

Exxon Valdez Oil Spill
Restoration Project Final Report

Survey of Octopuses in Intertidal Habitats

Restoration Project 96009D
Final Report

David Scheel
Rebecca Dodge
Tania L.S. Vincent
Katherine Hough

Prince William Sound Science Center
P.O. Box 705
Cordova, AK 99574

March 2002

[NOTE: Report compiled by Sandra Schubert, Trustee Council Staff]

The *Exxon Valdez* Oil Spill Trustee Council conducts all programs and activities free from discrimination, consistent with the American with Disabilities Act. The publication is available in alternative communication formats upon request. Please contact the Restoration Office to make any necessary arrangements. Any person who believes she or he has been discriminated against should write to: EVOS Trustee Council, 441 W. 5th Ave., Suite 500, Anchorage, AK 99501-2340; or O.E.O U.S. Department of the Interior, Washington D.C. 20240

Survey of Octopuses in Intertidal Habitats

Restoration Project 96009D Final Report

Study History: This project began in 1995 (95009D) and was renewed in 1996 (96009D) for a second year of field work. The closeout year for this project was 1997 (97009D). The project investigators did not submit a final report. Rather, this report – which simply cites three manuscripts prepared with results obtained through this project – has been compiled by Trustee Council staff.

Abstract: Diet and foraging behavior of *Octopus dofleini* in Prince William Sound and Port Graham, Alaska, were studied from collections of den litter, measurements of octopuses and estimates of live prey abundance. We described the contents and the field signs of 52 midden piles found outside occupied dens of *Octopus dofleini* in Prince William Sound and Cook Inlet, Alaska. Habitat characteristics associated with the Giant Pacific octopus, *Enteroctopus dofleini* were studied in Prince William Sound and Port Graham, Alaska from beach walk, SCUBA and submersible surveys to depths of 197 m.

Key Words: Giant Pacific octopus, *Octopus dofleini*, subsistence, *Exxon Valdez* oil spill, Prince William Sound, intertidal, habitat

Citation: Scheel, D., R. Dodge, T.L.S. Vincent, and K. Hough. 2002. Survey of octopuses in intertidal habitats, *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 96009D), Prince William Sound Center, Cordova, Alaska

INTRODUCTION

In response to interest from Alaska Native villages in the *Exxon Valdez* oil spill impacted area, this project studied Giant octopuses, *Octopus dofleini* (Wulker), in Prince William Sound and Cook Inlet (Port Graham), Alaska. Villagers use octopuses for subsistence and have reported that octopuses became scarce in years following the 1989 oil spill. This project conducted two summers of work on octopus (1995 and 1996), focused on intertidal and shallow subtidal habitats that are accessible during low tides or by SCUBA diving. In addition, some studies were conducted by beach walk and submersible surveys.

The project investigators did not submit a final report. Rather, this report – which simply cites three manuscripts that rely on results obtained through this project – has been compiled by Trustee Council staff.

The results of this project appear in three manuscripts:

Vincent, T.L.S., Scheel, D., Hough, K.R. 1998. Some aspects of diet and foraging behavior of *Octopus dofleini* (Wulker, 1910) in its northernmost range. *P.S.Z.N.: Marine Ecology*, 19(1): 13-29.

Abstract: Diet and foraging behavior of *Octopus dofleini* in Prince William Sound and Port Graham, Alaska, were studied from collections of den litter, measurements of octopuses and estimates of live prey abundance. Based on 193 den collections from depths of –31 to –1.3 m, a diet of hard-bodied prey could be identified. The five most common litter species made up 80 percent of the litter remains with nearly 30 species of various taxa making up the rest. The proportions of major hard-bodied prey species in each litter pile significantly differed with depth of den, associated substrata, presence of cobble and geographical location but not with the presence of boulders or outcrop, the density of kelp or season of litter collection. Octopus weight was not significantly correlated with the size of prey remains although *O. dofleini* may take a wide range of prey sizes once it reaches 2.5 kg. *O. dofleini* was more likely to be found at sites with crabs, although no litter species was significantly preferred over its estimated abundance, and one species was significantly avoided. These results suggest that *O. dofleini* includes suitable bivalve and crab species in its diet in relation to live abundance, while at the same time exercising an element of selectivity, as some species were actively avoided. Comparison of litter remains from the northern-most range of *O. dofleini* with those published for British Columbia show that diet breadth was similar, but the identity of major hard-bodied prey species was very different for Alaskan octopuses.

Dodge, R., Scheel, D. 1999. Remains of the prey – recognizing the midden piles of *Octopus dofleini* (Wulker). *The Veliger*, 42(3): 260-266.

Abstract: We described the contents and the field signs of 52 midden piles found outside occupied dens of *Octopus dofleini* in Prince William Sound and Cook Inlet, Alaska. The

contents of midden piles are important data for describing octopus diets, yet the field signs for distinguishing octopus midden piles from remains left by other processes can be subtle. Remains of four crab species, *Telmessus cheiragonus*, *Cancer oregonensis*, *Pugettia gracilis* and *Lophopanopeus bellus* composed 74 percent of the prey individuals represented in intertidal middens in Prince William Sound. However, the same species were not typical of other locations: *Chlamys hastata* and *C. rubida* were the most common species represented in subtidal middens, while the crab *P. gracilis* and the mussel *Mytilus trossulus* were among the most common in intertidal middens found in Cook Inlet. Drills were found on the hard remains of six species of crabs. Fifty-six percent of drill marks on crab species were located toward the carapace posterior. Of the crab species sampled in Prince William Sound that were drilled at all, *C. oregonensis* was the species most often drilled (36 percent), whereas *T. cheiragonus* was drilled least often (six percent). Drills of *O. dofleini* on crabs were oblong and came to a point at one or both ends. Drill marks tapered toward the inside of the shell, and when the final perforation of the inner surface was made, the drill was no more than a pinpoint. A previously undescribed mark in prey remains, the bite mark, occurred on the leg of *T. cheiragonus*. Bites on weathered prey remains were about 1.2 cm long X 0.5 cm wide, occurring on the inside and outside of the leg.

Scheel, D. Characteristics of habitats used by *Enteroctopus dofleini* in Prince William Sound and Cook Inlet, Alaska. Submitted June 7, 2001 to P.S.Z.N.: Marine Ecology.

Abstract: Habitat characteristics associated with the Giant Pacific octopus, *Enteroctopus dofleini* were studied in Prince William Sound and Port Graham, Alaska from beach walk, SCUBA and submersible surveys to depths of 197 m. Octopus counts on beach walk transects were positively correlated with soft substrates (sand, gravel or broken rubble), the presence of boulders, and dense kelp cover immediately offshore of the transect; and negatively correlated with depth on SCUBA transects. No significant habitat correlations were found with counts on submersible transects. On beach walks, octopus counts were reduced on hard substrates 38 percent of the values on soft substrates. Counts increased fivefold in the presence of boulders over counts in their absence, and increased 39 percent for an increase of 25 percent in adjacent kelp cover. On SCUBA transects, the average density at less than 5 m depth was over five times that below 5 m. No trends in octopus size or sex ratio were detected with depth. Den use was inversely correlated with depth although there was no indication that den availability declined with depth. Octopuses were found at densities from 0 to 2.5 per 1000 m². These densities were only one to fifty percent of densities of the same species recorded in British Columbia in the late 1970s and early 1980s. Few data are available to test recruitment, mortality and habitat selection hypotheses that would account for differences between habitats. However, the presence of the highest octopus densities in intertidal and very shallow subtidal areas indicate the likely importance of nearshore, shallow water habitats for octopuses, and highlight the vulnerability of octopus populations to changes in these habitats.