MARYLAND COOPERATIVE EXTENSION
UNIVERSITY OF MARYLAND COLLEGE PARK • EASTERN SHORE

MARYLAND AQUAFARMER ONLINE

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In This Issue:

U.S. Fisheries Flat in 1995

Doug Lipton, Marine Economic Specialist

According to the National Marine Fisheries Service (*Fisheries of the United States 1995*) the supply of edible fish on the U.S. market was down slightly in 1995, compared to the previous year. Landings of edible fish and imports amounted to 13.7 billion pounds. A decline from the previous year in landings of 153 million pounds was partially offset by an increase in imports of 139 million pounds. The rise in seafood imports brought the total value of imported product to $6.79 billion in 1995, though there was also a slight rise in seafood exports to $3.26 billion.

Per capita consumption dipped back to 15.0 pounds per person from the previous 15.2 pounds. After tremendous growth in the 1980s, per capita consumption has remained at around 15.0 pounds in the 1990s. The decline in per capita seafood consumption was mainly for fresh and frozen products, which fell 0.4 pounds. Canned and cured seafood consumption was up 0.1 pounds for canned salmon and 0.1 pounds for canned tuna. Within the fresh and frozen category, per capita consumption was down 0.2 pounds for fillets and steaks, though it rose 0.3 pounds for fish sticks and portions. Per capita consumption of shrimp was also down 0.1 pounds.

Fishermen's revenues from 1994 to 1995 showed little change. Ex-vessel prices (the price paid to fishermen at the dock) were up only 1.5% which was not enough to keep up with the overall rate of inflation of 2.8%. Since the decline in edible fish landings was around 2%, the price rise was not enough to compensate, and revenues fell 0.5%.

Although 1995 will go down as an uneventful year in the aggregate U.S. seafood market, there are indications that without aquaculture products, the situation could be a lot worse. For example, tilapia imports increased 34% in value over 1994 imports with a total imported value of $34.1 million. As recently as 1992, tilapia imports were only $6.1 million.

Fisheries of the United States 1995 is available on the worldwide web: http://remora.ssp.nmfs.gov/.

For more information, contact Fisheries Statistics and Economics Division, NMFS, National Oceanic and Atmospheric Administration, 1315 East-West Highway, Silver Spring, Maryland 20912. Phone (301) 713-2328.

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23rd Annual East Coast Commercial Fishermen's and Aquaculture Trade Exposition

January 17, 18, 19, 1997
Wicomico County Civic Center
Salisbury, Maryland

The Exposition will be open on Friday, 11 a.m. to 6 p.m.; Saturday, 10 a.m. to 6 p.m.; Sunday, 10 a.m. to 5 p.m. Seminars on aquaculture and commercial fisheries will be held on Saturday and Sunday. (The Ocean City Convention Center is closed for renovation.)

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New Sea Grant Extension Agent In Southern Maryland

Jackie Takacs has joined the Maryland Sea Grant Extension Program as its newest marine agent. She will be stationed at the University of Maryland Center for Environmental Science (UMCES) Chesapeake Biological Laboratory (CBL) in Solomons Island, Maryland, where she will undertake outreach programs in aquaculture and other marine-related issues.

According to Doug Lipton, Coordinator of the Sea Grant Extension Program, "Jackie's experience with both shellfish and finfish aquaculture will be a tremendous help as we work on oyster restoration and other projects in Southern Maryland." Lipton says that Jackie will be able, for example, to help the state as it attempts to get the most out of the oyster hatchery at Piney Point.

Ken Tenore, marine scientist and head of CBL, is excited about the new position. "CBL has its roots in Southern Maryland," he says, "and this gives us a chance to work with other parts of the University to mount a new outreach effort in this part of the state."

Jackie will begin her new job on November 4 and can be reached at CBL (410-326-7356). Jackie replaces Rich Bohn, who left Sea Grant Extension to become the executive director of the National Aquaculture Association. The Sea Grant Extension Program is a joint effort of the Maryland Sea Grant College and the Cooperative Extension Service, in cooperation with the University of Maryland Center for Environmental Science, the University of Maryland Eastern Shore, the Columbus Center, and other partners.

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Oyster Habitat Restoration in Severn River

Robert Pfeiffer, Executive Director
Oyster Recovery Partnership

A long-range project to restore oyster populations in the Severn River will provide habitat for invertebrate and vertebrate species, many of which have a recreational value. The restoration effort, undertaken by the Oyster Recovery Partnership, in cooperation with the United States Naval Academy, the Maryland Department of Natural Resources, the Severn River Association and the University of Maryland Center for Environmental Science (UMCES), will also demonstrate the value of the oyster to improving water quality in this heavily developed river.

There are 813 acres of charted, natural oyster bottom in the Severn that are closed to public harvest as established in the 1993 Maryland Oyster Roundtable Action Plan. The first area to receive oysters is the Old Fort Bar located at the junction of Carr's Creek and the Severn River in

front of the Naval Experiment Station.

The oyster seed was produced at the UMCES Horn Point Environmental Lab hatchery. In August they were transported by truck to a nursery area on Mill Creek, north of Greenbury Point, where they were protected from predators and allowed to grow in the nutrient-rich waters of the creek. In late October, midshipmen from the United States Naval Academy loaded the bags of seed oysters onto boats belonging to members of the Anne Arundel Watermen's Association and moved the seed, between 1/4 to 1/2 million oysters, to the Old Fort Bar.

For more information on this project and others by the Oyster Recovery Partnership, contact Bob Pfeiffer at (410) 269-5570.

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Feature: Pond Management in Maryland: Part II, Harvesting your Pond

Reginal M. Harrell, Finfish Aquaculture Specialist

Part I of Pond Management in Maryland: "Species Considerations and Pond Stocking" appeared in the Spring 1996 issue of Maryland Aquafarmer. It covered such topics as stocking procedures, selecting and obtaining the proper fish, and species profiles. Part I and past issues of Aquafarmer are on the worldwide web: http://www.mdsg.edu/Extension/Aquafarmer/index.html

Why would you go about managing a farm pond for recreational fishing if you aren't going to fish it? The goal of managing a farm pond, therefore, is to provide good fishing opportunities. Surprisingly, however, this cannot be accomplished without control and management of the fishing pressure. Fish removal is a necessity for the pond to remain in balance. Balance means that there is the proper ratio of predators to prey at all trophic, or nutritional levels. In other words, there must be plenty of food (i.e., insects, and small aquatic organisms like worms) for the bream (species such as bluegill and redear sunfish) to eat, there must be plenty of bream for the largemouth bass to eat, and there must be enough bass to control the bream reproduction potential. To effectively accomplish this task, you need a harvest plan as part of your overall management scheme.

Let's examine a proper management schedule for harvesting your pond. Assuming that you have followed the previous recommendations (Aquafarmer, Spring 1996) and reclaimed your pond or you have just filled a new pond, then you are ready to stock your fish. Stock bluegill, redear, and hybrid sunfish in the fall of the first year, and largemouth bass in the spring of the second year. You should not begin fishing the largemouth until the third year, when they reach at least 14 inches. You can fish the bluegill and redear population the first summer following the fall stocking.

Be careful: you can easily overharvest, especially the bass, when you first begin fishing your pond, so make sure you that don't take too many large bream the first year and that the bass have reached maturity and spawned at least once before you start removing them from the pond. Likewise, never remove largemouth bass less than 14 inches in size as they are very aggressive feeders and help maintain the proper balance between the bass and the bluegill. If you catch a bass under 14 inches, carefully handle and release it while the fish is still in the water. Do not take the fish out of the pond and do not hold it -- you increase the risk of hurting the fish and making it susceptible to disease.

To maintain a balanced pond, once you have begun harvesting you can safely remove four to five pounds of bream for every pound of largemouth bass taken. In a nonfertilized pond with agricultural run-off, such harvesting equates to about 20 to 25 pounds of bass per acre per year and 80 to 100 pounds of bluegill and redear. In a completely nonfertilized pond, the bass harvest rate drops to 10 to 15 pounds and about 40 pounds of bream per acre per year. In a fertilized pond managed for maximum yield, you can take about 30 to 35 pounds of bass per acre each year, which would relate to 120 to 160 pounds of bream per acre per year (see table).

Annual Harvest Per Acre
In a Fertilized Farm Pond

During the first year of fishing a fertilized pond, you should not take more than about 80 pounds of harvestable bluegill (about 320 fish) per acre, though after the first year, you can increase that harvest level to the 150 to 160 pound

Kind of Fish	Number	Average Weight (lbs)	Total Weight
Largemouth Bass	30	1.5	45
Sunfish (bluegill and redear)	400	0.3	120
Channel catfish	30	1.5	45
Total Harvest			210

* From Hill (1987)

range (about 600 to 700 fish). Harvest the channel catfish, hybrid sunfish, hybrid striped bass, and rainbow trout at whatever rate you desire because these fish are replenished by restocking, not reproduction.

Once the fish reproduction is well established in the pond (second to third year) all bream caught should be removed from the pond since they reproduce rapidly. Remember, bluegills can reproduce two to four times a year, and if there are not plenty of bass available to feed on them, the only bluegill that will grow to harvestable size are the ones that were initially stocked.

If too many bluegill survive, they can prevent bass from spawning successfully: bluegill enter bass nests and eat the eggs while bass are off chasing other bluegill away. Eventually all the eggs can be eaten and the bass spawn could fail. In addition, because so many small bluegill are feeding on the same size and types of food, none of them get enough to eat and therefore do not grow larger than four inches. Thus, undersize bluegill should not be returned back to the pond.

Spread your harvesting throughout the entire fishing season and do not take too many adult fish, especially bass, early in the season--otherwise you will overcrowd bluegill. Keep good records of your harvests and ask friends who fish your pond to do so as well. Once your annual harvest quota for largemouth is met, you should simply release any largemouth you catch, regardless of the size. Include in your harvest records the number of non-bass and bluegill caught so you will have an idea of when you need to restock.

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Aquatic Vegetation Management Tip

Reginal M. Harrell, Finfish Aquaculture Specialist

Fall is the time to control your large grassy aquatic plants such as sedges, rushes, and *Phragmities* (Common Reed) and cat tails. While herbicides can be used on these plants anytime during the growing season, it is best to treat them once this plant "heads-out" or flowers. Contact your local County Extension Service office or the nearest Sea Grant Extension office for fact sheets on Maryland's common aquatic plants and suggested recommendations on how to control them.

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Student Aquaculture Project at the Columbus Center, Baltimore

J. Adam Frederick, Extension Education Specialist

Under the direction of award-winning teacher Bob Foor-Hogue, students at South Carroll High School in Carroll County, Maryland, have designed innovative aquaculture systems in a science research course. The aquaculture projects provide a means for studying aquatic systems while integrating other subjects like engineering, math, computer aided drafting, and writing. The unique curriculum allows students to solve practical problems while working as part of a team. The aquaculture projects have been used to teach fundamental concepts about water quality, raising fish for restocking local streams, and practicing techniques like tagging and anesthetizing fish.

Students at South Carroll High School have designed and built seven aquaculture systems, ranging in size from 150 gallons to 550 gallons. Students design the systems using computer aided drafting with three-dimensional graphics, and they produce their own multimedia programs

including animations. In addition, the students write their own grants to support the funding for these projects and have successfully procured money each school year. This is science at its best.

For the Columbus Center, Bob Foor-Hogue and his students will incorporate a student designed aquaculture exhibit that will be constructed in the second phase of the Hall of Exploration opening. The exhibit will feature three model systems for highlighting the aquaculture research at the Center of Marine Biotechnology and the student-based research at South Carroll High School-- it will also illustrate how aquaculture provides an exciting way to study many aspects of science. The exhibit will also feature the restocking and wetland preservation work performed by the students in the field. Visitors to the Hall will be able to see a "work in progress" as students and teachers collaborate in constructing and stocking the systems with such fish as yellow perch, trout and shad.

Editor's Note: The Columbus Center, the National Center for Marine Biotechnology Research and Education, will be opening a public Hall of Exploration in spring/summer of 1997. Maryland Sea Grant Extension Education Specialist J. Adam Frederick is based at the Columbus Center, developing and implementing educational programs and consulting on exhibits for the Hall; for more information, contact him at (410) 576-5788.

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Aquaculture Tour to Virginia and North Carolina

Steve Bogash, Sea Grant Faculty Extension Assistant

On April 29 and 30, 1996, Maryland Sea Grant Extension organized a van trip of potential aquaculturists to the aquaculture research operations at Virginia Tech, Blacksburg, and the University of North Carolina Hendersonville and to a commercial producer near Asheville. The purpose was to observe aquaculture efforts at these facilities in an effort to enhance the development of aquaculture enterprises in Western Maryland and the surrounding region.

While Virginia Tech's facility was undergoing reconstruction after a serious fire, the staff was outfitting the new facility to directly compare three different types of biofilters. Though much of the work at Virginia Tech will continue to focus on tilapia, researchers are also examining the potential of more exotic species such as paku. The paku has all the endearing looks of a piranha but has evolved to eat the fruits and nuts that fall into South American rivers. While our group was there, the paku were consuming zucchini squash. A graduate student was also running a study on the candy stripe darter, attempting to induce breeding while in captivity.

Jeff Hinshaw was our host at the North Carolina Hendersonville Research Facility. Ongoing work focuses on atlantic salmon, freshwater prawns and yellow perch. The prawns and Atlantic salmon are part of a cooperative research project with the nearby Biltmore Estate on their 40 acre reservoir. The 25,000 acre estate has a goal of producing as much of the food for their restaurant as possible. The estate is also producing several thousand pounds of rainbow trout in large net pens on the same reservoir. This is also the site of the most elegant floating dock system this writer has ever seen. The docks are constructed of stainless steel covered styrofoam interlocking sections. They are wide, easy to work on and one of the most beautiful cases of pure overkill ever.

The driving force for the trip was to visit a producer in the hills just outside Asheville, North Carolina. Working with local regulatory authorities and UNC aquaculture staff, the producer has constructed a concrete stepped raceway system that consists of two parallel stepped runs. The system currently produces over 70,000 pounds of rainbow trout a year with only minimal energy inputs. All aeration comes from water falling approximately three feet through screens between sections in the raceways. Waste is collected in a basin at the exit to each section and periodically vacuumed out to a settling tank. From the settling tank the waste is pumped to a sand filter composter. The treated water is then returned to a settling pond before returning to the stream from which the water was originally drawn upstream. This system has huge potential for sections of far Western Maryland and the surrounding region.

Editor's note: Maryland Sea Grant Extension may organize future tours of other aquaculture enterprises. If you are interested, contact Steve Bogash or a Sea Grant extension agent (see last page for phone numbers and e-mail addresses).

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Toxic Algae and Aquaculture

Dan Terlizzi, Water Quality Specialist

When a fish farmer has spent months raising his crop to near market size and then watches helplessly as the fish float dead to the surface, it is a devastating loss, exceeding the value of the fish. Tony Mazzaccaro, owner and manager of Hyrock Farms, recently suffered a major fish kill, possibly due to Pfiesteria piscicida, the so-called "phantom" dinoflagellate, a fish killer discovered several years ago in North Carolina,

Toxic algae, including Pfiesteria, have made the news recently, in the New York Times as well as in the mid-Atlantic region. They pose serious risks to human health and to aquaculture. And they occur frequently enough to emphasize the need for a better scientific understanding of the factors that influence their growth so that we can more effectively manage fresh water and estuarine environments.

Throughout the world, the frequency of algal blooms, among them, toxic species, seems to be increasing. Reports in aquaculture publications on fish loss from such blooms have become commonplace. For some years, various flagellates, including dinoflagellates, have been appearing in areas where they were not previously seen. In 1987, for instance, the first recorded instance of human illness related to a diatom toxin, demoic acid, was observed in Nova Scotia; in California in 1991, there were reports of pelican deaths which were attributed to the pelicans feeding on anchovies that had accumulated demoic acid from diatoms. Even algal species that do not release toxins can pose problems to fish if the blooms are dense enough. Chaetoceros, a widely distributed group of diatoms common in the Chesapeake and known for having long and sharp cactus-like spines, can injure the gills of fish at high bloom densities.

Whether the fish kill at Hyrock Farms was the result of Pfiesteria or other dinoflatellate species, it should focus our attention on the problem of algal management in aquaculture systems in estuarine and marine waters. With help from Maryland Sea Grant and working in cooperation with researchers in North Carolina, plans are in development to prevent introductions of Pfiesteria from the estuarine supply waters to production ponds at Hyrock. The goal is to eliminate Pfiesteria from ponds where it is already established and to manage all ponds to prevent other undesirable algae from becoming dominant. The fact that toxic blooms can occur in Maryland waters is another wake up call -- the message is that aquaculturists have to be alert to changing conditions in their ponds and must monitor water quality regularly.

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Legislative Update

Richard Bohn, Executive Director
National Aquaculture Association

Animal Drug Availability Act Passes

After considerable maneuvering, debate and effort, the Animal Drug Availability Act of 1996 achieved passage in the final days of the 104th Congress, and was signed by President Clinton on October 9, 1996. The law had broad support from animal husbandry organizations and Congress. It will provide for a much earlier, clearer definition of the "substantial evidence" required for New Animal Drug approvals and combination drugs, and streamline the consideration process by the Center for Veterinary Medicine. The law also contains a "veterinary feed directive," outlining a category of manufactured animal feeds containing drugs without requiring prescriptions or over-the-counter approval, allows the Food and Drug Administration to set import residue tolerances for animal drugs not allowed in the U.S., and simplifies licensing procedures for feed mills.

Delaney Clause Reformed

In early August, the President signed the Food Quality Protection Act, which addresses a number of issues concerning pesticide registration, use and risks. One portion of the bill, called the Delaney Clause, had been unchanged since its establishment over thirty years ago. Originally passed to protect consumers from carcinogens in processed foods, the "zero tolerance" level it

established had been upheld repeatedly in court, thus threatening continued registration or use of a number of crop protection chemicals. Meanwhile, "safe" levels yielding "reasonable certainty of no harm" applied to raw foods. Reform of the Delany Clause brings processed foods into compliance with these standards.

For more information, contact the National Aquaculture Association, (304) 728-2167.

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Blue Crabs: What Year Is This Again?

With all the recent articles about the imminent demise of the Chesapeake Bay blue crab, we thought that readers of Maryland Aquafarmer would be interested in the following article that was sent to us by our friend, Mr. Harold B. Kennerly of Salisbury, Maryland.

CRAB CONFERENCE IN WASHINGTON

At the request of Governor Herbert R. O'Conor, a conference will be held in the offices of the Secretary of the Interior on March 24th between the Governors of Maryland and Virginia and Secretary Ickes, to discuss steps to be taken on the conservation of the Chesapeake blue crab.

In the last few years the crab population has declined to a point where successful operations are no longer profitable in many sections. Governor O'Conor recognizing the serious threat to the industry, has made every effort to work out the details of this conference in the hope that adequate immediate steps will be taken to effectuate a rapid recovery of the crab population. He feels that conservation of this species is of particular importance now, in light of the present emergency and the pressing need for a high production of food.

The Maryland representatives at this conference, besides the Governor, will include the Commission of Tidewater Fisheries, Mr. George Harrison, Tilghman, and Mr. Albert Woodfield, Galesville, members of the Maryland Marine Fisheries Compact Commission, Mr. John Handy, Crisfield, member of the Commission of Research and Education, and Dr. R.V. Truitt, Director of the Department of Research and Education.

The article is from Vol. 2, No. 11 of the "Maryland Tidewater News," a bi-weekly newsletter of the Department of Tidewater Fisheries, Annapolis MD. The date: March 20, 1942!

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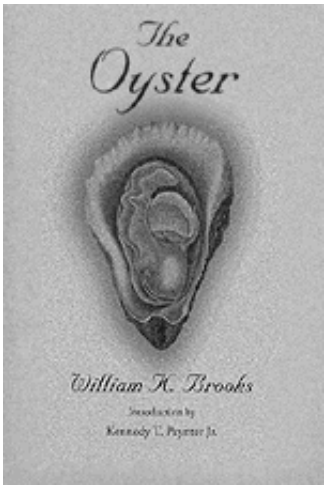
The Oyster: A Century Ago and Today



A Book Review by Don Webster
Eastern Shore Area Agent

Dr. William K. Brooks has reached from beyond the grave. His book, The Oyster, published in 1905, has been reissued by its original publisher, Johns Hopkins University Press, and stands in stark condemnation of how Marylanders have politicized their oyster industry for over a hundred years. "We have wasted our inheritance by improvidence and mismanagement and blind confidence; but even if our beds had held their own and were today as valuable as they were fifty years ago, this would be no just ground for satisfaction, in this age of progress, to a generation which has seen all our other resources developed and improved."

Brooks was writing in a period when the oyster harvest had started to recede from a 10,500,000 bushel annual yield. Harvests had routinely been in these eight digit figures and yet he foresaw the destruction that was occurring through indiscriminate gathering. He also had an unshakable faith that, with cultivation methods, harvests could not only be maintained at these high levels, but increased. He was one of Maryland's first Oyster Commissioners and, in that position, argued for the first surveys of the State's oyster bars, a feat which took place early in the 1900s. Unfortunately, most of his other strongly held opinions on how to increase the harvest for the betterment of the

citizens were never instituted.

I first read Brooks twenty two years ago when my wife gave me a mint copy that she had found in an old book store as a present. I have treasured it since. The impact of the first reading was immense. His warnings, laid down with laser precision, have not diminished to this day.

This edition is enhanced with an introduction by Kennedy T. Paynter, Jr., one of today's bright young oyster scientists. He essentially reinforces Brooks' arguments and updates them with references to contemporary oyster literature and the industry crisis resulting from the two devastating oyster diseases, MSX and Dermo. The interesting factor in the diseases, however, is that they have likely been spread by the same well-intentioned mismanagement that has characterized the fishery for over a century.

If you follow the history of conflict in public policy regarding the Maryland oyster industry, you find that about every generation a new scientist comes to the same conclusions as Brooks, and has about as much success in effecting a long lasting and meaningful change in the industry. Today, however, there is a recognition of the oyster not just as a commercial entity but as an important benthic organism and effective biofilter that can be of significant value in helping to cleanse the Bay from excessive phytoplankton.

While the reprint is excellent, it unfortunately cannot come close to the original. The first edition is bound in green with a gilt oyster upon the cover. The original lithographic illustrations are a magnificent sepia tone, and are not well reproduced in the latest volume. Some plates seem to have been photographed from less than perfect originals as wrinkles and tears seem evident in the camera reproduction on a few. Perhaps, if this volume sells well, a special collector's edition should be considered that would reproduce the original binding and plates.

Brooks' popular treatise on oysters contains the basics of how an oyster works, explained in a form easy enough for youngsters to understand. Indeed, in addition to his prowess as a biologist, Brooks was an excellent popular writer -- in explaining the amazing fecundity of the oyster, for instance, he calculated that, if all descendants from a single female lived and reproduced only once, in the fifth generation their mass would make up more than eight times the volume of the Earth! And this was in the days before computers.

Brooks traces the culture of oysters through manipulation of spawning and catching spat in the water to the early Romans and discusses successful culture operations in Europe and various parts of the United States. The examples serve as argument for how the Chesapeake Bay could become an oyster goldfield, if properly managed. "Our opportunities for rearing oysters are unparalleled in any other part of the world, and in another place I have shown that, in other countries, much valuable grounds have by cultivation been made to yield oysters at a rate per acre which, on our own great beds, would carry our annual harvest very far beyond the sum of all the oysters which have ever been used by the packers of Maryland and Virginia."

In his chapter "The Cause of the Decline of our Oyster Industry, and the Protection of our Natural Beds" Brooks notes that the primary problems for measuring production are lack of access to planting grounds and theft of privately cultured oysters. These problems remain today as two of the most persistent in inhibiting production through non-public means.

Brooks' final chapter is "The Remedy," where he gives ideas about how oyster harvest from the Bay could be increased, although he has enough humility to note that there are many divergent interests and viewpoints. His proposals, however, remain as relevant today as when they were written. "To ourselves and to our posterity we owe it that our resources shall be fully developed, for our oyster-beds are our greatest source of wealth, and upon them, more than upon our commerce, our manufactures, or our farming land, the future wealth and prosperity and population of our State depend."

The Oyster should be in the collection of every person who values the Chesapeake Bay and its natural resources, including, every politician and policy maker in Maryland. The trick then, of course, would be to get them to read it. I have noted with interest, during my years dealing with the oyster industry, that those politicians who most promoted themselves as the saviors of the seafood industry were often those who were the proximate cause of its demise.

Perhaps William K. Brooks, in his second time around, will be able to change a few hearts and minds about the potential of this great estuary and its oyster industry. But even if that doesn't occur, he will still be seen as a visionary with a hard, practical streak. Not unlike Kennedy Paynter and some of his contemporaries who will perhaps have more luck during their careers.

The Oyster is $14.95 (paperback) and can be ordered by calling The John's Hopkins University Press, 1-800-537-5487.

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