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Concentrations and Distribution of Oil Pollutants in McNabs Cove, Halifax Harbour, Nova Scotia by CREIGHTON D. BRISCO, Department of Geology, Dalhousie University, Halifax, Nova Scotia.

Introduction

This study examines factors influencing the distribution of oil in a nearshore marine environment where there is continuous oil pollution. Von Borstel (1974) studied the occurrence and distribution of oil on Maughers Beach situated in McNabs Cove, a sheltered area in the outer part of Halifax Harbour. He found that oil on the beach occurred as weathered particles of oil, oil-sediment aggregates, partial or complete coatings on sand grains, and as matter in suspension or solution in groundwater. He demonstrated that particulate oil was winnowed from the beach, presumably to be deposited offshore.

Thirty-three sediment samples were collected in McNabs Cove. There is mostly sand in water depths less than 6 m, silty sand and sandy silt from 6 to 20 m, and mostly mud in greater depths.

As semi-quantitative analysis of oil content was made using fluorescence analysis (Michalik and Gordon, 1971; von Borstel, 1974). Oil was extracted with n-hexane. Fluorescence analysis is specific for aromatic compounds, but these compounds are present in different amounts in different petroleum products, and also vary according to the degree of weathering. Separate determinations were made on three splits from each sample. Results are reported in the arbitrary scale of fluorescence peak height in centimetres.

Results

All the offshore samples contained aromatic hydrocarbons. This is in marked contrast to surface samples from Maughers Beach (von Borstel, 1974), in which 60% contained no trace of oil. No surface beach sediments had an average fluorescence peak height exceeding 15 cm, but 80% of the offshore sediments had average peak heights over 20 cm.

The highest concentrations of oil were found in nearshore sands with an average fluorescent peak height of 42 cm, compared with 33 cm for silts and 20 cm for muds. The nearshore sands also showed the greatest variability in concentration, both within and between samples.

Separation of samples into sand and silt-size fractions by means of sieving showed a higher ratio of oil to sediment in the silt-size range in nearshore sandy sediments, but in deeper-water silty and muddy sediments, the higher ratio was in the sand fraction.

Microscope examination of grain mounts showed that oil occurred as: (1) Tar-like fragments and rounded grains, consisting entirely of oil, and ranging in size from fine silt to medium sand.

This is the predominant type of oil in deeper water muds. (2) Composite silt-oil and clay-oil grains. Composite grains with medium and coarse silt are up to 1 mm in size, and the highest concentration of such coarse grains is nearshore: none is found in offshore muds. Clay and fine silt composites are found in almost all samples. (3) Coatings on organic material. Plant fragments are found in all the sediment samples, and are commonly coated with oil. Samples with abundant plant fragments commonly had above-average oil concentrations. (4) Coatings on sand grains are infrequent.

Discussion

Oil concentrations in offshore sediments are much greater than in beach sands. This substantiates von Borstel's (1974) suggestion that beached oil is continuously removed by wave activity. The greatest concentrations are in nearshore sands, in the form of agglutinated oil and silt particles, and oil-coated organic matter. The variability in oil concentration in this zone appears to be the result of varying amounts of oil-coated plant material. In offshore silt and mud areas, oil is mostly in the form of tar fragments, and is more evenly distributed. Sand-sized oil-sediment aggregates and tar fragments appear to behave hydrodynamically like quartz silt.

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References

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- VON BORSTEL, B.B., 1974, The physical behaviour of oil in sandy beaches, McNabs Cove, Nova Scotia. Unpublished M.Sc. thesis, Dalhousie University, Halifax, Nova Scotia.

State of the Geosciences in Canada - Press Release

"Every aspect of our present and future prosperity depends directly on the supply of mineral and energy resources and, hence on the geosciences. Probably no other group of disciplines will be so vitally important in the 25 years remaining in this century." These are the opening lines of a report on the geosciences in 1974 prepared by the Canadian Geoscience Council under contract to the Department of Energy, Mines and Resources. The report, first of its kind, was compiled from submissions on the various disciplines by the 12 member societies of the Council. It consists of three parts: (1) Analysis and recommendations; (2) The individual disciplines;

and (3) Funding and society activities.

A major recommendation applies to the current energy crisis and the declining rate of mineral discovery and calls on governments and industry to stimulate exploration, to ensure that scientists are not lost or redeployed from the Canadian scene, and to further encourage enrolment and research in geosciences in the universities.

The report notes that although a high level of activity is maintained there is lamentably little real excellence above the level of single individuals. Canadian geoscience is strong on data collection and analysis but weak in providing new conceptual models and syntheses. The probable explanation is too few people and too much territory and, hence, a preoccupation with non-innovative research to provide a minimum inventory. The Council notes that the geosciences receive only eight percent of National Research Council research grants and recommends that the Federal Government re-examine its grant priorities with a view to increasing both financial support and representation in the decision-making process by geoscientists. It is also suggested that centers of specialization and concentrations of equipment be implemented so that basic research in some aspects of geoscience is raised to the level of excellence.

The present transfer of responsibility for communication from governmental to non-governmental organizations has left the geosciences without direct influence within the Federal Government. Until the societies become strong enough to undertake this responsibility fully, the Council asks that the Department of Energy, Mines and Resources continue to play a major part in maintaining and fostering the health of geoscience disciplines.

It is noted that many important disciplines such as coal geology, marine geosciences, mathematical geosciences, paleontology, and experimental and igneous petrology are not yet well served by any national society. Geoscience societies are urged to form sections or divisions to take care of the needs of these specialist groups.

The report describes many bright spots in the Canadian geoscience scene. For example, Canada is world leader in geophysical instrumentation and prospecting methods, it has pioneered in seismic studies of deep mantle inhomogeneities, it has produced internationally renowned geological and geophysical maps, it is far advanced in data storage and retrieval and the production of colored geological maps by autocartography, studies of the Appalachian and Cordilleran mountain belts and their contained mineral deposits have attracted wide attention, the stratigraphy of the Devonian and Triassic systems has been unravelled and important contributions made to world understanding of these rocks.

However, there are many weaknesses to be rectified, such as: the lack of innovation in our isotopic age programs which is inconsistent with the magnitude of Canadian Precambrian Shield problems, the shortage of manpower at all levels in

geodesy, the urgent need for financing of university seismological research, the growing obsolescence of the country's marine science fleet and the need for marine geoscientists to communicate more frequently with colleagues at home and abroad, the need to participate much more vigorously in international offshore drilling programs and to become more aware of the implications of deep-sea mineral exploitation, the lack of a national center of applied geomathematics, and the need for a national system of recording economic mineral data in postgraduate theses which are identified as the single most important source of geological data in mineral deposits.

The Canadian Geoscience Council, which represents 12 geoscience societies comprising 9300 individual members, was formed in response to recommendations of the Blais Report to the National Science Council. Its prime responsibilities are to integrate the activities of its member societies and to monitor and report on the health of the various branches of geoscience.

The report is unique in that it represents a state of the art summary by non-governmental organizations commissioned by a federal government department. The report, edited by E.R.W. Neale, A.C. Clague, and H.R. Wynne-Edwards, was accepted by officers of the Department of Energy, Mines and Resources at a joint meeting with the members of the Canadian Geoscience Council on December 16, 1974. Although it is a Council report and its contents do not necessarily have the endorsement of government, the Geological Survey of Canada has offered to publish it in its Paper Series during the first half of 1975. It will be available free of charge to all those who request it.

For further information:

Dr. H.R. Wynne-Edwards
University of British Columbia
Vancouver (604) 228-5543