

**Effects of recreational disturbance on the productivity of Black
Oystercatchers (*Haematopus bachmani*) in Kenai Fjords National Park.**

A Research Proposal

Julie Anne Morse
Alaska Cooperative Fish and Wildlife Research Center
University of Alaska, Fairbanks
julie.morse@uaf.edu
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Introduction

The black oystercatcher (*Haematopus bachmani*) is entirely dependent on rocky intertidal shorelines along the Pacific coast of North America. Given the fondness of humans for beach-associated recreation, population dynamics of intertidal species may be impacted. Specifically, as ground nesters with semi-precocial young, black oystercatcher productivity may be negatively affected by human disturbance. Due to recent increases in recreational activities in Alaska, where more than half the black oystercatcher population breeds, it has been designated as a Species of High Concern (Alaska Shorebird Working Group 2000, Brown et al. 2001). Residents of the Pacific Coast of Canada are also considered a species of high conservation concern (Donaldson et al. 2000).

The effect of human disturbance on bird populations has been extensively studied on many levels and at different stages of their annual cycle. Burger (1986) noted that although data are limited, shorebirds may be more sensitive than other waterbirds to human presence due to their social congregations and dependence on few suitable marine habitats. The European and African congener oystercatchers are arguably the most intensely studied shorebirds in the world and have clearly been impacted by human perturbations of shoreline habitats. However, not all human disturbances have had a measurable negative effect on populations. Levels of disturbance effect have ranged from modified behavior, which suggests populations may become habituated to human presence (Lambeck et al. 1996), to extinction of local populations (Jehl 1985, Hockey 1987).

From a management perspective, human impacts of concern are those that can be measured in terms of effects on population size (Verhulst et al. 2001). Productivity, a highly variable component of avian life history, is a significant proximal factor influencing population dynamics. Therefore in the proximal sense, we need to identify those disturbances that perturb a species productivity from its natural levels. Mechanisms of human disturbance on oystercatcher productivity may be direct such as nest abandonment (Leseberg et al., 2000) or indirect through reduced time spent incubating and foraging (Leseberg et al. 2000, Verhulst et al. 2001). Additionally, humans have a tendency to attract predators to nests and thus their presence may indirectly cause nest failures by increasing levels of predation. Abundances of one avian predator, common raven (*Corvus corax*), were negatively correlated with black oystercatcher productivity in nearby Prince William Sound, Alaska (Andres, 1999). Few studies however, have examined the interaction of humans and predators and their effects on productivity.

Variation in individual reproductive success in oystercatchers is high (Andres 1999, Hazlitt and Butler 2001) and has been attributed to variation in aspects of territory quality (for review see Ens. 1992; Ens et al. 1992, Andres 1999, Hazlitt 2001). Additionally, black oystercatchers, and shorebirds in general, have shown high site fidelity to individual nesting territories (Andres and Faxla, 1995, Hazlitt and Butler, 2001). As

such, features of these territories are an important component of reproductive success. I hypothesized, as have others, that reproductive success may be negatively correlated with human and/or predator densities within territories. Further, individual pairs are likely to return to these same territories to breed in subsequent years regardless of disturbance levels or previous reproductive success. If so, productivity may be a limiting factor in the population dynamics of black oystercatchers in areas with high human disturbance levels.

Objectives

1. Estimate nest and fledgling success of black oystercatchers in Kenai Fjords National Park, Alaska May – August 2003 to 2005. Compare productivity estimates to concurrent studies of breeding ecology of black oystercatchers in Glacier Bay National Park and elsewhere in Alaska.
2. Examine the covariate effects of distance to nearest campsite, frequency and magnitude of human disturbance, and disturbance type on nest and fledging success.
3. Establish a population of marked birds to identify individual territories, site fidelity, annual variation in individual productivity, and eventually estimate adult survival.
4. Examine the overlap of human and predator densities within individual territories using GIS generated density maps.
5. Examine cause of mortality of unhatched eggs or chicks found dead in the nest through testing for contaminant exposure and temporal covariate analysis (primarily weather parameters).

The primary objective of this study is to examine factors influencing the productivity of black oystercatchers in Kenai Fjords National Park. Conducted in a National Park, this study allows evaluation of human disturbance in pristine habitat compared to oystercatcher studies in other parts of the world. The results of this project will provide a valuable tool to managers in coastal environments to address increasing levels of human activity. This information is needed to formulate backcountry management plans as well as develop conservation strategies for the black oystercatcher throughout its range.

Methods

This study will be conducted in Kenai Fjords National Park, which lies on the southeastern corner of the Kenai Peninsula, Alaska (Fig.1). The park landscape is dominated by the Harding Icefield, and is characterized by steep mountains, tidewater glaciers, and a very convoluted shoreline. The shoreline in general is steep and rocky, but is interspersed with low-sloped gravel beaches. Low-sloped beaches are essential foraging areas and are characteristic of black oystercatcher breeding habitats (Andres 1988).

An initial boat-based survey of all shoreline habitats within Ailak Bay, Harris Bay, and Northwestern Fjord will be conducted in mid-May. The location of all Black Oystercatchers will be mapped on aerial photographs and GPS locations recorded. Locations with territorial pairs will be searched extensively by foot for nests. Following the initial survey, areas where oystercatchers have been observed but no nest was found will be revisited in approximately 5 days. This intensive survey will be repeated once in June and July in effort to locate all oystercatcher nests throughout the nesting season. In the first year of the project this inventory will be conducted over the entire coastline of the Park, not just within the study area defined above. This park-wide survey of abundance and distribution, which has never been done before, will provide an indication of the degree to which the sample population within the study area represents the overall population.

When an active nest is identified in the study area, the number of eggs will be recorded and the stage of incubation will be determined through floating the eggs. Data on landform type, shoreline characteristics, and distance to nearest campsite will also be collected on the initial visit. Behavioral response of each adult oystercatcher (i.e. distanced flush, flush behavior) will be recorded for every nest visit. Breeding territories will be visited every five days until nest failure is confirmed or chicks are observed flying. Any unhatched eggs or chicks found dead in the nest will be collected and tested for contaminant exposure.

On nest revisits eggs will again be floated to determine age of nest. Once a nest has been incubated for at least 10 days the adults will be trapped on the nest with a bownet and marked with a USFWS metal band, and color-coded darvic bands for individual identification in the field. On subsequent visits (after successful trapping) pairs will be noted for presence/absence on the territory, but the nest will not be further disturbed for a minimum of 10 days. Ideally all birds nesting in the study area will be trapped in the first year of this study to eliminate disturbance from trapping events in subsequent years.

Measures of human disturbance will be evaluated for both passive (campers at nearby campsites likely unaware of nest) and direct (researcher visits to the nest) disturbances. In addition to recording the distance to the nearest campsite for each nest, an index of the magnitude (number of campers) and frequency (number of nights site occupied) of disturbance will be calculated for each campsite. This data will be determined through

the use of exit surveys required of all backcountry users supplemented with daily checks of suitable campsites near active nests by researchers. Direct disturbance will be measured in terms of the frequency of nest checks. In years subsequent to banding, these two types of disturbance will be manipulated into different treatment levels to experimentally test the effect of disturbance type on productivity. The experimental design for this study will require the exclusion of camping from some areas.

Daily resightings of marked birds will be used to generate Kernel density estimates and home ranges (henceforth territories) for each breeding pair (Hooge and Eichenlaub 1997, Seaman et al. 1998). Resighting locations will be marked on detailed shoreline maps and GPS coordinates will be recorded. The resighting schedule will vary across all tide cycles and time of day. All efforts will be made to conduct resightings from afar and minimize further researcher disturbance of marked birds.

To determine the abundance of avian predators in the vicinity of oystercatcher territories multiple point counts will be conducted systematically along the entire shoreline of the study area and at nest locations. Point counts will record the presence or absence of any potential avian predator during a 3-minute period (Luginbuhl et al. 2001, Andres 1999). All point counts will be conducted in a 12-hour period and will be repeated every 5 days. Additionally, 2 remote cameras will be set up near a sample of nests each year to document predation events (Cutler and Swann 1999).

Data Analysis

We will use daily survival rates (DSR) to examine temporal and spatial variation in nest and fledging success (Johnson and Shaffer 1990). The analysis of covariance model DSR = year, date of initiation, date of failure, distance to nearest campsite, disturbance index, predator abundances, and all parameter interactions will be used to assess variation in DSR. Additional covariates related to failure date, i.e. weather parameters and highest tide, will also be evaluated in the model. Spatial and temporal analysis of human predator interactions within territories will be conducted using GIS maps. Density maps of avian predators will be generated and analyzed for percent overlap with density maps of human activity.

Preliminary Data

This study will be conducted over three field seasons beginning in May 2003. Preliminary data on the breeding biology of black oystercatchers in Kenai Fjords National Park was collected from 1999 to 2002 by the National Park Service. This data is now being used as background information and as input to a power analysis to ensure feasible design of this study. 145 black oystercatcher nests (including renests) have been monitored for success over the past 3 years. Initial estimates of productivity are low (Mayfield estimate 27%, M. Tetreau unpublished data), but are comparable to estimates of productivity in Prince William Sound (Andres 1999), and British Columbia (Hazlitt 2001). The majority of nest failures occurred just before or at hatch. Thus our analysis for this study will examine covariate effects on DSR over nest age.

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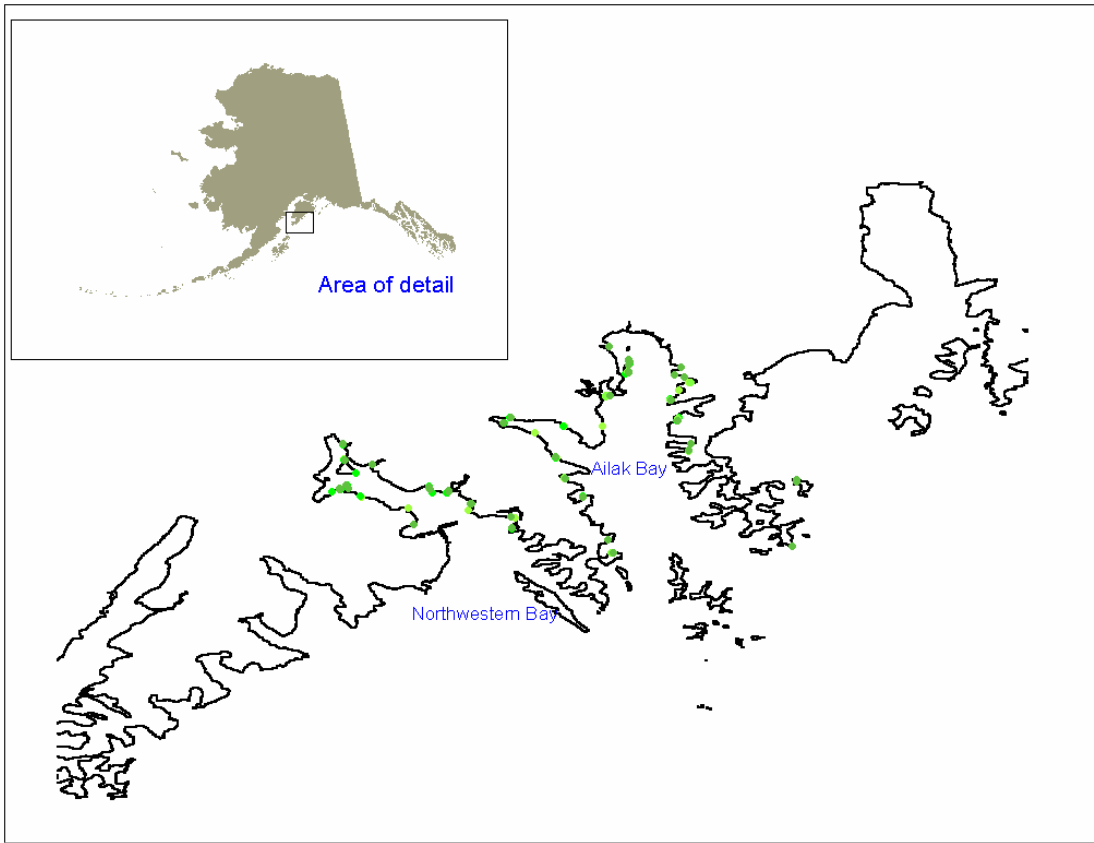


Figure 1. Study area and locations of black oystercatcher nests found 1999 - 2002.