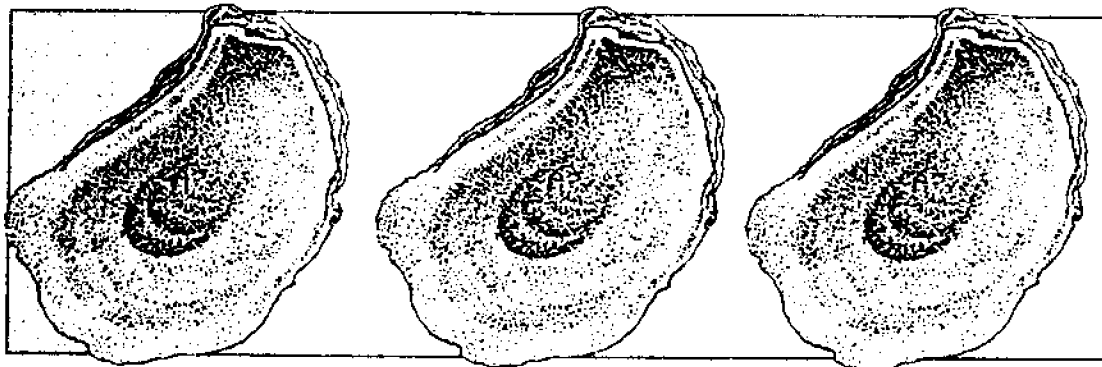
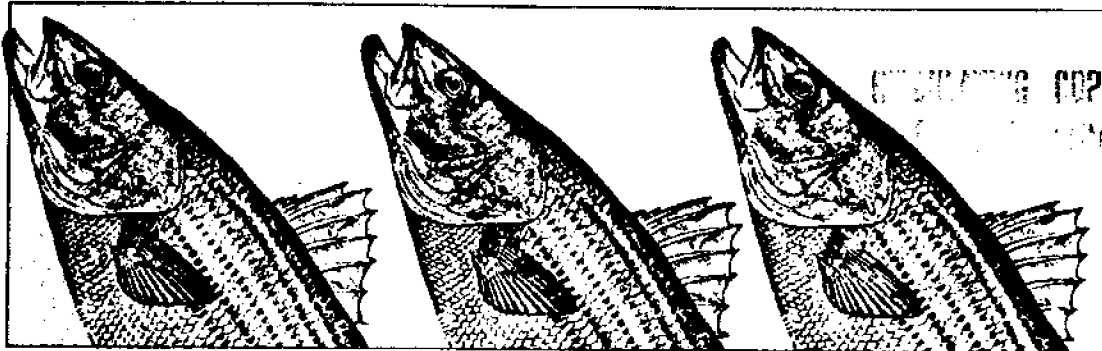


# AQUACULTURE

## IN MARYLAND & VIRGINIA

*Problems, Politics and Potential*



*A Conference Summary Edited by*  
**Donald Webster, Donald Meritt and George J. Flick**

MARYLAND SEA GRANT COLLEGE • VIRGINIA SEA GRANT COLLEGE

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# **AQUACULTURE**

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*Problems, Politics and Potential*

*Edited by*

**Donald Webster, Donald Meritt  
and George J. Flick**

*A Summary from a Conference Held  
June 8 and 9, 1988 in Waldorf, Maryland*

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## Foreword

Why aquaculture? Because it became apparent during the mid 1970s that the Chesapeake Bay seafood industry was headed for a rather severe change.

The species upon which this inshore, small scale fishery was based were in a period of heavy reproductive decline. Scientists were asked, "Why haven't the oysters, striped bass and other fish been reproducing at or above their historic levels?" By posing the question in this way you are forced to investigate hundreds, or perhaps even thousands, of individual and interactive factors which could take decades of concentrated work. The answers are important for they provide the essential information we need to manage our estuarine and coastal waters.

Others, however, posed the question differently. "How can we produce more oysters and striped bass," they asked, "so that the seafood industry can meet the growing consumer demand for fresh seafood?" Since it was clear that many of the reproductive problems lay in the early life stages of the animals, aquaculture was thought of as being able to provide some means for controlling these early stages.

The move to aquaculture is proving to be correct. Those who worked on early programs were fortunate to have administrators within the university who were supportive and who backed up their verbal support with funds and positions. You will find that these people head most of the sponsoring organizations for this conference, a further indication of their interest and support.

This conference marks the tenth anniversary of the first such effort, held in Annapolis in 1979. That was meant to be a "one time" program but at the urging of the industry, it has become annual. Now the list of sponsors has grown to include other state and local agencies and institutions.

One speaker who was on the program several years ago said that there seemed to be a "decided optimism." "You have a lot going for you," he said, "and I hope you get your industry developed soon because there's a lot of competition out there."

Development of an effective aquaculture industry will require reasonable regulations by government agencies, active participation by the financial community, and service from educational and research institutions. The industry is going to have to represent its interests itself by forming associations and alliances with groups having similar goals.

There is no doubt that it can be accomplished. It speaks well for the future that the sponsors of this program have, by their interest, supported the development of aquaculture in Maryland and Virginia.

—The Editors

INTRODUCTORY REMARKS

# Aquaculture and New Opportunities

**Honorable Robert T. Jarboe**

*Chairman*

*Tri-County Council for Southern Maryland*

*P.O. Box 1634*

*Charlotte Hall, Maryland 20622*

*(Commissioner Jarboe serves St. Mary's County and is currently Chairman of the Tri-County Council, one of Maryland's most active and effective economic development organizations.)*

It is with great pleasure that I welcome you to this historic conference on aquaculture. I believe it is very appropriate that we are meeting today in Southern Maryland to discuss the opportunities and challenges that aquaculture presents.

Since the first Europeans settled here more than 350 years ago on the shores of the Chesapeake, the "great shellfish Bay" as the Indians called it, our people have been harvesting seafood from the productive waters of this region. In recent decades we have seen that harvest decline to a mere fraction of its former abundance. The Maryland oyster harvest, for example, has fallen from more than 2.5 million bushels in 1975 to less than one million bushels last year. Oyster diseases pose still further threats to production. A moratorium on striped bass was imposed in 1985 to save this prized fish from extinction.

We are also a tobacco growing region. In six short years we have seen a tobacco crop exceeding 30 million pounds, which sold for more than \$57 million, decline to a crop of less than 12 million pounds, worth less than \$15 million at auction.

In short, we are witnessing the steady decline of a traditional way of life—on the water and on the land. I expect the same story could be told by many of you here today from other regions of Tidewater Maryland and Virginia. We are working to save the Bay and to clean up the rivers that are its tributaries. We are working to stabilize the decline of our tobacco industry, in the face of growing sanctions and economic pressures.

But the fact is that as farmers, watermen, scientists and public officials, we need to turn our attention to the future. We need to take a serious look at alternative crops and we need to look at alternative methods of seafood production. There are markets for these products, and they are right on our doorstep, in our neighboring metropolitan areas. We in Southern Maryland believe that aquaculture may represent a great opportunity for the future. There are also obstacles—administrative and legislative obstacles that centuries of lawmaking, much of it well-intentioned, have imposed. These can be eliminated. We need research and training and financial assistance that will reduce the risks for those who want to begin aquaculture operations, even on a small scale.

### *INTRODUCTORY REMARKS*

With the help of our State, under the leadership of our dynamic Governor William Donald Schaefer, and in partnership with local government, we are confident that these obstacles can be overcome. These are some of the issues that will be explored here during this historic conference.

I want to thank the University of Maryland's Sea Grant College, Cooperative Extension Service, and Horn Point Laboratories, the Virginia Polytechnic Institute, and the Maryland Department of Agriculture for organizing this conference. The Tri-County Council for Southern Maryland is honored to be among the sponsors, and I am pleased to recognize the contributions of the Boards of Commissioners of the three Southern Maryland counties, Calvert, Charles and St. Mary's, to our efforts. I also welcome those who have traveled from near and far to share their experiences and successes with us.

Welcome to Southern Maryland. We hope your stay with us is a pleasant one. We know that we will benefit from your knowledge and your insights as we overcome the problems and the politics to realize the potential of aquaculture.

INTRODUCTORY REMARKS

# Putting Aquaculture to Work in Maryland

Wayne Cawley

Secretary, Maryland Department of Agriculture  
50 Harry S. Truman Parkway  
Annapolis, Maryland 21401

*(Mr. Cawley has served two Governors as Maryland's Secretary of Agriculture. He is a working farmer from the Eastern Shore and has been a strong supporter of aquaculture development.)*

When Governor Schaefer took office, he directed me to help prepare an aquaculture initiative for implementation in Maryland and we've done it. I am proud to tell you that this past session of the Maryland General Assembly passed an aquaculture bill that does four things for the development of aquaculture in Maryland.

1. It defines *aquaculture as agriculture*. This puts aquaculture on the same footing as agriculture when it comes to getting the *same rights and privileges* as agriculture from governmental agencies.
2. It establishes a *separate section* within the Maryland Department of Natural Resources law that deals *only with aquaculture*, so we aren't using the same law to save our natural resources that we're using to promote aquaculture production.
3. It establishes an *Aquaculture Advisory Commission* of 18 members which will advise the state on how to best serve those involved in aquaculture.
4. It makes the *sale of hybrid striped bass*—our most promising cultured fish—*legal in 1990*, unless the legislature decides to legalize it even earlier.

Although the bill does not do everything for Maryland aquaculture that needs to be done, it is a big first step in the right direction, and the Maryland legislature deserves high marks for enacting this legislation. Down the road I think that we will look back on this joint aquaculture conference as a turning point in the fisheries' economies of both Maryland and Virginia.

We are past the point where we can enjoy the luxury of being able to depend on the bounty of the Bay to provide us with all the seafood we can consume. We are going to have to help ourselves and continue to help nature at the same time. It is time we



#### INTRODUCTORY REMARKS

started to put the best minds and resources we have in both states to work on developing the expertise and services for those involved in aquaculture, just as we did years ago for those involved in agriculture. If we can achieve anywhere near the same return on the investment in aquaculture that has made our agricultural industry the wonder of the world, then we will be doubly blessed. I can't help but feel that we are on the edge of a new technology that will carry us to new levels of productivity in our seafood industry.

These endeavors will benefit all of us—the aquaculturist, the waterman, the farmer, the processor and, most of all, the consumer. I say the consumer most of all because that is what we are in business to do—to feed the citizens of our state, our country, and the rest of the world with seafood from the Chesapeake Bay. So let's start this conference with the resolve that we will not think as Marylanders or as Virginians, but as aquaculturists from the Chesapeake Bay region. Let's take the best both states have to contribute and together develop a seafood economy that is bigger and better than either state could produce alone.

I am looking forward to the increased cooperation and knowledge that will come from this conference. We will solve the problems, negotiate the politics and realize the potential of aquaculture in the Chesapeake Bay region—and we will all be winners.

INTRODUCTORY REMARKS

# Clearing the Way for Aquaculture in Virginia

**T. Robins Buck**

*Aquaculture Development Manager  
Virginia Department of Agriculture and Consumer Services  
1100 Bank Street  
Richmond, Virginia 23219*

*(Mr. Buck served the Commonwealth as Chief of Marketing and is currently the Aquaculture Development Manager and a member of Virginia's Aquaculture Task Force. He spoke for S. Mason Carbaugh, Commissioner of Agriculture and Consumer Services.)*

Aquaculture is the "buzz word in Richmond" at the present time. A lot of activity is going on in Virginia and it will continue for some time into the future as agriculture looks for alternatives to traditional crops and ways to increase the profitability of its industry. Previously there was a "futures study" performed by the state which concluded that the Department of Agriculture should study the possibility of aquaculture for small business and on-farm production. A Task Force was then formed appointing key people to it with the charge of developing the possibilities further. The Chairman of the Task Force was the Deputy Secretary of Economic Development.

The Virginia Marine Resources Commission (VMRC) has now developed regulations legalizing the raising of striped bass and hybrid striped bass and this is where we are going to target our efforts on commercialization. We realize that we are going to have to work to get regulations changed on both a regional and national basis in order for the industry to grow. There are too many impediments in the way of the potential striped bass farmer. We feel that aquaculture should be a farm enterprise. Virginia has authorized \$2.3 million in the next two years for hybrid striped bass research and development. Currently there are three or four demonstration projects on hybrid striped bass gearing up.

Aquaculture, Inc., in Lancaster County was the first commercial operation and have recently been test marketed. Two ponds are presently in production with plans to expand in the future. Plans in other areas of the state call for stocking fingerlings in indoor recirculating systems.

#### *INTRODUCTORY REMARKS*

Problems encountered to this point are a lack of fingerlings and competitive feed sources. Associated with these are lack of disease diagnosis and control agents, fingerling mortality, and a need for nutritional requirements for each specific species. The future looks bright for Virginia, however, with a great deal of interest on the part of the industry to see the development of a new source of fish.

AQUACULTURE: A GLOBAL PERSPECTIVE

## Seafood—Bright Future for Consumer Demand and Aquaculture Production

**Paul A. Sandifer,**  
*Director, Marine Resources Division  
South Carolina Wildlife and  
Marine Resources Division  
P.O. Box 12559  
Charleston, South Carolina 29412*

*(Dr. Sandifer is involved in management and research in coastal aquaculture, fisheries, and marine ecology and has served as president of the World Aquaculture Society. He holds appointments at the University of South Carolina, Clemson University and the Medical University of South Carolina.)*

Although oyster culture was practiced in the Mediterranean region during the Roman period, aquaculture in the West is in its infancy. Most commercial production has occurred in the last 30 years, with an actual "industry" only appearing within the last decade. Aquaculture is truly a "sunrise" industry in the west, and it appears to have all the vigor, growth potential, identity crises and growing pains of any adolescent.

Even with increasing areas of fishery production, under the most optimistic domestic fishery production assumptions, the United States will continue to require large imports of fishery products, more than one million metric tons by 1990. On a world basis, Colin Nash of the United Nations Food and Agriculture Organization (UNFAO) predicts that aquaculture production will reach 25 percent of total world fishery harvest by the year 2000, and I confidently expect Western aquaculture to play a major role in this expansion.

In the early 1980s per capita use jumped by one kilogram (2.2 lbs) per person. Just this modest increase required an additional 363,000 metric tons (over 800 million lbs) of finished product and about one million metric tons (2.2 billion lbs) of raw material. This increase is directly related to the health-food attributes of seafood perceived by the American public.

It is estimated that by 1990, per capita consumption of seafood in the U.S. will reach 9.5 kilograms (almost 21 lbs), but this will only occur if we in the seafood production business take full advantage of the marketing opportunities available. The clear potential is for the same kind of growth seen in the poultry industry.

## *AQUACULTURE: A GLOBAL PERSPECTIVE*

Farmed salmon is a relatively young industry, but by 1968 it accounted for nearly ten percent of the world's supply and this could reach twenty percent by 1990. Production of farmed salmon has doubled every two years since 1980, and the U.S. government predicts that production could exceed 200,000 metric tons (441 million lbs) by 1990.

The growth of the catfish industry is a major success story in freshwater fish production in the United States. Mississippi has 80 percent of the production with 34,391 hectares (84,980 acres) of ponds devoted to the industry in 1986. It is relatively well developed and mechanized and large, modern processing plants prepare the product for the consumer. The fish are delivered live to the processing plants so the highest quality is assured. Growth has been nothing short of phenomenal and this is a result of an industry-based, comprehensive marketing effort.

For crustaceans, crawfish farming is relatively low technology and ponds used for production have grown from 800 hectares (1,977 acres) in 1960 to more than 54,000 hectares (133,434 acres) in 1987. Nearly all the production is consumed domestically, although a small effort is now underway to develop export markets, particularly in Europe.

Let me finish this review with a few ideas on the future of aquaculture in the West. First, we see the demand for seafood growing rapidly in the major U.S. market and also in Europe. Per capita consumption in the west is rising and the seafood industry has potential to mimic the growth of the poultry industry, if and only if aquaculture can supply sufficient quantities of high quality products desired by the consumers at prices competitive with other meats.

With few remaining under-exploited stocks of traditional high-valued seafood products available, aquaculture can compete with capture fisheries. In fact, if it were not for aquaculture we would probably be unable to supply the existing demand for salmon, catfish, crawfish and shrimp, much less respond to expanded demand. As Colin Nash of UNFAO pointed out, "The major potential for growth in fisheries production is through aquaculture."

In the west, with its history of strong fishery management, we will see increasing quotas, season and gear restrictions, allocations among user groups, and even fishery closures as a result of stock failures. We have already seen marine species for the first time being reserved for recreational fishermen, with commercial fishing on these stocks prohibited. This trend is spreading. Overall, we can conclude that the more problems and limitations in the capture fisheries, the greater the opportunities for aquaculture, with its abilities to produce consistent, high quality products on a regular, predictable basis.

This also gives us tremendous opportunities for developing both government and private aquaculture operations in support of recreational fisheries. Over the next few decades I predict we will see more and more coastal fishery populations that once were shared by commercial and recreational fishermen being reserved exclusively or in large part for the higher value recreational use.

Undoubtedly there will be business failures, including some spectacular ones. But that should not be a cause for writing off aquaculture as being unproven or extreme-

## AQUACULTURE: A GLOBAL PERSPECTIVE

ly risky. Aquaculture is not the only business that has failures; every kind of business does. We must simply learn from the failures and move on. There will be problems of supply and demand and price—demand will increase beyond supply; supply will then increase and probably overshoot, resulting in what appear to be catastrophic decreases in prices. After some Darwinian sorting out in the industry, I predict that the long-term result will be higher demand at a reasonable price. With higher demand will come substantial growth in the industry.

Aquaculture is now being formally recognized as a specialized form of agriculture and as the provider of diversification opportunities for a number of traditional farmers. A great opportunity presents itself for aquaculturists to ally with farmers and fishermen to achieve real political strength. Achieving political clout is central to rapid progress in aquaculture development in the west.

Finally, if there is a one-word key to the future of our aquaculture industry it is *marketing*. We can no longer afford to follow the tradition of the independent "mom-and-pop" fishery business. We have got to get together and develop strategies to sell more of the products that we can produce. The market climate is right, the time is now, the opportunity is unlikely to ever be better, and the responsibility is ours.

*(Editors' note: Dr. Sandifer originally delivered this paper as a keynote address before the 19th annual meeting of the World Aquaculture Society. It is reprinted in its entirety in the Journal of the World Aquaculture Society, Volume 19, Number 2, June 1988, pp. 73-84.)*

OVERVIEW OF THE POLITICAL AND LEGAL CLIMATE

## Needed in Virginia: New Codes for Marine Aquaculture

**N. Bartlett Theberge, Jr.**  
*Virginia Institute of Marine Science  
College of William and Mary  
Gloucester Point, Virginia 23062*

*(Mr. Theberge is a Professor at the School of Marine Science of The College of William and Mary and Chairman of the Department of Ocean and Coastal Law. He has a background in biological science and law degrees from the College of William and Mary and the University of Miami.)*

I've been a critic of the Virginia role in aquaculture over the last decade but there has been some movement towards development recently. This is evidenced by advances in the pond culture of striped bass. Virginia, however, is not as far along in marine aquaculture as some other states. Tremendous potential exists in marine culture, particularly in the production of clams and oysters.

A survey that we conducted of various states involved in marine aquaculture (such as Connecticut, California, Washington, Virginia) yielded a list of 27 impediments to the industry. Some of these were:

1. water quality concerns
2. lack of investment capital
3. burden of permits
4. access to and cost of coastal property
5. antiquated laws and regulations
6. lack of understanding by the investment community
7. conflicts with private property owners and watermen
8. lack of coordination between state and federal agencies
9. disease and predation
10. theft control

Mentioned specifically in Virginia were antiquated laws and regulations and the lack of rights to the water column in present leasing provisions. Marine aquaculture could provide a boost to the state economy, prove an incentive in maintaining water quality in the Chesapeake Bay area and may prove more compatible with traditional public fisheries than is commonly thought.

## OVERVIEW OF THE POLITICAL AND LEGAL CLIMATE

We have relatively good water quality and technical and scientific support in the Bay region. While we need to foster a good economic climate for aquaculture development, the legal and policy framework is the biggest problem. The industry needs to help educate the policy makers. We have seen that those who succeed at marine aquaculture don't want the competition, the failures say it can't be done, and the legislators just don't understand it. Most legislators think in terms of traditional fisheries and are going to have to be educated to the benefits of developing a marine aquaculture industry.

If we do not address the inadequacies of legal and policy frameworks for marine aquaculture, there will be conflicts between federal, state and local laws on the one hand and riparian rights on the other hand. Aquaculturists may be caught in the middle. There will be conflicts with the rights of the public to use the waters of the state and the rights of the shellfish industry to lease those waters.

We will have to come to grips with issues such as:

- use of the water column and surface water
- harvest restrictions which bear no relationship to private production of aquacultural crops
- residency restrictions

We need to address these issues and concerns and we need to do so *before* the growth in marine culture can occur.

What has been done with the pond culture of striped bass is a step forward. It has taken a long time. We need to do more. Virginia, like Maryland, should have two separate sections of the state code, one for aquaculture and one for the traditional commercial harvest of marine species. The structure of policy and the legal framework should be addressed before the demand for decisions becomes heavily politicized by conflict. Addressing these issues now will further enhance the long term economic and business potential of marine aquaculture.



OVERVIEW OF THE POLITICAL AND LEGAL CLIMATE

# Maryland's First Steps Towards Encouraging Aquaculture

**Robert Percival**  
*Acting Program Director  
Coastal and Estuarine Policy  
University of Maryland Law School  
Baltimore, Maryland 21203*

*(Dr. Percival is the Acting Program Director for Coastal and Estuarine Policy at the University of Maryland Law School. He has been involved in the analysis of aquaculture policy questions.)*

Having been involved in the development of the Maryland Task Force Report on Aquaculture I see many significant changes between it and the final bill which passed the most recent legislature. There are still significant questions pertaining to how to proceed and divide the responsibilities between the Maryland Departments of Agriculture and Natural Resources. I notice also that the concept of the "aquaculture enterprise zone" has been deleted. It was originally developed as a means to assist in the protection of the aquacultural products of small growers by aggregating their operations in currently barren portions of the Bay.

What has been passed establishes a new code in the law and sets up a new 18-member Aquaculture Advisory Committee. It removes some restrictions on the hybrid striped bass question and calls for the establishment of regulations for its development.

With regard to leasing Bay bottom for oyster culture, there is a provision for a five year "use it or lose it" lease reversion back to the state if the lessee fails to utilize the bottom for production. The law addresses the question of private property rights and authorizes (rather than mandates) the withholding of commercial harvesting licenses for thefts of private oysters.

Clearly, availability of seed oysters will be an important problem in the future and access to seed will be a concern of the private oyster planter. Financing will be critical for development of the industry. I should caution, however, against the rush towards public subsidy(s) for development of aquaculture. What you need is a level playing field where restrictions are removed and you allow market forces to become the major factor in competition. The aquaculture industry needs to develop an involvement in the political process in concert with environmental and industrial organizations.

AQUACULTURE AND THE LEGISLATIVE PROCESS

## **Aquaculture Legislation Requires Industry Participation**

**Honorable John F. Slade, III**  
Box 15  
Valley Lee, Maryland 20692

*(Delegate Slade represents Maryland's 29th District and serves on the House Environmental Matters Committee. He has been appointed to represent the House of Delegates on the new Aquaculture Advisory Committee.)*

Maryland has always been known for fine seafood products but it is also becoming known that we are in trouble at the present time. We have seen a heavy reduction in the amount of fisheries products harvested in traditional fashion in recent years. It is becoming clear that we must encourage aquaculture to help restore Maryland to the former prominent position which we occupied with such species as oysters and rockfish (striped bass). At the same time we should be looking at opportunities to produce new, non-traditional Maryland products such as crawfish and other species which may be suitable to be raised here.

Both agriculture and the wild fisheries are currently undergoing some hard times in the area which I represent and perhaps aquaculture will present a possibility for both of these segments of the food industry to begin to produce and, hopefully, cooperate in the future.

I believe that if we are going to lease areas of the Bay for production of seafood then we should keep them all productive. Towards that end I think we need to require that people who lease bottom from the state use that lease or else allow for it to be reallocated to those who will. This seems only fair.

The aquaculture industry is relatively small in the state of Maryland at the current time. I would encourage its participants to affiliate with economic development and other business development groups and farm organizations so that members of the industry can have a voice and be heard in the legislative process.

AQUACULTURE AND THE LEGISLATIVE PROCESS

## Virginia's Oyster Fishery: A Long History of Leasing

Clay Jones  
Assistant Director,  
Chesapeake Bay Commission  
60 West Street, Suite 200  
Annapolis, Maryland 21401

*(Mr. Jones has had a long involvement with environmental and management issues in the Chesapeake Bay area. He spoke for the Honorable Tayloe Murphy of Virginia.)*

Virginia has had a long history of oyster leasing—much more so than Maryland. The Baylor survey charted the natural oyster bottoms and the legislative process set these aside for the public fishery at an early date. Those areas not reserved for the public were available for lease for the private production of oysters.

Virginia was fortunate in that the important seed areas of the James River were available for private producers to obtain the spat with which to plant their leased bottom. Although leases only account for about twenty-seven per cent of Virginia oyster producing areas, they have traditionally produced well over half the total harvest. Currently, about 100,000 acres are leased in Virginia but there are problems in the industry.

Many of the laws and regulations are outdated and antiquated. Leased beds lie fallow and unproductive, while lease rates have not changed in many years—they are still at \$7 per acre. The Virginia Marine Resources Commission (VMRC) is trying to enact a "use it or lose it" provision to allow for bottom which is not being used to revert back to the state and become available for re-leasing to individuals who will use it.

In August, 1987 Regulation 34 was passed which was designed to allow the raising of hybrid striped bass by private individuals. This was developed to allow a year by year permit by which persons could propagate this species. The current regulations require designs to protect the natural stocks along with a "paper trail" to ensure that only properly raised fish get to market. One individual has begun start-up operations on hybrid striped bass culture in Lancaster County and eight applications are pending from the Northumberland County area.

It will become imperative for the Virginia legislature to address some of the standard questions raised by development of the aquaculture industry during the next couple of years.

AQUACULTURE IN OTHER REGIONS

## Catfish: The Rise of an Industry

**Hugh Purnell**  
214 Pembroke Drive  
Jackson, Mississippi 39208

*(Mr. Purnell has been involved in agriculture and aquaculture for over twenty years and has served as the Executive Director of the Catfish Farmers of America.)*

This morning I asked one of the speakers a question about concern for the consumer and didn't receive a response. But this is a very important point and one that most people don't seem to think about because they put the emphasis on production alone. Consumers are very demanding. They demand wholesome food which most would like to see inspected under federal programs. There is a move towards light, healthy, low cholesterol foods. This is what the aquaculture industry provides.

The key to getting an industry producing is to minimize production and marketing barriers. Too much regulation can quickly kill your industry.

In the early 1960s farmers in the South couldn't figure what to do on agricultural land with unprofitable crops. Small groups developed which looked at ideas like raising catfish. In the beginning there was a lot of small acreage used to produce fish. Today you would need a 160 acre minimum size operation at about a \$1 million investment just to get into the industry and be production efficient, according to estimates by researchers at Mississippi State University.

We were fortunate in Mississippi that we had a very favorable political climate which allowed the catfish industry to develop and grow at a very fast rate. There are now about 135,000 acres in catfish production with 86,000 in Mississippi and 30,000 in one county alone.

In 1978 catfish production was at 30 million pounds. By 1987 it had grown to 327 million pounds. The price to the farmer has risen from 57 cents per pound in late 1968 to 70 cents a pound this year. The industry operates in the free market with a growing consumer acceptance of about 10 to 15 percent per year. Aquaculture offers the potential to produce a quality, nutritious product with year round availability, and the industry is spending a lot of money on market development. While 90 percent of the fish are marketed through normal channels, there is a great deal of interest in value added and portion control products and other modern food marketing techniques. The poultry industry has been progressive in using whole birds and creating nuggets and other products; now the catfish industry is looking at marinades, stuffed fish and offering more va-

## AQUACULTURE IN OTHER REGIONS

riety. It's not just a fried fish market anymore. States like California have developed into an excellent market for farm raised white fish.

Live fish are processed in the 1.25 to 2.0 pound size and are harvested from ponds using grading seines. Although the industry is currently one of open pond production there is the possibility of closed systems coming on line in the future. Strong farmer owned cooperatives operate many of the processing facilities and feed mills. There are about 6,500 people employed in the catfish industry in Mississippi alone, with feed production at about 300,000 tons a year. In processing, Delta Catfish is the largest in the United States and represents some 50 percent of the industry. They are now fully automating plant equipment.

If you're thinking about getting into the industry, you have a lot of homework to do first. You need good figures on production and supply. You can't be a peddler to the big boys like Red Lobster Inns without good statistics. Aquaculture requires different thinking. Financially, you need to know that you're not going to get a crop in a year. Start-up times generally run from about 24 to 27 months. Proper financing is not only important but critical. You need adequate supplies. For example, feed may run to 50 or 65 percent of production costs, and you need access to good nutrition products. Realize that you are going to be competing for the price of protein in the market place.

You need to start marketing at the local level before you try building up. Market research is very important in any venture. Extension services and university support are likewise important and require dedicated people to support the industry. I should offer one strong cautionary note. You don't need too many regulations if you're trying to build an industry. You're trying to give the consumer a good product. The last thing you need to build in is market barriers. There are enough out there naturally.

There are fish farmers out there now looking to get into other products like striped bass. Several operations are already on the drawing board which will be designed to produce a million pounds a year. You don't have much time left to get your act together, if you want to compete with them. You can fiddle with your state regulations all you want to, but the barn of opportunity is burning down. There are many opportunities in aquaculture for you if you act today!

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## Pacific Oysters: Largely a Family Business

Lee Wiegardt

Jolly Roger Oyster Company  
Ocean Park, Washington 98640

(Mr. Wiegardt operates one of the largest oyster businesses on the West Coast. He has traveled extensively and seen the oyster industry in many parts of the world.)

On the west coast, the native industry based on the Olympia oyster crashed many years ago from overharvesting. We realized we could not continue buffalo hunting and relying on the wild reproduction and harvest of the oyster. We then turned to producing several other species of oysters, including your Eastern oyster, *Crassostrea virginica*.

By the 1920s we had introduced the Japanese oyster *Crassostrea gigas* to the area. At that time we were buying seed from the Japanese and this continued for many years. We needed to import seed because in our area the water is generally too cold for the Japanese oyster to spawn on its own. Buying seed from Japan did have its drawbacks, like back in the 1940s when some unpleasantness existed between our countries.

In later years it became harder to obtain seed from the Japanese because they used so much of it support their own domestic industry. West coast planters decided that we would have to develop our own sources in order to continue production—and that meant hatcheries, which now supply most of the industry. Our own operation uses about a billion eyed larvae a year in remote setting production. We think that is the way to go.

Time spent on site selection, including a good bioassay of potential areas, is mandatory before you build up. In our area oysters need about six years to develop a cash return. Today the industry in the Pacific Northwest is about as modern as you will find in the United States. It is dominated by families, most of which have been in the oyster business for many generations and people who have built up their businesses over the years. We are certainly not owned by General Foods or General Mills or any of the others that people out here fear.

You need to bring private industry and capital into the business. Large scale government programs end up producing more on paper than in the water. Any programs to encourage people to get into the business should be tied to their ability to produce. You have to help yourself. You can't rely on natural reproduction to sustain the industry today.

AQUACULTURE IN OTHER REGIONS

## Gulf Oysters: Private Enterprise Increases Production

**Mike Voisin**

*Motivatit Seafood, Inc.*

*P.O. Box 134*

*Houma, Louisiana 70360*

*(Mr. Voisin is the fifth generation of his family to be in the oyster industry in Louisiana. He recently was appointed to the National Seafood Promotion Council.)*

The Gulf Coast oyster industry produces about 28 million pounds of oyster meat. About 17 million pounds are from public areas and 11 million from private producers. Louisiana alone accounts for 13 million pounds with some 9 million coming from private production. The dockside value runs to \$24 million for the public and \$18 million for the private harvest. Private industry has flourished over the years.

Individuals or corporations can lease up to 1,000 acres for 15 years; leases are automatically renewable. Of the 3 million acres available in Louisiana waters, about 300,000 are currently leased and 1 million are in the public fishery; this leaves 1.7 million with potential for use. A major problem we are facing is competition for space from continuing industrial and residential development. Recreational demand sometimes leads to conflict over use of the areas in which we grow and process oysters. It is clear that the lending and insurance institutions don't understand the industry.

In the 1880s the state established the Louisiana Oyster Producers Board to assist in marketing. Promotion and marketing continue to be a critical need for the industry: we have got to let people know that our product is first rate; we must work with state and federal legislators to get economic development people to help with the industry.

In the future we see hatcheries and remote setting for seed production playing an important role. Remote setting is currently in development in our area. Privatization of bottoms will increase production as the state realizes that public bottom does not work very well. I think that depuration is going to become a reality, probably within five years, as we try to get a product on the market that the consumer is going to have confidence in.

We will have to look for alternative cultch materials with which to prepare bottoms and set spat on and continue to watch and work with government at all levels, even locally, to assure that laws, regulations and ordinances which may be developed do not do anything to destroy the oyster industry.

AQUACULTURE IN OTHER REGIONS

## Clams: Production 52 Weeks a Year

**Chad Ballard, Jr.**  
*Cherrystone Aqua-Farms*  
*P.O. Box 347*  
*Cheriton, Virginia 23316*

*(Mr. Ballard has been in the seafood industry for many years. His aquaculture operation is located on the Eastern Shore of Virginia.)*

We began the company in 1982 and purchased clam seed. By 1984 we realized that we needed a hatchery to have some control on both quality and quantity of our clams. We presently raise about 100 million seed ranging in size from 200 microns to 4 millimeters (mm). We raise them to 6 mm for planting or for sale. This fall we will be planting 10 to 15 million and have 20 to 25 million available for sale. We operate on a two to three year grow out. One thing aquaculture allows you to do is to get 52 weeks a year production.

One problem we encounter in the hatchery is with oyster spat setting on the tanks and liners and clams. We are trying trays of a thousand clams each in grow out. We use aggregate and netting to protect the clams from predators.

Negative factors affecting the business are lack of access to clean water, shallow bottom, and a hatchery nearby for security. We have biological problems with fouling, disease (primarily in the larval stages), and predation (from wild animals such as crabs and, of course, man). Management problems exist with lack of labor. Technical help is no problem—we are able to attract biologists. What we need is a lot of "bull" labor.

Political problems exist in trying to grow clams while being affected by natural resource laws. For example, there is a 1-inch minimum clam law (even though they spawn at about 1/2 inch) but the market will take 3/4 to 7/8 inch clams. Meeting the 1-inch minimum requires us to hold our animals over an extra winter with all of the associated risk to our investment. We would like to see this repealed or modified for aquaculturally produced clams. We would like to see wetland regulations modified to permit existing aquaculture facilities. While these regulations are usually put in place to protect the environment from wide ranging impacts from industrial and housing development, they don't recognize the minimal effects from aquaculture operations.



### *AQUACULTURE IN OTHER REGIONS*

Though we believe there needs to be changes and modifications in the laws and regulations affecting aquaculture, we remain wary of broad ranging aquaculture bills and government assistance dollars. They often attract people to the industry for the money rather than a commitment to produce. The money would be better used for research and development. Private industry can produce better than government—and this adds private capital to the economy.

AQUACULTURE IN OTHER REGIONS

## Louisiana Crawfish: Growth through Marketing

**Larry Delabrettone**  
*Extension Specialist*  
*Cooperative Extension Service*  
*Louisiana State University*  
*202 P Knapp Hall*  
*Baton Rouge, Louisiana 70803*

*(Mr. Delabrettone has served the crawfish industry for many years as an Extension Specialist and is widely regarded as one of the country's experts in crawfish production.)*

All you have to do is look at the figures on consumer food consumption to know there is a golden opportunity out there for people to produce more fish products.

- Poultry is up 46.4 percent
- Fish is up 28.3 percent
- Pork is down 13 percent
- Beef is down 32 percent

Natural production of crawfish occurs in Louisiana in 2 out of 3 years. The industry needed to extend the live product to support the market throughout the year and realized they were going to have to increase production, even out the bumps in natural cycles, and try to raise crawfish so that they would be available whenever there was a market. So they went to Louisiana State University (LSU) for help in raising them.

We now have about 135,000 acres under production. First we started with wooded ponds, then went to semi-wooded, then to rice fields and other ponds constructed especially for crawfish. There is a great deal of work now going on to try to increase the production levels of crawfish for the heavy demand that has developed.

Water requirements are about 100 gallons per minute per acre. Grass decomposition adds to the oxygen requirements. Recommended pond sizes are between 40 and 660 acres. How many can be practically harvested in the course of a day depends on harvesting practices. A man can walk about 400 traps a day. A mechanized ("Go Devil") operation can pull 200 an hour. There are now various mechanized harvesters such as crawfish combines which are coming on the market.

### *AQUACULTURE IN OTHER REGIONS*

Spinoffs from the industry have included artificial baits with 13 manufacturers, harvesting equipment, and feed for crawfish for extended seasons. We have over 13,000 people employed in the industry in Louisiana with 13 extension agents and 3 specialists supporting the industry at LSU. We include an aquaculture course at the annual 4-H camp.

The key to growth is in marketing. You have to realize that you can't just give consumers what you have—you have to give them what they want. This is where aquaculture excels and why there has been such growth in the industry in the past couple of decades.

The biggest growth in the industry recently and the area which seems to have a lot of room left for expanded production has come in the area of soft shell crawfish. From a very modest beginning a few years ago production should reach 100,000 pounds this year. Shedding occurs in 80° F water temperatures which requires heating or greenhouses. They are examined and sorted according to their ability to shed and placed in trays. They will usually molt between 7 AM and 7 PM. Current prices are running about \$8 to \$10 per pound to the producer and there seems to be a ready market for the animals not only domestically but in Japan.

One thing you have got to be wary of in any aquaculture venture is the fast buck hustler. There are a lot of them out there and they like to take advantage of the fact that you may not have much technical knowledge about the industry but that you've read or heard about it and want to get into it. I would advise you to investigate every opportunity and claim that comes along before you invest and, as with any business, take a long, hard look at the economics before you proceed.

RETAIL POTENTIAL OF AQUACULTURE PRODUCTS

## Corporations and Aquaculture: A Case in Point

Carey Monaghan  
Campbell Soup Company  
Campbell Place  
Camden, New Jersey 18103-1799

*(Mr. Monaghan is the Director of Seafood Marketing for the Campbell Soup Company. His responsibilities include management of Domsea, a subsidiary which raises salmon.)*

Our Domsea operation raises plate size or baby salmon. We bought it in 1979. The aquaculture salmon business now produces several million pounds per year in contrast with the hundreds of millions of wild caught salmon. We operate in a different niche: our fish have a low fat and oil content with a different taste. About 80 percent of our business is with restaurants and 20 percent retail.

We are in what is called a "medium risk aquaculture execution." It is, however, a risky business and one that takes a stout heart and reasonable financial backing. You have to learn what you are doing. It's also risky from a market standpoint. We view our competition as other trout growers. From an aquaculture point of view it is anyone in the world; for instance, South America can produce many species at lower cost. Substitutability of species is something that you must take into account. Along these lines, you have to take a world look at your competition.

Within the Campbell's Company we have a seafood unit that is made up of both frozen and fresh products. Domsea is our fresh product unit; Mrs. Paul's is the frozen line and that is a tough business. They are generally coating fish and freezing it so they can use low cost raw product. Aquaculture cannot compete with wild caught volume products like pollack and hake. Frozen product today is probably not the way to go.

The frozen food service outlook is better. For instance, salmon which is individually quick frozen within a day is virtually indistinguishable from fresh product six to nine months later. The name of the game is that the consumer wants good tasting fish. You need to be aggressive in retail sales. Getting in to large chain distribution takes time and effort. Retail stores are moving into fresh products. Due to the structure of the supply end of the business, the fishing industry drives them crazy.

Airline shipment is a major problem in distribution and what the retail buyer wants is stability—not headaches. The factors of availability, price stability and quality

## *RETAIL POTENTIAL OF AQUACULTURE PRODUCTS*

are important. Here is where aquaculture comes in. It can help to take away some of the problems. Commercial harvesters are getting better at this but aquaculture competes better in quality.

Consumers surveyed about seafood noted that they perceived 48 hours to be a long time for seafood distribution and there was a lack of excitement over the "farm raised" connotation. What that says is that "I want fresh fish that tastes good" and that I shouldn't base a marketing plan on trying to stress that something is "farm raised."

High priced products will meet consumer resistance. For instance, chicken is perceived as being bland, healthy and cheap. To increase consumption, watch prices and try to lower cost. In the fresh food service you can lock in the price for some time. The important thing is to get on the menu. That's your number one objective.

There has always been talk about our company or others in the food business trying to take over the whole production spectrum. In this regard Campbells is not vertically integrated. We are not interested in owning or raising the aquaculture products. Farming operations cannot give us the return that we require. The farmer asks, "How can I get the most dollars out of my land?" We compete with other buyers for the raw product and we compete in the marketplace with our processed products. Becoming the "Perdue of fish" may be very hard to do. What you need is a broad product line, sourced reliably.

RETAIL POTENTIAL OF AQUACULTURE PRODUCTS

# Maryland Processors Have the Know-How—What They Need Is Seafood Product

**Casey Todd**

*MeTompkin Oyster Company  
Crisfield, Maryland 21817*

*(Mr. Todd is the third generation in his family to be in the seafood processing industry. The MeTompkin Company plants are in Crisfield and he has an interest in aquaculture.)*

My family has been in the seafood processing business for several generations. We've operated in Crisfield, which has always called itself the "Seafood Capital of the World" although in recent years that kind of seems to be stretching the point.

The fact remains that the seafood industry in Maryland and in our area in particular is in big trouble. We have seen the decline of most of the commercially important species and from our point of view it doesn't look as though we're going to be able to just rely on Mother Nature anymore. We are going to have to increase production on our own.

Our family started out in the oyster business. Now it's the smallest part of our operation. We are a major crabmeat processing house with hand picking, machine picking, and brine flotation lines for production. We also built a new soft crab processing plant a few years ago which we operate seasonally. What we need is product to keep our operations going year round.

We can readily convert our plants to processing other products such as hybrid striped bass and that's where we would like to see aquaculture come in and start to turn out the raw product that we could produce. Just like Campbells Soup, we have no desire to own all the operations that produce the raw product. We want to purchase that raw product from local producers.

Whenever we talk about aquaculture, it always gets bogged down in a fight over where the labor force to process the product is going to come from and where and when we're going to let people get in the processing business. But the plants are already here with underutilized capacity. What we need is the product to process. That's why our company has had an interest in seeing the aquaculture business increase. We have the expertise in processing, marketing and distribution. We already ship soft crabs any-

*RETAIL POTENTIAL OF AQUACULTURE PRODUCTS*

where in the United States in 48 hours. There is no reason that we couldn't do the same thing with other products.

It would help to broaden product lines, increase our market penetration, and provide income and employment for our entire industry. We think that aquaculture deserves a chance to develop in this area. It will benefit the entire seafood industry.

THE PROBLEMS OF AQUACULTURE AS A BUSINESS

## The Goal Must Be Stability of Production and Quality of Product

Oscar Nelson  
Kennerly/Booth Seafood  
Box A  
Nanticoke, Maryland 21840

*(Mr. Nelson manages the H.B. Kennerly Company of Booth Seafood. He has had a long career raising, buying, processing and selling oysters and other products.)*

We have some great problems in the oyster industry right now. We have seen salinity moving up the Bay and carrying with it the capacity to bring MSX and Dermo into areas where they had not been found before. We have pollution moving down the Bay and a lack of oxygen in a lot of the deeper areas which used to be productive.

Oyster bars like Tea Table Shoal which used to be tremendous harvesting areas haven't been producing for 40 years. In the James River, oysters used to go as far as Williamsburg but that hasn't happened for most of this century. The seed beds of the James, which are so important to the Virginia oyster industry, and many Maryland private planters, have been having a bad time with low reproduction for several years.

The H.B. Kennerly Company is in the oyster business 12 months a year. We developed that business over many years and we deal in both in-shell and shucked oysters as well as other products. We depend on the local leases for oysters during the summertime. In our area most of the local watermen have leases that have often been in their families for generations. Traditionally they would plant shell on these leases and wait for natural spatfall to occur. Then, after the public harvest season was over, they would turn to their leases and sell the oysters, usually for a better price than the public season would bring. This would provide a good income for them and it allowed us to develop year round markets.

A stable supply of raw product is very important to us. We don't find it in Maryland or even in the Chesapeake anymore. We believe that we have got to investigate new ways to produce. Using hatcheries and remote setting may be a way to get around the lack of natural spat set which is a current problem. We need to look at techniques like off-bottom culture. The end product could justify the risk today. We have got to improve our Maryland and Virginia product to compete with the Gulf Coast oyster which has an 18-month growout and is cheaper to harvest. We also have to look at packaging improvements for our products because you have to grab attention to compete in the market today.



AQUACULTURE AND ITS IMPACT ON THE CAPTURE FISHERIES

## **Natural Stocks and Farm Reared: A Need for Both**

**Robert A. Siegel**

*Senior Economist*

*National Marine Fisheries Service*

*Silver Spring, Maryland 20910*

*(Dr. Siegel serves as a Senior Economist with the principal government agency responsible for fisheries. This summary of his presentation is taken from a recently completed research project.)*

If the upward trend in seafood consumption continues, the United States is going to need new supply sources in the 1990s. The United States relies heavily on imports of both capture and aquaculture species, and faces a growing trade deficit in fisheries products. With many of the world's principal capture fisheries at or approaching their maximum biological levels, the United States dependence on aquaculture imports will increase in the future. This also holds for other major seafood importers. In the case of salmon and shrimp, it appears that future increases in demand will be supplied primarily from aquaculture products. Although the projections show significant increases in salmon and shrimp aquaculture production, it appears that producers will still have ready markets in the major seafood consuming nations.

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# Planning for Aquaculture Development in the Region— Facing the Problems

**Donald Webster**

*Area Agent*

*University of Maryland*

*Sea Grant Extension Program*

*125 Bay Street P.O. Box 519*

*Easton, Maryland 21601*

*(Mr. Webster has been involved with aquaculture and the seafood industry for many years. He covers the Eastern Shore for the University of Maryland Sea Grant Extension Program.)*

Before we get into what the future has in store for the area I think that we should discuss some of the factors that anyone is going to have to address in a start up operation.

First of all you must realize that aquaculture is site specific. Anyone considering going into this industry will have to put a lot of work into gathering enough information to make an informed, rational business decision on whether or not to proceed. You need to assess the species to see if they will survive in the prevailing growing conditions and if they are acceptable in the marketplace.

You need to know about the water supply—both in quantity and quality—which you will be using. You will need to know something about the chemicals which may be in both the water and the pond soils. This can be expensive if laboratory testing must be carried out.

You need to consider the knowledge and skills you will need in order to manage what, for most people, will be new species in new environments. You have to consider whether you are going to obtain those skills yourself or hire those who already have them. Although many skills which are already known and used by farmers and watermen make them "naturals" for the business, there are others which need to be learned for an aquaculture operation to be successful. Water quality monitoring is one of the most important.

Permits can become a major problem. Since aquaculture is not yet familiar to many state agencies they are likely to try to include your activities with others which

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may not be at all similar. Lack of timely action on applications, both at the federal and state levels, can be frustrating and costly and can severely prolong start up times.

Also, the term "permit" indicates that someone is "allowing" you to do something and, if you don't conform to their dictates, they will revoke your "privilege." This is why many people in the industry argue that states should develop a system of "registration" rather than "permit" if they wish to develop a successful industry.

Many laws and regulations, like permits, make little sense when applied to aquaculture. Most were developed to deal with the harvest of natural resources, which aquaculture is not. Two examples from this conference will help to illustrate the problem:

- Chad Ballard mentioned that he has a market for clams smaller than one inch. Virginia law, however, requires that they be that size for sale. Having to grow them until they reach that size compels him to hold them over an extra winter and accept the resulting mortality. Clams produced by a private individual are therefore being lost without any benefit being realized by the producer, the consumer, the economy, or government which would reap additional tax revenue through increased income.
- A representative of the Maryland Natural Resources Police mentioned to me that a statement by Oscar Nelson needed clarification. Even if oysters came from a private lease they must meet the three inch minimum law in order to be sold. So if a market for a small, premium half shell or raw bar product was available it could not be met by Maryland private growers or sold by the Kennerly Company although other states do exist which would allow this to occur. This, of course, limits growth in the industry and discriminates against local producers.

The messages delivered by the speakers at this conference were clear. Hopefully they will be heard by those who are responsible for policy. We can summarize them:

1. Minimize your laws and regulations and the industry will grow.
2. Government financing and development grant programs often become giveaways that end up producing more paper than seafood product.
3. Bureaucratic and government planning about how you're going to let people produce is the best way to ensure failure.
4. Private industry can produce; government should be supportive. Too often government becomes part of the problem rather than part of the solution.

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5. The industry is moving fast; if you don't get your act together soon (in the Mid Atlantic), you'll find it hard to get into the marketplace.
6. Not doing anything is a decision; it means that you're saying NO.
7. Marketing is the key to the future in the seafood industry and it is here that aquaculture excels.

We have come to a time when aquaculture has been given to the U.S. Department of Agriculture as "lead agency" at the federal level. It probably makes the most sense then to have a similar setup within the states. Agriculture involves food production and so does aquaculture.

The decline of the public fishery in the Chesapeake Bay makes a statement by Max Chambers of the FLOMAX Oyster Hatchery all the more cogent: those who are opposed to aquaculture as a means of seafood production, says Chambers, "are coming to the point where they will have to make a fundamental decision over whether they are going to change their philosophy. . . or their occupation."

The stationery of Walnut Point Farm, with which we have had a long relationship in aquaculture development in Maryland, has a covered bridge on it. Beneath this is an inscription which reads, "Bridging the gap between the worlds of academia, private industry, and government." There is certainly room for involvement by all—industry, government and our institutions—in helping to develop this industry which could do so much to better the lives of those in our respective states and help to restore this area to that of its former prominence in seafood production.

Hopefully, conferences and other meetings such as this will help to bring together many of the people and organizations in Maryland and Virginia who share common goals. We share a Bay, we share many interests and concerns, some people even think that we share a common language although I'm sometimes not too certain of that. I am certain, however, that we can work together to develop seafood products in our region with the goal of producing *quality products with constant availability and stable prices*—those factors which aquaculture excels at.