Checking *mesocosms*, 300-gallon plastic tanks containing water from Coecles Harbor, Shelter Island, that have been given experimental treatments as part of the Caron/Lonsdale brown tide project. Pictured are graduate students Katie Rose Boissoneault-Cellineri of the MIT/WHOI Joint program (left) and Becky Shaffner of SUNY Stony Brook (right). Photos by Barbara Branca

Sea Grant Scholar Christopher Gobler collects water samples in West Neck Bay, Shelter Island.

Brown Tide Update

What is the cause of the brown tides that have periodically darkened some of Long Island's bays during the past dozen years? That's what a crowd of educators, baymen, concerned citizens, scientists, and members of the seafood industry came to find out at New York Sea Grant's Brown Tide Second Annual Informational Symposium on April 25, 1998 in Riverhead. The audience heard some answers as well as more questions from researchers who are looking into the cause and solution to the problem of brown tide. Brown tide refers to the bloom of microscopic algae in such densities that shallow bays turn coffee color affecting some shellfish, especially scallops. The brown tide algae have no known effect on human health.

Researchers gave the public an update of the Brown Tide Research Initiative or BTRI, a $1.5 million program which started in 1996 and is administered by New York Sea Grant at the State University of New York at Stony Brook and funded by NOAA's Coastal Ocean Program. From over a dozen universities and research institutions, the investigators came with their current research about this alga, *Aureococcus anophagefferens*, which has bloomed not only in New York, but also in New Jersey and Rhode Island. "Teamwork among the scientists, monitoring groups, and agencies will make a critical difference in the speed and effectiveness of our efforts to find answers," says Cornelia Schlenk, Assistant Director of New York Sea Grant and Chair of the BTRI Steering Committee. "New York Sea Grant's coordinated BTRI Program is an excellent example of how useful this collaboration can be."

> *"...trying to predict harmful algal blooms is like trying to predict a tornado."*

Becky Shaffner of SUNY Stony Brook prepares a water sample to be measured for chlorophyll content.

The "take-home message" according to Gregory Boyer, associate professor of the SUNY College of Environmental Science and Forestry in Syracuse, is that the tiny alga — only one ten-thousandth of an inch — is "very ordinary" in how it goes about using nutrients such as iron. A number of researchers have theorized that iron, found in measurable quantities in our bays, might be linked to algal blooms.

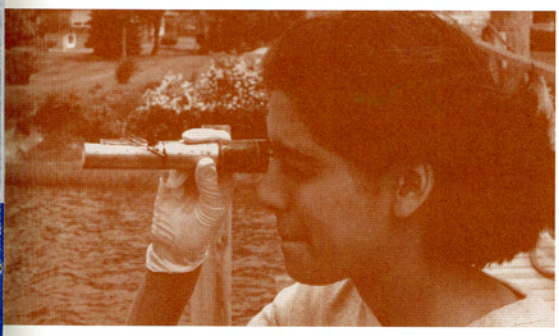
Describing work done with Sergio Sanudo-Wilhelmy, assistant professor at SUNY Stony Brook, Sea Grant Scholar Christopher Gobler explained how different conditions triggered blooms in West Neck Bay, Shelter Island. "There's no magic bullet, no one factor that triggers blooms," observed Gobler. In that unspoiled, unpolluted bay, high organic nitrogen levels preceded the 1995 bloom. But in 1997, high iron content in the water came right before a bloom. These researchers conclude that organic nutrients may not be required to initiate a bloom, but may be important to sustain it.

Darcy Lonsdale, associate professor of SUNY Stony Brook and David Caron, senior scientist at Woods Hole Oceanographic Institution in Massachusetts

Watch

recounted their experiments in Coecles Harbor, Shelter Island, when they used 300-gallon plastic tanks (the mesocosms pictured) to simulate conditions of shallow bays. When sediment and sediment-containing seed clams were added to the tanks, it triggered a population explosion resembling an algal bloom. These investigators are examining factors that lead to the initiation of brown tide, with a focus on the complex feeding relationships among microscopic animal grazers and the phytoplankton that they consume.

Other researchers have examined the effect of the brown tide organism on shellfish. V. Monica Bricelj of the Canadian National Research Council, has investigated mussels, clams and oysters, finding that even when there is a mix of nutritious alga and brown tide in the water, these bivalves are still unable to feed normally. Stephen T. Tettlebach, associate professor of biology and marine science at Long Island University's Southampton College has found that while bay scallops can reproduce under brown tide conditions, their subsequent growth and recruitment are



Mausmi Mehta, a student from MIT, measures salinity from a water sample in West Neck Bay, Shelter Island for the Caron/Lonsdale project.

hindered. The brown tide of 1985 led to a virtual eradication of the $2 million annual bay scallop industry. These research efforts help to gauge what the critical levels of brown tide are for these economically-important shellfish.

So why does the brown tide alga bloom to the tune of a million strong in a tiny milliliter of bay water? At the end of a lively synthesis panel discussion, Theodore Smayda of the Graduate School of Oceanography at the University of Rhode Island summarized that in his opinion there seem to be several bloom mechanisms. Some are stimulated by nutrients mixed in the sediment and water, others stimulated by chemicals such as iron, and still others by the physical conditions such as flushing of the bay and wind conditions. These factors may differ in importance according to location. In Peconic Bays, it's likely that nutrients are the most important factor whereas in Narragansett Bay, Rhode Island, inability of the bay water to flush seems to rule.

Not only location, but the "timing of the bloom" is important according to Terry Cucci, researcher at the Bigelow Laboratory for Ocean Sciences in Maine. As spring progresses into summer, then fall, the dynamic world of the bay changes, changing the balance of biological, chemical and physical factors that potentially could cause a brown tide.

"To date, not all the pieces are there yet, but it's nice to see parallel tracks among these projects," said Dr. Patricia Glibert of Horn Point Environmental Laboratories in Maryland. "The strength of the Brown Tide Research Initiative is the multi-faceted approach." Glibert continued, "But trying to predict harmful algal blooms is like trying to predict a tornado."

A thorough report on the research presented at the Brown Tide Symposium, BTRI Report #2, has been written by Symposium moderator Patrick Dooley, NYSG brown tide outreach specialist. That publication and several brown tide journal reprints are available from NYSG. See page 15 for details.

— Barbara Branca

Christopher Gobler measures a variety of conditions on West Neck Bay, Shelter Island considered a 'hot spot' for brown tide, probably due to its low flushing rates.

Glow With The Flow

With funding from New York Sea Grant, Edward Carpenter and Senjie Lin of the Marine Sciences Research Center (MSRC) at the State University of New York at Stony Brook are developing a method to estimate growth rates in the brown tide alga. To date, there has been no easy way of finding the alga's growth rate in the field. The investigators have found two cell-cycle proteins which can be used as markers to indicate periods when cells are growing rapidly. They are perfecting an immunofluorescence technique that will allow them to use the "green glow" of the stained proteins to indicate the conditions and locations of brown tide alga exhibiting the rapid growth known as a bloom. At present, only cell density can be determined by immunofluoresence methods which were developed by Robert Nuzzi of the Suffolk County Department of Health Services.