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Citizen's Oyster Forum

Don Webster, Eastern Shore Area Agent and
Don Merritt, Shellfish Aquaculture Specialist

If you thought that the only reason to raise oysters was for market, there are several hundred people in Maryland and Virginia who would disagree with you. And eighty of them recently showed up in Annapolis to learn more about how to do it.

There has been a great increase in awareness of how important oysters are in the Chesapeake Bay. From the billions of animals that literally paved the Bay in the past century, today's population has dwindled through overharvest, disease, and mismanagement. The elimination of oysters has also brought destruction of oyster reefs themselves, an important habitat for other organisms.

Numbers of efforts are underway to reverse the incalculable loss of oysters to the Bay ecosystem - they range from the Oyster Disease Research Program, in which the National Sea Grant College has been supporting innovative methods for combatting disease, to oyster reef rehabilitation projects, to citizen programs for rearing oysters to maturity.

Two years ago, the Chesapeake Bay Foundation (CBF) began an Oyster Gardening Program designed to involve shoreline property owners in raising young oysters that would then be planted on newly created sanctuary reefs. Citizens received some training in how to keep oysters clean or preventing biofouling, how to monitor them for growth and survival, and how to construct "Taylor" floats for rearing them off bottom.

At about the same time, the Oyster Recovery Partnership (ORP) was organizing volunteers to fill shell bags for placement in setting tanks with hatchery-spawned oyster larvae; once the eyed larvae had "set" on the shell - they are called "spat" at this stage - the bags would then be moved to nursery areas and planted in areas where they could be monitored. The objectives of these plantings are to restore oysters to small habitats and learn more about managing around the diseases MSX and Dermo, which have so devastated efforts aimed at oyster rehabilitation in the Chesapeake Bay and mid-Atlantic waters.

In 1997, the Maryland Sea Grant Extension Program and the University of Maryland Center for Environmental Science joined with the Chesapeake Bay Foundation and the Oyster Recovery Partnership to form the Oyster Alliance. The Alliance brought the expertise of each group to expand oyster restoration and education activities in Maryland's portion of the Bay. A Project Development Grant from Maryland Cooperative Extension helped develop an annual training program; this "Citizen's Oyster Forum" helps provide updated information and further training to the oyster gardening community.

At the Forum, lead-off speakers from the Chesapeake Bay Foundation and Oyster Recovery Partnership summarized program activities during the past year. Bill Goldsborough, CBF Chief Scientist, summarized the changes that have occurred in the Bay from the time that Captain John Smith first arrived. He brought everyone up to date on the state of the Oyster Gardening Program and discussed some future plans. Bob Pfeiffer of ORP gave an overview of the organization's plans for oyster planting in 1999.

Mary Jo Garreis of ORP, and former head of the state's shellfish monitoring program, provided a word of warning to those who want to raise oysters for consumption. She advised growers to make sure waters near their piers were safe from any form of contamination; there is a vast difference, she stressed, between raising oysters for restoration projects and for eating.

If you want to find out about successes and failures of oyster gardening, the best way is to ask the gardeners. A panel of four of them provided an excellent overview of their experiences. Phil Conner of Crockett Brothers Boat Yard in Oxford showed the signs he posted around the marina that informed boaters he was raising oysters in the floats; he said that people became very interested in the project and that he then began to notice a decrease in the amount of detergent and other contaminants that boaters would use to clean their boats. Other gardeners told of how they got started working on projects and of their increasing interest.

Don Meritt, Maryland Sea Grant Shellfish Aquaculture Specialist, showed how the University's Horn Point hatchery operated. He demonstrated many oyster propagation methods from around the world to show how growers adapted to local animals and conditions using innovative techniques.

The keynote speaker was Dr. Stan Allen of the Virginia Institute of Marine Science. Allen, one of the country's top shellfish geneticists, spoke of the CROSBreed (Cooperative Regional Oyster Selective Breeding Program) oysters that he is working on with other institutions. These are animals that have been bred over several generations to exhibit greater resistance to MSX and Dermo, the two major oyster diseases plaguing the northeast. CROSBreed oysters may be one of the primary means by which the oyster industry is able to survive; they will be used in some of the hatchery production for gardening projects this summer.

Don Webster and Dan Jacobs of Maryland Sea Grant provided overviews of two developing efforts of the Oyster Alliance, and asked the audience for comments. Webster discussed the Master Oyster Gardener Program that will be started in 1999 in Maryland. Individuals will receive in-depth training in oyster aquaculture subjects and serve as the principal contact in their area for production questions and data collection. Jacobs is developing a Sea Grant web site on the oyster that will include many different sub-topics. One of these will be a link for Oyster Gardening where growers will be able to get the latest information on how to grow oysters and follow the progress of the oysters they raised after they're planted on a reef.

Evaluations by participants rated the Forum very highly and clearly indicated the desire for programs in the future. The planning staff will use the information to put together more educational programs to further enhance the efforts of citizens in bringing back the important oyster resource and increasing the benthic communities in our waters.

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Recent Oyster Publications

- **Oyster Gardening for Restoration and Education**, an eight-page publication about getting started in the Oyster Gardening Program is available from Maryland Sea Grant. A publication of the Oyster Alliance, the guide provides basic information on setting up and maintaining oysters in Taylor floats or mesh bags, dealing with oyster predators and contending with oyster disease, and collecting growth and survival data.

- **Restoring Oysters to U.S. Coastal Waters: A National Commitment** will let you know about current research on oyster disease and the CROSBreed (Cooperative Regional Oyster Selective Breeding Program) oysters that are being bred to better resist the devastating impact of MSX and Dermo. The Maryland and Virginia Sea Grant College Programs have produced this 24-page publication for the National Sea Grant College Program.

For copies of these publications, call (301) 405-7500 or send an e-mail request to Jeannette Connors: connors@mdsg.umd.edu

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Using Chemical Start Up for Crab Shedding

Don Webster, Eastern Shore Area Agent

Biofilters | **Chemical Conditioners**

Recirculating crab shedding operations have become very popular over the years. In Maryland, we estimate that there are now between 500 to 700 units. Watermen have learned that they not only have better control over water quality, they don't need expensive or hard-to-obtain waterfront property - they can shed crabs on land.

Biofilters

The key to all recirculating systems is the biological filter or "biofilter." It consists of "media," materials that provide a surface area for bacteria to grow on. Bacteria use the toxic ammonia that crabs excrete, first turning it into nitrite, which is also toxic, and then to nitrate, which crabs can tolerate at quite high levels.

Filter media can consist of materials that provide a lot of surface area. Many watermen use oyster shell and pea gravel. The oyster shell is inexpensive and has the added benefit of providing carbonates to the system which can help "buffer," or even out, swings in the pH. If you use oyster shell, it needs to be at least a year old and totally free of any decaying oyster meat or other organisms like barnacles. Fresh shell will cause your system to have many problems and probably lead to severe mortality of crabs.

There are also commercial plastic biofilter materials that are quite useful, although more expensive; they do provide the benefit of knowing exactly how much surface area is provided per cubic foot of material. For example, one such filter material may represent 100 square feet of surface area per cubic foot. There are trade-offs, however. While smaller particles in the biofilter may have more surface area per volume, the filter can clog more quickly and be hard to clean. We have seen many materials used as biofilter media over the years, including pink plastic hair curlers bought in bulk from the manufacturer!

There is a fact of life with all biofilters, however, and that is they all take time to get in condition and grow the bacteria that will purify the water. When new, they will frequently take more than a month to get ready. Even old ones must be started at least three weeks before the first run of crabs comes on. In "the old days" we recommended putting fish or turtles in the system to provide an ammonia source for getting the biofilters conditioned. The problem with this technique is that you do not really know how much ammonia is in the system, so it is difficult to measure and figure out how well the filters are coming on line. You can do a better job by using chemical fertilizers and testing the water to check your filters as they start.

Chemical Conditioners

Ammonium chloride, ammonium sulfate, ammonium hydroxide, or ammonium nitrate can be used in measured amounts to provide a known amount of ammonia for your system. You then measure how much is left after a 12- or 24-hour period to judge how much is converted by your bacteria

and, therefore, how advanced the populations are to handle a load of crabs. These fertilizers are usually available at local farm supply outlets.

In getting a biofilter conditioned, it is not necessary to use the total water capacity available for the system, nor is it necessary to run the water through any other components of the system. You can design your system with a "start up loop" that will just run the water through the pump and back into the biofilter. If you have a large water capacity, you can fill it partially and dilute it after you get the filters conditioned and ready for crabs.

Let's look at an example of chemical conditioning (understand that "milligrams per liter" and "parts per million" are the same), in which we'll use ammonium chloride for a 1,000-gallon system. We know that it takes 0.0113 grams of the fertilizer per gallon of water to get an ammonia concentration of one part per million. We want to put 5 parts per million in our system to start out. Multiplying 0.0113 grams by 1,000 gallons gives 11.3 grams for a one part per million mix. We multiply 11.3 grams by 5 parts per million, which gives 56.5 grams of ammonium chloride. The easiest way to do this on a continuing basis is to mark a cup with the amount you require to get one part per million intervals and then just take the amount needed with your customized measuring cup.

In starting a system with a chemical you would add your ammonium source to maintain 5 milligrams per liter (parts per million) of concentration in the system and monitor the water for ammonia, nitrite, and pH daily. You will want to keep the ammonia level less than 10 milligrams parts per million at all times and keep the nitrite levels to less than 5 parts per million at all times. Dilute the system water as necessary in order to keep concentrations within range and be sure to maintain the desired salinity in the system. Salinity should be matched to within 5 parts per thousand of the water that the crabs came from. Gradually increase the ammonia addition by 2 parts per million, up to a total daily dose of 15 parts per million, which should be added in several dosages throughout the day rather than all at once. Your start-up should be complete in 21-30 days and your system ready to handle that first run of peelers.

The ammonia dosages of the recommended ammonia based fertilizers in order to reach 1 part per million of concentration are:

- Ammonium Chloride - 0.0113 grams per gallon
- mmonium Sulfate - 0.0135 grams per gallon
- Ammonium Hydroxide - 0.0135 grams per gallon
- Ammonium Nitrate - 0.0169 grams per gallon

Remember that these fertilizers are chemicals and may be caustic or otherwise unsafe if handled improperly. Always use rubber gloves and wear safety glasses when handling them.

Starting your system early and properly can ensure that you will have strong survival of your crabs throughout the season without the high mortality that we frequently see in systems that are not properly conditioned. Remember dead crabs can kill your business!

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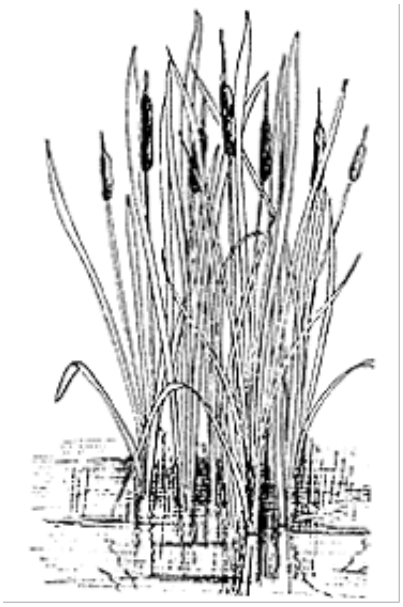
Water Quality in Aquaculture: Testing and Treatment

Daniel E. Terlizzi, Water Quality Specialist

Testing Is Critical

Fish depend on their aqueous environment to provide oxygen and nutrition to support respiration and growth. However, the water that supplies materials for growth is simultaneously receiving waste products like carbon dioxide and ammonia from the fish. Water quality management in aquaculture maintains the balance between the life support and waste disposal functions of water. To be a successful fish farmer, you must routinely determine if the water quality is suitable for fish



culture and what treatments may be required to correct poor water quality.

A fish farmer's most valuable tool in water quality management is chemical testing. Routine testing helps prevent fish losses that result from poor water quality or stress induced disease that results from marginal water conditions. In addition, monitoring water quality provides the grower with valuable information about natural chemical cycles, daily and seasonal, that are operative in the system.

Chemical test kits provide simple, inexpensive analytical methods adapted for field use. Manufacturers offer combination kits that can perform a complete water quality profile as well as single-function kits for special needs or more simplified testing requirements. Test kits vary in price, quality, and accuracy varying from semi-quantitative visual comparators and drop titrators to research grade electronic colorimeters, dissolved oxygen (DO) and pH meters.

In selecting a test kit, it is important to determine the level of accuracy you require and the number of tests to be performed daily. Whatever test kit you select, a complete water quality profile can usually be performed for less than a dollar per day in 15 minutes or less.

What to Test

Critical Chemistry. Includes chemicals that are most likely to cause fish mortalities.

- Dissolved oxygen (DO). Highly variable with temperature, wind activity, phytoplankton photosynthesis and night respiration.
- Ammonia. A direct excretory product of fish. The toxic unionized form increases with temperature and pH.
- Nitrite. An intermediate in the nitrogen cycle. Bacteria (Nitrosomonas sp.) convert ammonia to nitrite; nitrite may then be converted to nitrate (Nitrobacter sp.) which is not toxic.

Water Condition Factors. Chemistry that can indirectly influence toxicity.

- Alkalinity. Includes the bicarbonate concentration of the water. An indication of the buffering capacity or the water's ability to resist changes in pH.
- Hardness. The calcium and magnesium concentration of the water. Low calcium can interfere with development of some species.
- pH. The acidic or basic condition of water. A range of 6-9 is fairly common in low alkalinity ponds.

Some fish farmers may find additional testing is necessary. For example, at high fish densities, carbon dioxide can be a problem. In other cases, monitoring iron, chlorides or hydrogen sulfide may be necessary. Depending on the frequency of testing, many fish farmers find that electronic analytical instruments are helpful; for example, DO and pH meters can be invaluable in operations that require frequent testing of a number of ponds. In some fish farming operations, testing can be simplified. The trout grower using water from a limestone spring is less interested in alkalinity and hardness than the hybrid striped bass grower using a recirculation system so testing for these factors could be reduced or eliminated.

Frequency of Testing

How often you should test can vary with the aquaculture system. For example, a recirculation system supporting one pound per gallon of hybrid striped bass will require more frequent monitoring than an open pond system containing 1,000 pounds per acre of channel catfish. Components of critical chemistry should be monitored frequently. Under conditions where DO is likely to be limited (e.g., high water temperature, high fish stocking density, excessive algae growth), oxygen tests may be required several times during the night and day. It is advisable to check ammonia and nitrite levels daily during start-up or until the operator has gained some familiarity with the variation of nitrogen components in the system. Although pH in the range of 6-9 is not likely to be directly toxic to fish, pH levels determine the concentration of the unionized or toxic form of ammonia and should be measured at the same time.

The water condition factors alkalinity and hardness are less variable than the critical chemicals. At high alkalinity (100 ppm), pH is less variable due to the buffering capacity of bicarbonate. In open pond systems, weekly testing of alkalinity and hardness is sufficient; recirculation systems may require more frequent testing.

Treatments

Testing provides information that can be used to determine if water chemistry is unsuitable for fish culture and to determine the treatment necessary to correct water quality problems. A regular testing program and careful use of corrective treatments will minimize the risk of fish loss to poor water quality and secondary losses to stress induced disease.

Treatment chemicals suggested are commonly used in other agricultural applications. Check with your local farm supply store for availability and pricing.

For further information on water quality and treatment recommendations, contact the Sea Grant Extension Agent in your area.

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OYSTER RECOVERY PARTNERSHIP

Volunteers Welcome

The Oyster Recovery Partnership welcomes anyone wishing to volunteer to help with the restoration of healthy oyster populations in the Chesapeake Bay. The Partnership offers "hands-on" activities, among them, working as a volunteer in hatchery operations, monitoring oyster growth in nursery areas, planting "spat on shell" at project sites, or serving as a diver in the monitoring of our efforts.

Interested individuals may contact the Oyster Recovery Partnership at (410) 269-5570 or e-mail oysterrecovery@erols.com to receive a volunteer application. With the arrival of warmer weather we will also be participating in several fairs and festivals. Stop by our booth on April 24 in Vienna Maryland at the Nanticoke Shad Festival.

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Pond Maintenance Begins Now

Jacqueline Takacs, Regional Marine Specialist

To many, the coming of Spring means one thing - an end to the grays of winter. This is the beginning of the growing season, and regardless of whether you are preparing acres of commercial farm land or tending to a garden, the goal is the same: to produce healthy, productive plants. Once cultivated, a lawn, flower garden, or field of tobacco requires regular maintenance to achieve your desired result, whether it be aesthetics or yield.

Regular maintenance applies to those of you with ponds. Warm temperatures, light, and nutrients (fertilizer) lead to the growth of plants within a pond. Aquatic plants play an important role in the natural ecology of a pond, providing food, shelter, and oxygen for fish and other organisms. Problems arise, however, when plant growth gets out of hand and interferes with the intended use of the pond - it can become a nuisance.

Often, an aquatic plant or algae problem is not a surprise to the pond owner if there was a problem the previous year and it was left unattended. If you want to get as much out of your pond as you do from the rest of your landscaping, maintenance begins now and must continue throughout the year.

The University of Maryland Cooperative Extension and Sea Grant Extension Program have published several publications that pond owners will find helpful in managing aquatic vegetation. Maintenance can be as simple as the following:

1. Start controlling vegetation before there are any problems. Stop the unnecessary loading of nutrients into your pond from your land. The fertilizers you put on your lawn and gardens to make them green will also make a pond green - too green. Contact the Maryland Home and Garden Information Center at 1-800-342-2507 and ask for the following fact sheets that describe different ways of controlling runoff from your land.

   Fact Sheet #701 - Landscapes that Help the Chesapeake Bay
   Fact Sheet #702 - Lawns and the Chesapeake Bay
   Fact Sheet #704 - Saving Your Soil and the Chesapeake Bay

2. Take action at first sighting. If your pond is not new to aquatic vegetation problems, then you should have some idea what your culprit looks like. As soon as you notice nuisance vegetation starting to grow, remove it! This does require a visit to your pond on more than a monthly basis during the warmer months of the year - you wouldn't let your lawn go a month without a mowing.

3. Extreme action. In cases where control was delayed and vegetation is getting out of hand, all is not lost. Pond owners can call upon their local Sea Grant Extension Agent for information on plant identification as well as the various removal methods available, or ask for the fact sheet below.

   Fact Sheet #415 - Aquatic Vegetation Control Aquatic Plant Identification and Management Workbook (Specify the plants you are interested in.)

A pond is like anything else in the landscape: with regular attention, it can become productive and beautiful.

Editors note: The University of Florida's Center for Aquatic and Invasive Plants, http://aquat1.ifas.ufl.edu/, is an excellent website for identifying aquatic plants and birds - you will find scores of photographs and line drawings, as well as a range of material on herbicide applicators, managing against invasive plants, and related materials. There are also comprehensive links to other sites on aquatic plants nationwide.

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