Sea Grant National

Program Impacts

NEW YORK

Theme: **COASTAL NATURAL HAZARDS**

Title: **Numerical Modeling of Flow and Scour at the Vicinity of a Coastal Structure (R/CCP- 9)**

Statement : **Breakthrough Sea Grant research has created a new tool for estimating scour in the coastal environment, giving managers a better measure of the potential damage to coastal structures. This project conducted important work to synthesize present knowledge of scour mechanisms in the coastal environment and developed a numerical model that can be used by engineers to estimate the potential scour in the vicinity of a coastal structure. The advancement of scientific knowledge in this area of coastal sediment transport is significant. The team's approach has started a new paradigm in sediment transport research that incorporates using numerical models like this tool in addition to experimental approaches. The research has also served as an impetus for experimentalists to develop better instruments to measure the sediment particle velocity and fluid velocity in the sheet flow region. The numerical model is being used by researchers in Florida and the UK; Taiwanese researchers are using it to investigate the transport process of sediment from a river mouth to the continental shelf.**

Program Impacts

Theme: **ECOSYSTEMS AND HABITATS**

Title: **New Approaches for Assessing Mutagenic Risk of Contaminants in the Long Island Sound Environment (R/CTP-30)**

Statement :

Sea Grant researchers have adapted a cutting-edge biomedical technique to test for the mutagenic potential of coastal sediments. The benthic sediments in urban habitats represent a reservoir of persistent contaminants that may pose a threat to both ecosystem and human health. To help evaluate these risks, testing approaches are needed that assess both acute mortality and potential chronic effects that may reduce the fitness of affected populations.

Using a strain of fish embryos carrying a specific gene developed for biomedical research (the Japanese medaka, Oryzias latipes, carrying a lambda cII transgene), researchers tested for the mutagenicity of a large number of sediment samples collected around metro New York and Long Island Sound (LIS). This was a novel use of a biomedical research tool to directly evaluate the mutagenicity of mixtures of contaminants in sediment samples. Results of the project provided baseline information on cytotoxicity and mutagenicity of a relatively large number sediment samples collected around LIS. This approach allows whole sediments to be assessed directly without chemical modification. Through direct contact with the sediment, the embryo accumulates only the bioavailable fraction of contaminants associated with the sediments. Thus, this method allows both environmentally and physiologically realistic exposure scenarios.

Based on this work, the lead researcher was awarded a major grant from the National Fish and Wildlife Foundation (NFWF) to study the combined effects of endocrine mimics and hypoxia on aquatic organisms using fish embryos to meet the objectives of the Dissolve Oxygen Benefit Fund. The aim of the NFWF project is to use molecular tools to develop a relatively rapid and inexpensive assay to discern the separate and combined effects of hypoxia and endocrine mimics in urban estuarine systems. New methods and rapid assays will lead to better management practices to mitigate effects of sewage loadings.

Program Impacts

Theme: **ECOSYSTEMS AND HABITATS**

Title: **Monitoring of Bottom Water and Sediment Conditions at Critical Stations in Western Long Island Sound (R/CMC-7)**

Statement : **Sea Grant researchers discover the geochemical factors that are key to the future management of Long Island Sound, one of the nation's most economically and environmentally significant estuaries**

Research results show that hypoxic conditions in western Long Island Sound (WLIS) are actually controlled by different processes at different times of the year. For the first time, a sediment geochemical control on bottom water chemical conditions has actually been documented in the Sound. This represents an important control on bottom water chemistry that is not accounted for in present water quality models of LIS. IMPACT: The results of this research point to the necessity to carefully monitor yearly inputs of organic matter to the sediments of WLIS, in conjunction with surface and sediment temperatures, and benthic community development, in order to formulate a management plan that may allow for the existence of some commercial fishery in WLIS. More importantly, these factors and their products (sulphide and ammonia released from sediments, bottom water and water column hypoxia and anoxia, sediment-oxygen demand, stratification) need to be monitored and results used to form the basis of a management plan for WLIS in an effort to prevent WLIS from becoming a dead zone akin to that which exists in the Gulf of Mexico at the present time.

Program Impacts

Theme: **COASTAL COMMUNITIES AND ECONOMIES**

Title: **Influence of Diet on Safety During Water Activities (R/DP-6)**

Statement : **Myth-busting Sea Great research has demonstrated to the Navy that eating carbohydrates rather than fasting before diving increases the safety of breath-hold divers. The familiar childhood admonition of not swimming after eating has led to the common practice of fasting before engaging in water sports and breath-hold diving, especially among professionals. Recent Sea Grant research results show that fasting divers risk losing consciousness. This research team measured the breath holding ability of test subjects after differing fasting times and after fasting followed by carbohydrate intake. Results show that divers may get closer to hypoxic loss of consciousness when breath holding is performed in a fasting state and that carbohydrate intake reduced the risk of losing consciousness. Researchers concluded that when doing sports that involve underwater breath holding, people should maintain good carbohydrate stores because high fat oxidation and low glycogen supply resulting from fasting alter CO_2 production. Results that were presented to scientists, the breath-hold diving community, and Navy commanders and personnel, led to the organization of a symposium on breath-hold diving in conjunction with the Undersea and Hyperbaric Medicine Annual Meeting in 2006 and the start of a shift away from fasting by breath-hold divers.**