



Project Summary

Petroleum Contamination: Quantification and Passive Tagging in Organisms and Sediments

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The Woods Hole Oceanographic Institution is engaged in various aspects of research in the coastal and deep ocean, including the study of environmental problems that result from man's activities. The results reported here demonstrate the analytical difficulties encountered when attempting to measure anthropogenically-derived hydrocarbons at concentration levels close to the levels of naturally occurring hydrocarbons. This report describes an analytical area in a state of flux, one in which methodological improvements are being made continuously.

This report was submitted in fulfillment of Grant No. R-802724 by Woods Hole Oceanographic Institution under the sponsorship of the U.S. Environmental Protection Agency. This report covers the period July 1, 1973 to February 28, 1976, and work was completed as of January 1979.

This Project Summary was developed by EPA's Environmental Research Laboratory, Narragansett, RI, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Petroleum and petroleum products are being used in increasing amounts,

and the trend is forecast to continue for at least two decades. Even with the application of new technology and greater care, there will be accidental spills of petroleum and small leaks in the production, transportation, and disposal systems. Federal agencies such as the EPA need analytical methods for monitoring and investigating the geographical extent of such spills and leaks. Evaluation of the reliability and limitations of analytical methods is important and helps to insure valid interpretation of chemical analyses for petroleum hydrocarbons. In this project, some aspects of the problems of analyzing for low concentrations of petroleum in organisms and sediments are dealt with (1 to 10 ug/g wet weight organism or 1 to 10 ug/g dry weight of sediment). A brief investigation was also made of the use of some passive tagging measurements to correlate the low concentrations of petroleum with possible sources.

Petroleum pollution in the oceans caused growing concern in the late 1960's and early 1970's and required a variety of studies on the input, fate, and effects of petroleum in the marine environment. The need to have adequate methodology to measure one to one hundred parts per million (wet weight) of petroleum pollution in organisms and similar concentration levels in sediments was recognized

early in those studies. The authors began research on some aspects of this measurement problem. The problem was approached by first thoroughly reviewing available knowledge of naturally occurring biosynthesized hydrocarbons and the composition of petroleum and petroleum products. Experiments and evaluation tests were then designed in the laboratory and in the field for the development of methods to detect petroleum hydrocarbons at various levels in the presence of biosynthesized hydrocarbons in organisms and sediments.

Conclusions and Recommendations

A review of hydrocarbons in the marine environment is presented in the report with the goal of providing a background for evaluating methods for the measurement of petroleum pollution in marine organisms and sediment. Comparisons are made of extraction, isolation and measurement procedures applied to hard shell clams (*Mercenaria mercenaria*) and near-shore and estuarine sediments. Gas chromatographic, gas chromatographic-mass spectrometric, and U.V. fluorescence techniques were used to analyze the hydrocarbons isolated by these procedures.

The analytical procedures were applied to surface sediments from the continental slope, shelf, and near-shore areas of the northeastern United States. The extent of chronic petroleum contamination was estimated as was the historical record of petroleum

contamination in selected areas via depth distribution measurements in sediment cores.

The extent of chronic petroleum contamination in selected areas via depth distribution measurements in sediment cores.

The methods were also applied to intertidal marsh sediments from areas

contaminated by two different No. 2 fuel oil spills. The absolute concentration changes and relative composition changes in aromatic hydrocarbons are reported for time intervals of six years after one spill and two years after a second spill. The influence of weathering processes on a few passive tagging parameters was also investigated.

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The complete report, entitled "Petroleum Contamination: Quantification and Passive Tagging in Organisms and Sediments," (Order No. PB 82-254 087;

Cost: \$15.00, subject to change) will be available only from:

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