

# **NEW ENGLAND ESTUARINE RESEARCH SOCIETY**

## **FALL MEETING**

**October 26-28, 1978**

**Marine Biological Laboratory  
Woods Hole, MA**

## **ABSTRACTS**

[NOTE: The abstracts for the papers presented at this meeting were never printed and made available to participants, and they have never been seen since that time by anyone other than myself. What you will find here is a compilation of the original submissions as mailed by presenters to the Program Chair of the meeting. --- NEERS Historian, March 2006]

POPULATION DYNAMICS OF THE ATLANTIC SILVERSIDE,  
MENIDIA MENIDIA, IN A NEW ENGLAND ESTUARY

David O. Conover\*, Massachusetts Cooperative Fishery Research Unit,  
University of Massachusetts, Amherst, Mass. 01003

Growth, mortality, production and fecundity are population parameters closely linked to the age structure and longevity of a particular species, yet these traits have rarely been elucidated for annual fish. The Atlantic silverside, Menidia menidia, lives approximately one year throughout its range along the eastern North American coast and provides forage for gamefish such as striped bass, bluefish and others. This paper describes a portion of the project dealing with seasonal density, mortality, growth and production of M. menidia in Essex Bay, Massachusetts.

In the summer and fall of 1976, YOY silversides were extremely abundant. However, over-wintering mortality removed 99% of the population and the density of reproductive adults in spring '77 was extremely low. The resultant '77 year class reached only about 10% of the '76 year class abundance. Growth rate and condition factor were higher in '77 and mortality the following winter was less severe possibly indicating a density compensatory mechanism. Sex ratios also differed significantly averaging 2.2:1.0 (males:females) in 1976 and 1.2:1.0 in 1977. Quantitative seining techniques used in 1977 showed that silversides reached an average low tide density of approx. 1.0 fish/m<sup>2</sup> by mid-August when recruitment was completed and did not decline until late fall indicating low summer mortality. Rapid growth thus resulted in a biomass of about 4-5 g/m<sup>2</sup> by November at which time the population moves offshore to over-winter. This life history pattern suggests that silversides are important exporters of estuarine production to the food chain of deeper adjacent waters.

\* present address, Dept. of Zoology, University of Massachusetts

## ABSTRACT

### Remobilization of Dissolved Sedimentary Substances by Winter Storms by

Jack Tramontano  
Marine Sciences Institute  
University of Connecticut

The pore waters of coastal marine sediments are enriched as compared to the water column with respect to concentrations of  $\text{PO}_4^{3-}$ ,  $\text{NH}_4^{3+}$ ,  $\text{H}_4\text{SiO}_4$ , Mn and Cu. The passage of intense winter storms during January 1976 and 1978 has been found to produce increases in water column concentration of these substances, in addition to increased suspended material concentrations (SMC). The sediment pore water is the most likely source of this material. However, estimates, using the recorded increase in SMC, indicate that the amount of sediment and its accompanying pore water that was resuspended could not account for the increased dissolved concentrations.

It is speculated that mixing of the pore water in place without the resuspension of the sediment occurs. This is supported by observation of the seasonal changes in pore water concentrations (down to 70 cm below the sediment water interface) made by Lyons (1968) and Thorstensen and MacKenzie (1973).

TITLE: Surface Deposit Feeding by Clymenella torquata, a Conveyor-Belt Species.

ABSTRACT:

Clymenella torquata, a widely-distributed malidanid polychaete, has been described as a classical example of a "conveyor-belt" deposit feeder. Positioned anterior end down in a vertical tube, it ingests sediment particles at depths down to 20 cm, then moves upward and defecates at the surface. During laboratory and field observations, I have seen another method of feeding, one in which the worm extends its posterior segments out from its tube and upon the adjacent surface. When the segments are retracted, they carry ("shovel") sand into the worm's tube. Laboratory manipulation with colored sand has shown that this shoveled material may be ingested or used in tube construction. I will discuss the implications of this surface feeding by Clymenella on the geologic record, sediment reworking estimates, and sediment bacteria.

PROJECTION NEEDS: Kodak Carousel Projector for 35 mm slides  
Overhead Projector

Fred C. Dobbs  
Box 278  
Marine Research Laboratory Univ. of Connecticut  
Noank, Connecticut, 06340

# Bioturbation in Estuarine Sediments: A Chemical Approach

by

Wm. Berry Lyons  
Theodore C. Loder  
Henri E. Gaudette

Department of Earth Sciences  
University of New Hampshire  
Durham, NH 03824

The sedimentary fluxes of dissolved phosphate and silicate have been measured in two locations in Great Bay, N.H., by two different methods: directly using benthic chambers and indirectly by using measured pore water gradients. In the more saline location where bioturbation has been documented to a depth of 8 cm, the calculated and the measured flux are different by an order of magnitude, indicating that the diffusion coefficient,  $D$ , can better be described as an eddy diffusional coefficient. At the other site, bioturbation appears to be limited to the surface of the sediments and the calculated fluxes are similar to the measured ones, suggesting that  $D$  is equal to a molecular diffusion coefficient. Recent seasonal pore water measurements of  $\text{PO}_4^{3-}$  and  $\text{SiO}_2$  will be discussed in the light of bioturbation-induced transfer processes.

## Abstract

An ecological model of anaerobic decomposition processes: validation

James P. Reed, The Ecosystems Center, M.B.L., Woods Hole, Ma.

This model is designed to simulate the disappearance of material at different depths in sediment. It predicts rates of decomposition from a Monod-type of equation based on substrate concentrations and microbial biomass. The concentrations of end products produced from decomposition are a function of the Gibbs free energy of reaction, the cell maintenance requirements and population turnover time.

For the sand-detritus system used to validate the model, there are two possible processes which provide substrate for the sulfate reducing microbes. One process is autolysis and leaching of the detritus. The other process is the release of material by the cellulose fermenters.

Model results agree well with experimental results using autolysis and leaching as the sole substrate source. The cellulose fermenters do not appear to serve as an important source of substrate for the sulfate reducers during the first six months of decomposition. Sensitivity analyses indicate that only the rate of supply of substrate is critical. Varying the quality of substrate from a high energy carbohydrate to a low energy fatty acid produced only a 20-30% change in the rate of sulfate reduction. A two to ten fold change in any of the remaining parameters accounts for less than an eight percent change in the sulfate reduction rate.

Evaluation of the Energy Term "U" for a Mud Snail  
(Ilynessa obsoleta) Population

Steven Edwards  
University of Connecticut  
Marine Sciences Institute  
Avery Point, Groton, CT, 06340

Excretory products and mucous losses (collectively symbolized as U) are frequently assumed to be insignificant components of population energy budgets or estimated by difference. Published nutrient regeneration experiments suggest that the former procedure may be erroneous. The latter practice of budget balancing by subtraction precludes internal checks on accuracy. Whether these practices will significantly alter values assigned to energetic efficiencies and subsequent conclusions can only be decided by more complete inquiries. Ammonia, dissolved organic matter, and mucous losses associated with excretion, trail secretion, and defecation have been quantified and assigned caloric values for a mud snail (Ilynessa obsoleta) population at Branford Harbor, Ct. Their contributions to the mud snails energy budget and to the mud flat ecosystem will be discussed.

## MANGANESE RECYCLING IN CONTROLLED MARINE ECOSYSTEMS

Carlton D. Hunt and Deborah L. Butler  
Project MERL - Graduate School of Oceanography - Univ. of Rhode Island

Evidence is presented for rapid recycling of the dissolved Mn flux from sediments in the MERL microcosms. Comparison of Mn cycling in a control and oil stressed microcosm show the internal cycle of Mn in the two systems is distinctly different. The recycling of Mn is apparently mediated by the particulate matter present in the water column. Total suspended loads were similar in both tanks thus the observed differences in the Mn recycling could not result from disparity in the suspended loads. It is suggested that the composition of the suspended load affects the recycling of Mn.

These results are used to support the utility of large controlled microcosms in assessing the biogeochemical cycling of trace metals in marine systems.

Maglione, Louis P., 1978. Effects of acute gamma radiation on the polychaete Nereis virens. M.S. thesis, C.W. Post Center of Long Island University, Greenvale, N.Y.

In response to the increasing radiation load of the marine environment, the survival of one-year-old sandworms, Nereis virens, was observed for 70 days after exposure to Cs-137 gamma radiation. Worms were given acute doses ranging from 20 to 100 kilorads, and lethal dose-time curves were constructed. LD-50 and LD-30 curves were linear, and the LD-50 (60 days) was estimated at 89 krad. Some behavioral changes were observed immediately after irradiation, but no long-term effects on behavior were discerned. A gradual loss in color over several weeks was apparent in animals receiving high dosages. Length of mortalities increased substantially over time, suggesting that increased body size may contribute to radioresistance.

24-HOUR TIDAL STUDIES OF ICHTHYOPLANKTON IN THE LOWER PISCATAQUA RIVER, A TIDALLY  
DOMINATED ESTUARINE INLET

BY

Mark Epply &  
Ken Kimball

Normandeau Associates, Inc.  
Piscataqua Marine Laboratory  
Portsmouth, N.H.

The lower Piscataqua River is characterized by strong tidal flows where maximum currents approach two to three meters per second and tidal range spans 2.5 meters. Very little knowledge had existed prior to this study regarding the importance of tidal influence on the Piscataqua estuarine ichthyoplankton community. Three stations in the immediate vicinity of an electrical generating plant were sampled as part of an on-going monitoring study. Depending on depth, either step-oblique or surface tows were taken with a 505 $\mu$  meter net every three hours over a 24-hour period (two complete tidal cycles) on two separate occasions in March 1978. The influence of tidal and diel variations on densities of *Ammodytes americanus* as well as other early spring ichthyoplankton (e.g., *Myoxocephalus aeneus* and *Liopsetta putnami*) are examined with regard to general distribution information and possible entrainment mortality. A discussion of other influences on changes in abundance, such as spawning habits, is included.

ABSTRACT-

PISCATAQUA RIVER ZOOPLANKTON 1977: DOMINANCE AND COMMUNITY STRUCTURE

Stephen A. Grabe  
Normandeau Associates, Inc.  
Piscataqua Marine Laboratory  
Portsmouth, New Hampshire 03801

Structure of the microzooplankton ( $>76\mu$ ) assemblage of the Piscataqua River April-November 1977 was evaluated by Sander's Biological Index for dominance, numerical classification (log n+1 transformed abundances; Bray-Curtis coefficient; unweighted pair group average clustering strategy), and species richness.

Dominant taxa included developmental stages of neritic copepods, polychaete larvae, bryozoan larvae and gastropod larvae. Cluster analyses indicated aggregations of ubiquitous and dominant species, seasonal taxa, neritic species, and estuarine species. Station-date assemblages were most influenced by season. Within these seasonal clusters, stations from the lower estuary were generally similar while the station located at the mouth of Great Bay, a more estuarine location, was generally an outlier. Species richness generally decreased as distance from the mouth of the estuary increased, reflecting the neritic origins of many of the taxa.

Quantification of -Zooplankton Behaviors by the "Bugwatcher," a New  
Video-Computerized Analysis System

Authors: D. C. Miller, W. Lang, R. Wilson, S. Lawrence, M. Marcy,  
and J. Pechenik

Address: U. S. EPA Environmental Research Laboratory, Narragansett, RI

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The operation of an interactive video-computerized behavioral analysis system (the "Bugwatcher") will be described and some of the capabilities illustrated using results from several projects completed to date. The "Bugwatcher" is a research tool which permits the biologist to rapidly and accurately quantify a wide variety of motile responses of a test group of organisms. Parameters measured include linear and angular velocity, direction of travel and rate of change of direction. It can also be employed to describe unique spatial and interactive relationships between organisms, such as occurs with fish schooling or predator-prey behaviors.

The principal species studied to date by our Laboratory include barnacle nauplii, juvenile mysids and Artemia. Two behaviors have been considered for these initial studies: photo-response and swimming rates and patterns. Data will be presented describing these behaviors under both "normal" conditions and following exposure to metal pollutants. The relevance of observed pollutant effects will also be considered, with data presented from simultaneous studies on animal energetics which provide an indication of the potential consequences of altered swimming behavior on growth and ecological fitness.

Projection needs: 2" x 2" slides

**WOODS HOLE OCEANOGRAPHIC INSTITUTION**

WOODS HOLE, MASSACHUSETTS 02543

Phone (617) 548-1400  
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15 August 1976

Bernie McAlice  
Ira C. Darling Center  
University of Maine  
Walpole ME 04573

Dear Dr. Malice:

Your announcement for the fall meeting of NEERS, to be held in Woods Hole, encourages reports on work in progress and wild-eyed speculation with some factual support. We have just the thing for you.

Eels in Cape Cod Marshes

R. L. Haedrich, P. T. Polloni, and C. M. Cetta

Populations of eels in two salt marshes on Buzzards Bay have been studied for three years, two of them intensely. Growth is slow, errantry is limited, and abundance can be deduced from shoreline length. The eels in an anonymous marsh of moderate size may be worth \$4500 on an Oriental table. As current practice in science demands, tonnes of data are used to make small points and a factorial model of eel modulation is presented.

If the paper is accepted for presentation, and I do believe it will be of interest, we will need a 35-mm (2 x 2) slide projector during the talk and, probably, an overhead projector as well.

Sincerely yours,

A handwritten signature in black ink, appearing to read "Rich Haedrich", followed by a large, stylized "X" mark.

Richard L. Haedrich

EDUCATION • RESEARCH • CONSERVATION

# NEW YORK ZOOLOGICAL SOCIETY

NEW YORK AQUARIUM and

OSBORN LABORATORIES OF MARINE SCIENCES

Telephone: 266-8500

Cable Address: AQUAPARK NEW YORK

Seaside Park, Coney Island

Brooklyn, New York 11224

Sept. 11, 1978 Dr.

Bernie McAlice

Ira C. Darling Center

Univ. of Maine

Walpole, Me. 04573

Dear Dr. McAlice,

Enclosed is a title and abstract of a talk I'd like to present at the Fall NEERS meeting in Woods Hole. My projection needs would be for a Carousel (or some such) projector. Thanks.

Sincerely,

Peter R. Burn

Title: The Use of Population and Community Structure to study Fish Parasites, their Hosts, and their Environment

Abstract: The frequency distributions and diversity indices of fish parasites are discussed, particularly with reference to their response to environmental changes. The former attribute is of value as a measure of pathogenicity for individual parasite species, and the latter as an estimate of free-living community diversity and of intermixing between fish stocks. Examples are provided from the Great Bay estuary, N.H., as well as prospective uses in the New York Bight.

Jerry Cura  
Department of Oceanography  
Darling Center  
University of Maine

Light Intensity and Temperature Effects  
on the Germination of Diatom Spores

The species composition of the diatoms found in mid-coast Maine estuaries display a relatively predictable seasonal sequence. Working upon the assumption that the source of these seasonal populations is spores which lie dormant on the estuarine bottom, we raised the hypothesis that either conditions of surface light intensity or temperature encountered when the spores are roiled up from the bottom will dictate whether or not these spores germinate. This hypothesis was tested by inoculating sterile culture media with small amounts of bottom material and subjecting the culture to various light intensities and temperatures for 7-10 days under a 12L:12D photoperiod. The results of spore germination under these conditions are compared to the seasonal sequence of diatom populations over the past year.

ABSTRACT

Bay Scallop Aquaculture in New England - Some New Methods,  
A Few Results and Some Future Directions

Edwin W. Rhodes

National Marine Fisheries Service  
Northeast Fisheries Center  
Milford Laboratory  
Milford, Connecticut 06460

Some excellent results from both an economic and biological standpoint have been achieved using a tank configuration in which larval bay scallops are allowed to attach to the walls of a container which is then converted to a flow-through system using unfiltered seawater.

An interesting method for tethering juvenile scallops for growth and mortality studies in field environments has been developed and deployed. Information on the results of this adventure will be available by NEERS time.

The medium range goal for our scallop program is the establishment of a recreational fishery for bay scallops based on seed production from our efforts. Commercialization of the process could proceed from that point if the economics look promising.

John Stewart

Survival of Mya arenaria (Soft-Shelled Clam) and Placopecten magellanicus (Sea Scallop) Veliger Larvae after Short-Term Thermal Stress

Mya arenaria and Placopecten magellanicus were reared to straight-hinge veligers at similar temperatures. They were then heat-shocked in a thermal gradient apparatus to determine mortalities under various time-temperature combinations. Analysis of the data revealed that M. arenaria larvae tolerated considerably higher temperatures compared to P. magellanicus larvae. This study is part of a larger program to assess entrainment effects of power plant operation.

Heavy Metals in Transplanted Hard Clams,, *Mercenaria*

*mercenaria*, in

Great South Bay, New York

William John Behrens

The Ecosystems Center Marine  
Biological Laboratory Woods Hole,  
Massachusetts

ABSTRACT

An area in Great South Bay, N.Y. which has been closed to shellfishing on the basis of coliform bacteria standards was shown to have elevated levels of heavy metals in hard clams, *Mercenaria mercenaria*, and sediments. Clams from this area were transplanted into the central portion of the Bay which is open to shellfishing. No depuration of any heavy metal analyzed (Cd, Cr, Cu, Ni, Pb and Zn) was noted over the 50 day duration of this study, while significant increases in the total body content of Cd, Ni and Pb occurred. Resulting Cd and Pb levels in hard clams were not elevated above natural levels found in the transplant area, but Ni levels were approximately 56% higher. Transplanting may therefore introduce hard clams with significantly higher levels of Ni into the harvestable resource.

Copper, Pb and Ni levels in natural populations of hard clams decreased from May to July and then increased through September, reflecting seasonal trends associated with biological processes of the organisms and environmental factors.

TITLE: Utilization of Tidal Salt Marshes by the meadow vole, Microtus pennsylvanicus

ABSTRACT: Microtus pennsylvanicus is one of the few mammals resident to the tidal salt marshes of the Northeast coast. However, very little is known as to how this herbivore survives in a habitat characterized by halophytic vegetation and at least some degree of daily tidal flooding. Populations from three salt marshes in Connecticut and Rhode Island were live and snap trapped at six week intervals for one year. Populations from three upland old fields and one fresh water wetland were studied simultaneously for comparison. The parameters measured were population distribution, residency, and diet,

The live mark and recapture study showed that the voles are distributed throughout the marsh in all months except the winter when the shrub border is used to a great extent. The voles were captured on the marsh even after flooding. Residency of the voles, as measured by recapture percentages, showed that at least half of the voles remain on the marsh six weeks or more. The conclusion drawn from these results is that dispersal in and out of the marsh habitat is not great. The marsh habitat is exploited throughout the annual cycle.

The diet of the marsh voles was found to consist largely of the halophytic grasses Spartina patens and Distichlis spicata. However, there was a seasonal dependence on seeds in July and August when plant salinities would be highest. This consumption of seeds could have a significant effect on resulting vegetational composition of the marsh habitat. There was no such dry season change in diet in the upland vole populations. On the marshes, only the stems of the grasses were eaten, indicating that the rest of the plant would be cropped and left to enter the detritus cycle more quickly due to vole grazing.

Penelope Howell  
University of Rhode Island

LABORATORY SIMULATION OF OPEN WATER DISPOSAL OF  
DREDGED MATERIAL

BY

STEPHEN H. GREENE, JBF SCIENTIFIC CORP.  
AND GILBERT L. CHASE, ARMY CORPS OF ENGINEERS

ABSTRACT

A series of tests were conducted to establish the mounding characteristics of polluted dredge material from Stamford Harbor, Conn., as a function of percent moisture when the material is bottom dumped in open water. Based upon the mounding tests two percent moisture values were selected for tank dumping to establish quantitative parameters for material that mounds and material that flows. Simulated dumps or "point drops" were made in a glass tank and high speed photography used to obtain velocity and spreading data. The photos were then analyzed and the values expanded to full scale using the Koh-Chang model to predict dump site conditions. Additional dumps were performed using median grained sands to evaluate the potential for capping or burial of these contaminated sediments with cleaner sediment from a second maintenance dredge project at New Haven Harbor.

An Abstract of a talk proposed for the October NEER'S Meeting, 1978

Title: Some Speculations Based on the Distribution Patterns of the Seastars Asterias vulgaris and Asterias forbesi on the Middle Atlantic Bight Between Cape Cod and Cape Hatteras

Author: David P. Franz

Biology Department, Brooklyn College CUNY, Brooklyn, NY 11210

Intertidal populations of the abundant American seastars Asterias vulgaris and A. forbesi overlap geographically and ecologically north of Cape Cod. Littoral populations in the Gulf of Maine and Bay of Fundy contain confusing "intergrades" which are thought to imply a degree of genetic hybridization in this zone. South of Cape Cod, A. vulgaris is restricted to sublittoral habitats while A. forbesi predominates in inshore and estuarine environments.

On the continental shelf of the Middle Atlantic Bight, both species co-exist in a broad zone of overlap in which, however, confusing intergrades are infrequent. Distributions of both species are well predicted by mean monthly bottom temperature. The absence of significant "hybridization" implies more successful niche separation on the continental shelf than in the littoral zone north of Cape Cod. We speculate that competitive interactions are inconclusive in preventing co-existence north of Cape Cod because thermal and trophic variability allows both species to survive. On the continental shelf south of Cape Cod, however, the more stable and predictable thermal and trophic environments may allow for a more complete and successful niche segregation and reproductive isolation.

In spite of genetic similarities between A. forbesi and A. vulgaris they are reproductively and ecologically separated over most of their geographical ranges. We hypothesize that A. forbesi is of Miocene American ancestry; and that populations of A. vulgaris in the northwest Atlantic are derived from A. rubens populations in northern Europe, probably during the Holocene. The genetic compatibility between A. vulgaris and A. forbesi in the Gulf of Maine suggests that the vulgaris/rubens complex probably shares a common ancestor with the endemic Western Atlantic A. forbesi.

## ABSTRACT

### The Reproduction Cycle of mahogany quahog, Arctica Islandica

Pat Clark

The reproductive cycle of Arctica islandica from beds off Hampton Beach, New Hampshire were observed for two years. Gonadal blocks were dissected from monthly samples of 25 individuals and identified for reproductive state. Males indicated slow but active spermatogenesis during winter and early spring, increased rate during April through June, spawning during the summer months with the greatest percentage in late summer-early fall and a slight resting period during November. Females indicated a gradual increase in the rate of oogenesis throughout the winter and early spring, spawning during the summer with the greatest percentage during late summer-early fall and a resting period during November. It appears that the critical minimum temperature of 13°C reported previously does not apply to this population. The majority of the individuals began spawning when the bottom temperatures were declining from the summer maximum of 11.5°C. Loosanoff (1953) and Landers (1976) report a temporally similar reproductive cycle for the population off Pt. Judith, Rhode Island. Yet these two populations experience quite different bottom water regimes. It was concluded that some other environmental variable common to both areas during September through October is triggering spawning. Possibly the regular occurrence of a fall plankton bloom is a principal environmental stimulus inducing spawning in Arctica populations.



THE INFLUENCE OF WATER MOTION, LIGHT, AND AMMONIA  
CONCENTRATION ON THE GROWTH AND AMMONIA UPTAKE  
RATE OF ULVA LACTUCA

Ulva lactuca discs were grown in a variety of simulated current (0, 7.5, 15, and 22.5 cm sec<sup>-1</sup>), light (ca. 40, 100, and 270  $\mu\text{E m}^{-2} \text{sec}^{-1}$ ), and ammonia (< 10, ca. 40, and ca. 120  $\mu\text{g-At l}^{-1}$ ) levels in order to test the independent and interacting effects of these factors on growth rate and ammonia uptake rate. At the lowest light, current had no effect on growth although all discs increased in size. At the two highest light levels, current significantly enhanced growth, but, at the two highest ammonia levels, this enhancement occurred only between 0 and 7.5 cm sec<sup>-1</sup>. At the lowest ammonia level, current enhanced growth up through 22.5 cm sec<sup>-1</sup>.

Ammonia uptake rates showed similar trends except that, at the highest ammonia level, current had no consistent effect on uptake rate.

Henry S. Parker

(Title submitted on 9/15/78)

Effects of Cadmium on the Intracellular Pool of Free Amino Acids  
in Mytilus edulis During Osmotic Stress

Lebaron R. Briggs, 4<sup>th</sup>

The common mussel Mytilus edulis (L.) was exposed to 0.1 ppm, 1.0 ppm, and 5.0 ppm cadmium at 30 ‰, 11 ‰, and 6 ‰ salinity water. After 544 hours exposure to 0.1 ppm cadmium, mussels in 30 ‰ salinity saltwater had accumulated at least 10x the amount of cadmium that the mussels in 11 ‰ salinity water had accumulated. The presence of cadmium had significant effects on the levels of free amino acids (F,A) in the posterior adductor muscle. The cadmium-exposed animals generally had reduced levels of FAA. This effect became more predominant as the length of the experiment increased and was not always dose dependent. Analysis of variance showed that with increasing length of exposure to cadmium, the variance attributable to salinity-cadmium interaction became increasingly important.

BIOLOGICAL IMPLICATIONS OF THE PESTICIDE, KEPONE,  
IN THE JAMES RIVER, VIRGINIA ECOSYSTEM

Charles Terrell

Uncontrolled release of the chlorinated pesticide, Kepone,\* into the James River, Virginia from two manufacturing plants in Hopewell, Virginia from 1966 to 1975 has resulted in Kepone deposition in Hopewell and contamination of approximately 70 miles of the river. The river's reach from upstream of Hopewell to the Chesapeake Bay remain closed for health reasons to the taking of many species of shellfish and finfish. Approximately 1,400 kilograms of Kepone have been found in Hopewell resulting from careless manufacturing and disposal procedures. About 9,000 to 17,000 kilograms of the chemical are located in the river. Current evidence indicates that the natural degradation of Kepone is insignificant and projections of continued elevated Kepone levels in the James River are on the order of decades.

The U.S. Environmental Protection Agency (EPA) at the request of the Governors of Virginia and Maryland initiated the Kepone Mitigation Feasibility Project to determine how the Kepone contamination could be eliminated or ameliorated in the Hopewell/James River areas. The year-long effort examined existing methods and new technologies for mitigation including dredging and fixation methods, elutriate and spoil slurry treatments, in situ processes, and biological approaches. The topic of this paper concerns the implications of Kepone to biological systems.

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\*Registered trademark of the Allied Chemical Company, New York

Kepone has bioconcentrated in organisms through sediment, water and food routes depending on the species. From laboratory experiments the highest bioconcentration factor reported is in juvenile sheepshead minnows (Cyprinodon variegates) at 20,000 times the ambient level of Kepone. Organisms have been shown to bioconcentrate Kepone from near the limits of detectability to concentrations near or above the Food and Drug Administration Action Levels, which are used for enforcement purposes. In general, resident fish species of the James River tend to maintain higher levels of Kepone than migratory species, but migrants can exceed the Action Levels after only a few weeks of exposure to the river's waters. Kepone has bioaccumulated in the aquatic food chains of the James River ecosystem with concentrations in the Bald Eagle exceeding 80 ug/g. Bald Eagle and osprey eggs also exhibit elevated Kepone levels. Terrestrial food chains appear not to be affected like aquatic food chains.

Seventy-six workers from the now-defunct Life Science Products Kepone-manufacturing facility in Howell were diagnosed to have symptoms of Kepone poisoning. Several workers required hospitalization. Symptoms included nervousness, tremor, bursts of rapid eye movement, weight loss and pleuritic and joint pain. Recent medical experiments have demonstrated that with the administration of cholestyramine, an anion-exchange resin, the elimination of Kepone from the workers bodies can be increased by seven times the natural rate. Kepone is a suspected carcinogen, but further testing will be required to fully substantiate this.

NEERS ABSTRACT

Luana Read

THE DISTRIBUTION OF INVERTEBRATES ON SHALLOW SUBTIDAL ROCKY SUBSTRATE

Two theories have been proposed to explain the distribution patterns along environmental gradients: the community - type theory and the continuum theory.

This study was designed to test the applicability of these theories to distribution patterns of organisms on subtidal rocks. 50 samples were taken from rocks in Groton, Conn. ranging in depths from zero to ten feet below low tide line, were enumerated for seaweed, prosobranch mollusks, and crustaceans associated with algal fronds. The data were analyzed by direct ordinations cluster techniques, Principal components analysis, and correspondence analysis. The conclusions depended to a certain extent upon the numerical method. The results support a third possibility; a "fluid" model in which there is some local structure without distinct boundaries.

ABSTRACT

Further Results from Studies on the Fouling  
Communities of the Damariscotta River Estuary

Bryan Field  
Jason M. Cortell and Associates, Inc.  
244 Second Ave.  
Waltham, MA 02154

The development of the marine fouling community at two stations in the Damariscotta River estuary was studied in the light of current theories of ecological succession. The fouling community can be divided into two subcommunities, the primary foulers, which attach directly to the substrate, and the secondary fouling community which lives on and among the primary foulers. Structure of these two communities was examined using measures of diversity, evenness, niche width, niche overlap and dominance, as well as the numbers of species and abundance.

Multivariate regression analysis was used to establish a hierarchical list of the factors influencing secondary fouling community structure. Time and the heterogeneity of the primary fouling community were determined to be more important than temperature in their influence on secondary fouling community structure.

A definite successional trend was observed, although the length of the study precluded any observation of a "climax" community.

NEERS ABSTRACT

Surface Microlayers in the Damariscotta Estuary

Dave Carlson, Ira C. Darling Center

The surface microlayers of the Damariscotta estuary are under investigation. The microlayer is sampled by the glass plate technique. Information collected includes nutrient, chlorophyll, cell count and dissolved organic material data. The microlayer is generally DOM enriched, distinct from bulk water in chlorophyll concentrations, and variable in nutrient concentrations. The screen sampler was used for comparison with the glass plate technique.