Identification of management strategies for promoting aquaculture in Virginia

Report to the Virginia Coastal Zone Management Program

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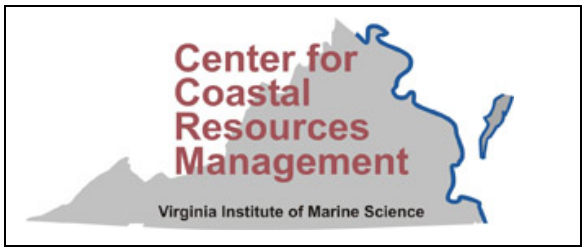

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Introduction

There continues to be a great deal of thought, effort and energy directed at promoting shellfish aquaculture in Virginia. The reasons are diverse and sometimes apparently divergent, but converge on an interest in the economic and ecologic benefits of shellfisheries in the face of the demise of the natural population of the native oyster *C. virginica* and the loss of the oyster fishery. Oysters are not just a commercial commodity, but also an estuarine ecosystem. Interest in culture of *C. virginica*, or some other oyster, has support from those seeking the private economic gain from commercial harvest, to those interested in the potential for public gain from the use of State-owned bottomlands to others seeking ecological improvement of the Chesapeake Bay waters.

Hard clam culture provides an opportunity for productive use of Virginia's subaqueous lands. Indeed, clam culture could be considered a success, with Virginia's clam farms leading the nation in the culture of hard clams. (Murray and Oesterling, 2007). While a trade-off, some of this benefit is an offset for the loss of oyster production.

The body of knowledge brought to bear regarding shellfish culture is ever increasing. Advances in oyster culture now allow for the production of market-sized oysters in less than 2 years. This critical timeframe is necessary to beat the oyster diseases to harvest. We have an understanding of where clam and oyster culture efforts may be most successful in the form of GIS based suitability models built on ecologic and physical criteria. Current efforts are underway to ensure that aquaculture activities are environmentally sound in the development of best management practices. Nevertheless, there remain some hurdles to the advancement of the shellfish culture industry in Virginia.

The roadblocks to successful culture of clams and oysters are not the same. Obstacles to clam and oyster culture have been identified by MRC staff, VIMS scientists, industry liaisons and aquaculturists. Clam culture has apparently few major obstacles, available growing space, user conflicts and the assurance of the necessary water quality being the greatest concerns. Oyster culture has a more diverse set of obstacles including growing space, user conflicts and water quality, but also disease, seed availability and economic issues of production costs, product price and market competition.

VMRC regulations created pursuant to the statutory goals of Title 28.2 include limits on the size and vertical relief of aquaculture related structures as well as requirements for marking leased grounds. Concerns regarding the cost and processing time of state permits for aquaculture activities has been recently addressed with legislative action. The responsibility for permitting temporary aquaculture enclosures (bags and cages) was transferred from the Habitat Division of the Marine Resources Commission to the Fisheries Division. Given the proposed fee structure, there is an anticipated reduction in the permit fee for most aquaculture activities. (See Appendix One for a comparison of fees under the two different fee structures)

Permit fees and lease pricing remains an issue for both aquaculturists who are interested in reducing costs and the State that seeks an equitable return for the use of the public trust

resource. It should be noted that if a 3 dimensional lease program is established (or re-established as the case may be), there would be the possibility for large numbers of shellfish to be produced on a small area of subaqueous bottom. If successful, there is the potential for a large economic return for the use of the state bottom. The public should be appropriately compensated for the essentially exclusive use of the bottom and waterway.

Just which of the various obstacles should be addressed by management efforts to the greatest benefit for aquaculture depends on perspective of the participants: growers, researchers, or regulators. Economic studies may be an effective way to identify management strategies that are likely to be the most economically successful.

Issue: Water Quality

The latest phase in aquaculture suitability modeling underway at VIMS incorporates a risk assessment of adverse water quality as determined by landuse and zoning. The outcome of the work is identification of those aquaculture areas that are at risk for a diminution of water quality. This information can be used to direct landuse decisions at the local level, inform management authorities, and aide choices made by aquaculturists. The study, funded by the Virginia Coastal Program, is being completed. One limitation of the effort is that it is only 3 localities are included. A previous study by the Center for Coastal Resources Management (2004) identified various approaches to address some use conflicts associated with aquaculture including water quality issues. The options identified in the report included new legislation, new water quality regulations, and the establishment of aquaculture priority zones. The concept of the priority zones is comparable to the latest thinking of enterprise zones, but was originally limited in concept of addressing use conflicts only.

Issue: Space

Baylor

Several sections of Title 28.2 of the Code of Virginia give the Virginia Marine Resources Commission (VMRC) jurisdiction over the use of the subaqueous lands held in the public trust. With the exception of the constitutionally reserved Baylor Grounds, which cover approximately 250,000 acres, VMRC has the authority to permit certain uses and to lease subaqueous land to private individuals for growing approved species of oysters and clams. The Baylor Survey conducted in 1894 delineated the bounds of natural oyster beds (living oysters on shell). No additional data on other marine fauna or bottom type was collected. It is thought that the survey did capture much of the naturally productive bottom, but also included unproductive bottom (Moore, 1910). The survey area was added to by petition or legislative action to reach the acreage of Baylor today (Haven, Hargis and Kendall, 1978). Currently, Virginians hold nearly 90,000 acres in the Chesapeake Bay and seaside coastal lagoons in private leases. This means that much (or all depending on opinion) of the best growing areas may be already taken or in Baylor.

Given the range of estuarine conditions tolerated by clams and oysters, the geographic distribution of potential growing areas identified by suitability models overlap. This means that much of the same area that is good for growing oysters is good for growing clams and visa versa. Additional competition for space comes in the form of oyster restoration efforts. These efforts are focused on the primary goal to re-establish populations of *C. virginica* as a natural component of the Bay ecosystem.

An analytical mapping effort was conducted at VIMS to identify the oyster restoration areas based on several criteria (Berman, et al, 2002). The criteria included the requirement that restoration be placed on Baylor grounds, hard substrate was preferred and navigational channels were excluded. Restoration efforts use many different methods, but instead of being maximized for harvest potential, restoration sites are designed for maximum habitat and ecological improvement. To allow oysters at a restoration site to grow and flourish into a thriving reef community, they need to be left unharvested. To protect the oysters, restorations sites are made into sanctuaries, where no shellfish harvest is allowed. Restoration areas are proposed to be located on Baylor in order to serve as sanctuary.

Recent discussion among scientists, resource managers and industry professionals led to agreement that the public use of our 240,000 acres of public Baylor grounds should be re-evaluated. As the original survey was a quasi-biological effort to identify productive oyster grounds, it has been argued that a new survey, to reflect current conditions should be conducted. The opportunity to make previously reserved lands available for lease appears to offer a logical solution to the competition for space.

Enterprise Zones

Enterprise zones are a management option that can address spatial concerns, water quality and economic issues. Enterprise zones can reduce the uncertainty of shellfish growing in the following ways;

Associated subsidies and/or reduced regulatory fees,
Siting in locations identified as most likely to be successful for growing,
Minimize water quality risk through strong state and local regulatory provisions,
Minimize use conflict.

Enterprise zones would be managed by the State and operate to the benefit of the State and private industry. The zones would operate under a given set of standard procedures thus removing most, or all, of the guesswork associated with leases and permits. Questions regarding the establishment of enterprise zones are: where should they be located and what, if any, subsidies should be offered.

Another modeling effort, just underway at VIMS, seeks to build on all the foregoing modeling efforts by finding the intersection between the suitability modeling for oysters and oyster restoration mapping. In this effort, Baylor grounds are specifically included in the model to identify those areas that are most likely to be good areas for growing oysters *within* Baylor. The results of this modeling effort will be available in 2008. The output of the model should be used in the siting of enterprise zones in concert with other pertinent

information regarding Virginia's waters and subaqueous lands such as fish habitats and sanctuaries, historic resources, and the like.

Use conflict may be minimized and water quality risk adverted to some extent by prioritizing adjacent uplands for fee simple acquisition or conservation easements. It may also be possible to minimize use conflict, and possibly water quality risk, by associating the enterprise zones with working waterfronts; shorelines which support traditional fisheries or water dependent activities. The compatibility from the water quality perspective will depend upon the specific activities occurring along the shoreline. However, this scenario should provide a readily available landing for shellfish and may be appropriate for hatcheries, or aquaculture training facilities.

Existing lease program

As previously stated, almost 100,000 acres of subaqueous lands are held in private lease. These lease are distributed throughout the Bay and tributaries and the seaside on the Eastern Shore. The lease system is operated by the VMRC (Code of Virginia related to Oyster Planting Ground: 28.2-600 ET. SEQ). The lease program was created historically for the purpose of offering area to oyster growers that harvested and worked the bottom. The Code of Virginia requires that leased areas "be occupied for the purpose of planting or propagating oysters" (Chapter 6, 28.2-603). Decline in oyster production associated with disease and over-harvest in the later decades of the 20th century meant that leases were no longer being used to propagate oysters. While there is still the obligation that leases are to be used for oyster culture, the ability of the Commission to verify the use has been problematic. Leases that are not productive may be revoked and the land made available for lease.

New reporting requirements, such as the Oyster Lease Use Plan (2006) and the new oyster production reporting requirement may help resolve this issue, there remain an unknown number of leases, representing some area of bottom that is not being used for this purpose. A contributing factor to the lease issue is that current lease rate is only $1.50 per acre. This rate has created a situation wherein individuals apply for and hold leases that never intend to grow oysters. Or, they hold the leases and then sublet to oyster growers at much higher rates. It may be possible to make additional bottom available for lease through better enforcement of the oyster growing requirement. However, it should be noted that all the legislative and regulatory language regarding leases specifies oysters. Are clam growers, therefore, not eligible to benefit from currently held bottom that could become available through this type of effort?

Fee table from the Oyster Ground Application form (2006)

APPLICATION FEE (NONUNDABLE) .....-.....$25.00
ADVERTISING COST IN THE NEWSPAPER BILLED TO APPLICANT DIRECTLY....cost varies
SURVEYING: VMRC SURVEY FOR LEASE ASSIGNMENT $510.00
ADDITIONAL PLAT CHARGE (if needed) $75.00
RECORDING FEE FOR EACH ASSIGNMENT & PLAT $12.00
ASSIGNMENT FEE FOR EACH ASSIGNMENT & PLAT $1.50
RENTAL AMOUNT (PER ACRE/PER YEAR)(NO ANNUAL CHARGE FOR RIPARIAN LEASES)..... .$1.50

Issue: Oyster Culture Economics

There are many questions regarding the economic viability of oyster farming. Two primary issues identified are limits on the availability of seed and competition in the market place due to oyster culture in Washington State and the Gulf Coast. One possible advantage for Virginia is access to a market for half-shell oysters which bring a higher price compared to shucked oysters.

There are a myriad of ways to address the issue of production costs for oyster culture. One option would be to make inexpensive loans available through a State managed fund. Maryland has a state managed fund known as the **Seafood and Aquaculture Loan Fund.** The fund was created in 1990 to promote the aquaculture industry in Maryland. The fund provides low-cost loans to individuals or businesses involved in seafood processing or aquaculture in order to finance the acquisition, construction, renovation, and excavation of real property or the acquisition of equipment and fixtures. In 1995, in an effort to increase the loan activity, the program was expanded to allow the fund to make loans to start a seafood processing or aquaculture operation, rather than only to improve existing operations. Further, the maximum allowable financing was increased.

Canada operates a funding program at the national level. The **Aquaculture Collaborative Research and Development Program** (ACRDP) is a Department of Fisheries and Oceans (DFO) initiative to increase the level of collaborative research and development activity between the aquaculture industry and the department, and in some instances with other funding partners. ACRDP is an industry-driven program that teams industry with DFO researchers. Funded projects are to be conducted at DFO Research facilities or industry partner facilities. The program will allocate ACRDP funds to collaborative research projects that are proposed and jointly funded by aquaculture producer partners. The current ACRDP funding is approximately $4.5 million per year and to be subdivided regionally. The program has several intended goals;

- Improve the competitiveness of the Canadian aquaculture industry
- Increase collaboration between the department and industry on scientific research and development that will enhance aquaculture in Canada
- Facilitate and accelerate the process of technology transfer and research commercialization through closer collaboration with the Canadian aquaculture industry, and
- Increase scientific capacity for essential aquaculture research and development in the aquaculture sector.

Another possibility would be to offset, or subsidize the costs of oyster culture. A long-standing oyster tax, established in the heyday of commercial oystering could be eliminated. The fee was historically linked to State replenishment efforts in the management and placement of shell and is currently tied, as a user fee, to a monitoring effort to track oyster

culture. Replenishment/restoration and monitoring efforts would need to continue even if the tax were removed.

Blue Ribbon Oyster Panel report (2007) provided several recommendations for management options focusing on the native oyster. Representation on the Panel included public and private sector, academicians and industry representatives. The Panel was tasked with providing guidance to the Marine Resources Commission regarding the use of oyster restoration funds. In general, the recommendations of the Panel require more money and a more active role on the part of the Commission and various public sectors partners. Some of the recommendations offered by the Panel:

Production of spat-on-shell,
Support private hatcheries,
Continue efforts to develop disease resistant oysters,
Expanded education and extension efforts,
Continued shell planting,
Establish aquaculture "Zones", and
Implementation of river-based management strategies incorporating rotational harvest planned to coordinate with other harvest seasons and creation of local sanctuaries.

The rotational harvest strategy involves the planting seed or spat, letting them grow for several years, then allowing their limited harvest by watermen, followed by several more years of protection. This on-again, off-again approach is intended to help struggling watermen and the oyster population. These areas would be pseudo-sanctuaries allowing some animals to reach reproductive age and beyond, while also allowing some harvest. The advantage to the production of spat-on-shell oysters versus seed is that the former are already attached to shell and larger than the later. This aids in protection against consumption by cow-nosed rays and jump-starts the timeline for grow-out to market size.

Of course, if the restoration sites are considered some of the best areas to grow oysters for restoration, is follows that they would be some of the best areas to culture oysters for harvest. This begs the question as to the capacity of the State and partners to "occupy" all the identified locations with restoration projects. As the zones are to be established and managed by the State would it possible and appropriate to identify criteria to prioritize restoration, making some areas available as enterprise zones until that time they are to become restoration sites? Alternatively, enterprise zones may be sited nearby restoration areas. In this scenario there is the opportunity for each effort to benefit from the other in terms of oyster reproduction and localized water quality improvement. On the other hand, given the current oyster culture practices, proximity to naturally productive area may be a detriment due to cage "fouling" by oyster set from reef reproduction.

If restoration of *C. virginica* is to be the highest, best use of state bottom with regard to shellfisheries, then the areas with the greatest likelihood for success should be set aside for this effort. If a private/public effort in shellfish growing is considered comparably important, consideration should be given to distribution of best growing areas.

Issue: Value added; Water Quality Improvement/ Nutrient trading

From an integrated coastal management perspective, there would be great advantages to promote shellfish culture by connecting it to existing environmental management programs or other production efforts. One possibility appears to be in the area of water quality management. Shellfish are filter feeders. The greatest water quality issue facing the Bay is excess nutrients. Is it possible to link aquaculture and water quality for beneficial outcomes for both?

Oysters filter waters at high rates converting suspended microalgae into oyster biomass. And oyster reefs provide hard substrate for epifauna, sea squirts, barnacles and mussels, which are also filter feeders. For animals that are removed from the system, the opportunity exists to quantify the nutrient removal and potentially trade credits to other sectors within the nutrient management arena. Ferreira, et al (2007) offer a model to determine the capacity for shellfish farms to serve as nutrient sinks. However, their model does not include the species of interest in Virginia and would need modification to apply.

Clam nets are regularly fouled with attached microalgae. While there is some incentive to remove the material to ease the use of the nets, the removal process is intensive. The ability to trade measurable algae for nutrient credits may create the necessary incentive to make this a regular practice.

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Appendix One

JPA #	Locality	Amount permitted (ft2)	Activity	Habitat fee $.005/ ft2	Fisheries Fee*
00-1653	Gloucester County	160	Cage culture area would be 57000 square feet, cages for oyster grow out	1	
01-0349	Accomack County	1,120	fixed pier and floating dock for clams and oysters	6	
01-1696	Accomack County	100	oyster floats (684) and pilings (62)	1	$250
02-0114	Accomack County	250	floating platforms and mooring piles (oyster/clams)	1	
02-0453	Accomack County	7,500	floating raft with trays and bottom cages (500), oysters	38	$250
02-0513	York County	127,000	bottom cages (1,000), oyster	635	$250
02-0581	Gloucester County	260,000	8' x 20' floating upweller and floating bags for growout, oysters	1,300	
02-1519	Northampton County	690	taylor floats	3	
02-1813	Accomack County	1,300,000	floating bags over 41 acres	6,500	
02-1896	Accomack County	2,500	open pile wharf and mooring	13	
02-2264	Gloucester County	1,236,673	10,645 oyster grow out racks	6,183	$1,000
04-1095	City of Hampton	320	open-pile floating upwellers	2	
04-1345	Accomack County	1,680	open-pile platforms	8	
04-1874	Accomack County	600	100 bottom cages	3	$125
04-2257	Accomack County	1,170	open-piles and taylor floats	6	
05-0707	Northumberland County	1,510	open-pile dock	8	
05-0958	City of Virginia Beach	246	loose oyster shell dumped for use as "living shoreline"	1	
05-0977	multiple	2,000	32 cages (rack and bags)	10	$125
05-2241	Gloucester County	503,921	cages (no number given)	2,520	
06-0645	Northumberland County	205,000	8,575 cages (max 350 cages per acre, 24.5 acres)	1,025	$1,000
06-0649	Westmoreland County	138,000	2,750 cages (max 250 per acre, 23 acres)	690	$1,000

*Proposed Fisheries Fee 1. For up to 500 structures, $125.00. For over 500 but not more than 1000 structures, $250.00. For over 1000 but not more than 2500 structures, $625.00. For over 2500 structures, $1000.00