



SUSB President Richard Schmidt and MSRC Professor D. W. Pritchard congratulate David J. Hirschberg on receiving award.

## FIRST STEINBERG-SQUIRES AWARD WINNER

The first annual Steinberg-Squires Award, created last summer to honor the best graduate thesis produced in an academic year, was presented to David J. Hirschberg for his M.S. thesis entitled "Recent geochemical history of sedimentation in the Northern Chesapeake Bay." Mr. Hirschberg received a certificate and a \$200 check. His name has been engraved on a plaque to be displayed permanently in the Center's reference room.

Criteria for selection of the award winner included not only originality and importance of the thesis, but also clarity of writing and the degree of independence shown by the student in pursuing his or her research. The award was established through a donation made to the Stony Brook Foundation by Donald F. Squires, Director of the New York Sea Grant Institute and his wife, Marian Steinberg.

## ASPECTS OF THE REPRODUCTION OF HARD CLAMS (*Mercenaria mercenaria*) IN GREAT SOUTH BAY-MONICA BRICELJ

The hard clam fishery is the most important and valuable commercial fishery in New York State. Great South Bay, Long Island, produces more than 50% of all hard clams harvested in the United States. Information about the reproductive capacity of hard clams of different sizes is important for the critical evaluation of some of the management practices currently employed in the Bay. Such practices

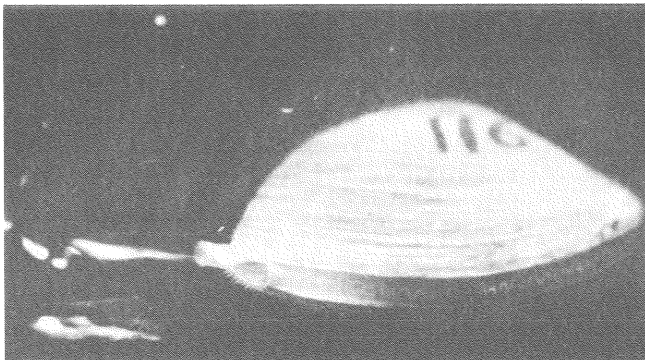
should be based on both socio-economic and biological considerations.

Clams are locally marketed in three size categories: littlenecks, cherrystones and chowders. In an attempt to extend the spawning season in the Bay, the local towns annually transplant spawner clams from colder waters into Great South Bay. These transplants usually involve chowder clams because they have the lowest market value. However, it has been stated, without supportive evidence, that older clams are less efficient spawners. In addition, no clams less than one inch in shell thickness may be legally harvested or marketed in New York State. The contribution to reproduction by sub-legal clams is of interest in assessing the biological significance of this restriction.

Clams for my study were sampled at two sites in the Bay: the mouth of Carmans River, and a location near Sexton Island. They were repeatedly induced to spawn in the laboratory to determine total individual egg production and quality of spawn.

Spawned eggs were found to vary considerably in diameter from about 50 to 90  $\mu\text{m}$ . This has interesting implications since larger eggs of the species result in higher larval survival. The study also involved development of a spectrophotometric method for rapid quantification of sperm and egg concentrations, and determination of an optimum sperm/egg ratio, since an excess of sperm can adversely affect development.

Correlation between size and egg production of clams was significant in spite of the high variability in fecundity among individuals; up to 25% of the variation in fecundity was attributable to the difference in size of eggs, or larval survival between clams of different sizes or between Bay locations. Other investigators found that clams from Long Island Sound produced a mean of 25 million eggs per female. Results of the present study suggest that this widely quoted figure represents too high an estimate for the heavily exploited Great South Bay populations. Despite their lower individual fecundities, littlenecks contribute the largest amount of eggs to total population fecundity in the Bay, because they are dominant in numbers.



Female clam spawning at Flax Pond Laboratory.

My study also indicates that chowders are at least as productive as cherrystones, and should therefore not be treated as an expendable group despite their low market value. Large cherrystones or chowders may be used alternatively as parent stock for transplant programs or hatchery use.

Although sub-legal clams can produce viable spawn, they have extremely low fecundities. This suggests that the State minimum legal size should be re-examined since it may be ineffective in protecting the breeding stocks in the Bay. Alternatively, regulatory efforts should be directed to preservation of selected clam beds dominated by larger clams, which have the highest fecundities.

*Monica Bricelj is a graduate student at MSRC. The study described here is part of her research for the M.S. degree.*

#### AWARDS

Prof. Edward Baylor received a Sea Grant award to continue his research on the physical chemistry of cell surfaces.

MSRC students Gordon Chu, John Lively, George McManus, Wayne Penello and Thomas Wilson were awarded Grants-in-Aid of Research from the Society of Sigma Xi in support of their research.

Prof. Orville Terry received an award to undertake an evaluation and analysis of research proposals submitted to the marine program of the U.S. Department of Energy.

Prof. Henry Bokuniewicz received awards from the New York Sea Grant Institute for studies of seasonal beach responses in East Hampton and bluff erosion on the north shore of Long Island. Student Jay Tanski received a Sea Grant traineeship to assist in the latter project.

Prof. Malcolm Bowman was awarded grants from Brookhaven National Laboratory and MESA to support the Middle Atlantic Bight Physical Oceanography Workshop to be held at MSRC this summer.

#### MSRC ASSOCIATES

We welcome David Sayre as a new Associate and Harry Carter, Anne Williams, and Ronald and Jeri Schoof as continuing members.

#### PEOPLE AND MEETINGS

Prof. MALCOLM BOWMAN and MSRC students STEVEN CHISWELL, RICHARD MURTAGH and BRIAN SANDERSON studied the relationship of oceanic fronts to phytoplankton productivity on a cruise in Cook Strait, New Zealand.

Staff oceanographer JEFF PARKER and student ROBERT RICHMOND recently returned from Costa Rica, where they studied the diversity and distribution of corals on the Pacific side of the country. This study was funded by a grant Mr. Richmond received from the Organization of Tropical Studies.

Prof. HENRY BOKUNIEWICZ attended a Sea Grant-sponsored workshop on Marine Geology in the Next Decade at Woods Hole Oceanographic Institute in October.

Prof. DOUG CAPONE participated in a cruise to the Bahamas aboard the R/V CALANUS. Prof. Capone continued his research on tropical seagrasses and investigated the possible sources of  $N_2O$  production in the pelagic environment.

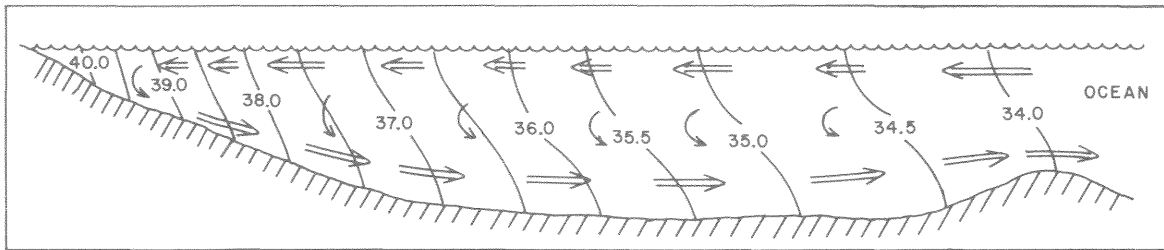
Prof. J. L. MCHUGH was reappointed to the Advisory Panel of the Mid-Atlantic Fishery Management Council.

Prof. J. R. SCHUBEL was a member of the review team for the N.J. Sea Grant program on 4-6 Feb. 1980. He also attended the meeting of the University National Oceanographic Laboratory System Advisory Council in Santa Barbara on 28-29 Feb. 1980.

Prof. D. W. PRITCHARD chaired a session at a meeting held at Brookhaven National Laboratory on 22-24 Jan. 1980. The purpose of the meeting was to assess the feasibility of Ocean Thermal Energy Conversion (OTEC) plants.

Profs. BUD BRINKHUIS, PETER WEYL and ROBERT WILSON recently returned from Chile. Prof. Brinkhuis carried out experiments on mercury uptake and the effects of mercury on photosynthesis in the red seaweed *Gracilaria*. Prof. Weyl set up a computerized information system for the development of Chile's coastal zone, and Prof. Wilson mapped temperature and *in vivo* fluorescence in a study of upwelling processes.

Profs. IVER DUEDALL and PETER WOODHEAD visited Besser Laboratory at the Alpena Community College in Alpena, Michigan. They oversaw the successful automated fabrication of coal waste blocks, which will be used to construct an artificial fishing reef that is part of the Center's Coal Waste Artificial Reef Project.



Longitudinal-vertical section along the channel of an estero in Baja California, showing the typical salinity pattern, with higher salt content at the head of the waterway than at the mouth. The arrows depict the typical anti-estuarine flow pattern of the evaporation-driven esteros, with inflow of lower salinity waters from the ocean in the upper layers, and outflow of higher salinity waters from the estero.

### THE PHYSICAL HYDROGRAPHY OF THE ESTEROS OF BAJA CALIFORNIA-D.W. PRITCHARD

An estuary has been defined as a semi-enclosed body of water having a free connection with the open sea and within which sea water is measurably diluted with freshwater derived from land drainage. A key feature of these coastal water bodies is the mixing of freshwater, which enters the estuary in streams and rivers, with salt water entering from the ocean.

Along both the west and the east coasts of Baja California there are a number of coastal waterways, locally called "esteros", which have the superficial appearance of estuaries. They appear to be formed in much the same way as estuaries, and they all have an opening to the sea that allows tidal flow and the free exchange of water.

Esteros differ in one significant aspect from estuaries: the salinity within them is higher than that of the waters of the adjacent coastal ocean, and the salinity usually increases from the mouth toward the head of the bay. The rivers tributary to these waterways are dry for most of the year, and evaporation from the surface of the waterway exceeds the sum of direct precipitation and land drainage.

On the basis of the studies to date it is clear that the definition given above for estuaries does not fit the esteros of Baja California. I have proposed that an estero be defined as a semi-enclosed coastal body of water having a free connection with the open sea and within which evaporation exceeds direct precipitation and freshwater inflow from land drainage, such that the salinity exceeds that of the adjacent open sea.

In most estuaries there is, superimposed on the oscillatory tidal motion, a much weaker density-driven flow which is directed out of the estuary, or seaward, in the upper layers, and up the estuary in the lower layers.

In the esteros of Baja California there is evidence that these flows are usually reversed. The higher salinity water produced by the excess evaporation within the estero is denser than the ocean water, and hence sinks to the bottom and flows out into the adjacent coastal ocean in the

lower layers, while the less dense ocean water flows into the estero in the surface layers.

Over most of the year the temperature increases with distance up the estero. This temperature gradient produces an effect on the density distribution opposite to that produced by the salinity gradient; that is, the increase of temperature with distance up the estero would, in the absence of any salinity gradient, produce a decrease in density with distance up the estero; while the increase in salinity with distance up the estero would, in the absence of any temperature gradient, produce an increase in density with distance up the estero. Sometimes this temperature effect dominates the salinity effect, and in this case the estero has an "estuarine-like" circulation.

Studies are underway of the effects of wind on the non-tidal variations in water levels and on the tidally averaged circulation patterns in esteros, and to adapt numerical models, developed for estuaries, to the esteros of Baja California.

### PUBLICATIONS OF 1979

HIRSCHBERG, D. J. and J. R. SCHUBEL. Recent geochemical history of flood deposits. *Est. and Coast. Mar. Sci.* 9:771-784.

ITZKOWITZ, N. and J. R. SCHUBEL. Thermal shock effect of eggs of the summer flounder. MSRC Special Report 29.

KINSMAN, B., J. R. SCHUBEL, G. E. CARROLL and M. GLACKIN-SUNDELL. A suggestion for anticipating alterations in wave action on shores consequent upon changes in water depths in harbors and coastal waters. MSRC Special Report 27.

McHUGH, J. L. Status of the Fisheries of the Middle Atlantic Bight region. MSRC Special Report 31.

SCHUBEL, J. R., W. M. WISE and J. SCHOOF (eds.). Questions about dredging and dredged material disposal in Long Island Sound. MSRC Special Report 28.

WEYL, P. K. An analysis of shellfish sanitation data. MSRC Special Report 30.

## NEW MESP GRADUATES

Four students completed requirements for the M.S. degree in December:

V. MONICA BRICELJ, Fecundity and related aspects of hard clam (*Mercenaria mercenaria*) reproduction in Great South Bay, New York (Prof. Robert Malouf).

PAMELA KANETA, Phytoplankton community structure in the New York Bight (Prof. Wayne Esaias).

DOMINICK NINIVAGGI, Morphologically determined particle retention efficiencies in *Temora longicornis* (Prof. Harold O'Connors).

MICHELLE SCHNITZER, Vertical stability in phytoplankton distribution in Long Island Sound (Prof. Wayne Esaias).

## HIGH SCHOOL STUDENTS JOIN BOKUNIEWICZ IN EROSION STUDY

Thirty East Hampton High School students are gathering data on East Hampton erosion as part of a study directed by MSRC Profs. Henry Bokuniewicz and J. R. Schubel. The study is supported by the East Hampton Beach Preservation Society, and is the first of its kind to be conducted on Long Island's south shore.

The students, under the supervision of East Hampton science teacher A. S. Minardi, are observing wave conditions and measuring the amount of sand gained or lost every month as a result of these waves. Arrangements are also being made to obtain wind data from the Montauk Coast Guard station. Such information will help scientists to understand the complicated processes that cause severe erosion problems in many coastal areas of Long Island. Results of the study will be interpreted for a year-end report.



MSRC Prof. Henry Bokuniewicz and East Hampton High School students measure beach profiles at East Hampton.

MSRC Profs. D. W. Pritchard and Blair Kinsman and Dr. M. P. O'Brien, former dean of the University of California's School of Engineering, have volunteered their help in organizing the research. MSRC student Mindy Zimmerman and intern Peggy Keyes are also assisting Prof. Bokuniewicz in the survey.

## SEMINAR SCHEDULE

- Mar
- 3 Environmental Changes in the Black Sea and Associated Ecological Problems.  
D. TOLAMZIN, Univ. of Conn.
  - 10 Dissolved Hydrogen in the Norwegian Sea: Mesoscale Surface Variability and Deep Water Distribution.  
M. SCRANTON, MSRC.
  - 17 Dissolved Oxygen in Fish Schools.  
A. OKUBO, MSRC.
  - 24 Predator-Prey Interactions in the Marine Environment.  
R. ARMSTRONG, SUSB.
- Apr.
- 2 Biogeochemistry of Methane.  
R. ORMOND, U.S. Geological Survey.
  - 14 Partitioning of Polychlorinated Biphenyls onto Simulated Hudson River Particulates and Associated Effects on Marine Phytoplankton.  
G. NAU-RITTER, MSRC.
  - 21 Chlorophyll-specific Photosynthesis by Phytoplankton in Coastal and Estuarine Environments.  
T. MALONE, Lamont-Doherty.
  - 28 The Role of Phytoplankton in the Dynamics of PCB Uptake, Depuration, and Toxicity Among Small Estuarine Copepods.  
K. WYMAN, MSRC.



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