Project Number: 10100132-H

Project Title: PWS Herring Survey: Seasonal and Interannual Trends in Seabird Predation on Juvenile Herring

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Time period covered: FY10

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Project website: www.pwssc.org/research/biological/seabirds/SeabirdOnHerring.htm http://www.pwssc.org/research/biological/PacificHerring/pacificherring.shtml

Work Performed and Preliminary Results:

During FY2010, diurnal and nocturnal surveys of seabird distribution and abundance in Prince William Sound (PWS) were performed during 12 - 17 November 2009 and 16 – 20 March 2010 cruises. Both cruises focused on five bays in PWS known historically to hold large overwintering aggregations of juvenile herring. These study sites included the four bays sampled as part of the EVOS Sound Ecosystem Assessment (SEA) program (Eaglek, Simpson, Whale, and Zaikof Bays), as well as Lower Herring Bay. A second vessel sampled fish in and around the acoustic transects to determine species composition and age of fish schools.

A primary objective of the November 2009 cruise was to evaluate nocturnal bird survey protocols. Several studies have successfully surveyed for birds at night (Blackwell et. al. 2006, Garner et. al.2009). While these studies focused on total numbers of birds in flight or on land, none of the studies provide methodology for identifying bird species detected at night. Being able to identify birds to the level of family or genus is critical to this study, therefore further evaluation of techniques was necessary.

During November 2009, we used two night survey methods. First, an infrared (IR) camera was mounted to the roof of the survey vessel (*MV Auklet*). IR images were displayed on a screen inside the cabin, permitting an observer to record observations in real time. Second, a Low Light Night Vision Monocular (NV) was used by an observer stationed outside the cabin on the bow of the boat. The NV monocular was a 3rd generation ATN Night Storm produced by Black Lion Optics.

During the March 2010 cruise we were able to perform concurrent IR and NV surveys, using a video recording system. A single observer was stationed on the bow of the boat with a NV scope and recorded observations in real time. Video recording equipment captured IR images, which were viewed post-survey. Concurrent surveys allowed us to compare detection rates and characteristics of species identification between the two survey methods.

Comparison of Nocturnal Survey Methods

The IR and NV survey methods covered slightly different viewing areas (Figure 1). Each method had different strengths and weaknesses in relation to weather, seabird detection and species identification (Table 1).

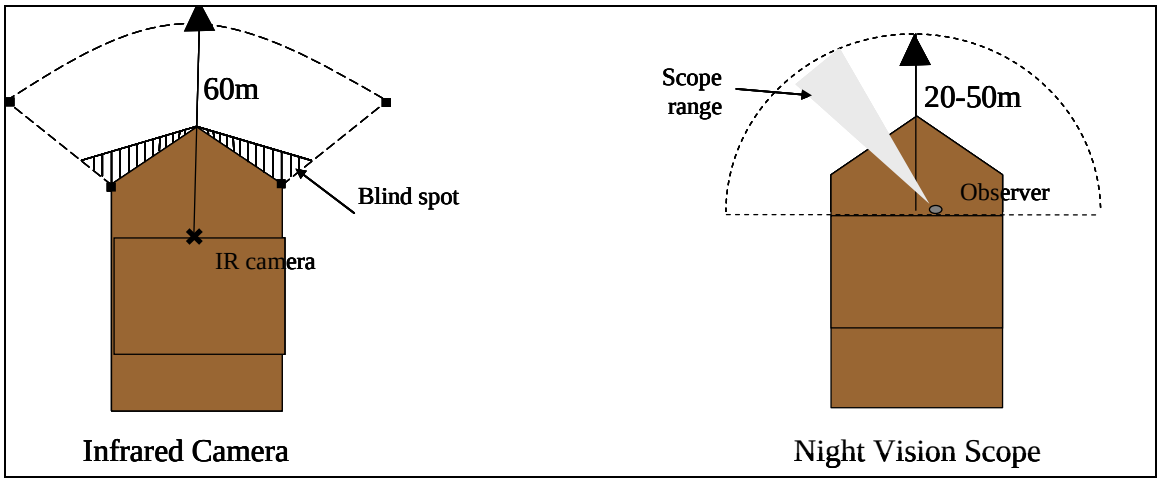

Figure 1. Comparison of survey fields for two night survey methods: (left) the infrared-mounted camera and (right) an observer equipped with a night vision scope.

Table 1. Pros and cons of nocturnal observation techniques.

Infrared Camera (IR)		Night Vision Scope (NV)	
Pros	Cons	Pros	Cons
Not affected by light conditions	Difficult to identify species	Easier to identify species if light conditions are good	Strongly affected by light
Greater field of view than NV	No visibility during fog, mist, rain, snow	More time efficient	Real-time viewing only
Videos can be viewed in real time or post survey		Greater overall viewing range	Viewing distance influenced by shadowing & ambient light
			Limited range & visibility during fog, mist, rain, snow

Both techniques were affected by weather. The IR system showed greater sensitivity to moisture, making surveys during rain, mist, fog and snow impossible. The NV scope also had limited range and visibility during fog, mist, rain and snow. In addition, viewing distance was also highly influenced by shadowing and ambient light for the NV scope.

The NV scope yielded better species identification, but fewer overall detections (Figure 2.). Greater detectability using the IR system was attributed to the slightly greater detection range (up to 60 m versus 20-50 m with the NV scope), and its more consistent survey area. The observer using the NV scope was limited by the necessity of scanning

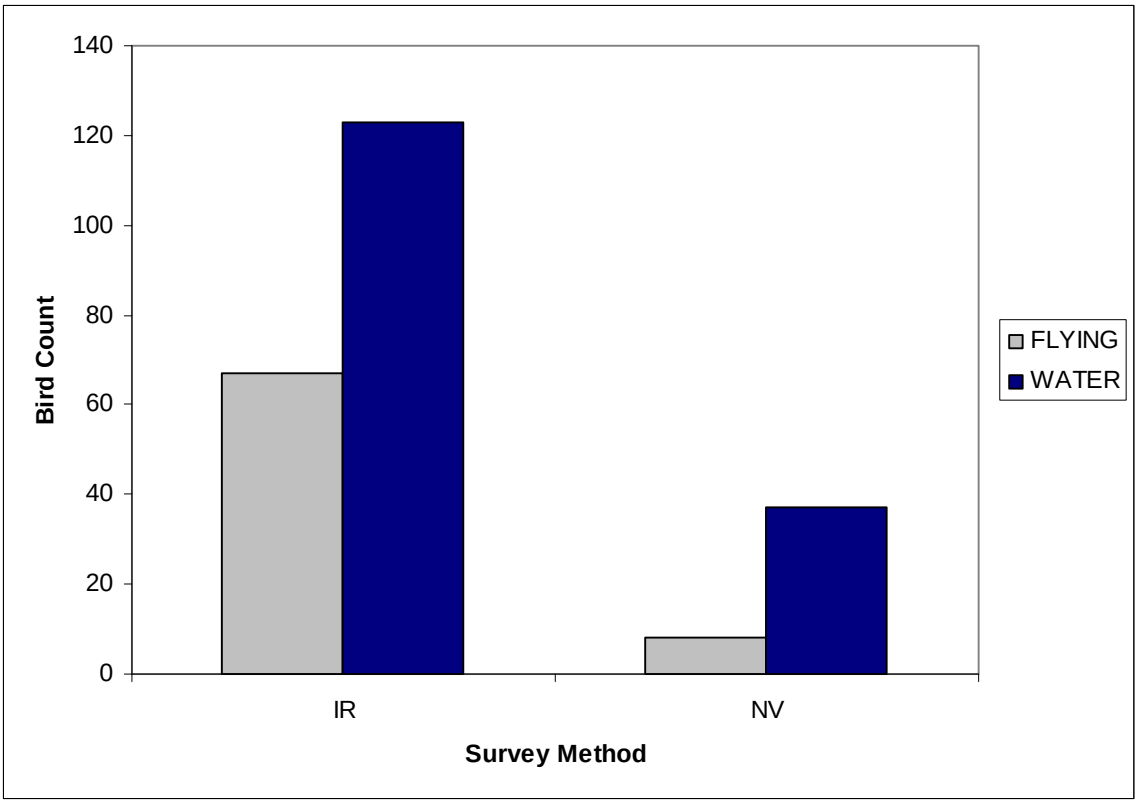

Figure 2. Comparison of detectability during nocturnal avian transect surveys using Infrared Camera (IR) and Night Vision Scope (NV), March 2010. Blue bars indicate birds detected on the water. Grey bars indicate birds detected in flight.

across the survey area, covering only a few meters at a time and leaving some areas temporarily uncovered.

Species identification with IR images is likely to improve with further data collection. Currently a library of positively identified IR images is being catalogued so that future images can be identified by comparing behavior, shape and color pattern with previously identified images. This resource will greatly improve our ability to identify bird genus and enhance the utility of IR imaging in nocturnal bird surveys.

Preliminary Results -Bird Behavior and Distribution

Preliminary analysis of daytime vs nocturnal bird surveys for the March 2010 cruise indicates both a difference in species composition and density between night and day. Dominant species observed during nocturnal surveys included goldeneye, scoters, and grebes, while day time surveys were dominated by murres, murrelets, and gulls.

Our diurnal surveys of the five juvenile herring bays surveyed found marked differences between densities of birds in November and March. Marbled murrelets were more abundant in November, compared with March (Figure 3). In contrast, common murres were more abundant in March compared with November (Figure 3).

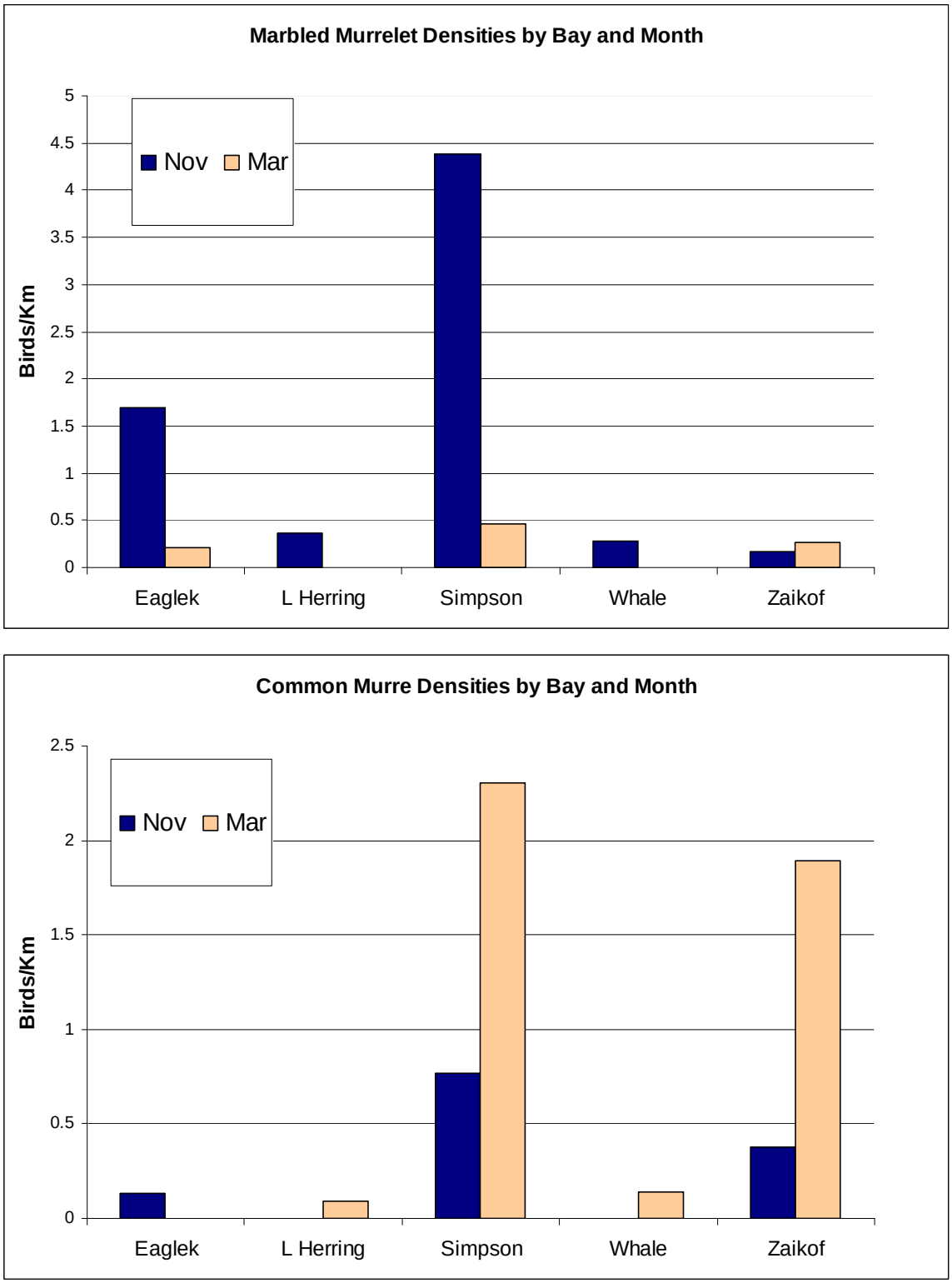

Figure 3. Marbled murrelet (Top) and common murre (Bottom) density by bay during November 2009 (Blue) and March 2010 (Tan) diurnal surveys.

We continue to explore the relationship between the spatial and temporal distribution of herring and seabirds. Preliminary analysis of November 2009 and March 2010 suggest a possible relationship between seabird density and herring biomass in bays (Figure 4), but further analysis is required.

During August 2010, we were originally scheduled to conduct avian transects in conjunction with hydroacoustic herring surveys. However, the objectives of the hydroacoustic surveys changed from conducting daytime and nighttime transects similar to the winter, to covering very short transects repeatedly during daylight hours. As a result, we decided not to send an avian observer on that cruise. We did provide the infrared system in case nighttime acoustic surveys were conducted, however no hydroacoustic surveys were conducted at night.

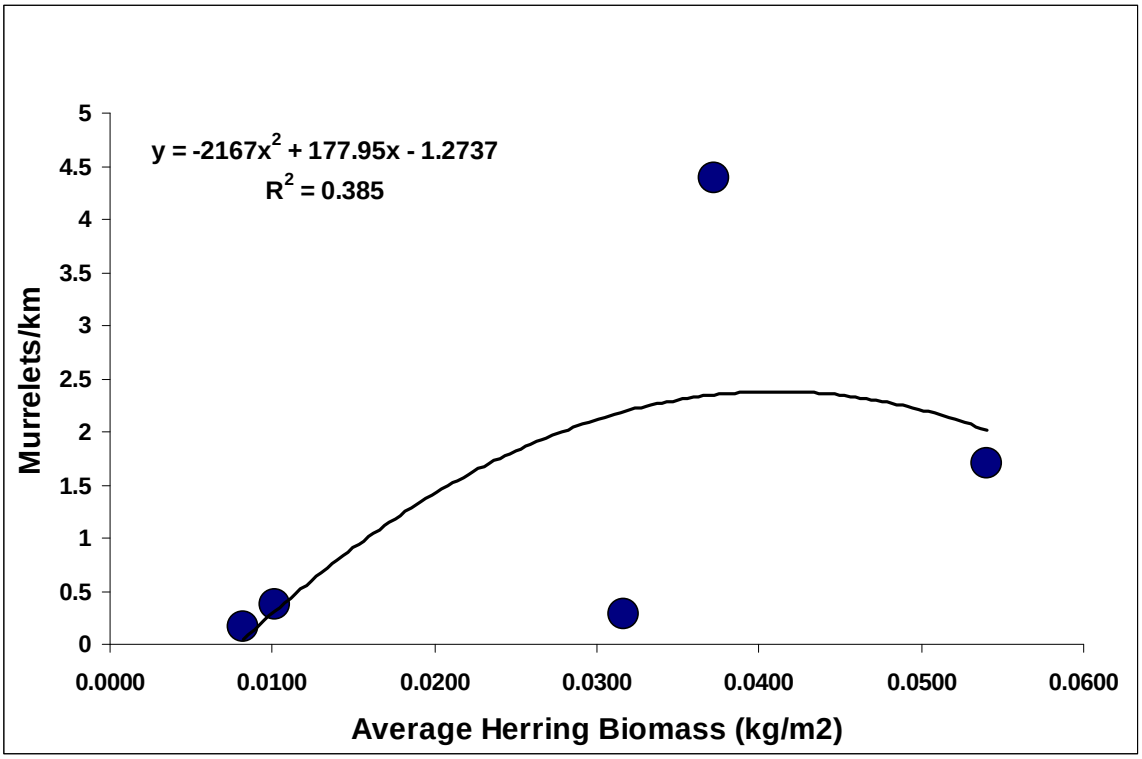

Figure 4. Relationship between herring biomass in five bays (Kg/m^2) and marbled murrelet density. Prince William Sound, November 2009.

Future work:

Four additional herring cruises are scheduled for November 2010, 2011 and March 2011, 2012 to investigate herring-seabird associations in PWS during the winter months. During these cruises we will continue to conduct both daytime and nocturnal bird surveys in conjunction with hydroacoustic herring surveys. The number of bays visited will also be expanded to include up to five additional bays believed to be of importance to juvenile herring. The change in hydroacoustic surveys for herring precluded our ability to conduct bird surveys during the scheduled August cruises. However, this will not hinder our ability to address the question of herring – seabird associations during the winter months in PWS.

Coordination/Collaboration:

Our project is part of the Prince William Sound Herring Survey Group. Field work is conducted concurrent with hydroacoustic herring surveys and with energetics, disease, and fish predator collections. Principal investigators Kuletz and Bishop both attended and presented at the November 2009 EVOS herring meeting in Anchorage as well as the May 2010 Herring Survey Group meeting in Cordova.

In addition, we have begun discussions with Evelyn Brown regarding her aerial survey work, to see how avian data collected during summer aerial surveys for juvenile herring schools can be incorporated or analyzed in conjunction with our project.

Community Involvement/TEK & Resource Management Applications:

During May 2010 Herring Survey Group meeting, held in Cordova, Principal Investigators Kuletz and Bishop fielded questions from the local community. One hour at the end of the meeting was dedicated solely to answering questions from the public.

Information Transfer: List (a) publications produced during the reporting period, (b) conference and workshop presentations and attendance during the reporting period, and (c) data and/or information products developed during the reporting period. ***NOTE:*** *Lack of compliance with the Trustee Council's data policy and/or the project's data management plan will result in withholding of additional project funds, cancellation of the project, or denial of funding for future projects.*

Workshop presentations:

Kuletz. Pacific Seabird Group Technical Committees for Marbled and Kittlitz's Murrelets: Information Needs and Prioritization Workshop, 15-17 December 2009, Anchorage. Provided presentations on marbled and Kittlitz's murrelets in Prince William Sound, including our EVOS winter project.

Bishop & Kuletz. Seabird predation on juvenile herring In Prince William Sound. EVOS Herring Group, Anchorage, November 2009

Bishop & Kuletz. Seasonal & interannual trends in seabird predation on juvenile herring. EVOS Herring Survey PI meeting, Cordova, May 2010.

Public Outreach:

Our project was featured along with the rest of the Prince William Sound Herring Survey Group in Field Notes, a radio program developed by Allen Marquette, of Prince William Sound Science Center.

These programs are available on Youtube.

Part 1 - http://www.youtube.com/watch?v=I37nv5Sq5fo

Part 2 - http://www.youtube.com/watch?v=mYW-2tNuV2U

On the Prince William Sound Science Center web site, we now have two pages that provide information on the project. The first is under the avian research program: *www.pwssc.org/research/biological/seabirds/SeabirdOnHerring.htm*

The second web page is under the Prince William Sound Herring Group web page: *http://www.pwssc.org/research/biological/PacificHerring/pacificherring.shtml*

This web page is still under construction but should be up and running by the end of September 2010.

Budget Changes:

No major changes.

Literature cited

Blackwell, F.B, T.W. Seamans and B.E. Washburn. 2006. Use of infrared technology in wildlife surveys. Proc. 22nd Vertebrate Pest Conference (R.M. Timm and J.M. O'Brien, eds.) University of California, Davis. Pp 567-472.

Garner, D.L., H.B. Underwood, and W.F. Porter. 2009. Use of modern infrared thermography for wildlife population surveys. Environmental Management 19(2):233-238.