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PROPOSED 1991 RESTORATION PROJECT DESCRIPTION

Title:	Feeding Ecology and Reproductive Success of Black Oystercatchers in Prince William Sound
Study No.	6
Lead Agency:	U.S. Fish and Wildlife Service, Marine and Coastal Bird Project, Anchorage, Alaska
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Project Supervisor:	Kent Wohl, U.S. Fish and Wildlife Service, Marine and Coastal Bird Project, Anchorage, Alaska

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Supervisor Kenton D. Wohl 6-7-91

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INTRODUCTION

The American black oystercatcher (Haematopus bachmani) is a conspicuous and important member of the intertidal community of Prince William Sound (PWS). During the breeding season of 1989, the U.S. Fish and Wildlife Service (USFWS) initiated a project to determine what effects the Exxon Valdez Oil Spill (EVOS) had on the reproductive success of oystercatchers in PWS. Green Island, an oiled site, and Montague Island, a non-oiled site, were chosen for comparative study (Sharp 1990). Because oystercatchers are long-lived birds and have a delayed maturity of 3-4 years, repercussions of the EVOS on the oystercatcher population may also be delayed. Factors which influence survival and development of chicks may include reduced feeding rate and variability of prey sizes and types. Adult oystercatchers are known to switch prey types when they begin to feed young. Morrell et al. (1979) found that adults switched from a diet composed of primarily mussels to a diet containing a substantial proportion of limpets. If prey types are differentially affected by the degree of oiling, or the beach cleaning technique, differential chick growth rates and survival may result. Conversely, predation by oystercatchers can exert predation pressure on invertebrate populations. Oystercatchers have been found to structure limpet communities in California (Hahn and Denny 1989) and mussel communities in England (McGrorty et al. 1990). Thus, oystercatcher predation may affect the restoration of these intertidal organisms in PWS. The proposed study will continue to evaluate the effects of the EVOS on the reproductive success of the black oystercatcher in PWS and will examine the interaction of predatory oystercatchers and their intertidal prey.

OBJECTIVES

1. Compare the reproductive success of black oystercatchers nesting and foraging on oiled and control shorelines by sampling replicate sites in PWS. Determine if growth rates are depressed in oiled sites and may be responsible for decreased survival. Resampling of sites visited in 1989 and 1990 will be used to determine the temporal trends in the reproductive success in oystercatchers.

2. Compare the foraging ecology of black oystercatchers on impacted and non-impacted shorelines. Determine how their feeding is being affected (i.e. handling time, encounter rate). Determine the role oystercatchers play in structuring the intertidal invertebrate community, specifically, the limpet assemblage.

METHODS

Study Subject

Oystercatchers provide an ideal subject for studying shoreline impacts as well as basic biological questions of foraging ecology and reproductive success. Black oystercatchers are completely dependent on shoreline habitats for their life's requirements. Throughout their annual cycle oystercatchers are found only on rocky shorelines. The conspicuousness and size of the adults (and thus, their prey) is quite advantageous for investigating feeding

ecology. The establishment and maintenance of feeding and nesting territories coupled with parental care enables observers to handily follow the fate of young. The general rarity of the black oystercatcher renders the population sensitive to environmental perturbations.

Study Area

A main study area will be established in the Herring Bay area of Knight Island. Several sites in Herring Bay will be chosen to overlap with invertebrate work conducted by other coastal habitat personnel. Additional study sites will include western Montague Island, Green Island, Smith Island and Naked Island. Other sites on Knight Island may be included in 1992. Personnel will include 2 full-time researchers. The 1991 field season will commence in late May-early June and terminate in mid-August.

Oystercatcher Reproduction

Study areas will be searched at the commencement of the field season to detect courting or incubating birds. Because oystercatchers initiate incubation after laying a complete set of eggs, clutch sizes will only be measured if an adult is determined to be incubating. Follow-up visits will be made if pairs have not begun nest-building. When measuring clutch sizes, percent of the egg shell surface covered by oil (if still present) will also be estimated. Locations of the nest and feeding territories will be mapped and recorded in detail. Shoreline type where the nest site and feeding territory is located will also be recorded. Extreme caution will be used to avoid attracting predators to the nest-site.

Based on the incubation initiation date, nests will be revisited 30 days later to determine the hatching outcome. Using age criteria described by Webster (1942), chicks will be weighed when they are 10, 20 and 30 days old. Because weight is correlated with size, chick bill length will be measured and used to standardize weight measurements. All chicks will be weighed at ± 1 hour of high tide to insure similar digestion rates. During the 20-day weighing, chicks will be fitted with a unique color and USFWS aluminum band combination.

Feeding Ecology

Foraging behavior observations of adults will be conducted on ≥ 20 territories each on oiled and non-oiled sites in 1991. An additional 20 territories in treatment and control sites are anticipated for 1992. Prior to and during incubation, territories will be randomly selected (without replacement) for behavioral observations. Each observational period will consist of a continuous 1 hour period starting 1 hour before low tide. To minimize disturbance to the birds, observations will be conducted from a portable blind. Observations will begin when a bird first arrives at the foraging site. Time intervals from the start of the foraging bout and between each prey attack will be recorded. When the focal animal discovers a prey item, the following information will be recorded: mode of foraging (stab, dorsal hammer, ventral hammer), water depth, species taken, size, and reject or accept prey. The time from attack to ingestion will be recorded. Size determination of mussels taken by oystercatchers is determinable in the field (Cayford and Goss-Custard 1990). However, it is necessary to train

observers and calculate observer differences in estimating size (Goss-Custard et al. 1987). Observer bias can be tested using oystercatcher models and a variety of prey sizes.

Foraging behavior of adults feeding young will also be measured. In addition to the aforementioned measurements, time spent in delivery of food to young will be recorded. As young become independent, similar measurements will be taken on young.

Shorter periods (1 hr) will be used to collect instantaneous samples of adult and juvenile oystercatcher behavior during high tides. Behaviors will be recorded as: feed, preen, incubate, sleep, active, stand. Counts of predators will also be conducted at this time as well as during foraging observations.

Prey Abundance

Prey items will be measured in each feeding territory immediately following oystercatcher feeding observations. Three transects will be randomly place din the feeding territory perpendicular to the shoreline. Three 20x50 cm quadrats will be placed at evenly-spaced intervals along the transects. Within each quadrat all living and dead molluscs, crustaceans and echinoderms will be counted. Counts of mussels (Mytilus edulis) will be divided into 4 size classes ranging from 10 to 50 mm. Percent algal cover in each plot will be estimated and the type of substrate will be recorded. These procedures generally follow the Standard Operating Procedures of the Coastal Habitat Program. Ten individuals from each of the 4 size classes will be collected to determine length-weight relationships (Hilbish 1986). Because changes in mussel weight will result from spawning, samples will be collected during each phase of breeding. Mussels will be desiccated (using a Coleman^{R} oven and stove) and weighed in the field. Additional analysis will be conducted on any other organism that is discovered to be prominent in the oystercatchers' diet.

Information on prey distribution and abundance gathered from Coastal Habitat program sites will also be incorporated into the database.

Statistical Considerations

For all statistical tests involving the oystercatchers, the experimental unit is a pair of oystercatchers. All measurements of foraging rates will be combined to produce an average rate for each territorial pair. These estimates will not be weighed by the amount of time or the number of bouts because each average is an unbiased estimate of the average rate on a territory. Main effects of oil and non-oiled treatment/control site and secondary effects of habitat type will be tested using factorial ANOVA.

Design Matrix:

	Exposed Rocky Shore	Coarse Textured Beach	Sheltered Rocky Shore
Impacted	x	x	x
Non-impacted	x	x	x

Tests for individual differences between treatment-habitat combinations will be performed using procedures based on Fisher's Least Significant Difference test. Using estimates of variance on clutch size and feeding rates from Sharp (1990), a minimum total (1991 & 1992) sample size of 15 per treatment-habitat group should be adequate to detect differences in the parameters. Assignment of sample sizes to individual habitat-treatment groups will be somewhat determined by the proportional representation of the habitats in the study area. It seems feasible to achieve this degree of effort in 2 field seasons. To avoid problems of covariance, a territory will appear only once in the dataset. Similarly, a single estimate on prey abundance will be produced for each territory.

Growth rates of chicks will be analyzed using repeated measure ANOVA. Survival models developed by the Patuxent Research Center of USFWS will be explored for their applicability for estimating chick and nest survival.

DURATION AND SCOPE

May 1991	Prepare for field season
June-August 1991	Field season
November 29, 1991	Draft Report
February 28, 1992	Final Report

EXPECTED RESULTS

Persistent effects of the EVOS might lead to avoidance of oiled sites by breeding oystercatchers. However, it appears that oystercatchers are fairly tenacious to their breeding sites. If reproductive success is continually depressed in these areas, the population will eventually experience a decline. The delayed maturity of the species incurs a time-lag in the process. By an understanding of which aspect of the reproductive process is affected will direct restoration procedures if ever needed. The dual consequence of the loss of prey for oystercatchers and the predatory influence oystercatchers have on rebounding invertebrate populations could lead to novel intertidal community structure.

COST

The budget delineated below reflects project costs between the period April 1, 1991, to September 30, 1991. Additional funds will be required for report preparation and attendance at possible peer review meetings during Fiscal Year 1992.

o Personnel		$ 30,000
Salary (PI)	$ 12,000	
Salary (Techs)	13,000	
Overtime Pay		5,000
o Travel/Per diem		10,000
o Equipment		15,000
14' Achilles inflatable	4,000	
2 25hp Outboard Motors	3,000	
4 2-person Tents	2,000	
Optics (Scopes, Binoculars)	2,000	
Generator	500	
Weatherport	2,000	
Radios	1,000	
o Supplies		5,000
Food	1,000	
Fuel	4,000	
Total		$ 60,000

LITERATURE CITED

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