



Coastlines

NEW YORK STATE SEA GRANT PROGRAM AND MARINE SCIENCES RESEARCH CENTER

Vol. 2 No.2

May 1972

LESSENING POLLUTION FROM OIL TANKERS

Jose Femenia, Engineering Dept., SUNY Maritime College, has achieved a breakthrough in his Sea Grant project of developing an inexpensive shipboard oil-water separation system. A major source of oil pollution is the current practice of flushing out tankers at sea before taking on another type of cargo. Even though the amount of oil discharged with the wash-water may be only one-tenth of one percent of the ship's cargo, on a typical modern 300,000 ton tanker this could be 300 tons of oil. Probably more than five million tons of oil is released in this way each year.

Femenia's cleaning method recovers the oil, using the water-injection cleaning apparatus already on board. The shipowners will have every incentive to use his method, because it saves money. Under the present system, the tanker has to either reduce speed considerably during cleaning operations, or carry extra heavy-duty boilers to get up enough steam to heat all the seawater required. With Femenia's method the wash-water is reused with less heat loss than normal.

There is a strong possibility that "intentional" pollution by flushing out tankers will be banned in several years by international agreement. Femenia's system would then save the expense of keeping a thousand tons of cleaning water and sludge on board and pumping it ashore, and building special shore-based facilities to dispose of the oily waste.

At present industry is doing something to alleviate the situation. Large international companies use the "load on top" method. The sludge and water

are left until the water can be skimmed off. If done properly, pollution is minimal, but the method is still susceptible to human error.

Femenia's separation system functions for the moment in a glass aquarium-like scale model, which will compensate for shipboard rolling and pitching. There is a possibility that his invention may be patented.

MARINE ADVISORY COUNCIL MEETS

The Marine Advisory Council of the N.Y. State Sea Grant Program met at the MSRC on April 25, to determine procedure for advising the Sea Grant Program Director during program formulation for the second year. The proposals, which are already in the first stage of preparation, will be reviewed at the next Council meeting at the end of this month. Council members, who represent sporting, commercial, local government and civic groups "using" the marine environment, will set priorities against which to review projects proposed for funding in the next few years. The Chairman of the Marine Advisory Council is Mrs. Claire Stern, who is also Executive Director of the Long Island Environmental Council and head of the Sierra Club Task Force on Long Island Sound. Mr. Thomas Dyer, Metropolitan Water Board and Eastern Oswego Basin, Chairman of the Great Lakes Advisory Council, Dr. Bruce Wilkins, Advisory Service Program Leader and Dr. Donald F. Squires, Sea Grant Program Director, also attended the meeting. On May 22 the Great Lakes Advisory Council will meet at Syracuse.

FIRST ADVISORY SERVICE CONFERENCE

New York State Sea Grant Advisory Service held its first conference on May 10 at Oswego. The topic was "Power Plant Siting in New York State," in response to the expressed need of the Cooperative Extension agents. Speakers included Public Service Commissioner Joseph Swidler, Dr. Vance Sailor of the Brookhaven National Laboratory, and staff of SUNY. Among the groups represented in addition to Cooperative Extension were the Wayne County Economic Development Corporation, the Oswego County Planning Staff, the St. Lawrence-Eastern Ontario Commission, and the Black River-St. Lawrence Economic Development Commission. Discussion centered on potential problems and concerns about siting of proposed power plants in New York, regulatory and fiscal constraints on siting, potential solutions, and the basic assumptions of different viewpoints. The conference was organized by Dr. Bruce Wilkins, Advisory Service Program Leader.

OIL SPILL DISPERSION

How fast will oil spilled at sea disappear through natural processes? According to the published literature it should take 30 to 40 days. Actual observed disappearance time, however, is often only 3 to 4 days. Dr. Edward Baylor of the MSRC set out to discover the mechanism most likely to account for this tremendous discrepancy. The prime candidate was the process called Langmuir circulation, which by downwelling of the surface waters would pull the oil beneath the surface and might cause it to sink. Sinking would occur where there was enough debris in the water to act as ballast, or if the cooler sub-surface water increased the density of the oil enough to make it heavier than water.

Dr. Baylor experimented with No. 2 fuel oil (household heating oil) in a laboratory tank designed to simulate gentle wave action. It became clear that disappearance by evaporation would not be aided by sinking unless the water was unusually full of debris, because No. 2 fuel oil is much less dense than water. Sand added to the tank to simulate offshore

conditions did not trap much oil.

Dr. Baylor then simulated a breeze of 15-20 knots, by aerating the water in the tank. The oil in the aerated tank disappeared from the surface 10 times faster than with the evaporation experiments. A breeze of this force, producing whitecaps, drives bubbles twice as deep into the water as the height of the breaking wave. The bursting bubbles eject droplets into the air, in this case a mixture of oil and seawater. This bubble-ejection mechanism increased the rate of loss of oil from the surface of the laboratory tank by a factor of 10.

Oil which disappears from the sea surface in this way is subject to photo-oxidation and becomes smog, eventually changing to CO₂ and water. Or the seawater part of the droplet can evaporate, leaving salt crystals and oil which act as condensation nuclei to form a cloud. Eventually only a thin invisible and harmless film of oil returns to the sea.

Dr. Baylor is now working on the second part of his Sea Grant oil spill project: prediction of the speed of the oil spill and the direction in which it moves.

MARICULTURE IN NEW YORK STATE

Mariculture, farming the sea, is a favorite topic for magazine articles but, with a few important exceptions, mariculture does not yet exist in this country beyond an experimental scale. We are still in the food-gathering or hunting stage. What can the New York State Sea Grant Program do, in the next few years, to assist significantly in the growth of a viable mariculture for New York? Dr. Orville W. Terry, MSRC, is principal investigator for a Sea Grant mariculture research project whose goal is to answer this question.

New York State, specifically Long Island, is fortunate in having one significant mariculture industry already in operation. This is of course the long established shellfish culture business, traditionally based on oyster production but now seriously considering other species (such as hard clams, lobsters, scallops, bait worms, trout and salmon) as a supplement or perhaps eventually an alternative to oyster culture. Sea Grant can add to the substantial research programs already supported by

veral oyster companies.

In a rapidly advancing field such as mariculture the information lag is especially serious. One promising area for Sea Grant is improved communication of research information.

Sea Grant therefore supports visits by Dr. Terry to a number of research locations where work of potential interest to the New York industry is being carried on. In St. Petersburg Dr. Terry visited the National Marine Fisheries and the Florida Department of Natural Resources and attended the annual workshop of the World Mariculture Society. He saw oyster, pompano, bait worm and red algae projects. The red algae known as Irish moss is the source of carrageenan, a stabilizer used in convenience foods and pharmaceuticals, and a multimillion dollar industry. Dr. Terry plans to begin an Irish moss research project this summer at Cedar Beach, Southold, L.I.

The Massachusetts state lobster hatchery on Martha's Vineyard, where John Hughes has been successful in raising larvae to the stage when they walk around, was the second stop on Dr. Terry's itinerary. Raising juvenile lobsters is still difficult because of cannibalism and feeding problems. An effort to solve the problem of raising juveniles is under consideration for New York State Sea Grant. Hughes has already demonstrated that the normally 7-8 year growth period to maturity in waters like those of Long Island can be reduced by 50 percent in warmer water.

Dr. Terry is going to the University of Washington Sea Grant office, the National Marine Fisheries Laboratory and the Lummi Indian reservation aquaculture enterprises in Washington State, to discuss salmon growing and uses of thermal pollution. New York's mariculture program will probably include a demonstration of salmon or trout raising in tanks supplied by saltwater wells. Saltwater intrusion, a problem in a location such as Long Island which relies on ground water for its drinking supply, can here be used beneficially. The salt water filtered by soil is relatively unpolluted and almost free of organisms. The temperature remains at 50-55° F. year round, ideal for salmon raising. Thus

one financial difficulty, maintaining water at proper temperature with expensive heating and cooling equipment, is solved. The investigation of other financial and legal problems associated with mariculture as a multi-disciplinary team effort is under consideration for the coming Sea Grant year.

POLLUTION ABATEMENT IN LAKE ONTARIO

J. George Bocsor, a graduate student at SUC/Oswego, and Dr. John H. Judd, Coordinator for Great Lakes Research, N.Y. State Sea Grant Program, presented a paper at the Fifteenth Conference on Great Lakes Research held in Madison, Wisconsin. The title was "Effect of Paper Plant Pollution, and Subsequent Abatement, on the Littoral Macro-invertebrate Community in Lake Ontario; Preliminary Survey."

The paper dealt with changes in the animal populations living on the lake bottom near Hammermill Paper Company, just east of Oswego. The lake has been receiving paper mill wastes for many years. Wastes are now carried to the secondary treatment plant in Oswego. Since the study has been in progress for several years, the researchers were able to provide "before and after" information relevant to other such pollution-abatement efforts. Although all the wastes were not removed until October 1971, Bocsor and Judd have already found changes in the populations of animals. It appears that the once polluted area of Lake Ontario shoreline is returning to natural lake conditions. This work was sponsored in part by the New York State Sea Grant Program.

HELICOPTER ON ICE

Dr. Kenton M. Stewart, Biology, SUNY/ Buffalo, has completed his first winter series of helicopter studies of Lake Erie's ice thickness and thermostructure. Surprisingly, in view of the notoriety of the Lake's pollution, relatively little is known about conditions under the Lake in winter. Lake Erie is one of the few Great Lakes to freeze over completely almost every year, and this kind of winter research is expensive and risky. In the past several years aerial reconnaissance flights have been carried out by the U.S. Coast Guard in conjunction with studies

by the U.S. Great Lake Survey, mapping ice conditions for the Great Lakes Ice Atlas (1969). The Canadian Centre for Inland Waters made one survey using a Bell Hover Craft, but the Hover Craft required the assistance of a helicopter to radio information about ice conditions. Dr. Stewart decided to use a pontoon-equipped helicopter, capable of landing on either ice or water.

Although the lake froze over later this year than usual, Dr. Stewart was able to complete four trips of two to three days each. The biggest risk was breaking through the ice and cutting the pontoons. If this happened, water would pour in and the helicopter might sink, Dr. Stewart explained matter-of-factly. On the last trip there was an additional problem: a haze over the lake, and such smooth water that it became impossible to see where sky ended and water began. To avoid nose-diving into Lake Erie, they were forced to turn back.

Dr. Stewart drilled through the ice at over 150 stations along the entire length and at several points across the width of the lake, to provide data on ice thickness and water temperature. Dr. E.W. Marshall of the U.S. Lake Survey, a noted ice authority, told Dr. Stewart that in his opinion the information gathered this way is the most detailed ice data available on Lake Erie. Water samples for chemical and biological analysis were taken on some of the trips, whenever Dr. Stewart was able to charter a helicopter large enough to carry the water samples.

The data on basic thermal structure, circulation patterns, and biological and chemical variations during this winter period will have implications for municipal effluent discharges. The project is funded by Sea Grant.

SEWAGE OUTFALL STUDY

The Marine Sciences Research Center has signed a contract with Bowe, Walsh and Associates to provide baseline data for study of the effects of a sewage treatment plant outfall. The secondary treatment plant, discharging 30 million gallons a day, will be built at Fleet Point (on the south shore of

Long Island near Babylon) for the Suffolk County Department of Environmental Control by the Huntington, L.I. engineering firm. The outfall pipe will be buried in a trench, with the release end at a 50-foot depth two miles offshore. The study is designed to predict the environmental impact of construction and operation of the outfall on the waters and marine life in Great South Bay and offshore in the Atlantic, and to provide data for management decisions on design and operation.

Great South Bay has an \$8 million hard clam industry which is dependent on maintenance of high water quality. Major recreational beaches are located in the Bay and on the Atlantic coast; sport and commercial fishing are important in the area.

The \$185,000 research program at MSRC is under the direction of Acting Director M. Grant Gross, with Edward Baylor as Co-Principal Investigator. Field work will emphasize the summer months, when biological activity in estuaries and coastal waters is most intense and environmental problems are most commonly observed. Offshore bottom topography will be studied to determine how deeply the pipeline must be buried to prevent exposure after a period of severe erosion.

Based on current and wind studies, a mathematical model to predict movement and dispersion of the effluent plume from the outfall will be prepared by HydroScience of Westwood, N.J. Longer term movements will be predicted by drift studies, using aerial photos of dyes released on the surface waters.

Chemical analyses of heavy metals, pesticide concentrations, and inorganic dissolved nitrogen will be made by E.G.&G. Environmental Services of Waltham, Mass. to identify potential problems. Sediment analyses, studies of primary production and biochemical oxygen demand, benthic organisms zooplankton and macrophyte will be made for their implications for fishes and shellfish in the area. Microbiological studies of phytoplankton and bacteria will be done for the MSRC by Dr. Joseph M. Cassin, Institute of Marine Science, Adelphi University.

The study was designed following a literature survey by C. Douglas Hardy and M. Grant Gross. The survey will be published

as a MSRC technical report.

SALINITY STUDY OF NEW YORK HARBOR

An important aspect in developing a management model for Long Island Sound is determining the transfer of pollutants from the East River into the western end of the Sound. Because of the complex tidal circulation around Manhattan Island, it is difficult to make quantitative estimates. To help study this problem, the MSRC carried out a detailed study, supported in part by Sea Grant, of the salinity variation in New York Harbor during one tidal cycle on April 8. The study was organized by a graduate student, David Jay, in the Marine Environmental Studies Program, with the advice of Professors Bowman and Weyl. Many student volunteers and city, state, interstate and federal agencies cooperated in this study. Water samples were collected every half hour through the tidal cycle from 8 ships and 16 land stations distributed from the Narrows at the South to Execution Rock in Long Island Sound and to the confluence of the Harlem and the Hudson Rivers. In spite of unseasonably cool weather during the period of observation, a very large number of water samples were collected. Once they are analyzed, they should give an excellent picture of the tidal exchange of water between the Hudson, the lower harbor and Long Island Sound.

A management model for the western end of Long Island Sound is required by governmental agencies such as the Dept. of Environmental Conservation and the Public Service Commission of the State of New York, and federal regulatory agencies, to predict the environmental effects of proposed developments. The model will aid these agencies in protecting the environment and in evaluating the relative merits of alternative developments. The management model is a Sea Grant project under the direction of Dr. Peter Weyl.

ADVISORY SERVICES BOOKLET ON SEA GRANT

An extensive discussion of the Sea Grant Program emphasizing the Advisory Service in New York and other states is now available. The 61-page proceedings

contains most of the material presented in a February training school sponsored by Cooperative Extension and the Cornell University Water Resources and Marine Sciences Center.

Compiled by Lyle Raymond, the materials describe Advisory Service efforts in Oregon and Rhode Island, and discuss New York expectations.

Interesting inclusions are the Sea Grant Colleges and Marine Science Development Act, and a listing of all New York Sea Grant research projects. Copies of "The Sea Grant Program in New York State with Emphasis on the Marine Advisory Service" can be obtained by writing Mr. Lyle Raymond at Cornell University Water Resources and Marine Sciences Center, 468 Hollister Hall, Ithaca, N.Y. 14850.

SMALL GRANTS FOR ADVISORY SERVICE

Cooperative Extension agents in New York were notified in late April that up to \$150 was available for use in furthering local educational efforts related to Sea Grant Advisory Service. Bruce Wilkins, Advisory Service Program Leader, noted that this is part of a continuing effort to achieve Sea Grant objectives through use of existing agencies and organizations whenever possible.

The small sum can be used for purposes such as preparing local informational leaflets, printing programs for a meeting or hiring a bus for a local tour. Requests from Cooperative Extension staff for grants should be directed to Dr. Bruce Wilkins, Sea Grant Advisory Service, Fernow Hall, Cornell University, Ithaca, N.Y. 14850.

FILM TO FOLLOW

A 16 mm. sound and color film on New York's Sea Grant Program is scheduled for completion by September 1. The film is intended to help leaders and potential users understand how New York's Sea Grant institution is organized, the initial priority research areas, and how the Sea Grant Advisory Service can serve the viewer.

Planning boards, service clubs, college students and similar groups will find this explanation of New York's Sea Grant Program particularly helpful. Richard Turner and

Todd Caso of the Department of Communication Arts in the N.Y. State College of Agriculture and Life Sciences at Cornell University are making five prints that should permit your ready access to this first New York Sea Grant film.

LEIBOVICH SEA GRANT PUBLICATION

The first publication of research assisted by the New York State Sea Grant Program appeared in the Journal of Geophysical Research, Vol. 77, No. 9, March 20, 1972. The title of the article by S. Leibovich and D. Ulrich, Department of Thermal Engineering, Cornell University, is "A Note on the Growth of Small-Scale Langmuir Circulations."

Langmuir circulations are the most important kind of sea-surface circulation. They appear as streaks or windrows which are readily visible features on the surface of lakes and the ocean on most windy days. The article is the first published result of Professor Leibovich's Sea Grant research project. He is studying these wind-driven, organized convective motions in the upper layers of oceans and lakes from a theoretical point of view, by mathematical modeling.

Despite its importance, the Langmuir circulation process is not yet understood. Understanding it is important not only to meteorologists and oceanographers but also to planners. It controls the energy exchange between atmosphere and surface waters which controls the weather. Mixing in the upper layers determines the rate at which nutrients and other contaminants introduced at the surface are dispersed through the main body of water. Predictions based on knowledge of the mixing process in surface waters will enable planners to make intelligent decisions on where and how much waste materials can be dumped.

SEA GRANT SUPERPORT STUDIES

MSRC scientists have been asked to make a study of the environmental impact of a superport facility in the Raritan Bay area as an additional \$25,000

Sea Grant project for this year. The report, to be presented to Sea Grant on October 15, 1972, was requested by the President's Council on Environmental Quality, and will be integrated with similar reports by Texas A & M, Massachusetts Institute of Technology, Louisiana State and Delaware Universities.

MSRC scientists will assess existing conditions and make predictions on effects of construction, operation, and a hypothetical major oil spill and a series of small oil spills.

New York Harbor is not deep enough to accommodate the new generation of deep-draft bulk carriers. New port facilities in the area will obviously be required. The New York region has a long history of deterioration from a variety of causes. It is therefore important to establish the existing condition and its rate of change prior to construction of a new port facility.

Existing oceanographic conditions, marine life and general water quality will be investigated by collecting available scattered data and making extensive computer analyses. In making predictions for effects of oil spills, MSRC scientists will be able to apply the results of Dr. Baylor's Sea Grant project discussed on page 2. Dr. J.L. McHugh will act as Principal Investigator; Dr. Baylor is Associate Investigator. Other MSRC scientists will be associated with the project, and much of the data gathering will be done by graduate students in the Marine Environmental Studies Program of the MSRC.

SUNY SUMMER COURSES IN MARINE SCIENCE

The Dept. of Botany and Physiology, SUC/Oswego, led by Prof. Norman J. Gillette, will hold its annual summer course in Tropical Botany and Tropical Zoology, using the SUNY facility of the Discovery Bay Laboratory, Jamaica, West Indies.

Corning Community College has a 4-credit course, "Man in a Water Environment," June 26-July 21. For information contact Prof. Gee, tel. (607)-962-9242.

Address change: Dr. John Judd, Coordinator for Great Lakes Research, SUNY College of Arts and Science at Oswego, 30 Sheldon Hall, Oswego, N.Y. 13126. tel: (315)-341-3042.

Coastlines is available free of charge from: Ellen Arel, Editor, New York State Sea Grant Program, J-143, SUNY/Stony Brook, N.Y. 11790