

Sea Duck Joint Venture Progress Report – FY2010

Project Title: Ecology and Population Affiliations of Molting and Fall Staging Barrow's Goldeneye at Cardinal Lake, Alberta (SDJV Project # 116).

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Additional Partners:

Alberta North America Waterfowl Management Plan Partnership, Alberta Conservation Association, National Science and Engineering Research Council

Project Description:

As a result of recent post-breeding waterfowl surveys and satellite telemetry research, several sites used intensively by molting and fall staging Barrow's Goldeneye (BAGO) were discovered in the Peace Parklands of northern Alberta. Most post-breeding BAGO were found on Cardinal Lake where fall numbers exceeded 4000 birds, placing this lake among the most important post-breeding sites currently recognized for this species. As a result of our work last year, a nearby site, Leddy Lake, was discovered to be hosting nearly 2000 post-breeding BAGO. The discovery of these significant post-breeding sites provides an important and readily accessible opportunity to investigate the poorly understood molting and fall staging ecology of this species. Furthermore, the ability to capture and mark large numbers of BAGO will help advance recent efforts to develop a better understanding of population structure and cross-seasonal habitat affiliations within the Pacific population of BAGO. Finally, it is also important to recognize that Bruce Power is currently considering several sites in the Cardinal Lake area as potential locations for western Canada's first nuclear power plant. It is essential to better understand the ecology of post-breeding BAGO in the Peace Parklands to accurately predict or assess the impacts of this proposed development on this species.

Through a combination of surveys, captures, an array of weights and measures, VHF telemetry, and satellite telemetry, we are addressing a suite of objectives related to the ecology of the remigial molt and fall staging periods, the importance of Cardinal Lake, and the remigial molt

stage in the context of population delineation and population dynamics throughout the annual cycle.

Objectives:

Our research is addressing the following objectives:

- 1) Determine the sex and age composition of molting and staging BAGO at Cardinal Lake.
- 2) Determine the timing of arrival, phenology and duration of remigial molt, and timing of fall migration for BAGO age and sex cohorts using Cardinal Lake.
- 3) Determine habitat use and movement patterns of molting and staging BAGO at Cardinal Lake.
- 4) Determine season-specific survival rates of BAGO molting at Cardinal Lake and investigate whether survival rates vary between years.
- 5) Determine breeding and wintering population affiliations of BAGO molting at Cardinal Lake.
- 6) Determine fidelity of BAGO to molting and staging habitats at Cardinal Lake and potentially locate other key molting and staging areas that have yet to be recognized.
- 7) Quantify body mass variation of BAGO through wing molt.
- 8) Document foraging effort of BAGO during wing molt.

Preliminary Results:

The second year of field work for the project is still underway. To date, data collection has gone very well and the field season has been an enormous success. We describe, in brief, activities and results for the second field season thus far.

While Cardinal Lake remains the core study area for this project, we once again conducted weekly surveys of BAGO use at both Cardinal and Leddy Lakes to support a number of our objectives. These surveys are used to index BAGO abundance and determine sex ratios of molting and staging birds, as well as timing of components of molt and migration. Peak counts of molting Barrow's Goldeneye approached 7000 birds on Cardinal Lake and 700 birds on Leddy Lake in 2010. These estimates should be considered conservative, particularly on Cardinal Lake where survey areas do not cover the entire lake area. Preliminary results suggest that while male BAGO use Cardinal Lake extensively throughout the molting and fall staging period, females use the lake primarily during fall staging.

During remigial molt, the male to female ratio was approximately 9:1 on Cardinal Lake and 8:1 on Leddy Lake; however, the proportions of females increased as the season progressed on both lakes. As observed last year, many male BAGO arrived on post-breeding habitats in the Peace Parklands by mid June and are not expected to depart until late October. This indicates that post-

breeding habitats are used by male BAGO for at least four months, or one third of their annual cycle.

We once again conducted drive trapping of flightless BAGO from the last week in July through late August. The modified Harlequin duck molt trap continues to be a successful method of trapping BAGO on Cardinal and Leddy Lakes. We captured 701 BAGO, including 613 new bands deployed, 59 within-year recaptures, and 33 recaptures of birds marked previously, one of which was banded at Riske Creek, BC and one from a currently unknown banding location. The vast majority of captured birds were after-second-year males ($n= 374$), but younger males ($n= 125$), as well as both adult ($n= 36$) and younger females ($n= 31$), were represented in the sample. For all captured birds we measured an array of morphometrics and body mass. Overall, this brings our two year banding total to 1193 BAGO. To our knowledge, this represents the second largest sample of BAGO ever banded during a specific project.

Based on an initial summary of these data, average body mass (\pm SE) of adult males ($n= 356$) during remigial molt was 1073 ± 3.3 g and ranged from 890 to 1301 g, while the mean body mass of sub-adult males ($n= 114$) was 1065 ± 5.6 g and ranged from 896 to 1229 g. Adult female body mass ($n= 34$) averaged 780 ± 6.8 g and ranged from 708 to 851 g, while sub-adult female body mass ($n= 29$) averaged 763 ± 8.9 g and ranged from 686 to 881 g. These average masses are consistent with findings from 2009. As observed last year, preliminary results suggest that there is no relationship between stage of remigial molt (i.e., 9th primary length) and body mass for any cohort. Furthermore, the average ninth primary growth rate for birds recaptured the first time was 4.11 ± 0.11 mm/day ($n= 33$), and 3.29 ± 0.35 mm/day for birds recaptured a second time ($n= 5$). This is comparable to the average feather growth rate calculated last year (3.46 ± 0.25 mm/day [$n= 12$]). Also, recaptured birds had lost an average of 4.7 ± 1.1 g/day ($n= 48$) between their first capture and second capture, and gained an average of 0.2 ± 1.2 (n= 6) between their second and third captures.

As part of captures, we deployed 50 subcutaneous-prong mounted VHF radios on molting male BAGO to monitor local movements, survival and foraging effort. We decided to mark 25 BAGO with VHF radios on Leddy Lake again this year as well as 25 on Cardinal Lake. Movements and survival of VHF radio-marked birds are being monitored on a weekly basis. These data will be useful in determining key areas for molting and staging BAGO at Cardinal and Leddy Lakes and survival rates in two distinctly different post-breeding habitats. Preliminary assessment of the movement data suggest most areas of both Cardinal and Leddy Lakes are used by post-breeding BAGO, with particularly concentrated use occurring in the major northern and western bays at Cardinal. Three VHF mortalities have occurred on Leddy Lake since deployment. The cause of these mortalities is currently unknown, as no carcasses have been recovered. Three radioed birds have also disappeared on Cardinal Lake, either due to radio malfunction, harvest by hunters, or because the birds have flown to another location. One bird on Cardinal Lake is also known to have been shot by hunters, though no identifying markers have been reported as of yet. Given these data, survival rates appear high during remigial molt this field season.

In 2009, molting BAGO spent approximately 8% of their day foraging. It appears that a similar amount of time was spent foraging in 2010. While post-molt foraging observations are still

underway, this also appears to be relatively low. The interesting occurrence of primarily nocturnal foraging at Leddy Lake discovered last year is once again true for 2010, while Cardinal birds continue to feed on a diurnal basis. A basic invertebrate sampling program has been developed this year to investigate this difference in foraging habits. Preliminary results suggest that the difference may be food related, as large numbers of amphipods tend to aggregate along the shoreline of Leddy Lake at night. This phenomenon has not been observed on Cardinal Lake.

In addition to VHF radios, we deployed 18 satellite transmitters on molting male BAGO at Cardinal Lake this year to monitor larger-scale movements and breeding/wintering subpopulation affiliations of these birds. Satellite transmitters were implanted by wildlife veterinarian, Dr. Malcolm McAdie, during the third week of August. All birds marked with satellite transmitters this year are currently alive and continue to transmit data.

Of the 20 birds marked in 2009, 3 continue to transmit data. Three birds died within 2 weeks of surgery, possibly due to surgery-related complications, 4 birds are suspected to have died due to hunting activities, 8 died due to unknown causes, and 2 stopped transmitting due to transmitter failure or for unknown reasons. We were able to identify migration routes and wintering areas for 11 birds marked last year, the majority of which wintered on the coasts of SW British Columbia and Washington (Figure 1). Four birds returned to Cardinal Lake to molt in 2010. All currently transmitting birds will continue to provide new insights into the timing and routes used to return to wintering areas along the Pacific Coast during fall migration. We will continue to post locations and fates on our website (see below) as ARGOS data are analyzed during fall migration and winter.

Website:

<http://www.sfu.ca/biology/wildberg/CWESeaducksfolder/BAGOwebpage/BAGOMigrationHome.html>

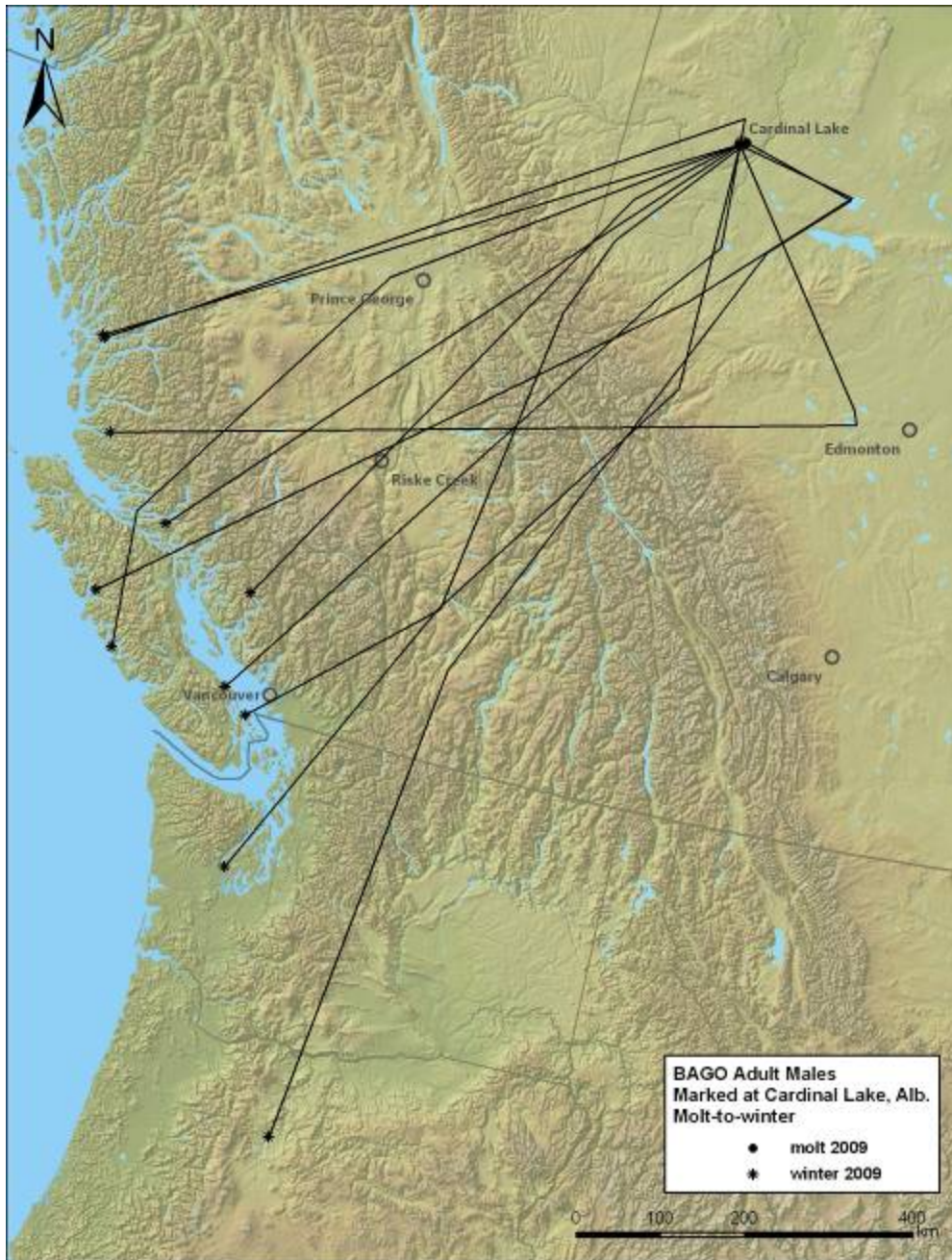


Figure 1: Winter population affiliations of male BAGO molting on Cardinal Lake.

Project Status:

We expect the remainder of the second field season to go smoothly. All captures and radio attachments have been successfully completed, and the remaining field work consists of radio monitoring, surveys of staging BAGO and invertebrate sampling. The field season will end when most BAGO have departed for wintering areas in late October.

Data entry, proofing, summarization, and analysis will be conducted following the field season. In addition to the completion of an MSc thesis at SFU, several manuscripts will be submitted for publication in respected scientific journals. We are confident that the objectives of this study are being met and that the data collected provide numerous new insights into the molting and fall staging ecology of BAGO.

Project Funding Sources (US\$).

| SDJV (USFWS) Contribution | Other U.S. federal contributions | U.S. non-federal contributions | Canadian federal contributions | Canadian non-federal contributions | Source of funding (name of agency or organization) |
|---------------------------|----------------------------------|--------------------------------|--------------------------------|------------------------------------|--|
| \$27,000 | | | | | SDJV |
| | | | | \$92,100 | DU Canada |
| | | | \$18,000 | | NSERC |
| | | | | \$15,600 | SFU-CWE ¹ |
| | | | \$28,000 | | EC ¹ |

¹ Revised project contributions from these project partners reflect the actual contributions necessary to manage Argos data and develop/manage the project website.

Total Expenditures by Category (SDJV plus all partner contributions; US\$).

| ACTIVITY | BREEDING | MOLTING | MIGRATION | WINTERING | TOTAL |
|--|----------|-----------|-----------|-----------|-------|
| Banding (include only if this was a major element of study) | | | | | |
| Surveys (include only if this was a major element of study) | | | | | |
| Research | | \$120,700 | \$60,000 | | |