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PAPER ABSTRACTS

Bricker Ursa S., Grad. School of Oceanography, Univ.of Rhode Island, Narragansett, RI

METALS POLLTION IN THE PROVIDENCE RIVER AND NARRAGANSETT BAY AS RECORDED IN THE SEDIMENTS

Providence, R.I. has been a center of industrial activity since the beginning of the Industrial Revolution. The particular mix of industries in Providence has resulted in large inputs of metals to the Providence River which have left a distinct record in the sediments of the river. This study was designed to analyze marsh sediments from the Providence River and Narragansett Bay area for metals in order to develop a history of the impact of industrialization on the estuarine environment for the past 200 years.

Preliminary results from this study suggest that the magnitude of metals (Cu, Ag, Pb) pollution increased dramatically during the 1800's but has eased in recent years. More detailed study of marsh sediment cores should offer a new perspective on the long-term impact of technological advancement and human activity on a coastal marine environment.

Curran, M.D. and J.A. Blake, Biological Oceanography Section, Battelle New England Marine Research Laboratory, Duxbury, Massachusetts. Suitability of the polychaete, Ophryotrocha costlowi Akesson, as a bioassay test organism.

A study was Performed to demonstrate the suitability of a polychaete, Ophryotrocha costlowl Akesson, in acute bioassay tests. Results indicate that O. costlowi is a promising organism for short term and possibly long term testing. Observations were made on laboratory reared stocks in order to gain an understanding of the animal's life cycle. O. costlowi is a gonochoristic species which completes its life cycle in less than one month. Culture techniques are quite simple and large numbers of animals can be gained from a small brood stock. The life cycle is characterized by easily measured parameters such as fecundity, reproductive success, and growth rate making it ideal for sublethal testing. As part of the study a 16 hour acute bioassay was performed using O. costlowi and a standard toxicant, Dodecyl Sodium Sulfate. An LC50 value of 7.18 ppm with 95% confidence limits of 5 and 10 ppm was calculated from experimental data.

Gratto,G.W., Biology Dept., Univ. of New Brunswick (Saint John). Saint John, N.B., Canada E2L 40

Patterns of swimming activity of benthic crustaceans over a mudflat.

As part of a study of the relationship between diet and available food for fish feeding over an intertidal mudflat on the Bay of Fundy, a modified epibenthic sled was used to collect samples of the hyperbenthos. Tows were made over a fixed distance of the bottom at hourly intervals from three hours before to three hours after high tide. Samples were collected at two areas of the flat: a gravel stream bottom and an area dominated by the tubicolous amphipod Corophium volutator. The most abundant organisms in the tows were the crustaceans C. volutator, Gammarus lawrencjanus, Crangon septemspinosa,and Mysids. The latter three predominated over the stream bottom but were relatively rare over the Corophiun bed. The occurrence of tidal, diel and lunar cycles of activity was investigated, particularly as they related to the feeding of fish on the intertidal flat.

Grelneder, O.N., Waterford, Connecticut

Factors That Affect The Distribution of UCA and Their Effect On The Sediment

Ouantitetive measurements were made of the effect of salinity, organic content, % silt-clay, and percent moisture on the distribution of the Fiddler crab, Uca. Salinity had a major effect on the distribution of Uca. The other variables had little effect on the distribution of Uca. Salinity, therefore, plays a significant part In the distribution of Ucas.

Hidu, H., Dept. of Zoology, Ira C. Darling Center, University of Maine, Walpole, NE
INDUCED TRIPLOIDY IN THE AMERICAN OYSTER - AN UPDATE

Cytochalazin induced triploid American oysters at five years continue to show growth divergence from their diploid siblings. Those produced at meiosis I are 22 percent larger in volume and those produced at meiosis II are but slightly larger than their diploid controls. It is apparent that the performance gains are due to increases in heterozygosity rather than triploidy per se. Triploid oysters undergo gametogenesis and experiments are now underway to learn of the ploidy and potential viability of the gametes. The new experimental approach is discussed.

Holland, M.M. and N. MacConnell, College of New Rochelle, New Rochelle, N.Y. and Hunter College, CUNY, N.Y.C., N.Y. PRIMARY PRODUCTION OF A FRESHWATER TIDAL WETLAND IN THE LOWER CONNECTICUT RIVER ESTUARY.

Aboveground plant biomass and litter measurements were made at six intervals between late September 1982 and mid-September 1983 on a 77 hectare tidal wetland located at Great Meadow, Essex, CT, approximately seven river miles upstream from Long Island Sound. Although the two marsh zones sampled differ in elevation by 30 cm, they are both dominated by Typha angustifolia. Peak aboveground biomass for Typha angustifolia was reached in both zones by mid-July, and measured 686.72 g/m^2. Annual net aboveground production was estimated to be 1,110.9 g/ m^2, a value computed by summing peak aboveground biomass values for all species independent of when the samples were collected. This is a vegetatively complex marsh system, with numerous environmental factors (e.g. geologic, hydrologic, climatic, and anthropogenic) influencing plant community dynamics. Although the meadow exists in a transition zone between brackish and freshwater marshes, the vegetation is predominantly freshwater.

Howarth, R. W. and R. Marino, Ecosystems Center, M.B.L.. Woods Hole, MA, J. J. Cole, Carey Arboretum, Millbrook, N.Y., and A. Hagstrom. Univ. of Umea, Sweden. DOES MOLYBDENUM AVAILABILITY CONTROL TRE NITROGEN CYCLE Of ESTUARIES AND COASTAL. SEAS?

Molybdenum is essential for both nitrogen fixation and nitrate assimilation. Mo is present in exit waters primarily as the molybdate anion which is chemically very similar to sulfate, and sulfate can serve as a competitive inhibitor of molybdate uptake. Although molybdate concentrations are higher in seawater than in most lakes, the sulfate/molybdate ratio is 100 to 1000 times greater in seawater. We hypothesize that the unfavorable sulfate/molybdate ratio makes Mo less biologically available in seawater than in most freshwaters. The lowered availability of Mo in seawater may explain why rates of nitrogen fixation by plankton are so much lower in seawater than in lakes. Our experiments suggest that nitrogen fixation rates in the Baltic Sea can be increased by molybdate additions. We have also found that nitrate assimilation and growth of plankton from Vineyard Sound are inhibited by naturally occurring concentrations of sulfate.

Jonhs, D. M.[1], R. Gutjahr-Gobell[1] and J. Heltshe[2], [1]New England Aquarium, Boston, MA, and Dept. of Experimental Statistics, Univ. of Rhode Island, Kingston, RI

USE OF BURROWING BEHAVIOR AS A FIRST, ORDER APPROXIMATION OF THE. IMPACT OF CONTAMINATED SEDIMENTS ON A POLYCHAETE

An investigation is in progress to evaluate the burrowing behavior of the polychaete, Nephtys incisa as an initial indicator of sediment quality. Currently, data are being collected on burrowing pattern, total burrow tube length and burrow depth on individual worms maintained in thin glass aquaria. Initial results indicate that total burrowing activity and avoidance of sediment types can be determined using this method.

Data thus far collected on total burrowing activity appears to be related to independent data collected on various aspects of the biology of N. incisa exposed to the same sediment types.

Johnson, D.A., Marine Science Institute, University of Connecticut, Croton, CT
CHEMICAL.AND BIOLOGICAL INFLUENCES OF ULVA LACTUCA IN SHALLOW ESTUARIES.

The green alga, Ulva lactuca., is common in shallow temperate estuaries. At high densities, this seaweed greatly amplifies the diel range of oxygen (0.5 -13.2 ppm), pH (5.1 - 8.6) and eH. It also produces chemical exudates. These exudates cause 100% mortality of estuarine crab larvae in 12 - 21 days. Combined with low oxygen, this mortality occurs within 13 - 40 minutes. Low oxygen alone was not lethal. The toxin appears to be soluble, hydrophyllic, nom-labile and of low molecular weight. Thus, dense blooms of this alga may seriously impact the ecology of estuaries.

Landers. D.F.Jr. and M. Keser, N.U. Environmental Laboratory P.O. Box 128, Waterford, CT.
POPULATION CIHARACTERISTICS OF 'THE AMERICAN LOBSTER, HOMARUS AMERICANUS, IN EASTERN LONG ISLAND SOUND

Population characteristics of the American lobster have been studied extensively in the vicinity of Millstone Point, Conn. Since 1975, 34,885 lobsters have been tagged and pertinent population data recorded. Size structure, sex ratios, growth rates, number of berried females, incidence of culled lobsters, and molting patterns, were within the ranges reported throughout northeastern North America. The local population was highly exploited, with over 90% of the commercial and recreational catch composed of lobsters that were newly recruited from the sublegal size class (< 81 mm carapace length). Catch per unit effort (CPUE) was significantly higher for wire than wooden pots, but no significant difference was found in the CPUE of legal-size lobsters between wood and wire pots. The incidental catches of crabs and fish in our pots were found to significantly influence lobster catch.

Lent, R.A., B. A. Harrington, J. Clarke (Manomet Bird Observatory, Manomet, MA), and T. Hruby (Massachusetts Audubon Society, G1oucester, MA).
OPEN MARSH WATER MANAGEMENT ON SALT MARSHES IN MASSACHUSETTS: II.. EFFECTS ON HABITAT USAGE BY BIRDS IN THE FIRST YEAR.

Six study plots in coastal Marshes of Essex Co., MA represented a range of ditching conditions from unditched to well-maintained grid ditch systems. In 1983, 2 plots were modified using open marsh water management (OMWM) techniques to create salt pans and deeper permanent reservoirs. In those experimental plots, shorebirds and waders were present in 1983 in areas where they were absent in 1962. When present in both years, these species were of greater abundance in 1983 vs. 1982. This suggests that OMWM was helpful in creating habitat for birds from previously drained marshland. Concurrent mosquito breeding surveys revealed reduced larval populations in OMWM vs. grid-ditched plots.

J.A. Love, Dept. of Earth Sciences. Univ. of New Hampshire. Durham. NH 03824
LONG-TERM ENVIRONMENTAL TRENDS IN THE GREAT BAY ESTUARY, NH-ME: II. AN INTRODUCTION TO NONPARAMETRIC TREND ANALYSIS. AND THE INFLUENCE OF "FAR-FIELD" EFFECTS ON. ESTUARINE HYDROGRAFHY

Seasonal Kendall Trend Tests were applied to 8 1/3 years of monthly hydrographic data from the Great Bay Estuarine System and nearshore Gulf of Maine. Results for both temperature and salinity show significant. but opposing trends which suggest that the estuary has become increasingly colder and more saline between 1973 and 1981. This finding is corroborated by similar trends in independent data from. the lower estuary and contiguous coastal waters. Decreasing water temperatures correlate well with a similar decline in air temperature. However, non-significant trends in both local precipitation and gauged river discharge suggest that the increase in salinity may be regulated by coupling with the offshore waters. Historical., cyclic fluctuations in Gulf of Maine temperature and salinity have been well documented., and the trends reported here may be additional evidence of the onset of a basin-wide period of increasing salinity and cooling temperature.

Mazurkiewicz, Michael, Dept. Biol. Sciences, Univ. of Southern Maine, Portland, Maine.
DISTRIBUTIONAL ECOLOGY OF AN ESTUARINE SNAIL, SPURWINKIA SALSA.

Spurwinkia salsa is a minute deposit-feeding hydrobiid snail limited in distribution to short stretches along upper reaches of estuaries. Two aspects cf the bio!ogy of S. salsa_, however, indicate the potential for colonization of the entire estuary namely, (1) an indirect development with planktctrophic veliger larvae pelagic up to one month before settlement, and (2) a remarkable degree of euryhalinity of larvae and adults. Field observations suggest that interspeci[f]ic competition limits the colonizing potential of S. salsa, thereby restricting its intraestuarine distribution.

McCallion, K.M., Dept. of Biology, Northeastern University, Boston, Mass. SECONDARY PRODUCTION OF GAMMARUS MUCRONATUS: THE FIRST COHORT

The objective of this study is to examine the most productive "cohort" of the multivoltine amphipod Gammarus mucronatus.

Two high marsh pools at the Parker River National Wildlife Refuge, Rowley, Massachusetts were sampled from 30 March to 10 July 1983. The pools were selected for varying amounts of Cladophora spp. cover as this has been associated with amphipod density. Concurrent lab work of similar parameters (temperature, salinity and food) was performed to determine growth rates for application in production calculations.

Thomas M.L.H.,M[c]Eachreon J.C.T., Dept. of Biol., Univ.of New Brunswick, Saint John, New Brunswick, E2L 4L5 Canada

Exposure to wave action is an obvious and principle factor modifying littoral zonation but is notoriously difficult to quantify. Recent success in predicting zonation patterns on Bermudian and Bay of Fundy shores using a combination of arc of exposure and wind energy distribution led to the postulate that gastropod shell morphology may also be predicted by similar comparisons. Study sites were located in Musquash Harbour, a small estuary of the outer Bay of Fundy located 25 km. south of Saint John, N.B.. Species collected included Acmaea testtudinalis, Littorina obtusata, L. saxatalis, and Nucella lapillus. In the latter two cases exposure did account for a significant amount of the variation in characters such as shell height, shell width, aperture height and width, columella lip width, and aperture area. In L. littorea and N. lapillus only 13% of the variation in aperture area and 40% of the variation in relative shell height respectively was accounted for. It is thought that a lack of association is due at least in part to the unusual tidal regime of the area.

Mosley. S.P., Dept. of Biochemistry. Univ. of New Hampshire, Durham. NH AN IMPROVED METHOD FOR THE DETECTION OF PARALYTIC SHELLFISH POISONS

Paralytic Shellfish Poison (PSP) profiles were determined by chromatographing crude shellfish extracts on a strong cation exchange mini-column.

A previously reported fluorescence method will detect saxitoxin (STX) and the STX related gonyautoxins (CTX-2 and GTX-3). This newly developed method utilizes the above fluorescence method in combination with a Folin-Ciocalteau reagent. assay which will detect neo-saxitoxin (neo-STX), and the neo-STX related gonyautoxins (GTX-I/CTX-4).

An improved separation is accomplished with gradient elution and allows identification (from crude extracts) of GTX-1/GTX-4, neo-STX, STX, GU-2, and GTX-3. Several red tide shellfish extracts are used to illustrate the method.

Nuzzi, R., Suffolk County Dept. of Health Services, County Center, Riverhead, New York 11901.
RED TIDE INDUCED RESPIRATORY IRRITATION

An episode of respiratory irritation which occurred in 1976 in Suffolk County, New York, will be discussed in relation to the aerosolization of surface waters. Circumstantial evidence associating this episode with a bloom of the dinoflagellate Prorocentrum minimum will be presented.

Pondick, J.S., Biological Sciences Group, Univ. of Conn., Storrs, CT. Pollutants as a possible cause of a reproductive abnormality in Nucella lapillus from New England.

A parasite study of New England populations of the gastropod Nucella lapillus revealed females possessing a penis-like structure. Of the 1992 females initially examined 324 (16.5%) had penises. All of these individuals came from populations located south of Cape Cod, while females from northern populations were normal. Females from two additional northerly sites were examined after Smith (J. Appl. Toxicol. 1: 15-21. 1981) reported that a similar anomaly in Ilyanassa obsoleta was caused by pollutants associated with marinas. One hundred twenty-five (93.9%) of 133 females examined from a protected site with heavy boating activity possessed penises while all 59 of the females from an exposed site with negligible boating activity were normal. Reevaluation of initial findings with respect to those observations suggested that the presence of abnormal females in a population was strongly associated with that population's proximity to marinas or harbors.

Pratt, S.D. Graduate School of Oceanography. University of Rhode Island, Narragansett, RI
DUMPING ON THE N. INCISA – Y. LIMATULA COMMUNITY

The Nephtys incisa - Yoldia limatula (Nucula annulata) community in Central Long Island Sound was the first level bottom community described is the western Atlantic. The trophic politics, long-term changes, and recolonization pattern at this location have been studied in detail.

The sensitivity to stress and recovery potential of this area is being truely tested by the deposition of contaminated dredged material in an ongoing Corps of Engineers/EPA study.

Baseline samples have identified both stable and varying species. Samples taken immediately after the end of dumping showed that the site center was empty and ready for recolonization, while at the site edge members of the baseline community had reached the surface and were ready to participate in a chronic exposure experiment.

Quinn, Michael E., Dept. of Biology, University of Bridgeport. Bridgeport, Conn.
SEASONAL ABUNDANCE AND DIVERSITY OF FISHES IN A CONNECTICUT SALT MARSH

Fish populations of New Meadows Salt Marsh in Stratford, Connecticut were sampled twice monthly over a 1-year period using a beach seine. Temperature, salinity, and dissolved oxygen was measured at each of 3 stations preceding each seine haul. A total of 18 species representing 12 families was collected. Fundulus heteroclitus was found to be the most abundant species with three species, F. heteroclitus, P. majalis, and Menidia menidia, present in all four seasons. The number of individuals caught had a direct relationship with the season and a corresponding increase in total biomass. Four species diversity indices were computed and analyzed for seasonality.

Richardson, K.A., Landsat Remote Sensing Center, Graduate School of Oceanography
University of Rhode island, Narragansett. RI.
LANDSAT REMOTE SENSING APPLICATION' TO URBAN WATERFRONT CLASSIFIICATION USING THEMATIC MAPPER DATA

The use of satellite data for the analysis of urban waterfront land use has been limited due in most part to the lack of surface resolution. The urban waterfront environment by its very nature is a very densely distributed area of development. To date the Landsat satellite has had the only sensor that is close to having the required surface resolution to study the urban waterfront environment. The Landsst Multispectral Scanner has been used by planners, but has not been very successful for general use in urban land cover classification, nor for the smaller more specialized waterfront areas of the urban environment. This project has used a new Landsat sensor, the Thematic Mapper, whose surface resolution is 30 meters, and also records three new bands of electromagnetic radiation for the Landsat sensor. The classification identified twenty-one classes of land cover from Aquidneck Island and the Newport, Rhode Island waterfront. Surface truth and serial photography were used to verify the classification results. Use of the Thematic Mapper data for urban waterfront classification shows significant improvement over the Multispatial Scanner

REDUCTION IN BENTHIC PATCHINESS BY PREDATORS--THE IMPORTANCE 0F SCALE

David C. Schneider, Department of Zoology, University of Rhode Island, Kingston. R.I. 02884

Mobile predators may either increase the patchiness of prey populations through disturbance, or reduce patchiness through selective removal of prey from high density sites. Rate of change in patchiness was measured in two important prey species of the Short-billed Dowitcher (Limnodromus griseus) during its southward migration through Plymouth, Massachusettts in July, August, and early September of 1976. Cage experiments showed that the density of two important prey species, the polychaete Clymenella torquata and the amphipod Acanthohaustorius millsi, was reduced by large predators, primarily shorebirds. During July, spatial heterogeneity of both prey species was scale dependent, with a strong component of variability at a scale on the order of 1 km. Reduction in prey patchiness between July and mid-September was scale-dependent; the strongest reduction occurred at a scale of 1 km in both species. Variability was restored by juvenile recruitment in A. millsi, but not in C. torquata. The seasonal changes in patchiness observed at Plymouth have important implications for the long-term monitoring of estuarine benthic populations.

Spencer, L. T., Natural Science Department, Plymouth State College, Plymouth, NH 03264

A SUMMER IN THE LIFE OF THE GREEN SHORE CRAB, Carcinus maenas: a report of a preliminary study of the population biology of the crab.

The population biology of Carcinus maenas was studied during the summer of 1983 at Odiorne Point, New Hampshire . Parameters such as numbers per square meter, size of individual, sex of individual, etc. were determined at two week intervals from a single transect. Nothing strange or unusual in the life of this population of crabs was detected during this study. This paper will present the pertinent results of this study in the hopes that listeners will offer hints as to what directions the next level of the study should take.

Tettelbach, S.T., P.J. Auster, Marine Research Laboratory, Marine Sciences Institute, University of Connecticut, Noank, Ct. 06340 E.W. Rhodes and J.C. Widman, National Marine Fisheries Service. Northeast Fisheries Center, NOAA. Milford, Ct. 06460

A MASS MORTALITY OF NORTHERN BAY SCALLOPS, ARGOPECTEN IRRADIANS IRRADIANS, FOLLOWING A SEVERE SPRING RANSTORM.

Observations of a mass mortality of northern bay scallops, Argopecten irradians irradians, were made shortly after a severe rainstorm on June 5-6, 1982, during which >21 cm of rain fell on the Poquonock River area in Groton, Connecticut, USA. Mortality levels approached 100 % at locations highest in the estuary and decreased with distance from the head, and with depth. Observed levels of bay scallop mortality resulting from estimated periods of exposure to reduced salinities compared well with published laboratory determinations. All other lines of evidence support the conclusion that the bay scallop mass mortality resulted directly from low salinities incurred by the storm. Significance of the event is framed in an ecological context.

Tracey, G. A., Graduate School of Oceanography, Univ. of Rhode Island, Kingston, RI 02882.

COPPER, EUTROPHICATION AND THE PHYSIOLOGICAL PERFORMANCE OF MYTILUS EDULIS IN A SIMULATED NATURAL ENVIRONMENT.

The blue mussel, Mytilus edulis, is found in estuaries along a gradient of combined nutrient-enriched and chemically polluted conditions having unknown interactions. The objectives of this study were first to examine the relationship between the degree of eutrophic conditions and growth of mussels, and subsequently, the effects of a single, acute addition of soluble copper (640 nm) on growth and bioenergetics of mussels living in the effluent waters of simulated natural environments (mesocosms) along similar eutrophication gradients. While growth was not adversely affected by eutrophic conditions alone, copper/nutrient caused a reduction in growth capacity (scope for growth) during both short-term (4 days) and long-term exposure (32 days). Food absorption efficiency deteriorated over time, despite much reduced availability of ambient copper. This is indicative that irreversible damage has occurred, and suggests a mechanism of toxicity related to nutrition, not previously reported for this species in a field-simulated environment.

Winnick, K.B. and W.F. Bohlen, Marine Sciences Department, University of Connecticut. Avery Point, Groton,Ct. 06340 FISHING ACTIVITY AND SUSPENDED MATERIAL CONCENTRATIONS NEAR A DREDGE SPOILS DISPOSAL SITE IN CENTRAL LONG ISLAND SOUND

Observations provided by a bottom-mounted array of instruments (DAISY) positioned adjacent to an active dredge spoils disposal area in central Long Island Sound indicate that trawl fishing activity has the potential to produce significant perturbations within the near-bottom suspended material field. Following 12 months of near-continuous deployment snagging and ultimate recovery of the array by a small dragger in September, 1983 provided prima facie evidence of fishing activity and prompted re-evaluation of what were previously considered to be aberrant, short-teem peaks in suspended material concentrations. For the period immediately proceeding the snag, analyses indicated that fishing activity had been to progress since September 5th and contributed to an increase in back-ground concentrations within the lower in of the water column ranging from 3 to 15 mg/l. This increase and associated variations in interface erodibility appears sufficient to modify bio-exposure estimates.

Wright, S.B., Dept. of Biology, Northeastern Univ., Boston, MA. Macroinvertebrate community structure in a rehabilitated Trout stream.

This study deals with the macroinvertebrate community in a rehabilitated coastal stream (Quashnet River, Waquoit, MA.) and its anadromous Trout population (Salmo trutta, Salvelinus fontinalis). Substrate composition is related to macroinvertebrate diversity, density, and production, and amount of rehabilitation work completed. Food consumption of the Trout population is also reported in relation to stream rehabilitation work.

During the study period (June 1982 - January 1984) substrate composition was seen to be a factor in determining benthic community structure. Also during this period the density, and diversity of the least rehabilitated sections increased with time.

Young, A. M., representing Laudholm Farm Trust, PO Box 1007, Wells, Maine.
WELLS NATIONAL ESTUARINE SANCTUARY

A National Estuarine Sanctuary is being established in Wells, Maine by Laudholm Farm Trust, a group of citizens raising funds to match a NOAA grant for acquisition of Laudholm Farm, a 271 acre tract of upland, marsh, and barrier beach. This land will be added to 1500 acres of land owned by Rachel Carson National Wildlife Refuge and 200 acres owned by the State of Maine to create a sanctuary stretching almost nine miles from the Little River to the Webhannet River system on the southern Maine coast. Future development of the Sanctuary will include construction of interpretive trails for public and educational use, renovation of some farm buildings for office and laboratory space, and establishment of full-time research and monitoring programs. It is expected that research proposals will be solicited beginning this year. Interested scientists should contact Laudholm Farm Trust.

POSTER PAPER ABSTRACTS

Aitkenhead, J.L., Project Oceanology, New London High School, New London, Ct.
THE EFFECTS OF FERTILIZER ENRICHMENT AND CLIPPING ON THE GROWTH AND SURVIVAL OF TRANSPLANTED Spartina alterniflora.

During the summer of 1983, the success of transplanting Spartina alterniflora to degraded marsh land ammended with mycelium and secondarily digested sewage sludge as a method of marsh rejuvenation, was investigated. The success of the transplanted plants was determined in terms of survival and growth. Plants were also clipped to a uniform height in an effort to speed growth. Clipped plants grew significantly more than unclipped in all cases, suggesting a possible method for future acceleration of growth on the marsh. Results also indicated that surface application of mycelium and sewage sludge was not effective in promoting the success of the preliminary stage of transplantation of tall form but encouraged the success of transplanted short form.

Cairns, Jill, Project Oceanology, Waterford High School, Waterford, Conn. THE RELATIVE IM.PORTANCE OF ENVIRONMENTAL AND GENETIC FACTORS IN THE DETERMINATION OF SHORT AND TALL FORMS OF SPARTINA ALTERNIFLORA.

This work supported the postulate that the two growth forms of Spartina alterniflora plants are ecophenes. This hypothesis was tested by a combination of a transplantation study and a soil chemical analysis. Tall and short form plants were trans-planted into opposite zones and their growth was monitored. Short form transplants grew significantly greater than short form plants in their natural zone. Tall form transplants showed a decrease in growth rates as compared to tall form plants in their original zone. These results support the hypothesis that the two growth forms are ecophenes, the result of environmental conditions. From the soil analysis, the environmental factors that can be attributed to this fact are soil moisture, oxygen limitations, and nutrient limitations.

Intrinsic and Learned Manipulation of Solanum melongens (Solanaceae) Prior to Ingestion by Homo sapiens aestuarensis.

Eileen Cummings, Kathleen McCallion and Ernest Ruber, Department of Biology, Northeastern University.

AN INEXPENSIVE MOORED WATER SAMPLER E FOR INVESTIGATING CHEMICAL VARIABILITY

G.E. Friederich, L.A. Codispoti and P.J. Kelly Bigelow Lab, McKeon Pt., W. Boothbay Harbor, ME 04575

Study of small and mesoscale variations in the chemical properties of seawater has been inhibited by the expense of taking time series data. With the exception of observations taken close to shore, collection of time series data on chemical variability has required considerable amounts of expensive shiptime.

We have developed an inexpensive sampling device that can collect twenty pairs of chemical or biological samples and which can be moored like a current meter. This sampler is controlled by a quartz timer that activates twenty pairs of syringes equipped with filters, one-way valves and an appropriate preservative for the variables of interest. Sampling intervals can be varied over the lhr-10day time scale.

Preliminary field tests of this sampler at Bigelow Lab and off Monhegan Island, Maine were a success. An array of these sampling devices could provide truly synoptic “pictures” of chemical fields in the area of interest.

Hartman*, J.M., S.M. Merkel**, A.E. Giblin** and R.W. Howarth**. *Univ, of Connecticut, Storrs, CT and **Ecosystems Center, M.B.L. Woods Hole, MA. FACTORS AFFECTING RECOLONIZATION OF SALT MARSH VEGETATION.

Salt marsh vegetation can take five or more years to recover after it has been covered by wrack in Great Sippewissett Salt Marsh, Cape Cod, MA. We tested two possible causes of slow recolonization: 1) edaphic conditions may be unfavorable for plant growth (e.g. high sulfide concentration) and 2) there may be a paucity of colonizers.

By comparing pore water from disturbed and undisturbed plots in the marsh, we show that edaphic conditions are probably not preventing recolonization. In fact, sulfide concentrations were lower in disturbed than undisturbed plots, while salinities were not predictably different. Results in a study to estimate density of viable seeds in salt marsh soil show that there is virtually no seed bank in this system. Also, vegetative growth patterns in most marsh grasses lead to slow clonal expansion rates. We conclude that recolonization rate is primarily a function of colonizer availability.

Honse, C.G. and D. S. Tolderlund, Department of Science, United States Coast Guard Academy, New London, CT 06320. OSTEOLOGY OF THE SEA RAVEN

The Osteology of the Sea Raven (Hemitripterus americanus) will be presented in a complete skeleton depicting the entire structure and arrangement of the bones. In addition a half skeleton will be mounted in an exploded view format. The major bones will be identified and labeled. The procedures used in the preparation and articulation processes will also be described.

Kennish, M. J., Environmental Controls Department, GPU Nuclear, Forked River, N. J. and R. E. Loveland, Department of Zoology, Rutgers University, Piscataway , N. J.
BENTHIC MACROPHYTES OF BARNEGAT BAY, NEW JERSEY.

The species composition, spatial distribution,, seasonal periodicity, and biomass of benthic macrophytes have been investigated in Barnegat Bay, New Jersey. More than 115 species of macroalgae and submerged vascular plants have been identified in the estuary, with Ulva lactuca, Gracilaria tikvahiae, Codium fragile, Ceramium fastigiatum, Agardhiella subulata, and Zostera marina consistently providing the bulk of the floral biomass. Among the benthic macroalgae, the highest number of species appears in late spring and the lowest number in late summer. Phaeophyta taxa are most characteristic of the winter months, whereas Chlorophyta and Rhodophyta taxa are most characteristic of the spring and summer months. Less than ten species of benthic macrophytes occur year-round. Variation in species composition correlates well with seasonal periodicities of environmental factors. Temporal and spatial changes in the benthic macrophytes of Barnegat Bay are similar to those of other mid-latitude estuaries.

Marino, R. and R. W. Howarth, M.B.L., Moods Hole, MA 02543.
SULFATE, CHLORIDE AND MOLYBDENUM RELATIONSHIPS IN THE BALTIC SEA

The Baltic Sea is a stable estuary which decreases in salinity from 10-12 ppt to less than 3 ppt as one proceeds northward. During a May-June 1983 cruise along this salinity gradient, surface water samples were collected and analyzed for sulfate, chloride, and molybdate. The sulfate/chloride calculated from a linear regression of the data is significantly lower than that of seawater. The molybdenum concentrations found were also consistently lower than those expected from the conservative mixing of seawater with freshwater. These sulfate-chloride-molybdenum relationships suggest that there are processes occurring in the Baltic which are removing sulfate and molybdate from the surface waters. The deeper waters of the Baltic periodically become anoxic, which may result in the precipitation of sulfide minerals like FeS, FeS_2, and MoS_2. Since Mo^{4+} is the main stable form of Mo under reducing conditions, MoS_2 is often found associated with iron minerals in sediments. Mo may also be removed from the water column incorporated in sinking phytoplankton.

Merkel, S.M., R.W. Howarth, R. Marino and J.M. Hartman. Ecosystems Center, M.B.L., Woods Hole, MA 02543. SULFATE REDUCTI0N AND PLANT GROWTH IN SALT MARSH SEDIMENTS

Sufate reduction rates were measured in salt marsh sediments to investigate interactions between Spartina alterniflora and sulfate reduction. We compared sulfate reduction rates in killed and control plots in Great Sippewissett Marsh (Cape Cod, MA). Results showed that after 4 months, reduction rates in the killed plots increased to 40% higher than the control plots, then stabilized at a level half that of the control plot. A microcosm experiment with decreasing drainage created a gradient of increasing plant senescence and increasing sulfate seduction rates.

We suggest that as sediments become more reducing, fermentation processes and leakage from roots supply labile organic compounds which fuel high sulfate reduction rates. As these compounds are consumed, reduction rates fall to a level below that of living root systems. Thus, the supply of easily metabolized compounds may be a factor controlling sulfate reduction in salt marshes.

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Miller, E.R., III, Marine Research Laboratory, Marine Sciences Institute, the University of Connecticut, Noank, CT.
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HEAVY METAL CONCENTRATIONS IN THE DOGWHELK (NUCELLA LAPILLUS) FROM POPULATIONS WITH NORMAL AND PENIS-BEARING FEMALES

Atlantic dogwhelks (Nucella lapillus) were collected from six sites along the northern New England coastline. Three sites had high incidence of female snails with 'imposex' (pseudohermaphroditism, manifested as female snails with non-functioning penises), while three sites had 100% normal females. The occurrence of 'imposex' in dogwhelks and other Stenoglossan snails, is often associated with vessel-related activities, and associated heavy metal contamination. Pooled whole-body tissues from each population were analyzed for Zn, Fe, Cu, Cd, Cr and Zn in order to determine the relationship between heavy metal levels and the incidence of 'imposex' . Dogwhels from populations with 'imposex' had higher concentrations of Cu and Zn than sites with normal females. There were no significant differences in levels of Fe or Cr between any of the sites, while levels of Cd were different between sites, but with no relationship to the incidence of 'imposex'.

Milne, G. T., Project Oceanology, East Lyme High School, East Lyme, CT.
THE EFFECTS OF AERATION AND SALINITY ON SPARTINA ALTERNIFLORA, SPARTINA PATENS, AND SALICORNEA EUROPEA. .

The salt marsh represents a highly productive but demanding ecosystem. The major grasses represented in New England salt marshes reflect differing adaptive mechanisms to handle varying levels of salinity and oxygenation. Spartina alterniflora (tall form), Spartina patens, and Salicornia europea were studied hydroponically at eight salinities (O, 10, 20, 30, 40, 50, 60, and 100 ppt). S. alterniflora and S. patens showed significant stimulation with regard to blade and new root growth at the lower salinities. In contrast, S. europea grew best at a salinity of 20 ppt. The aeration study consisted of three treatments: aerated, control, and lowered (with the use of Fucus sp.). S. alterniflora exhibited tremendous increases in blade and root growth under aerated conditions and was greatly inhibited at low oxygen levels. S. patens and S. europea demonstrated a decrease in growth in both the aerated and deoxygenated environments. A better understanding of the factors which influence the productivity of the major salt marsh plaints could be of major importance in the rebuilding of salt marshes partially destroyed in the name of progress.

Peterson, B. J., R. W. Howarth, and R. H. Garritt, Ecosystems Center, M.BL., Woods Mole, MA.
HYDROLOGICAL EFFECTS Of SPARTINA GROWTH AND S U L F U R POREWATER CHEMISTRY IN SALT MARSH MICROCOSMS.

Porewater percolation and drainage rates can have significant effects upon interstitial water chemistry and the subsequent rate and health of Spartina. Microcosm cores of dwarf Spartina alterniflora from Great Sippewissett Marsh were used to examine hydrological effects on plant growth and sulfur perimeter chemistry. We maintained microcosms in a greenhouse for five weeks while carefully monitoring perimeter chemistry and variable percolation and drainage rates. Our results indicate that stagnant water conditions result in high concentrations of sulfide (>2mM) and chloride (>23 ppt), which appeared to produce noticeable growth inhibition by three weeks and death within five weeks. In contrast, microcosms with percolation rates up to 4 cm per day result in lower sulfide concentrations and increased plant growth. In partially drained microcosms, in situ sulfide oxidation and lower sulfate reduction rates allowed vigorous above ground Spartina growth at intermediate percolation rates (1.25 cm per day).

Reynolds, W.W. and M.E. Casterlin, Biothermal Research Inst., 34 Mt. Zion Rd., Wyoming, PA 18644.
ZOOGEOGRAPHY AND THE PREDATOR-PREY "ARMS RACE:" AN ANALYSIS BASED ON ERIPHIA AND NERITA, WITH NEW DATA PROM THE NORTHERN ARABIAN SEA

We compared morphological data for species of Eriphia (Brachyura: Xanthidae) and Nerita (Gastropoda: Neritidae) from different zoogeographic regions of tropical and sub-tropical seas. Eriphia species from the Indo-West Pacific (IWP) region have relatively larger crushing claws than do their congeners from other regions. Nerita from the IWP have relatively thicker shells, which are more resistant to crushing, than do Nerita from other regions. Predator and prey indices, based respectively on relative claw site of crabs and relative shell thickness of gastropods, parallel the relative numbers of species in the various marine zoogeographic regions, suggesting that predator-prey coevolution -- the "arms race"-- has escalated to a higher level in the IWP than in less species-rich areas.

Yuhas, E.S. Project Oceanology, Groton, Conn.
THE IMPORTANCE OF OXYGEN DIFFUSION RATES AND CHEMICAL OXYGEN DEMANDS IN INFLUENCING VASCULAR PLANT ZONATION PATTERNS ON THE SALT MARSH

Oxygen diffusion rates and chemical oxygen demands were examined in the Spartina alterniflora, short and tall form, Spartina patens, and Juncus gerardi zones of a salt marsh along the lower Poquonnock River in Groton, Conn. Oxygen diffusion rates were found to be significantly higher in the tall Spartina alterniflora zone than in all the other zones. Chemical oxygen demands were found to be higher in the tall Spartina alterniflora zone, but in this zone, the chemical oxygen demand was found to be a lesser percent of the available oxygen than in all the other zones. The zonation of the height forms of Spartina alterniflora was found to be influenced by oxygen diffusion rates and available oxygen, which is affected by chemical oxygen demand. The zonation of Spartina patens and Juncus gerardi was found not to be influenced by these factors.