may have an impact on distribution of birds at the time of the survey or availability of nesting sites annually. In this sense, the addition of the Bathurst Inlet study area in 2015 and 2016 proved extremely useful because survey conclusions would have been much different had we only surveyed Queen Maud Gulf.

The goal for long term monitoring of Pacific Common Eiders is to establish a rotational survey system of 3 years on and 3 years off. Data analyses will be conducted before the next survey period to determine the effectiveness of the experimental detection approaches tested in 2015 and 2016. We also plan to search for alternative sources of data that could allow us to better determine nesting phenology and ice patterns in the area. Results from the current project will allow us to determine whether both portions of our study area should be surveyed in the future and optimal survey periods.

Figure 1. Map showing overview of survey area. The entire area was surveyed in 2015 and 2016. Only the Queen Maud Gulf area was surveyed in 2014.

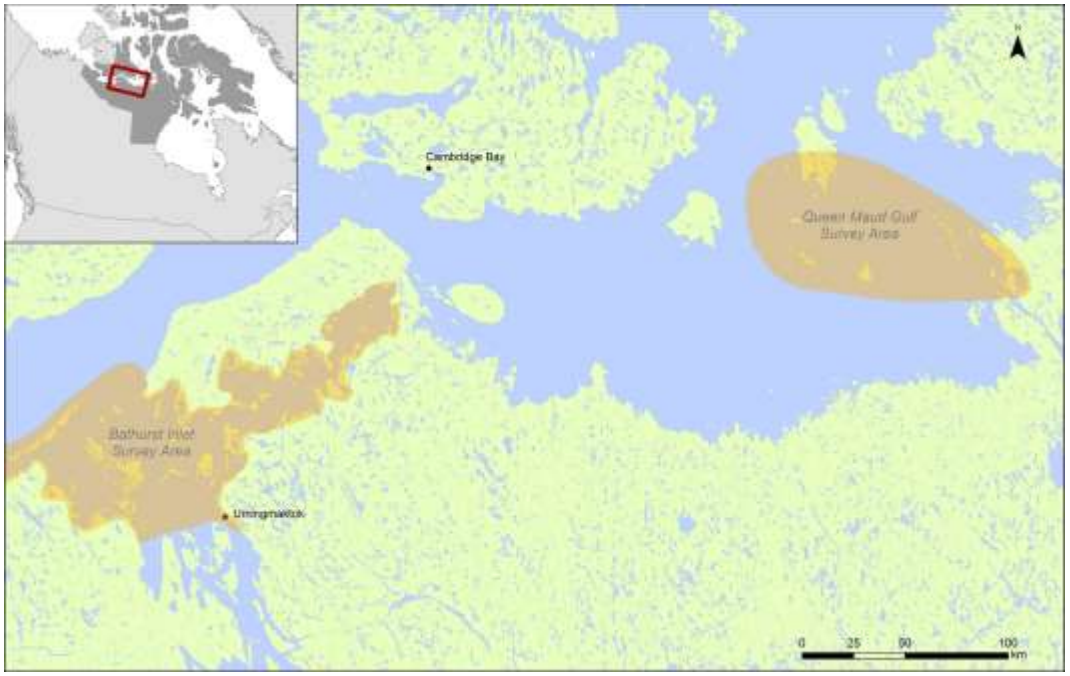

Figure 2. Population size estimates for Queen Maud Gulf (NU) survey area between 1995 and 2016. Dark green bars represent raw counts while light green bars represent the visibility correction adjustment.

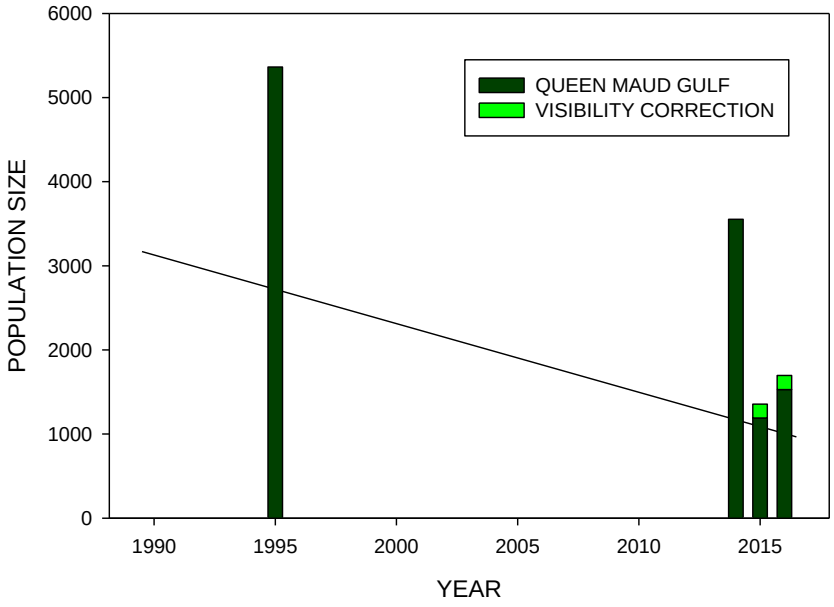

Figure 3. Population size estimates for Bathurst Inlet (NU) survey area between 1995 and 2016. Dark green bars represent raw counts while light green bars represent the visibility correction adjustment.

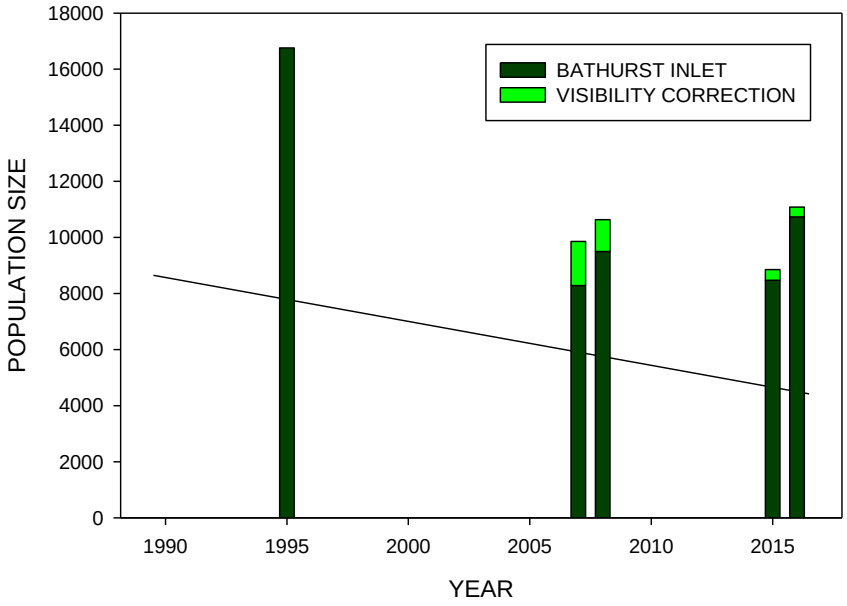

Figure 4. Examples of ice conditions in (a) Bathurst Inlet (2015 – Left, 2016 – Right) and (b) Queen Maud Gulf (2015 – Left, 2016 – Right).

a) Bathurst Inlet

b) Queen Maud Gulf