Environment Canada Environnement Canada

The Effects Monitor

Environmental Effects Monitoring Newsletter for the Atlantic Region

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Update on AQUAMIN

The Assessment of the Aquatic Effects of Mining in Canada (AQUAMIN) program has entered its final year. The multi-stakeholder process began in 1993 with the objective of making recommendations about:

- amendments to the Metal Mining Liquid Effluent Regultions (1977) and the federal regulatory framework for mining;
- the design of a national environmental effects monitoring program for metal mining;
- data gaps requiring further research.

For the past year, independent working groups have been conducting detailed assessments in the four geological regions of Canada. Their draft reports were submitted in April, 1995 and were discussed in some detail at a two day workshop held in Ottawa in early May. At that workshop, plans were made to form two new working groups. Working Group #7 will summarize the findings from the four regional working groups concerning aquatic impacts from mining operations and they will draft recommendations on the design of a national environmental effects monitoring program for metal mining. Working Group #8 will review the reports from the first six working groups and draft recommendations about amendments to the mining regulations and the overall federal regulatory framework. Both groups will identify any areas where additional research is required. The two groups will collaborate to produce the final report from the AQUAMIN program.

Both Working Groups #7 & #8 are made up of representatives from the mining industry, government and environmental groups. Their first draft report is due by October, 1995 and following several rounds of review, the final report is scheduled for completion by March 31, 1995. The AQUAMIN Final Report will be submitted to Environment Canada to provide guidance to the federal government on possible amendments to the Metal Mining Liquid Effluent Regulations.

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The Irving Whale Recovery Operation

In September, 1970, the barge ***Irving Whale*** sank in the Gulf of St. Lawrence about 60 kilometres northeast of North Point, P.E.I. The barge, loaded with 4200 tonnes of heavy bunker oil settled in 67 metres of water. Initially, oil leaked from the barge and formed a significant oil slick in the area. Oil reportedly washed ashore on the Iles-de-la-Madeleine, P.E.I. and western Cape Breton Island. The barge has continued to slowly leak oil over the past 25 years. It is estimated that some 1100 tonnes of oil has leaked from the barge since it sank. Generally this oil has been dispersed by natural processes but there have been occasional reports

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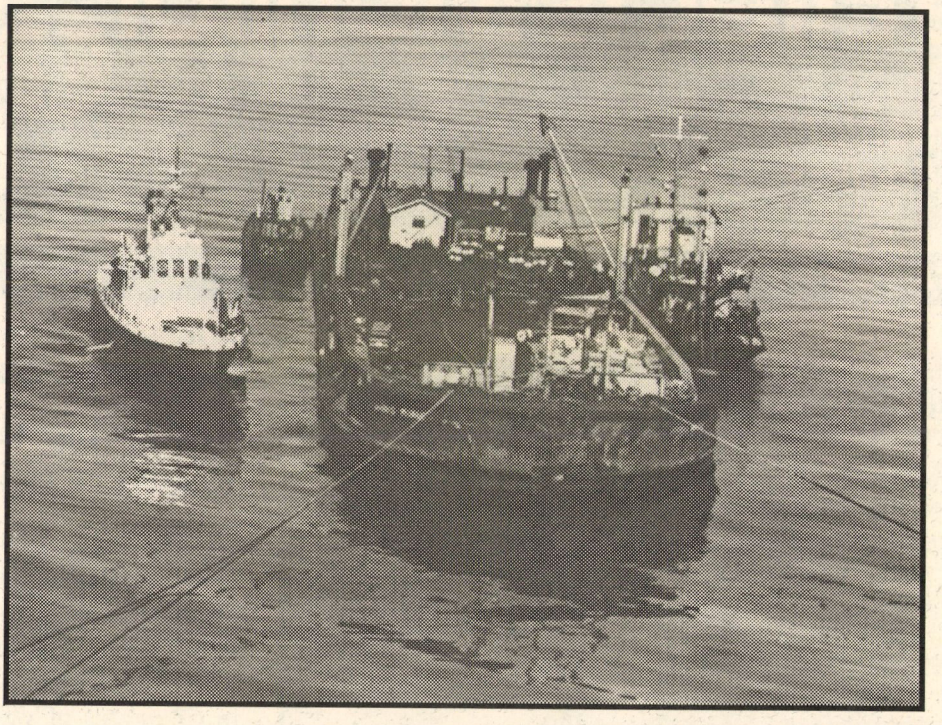
of oil reaching the shores of P.E.I. and the Iles-de-la-Madeleine. Concerns have been raised about a major leak of oil from the sunken barge and the impacts that it could have on the tourism and fishing industries.



During the summer of 1995, an operation to recover the ***Irving Whale*** will be undertaken as a pollution prevention measure. The recovery project will involve lifting the barge from the ocean floor using floating cranes and placing it on a submersible vessel or a floating drydock for transport to Halifax. The barge will then be transferred to a drydock facility where the remaining oil will be recovered. The Canadian Coast Guard is the lead federal agency for this recovery project; they will be supported by Environment Canada, the Department of Fisheries and Oceans, Heritage Canada and several provincial government departments. An environmental impact assessment of the Irving Whale recovery project was conducted.

A detailed contingency plan has been prepared for the ***Irving Whale*** recovery project by the Regional Environmental Emergencies Team (REET). There are two key facets to the contingency plan; a monitoring mode during the recovery project and a response mode should a serious leakage of oil occur while the barge is being recovered. Environmental monitoring plays an important role in both aspects of the contingency plan.

For the monitoring mode, observations and measurements will be made in several areas of concern. A weather buoy will be deployed at the recovery site throughout the operation to provide up-to-date and site specific information on winds, temperatures and sea state. Surface drifter studies and ship-based measurements will be undertaken to verify ocean currents in the area. Fisheries observers will document fishing activity in the vicinity of the sunken barge and Canadian Wildlife Service staff will undertake wildlife surveys prior to and during the operation. Environment Canada will undertake regular remote sensing with aircraft mounted sensors during the recovery process. Heritage Canada staff will conduct regular shoreline surveillance within the parks to watch for the presence of oil or oiled seabirds and volunteers, coordinated by the Prince Edward Island Emergency Measures Organization, will carry out beach watches in other areas. The Environmental Protection Branch of Environment Canada has prepared detailed resource maps which identify areas which would be sensitive to the effects of an oil spill and which will be continually updated as the monitoring information becomes available during the recovery operations.

Should a major spill of oil occur at any phase of the recovery project, the response mode of the contingency plan will be activated. The monitoring program described above would become more intensive and the weather and ocean current data would by used in oil slick trajectory models to predict where the oil might travel and what resources might be at risk. Shoreline Cleanup Assessment Teams would be deployed to conduct visual observations on impacted shorelines and to advise the REET about the priorities for clean up. Water column sampling would occur to determine the fate and effect of the spilled oil. Laboratory analyses of samples of oil from slicks, oil washed ashore, oil fouled fishing gear and contaminated seabirds would be conducted to confirm

the source of the contamination and determine liability. Research teams would be deployed to determine the impacts of the oil spill on wildlife and fisheries resources.

Although the marine salvage experts have assured the federal government that the ***Irving Whale*** can be recovered with a minimal risk of an oil spill, the contingency plan and its associated monitoring are in place to observe the project closely and to respond immediately to any upset condition that might arise.

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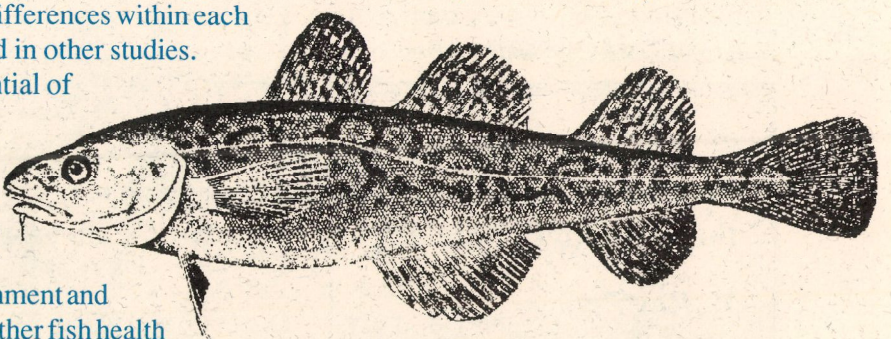
Biomonitoring of Maritime Estuaries

Stricter water quality guidelines and increasing concerns about potential impacts of contaminants on aquatic ecosystems have placed ever increasing demands on those agencies who must monitor the state of our freshwater and marine environments. The cost of monitoring at these levels can be astronomical. For example, a full suite of analyses for organic and metal contaminants in one fish can cost as much as $1800.00. The high cost of analyses, coupled with a climate of fiscal restraint and cutbacks, provides considerable impetus for the development of cost-effective monitoring methods.

A team of researchers at Gulf Fisheries Centre of the Department of Fisheries and Oceans (DFO) are exploring the feasibility of using two species of marine fish, Atlantic tomcod and smooth flounder, as sentinels to monitor effects from certain chlorine containing organic contaminants in Maritime estuaries. This project, funded by the DFO Toxic Chemicals Program, uses an enzyme system in the fish, known as cytochrome P4501A, to monitor the environment. Production of this enzyme increases when the fish are exposed to certain contaminants. The advantage of this type of monitoring system is that it responds to very low levels of contaminants and it is relatively inexpensive (about $40.00 per fish) to analyze the samples. In addition, because fish are effectively being used to go out and sample the environment (as opposed to having humans taking sediment and water samples), these researchers are measuring the presence of a contaminant that is actually biologically available in these estuaries.

The biomonitoring program samples tomcod and flounder from five Maritime estuaries in the spring and the fall. Three of these estuaries, the Restigouche, the Miramichi and Pictou Harbour have operating pulp mills located on them. The other two sites, the Margaree and the Kouchibouquac, have no appreciable industrial input. Preliminary results are promising, with sex of the fish and time of year differences within each river estuary that are consistent with those found in other studies. Final analyses will allow evaluation of the potential of the enzyme system of these fish as a biomonitoring tool applicable at many sites over a longer period of time.



In addition to measuring cytochrome P4501A, the researchers, in collaboration with other government and university laboratories, are measuring a suite of other fish health indicators. These include measuring reproductive hormone levels, determining egg sizes and counts, calculating reproductive and liver indices, assessing growth parameters, microscopically examining selected organs, measuring vitamin levels and determining the presence of parasites. The project is approaching its fifth sampling period and opportunities exist for further collaboration. If other laboratories are equipped to measure some aspect of fish health or contaminant effects, samples can be provided from either new or archived material.

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Landfill Leachate Toxicity Studied

As a follow-up to a 1989 investigation into the acute aquatic toxicity of landfill leachate from the Highway 101 Landfill in Sackville, N.S., the Environmental Protection Branch of Environment Canada conducted a study in 1993-94 to determine whether discharges from that landfill were having long-term biological effects on the Sackville River. The study was designed with three main components: an acute and chronic toxicity assessment of the landfill leachate and of the water in the Sackville River; chemical characterization of the leachate and river water; and an ecological investigation of the effects of leachate discharges on benthic invertebrates in the river.

Samples collected for toxicity assessment were not acutely toxic to rainbow trout, water fleas and bacteria. There were no detrimental effects on the survival and reproduction of water fleas, although a slight effect on reproduction was detected in river water at the control station (700 m upstream). Moderate toxicity to algae was detected at the control and at station 2 (40 m from the outfall), while only marginal toxicity or no effect was detected in the actual leachate and at station 1 (30 m from the outfall). Ames tests revealed no mutagenic or cytotoxic effects from the leachate or from river water from stations 1 and 2; the control sample was slightly cytotoxic however.

From an aquatic toxicity standpoint, the above results indicate a substantial improvement in the quality of the leachate, when compared to the 1989 results. That study found that the "treated" leachate from the settling pond outlet was highly toxic to rainbow trout and brook trout and was moderately toxic to water fleas. The 1993 samples were not acutely toxic and did not exhibit significant sublethal effects. Toxicity identified in 1993 was most often associated with the upstream control station, substantiating the 1989 conclusion that the landfill leachate discharge may actually have a moderating effect on the river's natural toxic potential.

Ecological investigations of the impact of the leachate discharges on benthic macroinvertebrates in the Sackville River revealed that the discharge had a localized impact on the aquatic environment. In general, diversity of organisms decreased at stations closest to the outfall (stations 1 and 2) but had recovered by stations 3 (50 m downstream) and 4 (1 km downstream). Pollution tolerant organisms, such as bloodworms, were extremely abundant close to the outfall while pollution intolerant organisms, such as mayflies, were present at the control site and at stations 3 and 4 but were absent close to the outfall. The landfill discharge appears to have a localized impact near the outfall, but by 50 m downstream, the conditions are approaching those upstream of the discharge point.

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The Effects Monitor will be published quarterly by Environment Canada, Atlantic Region. Anyone interested in receiving a copy of the newsletter, submitting an article for the newsletter or making any comments or suggestions, should contact:

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