

SUBTIDAL STUDY NUMBER 4

Study Title: Fate and Toxicity of Spilled Oil From the Exxon Valdez Oil Spill

Lead Agency: NOAA

PROJECT JUSTIFICATION

This study, originally called Air/Water Project Number 6, was designed and undertaken by NOAA in 1990. The study was designed to: a) determine the toxicity of oiled environmental samples, using standard toxicity tests; b) examine the extent to which any observed toxicity may be attributed to oxygenated, polar products in weathered oil (versus the parent hydrocarbons found in fresh crude); and c) promote the synthesis of data and information (generated largely by other projects) on the geographic distribution, weathering, and potential effects of petroleum on living marine resources.

Toxicity testing has been conducted on sediment samples taken both inside and outside of Prince William Sound in 1989, 1990 and 1991.

Petroleum hydrocarbon concentrations were estimated by ultraviolet fluorescence spectroscopy on the sediment samples collected in 1989 and 1990. Between 1989 and 1991, oil concentrations declined in intertidal sediments sampled at most oiled locations, while the concentrations in shallow subtidal sediments (3-20 meters) remained about the same, or in some cases, rose slightly. Patterns of sediment toxicity to test organisms (marine amphipods and larval bivalve molluscs) reflected similar patterns.

In 1990, significant toxicity was associated only with intertidal sediment samples from heavily oiled sites, but in 1991, toxicity was associated primarily with sediment samples from the shallow subtidal zone. The toxicity of sediments from oiled sites was generally greater than that from unoiled reference sites in both 1990 and 1991. Final interpretation of sediment toxicity will require data on hydrocarbon chemistry and grain size of the sediments (expected from Technical Services Study Number 1). These analytical data are now available for 1989 and 1990, but have not yet been analyzed in detail; data for 1991 are not yet available.

The study determined the extent to which any toxicity present in oiled sediments and interstitial waters may be attributed to polar oxidation products (as opposed to parent hydrocarbons) in petroleum. Intertidal sediments and interstitial waters from oiled and reference sites in Prince William Sound were extracted and separated into polar and nonpolar fractions, and the fractions were tested for relative toxicity. Polar fractions from most

heavily oiled sites exhibited toxicity similar to that associated with the nonpolar fractions, but this toxicity was detectable only at very high concentrations. A draft final report on these tests is expected in March 1992. Extracts of mussel tissues from oiled and unoiled sites were chemically fractionated into nonpolar and polar constituents and analyzed by ultraviolet fluorescence spectroscopy. Polar constituents occurred in mussel tissues from oiled sites at levels that were proportional to, or less than proportional to, the amounts present in the original parent oil simultaneously accumulated in the tissues. These analyses have verified that toxicity associated with oiled sediments may arise in part from polar constituents and/or metabolites; however the toxicity levels associated with polar and nonpolar constituents were generally similar for all of the endpoints tested.

Relevant literature and data have been identified and assembled for the petroleum budget (objective c above), and a synthesis workshop still is recommended as an important step in completing this synthesis task.

No new field work is proposed under this project, and a final report will be prepared at the end of the year on all aspects of the projects. The synthesis and integration of data and information of the fate of the spilled oil through time will provide essential context for the interpretation of initial injury to, and subsequent recovery from the spill.

	BUDGET (\$K)
Salaries	\$ 29.0
Travel	15.0
Contracts	4.0
Supplies	0.0
Equipment	0.0
Subtotal	<hr/> \$ 48.0
General Administration	4.6
Total	<hr/> \$ 52.6