

**INTERIM REPORT OF  
THE VIRGINIA DELEGATION  
TO THE CHESAPEAKE BAY COMMISSION ON**

**House Joint Resolution No. 535, 1993:  
The Condition and Future Prospects of  
the Shellfish Industry in Virginia**

**TO THE GOVERNOR AND  
THE GENERAL ASSEMBLY OF VIRGINIA**



**HOUSE DOCUMENT NO. 87**

**COMMONWEALTH OF VIRGINIA  
RICHMOND  
1994**

# Chesapeake Bay Commission

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April 19, 1994

To the Governor and the General Assembly:

On behalf of the Virginia Delegation to the Chesapeake Bay Commission, please accept this report prepared pursuant to House Joint Resolution 535 (1993).

House Joint Resolution 535 directed the Virginia Delegation to the Chesapeake Bay Commission to examine the condition of the shellfish industry in Virginia. The members of the Commission, assisted by capable individuals from state government, academic institutions and private industry, spent the last year considering the issues facing the shellfish industry.

It is the firm belief of the study committee that Virginia must do all within its power to see that shellfish remain an important part of both Virginia's economy and the ecology of Chesapeake Bay. Without a vibrant industry, many regions of Virginia will continue to suffer economically and the restoration of Chesapeake Bay will be incomplete.

This is an interim report. Due to the variety and complexity of the issues under study, the committee chose to continue the study for an additional year. A final report will be presented for your consideration at the 1995 session of the General Assembly.

With all good wishes, I am

Sincerely,

A handwritten signature in dark ink, appearing to read "W. Tayloe Murphy, Jr." with a stylized flourish at the end.

W. Tayloe Murphy, Jr.  
Chief Patron, HJR 535

WTMJr:cc

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## **HJR 535 COMMITTEE MEMBERS**

### Virginia Delegation to the Chesapeake Bay Commission

Delegate W. Tayloe Murphy, Jr. (HJR 535 Committee Chairman)  
Delegate S. Wallace Stieffen (Delegation Chairman 1993)  
Delegate Robert S. Bloxom  
Senator Elmo G. Cross, Jr.  
Senator Joseph V. Gartlan, Jr.  
Secretary Elizabeth H. Haskell  
Mr. Irvine B. Hill

### Virginia Institute of Marine Science

Dr. Dennis Taylor

### Department of Environmental Quality

Dr. Bernard Caton

### Marine Resources Commission

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### Department of Health, Division of Shellfish Sanitation

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### Watermen's Organizations

Mr. Kenneth W. Williams, Virginia Watermen's Association  
Mr. A. Thomas Leggett, Jr., Working Watermen's Association

### Seafood Processing Industry

Mr. Ronnie Bevans, Bevans Oyster Company  
Mr. Tommy Shackelford, Shackelford Seafood Corporation  
Mr. Lake Cowart, Jr., Cowart Seafood Company

### Aquaculture Industry

Mr. Chad Ballard, Jr., Cherrystone Aqua Farms

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Mr. Jack Frye

Marine Resources Commission

Dr. James Wesson  
Mr. Jack Travelstead

Chesapeake Bay Local Assistance Department

Mr. Scott Crafton

Virginia Institute of Marine Science

Dr. Bruce Neilson  
Dr. William Hargis  
Dr. Eugene Burreson  
Dr. Roger Mann  
Mr. Dexter Haven

Department of Environmental Quality

Mr. Alan Pollock

Department of Health, Division of Shellfish Sanitation

Ms. Mary Wright

Committee Staff: Russell W. Baxter, Chesapeake Bay Commission

Thanks to Franklin D. Munyan, Division of Legislative Services

## **I. INTRODUCTION**

In a 1928 communication to the Virginia General Assembly, Governor Harry F. Byrd wrote that "[t]he commercial sea food industry is one of Virginia's greatest assets. Its annual output is valued at \$30,000,000; 38,000 people are regularly employed and 60,000 at certain seasons." In that communication, he expressed particular concern about the condition of the oyster industry, which at that time had fallen from 7,612,299 bushels in 1904 to 4,356,416 in 1925. He implored the General Assembly to recognize the value of the seafood industry in general and the oyster industry in particular and stated that "Virginia as a State has the full right to ask that this industry be conserved and administered with broad vision and business efficiency ..... whether you come from the mountains or the sea, it is your duty to unite and preserve this industry from extinction."

Obviously much has changed since Governor Byrd wrote those words. However, his depth of feeling about the importance to Virginia of the seafood industry as a whole and the shellfish industry as a vital component, is shared by many today. It is the firm belief of the members of the committee formed pursuant to House Joint Resolution 535 that a vibrant shellfish industry is a worthy goal and it is the obligation of the Commonwealth to do all within its power to achieve that end.

House Joint Resolution 535 (see Appendix 1) adopted by the 1993 session of the Virginia General Assembly charged the Virginia members of the Chesapeake Bay Commission with reporting on the condition of the shellfish industry and making recommendations for the future. The members of the commission selected state agency officials, seafood packers, watermen and scientists to assist them in the fulfillment of their charge.

The purpose of this report is to report on the progress of the committee and to set the stage for a comprehensive strategic plan for the protection, enhancement and restoration of the shellfish industry which will be submitted to the Governor and the General Assembly at the 1995 session. As noted in the findings to follow, the HJR 535 committee wishes to make recommendations that will result in a healthy shellfish industry within Virginia's tidal waters. Given the complexity of the issues involved and desire of the committee to proceed deliberately and responsibly, the committee has recommended that the study be continued for another year.

## **II. HISTORY, STATUS AND POTENTIAL OF THE SHELLFISH INDUSTRY**

This shellfish industry has historically been one of the foundations of Virginia's economy. It has provided employment for watermen, packers and processors and others throughout Tidewater Virginia. It has been particularly important to the economies of the rural areas of eastern Virginia. At the core of the shellfish industry has been the oyster industry which has historically accounted for the vast majority of economic activity. At this time, while there are bright spots in the wild clam harvest and in aquaculture, we are faced with the prospects of a future without a viable oyster harvesting and processing industry. Harvest of oysters

have declined from 4.5 million bushels in 1958 to only 46,000 bushels in 1992 with the expectations for 1993 to be significantly lower (see appendices 2 - 5).

Even a cursory analysis of the economic importance of the shellfish industry reveals the potential benefits of its restoration. As the following comparative tables demonstrate, since the pre-disease years in the late 1950's, the economic impact of the combined oyster and clam harvest have fallen. In the case of oyster harvests, reductions in harvests from private grounds have been more pronounced since the early 1970's. Restoration to levels of even a decade ago would nearly double the commercial value and potential employment in harvesting and processing. Employment figures to not include ancillary employment such as boat builders and repairers, gear manufacturers and related trades and industries.

**Table 1** **VALUE OF OYSTER CATCH**

<b>YEAR</b>	<b>1958-59</b>	<b>1982-83</b>	<b>1992-93</b>
<b>DOCKSIDE VALUE OF CATCH</b>	\$13,374,000	\$5,883,000	\$2,060,000
<b>ESTIMATED RETAIL VALUE OF CATCH</b>	\$66,735,000	\$32,356,500	\$11,330,000

Sources: VMRC, Virginia Marine Products Board

**Table 2** **VALUE OF CLAM CATCH**

<b>YEAR</b>	<b>1958-59</b>	<b>1982-83</b>	<b>1992-93</b>
<b>DOCKSIDE VALUE OF CATCH</b>	\$832,000	\$2,492,000	\$1,693,000
<b>ESTIMATED RETAIL VALUE OF CATCH</b>	\$4,576,000	\$13,706,000	\$9,311,500

Sources: Marine Resources Commission, Marine Products Board

**Table 3** **NUMBER OF SHELLFISH PROCESSING FACILITIES**

<b>YEAR</b>	<b>1958-59</b>	<b>1982-83</b>	<b>1992-1993</b>
<b>NUMBER OF PROCESSING FACILITIES</b>	> 400 (est.)	250	157

Sources: Marine Resources Commission, Marine Products Board, Division of Shellfish Sanitation

**Table 4****NUMBER OF HARVESTERS**

<b>YEAR</b>	<b>1958-59</b>	<b>1982-83</b>	<b>1992-93</b>
<b>NUMBER OF INDIVIDUALS ENGAGED IN HARVESTING CLAMS AND OYSTERS</b>	4540	2511	1663

Source: Marine Resources Commission

**III. CHALLENGES TO THE VIRGINIA OYSTER INDUSTRY**

Recent declines in oyster harvests have left Virginia processors at a competitive disadvantage with other oyster producing states. Oyster processing in Virginia is now almost exclusively based on importation of oysters from other regions in the country. According to Virginia processors, it will be exceedingly difficult for the industry to survive based on less desirable imported oysters. According to surveys conducted by the seafood industry, the Virginia oyster is preferred over other competing products.

Further, the industry faces growing marketing challenges. Despite the safety and quality of Virginia shellfish, doubts about seafood safety have been raised in some media reports. In addition, the oyster industry is facing a "graying" market. The traditional consumers of oysters are growing older and fewer younger persons are consuming oysters. Finally, Virginia faces increased competition from other states, particularly the states bordering the Gulf of Mexico, and in many cases Virginia is being outspent by competing states in the marketing of its seafood.

**IV. OTHER ISSUES OF CONCERN**

As noted, in the findings in section VI, the necessity of revitalizing the shellfish industry is also driven by other factors. The ecological role of shellfish in Virginia's tidal waters must be reestablished for water quality protection and habitat restoration. In addition, other fisheries, particularly the blue crab, are being placed under increasing pressure as a result of the loss of the oyster fishery as commercial fishermen seek to earn a living from another fishery.

**V. THE CONDUCT OF THE STUDY**

The following section summarizes the meetings of the HJR 535 committee during 1993. Meeting agendas are contained as appendix 6.



### Meeting One (June, 1993)

The committee adopted a plan of study to examine the principle issues defined in the resolution. At the first meeting of the committee, an outline of issues to be addressed was adopted which would provide the base of knowledge necessary to develop an effective and workable strategic plan for the restoration of the shellfish industry in Virginia.

### Meeting Two (July, 1993):

With the assistance of a panel of representatives from state water resource agencies including the Department of Environmental Quality, the Division of Shellfish Sanitation, the Chesapeake Bay Local Assistance Department, the Division of Soil and Water Conservation of the Department of Conservation and Recreation, and the Virginia Institute of Marine Science, examined issues related to the condition of shellfish waters, including the number of condemned acres and the nature of their condemnation. The committee also examined how shellfish resources are factored into agency decisions regarding the promulgation of regulations, the granting of permits, and actions which directly or indirectly impact water quality and the harvest and management of shellfish.

**Division of Shellfish Sanitation:** Mary Wright of the Division of Shellfish Sanitation, described Virginia's shellfish sanitation program and the regulatory environment in which the program operates. Virginia must operate under the National Shellfish Sanitation Program (NSSP), a federal program, in order for its seafood to be marketed. The standards for the NSSP are contained in regulations known as "the Manual" which is promulgated by the Food and Drug Administration. Under the program, growing waters are measured for fecal coliform bacteria and when certain concentrations are exceeded, direct harvest is prohibited. Sampling for fecal coliform bacteria does not distinguish between animal or human. Sources of fecal matter include privies, septic tanks, drainfields and large concentrations of animals. Also, known sources of pollution such as sewage treatment plants and marinas are required to have buffer zones around them from which direct harvest of shellfish is prohibited. Ms. Wright noted that the National Indicator Study is currently underway which may better allow regulators to evaluate closures and buffer zones depending on the identified pollution sources.

Growing areas are also classified based on the results of shoreline sanitary survey which examine actual or potential sources of pollution. Harvesting is prohibited from any areas without a current survey. When condemnations are made, it is not always clear what the source of fecal matter is, simply that it is or is not present.

**Department of Environmental Quality (DEQ):** Alan Pollock of the Water Division of DEQ explained that DEQ is responsible for issuing permits for discharge of pollutants into state waters. With respect to protection of shellfish areas, there are three primary elements. First, the Commonwealth's water quality standard narrative language says that "state waters shall be maintained at such quality as will protect all existing beneficial uses and will support propagation and growth of all aquatic life ...which might reasonably be expected to inhabit

them." Beneficial uses include production of edible and marketable resources such as fish and shellfish. In addition, a numerical standard for fecal coliform of 14 per 100 milliliters applies in waters capable of propagating shellfish. Finally, in 1980 the Water Control Board adopted a policy for the protection of water quality in shellfish growing areas which include a public hearing if the discharge will result in condemnation of shellfish beds by the Health Department. If a proposal will result in condemnation, the board must disapprove the application.

**Chesapeake Bay Local Assistance Department:** Scott Crafton of the Chesapeake Bay Local Assistance Department explained the role of the Department in administering the Chesapeake Bay Preservation Act relative to the protection of water quality. The Chesapeake Bay Preservation Act is implemented through local land use ordinance and is intended to supplement existing water quality programs. While there are no provisions in the regulations that specifically address shellfish growing areas, the provisions of the Act call for a no net increase in pollution loads from land uses through best management practices prescribed in the regulations. In addition, the Act calls for revisions of local comprehensive land use plans to ensure water quality protection. This process, now underway, could offer an opportunity for shellfish area protection as part of a local government's comprehensive planning process.

**Division of Soil and Water Conservation:** Jack Frye explained that the lead nonpoint source pollution control agency is the Division of Soil and Water Conservation housed in the Department of Conservation and Recreation. The Division administers the nonpoint source elements of the Chesapeake Bay Program, responsibilities related to management of agricultural lands and federal mandates related to nonpoint source pollutants. The Division also helps fund research on discharge of groundwater to establish links between land uses and groundwater quality. The Division is also the lead agency for administration of the Erosion and Sediment Control Law, which was substantially improved as the result of legislation passed by the 1993 General Assembly.

**Shellfish Enhancement Task Force:** The Shellfish Enhancement Task Force was established in 1985 to coordinate water pollution control efforts for the benefit of shellfish growing areas. Its 1992 report, "Man Versus Mollusk", examines additional steps that the Task Force recommends to ensure water quality conditions necessary for shellfish harvesting. Bruce Neilson noted that the water quality standard for direct harvesting is well below the standard for recreational uses (14 fc/100 ml for direct harvesting and 200 fc/100 ml for recreational uses.) The Task Force concluded that exceptional measures are necessary to maintain the exceptional water quality necessary for shellfish.

#### Meeting Three (August, 1993)

The committee examined, with the assistance of scientists from VIMS, the current status of the two diseases affecting Virginia oysters, dermo and MSX. The committee also examine gaps in current knowledge and what resources may be necessary to fill those gaps. The

committee also reviewed current research regarding the impacts of pollution on shellfish with a focus on toxics.

Alan Pollock of the Department of Environmental Quality (DEQ) briefed the committee on Virginia's efforts to control toxic discharges and the methods used to establish standards to protect human health and aquatic life. In the late 70's and early 80's, water quality standards were adopted for a variety of substance based on several factors. In the case of kepone and mercury, specific circumstances in the James River and the Shenandoah River lead to standards. In addition, standards were established for chlorine and tributyltin because of toxicity concerns raised at the time.

With the passage of the 1987 Clean Water Act, toxics standards were required for "priority pollutants". The Water Control Board proceeded to adopt standards for toxic pollutants found in Virginia waters. The standards were adopted in March of 1992 and included 41 numeric standards for aquatic life protection and 66 numeric standards for protection of human health.

The Commonwealth has also embarked on a Toxics Management Program because of concerns over the limitations of chemical by chemical standards when faced with the possibility of more complex interactions of the 60,000 chemicals in use. The Program includes a monitoring program and a process for systematically reducing toxics.

Shellfish and other aquatic life are used to establish toxic standards which are designed to protect the most sensitive species for which there is data. Commercial species are sometimes used when they are the most sensitive to a particular substance. Often, they are not the most sensitive and other species are used. Standards undergo a triennial review and are generally modified as new data become available, although lack of data remains a problem in some circumstances.

Mr. Pollack's presentation prompted a number of questions and comments by committee members. Members were interested in the extent of monitoring toxic discharges of both individual permit holders and ambient conditions. DEQ monitors under both circumstances and based on the monitoring have determined a general downward trend in toxic materials although TBT is still found in certain areas likely due in some part to continued use at federal facilities, on aluminum hulled boats and on larger ships.

Dr. Robert Hale of the Virginia Institute of Marine Science joined the committee and discussed research that he and others have undertaken to determine specific toxic impacts on shellfish organisms, primarily the effects of "sub lethal" exposures. Recent studies are beginning to show effects on reproductive systems and immune systems. While a link is being established, the threshold at which the effects begin is not yet known.

Dr. Gene Burreson of VIMS addressed the history and current status of oyster disease. In 1959, MSX was first detected in Mobjack Bay and resulted in significant declines in

production on private grounds beginning in the 1960s. Dermo, which is likely to have always been present, exploded in the late 1980s concurrent with a series of dry years which resulted in higher salinity levels throughout the Chesapeake Bay and its tributaries. Testing this year in the James Rivers have shown an abatement of MSX largely due to the fresh water influx from heavy spring rains. Dr. Burreson made a number of points in response to committee member's questions:

- ◆ Current research on *c. gigas* to determine disease resistance is currently underway but it is too early to tell the results.
- ◆ MSX is found everywhere on the east coast except in the Gulf of Mexico. Dermo is found everywhere except in the colder waters.
- ◆ Dermo has not been a problem in the Gulf of Mexico because the oysters grow fast enough to be of market size prior to dying from disease.
- ◆ A series of research efforts need to be pursued including selective breeding, host defense mechanism, among others.

#### Meeting Four (September, 1993)

The committee reviewed recent management initiatives and discussed additional options to improve management programs, including management for harvest and management to maximize ecologic values.

Mr. Jack Travelstead of the Marine Resources Commission recounted the history of oyster management in the Commonwealth. The first replenishment activities began in 1928 with the establishment of a fund to finance shell planting. Since that time, oyster replenishment activities have been based on two primary activities: shell planting and transplanting seed oysters. Funding for these efforts have come from two primary sources; the general fund and special funds that have primarily been taxes or other fees on catch. Funds for replenishment activities have fallen in recent years because of falling harvests.

In 1986, VMRC began work on a management plan for oysters, but unfortunately, the efforts could not keep up with the increased infestation of MSX and dermo. The following initiatives were undertaken by the Commission: 1) Expand shell planting 2) Increase emphasis on seed production and transplantation 3) Continue support for the VIMS hatchery 4) Encourage the work of SENTAF 5) Improve the management capabilities of VMRC by allowing greater flexibility in the adoption of regulations. It is the estimation of VMRC staff that the measures that were necessary were adopted as the result of this management effort, however, no one was prepared for the level of mortality that disease would cause.

In 1991, Governor Wilder appointed the Blue Ribbon Oyster Panel. Dr. George Webb, Dean of the School of Science and Technology at Christopher Newport University, who facilitated the work of the panel, spoke to the committee about the panel and its recommendations. The panel was composed of thirty four individuals including VMRC commissioners, commercial fishermen, seafood packers and dealers, scientists and interested members of the public. The

panel focused on two primary goals: restoring harvest and maintaining markets for that harvest. The panel framed its recommendations with the following; the oyster industry has both economic and symbolic significance to Virginia and oyster diseases are here to stay. The panel identified four primary sources for oysters in the Commonwealth: on-bottom culture, off bottom culture, non-native species and depuration from condemned grounds.

Since the panel's report was issued in 1992, actions have been taken on a majority of the panel's recommendations. Data collection has been improved, authority for limiting entry has been authorized and adopted, a repletion strategy has been developed, evaluation of a non-native species has begun, and work on developing aquaculture has continued. Two other recommendations have not been acted on including market evaluation and development and construction of a depuration facility.

Following Dr. Webb's presentation, Jack Travelstead outlined recently proposed oyster management initiatives. VMRC staff, after evaluating catch and effort data concluded that continued harvest pressure, combined with disease mortality, would prevent reaching the goal of no net loss of the existing resource and a doubling of oyster stocks in the next 10 years which is embodied in a VMRC resolution. With the resolution as the driving force, VMRC staff has recommended the following measures in the Bay and its tributaries: 1) closure of public grounds 2) return to the water of oyster 2.5 inches or greater 3) placement of violations overboard in a reef sanctuary. On the seaside, staff is recommending a 3 inch minimum size and close of groups from April 1 to September 30 to those with permits. Staff bases its recommendations on the following factors: 1) Each year harvests reach a new low 2) There is a decline in average catch per boat, which indicates declining populations 3) There continues to be a decline in populations based on specific sampling 4) Spat sets have dropped dramatically 5) Protection of larger oysters which produce larger quantities of eggs is necessary. The repletion strategy also recognizes that there is less shell available for planting and therefore is focusing shell placement on rebuilt oyster reefs.

#### Meeting Five (October, 1993)

The committee heard presentations regarding the commercial value of the shellfish industry and the marketing challenges it faces. The committee also discussed condition and prospects for markets for Virginia seafood as well as potential incentives and other initiatives to increase its value and contribution to the Virginia's economy. The committee examined current issues facing the aquaculture industry. The committee also examined the steps taken by other states to support fishermen who have been severely affected by closures of particular fisheries.

Ms. Shirley Estes, the Executive Director of the Virginia Marine Products Board briefed the committee on current efforts to market Virginia Shellfish. Ms. Estes noted that the marketing of shellfish is becoming increasingly difficult due to the often negative and sensational press that accompanies findings of shellfish contamination. She also noted that the market for shellfish, particularly oysters, is growing older and there is increasing competition from other

states, particularly those bordering the Gulf of Mexico. For example, Louisiana has launched a \$200,000 marketing campaign for oysters alone. The price of gulf oysters is also lower allowing the gulf states to compete in the Virginia market on price alone.

Ms. Estes noted that there remain significant opportunities for Virginia shellfish to compete in emerging markets. There are also efforts underway to market to younger consumers.

Mr. Michael Oesterling of the Marine Advisory Service provided the committee with an overview of the aquaculture industry in Virginia. Mr. Oesterling noted that aquaculture has been practiced in Virginia for many years, primarily through the planting and harvest of oysters. Clams are a recent addition to the industry and currently cultured clams exceed the value of the wild harvest by about \$500,000.

The issues that surround the industry are varied and deal with available "raw materials", regulatory issues and marketing issues. With respect to the oysters, there is a great need for a disease-resistant seed available on a consistent basis. There are also specific changes necessary to account for the different needs of the industry from the wild harvest including gear and time restrictions. There is also a need to deal with changing markets, as Ms. Estes noted.

The clam industry is becoming an increasingly important segment of the shellfish industry and the competition between cultured products and wild products is of concern. There are also regulatory issues similar to the oyster harvest, where gear and time restrictions are designated for a strictly wild harvest. The industry also faces environmental concerns especially as they relate to water quality conditions and potential or actual condemnations.

Mr. Oesterling outlined a number of issues that face the industry as a whole. He noted a need to look at additional governmental recognition and support of the industry and the need to sanction the leasing of the water column for aquaculture activities. Mr. Oesterling noted that there are currently no legislative based incentives, including tax credits or loans for support activities. There needs to be additional research, development and educational activities. In addition, there needs to be work to investigate non-traditional species such as the bay scallop, mussels, and surf clams.

Mr. Roy Insley of the Marine Resources Commission provided an overview of the clam fishery and current initiatives related to it. There are two segments of the fishery, relay and clean harvest. According to data compiled by VMRC, there has been a relatively stable catch per unit uniform and a relatively stable harvest over recent years.

A Clam initiative has been under study by a subcommittee of the Fisheries Management Advisory Committee and includes proposals for the protection of broodstock through the return of large clams and the establishment of clam management areas to develop a winter fishery.

Chesapeake Bay Commission staff member Russ Baxter reported on efforts of other states to provide some measure of support to commercial fishermen when fisheries are severely restricted or closed. Mr. Baxter's presentation offered examples from New York State, Alaska, Maryland and Massachusetts. The Maryland example was of most interest to the committee. Following the closure of the striped bass fishery in the 1980's the Maryland General Assembly made funds available for the Department of Natural Resources to contract with watermen and charter boat operators to conduct research and other related activities.

#### Meetings Six and Seven (November, December 1993)

The committee members began the process of defining the findings, goals and recommendations for inclusion in the committee report and spent considerable time examining the issue of study and possible introduction of non-native species. The consensus findings and goals agreed to during the discussion are contained in sections VI, VII and VIII below.

### **VI. CONSENSUS FINDINGS**

Based on the information gathered during the first phase of the study, the committee agreed to present the following findings and goals. The second year of the study will be devoted to considering the issues outlined in section IX as well as any new issues that may come before the committee. The committee has adopted the following findings to serve as the foundation for the goals and the recommendations which follow:

**Finding 1: For the purpose of this study, the shellfish industry includes the wild harvest of clams, oysters and other commercially marketable mollusks, the culturing of those species and the processing of those species for wholesale or retail sale.**

**Rationale:** While the committee has spent a great deal of time examining the plight of the oyster industry specifically, it is not the only component of the shellfish industry in Virginia. The committee believes that a comprehensive strategy which encompasses all marketable mollusks is in the best interest of a stable, economically viable industry and will therefore develop recommendations related to all aspects of the industry.

**Finding 2: The shellfish industry has been an important component of Virginia's economy but has seen declines in recent years.**

**Rationale:** As noted at the outset of this report, the economic value of a restored shellfish industry will be substantial. Restored and enhanced fisheries will increased opportunities for harvesters, processors and marketers and will yield a significant return on public and private investment.

**Finding 3: Shellfish play an important role in the ecology of Virginia's tidal waters.**

**The restoration of populations is a component of habitat restoration, water quality protection and restoration of ecologic systems.**

Rationale: The ecologic role of filter feeding shellfish is increasingly well understood. Filtering action removes nutrients and other pollutants from the water column and the structure of reef communities offer important habitat which contribute to the biological diversity of the Chesapeake Bay ecosystem.

Finding 4: **Historic declines in harvest and total populations of shellfish species, particularly of oysters, is due to a variety of factors including harvest, the spread and intensification of dermo and MSX, water quality degradation, loss of habitat from encroachment of land-based uses, climatic events, predation, and loss of habitat from dredging and other subaqueous bottom modification.**

Rationale: It is the finding of the committee that the current depressed levels of the oyster has many causes, of which not all are fully understood. The committee recognizes that a variety of factors cited above, some of which are outside our control, have combined to decimate oyster populations.

Specifically, the intensification and spread of dermo and MSX coincided with a series of years of below average precipitation in the late 1980's. Precipitation in 1993, which is closer to historical averages, has led to some abatement of MSX in the upper reaches of the James River. However, dermo has proved to be less susceptible to changes in salinity and is present throughout the oyster's range in Virginia. Obviously, there is no firm method of determining whether future weather patterns will match historical averages and even if MSX abates due to a return to normal weather patterns, dermo may not abate.

Further, the committee remains concerned about the protection of water quality and the closure of shellfish areas due to the pollution generated by human activities. As of July 1, 1993, some 99,236 acres of productive or potentially productive shellfish growing areas are condemned (see appendix 7). The Division of Shellfish Sanitation has been justifiably conservative in its closure policies in order to protect the public health and ensure the ability of the Virginia industry to market its products in accordance with national standards. However, the committee believes that for the industry to reach its full potential condemned areas must be reopened and new condemnations must end.

Finally, effective management and regulation is a vital component of a restoration strategy that needs to be implemented in the context of the ecological and economic value of individual species and communities of shellfish species.

Finding 5. **Just as declines are attributable to a variety of factors, restoration of the**



**industry will only come from progress on a variety of fronts including management, disease and immune system research, habitat protection, selective breeding, alternative species and market restoration and development.**

Rationale: This report recognizes that a combination of strategies will be necessary for the restoration of the industry, some of which are long term and some short term. Pollution control efforts, for example, have reduced the concentrations of nutrients and bacteria in many part of Chesapeake Bay. Over the long run, however, population growth and increased development are likely to reduce these gains and could produce shellfish closures. A successful program will incorporate a number of approaches and the mix and emphasis will change with time.

This report reflects the combined wisdom of the members of the committee and the advisors and other experts who assisted the committee in its work. While there is no single initiative than will restore the industry, taken in total the committee believes that success will be achieved.

**Finding 6. Not all components of the shellfish industry are in decline, however, the current depressed condition of the oyster industry is of greatest concern due to the historical importance of oysters to the economy of Virginia.**

Rationale: The news about the shellfish industry is not all bad. Clam harvests remain stable although there is some concern about increased fishing effort, and there is optimism about the future of the aquaculture industry. However, the relative value of these components of the industry are small compared to the historical value of the oyster industry.

**Finding 7. MSX and Dermo will always be present and must be taken into consideration when undertaking research, habitat restoration and management.**

Rationale: There is little doubt that MSX and dermo will continue to effect the oyster resource. The portion of the shellfish industry that is based on the native oyster will always be impacted to a certain extent by dermo and MSX.

**Finding 8. While efforts are underway to reduce toxics, serious concern remains over the presence and impact of toxic pollutants on the survival, resistance to disease and reproduction of shellfish species.**

Rationale: Scientific investigation conducted by scientists at the Virginia Institute of Marine Science have begun to establish a link between certain toxic pollutants and the ability of shellfish to resist disease, thrive and reproduce. While the amount of toxic materials released into Chesapeake Bay have decreased in

recent years, there remains a good deal a scientific uncertainty amount the cumulative effects of certain toxic materials and combinations of toxics materials. Further investigations are required to fill these gaps in knowledge, but prudence dictates that further reductions and elimination of toxic discharges should be a goal.

**Finding 9. Aquaculture has and will continue to be an important part of a comprehensive strategy to restore Virginia's shellfish industry.**

**Rationale:** Prior to the late 1970's, the private planting of oysters accounted for the vast majority of oyster harvests (see appendix 2). Increasingly, other species, particularly clams, are being cultured. A robust shellfish industry must have a strong private component.

## **VII. GOALS**

Based on the information gained over the course of the study, the committee has adopted the following goals. Virginia should:

- GOAL 1:** Protect and restore habitat in productive and historically productive shellfish areas and maintain a healthy shellfish resource.
- GOAL 2:** Promote oyster disease research, including immunity research, genetics research and breeding programs, as a high and consistent priority for the Commonwealth.
- GOAL 3:** Increase the shellfish production potential of aquaculture by developing native shellfish species with market potential, developing new technologies for transfer to industry, and lowering legal, regulatory and financial barriers to aquaculture.
- GOAL 4:** Enhance and support more effective management of all commercial shellfish species, restore the public fishery for the oyster and maintain the fishing fleet.
- GOAL 5:** Commit the resources of the state to identify for introduction in the shellfish growing waters of the Commonwealth, oysters that will support a viable commercial oyster industry.

## **VIII. RECOMMENDATIONS FROM THE FIRST YEAR OF THE STUDY**

### Non-Native Species

The committee does not support the immediate introduction of a non-native species into Virginia waters. However, the committee does believe that appropriate scientific investiga-

tion, to be conducted by the Virginia Institute of Marine Science, to determine the suitability and likely environmental impact proceed with dispatch and the committee endorses the timetable proposed in section one of the "Strategies and Time Lines" section of the issue paper contained as appendix 8. The committee does believe that should a suitable species be found following intensive scientific research that is a disease-resistant, reproducing and marketable species that can support both a public and private fishery which will not severely upset the ecology of the Chesapeake Bay, introduction should be pursued.

### Legislative Actions

In addition to the resolution continuing the subcommittee (HJR 95 - See appendix 9). The committee is proposing two additional pieces of legislative in the 1994 session of the General Assembly:

HB 441 - This bill allows the Marine Resources Commission to use funds from the Marine Fishing Improvement Fund to contract with commercial fishermen to perform repletion, research or other activities. In awarding the contracts, the commission is to give preference to bona fide commercial fishermen who have been severely impacted by regulations adopted by the commission. The text of the bill is contained as appendix 10.

HB 443 - This bill suspends the collection of the three cent per bushel oyster inspection tax for two years. Declining harvests have left Virginia in the situation where the administrative costs of collecting the tax exceed its revenues. The text of the bill is contained in appendix 11.

## **IX. TOPICS FOR CONSIDERATION DURING THE SECOND YEAR OF THE STUDY**

A variety of proposals have been suggested by committee members and others that merit further study. This section outlines the issues that will be addressed over the coming year. No conclusion or recommendations have been made yet regarding these issues. They are grouped by topic headings.

### Habitat Protection and Restoration

The committee will examine:

- ◆ the necessity and/or feasibility of adopting procedures for permit issuance that results in no additional condemnation of shellfish areas,
- ◆ continued efforts to identify, reduce and ultimately eliminate toxic discharges into Chesapeake Bay and its tributaries,

- ◆ the feasibility of establishing shellfish culture areas as recommended by the Shellfish Enhancement Task Force (SENTAF) in their April, 1992 report "Man vs. Mollusk",
- ◆ feasibility of extending sewer lines to areas vulnerable to septic system failures to protect shellfish waters as recommended by SENTAF,
- ◆ designation of no-discharge zones for boats including the possibility of establish a timetable for full compliance with requirements for marinas to have operational pumpout facilities,
- ◆ providing financial assistance for low income families who reside near growing waters to correct failing septic systems,
- ◆ increasing educational efforts aimed at boaters regarding water quality protection, methods of controlling sewage problems from "live-aboard" boats,
- ◆ continuing to rebuild oyster reefs, cleaning oyster beds prior to re-shelling in an effort to produce disease free seed oysters,
- ◆ continuing current repletion program.

#### Disease and other research

The committee will examine:

- ◆ expenditure levels for basic research on oyster disease including host defense mechanisms host/parasite interactions, selective breeding and a strategy to determine the applicability of immunology research to oyster disease.

#### Aquaculture

The committee will examine:

- ◆ existing laws and regulations which may inhibit aquaculture development such as gear and time restrictions that are only applicable to the wild harvest.
- ◆ methods of supporting development of alternative shellfish species (i.e. bay scallops, soft clam, surf clam, ribbed mussel)
- ◆ the feasibility of supporting the Clam Fisheries Initiative as proposed by the clam subcommittee to provide training and expertise to watermen who wish to engage in aquaculture.
- ◆ the feasibility of empowering VMRC to lease in-water areas for aquaculture produc-

tion.

### Management

The committee will examine:

- ◆ the long-term management strategies as proposed by VMRC and others,
- ◆ the feasibility of setting aside broodstock sanctuaries within clam management areas and oyster grounds,
- ◆ increasing the number of grounds available to private leaseholders,
- ◆ protection by closing certain broodstock areas to harvest,
- ◆ the feasibility of leasing public grounds to private individuals.
- ◆ methods to increase the percentage of shells that must be sold to the state from shucking houses through modification of existing taxes or code requirements or other methods.

### Maintenance and improvement of Markets, Industry and Fishing Fleet

The committee will examine:

- ◆ VIMS research on a alternative species in order to effectively advise the Commonwealth and VMRC on the full range of options for the industry, including but not limited to the in-water scientific testing of animals that are able to reproduce.
- ◆ the feasibility of supporting research with a per gallon fee on oysters shucked and sold in Virginia.
- ◆ the feasibility of committing general funds and seeking federal funds as well as pursuing cooperative funding with Maryland.
- ◆ methods of maintaining and expanding markets by determining the feasibility of funding a generic oyster marketing campaign to promote consumption of oysters particularly among younger consumers.
- ◆ the feasibility of supporting, in concert with other shellfish producing states, a shellfish merchandising plan by committing \$25,000 to match Marine Products Board funds.
- ◆ the feasibility of assessing a fee on aquaculture to support national and international

marketing of products raised by aquaculture.

- ◆ the feasibility of directing funds to provide a basis for underwriting some cost associated with restructuring the industry and to encourage expansion of aquaculture, i.e. low interest loans, price supports, training grants.
- ◆ methods of integrating production science with economic information to produce marketable products.
- ◆ the feasibility of building a prototype depuration facility

## **X. CONCLUSION**

The HJR 535 committee believes that a comprehensive strategic plan for the future of the shellfish industry in Virginia will assist the Commonwealth in making necessary decisions about its role in the future of the industry. Over the coming year, based on the findings and goals contained in this report, the committee will consider a variety of issues and craft a plan that will hopefully return the industry to its historical prominence in Virginia.

ACTS OF ASSEMBLY

HOUSE JOINT RESOLUTION NO. 535

*Requesting the Chesapeake Bay Commission to study the condition of the shellfish industry in the Commonwealth.*

Agreed to by the House of Delegates, February 7, 1993

Agreed to by the Senate, February 16, 1993

WHEREAS, the Commonwealth, with an estimated 240,000 acres of oyster growth, was the most important producer of the American oyster, *Crassostrea virginica*, in the nation through the first half of the twentieth century, with landings in the 1950s averaging 3.2 million bushels annually; and

WHEREAS, in the 1960s and 1970s, the average annual oyster landings declined to an average of 1.26 million bushels; and

WHEREAS, the decline in oyster landings continued to accelerate in the 1980s, with oyster landings falling from 1,177,313 bushels in the 1980-81 season to 111,992 bushels in the 1990-91 season; and

WHEREAS, oyster landings for the 1991-92 season fell to an all-time low of 82,367 bushels; and

WHEREAS, the decline in oyster landings has witnessed a corresponding decline in the number of watermen, as evidenced by the drop in the number of oyster licenses issued from a peak of 4,566 in 1960 to a low of 1090 in 1991; and

WHEREAS, the decline in oyster harvests since the 1950s has been attributed in part to extensive disease mortality from MSX ( *Haplosporidium nelsoni* ) and Dermo ( *Perkinsus marinus* ); and

WHEREAS, stresses from low oxygen and high levels of toxic chemicals in the Chesapeake Bay are believed to make oysters more vulnerable to disease; and

WHEREAS, many areas otherwise suitable for shellfish production are closed or lost due to contamination by pollutants and bacteria; and

WHEREAS, revenues from the sale of oyster meat harvested in the Commonwealth have declined from over \$10 million in 1986 to less than \$5 million in 1990; and

WHEREAS, a decline in the value of the shellfish industry reduces revenues earned by the Commonwealth through lease payments, taxes, license fees and other means; and

WHEREAS, a decline in the populations of oysters and clams threatens the quality of water in the Chesapeake Bay since mollusks filter pollution out of the water by straining it through their gills; and

WHEREAS, clam culturing has proven successful in the Commonwealth, accounting for nearly half of the market clams sold, and clam farmers are having difficulty finding uncontaminated grow-out areas; and

WHEREAS, remaining waters in the Commonwealth which can support shellfish are under pressure from other competing uses; and

WHEREAS, both a Blue Ribbon Panel on the Oyster Industry and the Shellfish Enhancement Task Force set up by the Commissioner of Marine Resources have recommended that programs be established to improve management of the oyster resources in the Commonwealth; and

WHEREAS, several of the options that have been suggested for revitalizing the shellfish industry in the Commonwealth include testing the suitability of the non-native species, *C. gigas*, introducing on-shore depuration of oysters taken from moderately polluted grounds, designating shellfish culture waters with measures to maintain water quality in those areas, and culturing shellfish off-bottom; and

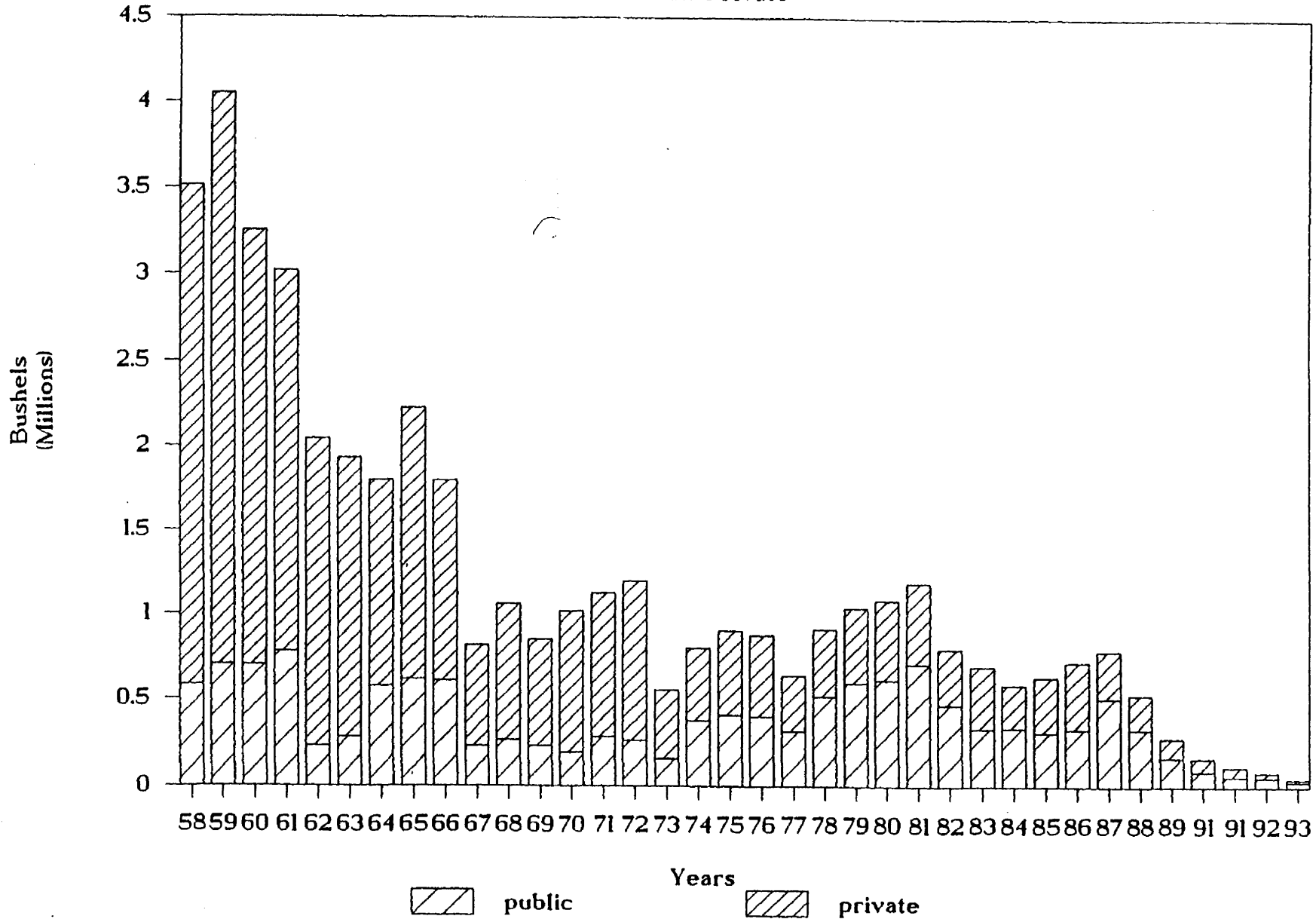
WHEREAS, a failure of the Commonwealth to take remedial actions to preserve its oyster and clam industries could lead to the end of direct shellfish harvests from Virginia waters; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Chesapeake Bay Commission be requested to study the condition of the shellfish industry in the Commonwealth. The Commission shall examine the (i) reasons for the decline in oyster harvests, including degradation of water quality and habitat, overharvesting, mismanagement, and disease; (ii) status of efforts to negate the impact of the diseases MSX and Dermo on oyster populations, including the introduction of disease-resistant varieties of oysters; (iii) options for providing financial and other forms of assistance to the shellfish industry during periods of low harvests; and (iv) development of policies to alleviate the problems facing the shellfish industry by restoring shellfish populations to historic levels, including testing of non-native shellfish species, developing depuration facilities, designating shellfish culture waters, and facilitating off-bottom oyster culturing.

The Commission shall complete its work in time to submit its findings and recommendations to the Governor and the 1994 Session of the General Assembly as provided in the procedures of the Division of Legislative Automated Systems for the processing of legislative documents.

# OYSTER PRODUCTION

Public/Private



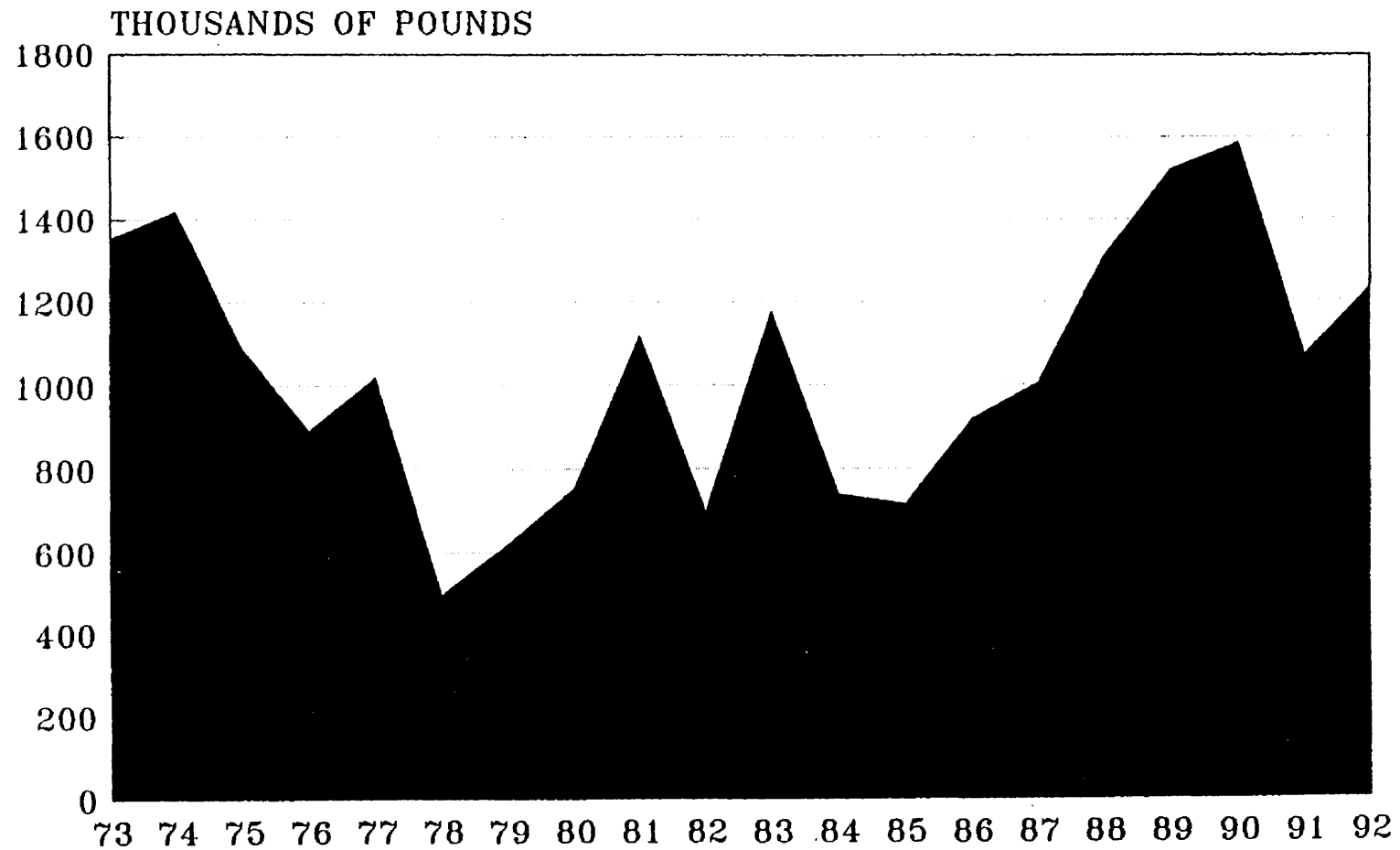


## OYSTER PRODUCTION (Public/Private)

APPENDIX 3

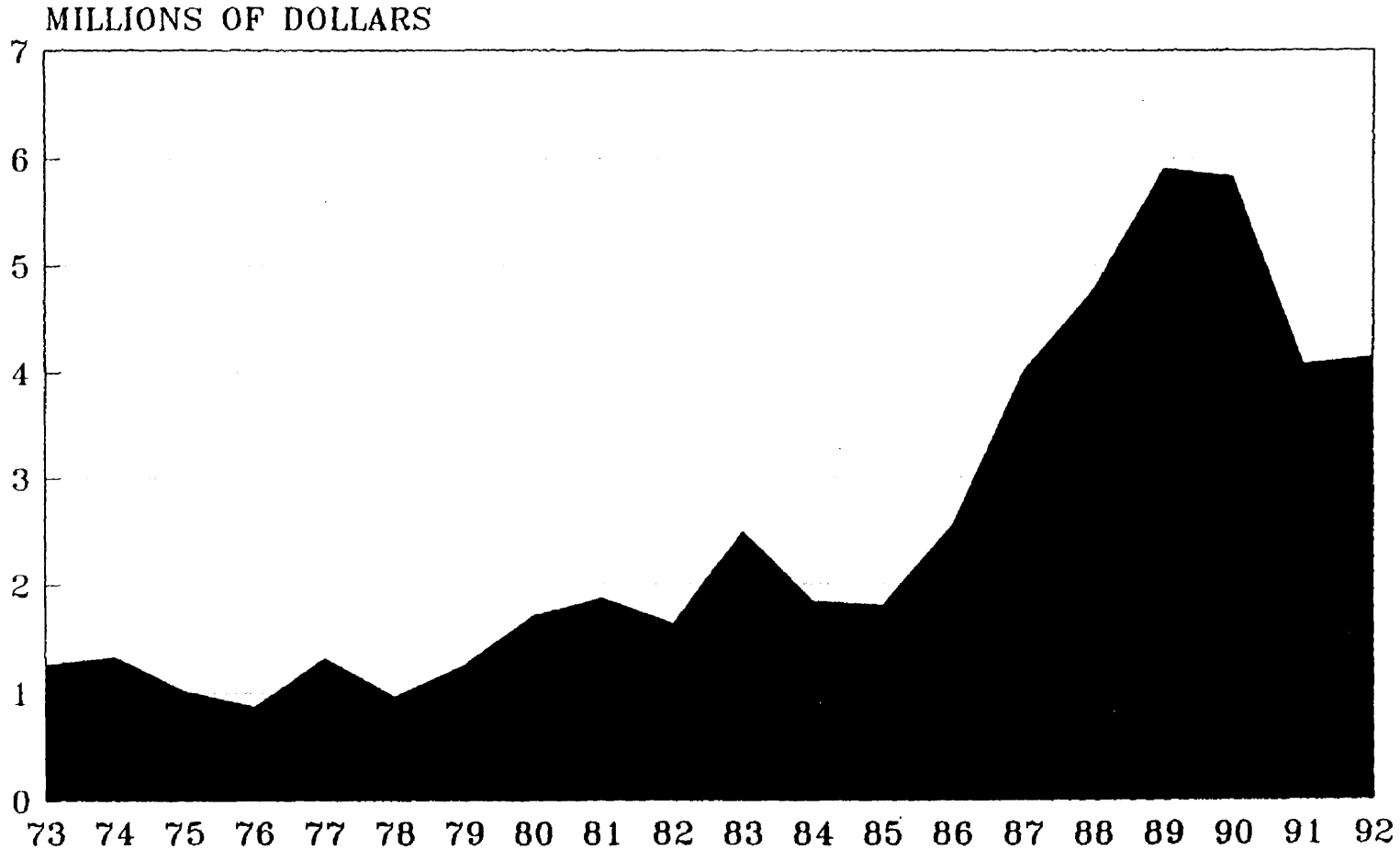
YEAR	Public Landings (Bushels)	Private Landings (Bushels)	TOTAL
57-58	586,304	2,926,750	3,513,054
58-59	703,915	3,347,170	4,051,085
59-60	699,420	2,553,275	3,252,695
60-61	781,783	2,237,736	3,019,519
61-62	227,921	1,815,001	2,042,922
62-63	278,830	1,652,880	1,931,710
63-64	576,857	1,223,549	1,800,406
64-65	615,864	1,605,759	2,221,623
65-66	605,982	1,188,633	1,794,615
66-67	226,855	587,105	813,960
67-68	262,996	790,483	1,053,479
68-69	227,577	621,463	849,040
69-70	192,187	818,943	1,011,130
70-71	281,001	836,014	1,117,015
71-72	260,241	928,404	1,188,645
72-73	157,890	394,121	552,011
73-74	374,522	424,277	798,799
74-75	403,737	491,860	895,597
75-76	397,209	475,159	872,368
76-77	312,539	320,711	633,250
77-78	512,687	394,692	907,379
78-79	590,533	441,082	1,031,615
79-80	608,880	465,896	1,074,776
80-81	704,848	472,465	1,177,313
81-82	464,280	326,809	791,089
82-83	329,492	361,792	691,284
83-84	334,749	247,525	582,274
84-85	308,392	318,660	627,052
85-86	328,338	386,665	715,003
86-87	501,075	279,872	780,947
87-88	325,527	194,654	520,181
88-89	165,061	107,612	272,673
89-90	88,635	73,983	162,618
90-91	59,883	52,109	111,992
91-92	53,288	29,079	82,367
92-93	30,152	16,355	46,507

# HISTORICAL HARD CLAM LANDINGS FOR VIRGINIA, 1973-1992



ALL LANDINGS DATA ARE PRELIMINARY

# HISTORICAL HARD CLAM VALUES FOR VIRGINIA, 1973-1992



ALL LANDINGS DATA ARE PRELIMINARY

**Chesapeake Bay Commission**  
**Virginia Office**

**APPENDIX 6**

**PROPOSED AGENDA**  
**HJR 535**  
**Condition of the Shellfish Industry in Virginia**  
**June 28, 1993**  
**Virginia Institute of Marine Science**

1:30 Welcome

- ◆ Del. S. Wallace Stieffen, Chairman of Virginia Delegation to the Chesapeake Bay Commission.

1:35 Remarks and Introductions of Study Committee members and technical advisors.

- ◆ Delegate W. Tayloe Murphy, Jr., Chief Patron, HJR 535

2:00 Remarks

- ◆ Dr. Edmund Tramont, M.D.

2:10 Development of Agenda/Schedule for study.

- ◆ Review of HJR 535.
- ◆ Discussion of issues to be addressed from members of the Committee and technical advisors.
- ◆ Establish Committee Meeting Schedule and study timetable.

3:30 Adjourn

**Chesapeake Bay Commission**  
**Virginia Office**

**PROPOSED AGENDA**  
**HJR 535**  
**Condition of the Shellfish Industry in Virginia**  
**July 26, 1993**  
**Virginia Institute of Marine Science**

- 2:00 Call to Order - Opening Remarks
- 2:05 Review of Meeting Summary and Study Outline
- 2:30 The Impacts of Pollution on Shellfish Resources  
- Presentations and Discussion
- 3:45 Comments by Members
- 4:00 Adjourn



**Chesapeake Bay Commission**  
**Virginia Office**

**PROPOSED AGENDA**  
**HJR 535**  
**Condition of the Shellfish Industry in Virginia**  
**August 30, 1993**  
**Virginia Institute of Marine Science**

2:00 Call to Order

2:05 Review of 7/26/93 Meeting Summary

2:15 Toxic impacts on Shellfish

- ◆ Alan Pollack, Virginia Department of Environmental Quality, Chairman of the Chesapeake Bay Program's Toxics Subcommittee: "Virginia's Toxic Standards and the Toxic conditions of Chesapeake Bay and its Tributaries"
- ◆ Robert Hale, Virginia Institute of Marine Science: "Recent Research regarding Toxic effects on shellfish"

3:15 Current Status of Shellfish Disease

- ◆ Eugene Burreson, Virginia Institute of Marine Science

4:00 Comments by Members

4:15 Adjourn

**Chesapeake Bay Commission**  
**Virginia Office**

**PROPOSED AGENDA**  
**HJR 535**  
**Condition of the Shellfish Industry in Virginia**  
**September 27, 1993**  
**Virginia Institute of Marine Science**

2:00 Call to Order

2:05 Review of 8/30/93 Meeting Summary

2:15 Shellfish Management Initiatives

- ◆ Dr. George Webb, Christopher Newport University, Facilitator of the Blue Ribbon Oyster Panel
- ◆ Mr. Jack Travelstead, Virginia Marine Resources Commission

4:00 Comments by Members

4:15 Adjourn



**Chesapeake Bay Commission**  
**Virginia Office**

**PROPOSED AGENDA**  
**HJR 535**  
**Condition of the Shellfish Industry in Virginia**  
**October 25, 1993**  
**Virginia Institute of Marine Science**

2:00 Call to Order

- ◆ Review of 9/27/93 Meeting Summary

2:10 Marketing Virginia Shellfish

- ◆ Ms. Shirley Estes, Executive Director, Virginia Marine Products Board

2:40 Aquaculture as a Component of the Shellfish Industry

- ◆ Mr. Michael Osterling, Marine Advisory Service, VIMS

3:10 Clam Management Initiatives

- ◆ Mr. Roy Insley, Virginia Marine Resources Commission

3:40 Maintaining the Fishing Fleet

- ◆ Staff Presentation and Committee Discussion

4:30 Adjourn





**Chesapeake Bay Commission**  
**Virginia Office**

**PROPOSED AGENDA**  
**HJR 535**  
**Condition of the Shellfish Industry in Virginia**  
**November 29, 1993**  
**Virginia Institute of Marine Science**

2:00 Call to Order, Announcements

2:10 Review and Discussion of "Strawman" Document

4:30 Adjourn



**Chesapeake Bay Commission**  
**Virginia Office**

**PROPOSED AGENDA**  
**HJR 535**  
**Condition of the Shellfish Industry in Virginia**  
**December 16, 1993**  
**Virginia Institute of Marine Science**

9:30 Call to Order, Announcements

9:40 Review and Discussion of Revised "Strawman" Document

12:00 Lunch

12:45 Continue Review and Discussion of Revised "Strawman" Document

3:00 Adjourn





# COMMONWEALTH of VIRGINIA

ROBERT B. STROUBE, M.D., M.P.H.  
STATE HEALTH COMMISSIONER

Department of Health

P O BOX 2448  
RICHMOND, VA 23218

## DIVISION OF SHELLFISH SANITATION

<u>Reporting Date</u>	<u>Productive Acres Condemned</u>
4/15/70	62,272
6/1/71	63,935
9/30/72	87,915
3/1/74	87,811
3/1/75	94,223
2/1/76	149,394*
1/1/77	91,206
1/1/78	87,646
1/1/79	85,129
1/1/80	86,442
1/1/81	85,238
1/1/82	85,288
1/1/83	85,278
1/1/84	91,160**
1/1/85	90,920
7/1/85	90,192
1/1/86	91,841
7/1/86	91,756
1/1/87	91,186
7/1/87	89,416
1/1/88	89,409
7/1/88	89,234
1/1/89	89,796
7/1/89	90,287
1/1/90	90,699
7/1/90	93,341***
1/1/91	94,735
7/1/91	97,192
1/1/92	101,855
7/1/92	102,605
1/1/93	98,775
7/1/93	99,236

- \* Short-term closure on the James River due to Kepone contamination
- \*\* Establishment of large buffer zones for 2 new STFs
- \*\*\* Beginning of growing area classification using revised NSSP guidelines

## **Restoration of the Virginia Oyster Fishery - the Alternative Species Strategy**

### **Introduction:**

While it may not be universally accepted, it is now generally recognized that the public oyster fishery in Virginia is in collapse. In recent years disease has been an important contributing factor, but in the absence of realistic management strategies it is not the sole cause. Overfishing has "set the table" for the decline of recent decades. Less than one percent of historically important Baylor Grounds have harvestable stocks. The majority of these are contained within the important seed producing areas of the James River, where pressures to continue harvests threaten the potential for any managed or natural recovery of the native oyster, *Crassostrea virginica*. In economic and ecological terms, this is a disaster of great magnitude. The plight of the species and the industry it sustains has received broad attention in the press, but surprisingly the implications of this collapse are not appreciated. The value of the commons is diminished and an important ecological element of the Chesapeake Bay is destroyed with concomitant losses of habitat and water quality.

As prospects for a sustainable public fishery for *C. virginica* become vanishingly small, calls for an alternative species solution are more frequent. The major motivation is to restore economic gain in a declining industry. Some species, notably *C. gigas*, exhibit strong potential for resistance to the diseases MSX and Dermo. Others are untested. The use of alternative species to produce disease resistant hybrids with *C. virginica*, or to genetically engineer a "super *virginica*" utilizing the genetic potential of an exotic species, poses essentially the same environmental, economic and social/political questions as an outright introduction of that species. Both scenarios deserve careful consideration in the light of our experience with exotic introductions throughout the world. Because of this they are treated here as the same practical problem although obvious differences do exist. It is also necessary to ask if such introductions are technically feasible and economically practical as realistic solutions to the current crisis, and whether such introductions can serve both fishery and ecosystem resource objectives.

In the following discussion, we attempt to review and project the ecological, economic and legal issues surrounding the alternative species strategy as it relates to the public fishery, and propose some possible approaches and timetables for dealing with these issues if it is agreed that an exotic introduction is desirable and practical.

### **Ecological Issues:**

Experience with accidental and intentional introductions of exotic species is generally unsatisfactory and most biologists and ecologists recommend that it should be avoided regardless of the presumed benefits. More often than not, such introductions have resulted in ecologic disruption and, in some instances, extinction of competing species. It is for this

reason that strict international protocols for handling and introducing exotic species exist (i.e. the ICES protocols), and why many nations and states give their concerns the force of law (i.e. The Lacey Act Amendments, U.S. Public Law 97-79; The Code of Virginia, Section 28.1-183.2; Chesapeake Bay Exotic Species Protocols). At the very minimum, these protocols and regulations must be followed if prior mistakes are to be reasonably avoided. A failure to follow them embodies unacceptable risks. In addition, there is reason to assume that each proposal for an introduction should include a comprehensive environmental impact statement. However, obtaining sufficient data for such an impact statement implies that some limited introduction must take place in order to project inter-species competitiveness, as laboratory studies on their own are insufficient. This is a dilemma that must be recognized by the authorities and bodies charged with the review and approval of an introduction.

Where oysters are concerned, there is considerable experience with the introduction of non-native species in several countries. Some of this experience suggests the loss of native species in competition (e.g. the loss of the New Zealand rock oyster due to the introduction of *C. gigas*), but in general geographic and physiologic barriers seem to permit a degree of co-existence with native species. There does not appear to be documented cases where non-native oyster species have disturbed an ecosystem or impacted genera and species other than native oysters. A far greater concern lies in the frequency of accidental introductions of diseases and parasites associated with oysters. These can have devastating impacts beyond the oyster itself. Careful adherence to the ICES protocols is the best prescription for avoiding this outcome. However, it is a fact that once an introduction is released, there is little chance to control subsequent events or contain the exotic species (or its fellow travellers) within geopolitical boundaries.

In the Chesapeake Bay, proposed non-native species such as *C. gigas*, exhibit preferences for higher salinities. Because disease currently restricts *C. virginica* to the lower salinity areas of the Bay, an effective separation may occur. Current evidence suggests that this would be the case rather than alternative scenarios of head to head competition resulting in the loss of *C. virginica*. The laboratory and hatchery culture of *C. gigas* in quarantine is well established, and there are numerous disease certified strains in existence. Other species such as *C. rivularis* are less well known, especially with respect to diseases and parasites. *C. rivularis* is also lower salinity tolerant, and poses a more direct potential for competition with *C. virginica*, although it may be a more suitable candidate for a total replacement. Proposals for its introduction will require a greater investment in research and time.

It is now recognized that the historic oyster resource had an intrinsic ecological value, that contributed to both habitat and water quality. Apart from industry needs, it may be appropriate to consider an alternative species introduction solely on the basis of its potential ecological value. If, as many economists contend, expenditures to restore the fishery are not justified in economic terms, it may still be appropriate on purely ecological grounds, where a managed fishery is a byproduct.

#### **Economic Issues:**

The economic issues of the alternative species strategy are essentially those of any

plan to restore the public fishery for *C. virginica*. The essential difference is that on the one hand we are considering restoration of a declining natural resource held by the commons, and on the other we are proposing to substitute that resource with an exotic species alternative in order to sustain a failing industry. This difference changes the character of the fishery from one held in trust for the public good where some are permitted to reap the harvest in return for a benefit to the commons, to a larger and more direct public subsidy of a specific segment of our society. We need to fully comprehend the meaning of this change, and recognize that it argues strongly for abandonment of the public fishery in favor of private enterprise in the form of traditional private leasehold and aquaculture.

Regardless of the change in the character of the fishery, there are several questions that relate to the economic issues at hand.

Who should pay for the program, and is it cost effective? For many years the Virginia Marine Resources Commission (VMRC) has operated a successful repletion program that effectively subsidizes the public fishery for *C. virginica*. Should this continue? Should the public fund additional efforts to introduce an alternative species into the public fishery? Should the repletion fund be redirected to support alternative species?

How will an alternative species resource be managed in a public fishery and maintained over time? " If the introduction is for the purposes of restoring a public fishery, the net benefit to producers will depend on how the resource is managed. If an open access management regime is maintained, then net benefits to producers will be less than if a bottom leasing program or limited entry program on public grounds are instituted..." (Lipton, Lavan, and Strand. 1992. Economics of Molluscan Introductions and Transfers: The Chesapeake Bay Dilemma, *Journal of Shellfish Research*, 11:511-519). A fundamental decision must be reached as to whether or not to continue a "put-and-take" fishery once an alternative species is introduced. There is a real distinction that must be made between the cost of introduction and the cost of maintenance. The latter represents a long term, perpetuating commitment of substantial public funds. This commitment argues strongly for abandoning the public fishery in favor of privately held grounds and aquaculture where the best prospect for success depends on private sector investment. "In reality, if any of the proposed research is to provide a rejuvenation of the oyster resource for private or public industry, there must be a significant culture (aquaculture) component..." (A Plan Addressing the Restoration of the American Oyster Industry, Virginia Sea Grant, VSG 90-02:20).

If more oysters are produced, is there a sufficient market for sale? There are conflicting opinions on the strength of the oyster market. A recently completed study suggests that there has been a measurable decline in the demand for oysters in the northeastern region of the U.S. (A Profile of the Oyster Industry of the Northeastern United States, Lipton, Douglas and Kirkley, eds., Final Report to the National Marine Fisheries Service, Northeast Region). Market strength and potential for increased production of oysters in the Chesapeake Bay must be thoroughly evaluated before any major investment is made in an alternative species introduction.

What are the requirements for new support infrastructure and for the preservation of existing infrastructure? Two problems exist that deserve attention. The first is concerned with the loss of industry capacity (i.e. the fishing fleet, shucking houses, watermen, shuckers, etc.) as the harvestable resource has declined. What will be the cost to restore this capacity if oysters are again plentiful as a result of an exotic introduction? The second relates to the need to provide hatchery support in order to accomplish a large scale introduction. What is the scale of the investment required? Should the costs be borne by the public or private sector?

### **Legal and Societal Issues:**

The use of alternative oyster species does not have universal support within the Virginia oyster industry. There are numerous reasons for this. Perhaps the most compelling is the recognition that *C. virginica* is locally perceived as a superior product in the oyster market. Because of this there is widespread support for continued efforts to solve the industry's problem with the survival of harvestable numbers of *C. virginica*. These efforts would include development of disease resistant strains, management strategies that allow harvest around the disease, and the use of genetic and cellular techniques to impart resistance to disease. There is also a segment of the industry that argues for continued harvest with the expectation that time and "Mother Nature" will resolve the dilemma. Some argue that introduction of a non-native species is attractive because it holds out the prospect for cheap seed and lower materials costs in the industry. However, this may not be realized due to the economics of introduction in compliance with established protocols (see above), and the high cost of hatchery produced seed to sustain a put and take fishery. In the absence of an industry consensus, it will be important to reach some general understandings before proceeding with any plan to introduce an alternative to the native oyster.

Because an introduction cannot be controlled within strict geopolitical boundaries, regional interstate agreement will be essential. States rights, and the general public view of the autonomy of individual states will make this difficult. Generally state government is, on such issues, reluctant to function within a single regional political unit. The success of the Chesapeake Bay program offers some hope, but there are many states outside those agreements with significant economic and political interests (i.e. Connecticut, Delaware, New Jersey, North Carolina). Experience at VIMS with the proposal to introduce sterile triploid *C. gigas* in 1990, on an experimental basis, gives some flavor for the difficulty and time involved in reaching multi-state regional agreements on this subject. Ultimately, federal and state governments, environmental interests and industry will have to reach a consensus that favors an exotic introduction. Given the effort required to reach agreement on experiments with sterile triploids, it is obvious that it will take a significant effort to reach agreement where reproducing populations are concerned. At this level, it will be a purely political decision.

The U.S. Code, in the form of the Lacey Act Amendments of 1981 (Public Law 97-79), regulates the movement of non-endemic species across state lines. The Code of Virginia, Section 28.1 - 183.2 ("Importing fish or shellfish for introduction into the waters of the State.") makes it illegal for any entity to place non-native fish or shellfish into Virginia waters

without prior approval of the Commissioner of VMRC, with concurrence from the VIMS Director. If permission is obtained, it is assumed that provisions of the Lacy Act would be satisfied and no Federal action would occur. Once permission is obtained from VMRC, the issues raised above come into play. VMRC approval would not preclude legal action by interested parties to intercede and block the introduction of alternative species. It is thus important to at least attempt to establish consensus before seeking permission from VMRC.

### **Strategies and Time Lines:**

#### **1. Species selection and evaluation:**

At present there are at least three likely candidate species that could be considered for introduction into the Virginia waters of the Chesapeake Bay, *C. gigas*, *C. rivularis* and the more tropical races of *C. virginica* in the Central and South American Caribbean. Each presents different concerns and considerations. Work with *C. gigas* is most advanced. It demonstrates pronounced resistance to both MSX and Dermo when compared with *C. virginica*. However its growth rate in the lower salinity, higher seasonal temperature regime of the Chesapeake Bay is impaired, and it is susceptible to heavy infestation by the flatworm *Polydora*. The latter may be of more concern to product quality and market acceptance. Several strains exist that may prove to be more suitable alternatives, but in general *C. gigas* could hold promise in the higher salinity region of the lower Bay. Scientific evaluation of alternative strains and field evaluations of reproducing populations to develop an environmental impact assessment would require at a minimum 2 years.

In the case of *C. rivularis* and the tropical strains of *C. virginica*, we have no definitive information on disease resistance characteristics, physiological tolerances or ecology. Their disease status under ICES protocols would also need to be established in quarantine. This would involve culture through at least the F<sub>1</sub> generation. The time to develop this information to the level now existing for *C. gigas*, and meet ICES protocols would require 2-3 years in addition to the time noted for *C. gigas* above.

#### **2. Species introduction:**

Three possible options exist for carrying out an alternative species introduction to establish a replacement oyster fishery in Virginia. Their exercise implies fundamental decisions by the Commonwealth regarding the desirability of creating a unique, publicly subsidized fishery outside the traditional natural resource held in the commons.

**a. Establish a put and take oyster fishery without following ICES protocols.** This might be called the NIKE approach - "Just do it!" Proceed with large scale bottom planting without research or evaluation by importing large quantities of seed and adult oysters regardless of source or disease status. This approach has been used historically in other regions of the world with mixed success, and it satisfies the demand for immediate action. Success and growth rates are likely to be variable and unpredictable. Planters would need to evaluate as they proceed and the approach would likely require plantings over several years.



At a minimum 4-6 years might be required before harvest could be attempted. This is a high risk approach that has numerous ecological, legal and political consequences that make it unacceptable to all but a very few advocates. It is an unquestionable violation of the Lacy Act Amendments.

**b. Establish a put and take fishery following ICES protocols, Bay Program protocols and state and federal law.** This option is strictly hatchery dependent with no attempt to establish independently reproducing oyster grounds. It closely follows the West coast model with the significant exception that the West coast model is privately owned and operated and it is not a state supported public access fishery. Time lines are in addition to those stated for species evaluation .

Additional hatchery capacity would be required. Within Virginia, this could be done at the VIMS Wachapreague Laboratory (new capital facilities) and at Gloucester Point (existing facilities), or through private venture facilities. Compliance with various laws and protocols would require new construction and modification of existing facilities. At Gloucester Point we would abandon programs supporting aquaculture development with *C. virginica*. Theoretically, west coast hatcheries producing *C. gigas* could also provide a source of seed in Virginia, but recent economic downturns and failures in the largest facilities suggest that reliable and adequate capacities might not exist. All of these methods of seed production require continuous annual investment, either public or private.

Once facilities were on line, a reasonable timetable would project 1 million seed oysters in year one, rising to 3 million in year three. Annual operating costs would be \$150,000 - \$200,000. Capacities well beyond these numbers would be essential, requiring a far greater capital investment.

This option makes no attempt to establish independently reproducing populations. However, over time inefficiencies in harvests and incidental in water reproduction may result in the establishment of natural breeding populations.

Worldwide hatchery - based oyster fisheries depend very heavily on predator protection methods in field plantings. The seed are simply too valuable to leave unprotected. In regions with significant decapod predators cages are almost always used. **Once cages are used, the benefits of bottom culture over off bottom culture disappear**. A hatchery - based put and take fishery in Virginia would most likely be off bottom, making it unsuitable for a public fishery. In addition, recent advances with the off bottom culture of *C. virginica* permit management around disease with successful market production. Why substitute a potentially less desirable species under this option when the more desired (marketable) *C. virginica* can be produced at the same relative cost? Furthermore, the labor intensive nature of this option and the need for continuous annual investment brings into focus the requirement for public vs. private funding of this option. Given these technical and economic realities, the question will arise as to whether the strategy is not more appropriate to the private sector as opposed to the public fishery. This is the reality of the U.S. Pacific Coast industry based on *C. gigas*. Washington and Oregon are often cited as examples of success with *C. gigas*, but its' private sector character is often overlooked in the enthusiasm for the species.

**c. Sustainable public fishery following existing law and established protocols.** This is the most difficult option to carry out from a technical, management and operational standpoint. The approach would attempt to establish self - sustaining oyster reefs, protect them from harvest until a sustainable yield fishery could exist, and manage closely to prevent over harvest. These goals require major investments of capital, time and research to establish suitable planting sites, reproductive rates and management strategies.

While data exist on some aspects of *C. gigas*' biology, we have inadequate information to assess fecundities in the field or even project the environmental conditions necessary for reasonable levels of egg production and larval survival. A base requirement would be a population model with an age-specific fecundity schedule related to environmental conditions. Placement issues demand detailed knowledge of the hydrography of planting sites. As a result of research at VIMS, we have gained a substantial understanding of circulatory patterns in the James River Estuary. From that understanding we would expect any successful reproducing populations of *C. gigas* to be limited to the lowermost reaches. We do not have comparable knowledge of other river systems in Virginia. Failure to do this prior to an introduction will extend the time scale, and possibly doom efforts to establish persistent breeding populations that will support a fishery. Application of current tools and analysis would require a minimum of three years.

At a minimum, this option will require 3-5 years investment in establishing the research data needed to execute the plan, and at least 6-10 years to establish manageable sustainable yield oyster reefs.

#### **Summary:**

If pursued by the Commonwealth, the alternative species strategy will require careful evaluation of the ecological, economic, political and legal parameters. The ecological, legal and political issues will likely transcend state boundaries. If we are speaking of the public fishery on traditional oyster ground, this strategy will also entail a fundamental decision to abandon a publically held natural resource in favor of a direct state subsidy to create a new industry option that will no longer be the domain of the commons. It is also necessary to consider whether the strategy is more suited to private oyster culture as opposed to the public fishery. Depending on the options pursued, an alternative species strategy may take anywhere from 6-15 years to accomplish before there would be any harvest potential in a traditional public fishery. Private planting on leased bottom, and aquaculture options may be more efficient on a limited scale for private sector production. Most of this time would involve the establishment of self sustaining populations that are manageable for harvest. The large scale dumping of seed and adults as a quick fix is unacceptable and would most likely be barred by existing law through legal action in neighboring jurisdictions and at the federal level.

Apart from the fishery restoration issues reviewed here, the matter of alternative species introductions for their ecological value alone deserves careful review and evaluation. Because there are no economic time constraints associated with the fishery, an ecologically motivated introduction may be an option to restore the ecosystem functions lost with the decline of *C. virginica* in the Chesapeake Bay. We are not in a position to offer a considered

opinion on this question at present.

The Virginia Institute of Marine Science cannot endorse, in the current understanding of associated risk, large scale, uncontrolled introductions of non-indigenous oyster stock into the waters of the Commonwealth or the Chesapeake Bay.

1994 SESSION

LD6512376

HOUSE JOINT RESOLUTION NO. 95

APPENDIX 9

Offered January 24, 1994

Continuing the Chesapeake Bay Commission study on the condition of the shellfish industry in the Commonwealth

Patrons—Murphy and Bloxom; Senators: Cross and Gartlan

Referred to Committee on Rules

WHEREAS, the 1993 Session of the General Assembly passed House Joint Resolution No. 535 requesting the Chesapeake Bay Commission to study the condition of the shellfish industry in Virginia; and

WHEREAS, the commission, assisted by a committee of individuals from private industry, state agencies and scientific institutions, has examined numerous issues related to the condition of the shellfish industry and its future prospects; and

WHEREAS, because of the quantity and complexity of the issues involved, the commission and the members of the HJR committee have agreed that another year of study is necessary to ensure that due consideration is given to these important issues; now, therefore, be it

RESOLVED by the House of Delegates, the Senate concurring, That the Chesapeake Bay Commission be requested to continue its study of the condition of the shellfish industry in the Commonwealth. The charge of the commission shall remain as set forth in House Joint Resolution No. 535 enacted by the 1993 Session of the General Assembly.

The Commission shall complete its work in time to submit its findings and recommendations to the Governor and the 1995 Session of the General Assembly as provided in the procedures for the Division of Legislative Automated Systems for processing legislative documents.

Official Use By Clerks

Agreed to By The House of Delegates without amendment, with amendment, substitute, substitute w/amdt. Agreed to By The Senate without amendment, with amendment, substitute, substitute w/amdt.

Date: \_\_\_\_\_

Date: \_\_\_\_\_

Clerk of the House of Delegates

Clerk of the Senate

1994 SESSION  
ENGROSSED

APPENDIX 10

1 LD5714376

2 HOUSE BILL NO. 441

3 House Amendments in [ ] — February 8, 1994

4 A BILL to amend and reenact §§ 28.2-208 and 28.2-550 of the Code of Virginia, relating to  
5 the Marine Fishing Improvement Fund.

6  
7 Patrons—Murphy and Bloxom; Senators: Cross and Gartlan

8  
9 Referred to Committee on Chesapeake and Its Tributaries

10  
11 Be it enacted by the General Assembly of Virginia:

12 1. That §§ 28.2-208 and 28.2-550 of the Code of Virginia are amended and reenacted as  
13 follows:

14 § 28.2-208. Marine Fishing Improvement Fund continued.

15 There is hereby continued a special, nonreverting fund in the state treasury to be  
16 known as the Marine Fishing Improvement Fund, hereinafter referred to as the Fund. The  
17 Fund shall consist of (i) that portion of the nonresident harvester's license fees which have  
18 not been allocated to the Virginia Marine Products Fund as provided for in § 28.2-227 and  
19 (ii) fees collected from the registration of commercial fishermen under § 28.2-241. The  
20 Fund shall be administered by the Commission and used solely for (i) managing and  
21 improving marine fisheries, (ii) seafood product promotion and development services, (iii)  
22 mandatory reporting and stock assessment, (iv) education of commercial fishermen, (v)  
23 conservation and management strategies identified by the General Assembly and the  
24 Commission, and (vi) public information pamphlets and summaries of rules issued with  
25 gear licenses, and (vii) retaining commercial fishermen to engage in replenishment,  
26 research, and stock assessment activities.

27 § 28.2-550. Authority of Commissioner to make certain contracts; funds received to be  
28 paid into Public Oyster Rock Replenishment Fund.

29 A. The Commissioner with the approval of the Commission may contract with any  
30 person to take or dredge submerged oyster shells or any other subaqueous materials from  
31 the tidal waters of the Commonwealth, and shall have the authority to plant, use, or sell  
32 such shells or other materials in whatever manner the Commission deems to be in the best  
33 interest of the Commonwealth.

34 B. The Commissioner, with the approval of the Commission, may contract with any  
35 commercial fisherman to engage in replenishment, research, and stock assessment activities  
36 in the Commonwealth. The Commission may promulgate regulations establishing criteria  
37 for awarding such contracts, including a preference for commercial fishermen actively  
38 engaged in the taking or catching of [ ~~elams or oysters~~ fish or shellfish ] who have  
39 suffered an adverse economic impact resulting from the implementation of regulations of  
40 the Commission regulating the seafood and marine resources of the Commonwealth. In  
41 determining whether a person is a commercial fisherman actively engaged in the taking [ ~~of elams or oysters~~  
42 or catching of fish or shellfish ] , the Commission shall consider,  
43 among other relevant evidence, (i) his possession of a license issued pursuant to Article 1  
44 (§ 28.2-500 et seq.) of this chapter or (ii) his voluntary reporting of shellfish catches to the  
45 Commission.

46 C. The Commission, when it makes a determination in writing that competitive bidding  
47 or competitive negotiation is not feasible or fiscally advantageous to the Commonwealth,  
48 may authorize other methods of purchasing and contracting for seed oysters, house shells,  
49 reef shells, shell bed turning, and other goods and services for oyster ground replenishment  
50 , including contracts with commercial fishermen for replenishment, research, and stock  
51 assessment activities as provided in subsection B, which are in the best interest of the  
52 Commonwealth and which are fair and impartial to suppliers. It may establish pricing for  
53 its awards and purchases; use selection methods by lot; and open, close, and revise its  
54 purchases according to changing conditions of the natural resources, markets, and sources

1994 SESSION

LD5712376

HOUSE BILL NO. 443

APPENDIX 11

Offered January 24, 1994

A BILL to amend and reenact § 28.2-539 of the Code of Virginia, relating to oyster inspection tax.

Patrons—Murphy and Bloxom; Senators: Cross and Gartlan

Referred to Committee on Chesapeake and Its Tributaries

Be it enacted by the General Assembly of Virginia:

1. That § 28.2-539 of the Code of Virginia is amended and reenacted as follows:

§ 28.2-539. Inspection tax.

All licensed oyster buyers, planters, packers, importers of shucking stock or shippers shall pay to the Commissioner an inspection tax of three cents for each bushel of oysters taken, caught, imported, or purchased. However, the tax shall not be imposed on those oysters which are to be replanted in the waters of the Commonwealth, and the tax shall not be imposed for the period from July 1, 1994, until July 1, 1996. The proceeds from this tax shall be paid into the general fund of the state treasury.

Official Use By Clerks

Passed By

The House of Delegates

- without amendment
with amendment
substitute
substitute w/amdt

Passed By The Senate

- without amendment
with amendment
substitute
substitute w/amdt

Date:

Date:

Clerk of the House of Delegates

Clerk of the Senate