COASTLINES

New York Sea Grant | Volume 22 Number 1 | Winter 1991–1992

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Breath-hold Diving: Study May Help Explain Diving and Swimming Deaths

Breath-hold diver Enzo Majorca gets ready for his "dive," while daughter Patrizia is seen submerged in the lab's hyperbaric chamber. *Photo: Scientific American Frontiers.*

In breath-hold diving experiments using three world-class Italian divers, a team of researchers has found, among other things, human blood pressures that peaked at over 300 systolic.

The divers, world-renowned Enzo Majorca and his two daughters, Patrizia and Rossanna, have been participating for the past several years as subjects in this research, which was funded through the National Oceanic and Atmospheric Administration's National Undersea Research Program (NURP) in cooperation with New York Sea Grant.

According to Dr. Claes Lundgren, a New York Sea Grant researcher at SUNY at Buffalo, the superelevated blood pressures were measured via arterial catheters in the divers while they were submerged underwater in the laboratory's hyperbaric chamber. The chamber simulates the increased pressures that divers experience in actual deep

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Breath-hold Diving Research

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water diving. Patrizia Majorca's blood pressure measured over 250 systolic, while her father's exceeded 300 systolic. "I don't believe that anybody has recorded these substantial blood pressures in human divers before," states Lundgren. Such pressures are approximately twice those normally found in men and women of comparable ages.

As the dive continued, the initial high blood pressures quickly become normalized, Lundgren explains, as a result of the so-called 'dive response.' Found in such animals as seals, ducks, and whales, this consists in part of a very intense constriction or closure of blood vessels in the periphery or extremities of the body, which initially leads to an enormous increase in blood pressure. The body reacts to the dive situation, reducing the rate of blood flow by slowing the heart's pumping action.

"By doing this, one theory suggests, the body is able to save oxygen in the blood that can be put at the disposal of the brain and the heart itself, since it is those organs that have an absolute need for a continuous oxygen supply," says Lundgren. "Presumably that explains why whales and seals can stay down under the water for half an hour and swim without suffering severe oxygen loss."

Another interesting discovery made by Lundgren and his co-investigators, Drs. Massimo Ferrigno, Avery Ellis, Paolo Cerretelli, Guido Ferretti, and Mario Costa and Mr. Dan Warkander, was that the divers also experienced a very irregular heartbeat. This, the researchers suggest, places greater emphasis on the risk inherent in record-setting deep breath-hold diving attempts, as well as on the potential hazards of general immersion in cold water for divers and swimmers. The researchers suspect that

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Coney Island High School Students Undertake Environmental Project

Students from John Dewey High School in Brooklyn recently began a campaign to educate the community near Coney Island Creek about the fact that waste oil and hazardous household chemicals that are dumped into storm sewers drain into the creek and ultimately run into Gravesend Bay. To dramatize their message, the students spent one day last fall stenciling the sewers on Neptune Avenue along the creek.

Stencils, along with informational packages explaining the problems associated with storm drain contamination and outlining how to set up a community storm drain painting project, are available from Sea Grant at no charge to those citizens and groups in New York City, on Long Island, and throughout Westchester and Rockland counties who would like to participate. Stencils are currently being designed for use along the Great Lakes as well.

Using painted stencils, students from John Dewey H. S. hope to alert the community not to dump chemicals and other substances down storm drains. *Photo by Dennis Bader, Council on the Environment, NYSMEA.*

Storm drain painting projects offer an ideal opportunity for cooperative community efforts. For instance, representatives from local businesses along Coney Island Creek, including Consolidated Edison, Neptune Marina, and Larry's Auto Body Shop assisted the students in Mr. John Wowk's marine science class with their project.

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Message from the Director

Avery Klauber

Anne McElroy
NY Sea Grant Director

As the New York Sea Grant Institute sets off into 1992, the program's 21st year and my first full year as director, I wanted to take this opportunity to inform our *Coastlines* readership about what's afoot for the coming months.

Beginning with this issue we will finally resume the Institute's schedule of publishing *Coastlines* as a quarterly newsletter with Winter, Spring, Summer, and Fall issues. We will feature more stories on Sea Grant research and introduce some other changes as well. Later on in the year a survey will be included to get your thoughts on *Coastlines* and our updated approach.

My goals for 1992 are to help the Institute expand both its role in science and environmental education and its base of research support. There is a pressing need for both in these times of limited budgets as we strive to increase the dissemination of useful marine and Great Lakes information to the public, expand training of the next generation of scientists, and maximize research efforts that will help us understand and resolve coastal issues.

This spring and summer, the Institute will be embarking on a long-range planning process to chart our goals for the next 5- to 10-year period. As part of this process, we will be soliciting suggestions and comments from our readership. With your help, we hope to ensure that Sea Grant does its best to promote the wise use of New York's coastal resources.

Anne McElroy, Ph.D.

MARINA INDUSTRY SURVEYED

Photo by Avery Klauber.

Marinas serve an important role in tourism, the second largest industry in New York State, by providing boaters with access to the ocean or to a river or lake of their choice. But marinas not only provide docks, ramps and moorings, they also provide services and supplies such as gasoline, electricity, ice, engine repair, rest rooms and even showers. In addition to making these many services available to boaters, marina managers must maximize capacity and deal with governmental regulations and a myriad of agencies.

In an effort to understand how the marina industry handles these issues, two surveys were conducted in 1990 by the Sea Grant and Marine Extension Program. Extension specialist Dave White surveyed marinas located along Lake Erie, Lake Ontario, and the Niagara and St. Lawrence rivers. A statewide survey providing information about the Great Lakes area had been conducted in 1972, enabling White to look at industry changes over an 18-year period. Mary E. Anderson, marine extension agent for Cornell Cooperative Extension of Rockland and Westchester counties, surveyed marinas in the Lower Hudson River Valley and Westchester County communities on Long Island Sound.

Services Offered by Marinas

A notable trend in the Great Lakes area is that services provided by each marina in the Great Lakes area appear to have declined. Eleven of 13 service categories such as gas, repairs, rentals, and marine supplies all showed a percentage decrease.

Anderson's survey of the Hudson Valley region found that marinas tend to offer more services than yacht clubs. She explains, "This may be because private clubs do not have employees or staff, but are generally run by member volunteers or a board in an attempt to keep costs low."

Marina Capacity and Configuration

According to the Great Lakes area survey, the number of acres owned or operated by a marina is significantly larger now than in 1972. "Marinas are physically larger now, with more land and expanded dockage area," says White. "But according to current inventories of marinas, the number of slips has not dramatically increased during a 20-year period. The fact that today's pleasure boats take up more physical space means that marinas have had to reconfigure their docks to accommodate them."

The average number of slips per marina in the Hudson Valley survey was 130, slightly higher than that in the Great Lakes area. But the average acreage of the Hudson Valley marina is much smaller. A good indication that marinas are operating at nearly full capacity is that marinas in the Great Lakes area report average advance reservation rates of 86%. In the Hudson Valley, 95% or better seasonal berth rental rate is reported.

One interesting item the Hudson Valley survey revealed is that more than one third of the businesses plan to increase the size of their marina or improve the services provided during the next three years.

Regulatory Agency Concerns

Perhaps the most important issue brought out in both surveys is how respondents reacted to governmental regulatory programs. According to Anderson, "An important issue facing marinas today is the escalating amount of paperwork in the permit process. This process can be time-consuming and frustrating." Half of the respondents in her survey claimed to have had difficulties in working with governmental agencies having regulatory authority over various aspects of the marine trades industry. Respondents expressed difficulties dealing with health, transportation, environmental, and other regulations.

Of marinas in the Great Lakes area, 41% claimed to have encountered problems with a regulatory agency. "Many regulatory programs are neither understood by marina managers nor appropriately directed. This can lead to difficulties in the implementation of regulations and possible conflict," says White.

According to Anderson, "One way Sea Grant and Marine Extension can help is to educate government agencies about the effects regulatory changes and processes can have on businesses. Equally, businesses need to be made aware of the existence of and rationale behind regulations that are intended to lessen environment impacts."

Surveys and Extension Education Efforts

"Surveys such as this assist in the development of educational programs on timely issues that are directly related and relevant to the marina industry." says White. "They help to focus Extension's education efforts on up-to-date and appropriate issues."

Jay Tanski, an extension specialist on Long Island, is planning a similar survey of marinas in New York's marine waters during the spring of 1992. "Because a complete, updated inventory was not available for the area, our first step is to develop a listing of the existing marinas," says Tanski. So far he has compiled a database of over 640 public and private boating facilities.

The November 1991 paper, *New York's Great Lakes Marinas: A 1990 Analysis and Profile* discusses the Great Lakes area survey. For more information contact Dave White, New York Sea Grant, Swetman Hall, SUNY College at Oswego, Oswego NY 13126, (315) 341–3042. For information on the Lower Hudson Valley survey contact Mary E. Anderson, Cornell Cooperative Extension of Rockland County, PO Box 1000, Thiells NY 10984, (914) 429–7085. For information on the forthcoming Long Island survey, contact Jay Tanski, New York Sea Grant, 125 Nassau Hall, SUNY at Stony Brook, Stony Brook NY 11794–5002, (516) 632–8730.

Human Perspective Brought Back to NYSGI Research

By Cornelia Schlenk

One of the many positive attributes of the Sea Grant system is its capacity to address coastal questions, opportunities, and problems from a wide variety of approaches. New York Sea Grant's managers have taken advantage of this strength by setting out to broaden the research program beyond its recent trend of focusing only on biological, chemical, geological, and physical perspectives.

Historically, the New York Sea Grant program has included a small but significant contribution of research projects in the social sciences, economics, and policy. However, after several years had gone by without fundable projects in these important disciplines of the "human dimensions," a special effort was undertaken in 1990 and 1991 to bring this component back into the program.

Working with the National Sea Grant College Program Office's specialist in the the social sciences, Dr. Shirley Fiske, New York Sea Grant developed and released a *Special Call for Preproposals in Economics, Policy and Social Sciences related to Marine and Great Lakes Issues* in 1990. According to Associate Director Dr. Michael P. Voiland, Jr., "We hoped to encourage innovative and creative research in areas of the social sciences—areas that were underfunded but viewed as critical to wise resource use and conservation."

Human dimensions: Coastal research helping people through the social sciences. *Photo by Avery Klauber.*

From an initial pool of 17 preproposals, a total of 6 projects were selected and are now being supported with a combination of existing program development funds and newly allocated funds

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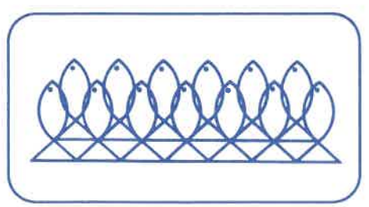
Sea Grant Joins Forces with Return a Gift to Wildlife Program

By Robert Kent

Local planning agencies control the vast majority of land use decisions in New York, but there is currently no mechanism—or funding—to educate these planning agencies about issues such as habitat loss and degradation, which are principal threats to wildlife. A new "planning for wildlife" program that is being developed hopes to address this situation.

New York Sea Grant, along with faculty in the Department of Natural Resources at Cornell University, will be working with the State's Return a Gift to Wildlife program to develop an educational program entitled "Planning for Wildlife—Incorporating Wildlife Needs into Local Land Use Decisions."

Cornell and Sea Grant extension staff, funded in part by contributions New York State taxpayers have made to the Return a Gift to Wildlife Program, will be developing a handbook and educational videotape that will explain how wildlife needs can be met through the local planning process. The role of Sea Grant will be to develop the units related to coastal wildlife issues, both along the Great Lakes and in the marine district. Included in the manual will be information about wildlife resource values and survival needs, along with databases and bibliographies related to wildlife planning and ecology, and addresses and sources of expert information. Target audiences for the Planning for Wildlife project include planning boards, zoning boards, town



boards and other local governing bodies, conservation advisory councils, and public and private land managers.

After the educational materials are developed, a series of workshops for land use decisionmakers will be held across the State.

The Return a Gift to Wildlife Program began in 1982, as an opportunity for New Yorkers to make a voluntary contribution to wildlife conservation on their State income tax form. New Yorkers contribute an average of $1.7 million annually. Over 150 important fish and wildlife projects have been funded to date. The projects are selected by the New York Department of Environmental Conservation, and awarded to participants such as Sea Grant via a competitive process.

Traditionally, the majority of funding for fish and wildlife conservation efforts has come from the sale of hunting, fishing, and trapping licenses and from federal excise taxes on sporting equipment. The Return a Gift program gives all New Yorkers, not just hunters and anglers, the opportunity to join in the support of fish and wildlife.

The easiest way to make a contribution to the Return a Gift to Wildlife program is to check the appropriate line on the New York State personal income tax form.

Alternatively, checks payable to "Return a Gift to Wildlife" can be mailed to the New York State Department of Environmental Conservation, 50 Wolf Road, Albany, NY 12233–4780.

The Human Factor

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from the National Office. A total of $313,559 has been approved for expenditure between 1991 and 1993, with the projects themselves contributing an additional $208,078 in matching funds.

The new project *Effects of Health Advisory Changes on Fishing Habits and Fish Consumption in Sport Fisheries*, being conducted by Drs. Barbara A. Knuth and Carole A. Bisogni of Cornell University, provides just one example of the kind of approach human dimensions research takes and how useful it can be. We all know that at least some chemical and biological information exists on the issue of contaminants in fish. Health advisories about the risks associated with eating certain sport-caught fish are widely distributed. However, a variable part of the safety equation rests with the human factor—the people who read the advisories. Do they understand the advisories? Do they believe them? Do they heed them? Through a series of surveys of licensed anglers, this Sea Grant project will be able to evaluate whether a recent change in the type of advisory information presented in New York State has affected people's knowledge, perception, and behavior. With these results in hand, recommendations can be made about risk communication techniques to further improve the effectiveness of contaminant-related advisories.

The titles and principal investigators associated with the other five new human dimensions projects are:

- *Reassessment of the Concept of Angler Specialization Through Sequential Stages of Development,* Chad P. Dawson (SUNY College of Environmental Science and Forestry);
- *Estimating the Sportfishing Participation and Consumption of Great Lakes Fish,* Tommy L. Brown and Barbara A. Knuth (Cornell University);
- *The Cultural Resources of Coastal Waterfront Communities: An Evaluative Research Design,* John Eilertsen (Hallockville Folk Arts Center for Suffolk County) and Nancy Solomon (Long Island Arts Council at Freeport);
- *A Decision Support System for Estimating Angler Harvests,* Bruce T. Wilkins (Cornell University) and Cynthia M. Jones (Old Dominion University); and
- *Hispanic Perceptions and Practices Related to the Quality, Safety and Healthfulness of Fish and Seafood,* Carole A. Bisogni, Diva Sanjur, Barbara A. Knuth and Joe M. Regenstein (Cornell University).

New Publications from NY Sea Grant

Please send requests for the following publications to:

Communications
New York Sea Grant Institute
Dutchess Hall
SUNY at Stony Brook
Stony Brook NY 11794–5001

Or call (516) 632–6905 for further information.

Acoustic measures of the abundance and size of pelagic planktivores in Lake Michigan. 1991. S. B. Brandt, D. M. Mason, E. V. Patrick, R. L. Argyle, L. Wells, P. A. Unger, and D. J. Stewart. Reprinted from *Canadian Journal of Fisheries and Aquatic Sciences.* 48(5):894–908. Free.

Why Can't I Take Home More Than 10 Bluefish? September 1991. M. Malchoff. Answers to three key questions young anglers may have about New York's bluefish law. 4 pp. Free.

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Taking Care of Seafood: Training for Retail Employees

A seafood retail outlet may offer consumers over 50 different species of fish and shellfish to choose from—and for service and safety, employees need to know how to identify, handle, prepare, and answer customer questions about each of these species. It's also important for employees to be well informed about sanitation, safe food handling practices, and merchandising. Unfortunately, training opportunities often occur sporadically and can be both time-consuming and expensive. Courses such as the Cornell Home Study Program in Service Seafood Management and Operations, however, don't require employees to travel to a workshop or take time away from the workplace. They are self-

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Breath-hold Diving Research

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immersion in cold water may elicit some of the physiological changes contributing to cases of sudden death among divers and swimmers. "Everybody knows the proverbial story of the proficient swimmer who falls into cold water, becomes submerged, and never surfaces," relates Lundgren.

"We are looking at mechanisms that might well be elicited during diving and swimming under less strenuous recreational conditions, especially in sensitive individuals, such as someone with a minor heart condition," says Lundgren. "If we learn enough about these mechanisms, we might be able to counteract them, and help people to swim and dive more safely."

The Majorcas have agreed to disclosure of certain personal medical information that specifically relates to these research efforts.

H.S. Environmental Project

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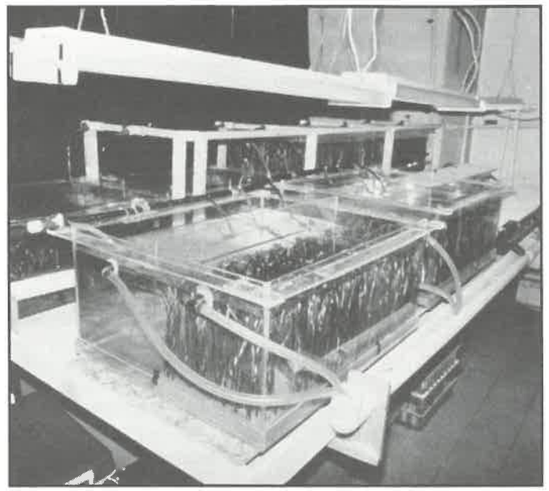
The New York City Department of Transportation and the New York City Department of Environmental Protection also provided support.

Wowk explained: "The kids want the community to be aware of the relationship between the drains and the immediate environment. By stenciling on the drains, we hope people will realize how close they are to the bay." In addition to stenciling the storm drains, the students tested the water quality and collected marine organisms from the creek, which, according to Wowk, has a five-foot-deep layer of coal-contaminated sediment at the bottom.

Bob Calderone, the owner of Neptune Marina, says, "The water of the creek has gotten cleaner in the last few years—the barnacles, grass, and shrimp have started to come back. If people stop polluting the creek, it could really become a nursery [for marine life] again."

For more information about the storm drain painting project, contact Melissa Beristain at New York Sea Grant, 125 Nassau Hall, SUNY at Stony Brook, Stony Brook, NY 11794–5002, tel. (516) 632–8737.

BAY SCALLOP RESEARCH MAY YIELD ANSWER TO GREATER HARVESTS



Recirculating seawater system used to conduct short-term experiments on scallop and crab behavior under controlled light and temperature conditions. *Photo by George Rowland.*

A close-up view of the recirculating system shows small scallops the researchers have attached or tethered to artificial eelgrass blades. *Photo by George Rowland.*

During the past seven years the bay scallop harvest in New York has undergone a staggering decline. In 1984 nearly 280,000 pounds of scallops were harvested. In just four years, that number was down to a mere 250 pounds. And while experts acknowledge that bay scallop populations will vary considerably during any given year, once populations reach a certain level, restocking efforts are the quickest way to effectively renew this important commodity.

For the past two years, Dr. Monica Bricelj of the Marine Sciences Research Center at SUNY at Stony Brook has been attempting to assess factors that may influence successful reseeding or restocking of bay scallops in coastal waters and provide important practical assistance to the shellfish industry.

According to Dr. Francisco Borrero, a New York Sea Grant funded postdoctoral fellow working on the project for the past year, juvenile bay scallops seem to be more abundant in places where sea grasses exist. Early juvenile scallops (up to 20mm in size) climb vertically up the sea grass blades. This behavior allows them to escape predation by crabs that feed selectively on scallops attached to the lower portions of the blades.

In addition to providing scallops with a means of escape from predators, the sea grasses also seem to stimulate growth. "We have performed experiments on the growth of bay scallops at various levels within the eelgrass and have found that juveniles closest to the bottom don't grow as well as those at higher levels," explains Borrero. Bricelj and Borrero hypothesize that the greater flow of water further up in the water column enables the juvenile scallops to filter feed more productively and grow more rapidly.

"Scallop size at planting is another important issue to consider when trying to maximize the survival of the scallops," says Borrero. "In general, animals less than 25mm are used in reseeding efforts by various towns. Many are quickly eaten, mostly by crabs." The researchers recommend seeding scallops of 25mm (about one inch) or longer, as they are more resistant to crab predation. Bay scallop density and the time of year that stocking takes place are also important factors, Bricelj and Borrero explain. Newly seeded scallops would have a better chance from April to June, when crab populations are less abundant. Bricelj's work will provide concrete information that can be used directly to help bring back Long Island's bay scallop fishery.

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Communicator
New York Sea Grant Institute
Dutchess Hall
SUNY at Stony Brook
Stony Brook NY 11794–5001

Managing Editor: Avery Klauber
Editor: Diana Puglisi
Staff Writer: Pat Peterson
Computer Layout: Pat Peterson
Production Assistants: Sharon O'Donovan, Susan Hamill

Contributors: Robert Kent, Cornelia Schlenk

New York Sea Grant
Announcements

Jennifer M. Pultz joined New York Sea Grant's extension program this January as a specialist in Great Lakes environmental quality. In this capacity Pultz will help develop extension education programs dealing with environmental issues. Pultz's previous position was with the Oswego County Environmental Management Council where she served as program coordinator. She holds a Master's degree in Wildlife Management and Education from State University of New York College of Environmental Science and Forestry at Syracuse. Pultz is located at the Cooperative Extension Center, 21 South Grove Street, East Aurora, New York, 14052–2398, (716) 652–5453.

Dave MacNeill, New York Sea Grant extension specialist at SUNY College at Brockport, has been awarded the 1992 specialist award this past January from the Cornell chapter of Epsilon Sigma Phi, the nationwide cooperative extension fraternity. MacNeill received the award for his efforts in developing a walleye culture program. Working with researchers from SUNY College at Brockport, the NYS Department of Environmental Conservation and angling clubs, MacNeill developed a plan to raise and then stock over 180,000 walleye in the Niagara River and Lake Ontario embayments. A follow-up monitoring program conducted by MacNeill found that the walleye not only survived, but attained growth rates that rivaled those of native Lake Erie walleye. In 1990, MacNeill received the Great Lakes Sea Grant Network Marine Advisory Service Outstanding Program Award in recognition of his work on the walleye culture program.

Sea Grant's Sound Gardening program, a series of 10 fact sheets describing ways people can enhance their lawns and gardens while protecting drinking water resources, also was recognized by Epsilon Sigma Phi in January. According to the presenters, the program, which was started in April 1991, was an excellent example of bringing together staff from a variety of disciplines and geographic areas to help the public deal more effectively with environmental concerns. To obtain a Sound Gardening packet, send $2.00 to New York Sea Grant at 125 Nassau Hall, SUNY at Stony Brook, Stony Brook NY 11794–5002, attention "Sound Gardening."

Two NY Grad Students Win 1992 Knauss Fellowships

Avery Klauber

Cynthia Decker

Avery Klauber

Sanjay Gupta

Cynthia Decker and Sanjay Gupta have been awarded John A. Knauss Marine Policy Fellowships for 1992. These $30,000 fellowships are sponsored by the National Oceanic and Atmospheric Administration's National Sea Grant College Program.and are used to compensate and support students in Washington, D.C. for one year as they assist Federal agencies or legislative committees.

Dr. Decker will be the first Knauss Fellow to work at the Office of Naval Research, Directorate of Ocean Sciences, where she will be involved with the development of a long-term research plan. The plan will be coordinated with the Assistant Secretary of the Navy for Installations and the Environment, the Navy's equivalent to the U.S. Environmental Protection Agency, which is concerned with issues such as marine mammal protection and waste disposal on naval bases and ships.

Decker recently completed her Ph.D.in Coastal Oceanography at the Marine Sciences Research Center at the State University of New York (SUNY) at Stony Brook. While there, she worked at the Waste Management Institute and became interested in issues of waste disposal in the ocean. As a result of her experience at the Institute, Decker identifies working in areas of marine policy and environmental affairs as an important career goal. "Part of what I would like to do is try to bridge the gap between the scientific community and the government," says Decker.

Mr. Gupta, another recent graduate from the Marine Sciences Research Center, has received a Master's in Marine Environmental Science. He will be working on the staff of Rep. Frank Pallone, Jr., from New Jersey's 3rd Congressional District.

Gupta explains that he has been hoping for an opportunity to become more involved with coastal management and policy issues. The Knauss Fellowship will provide him that opportunity. "One of the main topics I hope to focus on for Congressman Pallone is the reauthorization of the Clean Water Act. This is high on his agenda as a member of the House Committee on Merchant Marine and Fisheries," says Gupta.

Winners of the Knauss Fellowship are selected through a nationwide competition. Qualification criteria include academic ability, communications skills, diversified academic experience, and strong endorsements from faculty advisors and a Sea Grant program. This year 25 Fellowships were awarded nationally.

"We are delighted that Dr. Decker and Mr. Gupta have been chosen for this prestigious national award," states Dr. Anne McElroy, director of New York Sea Grant. "I know that they will gain valuable experience in Washington that will serve them well in whatever career paths they choose to follow."

New Publications from NY Sea Grant

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SUNY College at Oswego
Oswego NY 13126–3599

Or call (315) 341–3042 for more information.

Conference Proceedings: Second International Zebra Mussel Research Conference. C. R. O'Neill, Jr. (ed.). 1991. The November 19-22, 1991 conference in Rochester, New York was a forum for the dissemination of new information resulting from current research on the biology, impact, and control of the zebra mussel in North American waters. Abstracts for all papers presented at the conference are included, grouped topically. Abstracts for the keynote presentations, case studies on zebra mussel control in public drinking water facilities, and poster session are also included. 56 pp. $8.00 for packet consisting of conference proceedings, addenda, and fact sheet *The Zebra Mussel* (Dreissena polymorpha)*: An Unwelcome North American Invader* (12 pp.).

For-Fee Pond Fishing: Decision-Making Factors. D. H. Ververs. September 1991. This fact sheet offers would-be entrepreneurs handy checklists for evaluating the potential success of a for-fee fishing venture. Economic, environmental, and production factors are considered, along with common risks and concerns. A convenient bibliography of literature on the topic is also included. Addresses and telephone numbers of licensing and permitting agencies in New York State are provided as well. 4 pp. $0.50.

Identification of Juvenile *Dreissena polymorpha* and *Mytilopsis leucophaeata*. D. B. MacNeill. 1992. In their juvenile stages, zebra mussels (*D. polymorpha*) bear an external similarity to dark false mussels. While these two mollusks have overlapping salinity tolerances, zebra mussels pose a much greater risk of biofouling. This three-fold flyer featuring side-by-side diagrams of the two mussels is the first guide designed to help industrial employees and utilities operators in North America distinguish between these two species in the field. A glossary and reference list are included. 2 pp. Single copies free.

Seafood Home Study Program

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paced, provide a means of assessing employees' knowledge, and ultimately recognize employees' satisfactory completion of a university-based training program by providing them with a certificate.

Cowritten by Robert E. Arnold (corporate purchasing agent for the Marriott Corporation and former executive director of the National Fisheries Institute) and New York Sea Grant Extension Specialist Ken Gall, the second edition of *Service Seafood Management and Operations* (1991), is now in print. A thorough revision of the original 1987 text, it reflects recent trends and changes in the industry. The only way to get this book is to sign up for the home study course. For further information, contact: Cornell Home Study Program, Warren Hall, Cornell University, Ithaca NY 14853, Phone: (607) 255–3028.

New York Sea Grant

Dutchess Hall
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