NEW ENGLAND ESTUARINE RESEARCH SOCIETY

ABSTRACTS

SPRING MEETING

Thursday 20 May 1999 - Sunday 23 May 1999

Oak Island Inn

Western Shore, Nova Scotia

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EFFECT OF BAITWORM DIGGING ON THE SOFT-SHELLED CLAM, *MYA ARENARIA,* IN MAINE

Experiments conducted during the fall of 1997 and spring of 1999 on intertidal flats in Maine determined the extent of shell damage and exposure of the soft-shelled clam, *Mya arenaria,* on the sediment surface resulting from commercial bloodworm *(Glycera dibranchiata)* digging. On one flat in the fall, we conservatively estimate that worm diggers dig up and expose on the sediment surface 6% of the greater than 2 mm fraction of the clam population each time they turn over the sediment. Twenty-percent of the clams had at least one valve damaged. Fifteen percent of intact clams exposed were found with their siphon up, 41% with their siphon down, and 44% were horizontal on the sediment surface. Siphon orientation of exposed clams influenced their rate and depth of reburial. Recovery of large clams (5.6 cm average shell length) was much greater (91.8%) from undug than dug sediment (59.4%), suggesting that predators are attracted to dug areas. Only about 50% of small clams were recovered live. Shell damage of recovered dead clams indicated that predators consumed some of the missing clams. These results are compared with similar experiments conducted during the spring of 1999 and observations on other intertidal flats. Our results suggest that baitworm digging negatively affects the survival of *Mya arenaria* by directly damaging shells and by exposing clams to increased risk of predation.

Andrew Bauder, Allan Cembella and Nancy Lewis. Institute for Marine Biosciences, National Research Council, Halifax, NS.

A. STRATEGIES FOR HARMFUL PLANKTON MONITORING IN MAHONE BAY.

Harmful algal blooms are episodic events that may cause toxicity and/or faunal mortalities, and thus restrict harvesting of coastal aquaculture species. Many blooms form cryptic sub-surface aggregations and high biomass is not necessarily a prerequisite for harmful effects. Examples of such blooms from coastal Nova Scotia include those of *Alexandrium tamarense,* which causes paralytic shellfish poisoning, and *A. ostenfeldii,* recently associated with spirolide toxicity in bivalve shellfish. Beginning in 1996, a detailed investigation into the distribution and biological origin of these toxins was initiated at Graves Shoal, an aquaculture site in Mahone Bay, Nova Scotia. Data on standard oceanographic parameters (chorophyll, macronutrients, plankton composition and abundance, water column stratification) and bulk toxicity of size-fractonated plankton samples from discrete depths were used to establish the spatio-temporal distribution and seasonal occurrence of toxigenic dioflagellates. This was complemented with the installation of a moored in *situ* optical sensor (TACCS) that detects both up- and down-welling spectral radiance. The vertical distribution of toxigenic plankton exhibited a temporal shift (from early May to July), which was coupled with the degree of water column stratification. Use of plankton profiling techniques for bloom dynamics and toxin monitoring will be specifically addressed for aquaculture applications.

Lenny Bellet and Scott Warren, Department of Botany, Connecticut College, New London, CT.

THE IMPACT OF INCREASED FLOODING FREQUENCIES ON SEDIMENT BIOGEOCHEMISTRY AND VEGETATION PATTERNS ON CONNECTICUT TIDAL MARSHES

Significant vegetation change has taken place on many Connecticut tidal marshes over the past 25 years. Large portions of dense *Spartina patens* high marsh have been converted to a mixed community consisting of stunted *Spartina alterniflora, Distichlis spicata,* forbs, and persisting *S. patens.* Some previously vegetated areas are completely devoid of angiosperms. In this study, five sites were examined in southeastern CT. On two the vegetation has remained relatively stable, while three have undergone significant change. Changed sites were found to have lower mean elevations and were therefore submerged by a greater percentage of flooding tides. The porewater salinity, sediment redox potential, and sulfide concentration were measured in vegetated and non-vegetated areas of two changed sites and one relatively stable site. Sites with the highest flooding frequencies had the lowest mean redox potential, with consistently lower readings at non-vegetated areas. Mean sulfide concentrations were inversely correlated with mean redox potentials (R^2= 0.93) although variability for sulfide was large. Increased rates of relative sea level rise and subsequent hydroperiod are favoring lower peat redox and greater sediment sulfide concentrations. Though marsh halophytes are adapted to a reducing environment, there seems to be a sulfide and redox threshold around 0.75 mM and -300 mV respectively, beyond which high marsh perennials can no longer survive.

Joan L. Beskenis, Dept. of Plant Biology, University of New Hampshire, Durham, NH

DOES THE BIOFILM ON THE SURFACE OF FUCOID GERMLINGS AND SURROUNDING SURFACES PROTECT THEM FROM METAL TOXICITY FOLLOWING EXPOSURE TO COPPER AND ZINC?

Experiments were conducted to examine the role that the biofilm (the covering of microscopic bacteria, algae, fungi in a polysaccharide matrix) has on the germination and development of fucoid germlings. Initially, glass slides were put out in a tidal stream in Kittery, Maine for a period of one week to allow the development of a biofilm. Following their retrieval, they were brought to the Jackson Estuarine Research Laboratory, Durham Point, New Hampshire where they were put into containers holding filtered seawater as well as male and female receptacles of *Fucus vesiculosus* var. *spiralis*. Their gametes were released onto these slides as well as slides that did not have a biofilm. Following fertilization, the slides with the zygotes attached were transferred to containers for the following treatments: 1) 2 mg/1 copper and zinc grown on slides with (BF) and without a biofilm (NBF), 2) 2 mg/1 copper BF, NBF, 3) 0.2 copper and zinc BF, NBF and 4) two controls filtered seawater BF, NBF. The culture trays were put into a 15 C incubator with a 16:8 day:night cycle and examined after two days when the length of the germlings was measured. Copper and zinc treated germlings grew the best on the biofilm. The containers with just copper at 2 mg/l, surprising, did better if no biofilm was present. The germlings with the highest mean length were grown on slides without a previously established biofilm and with no added metals.

Alison Biddle and R. Scott Warren. Center for Conservation Biology and Environmental Studies, Connecticut College, New London, CT 06320.
SEA-LEVEL, MARSH SURFACE MICRORELIEF, AND VEGETATION: 25 YEARS OF CHANGE ON A LONG ISLAND SOUND TIDAL SALT MARSH.

A 66 x 13 m microrelief/vegetation transect, established on Cottrell Marsh, Stonington, Connecticut in 1973 was re-surveyed in 1989 and 1998. Microrelief/vegetation surfaces were prepared for all three sampling years. Over these 25 years the marsh surface lost more than 2 mm yr^{-1} against rising sea level. From 1973 - 1989 elevation increased 1.78 mm yr^{-1}, substantially faster than sea level during that interval. Elevation increased 2.80 mm yr^{-1} from 1989 to 1998; sea level rise over that period, however, averaged 14.2 mm yr^{-1}. Within the transect, accretion was inversely related to initial elevation over both time intervals. In 1973 a nearly monospecific *Spartina patens* levee occurred behind tall *Spartina alterniflora* low-marsh. Landward, lower elevations dominated by stunted alterniflora and forbs gave way near the upland to mixed *patens/Distichlis spicata,* followed by nearly pure *Juncus gerardii.* Forb patches had invaded levee patens by 1989 while *Juncus* belt extent and purity had decreased. Accretion in these forb patches and in *Juncus* was less than the marsh mean. From 1989 to 1998 forbs and *Distichlis* continued to increase, as did stunted alterniflora. Plant stand purity has also declined since 1973. A mean of 2.0 species occurred within 15 cm of each elevation point in 1973. 1989's 2.1.8 species point^{-}' was significantly greater; by 1998 this index reached 2.34. These values reflect increased *Distichlis* and forb frequencies. In summary, Cottrell Marsh is not keeping up with sea level; vegetation change is most apparent where surface accretion is the slowest, suggesting a causal relationship.

Joanne C. Bintz, Scott W. Nixon, Stephen Granger, Graduate School of Oceanography University of Rhode Island, Narragansett, RI
PHOTOSYNTHETIC RESPONSE OF EELGRASS *(ZOSTERA MARINA* L.) SEEDLINGS TO REDUCED LIGHT

Eelgrass habitat has declined in many locations along the East Coast of the United States. Because of the widely recognized importance of seagrass habitat, efforts are increasingly being made to create seagrass beds in relatively unimpacted areas or to recreate beds in systems after pollution inputs have been reduced. Using seeds to enhance transplanting and restoration efforts would be an efficient, low cost method of creating habitat on a large scale. However, little is known about the light requirements of seedlings or their ability to adapt to sub-optimal light conditions. Photosynthesis - irradiance (P-I) response curves were obtained over a summer for seedlings grown in 13%, 47% and 100% light. Individual plants were placed in 300 ml BOD bottles filled with filtered estuarine water, and placed under various levels of shade screening or in 100% light. Apparent photosynthesis was measured as 02 evolution during a 5 hour incubation. Pmax was highest in plants grown at 13% light and was not significantly different in plants grown at 100% and 47% light. Respiration rate was highest in plants grown at 100% light.

Robert Buchsbaum, Massachusetts Audubon Society, Wenham, MA 01984; John Catena and Eric Hutchins, National Marine Fisheries Service, Gloucester, MA, David Burdick, University of New Hampshire, Durham, NH, Eric Holt, Massachusetts Audubon Society.

FISH IN DEGRADED SALT MARSHES IN THE PLUM ISLAND SOUND REGION: IMPLICATIONS FOR RESTORATION.

One of the prime causes of degradation of salt marshes in New England has been tidal restrictions. This has led to a decrease in the sizes of marshes and changes in hydrology, salinity, and vegetation. The Plum Island Sound/ Essex Bay region has a number of areas where degraded salt marshes are either in the process of being restored by increasing the tidal exchange or are being considered for such restoration. In anticipation of the restoration, we have collected baseline data on a variety of parameters that we expected might change as a result of increasing the tidal flushing. At our most intensively studied site in Ipswich, we found that the are behind the tidal restriction was actually a thriving habitat for small fish, probably for two reasons. First, submerged vegetation had developed because the tidal restriction did not allow the area to drain completely during low tide. Second, predatory fish may have been kept out of the area by the narrow culvert that created the restriction. Based on these observations, we designed our restoration at this site to maintain the SAV while at the same time increasing the tidal flushing to remediate areas of *Phragmites australis.* Other restricted marshes in the region did not have The same abundance of fish, which points out the site specificity of impacts.

David M. Burdick and Alison Bowden, Jackson Estuarine Laboratory, Department of Natural Resources, UNH, Durham, NH 03824

ENHANCEMENT OF SALT MARSH REESTABLISHMENT TO IMPROVE HABITAT AND WATER QUALITY

Sediment instability and limited organic matter are common features of immature created marshes and these features often lead to marsh loss. We constructed organic, biodegradable Filtration Enhancement Devices (FEDs) to stimulate functional development of created marshes in Portsmouth, New Hampshire (USA). The FEDs were designed to catch sediments, stimulate plant and animal colonization, and establish an erosion resistant, self-maintaining feature. The FEDs are constructed of 2 layers of erosion control fabric (Geojute and Curlex), rolled tightly around hay or wrack to form a 25 x 120 cm cylinder. Function of the FEDs was assessed using water traps, sediment pads, and marker horizons placed seaward and landward of FEDs to measure suspended sediments, sedimentation rates, and erosion/accretion across transects. FEDs reduced wave energy in the low marsh areas, resulting in increased deposition, and appeared to decrease resuspension of sediments by wave action. Significantly more sediment was deposited on sediment pads landward of FEDs than at control sites or seaward of FEDs. We anticipate that stabilization of the substrate will increase success of plant and invertebrate communities, thus increasing structure and enhancing functions of created marshes.

Michael Dadswell and Duncan Bates. Acadia University, Wolfville, NS
INTRODUCTION TO MAHONE BAY: A HIGH SALINITY, FJORD-LIKE ESTUARY.

Mahone Bay is a large embayment on the Atlantic coast of Nova Scotia containing a large number of islands, which are partially submerged postglacial drumlins. The Bay is deep (+60m) and is separated from the Atlantic by a 16m sill. The sill restricts inflow of Atlantic Ocean water and creates fjord-like conditions. Deepwater portions of the Bay (+30m) remain at temperatures of 2C or less during summer. The Bay has warm surface temperatures in summer (20°C) because of thermocline creation at an average depth of 5m but stratification can break down rapidly during westerly wind stress with surface temperatures declining up to IOC in 12 h. Phytoplankton concentrations are low (2-4mgC/l) and concentration maxima tract the surface of the thermocline. Water clarity is usually high (Secchi 5-10m) and phytoplankton maxima occur at depths of 20m or deeper in late fall. The Bay contains a mix of arctic, boreal and Virginian faunal elements and it even has a treasure island.

Jeffrey L. Gaeckle and F. T. Short. Department of Natural Resources, University of New Hampshire, Jackson Estuarine Laboratory, Durham, NH 03824, USA
COMPARISON OF FISH ASSEMBLAGES IN TRANSPLANT VERSUS REFERENCE EELGRASS *(ZOSTERA MARINA* L.) BEDS

As part of an effort to assess the success of eelgrass transplant sites compared to local reference eelgrass beds, fish populations were sampled during the summers of 1993 through 1998, in the Great Bay Estuary, New Hampshire and Maine. Eelgrass was transplanted in 1993 and 1994 as part of the New Hampshire Port Authority Mitigation Project. From 1993-1995, purse seines were used to sample transplant and reference eelgrass. In 1995, the catch efficiency of purse and beach seines was compared. For juvenile and adult fish, no significant difference was found between sampling gear; subsequent fish sampling used the easier beach seine method. Pipefish and lumpfish densities were similar in abundance between reference and transplanted eelgrass sites after 3 years, suggesting these species were attracted to eelgrass. The higher pelagic and resident fish (smelt, silversides, herring, sea bass and tomcod) abundance in the 4-5 year old transplanted eelgrass beds illustrate the value of this restored habitat.

Douglas Hodum, Department of Biological Sciences, University of Maine
THE EPIC SAGA OF MUD, INVERTEBRATES AND ENGINEERING STRUCTURES - WHAT IS THE CONCLUSION?

Coastal bluff erosion is claiming economically valuable real estate as sea level rises. With the loss of such property, landowners are erecting erosion-prevention structures in an attempt to stem the rising tide. These structures slow coastal erosion, but the effects on the adjacent intertidal flats have not been studied. By sampling 11 sites (6 with natural and 5 with engineered abutments) in Casco Bay, Maine, I am investigating the interaction of coastal geological and biological processes and structures. Through the use of sediment samples and biological samples, a holistic picture of intertidal mudflats and the communities inhabiting them has come into focus. Analyses of variance were run for the most common invertebrate species to investigate the treatments (natural and engineered) as well as the varying conditions between sites. Analyses on the feeding guilds were also performed. The sediment results yielded no significant differences between the two treatments in the total carbon, total nitrogen and enzyme hydrolyzable amino acids levels or in the grain size distribution. Combining the biological information with the sediment data, these communities appear to be quite similar. The only comprehensive and statistically supported difference in the communities was the total number of individuals found in each of the two treatments. Interestingly, natural sites have significantly larger populations, which may indicate depauperate populations at the engineered sites. While this study is far from conclusive evidence, it does raise the question as to the biological effects that engineering structures have on intertidal mudflats in Casco Bay.

B. S. Kopp[1], F.T. Short[1], and R.C. Davis[2], [1]Department of Natural Resources, Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH 03824, [2]Alliance for Chesapeake Bay, 6600 York Road, Baltimore, MD 21212.
TRANSPLANTING EELGRASS *(ZOSTERA MARINA L.)* WITH REMOTE FRAMES: A LOW-COST AND EFFECTIVE HABITAT RESTORATION METHOD

The high cost of restoring eelgrass beds in subtidal environments, and the difficulty in protecting transplants from various bioturbating organisms, lead us to develop a new method not requiring SCUBA. Transplanting Eelgrass with Remote Frame Systems (TERFS) is a modification of bare-root transplanting methods. Eelgrass shoots are attached with biodegradable ties to ballasted wire frames that provide mechanical protection from uprooting and bioturbation. Deployed from any small boat, TERFS create 0.25 m^2 patches at the relatively high shoot density of 200 m^{-2}. After three to five weeks, the frames are retrieved for reuse, leaving behind dense patches of eelgrass. Preliminary tests in the Great Bay Estuary, NH, showed this method to be highly effective in creating eelgrass patches, even at sites where conventional transplanting had previously failed. Initial survival ranged from 50 to 95% of individual shoots. In a side-by-side comparison in New Bedford Harbor, MA, the TERFS method outperformed the horizontal rhizome method at nine of ten sites. The ease and success of this technique provides an approach to restoration that potentially could be undertaken by volunteers. More importantly, it drastically reduces the cost of eelgrass restoration.

Pamela A. Morgan and Frederick T. Short, Jackson Estuarine Laboratory, University of New Hampshire, Durham, NH.

FUNCTIONS AND VALUES OF FRINGING SALT MARSHES IN NORTHERN NEW ENGLAND.

Fringing salt marshes are common along rivers and bays in northern New England, and yet their role in the estuary is not well understood. Their location also makes them particularly susceptible to environmental impacts from residential and commercial development. We decided to study several ecological functions of fringing salt marshes and compare them to those of larger, meadow marshes. Here we report on the functions of sediment trapping, primary production, soil organic matter building and maintenance of plant diversity. Indicators of these functions were measured in five fringing marshes and five meadow marshes in southern Maine and coastal New Hampshire. Means values for fringing marshes were compared to mean values of meadow marshes by analysis of variance using elevation, soil salinity, suspended sediment and/or percent surface slope as covariates where they correlated with the indicator measured. On a per unit area basis, fringing marshes had fewer plant species and lower percent soil organic matter content, but trapped as much sediment and were as productive as meadow marshes. Fringing marshes in northern New England therefore should be recognized for their value in supporting food webs, improving water quality and countering the effects of sea level rise.

Vic Pyle, Habitat Restoration Project Manager; Save the Sound, Inc.; Stamford, CT, USA.

THE ERF-RAE PARTNERSHIP FOR ESTUARINE HABITAT RESTORATION

The Estuarine Research Federation (ERF) and Restore America's Estuaries (RAE), two organizations with similar missions and goals, have recently formed a partnership to improve the practice of habitat restoration by promoting increased collaboration between scientists and practitioners. ERF is an international scientific organization whose mission is to promote research in estuarine and coastal waters, to promote communication between members of affiliated societies, to conduct meetings, and to be available as a source of advice on matters concerning estuaries and the coastal zone. RAE is a national coalition of 11 regional, community-based environmental organizations whose mission is to work together to restore one million acres of estuarine habitat by 2010. The ERF-RAE partnership was formed in the fall of 1998 with funding from the Kraft Memorial Fund/New York Community Trust and The Pew Charitable Trusts. Three regional "roundtable" meetings will be held across the nation in the Southeast (March 15-16, 1999 - Beaufort, NC); Northwest (May 6-7, 1999 - Seattle, WA); and Northeast (June 21-22, 1999 - Stamford, CT) which will build upon each other and will culminate in a session at the ERF 15th Biennial Conference in New Orleans, LA. The meetings will provide a forum for ERF and RAE members to share their collective expertise, perspectives, and experiences on how to: 1) best invest resources in future restoration initiatives; 2) improve the scientific rigor of the planning and implementation of restoration; 3) increase the effectiveness and credibility of restoration; and 4) provide Sound and defensible public outreach and education materials about restoration.

Kenneth B. Raposa, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI; Charles T. Roman, USGS, University of Rhode Island, Narragansett, RI; Susan C. Adamowicz, Graduate School of Oceanography, University of Rhode Island, Narragansett, RI

EARLY ECOLOGICAL RESPONSES TO RESTORATION OF A TIDALLY RESTRICTED SALT MARSH (SACHUEST POINT, MIDDLETOWN, RI)

Prior to March 1998, the salt marsh at the Sachuest Point National Wildlife Refuge was a classic example of a tidally restricted salt marsh, with a road bisecting the marsh and a small culvert reducing tidal exchange to upstream areas. Restoration included installation of larger culverts and creation of new tidal creeks and marsh pools. Under tidally restricted conditions, the 12 ha restricted marsh was dominated by *Phragmites australis,* while an unrestricted control marsh supported a typical *Spartina* dominated mosaic. After just one growing season under restoring hydrology, *Phragmites* height decreased significantly (140 cm vs. 82 cm; t-test, $p<0.001$), and a different vegetation community developed within the restoring marsh (ANOSIM, $p<0.001$). This was largely due to decreased *Phragmites* cover and a concurrent increase in *Spartina patens* cover. Using a 1 m^2 throw trap, we sampled nekton and compared 1997 pre-restoration conditions with the 1998 restoring marsh. *Fundulus heteroclitus* and *Palaemonetes pugio* density increased significantly in the restoring marsh (13.0 m^{-2} vs. 4.6 m^{-2} and 1.7 m^{-2} vs. 0.3 m^{-2}, respectively; ANOVA, $p<0.05$), while remaining unchanged in the unrestricted control. Using bottomless lift nets, we also observed differences in nekton utilization of the restricted and control marsh surface habitat in 1998 (ANOSIM, $p<0.05$). Quantitative sampling methods were effective in detecting early ecological responses to restoration and should prove useful for quantifying long term response trends at this and other restoration sites.

Larry T. Spencer, Natural Science Department, Plymouth State College, Plymouth, NH

THE *R/V ALBATROSS:* HOW ITS USAGE CONTRIBUTED TO THE GROWTH OF THE MARINE SCIENCES IN THE UNITED STATES.

The *Albatross* was the first vessel ever built specifically for use in the marine sciences. It was built and first used by Spencer Fullerton Baird, the first Commissioner of Fish and Fisheries, in 1882. It sailed/steamed the world's oceans and served a variety of researchers including Alexander Agassiz, David Starr Jordan, C. A. Kofoid, Roy Chapman Andrews, and Henry Bryant Bigelow. Often in science we have a "great man" theory of science. Perhaps we should also have a "great vessel" theory of science. If so the *R/V Albatross* would and should be ranked higher than the *HMS Challenger.* This talk will support this contention.

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MARINE SURVIVAL OF WILD ORIGIN AND CULTURED HATCHERY ESCAPEE ATLANTIC SALMON *(Salmo salar* L. 1758) IN THE SPAWNING MIGRATION OF THE MAGAGUADAVIC RIVER, NEW BRUNSWICK.

Marine survival was determined for wild origin and cultured hatchery escapee origin Atlantic salmon in the spawning migration of the Magaguadavic River, New Brunswick. Survival was calculated by comparing the number of returning 1SW (1997) and 2SW (1998) salmon with the number of smolts in the same cohort that left the river in 1996. Two methods were used to determine the origin of the returning adults 1) sea-cage escapees were separated from salmon that originated in the river by assessment of the transition zone between fresh water and ocean growth on scales, 2) discriminant function analysis of scale characteristics was used to classify the river produced salmon that originated in the wild and as cultured hatchery escapees. The two methods indicated that 57.0% of the salmon were sea-cage escapees, 34.4% were of wild origin, and 8.6% were cultured hatchery escapees. Wild salmon had a higher marine survival rate (2.0%) than cultured hatchery escapees salmon (0.3%).

Theresa A. Theodose, Department of Biology, University of Southern Maine, Portland, Maine

NUTRIENT AVAILABILITY, NUTRIENT LIMITATION, AND SPECIES DIVERSITY IN SALT MARSH FORB COMMUNITIES

Maine high salt marshes house large expanses of forb dominated plant communities. Some studies suggest that forb communities may be displacing graminoid communities on New England salt marshes. Although marsh forb zone encroachment, salinity and waterlogging have been well investigated, no studies have examined forb zone plant nutrient availability and plant species diversity. The objectives of this study were to 1) determine the variation in nutrient availability and diversity among forb and graminoid zones, and 2) determine the limiting resource to forb zone primary production. I found that although forb zone production was lower than that of graminoid zones, available P, net N mineralization rate, and plant species diversity were higher in forb communities than in graminoid zones. A nutrient amendment experiment revealed that forb zone production was limited by nutrients (N and P), rather than stress, even though salt stress was high in these soils. This N + P co-limitation occurred because species using nitrogen based osmoticum to combat salinity were limited by N, while those using carbon-based osmoticum were limited by P. Since high species diversity is typically associated with low nutrient availability and production, these results suggest that stress and differential limitation of plant functional types may interact to promote diversity in forb zone communities.

David W. Townsend, Neal.R. Pettigrew, Andrew C. Thomas, School of Marine Sciences, University of Maine, Orono Maine, and Maureen D. Keller, Bigelow Laboratory for Ocean Sciences, W. Boothbay Harbor, Maine.

COASTAL AND OFFSHORE DISTRIBUTIONS OF ***ALEXANDRIUM*** SP. (THE RED TIDE DINOFLAGELLATE) IN THE GULF OF MAINE AND BAY OF FUNDY.

Three oceanographic survey cruises were conducted in the Gulf of Maine - Bay of Fundy region during June, July and August of 1998, as part of a larger 5-year multi-institutional, multi-investigator study (ECOHAB program). Some 215 stations were sampled on each cruise, at which measurements were made of the hydrography, inorganic nutrients, phytoplankton chlorophyll, and relative densities of *Alexandrium* sp. cells. Our qualitative estimates of *Alexandrium* cell densities were based on a vertical plankton haul at each station (0-20 m; 20 um mesh) which was examined under a microscope immediately upon collection aboard the ship. Quantitative estimates of cell densities are presently underway using immunofluorescence techniques and are not yet available for presentation; however, our initial counts suggest that the general spatial and temporal trends revealed in the qualitative net haul data are representative. These qualitative distributions of *Alexandrium* are interpreted against the physical oceanography of the region, and a conceptual model of *Alexandrium* blooms is offered based on the light and nutrient fields.