Sea Duck Joint Venture
Annual Project Summary
FY 2015 – (October 1, 2014 to Sept 30, 2015)

Project Title: SDJV Project# 137: PTT sample sizes required to delineate sea duck populations

Principal Investigator(s)*:*
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Partners:
Pacific Wildlife Foundation (PWF)

Project Description:
The objective is to determine the optimal number of deployed PTTs needed to delineate a sea duck population; methods involve theoretical modeling and analyses of actual PTT data sets.

Objectives:
Determine the sample size of sea duck individuals needed to delineate spatially independent sub-units during breeding and wintering seasons for Barrow's Goldeneye, Black Scoter, and Surf Scoter.

Preliminary Results*:*
Funds for this project were arranged with the Pacific Wildlife Foundation (an NGO based in Vancouver BC) in 2013. Project completion has been delayed primarily because of the difficulty in finding an individual with the necessary GIS and statistical skills. We contracted Suzanne Gifford in May 2015 and she has completed about one-third of the work so far. Suzanne's first invoice and project update were received on 5 August 2015 and her update indicated that she has: "gathered and organized available spatial data; determined criteria to divide points into breeding/wintering seasons, along with evaluations of variability within BAGO dataset; calculated and mapped centroids for each bird for each season; developed preliminary point density estimates; reviewed clustering methods; and held meetings with E. Silverman and T. Roberts at Patuxent."

Since our ultimate objective is sample size determination, we decided to start with the largest data set. We will first determine methods and analyze BAGO data and then repeat the methods using data for the remaining two species.

Behavioral and biological criteria and published season dates were ineffective at defining seasons for our purposes. Data separated using these criteria included long movements (>600km) and high mean point distances to seasonal centroids, particularly during breeding seasons. We calculated net displacement (Bunnefeld et al. 2011) from starting locations for each BAGO individual. Migratory and relatively stationary periods are apparent from visual inspection (Figure 1). Dates of these relatively stationary periods will be determined and used to select location data for analysis of wintering and breeding areas.

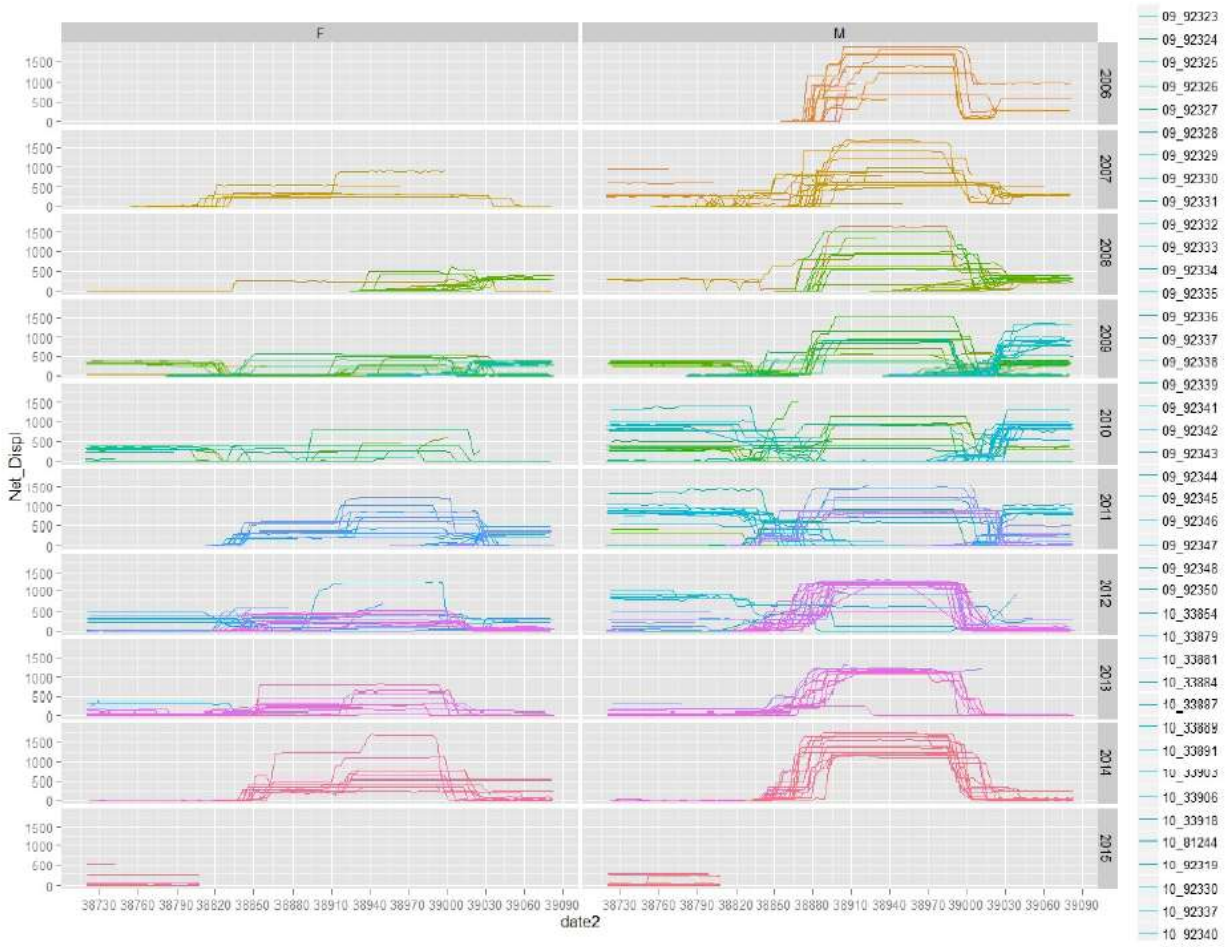

Figure 1. Net displacement (km) of female (F) and male (M) BAGO by year, 2006-2015.

We will calculate a centroid for each individual for each season (breeding, wintering for each year), and perform a cluster analysis to delineate breeding and wintering ranges. We will calculate the transition probabilities of individuals moving between the ranges, defined as the proportion of individuals moving from each breeding area to each wintering area, and each wintering area to each breeding area. We will repeat the range determination and transition probability evaluation using bootstrap samples of birds beginning with n = 10 and continuing until the number of identified populations at each stage reaches an asymptote.

Suzanne expects to complete the project by February 2016.

Literature Cited

Bunnefeld, N., L. Borger, B. Van Moorter, C. M. Rolandsen, H. Dettki, E. J. Solberg, and G. Ericsson. A model-driven approach to quantify migration patterns: individual, regional and yearly differences. Journal of Animal Ecology 80: 466-476.

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
			20,000		Environment Canada (in-kind)

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	11,750	11,750	11,750	11,750	47,000