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Fish Kills and Harmful Algal Blooms



Dan Terlizzi, Water Quality Specialist

Last year at this time HyRock Fish Farm -- a hybrid striped bass farm using water from the Manokin River -- suffered the loss of about 15,000 fish. While this fish kill was associated with the notorious "Phantom flagellate," *Pfiesteria piscicida*, there were also several other dinoflagellate species present. Dinoflagellates are single-celled algae that act very much like animals, though half contain chloroplasts and perform photosynthesis like other algae. Neither plant nor animals, they are called "protists" and are responsible for what we call red tides or mahogany tides. While dinoflagellates may contain toxins, only about one or two percent are known to be toxic to fish or other organisms.

The fact that other dinoflagellates were present at HyRock, combined with the absence of distinctive lesions on the fish, suggested *Pfiesteria* was not responsible for the kill. This summer HyRock suffered another fish kill; an estimated 8,000 fish were lost and once again dinoflagellates appear to be the culprits. The evidence argues against *Pfiesteria*, even though the Pocomoke River is just 20 miles away and *Pfiesteria* fever is running high in Maryland. After a year of monitoring phytoplankton in the ponds at HyRock and discussing feeding behavior and signs of stress in relation to the phytoplankton with HyRock's proprietor Tony Mazzacarro, we have concluded that dinoflagellates in general, not just the notorious fish killer *Pfiesteria*, are problems in estuarine aquaculture operations.

Dinoflagellates are abundant during summer and because many are photosynthetic they are important food for grazing animals such as zooplankton. So in view of their important role in the food web and in nutrient processes of the Bay, they are mostly beneficial. So why would we make the generalization that dinoflagellates are usually problems in estuarine aquaculture systems like HyRock? Because every time dinoflagellates appear in significant numbers there are signs of stress and often mortality - and twice now the loss of fish has been substantial.

What can we do about mitigating the impacts of harmful algae? Currently, we have limited management tools. While copper sulfate is routinely used in fresh water ponds, its use has led to

fish loss in the salt water ponds at HyRock. Permanganate, a strong oxidizer, has proven effective this summer in treating dinoflagellate blooms but it is very expensive. Ozone is planned as a treatment for intake water from the river to eliminate potentially problematic algae like dinoflagellates; however, this is also an expensive treatment and there is no guarantee that harmful algae will not appear in ponds. On the basis of our experiences so far, problem algae begin to arrive in late July and become a chronic problem during August. Whatever management techniques we can currently employ, e.g., permanganate treatment or ozone to reduce bloom densities will be critically needed during this time.

Some years ago, Maxwell Doty, a marine botanist, argued that as interest in aquaculture progressed we would need to understand our growth medium - water - in the same terms that our aquaculture needs to understand the soil. As a result of our investigations at HyRock we are becoming more aware of that; for example, it is not enough to know how much phytoplankton is present in the water but what kinds are present as well. In an agronomic sense, it is literally the difference between fescue and thistle.

In the meantime, we are looking forward to the end of dinoflagellate weather. If nothing else we have learned, to paraphrase Mark Twain, that August is among the worst months to try to raise fish. With a wry twinkle he might have added, the others are September, October, November, December, January, February, March, April, May, June, and July.

***Pfiesteria* and Fish Health Information Web Site**

<http://www.mdsg.umd.edu/fish-health>

A new World Wide Web site now provides up-to-date information about *Pfiesteria piscicida* and harmful algal blooms such as "red tides." *Pfiesteria*, a single-celled alga, is the toxic dinoflagellate implicated in fish kills in several rivers in the Chesapeake Bay. The web pages contain up-to-date information about *Pfiesteria* and issues related to fish disease, human health and seafood safety.

The site also has links to numerous other sources about harmful algal blooms; they include federal and state agencies, university research labs and newspapers. Aquaculturists will be especially interested in the information having to do with fish diseases and lesions. The web site is a joint effort by the Maryland Sea Grant College and Aquatic Pathobiology Center of the University of Maryland School of Medicine, Department of Pathobiology.

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Pond Management Tip: Fall Is the Time for Pond Soil Testing

***Don Webster, Eastern Shore Area Agent
Reginal Harrell, Finfish Aquaculture Specialist***

Lime has been an accepted method of raising alkalinity in ponds and increasing productivity for many years. It is a basic way to manage your pond to prevent future problems and enhance production. But liming requires some planning and forethought in order to do it right. Now is the proper time to begin.

Carbonates help to buffer the water and prevent wide pH swings that can occur during the summer. These swings, depending upon their severity, can stress fish and lead to disease outbreaks and other management problems. Lime will help to even these swings out, providing a more stable environment for your fish and fewer problems for you.

Another reason to consider liming your pond is for aquatic weed control. In Maryland one of the most persistent problems we have in summer is filamentous algae. It is a long, stringy plant that grows from the bottom to form dense mats on the surface. It looks awful and can ruin a good fishing pond since it's very hard to pull a hook through it. Fortunately, filamentous algae are fairly easily controlled by using any of the approved copper compounds labeled for aquatic use. These are

among the least expensive control agents and one with the fewest use restrictions. However, a drawback is copper's toxicity to fish in waters of low alkalinity: such compounds can kill your fish if the alkalinity is less than 50 parts per million. Liming can raise the alkalinity and allow the use of copper in the event that filamentous algae become a problem.

The University of Maryland conducts soil tests for ponds. Sample boxes for soil are available for purchase at your local County Extension Office along with instructions and data sheets. Specify that the sample is for a fish pond and the University will send you back a recommendation for application.

It takes agricultural limestone, the recommended substance for use, several months to get into solution. So in order to ensure that your waters are properly alkaline for next summer, you need to apply lime during the fall or winter. Now is the proper time to get that soil test sent off for analysis!



A fact sheet, *Liming Aquaculture and Farm Ponds in Maryland*, by Reginal M. Harrell and V.A. Bandel, (UM-SG-MAP-91-02) explains the proper types and application of lime for your pond to give you a healthier, more productive body of water for next summer and beyond. For a copy, call your Sea Grant Extension Agent or (301) 405-7500.

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Fisheries Facts for 1996

Douglas W. Lipton, Marine Economic Specialist

In 1996, U.S. consumers spent \$41.2 billion on seafood and other fishery products according to the latest release of the National Marine Fisheries Service's publication, *Fisheries of the United States, 1996*. That spending represents a 6.8% increase over the 1995 figure. The contribution of U.S. fisheries landings to that market fell 2.3% in quantity and 6.7% in value (as measured by the price paid to fishermen).

Total imports of edible fishery products increased about 3.3% in quantity, but the total value of those products decreased about 1%. Shrimp, which constitutes 36% of the value of edible imports, was down \$116 million in value compared with 1995. Whole salmon imports, on the other hand, increased about \$24 million. The total value of imported seafood was \$6.7 billion in 1996.

Exports of edible fishery products also increased in volume (3.1%) and decreased in value (7.0%). Our primary export product, whole salmon, decreased in value by \$84 million. The total value of edible seafood exports was just over \$3.0 billion, leaving a gap of \$3.7 billion between seafood imports and exports.

U.S. per capita consumption of seafood fell from 15.0 pounds to 14.8 pounds, the lowest value since 1992. This consumption level is 9.5% below the record set in 1987 of 16.2 pounds per capita. Although certain aquaculture products continue to grow in production and sales, the overall

Oysters and Education

Jackie Takacs, Eastern Shore Agent

Since its adoption in 1993, the Maryland Oyster Roundtable Action Plan, which recognizes the environmental and economic role of the oyster to the Chesapeake Bay, has furnished the groundwork for one of the most popular restoration activities in the state. While the Action Plan has catalyzed cooperative efforts among university and state scientists, watermen, aquaculturists and environmental groups, it has also led to educational opportunities for youth in the region.

Since the first hatchery-reared spat plantings in 1995, restoration efforts have become an interdisciplinary means for teaching children (pre-kindergarten through high school) the concepts of history, math and science. The following summaries give a snapshot of educational activities that Maryland Sea Grant Extension has been actively involved with.

Living Classrooms Foundation Oyster Program (1995-1997)

This summer, for the third year, the Living Classrooms Foundation and Center for Academic Advancement teamed up with the Horn Point Laboratory to offer students a unique two-day program in oyster culture. This program is part of an 18-day course for middle schools by Living Classrooms, a non-profit organization that provides hands-on learning programs and job training for young people (its emphasis is on disadvantaged and at-risk youth); the Center for Academic Advancement is a Johns Hopkins University program for gifted and talented youth from across the country.

Prior to their arrival at the Horn Point Lab (HPL), part of the University of Maryland Center for Environmental Science, students took part in classroom and laboratory activities that are based on the principles of aquaculture, water chemistry, oyster anatomy, and Bay ecology. They were then off to the field where they learned about historical aspects of the fishery from researchers and those in the oyster industry. Students then went to HPL's oyster hatchery. There they learned to spawn oysters, count eggs, and count, grade and set larvae - as any good technician, they also had responsibilities for cleaning floors and scrubbing tanks.

The hatchery was not the last stop: on the second day, students worked alongside local watermen moving shellbags set with spat to either nursery or planting grounds. The program concluded in the afternoon at an oyster reef, where the effects of the restoration on benthic community and food web dynamics were discussed. In the past three years, this program has helped to move over 8,000 shellbags and more than eight million oyster spat for restoration purposes.

Adopt-A-Bag Oyster Program (1996-1997)

Maryland Sea Grant Extension developed the Adopt-A-Bag Oyster Program to give pre-kindergarten and grade school children an opportunity to participate in Maryland's initiative to restore oysters in the Chesapeake Bay. This hour long activity, developed for the Horn Point Laboratory's open house, invited community youth to get involved in restoration efforts in their area, the Choptank River.

The program began with a guided tour of the oyster research hatchery, where children learned about the life cycle and culture requirements of the oyster. They later learned about the plight of the oyster (overfishing, pollution, disease), the importance of the oyster in the aquatic community, and the expected benefit of oyster restoration. The children aided in restoration efforts by bagging shell material critical to the construction of new reefs. Each bag was tagged with the child's name and placed in a larval setting tank. At the conclusion of this year's plantings, each child will receive a personalized letter and fact sheet, informing them about the final spat count and destination of their bag. After two years this program has produced 110 bags and approximately 342,000 spat, with nineteen children returning from the first year.

Historical Ecology of the Chesapeake Bay

This past summer, the Solomons Environmental and Archaeological Research Consortium offered a new environmental science program for selected St. Mary's and Calvert County high school students. Entitled Historical Ecology of the Chesapeake Bay, the program focused on the oyster and was taught by a team of experts from southern Maryland's museums and educational institutions.

In the first phase of this three-phase program, students participated in a two week, non-residential field course that focused on the ecology of Chesapeake Bay and how human activities are related to ecological processes. That participation took them to a number of institutions that have a direct involvement in improving our understanding of the Bay and the development of the region. Students began at the Chesapeake Biological Laboratory (part of the University of Maryland Center for Environmental Science) with a research cruise aboard the R/V Aquarius; at CBL they studied oyster reef communities and conducted toxicology experiments. They explored the Bay's geological history at the Calvert Marine Museum, and then followed the rich history of oystering and processing at the Lore House Museum. At St. Mary's College of Maryland, the students learned about fish and salt marsh communities; at Jefferson Patterson Park and Museum of the Maryland Historical Trust, they helped excavate an archaeological site; at Historic St. Mary's City, they studied how pre-colonial and colonial settlers used land, water and natural resources. At the Academy of Natural Sciences Estuarine Research Lab and the Department of Natural Resources Piney Point Aquaculture Training Facility, they learned about oyster biology and culture, measures for evaluating human impact on the environment, and restoration activities.

For the remainder of the summer and for the fall semester (phases two and three), students were given the opportunity to undertake mentor-directed research projects. These projects could focus on any field of estuarine science, for instance, ecology, toxicology, paleontology, geology, history and archaeology. On completing their projects, students will participate in their counties' science or history fairs. As an added benefit, students produced some 100 shellbags of oysters for restoration activities in the Patuxent River.

For more information on these programs contact Jackie Takacs or Don Meritt, Sea Grant Shellfish Specialist.

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Commentary

Pfiesteria and Seafood Safety

Gayle Mason-Jenkins, Seafood Specialist

As I approach my office, the phone is ringing. This in itself isn't unusual but during these past several weeks the phone has been ringing and ringing, as though it were an alarm ringing out the anger, confusion, and helplessness that have come to what has been a happy small town tourist area. Everyday the headlines themselves ring out, "*Pfiesteria* Suspect in Fish Kill in Pocomoke River . . . Dead Fish Mystery Hurts Tourism . . . Doctors Study River's Tie to Illnesses."

Everywhere you turn, local, state and national news stations are talking about the killer dinoflagellate *Pfiesteria piscicida*, that is the cause of fish kills, for fish lesions and for human health problems that watermen and others have been reporting.

These days, the calls are not about the health benefits of seafood or how to grill fish for a cookout or facts on fish oils -- most now deal with *Pfiesteria* and the worry over eating fish and shellfish . . . any seafood. We are all very concerned about *Pfiesteria* -- watermen, retailers and producers, consumers, ordinary citizens. But the massive media coverage, understandable as it may be, has had a devastating impact on the public perception of seafood and seafood products from the Chesapeake region. Seafood wholesale and retail suppliers have reported large declines in local sales, not only for fish from the Chesapeake region. *Pfiesteria* hysteria has become seafood hysteria.

As Cooperative Extension and Sea Grant Extension educators, we must educate ourselves and the public about the safety of seafood and its products. Much of the work we have done in the past to demonstrate the benefits of seafood and to teach consumers skills in selecting,

preparing and cooking seafood has taken a setback because of *Pfiesteria*. We have a duty to educate the public about the implications of *Pfiesteria* and harmful algal blooms for seafood. As we learn more, we will do presentations, and prepare fact sheets, and seafood updates to keep information current. At the same time, we will need to reexamine our efforts so that we can help the public distinguish between seafood hysteria and seafood safety. Our greatest task will be to deliver reliable information and to try and ensure that it is heard.

Gayle Mason-Jenkins is the Seafood Specialist with Cooperative Extension Service and Maryland Sea Grant Extension. She is located at the University of Maryland Eastern Shore.

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Aquaculture in the Mid-Atlantic/Interstate Seafood Seminar

November 4-7, 1997, Ocean City Sheraton Hotel, Ocean City, Maryland

Tuesday, November 4

Registration and Reception: 6-8 pm at the pool cabana

Wednesday, November 5

Morning Session: *Seafood News* (Interstate Seafood Seminar)

Moderator: Ms. Kathy Brohawn, Shellfish Specialist, Environmental Risk Assessment Program, Maryland Department of the Environment

8:30 Welcome

8:35 What's New at FDA? Ms. Patricia Schwartz, Deputy Director
Office of Seafood, U.S. Food and Drug Administration

8:50 What's New at ISSC? Mr. Ken Moore, Executive Director, Interstate Shellfish
Sanitation Conference

9:10 New Perspectives on the Use of Indicators in Water Monitoring. Dr. Steve Schaub,
Senior Microbiologist, Office of Science and Technology, EPA

9:40 Educating At Risk Consumers about *Vibrio vulnificus*. Mr. David Resh, David Resh
and Associates, Hagerstown, Maryland

10:10 Blue Crab Economics: Impact of Maryland Crab Harvest Regulations on Maryland
Industry. Dr. Douglas Lipton, University of Maryland, Agriculture and Resource
Economics, and Maryland Sea Grant Extension

10:45 Preserving Crab Meat's Identity of Origin. Mr. Paul Carliner, Legislative Assistant to
U.S. Senator Barbara Mikulski

11:00 The Columbus Center: What's It All About? Dr. Rita R. Colwell, President, University
of Maryland Biotechnology Institute

11:30 Virginia Center for Fish and Shellfish Technology (CFAST): Quick Response to
Industry Needs. Dr. George Flick, Department of Food Science & Technology,
Virginia Polytechnic Institute, VPI

12:00 Luncheon (included in registration)

Wednesday, November 5**Afternoon Session:** *Oysters and Other Things* (Interstate Seafood Seminar)

Moderator: Dr. Robert Croonenberghs, Director, Division of Shellfish Sanitation, Virginia Dept of Health

- 1:30 Oyster Harvests in Colonial Times. Dr. Kent Mountford, Senior Environmental Scientist, EPA, Annapolis, Maryland
- 2:00 Oyster Recovery Partnership: Working Together Through the Oyster Roundtable to Restore Oyster Resources. Mr. Robert Pfeiffer, Executive Director, Oyster Recovery Partnership, Annapolis
- 2:30 The Great Oyster Disease Mystery: Where Do Diseases Come From? Dr. Austin Farley, Cooperative Oxford Laboratory, Oxford, Maryland
- 3:00 Natural and Ex-vessel Moisture Content in Sea Scallops-Searching for a Standard of Identity. Dr. William DuPaul, Marine Advisory Services, Virginia Institute of Marine Science
- 3:30 Turning Your Aquaculture Waste to Profit. Mr. Doug Burdette, Maryland Pride Farm and Aquatic Technologies, Inc., Aberdeen, Maryland
- 4:00 HACCP Monitoring Strategies for Processing Plants. Dr. Thomas Rippen, Seafood Technology Specialist, Maryland Sea Grant Extension Program, Princess Anne, Maryland
- 4:30 Adjourn

Thursday, November 6**Morning Session:** *Getting Acquainted with HACCP* (Joint ISS/AMA)

Moderator: Mr. John Ewart, Aquaculture in the Mid-Atlantic

- 8:00 HACCP: What's It All About? Mr. Donald Kraemer, Associate Director, Office of Seafood, U.S. FDA
- 8:50 Integrating the ISSC Model Ordinance, HACCP and the NSSP: Challenge and Opportunity. Mr. Ken Moore, Executive Director, Interstate Shellfish Sanitation Conference
- 9:30 HACCP at the State Level: The Same Difference. Mr. Alan Taylor, Maryland Dept. Of Health and Mental Hygiene. Dr. Robert Croonenberghs, Director, Shellfish Sanitation Division, Virginia Dept. of Health; Mr. Jack Pingree, Delaware Dept. of Natural Resources and Environmental Conservation; Mr. Gary Wolf, New Jersey Dept. of Health
- 10:00 Learning To Live With HACCP: One Firm's Experience. Mr. Steve Fleetwood, Bivalve Packing Co.
- 10:30 What Does This Gobblygook Mean: SSOP, GMP, PLAN, Record Keeping? Dr. George Flick, Department of Food Science & Technology, VPI; Dr. Thomas Rippen, Seafood Technology Specialist, Maryland Sea Grant Extension Program
- 11:10 How Do I Learn HACCP and Who are the Trainers? Dr. George Flick, Department of Food Science & Technology, VPI
- 11:40 Entering the European Market: Health Certificates for the European Union. Mr.

Arthur T. Ogdahl, Supervisory Investigator, U.S. FDA; Mr Richard V. Cano, Chief, Inspection Services Division, National Marine Fisheries Service

12:30 Lunch (included in registration)

Thursday, November 6

Afternoon Session: *Good Water Quality is Everyone's Business* (Joint ISS/AMA)

Moderator: Mr. Jack Pingree, Delaware Dept of Natural Resources and Environmental Conservation

1:30 Watershed Management. Speaker TBA, U.S. EPA Office of Water

2:00 Navesink River Watershed Management Program. Mr. Bill Eisele, New Jersey Dept. Of Environmental Protection

2:30 Sharing the Waterway: Can Tomatoes and Hard Clams Co-exist? Dr. Mark Luckenbach, Director, Virginia Institute of Marine Science Eastern Shore Laboratory

3:00 Good Water Quality is Everybody's Business: How Do I Get Involved? Ms. Mary Jo Garreis, M.S.P.H., R.S., MJG Enterprises, Annapolis, Maryland

3:30 Clean Water, Safe Shellfish. Dr. Howard Kator, Virginia Institute of Marine Science

4:10 We are the Enemy: Pesticide Runoff from Residential Areas. Ms. Rosanna Kroll, Maryland Dept. of Environment

4:45 Adjourn

7:00 Our Fabulous, Famous Seafood Banquet at Phillips Seafood House

Friday, November, 7

Session A: *More Water Quality* (Interstate Seafood Seminar)

Moderator: Mr. Gary Wolf, New Jersey Dept. of Health

8:00 Mosquito Spraying: Natural vs. Manmade Controls and What it Means to a Waterway. Mr. Cyrus Lesser, Chief of Mosquito Control Section, Maryland Dept. of Agriculture

8:30 Yesterday's Damage, Tomorrow's Challenge: Rebuilding and Restoring Wetlands and Streams. Mr. Keith Bowers, Biohabitats Inc.

9:05 Atrazine in the Chesapeake Bay: An Ecological Risk Assessment. Mr. Lenwood Hall, University of Maryland Wye Research and Education Center, Queenstown, Maryland

9:35 Developing Sustainability in the Nanticoke Watershed: Partnership for Tomorrow. Speaker TBA, The Nature Conservancy

10:10 Restoring Poplar Island. Mr. Frank Hamons, Manager Port Development, Maryland Port Administration, Baltimore

10:45 Whatever Happened to Zebra Mussels? Dr. Daniel Terlizzi, Water Quality Specialist, Maryland Sea Grant Extension Program

11:15 Agriculture Protecting Our Waterways and Water Quality. Ms. Louise Lawrence,

11:50 Wrap-up

12:00 Adjourn

Friday, November 7

Session B: *Algal and Nursery Culture Methods for Commercial Shellfish Production*
(Aquaculture in the Mid-Atlantic)

Moderator: Mr. Michael Oesterling, Virginia Sea Grant Marine Advisory Program, Gloucester Point, Virginia

8:30 Cultured Microalgal Feeds for Shellfish. Dr. Gary Wikfors, Research Microbiologist, National Marine Fisheries Service, Milford, Connecticut

8:55 Use of the Continuous Bag Method for Commercial Algal Production. Mr. John Bayes, Seasalter Shellfish (Whitstable) Limited, Whitstable, Kent, England

9:20 Continuous Algal Production Using Turbidostat Technology. Dr. Kelly Rusch, Louisiana State University, Baton Rouge, Louisiana

9:45 Preparation and Use of Algal Pastes for Shellfish Hatchery Operations. Mr. Gary Baptist and Dr. Don Meritt, University of Maryland Horn Point Laboratory

10:10 Discussion: Question and Answer Session

10:30 Break

10:50 In-Water Shellfish Nursery Systems. Mr. Gregg Rivara, Cornell Cooperative Extension

11:15 Field Nursery Culture of Hard Clams. Mr. Gef Flimlin, New Jersey Sea Grant Marine Advisory Service

11:40 Discussion: Question and Answer Session and Wrap up.

12:00 Adjourn

The conference will be held at the Ocean City Sheraton, located at 10100 Ocean Highway in Ocean City, Maryland. Special room rates are available for the meetings. Don't miss the seafood banquet to be held at Phillips restaurant on Thursday, November 6, 1997 at 7:00pm.

Full conference registration is only \$90, which includes programs, two lunches, breaks, and the seafood banquet. Rates are also available on an "a la carte" basis for those wishing to attend only certain days or events. For conference registration contact: Mary Jo Garreis, 129 Severn Way, Arnold, Maryland 21012 or by phone at 410-757-1232. For brochures about the conference contact Ms. Garreis or your local Sea Grant Extension Agent or Specialist in Maryland, Delaware, Virginia, or New Jersey.

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Upcoming Conferences

25th East Coast Commercial Fishermens' and Aquaculture Trade Exposition

January 30-31, February 1, 1998
Ocean City Convention Center
Ocean City, Maryland

One of the longest running, as well as longest named, industry shows in the country, returns to the newly enlarged Ocean City Convention Center on January 30-31 and February 1, 1998.

The Expo will mark the 25th anniversary of the formation of the Maryland Waterman's Association (MWA), the sponsor and owner of the trade show. The Mid Atlantic Sea Grant Extension Programs will organize the seminars, with the advice and assistance of the MWA and Maryland Department of Agriculture.

Seminars for both commercial fishermen and those interested in aquaculture will cover the hottest topics in the industry and will highlight research that can help return the region to leadership in seafood production. Among these will be updates on fish disease as well as oyster restoration efforts that have put millions of new oysters in the Chesapeake Bay. A special program on crab shedding will provide an update on this important part of the industry; the information here should help watermen in planning new systems for the 1998 production season.

Aquaculture will also be featured with programs to provide the latest information on planning, production, and marketing.

The Mid-Atlantic Sea Grant Extension Programs will also be well represented on the trade show floor for those who have more in-depth questions or need followup assistance for commercial fisheries and aquaculture questions. Plan to spend some time with the agents and specialists who are there to serve you and assist in your business planning and operation. New for the 1998 show will be programs specially planned for wives and children of those attending. Along with these programs will be the finals of the Maryland Rockfish Cookoff planned by the Maryland Seafood Marketing Department. If you have a favorite recipe, you could be a winner. Information on the Trade Expo is available from the Maryland Watermen's Association; Maryland Aquafarmer will feature the complete seminar schedule in the winter issue.

Call for Abstracts 18th Milford Aquaculture Seminar

February 23-25, 1998

Quality Inn Conference Center
100 Pond Lily Avenue
New Haven, Connecticut

Aquaculturists and researchers with professional interest in the culture of shellfish and finfish or research activities related to stock enhancements are invited to submit abstracts for both oral and poster presentations. Abstracts should include the title, names, and affiliations of authors and a complete address. There must be a clear statement of work, methods employed, results and conclusions. Abstracts should not exceed one page in length (single spaced) and should be submitted by January 5, 1998, to Walter Blogoslawski, NMFS, Milford Laboratory, 212 Rogers Avenue, Milford, Connecticut 06460, in hard copy and on IBM compatible diskette. Please label the disk and note the format. Hard copy may also be faxed to Walter Blogoslawski at (203) 783-4217 or sent by e-mail to walter.blogoslawski@noaa.gov for inclusion in the final printed program. All accepted abstracts will be reviewed and edited for publication in the Journal of Shellfish Research, June-July 1998 issue.

Striper 2000: Technological Advances In Striped Bass and Hybrid Culture

June 6-7, 1998
Center for Adult Education
University of Maryland, College Park

Striped bass and hybrids are an important segment of the aquaculture industry. Where seafood markets once relied solely on commercially caught stripers, today they are being supplied as well by growers who use the latest technology and rely on carefully researched diets. Different strains are being assessed for their applicability in aquaculture and scientists are unlocking the secrets of spawning the fish on demand throughout the year. Today, striped bass and hybrids are an international business and are raised in a variety of production systems including ponds, tanks, and cages. Production has gone from a few thousand pounds in the 1980's to millions.

The University of Maryland, Agricultural Experiment Station and the Maryland Sea Grant Program will sponsor "Striper 2000," a conference that highlights research on striped bass and the results of this research for applications to aquaculture. This will be the first directed striped bass and hybrid conference in several years. Anyone interested in the culture of these fish should make plans now to attend. In addition to the meeting, tours of aquaculture research facilities will be available.

Further information about the conference will be available in upcoming issues of Maryland Aquafarmer.

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Alien Ocean:

A New Documentary from Maryland Sea Grant

Back and forth across the world's oceans, big ships are transporting more than the cargo in their holds or containers on their decks. Ballast waters in these ships are also ferrying organisms between one ecosystem and another, sometimes with disastrous impacts on established aquatic food webs. Whether green crabs from the Baltic Sea, zebra mussels from the Black Sea, seagrasses from Japan, clams from Korea, dozens of exotic species are infiltrating harbors, rivers, lakes and estuaries throughout the world. Alien Ocean, a half-hour documentary examines the threat of such invasive species. Summarizing the history of recent invasions, the video illustrates the havoc they are causing in the tidewater coves of New England, the Great Lakes of the Midwest and in estuaries like San Francisco Bay and Chesapeake Bay. Storytellers for the video include coastal fishermen who are struggling to eradicate green crab invaders and scientists who are pioneering a new field called "invasion ecology."

According to the fishermen and the scientists, all these aliens are altering the ecology of coastal ecosystems. Some scientists have theorized that the increasing frequency of harmful algal blooms throughout the world may be exacerbated by the global transport of non-indigenous microorganisms from one ecosystem to another. "Invasions are part of the game of ecological roulette that we play with nature," says Jim Carlton, an invasion biologist from Williams College. "And because it is roulette, the outcome is almost always unpredictable - and we are far more often the losers."

In Chesapeake Bay, the lead scientist is Greg Ruiz from the Smithsonian Environmental Research Center. Working with Sea Grant support, Ruiz has sent researchers onto cargo ships to sample ballast water in search of invasive organisms. To date, they have identified over 100 alien species in Chesapeake Bay. Their work led agencies like the Chesapeake Bay Commission to ask Congress for new legislation to protect American coastal waters."

To learn about Ruiz's research project and other Maryland Sea Grant supported research, visit our web site at <http://www.mdsg.umd.edu/Research>.

To learn more about exotic species in this area, please visit [Exotics in the Chesapeake](#).

Alien Ocean was written and edited by Michael W. Fincham, produced with Jack Greer and Dan Terlizzi, and photographed by Mac Nelson and Michael W. Fincham. Funding came from NOAA, Maryland Sea Grant and the EPA Chesapeake Bay Program. Copies are now available for \$24.95; to order, call Maryland Sea Grant at (301) 405-7500.

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