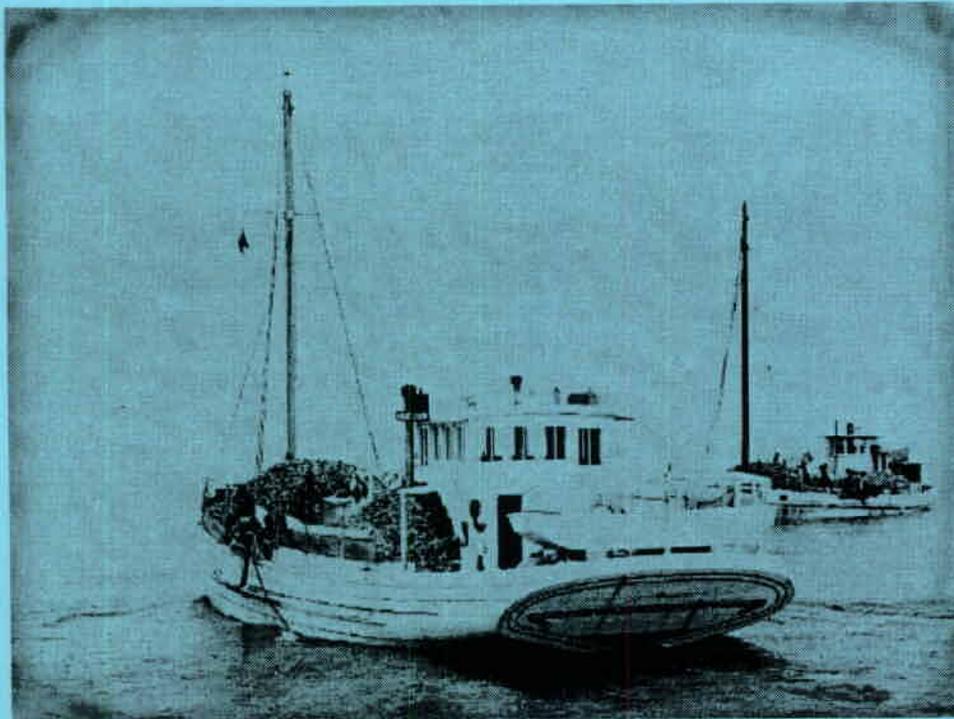


OYSTER INDUSTRY REVITALIZATION TASK FORCE



**REPORT
TO THE GOVERNOR AND LEGISLATURE
OF THE
STATE OF NEW JERSEY**

January 1999

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Executive Summary

Oyster industry Revitalization Task Force

History of the Delaware Bay Oyster Industry

Oysters grow in Delaware Bay from its mouth to Bombay Hook, on the western (Delaware) side of the estuary, and to just below Artificial Island on the eastern (New Jersey) side, a distance of about 50 miles. They have provided a sustainable food supply, been enjoyed and contributed to the local economy for centuries. From the mid-1800's to the first quarter of the Twentieth Century, oysters were the most popular seafood in the United States. They were the food of not only connoisseurs and blue-collar workers but also of convalescents and young children since they were easily digestible sources of high quality protein. In these early years, the oyster industry produced an annual average of 9.2 million pounds of product worth \$1,600,000.

Shucking houses opened along the New Jersey side of the Delaware Bay creating jobs and the economy boomed. Shops and services sprang up in the small towns along the Bay. People flocked into the region because of the employment opportunities and a chance to share in the good life. In this period until the onset of MSX in the mid 1950's, the industry produced an annual average of 4.7 million pounds of product worth \$1,900,000.

In the late 1950's, the oyster industry fell victim to MSX disease and, consequently, the local economy slumped. Average annual yields fell to 900,000 pounds of product worth \$1,000,000. Despite efforts to revitalize the industry, it never recovered. The Delaware Bay oyster industry has continued to decline because of additional oyster disease problems (Dermo), poor seed bed maintenance coupled with a ban on the importation of seed, lack of innovation in production techniques, human health scares, bad press, lack of supply and the lack of a proactive marketing campaign.

Potential for Recovery

Although there are differences in the fisheries, the history of the oyster industry in Connecticut provides an example of an industry that declined to near zero production in the late 1960's and subsequently recovered to become one of the leading suppliers of oysters in the United States.

To address the problem in New Jersey and to develop recommendations that might lead to a similar recovery in New Jersey, the Legislature passed a joint resolution (SJR-19, 1996; Appendix 5) establishing the "Oyster Industry Revitalization Task Force." Members of the Task Force included representatives of industry, the Departments of Agriculture and Environmental Protection, and researchers from the Haskin Shellfish Laboratory in Port Norris.

Recommendations for Action

1. *Enhancement of natural seed supply through improved/innovative management of the seed beds and expansion of the cultch program.*
2. *Development of new approaches to transplanting to foster optimum growth and minimize mortality.*
3. *Enhancement of production based on current practices including extension of the season for direct marketing from the seed beds and better stock assessment.*
4. *Development of intensive aquaculture production including development and use of disease resistant oyster stocks, and stabilization of seed production.*
5. *Development of marketing options and value-added products.*
6. *Financing of research and development for enhanced production methods.*

Funding Requirements

Recovery of the oyster industry in Delaware Bay requires supplementing current funding with additional dollars to enhance production, support capacity building within the existing oyster resource management program, and expand market development efforts. These activities will provide the greatest economic return to the industry in the short term and establish the basis for a sustained, economically viable industry/government/academia program.

Annual Minimum Base Support Required: (not including special projects)

Current water quality monitoring program in Delaware Bay	\$100,000*
Shell planting & transplant	324,000
Oyster bed survey/technical assistance	97,000*
Current Shellfish Program Budget line	142,000*
Capacity Building within Shellfish Program	106,000
ISSC participation costs (special water quality studies)	35,000
Oyster advocacy/marketing/technical support NJDA	25,000

Total **\$829,000**

Funded currently through the annual state budget

-339,000

ADDITIONAL BASE FUNDING NEEDED:

\$490,000

Annual Private Industry Contribution:

<i>Oyster Resource Recovery Account (variable estimate)</i>	\$50,000
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Special Projects: (Costs reflect multi-year term of each project)

<i>Commercial scale planting on Cape Shore</i>	\$31,000/harvest cycle
<i>Demonstration planting with multiple transfers</i>	\$562,000
<i>Purchase of suction dredge</i>	\$1,400,000
<i>Mapping and definition of oyster beds</i>	\$250,000
<i>Aquaculture and Disease Resistant Seed Development</i>	\$200,000

TOTAL FUNDING REQUIRED TO SUPPORT SPECIAL PROJECTS: \$2,443,000

Estimated Return on Investment

Coastal towns edging the Delaware Bay developed as a direct result of the healthy oyster industry. Subsequent decline of the industry led to a high rate of unemployment and a drastic decline in the standard of living for many families with established roots in the region.

It is anticipated that given an initial input of state funds to bolster the industry, within a five-year period, production can increase to between 200,000 and 330,000 bushels per year. It is anticipated that stabilization of supply and increased market development activities will result in a higher ex-vessel price (\$21 per bushel). Using a very conservative harvest and a very conservative ex-vessel value of \$4 million annually and applying a standard seafood economic multiplier of (6), the value of the industry to the state's economy is potentially \$24 million annually. *This is especially critical because these economic gains can be achieved in an area that is under severe economic stress.* It can be anticipated that most dollars earned in the region will stay in the region supporting local small businesses. The value of the industry extends well beyond the oyster industry itself and extends to other waterfront activities such as shipbuilding and repair, preserving New Jersey's maritime heritage through ecotourism and preservation of the maritime way of life.

Given changes in environmental conditions and other natural variables, it is difficult to develop accurate projections of return on investment. However, even under the most conservative estimates, return on investment in the State's oyster industry is substantial.

COST BENEFIT ANALYSIS

Program	State Funds Required	Ex-Vessel Value	Total Return to Economy	Expected Taxes Generated	Benefit for every \$1 invested (Total Return)
Base Support	\$829,000	\$7,000,000	\$42,000,000	\$2,940,000	\$51
Cape Shore Planting	\$ 31,000/cycle	\$ 175,000/cycle	\$ 1,050,000	\$ 73,500	\$34
Multiple Transfers	\$ 562,000	\$3,265,920	\$19,595,520	\$1,2371,686	\$35

**Oyster Industry Revitalization Task Force
Report to the Governor and Legislature of the State of New Jersey**

INTRODUCTION

The culture of oysters in New Jersey estuaries is the oldest form of aquaculture practiced in the State (cf. Appendix 1). This practice gave rise to a highly productive industry in the Delaware Bay (Appendix 1, Figure 2) during the second half of the nineteenth century and first half of the twentieth century. In the last forty years, the production of oysters has steadily declined to a fraction of earlier levels (Appendix 1, Figure 2). This decline is attributable to a complex of factors, many of which are not directly controllable by the oyster industry.

There are three principal reasons for the decline of oyster production in New Jersey:

- 1) High mortalities due to two parasites that cause disease in oysters - MSX (beginning in the late 1950s), and Dermo (beginning in 1990).
- 2) Reduced quantities of oyster seed due to relatively poor natural setting in many years and to a ban on the importation of seed. (This ban began after the onset of MSX and eliminated the practice of planting large quantities of seed oysters from outside the bay on leased grounds. This imported seed had previously helped sustain high landings of market oysters.)
- 3) Lack of innovation in applying biological and marketing knowledge to increasing the production and value of New Jersey oysters.

The decline in landings became especially severe since the onset of Dermo disease. Management strategies that had evolved to circumvent the impact of MSX were not effective on this disease. Yet, there is ample evidence that the biological potential for oyster production in the Delaware estuary remains high, but is not being effectively utilized (Haskin et al. 1983; Ford, S. E. 1997; Canzonier 1992 (a)). That is, with the use of different techniques, oyster production could be significantly enhanced even in the face of the diseases. Some industry members and shellfish technologists recognize the need for introduction of innovative changes in oyster culture practices in order to reverse the downward trend, realize the full biological potential of Delaware Bay, and reestablish a self-sustaining industry. It is also evident that modernization of culture practices will require changes in management of the resource as well as revising the current statutory and regulatory structure to facilitate application of innovative approaches.

To address this problem the New Jersey Legislature passed a joint resolution (SJR-19, 1996; Appendix 5) which establishes the "Oyster Industry Revitalization Task Force". The resolution mandates that: "It shall be the duty of the task force to

examine the status of oyster culture as currently practiced in New Jersey. The task force shall evaluate the technological, sociological and regulatory aspects of the harvesting and culture of oysters in the Delaware Bay and adjacent waters. The task force shall define the problems confronting the oyster industry, including the causes for its reduced production and diminished economic return, examine feasible alternative strategies that might be utilized in reversing the negative trend in the industry, and provide a comprehensive plan of action for revitalization of the industry, including recommendations for actions to be taken by the Legislature and the Governor to address the technical, regulatory and legal problems impeding the proper utilization of this valuable natural resource...."

Pursuant to the Joint Resolution, on 11 February 1997, Governor Christine Todd Whitman designated members of the shellfish industry, members of the technical community and representative of relevant State agencies to serve on the Task Force and to submit a report within 180 days of appointment. The members of the Task Force and their affiliations are listed in Appendix 2. The initial meeting of the Task Force was held on 24 March 1997. Minutes of this and subsequent meetings are attached as Appendix 3. A synopsis of infrastructure, biological, technical, sociological, marketing, product characteristics, and governmental/regulatory elements of the current industry and its operation, noting both positive and negative aspects, was utilized as an outline to initiate discussion and establish objectives. Four working sub-committees, each composed of representatives from industry, the research community, and state agencies, were assigned the task of examining the issues and objectives identified in the outline and developing recommendations for addressing the technical, legal and sociological issues. The subcommittees reported their findings in plenary meetings of the Task Force. Alternative approaches for optimizing production and increasing the economic return on the product were discussed and weighted with respect to feasibility and costs. Probabilities for both long- and short-term impacts, as well as the acceptability of changes in management approaches for industry members and State agencies were assessed.

BACKGROUND

Traditional Oyster Culture Strategy

Traditionally, oyster growers on the New Jersey side of Delaware Bay have relied on the natural oyster beds in the upper bay and imported seed to provide seed for planting on leased grounds for growout to market size (Appendix 1). Lower salinities in the waters overlying these Natural Seed Beds provide a sanctuary from heavy predation and other causes of mortality that exist in higher salinity portions of the lower bay. The seed, after varying periods of growth in this haven, are moved to the privately leased grounds in the lower bay to complete growth and attain the meat condition desired by the market. Even after the advent of high mortalities due to the oyster parasite MSX (*Haplosporidium nelsoni*) in the late 1950s, the industry

was still able to pursue this traditional mode of culture, albeit with an abbreviated growing cycle. This abbreviated growing season enabled the industry to evade the high mortalities on the planted stocks due to this salinity-limited disease organism. Since 1990, however, this strategy has not been effective because another oyster parasite, Dermo (*Perkinsus marinus*), has become established in New Jersey waters. Unlike MSX, which is relatively rare in oysters collected from the seed beds during the spring planting season, the Dermo parasite survives low salinities fairly well and quickly develops to lethal levels when the oysters are transplanted into higher salinity areas, e.g., the leased grounds. In 1991, 290,000 bushels of seed, much of it infected with the Dermo parasite, were transplanted to leased grounds in late May and died before harvest began in September. Clearly, even the modified strategy of reducing residence time on the leased grounds was no longer valid.

Current Oyster Harvest Strategy

In response to this second mortality-causing agent, a new strategy was formulated and tried for the first time in 1995 - direct marketing of oysters harvested from the seed beds. Under this new program each vessel receives a harvest allotment and is required to pay \$1.25 per bushel of oysters removed from the seed beds. (Previously, there was no per bushel fee for seed and only a nominal fee has been charged annually for an oyster dredge boat license). Since the spring of 1996 over 222,500 bushels have been harvested and marketed, with a dockside value of nearly \$4.7 million. This strategy has resulted in a seven-fold better increase in economic return per unit of seed, compared with the rather risky alternative of transplanting these oysters to leased grounds under the prevailing pressure of the Dermo parasite (Appendix 4c). In addition, the direct market program has provided extended employment opportunities for several dozen individuals and has accounted for nearly 1,200 vessel days. Though this strategy has resulted in a significant increase in production, it alone is not an acceptable long-term solution to the problems besetting the industry. Also, because the oysters are marketed directly from the seed beds, they lose the benefits of rapid growth and improved meat quality formerly provided by the leased ground, thus reducing the unit value of the marketed oysters. Further, the period of harvest is necessarily restricted to that window of time which was convenient for simultaneous participation by the entire fleet, thus limiting the ability of the individual oyster producer to appropriately respond to needs of his specific market. To counter these limitations, the strategy of a few operators has been to market part of their allotment directly and to transplant the remainder to their leases where they expect better growth and meat yield. Although the latter is risky because of the high disease activity in the leased ground area, it is instructive that a few individuals are willing to chance it with seed costing them \$1.25 per bushel in the hopes of getting higher prices for their oysters. The new system illustrates the kind of flexibility necessary, in any long-term strategy, to allow each individual to make business decisions that will maximize the return on their own efforts as well as on the public resource.

Other Factors Limiting Production

Unacceptable economic losses due to parasite-caused mortalities are not the only encumbrance to utilization of the oyster production potential of the estuary. An abundant and consistent supply of seed oysters is the *sine qua non* of any culture system. Abundant seed that is regularly and predictably available can greatly mitigate the losses due to predation, parasites, and other uncontrolled causes. Even the success of the recent practice of direct harvest for market from seed beds is dependent upon a chance recruitment of juvenile oysters to the population (Appendix 4c). Lack of a consistent supply of seed has been a long-standing problem for not only the Delaware Bay industry, but for oyster producers in many other areas as well. It is noteworthy that throughout the history of this industry, seed supply has usually been the limiting factor in the output of market oysters (Ford 1997, Appendix 1). The industry has long recognized this limit, and in the past, has compensated for it by importing large quantities of seed. This imported seed was planted on the leased grounds. There have been numerous sporadic attempts to enhance seed production in Delaware Bay. These efforts, however, have met with limited success. During the 1980's, concern for the lack of adequate native seed supplies and the ability to import seed led the industry to create the "Oyster Cultch Fund", presently known as the "Oyster Resource Development Account." The purpose of this fund was to support enhancement programs through the imposition of a landing/harvest fee on each bushel of oysters marketed from the bay. However, financial limitations have led the industry to rely largely on the vagaries of nature to provide this essential component in oyster production. With a few notable exceptions, there has been little initiative directed at enhancement of seed production. Indeed, the general philosophy has tended to minimize the inputs of time and money to enhance the natural processes, yet many producers continue to anticipate a consistent output in the form of harvestable oysters. It is not difficult to see why such a philosophy should persist, considering the fact that periodically there have been years of outstanding recruitment of small oysters, which can sustain long-term commercial output even in the face of adverse conditions (Fegley et al. 1994). However, the presence of the two parasites has drastically diminished the validity of this "opportunistic" approach to resource utilization by reducing the effectiveness of the transplant concept. The persistence of this approach to seed production is perhaps the most insidious impediment to reversing the downward trend in oyster production in New Jersey. Though several of the more progressive members of the industry have expressed support for new approaches to production strategy, resistance to changes in the traditional practices is evident and continues to influence community efforts.

Potential for Recovery/Experience Elsewhere

Although there are differences in the fisheries, the history of the oyster industry in Connecticut is an excellent example for illustrating both the demise and

subsequent recovery of a shellfish industry in the northeast region. From a two million bushel per year output at the turn of the century the industry of that state collapsed to near zero in the late 1960s, due to climatic events and ineffective culture practices on the part of the industry. A change in industry philosophy and operational strategy recognizing that "inputs of well formulated and persistent enhancement efforts" were required to obtain a predictable output, fostered by a revised regulatory structure and a pro-active approach by state agencies, has permitted the industry to recover and become the top producer of oysters on the east coast (Volk 1994; Webster 1997). Specifically, intensive efforts at predator control and enhancement of natural setting by planting large quantities of clean shell in known high setting areas have become standard operating procedures in Connecticut. Growers are charged a fee that is 10% of the market price for seed from public areas; "private" growing grounds are leased to the highest bidder. Proceeds are put back into enhancement programs.

Similar experiences with oyster industry recovery efforts in other areas (e.g.: Pacific NW, Ireland, Prince Edward Island), as well as the outstanding success of recently introduced hard clam culture practices in New Jersey and other east coast states (Mathis and Crema 1994), indicate that the application of innovative approaches has a high probability for reversing the current situation afflicting the New Jersey industry. Except for the greater impacts of the oyster diseases, the biological potential for oyster production in Delaware Bay is as promising as that of Connecticut (Canzonier 1992a). However, it will take a consistent and expanded effort on the part of both the industry and the state to realize that potential.

PROBLEM DEFINITION AND ACTION PLAN

A variety of factors has caused the output of marketable oysters to fall below a level that can sustain the infrastructure and labor base that is required to operate a viable industry and permit it to maintain its position as a key component in national and international markets. Direct government subsidy of such an enfeebled industry has repeatedly proven to be ineffective and economically unjustifiable. Rather, systems in which participants have responsibility for making their own business decisions and which encourage individual initiative have historically made the most substantial contributions to the restoration of failing shellfish industries.

The Task Force has examined many of the impediments confronting the industry in its attempts to increase production. Numerous approaches to overcome these impediments have been examined in detail. Their technical and financial feasibility, as well as social acceptability, have been assessed. The discussions have also considered the legal and regulatory constraints that might impede the efficacious application of these approaches, and the probabilities for short- and long-term success. The deliberations of the Task Force have resulted in a series of recommendations that are presented below in synoptic form, along with a statement of expected results and a set of criteria for judging success.

As deliberations progressed it became obvious that not all members of the Task Force were comfortable with certain of the recommendations formulated by the subcommittees. A number of industry members from outside the Task Force voiced reservations concerning certain recommendations, e.g. leasing above the Southwest Line, when apprised of the Task Force developments. These individuals were quite outspoken regarding those issues that would require substantial changes in management approaches. Several members of the task force also expressed strong reservations about some of the recommendations. Objections, reservations, and public comments have been noted in the report, along with the rationale for the reservation, if this was available.

The recommendations below are presented in outline form. Details of the individual recommendations, including reservations and concerns, are contained in appendices as noted. Though the recommendations have been assessed for feasibility and probability of success, it is not the intent of the Task Force to impose specific courses of action on the industry and regulatory agencies. As stated in its mandate, the role of the Task Force was to identify approaches that can be applied to revitalization of the oyster industry and point out the technical, social and legal constraints that must be eliminated to permit effective application.

RECOMMENDATIONS FOR ACTION

I. Enhancement of Natural Seed Supply (see Appendix 4a for details)

- A. With the due deliberation and consent of the Shell Fisheries Council, intensify effort to apply innovative systems to enhance production of small oyster seed in areas of the Delaware Bay Natural Seed Beds that are known to have typically high setting potential.**

Expected Results: increased and more stable supply of very small seed for transfer to upper seed beds high-survival havens for a period of initial growout; replacement of seed moved downbay as part of a multi-phase transplant program.

Measures of Success:

- ◆ Within one year of acceptance of this document, an initial program designed to collect and move seed on cultch will be publicly funded and scientifically evaluated.
 - ◆ Within one year, a program will be designed and implemented to collect several years of data documenting the growth and survival of seed oysters from various setting areas and moved to growout seed beds.
 - ◆ Within one year, a program will be designed and implemented to evaluate the economic cost/benefit of utilizing known high setting versus other similarly prepared areas.
 - ◆ Within three years, seed from the shelled setting areas will be routinely moved to high survival nursery havens in time to prevent mortality.
 - ◆ Within five years, a management plan that includes preparation of natural setting areas on the Natural Seed Beds will have been developed and the industry will have accepted a role in their preparation and maintenance.
 - ◆ Over five years, there will be at least a 50% per bushel increase per year (on a three year running average) in the set on the high setting prepared areas as compared prepared areas outside of the high setting areas.
 - ◆ Seed supply will be enhanced so that after five years, an average of at least 200,000 bushels of seed per year are moved from areas of high setting to designated nursery areas.
 - ◆ Within ten years, fees collected from the industry will replace public funding of this program.
- B. With the due deliberation and consent of the Shell Fisheries Council, expand the cultch program to areas of extraordinary and consistent setting potential in the lower Delaware Bay for the production of high-density spatting cultch.**

Expected Results: consistency in supply of high density seed (5000+ spat per bushel) for 1) restocking nursery areas in the Natural Seed Beds, 2) transfer to areas where high mortality might be avoided by rapid growth, and 3) sale of small, high quality oysters to specialty market after only 1.5 growing seasons.

Measures of Success:

- ◆ Within four years of establishment of the cultch program, a cultch planting will be initiated with the goal of producing 20,000 bushels of 5000 spat per bushel seed within 3 years.
- ◆ Within two years, appropriate technology will be developed to efficiently utilize this resource.
- ◆ Within two years, a program will be designed and implemented to compare the economic cost/benefit of using the extraordinarily high setting areas in the lower bay with high setting areas on the upper bay natural seed beds.
- ◆ Within ten years, there will be routine use by the industry of this seed as a viable alternative to other less consistent and predictable sources.

II. Development of New Approaches to Transplanting (see Appendix 4b for details)

A. With the due deliberation and consent of the Shell Fisheries Council, enhance the current program of transplanting uppermost oyster seed bed stocks to intermediate locations on the Delaware Bay Natural Seed Beds to foster optimal growth while minimizing mortalities, including consideration of a multi-phase transfer program.

Expected Results: optimized availability of near-market size seed for final growout on lower Natural Seed Beds and/or on leased grounds; increased numbers of oysters available for market.

Measures of Success:

- ◆ Within one year, a program will be designed and implemented to evaluate the economic cost/benefit of the transplanting program.
- ◆ Market oysters from the seed beds will increase from current levels to an annual production of 100,000 bushels (@300 oysters/bushel) by the year 2002.
- ◆ Seed moved from upper bay seed beds to lower bay seed beds will increase from current levels to a level that will support landing of 100,000 bushels (@300 oysters/bushel) by the year 2002.
- ◆ Two bushels of cultch or spatted shell per bushel of oyster removed will be added to the upper seed bed locations used as transplantation sources.

B. Permit the Shell Fisheries Council to designate selected low-salinity areas above the Southwest Line and in rivers and creeks for pilot-scale trials by oyster growers as setting, intermediate transfer, or final growout areas.

Expected Results: development of modern and innovative culture practices; development of areas for wild or hatchery-produced seed.

Measures of Success:

- ◆ There will be a 20% increase in production from the pilot scale trial areas compared to equivalent unimproved public areas.

C. Maintain a full complement of Shell Fisheries Council members by expeditious appointments to both sections.

Expected Results: increased diversity of Council membership; improved decision-making capability of Council.

Measures of Success:

- ◆ Within one month, the Governor will be provided with a list of candidates for the currently vacant seats.
- ◆ Within three months, the Council will have a full complement of members.
- ◆ Appointments to the Council will be made within 60 days of a subsequent vacancy.

D. Encourage the Shell Fisheries Council to use advisory committees to provide expert advice.

Expected Results: improved decision-making capability of the Shell Fisheries Council

Measures of Success:

- ◆ The Council will appoint at least one committee per year to investigate and provide a written report on selected issues.

III. Enhancement of Production Based on Current Practices (see Appendix 4c for details)

- A. With the due deliberation and consent of the Shell Fisheries Council, extend season for Direct Marketing from Delaware Bay Natural Seed Beds, with establishment of appropriate fees.**

Expected Results: maximized yield and value of oysters marketed from the Natural Seed Beds; stabilized year-to-year production; shift from publicly funded resource development and management programs to an industry driven and industry supported system.

Measures of Success:

- ◆ Total direct market harvest will have increased, on average, from 70,000 to 100,000 bushels per year by the year 2002.
- ◆ By 2002, the volume of seed transplanted within the seed beds (see Recommendation I-A) to replenish marketed oysters will have increased to 100,000 bushels.
- ◆ The percentage of Delaware Bay oysters marketed as **shell stock** will demonstrate an increasing trend from current levels of less than 5%.
- ◆ The average per bushel value of the Delaware Bay direct harvest products will increase by 10% per year, until 2002, from the current \$18-20.00 per bushel.
- ◆ Fees collected on greater harvests will increasingly help offset the higher costs of resource enhancement (shell plantings and seed transplants) and stock assessment.
- ◆ The industry participation, as measured in vessel harvest days, in the direct program will increase by approximately 8% per year through 2002.
- ◆ Increase in the number and duration of jobs associated with oyster production.

- B. With the due deliberation and consent of the Shell Fisheries Council, develop a seed bed stock assessment system for the Delaware Bay Natural Seed Beds, with stable funding, that provides an appropriate index of commercially recoverable oysters for market or transplant, assesses the effects of harvest on these stocks, and identifies commercially productive sections of the beds that must be reserved for public use.**

Expected Results: better delineation of seed beds to identify areas with long-term history of commercially exploitable oyster populations, and those areas with a history of little or no production; more appropriate estimates of recoverable available stocks; more accurate projection of potential production; better evaluation of harvest pressures and other causes of attrition in these stocks; more rational assignment of quotas and their acceptance by the industry; better delineation of shell resources in the seed bed area; stable funding for necessary scientific data acquisition.

Measures of Success:

- ◆ Within one year, existing data will have been analyzed to provide the Shell Fisheries Council with preliminary information about potential low-salinity areas that could be used for pilot-scale trials by oyster growers (see Recommendation II B).
- ◆ Within two years, existing data will have been analyzed and used to develop a model for determining harvestable stocks. The model will be re-evaluated every two years.
- ◆ Within four years, industry will be routinely using projected production volumes to respond to market conditions.
- ◆ Within four years of securing funding, the oyster and oyster shell resource of Delaware Bay will have been surveyed, quantified, and incorporated into a Geographic Information System (GIS) format.
- ◆ Yearly funding will be maintained to conduct a quantitative stock assessment program.

IV. Development of Intensive Aquaculture Approaches to Oyster Production (see Appendix 4d for details).

- A. With the due deliberation and consent of the Shell Fisheries Council, experiment with intensive aquaculture techniques that will allow increased industrial use of disease resistant oyster seed stocks and stabilization of seed production.**

Expected Results: use of hatchery seed to determine the seed size and cultch characteristics required for successful use of hatchery-reared disease-resistant oysters in New Jersey coastal waters; development of demonstration programs to evaluate the various nursery and grow out options available to New Jersey oyster aquaculturists; use of hatchery-produced seed to enhance seasonal marketability of select products; modification of current lease practices to provide nursery areas in New Jersey coastal waters to enhance hatchery reared seed production.

Measures of Success:

- ◆ Feasibility studies of techniques for nursery of seed oysters in low salinity waters of New Jersey will be conducted by 2004.
- ◆ Seed oyster nursery techniques at a pilot scale (equivalent to 20,000 bushels of final market product) will be demonstrated by 2006.
- ◆ Hatchery produced seed will provide 20% of the planted seed by 2010 and 40% by 2015 years.

- ◆ Development of a private sector hatchery or hatcheries for the production of oyster seed will occur within eight years of the success of pilot scale seed nursery trial.

**V. Development of Marketing Options and Value-Added Products
(see Appendix 4e for details)**

A. Over the short-term, develop strategies for controlling product flow, opening new product marketing channels, educating consumers about the attributes of New Jersey oysters, and developing name recognition.

Expected Results: more consistent production and demand for New Jersey oysters; product enhancement leading to higher value; development of a specific market name that will become identified with high quality oysters by end users; improved dissemination of information about New Jersey oysters; increased demand for New Jersey oysters.

Measures of Success:

- ◆ Over a three-year period, an increased demand for New Jersey-harvested oysters will develop.
- ◆ Over a three-year period, the demand for shell-stock oysters harvested in New Jersey will develop.
- ◆ Over a three-year period, a decreasing percentage of New Jersey oysters will enter the lower priced shucked market.

B. Over the longer-term, develop value-added products, export and specialty markets, and identify waste-stream recovery strategies.

Expected Results: increased market demand and return to producers of value-added products; increased employment opportunities and tax base in economically stressed areas; increased global market share for New Jersey oysters; development of markets for small, high-quality oysters; development of markets for by-products of shucking; and decreased costs of waste disposal.

Measures of Success:

- ◆ A program to develop value added products from oysters will be instituted within one year.
- ◆ A targeted oyster marketing program will be developed within two years.
- ◆ Specialty markets for small, high quality oysters that can be harvested within two years of setting will be developed within three years.
- ◆ At least three promotions featuring New Jersey oysters will be made at international seafood shows over the next three years.

VI. Financing of Research and Development for Enhanced Production Methods (see Appendix 4f for details).

A. Funding Requirements

Recommendation: It is recommended that there be a short term (3-5 year) increase in the current level of state/private funding to be used specifically for oyster resource management programs to support production enhancement, capacity building within the existing management program and market development with the long-term goal of developing a healthy oyster harvesting/processing/marketing industry along the shores of Delaware Bay. A secondary goal is to increase the proportion of direct industry support of resource enhancement including fees, cash contributions, and in-kind goods/services, in relation to public funding. In addition, sources of federal and other state funding for specific programs, such as Department of Community Affairs, Department of Agriculture and Department of Commerce, will be utilized. To maximize the effectiveness of these efforts, an industry manager who shall answer to the Delaware Bay Section of the New Jersey Shell Fisheries Council will be hired. All activities will be integrated with the provisions of the Aquaculture Development Act.

Expected Results: Initially, increased state/federal funding will be used to prime the pump and foster increased production with the long term goal of developing a sustainable oyster fishery in Delaware Bay. Industry growth will result in a subsequent increase in the proportion of private industry support in relation to state/federal funding. Funds will be targeted toward production enhancement, capacity building within the current oyster resource management program, more intensive management and market development. As the economic health of the Delaware Bay oyster industry improves, it is expected that private industry contributions to support oyster production and the resource management program will increase.

Additional intangible benefits will be provided to the region. The maritime way of life along the Delaware bayshore will be enhanced. A healthier oyster industry will contribute to overall economic improvement in an area that has been economically stressed.

Measures of Success:

Stimulated economic returns will allow private industry to assume a larger percentage of the costs involved in resource enhancement within three to five years.

- ◆ As a result of educational and promotional efforts, new value-added products and new marketing options will be developed.
- ◆ Increased productive acreage will be developed.

- ◆ The industry manager will be hired within one year of the acceptance of this document.

VII. Implementation of Task Force recommendations (see Appendix 4g for details)

A. Under the provisions of the New Jersey Aquaculture Act, a committee appointed by the Delaware Bay Shell Fisheries Council will work closely with the Aquaculture Advisory Council to develop appropriate language that supports the growth of the Delaware Bay oyster industry as an integral component of New Jersey aquaculture development.

Expected Results: revised statutes and regulations that produce maximum flexibility in the management of the oyster industry so as to encourage and facilitate changes needed for its rehabilitation; inclusion of the oyster culture rehabilitation initiative as a major activity of the Aquaculture Advisory Committee, when it is designated; the oyster industry will receive all of the additional benefits provided to aquaculturists under the New Jersey Aquaculture Act; regulations having an impact on the oyster industry will become more business-friendly and will remain environmentally sound.

Measures of Success:

- ◆ Within six months, a committee representing industry, the State Departments of Agriculture, Environmental Protection, Commerce and the Haskin Shellfish Research Laboratory will be appointed by the Shell Fisheries Council and charged with the above task.
- ◆ Within six months of the formation of the committee, sponsorship of new legislation by local and State-level elected officials will be obtained.
- ◆ Legislation recommended by the committee will be drafted, and introduced into the Assembly and Senate within one year after the committee is installed.

B. The Chair of the Delaware Bay Section of the Shell Fisheries Council or his/her designee(s) shall act as a liaison among parties cooperating in the implementation of the Task Force recommendations and to inform the Governor and the Shell Fisheries Council on the progress in achieving the objectives of these recommendations. This individual should be considered for a seat on the Aquaculture Advisory Council.

Expected Results: full and timely implementation of the Task Force recommendations; Governor and Shell Fisheries Council will be kept informed as to the status of the Task Force recommendations and their implementation.

Measures of Success:

- ◆ Within six months, an individual will be appointed to act as a liaison between the Governor, the Legislature, and the Shell Fisheries Council.
- ◆ Programs will be initiated according to the timing recommended in the Task Force Report.

Appendix 1

HISTORY AND PRESENT STATUS OF OYSTERING IN DELAWARE BAY

HISTORY AND PRESENT STATUS OF OYSTERING IN DELAWARE BAY

excerpted from
History and present status of molluscan shellfisheries from Barnegat Bay to
Delaware Bay.
By S. E. Ford

in

The History, Present Condition, and Future of the Molluscan Fisheries of North and Central America and Europe Vol. 1, North America (MacKenzie, C.L., Jr., V.G. Burrell Jr., A. Rosenfield and W.L. Hobart, Ed.) pp. 119-140. U.S. Department of Commerce, NOAA Technical Report NMFS, Seattle, Washington, 1997.

Development of an Industry: Colonial Era to mid 1800s

Oysters grow in Delaware Bay from its mouth to Bombay Hook, on the western (Delaware) side of the estuary, and to just below Artificial Island on the eastern (New Jersey) side, a distance of about 80 km (50 miles) along a salinity gradient that decreases from about 30 to 5 parts per thousand (ppt) (Fig. A1-1). Oyster beds are more numerous on the New Jersey side, not only because it has greater area, but because a net inflow of water on the eastern shore, as well as prevailing westerly winds, tend to concentrate larvae on the New Jersey side. The industry on the New Jersey shore has always been much larger, producing an average of four times as many oysters and often attracting more attention than the Delaware industry.

Thomas Campanius Holm, an early Swedish settler, wrote in 1642 that Delaware Bay oysters were "so very large that the meat alone is the size of our oysters [*Ostrea edulis*] shell and all" (Ingersoll, 1881). A chart drawn by another Swede, Peter Lindstrom, between 1654 and 1656 showed the entire Delaware shore lined with oyster beds, as well as a large bed extending west from Cape May Point in New Jersey (Miller, 1962). Oysters from the bay were an important food source for early Dutch and Swedish colonists, and the establishment of British settlements along the bayshore later in the 1600s, especially the growth of Philadelphia as the region's largest city, fostered the beginning of commercial harvests. By the 1750s, fresh oysters from Delaware Bay were being shipped to Philadelphia and New York (Smith, 1765), and pickled oysters, to the West Indies (Miller, 1962). The earliest oystermen were also farmers who probably gathered oysters from inshore areas using small boats and tongs; however, sloops and schooners capable of harvesting oysters from deep-water beds were built on the Cohansey River at Greenwich in the 1730s (Rofls, 1971), and a 1777 map of New Jersey shows a large area of oyster beds offshore from Ben Davis Point.

During the late 18th century, seed oysters from Delaware Bay were being sent to Connecticut and Massachusetts for growout and subsequent marketing in New York City and Boston, respectively (Ingersoll, 1881; Kochiss, 1974). Early in the 19th century, the oyster dredge was introduced into Delaware Bay by the northerners because they wanted a more rapid and efficient way than tonging of gathering large quantities of seed (Miller, 1962). In response to the influx of out-of-state boats, Delaware enacted legislation entitled "An Act for the Preservation of Oysters, Terrapins and Clams" in 1812, which restricted the taking of these species to residents of the state. There was little public support for, or enforcement of, the legislation, however, or for subsequent laws passed in the 1830s, which prevented the taking of oysters during their reproductive period, from 15 May to 15 August (Miller, 1962).

Oystering was becoming more profitable: records of the duPont household from 1828-1842 show that a bushel of oysters cost \$0.50 and a quart of shucked oysters



Figure A1-1: Delaware Bay showing location of natural seed beds (black) and delineation of the leased grounds. SWL = Southwest Line.

was \$0.25 (Miller, 1962). Interest in the growing industry by outside investors led to the founding of the "New Jersey-Delaware Oyster Company" in 1825 (Hall, 1894). Its purpose was to improve the industry and protect the natural beds, but shareholders soon grew dissatisfied with incompetent management of the company and litigation resulted in its eventual dissolution. The existence of an important oyster fishery in the bay was acknowledged by the State of New Jersey in the "Act for the preservation of clams and oysters", passed in 1846, which specifically exempted Delaware Bay from a statewide prohibition against the use of dredges (Bacon, 1903).

Although dredges were then operated entirely by hand, they had already made a major impact on natural beds, destroying their critical reef-like (i.e., vertical) nature. As described in Watson's Annals of Philadelphia written in 1843 (Ingersoll, 1881), this outcome was considered beneficial at the time:

"...that our fields of oysters [i.e., Delaware Bay seed beds], notwithstanding their constant delivery, are actually on the increase, and have been augmenting in extent and quality for the last thirty and forty years. This fact...is said to be imputable to the great use of the dredging-machines, which, by dragging over a greater surface, clears the beds of impediments, and trails the oysters beyond their natural position, and thus increases the boundaries of the field."

The Industry Develops: 1850 to 1900

When oysters were first harvested commercially in Delaware Bay, they were transported directly to Philadelphia by the same boats that caught them. During this era Philadelphia businessmen controlled most of the industry's commerce. After the opening of the Chesapeake and Delaware Canal in 1829, Delaware Bay oysters were shipped to Baltimore where they were shucked and canned fresh for shipment west (Miller, 1962). Several canning houses opened in Delaware starting around 1840; however, Philadelphia was still the major oyster marketing center in 1880, when Ingersoll (1881) estimated that 2,700,000 bushels were either consumed in the city or shipped west.

In a continuing attempt to preserve the resource, both New Jersey and Delaware passed legislation that promoted oyster planting in the Bay (reviewed by Ingersoll, 1881). In 1856, the state of New Jersey granted the Board of Freeholders of Cumberland County, which bordered the rich oyster growing area south of Egg Island Point known as the Maurice River Cove, the right to "occupy" that section of the bay from Egg Island Point to East Point and out to the ship channel (Fig. A1-1), to survey and map the area, and to lease 10-acre plots to the highest bidder for periods up to five years to "promote planting and growth of oysters". Numerous natural beds existed in the lower bay at that time and planting was forbidden on them. In addition, oyster boats were assessed a license fee, with the collections paid into an "Oyster Fund", administered by several oyster commissioners, who were expected to enforce the oyster laws and prevent theft. Neither this act, nor the earlier law of 1846, however, provided any effective means for their enforcement.

The oyster industry grew rapidly after the Civil War and as pressure on the resource increased, both states were forced to remedy defects in enforcement of shellfish laws.

New Jersey enacted legislation in 1871 that created the "Maurice River Cove and Delaware Bay Oyster Association" and vested it with regulatory and law-enforcement powers. This group, made up of captains and owners of all licensed oyster boats, collected lease and boat license fees that were deposited into the "Oyster Fund" and used to hire a watch boat and crew to patrol the planting grounds. As all members of the Association had a vested interest in the oyster industry, it was expected that they would faithfully enforce laws protecting it. If the fund exceeded \$2,000 at the end of the fiscal year, the surplus was to be used in support of state schools. Not surprisingly, in 1894 Hall (1894) found that no funds from this source had ever been deposited in the state treasury.

Across the bay, the State of Delaware was also trying to protect and encourage its oyster industry. In 1871, the oyster grounds were officially divided at Port Mahon (Fig. A1-1) into upbay public beds and downbay planting grounds (Miller, 1962). This was followed in 1873 by an act permitting any person to lay out and stake up a 1-acre plot of bay bottom for planting (Ingersoll, 1881). It also provided for larger plots, up to 15 acres, termed "Oyster Plantations," which were leased from the state. Plantings could not, however, be made on an existing natural bed. In contrast with New Jersey, funds collected from vessel licenses and ground lease fees were paid directly to the State of Delaware, which administered and regulated the fishery.

On both sides of the bay tensions arose because of the division between privately leased grounds and natural seed beds, which remained in the public domain. During the 1880s and 1890s, perceived encroachment on the public beds by several planters who obtained riparian grants extending 0.8 km (0.5 miles) into the bay along a 10-km (6-mile) section of the New Jersey seed area just above Egg Island Point, precipitated a bloodless "oyster war" (Hall, 1894). A series of forays by oystermen on the riparian grants were designed to force a legal settlement of claims that the riparian grants infringed on the natural oyster beds. The conflict culminated in the arrest of more than 30 persons after a raid in April 1894 (McCay, 1998). Subsequent court cases found that merely planting shells or oysters did not qualify as an "improvement" to the grant, which was a necessary condition for maintaining exclusive use of a riparian claim. Thus, the raiders were exonerated and any oysters on the riparian grants were considered common property. The grants themselves were eventually repurchased by the state (New Jersey Bureau of Shellfisheries, 1905a), which re-emphasized the principle that the oyster seed beds were part of the "public trust":

" These oyster beds are the natural heritage of all the people of the State, and should be forever preserved and kept sacred to the free public use of the inhabitants of the State..."

The growth of the oyster industry in the Maurice River Cove and the apparent effectiveness of the 1871 legislation was described the following year by a resident of nearby Port Norris (Mints, 1964):

"Our oyster business now seems to be in a safe and sound condition. The special officer, Mr. Gilbert Compton, with the assistance of the oystermen, has purchased a steamer, which cruises the bay and cove very greatly to the terror and annoyance of the Philadelphia oystermen, and....we can see the boats hanging off our reach and we presume longing with wishful eye after our oysters, but the presence of the steamer in the bay bodes to them an ill omen, bearing the inscription, "Thus Far Shalt Thou Come and No Farther". We calculate the Philadelphians will get tired of risking their boats to the tender mercies of the New Jersey Oyster law, and will either become residents of our state, or put their boats in command of those who can employ them legitimately, for the faithful watch kept by our steamer during the season will break up a business that must prove unprofitable, and thus reassure our oystermen of permanent and sure protection. Our oystermen are engaged in planting in greater quantities than ever before but the great and increasing demand for cove oysters, we expect to have ready for sale all we have the capacity for producing. We anticipate the establishment of a large and profitable oyster market at our town."

This letter was written in the same year (1872) the railroad was extended to Port Norris and the neighboring port of Bivalve (then called Long Reach) on the Maurice River (Fig. A1-1). After the railroad was established, the writer's forecast came true: both Bivalve and Port Norris became "boom towns." Railroad tracks, four abreast, paralleled the River at Bivalve where the railway companies built shipping offices on the waterfront. A second rail line ran to the smaller port of Maurice River directly across the river from Bivalve. Oysters could be moved easily from dockside to boxcars waiting a few meters ashore. When Ingersoll (1881) visited the area in 1879-80, the railway was still new and he estimated that of the 1,600,000 bushels sent to market from the New Jersey grounds, only 100,000 went by rail; the rest were carried by ship directly to Philadelphia, some 115 km (70 miles) up river. Soon, however, captains were attracted to the new port adjacent to their oyster beds. In 1882, Lockwood (1882) predicted that

"The whole market will soon be at Port Norris, where there are no wharfage, no commissions, and no expenses of any kind, the captain selling his own cargo. A large proportion of the boats now running to Philadelphia would not go if not owned there."

Gradually, the New Jersey industry moved from control by Philadelphians into the hands of in-state residents. By 1888, most of the harvest was shipped by rail (Nelson, 1889). Oysters harvested from Delaware waters continued to go by boat to Philadelphia or across the bay to Port Norris or Greenwich (Fig.A1-1), where they were shipped by train to Philadelphia (Ingersoll, 1881; Hall, 1894). Unlike New Jersey, the coastal railroad in Delaware served primarily to transport salt hay and agricultural produce.

When Ingersoll (1881) visited Delaware Bay in 1879-80, there were already nearly 1,400 vessels (about 300 of them sloops and schooners greater than 5 tons) and 2,300 men employed in taking oysters from the estuary. As is the case today, the majority of these vessels were doubtlessly used just for gathering seed oysters in the spring, when the goal was to obtain as many oysters as possible during an 8-10 week period. Fewer boats were required to harvest oysters for market because it was done over a longer period. The sailing vessels were operated by captain-owners and crews of 5-6 men, who were paid by shares or cash wages and earned from \$240 to \$500 per year plus board while they were on the boats. In 1879-80, Ingersoll estimated that 1,600,000 bushels were harvested from the New Jersey side (about half of the total New Jersey harvest) and 300,000 bushels from the Delaware side.

Rarely Enough Seed for Planting

In contrast to areas around New York Harbor and New England, where oyster planting with out-of-state seed developed because natural beds were depleted, seed planted on leased grounds in Delaware Bay came from creeks and upbay beds within the bay itself. The practice of planting arose because oystermen discovered that oysters in the lower estuary grew faster and attained a better meat quality than did those taken from the upbay beds and lower salinity creeks. A natural division arose between the planting grounds and the upper bay seed beds, where low salinity protected the young oysters from major predators. Restricted seed-dredging seasons in Delaware and New Jersey legislation of 1835 and 1846, respectively, were intended to preserve the beds. The New Jersey law also contained a rough cull provision. Delaware enacted a similar measure in 1873, but it applied only to creeks and rivers. As a matter of fact, to foster road improvement in Kent County, which borders most of Delaware's oyster grounds, it became mandatory in 1875 for oystermen to "land and deposit their oyster-shell on shore [for road repair] and [it was] unlawful to empty or throw such shells into the water...". Two years later, in 1877, the New Jersey rough cull law applying to Delaware Bay was repealed. Hall (1894) reported that, "According to the oystermen, the number of bushels of shells annually taken from the beds during the planting season considerably exceeds that of the oysters." The shells were frequently covered with spat, however, which "if they live, will in time grow to marketable size." Also, shells were valuable on the leased grounds because they stabilized otherwise soft sediments. Nevertheless, continual removal of cultch over the next quarter century surely hastened the deterioration of public beds, a condition stressed in all reports of the period.

Delaware Bay, with its expanse of seed producing and planting areas, favored the growth of sizable companies, which could afford capital investment in large dredge boats, much more so than did the Atlantic coast, where tonging was the only legal means of catching seed and where small boats could operate safely in all areas. However, not all Delaware Bay oystermen owned vessels big enough to transport seed oysters in quantities needed for planting. To accommodate smaller oystermen who wished to continue marketing wild seed, certain areas in creeks and

rivers, or at their mouths, were set aside. Dredging was prohibited, but enforcement was lax. During the 1880s conflicts between tongers and dredgers in Delaware became violent as pirate dredge boats stole oysters from both the tongers and private planters (Miller, 1962). Until MSX disease put them out of business, many small dredge boat operators and tongers sold seed oysters to the larger planters, who stationed "buy boats" in the creeks adjacent to the natural beds during the seed dredging season. Tonger's beds still exist, although in the last 35 years many have become silted over.

Although the natural beds of Delaware Bay produced large quantities of oysters during the 19th century, the demand was frequently greater than the supply, and oystermen began importing seed from the Chesapeake. From the first year of its operation in 1829, records of the Chesapeake and Delaware Canal indicate large quantities of oysters being moved in the direction of the Delaware. During the 1830s, an average of 150,000 bushels per year passed through the canal. Each decade thereafter, the volume increased until during the 1880s, it averaged nearly half a million bushels a year. In fact, Ingersoll (1881) estimated that in 1879-80, the total was nearly 940,000 bushels, 700,000 of which were destined for planting in the bay and the remainder for market in or through Philadelphia. Nelson (1889) commented that although the New Jersey seed beds yielded an estimated 1,250,000 bushels in 1888, "the cry is more seed".

Over the next 70 years, imported seed continued to supplement the native supply in Delaware Bay. Originally, most came from the vast James River seed beds in Virginia or from the Maryland beds in the upper Chesapeake. Alarmed at the drain on its resource, Virginia banned the practice, and by 1900, the newly appointed Oyster Commissioners in New Jersey reported that Virginia seed was becoming scarce and expensive because Virginia was "stepping up enforcement" of the ban. Some seed was then brought from Long Island (Nelson, 1934), and in the early 1950s, hundreds of thousands of bushels were imported from the seaside bays of Virginia, especially Chincoteague Bay. The practice ended shortly after the outbreak of MSX disease in 1957, when all imports and exports were banned.

The Boom Years: 1900 to 1930

For nearly 30 years beginning in 1871, the administration and policing of industry on the New Jersey side of the bay remained entirely in the hands of oystermen themselves. Hall (1894) was convinced that "the means for enforcing the law [are] so efficient, that...offenses are seldom committed". Nevertheless, many of the larger growers were less enchanted and petitioned the state to assume the responsibilities of the Oyster Association. Their efforts were eventually successful, and in 1899 the state took control of the industry and all of the oyster growing areas in Delaware Bay. Many of the measures enacted in previous legislation were reiterated in the act of 1899, but supervision of the industry and enforcement of the law were placed in the hands of a 3-member Oyster

Commission, all of whom were industry members appointed by the Governor and who now had the full force of the State behind them. The Commission was replaced by a Board of Shellfisheries and eventually by the Shell Fisheries Council. This latter council has been divided into the Atlantic Coast and Delaware Bay sections. The Shell Fisheries Council's members are appointed by the governor and have exclusive authority to lease subtidal areas in the coastal estuaries for shellfish cultivation. The primary function of this Council is to advise the Commissioner of the Department of Environmental Protection on resource and regulatory matters affecting the shellfish industry in this state.

The long-recognized division between upbay seed beds (now to be managed by the state) and lower bay planting grounds (now to be leased and patrolled by the state), was officially acknowledged in the 1899 act. By this time, natural seed beds existed only in the upper bay and most of the lower bay was available for planting (Fig. A1-1). Seed dredging was to occur between 1 April and 15 June (in 1905 this was changed to 1 May to 30 June) and came to be known as "Bay Season." Of major importance was reinstatement of the rough cull law, which mandated that no more than 15%, by volume, of material removed from the beds could be shell.

On the Delaware side of the bay, division between leased grounds and natural beds had occurred 30 years earlier, in 1871, but "clarifying" legislation continued, much to the confusion and dismay of the oystermen, over the next decades culminating, in 1909, in the establishment of a Shellfish Commission to foster oyster interests (Miller, 1962).

The industry prospered during the early years of this century, helped according to New Jersey officials, by the new legislation, especially the rough cull law (New Jersey State Oyster Commission, 1901; Commission for the Investigation of the Oyster Industry of New Jersey, 1902; New Jersey Bureau of Shellfisheries, 1905a and b). For several years, the state bought shells and returned them to the seed beds where they caught a series of good sets and provided large quantities of native seed. The total leased acreage increased from 12,000 acres in 1900 to nearly 30,000 acres by 1914. More and larger dredge boats were added to the fleet, which reached a peak of nearly 7,700 gross tons in New Jersey in 1929. At that time, 247 vessels larger than 5 gross tons, and averaging 31 gross tons, were licensed for oystering in Delaware Bay. Most vessels were between 10 and 25 m (30-80 ft) in length. Of these, 77 operated exclusively under sail and 177 were motorized, although the latter also carried sails (Fiedler, 1932). Power dredging had been legalized on the New Jersey leased grounds around 1905 (New Jersey Bureau of Shellfisheries, 1905a), but sail was still the only permitted method of gathering oysters on the seed beds. The number of men working on each boat varied with vessel size; however, about 2700 men were employed on New Jersey's Delaware Bay dredge boats in 1930 (Fiedler, 1932), giving an average crew size of about 11. In Delaware, 16 vessels, averaging about 20 gross tons were licensed. Ten were sail boats and 6 operated under power. Ninety men were employed on the dredge boats, for an average crew size of just 6 (Fiedler, 1932).

Floating and Shucking

The growth of the Delaware Bay industry was built largely on marketing oysters in the shell, although the practice of shucking oysters was already well established in other areas (Ingersoll, 1881; Kochiss, 1974). A crucial element in the marketing process involved placing oysters in floats in brackish water for one or two tides during which they "cleansed" themselves of mud and debris, and repaired minor dredge-caused shell damage, before rail shipment. They also added about 20% to their meat volume by uptake of water (Nelson, 1911). Floating made the oysters better able to survive their long rail voyages, and was widely practice along the mid-Atlantic, including the Maurice River at Bivalve (Ingersoll, 1881; Nelson, 1911; Kochiss, 1974). By 1905, public health officials were becoming alarmed at the consequences of allowing oysters to be immersed in waters near population centers. The newly created U.S. Food and Drug Administration was also concerned that the uptake of fresh water resulted in an adulterated product. The floating practice was banned in 1909. However, pressure from oyster interests, including those in New Jersey led by Julius Nelson (1911), resulted in an amendment that allowed floating "in waters of sufficient salinity to permit oysters to grow therein" with the proviso that they could be placed in lower salinity as long as the product was labeled "Floated Oysters". At the same time, legislation was enacted to stop polluting water that affected oyster beds. Bivalve, on the Maurice River, with its burgeoning population and primitive sanitary facilities, was an obvious target for the new law, and members of the Oyster Association took it upon themselves to clean up the town, including diverting a drainage ditch and moving 50 families away from the wharf area (New Jersey Bureau of Shellfisheries, 1911).

Floating resumed at Bivalve, but was permanently banned in 1927 after a typhoid outbreak in 1924 was traced to New Jersey oysters (Nelson, 1929). In 1922, the first shucking house was established in Bivalve and several others quickly followed (Mints, 1976). Over the next few years, the ban on floating pushed the remainder of the industry to shucking. Ironically, the shucking process, in which meats are washed in fresh water, increases the packed volume and adds more to the value (i.e., weight) of shucked meats than it does to oysters shipped in the shell. Another benefit of this system was that shells remained near the shucking houses where they could conveniently be returned as cultch to the public beds or private grounds. After floating was abandoned, most oysters marketed from Delaware Bay were shucked, although recently the marketing of carefully culled, high-value shell stock has resumed to supply restaurants on the U.S. east and west coasts.

Initial Decline: 1930 to 1957

From 1880 until 1930, Delaware Bay oyster production ranged between 1 and 2 million bushels annually (Fig. A1-2). On the New Jersey side, this represented 54% of the state's production in 1880 and 90% by 1930, as the once productive industry on the coast, especially Raritan Bay, fell into decline. After 1930, production remained fairly steady at about 1,000,000 bushels a year until 1957. It is not entirely clear why harvests declined around 1930. Failure to return shells to the

seed beds was reducing harvests in Delaware (Miller, 1962), and drought early in the decade allowed predatory oyster drills, *Urosalpinx cinerea*, to move upbay onto the seed beds. An equally important factor may have been loss of markets and frozen credit during the Depression, which made it difficult for planters to maintain their large vessels (Nelson, 1934). In fact, between 1929 and 1936, the number of licensed vessels fell nearly 60%, from 247 to 103. Lack of credit may also have reduced purchases of seed from other states so that planters were relying more heavily on Delaware Bay seed beds, which, despite drill predation, still produced between 800,000 and 1,000,000 bushels per year during the 1930s (Fiedler, 1931, 1932, 1934, 1936, 1938).

Another important change came to the industry during the 1930s. As roads improved, trucking began to replace rail as the preferred method for shipping oysters. By 1946, the changeover was complete and the railroad ceased transporting oysters from the Maurice River ports.

Despite repeated legislation to protect the resource, overharvesting of seed beds was a chronic problem in Delaware Bay. Some of the New Jersey beds nearest to the leased grounds, where both seed dredging and oyster drill predation were heaviest, had ceased production by 1900 (Commission for the Investigation of the Oyster Industry of New Jersey, 1902). The rough cull law was poorly enforced in Delaware and deterioration of the seed beds was accelerated during World War II when the requirement for sail dredging was eliminated in both states. Sailing gear was removed from the sloops and schooners, and replaced by engines. Motorized boats were much more efficient at harvesting seed: they could be operated in most weather, and could dredge in smaller and shoaled areas. By 1946, the seed beds were in such poor condition that the New Jersey oyster planters themselves co-sponsored, with the Department of Conservation, an act requiring that they return to the seed beds, at their own expense, 60% of all shells from oysters originating on the beds. During that year, they replanted nearly 500,000 bushels of shells. Subsequent legislation reduced the requirement to 40%, and in 1979, eliminated it completely, the rationale being that the natural death rate of oysters on the beds contributed far more shell than could the oystermen. During the past several decades, shell planting has been limited in quantity and sporadic at best.

During the 1940's and 1950's the industry was beset with severe resource problems. During this period the seed stocks apparently suffered from unexplained mortalities (Miller, 1962) and a series of set failures. These phenomena left the natural beds in a condition that had never before "been so uniformly bad for so long a period as at present." It was also reported at the time "that the present oyster population of the Natural Beds represents an all time low." Only continued importation of seed from Maryland and Virginia allowed the industry to market the average one million bushels per year that it did until 1956. In response, both the University of Delaware and Rutgers University began studies of factors influencing seed bed recruitment. Rutgers' Department of Oyster Culture, under Harold Haskin, collected data on larval abundance, setting, survival, and harvests annually between 1954 and 1991. These showed that a major influence on recruitment was

the amount of fresh water entering the upper estuary. During periods of low river flow, which existed from the start of the study until the late 1960s, predators, primarily the oyster drill, moved onto the lower seed beds (below Ben Davis Point) and destroyed newly set spat shortly after they set. Beginning in 1968 and continuing for a dozen years, however, Delaware River flows returned to, or exceeded, the average. Oyster drill numbers diminished on the lower seed beds allowing spat to survive, and those areas began a return to productivity.

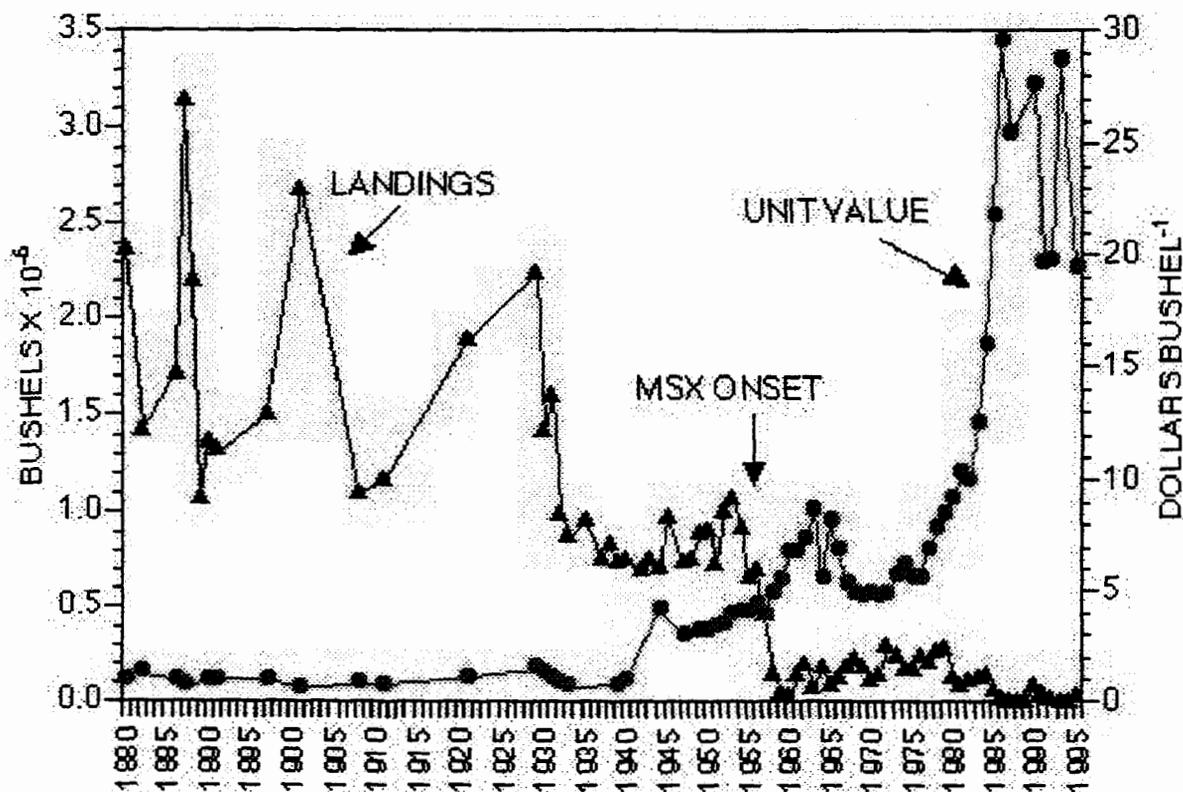


Figure A1-2. Reported landings of oysters in New Jersey. Since 1930, nearly all oysters harvested have come from Delaware Bay.

In 1972, the entire Delaware Bay received a tremendous oyster set. Oysters were plentiful even on beds that had been out of production for at least 50 years, and oystermen remarked that it was the best set anyone could remember. This and subsequent good sets over the next dozen years sustained the industry from 1973 through 1985, when seed harvests from the New Jersey beds averaged 370,000 bushels per year. From 50-60 vessels, nearly all of them former schooners 12-25 m (40-80 ft) in length, averaged 400-500 bushels per day each during a 4-week

season. The average vessel's catch from the Delaware seed beds was 300-600 bushels per day, totaling about 40,000 bushels annually. Daily per vessel catches was similar to Ingersoll's (1881) estimate of about 400 bushels in 1880. Major differences, of course, were that all vessels operated under sail in 1880, the season lasted 10 weeks, 300 boats participated in the harvest, and an estimated total of about 2,500,000 bushels was caught.

MSX - Devastation and Recovery

In 1957, the oyster industry suffered its most serious blow yet. That spring, heavy mortality was discovered in oysters planted the previous year on the New Jersey leased grounds (Ford and Haskin, 1982). The cause, soon discovered to be a protozoan parasite, had never been seen before. It was initially given the acronym "MSX", standing for "multinucleated sphere unknown" and was later classified *Haplosporidium* (formerly *Minchinia*) *nelsoni* (Haskin et al., 1966). The parasite spread rapidly over most of the bay, limited only by the fresher waters of the creeks, rivers, and upper bay (Haskin and Ford, 1982). By the end of 1959, 90-95% of the oysters on the planted grounds and about half of those on the seed beds had died. The coastal bays were also hit and the industries in New Jersey and Delaware were devastated. Their combined harvest fell from 711,000 bushels in 1956 to only 49,000 in 1960 (Fig. A1-2).

Gradually, the industry rebounded as the seed beds recovered in the late 1960s and early 1970s, and native oysters developed some resistance to MSX disease as a result of natural selection (Haskin and Ford, 1979). Changes in planting and harvesting practices added to the recovery. Before MSX, the seed oysters planted were very small, with as many as several thousand to the bushel. They remained on the leased grounds for 2-4 years before harvest. Predation by oyster drills was high, and the growth of surviving oysters just balanced the volume lost to predation and other causes of natural mortality so that the long-term average was one bushel of oysters marketed to one bushel of seed planted (Ingersoll, 1881). When planting resumed after the MSX epizootic, and for a dozen years thereafter, the ratio remained 1:1, even though the disease persisted on the lower bay planting grounds (Haskin and Ford, 1983). This was achieved because planters learned to avoid areas of high disease activity in the lower bay, and they sought seed oysters large enough to plant and market after only a single growing season, which minimized the time oysters, were exposed to infection.

The extent of the post-MSX recovery is not reflected in the landing figures of the period, which show that, starting in 1974, less than half of the seed planted on the New Jersey grounds was brought to market. Mortality rates for the transplanted oysters, which were being monitored by the Rutgers Laboratory, showed no evidence of an increase in disease activity that could explain this change. In addition, the seed versus market ratio remained 1:1 in the Delaware fishery. Both seed planted and oysters marketed are closely monitored in Delaware by personnel from that state's Division of Fish and Wildlife (Haskin and Ford, 1983). Haskin and Ford (1983) hypothesized that the discrepancy, which coincided with a return to

profitability of a business that had been in severe depression for 15 years, was due to substantial under-reporting of oysters marketed by New Jersey planters. In fact, the quantity of oysters marketed from the New Jersey side of Delaware Bay between 1973 and 1985 was probably close to the volume of seed planted, or from 300,000 to 450,000 bushels per year. Although that was less than half of the pre-MSX average of about 1,000,000 bushels, it was based entirely on native seed, whereas nearly half the seed planted in the 1940s and early 1950s is estimated to have been imported.

During the 1970s and early 1980s, at the peak of the post-MSX recovery, 50-100 boats with an average weight of 31-34 gross tons, were licensed for seed dredging in New Jersey each year. At the same time, 6-12 boats were operating in Delaware. Most of these vessels were used solely to catch seed oysters during the short spring Bay Season. On any given day during market season, only 10-15 boats might be operating. When a planted ground was first dredged in the fall, the large vessels typically caught 600-700 bushels. The ground would be "worked" until the yield decreased to 50-100 bushels a day. Oysters were marketed from leased grounds from 1 September through the end of June until 1975 when year-around harvesting was legalized in New Jersey. The change permitted oystermen to harvest oysters within two months of planting and thus to reduce exposure to potential MSX infections.

An important change to the oyster boats occurred in 1975. Two New Jersey planters, Luther Jeffries, Jr. and Robert Morgan, Jr., built an automated culling machine and within 2 years, culling machines were installed on nearly every dredge boat. The machines operate by moving shells through a drum with sides of evenly spaced bars, or along a slotted conveyor belt. Shells fall through the spaces or slots and are directed overboard whereas the oysters are retained aboard. Before the advent of culling machines, crews of up to 10-14 men were required on each vessel during Bay Season to cull. Culling machines have made it possible to operate even the largest vessels with only a captain and one or two deck hands. Deck hands typically earn \$100-\$125 per day and captains may make as much as \$300 daily.

New Jersey vessels plant seed oysters on leased grounds that ranged in size from 10 to 60 acres, generally at the rate of 1,500-2,000 bushels per acre. Because losses to MSX disease are highest downbay, only about 2,000 acres at the upbay edge of the leased area have been regularly planted for the past 30 years. In 1981, a new planting area was established adjacent to some of the lower seed beds. Area E, as it is called, was set up to allow leasing in a section of the bay even farther removed from high MSX disease activity. Plantings in the new area were not as successful as expected, partly because the opening of Area E coincided with drought and a movement of MSX upbay, and partly because the substrate on many of the new grounds was too soft to support oysters.

Companies continue to lease ground downbay. Some of these grounds were several hundred acres in size and received occasional natural sets. These leased

grounds were also used for dredging blue crabs, *Callinectes sapidus*. Ten packinghouses operated in and around Bivalve in 1977, each employing 15 to 150 people as shuckers or on dredge boats harvesting market oysters. The total for all houses was about 400 employees. Some individuals worked for more than one company, however, so that the true number persons employed was less than 400, although available records do not permit determination of exact numbers.

Although harvests did not equal those of pre-MSX years, it must be emphasized that they were based entirely on native seed. Further, it is probably unrealistic to think that annual seed harvests exceeding 1,000,000 bushels, as was reported in some years, could be sustained indefinitely. Before about 1955, each time the seed beds received a heavy set it was dredged out within 2 or 3 years during an 8-10-week season. The strategy in recent years has been to make sets last as long as possible by restricting the season to 3 or 4 weeks and by closing beds when the volume fraction of oysters on them nears 40%. With this plan, the vast 1972 set, added to by good sets in several succeeding years and the closing of the seed fishery to new vessels in 1980, lasted the New Jersey industry until 1985.

Weather and Parasites Cause More Problems

In 1985, after 15 years of modest prosperity, the oyster industry in Delaware Bay suffered another setback. Severe drought accompanied a resurgence of MSX disease. High mortalities affected planted and seed oysters over the next 2 years. Recruitment to the seed fishery decreased and the low numbers of oysters on the beds caused the Shellfish Councils of both states to close them to dredging beginning in 1987. The condition of the beds improved over the next few years and when the New Jersey beds were reopened for two weeks in 1990, 160,000 bushels of seed were planted. The following year, the beds produced 290,000 bushels in three weeks, the best weekly yield in a decade.

In 1990, however, a new problem surfaced when the southern oyster parasite, *Perkinsus marinus*, cause of Dermo disease (Andrews, 1988), was found in several locations on the New Jersey side of Delaware Bay (Ford, 1996). By 1991, it had spread over much of the eastern bay, causing heavy losses of planted and seed oysters. This was not the first time that *P. marinus*, usually restricted to waters south of New Jersey, had been in the bay. During the 1950s, large numbers of oysters from the Virginia portion of Chesapeake Bay were imported. They were infected with *P. marinus*, which spread to adjacent native oysters. Despite this massive introduction of a highly contagious disease organism, no mortalities were reported and the disease effectively disappeared after imports were banned in 1959. It was concluded that temperatures in Delaware Bay were not warm enough to support the parasite without continued introductions (Ford and Haskin, 1982); however, it is likely that the parasite persisted at very low levels and proliferated beginning in 1990 during a period of record high temperatures. Interestingly, as of spring 1995, only a few cases of the disease had been detected on the Delaware side of the bay, although it has been found since 1991-92 in New York, Connecticut, and Massachusetts (see Ford and Tripp, 1996). The relative scarcity of oysters to

serve as hosts and the more rapid flushing on the Delaware side may be responsible. Also, shucking house wastes from Chesapeake Bay and Gulf of Mexico oysters processed in Bivalve may have contributed to the New Jersey problem.

There is currently one shucking and one packing house, with combined employment of about 50, operating in Bivalve. Because of the decline in oyster production from Delaware Bay, they process mostly of out-of-state oysters, especially those from Connecticut. Many oysters are packed in the shell for shipments to seafood markets and restaurants as distant as California. Oysters marketed in this way are generally served raw on the "half shell". Shucked oysters are sold by volume (half pints to gallons) for stews, frying, or to make scalloped oysters. Shuckers are currently paid \$1.00 for each pound (~1 pint) of oyster meat they shuck.

A number of smaller oyster planters have gone out of business since 1985, selling their boats to the larger remaining companies. The largest New Jersey company owns 13 vessels. Half a dozen smaller companies and individuals own 3-6 boats each. About half of the license holders own just one boat. Several large companies lease planting grounds covering 2,500-3,500 acres each, but most individuals and smaller companies each lease a few grounds totaling up to several hundred acres. The annual lease fee is \$0.50 per acre in New Jersey and \$0.90 in Delaware. New Jersey imposes a \$0.70 tax on each bushel of oysters taken to market from leases; the figure in Delaware is \$0.15.

The Future

The Delaware Bay oyster industry faces an uncertain future. The seed beds in both states have been closed for 6 of the 11 years between 1987 and 1997 because of disease-caused losses and relatively poor setting. The consequent lack of harvestable oysters has resulted in loss of skilled shuckers; a deterioration of boats, wharves, and buildings; and a diminished market for local oysters. In addition, the oysterman must contend with normal uncertainties: fluctuations in the national economy, competition for markets from other regions of the country, and variation in meat yields. One bright spot is the sharp increase in prices over the last few years (Fig. A1-2).

The presence of the two oyster diseases makes planting of oysters in the lower bay very risky. In response to the disease problem, New Jersey initiated a new strategy to mitigate the consequences of the diseases on production. In 1995 New Jersey began to direct market oysters from the seed beds in the spring and the fall of the year. It has been the predominant method of oystering since 1996. For the past few years, each licensed vessel has received a quota of 1,000 - 2,000 bushels per season. The oystermen are charged a harvest fee of \$1.25 per bushel. This money has been dedicated to funding the enhancement of the oyster resource. From the spring of 1996 through the spring of 1997, 88,000 bushels of oysters were

harvested in the direct market program. These oysters had a dockside value of approximately \$1,800,000.

Although marketing from public beds goes against the policy of encouraging private planting, it has clearly been a better utilization of the resource under the currently prevailing disease conditions. For instance, in 1991 and 1995 (the beds were closed from 1992 through 1994), 397,000 bushels were taken from the New Jersey seed beds and transplanted to the leased grounds. Because of high Dermo disease-caused mortality, only a small fraction, worth \$1,189,000, was landed. Thus, for each bushel removed from the seed beds, the direct market strategy has returned nearly 7 times more in dockside value compared to typical planting returns during periods of high Dermo disease.

The seed beds have returned to production twice (1970s and 1990-91) after serious depletion and there is no reason to believe that they will not do so again. Nevertheless, their inconsistent production has led to interest in alternative sources of seed oysters. Between 1987 and 1991, the Maurice River Oyster Culture Foundation, a consortium of New Jersey planters, attempted to develop growout techniques that would make it economical to use Rutgers MSX-resistant, hatchery-reared seed in Delaware Bay. Results showed that hatchery-produced juveniles, which would take 2-3 years to reach market, cost \$12-\$17 per bushel to plant, whereas natural seed, most of it large enough to be marketed after one season, could be planted at a cost of only \$2.5-\$8 per bushel. The difference in survival was not enough to compensate for the higher cost of hatchery seed. The advent of Dermo disease has placed on hold any further attempts at refining growout methods.

Although the history of the oyster fishery in Delaware Bay has been one of ups and downs since at least the 1880s, the appearance of MSX disease in the late 1950s and Dermo disease in the early 1990s placed additional burdens on an already stressed industry. Nevertheless, oysters marketed from Delaware Bay remain of very high quality. To take advantage of the bay's capacity to produce excellent oysters, the industry must be restructured to encourage new methods of culturing oysters. At present, the only cost to planters for natural seed, exclusive of vessel operating costs, is a small (\$2-5 per ton in New Jersey) annual fee. Boats capable of dredging 8,000-12,000 bushels per season pay less than \$350 for the license. In Delaware, a flat-fee dredge boat license costs \$57.50 per year. Until the cost of natural seed is more into line with its true value, serious private investment in alternative methods for obtaining and culturing seed will not occur.

APPENDIX 2
MEMBERS OF THE OYSTER INDUSTRY REVITALIZATION TASK FORCE

OYSTER REVITALIZATION TASK FORCE MEMBERS

Name	Mailing Address	Business Phone	Affiliation
Scott Bailey	205 Vine Road, Millville, NJ 08332	609-785-0025	Delaware Bay Oyster Industry
Walter Canzonier	PO Box 662 Port Norris, NJ 08349-0662	609-785-0402	NJ Aquaculture Association
Stephen Carnahan	976 Ocean Drive, Cape May, NJ 08204	609-898-8179	Statewide Advisory Committee of New Jersey Agriculture, Extension Service Board of Managers
Joseph A. Dobarro ¹	132 Great Bay Blvd., Tuckerton, NJ 08087	609-296-5260 (x239)	Institute of Marine & Coastal Sciences Rutgers University
Susan Ford	HSRL, 6959 Miller Ave. Port Norris, NJ 08349	609-785-0074 (x105)	Rutgers University – Haskin Shellfish Research Laboratory
James Gifford	PO Box 35, Mauricetown, NJ 08329	609-785-2677	Delaware Bay Oyster Industry
George Horzepa	NJDA, CN 330, Trenton NJ 08625	609-292-5511	NJ Department of Agriculture
James W. Joseph	NJBS, PO Box 418, Port Republic NJ 08241	609-748-2038	NJ Department of Environmental Protection
John Kraeuter	HSRL, 6959 Miller Ave., Port Norris, NJ 08349	609-785-0074 (x131)	Rutgers University - Haskin Shellfish Research Laboratory
Richard Malinowski	940 Main Street Canton, Salem NJ 08079	609-935-4699	Delaware Bay Section of the Shell Fisheries Council
Linda O'Dierno	NJDA, CN 330, Trenton NJ 08625	609-984-6757	NJ Department of Agriculture
Alexander Ogden	PO Box 112, Port Norris NJ 08349	609-785-0297	Delaware Bay Oyster Industry
Eric Powell	HSRL, 6959 Miller Ave., Port Norris NJ 08349	609-785-0074 (x109)	Rutgers University - Haskin Shellfish Research Lab.

1. Formerly employed by the New Jersey Department of Environmental Protection, Division of Fish, Game and Wildlife, Bureau of Shellfisheries

APPENDIX 3
Minutes of the Oyster Task Force Meetings

Oyster Industry Revitalization Task Force Meeting

March 24, 1997

The initial meeting of the Oyster Industry Revitalization Task Force was held on March 24, 1997, beginning at 6:00 p.m. at Rutgers University's Haskin Shellfish Research Laboratory.

Members of the task force in attendance were: Scott Bailey, Walt Canzonier, Joe Dobarro, Susan Ford, Jim Gifford, George Horzepa, Jim Joseph, John Kraeuter, Richard Malinowski, Linda O'Dierno, Alex Ogden, and Eric Powell. Mr. Steve Carnahan was absent.

Mr. Jim Joseph distributed copies of, laws applicable to the shellfish industry, N.J.S.A. Title 50, and the Oyster Management Regulations (N.J.A.C. 7:25A). He also distributed a copy of the 1985 Coastal Bay Clam Resource Task Force Report to each attending member of the task force.

The initial order of business was to elect a chairman for the task force. Mr. Canzonier nominated Mr. Richard Malinowski. Mr. Joseph seconded the motion. Mr. Richard Malinowski asked that a vice-chairman also be appointed. Mr. Canzonier suggested that two other individuals be appointed as vice-chairman and recording secretary. Mr. Malinowski was unanimously elected as chairman.

Mr. George Horzepa nominated Ms. Linda O'Dierno as vice-chairman. Dr. Powell seconded the nomination. The nomination was approved unanimously.

Mr. Joe Dobarro accepted the role as recording secretary. It was agreed that the minutes would be a brief summary of the meeting; other committee members will provide assistance with the minutes. The meetings will be recorded.

Mr. Joseph said that he would assist with the revisions to the regulations and statutes, as the need arises. Mr. Horzepa said that the Department of Agriculture would collaborate on this matter.

The committee agreed to hold a monthly meeting at the Haskin Shellfish Research Laboratory. This location was considered to be the most convenient for access to the oyster industry. Mr. Jim Gifford thought that the committee would have to meet more frequently than once a month. There was a discussion on the term of the task force. It appears that the task force has 180 days from the date of the appointments to the submission of a final report to the governor. Mr. Dobarro thought this working period had been extended to 18 months. After a reading of the legislation, it appeared that the report was due within 6 months of February 11, 1997, the date when the task force members were appointed.

Dr. Powell suggested that the task force meet again in mid-April. He indicated that it was very important to define the specific topics that had to be addressed. These topics could be developed by sub-committees and addressed later by the full task force group.

Mr. Canzonier provided a handout with his thoughts for needed changes in the industry (Attachment). Dr. Ford inquired as to whether the objective was to re-write Title 50. Mr. Dobarro said that it was necessary to define what was realistic and what so not. Chairman Malinowski asked for a summary of the industry's problems and management objectives. Mr. Gifford stated that foremost it was necessary to learn how to maximize the benefits of the oyster resource on the seed beds. Mr. Canzonier and Dr. Ford agreed.

Dr. Kraeuter asked the industry members for information on the type of products that they needed from the resource, e.g. seed oysters, stock for half-shell trade and/or shucked stock. Mr. Bailey said that the market must be developed regardless of the product stock. Mr. Bailey indicated that the lack of product has contributed to the loss of a market (for New Jersey oysters). Dr. Powell agreed that the lack of a consistent supply of oysters is the main problem for the industry. He indicated that there were a number of ways to increase consistency in supply. He suggested that areas of the seed beds should be leased. Another option was to establish a hatchery facility for the production of disease resistance seed for planting in the lower bay. Dr. Powell also said that exotic oysters such as *Crassostrea gigas* may have to be considered. Dr. Ford reminded the group that *C. gigas* was not completely resistant to disease. She was emphatic that exotic oysters shouldn't be presented in that context. Mr. Dobarro also reminded the group that the disease resistant oysters developed by Rutgers were not resistant to Dermo.

Mr. Dobarro provided a quick overview of the oyster industry and physical distribution of the resource areas to the members of the task force not completely familiar with the fishery.

Dr. Powell thought the main problems faced by the industry involved ways of increasing production on the seed beds and the leased grounds.

Dr. Kraeuter asked if the task force would be concerned with the oyster resource outside of the Delaware Bay. Mr. Canzonier said that task force should be concerned with the resource outside of the bay. Mr. Dobarro said that it will be extremely difficult to deal with the resource outside of the bay given the time frame the group has to complete its mission.

Mr. Ogden asked if the task force would consider above bottom culture. Mr. Canzonier said that this technique would be considered within the Aquaculture Plan and probably shouldn't be specifically addressed by the task force. Mr. Dobarro informed Mr. Ogden that the transmission mode for the two oyster diseases might be waterborne. Off-the-bottom culture, therefore, probably would not be a solution to the current problems.

Dr. Kraeuter again requested information from the industry regarding market strategies and product requirements. Mr. Gifford said that with the current disease problems, the industry should be focused on harvesting oysters from the seed beds as soon as they are of market size. He didn't think it was presently possible to grow oysters below the Southwest Line. Mr. Canzonier said that disease shouldn't dictate the type of plan the task force develops, since disease is unpredictable. He said the plan shouldn't be designed to just circumvent the problems, but rather provide strategies for mitigating the impact of disease.

Mr. Bailey told Dr. Kraeuter that market conditions fluctuate both within season and throughout the year. He thought the industry needed a stable supply of oysters rather than a specific product type as Dr. Kraeuter was implying. Dr. Powell said that all the marketing strategies are currently being restricted by the lack of an adequate supply of oysters. He said that with a consistent supply, markets could be developed for whatever product is available. He thought that the supply problem could be resolved if the entire bay could be used to grow oysters. This scenario would require the development of creative approaches to improve production in the lower bay, as well as the upper bay. Dr. Ford said that a program needs to be developed so the oystermen can make timely, unconstrained business decisions throughout the year.

Mr. Bailey explained that the (wholesale) market wasn't currently aware of New Jersey's ability to produce oysters and the state should develop a listing of oystermen, which would be distributed to buyers in other states. In response to his statements, Linda O'Dierno said that the Department of Agriculture currently publishes a directory of the seafood wholesalers in New Jersey. This publication does not include many oyster dealers. This directory will eventually be put "on-line" (the Internet) so anyone can get product information for New Jersey. The directory will also be revised this summer so the local oyster dealers should make sure they are included in the directory.

Mr. Dobarro said that there was a need to educate the public on the safety of eating oysters from Delaware Bay. Mr. Ogden and Mr. Canzonier agreed. Mr. Canzonier said that it was important to educate the dealers in product safety.

Ms. O'Dierno stated that it was important to have a consistent supply of oysters if the product was available, a market could be developed. Chairman Malinowski asked how a consistent supply of oysters could be provided. Dr. Powell said the response to that question was the purpose of the task force.

A discussion on alternatives for increasing production included: producing seed, seasonal movement of oysters, and growing oysters in various areas of the bay. Dr. Powell suggested a need for the development of a comprehensive list of all the potential and actual production strategies, development scenarios, and current legislative restrictions. The list of strategies should be prepared before the next task force meeting. It was the consensus of the group that a comprehensive list of potential production strategies and current impediments to the programs needed to be developed. Dr. Powell suggested that a couple of sub-committees be formed to discuss these issues and submit a summary report to the full task force at its April meeting. Two groups were formed. Members of one group included: Eric Powell, Richard Malinowski,

Steve Carnahan, John Kraeuter, and Alex Ogden. The second group included: Scott Bailey, Jim Gifford, Joe Dobarro, Susan Ford, and Walt Canzonier.

The group briefly discussed various market strategies that included different oyster sizes and processing techniques such as flash freezing to provide product consistency.

Mr. Gifford asked about the world market. Dr. Powell said the world market was important, especially the Far East. He said that a Korean market is developing a large demand for quality small oysters for use in sushi bars. There was a brief discussion on production in foreign countries such as France, Australia, and New Zealand. Mr. Canzonier indicated that the production strategies used in other areas would have to be evaluated for use in Delaware Bay. It was indicated that the industry might wish to shift from providing a large oyster, i.e. >3 inches, to a smaller oyster (2.5 inches). Dr. Powell thought this smaller oyster may provide a new niche for New Jersey oystermen. Ms. O'Dierno indicated that the state was in a position to begin trade with Japan and other countries. She said that if the product was available, a market could be established.

The next meeting of the task force was scheduled for the Wednesday, April 9, at 6 p.m. The individual committee will report on the results of their work session(s) at this meeting.

The Powell committee decided to meet on Wednesday, March 25, at 6 p.m. The second work committee agreed to meet on Monday, March 31, at 6 p.m. Both sessions were scheduled to be held at the Haskin Shellfish Research Laboratory.

Dr. Ford suggested that the meetings be limited to two (2) hours. The members were in agreement with this proposal.

Chairman Malinowski adjourned the meeting after a motion by Dr. Ford and a second by Dr. Powell.

**Meeting of the Oyster Industry Revitalization Task Force
May 12, 1997**

Task Force Members in attendance were:

Richard Malinowski
Steve Carnahan
Walt Canzonier
Dr. Susan Ford
Alex Ogden

Jim Joseph
Dr. Eric Powell
Dr. John Kraeuter
Jim Gifford
Joe Dobarro

Absent from the meeting were:

Linda O'Dierno
George Horzepa
Scott Bailey

Chairman Malinowski called the meeting to order and called for the reports from the various subcommittees.

Dr. Kraeuter began the discussion by distributing a report compiled by him on aquaculture. This report included a comparison of the cost of seed from both the natural seed beds and hatchery production. He concluded that the cost from these two sources was nearly comparable. The cost analysis was based on the (market) price for the product. He quickly summarized two charts included in the report. The charts included a regional comparison of production by meat weight and price/lb. New England and the mid-Atlantic had a much greater price/lb. value than all other regions of the country. He expressed the opinion that oystermen could increase their profits, if the right markets were available.

Mr. Dobarro asked if the New England information was based on *C. virginica*. Dr. Kraeuter said that the New England landings were primarily *C. virginica*. The data in the report indicated that the value, price per pound, for the Pacific coast oyster has been increasing during the past few years. The Pacific product was marketed primarily as shucked meats. Dr. Kraeuter stated that the West Coast fishery was producing their product cheaper than the East Coast oystermen. He concluded that the East Coast oystermen should be able to produce a product with competitive production costs, especially since the production of seed on the West Coast fishery is hatchery dependent. During his assessment of the cost for seed production, Dr. Kraeuter determined that oyster seed was cheaper than clam seed. This analysis was, again, based on the final market value of the product. Dr. Kraeuter suggested that the task force members review the document and provide comments. He informed the group that the New England data included New York and Connecticut landings.

Mr. Dobarro had several questions about the West Coast production. A major difference between fisheries on the east and west coasts was the predominant product. The West Coast fishery was primarily dependent upon *C. gigas*, while the East Coast product was *C. virginica*. Dr. Kraeuter said that the hatchery production costs for these two species were nearly identical. His analysis of seed production for the Delaware Bay fishery was based upon data provided by Mr. Canzonier. He estimated that the cost of Delaware Bay oyster seed ranged between \$2.50 and \$8.50 per bushel. Mr. Kraeuter indicated that this price could exceed \$12.00 per bushel, if other miscellaneous expenses were included in the analysis. Mr. Dobarro said that he had previously questioned oystermen about the operating costs. This estimate for the cost of seed was slightly less than the values presented by Dr. Kraeuter.

Dr. Ford momentarily changed the focus of the meeting. She expressed concern about the style of the task force report and suggested that the document be general in content and not dwell on specifics. She also recommended that a standard format be developed for the document. Dr. Ford thought that the narrative should include general background information, which would be accompanied by action items. The final section should include any recommendations prioritized and classified for short and long-term benefits. Dr. Powell requested that the subcommittee dealing with the legal aspects of the task force's recommendations consider all the legal impediments that may be encountered with the implementation of the plan.

Although Ms. Linda O'Dierno was absent, Dr. Powell gave a quick over view of her report on marketing strategies.

Mr. Joseph summarized the issues considered by the subcommittee dealing with alternative leasing strategies. Mr. Joseph said it was the unanimous position of the subcommittee that no portion of the seed beds be leased. This subcommittee stated that the seed beds should remain in the public domain. Mr. Joseph said that this subcommittee was concerned with maximizing employment in the oyster fishery. This objective could best be attained by not removing seed bed areas from access to the majority of the oystermen. The subcommittee considered a number of leasing scenarios and believed that under most (leasing) situations the seed beds would eventually be controlled by a very limited number of individuals or companies. He continued to summarize the group's discussion. He informed the attendees that this subcommittee discussed a number of management alternatives, which could be tried in lieu of leasing the seed beds.

Mr. Joseph indicated that this subcommittee was in favor of providing the Delaware Bay Shellfish Council (the Council) with more flexibility in dealing with fiscal issues, e.g., the distribution of money from the oyster cultch fund. Mr. Joseph elaborated on some problems he had encountered with the pooling of monies from several sources for the shell-planting program. Dr. Kraeuter asked if the subcommittee had a recommendation for resolving problems with the state's fiscal procedures. Mr. Joseph said that he was pursuing several options but the subcommittee did not have specific recommendations at the moment. Mr. Dobarro said that his office had previously tried to add language to the statutes permitting the Council and the Commissioner much greater flexibility in the

disbursement of funds from the Oyster Resource Redevelopment Fund (a.k.a. Oyster Cultch Fund).

Dr. Kraeuter suggested that the industry establish a separate corporation to handle the cultch fund. Mr. Dobarro said that a separate corporation may be one way of dealing with the problem, but the industry's history suggested otherwise. Dr. Powell thought that the fund could be managed through the Council as a non-profit corporation. Mr. Carnahan said this situation would require the attention of both an accountant and attorney. According to Dr. Powell, the Council could operate as the board of trustees for the corporation. The chairman of the Council would act as the chairman of the board. Mr. Canzonier said that the watermen in the Maritimes of Canada have established a quasi-corporation to handle the collection of fees and disbursement of funds for fishery management programs. The task force members discussed revenue collection procedures and the role of state agencies in the collection and enforcement of the landing fee program.

Dr. Kraeuter suggested that the state would probably be amenable to the formation of a corporation for management of the "Oyster Cultch Fund," if the state began to share in the revenue. The task force continued with this discussion for several more minutes. Mr. Dobarro informed the task force that the revenues collected for the cultch program are currently placed into a dedicated fund. The state does not access this money. Dr. Kraeuter reiterated his previous comment that the state probably should receive a portion of this revenue, if major changes were made in the structure of the program. Mr. Dobarro thought that it was preferable to keep all the cultch fund money available to the industry for resource enhancement programs.

Dr. Powell questioned the subcommittee's position on leasing. Mr. Dobarro said that the subcommittee preferred exploring all possible solutions to increasing production on the seed beds before leasing of these areas were considered. He said that the subcommittee considered leasing areas adjacent to the seed beds. Dr. Powell asked if the committee was suggesting that non-productive bottom adjacent to the seed beds could be leased. He said that Texas had such a program. Mr. Canzonier said that Connecticut had a similar program for leasing areas, which were not considered productive. Dr. Powell said this scenario would permit people to develop bottom in the upper bay areas. Mr. Dobarro reminded the committee that the lower seed beds did not provide the oyster planter with a safe haven from disease. Dr. Kraeuter stated that these areas were free from predators. Dr. Ford and Mr. Dobarro both disagreed with this statement. Dr. Powell said that the advantage to leases near the seed beds would be that they could be established over a salinity gradient. Mr. Dobarro argued that the task force should be careful not to represent the seed beds as a "safe haven." Dr. Kraeuter said that the seed would have to be moved continuously over the salinity gradient to take advantage of conditions for minimizing mortality without substantially reducing growth. He expressed concern that without the ability to lease areas among the seed beds, aquaculture opportunities would be limited.

The task force members debated the advantages and disadvantages of leasing areas on the seed beds or adjacent to the seed beds to private enterprise for rearing hatchery or natural seed. Dr. Ford said the plan submitted by the task force should be

as broad as possible to maximize flexibility for long-term management strategies. Dr. Powell said that the impediments to leasing in the area of the seed beds should be eliminated so that an individual would have the ability to experiment with seed production along a salinity gradient. He argued for stringent control of the leasing program and suggested that if a lease wasn't being use, it should revert back to the state.

Dr. Kraeuter thought that time limits should be placed on the development of alternative production strategies. If the alternative strategies didn't prove successful within the specified time period, leasing of the seed beds would then be considered the primary option for increasing oyster production. Dr. Kraeuter also thought that the leasing program shouldn't be subjugated to leasing non-productive areas. He stated that the success of the leasing program would be ensured if the best areas of the seed beds were leased. Mr. Gifford stated that if someone wished to collect a spatfall on the Cape Shore flats, they should be provided with good, stable bottom on the seed beds to cultivate this spatfall.

Dr. Powell said that some of the seed bed areas have not been continuously productive. He said that the industry should not be expected to develop marginal bottom on the seed beds. He thought that the bottom on the seed beds should be defined. He stated that bottom capable of supporting oysters should be made available for leasing. He reiterated his previous position that if the lessee wasn't developing the bottom, it would revert to the state.

Dr. Kraeuter asked how the task force members responded to the subcommittee's statement. Mr. Dobarro said that it was only a draft and any comments would be tended.

Dr. Powell discussed the marketing report submitted by Ms. Linda O'Dierno and summarized his subcommittee's discussion. He said that it was necessary to determine and target high value markets. Dr. Powell thought that it may be necessary to develop a marketing co-op. Dr. Powell suggested to Mr. Carnahan that the Seafood Marketing Coalition should begin to target oysters. Mr. Carnahan agreed that oysters and clams should be targeted. Dr. Powell said that the key markets were the specialty markets, e.g. farmer's market and the restaurant trade. He surmised that the public patronizing these markets was accustomed to paying a premium price for their product. Mr. Carnahan said that it may be possible to obtain funds from the "Jersey Fresh" program. Dr. Powell said that these particular markets have to be developed. The potential for the casino market was also discussed.

Dr. Powell said that the Seafood Coalition and the restaurant trade had to get together in order to ensure the oyster was presented in a favorable, up-scale manner. It was agreed that there was a need for consistency in both the quality and supply of the product. Mr. Carnahan discussed the Jersey Shore Seafood Program.

Dr. Powell said that the (oyster) industry would gain significantly if it contributed to the Seafood Coalition either as a direct contributor or through the cultch fund. Dr. Powell also stated that it was necessary to discuss pro-active approaches for the

movement of oysters from harvest areas to the market place. Mr. Gifford said that it was difficult to develop a market if the product wasn't available throughout the year. He said that it was necessary to either lease bottom in the vicinity of the seed beds or develop other scenarios so the product was available year round. Dr. Powell agreed that the production period needed to be expanded in Delaware Bay. He also thought that there were quite a few market areas, which weren't currently being supplied with a product. These markets had to be aggressively pursued.

Mr. Ogden discussed perceived problems with leasing and planting oysters in Section E. He claimed to have planted 5,000 bushels of oysters on his leases in Section E, but lost them due to planting constraints imposed on the oyster planter by the state's regulations. Dr. Ford asked if the lease areas were too small. Mr. Ogden said that the currents in Section E made it difficult to plant. Mr. Ogden said he visualized a number of 5 to 10 acre plots being scattered throughout the seed beds for use by the oyster industry. He didn't think leasing a number of plots on the seed beds would restrict access to the natural resource. He stated that the oyster harvesters developed the leased bottom in the lower bay. Mr. Dobarro questioned the validity of this statement. Mr. Dobarro said that the problem with Section E wasn't the tide or the regulations but the bottom. In spite of intensive effort by the industry, the Division, and personnel from Rutgers to identify productive bottom in Section E, this effort ultimately fell short of the intended objective, i.e., providing productive leases along a salinity gradient in the upper bay. Mr. Dobarro said that although a particular bottom may give the appearance of being capable of supporting oysters, it may not. He said that not all areas of the seed beds may be capable of supporting oysters either. Dr. Kraeuter agreed.

Mr. Ogden said that options would have to be developed for different grow out techniques. Dr. Powell said that the opportunity has to be provided for leasing selected areas of the seed beds. He said that the leasing program has to be regulated correctly. It was his opinion that without leasing in the seed beds, New Jersey would not be able to emulate the success experienced in Connecticut. Dr. Kraeuter said that another possibility was leasing the former beds in the tributaries of the upper bay. These areas may be appropriate for line and rack culture.

Dr. Powell asked that each member of the task force make an effort to record his or her comments and recommendations on this issue. He also asked if any other committee reports were available.

Dr. Ford stated that her committee did not have a formal report to submit. Mr. Dobarro said that Mr. Marvin Moore had submitted a request to participate on the subcommittee dealing with increasing short-term production. Dr. Ford said that this subcommittee had completed its discussion of this issue.

Mr. Joseph commented on the use of the oyster cultch fund. He said that the money is currently earmarked for enhancement and improvement of the resource. Based on earlier remarks made by Dr. Powell, Mr. Joseph expressed concern that some of this money would be diverted for marketing programs. Mr. Joseph considered this to be an inappropriate use for cultch fund monies, which were dedicated for resource

enhancement. Dr. Powell said that the Council had to take a more aggressive role in operating and controlling the management programs.

In response to the suggestion that there were problems with the sale tags for the direct market harvest, Mr. Dobarro reported that there was no evidence that this problem existed. Mr. Dobarro said that the harvest was being monitored and the tag program was not experiencing problems.

Dr. Powell challenged Mr. Joseph's statement regarding the use of the cultch funds. Dr. Powell believed that the cultch fund would increase substantially with an increase in production and an investment in marketing would provide a considerable financial return to the industry. Mr. Joseph reiterated his opinion that funds raise by the cultch program have been limited, therefore this money should be use only for the designated enhancement programs. Dr. Powell agreed that the funds were currently limited but he believed revenues would dramatically increase with an increase in production.

A short discussion of methods for generating revenues for the cultch fund ensued. Dr. Powell stated that the \$1.25 currently being paid by the industry for market oysters was a high tax relative to the value of the industry. He said that the industry has demonstrated a willingness to contribute to the various programs and this money should be used as leverage for funding from outside sources. The focus of the industry should be to increase production so the cultch fund could be increased concurrently. Dr. Powell believed that the cultch fund could be used as leverage for \$500,000 to \$1,000,000 in grant money and other funding from the state. Mr. Carnahan said that this type of activity was difficult for the fishermen to accomplish. Therefore, there was a need for someone with expertise in fundraising to provide the fishermen with assistance. Mr. Carnahan was of the opinion that there is a need to have some focus and general consensus for the program's objectives. He didn't think that the problems being described in the oyster fishery were all that unique.

Mr. Ogden said the general feeling among the oystermen was that the money put into the cultch fund was being used by the state for other purposes. Mr. Dobarro strongly disagreed with Mr. Ogden stating this money has never been accessed by state for any purpose other than that described by the oyster industry. Mr. Joseph was also emphatic about the use of the cultch fund. He adamantly stated that the oyster cultch fund has only been used for shell planting and research activities. Mr. Joseph said no funds from the cultch fund have been diverted to any other state program as inferred by Mr. Ogden. Mr. Joseph re-emphasized the point that the cultch money has never been used for any purpose other than the programs approved by the Council and industry.

Mr. Gifford thought that production in the bay could be increased if seed could be moved from the upper bay to the lower bay in a step-wise fashion. He said that the movement of these stocks combined with the shell planting program and other enhancement efforts would help improve production. Mr. Dobarro said that these activities were already being discussed with the Council as possible enhancement strategies for this summer.

Dr. Ford said that these suggestions were part of her subcommittee's discussion. She quickly summarized her subcommittee's discussion.

Dr. Powell thought that the task force had to provide very specific recommendations in the final report. There was a general discussion regarding specific versus general recommendations for the inclusion in the report. It was agreed that individuals should begin prioritizing their recommendations. Mr. Canzonier said all the options have to be presented and available to the management board. He believed that the task force should be cautious about dictating management terms to the Council.

Dr. Powell stated that the task force must begin to draft a report by early June. Several members of the task force expressed concern that the time element for conducting the business of the task force and drafting the report was too restrictive. It was agreed that the task force would meet again on May 20 and June 2, 1997. The meeting was scheduled to begin at 7:00 p.m. and end at 10:00 p.m. After the June meeting, a draft report will have to be prepared. Dr. Powell reiterated previous comments that everyone should beginning to prioritize their recommendations, limiting the recommendations to 6 or so of the most important items.

Chairman Malinowski adjourned the meeting.

**Meeting of the Oyster Industry Revitalization Task Force
May 20, 1997**

Task Force Members in attendance were:

Jim Joseph
Walt Canzonier
Dr. Susan Ford
Alex Ogden
Linda O'Dierno
George Horzepa
Scott Bailey

Steve Carnahan
Dr. John Kraeuter
Jim Gifford
Joe Dobarro
Dr. Eric Powell

Vice-Chairperson O'Dierno called the meeting to order.

Chairman Malinowski arrived after the meeting was call to order.

Dr. Powell stated that this meeting of the Oyster Task Force was called to discuss short-term solutions to oyster production in Delaware Bay. He said this meeting was necessary because of the lack of consensus on this topic during the previous meeting. He indicated that each individual member of the task force was requested to develop several issues that they considered to be key elements for the resolving production problems.

Dr. Kraeuter distributed a synopsis of several key issues, which he thought were important for the discussion. Mr. Canzonier called the group's attention to several items that he perceived to be necessary recommendations for the resolving the oyster industry's problems. He asked the task force members to note these recommendations in the handout that he distributed.

Mr. Canzonier discussed a set of maps at the back of his packet illustrating the areas of high setting potential in the bay. These maps also illustrated the reliability of setting in these areas. The data used for these maps was derived from the shell bag program. Mr. Dobarro had a word of caution for interpreting this data. He said that although these maps indicated areas along the shoreline of the bay had a high set potential, the bottom in these areas were frequently influenced by fluid sediments. These sediments could bury a substrate with several millimeters of fine grain material which would suffocate spat. These sediments weren't detectable by an oyster dredge.

Ms. O'Dierno asked if the recommendations were intended to be generic. She thought that specific action steps should accompany the recommendations. Mr. Canzonier believed that the recommendations should be emphasized in the report.

Dr. Kraeuter provided a review of his handout. His handout included recommendations with an outline of success criteria. He suggested that criteria to measure the success of the various programs be included in the program. Dr. Kraeuter said that it was necessary to delineate the seed beds and leased grounds. He also thought that it would be important to delineate the shell and oyster resources of the bay. Mr. Manuel Taylor had several questions about the prioritization of the items in Dr. Kraeuter's handout. Both Dr. Kraeuter and Mr. Canzonier stated that it wasn't the responsibility of the Oyster Task Force to prioritize and implement the action items. They expressed the opinion that it was the responsibility of the industry to assign priorities and implement the action items. The purpose of the task force was to identify problems and offer potential solutions.

Mr. Robby Morgan said that he was concerned about the proposal to lease the seed beds. Mr. Joseph said that a sub-committee had reviewed this issue and recommended against it. Mr. Canzonier said that it wasn't the role of the Oyster Task Force to make decisions for the industry but rather to present as many options as possible for the industry's consideration. Mr. Morgan reiterated his apprehension for leasing the seed beds. Mr. Canzonier tried again to clarify the mission of the task force. He emphasized that it wasn't the prerogative of the task force to make decisions for the industry. The industry had to be presented with all potential options and decide which ones to pursue. Dr. Powell disagreed. He thought the task force could make specific recommendations. Dr. Kraeuter supported Dr. Powell. Mr. Canzonier said that it was important for the task force to recommend options. He was emphatic in his opinion that the task force not make the decisions for the industry. Mr. Canzonier didn't believe that the industry would accept the options if the decision making process was taken from them. Mr. Morgan said that the task force should be making recommendations to the Council. Dr. Kraeuter disagreed and said that the task force makes its recommendations to the governor. Mr. Dobarro expressed the opinion that any recommendations presented to the governor probably would be referred by the governor's office back to the Council. Mr. Canzonier thought that any task force recommendations should be made to a fully appointed Council.

Mr. Joseph stated several members of the industry were on the task force. The recommendations of the task force would have to be considered by these individuals. Mr. Joseph informed Mr. Morgan that the sub-committee addressing the issue of leasing the seed beds was unanimous in its opposition to this option. Mr. Joseph said that although all ideas generated by the task force should be put on the table only those recommended by the task force should be forwarded to the governor. Mr. Joseph said that there should be a consensus of opinion by the task force members. Dr. Powell agreed. Dr. Powell said that the task force should make some clear-cut recommendations. Mr. Canzonier thought that the document should present as many options as possible and note whether industry members support the recommendation or not.

Dr. Powell said it was clear that leasing the seed beds would be a very controversial issue. He thought that the Council should have the ability to lease the seed beds if it so desired. Mr. Ogden indicated that the intent wasn't to lease all of the seed beds but small, scattered parcels.

Ms. O'Dierno suggested that the task force discuss Dr. Kraeuter's recommendations in a more organized fashion. She suggested starting with the first item on Dr. Kraeuter's list. Dr. Powell thought the Council should have the ability to authorize a year-round harvest. Mr. Manuel Taylor said that it was necessary to evaluate the oyster stocks. Mr. Dobarro said many of the items listed in Dr. Kraeuter's recommendations already exist. A short debate ensued regarding landings and marketing. Mr. Canzonier said that the industry should be able to land oysters at anytime. Mr. Dobarro responded that the industry already had this ability. Mr. Canzonier said that the industry had to request permission from the Commissioner before landing oysters in the summer. Several small discussions developed regarding these issues. In response to a question from Mr. Horzepa, Mr. Dobarro provided a brief overview of existing statutory and regulatory control of the fishery.

Mr. Dobarro said his primary concern with the effort to completely install control of the fishery with the Council was the lack of legal control and enforcement of the Council's actions. Mr. Canzonier stated that these problems could be resolved simply by re-writing the statutes. Mr. Canzonier said that he sought to weaken the power of the commissioner (of DEP) and put more of the power for controlling the fishery in the hands of the (Delaware Bay Shellfish) Council. Mr. Horzepa said that this suggestion really didn't resolve the problem because of the need for "due process". Based on Mr. Canzonier's statements, Mr. Horzepa said that a system was already in place to deal with the "due process" issue and he didn't understand where a problem with the current system existed. Dr. Kraeuter said that the industry members shouldn't have to ask to move oysters from their leased grounds during the summer. Mr. Dobarro said that this issue has been quickly resolved with the Commissioner's office each year and hadn't presented a problem for the oyster planter. Mr. Ogden said that the industry has frequently been misled. He alluded to a catch problem with finfish between the recreational and commercial fishermen.

Ms. O'Dierno said that it was her impression that several members of the task force wished to completely remove the commissioner (of DEP) from the regulatory process. The justification for this arrangement was to expedite management practices and give industry "blanket permission" to harvest from oysters from any of the beds at any time. Dr. Kraeuter clarified this issue by stating the oystermen should be able to "land" oysters at anytime. Mr. Dobarro informed Ms. O'Dierno that the restriction in question was based on an erroneous assumption, which previously had been supported by the lab. This assumption was that a relationship between brood stock and recruitment existed. This relationship has not been validated so there was no reason for restricting the harvest of oysters during the summer months from leased grounds.

Mr. Dobarro said that he agreed with the proposal to provide the Council with more discretionary authority but had concerns for the enforcement and management of the Council's decisions. If the state was eliminated from the management of the fishery, the Council would not have the authority to enforce compliance with its programs. Mr. Horzepa said that this was a very interesting problem. Dr. Powell also agreed and there was a need to ensure that everyone conformed to the program. Mr. Horzepa thought

that the management of the program should provide some assurances for fishery participants.

Mr. Manual Taylor said that the state already has some control over the fishery. It was his opinion that the state was providing some protection to the resource and ensuring that the fishery could be a profitable business for everyone. He thought that this was fine.

Dr. Powell said that there was need for control within the fishery. This control should have two levels. First there was a need to provide oversight for the management of the fishery. The second element of control was the ability to enforce the designs and mechanisms of the various management strategies.

Ms. O'Dierno directed the task force members to item 4 on Dr. Kraeuter's handout (see Attachment 1). Dr. Powell said that there was a need for bed revitalization. The group was unanimous in its opinion that item 4 was appropriate for inclusion in the plan.

The task force members reviewed item 5 on Attachment 1. This item dealt with methods for utilizing high setting areas in the bay. Dr. Powell thought that this issue was very important but also there was a need for identifying a funding mechanism for the program. Mr. Dobarro referenced the maps of set potential that Dr. Susan Ford had prepared. These maps indicated that there are seed beds along the shoreline of the bay. These beds had the same setting potential as the areas in the lower bay. Dr. Kraeuter agreed.

Mr. Horzepa said that the group had to divorce itself from the money issue and establish the necessary management programs. He suggested that after these programs were established, the task force, or whoever, could begin to consider the funding requirements. If adequate funds weren't available, some programs would have to be scaled back. There were a number of comments regarding the funding issue.

The task force began a discussion on item 3 of Attachment 1. This topic dealt with leasing the seed beds. Dr. Powell said that leasing the seed beds should be done on an experimental basis to determine if production could be improved through this scenario. Mr. Joseph summarized the sub-committee's discussion on this issue and previous discussions by the Council on leasing in Section E. During the past few years, some council members had been debating the wisdom of leasing in Section E. Dr. Powell said that he perceived a need to lease along a salinity gradient in the bay. Also, he suggested leasing seed bed areas because it was impractical to expect someone to develop marginal (muddy) bottom for an oyster reef. Mr. Horzepa thought that the certain areas of the seed beds could be leased at a premium fee and this money used to restore other less desirable areas on the beds. Mr. Joseph commented that the best grounds would therefore be leased to the wealthiest individuals.

Mr. Canzonier commented on the leasing policies in Connecticut. He said that some of the natural beds in Connecticut have been leased. These leases have a historical basis. Mr. Canzonier said that the management and leasing policies in Connecticut have lead to a significant increase in production and employment. He indicated that

currently the Connecticut fishery had 71 large dredge boats. Mr. Dobarro questioned this number since he had just recently discussed the Connecticut fishery with state personnel and they had indicated a different scenario. Mr. Morgan said that the Connecticut and New Jersey fisheries shouldn't be compared because there were substantial differences in the fishery. Mr. Canzonier expressed the opinion that the Connecticut experience could be repeated in New Jersey given the right incentives and financing. Mr. Canzonier continued to elaborate on the development of the Connecticut fishery. He stated that some of the bids for leased grounds in Connecticut were exceeding \$400.00 per acre. Mr. Canzonier said that these bids are worrisome to the established oystermen because some of the high bidders do not have a long-term interest in the oyster fishery.

Dr. Powell reiterated his earlier comments that there should be some mechanism for leasing parts of the seed beds. He wanted stringent controls to ensure that these leases were worked. Mr. Morgan questioned the wisdom of leasing marginal bottom on the seed beds. Dr. Kraeuter said the leases should be along a salinity gradient from New Beds to Arnold's. Mr. Dobarro said that one way of dealing with the salinity issue was to alter the harvest season. Dr. Kraeuter disagreed. He said that seed should be raised as far up-bay as possible and moved down-bay as growth and environmental conditions warranted. Mr. Morgan said that this was a real radical move. He thought that this effort should be done on an experimental basis. Dr. Kraeuter said that a private individual should do this. Mr. Horzepa asked about the number of times that the oysters would have to be moved. Mr. Morgan said there would be no enforcement of this arrangement. Mr. Canzonier informed the task force that New York watermen have hired a private security firm to monitor their resource.

There was a discussion about the number of times the oysters would have to be moved during a year to improve growth and minimize mortality to disease and predators. Mr. Horzepa had several questions regarding funding for this effort. Dr. Kraeuter and Mr. Dobarro discussed the mechanics of the programs. Mr. Morgan said that the upper beds already have large populations of small oysters.

Dr. Powell presented several scenarios for leasing and an assumption of risk for cultivating oysters in the upper bay by industry members. Mr. Canzonier said that the impediments to the management programs should be removed. Mr. Taylor said that although some impediments may have to be removed, it shouldn't be done at the expense of anyone. Mr. Horzepa wondered if the movement of oysters several times to accommodate biological and environmental conditions was cost effective.

Mr. Joseph thought that production could be increased through a communal effort. Dr. Kraeuter said that the industry wouldn't participate in alternative production programs on a volunteer basis. Mr. Dobarro commented that any areas leased would have to be firm, stable. This most likely meant that bottom would be productive seed area.

Dr. Powell said that the leasing impediment would have to be removed so Council had the option of leasing the seed beds. He thought that anyone with a proposal to grow oysters on the seed beds should be able to apply to the Council. Mr. Horzepa

said innovative strategies should be encouraged but there were other considerations such as user conflicts, i.e., commercial crabbing, gill netting, etc., for leasing the seed beds.

Ms. O'Dierno asked Mr. Morgan if he was against leasing any portion of the seed beds. Mr. Morgan said that he was against leasing the seed beds but was willing to accept a pilot program. The group discussed constraints for a pilot program. Mr. Morgan discussed possible scenarios for this pilot program. Mr. Canzonier described a program in Connecticut whereby Mr. Hillard Bloom has had considerable success raising oysters on beds off Bridgeport which were formerly public areas. In addition to his success, Mr. Bloom was providing assistance to the City of Bridgeport in order to increase production on the public beds. Mr. Canzonier said that public initiative can not match the initiative of private business. Mr. Morgan said that it was important to have surveillance if this pilot program is to be conducted. Mr. Horzepa thought that both the lab and private enterprise could conduct this pilot program.

Mr. Dobarro discussed the programs with which the Bureau of Shellfisheries was currently involved. These programs included: a movement of oysters from the upper beds to supplement heavily worked areas on some intermediate seed beds, a direct market harvest, and a proposed late summer transplant from the upper seed beds to either a sanctuary area on the lower seed beds. Dr. Kraeuter said that these programs have to be longer than one year.

Mr. Joseph said that the Division of Fish, Game and Wildlife was opposed to leasing the seed beds. Dr. Kraeuter said that the Division had to be amenable to accepting the results of the pilot study. Dr. Powell said that it was clear the Council would not arbitrarily lease the seed beds. He thought that it was necessary to provide the Council with the authority to lease the seed beds if it was deemed appropriate. Mr. Joseph said that the state had the responsibility for managing the seed beds. He said if the pilot program provided useful information, the state would use this information to revise management strategies. Mr. Canzonier said that a communal program would not work for this fishery. He alluded to the fact that it has been difficult to get the industry to participate in communal projects.

Ms. O'Dierno inquired about the length of time required for a demonstration project. Mr. Canzonier's response was 5 years. This period was required because of the variability of environmental and biological conditions. Dr. Powell said that it would take 3 years to raise the oysters to market size. Mr. Ogden questioned the type of system, e.g., transplant, rack or string culture, etc., which would be used. Mr. Canzonier said that it was necessary to provide the opportunity for leasing the seed beds. Mr. Ogden had several questions regarding the source of the seed to plant on these grounds. Mr. Canzonier said that the seed could come from a natural set, hatchery, or other source.

Mr. Canzonier provided a summary of the disposition of oyster seed in Connecticut. He said that Hill Bloom purchased most of the seed in Connecticut and also paid the landing fees for the harvester. The seed costs Mr. Bloom approximately \$7.70 per bushel. Mr. Canzonier said that the local industry had to realize there was a value to the seed from the natural beds.

Mr. Bailey said no one would want bottom that wasn't stable. He said that this leasing program will remove prime bottom from the open fishery. There was a discussion about this concept. Dr. Kraeuter said that there is no incentive for the industry to maintain the seed beds.

Dr. Kraeuter asked if the industry was willing to put the effort into enhancing production on the seed beds. Mr. Bailey said that they were talking about two different issues. Mr. Bailey was concerned about removing productive seed bed areas from the open fishery. Dr. Kraeuter said that leaseable bottom should be areas with shell bottom but without oyster. Mr. Bailey said that any shell bottom had the potential for a spatfall and therefore should be considered prime seed bed area. Dr. Kraeuter disagreed and stated that there was a definition problem between him and Mr. Bailey. Mr. Canzonier said that the bottom with standing crop couldn't be leased. He said that bottom with shell should but no oyster should be leased. This discussion continued for several more minutes.

Dr. Powell suggested that some shell areas were only occasionally productive and shouldn't be considered prime seed bed areas. Ms. O'Dierno suggested that lab personnel design a pilot program for discussion. Dr. Kraeuter balked stating that he wouldn't design a pilot program unless there was agreement to accept the results. Mr. Horzempa thought that Mr. Bailey's comments were valid. He tried to analyze the risk to the industry by removing some of these less productive areas from inventory for the pilot studies. Dr. Kraeuter said that the lab had enough data to locate some general areas for a pilot program. He said that the data wasn't sufficient for a leasing program.

Mr. Canzonier said some areas along the inshore edge of the seed beds have never been used by the fleet. There was a discussion regarding areas of the seed beds that could potentially be leased.

Dr. Powell talked about the leasing program in the Galveston Bay area of Texas. He said that the state does not lease productive areas but will lease non-productive areas. Productive areas were determined by oyster density. He said that these non-productive areas have been cultivated by the leasee and are now very productive due to the efforts of the industry. Dr. Powell said that he had delineated the oyster grounds, both natural and private, in Galveston Bay. The cost of that program was about \$250,000. He said that it was a comprehensive program for delineating the area and quality of the beds.

The next issue discussed by the task force was the marketing issue. Mr. Taylor said that the industry should try to have oysters for nine months of the year. Dr. Powell said that the industry should use a group like the New Jersey Seafood Coalition to define and market the product. Mr. Taylor said that the industry had to develop a substitute product for the off season. Ms. O'Dierno stated an identity had to be established for the New Jersey oyster. Dr. Powell said that the industry had to associate itself with the Seafood Coalition to develop its markets. Dr. Powell said that the cost to the industry would be returned many times.

Ms. O'Dierno said that it was important to establish an identity for the oyster. Some oysters were known by the area of production. No one recognizes the eastern oyster. Mr. Taylor said that the oyster should be identified as the New Jersey Oyster.

Dr. Powell asked about the short-term solutions to increasing production. He said that most of the discussion had focused on long-term strategies. Mr. Horzepa stated that his recollection of previous meetings was that short-term strategies included increased landings, more consistent product, and better marketing programs. Dr. Powell said that the key issue for the short-term was the management of the seed beds. Mr. Joseph said that the short-term strategies could be treated within the existing framework. Dr. Kraeuter and Mr. Canzonier disagreed stating that there were limitations to these programs.

Dr. Powell said he was in complete agreement with the philosophy to privatize the oyster industry. He didn't think short-term solutions would increase production as much as the privatization of the fishery would. According to Dr. Powell, a five-year plan for increasing production would be a cooperative effort to manage the fishery. Mr. Dobarro said that the Council has been working on new management strategies for the fishery over the past two years. These new programs have been a cooperative effort between the Council, industry, state and university. Dr. Powell agreed that there already was considerable effort being expended to increase production in a cooperative manner.

Mr. Dobarro elaborated on the programs that were already in place and or were being initiated to revise the management programs and increase production. These programs included restricting the traditional transplanting practices and emphasizing a direct market program to conserve the resource and increase landings. Additionally, the industry was transplanting oysters from the upper, under-utilized beds to supplement those areas of the lower beds that had been intensively dredge during the direct market component of the program. And, in order to ensure a market supply during the holiday season, the industry was being encouraged to move oysters to a sanctuary area that would be opened in late fall after the primary beds were closed to harvest. Another scenario would be to move oysters in late summer to the planting grounds. These oysters would be used for market at anytime including the pre-, post-, and during the holiday season. Mr. Dobarro said that with these programs the industry would have a local product for 7 to 8 months of the year.

Mr. Dobarro said that one reason for his hesitation with leasing the seed beds was that these alternatives weren't tested. Mr. Horzepa said that these alternatives should be put on the table for consideration. Dr. Powell stated that although the effort has been positive, there was a need to increase the management of the seed beds. Dr. Powell suggested rotating harvest areas on the seed beds so one area wasn't worked excessively. He said that a funding mechanism for the transplant/supplement program, e.g., the cultch fund, should be established. This fund would be supported through seed harvest fees paid by the industry. Mr. Dobarro said that the problem with short-term planning was the lack of recruitment. Dr. Powell said that production could be dramatically increased. Dr. Kraeuter said that production had to be substantially increased. Dr. Powell said that any mechanism for intensively managing the seed beds would have to be properly funded. Dr. Powell thought the interim production should be

about 5 times greater than it is currently. Dr. Powell stated that it was important to have a list of short-term production solutions for the next meeting. Mr. Dobarro said that it was without question, annual oyster production in the bay should be in the neighborhood of 400,000 to 500,000 bushels. Dr. Kraeuter and Mr. Dobarro agreed to develop a list of short-term production strategies for the next meeting. Dr. Powell thought that the short-term production strategies and the financing of the various programs are current shortfalls of the task force.

Mr. Horzepa asked about the Oyster Resource Development Account as specified in N.J.S.A. 50:1-18(e) (a.k.a. the Oyster Cultch Fund). Mr. Dobarro provided Mr. Horzepa with both a summary of the history and current status of the fund. Dr. Powell said that the shell tax should be used as leverage for additional state funds.

Mr. Dobarro had a different slant to the discussion. He said that there are stocks in the bay, which appear to have the "silver bullet" for both MSX and Dermo, because they have survived the very intense infection periods of the early 1990's. With the advancements in the bio-technical fields, he felt that the genetic structure of these oysters should be thoroughly evaluated because they may hold the solution to disease problems in the bay. It was agreed that this was a long-term strategy. Dr. Powell informed the group that some of the experimental stocks maintained at the Cape Shore facility clearly had some resistance to both diseases. He said that there was a Mid-Atlantic research effort to increase resistance in those stocks. Mr. Canzonier and Dr. Kraeuter said that it would be necessary to use the seed beds to grow these stocks due to predation in the lower bay. Mr. Canzonier said that even the Cape Shore wasn't a viable grow-out area due to predation.

Before adjourning, the task force agreed to meet at 7:00 p.m., June 3, 1997.

**Meeting of the Oyster Industry Revitalization Task Force
June 3, 1997**

Task Force Members in attendance were:

Jim Joseph
Walt Canzonier
Dr. Susan Ford
Alex Ogden
Linda O'Dierno
George Horzepa
Scott Bailey

Steve Carnahan
Dr. John Kraeuter
Jim Gifford
Joe Dobarro
Dr. Eric Powell
Richard Malinowski

Chairman Malinowski to called the meeting to order.

Dr. Eric Powell began the discussion by distributing a handout of his proposal for the oyster industry. Dr. Powell suggested that a non-profit corporation be formed to manage the seed beds. According to Dr. Powell, the non-profit corporation would be composed of members from the shellfish council and a representative from the Haskin Shellfish Research Laboratory. This document generated considerable discussion among the task force members. Chairman Malinowski asked Dr. Powell for justification of this proposal. Dr. Powell responded by stating that a corporation would provide considerable advantages over the current management structure. These advantages included the streamlining of management decisions and programs and the ability to apply for business incentive grants.

Chairman Malinowski said that the industry wasn't ready for dramatic changes in the management structure of the fishery. Dr. Ford responded that the task force shouldn't be bound by the industry's unwillingness to change. Mr. Dobarro said that the current members of the industry are more willing to change their philosophy but only if there was a legitimate need.

Chairman Malinowski asked Mr. Dobarro about the state's position regarding Dr. Powell's proposal. Mr. Dobarro responded that although he was a representative of the state, he didn't have the authority to establish the state's position regarding this proposal. Chairman Malinowski asked Mr. Dobarro to present his personal opinion of Dr. Powell's proposal. Mr. Dobarro said that he didn't see the need for Dr. Powell's non-profit corporation. He felt that although the current management program could be adjusted, the current management structure was adequate. Mr. Joseph felt that Dr. Powell's proposal was just another effort to remove the seed beds from state control. Mr. Horzepa interjected that there was a need to manage the seed beds. However, from discussions presented in earlier meetings, he said that it appeared the seed beds were currently being managed. Dr. Kraeuter said that the management of the seed beds required more than the periodic harvest of oysters. Mr. Horzepa said that the private corporation wouldn't negate any rules or regulations applicable to the

management of a public resource. Mr. Horzepa believed that all the management objectives for the oyster fishery could be achieved through the existing framework. He stated that if the sticking points within the current management program could be defined, the management strategies for the fishery could be fine-tuned.

Mr. Gifford expressed confusion about Dr. Powell's proposal. He said that the private corporation would be composed of oystermen and, therefore, identical in structure to the current system. He questioned the differences between the current and proposed management structures. Mr. Ogden tried to analyze Dr. Powell's proposal and made several statements alluding to the state's purchasing process.

Dr. Powell commented that regardless of the management structure, the management of the money (i.e., the Oyster Cultch Fund) should be at a local level. He stated that a corporation would be the best way to deal with the legalities of managing the money. He was insistent that the money had to be handled outside of state control. Mr. Horzepa discussed the manner in which the commodity councils for the Department of Agriculture managed the money received from the various components of the farming community. He informed the task force that these various councils raised money through assessments on a per unit of production basis. The money received was used by each individual commodity council to promote the particular group's product. He said that these commodity councils operated under state supervision and were subject to state control of expenditures. He elaborated on the fiduciary responsibilities and obligations for managing these commodity funds. He stressed the point that there were numerous advantages to having state oversight of these funds. According to Mr. Horzepa, if problems existed with the disbursement of funds, these problems could be readily resolved with the Department of Treasury. Dr. Powell was skeptical that all the financial problems could be completely resolved with the state's purchasing agency. Mr. Horzepa reiterated his previous comments about the advantages of having the state's auditors control these (the oyster cultch) funds.

Mr. Dobarro requested that Dr. Powell clarify the problems he perceived with the current management of the oyster cultch fund. Dr. Powell said that he recalled several instances when state representatives had trouble getting money from the fund. He also stated that research personnel at the lab had experienced problems receiving payment for services rendered. Dr. Ford responded that the problem was mainly with the length of time required for payment. Mr. Joseph stated that most problems could be avoided with the proper planning. He also reminded Dr. Powell that the university's purchasing department caused many of the longest delays. According to Mr. Joseph, the main problem with the oyster cultch fund was the lack of sufficient funds to finance some of the more desirable programs. Mr. Dobarro informed the task force that he had dealt with a number of non-university contractors using cultch funds without the problems alluded to by Dr. Powell. Mr. Dobarro stated that the only problems of which he was aware were those involving disbursements to the university. Dr. Powell agreed that the university system was also very difficult to deal with and he has spent many hours trying to handle Rutgers' purchasing system. He believed that any bureaucratic system would cause delays with the disbursement of funds. Dr. Ford expressed reservations with the need to plan several months in advance for the initiation of any management program. She thought that it was extremely important to have as much flexibility as possible with

regard to time. Dr. Powell stressed he wasn't suggesting that the (oyster cultch fund) money was being mismanaged. It was his opinion that the money had to be more accessible. Dr. Kraeuter stated that there was a real need to initiate the various management components of the plan based on environmental parameters and therefore there was a need to act promptly when conditions were favorable. He didn't believe the present system could respond to environmental conditions. It was his opinion that the shellfish council had a tendency to manage by crisis. Dr. Ford noted that Dr. Kraeuter was discussing philosophical problems and not financial. Dr. Powell stated that the management programs had to be positioned to take advantage of the prevailing environmental conditions. It was his opinion that the existing programs were not adequate to deal with time flexibility.

Mr. Dobarro stated that many of the management programs were very easy to set up. Dr. Kraeuter agreed that most of the management programs had worked very well. Mr. Dobarro informed the task force that he had some discussion with the Township of Commercial regarding the management of the oyster cultch fund. He said that the township appeared to be more efficient with contract procedures than the state.

Chairman Malinowski questioned the disposition of Dr. Powell's proposal. He had several questions regarding the township's position with managing the cultch fund. Mr. Dobarro said that the township may be one of several options for dealing with the cultch fund. Dr. Powell suggested that this issue be presented to the industry for their recommendations. Dr. Powell wanted some recommendation included in the task force's final report.

Chairman Malinowski said that the industry has expressed considerable concern regarding the proposition to lease the seed beds. Dr. Powell said that the private corporation could be formed with the sole purpose of managing the money. Mr. Horzepa questioned Dr. Powell about the source of this money. Dr. Powell said that there could be several different sources of money coming into the industry, the immediate source was the oyster cultch fund. Mr. Horzepa asked Dr. Powell if he was implying that the cultch fund wasn't being used effectively. Dr. Powell responded affirmatively. Mr. Horzepa wanted to know if this situation was due to the lack of long-term strategic planning.

Mr. Ogden discussed setting on the natural oyster seed beds. He stated that if a natural set occurred on the seed beds there would be no need for a hatchery. Dr. Powell said that the corporation could purchase hatchery seed for the oystermen and levy a landing fee on each bushel of oysters landed to cover the expense of the program. The corporation would deal with all purchases and tasks required for the communal management of the industry. Mr. Horzepa said that the state already provides many of the services that the corporation would have to develop and pay for. Mr. Horzepa said that Mr. Dobarro had presented the details of a fairly good baseline management program at the last task force meeting. He thought that this plan only needed to be built upon. Mr. Steve Carnahan said that no one in this or any other fishery should be dependent upon state money. He believed that private industry needs to step up and finance fishery management programs. Mr. Dobarro provided the background for several programs that were initiated by the oyster industry. Mr. Dobarro

said that the industry was responsible for the current cultch fund program and several ongoing programs for increasing production in the bay.

Mr. Canzonier said that there was a definite need to improve upon the state's disbursement mechanisms. He stressed that the primary objective of the Oyster Task Force was to define the mechanisms for improving production. He stated that the objective wasn't to manage the oyster cultch fund. He reiterated his comments that the primary mission of the task force was to recommend strategies for improving oyster production and defining the mechanisms for facilitating this objective. Mr. Canzonier expressed concern that many members of the industry were opportunistic and weren't concerned about participating in programs to enhance production. He also stated that the shellfish council wasn't concerned with increasing production on the natural seed beds. Mr. Dobarro asked Councilman Fleetwood if Mr. Canzonier's statement was accurate. Mr. Gifford entered the discussion by saying that he had seen major changes in the council's management philosophy over the past year or two. Mr. Dobarro reminded everyone in attendance that the development of oyster management programs had involved not only the state and industry but also had included the personnel from the Rutgers' Shellfish Research Laboratory.

Mr. Canzonier continued by stating that the industry shouldn't depend on natural setting on the seed beds for continuous production. He was emphatic that he felt this to be a foolish philosophy. Councilman Steven Fleetwood said that he was disappointed that the task force was spending so much time trying to resolve a problem with money that he was unaware existed. He said that the oyster industry had made great strides over the past year. Councilman Fleetwood thought that the task force was moving in the wrong direction by spending too much time discussing matters which weren't of major importance at this time. He said that the task force should be addressing issues which would help increase production during the coming summer. He also questioned the wisdom of privatizing the state oyster beds. Dr. Kraeuter said the task force had to make decisions that were in the best interest of the industry.

Dr. Powell said the task force should discuss issues that address the short term production in the bay. He referenced a document distributed by Mr. Canzonier. The first item on Mr. Canzonier's list of suggestions was to extend the harvest season and attach a fee to all oysters removed from the seed beds. Mr. Malinowski said that the shellfish council had already provided for an extended season and had attached fees to the oysters harvested. Dr. Powell said that everyone was in agreement that the harvest season had to be extended. Dr. Ford asked if there were any statutory restrictions on the harvest season. Mr. Dobarro said that the law permitted the shellfish council to determine the harvest season. Mr. Dobarro said that the council should consider keeping the seed beds open until mid- November. He also discussed a scenario for the possible transplant of oysters from the upper seed beds to the leased grounds during late summer. This harvest would provide oysters for the holiday season. There was some additional discussion regarding this proposal and other opportunities for the oyster harvester.

There was also discussion regarding harvest and landing fees. Dr. Powell summarized Mr. Dobarro's list of suggestions. These suggestions included several different scenarios for a direct market harvest and transplants from the upper seed beds to intermediate sites or leased grounds. Mr. Dobarro discussed a late summer transplant. He indicated that a late summer transplant might minimize mortality and increase growth. Dr. Powell said that the problem with a major transplant was the qualification of the volume of oysters taken by an individual harvester. Mr. Dobarro agreed. Mr. Joseph said that with a direct market harvest there would be more control. Dr. Powell thought there would be problems with control and collection of fees if the direct market harvest was combined with oysters harvested for market from the leased grounds. Dr. Powell said that the industry would have to make a decision about moving oysters to the leased grounds and potentially wasting a large part of the resource. He thought that a landing fee should be collected on all oysters delivered to the dock. Mr. Fleetwood said that all oysters landed may have to be tagged with tags issued by the Bureau of Shellfisheries. Dr. Powell said that there was a need to have the industry support the enhancement programs. At the moment, there wasn't a great incentive for the industry to support the enhancement of the seed beds.

There was also some concern for the individuals who may transplant a large volume of oysters without paying a harvest or landing fee. Mr. Joseph was concerned about high mortalities. Mr. Dobarro didn't believe that mortalities would be excessive with a fall harvest. Dr. Powell thought that the industry had to have some financial responsibility for the fishery. Mr. Fleetwood said that this situation would improve if the industry could establish a steady supply of oysters. He said a limited transplant to the leased grounds would help ensure this supply during the fall and holiday season. Mr. Fleetwood believed that only 15 to 20 boats would participate in this limited movement of oysters from the upper seed beds. He thought that the industry would support a harvest fee if an accurate means of estimating the loads could be developed. The oysters for this program would be harvested from the intermediate beds such as Shellrock, Cohansey, and Ship John. Mr. Gifford thought the oysters should be harvested by the interested oystermen and transplanted to a common area on one of the lower seed beds. He wished to avoid any loss of the oyster stocks through a transplant to the leased grounds. Mr. Fleetwood suggested that oysters be moved from the intermediate beds and placed in a sanctuary on one of the lower beds. He also recommended that these stocks be monitored and evaluated for dredge damage. This information could be used to assess and evaluate the impact of the fall and winter dredge fisheries.

Dr. Ford expressed the opinion that any oysters removed from the seed beds should have the harvest fee attached. She was concerned about any program that would permit the harvest of oysters without payment for the stock. She said that as long as the harvester paid for the oysters, he should have the option of either marketing the stock or transplanting the oysters to the leased grounds. She thought that several oyster dredge boats should be hired to transplant oysters to intermediate sites on the seed beds. These areas would be eventually opened to all the oyster harvesters who would pay a harvest fee on all the oysters removed from these planting sites. Mr. Fleetwood speculated that the number of vessels participating in this program wouldn't be able to provide for the industry's needs. According to Dr. Kraeuter, these vessels would basically be subsidizing the other vessels in the fishery. In his opinion, if the

dredge vessels were to reap the benefits of the program, they should be willing to participate in the transplant effort. Members continued this discussion for several more minutes.

Mr. Canzonier stated that the task force shouldn't be concerned with the programs the shellfish council was currently discussing. He thought that the task force's report should include all the possible alternatives for increasing oyster production in the bay. He said that the council should have the option to accept or reject the task force's recommendations.

Mr. Dobarro and Mr. Joseph provided a summary of the current management strategies for the direct market harvest program. There was discussion regarding methods for measuring and quantifying oysters taken during a late summer transplant program to the leased grounds. Mr. Fleetwood said that the most practical program was one where the oyster harvesters participated in a program to transplant oysters on a sanctuary for later harvest. Only the vessels that participated in the transplant program would be eligible to harvest from the sanctuary. Mr. Fleetwood said that it was very important to have oysters for the holiday season.

Dr. Kraeuter thought that the harvest and/or landing fee should be based on a percentage of the market value for the oysters. Mr. Dobarro said that the bureau had tried to develop this concept previously but had trouble with the state's attorneys. Mr. Fleetwood suggested that the council consider several different mechanisms for providing oysters during the holiday season. He suggested that any program be tracked on an experimental basis to determine either the benefits or negative impacts of the program. It was Dr. Powell's opinion that the task force should not be concerned with specific details for any program. The task force should ensure that the mechanism for a transplant program be set up with the recommendation to assess each bushel of oysters removed from the seed beds. This assessment could either be monetary or for services rendered such as the movement of oysters downbay. Mr. Dobarro said that the current regulations provide mechanism for either of the scenarios suggested by Dr. Powell. It was agreed that the oyster seed had value and the harvest should be assessed in some manner. Mr. Horzepa indicated that any recommendations of the task force provide for the greatest amount of flexibility. He thought that there would be unexpected problems with each new program. Dr. Powell said that the industry couldn't depend on natural setting. He believed that it was very important to establish an ambitious and consistent cultch program or seed program. It was obvious from the discussion that there was a need to combine several different components to any strategy for increasing production in the bay. These components would have to include the transplant of oysters from the upper beds, a large and consistent shell planting program, and other means of replacing seed.

Mr. Canzonier discussed the stock assessment program and the need for improvement in the data collection. Dr. Powell agreed that there was a need to improve the data being collected. Mr. Canzonier suggested that there be a two step movement of the smaller oysters from the upper seed beds. This movement would include moving the oysters to an intermediate bed before being moved to the lower beds. Dr. Powell suggested that with the direct market program the seed beds should be rotated to avoid

stressing any one particular bed. Dr. Powell and Mr. Canzonier discussed various scenarios of utilizing various discrete areas of the seed beds. Mr. Canzonier also discussed utilization of high setting areas of the lower bay. Dr. Powell thought that it was extremely important to provide a mechanism and funding source for this particular program. He said that it was important for the industry to have a business plan with a detailed analysis of various costs for each program. He didn't believe that the council would be the appropriate forum for this type of analysis.

Mr. Gifford reminded the task force members that he had previously provided a suggestion to establish a management team for regulating harvest activities on the seed beds. He was of the opinion that the management team would have to meet more frequently than once a month to be effective. He didn't believe that the monthly meeting by the shellfish council was an efficient way of managing the seed resource. Dr. Powell agreed with Mr. Gifford and said that the management team would be the only way of increasing the harvest above the natural production potential. Mr. Gifford didn't think that the council could make the difficult and timely decisions necessary for the successful enhancement of the resource. He thought that a management team would be much more effective if it was empowered to make decisions. The group discussed composition of this management group. Mr. Dobarro said that the components for such a management effort were already in place with the council, the program only needed to be fine-tuned. Mr. Canzonier and Dr. Ford thought that even with a management team, the shellfish council should still have the final word in the management of the fishery. The group continued this discussion and the mechanisms for such a management team.

Dr. Powell used the role that Mr. Carnahan has with the New Jersey Seafood Coalition as an example of the type of business administrator the oyster industry needs for its management programs. Mr. King discussed the lack of a politically active administrator in Trenton. Dr. Powell stated that the state didn't have the resources to provide for such an administrator. Mr. Joseph thought that this discussion was short-changing the shellfish council. He suggested that the manner in which the council operated may have to be adjusted but the council didn't need to be removed from the decision making process. Dr. Powell didn't believe that the council could be effective meeting once a month. He stated that there had to be either an administrator or management team to develop the management strategies between meetings. The administrator or management team would provide the council with its recommendations. Mr. Horzepa wondered why each concept had to be presented to the council if there was a general management scheme. Mr. Horzepa said that the task force should put together a flexible management scheme to present to the council. This plan would provide the management team with the discretion to manage the resource on a day to day basis. The plan would have to be updated on a periodic basis.

The group discussed the manner in which management programs were currently handled. It was indicated that Mr. Dobarro and Mr. Joseph provided most of the logistical and administrative services for the industry. Mr. Joseph discussed the role of the various members currently involved with the management of the fishery. He didn't believe that this management structure should be abandoned. Dr. Powell said that the oyster industry needed a manager who would deal with the necessary issues on a daily

basis. It was Dr. Powell's opinion that the administrator should be someone who was employed by the industry or some component of the industry. He didn't believe that the personnel from DEP had the time to deal with the daily management operations for the industry. Mr. King didn't believe that a program of set strategies will work for this fishery because of the environmental dynamics and other factors. He suggested that management strategies would have to be developed for each given set of circumstances. Each suite of management strategies would have to be evaluated and adjusted for the prevailing conditions. He said that transplanting small oysters from the upper seed beds to the planting grounds does not work. These small oysters have to be left on the seed beds.

Ms. O'Dierno discussed her statement on marketing strategy for the industry. She indicated that there was a need to develop a specific name for the product. Her program also included market education programs, which include the safe handling of oysters. She also indicated that the oysters should be tested to certify their quality for the market place. There was also a need to ensure the consistency of the supply and manage the product's flow into the market place. The market should be investigated for the possibility of developing value-added products. She briefly discussed several different options for marketing the product (oysters). Because the product may not be available throughout the year, it may be wise to develop a "market exclusivity concept" for the product. There was also some discussion about developing international markets.

Mr. Carnahan talked about the benefits to the oyster industry that may be derived by advertising through the New Jersey Seafood Coalition's marketing program. Mr. Ken Donelson and Mr. Horzepa discussed the role of the Department of Agriculture and the Secretary of this department in the marketing of seafood in this state.

Before the meeting was adjourned, the task force members agreed to hold their next meeting on June 26, 1997. The meeting was scheduled to begin at 7 p.m.

**Meeting of the Oyster Industry Revitalization Task Force
July 1, 1997**

Task Force Members in attendance were:

Jim Joseph
Walt Canzonier
Dr. Susan Ford
Alex Ogden
Linda O'Dierno
George Horzepa
Scott Bailey
Joe Dobarro
Richard Malinowski
Jim Gifford

Absent from the meeting were:

Steve Carnahan
John Kraeuter
Eric Powell

Chairman Malinowski to called the meeting to order.

Mr. Dobarro presented the minutes of the May 20 and June 3, 1997 Oyster Task Force meetings. Task force members accepted the minutes.

Dr. Susan Ford provided a preliminary draft of the Oyster Task Force report to the committee. She indicated that this draft was a result of efforts by herself, Mr. Canzonier, Mr. Dobarro, and Dr. Kraeuter. Dr. Ford reviewed the format of the preliminary report and suggested that the draft be distributed among the individual agencies for review and comment. She also informed the attendees that several of the appendices still needed to be prepared. These appendices included the marketing and funding sections.

The draft report included an introduction, purpose for the task force, methodology utilized by the task force in developing the report, and recommendations to be presented. Dr. Ford said that the recommendations were in a specific format. This format included the specific recommendation with the expected result(s) defined, and a series list of criteria by which compliance with the recommendation and expected results could be measured. The recommendations were listed under topic headings that corresponded to the subject matter dealt with by the various sub-committees.

Dr. Ford indicated that the "measure of success" criteria hadn't been fully completed at this time. She said that Dr. Kraeuter was primarily responsible for the "measure of

success" criteria. Dr. Kraeuter believed it was that the "measure of success" criteria had to be very specific so that the effectiveness of the programs were measurable. Dr. Ford said that some of these criteria were uncomfortable to her, and others, because of the imposition of specific time limits and numbers against which to evaluate the programs. But, she also thought the "measures of success" forced someone to be realistic about the recommendations. Dr. Ford suggested that the success criteria be reviewed thoroughly for completeness, practicality, and compatibility with other sections of the report

Each one of the major sub-headings refers to an appendix which will include support information and documentation for the particular section. It was agreed that the minutes of the full task force would be included in the final report but due to the lack of completeness, the minutes of the sub-committees would not be included in the document. The minutes would be included to provide a more comprehensive picture of the discussions that occurred at the task force meetings. They would also provide more background information on the proposals included in the document. The background data for the recommendations is included in Appendix 4. This appendix would also include any recorded objections and/ reservations regarding the recommendations as well as any legal constraints for the implementation of the recommendations.

This preliminary report also included the drafts of several appendices for review and format criteria. Dr. Ford reiterated the purpose of the appendices, i.e., to provide background information and support documentation for each of the recommendations. Dr. Ford said that it was the responsibility of the individual preparing each section of the document to ensure that any objections or reservations to the particular recommendation are included in the section. Mr. Dobarro asked for clarification of Dr. Ford's statement. She said the people assigned to write the particular section should be responsible for the inclusion of any comments received regarding the recommendation in the report. Dr. Ford felt strongly that any task force member who had an objection or reservation regarding the recommendations needed to ensure that these counter opinions were included in the report.

Mr. Joseph asked about the possibility of including the comments along with the recommendations and the prioritization of the recommendations. Dr. Ford said that there had been discussion relative to weighting the recommendations. Mr. Dobarro said it also had to be determined that the recommendations included in the preliminary draft were in fact the group's recommendations. Dr. Ford agreed. She didn't believe that the group had to be in total agreement for inclusion of the recommendation. It was Dr. Ford's opinion that any reasonable recommendation should be included in the report with the reservations or objections included. There was a question as to whether support and opposition statements should be included with the recommendations or be expressed in the appendices. Mr. Horzepa said that it was very important to consider this issue of support and/or opposition. He thought that state policy makers should be engaged with the task force's process to keep them informed of the potential proposals. He said that he believe that there should be near unanimous consensus on the direction of the task force. He thought that this consensus would be necessary for the success of the programs presented. Mr. Canzonier said that there was bound to be disagreement among the members and he didn't think it was realistic to expect a consensus of

opinion. Mr. Horzepa said that the best opportunity for the program succeeding was to have agreement on program specifics. Dr. Ford believed that it would not be possible to have total agreement on all aspects of the program from all the players in the industry. Mr. Horzepa agreed that it would be difficult to have consensus on all the details of the program but it was very important to have the consensus of all the major players for the recommended programs. Mr. Gifford and Mr. Malinowski agreed with Mr. Horzepa. They stated that the final report should include those recommendations with which everyone could agree. Mr. Horzepa said that there had to be conceptual unanimity on the recommendations if the program was to succeed.

Mr. Canzonier said he believed everyone was in agreement with the primary objective (of the task force), i.e., increasing production of oysters. According to Mr. Canzonier, the disagreement among members of the task force was regarding the mechanism for increasing production. He thought the basic concept of increasing production should be retained and the difference of opinion on the mechanisms for increasing production would be resolved. Dr. Ford said that it may better to eliminate those specific items for which there was no agreement and retain only those items for which there was agreement. Mr. Canzonier thought that none of the suggested mechanisms should be discarded because some individuals didn't agree with the concept. He stated that all suggested mechanisms should be included in the report regardless of status because these mechanisms represented information. Mr. Alex Ogden agreed with Mr. Canzonier. He stated that all the recommendations should be included in some manner even if they didn't represent the consensus. Mr. Horzepa said that the final report could be structured so that it evolved with the interests of the industry.

Dr. Ford stated that the purpose of this preliminary draft was for review and comment. A Report considering the position of all interested parties would be generated based on this review. Mr. Horzepa said that the document should be circulated among industry members. He believed the industry should have as much opportunity as possible to provide feedback on the recommendations that may be included in the final report. Mr. Ogden said that the problem usually isn't with the concept but with manner in which the concept is expressed. Dr. Ford expressed hope that all the stakeholders will review the document and comment. Mr. Dobarro indicated that industry members would be made aware of the draft document and need for review and comment. Mr. Dobarro also stated that the industry members on the task force were not elected to the task force by the task force. So, although they may have been appointed to the task force as industry representatives, they may not represent the consensus opinion of the industry. Mr. Dobarro agreed to distributed a copy of the draft report to the industry. It was agreed that the committee would provide comments for revising the preliminary draft before it was disseminated. Mr. Horzepa thought the industry should have at least several days to review the document and the opportunity to express their opinions before the final report is drafted.

The committee discussed a calendar for committee benchmarks. Mr. Joseph thought that there should be a separate public meeting to discuss the recommendations contained in the draft report. Mr. Ogden suggested that the New Jersey Oyster Planters and Packers Association sponsor the public meeting. According to Mr. Canzonier, Mr.

Wayne Robinson was serving as the current president of this group. It was agreed that the committee would review and provide comments on the preliminary draft. A public meeting after which the document would be presented to the shellfish council would follow this review. Once all parties had had an opportunity to comment on the document, a final draft would be prepared and presented to the shellfish council at a special meeting. Mr. Horzepa expressed the need to be politically aggressive after the final report has been submitted in order to ensure that the programs were activated.

The committee agreed to have comments back to Dr. Ford by July 18th. A revised text would be prepared and disseminated by the July 25th to interested parties. Mr. Horzepa said that the report should be disseminated to as large a consumer group as possible to generate broad based support for the document. It was decided that the public meeting should be held August 5th. After the public comments were received, a document considering the public comments would be presented to the shellfish council. A discussion regarding the consumers for this draft document ensued.

Mr. Canzonier said that all recommendations should be included, in some fashion, in the report regardless of the level of support for the particular item. Mr. Bailey believed that the final document should represent consensus of opinion expressed by industry. Mr. Canzonier argued against eliminating any recommendation from the report. Mr. Horzepa said that he was most interested in determining the industry position and comments on the report. He was primarily concerned with producing a document representing the interests and concerns of the group that the document was supposed to support.

Mr. Joseph said that the alternatives could be listed as preferred and non-preferred recommendations. Mr. Canzonier said that all valid comments, whether positive or negative, should be included but should not necessarily dictate the composition of the final report.

Dr. Ford thought that the committee should try to reach consensus for the recommendations. Mr. Horzepa stated that the committee should meet after the public session to agree upon the final narrative for the document. Mr. Horzepa said that the task force should be in agreement with the document before it was disseminated to the public. A task force meeting was scheduled for July 22nd to discuss the committee's comments before it was sent to consumers on the 25th of July. A task force meeting was scheduled for the 7th of August to discuss the results of the public meeting.

The committee agreed to request the use of the Commercial Township hall for the public meeting. Mr. Dobarro agreed to contact the township and determine the availability of the township's facility. A final draft of the report would be prepared and presented to the shellfish council at a special meeting. A final task force meeting was scheduled for Tuesday, August 19th. A final draft of the report would be sent to the (shellfish) council by August 21 and the special meeting of the (shellfish) council would be scheduled for the 26th of August. After the special meeting, the final adjustments would be made to the report, which would thereafter be submitted to the Governor.

The committee reviewed the schedule of events. Dr. Ford asked that all outstanding sections be completed and forwarded for inclusion in the report. Mr. Horzepa said that he would need some input from the lab and shellfish personnel for development of the funding section. He also discussed the funding sources for the various programs.

It was also agreed the governor's office should be informed that the report wouldn't be submitted until the latter part of August.

Mr. Dobarro said that the committee should express its appreciation to Dr. Ford's for her effort to collate all the data presented to date into the preliminary draft. The committee agreed and adjourned.

**Meeting of the Oyster Industry Revitalization Task Force
August 7, 1997**

Task Force Members in attendance were:

Jim Joseph
Walt Canzonier
Dr. Susan Ford
Alex Ogden
Linda O'Dierno
George Horzempa
Scott Bailey
Joe Dobarro
Richard Malinowski

Absent from the meeting were:

Joseph Dobarro
James Gifford
Eric Powell

Chairman Malinowski to called the meeting to order.

Chairman Malinowski summarized the comments received by the oyster task committee at the public meeting held August 5, 1997 in Commercial Township's Municipal Building. Chairman Malinowski indicated that from the comments received the (oyster) industry was opposed to leasing above the Southwest Line and the concept of a facilitator as outlined in the draft proposal. Mr. Canzonier and Dr. Kraeuter said the public didn't understand the purpose of the facilitator. Chairman Malinowski stated the shellfish council members present at the public meeting were also opposed to leasing above the Southwest Line. Dr. Ford remarked that the recommendations didn't require leasing above the Southwest Line but rather presented the council with the option of conducting a trial program in the upper bay. Dr. Kraeuter claimed that the members of the public attending the meeting did not have a problem with a trial program on the lesser productive areas of the beds. Dr. Ford indicated that after the trial program, the council would have the discretion to lease these low productive areas if it so desired. Mr. Joseph said that the argument was with leasing above the Southwest Line. He thought that the council, Department of Environmental Protection, and laboratory could look this issue. Dr. Ford asked if this trial program had the potential for including private individuals. Mr. Joseph didn't believe so. Dr. Kraeuter said that if this were the case, the state should not be leasing in any areas of the bay. Chairman Malinowski said that the Delaware Bay Section of the Shell Fisheries Council was opposed to leasing above the Southwest Line and would oppose this concept in Trenton. Dr. Ford said that it was the task force's responsibility to consider all possible viable alternatives for increasing production. She suggested that if the industry was opposed to it then it shouldn't be presented as a recommendation, but should be mentioned in the report as a potential alternative in some fashion. Dr. Ford talked about the rationale arguments for trying to move oysters above the Southwest Line.

Mr. Joseph discussed the State of Maryland's Roundtable for Increasing Oyster Production in Chesapeake Bay. This report indicated that Maryland's report agreed to consensus for their recommendations. Dr. Kraeuter argued against this premise since it wasn't agreed to during the preliminary discussions of the committee. Mr. Canzonier also disagreed with having consensus for the recommendations. Dr. Kraeuter claimed that Mr. Joseph was trying to ramrod the decision making process. Mr. Joseph said that he wasn't trying to impose new ground rules on the group but to present a final document, which would have clear agreement on the principals. He said that there should be at least simple majority for the recommendations. Dr. Ford said that she still questioned the reasons for the objections. She didn't think that there was a scientifically valid reason for not dealing with this issue. Dr. Ford said that as a scientist she couldn't discount this concept for political reasons. It was her contention that the objective of this program was to increase the numbers of oysters in marginal areas through the use of private capital and initiative. Mr. Joseph said that all other options for increasing production in the bay should be explored before the council considers leasing above the Southwest Line. Dr. Kraeuter disagreed with this argument. He said that this was no current program to increase production on the seed beds. Dr. Ford disagreed with Dr. Kraeuter's statement indicating that there was a public effort for increasing production through the landing fee program. Mr. Joseph also reiterated previous program efforts for enhancing production.

Mr. Ogden tried to summarize previous discussions for leasing areas on the seed beds. He said that the original discussions included minimum acreage for the leases and bottom topography having less than a certain percentage of oysters. He said that the use of the basic natural beds was being prohibited. Chairman Malinowski asked about enforcement on the leases and seed beds. Dr. Ford said it was ironic that use of the suction dredge was being proposed for enhancement programs when this vessel owed its existence to private initiative. A discussion ensued regarding the use of the suction dredge both in Connecticut and New Jersey. Dr. Ford stated that private industry had successfully generated the revenues in Connecticut to fund the construction of the suction dredge vessel. She added that the success of the oyster industry in Connecticut is primarily due to private initiative. It was noted that the small operator also benefited from this private initiative. Dr. Kraeuter and Mr. Canzonier said that the success of the Connecticut fishery was due to the access and private control of the seed beds. Dr. Ford said that the problem with this proposal locally was the fear that the small operator would be placed at a disadvantage. Dr. Ford and Mr. Canzonier said that this resource was already privatized to an extent due to "limited entry." Dr. Kraeuter said that this resource was not being used very well. Dr. Ford indicated that if leasing in the upper bay was not included in some format, she wouldn't sign the final document. Dr. Kraeuter and Mr. Canzonier supported Dr. Ford's position. Mr. Ogden said that there was a possibility for the submission of a minority report. Mr. Canzonier said that he hasn't been presented with a valid reason for refuting this concept.

Ms. O'Dierno indicated that she supported Mr. Joseph because the common perception considered the seed beds to be a public resource. She said that perception was the critical value. Dr. Ford asked about the objective of the task force. She wished to know whether the purpose of the task force was to present ideas for increasing the

economic benefits from the bay or serving the lowest common denominator in the industry. Ms. O'Dierno expressed the opinion that the task force was to serve the needs of the industry. She said that it was her impression that industry was unanimously opposed to this concept. Dr. Ford said that industry wasn't unanimously opposed to this concept. Dr. Kraeuter said that due to sociological problems in the community, those in favor of this proposal have not voiced their support. He said that the shellfish council should have addressed this issue. Mr. Canzonier believed that leasing areas of the seed beds was an appropriate measure. Ms. O'Dierno said that she didn't consider this issue to be an appropriate recommendation since there was so much opposition to leasing seed beds areas from most task force members and the oyster industry. Ms. O'Dierno said it was necessary to focus on the issues that would have acceptance of and benefit to the industry. Dr. Kraeuter said that it is necessary to enhance production above the Southwest Line. Because the state doesn't have the funds for this enhancement, he felt it was necessary to draw in private money. Mr. Canzonier said that the state wouldn't fund the necessary enhancement programs.

Mr. Horzepa said that he had been listening to the comments of the task force, shellfish council, and oyster industry (at the public meeting) and the general consensus was not to lease the oyster seed beds. He indicated that there was some interest in an experimental program. He believed that the task force had a responsibility to present a recommendation that was feasible. There was a discussion on design of an experiment for this trial program. Mr. Canzonier thought that it was important to have private enterprise conducted the experiment. Mr. Joseph suggested that the experiment be conducted on a communal basis.

Mr. Ogden questioned the seed transplant programs being conducted by the state. He didn't think that sufficient notice was provided to the industry. Both Dr. Kraeuter and Mr. Canzonier said that these programs were discussed at several council meetings and very few individuals stepped forward to participate. Dr. Kraeuter said that the council even discussed vessel charter fees. Dr. Kraeuter stated that the industry should participate in these programs without compensation. He said it was necessary for the industry to participate in these programs if the enhancement efforts were to be successful.

Dr. Ford said that it was important for the task force to decide on this issue. Chairman Malinowski suggested that the leasing component could remain but the shellfish council would surely reject it. Mr. Joseph said that it shouldn't be included in the recommendations. Mr. Horzepa said that he hadn't heard any support for this recommendation outside of the task members from the university. Mr. Horzepa thought that the experimental program possibly could be included. Dr. Ford said it was important to have someone from the private sector demonstrate that it was commercially viable for someone to move oysters from a high salinity to a low salinity area. Mr. Canzonier also agreed that it was necessary to determine the commercial viability of the operation. Dr. Ford said the bottom line was to make money from the bay. Dr. Kraeuter said that leasing of the seed beds was necessary to promote aquaculture. According to Dr. Kraeuter small oysters can't be raised in the lower bay. Mr. Canzonier said that small oysters needed a "safe haven". Dr. Ford said that with Dermo, things had to change in the bay. It was her opinion that neither the state nor the

university was capable of resurrecting the resource. She thought the only way to improve the situation in Delaware Bay was through private industry. Dr. Kraeuter said that the industry didn't need more science, the industry, itself, needed to become more aggressive. Mr. Horzepa said that the industry was concerned about the potential for excluding many operators from the fishery. He discussed that status of the natural seed beds as a public resource.

Mr. Canzonier said that it was important to provide the shellfish council with the mechanism for encouraging private initiative. Mr. Canzonier thought that this mechanism could be made available through the Advisory Committee, created by the Aquaculture Act, and the shellfish council. Mr. Canzonier suggested that the industry would have to provide protection for their leases. Mr. Ogden said that he wasn't concerned about pilferage on the natural beds but rather on areas on which he may plant seed stock.

Chairman Malinowski requested revisions to the leasing recommendation. Dr. Ford said that it could either be revised or included in some other area of the document as an option discussed by the task force, which didn't receive support. Mr. Horzepa said that the issue with the industry is increasing production. He stated that the mechanism for increasing production had to be inclusionary, i.e., a program which would include everyone in the industry in the benefits of the enhancement efforts. Dr. Kraeuter didn't believe that individuals who didn't invest their time and money into the enhancement efforts should benefit from the results of these efforts. Mr. Joseph said that several proposals have been presented to encourage individual oystermen to participate in enhancement programs. Those oystermen participating in the programs would reap the rewards of the enhancement efforts. Mr. Canzonier explained that there was virtually no response to these proposals. Mr. Joseph said that the opposition to these programs was from the smaller operators who claimed they would be put at a disadvantage in this type of program.

Dr. Ford thought the discussion was divergent. She indicated some members of the group were discussing communal efforts while other members were focused on the efforts of individuals. She said that individuals should have the opportunity to explore this option. Dr. Ford claimed that it was the efforts of a few individuals in Connecticut that revived the fishery. Dr. Ford stated that there were a larger number of individuals participating in the Connecticut fishery after its revival than before. Mr. Canzonier indicated that the revival of the Connecticut fishery didn't lead to the exclusion of the small operators. Mr. Joseph thought that a number of things could be done above the Southwest Line without leasing the seed beds. Mr. Horzepa discussed some possible methods for improving the management of the seed beds. He reiterated his previous statement that the primary objective of the task force was to increase production. Mr. Horzepa didn't think that this program should include leasing the seed beds. Dr. Ford asked Mr. Horzepa about the rationale for considering leasing to be exclusionary. Mr. Horzepa responded that under a leasing scenario the state gives up rights to the public resource. Dr. Kraeuter argued that the practice of leasing in the lower bay wasn't appropriate if this were the case. Mr. Joseph said that the seed beds were considered to be a different resource. Mr. Canzonier argued that the designation of the seed beds was only for political purposes. Dr. Kraeuter said there was a limited area above the

Southwest Line that was productive. Dr. Ford said that if everyone had an opportunity to participate in the leasing program, it couldn't be considered to be exclusionary. Mr. Canzonier said that the mechanism could be established to ensure leasing wouldn't be exclusionary. Dr. Ford thought this power should be put into the hands of the (shellfish) council. Mr. Canzonier argued that the leasing option should remain as an option for increasing production in the upper bay. Mr. Canzonier thought that there was a general misunderstanding among the industry regarding this program.

Mr. Horzepa asked about the use of the "cultch fund." Mr. Scott Bailey said that the money was being used to plant shell. Dr. Kraeuter said that more had to be done for increasing production than planting shell. Mr. Canzonier stated that the industry had to move to the next step. Mr. Bailey claimed that the industry was already making progress with its enhancement efforts and harvest program. Dr. Kraeuter said that it was his intention to provide an opportunity for someone who was willing to put money into developing the leases. Mr. Canzonier discussed the methods and commitments that private industry would make to increasing production. Mr. Ogden said that the problem with government was it needed guarantees and quantifiable measures of success, otherwise funding would be short lived. Dr. Kraeuter suggested that the government would have to charge a lot more for the seed to finance the enhancement programs. Mr. Joseph said that the program is being developed to provide more money for the enhancement efforts. There was some discussion about the interactions of the State of Connecticut and the private sector. Dr. Kraeuter stated that the private sector has helped finance some of the programs in Connecticut.

Ms. O'Dierno suggested that the wording of the document be modified. She said that the section regarding restricted use of the leased areas be eliminated. Mr. Joseph said that he preferred an effort, which would be applied for the communal benefit rather than limited use by private lessees. Ms. O'Dierno commented on the components of the Aquacultural Development Act. Mr. Horzepa said that the restrictions on the use of the areas above the Southwest Line were the issue of concern. Dr. Kraeuter said that the oyster industry should form a co-operative to manage the resource. He claimed that this program would be inclusionary. Mr. Canzonier stated that a co-operative had been formed in the 1940's to manage the resource but had failed. According to Mr. Horzepa, it would be better to improve the management of the resource so the responsibilities of the members of the industry were clearly defined. Dr. Ford objected to the restriction inherent with a communal program. Dr. Ford thought that the recommendation should be included in the document and it shouldn't be watered down.

Mr. Peterson, a licensed oyster planter, said that a small operator couldn't afford to develop bottom in the bay. He said that the larger operators have been able to hang on during the financially difficult periods experienced by the industry. Mr. Canzonier suggested that the small operator would have more flexibility if he had more options. Dr. Kraeuter stated that he was opposed to leasing the most productive areas of the seed beds. Mr. Peterson asked for clarification of the task force's proposal. Mr. Peterson discussed his involvement with the fishery in the transplant mode. Mr. Ogden discussed a transplant of seed from Section A to private grounds on the Cohanse or Ship John. Mr. Ogden said that the council won't pay for this transplant so the opportunity should be available to the individual. Mr. Peterson said that the oystermen

should be willing to invest some of his profits back into the resource. Dr. Ford asked Mr. Peterson if he was willing to pay up to \$3,000 for the dredge license. Mr. Peterson said that he was willing to participate in programs which included transplanting oysters from one bed to another. Mr. Joseph indicated that the state currently has the authority to require the industry to participate in enhancement programs. The authority is presently in the oyster management regulations.

After further discussion, Dr. Ford expressed frustration with the stalemate that had occurred in the meeting over the inclusion of leasing the seed beds as a recommendation in the task force's report. She stated that it was a viable alternative to current practice and should be included in the document in some manner if not as a recommendation. It was Mr. Canzonier's opinion that this concept may have to be included as a minority recommendation. Dr. Kraeuter agreed. It was Mr. Joseph's opinion that only those recommendations, which had the majority support of the task force members, should be included in the final report. Mr. Canzonier continued with justification for including the leasing component in the final set of recommendations. There was a discussion of the involvement of the legislature and Governor in implementing the recommendations of the task force. Mr. Ogden responded that the DEP was against any verbiage relative to leasing above the Southwest Line. According to Mr. Joseph, the industry had also expressed total opposition to this concept at the public meeting. Members continued the debate of leasing above the Southwest Line. It was indicated during this discussion that proponents of this concept were not suggesting leases on the Natural Seed Beds. Dr. Ford said that the current recommendation stated leasing would be done only in selected areas above the Southwest Line, it made no reference to the seed beds. Mr. Canzonier said that the language should be modified to suggest leasing only be done in areas of appropriate salinity.

Mr. Horzepa said that the current rules require a more intensive management of the seed beds by the industry. He suggested that industry members be excluded from seed harvest if they don't co-operate with the transplanting of seed on the beds. He suggested that this rule be implemented to increase participation in the management programs by the industry. Those members of the industry unwilling to participate would be excluded from the fishery. Dr. Ford said that anyone should be able to participate in the harvest of the seed, regardless of their activity in the management schemes, as long as they pay for the seed. These fees should be used to replace seed on the beds. Mr. Joseph agreed, but added that this program didn't require the leasing of the beds. Dr. Ford said that a private individual should have the opportunity to compete with the natural resource. Mr. Ogden said that he didn't know how to protect the natural areas of the seedbeds under the leasing scenario. Dr. Ford said that they were not proposing to lease productive areas of the seedbeds. Dr. Kraeuter said that the state or the lab could delineate the productive areas of the areas fairly quickly. Mr. Horzepa asked about the leases on the lower side of the Southwest Line. He questioned if anyone was working to improve production on the lower grounds. Dr. Ford said that the problem with the lower grounds was salinity. She said that the upper bay offered lower salinity areas for increasing survival of younger oysters. Mr. Peterson commented on the seed source in the Cohansey River. Dr. Kraeuter commented on the industry and state's limited efforts to increase production on the seedbeds. He stated that there should be

some private initiative involved with increasing the seed supply in the bay. Dr. Kraeuter discussed the variation in production among the seed bed areas. Mr. Joseph discussed problems with developing non-productive bottom, enforcement, and user conflicts.

Mr. Canzonier said that the leasing recommendation should be included in the report to ensure that this opportunity wasn't lost. Mr. Joseph claimed that this opportunity would always be available. He stated that the laws could be changed to permit leasing above the Southwest Line if the industry wished to do so. He cited a number of statutory changes that have occurred in the past few years. Dr. Kraeuter berated these changes saying that they were insignificant. Mr. Canzonier said that someday there might be consensual support for leasing in the natural seedbed areas. He claimed that the state representatives would fight any such change in the law regardless of the (production) potential of these areas. Mr. Joseph rebuked Mr. Canzonier. Mr. Joseph stated if the community supported this issue, the state would support the necessary changes. Mr. Canzonier said he was aware that many people in the community would not support this concept.

Chairman Malinowski demanded a resolution to this issue. Mr. Canzonier said that this issue had to be included either as a majority or minority recommendation. Mr. Horzepa objected to a minority recommendation because it would dilute the strength of the document. Dr. Ford said that without inclusion of the leasing recommendation, the report would be weakened because it is the only new idea in the report. She indicated that many of those items included in the recommendations were currently being done. Dr. Kraeuter said that leasing has the potential for encouraging private initiative. Dr. Kraeuter said that the leasing recommendation should remain. Mr. Horzepa suggested rewording the recommendation: Dr. Kraeuter opposed this recommendation. Mr. Horzepa suggested that the Aquaculture Advisory Council could discuss this issue. He suggested that results of the more intensive culture programs would probably be available by the time this council was organized. Dr. Kraeuter said that this would dilute the influence of the shellfish council, which this group had sought to avoid. Mr. Ogden expressed concern that the shellfish council would be eliminated from this issue in the future. Dr. Kraeuter said that the council should have the authority for leasing above the Southwest Line, therefore reference to this issue should be included in this document. Ms. O'Dierno indicated that the Aquaculture Act recognized the shellfish council's leasing authority.

Mr. Canzonier said that the shellfish council was included in the membership of the Aquaculture Advisory Council. Mr. Joseph asked for specific information on the relationship of the shellfish council and the Aquaculture Act. A discussion of the Aquaculture Act ensued. Mr. Horzepa had several suggestions for rewording the leasing recommendation included in this report. Dr. Ford said that the wording should specify low salinity areas. Mr. Horzepa said that a rewording would permit experimentation in these areas without "closure" on the eventual use of these areas for private investment. Dr. Ford said that the experiment had to include individuals because of a communal approach would not work. Dr. Ford stated that the rationale of this recommendation was to encourage private investment. She said that it should be within the shellfish council's authority to determine whether this program is conducted by a single individual or on a communal basis. There was a discussion on the type of

experimentation that would be conducted and ownership of the oysters. Dr. Ford thought that an individual should be granted exclusive use of an area if they participate in this experiment. Mr. Canzonier said that this program required exclusive use or ownership of the oysters used in the pilot program. Mr. Canzonier presented his own wording for this recommendation. This wording included ownership to the oysters. Mr. Joseph suggested that the experimental plots be "apart and separate" from the Natural Seedbeds. Mr. Canzonier and Dr. Kraeuter disagreed. The task force discussed production in the creeks above the Southwest Line.

Dr. Ford voted for including "lower salinity areas" in the wording of the recommendation. Mr. Horzepa discussed the concept of pilot scale programs for areas above the Southwest Line. Dr. Ford said that if someone attempted this program on a pilot scale and proved successful, then the industry as a whole probably would embrace the concept. Dr. Ford said that a private individual could proceed with this program with much more vigor than either a communal effort or a program conducted by the state. Mr. Canzonier suggested that the various programs be conducted in parallel rather than sequence to conserve time. Dr. Ford stated that the lab already had data to indicate the feasibility of growing oysters in the lower salinity areas of the seedbeds. Mr. Horzepa questioned whether the proponents of this proposal were still recommending the leasing of the seedbeds. Mr. Joseph indicated that the lab personnel were still making this recommendation. Dr. Ford agreed with Mr. Joseph's assessment. Mr. Horzepa stated this arrangement should only be accomplished through agreement with the Departments of Environmental Protection and Agriculture. The group continued the debate regarding the leasing of the seedbeds. Dr. Ford said that the wording called for the leasing in the low salinity areas of the bay and didn't eliminate the seedbeds from this leasing program. In response to a question from Mr. Ogden, Dr. Kraeuter said that an individual would own the stock that they are culturing. The individual had a proprietary right to the aquaculture stock.

The discussion regarding the leasing of public bottom below the Southwest Line continued. Mr. Joseph said that the quality of the resource was different in the two areas and the seedbeds required special attention. Dr. Kraeuter and Mr. Canzonier expressed the opinion that the bottom in the lower bay was more valuable to the industry because it was difficult to grow a market size oyster on the seedbeds. Mr. Ogden thought there was some confusion about the areas that were to be leased. Ms. O'Dierno also said that there was some concern about the wording of this recommendation. She asked if the productive areas of the seed beds could be clearly defined. She discussed the designation of the naturally productive areas of the seed beds. Mr. Joseph said that the areas would have to be defined in the statutes or regulations. Mr. Canzonier suggested that the descriptive terminology "low salinity areas" was most appropriate. Mr. Joseph disagreed because of this terminology wasn't descriptive enough. He also thought enforcement would be very difficult. He worried about the violation of the seedbeds by adjacent lessees. Mr. Canzonier argued that the individuals involved with this type of aquaculture would not be those who would violate the seedbeds. Mr. Peterson disagreed with Mr. Canzonier.

Mr. Horzepa thought that this effort should be conducted on an experimental basis and the leasing issue should be deferred until the results of the experiments are known.

Dr. Ford stated that the Delaware Bay Shellfish Council should have the authority to select designated areas of low salinity for pilot scale trials for grow out efforts by private growers. Mr. Canzonier said that these trials should be of a commercial scale. He offered wording for revising this recommendation. He stated that the "shellfish council should investigate the mechanisms for designating selected low salinity areas and assigning these areas to private individuals or groups for intensive, long-term intensive enhancement efforts. Mr. Joseph said that this was basically the same wording as originally proposed. Dr. Ford said that leasing should be stated in the recommendation because that was the position everyone agreed with. Ms. O'Dierno rebutted this statement. She said Dr. Ford was in error with regard to the majority of the task force's position. Mr. Ogden said that this wording doesn't protect the natural seed areas of the beds. Dr. Ford thought that the council should eliminate productive areas from this recommendation. Dr. Kraeuter said that the productive areas of the seedbeds could be defined. Mr. Canzonier said that it would be easy to define productive areas of the seedbeds. Dr. Kraeuter discussed the feasibility of establishing buffers between the leases and productive areas of the seedbeds. Mr. Joseph suggested that wording be included to require the state and laboratory to delineate the natural seedbeds and adjacent areas for possible utilization by private growers. The committee continued to discuss the delineation of the productive areas of the seedbeds and the potential for leasing these areas. Dr. Kraeuter said that the council should be presented with the appropriate data for the various programs being discussed. Mr. Joseph said that this recommendation would be more palatable if the proposed leases weren't immediately on or adjacent to the productive areas of the beds. Mr. Canzonier said that the individuals involved with this program would ensure enforcement of the integrity of the natural beds. Dr. Ford said that there had to be strict rules regarding the use of these plots. There was additional discussion regarding the leasing format. Mr. Horzepa said that with a pilot scale experimental program many of the issues being discussed could be evaluated and resolved. He said that leasing should be deferred until after the results of the experimental program are known. Mr. Horzepa expressed discomfort with entering into a leasing program among the seedbeds without resolving some the potential variables through an experimental format.

Dr. Ford thought the committee should consider Mr. Horzepa's comments and indicated a mechanism should be developed to protect the public areas. A general discussion ensued on protecting the commercially productive areas of the seedbeds. Dr. Ford suggested that the recommendation be changed to "permit the Delaware Bay Shellfish Council to designate selected areas in low salinity waters for pilot scale trials by oyster growers in setting, intermediate transfer or final grow out areas." Mr. Canzonier added that "contingent upon demonstrated benefits of these trials, the shellfish council in collaboration with the Aquaculture Advisory Committee, in the spirit of the Aquaculture Act, should investigate mechanisms for designating selected low salinity areas and assigning or leasing these to private individuals or groups for intensive enhancements efforts for specific periods of time as determined by the council." The group discussed some modification of this wording. Dr. Ford stated that the wording should specifically eliminate the productive areas of the seedbeds. It was agreed that wording had to be modified. Mr. Joseph thought that this was simply another way of addressing a recommendation that had a great deal of opposition. Dr.

Kraeuter said that if the modified version was acceptable to all but Mr. Joseph then there would be consensus. Mr. Horzepa recommended that the concerns expressed by the task force members and the industry must be addressed and could be through a pilot scale program. Dr. Ford and Mr. Canzonier agreed to work on the re-wording of the recommendation.

The task force discussed the section applicable to the concept of the facilitator included in the document. Mr. Horzepa said that this was an important concept but he wasn't sure of how this concept would be integrated into the plan. Mr. Canzonier and Mr. Horzepa agreed to work on this concept.

The schedule for future meetings was discussed. A special meeting of the Shellfish Council was to be held on August 26, 1997 to specifically review the task force's report.

Mr. Canzonier said that there was a misunderstanding for the concept of the "Facilitator". He said that the facilitator was not an authority figure but a neutral individual whose sole purpose would be to help implement those programs designated by the task force. Mr. Joseph asked if these efforts would be at the direction of the shellfish council. Mr. Canzonier said this individual's role would be to seek implementation of the task force's recommendations. Mr. Donalson, a part-time lobbyist for the industry, inquired about the appointment process. He wondered about the need for the governor appointing this individual. Mr. Horzepa also questioned the role of the facilitator and interaction with the shellfish council and industry. He stated that the infrastructure already existed for implementing the acceptable programs through various government agencies. Mr. Ogden agreed with Mr. Horzepa's assessment. Mr. Ogden suggested that this individual be designated as a "Liaison" instead of a "Facilitator", which had other connotations. Mr. Joseph supported the concept of liaison. This individual would work with the shellfish council so the council retained control of the programs. The task force discussed potential candidates for this position. Mr. Horzepa discussed this concept in relationship to the new Aquaculture Act. Dr. Ford wondered if this individual would work with the council to ensure that the various recommendations were implemented as well as report to the governor on the process of these programs. Mr. Joseph thought that this individual would work with the council as well as report to the governor. Mr. Donalson again questioned the need for this individual to be appointed by the governor. Mr. Donalson discussed his efforts as a lobbyist for the industry and his future involvement with the industry. Mr. Joseph said that this individual should be associated with the shellfish council, such as the chairman. Dr. Ford said that this person should be the chairman of the shellfish council or his/her designate.

Dr. Kraeuter spoke about including the creeks and tributaries of the bay in the rehabilitation efforts. He suggested that these areas needed to be clarified in the document. Mr. Canzonier said that this could be clarified in the opening statements of the document.

Chairman Malinowski entertained a motion for adjournment. Mr. Canzonier made the motion and Mr. Ogden provided the supporting motion.

**Oyster Industry Revitalization Task Force
September 2, 1997**

Members present:

Chairman Malinowski
Ms. O'Dierno
Mr. Horzepa
Mr. Canzonier
Dr. Ford
Mr. Joseph
Mr. Ogden
Mr. Bailey
Mr. Dobarro
Mr. Carnahan

Members absent included:

Mr. Gifford
Dr. Kraeuter
Dr. Powell

Chairman Malinowski called the meeting to order. The committee opened the discussion by reviewing comments made the industry at a special meeting of the Delaware Bay Section of the Shell Fisheries Council (Council) held on August 26, 1997. Mr. Dobarro made the comment that the task force's report should be clear on which section of the Shell Fisheries Council had authority in what areas of the state. For clarification of this remark, Mr. Dobarro informed members of the task force that the Shell Fisheries Council was composed of two sections, i.e. the Atlantic Coast Section and the Delaware Bay Section. By clarifying the role of the two sections, there would be no ambiguity as to each section's role in the recommendations submitted by the task force. This clarification was necessary because the legislation establishing the task force discusses Delaware Bay and adjacent waters. It was agreed that the specific authority of each section would be defined in the opening statements of the final report.

Another suggestion provided by the industry was to ensure that each section of the Council be fully appointed. The industry also recommended that the governor appoint someone to any vacancy on the Council within 60 days of a vacancy. Mr. Joseph read the current law regarding the appointment of members to the Council. Mr. Horzepa questioned the composition of the narrative in the "measures of success" for this section of the report. He said that the narrative should be worded in a fashion that it didn't have the tone of a command to the governor. He suggested the word "should" for "will" in these measures. Mr. Canzonier claimed that this change would no longer be a "measure of success." A discussion evolved over the appropriate terminology to use in the "measures of success." It was decided that "will" would be replaced with "would."

Chairman Malinowski moved onto the next industry comment. Chairman Malinowski referred to section III.A. of the report dealing with "Enhancement of Production based on Current Practices". This item was on page three of the draft recommendations, August 25, 1997 version. The industry indicated that it wanted the reference to "adjusted for boat size eliminated from the "measures of success."

The next item to be addressed by Chairman Malinowski was the phase in section III.B's opening statement which "... in a potentially expanded leasing program." The industry wished this reference to an expanded leasing program eliminated. This opening statement would end after the statement "...reserved for public use." Mr. Dobarro said that "public use" versus "private use" should be defined. Mr. Canzonier said that "public use" should be defined in the introductory portion of the document. He thought that this was appropriate because this phrasing was used in several different context within the document.

Chairman Malinowski stated the industry's only other concern as with the wording in section VII.B. regarding the appointment of a liaison for coordinating the implementation of the task force's recommendations. The industry wanted this liaison to be either the chairman of the (Delaware Bay Section of the Shell Fisheries) Council or his/her designee. Mr. Canzonier said that it probably would be more appropriate to use the "chair" of the Council. Mr. Horzepa said that the Aquaculture Act had an allocation of responsibilities to a number of different entities. The Aquaculture Act has assigned a number of responsibilities to the Department of Agriculture. He asked if the chair of the Council had the time to dedicate to this role. Since the Department of Agriculture was already assigned an advocacy role, it may be appropriate to have the Department of Agriculture acting as this liaison.

Mr. Joseph said that there was some thought to have this individual removed as much as possible from the government and influence within the fishery. Mr. Horzepa reiterated his earlier comment regarding NJDA's role in the Aquaculture Act. He said that NJDA's interest was advocacy for the aquaculture industry. Since state agencies are accountable for their actions, it may be appropriate to have a state agency involved in this role rather than someone with no interest in this program. Chairman Malinowski said that the chair could designate the NJDA as his designate. Mr. Canzonier thought that this would be an appropriate mechanism and in the spirit of the Aquaculture Act. The discussion continued on the possible role of the NJDA as an advocate for the oyster industry.

Ms. O'Dierno suggested it be stressed that a member of the shellfish council be included on the Aquaculture Advisory Committee. Mr. Canzonier said that a member of the shellfish council should be included in the Aquaculture Advisory Committee. He suggested that this liaison should probably be the primary appointee to this committee from the shellfish council. Mr. Canzonier said that after the Aquaculture Act was signed, there was a procedure for appointing individuals to the advisory committee. Ms. O'Dierno described the appointment process. Mr. Canzonier thought it would be appropriate for the task force to recommend that the designate liaison be appointed to the Aquaculture Advisory Committee. He said that they (the drafters of the Aquaculture legislation) were remiss for not concerning the recommendation to include a member

from the Shell Fisheries Council on the advisory committee. A member from the Fish and Game Council was included as a member. Mr. Horzepa read from the aquaculture act. It stated that the Department of Agriculture would be the lead state agency for the development, marketing, promotion, and advocacy of aquaculture in the state. The Department of Environmental Protection shall be the lead state agency with the regulation of aquaculture activities in the waters of this state. Mr. Horzepa repeated that with this assignment of responsibilities, it seemed logical that the NJDA would serve in this liaison role.

**Meeting of the Oyster Industry Revitalization Task Force
September 8, 1997**

Members present:

Chairman Malinowski

Ms. O'Dierno

Mr. Horzepa

Mr. Canzonier

Dr. Ford

Mr. Joseph

Dr. Powell

Mr. Ogden

Mr. Bailey

Mr. Dobarro

Members absent included:

Mr. Gifford

Dr. Kraeuter

Mr. Carnahan

Chairman Malinowski called the meeting to order. The first order of business was the financial section of the task force report submitted by Ms. O'Dierno and Mr. Horzepa. Ms. O'Dierno distributed copies of report for review by the task force members present. Dr. Powell began the conversation by suggesting that the recommendation be reduced in verbiage. He stated that the Department of Agriculture should be the lead agency for production enhancement and market development since the state was now operating under the Aquaculture Development Act. He thought that the Departments of Agriculture and Environmental Protection should jointly conduct these programs.

Dr. Powell referenced the section of the financial report that discussed the oyster bed survey. He suggested that this section be changed to include scientific research as well, i.e. oyster bed survey and/or scientific research. He said that this wording would provide the shellfish council with more flexibility in the manner in which the random sampling money was spent. Dr. Ford stated that the funding for the sampling program was a line item within the state budget and earmarked for the Haskin Shellfish Research Laboratory. Dr. Powell agreed. Mr. Dobarro suggested that this section of the report include the recommendation for maintaining this line item within the university's budget. In response to a question from Mr. Horzepa, Dr. Powell said that the council should have the option to spend this money for other technical services rather than being locked into a very specific program.

Dr. Ford quickly discussed an additional \$250,000 which was included in the recommendations for surveying and mapping the seed beds. Both Mr. Canzonier and Dr. Powell indicated that this funding was for a very specific purpose and wouldn't be a

repetitive funding request. This section also included funding for an annual shell-planting program. Chairman Malinowski asked about funding for the shell-planting program this past summer. Mr. Dobarro indicated that \$106,000 had been spent for shells this past summer. Ms. O'Dierno informed Chairman Malinowski that the report included a recommendation that the shell-planting program be increased to 200,000 bushels annually at an approximate cost of \$134,000. Mr. Dobarro stated that this should be the minimum quantity planted each year. Dr. Powell said it should be made very clear in the report that this was a minimum quantity and this program had to be conducted annually. According to Dr. Powell, the requested sum of \$250,000 for shell planting and other programs was marginal considering the size of the bay and the importance of the industry.

Mr. Joseph had several editing comments for this section of the report. He indicated that the correct title for the oyster account was the "Oyster Resource Development Account."

Dr. Powell suggested the wording regarding funding should strongly indicate that the industry was financially contributing to these enhancement programs. Ms. O'Dierno said that the industry's support was one of the reasons for indicating in-kind support for these goods and services. Mr. Horzepa said it was important to indicate that the industry was contributing to these various programs. There were several other editorial comments made on this section. Mr. Joseph also noted that the narrative stated there were two biologists on staff at the Bivalve office. He indicated that this office was staffed by only one biologist and an environmental technician. Mr. Joseph also had a question regarding the \$100,000 earmarked for water quality monitoring in Delaware Bay. Ms. O'Dierno stated that this sum was to maintain the program being conducted by the Bureau of Marine Waters Classification and Analysis. Mr. Horzepa said that this funding should be clarified. Mr. Canzonier said it should be clearly stated that the FDA requires this program. Dr. Powell said that there should be a paragraph included explaining this required program.

Mr. Horzepa stated that this section of the report still had some open areas such as the annual contribution of the industry to the oyster cultch fund. Mr. Joseph said that it would be difficult to provide an average figure because the contributed funds are based on the harvest. Dr. Powell said that since we know the average price the report could use landings for the 1996 season. Mr. Joseph informed the task force that the money received in the form of oyster dredge boat license fees and landing fees are deposited in the Oyster Resource Development Account. He said that the lease fees are placed into a separate account. Formerly, these funds were deposited in the state's general fund but have recently been returned to the bureau for its operation. The money is currently being used to support the bureau's hydrographic survey operations. The task force continued discussing the financial situation and contributions made by the industry. Dr. Ford had questions about the amount of revenue generated from the boat license fees. Mr. Dobarro stated that these fees amounted to approximately \$4,500 to \$5,000 annually.

Dr. Ford made some other editorial comments, especially regarding the cost of (oyster) seed. Chairman Malinowski asked about the \$60,000 contributed by the

Coastal Zone Management funds for shell planting. He wondered whether this sum was in addition to the money already received from the CZM program. He was informed that only some of the CZM money was used for shell planting this year and additional funds may be available in the future. Mr. Dobarro noted that the Community Development money, administered by Commercial Township, hadn't been accessed, as of yet, this year. He said that if an oyster transplant program was conducted, the money from a Department of Agriculture grant would be used to cover the costs.

Dr. Ford made a comment on the measures of success listed in this section. She indicated that Dr. Kraeuter would like these measures to be much more specific. Dr. Powell stated that earlier recommendations included assumptions regarding the annual revenues, which would be generated by these enhancement programs. He suggested that the measures of success refer to these earlier assumptions. Mr. Horzepa said that he had a hard time with this concept of "measures of success". He suggested that these measures were not based on anything but speculation and the report should take a more pragmatic approach. Dr. Powell reiterated his previous comment that this section could simply reference those success measures included elsewhere in the report. Mr. Canzonier said that increased leased acreage could be one of the standards referenced, such as an increase of 20% over a period of years. He also suggested that Ms. O'Dierno elaborate on marketing strategies.

Mr. Canzonier commented on the costs for the daily rental of a dredge vessel, such as the suction dredge boat. He stated that the operational cost of \$1,500 per day was based on local ownership, maintenance, and amortization costs. He thought the report should be more specific about amortization costs being included in estimated daily rental fees. Mr. Joseph said it was his impression that this cost included the rental of the existing suction dredge. There were some additional questions and comments regarding the suction dredge. Mr. Dobarro questioned which vessel was being earmarked for the oyster transplant and shell planting programs. Mr. Canzonier said that it was his intent to express the use of the suction dredge. Mr. Dobarro said that this should be clarified in the narrative for these programs. Mr. Canzonier said that if the vessel was constructed for the industry, it probably should be amortized over a 20-year period. Mr. Canzonier and Dr. Powell reiterated comments that these programs should reference the Aquaculture Development Act.

After requesting additional comments, Chairman Malinowski asked for consideration of the minority report. He suggested that the minority's report be attached to and submitted with the final report of the task force. Mr. Ogden asked about the presentation of the report with the minority's report attached. He asked if the final report would be considered a single document or as two separate documents. It was indicated that the minority report would be treated as an appendix.

Mr. Horzepa took exception to the manner in which the minority report was presented. He said that he had problems with some of Mr. Canzonier representations. He thought Mr. Canzonier had distorted a number of situations, which had occurred within previous task force meetings. Mr. Horzepa said that the group wasn't debating the technical issues. The report was simply to describe management mechanisms. He

claimed that many of representations included in the minority report were contrived. Mr. Canzonier asked for specifics.

Mr. Joseph stated that Mr. Canzonier's claimed that the leasing of the seed beds previously had the "tacit approval of the task force" was not correct. Mr. Canzonier claimed that he was correct with this statement. Mr. Bailey also refuted Mr. Canzonier's position. Mr. Horzepa stated that the task force had arrived at an understanding the leasing concept was a contentious issue from the outset. The only reason that this recommendation was carried in the report was to establish industry's reaction to this concept. Mr. Horzepa also took issue with Mr. Canzonier's position that the public reaction to the recommendations was of no concern to him and he would do whatever he wanted to regardless of public sentiment. Mr. Canzonier responded that that was Dr. Kraeuter's stated position but he agreed with it. Mr. Horzepa said that the task force had not provided "tacit approval" of this recommendation. Both Dr. Ford and Dr. Powell suggested that this statement indicating tacit approval by the task force be stricken from the minority report. Mr. Horzepa claimed that this type of tenure was pervasive throughout the minority report. Mr. Canzonier claimed that individuals were changing their minds after they had previously accepted the recommendation. Mr. Horzepa argued, again, that the only reason the majority of the group had accepted retaining this recommendation in the draft report was to get public reaction. He stated that the group didn't want to exclude any possible recommendation prior to receiving public comment. Mr. Canzonier claimed he had no understanding of this position. Dr. Ford said that it was included because it was technically feasible. It is now politically unpopular: she suggested that the discussion move on. Mr. Horzepa said that the discussion wasn't over technical feasibility but rather a public policy issue over leasing areas that were not formerly leased. Dr. Powell again stated that this paragraph should be removed from the minority report and suggested some alternative wording. Mr. Horzepa thought that the revision also conveyed the wrong message. He once again stated that the only reason this recommendation was retained in the draft was to garner public comment. Mr. Canzonier said that he disagreed with Mr. Horzepa's position regarding this matter. Mr. Horzepa responded that it was natural for Mr. Canzonier to disagree since he wasn't interested in receiving comment from the industry. Mr. Canzonier stated that this recommendation was put into the report as a technical measure. Mr. Horzepa rebutted Mr. Canzonier by stating that the leasing of areas on the seed beds was a matter of public policy and not a technical issue. Ms. O'Dierno indicated that at a previous (task force) meeting, one of the industry members asked if this recommendation would be removed from the report if the industry did not support it. She said based on this agreement, the recommendation was retained in the draft for public comment. Mr. Dobarro said that the task force had very definitely indicated its opposition to this recommendation well before the public review of this document. Mr. Dobarro also believed that the minority report was distorting the position of many members of the committee. Mr. Joseph stated that it was Chairman Malinowski's request to have this recommendation removed from the document, if the industry opposed it. Mr. Joseph also said that Mr. Horzepa had entered the committee as a neutral, unbiased observer and had taken a position in opposition to the leasing of areas above the Southwest Line only after receiving public comments. According to Mr. Joseph, Mr. Horzepa had remained an objective participant willing to consider all feasible recommendations contingent upon industry input.

Mr. Horzepa said his sense of the task force was that most of the members didn't want it in the report even prior to the public meeting. Mr. Canzonier agreed. Mr. Horzepa took Mr. Canzonier to task over his statement in the minority report that the committee had changed its mind "subsequent to the public meeting." Mr. Horzepa stated that this was also a misleading statement. Dr. Ford offered a revision to the wording of the recommendation. Mr. Joseph said that it should be made clear the majority of the task force was opposed to this recommendation prior to the public meeting, which Dr. Ford's revision did not state. Again, Mr. Horzepa stated that the reason this recommendation continued to appear in the earlier versions of the report was to receive industry reaction, otherwise it would have been voted out. Dr. Ford suggested that wording should be developed to reflect this position. Mr. Joseph suggested that the wording to be changed to "however, the majority of the task members were opposed to this recommendation but agreed to include it in the draft report for purposes of soliciting industry comment."

Mr. Horzepa said that before there was detailed editing of the (minority) report, it should be determined whether or not this report would be included in the final document. Mr. Horzepa said that he didn't like the tone of the minority report, found it to be full of inaccuracies, and misleading interpretations of the previous task force actions. Mr. Canzonier said that Mr. Horzepa should pick out the specific things with which he had a problem. Mr. Horzepa said that he wouldn't be put into a position where he had to pick apart the minority report. He declared that it should be decided as to whether the minority report would be included in the report. Mr. Canzonier informed Mr. Horzepa that he had spoken to a lawyer in the Public Advocate's office, who claimed that the minority opinion must be included with the task force's final report. Mr. Dobarro asked if Mr. Canzonier had been provided with the legal citations for this position. Mr. Joseph said that he had discussed this matter with personnel from the Mid-Atlantic Fisheries Council and people familiar with the proceedings of ISSC. He said that both these organizations handle minority opinions in different manners and neither was applicable in this situation. Mr. Joseph read that the ISSC guidelines for considering a minority report.

Mr. Horzepa read from the legislation creating the task force. This legislation did not provide for a mechanism to deal with a minority situation. Mr. Horzepa declared that the task force would therefore have to make a decision regarding the minority report. He said that if the majority of the task force accepted the minority report, it would have the right to determine the presentation format for the report. Mr. Canzonier disagreed. Mr. Horzepa said that due to the tone of the minority report, it shouldn't be included in the final report. Mr. Horzepa, and other members, also thought that this report contained several inaccurate statements. Mr. Canzonier said that the inaccuracies should be pointed out. Mr. Horzepa stressed that several had already been described and there were still several additional misrepresentations included in the report. He didn't feel obligated to pick out each individual item. Several members of the group agreed that the minority report as presented was simply unacceptable to the group.

The argument over leasing areas above the Southwest Line continued. Mr. Ogden said that the advisory committee established by the Aquaculture Act would surely revisit

this issue. He stated that the shellfish council currently had authority to lease below the Southwest Line. He thought it was very likely that aquaculture advisory committee would try to establish authority for leasing above the Southwest Line outside of the shellfish council. Mr. Joseph said that the Aquaculture Act provided for the role of the council in leasing. Dr. Powell said that it was inherently true that private aquaculture can not exist above the Southwest Line under current law. Mr. Joseph said that just because it wasn't included in the task force report doesn't mean leasing above the Southwest line couldn't happen in the future. Mr. Canzonier said that if the door wasn't opened now (for leasing above the Southwest Line), it would be closed forever. Mr. Canzonier was emphatic about never having leasing access to the seed beds if this opportunity was not taken by the task force. Mr. Joseph replied that if the industry decided this program was needed at some point in the future, it would be easy for this issue to be revisited. A long debate ensued as whether the minority opinion could be included as an appendix or addendum if accepted by the majority of the task force. Mr. Horzepa and Mr. Joseph argued that it should appear as an appendix with supporting statements. Mr. Canzonier was vociferous in his opinion that it should be included as an addendum. This debate remained unresolved.

(Note: At this point there was either a mechanical or operational error with the tape recorder and part of the session was lost. The next verbiage on the tape began with a discussion of pilot programs and modifications to the leasing recommendation).

Dr. Powell said that if the majority recommendation was to try a collective aquaculture effort on the seed beds and this approach didn't succeed within a specified period of time then private enterprise should be encouraged. He said the economic benefits from the bay had to be increased. Mr. Horzepa said that he didn't want to foreclose on the pilot scale trials while the other enhancement programs are being tried. He said that it wasn't essential to the overall program to include the concept of leasing the seed beds at this point in time. Mr. Horzepa said that he was in favor of innovative approaches when they were necessary. He didn't feel, however, that it was appropriate to include leasing the public resource at this time. Dr. Powell thought that the minority recommendation should be modified to permit pilot aquaculture programs above the Southwest Line. He also felt that the minority report should be placed in the appendix. Mr. Canzonier refused to accept Dr. Powell's recommendation. Dr. Powell suggested that Mr. Canzonier compromise on this issue. It was Dr. Powell's opinion that a compromise on this issue was in the best interest of all parties. Mr. Canzonier stated adamantly that he was opposed to compromise. According to Mr. Canzonier, he had already compromised when he accepted to present this recommendation in a minority report. And, he stated vehemently that this recommendation would be submitted with the report. He threatened to obtain legal support to have the minority report included in the document and stated that he was the "only one with guts to submit it." Mr. Horzepa suggested, again, that the minority report be included in the appendix. Mr. Canzonier staunchly refused. Dr. Powell suggested that Mr. Canzonier reflect on this issue for awhile. It was Dr. Powell's opinion that the inclusion of this recommendation in the appendix was appropriate and comparable to the treatment of some other recommendations. Dr. Powell stressed that it was reasonable to include this recommendation in the appendix but to eliminate it wasn't. Mr. Horzepa said that he was in favor of pilot scale trials and innovation in the fishery. He didn't believe this

recommendation should be completely eliminated from the report. He stated that it wasn't reasonable to elevate the status of this recommendation because of the overwhelming opposition to it by the industry. Mr. Horzepa said that he hasn't been convinced that this program was in the best interest of the industry.

Mr. Bailey described the development of the direct market program, the current focal point for production in the fishery. He said that a few years ago there was considerable opposition to the direct market program by many members of the industry. Because oysters continued to die under the traditional transplant program, the industry was forced to consider alternative strategies. Mr. Bailey said that the direct market developed slowly with only a few individuals taking advantage of it in the first year. He indicated that as the oystermen saw that the direct market program could provide some profit and was a better use of the resource it became more acceptable. Since this program has been successful, most oystermen now accepted it as an appropriate management strategy. Mr. Bailey thought that the pilot scale aquaculture program would develop in a similar manner. He took Mr. Canzonier to task for his approach to this subject. Mr. Bailey thought the program had to be approached cautiously and on a small scale. It was Mr. Bailey's opinion that the industry would embrace this program if it was developed correctly and demonstrated to be effective. Mr. Bailey thought Mr. Canzonier's attitude was abrasive and the approach that it had to be Mr. Canzonier's way or nothing at all was incorrect. Mr. Canzonier responded that this recommendation had to have both its technical components and he wouldn't settle for less. Dr. Powell said that one on the components would be included in the appendix, which was appropriate, and the other treated in the main text. Mr. Bailey said that if the pilot scale program was a success, the industry would be anxious to support it. Dr. Powell stated that Mr. Canzonier was beginning to pull the entire process down. Mr. Canzonier rebutted Dr. Powell by stating that this issue shouldn't be compromised because compromise would dilute its purpose. Dr. Powell stated that if this recommendation include the first sentence of recommendation II-B with the remainder of the recommendation appropriately treated in the appendix, he would support the majority's position. (Note: The first sentence of recommendation II.B read "Permit the Delaware Bay Section of the Shell Fisheries Council to designate selected low salinity areas above the Southwest Line and in rivers and creeks, for pilot-scale trials by oyster growers as setting, intermediate transfer, or final growout areas.") Mr. Joseph asked Mr. Bailey for his thoughts about including the phase "oyster growers" in that recommendation. He said this phase suggests the potential for privatization of some areas of the seed beds even with the pilot-scale trials. Mr. Horzepa said that "oyster growers" could also refer to a non-profit group. It was Mr. Bailey's opinion that some members of the industry would be opposed to this wording. But, Mr. Bailey added that if it could be demonstrated this venture was profitable, he would be willing to try it. He urged that the program had to be carefully constructed. Mr. Horzepa stated that the mechanics of the program would have to be worked out. Dr. Powell reiterated his earlier comments about the presentation of this recommendation. He also stressed the opinion that if someone wished to file a minority report, they should be permitted to do so. Mr. Horzepa countered by stating that if someone wished to file a minority report it should be independent of the task force's report. He said that the minority's opinion would be treated adequately in the appendix of the majority report, if this wasn't

acceptable then the minority's report should be submitted independently of the majority's report.

Mr. Canzonier said that compromise was not acceptable to him.

Dr. Ford, who was out of the room for several minutes, asked for clarification of the discussion. After Dr. Powell explained the compromise to Dr. Ford, Mr. Canzonier interjected that this compromise diluted and reduced the force of the recommendation. Mr. Horzepa said that this issue will not be forgotten and probably will be addressed by other committees dealing with the aquaculture program. Mr. Canzonier continued his opposition to compromise.

Dr. Powell presented a motion to modify the recommendation II-B, as described above. This modification provided for pilot scale trials of aquaculture activities above the Southwest Line. The remainder of the original recommendation would become part of the appendix. Mr. Alex Ogden provided a second to this motion. Mr. Joseph asked about the verbiage for the measures of success. He wondered about the significance of the terminology "production from these privately developed and managed areas." Again, he expressed concern that this recommendation would lead to the leasing of the seed beds. There was some discussion regarding where this wording should reside.

Chairman Malinowski asked about the significance of this motion. He was concerned that a vote in favor of this motion would imply that the task force was amenable to conducting these pilot-scale trials on the seed beds. Mr. Joseph said that the acceptance of this motion would indicate that the task force was in favor of leasing the seed beds. Mr. Joseph explained he was concerned that the inclusion of "oyster growers" would be the equivalent to leasing the seed beds. Dr. Powell addressed the "measures of success." He indicated this section could simply state that there would be a 20% increase in production over equivalent publicly managed areas. Mr. Joseph said that it still appeared to be a lease. Dr. Powell took the position that it was a trial program. He stated that the council should be given the authority to designate the mechanics of the program. Mr. Horzepa suggested a revision to the wording for the "measures of success." His suggestion was that instead of "increase in production over equivalent publicly managed areas" these measures should read "pilot scale trial areas compared to equivalent public areas." Dr. Powell said the word "production" should be stricken from the second measure of success. Mr. Horzepa questioned the terminology of the section listed the "expected results." He suggested eliminating the first item listed in this section, i.e. "Availability to individuals or groups of private oyster growers low-salinity areas that can serve as refuges from high disease and predator activity." Dr. Powell suggested that several other statements in this section be eliminated. He thought the "expected results" section could be trimmed to include the following four statements: development of innovative modern culture practices, development of areas for wild and hatchery reared seed, increased yield, and enhanced utilization of the biological potential of the estuary. Mr. Joseph asked Mr. Bailey again if the industry would have a problem with this wording since it was simplification of the previous wording for leasing the seed beds. Mr. Bailey said that if the program was carefully constructed and started slowly, the industry may be more amenable to the concept. If the pilot program was successful, Mr. Bailey thought the industry would change its

position and embrace the concept. Mr. Horzepa said that he wasn't overly concerned with industry's support for this program but wished to reduce its opposition. He thought that this goal might be accomplished by changing the language.

Dr. Powell asked Chairman Malinowski to tender a vote on this motion. Before the vote, Mr. Horzepa inquired as to the structure of the appendix where this recommendation would be included. Mr. Canzonier said that Mr. Horzepa could refer to his minority report. Mr. Horzepa indicated strongly that the minority opinion was inflammatory and skewed by Mr. Canzonier's personal perceptions. Mr. Horzepa said that he would rather operate on the merits of the issue. Dr. Powell agreed that some areas of the existing minority report were rather strongly worded. He suggested that this report be toned down before inclusion in the appendix. He recommended that the revisions to the minority be circulated among the task force members for review before being included in the appendix. Mr. Horzepa said that the appendices already included a discussion of this issue.

Chairman Malinowski began a roll call vote on this motion. Mr. Joseph asked for the vote to be deferred to a later meeting so the task force members had an opportunity to review the final draft including the appendix. Dr. Powell thought the vote should be taken at this meeting. Chairman Malinowski proceeded with the voice vote. Members of the task force in favor of the motion included: Mr. Horzepa, Ms. O'Dierno, Dr. Ford, Dr. Powell, Mr. Bailey, and Mr. Ogden. Mr. Canzonier, Mr. Joseph, and Chairman Malinowski opposed this recommendation. Mr. Dobarro abstained. Mr. Joseph said that there was little difference between this recommendation and previous ones, which have been strongly opposed to by the industry. Mr. Canzonier claimed that he had been provided with Dr. Kraeuter's proxy and tried to submit a negative vote for Dr. Kraeuter. Dr. Powell stated that Dr. Kraeuter provided his proxy for only those issues of which he had been informed and not for all unforeseen matters. Mr. Canzonier said that he would abstain for Dr. Kraeuter. Mr. Horzepa asked if the document should be submitted, once again, for public comment. Chairman Malinowski said that it wouldn't have to be reviewed by the industry. He stated that the industry has made its feelings very clear regarding this issue: the industry was nearly unanimous in its opposition to leasing areas above the Southwest Line. Since recommendation II-B had been revised, Mr. Joseph thought it was appropriate to submit it for public review and comment.

Mr. Horzepa stated that although industry members had opposed leasing above the Southwest Line during his conversations with industry members, he hadn't received any negative comments about pilot-scale trials. Dr. Powell said that these pilot programs had to be conducted by private individuals because the incentive for investment in the programs was the potential profits. A discussion ensued concerning the definition of "oyster growers." Dr. Powell said it was inherent in the Aquaculture Development Act that joint public-private ventures be formed. These programs would permit private individuals the opportunity to develop aquaculture programs with government support and technical expertise. Dr. Powell indicated that there was a need to encourage private investment. The program also should be structured to permit an independent investor control over management decisions. He stated that private investors had to have the opportunity to succeed or fail on their own in this venture. In response to a question from Mr. Joseph, Dr. Powell said it was necessary for the private individuals to

invest their personnel funds with some government money. The private individual should have control over the decision making process with the opportunity to profit or lose at the operation. Dr. Powell said that there appears to be support within the industry for trial programs, if they were carefully orchestrated. If this concept proved profitable, there would probably be a great deal of support from the industry for expanding the program. Dr. Powell said that there has been considerable interest in Daniel Cohen's oyster farm, located in Cape May County. According to Dr. Powell, if Mr. Cohen is successful with this program, a number of people would be willing to invest in their own oyster farms.

A motion was made by Mr. Horzepa to adjourn. Mr. Ogden seconded the motion.

**Oyster Industry Revitalization Task Force Meeting
March 2, 1998**

Members Present:

Chairman Richard Malinowski
Eric Powell
James Joseph
Linda O'Dierno
Alex Ogden
John Kraeuter
George Horzepa
Scott Bailey
Stephen Carnahan
Walter Canzonier
Joseph Dobarro
James Gifford

Members Absent:

Susan Ford

Chairman Malinowski called the meeting to order.

The first discussion topic was the latest version of the Funding Requirements section submitted by Ms. O'Dierno and Mr. Horzepa at the start of the meeting. After a brief review of this section of the report, it was decided that task force members would review the document in detail and submit comments to Ms. O'Dierno by March 6, 1998. That notwithstanding, some questions were raised about specific items within the Funding Requirements section.

Mr. Dobarro asked for clarification regarding the purchase of a suction dredge boat for \$1.4 million as described in the Funding Requirements section. He inquired as to whether the intent was for the State to purchase the vessel or whether a small business loan would be made to the community for its purchase, or if some type of industry cooperative would be formed to purchase the vessel. While the specifics of the purchase of such a vessel had not previously been discussed in detail, Mr. Canzonier suggested that a number of mechanisms could be expended. These could include: a direct purchase by the State with the vessel operated by the State, a cooperative of industry members with "outside" funding, purchase and ownership by the county or municipality, purchase by the Delaware River Bay Authority and a 20 year lease strategy, or leasing an existing suction dredge vessel owned by Hill Bloom. Mr. Dobarro

and Mr. Canzonier agreed that some of these options should be included in the task force report.

Chairman Malinowski suggested that the group review the latest draft of the Recommendation for Actions section of the task force report that Mr. Dobarro had prepared based on comments to the previous draft. Mr. Dobarro asked members to review this draft to ensure that the changes reflect the issues agreed upon by the majority of the group. The task force made a cursory review of Mr. Dobarro's draft, which was provided at the outset of the meeting. Mr. Joseph noted that according to his notes, the wording of Recommendation II had been changed to: "Development of new approaches to transplanting" rather than ... "new approaches to leasing and transplanting." With respect to recommendation IIB, Mr. Dobarro reminded task force members that the introduction of the task force report should specifically define Shell Fisheries Council (Council) so as not to confuse the Delaware Bay Section with the Atlantic Coast Section. Some editorial changes were also suggested for the "expected results" and "measures of success" portions of this recommendation.

With respect to recommendation IIB, there was a brief discussion of the Aquaculture Advisory Council membership. Since this group was established to operate for an extended period, it was agreed that the wording of this section should include a recommendation that the Chair of the Delaware Bay Section of the Shell Fisheries Council "should be considered for a seat on the Aquaculture Advisory Council." Some additional minor editorial comments were made to this section.

Mr. Dobarro requested that any additional comments be forwarded to him by March 14, 1998 after which time he would make the necessary changes and forward an updated version to task force members.

Chairman Malinowski suggested that section IIB make reference to the fact that the Delaware Bay Section of the Shell Fisheries Council was opposed to this recommendation. Mr. Dobarro stated that such a notation would be inappropriate for the recommendation section. He mentioned that the Council's position would be noted in other areas of the document. Mr. Joseph reminded Chairman Malinowski that the minutes of the task force meetings would be attached as an appendix to the report to the Governor. These minutes would provide documentation of the opposition by the Council and the Department to any recommendation that would ultimately lead to the leasing of the seed beds. Mr. Joseph also noted that at a special meeting of the Council on August 26, 1997, the Council unanimously opposed leasing the seed beds. Mr. Joseph also noted that an appendix prepared by Mr. Dobarro would discuss opposition to leasing the seed beds.

There was a brief discussion of the timeline for completion of the final report. Mr. Horzepa suggested that the submission of the final report to the Governor could be tied to some event important to the industry to make the public more aware of the revitalization efforts. Mr. Joseph suggested that the planting of cultch material in early July could provide a forum to announce completion of the report and that this might also present the opportunity to solicit the legislature to appropriate funds from the reported budget surplus for additional shell planting. Mr. Canzonier made reference to a

proposed development commission within the Department of Commerce that has targeted the oyster industry. Mr. Dobarro suggested a presentation of the report in conjunction with the spring oyster harvest.

Mr. Horzepa discussed the distribution of the final report to the Governor and the Legislature, suggesting that a transmittal letter accompanying the report lay a foundation for the future. Dr. Kraeuter suggested that the packet to be submitted to the Governor include a one-page item that could be used as a press release by the Governor's office. Mr. Joseph raised the issue of potential funding sources to pay for printing costs of the report. Various funding sources were discussed. Mr. Horzepa thought that the Department of Agriculture may have funds available to cover printing costs. Mr. Horzepa requested that he be given an estimate of the total number of pages of the final document so that he could obtain printing cost estimates. Mr. Dobarro said that he would attempt to compile all report components and distribute copies to task force members for final edits. This would also allow printing costs to be estimated.

In other business, Mr. Canzonier made a motion to include a minority opinion as an addendum to the final report and that reference to the minority opinion be made in the recommendation section (IIB). The minority opinion included a provision for assigning and leasing limited, currently unproductive bottom in low salinity areas to private individuals or cooperatives for oyster culture that would not be feasible in higher salinity areas of the estuary. To facilitate discussion and a vote on this motion, Dr. Kraeuter seconded the motion. Several task force members questioned why Mr. Canzonier raised this issue, since the task force had discussed the matter at great length and voted on the current language of recommendation IIB. Dr. Powell opined that the appendix will include sections dealing with both the pros and cons of the issue of leasing areas of the seed beds and that was an appropriate way to deal with this issue. Mr. Joseph stated that it was his understanding that after two hours of debate on the language of recommendation IIB on September 8, 1997, the task force, by majority vote, approved an amended version of this section which satisfied Mr. Canzonier's concerns over the concept of utilizing low salinity areas of the bay. Furthermore, it was agreed that the amended version would take the place of Mr. Canzonier's proposed minority report, according to Mr. Joseph. Dr. Powell agreed with Mr. Joseph's synopsis of the resolution of this issue on September 8, 1997. Dr. Powell reiterated that both issues can be adequately addressed in the appendix. Mr. Horzepa noted that the Aquaculture Advisory Council would be addressing various aspects of the leasing issue, so there would be ample opportunity to discuss this matter in the future. Mr. Horzepa stated that the task force report will make a fair representation of the issues involved and that it has opened the door for some kind of experimentation and innovation.

After some additional discussion, a roll call vote was conducted on Mr. Canzonier's motion to include a minority opinion regarding the issue of leasing low salinity areas by private oyster growers. A "no" vote was to exclude Mr. Canzonier's minority opinion while a "yes" vote would favor inclusion of the minority opinion. Task force members voting no were: Dr. Powell, Mr. Bailey, Mr. Gifford, Mr. Horzepa, Ms. O'Dierno, Mr. Ogden, Mr. Dobarro, Mr. Joseph and Mr. Malinowski. Individuals voting yes were: Dr. Kraeuter and Mr. Canzonier. Mr. Carnahan abstained. Dr. Kraeuter, holding Dr. Ford's

proxy vote, abstained on behalf of Dr. Ford. Thus, Mr. Canzonier's minority opinion will not be included in the report.

With respect to the final report, Dr. Powell suggested that the appendix prepared by Mr. Dobarro addressing arguments against leasing the natural seed beds be shortened to a length similar to the appendix prepared by Dr. Ford. Dr. Ford's submission addressed issues that favor the concept of leasing portions of the natural seed beds. Mr. Dobarro indicated that he would be talking to both Dr. Powell and Mr. Canzonier regarding the final version of the appendix he prepared.

Dr. Kraeuter raised some concern over the Funding Requirements section of the report, noting that it did not include a business plan. Without a business plan, Dr. Kraeuter felt that a convincing argument could not be made regarding the benefits to the industry and the economy that would be realized from the various recommendations for action and the funding sought from the State. Dr. Kraeuter also felt that this section needed to better justify why the requested funding was needed.

Dr. Kraeuter cited some examples within the Funding Requirements section that needed further justification. The first item questioned by Dr. Kraeuter was \$10,000 for Interstate Sanitation Conference (ISSC) and Water Quality Monitoring. Since water quality monitoring was already being conducted by the State, Dr. Kraeuter questioned why the additional money was needed and what would be the benefit to the oyster industry. Mr. Canzonier gave a brief overview of the ISSC program and noted that the additional funding would enable the D.E.P. to upgrade the water monitoring program within Delaware Bay. Ms. O'Dierno indicated that based on conversations with William Eisele (Bureau of Marine Water Monitoring) and the Department of Health, part of the \$10,000 would be used to offset travel costs incurred to participate in various ISSC activities. Mr. Joseph added that the Department was also seeking additional funding to conduct additional water sampling to determine the cause of various closures, particularly at the mouths of various creeks and rivers. Dr. Kraeuter emphasized that all costs should be justified in the form of expected benefits to the oyster industry.

In a continuing review of the Funding Requirements section, Dr. Kraeuter questioned why \$105,784 in supplemental funding for the Bureau of Shellfisheries was needed. There followed a general discussion of this section. Dr. Powell also suggested that if the Funding Requirements section was too specific, it may hamper the future use of funds if changes are made to the recommended actions. Dr. Powell stressed the need to show the return on the investment for each of the areas of funding. This should be in the form of increased oyster production (in bushels and dockside value), the number of jobs created among fishermen and land based support services, and overall benefit to the State economy. Various means to ascertain anticipated increases in employment were discussed. It was suggested that Mr. Bailey and other industry members discuss this issue and provide employment estimates to Ms. O'Dierno for inclusion in the report.

Regarding the measures of success, Dr. Kraeuter reviewed a number of examples where the measures of success were not quantifiable and therefore unsuitable measures (e.g. "The maritime way of life along the Delaware Bayshore will be

enhanced"). Mr. Horzepa reminded Dr. Kraeuter that many of the measures of success and expected results are addressed in the text of the report.

Dr. Powell recommended that the word "optional" be removed from some of the projects listed in the Funding Requirements section. After a brief discussion of this issue it was agreed that this change should be made.

Given the number of comments Dr. Kraeuter had regarding this section of the report, Dr. Powell suggested that Dr. Kraeuter provide a copy of his recommendations to Ms. O'Dierno and all task force members. Dr. Kraeuter agreed to submit his comments to the task force members who would, in turn, review his comments and submit final recommendations on the Funding Requirements section to Ms. O'Dierno. Mr. Horzepa reiterated Dr. Powell's earlier comment that some sections should not be too detailed, particularly since many of the items are addressed in the body of the report.

The next meeting was scheduled for March 30, 1998 at 6:00 PM at the Haskin Shellfish Research Laboratory.

There being no further business, the meeting was adjourned on a motion by Mr. Bailey and a second by Dr. Kraeuter.

**Meeting of the Oyster Industry Revitalization Task Force
March 30, 1998**

Members Present:

Richard Malinowski
Walter Canzonier
Stephen Carnahan
Scott Bailey
John Kraeuter
Linda O'Dierno
James Joseph
Eric Powell
George Horzepa

Members Absent:

Susan Ford
James Gifford
Alex Ogden
Joseph Dobarro

Chairman Malinowski called the meeting to order.

Chairman Malinowski initiated discussions by suggesting that the latest draft of the Funding Requirements section of the report submitted by Ms. O'Dierno be reviewed page by page in order to finalize this segment of the task force report.

Dr. Kraeuter disagreed with the proposal to increase funding to the Bureau of Shellfisheries for its oyster management program as he felt it wouldn't help the oyster industry and that any additional funding should be for enhancing oyster production. Mr. Horzepa responded that the production enhancement needs to be overseen in some manner and the Bureau of Shellfisheries is responsible for that oversight. To enable the Bureau to meet this responsibility, Mr. Horzepa stated that the Bureau needed additional staff. Dr. Kraeuter stated that the Bureau already had enough staff if they were used for oyster management, but he felt staff were "used for everything else." Dr. Kraeuter stated that the oyster industry shouldn't be paying for staff that are going to be used for something else (i.e. activities unrelated to oyster management). Mr. Horzepa noted that the oyster industry would not be paying for this cost, that the taxpayers throughout the State would be paying for additional Bureau staff. Mr. Joseph read a quote from a newspaper article in 1997 that indicated: "A lot of responsibility falls on management." The State just hasn't maintained the beds the way they should, Powell said." Mr. Joseph responded that any shortcomings in the State's management efforts were due to the fact that the Bureau didn't have the staff and, therefore, the ability to do too much and the proposed increase in staff would enhance management efforts. Dr.

Kraeuter disagreed, stating that the existing staff did an excellent job but that they were often diverted to perform tasks, such as staffing deer check stations, which are unrelated to the oyster management program in Delaware Bay. Mr. Joseph noted that deer check duties amounted to only two days per year and that the Bureau's Bivalve staff was devoted almost exclusively to oyster work. Mr. Joseph expressed frustration at being criticized for a lack of management effort when the Bureau has such a limited staff and has not received support to increase its staff to adequate levels.

Dr. Powell opined that if the task force recommendations are to be successfully implemented, someone would have to be involved on a full-time basis managing the cultch program. Dr. Powell suggested that such an individual could be within DEP, but that he would prefer this individual be in the private sector. Dr. Powell suggested that the Shellfish Council should use part of the cultch fund to hire an individual from the industry to perform this function. Mr. Malinowski noted that if an individual was hired with cultch fund monies, the Council would select the individual and could fire the individual if they didn't do an adequate job. Mr. Bailey agreed with Mr. Malinowski.

Dr. Powell acknowledged that the Bureau's staff along Delaware Bay is "pretty thin" and that it was not unreasonable that there be an increase in the budget for this office. Mr. Horzempa stated that the management of the oyster resource was a DEP responsibility and that since many of the task force recommendations will require management oversight, the Bureau should be performing that function. Dr. Kraeuter responded that the proposed budget did not include money for hiring a manager. Mr. Joseph briefly described the Bureau's management efforts, noting that despite Dr. Kraeuter's assertion, Mr. Dobarro had spent at least 90% of his time on oyster management issues and that additional staff would bolster the Bureau's management efforts. There was some discussion regarding whether various management efforts could or should be performed by a biologist or someone with the title of manager. Dr. Kraeuter expressed the opinion that there was a great difference between a biologist and a manager and that a manager was clearly needed rather than a biologist. Mr. Horzempa and Mr. Joseph responded that a biologist can, in fact, perform this function as he or she would have the technical background and would also be able to use that knowledge to best perform the management aspects as well. Mr. Bailey thought that a manager oriented to business would be best suited to oversee the oyster management issues on a full time basis. Mr. Joseph responded that if adequately staffed, the Bureau could provide all necessary management oversight.

Dr. Powell stressed that the task force report should include reference to a management position, whether it was within DEP or associated with the Council as part of the industry. Dr. Powell stated that individuals in a regulatory agency, for example, should not be involved in the day to day operations of a cultch program. Rather, Dr. Powell stated that this task required someone to make business decisions, not regulatory decisions or biological decisions. Mr. Bailey added that in order for the industry to move ahead, a full time manager focusing on making money for the industry needed to be hired. Mr. Joseph asserted that a biologist within an expanded Bureau would be able to perform all the tasks discussed.

Dr. Powell suggested that this issue be resolved by maintaining the recommendation to increase Bureau funding by \$105,784 while adding a management position associated with the Shellfish Council elsewhere in the budget. This individual would be solely devoted to oversee the management measures recommended in the task force report. Dr. Powell suggested that under the category "Shell Planting and Transplant" within the Funding Requirements section, a position of "Industry Manager" should be included in the budget with a salary of \$40,000/year. Mr. Joseph suggested that within the section for Shellfish Resource Development, language be inserted specifying that additional staff within the Bureau of Shellfisheries will be dedicated to oyster management duties. Dr. Kraeuter argued that in large bureaucracies', e.g., state government and Rutgers University, employees regularly get "pulled off" into other jobs that prevent an individual from working solely on oyster management issues. Mr. Horzepa felt that if an individual was funded via a dedicated fund, that person could be dedicated to a specific function. Dr. Powell and Dr. Kraeuter disagreed, stating that this position must be filled by an individual from the oyster industry and not from State government or Rutgers.

Dr. Kraeuter stated that production enhancement should be the goal of the program, not increasing the bureaucracy by increasing the staff of the Bureau of Shellfisheries. Mr. Joseph asked Dr. Kraeuter if he felt shell planting and transplanting were, in his opinion, a part of production enhancement. Dr. Kraeuter responded in the affirmative. Mr. Joseph responded that he had been making the arrangements with Langenfelder for the 1998 shell planting and all Bureau staff had been involved in coordinating this year's transplanting operations. Additional staff made available to the Bureau's Bivalve office would be performing these management functions, thus negating the need for some industry manager, according to Mr. Joseph. Dr. Kraeuter stated that Mr. Joseph and the State shouldn't be performing such activities as it wasn't the State's function and that it is a direct conflict of interest. Dr. Powell stated that the State's job was to make sure that various activities don't hurt the resource and that industry should make specific decisions and recommendations to the Council about how these operations should be conducted. Only a private sector manager could have the perspective to make the types of business decisions necessary to perform this task. Mr. Bailey stated that only a private individual whose income is directly related to increasing oyster production would be committed to this job full time, and wouldn't be able to "go home and forget about it." Mr. Joseph stated that the Bureau's staff cared more about the oyster industry than Mr. Bailey realized, and that while staff salaries don't depend on the level of oyster production, the Bureau is committed to the oyster management program. Everything the Bureau does is to benefit the oyster resource and ultimately the oyster industry, according to Mr. Joseph. Mr. Bailey stated that he didn't doubt the Bureau's commitment, but he felt that a private business manager whose goal is to make the industry better and make more money was needed. Mr. Canzonier stated that a production-motivated manager is needed, and that only an industry manager could act in that manner.

Dr. Powell gave the example of increasing production within the cranberry industry. If an Ocean Spray Company manager wants to increase production by putting more acres into cranberry bogs, DEP has a major say so about whether that's how wetlands should be used or not. Mr. Joseph noted that this issue involved private land, not public

land. Dr. Kraeuter argued that such land wasn't private when DEP has that much control over it. Mr. Joseph opined that a production manager to oversee activities on leased ground was completely different from activities which are conducted on the natural seed beds, which are the State's responsibility. Dr. Powell stated that management decisions will have to go through the Council and clearly DEP would have some approval over these matters and that the person bringing the recommendations to the Council should be an industry person. Mr. Joseph reminded Dr. Powell that the Commissioner of the DEP has the responsibility for the management of the oyster resource, not the Council, and that the Shell Fisheries Council, the Marine Fisheries Council, and Rutgers serve to advise the D.E.P. Dr. Powell stated that the recommendations would have to go through the Council and that DEP will have approval authority over the recommendations. Dr. Powell emphasized that an industry person should be the one to bring these recommendations to the Council.

After some additional discussion, Dr. Powell made a motion to include a position of "industry manager" (someone from the oyster industry) under the budget for the section entitled "Shell Planting and Transplant." Dr. Kraeuter seconded the motion. Mr. Joseph questioned how an industry manager could perform certain tasks currently performed by Bureau staff. For example, an industry manager couldn't write contracts for shell planting utilizing funds within the dedicated fund administered by the Division. Dr. Kraeuter responded that: "Since the shell planting operation is simply returning shells, why should the State have anything to say about it?" The State should only be concerned with where the shell goes so that the resource isn't damaged, according to Dr. Kraeuter. Mr. Joseph stated that landing fee monies being discussed were in a dedicated fund administered by the Division for specific purposes. Mr. Canzonier said that the cultch fund should not be "tied up" in this way and it should be changed. The State contract system currently required to use these funds makes no sense whatsoever, according to Mr. Canzonier. Chairman Malinowski called for a vote on Dr. Powell's motion. A yes vote would support the inclusion of an industry manager position. Those voting "yes" were: Mr. Bailey, Mr. Canzonier, Dr. Kraeuter, Mr. Malinowski, and Dr. Powell. Mr. Joseph voted "no" while Mr. Horzepa and Ms. O'Dierno abstained. The motioned carried.

Moving on to other aspects of the Funding Requirements section, Dr. Kraeuter made a motion that when a list is made of what the funding is to be for, production enhancement be placed first on that list followed by other purposes. Dr. Powell seconded the motion. The motioned carried unanimously.

Dr. Kraeuter suggested a change in the last sentence of the second paragraph under the heading of "Funding Requirements." The draft under review read: "As the economic health of the Delaware Bay oyster industry improves, it is expected that private industry contributions to support the oyster resource management program will increase." Reiterating previous comments, Dr. Kraeuter felt that production enhancement, not the resource management program, should be the primary objective of the report. Dr. Powell suggested changing this to "... private contributions to increasing production and resource management will increase." All members agreed to this change.

Dr. Kraeuter noted that the vessel referred to as the Meerwald in the paragraph preceding "Shell Planting and Transplant" should specify the "A. J. Meerwald" so that this was not confused with another vessel with a similar name. Drs. Powell and Kraeuter also suggested some transitional language within this paragraph to introduce the programs requiring funding.

In the continuing review of the Funding Requirements section, Dr. Kraeuter expressed concern that there was too much detail within each section. He felt they could be reduced in length, especially since these issues are addressed within prior sections of the report. The shortened versions should, however, refer to the sections of the report where these issues are addressed in detail. The task force members agreed to this change. Additional editorial changes were discussed to make the report more succinct, including "firming up" the cost of daily vessel charter, rather than including a notation that long term costs would be greater. Within the section entitled "Demonstration Planting with multiple transfers of spatting cultch," the task force agreed that the line item for \$166,000 for "Harvest with oyster boats @ 1200 bushel/day for 166 days should be removed. Since oystermen would be harvesting these oysters for market, they would be compensated through the sale of the oysters and not through payment of a daily charter fee.

Dr. Kraeuter emphasized that the report should stress the potential financial return for the various components of the recommended actions. Dr. Powell suggested that Ms. O'Dierno expand the table to provide greater detail on the expected return on investment. As an example, Dr. Powell suggested that for the 200,000 bushels of planted shell, assuming a minimal return of one bushel of market oysters at \$20/bushel for each bushel of shell planted, would yield a return of \$4 million. This would provide the reader of the task force report with a clear picture of potential benefits of each production enhancement measure.

With respect to the funding section entitled "Aquaculture and Disease Resistant Seed," Dr. Kraeuter stated that the second sentence should read: "... at least two models that prove....", not "... at least two US models that suggest" After a brief discussion, it was agreed that the word "suggest" would be replaced with the word "show." Within this same section, Dr. Kraeuter indicated that the third and fourth sentences of this paragraph which make reference the use of natural set and the Connecticut oyster industry should be removed since this issue was covered in another section of the report.

Under the section entitled "Mapping and Definition of Oyster Beds," Dr. Kraeuter stated his opinion that it should not be performed by DEP, but rather this work should go out for competitive bid. Dr. Powell agreed, noting that a private firm could be able to perform this work with greater expertise. Dr. Kraeuter noted that if the DEP could do the work cheaper, that would be fine. Mr. Joseph reluctantly agreed that Dr. Kraeuter's suggestion was valid, since the departure of Mr. Dobarro would severely limit the Bureau's ability to perform this work as originally planned. There was a discussion regarding the possible mechanisms to perform this work by DEP, by a DEP contract with a private contractor, or some cooperative effort between the State and a private agency. In this same section, it was agreed to delete the three sentences noted with an

asterisk that made reference to project cost changes and a similar project in Galveston Bay, Texas.

Moving on to the section entitled "Interstate Shellfish Sanitation Conference (ISSC) and Water Quality Monitoring," Dr. Kraeuter expressed concern that this section didn't make any reference to the collection of additional water samples. Based on conversations with William Eisele of the Bureau of Marine Water Monitoring (BMWM), Messrs. Canzonier, Horzepa and Joseph discussed how this money would be used to enhance the existing program, including increased participation in the ISSC, staff training and perhaps additional sampling and analysis. Mr. Horzepa suggested that a line be added for "special shellfish growing water quality studies" which would allow DEP to examine specific problems which might arise. As an example, Mr. Joseph noted that the BMWM was currently seeking funding for sample collection and analysis to determine the specific source of elevated coliform levels observed at the mouths of various Delaware Bay tributaries. Dr. Powell suggested that this additional item be funded at \$25,000, which would be in addition to the \$10,000 level of funding previously listed. The assembled task force members agreed with this addition.

In the funding requirements summary table, Dr. Powell suggested that the dollar amounts for the various components be rounded to the nearest thousand dollars.

In the section entitled "Expected Return on Investment," Dr. Kraeuter stated that within the first sentence of the second paragraph, the word "potentially" should be deleted. Dr. Kraeuter also stated that the third sentence should be underlined for emphasis. There were no objections to these changes. Dr. Powell suggested that the third paragraph of this section should be moved to the bottom of this section just before the table regarding costs and benefits. There followed a brief discussion of some of the dollar figures within this table.

Within the "Employment" section of the Funding Requirements component of the report, Ms. O'Dierno noted that there had been few changes since the previous draft. Mr. Horzepa suggested deleting the word "only" with respect to "24 person years of employment" in the third sentence. There followed a brief discussion of the economic benefits to the regional economy.

Having completed its review of the Funding Requirements section, the task force members discussed the tasks remaining for the completion of the report. Since Mr. Dobarro and Dr. Ford had compiled much of the report material, Dr. Powell suggested that Mr. Dobarro continue to compile the various plan components and send them out to task force members for review prior to a final meeting of the group. Dr. Powell indicated that he would contact Dr. Ford to ensure that Mr. Dobarro received the appendices prepared by Dr. Ford. Dr. Powell offered the assistance of Rutgers' staff if Mr. Dobarro needed secretarial help in order to compile the report.

Mr. Joseph asked Mr. Horzepa if the Department of Agriculture could cover printing costs for the final report as had been previously offered. Mr. Horzepa confirmed that the Department of Agriculture would be able to provide the funds necessary.

Mr. Horzepa commented that the next meeting should be the final meeting. Prior to the final meeting, the group should have the opportunity to review the final document and make any needed changes. After members have had the opportunity to review this compilation, a final meeting date would be established.

There being no further business, the meeting was adjourned on a motion by Dr. Powell and a second by Dr. Kraeuter.

APPENDIX 4
Program Rationale and Justification

APPENDIX 4a

ENHANCEMENT OF NATURAL SEED SUPPLY

Upper Bay Seed Bed Area

Background/Rationale

Insufficient seed for planting has plagued the Delaware Bay Oyster Industry for decades. Until the MSX disease epidemic in the late 1950s, seed was imported from outside the estuary to supplement that produced by the Bay itself. In some years, the volume of imported seed exceeded that produced in the Bay itself (Ford, 1997; Appendix 1). Because of MSX disease, an embargo was placed on imported seed in 1959 and the industry has been forced to rely entirely on native seed. Attempts to enhance the supply have been made sporadically in the form of shell plantings, to catch natural oyster sets, on the seed beds. The planters themselves were once required to replace a portion of the shell from oysters they harvested, but this practice was eliminated in 1979. Federal funds were available during the 1960s and early 1970s and several significant shell planting were made at that time (Table A4-1). The value of planting clean shell at the right time (i.e., when larvae are ready to set) is illustrated by results recorded in 1966 when clean planted shell received a set of 5,000 spat per bushel whereas old shell on the same bed received only 90 spat per bushel (records of D. E. Kunkle, Haskin Shellfish Research Laboratory). Most plantings did not receive this kind of set, but there was little attempt to regularly place the shells in areas of historical good setting. Rather, cultch went to areas that had been recently harvested, which were not necessarily very good setting areas. Recently, very little clean shell has been replaced on the seed beds because the only source of funds has been the Oyster Resource Development Account. This account receives fees from oyster growers, but due to low harvests, rarely has sufficient funds for a significant planting.

There is little doubt of the value of shell planting, as long as it is done at the appropriate time, in the areas most likely to catch a set, is of sufficient size, and the resulting set is managed effectively. Long-term records of the Haskin Shellfish Research Laboratory show clearly delineated areas of high set potential on the inshore areas along the New Jersey shore (Fig. A4-1). The expansion of the oyster industry in Connecticut (from 161,000 bushels in 1985 to 1.3 million bushels in 1994) is due largely to the timely planting of clean shell in high setting areas followed by its transplantation to nurseries and then to final growout grounds. In Connecticut, as well as in Louisiana and Maryland, which also plant shells, several million bushels of shells are put down each year.

Enhanced Management Options

For shell planting to be successful in New Jersey, it must be done regularly, on a much larger scale, and closer to setting time than it has been in the past. There should also be a move from broadcasting on the large beds towards planting in inshore areas to maximize set. The major constraints are financing and a supply of shells. It is essential that shell planting is done on a large enough scale to make a difference. Also, an infusion of public funds will be needed to initiate the program. Subsequently, fees on oysters taken for market or for replanting onto leased grounds will pay for the shell planting.

At present, the shells being generated from Delaware Bay harvests would need to be supplemented by other sources of cultch in order to achieve sufficient quantity to make a significant planting. Surf clams and ocean quahogs are shucked in large quantity in southern New Jersey, including Bivalve on the Maurice River. An attempt should be made to secure some of these shells for planting on the oyster beds. The uses of other sources of cultch such as slag from the Beasley Point Power plant should be investigated for technical, regulatory, and financial feasibility. Millions of bushels of oyster shell are already in the Delaware Bay, buried under sediment. If removed and relocated to high setting areas, this could prove to be an easily accessible and relatively inexpensive source of cultch. A suction dredge vessel currently being tested on the seed beds shows great promise for this task.

Lower Bay - Cape Shore Flats

For over 60 years the intertidal flats on the Cape May shores of Delaware Bay (see Fig. A1-1) have been utilized for the collection of native spat as well as the grow-out and fattening of market size oysters. T. C. Nelson and J. R. Nelson, of the Rutgers Department of Oyster Culture, for many years were directly involved in experimental trials to define the practical parameters of collection of spat and eventual planting of seed from a location near Pierces Point (Nelson 1934,1959, 1960 ca.; Nelson & Chestnut 1944). Commercial activities have been undertaken by several watermen, including Sommers Izzard and his brother, Wes Adams, Gus Hilton, Charles Hilman, Robert Lake Jeffries and Norman Jeffries Sr., at various times during this period. Most recently, others (Russell J. Down; Geoffrey A. Carr; H. H. Haskin and W. J. Canzonier) have taken interest in utilizing this resource (Table A4-2).

Table A4-1. Shell Planting Program for the Natural Oyster Seed Beds of Delaware Bay (Data are presented in bushels.)

Year	Clam Line	Egg Island	Beadons	New Beds	Nantuxent	Bennies	Shellrock	Cohansey	Cohansey Point	Ship John	Middle	Arnolds	Island Round	Misc	Total
1956				50,876	9,660	58,926	47,172	27,462			40,411			13,031	247,538
1957				52,169		63,112		53,157			4,000			11,725	184,163
1961				2,703		4,445									7,148
1961															0
1962															0
1963															0
1964															0
1965					151,274										151,274
1966			76,018		151,274		101,950	402,266	112,462	142,110	362,765	213,924	78,616		1,641,385
1967	88,174		33,826		32,247		47,600	168,344	150,627	66,383	164,000	201,399	45,000		997,600
1968							52,000	48,000				203,000	99,000	89,759	584,031
1969							202,000		225,000		184,000				611,000
1970						71,480		200,162			209,772				481,414
1971				232,249						241,605					473,854
1972								206,867		16,800	84,856				308,523
1973															0
1974															0
1975															0
1976															0
1977															0
1978															0
1979															0
1980															0
1981															0
1982						59,400									59,400
1983															0
1984		8,500		17,000		25,500									51,000
1985				19,282		19,834									39,116
1986															0
1987				106,432											106,432
1988							131,504	100,000			110,604				342,108
1989															0
1990															0
1991															0
1992															0
1993															0
1994															0
1995															0
1996															0
1997				83,000							82,000				165,000
Total	88,174	8,500	109,844	563,711	344,455	302,697	582,226	1,206,258	488,089	466,898	1,242,408	618,323	222,616	114,515	6,450,986

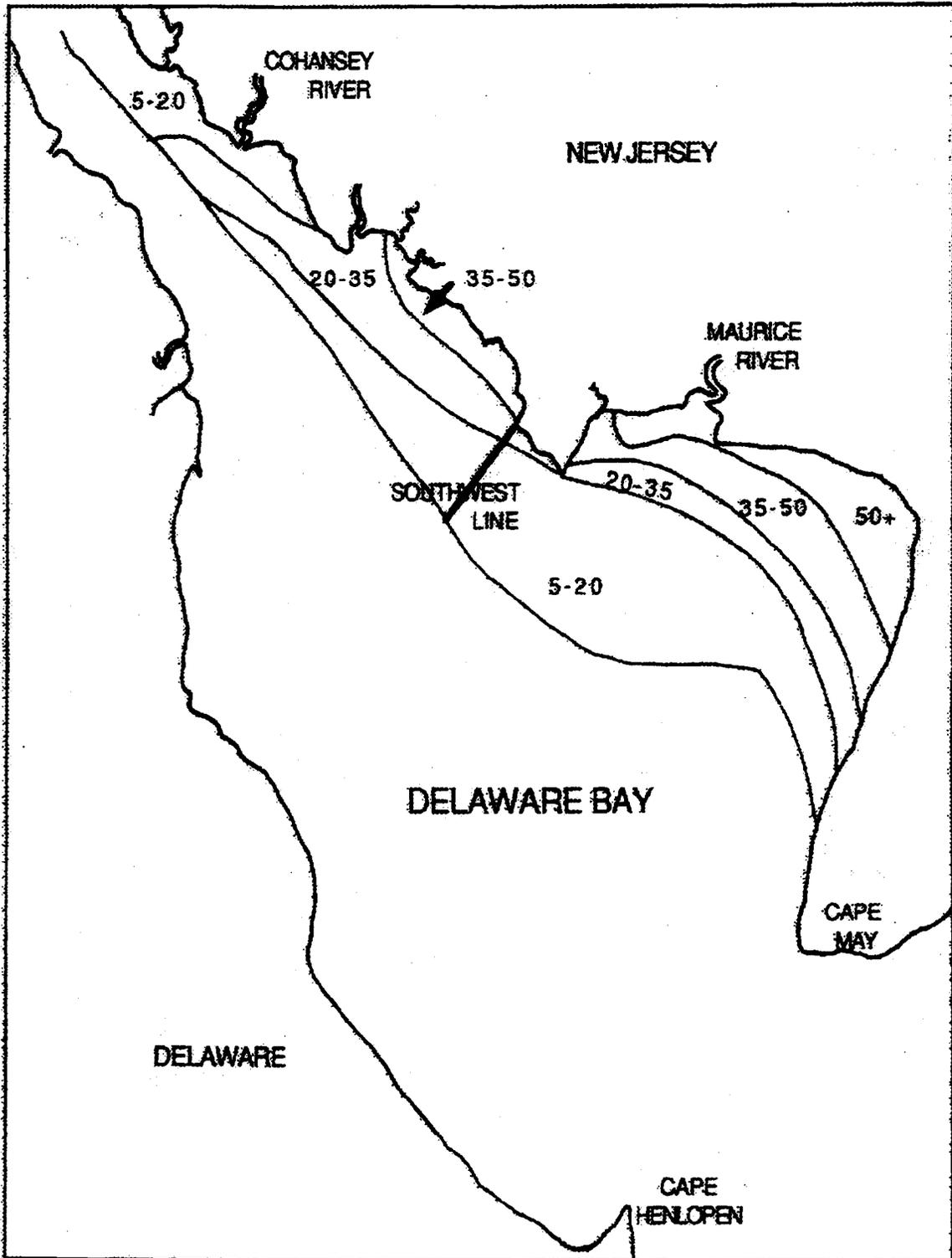


Figure A4-1. Natural oyster setting potential on the New Jersey side of Delaware Bay. Numbers represent the percent of years in which natural oyster set of 20 spat per shell or more can be expected on clean shell (1954-1983).

The outstanding feature of this intertidal area is the consistent, high-density setting of oysters that occurs in mid-summer (Fig. A4-1). This phenomenon results in sets on clean shell cultch that often exceeds 7500 spat per bushel by late summer. Haskin Shellfish Research Laboratory records of spat counts on bagged shell for the 1957 season indicate a potential set of 35,000 spat per bushel! Indeed, no other area Bay has consistently exhibited such good recruitment. Complete "set failures" (less than 500 surviving spat per bushel) are rare occurrences, seldom exceeding once in a 15 to 20 year period. Failures, or near failures, have been recorded for 1927, 1965, 1967 and 1979. These failures are correlated with prevailing easterly winds prior to and during the period of typical setting (early July/mid-August) (Notes of D. E. Kunkle on file at the Haskin Shellfish Research Laboratory).

Though the setting potential of this area is quite high, there has been a traditional reluctance by the Delaware Bay oyster industry to use it as a source of commercial seed. This reluctance is probably based on a few experiences of poor recovery of marketable oysters after transfer of the small spat to deep-water planting grounds, as well as the technical problems and high costs associated with collecting the seed using the conventional equipment and vessels available to the oyster industry.

Losses occurring upon transfer are primarily attributable to heavy predation by crabs and oyster drills (a small snail) which can quickly decimate the very fast-growing but thin-shelled seed oysters. Planting on soft mud was signaled as the cause of losses in one small planting (1943). However, there are documented cases of successful transfer of this seed and subsequent harvest of market oysters from the transferred stock. In 1955 a lot of about 3500 bushels of Cape Shore seed was transferred to leased grounds in the Delaware portion of the Bay by Norman Jeffries Sr. When harvested in 1957 the recovery ratio was about 4 bushels of market oysters for each bushel of seed planted. The Haskin Shellfish Research Laboratory also transferred commercial quantities of Cape Shore seed on several occasions during the 1960s. All of these transfers were successful in that the oysters survived well, MSX infection pressure notwithstanding, and resulted in growth to market size of an acceptable proportion of the seed. Indeed, on three occasions the oysters that had been transferred to lower-Bay grounds were eventually harvested and sold via normal commercial channels.

The cost of planting cultch in this intertidal area is quite low per unit of potential seed production; however, recovery of the seed, which must be accomplished in the fall before icing of the Bay disperses and destroys the young spat, has usually proven to be quite costly. Earlier methods, using shell contained in wire mesh bags of 2/3 to one bushel in capacity, though resulting in fairly high setting and survival of the spat, did not lend itself to easy recovery and transfer in the fall due to rapid deterioration of the bags on the flats, with consequent poor return on the total volume of cultch set out on the flats.

Experimental plantings by the Haskin Shellfish Research Laboratory demonstrated the feasibility of depositing loose shell directly on the surface of the flats. However, this

method required the use of considerably larger volumes of shell to stabilize the bottom initially so that it would support a layer of unfouled shell above the sandy sediments. There were also serious limitations encountered in the recovery of the spatted shell, due to the requirement of performing the dredging operations in the rather limited time window of about two hours at high tide. The characteristics of the vessel required are also quite peculiar to this operation: it must be of rather shoal draft (preferably less than 1 m loaded), have a deck load capacity of 1000 to 1500 bushels (for shell planting) and be highly maneuverable with little water beneath the keel, in order to permit dredging effectively in confined areas on the flats. Such characteristics are not typical of the oyster boats used in Delaware Bay.

Norman Jeffries and associates have recently experimented with the use of plastic mesh-tube bags, filled with about 1/3 bushel of shell, as the cultch units deployed on the flats. Though the number of bags used over four setting seasons was small (1200 bags each year), the results were promising. Indeed, the ease of filling, transfer and deployment of this type of bag, as well as their stability and ease of recovery, indicate that the method has considerable advantages that favor its viability as an economically feasible method for utilizing this heretofore little appreciated natural resource. However, on a volume for volume basis, the cost of recovery and replanting of the bagged cultch is still considerably in excess of the cost of recovering loose, spatted shell from the bottom.

Projected costs and yields for Cape Shore set for a small commercial planting are provided in Tables A4-3 through A4-6.

Table A4-2. Records of oyster spat collecting on the Cape Shore flats of Delaware Bay and its transfer to various planting areas, including records of the New Jersey Oyster Investigation Laboratory (on file at the Haskin Shellfish Research Laboratory, Rutgers University). Compiled by W. J. Canzonier, Aquarius Associates, Port Norris, NJ.

YEAR	CULTCH TYPE	PLANTING SITE	ESTIMATED MORTALITY	REMARKS
1930	Wire Mesh Bags	JRNelson/Jeffries Leases?	N/A	Used vessel "HARVESTER" JRNelson
1943	Wire Mesh Bags	Parker Grounds (5A Maurice R. Cove)	Good survival (drills & mud as probable cause)	2 wk old at transfer (T.C. Nelson/ A. Chestnut?)
1950	Wire Mesh Bags ?	Not specified (N. Jeffries)	N/A	Also used "SEARACK" trays
1951	Loose Shell	Not specified	N/A	"DOROTHY G", "BROWNIE", large barge, "ETHYL" Wire Bags and small landing craft
1955	Wire Mesh Bags (0.7 bu/bag)	Jeffries /Hand Del. Leased Grounds	N/A	Harvested 1957; 4X yield
1956	Wire Mesh Bags	Jeffries	N/A	started layout on 20 June
1957	Wire Mesh Bags	Del. & NJ Grounds	90%+ Lost due to MSX 1958	1500-2200 spat/bushel
1960		Wire Mesh Bags	Jeffries	(may be confused with 1961 ; record not clear)
1961	Wire Mesh Bags	NJ Sanctuary (Cohansey/Back Creek?)?	Good survival to market size	Followed by D. Kunkle and W. Richard of the Oyster Lab
1962	Loose Shell	Cohansey NSB	Good survival	Baskets to barge;large crew needed; not cost effective
1964	Loose Shell	Lab C ground	Jun. 1967: 22%	10,000 bushels July; dredged "QUEEN MARY" 176 spat/shell ; Followed by Lab
1968-75	Variety of Cultch	Left in place and some transferred to coastal ponds	N/A	Russell Downs. Some oysters were transferred to a pond adjacent to Great Sound, Cape May County.
1967	Loose Shell	126 C ground (Ridge)	Nov. 1968: 20% Dec. 1969: 41% Dec. 1970: 47%	Followed by Lab
1970	Loose Shell	Lab C ground (Ridge)	Dec. 1972: 67% Dec. 1973: 76%	Followed by Lab
1970	Loose Shell	295 D ground (Deepwater)	Dec. 1972: 87% Dec. 1973: 91%	Followed by Lab
early 1980s	Loose Shell	?	Not used?	N. Jeffries/Jim Gifford w/ WARREN
1987	Plastic Mesh Bags	Great Egg Harbor	N/A	N. Jeffries / S. Tweed
1988	Plastic Mesh Bags	Not Planted	N/A	N. Jeffries
1989	Plastic Mesh Bags	Great Egg Harbor	N/A	N. Jeffries
1985-91	Tire Beads	Retained on flats	High Dermo mortality in 90-91	G. Carr-Dias Creek flats

Note: In the period 1938-1941 there were apparently commercial plantings of Cape Shore spat (Nelson and Chestnut 1944). Early records are found in Nelson (1960ca.)

Table A4-3. Projected costs for the first year of Cape Shore Shell Planting.

Activity	Cost
Surf-clam Shell; 15 000 bushels @ \$0.40/bu.	\$6,000
Planting of Shell; 15 boat trips @ \$600/trip	\$9,000
Preparation of Intertidal Ground (Lease, survey, stakes, crew, transportation)	\$2 100
Harvest of Spatted Shell (est. first yr. 4000-5000 bushels) 500-600 bushels per boat load @ \$800/load; 8-9 loads	\$7,200
Total First Season Operating Costs	\$24,500

Table A4-4. Subsequent Operating Costs for Cape Shore shell planting

Activity	Cost
Thinning and Replanting During Second Season 10 days @ \$600/day	\$6,000
Harvest of Market Oysters (third season) 12-14 days @ \$800/day	\$11,200
Total Materials & Operating Cost to Harvest Time	\$35,500

Table A4-5. Projected yield from Cape Shore shell planting.

Projected Item	Projected Result
Projected Min. Count of Spat Per Bushel Of Shell Recovered From The CS Flats ¹	1500 to 2400
Total Number Of Oysters Planted From CS Flats (first year)	6 to 12 million
Estimated Yield Of "Small" Market Oysters @ 20% Recovery Of Those Planted	1,200,000 to 2,400,000
Culled Volume Of Oysters Recovered @ 350 - 400 /Bushel	3,000 to 6,860 bushels
Value Per Bushels At Average Current Landing Value	~\$26
Recovery of 3000 Bushels	\$ 78,000
Recovery of 6000 Bushels	\$178,300

¹Based on historical records of the Haskin Shellfish Research Laboratory.

Table A4-6. Synopsis of Operating Costs and Returns for Cape Shore shell planting.

Activity	Costs
Planting Cultch and Transfer of Spatted Shell	\$24,300
Loan Service (4 yr. @ 12%)	\$10,080
Maintenance & Harvest of Market Oysters(6-12 days @ \$500)	\$17,200
Total Expenditures	\$51,580
Ex-vessel Value of Product ¹	\$78,000 - \$178,380
Net Yield (Conservative Projection)	\$26,420 - \$126,780

¹Range depends on recovery of spatted shell.

APPENDIX 4b

DEVELOPMENT OF NEW APPROACHES TO LEASING AND TRANSPLANTING

Background/Rationale

Since their recognition in New Jersey as a public resource 150 years ago, the seed beds in Delaware Bay have been treated in regulation and statute as a single entity. However, it is clear that they have different characteristics depending on their location along the salinity gradient (Fig. A4-2). Oysters on the upper most beds, for instance, survive well because they are rarely affected by predation and do not experience high levels of disease-related mortality (Figs. A4-3). On the other hand, they are thin-shelled, slow growing, and of marginal market quality.

These oysters frequently grow in clusters, which makes them less desirable for market because of increased handling. Survival on these upper beds (Round Island, Upper Arnolds, and Arnolds) is primarily attributed to low salinities. Mean salinity in this range is approximately 10.8 parts per thousand (ppt). This salinity range is below the threshold for predator and MSX -disease activity, but within the tolerance limits for the Dermo parasite (see Appendix 1 for a discussion of the oyster diseases). Because of the general physiological condition of these oysters, they are rarely harvested by the oyster industry for transplanting, and it is very unlikely that they would be harvested for the direct market program (see Appendix 4c). The contribution of these beds to the total seed harvest since 1958 has been less than 5%.

Oysters at the downbay limits of the seed beds are characterized by good growth and market quality. However, stocks within this lower range are frequently exposed to intense predation and disease activity (Fig. A4-3). During periods of high disease activity, oyster populations on the lowermost beds (Egg Island, Ledge, and to a somewhat lesser extent New Beds) can be severely reduced. Mean salinity in this region is approximately 19.9 ppt. Since 1958, these beds have provided less than 5% of the total seed production.

Typically, the majority of the annual seed production is harvested from the beds distributed within a region classified as an intermediate zone. This zone includes all the beds from New Beds to Upper Middle. Survival, growth, and market quality can vary widely within this zone, but are best on the beds (New Beds, Bennies, Bennies Sand, and several small nearshore beds) within the lower limits of this zone. The importance of this intermediate region to the industry can not be over-stated since it accounts for better than 90% of the total seed production. Since 1958, New Beds (located in the lower limits of this range) has accounted for nearly 22% of the total seed harvest. This bed has contributed over 50% of the total harvest for the direct marketing since the program's inception in 1996. Mean salinity for this seed bed region ranges from 16.1 ppt in the lower end to 12.8 ppt in the upper portion of the zone.

In addition to the differences in oyster growth and survival, there are also differences in the setting patterns of oyster larvae over the range of the seed beds. Although setting will occur throughout the range of the seed beds, the most reliable setting areas are along the nearshore. This setting pattern is also typical of the lower bay (Fig. A4-1). The greatest set potential occurs below Ben Davis Point.

The growth and survival differences expressed by the various populations of the oyster seed beds suggest a number of management options for the utilization of these regional stocks. These options will be most viable when the programs are correlated with long-term environmental projections to ensure a maximal potential for success.

The traditional transplant program began failing in the early 1990s because of Dermo disease. Oysters were transplanted from the seed beds to the leased grounds in the lower bay during the spring of the year. This transplant activity was concurrent with rising water temperature and disease activity. As previously noted in this report, the spring transplant was extremely productive for the industry prior to disease gaining a foothold in the bay. Without disease pressure, oysters transplanted to the leased grounds would typically increase in quality and size. Individual harvesters were also able to establish inventories of seed stocks on their leases in the lower bay. Although it is difficult to develop an accurate estimate of the market production relative to seed production prior to the mid-1950s, anecdotal information suggests that this ratio was frequently greater than one-to-one. Since the initial epizootic event (MSX) in the bay, the ratio for market production relative to seed production has been greater than one in only seven of the last 41 years. This ratio has rarely exceeded 0.5 since 1974 and with Dermo has fallen closer to 0.25 to 1. The losses to disease have been staggering for the industry. Although resource data indicate that the seed stocks have been under-exploited throughout the years, these losses have become unacceptable to the industry.

The negative effect of disease on current stock conditions requires that the industry and management become more introspective regarding the utilization of the seed resource. It is apparent that advantages can be gained by capitalizing on the different characteristics of the seed stocks. In order to benefit from these regional characteristics, new approaches will have to be developed for the utilization and manipulation of these stocks.

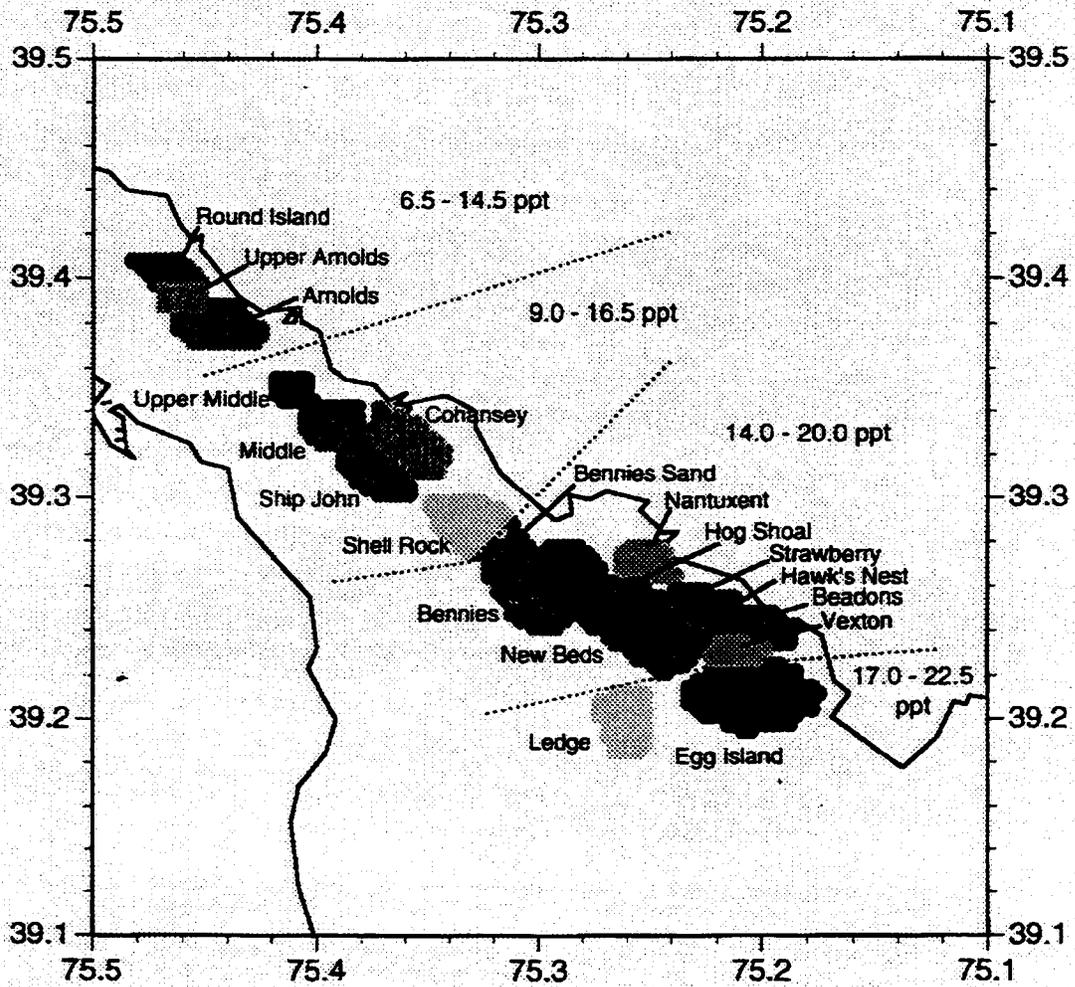


Figure A4-2. Delaware Bay New Jersey Natural Seed Oyster Beds. Dotted lines separate beds within particular salinity region. Numbers refer to the seasonal range in average salinity within the region.

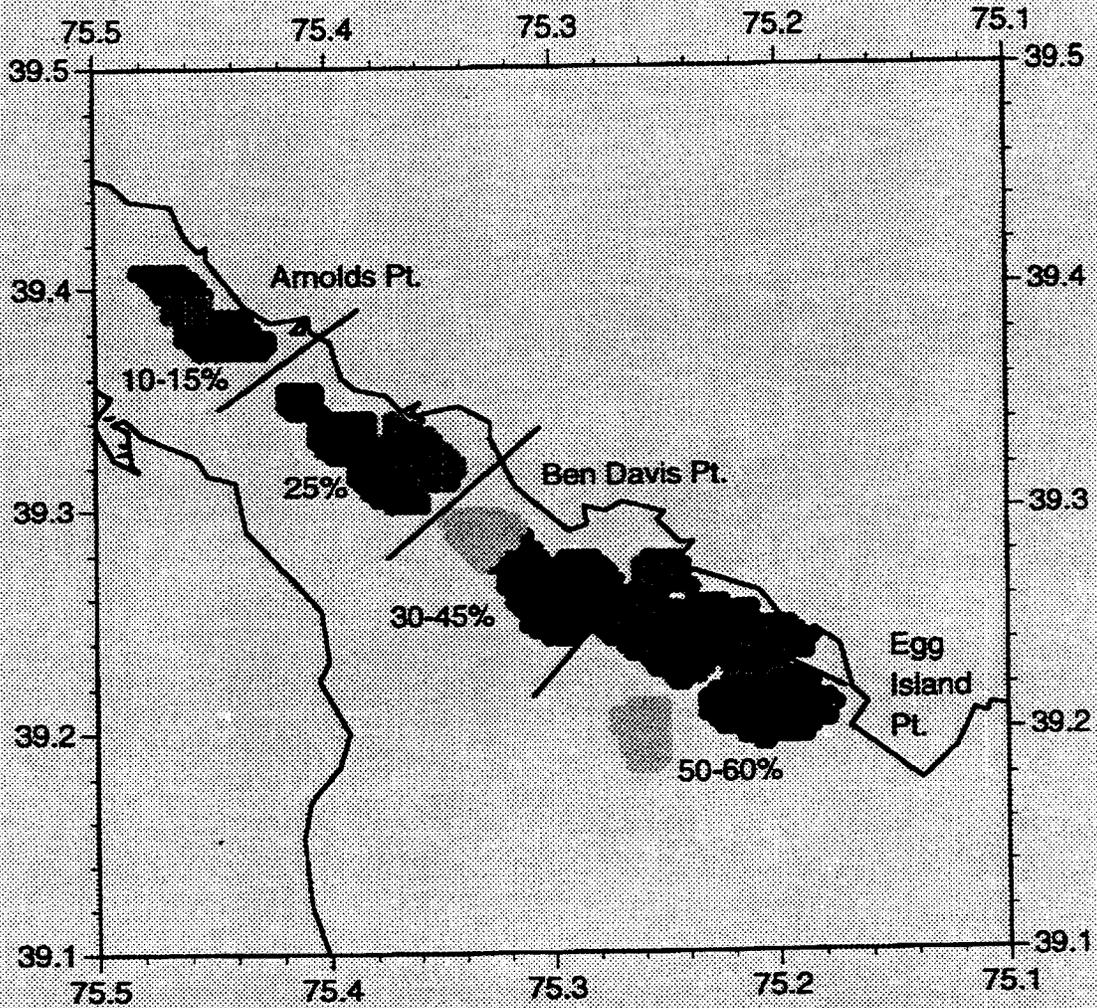


Figure A4-3. Delaware Bay New Jersey Natural Seed Oyster Beds showing estimated mean annual mortality (all causes), 1991-1996.

New Transplant Strategies within the Natural Seed Beds

1. Movement of Seed Oysters from Low-Growth Areas to Intermediate Beds

Currently with the direct market program (see Appendix 4c), the oyster industry has focused its harvest activities on the lower intermediate seed beds. This concentration of effort is primarily due to greater quantities of market size oysters and higher meat quality. As the market stocks are reduced on each of the lower intermediate beds, the fleet shifts harvesting activities to beds farther up bay. These oysters are usually smaller and meat quality is frequently less desirable. Therefore, it is unlikely that these upper bay stocks will be marketable if they remain in position. These stocks can, however, be used to supplement harvested areas in the lower bay. Once transplanted from the upper bay to lower bay locations, these upper bay oysters slowly develop the characteristics of the oysters at the transplanted site. When oysters are moved from the upper beds to the lower intermediate areas, growth can be rapid, three quarters of an inch or greater, and meat quality can substantially improve during a single growing season. These oysters could either be marketed directly from the transplanted areas during an open harvest season or transplanted further downbay for a few months of final growth and conditioning. In addition to supplementing dredged areas on the lower seed beds, this upbay-downbay transplant program can be used to establish oyster reservoirs on the lower beds, which are solely designated for specific harvest programs, such as holiday markets. These supplemental transplants can be accomplished in several ways depending on funding and other program specifics designated by the Shell Fisheries Council. Several mechanisms are available to the industry for implementing these programs:

a. Competitive Bidding

The Council would select vendors on a competitive bid process to move oysters from the upper beds to designated seed areas in the lower bay. Funding for this program would be made available through a per bushel harvest/landing fee paid by the oyster harvesters during the open harvest seasons. This money would be deposited into and disbursed from the "Oyster Resource Development Fund." The Council would designate the terms and conditions of the programs and purpose of the transplant. The program would be administered by the state's resource management agency.

b. The State would conduct the transplant program using available resources to relocate oysters from the upper beds to designated transplant sites.

In order to accomplish this task and other enhancement tasks, the State and Oyster Industry could jointly invest in a suction dredge to transplant oyster stocks between selected natural oyster beds. In addition, the suction dredge would be used to: mine shells for conditioning and return to spat collection areas; to prepare areas of the seed beds for spat collection; to relocate spatting cultch material onto the seed beds; to plant cultch material; and to lease to oyster industry members for their own enhancement programs. The oyster industry's share for the purchase of the vessel would be paid

through revenues generated by harvest fees on the seed removed from the natural seed beds. These fees will be deposited in the Oyster Resource Development Fund managed by the state. The primary function of the vessel would be to perform those resource enhancement programs designated by the Council for the cultivation and enhancement of oyster production on the natural seed beds of Delaware Bay. Industry members would be able to lease the suction dredge vessel for resource enhancement efforts on their leased grounds. The suction dredge vessel would also be made available for resource monitoring programs.

The only caveat with the use of the suction dredge is that this dredging operation isn't size selective. This type of vessel is capable of moving large quantities of oysters in a very efficient manner, unfortunately technology is not currently available to mechanically cull the shell and smaller oysters from the dredged material. Since the primary objective of the transplant program would be to relocate near market size oysters, this objective would not be met with the indiscriminate use of a suction dredge on a particular area unless the relocation effort was combined with a replenishment program for the source area(s) harvested.

c. Resource Relocation Efforts through the Barter System

The Shell Fisheries Council would initiate a program to encourage industry participation in the stock relocation efforts by compensating the vessel owner's efforts with an additional resource allocation. This allocation could be based on a bushel per bushel allocation or a percentage of the estimated relocated volume. Oysters would be transplanted to designated areas of the lower intermediate seed beds for conditioning and growth. The oystermen volunteering to participate in this program would receive a preferential vessel allocation during the open harvest season in order to recover operating costs incurred during the relocation program and to provide incentives for future participation in management programs.

Regardless of the mechanism for transplanting these stocks, there are several programs that have the potential for maximizing the utilization of all the seed stocks and substantially increasing the long-term economic potential of this industry. These programs include the following:

1. Mid to Late Summer Transplant of Underutilized Stocks from the Upper Bay Seed Beds (Shell Rock to Round Island) to Lower Intermediate Seed Beds (New Beds and Bennies).

The transplant to the lower seed beds (New Beds and Bennies) will be determined by:

- a. Stock conditions on the upper beds.
- b. Water temperature or air temperature for the months of June and July.
(26 year {1960-1996} maximum temperature normal for Millville, NJ for June is 81.0 °F {27.2°C} and 85.3°F {29.6°C} for July)
- c. River Flows for May through July as measured in cubic feet per second (cfs) at Trenton, NJ.
- d. Disease levels

Oysters will be harvested from selected beds in the upper bay and broadcast over designated areas on the lower intermediate seed beds. The transplant will occur in late July/early August if temperatures are below normal or river flows are above normal for the observation period, otherwise the transplant would occur in the latter part of August.

The Council shall designate:

- a. Areas of harvest
- b. Vessel allocation limits
- c. Terms and conditions for participation and harvest
- d. Harvest fees - minimum \$1.25 per bushel

Expected Results:

- ◆ Production on the intermediate beds will be enhanced and sustained by transplanting underutilized stocks from the seed beds lying in the middle and upper bay (Shell Rock to Round Island).
- ◆ By planting these stocks in mid to late summer, after the major infection period for the oyster parasites, the potential mortality due to disease should be lessened.
- ◆ Beds utilized for source oysters during this transplant program will be rotated to lessen the impact of this stock reduction program, thus ensuring the maintenance of these beds.
- ◆ Transplanted stocks should experience accelerated growth rates and improvement in meat quality once moved to the better growing conditions of the lower seed beds.
- ◆ The industry should realize a higher price for the product. The oysters moved to the lower beds should supplement both the fall direct market harvest and the harvest during the subsequent spring and fall.
- ◆ Fall harvest from the lower seed beds should gradually increase from current production levels of 40,000-45,000 bushels as the transplanted stocks improve in size and meat quality.
- ◆ The harvest season will be extended for at least another 2 to 2 1/2 months (September to mid-November). The fall harvest season on the seed beds could possibly be extended later into the year as data on the effects of harvesting with declining water temperatures are accumulated.
- ◆ With an improvement of recruitment on the lower beds, pressure on the upper seed beds will eventually be reduced ensuring the continuation of the oyster stock reserves.
- ◆ Increased employment in the fishery.
- ◆ Positive economic impacts on the communities surrounding Delaware Bay.

Potential Consequences:

- ◆ Long-term production of the source beds could be adversely affected if the beds did not receive a sustaining spatfall during years, bed was not harvested, or if the bed had received heavy spatfall which was relocated during transplant.
- ◆ There may be a net loss of cultch material from the bed unless replaced through natural processes, or a shell or spatfall-cultch planting (replenishment) program.

2. Mid to Late Summer Transplant of Underutilized Stocks from the Beds of Shell Rock to Round Island to Fall Harvest Sanctuaries on New Beds and Egg Island or to privately leased grounds.

Oysters would be moved from several of the underutilized beds of the upper bay, Shell Rock to Round Island, to temporary sanctuaries on selected areas of New Beds and Egg Island. These sanctuaries will be closed to harvest until the fall direct market season is terminated. Once the direct market areas have been closed, the sanctuaries will be opened for harvest. It is anticipated that opening of these areas will coincide with the lucrative holiday season market from late November through December. Oysters transplanted to these sanctuaries will be available to the oyster harvester on an allocation basis. The allocation will depend on the total volume of oysters transplanted to these sanctuaries and be determined by the Council. These areas would remain open through the harvest period of the following spring. The sanctuaries would then be closed and replenished by through another transplant program. If individual oyster growers wished to transplant the oysters to their own leased grounds, they would be able to do so, as long as they had paid the bushel fee.

The late season transplant could have significant benefits for the oyster grower. For several years the Bureau of Shellfisheries tracked the growth of oysters relocated from the Shell Rock, Arnold's, and Round Island to either the lower-intermediate beds or planting ground. These investigative efforts indicated that although some growth occurs in the spring, maximum growth occurred from August through mid-October (NJBS unpublished data). Recently, a more elaborate study looking at the seasonal effects of a downbay transplant has suggested that a late summer transplant may be beneficial to the industry (Canzonier 1997).

The transplant to sanctuaries on the lower, intermediate beds will be determined by:

- a. Stock conditions on the upper beds.
- b. Water temperature or air temperature for the months of June and July.
(26 year {1960-1996} maximum temperature normal for Millville, NJ for June is 81.0 °F {27.2°C and 85.3°F {29.6°C} for July)
- c. River Flows for May through July as measured in cubic feet per second (cfs) at Trenton, NJ.
- d. Disease levels

Oysters would be transplanted in early August if temperatures were below normal for the observation period or river flows were above normal for the period. The transplant would occur late August if temperatures were normal or above normal and/or river flows were below normal for the observation period.

The Council shall designate:

- a. Areas of harvest
- b. Vessel allocation limits
- c. Terms and conditions for participation and harvest
- e. Harvest fees - minimum \$1.25 per bushel

Expected Results:

- ◆ The oyster industry would benefit by having a supply of oysters available after the core areas of the Natural Oyster Seed Beds have been closed.
- ◆ Product quality should be high at the time of harvest, therefore market price should be high.
- ◆ The nature of this program, whether communal or private, would ensure that each harvester had an opportunity to share in the highly lucrative holiday market (Thanksgiving through Christmas).
- ◆ Because of the allocation system, no single operator would be able to exert control over the market.
- ◆ The impact of harvesting oysters from the Natural Oyster Seed Beds during the colder months of the year would be minimized.
- ◆ The oyster industry would have a supply of oysters for several additional months, enabling the industry to solidify its position in the marketplace.
- ◆ The economic benefits would be increased because a supply of oysters would be available over a longer period of the year.
- ◆ By planting oysters to their leased grounds during the late summer, oyster planters will be ensured of a supply of oysters for their exclusive use after the fall market harvest from the seed beds is terminated.

Potential Consequences:

- ◆ Long-term production of the source bed(s) could be affected if the bed(s) does/do not receive a sustaining spatfall during years the bed was not harvested or if the bed had received heavy spatfall, which was relocated during transplant.
- ◆ There may be a net loss of cultch material from the bed unless replaced through natural processes, or a shell or spatting-cultch planting (replenishment) program.

3. Complementary Programs

In addition to these programs, which target the economic potential of the fishery through the supplementation of stocks on the preferred harvest areas of the lower bay, there are several other programs that will complement the transplanting efforts

mentioned above and will ensure continued oyster production in the bay. These complementary programs include:

a. Relocation of Market Stocks from Areas of High Set Potential

Market or near-market size oysters would be removed from areas designated as spat collection reservoirs. The oysters would be placed on designated areas of the intermediate seed beds for potential recovery by the oyster industry. This would provide the industry with a greater concentration of marketable stocks within specific areas of the seed beds, thereby reducing operating costs. Since the spat-collection reservoirs would have reduced quantities of marketable oysters, the incentives for the industry to operate in these would be removed until the spat attain market size or are relocated to grow-out areas at other locations.

b. Transplanting of Spatted Cultch (see Appendix 4a)

Areas of high natural set potential (Fig. A4-1) would be prepared using either oyster dredge vessels or a suction dredge vessel to remove the harvestable stocks. These areas will be planted with clean cultch at the appropriate time to provide a suitable substrate for oyster larval attachment. The newly spatted shell would be relocated, using a suction dredge or other dredging vessel, to designated grow-out areas in the upper bay. This movement of the spatfall to low-salinity upper bay areas should significantly increase the survival of these young oysters. Eventually, these stocks would be returned to the downbay beds to replace the oysters removed for market or transplanting purposes.

c. Leasing of Bottom in Low Salinity Areas above the Southwest Line and in Rivers and Creeks

Areas of the estuary with lower salinities than those typical of the traditional leased grounds are found above the Southwest Line and in the creeks and rivers. They present a distinct advantage to the oyster culturist for two reasons:

- ◆ Higher potential for survival and growth of the oyster in its earliest stages immediately following setting, hence increasing the probability of successful recruitment to the seed stock as compared to the more saline areas; this differential in early survival is due primarily to reduced predation and to less severe competition by fouling organisms;
- ◆ Better survival of the oyster up to the market size, since pressures on the older oysters due to disease parasites is considerably reduced over that typical of more saline downbay locations.

The former feature, i.e. better survival of spat, has long been recognized as a critical component in management of the oyster resources of many East Coast estuaries. It is for this reason that upbay areas have been traditionally utilized as collection and nursery sites, often being dedicated exclusively to that purpose. The latter advantage,

i.e. reduced losses due to parasite pressures, has gained recognition in the last half century, primarily due to experience derived from the efforts to manage around the two diseases, MSX and Dermo. It should be noted that whereas these low-salinity areas have traditionally served as refuges for natural set, they are equally crucial as nursery areas for hatchery produced seed. Hatchery production offers the distinct advantage of employing MSX or Dermo disease-resistant strains, but the young oysters are as vulnerable to predation as are naturally set spat and must also be protected during their juvenile stage.

Utilization of these lower salinity areas as seed sources has led to rather rigid restrictions - in some states - on their use as part of resource management strategies that were intended to optimize the seed production for the common benefit of the oyster culturists. Indeed, rather elaborate sets of regulations and exclusionary policies were developed specifically to foster the appropriate, though limited, use of these "seed beds" by those involved in oyster culture and/or harvesting (Appendix 1). For several reasons, exclusionary policies regarding the use of "seed beds" have been developed, codified, and accepted as immutable by the regulatory bodies as well as the majority of the producer community.

However, with the changing conditions that have beset the oyster producers in recent years, due to both disease pressures and restricted availability of seed oysters, it is opportune to re-examine the old policies governing the utilization of these critical areas. As early as the end of the last century (Ingersoll 1881) it was recognized that seedbed management policies that depended on voluntary efforts of the common users for maintenance and judicious harvest practices usually led to rapid decline in the once self-sustaining oyster bars. This aspect of resource management has been carefully analyzed by Haven et al. (1978, page 895) who reported that private seed grounds produced nearly five times as many oysters as did public beds in the Virginia portion of Chesapeake Bay. In New Jersey, there has been a long-standing recognition of the need to protect and enhance the natural seed beds; this was reinforced in the early 1950s as a result of the rapid decline that was experienced upon introduction of more efficient seed harvest techniques. Unfortunately, most effort has gone into protection, rather than enhancement, of the resource.

As a result of policies that restrict most low salinity areas to public use only, there has been only limited incentive for private participation in seed bed enhancement programs. It is interesting to note that, although the consensus in the industry has been that some form of enhancement effort is essential to maintain consistent output of seed, most attempts at this have been rather limited in scope and disappointingly short-lived. Enhancement of seed beds requires an investment of both time and money. Clearly, if only a portion of the producer community makes this investment, yet all are permitted to reap the benefits, the efforts at enhancement will have minimal support. An example from Connecticut serves to illustrate the benefits of private initiative in seed production activities. In that state, there are both public and private portions of the seed beds. A case in point is Bridgeport Harbor, where little effort has been expended on enhancement operations on the public portion of a potentially productive oyster bar; the other half has been intensively cultivated and shelled by a private operator for many

years. The former, though it consistently obtains a fair set of oysters, has shown negligible output as compared to the adjacent privately managed portion. In 1997, the private operator was asked by the city of Bridgeport to apply the same culture practices to the public portion as that used on the private portion, to illustrate the benefits of the most up-to-date enhancement procedures.

The potential benefits of the second aspect of seed bed use, as a haven to minimize unacceptably high losses due to oyster parasites such as MSX, was explored in Delaware Bay during the early 1980s. During this period a new section (Section E) of leased bottom, an area adjacent to the lower seed beds, was established. Largely because most of the bottom available for leasing was off the beds and not suitable for oyster growing, this trial did not prove to be effective. There remains, however, the need to explore the potential benefits of using limited upbay areas for evading some of the losses attributable to the newly emergent disease known as Dermo. Development of such practices on a commercial scale could best be executed by private initiative, since financial investment, added effort and increased risk for even a small operation might prove unattractive to many of the oyster producers.

In order to permit application of private initiative in enhanced seed production, including hatchery-produced seed, and in other management strategies in lower salinities as havens, it would be necessary to change both policy and statutes pertaining to the private use of certain portions of the Natural Seed Beds. It is for this reason that a recommendation has been proposed by some members of the Task Force to give the Shell Fisheries Council the ability to develop new policies and regulations that would permit eventual trial of these approaches to oyster culture in Delaware Bay. It should be clear that the proposal does not recommend leasing of those portions of the beds that have been commercially productive through the years; these should remain a public resource under state control. However, only about 65% of the 13,000 acres designated as "seed beds" falls into this category. In addition, much bottom not designated as "seed beds", still falls within the restricted area. Consequently, there are low-salinity areas that could be leased without infringing upon the public resource. It should also be clear that the proposal recommends only that the Shell Fisheries Council be given the option of permitting pilot-scale trial uses of designated low-salinity areas, and that consideration of a leasing policy would only be made later and only if the trials proved successful.

This proposal is considered by many in the community to be too revolutionary in the context of current practices; however, some in the technical community strongly believe that such a new approach has a high potential for overcoming some of the existing impediments and increasing overall oyster production - with benefits to the community as a whole. Haven et al. (1978, page 917) make a similar observation concerning recommended changes in Virginia oyster culture policy: "There will be some resistance to leasing Baylor grounds (seedbeds) by tongers or by traditionalists in the industry or State government, but it should not be allowed to eliminate this highly useful management alternative. There is no good reason to abstain from such a highly promising practice".

d. Leasing Non-Productive Areas of the Natural Seed Beds - Counterpoint

For almost four hundred years, the oyster harvesters of this state have recognized the value of protecting and restricting control of the natural oyster beds of Delaware Bay. Although directed at the activities of non-residents, some of the earliest legislation promulgated in New Jersey was for the "preservation and care of the natural beds." The central theme throughout the history of the Delaware Bay oyster fishery is that the "natural beds" were part of the "public trust" and should be preserved as such "forever." Participants in the fishery and political figures have constantly reaffirmed this principle since colonial times. Prior to the 1850's, the industry was solely dependent upon the production of the close natural beds for its product. During this era, the industry began to experiment with and soon realized the value of transplanting oyster stocks from the natural beds to sites in the lower bay. The natural beds primarily occupied the area of the bay above Egg Island Point. Because of the change in configuration of the bay at this point and a noticeable change in oyster production, the oystermen considered this point to be a natural break in the separation of the natural beds from other areas of the bay. The distinction was solidified with legislation in 1899, when the New Jersey legislature passed an act entitled "An Act for the better regulation and control of the taking, planting and cultivating of oysters on lands lying under the tidal waters of Delaware Bay and Maurice River Cove, in the State of New Jersey." It was within this act that a line, the "south-west line", was drawn from the mouth of Straight Creek, just north of Egg Island to Cross Ledge Light on the edge of the Main Shipping Channel to separate the two oyster sections of the bay. Concomitant with this act was the state's assumption of an active role in the management and regulation of the oyster resource of Delaware Bay. In keeping with the longstanding practice of maintaining the natural beds in public trust, this act empowered the Commissioners of the New Jersey State Oyster Commission to lease "any of the lands of the State under the tidal waters of the Delaware Bay and Maurice River Cove" below the South-West Line for the "planting and cultivating of oysters." The sentiment for maintaining the natural beds of the bay as part of the public trust is embodied in a speech presented by Senator Edward C. Stokes, a New Jersey legislator, in support of the above mentioned legislation. In this speech Senator Stokes stated that: "For a period of 175 years it has been the policy of this State to reserve its oyster grounds for the benefit and enjoyment of the tenants of the soil. These grounds belong to the State; the State holds them in trust for its own citizens. These grounds or beds are the common property of its citizens, and the State has no right to part with that property..." This speech was in support of a section of the legislation which addressed imposing limitations on the activities of non-residents in the oyster fishery, but eloquently stated the basic tenet of the industry since its inception, i.e., the natural beds should remain as part of the public trust "forever."

With the passage of this act, the long-standing tenet of the industry that treated the two sections of the bay, i.e., the natural oyster seed beds of the upper bay and sub-tidal areas of the lower bay, differently was provided substance and acceptance by the State. It is without question that the oyster community recognized the value and differences between the sections of the bay from colonial times. The natural beds were areas with good support structure, i.e. firm sediments, shell material, and oysters. Swift currents also flushed these areas. The oysters propagated readily and grew to marketable sizes given adequate time. They realized that these standing stocks of oysters were not

inexhaustible and from time to time requested legislative action to maintain and preserve these natural beds. In contrast, the areas below these natural beds were good for growing and improving the meat quality oysters, but were somewhat limited for propagation because of higher levels of siltation and shifting sands. These limitations were not universal for this latter area as locations with higher elevations frequently acquired appreciable sets of young oysters. The fact that the industry recognized the variations and benefits of these two areas to the total potential production of the bay and continues to consistently, sometimes passionately, demand a differentiation between areas of the bay, is indicative of the concerns the industry has for the loss of the natural beds from the "public domain". Throughout the first 200+ years of this fishery, the natural beds have remained in the public trust in spite of the industry being in almost absolute control of the resource's disposition. The industry had also resisted the loss of control to areas adjacent to the natural beds because of concerns for the loss of sub-tidal areas with production potential from the public trust. More realistically, there was serious concern with the pilferage of oysters from the natural beds by unscrupulous individuals. The financial disparities within the community also created the feeling that the wealthier members of the industry would eventually monopolize the productive areas of the bay.

These concerns are still paramount to today's industry, which has been as adamant in its opposition to leasing the natural beds and adjacent "non-productive" areas as their forefathers. The wisdom of growing oysters in low salinity areas of the bay has also been questioned. Several members of the Oyster Task Force have become proponents of leasing non-productive areas of the seedbeds for the cultivation of oysters by private growers. These individuals argue, correctly so, that survival in these low salinity areas is greater because of reduced predator and disease pressure. They also validly argue that in order for these non-productive areas to be developed, an individual must be assured that his/her investment will be legally protected. Therefore, a lease for the exclusive use of the cultivation site will have to be made available in order to afford an investor legal protection of his/her investment. This argument of leasing non-productive coastal areas, including Delaware Bay, for the cultivation of oysters and, ultimately, increasing (oyster) production in the state may be as old as the fishery itself. Certainly, this concept was debated extensively by the Commissioners of the (New Jersey) Oyster Commission after the promulgation of the State Control Act in 1899. The Commissioners at that time conducted numerous hearings on the status of the shellfish resources of the state and received suggestions for increasing oyster production. The Commissioners also reviewed the policies and programs of other oyster producing states, e.g., Rhode Island, Connecticut, Maryland, and Virginia. They concluded that although the natural beds should remain in the public trust in perpetuity, the industry should consider leasing the non-productive areas of the bay for the cultivation of oysters. This recommendation was included in the annual report of the Commission for nearly 20 years after the Commission was established. This recommendation was never implemented, except for areas of Atlantic County, because of the strong and vocal opposition of the "oystermen themselves." This opposition continues today as the vast majority of the oyster industry is opposed to providing any one individual or entity with the opportunity to monopolize these "leasable" areas or encroach upon the natural oyster seed beds. The Delaware Bay Shell Fisheries Council has also emphatically stated its opposition to this option. The State of Virginia feels so strongly about

protecting its natural oyster beds that the public beds are protected in the constitution of that state. The Constitution of Virginia, Article XI Section 3, states that: "The natural oyster beds, rocks, and shoals in the waters of the Commonwealth shall not be leased, rented, or sold but shall be held in trust for the benefit of the people of the Commonwealth..."

The argument for leasing the non-productive areas of the coastal embayments is usually based on experiences in other states or short-lived cultivation efforts. It is also embodied in the argument that the state has done little in the way of maintenance and enhancement of the natural oyster seed beds in order to increase production. The natural oyster seed beds occupy an area of approximately 15,000 acres with roughly 12,000 acres considered to be productive. The remaining 3,000 acres are described as being fringe or of marginal productive capacity. Although the oyster resource has never been accurately quantified, it has been estimated that the productive areas of the natural beds could readily support more than 10 to 14 million bushels of seed. Typically, the standing inventory is probably less than 50 to 60% of this capacity. The setting of oyster larvae in these areas is also quite variable and dependent upon an indeterminable suite of environmental conditions which can influence the setting success and survival of an any given year class of oysters. Substrate quality, however, is known to have a strong influence on setting potential and can quickly have an impact on the production potential of an area. Setting is frequently very heavy on cultch material placed in the proper locale immediately prior to the advent of setting by the oyster larvae. This is the basis for private cultivation, i.e., a private entrepreneur would be willing to invest intensely in and manage a shell planting program to develop the support structure for planting oysters or acquiring a set. This is also the track for increasing production on the natural seedbeds and maintaining an intensive public program. For this latter program to succeed, the user group, in this case the oyster industry, must be willing to support the enhancement effort for the communal benefit rather than depend on the gratuity of state government for production on the beds. The oyster industry has expressed a willingness to assume the responsibility for this program on several occasions in the past. These programs have faltered, however, when stressing factors such as a sequence of poor setting years or disease, have negatively impacted production in the bay. The oystermen have been hesitant about providing funds for enhancement programs when production is declining. The most recent effort by the oyster industry in support of the enhancement programs has come in the form of the "Oyster Resource Development Account." Revenue for this fund is generated through a landing fee on each bushel of seed removed from the natural beds or marketed from the leased grounds. The money from this fund has been used to support shell planting operations and the movement of oysters from under-utilized beds in the upper bay to supplement beds in the lower bay, which are being heavily harvested for market purposes. If applied on a consistent basis, this effort could produce the oysters needed for current and future market demands. The burden for ensuring the success of these enhancement programs should be borne by every member of the fishery.

The argument for leasing non-productive areas also postulates that this program will stimulate investment in the fishery and result in a significant increase in production. The recent renaissance of the fishery in Connecticut has been presented as an

argument for the advocacy of leasing non-productive areas adjacent to the natural beds of Delaware Bay. Originally, proponents of this program suggested that the natural seed beds, themselves, be privatized at the possible exclusion of those unable to financially compete for the leases. The Connecticut experience, which has been presented as innovative and totally due to private initiative, is really the application of enhancement efforts developed in the mid-1850's. At that time some of the Long Island Sound oystermen began to apply clean shell to the near shore areas in order to acquire a set of oysters. These efforts proved very fruitful and eventually this shell planting effort began to expand. Because of claims that this activity was infringing upon natural oyster bottom, the planters moved the shell planting operations into the deeper waters of the Sound where these claims were no longer valid. Because of the intensive shell planting program, the Connecticut fishery flourished. According to MacKenize (1996) the fishery flourished until 1938. During that year, a hurricane struck the coast and apparently buried most of Connecticut's oyster producing grounds. This burial phenomenon occurred again in 1950 when the beds were once again decimated by climatic events. The Connecticut Department of Agriculture has indicated that the decline began after the First World War and was due to anthropogenic causes. Severe pollution led to deteriorated water quality, prohibitions on the harvest of oysters, loss of market, and the diminishment of seedlings in Connecticut. Mackenize (1996) also indicated that during the late 1950's and early 1960's, the Connecticut fishery was severely impacted by predators, primarily starfish, and a series of set failures. Fortunately for the Long Island oyster fishery, some industry members began to tenaciously develop a program to rehabilitate the oyster resource. These industry members began to apply the lessons learned many years before. They began to recover the lost oyster beds of the Sound through the recovery of buried shell and the planting of vast quantities of shell on the "best setting beds" in the Sound, especially in New Haven Harbor (MacKenize 1996). Through a consistent shell planting program and predator control program combined with an intensive effort by the state of Connecticut to improve water quality, the public beds and private beds of Connecticut have flourished during the past decade. In order to improve the setting potential, the Connecticut industry uses suction dredges to clean their best setting grounds of debris and predators, e.g. starfish and oyster drills, before treating the site with clean oyster shell just as the oysters begin to spawn. The techniques employed in Connecticut have long been demonstrated for their efficiency in increasing set potential. These techniques have also been employed in New Jersey (and have had demonstrable success) but without the long-term consistency or magnitude of the Connecticut program. Except for some historical leases, the State of Connecticut does not lease its natural oyster seed beds (Volk 1997). The Connecticut fishery has also benefited from their ability to control the starfish, its most serious predator. Using suction dredges and starfish mops, the Long Island Sound fishery is able to negate the impact of both the starfish and oyster drills on the Sound's oyster stocks. Additionally, the occurrence of (oyster) pathogens is generally low in Connecticut, therefore oyster stocks in that state are usually not adversely affected by disease, as are the oyster stocks of Delaware Bay. The ability to relocate the spatfall from the setting beds to either nutrient rich, shallow water nursery areas or to deep, cool water storage beds is another advantage maintained by the Connecticut industry. Because of the lack of significant disease pressure and effective predator control programs, the Connecticut industry has been able to enhance survival of oyster spat, control growth rates by the strategic planting

of growth stocks, and establish inventories at various stages of development by shifting their oysters from one locale to another. These advantages do not exist in Delaware Bay. The Delaware Bay stocks are afflicted by disease. There is no deep, cool water locale available to store oysters and slow growth and the effects of disease. Also, no effective predator control programs have been developed to protect the oyster stocks. The application of an intense, appropriately managed shell planting and resource management program on selected areas of the natural beds could lead to a success similar to that achieved in Connecticut without the privatization of the natural beds. It is quite obvious from the Connecticut experience that if the oyster setting areas are manipulated properly, oyster production can be significantly increased over the natural potential of the system.

Advocates of leasing the non-productive areas of the seed beds claim that leasing these areas will lead to increased investment in the resource and "the creation of new self sustaining oyster producing areas under private ownership." The experience of the Texas oyster fishery in Galveston Bay was cited as an example of the success of this type of leasing program. The Texas leasing program was initiated in the late 1800's and modified in 1919. The primary objective of this program was to permit the creation of "new self-sustaining oyster producing areas under private ownership." In 1985, the Texas Legislature mandated that the Texas Parks and Wildlife Department develop an oyster management plan, the *Texas Oyster Fishery Management Plan*, and economic impact statement for the oyster fishery. The plan was developed after a broad and diversified input from organizations, agencies, industry groups, and "other parties with a special interest in the Texas Oyster Industry (Quast et al. 1988). During its discussion of the leasing program, Texas management plan concludes that the leasing objective of "creating new self-sustaining oyster producing areas under private ownership" had not been met. However, following an acoustic survey of the oyster reefs of Galveston, Powell et al. (1995) indicated that the distribution of oyster reefs in Galveston Bay has been altered by both natural and anthropogenic causes. This survey found a substantial increase in the extent of oyster reefs and "unconsolidated shelly substrate" when compared to a previous survey conducted in the early 1970's. A large portion of this increase in acreage may, however, been due to the enhancement of survey capabilities because of technological advancements and improved methodology. In general, Powell et al. (1995) found that reef accretion was typical in many areas. The authors concluded that reef "siting" rather than "mode of origin", i.e. natural versus artificial, was the most important factor influencing the viability and growth of a reef. These investigators also stated that accretion was primarily occurring at the reef margins. It was thought that shell material being scattered about the reefs by the industry might be contributing to this observed growth. The report concluded that the overall increase in acreage of the Galveston Bay reefs was primarily due to "natural responses to changes in circulation and salinity by the oyster populations...rather than the direct production of new reef by man." Leases, artificial reefs, and shell dredging were thought to "have had less impact" relative to the increased acreage observed than other natural and anthropogenically related changes that have occurred in Galveston Bay during the past few decades.

Through attrition, most of the oyster leases in Texas are now located exclusively in Galveston Bay. These leases primarily serve as depuration sites for oysters

transplanted from restricted waters (Benefield 1997). The Texas management plan indicates that there are approximately 1,600 acres of natural beds located in the polluted waters of Galveston Bay and that these beds provided the oyster stocks required for the leased grounds. Currently, there are 2,320 acres leased in the bay. According to the Texas Parks and Wildlife Department (TPWD), Galveston Bay has produced about 80% of the coastwide landings, 3 to 3.6 million pounds, for Texas since 1977. Although some commercial harvesters have planted shell on their leases to increase the production from these leases, approximately 85% to 90% of all commercially landed oysters in Texas are attributed to production from the public reefs (Benefield 1997). The Texas management plan concluded that "the long-term viability of the Texas oyster fishery depends on the maintenance and enhancement of natural oyster reefs." It further states that "an industry financed shell recovery and cultch replacement program should be implemented" and that the enhancement of the (natural) oyster habitat should be approached aggressively. Benefield (1998) has indicated that the tenor of the Texas Oyster Fishery Management Plan regarding the success of the leasing program still prevails. According to the TPWD, the majority of the leasable acreage in Galveston Bay is controlled by three or four individuals and there is general concern regarding the permanent removal of potentially productive areas from public control through the leasing program.

In Louisiana, the oyster fishery very much resembles the structure found in New Jersey. The oyster grounds are divided into two sections, i.e., the leased grounds and the State controlled areas. The permanent beds in Louisiana are spread throughout coastal areas where lower salinities generally prevail. The leased areas are also focused along the Louisiana coast but are "usually in water of higher salinity where oyster growth is faster" (Mackenzie 1996, Pausina 1988). As in New Jersey, oysters transferred from the state controlled areas grow rapidly once transplanted into the higher salinity areas of the coastal estuaries. Mackenzie (1996) reported that the setting period in the Gulf of Mexico region can last at least 7 months and commercial density spatfalls occurs on the beds every year. Commercially dense spatfalls in New Jersey are infrequent and the spawning period can usually be measured in weeks. The Louisiana oyster harvesters remove the seed from the state-controlled areas beginning in late summer for transplanting to their leased grounds. Growth is rapid in Louisiana's coastal waters and the seed may be between 25 and 75 mm long by the time of transplanting. It should be noted that oyster seed, which survives in the high salinity waters of lower Delaware Bay, could attain a size between 25 and 50 mm in length within a few months. Oysters will attain an average length of 4 to 6 inches in about 22 months in Louisiana. This prolonged setting period, high recruitment, and rapid growth rate help offset the effects of Dermo which has been a major cause of oyster mortalities in Louisiana. Louisiana has consistently been one of this nation's largest producers of oysters, landing 42 % of the national production in 1995 (MacKenize 1996). The bulk, 65 to 95%, of Louisiana's annual market production comes from the leased grounds (Keithly and Roberts 1988). However, many of the oysters harvested had originally been transplanted from the state-controlled beds (Pausina 1988, MacKenize 1998 and Dugas 1998). It is commonly accepted that a consistent shell planting program conducted by Louisiana on its natural beds is responsible for that state's continually high production of oysters. It should be noted production has also been enhanced by industry members planting shell on their own leased areas.

As already described, the oyster resource of Delaware Bay is currently divided between two areas of the bay: the planting grounds of the lower bay and the natural oyster beds lying northwest of Egg Island. These latter beds have been responsible for nearly all the total natural oyster production of the bay. For many years stocks transplanted to the leased grounds were supplemented with imported seed from other states such as Virginia and Connecticut. Since the mid-1800's, oysters have been transferred from the natural beds to the planting grounds in order to take advantage of the nutrient rich waters of the lower bay. Basically, 90% of the primary production (phytoplankton) and the bulk of the secondary production (zooplankton) of the Delaware Bay occur in the waters below Ben Davis Point (Pennock and Sharp 1986, Herman and Hargreaves 1988). Below this point lie some of the most productive natural oyster beds in the estuary. For the most part oysters lying above this line are usually slow growing, thinned shell, and have marginal meat quality. The suite of beds lying below Ben Davis Point (Bennies and New Beds and the secondary beds of: Hog Shoal, Nantuxent Point, Strawberry, Hawks Nest, and Vexton) typically account for the greatest annual production from the natural beds. From 1970 to 1986, New Beds alone accounted for nearly 20% of the total volume of seed removed from the beds. During the past several seasons, 1995 through 1997, New Beds has accounted for more than 50% of the oysters removed from the beds for market purposes. In spite of the production capacity of these beds, they are also within the susceptible ranges for MSX and Dermo, as well as predators such as the oyster drill and blue crab. The operative salinity threshold for MSX is thought to be around 15 ppt, while Dermo can be effective at salinities as low as 10 ppt. All of the beds below Ben Davis Point lie within these salinity ranges and are therefore susceptible to the ravages of these diseases. During the spring/summer of 1996, it was estimated that over 50% of the standing stock in the bay was affected by disease. A transplant effort to relocate oysters from some of the beds in the upper bay to the lower beds had to be terminated due to the lower percentages of oysters (< 50%) being harvested from these "safe" beds. Prior to the arrival of Dermo, it was assumed that the beds lying adjacent to or above the Cohansey River were beyond the influence of disease. Dermo has been documented at varying levels of prevalence and intensity on all of New Jersey's natural seed beds in Delaware Bay. Disease prevalence and intensity are variable and dependent on environmental as well as other factors. Therefore, the impact of the pathogens is difficult to predict from year to year. It may be safe to assume, although not absolutely true, that during high prevalence years oysters over a very broad salinity range will become infected with Dermo. This would also be true for any cultured stocks. In the presence of a major epizootic event, the private investor will be forced to take one of several actions: do nothing, try to relocate his/her stocks into low salinity waters, or try to market whatever quantities possible. Regardless of the option selected, the economic return will be reduced due to the loss of economic potential as result of mortality, additional overhead due to the relocation activities, or a decline in market value due to poor meat quality.

A leasing program in the upper bay will also require that several grounds be provided over a salinity gradient. This is necessitated due to the variations in the quality of the growing areas. If the Connecticut experience is to be replicated, the initial culture activity will have to occur in areas with the best setting potential. This area is adjacent to the shoreline between Money Island and Fortescue. This is also an area with

numerous small natural beds that occupy the elevated shoals. Sand and muddy sand characterize the bottom off these shoals. Sand and fluid sand are a bane to the oyster. The very nearshore areas are frequently exposed to the accumulation of flocculent sediments during the summer. The sediments can be a major deterrent to a successful spatfall. These areas will need extensive development with shell, gravel, or supporting structure in order to prepare the bottom for acquiring a set. Also, the boundaries between the productive areas of the beds and this non-productive substrate are not clearly defined or adequately separated. Without adequate protection, leases among the lower beds will create the potential for pilferage directly from the natural seed beds or lease encroachment into the productive areas of the beds. This program lends itself to harm for the natural beds and the industry in general. In order to curtail losses from disease and predation, oysters set in the lower bay will have to be moved to locations among the upper "safe" beds for partial growout.

Sediments in the upper bay are primarily mud and sandy mud, except for the shoal areas occupied by the natural beds. The sediment conditions combined with lower salinity and nutrient loads will add to the complex set of conditions that the private investor must overcome in order to develop a commercially viable venture. During the 1960's, the oyster industry tried to develop oyster beds in the upper bay by planting thousands of bushels of shell in an area off Sea Breeze, New Jersey. This effort failed and although shell can still be dredged from the area, oyster production is negligible. Generally, oysters of the upper bay are very slow growing and of poor meat quality.

Oysters may require five to seven or more years to attain near market size. Both growth and meat quality can be enhanced considerably by moving these stocks into the lower bay for several months. Once moved into the lower bay, these oysters will once again be exposed to the potential ravages of disease, predation, shifting sediments, and other undetermined factors that may result in low recovery.

The problem of clearly defined boundaries between productive areas and non-productive areas also exists in the upper bay as it does in the lower bay. There are statements in some of the historic reports of the fishery, which suggest that the natural beds were once contiguous from Egg Island Point to Round Island. Based on these statements, it could be argued that the whole of the seed beds areas are potentially productive and should be preserved for common usage. From a practical point-of-view, there is probably large acreage above the SouthWest Line that could be classified as non-productive. These areas may be non-productive for a host of reasons, but primarily because of the lack of support structure for an oyster community and the influence of sediment transport. The oyster industry experimented with moving the leased grounds into non-productive areas along a salinity gradient in 1981, when after an intensive sampling and mapping effort, leases were made available above the South-West Line and adjacent to several seed beds. This area was referred to as "Section E." After a few years, this area was abandon primarily due the lack of bottom stability. Some planters claimed that current velocities in the area made it difficult to plant oysters but other planters indicated that the currents were a problem readily overcome. The few individuals who reported satisfaction were those who obtained areas that were formerly productive seed beds. Claims that the productive areas of the adjacent seed beds were being violated were also routine. Of the total area of the upper bay, mud and sandy

mud compose nearly 90% of the sediment type found (Biggs and Beasley 1988). Neither of these sediment types is very conducive for growing oysters and prior experience has indicated these sediments may be very difficult to stabilize for that purpose.

The question of oyster culture in the Delaware estuary is a very important issue and should be approached with a great deal of introspection. For nearly 400 years, the industry has avoided, in one manner or another, the privatization of the naturally producing oyster areas of the bay. For the past 150 years, the industry has also either tacitly or actively recognized a distinction between the utilization and management of different sections of the bay, i.e. the natural seed beds and the leased grounds. Over this century and a half, the industry has vociferously expressed its desire to maintain the natural seed beds of the bay in the public realm. This commitment has been re-affirmed at several public meetings within the past year. The majority of the contemporary industry has also expressed a great deal of skepticism and reservation about the leasing of non-productive areas of the beds. For some the failure of the Section E experiment and the loss of planted stock to shifting sand and mud is still vivid. The Delaware Bay Section of the (New Jersey) Shell Fisheries Council has also stated several times its opposition to leasing the seed beds or adjacent areas.

It is without question that private and public culture of good setting areas can significantly enhance oyster production. The Connecticut experience profoundly demonstrates the economic benefits of the persistent application of the shell to the best setting areas. New Jersey has also demonstrated that with prudent management strategies a substantial industry can be supported with limited production. In 1997, 118,000 bushels of oysters were marketed from the state controlled seed beds. This harvest had an estimated dockside value of \$2.5 million dollars and provided employment to 150+ individuals. This harvest was sustained by natural recruitment production, which has been marginal for nearly two decades. A shell planting conducted in June 1997, funded in part by the state and industry, received a set in excess of 1,900 spat to the bushel (some of the samples exceeded 5,000 spat/bushel). This current program is indicative of the social and economic potential for an industry operating in an open fishery. The 40-year average for seed production in Delaware Bay is between 250,000 to 300,000 bushels. With a consistent enhancement program, appropriate utilization of the various stocks in the bay, prudent management, and the benevolence of Mother Nature, the natural beds should be capable of sustaining an annual market in the range of this traditional seed harvest. MacKenize (1996) has indicated that oyster production in most estuaries can be improved by spreading more shells and cleaning silt off existing cultch. This program is the common theme in areas that have had either consistency in production or a renaissance in their fishery's oyster production.

Mackenzie (1996) also indicates that predators are limiting to production in most estuaries. This situation has been used to support the claims that leases in low salinity areas are necessary to increase oyster production in Delaware Bay. Oyster drills are common in many estuaries and are usually responsible for the demise of large quantities of small oysters. Drill predation is a significant factor in limiting the development of oyster populations in lower Delaware Bay but this problem is not

insurmountable. For the most part (oyster) drill control programs are not existent in many estuaries, yet Mackenzie (1996) indicates that the technology exists for substantially reducing drill predation for extended periods of time over an area. He suggests that drill populations can be effectively reduced for several years by using a suction dredge as is done in Long Island Sound. Material is vacuumed from the bottom with the larger fragments being returned immediately to the bottom. Small fragments, less than one inch, are usually retained aboard the suction dredge vessel and crushed in some manner before being returned on the bottom. From 1978 to 1981, a suction dredge was experimentally used on a couple of grounds in lower Delaware Bay. The results of this project indicated that the drill populations on a ground could be effectively reduced using this device. The one caveat is that the treatment would have to be repeated periodically since the drills will repopulate a given area within one year either through immigration or reproduction by residual populations (Haskin, Stecher & Ismail 1981).

Predator control is a technical issue that should be addressed aggressively in the promotion of oyster aquaculture. The application of predator control methods is being effectively applied in hard clam culture and in Connecticut's oyster program. The development of technology to efficiently control predators would permit the development of oyster culture in the best growing area of the bay, the lower bay. It is known that spat may achieve 1.5 to 2 inches in length during one growing season, July to October, in the lower bay. These oysters could reach market size by the end of the second growing season if they survive. One individual who has been culturing oysters on a tire bar at Kimble's Beach in Cape May County for several years claims that market size is routinely achieved in two years. Maurer and Aprill (1973) have also had success with raising oysters to market size in approximately two years using off-the-bottom culture techniques in the Mispillion and Murderkill Rivers. These rivers are located in the State of Delaware and drain into lower Delaware Bay. Oysters grown on the natural seed beds require three to five years or more in order to attain market, or near market, size. Ideally, these oysters should be moved into higher salinity waters for several months in order to enhance flavor and meat quality prior to being marketed. This transplanting operation adds to both operating costs and potential loss of stock because of handling and low recovery efficiencies.

The rapid growth rates typically achieved in the lower bay may also have additional benefits to the aquaculturist. Ford and Tripp (1996) indicated that younger oysters are "generally less likely to be infected and more likely to have lower mortality rates than older oysters." Therefore, if stocks can be grown to market size in two years in the lower bay, the impact of disease may be marginal to the overall operating costs of this aquaculture effort. This effort could also be enhanced through the development of disease resistant brood stock. It is apparent that some of the natural stock of the bay has a high tolerance to the diseases. In spite of nearly a decade of intense disease activity from both MSX and Dermo there are stocks which have survived and continue to grow in the lower bay. The isolation of the genetic code for the "silver bullet" phenomenon of these stocks could be a major boost to the culture of oysters in the lower bay. A small-scale culture effort is already being conducted, using disease resistance stocks, in a coastal estuary of Cape May County. The preliminary results of

this operation are apparently quite promising with relatively low mortality among these selected stocks and market size being achieved in slightly more than two years.

The lower bay also affords the aquaculturist with opportunities not available in areas adjacent to the seed beds. With shoal areas extending into the bay, the culture plots would be more accessible for a land-based operation. Areas adjacent to the natural seed beds will require a dredge vessel and crew capable of handling the dredging equipment and working in waters with a minimum depth of 9 to 18 feet.

The Cape Shore flats and areas adjacent to Thompsons Beach and Moores Beach are considered to be the best setting area in the bay. A properly managed aquaculture program would be able to take advantage of this setting potential, readily accessible culture plots and rapid growth rates. The main problems affecting the development of culture programs in the lower bay are predation, high energy events (storms and waves), ice, and fouling organisms. Methods for successful predator control have been developed in other areas and could be developed for Delaware Bay. Technology solutions can also be developed to provide the aquaculture beds with protection from potentially damaging wave and storm events. Fouling organisms may also be controlled easily. During their four-year study Maurer and Aprill (1973) found that competition from fouling organisms was significantly reduced by air drying the oysters for as little as four hours per week.

The lower Delaware Bay has many of the prerequisites, e.g., high nutrient loads, good setting, shallow waters, stable bottom, and accessibility, for developing an aquaculture program in the region if some of the mechanical (wave and ice protection) and biological (disease, predation, and fouling) problems can be resolved. The upper bay areas also offer the aquaculturist several technical problems such as accessibility and bottom stabilization. Generally, this latter area is less susceptible to the ravages of disease and predation but it should not be considered to be a "safe haven" from disease until salinities drop below 10 ppt. At this salinity threshold, disease may not be a factor but there will be other physiological consequences for the oysters as growth rates are usually stunted. Given the overwhelming opposition of the industry and Delaware Bay Section of the Shell Fisheries Council to leasing areas above the South-West Line and the potential loss of naturally productive bottom the "public trust", this recommendation for leasing the areas of the upper bay should not be considered or implemented until the full aquaculture potential of the lower bay has been explored. The fact that technical problems exist for the development of aquaculture in the lower bay is not adequate justification for surrendering naturally productive areas to private enterprise. It is the nature of the academic and business community to develop solutions to problems affecting industry in order to develop a competitive advantage. Solutions to business problems are not resolved through the distribution of natural resources. The disease and predator problems afflicting the oyster resource will be resolved when industry and the research community are working in unison to actively develop solutions and not abdicating this responsibility by advocating the privatization of the public resource.

APPENDIX 4c

RAPID ENHANCEMENT OF PRODUCTION BASED ON CURRENT PRACTICES

Background/Rationale

For 150 years, oyster growers on the New Jersey side of Delaware Bay have relied on the natural oyster beds in the upper bay to provide seed for planting on leased ground in the lower Bay. Low salinity over the seed beds provided a sanctuary from the heavy predation by oyster drills that existed in the higher salinity portions of the lower bay, where oysters were moved to achieve the high growth and meat condition desired by the market. Even with the advent of MSX disease in the late 1950s, the industry was able to operate in the traditional mode, albeit with a shorter planting cycle in which oysters were left only one growing season to minimize their exposure to the MSX disease organism, which prefers high salinity. After 1990, however, this situation changed markedly with the establishment in Delaware Bay of a second oyster disease known as Dermo disease. Unlike the MSX parasite, which was relatively rare in oysters moved from the seed beds during the spring transplant season, the Dermo parasite survives low salinity fairly well and remained present in the transplanted oysters, killing them before they were marketed. In 1991, 290,000 bushels of seed, much of it infected with Dermo disease, were transplanted and died on the leased grounds. The disease spread over the beds in ensuing years causing them to be closed for seed transplant.

Direct Marketing from the Seed Beds

It was obvious by this time that the traditional transplant scheme was no longer working. In 1995, a new strategy was agreed upon and tried for the first time - direct marketing from the seed beds. Up to this time, all oysters removed from the public seed beds had to be transplanted onto private grounds before they could be marketed. Each licensed vessel received an allotment. Vessel owners are currently required to buy a tag costing \$1.25 per bushel for each bushel they expected to harvest up to their quota. Although the direct market option was available during the traditional harvest ("Bay Season") season in the spring of 1995, many oystermen were skeptical of the value of the direct market program and this option was utilized by only a few small dredge boat operators. Although only 3,200 bushels were harvested for direct market during this first season, the economic advantages of the direct market program became readily obvious to most of the harvesting community. Some industry traditionalists argued, however, that the direct market program would be the death knell for the struggling industry. Resource managers and industry members recognized that the direct market program was not the panacea for the industry's woes, but provided a strategy to circumvent the ravaging effects of disease on the leased grounds. From the spring of 1995 until the present (spring 1998), a total of 222,568 bushels has been harvested during this program.

The estimated dockside value of this harvest is approximately \$4,673,928 (Table A4-7). Tag sales totaled \$278,209.50, which was deposited into the "Oyster Resource Development Account".

Table A4-7. Statistics on direct marketing of oysters from Delaware Bay, New Jersey Seed Oyster Beds

Time Period	Number of Bushels Landed	Approximate Dockside Value of Bushels Landed	Value of Tags Sold
Spring 1995	3,200	\$67,200.00	\$4,000.00
Spring 1996 (10 weeks)	18,999	\$398,979.00	\$23,748.75
Fall 1996 (7 weeks)	42,140	\$884,940.00	\$52,675.00
Spring 1997 (10 weeks)	28,635	\$601,335.00	\$35,793.75
Fall 1997 (14 weeks)	89,620	\$1,882,020.00	\$112,024.50
Spring 1998 (10 weeks)	39,974	\$839,454.00	\$49,967.50
Total	222,568	\$4,673,928.00	\$278,209.50

Although direct marketing from public beds goes against the trend of privatization, which generally is more efficient than public fishery, direct marketing from the New Jersey Beds has clearly been a better utilization of the resource under the currently prevailing disease conditions. For instance, in 1991 and 1995 (the beds were closed from 1992 through 1994), a total of 390,000 bushels was taken from the seed beds and transplanted to the leased grounds, but because of high subsequent mortality, only 63,000 bushels were landed, producing a total return of \$1,189,190. Thus, for each bushel removed from the seed beds, the direct market strategy has returned nearly 7 times more in dockside value compared to typical planting returns during periods of high Dermo disease (Table A4-8.).

Table A4-8. Comparison of returns per bushel of oysters removed from the seed beds by planting (in 1991 and 1995) and by direct marketing (1996-1997) during periods of high Dermo disease.

TRANSPLANT TO LEASED GROUNDS			DIRECT MARKET		
Bushels	Total Sales	Average Bushel Return	Bushels	Total Sales	Estimated Average Bushel Return
390,000	\$1,189,190	\$3.05	222,568	\$4,673,928	\$21.00

Modifications to Direct Marketing

Results from the first two years of the direct marketing program are encouraging; however, some changes and additions would be an improvement. There is one major disadvantage to direct marketing from the seed beds: the meat quality is often low, especially in the spring. If the period during which marketing can occur is too restricted, harvesters may not be able to take advantage of oysters in the peak condition. Also, they may not be able to harvest when market prices are most attractive. Extending the

period over which oystermen may harvest their quota would allow them to plan more effectively to take advantage of both meat quality and market prices. In addition, allowing individuals to plant onto their leased ground any or all of their allotment gives them additional flexibility to potentially improve meat quality or stockpile oysters in anticipation of improved markets. ***As long as a bushel fee is paid***, subsequent disposition of the allotment should be entirely up to the harvester.

Stock Assessment

A reliable stock assessment program is at the heart of good fishery management. At present, the status of the oyster stocks on the public beds is assessed annually by the Haskin Shellfish Research Laboratory using a survey method that has been in place for 40 years. Although the method has been the basis of a very effective management system (Fegley et al., 1994), it is not a true stock assessment because it measures only the relative abundance of oysters. It does not estimate the actual quantity of oysters on the beds. The results are adequate for describing trends, but not for setting quotas. In addition, because the survey is conducted only once a year in the fall, it is not capable of assessing both pre- and post-harvest conditions. A change in management as substantial as the change from transplanting to direct marketing requires careful monitoring using a more quantitative approach than is currently practiced. Results should be used to set quotas and to assess the effects of the harvesting on the oyster stocks.

Most states with large public fisheries routinely perform quantitative stock assessments using divers, patent tongs, or some other method that estimates the number of oysters per unit area of bottom, which can then be extrapolated into the quantity of oysters available for harvest. The current availability of a suction dredge boat, which collects material from the bottom with an efficiency of essentially 100% and which can be calibrated for area dredged, offers the potential for establishing a true quantitative stock assessment in Delaware Bay.

APPENDIX 4d DEVELOPMENT OF INTENSIVE AQUACULTURE PRACTICES FOR OYSTER PRODUCTION

Movement of oyster seed to better growing sites and to avoid predation has been practiced in Delaware Bay since the 1800s. These techniques were based on the use of natural seed. Oysters harvested from planted seed were initially sold in the shell, and, with the advent of refrigeration, both in the shell and as shucked meat. From the 1930s to the 1950s the Mid-Atlantic region production was relatively stable at 10 - 20,000,000 lb. of meat (Figure A4-4). The appearance of the MSX parasite in the mid-1950s reduced production to below 2,500,000 lb., and there has been no recovery. New England produced nearly 10,000,000 lb. of oysters during the 1930s. By the 1950s, the industry was reduced to service of small local markets. The recent revitalization of the Connecticut oyster industry is responsible for the 1990s New England landings of nearly 5,000,000 lbs. (Figure A4-4). This production is based on natural set coupled with more intensive management of beds and cultch. These bed management techniques may or may not be considered to be aquaculture. But, if bottom planting of hatchery produced seed becomes an important component of Delaware Bay oyster production, bed management will be a critical component.

In contrast to the East and Gulf Coasts, the Pacific Coast oyster industry was small in the 1930s and developed culture techniques based on importation of seed oysters from Japan. This industry was producing 10,000,000 lb. of shell stock and shucked meat by the 1940s. The development of hatchery technology and the advent of remote setting techniques stabilized this industry from the 1970s onward (Figure A4-4). In

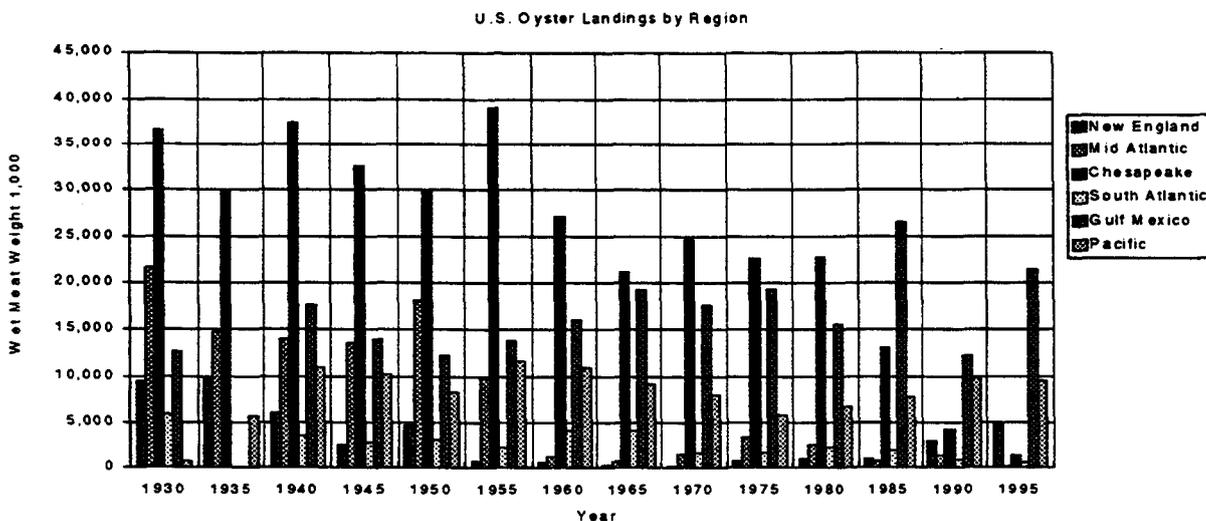


Figure A4-4. Relative oyster production by region for period 1930 to 1995.

many respects, the Pacific Coast industry mirrors the worldwide change from utilization of natural seed to hatchery production.

While the price of oyster meat has increased greatly from the 1930s to the present, landing and price trends differ from region to region (Figure A4-5). Product from all regions remained about the same until the mid-1950s when prices of the New England

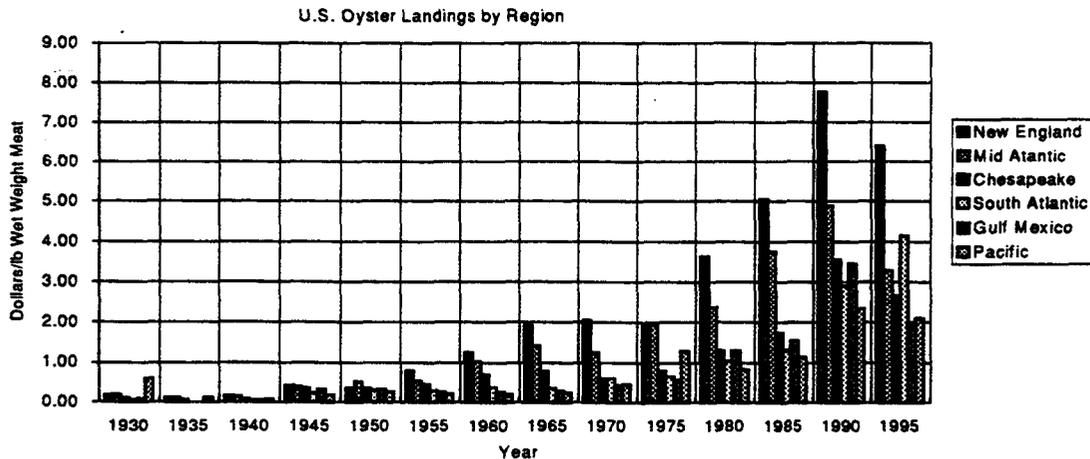


Figure A4-5. Price of oyster meat by region for period 1930 to 1995.

and Mid Atlantic oysters began to diverge. This divergence became greater through the middle of the 1980s when the per pound value of New England and Mid Atlantic oysters were 77 and 70% higher than Pacific oysters, and 64 and 54% higher than Chesapeake Bay oysters, respectively in 1985. By 1995 New England and Mid Atlantic oyster value was 67 and 37% greater than Pacific oysters and 58 and 19% greater than Chesapeake Bay oysters, respectively. Mid-Atlantic oysters failed to grow in value per pound of meat from 1985 to 1995. The causes of this loss in value are unknown, but may result from loss of market niche and established reputation as a high quality product due to lack of consistent production.

It is also important to recognize that the Pacific Coast growers are able to produce product that is >90% based on hatchery seed and sell that product at a lower price than Mid-Atlantic harvesters. Because many oyster lovers consider Delaware Bay oysters a superior product, these data suggest hatchery technology should not be an impediment to development of the industry.

Cost of Oyster Seed

There is a general feeling that hatchery production of *Crassostrea virginica* is not economical. The experience on the West Coast with *Crassostrea gigas*, and the Flower's hatchery in New York with *C. virginica* suggest that aquaculture production of seed can be the basis for large scale oyster production. The Flowers hatchery produces enough seed to supply a portion of the traditional Delaware Bay markets, and

West Coast producers match the traditional Delaware Bay production. Thus, there are at least two U.S. models that suggest hatchery production of oyster seed can be the basis for a successful business. The alternate technology, the use of natural set, has been the basis for the dramatic restoration of Connecticut oyster production, but this was coupled with intensive bed management techniques.

A second point of comparison is the most successful marine aquaculture in the Mid-Atlantic, the production of the hard clam, *Mercenaria mercenaria*. The production of clam seed is entirely dependent on hatchery and nursery technology. In most respects brood stock preparation and hatchery production techniques are identical for clams and oysters. Even the early nursery phases are the same if cultchless oysters are produced, but oysters set on shell require slightly different handling methods. These methods are covered in more detail below; this section compares the cost of oyster seed and clam seed.

Clam seed is readily available in quantity. The price depends on the seed size and the season. Large seed that have been held during the winter at the hatchery will cost more than the same seed in the fall. The smallest seed (1 mm) can be purchased for about \$3.00/1000. Placing clam seed in the field for grow out to market size requires at least 8 mm seed. Survival is higher and more predictable with larger seed. Most growers prefer to plant 10 - 12 mm seed. The 8 mm seed cost between \$10 and \$15/1000 while 12 mm seed generally cost about \$20.00/1000. Survival of clam seed for experienced growers usually exceeds 60%, thus the cost of seed for the final product is approximately \$0.028. Marketable clams take 2 to 3 years to grow from the planted seed, and sell for between \$0.12 and \$0.25 each. Thus seed costs are between 11 and 23% of sales price.

Oyster seed are generally not available in quantity on the East Coast. A few producers have quoted prices. For comparison, eyed larvae are available at \$0.50/1000 and 12-20 mm oysters are being offered at \$15.00/1000. The prices for eyed larvae on the Pacific are considerably less (\$0.10 or less/1000). Canzonier (1992b) concluded that costs of *C. virginica* larvae on the East Coast would come down if high demand stimulated increased hatchery production.

An industry sponsored evaluation of remote setting generated production costs for a bushel of *C. virginica* oyster seed (Canzonier, 1992b). These costs were based on trials at a small scale setting and production facility, and considered a variety of scenarios. Costs ranged from \$18.00 to \$50.00/bu. The lower of these two values approximates the cost of set hatchery seed on the West Coast. Based on these numbers and a final harvest of 2.6 marketable oysters per shell, costs ranged from \$0.007 to \$0.02/oyster. These were compared with the perceived cost of harvesting and planting seed from natural sets in Delaware Bay (\$2.50 to \$8.50/bu.)(Canzonier, 1992b). This process selects large seed and approximately 350-600 oysters are present in a bushel. These seed would cost between \$0.004 and \$0.024 each. Recent experience with moving these oysters suggests that only about one half of the oysters survive to market size, thus we can assume the costs equivalent to hatchery seed are \$0.008 to \$0.048. The advantage of the natural seed is that they require < 1 year to reach market size as opposed to the 2+ years for the hatchery seed. Given all the

variables associated with these cost estimates, they appear to be about the same, but suggest the use of hatchery produced seed could be as profitable as the use of wild seed.

Oysters in the shell sell from \$0.23 to \$0.50 each or nearly double the price of hard clams. Thus the cost of hatchery oyster seed would be between 1.4 and 10% of market value or 1.6 and 21% for the wild caught seed. These are in the same range as the equivalent percentages for hard clam production. If all oysters were being sold for shucking (\$0.136 ea.), the cost of seed would range from 5 to 35% of the final product price. This comparison suggests that with experience and a hatchery capable of producing large numbers of seed, there is no economic impediment to the use of hatchery seed. The economics of a hatchery would have to be evaluated.

Production Techniques

Once oyster seed have reached the size for setting there are two options: on shell or cultchless. The former is used extensively for oysters that are to be planted on bottom, while the latter is most often associated with culture in a variety of bag, tray or other systems.

Oysters on Cultch

If oysters are to be set on shell the hatchery will ship the ready-to-set larvae (eyed larvae) to the grower. The grower places the cultch material (usually oyster shell) in a tank that is supplied with a means of mixing the water. The larvae are dispersed in a quantity of water and distributed into the tank. The larvae are then allowed to remain in the tank for one to three days. Once larvae have attached to the shell the tank is drained, unloaded and the bags of shell with the attached spat are placed in the intertidal zone for initial growth. Approximately 20-25% of the eyed larvae are recovered as spat.

In areas having a large tide and low silt loads the bags are simply stacked on hard substrates, but in areas with high silt loads stacking cannot be utilized and a rack system may be employed. Once the oysters have reached a plantable size they are taken to the growing areas and the bags slit open and the oysters distributed on prepared beds. These beds may be intertidal or subtidal.

Cultchless Oysters

Oysters that are to be set without shell can either be held at the hatchery or sent to the grower. Usually the hatchery will set the oysters and place them in a container that can be supplied with flowing water. Unicellular algae are added as food. The larvae are kept in these containers and fed for at most a few weeks before they are thinned and placed in similar containers, but supplied with flowing seawater. This system allows the seawater to provide food for the animals. After oysters reach approximately 5 mm they can be transferred to protective mesh polyethylene bags for placement in the field. These bags may be deployed in two ways. The difference between the two methods is the difference in the orientation of the bag relative to the structure it is attached to. The

first method is on a rack (the position is fixed relative to the bottom), and the second method is on a float (the position is fixed relative to the water surface). There are numerous variations of both systems, but in both cases the oyster is suspended in the water column rather than being placed directly on the bottom. This positioning usually allows some protection from predators and some growth advantage.

Advantages of Hatchery Seed

Hatchery production of oyster seed allows control of genetics and the setting process. The use of hatchery seed as an adjunct to use of natural set also allows production of a reliable seed supply that can be handled in an efficient manner.

Genetic Control

Until recently, control of oyster genetics was mainly a theoretical exercise, but recent advances in ploidy control have made the use of genetics an important marketing tool for Pacific oysters. In this case, normal diploid adults are of poor market quality due to large quantities of eggs or sperm. Reduction in the ability of the gonads to produce gametes by triploidy increases the market value of triploid oysters during spawning season.

Stocks of Eastern oysters that have resistance to MSX, *Haplosporidium nelsoni*, are available, and can be used for commercial production in high MSX areas. Efforts are underway to produce seed that are resistant to MSX and Dermo, *Perkinsus marinus*. Selected oyster stocks in New England are being bred for resistant to juvenile oyster disease.

Further enhancement of production is possible if stocks are selected for certain localities. In a recent trial, disease resistant Delaware Bay stocks were compared with disease resistant Long Island Sound stocks. The latter oysters grew faster in a high salinity location than the Delaware Bay stock. Whether this will be consistent from year to year remains to be seen. Similar strong stock/location effects have been noted for hard clams as well, and culture of oysters in areas where they typically are not found such as in the ocean (see below) may require specialized stocks. The only way for the industry to take advantage of genetic advances in disease resistance, ploidy control and stocks selected for certain environmental condition is through the use of hatchery technology.

Supply Control

The second advantage of hatchery produced seed is that it can be produced on a schedule and moved efficiently. Brood stock oysters can be conditioned to spawn so that seed can be produced over an extended period. With experienced operators, shells loaded into bags and setting tanks will receive a specific number of spat per shell face. If for some reason setting does not achieve the desired level, more larvae can be introduced without additional materials handling. If cultchless seed are produced even more efficiency can be gained because only oysters are being handled. This space saving advantage allows greater effort to be made in predator protection and devices

such as mesh bags can be used efficiently. The process of grading oysters by size, and distributing them in new bags as they grow allows inventory of the stocks and permits efficient marketing projections. If oysters are suspended in the water or held off bottom on racks, fouling can be controlled and factors that lower market appearance and value such as mud blister worms can be reduced (Littlewood et al. 1992). Initial trials are underway to evaluate the production of oysters using a rack and bag system in the NJ coastal bays. As the industry becomes more self sufficient through the use of natural seed, a significant effort will be required to evaluate the variety of techniques for utilization of hatchery produced seed.

Suitability of New Jersey's Subtidal Areas for Different Production Techniques

Oysters on Cultch

Oysters set on cultch are suitable for traditional bottom culture techniques. It seems likely that optimum utilization of such shell will require an extensive area of high quality bottom in low salinity water to protect the newly set animals from predation. While limited numbers of oysters could be grown on racks in higher salinity areas for later planting, the area of racks required for production of enough seed on cultch to produce 1,000,000 bushels would require careful financial analysis. The major problem for individuals wishing to use rack culture in the Delaware Bay will be removal of the racks to avoid their destruction by ice. Similar problems would face raft culture systems anchored in the bay, and they would have to accommodate the extra costs of supporting the weight of the shells. Placing oysters on shell on longline systems might provide an operational means of reducing ice damage, but the extra flotation required to support the shell may reduce the cost effectiveness of these systems. An economic evaluation should be attempted before biological experiments are initiated.

Faced with these constraints, early trials with set on shell should focus post set culture efforts on bottom plants in prepared beds in low salinity areas. The efforts should evaluate bed preparation and the size of seed required for survival under several salinity regimes. Evaluation of systems for increasing the seed size from set to a size that yields increased survival of bottom plants should be an integral part of this project. Racks could be placed in a variety of shallow water areas and rafts could be used in some creeks.

Cultchless Oysters

More options are available for growing cultchless oysters because only the growing oyster is being moved. Bottom planting of small cultchless seed has not been effective because of losses to silting and predation. Once oysters reach about 5 mm they can be placed in bags that are: put on racks, held in floating trays, supported on longlines, or attached to an innovative intertidal system that combines longline and rack technology. Oysters are graded by size and moved to bags of larger mesh as they grow. A general rule of thumb is that oysters will have to be graded and moved each time their volume doubles.

At least one of these systems can be placed in almost any area where oysters are to be raised. The shallow bays along the NJ Atlantic coast are ideal areas for rack and bag or the longline/rack systems designed in Australia. These systems could also be used in a number of Delaware Bay sites. Easy access to the site for maintenance of the stocks will be essential.

The final option is to utilize an inshore system to grow oysters from 5 mm to approximately 20-30 mm and to place these oysters in trays suspended from longlines in the coastal ocean. Such a technology has supported the increase in oyster production in New Zealand. A significant advantage has been that fouling is reduced in offshore waters. This has also been noted in efforts to grow oysters on oil platforms in the Gulf of Mexico. A second advantage may occur if disease incidence is lower on the continental shelf because there are no disease sources nearby. A proposal to evaluate the possibility of oyster culture in the open ocean off New Jersey has been prepared and submitted. This proposal provides a mechanism for researchers and commercial fishermen to evaluate both the technology and the use of currently underutilized fishing boats as a means of tending the long line systems.

Oyster Seed – Hatchery Capacity

Hatchery production of large quantities of oyster seed for specific delivery dates is a matter of routine on the west coast; however East Coast hatcheries do not have the experience to produce and set oysters on demand (Canzonier, 1992b). Current experiments in New Jersey rely on some limited production by clam hatcheries, and the Rutgers University Cape Shore Facility. Neither the clam hatcheries nor the Rutgers facility are capable of large-scale production of oyster seed. Rutgers is in the process of developing a demonstration aquaculture facility that will have the capability to produce at nearly commercial levels. Once the facility is completed and operational protocols have been evaluated, it will be able to provide enough seed for early trials and to transition the oyster industry as they develop their own hatchery and expertise. A large-scale production hatchery and nursery will be essential components for development of oyster aquaculture in New Jersey.

Availability of Subtidal Areas for Shellfish Culture

There are approximately 392,000 acres of shellfish growing water in New Jersey estuaries and another 281,000 acres in the coastal ocean (Table A4-9). Of the shellfish growing water, 560,000 acres or about 85% of the area is either approved, seasonally approved, or special restricted for harvest. Approximately 30,000 acres of state water (7.6%) is leased for shellfish production and 90% of this is in Delaware Bay. Within Delaware Bay there are 18,500 acres of oyster seed bed, and between 25,000 - 28,000 acres of oyster planting ground. The New Jersey portion of Delaware Bay has 229,000 acres of classified shellfish growing waters. Statutes limit leasing to approximately 125,000 acres. The majority of the prohibited shellfish area in Delaware Bay is in or near creeks that enter the bay. The coastal bays (also called lagoons and sounds) of New Jersey have considerable approved acreage that could be used for aquaculture. Most of these systems are shallow and this will limit the type of culture techniques that can be utilized. The coastal ocean is not limited to the area indicated in Table A4-9.

These figures are for the State of New Jersey three-mile limit. Approximately the same area would be available for each three-mile increment as one proceeds offshore. The prohibited areas in the Coastal Ocean are near inlets, sewage outfalls and shipping lanes. The offshore areas will present challenges for any form of aquaculture, but recent advances in technology may allow cost effective use of the nearshore coastal ocean for shellfish culture.

Table A4-9. New Jersey acreage in coastal marine and estuarine waters. Shellfish classification and marshlands. All area in acres (Holt and Brown, 1995).

Area	Approved	Seasonal	Special Restricted	Prohibited	Total Shellfish	Marsh	Grand Total
Sandy Hook – Raritan Bays	0	0	19,958	13,077	33,035	8,700	41,735
Coastal Bays	74,254	15,296	21,380	19,085	130,015	135,000	265,015
Delaware Bay	205,840	5,329	13,805	4,410	299,384	75,000	304,384
Coastal Ocean	213,619	0	0	67,089	280,708	0	280,708
Grand Total	493,713	20,265	55,143	103,661	673,142	218,700	891,842

Production and Area Requirements

Examination of intensive bivalve culture suggests that yields of nearly 10 metric tons (MT) of meat per acre per year are possible. Traditional oyster farming requires more space and yields are approximately a factor of 100 less (0.1 MT for Delaware Bay) than those for hard clams and mussels. There does not appear to be any reason why off bottom oyster culture cannot provide equivalent per acre production to mussels and clams. This would suggest that the historical oyster production (about 800,000 - 1,000,000 bushels per year) of Delaware Bay could be produced in approximately 300 acres of intensive culture. Given these statistics it is clear there is enough area in New Jersey to provide for intensive oyster aquaculture, intensive clam aquaculture, traditional oyster culture and the myriad of competing uses, provided each group is willing to compromise in good faith.

Not all of the various nursery, or growout techniques are equally desirable for all sites. Table A4-10 attempts to evaluate which phases of oyster aquaculture and which techniques within those phases would be applicable to various water bodies. In general, hatcheries function best in high salinity (euhaline) water. Except for Delaware Bay, where there is little euhaline nearshore area, we have chosen not to evaluate mesohaline areas because it has relatively little usable area in most of New Jersey estuaries.

Employment Potential

Most of the jobs directly associated with oyster aquaculture will be in the nursery, growout, harvesting, processing and marketing stages of the industry. Efficient hatcheries typically employ 5 or fewer people. Very large hatcheries (production > 25 billion eyed larvae) may employ more individuals, but the numbers of eyed larvae

produced may reach 2 billion per person while smaller (5-10 billion eyed larvae) hatcheries may only produce 1-1.5 billion larvae per person. Smaller hatcheries may be substantially less efficient.

Once the oysters have been set, the numbers of individuals needed to maintain the stock increases somewhat, but because the techniques differ so radically it is more difficult to evaluate the number of individuals required to run nursery and growout operations. Comparisons between shellfish farming and fish farming suggest that more integrated production systems such as catfish in the southeast of the US and mussels in Holland produce 18 to 20 MT per person per year. Salmon farming and clam farming produce between 3 and 13 MT per person per year. Clam farms are typically not integrated and thus many of the single proprietorships are near the low end of that range. Typical oyster harvesting as practiced in the Mid Atlantic can yield up to 34 MT per person per year. Thus 1,000,000 bushels oysters might be produced by as few as 100 individuals, but more typical figures from clams, fish, and mussels suggests a more realistic employment figure of about 250 individuals. At the current price of \$18.00 per bushel this would yield a cash flow of \$69,000 per person per year. Each additional \$1.00 per bushel would yield \$4,000 to the cash flow created by each worker. The New Jersey Aquaculture Development Plan estimated that oysters could easily employ 70 individuals and generate \$ 24 million in sales. Under slightly more optimistic assumptions about the numbers of acres that could be brought into production employment of 500 individuals and revenue of \$77 million was envisioned. These data were compiled without the use of acreage in the coastal ocean. Development of ocean longline technology for oyster culture could make the more optimistic projections easily achievable.

Timelines

Emphasis during the early stages of revitalization should focus on the enhancement of natural seed production. As that process begins to create additional sales the industry should begin to invest in mechanisms that will stabilize seed production. Initial efforts can be timed to the construction and operation of the Rutgers Multispecies Aquaculture Demonstration Center in Cape May. This facility will have the ability to produce the large numbers of seed required for critical field testing of nursery areas and growth to market size. Once the quantity, size and cultch characteristics are clearly developed then the industry can consider developing its own hatchery. This could be developed in conjunction with hatchery operators now engaged in production of clam seed, or a single purpose facility built either independently or as an industry consortium. We have made an optimistic estimate of a time frame for trials of various techniques by general water body (Table A4-11). This chart begins with Year 0 being the second year of operation of the MADF facility, but trials of some techniques are already underway.

Table A4-10. Potential sites for various oyster aquaculture options. Lists of various techniques are provided by system. Items in *italics* are those that have the greatest potential in the area. Where only one item is listed no italics was used.

Area	Approved	Seasonal	Special Restricted	Prohibited
Sandy Hook - Raritan Bays Euhaline areas	NA	NA	Hatchery Nursery <i>a. Float</i> <i>b. Longline</i>	Hatchery
Coastal Bays Euhaline	Hatchery Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i> Growout <i>a. Bottom Plant</i> <i>b. Rack and Bag</i> <i>c. Float</i> <i>d. Intertidal</i> <i>Longline</i> <i>e. Longline</i>	Hatchery Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i>	Hatchery Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i>	Hatchery
Coastal Bays Oligohaline	Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i>	Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i>	Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i>	
Delaware Bay Mesohaline	Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i> Growout <i>a. Bottom Plant</i> <i>b. Rack and Bag</i> <i>c. Longline</i>	Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i>	Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal</i> <i>Longline</i> <i>d. Longline</i>	
Delaware Bay Oligohaline	Nursery <i>a. Bottom Plant</i> <i>b. Rack and Bag</i> <i>c. Float</i> <i>d. Intertidal Longline</i> <i>e. Longline</i>	Nursery <i>a. Bottom Plant</i> <i>b. Rack and Bag</i> <i>c. Float</i> <i>d. Intertidal Longline</i> <i>e. Longline</i>	Nursery <i>a. Rack and Bag</i> <i>b. Float</i> <i>c. Intertidal Longline</i> <i>d. Longline</i>	
Coastal Ocean		Nursery <i>a. Longline</i> Growout <i>a. Longline</i>	NA	NA

Table A4-11. Estimated time frames for demonstration of various oyster culture techniques by year and New Jersey coastal systems.

Area	Year 1 & 2	Year 3 & 4	Year 5 & 6	Year 7+
Sandy Hook - Raritan Bays Euhaline areas	Nursery a. Float		Nursery	Industry Hatchery Nursery a. Float b. Longline
Coastal Bays Euhaline	Nursery a. Rack and Bag b. Float c. Intertidal Longline d. Longline Growout a. Rack and Bag b. Intertidal Longline	Nursery a. Rack and Bag b. Float c. Intertidal Longline d. Longline Growout a. Rack and Bag b. Intertidal Longline	Industry Hatchery Nursery Nursery a. Rack and Bag b. Float c. Intertidal Longline d. Longline Growout a. Bottom Plant b. Rack and Bag c. Float d. Intertidal Longline	Nursery a. Rack and Bag b. Float c. Intertidal Longline d. Longline Growout a. Bottom Plant b. Rack and Bag c. Longline
Coastal Bays Oligohaline	Nursery a. Rack and Bag b. Float	Nursery a. Rack and Bag b. Float c. Intertidal Longline	Nursery a. Rack and Bag b. Float c. Intertidal Longline d. Longline	Nursery a. Rack and Bag b. Float c. Intertidal Longline d. Longline e. Bottom Plant
Delaware Bay Mesohaline		Nursery a. Rack and Bag b. Intertidal Longline Growout a. Bottom Plant	Nursery a. Rack and Bag b. Intertidal Longline c. Longline Growout a. Bottom Plant b. Longline	Nursery a. Rack and Bag b. Float c. Intertidal Longline d. Longline Growout a. Bottom Plant b. Rack and Bag c. Longline
Delaware Bay Oligohaline		Nursery a. Bottom Plant b. Rack and Bag	Nursery a. Bottom Plant b. Rack and Bag c. Intertidal Longline	Nursery a. Rack and Bag b. Float c. Intertidal Longline
Coastal Ocean		Nursery a. Longline	Nursery a. Longline	Nursery a. Longline

APPENDIX 4e

DEVELOPMENT OF MARKETING OPTIONS AND VALUE-ADDED PRODUCTS

History of Delaware Bay Oyster Marketing

According to Mints and Ogden (1992), marketing of Delaware Bay oysters can be traced back to the Lenni Lenape Indians. In addition to the numerous oysters that they enjoyed personally, they began smoking their excess oysters, threading them on white oak twigs and selling them to inland tribes. In at least one instance, this early attempt at adding value and packaging did not proceed as well as might be hoped. The Tellegwi Tribe, a branch of the Iroquois living in western Pennsylvania, decided to simply steal the oysters rather than purchase them. That led to the first of a long series of oyster wars. After that experience, the Lenape posted guards to watch over their product.

From the mid-1800's to the first quarter of the Twentieth Century, oysters were the most popular seafood in the United States. Fresh oysters were shipped all across the country. Product from the Delaware Bay was often marketed as the "Maurice River Cove" oyster. Oyster vendors were as common on the streets of Trenton and Philadelphia as hot dog vendors are today. The Original Trenton Oyster Cracker, the oldest continuously manufactured food product in the United States, was developed as a natural adjunct to these street sales. The target market segment for these street vendors was the factory worker in the highly urbanized Northeast. Oysters were commonly sold at local saloons as well as at the finest restaurants. Diamond Jim Brady was a tremendous fan of oysters and had barrels shipped for his personal use.

During the winter, oystermen along Delaware Bay would harvest ice to refrigerate their product as it was shipped across the country. Oysters were not only the food of connoisseurs and blue-collar workers but also of convalescents and young children since they were easily digestible sources of high quality protein.

The first shucking houses along the Delaware Bay were opened in the 1920s. In 1928, New Jersey began inspecting and licensing the shucking houses. The price of shucked oysters was considerably lower than the shell oyster but the processing step created jobs and the economy boomed. Shops and services sprang up in the small towns along the Delaware Bay. People moved into the region because of employment opportunities and a chance to share in the good life.

In the late 1950s, the oyster industry fell victim to MSX disease (Appendix 1; Figure A1-1). Despite efforts to revitalize the industry, it never completely recovered. The Delaware Bay oyster industry has continued to decline because of additional oyster disease problems, human health scares, bad press, lack of supply, and lack of a

proactive marketing and promotion program. Although at one time, the oyster was the most popular seafood in the United States, consumption is now at an all time low.

Current Marketing System

In general, shell oysters are marketed based on the area of harvest. Differences in growing environment tend to provide different flavors. This has given rise to market names such as Malpeques, Chincoteagues, Blue points, Wellfleets, and Apalachicolas. Although all of these oysters are eastern oysters (*Crassostrea virginica*), each has distinct market name and these market names are powerful marketing tools. In addition to the eastern oyster, several other species of oyster are sold in the United States: Pacific oysters (*Crassostrea gigas*), European flat oysters (*Ostrea edulis*) and Olympia oysters (*Ostrea lurida*)

The majority of Delaware Bay oysters are currently marketed to shucking houses in New Jersey and neighboring states, primarily Maryland. Although buyers for the shucking houses indicate that all product is destined for shucking, it is believed that some of the oysters reach the half-shell market. Half-shell oysters command a higher price than shucked. Oysters are often sold directly by harvesters in a reactive rather than proactive mode. This means that once the oysters are landed, the harvester begins looking for a market rather than identifying a market prior to harvest. Market identification is most easily achieved when a steady supply of product is available. This is often accomplished by the formation of cooperatives or marketing groups.

In today's marketplace, many oysters are marketed under the umbrella of aquacultured or farm-raised product. This differentiation is largely a marketing tool. Given the concerns about shellfish safety, it is a terminology that makes buyers feel more comfortable with the product. According to the Northeast Regional Aquaculture Center (Spatz et al., 1996), farm-raised oysters commanded a price of 23 to 34 cents during 1995. The Maryland Department of Agriculture Wholesale Market Summary for 1996 indicates an average wholesale price of 26 cents. In 1996 a pint of shucked oysters sold for an average price of \$3.99. Although the price was steady at \$3.95 for eleven months, there was a spike to \$4.25 in December as a result of increased demand for the Christmas and New Year's holidays. Using the most consistent price of \$3.95 per pint and assuming that there are 29 oysters in a pint (230 select oysters in each gallon), the average price per oyster now drops to \$0.136 cents at wholesale. The actual price paid to the harvester must be considerably lower so that all intermediate overhead costs including labor, packaging, and transportation are covered. The spring '97 price for Delaware Bay oysters averaged \$21 per bushel. Estimating 250-300 oysters per bushel, the per oyster price was \$0.07 to \$0.084.

Due to the low level and sporadic nature of the harvest, the market recognition and the large network of buyers that used to support a premium price for New Jersey oysters has nearly vanished. Sales have, in many cases, become reactive rather than proactive. Often the harvester spends undue time trying to locate a buyer when product becomes available.

According to Spatz et al. (1996), producers in the region expect that consumer demand for oysters will increase over the next five years. Eighty percent expect a slight to significant increase and the other 20% expect demand to remain stable. These projections are based upon producer assumptions that prices will be constant and supply will increase. The same sample believed that farm-gate prices would increase at a slower rate than previously. Fifty percent of the respondents expect prices to increase by 1 to 3% per year, and 44% expect them to remain stable or decline.

The American oyster market tends to be highly seasonal with peak demand occurring in November and December for the holidays. This is consistent with European demand. Oysters are also popular at restaurant raw bars, unfortunately although New Jersey has a strong and growing hospitality industry, few local restaurants offer this amenity. The strongest demand for seafood in the United States is at the restaurant or food service level. Oyster bars clearly demonstrate a restaurateur's commitment to high quality seafood and can add to a diner's enjoyment. With the wide variety of oysters now available, sampler plates can add considerably to a restaurant's bottom line. For home consumption, most Americans prefer easy, convenience foods and this precludes the use of shell oysters.

When New York and New Jersey area residents were questioned about aquacultured products, 2% of those surveyed indicated that they had purchased aquacultured oysters. For the bivalve shellfish included in the survey, it was not clear whether or not the products were actually labeled or marketed as aquacultured or farm-raised, or whether consumers simply perceived that at least some of the product that they had purchased was farm raised (Gall and O'Dierno, 1994).

The same study found that many consumers view aquaculture production as being an environmentally friendly alternative to harvesting seafood from the wild. This perception can be built upon to include a perception of the overall health of the Delaware Bay.

Because fish and seafood are often hunted commodities, a global market for these products has emerged. Most consumer economies practice global sourcing of product. Oyster exports continue to grow. Canada receives approximately two-thirds of all U.S. oyster exports. There have been some small sales to Japan, but because Japan requires a special certification program, these sales were largely confined to Oregon, the only state that currently has an acceptable certification program. To protect their local industry, the French have adopted a rigorous program that does not recognize U.S. water classifications; however, some U.S. oysters do enter France through Rotterdam or other European Union ports. There are some high income economies such as Hong Kong and Singapore where fresh oysters are in high demand. Because these markets are not protective of a local industry, they tend to have less rigorous import restrictions. To effectively access international markets, especially those along the Pacific Rim, it is critical to develop value-added products such as flash frozen half-shell oysters. Currently, New Zealand and Australia have been very successful in developing Asian markets. Often this has been accomplished with considerable government funds being allocated for marketing and promotion. Other important European markets for fresh shell oysters are highly seasonal, with demand focused on

December and January. Currently, the New Jersey industry is not harvesting at these peak times. New Jersey is in an ideal position to export fresh oysters because of proximity of major airports. Removal of these impediments can make New Jersey more competitive in the global market.

Marketing Goals and Impediments

Goals for improving the marketing of New Jersey oysters and impediments to achieving these goals are listed below.

Goals

1. Development of a marketable product, e.g. shell oysters
2. Development of a market identity for New Jersey oysters
3. Development of sufficient supply to meet market demands
4. Development of increased market demand
5. Development of a better price structure for New Jersey oysters
6. Development of a more organized and more effective marketing system for New Jersey oysters

Impediments

As a factor of the product:

1. Lack of supply
2. Inconsistency of supply
3. Harvesting regulations that create a market glut at certain times and no product at other times
4. Quality issues--salinity, plumpness, etc.
5. Safety concerns
6. Lack of value-added options

As a factor of the harvester:

1. Harvesters often sell at a lower price simply to make an immediate sale
2. Lack of packaging sophistication to address more upscale markets
3. Potential obligations to meet HACCP requirements as a consequence of processing activities

As a factor of the market:

1. Lack of market identity--product is generally shucked and often co-mingled. There is no specific market name such as Bluepoints or Wellfleets.
2. Lack of buyer awareness at the wholesale, food service and consumer level of the quality of the local harvest
3. Lack of clearly identified buyers other than shucking houses
4. Lack of strategy for reaching those buyers
5. Lack of market demand

6. New Jersey oysters are not positioned in the marketplace as an indicator of the health of the bay. There is no sense of state pride and ownership as there is in the Chesapeake
7. Concerns about product safety
8. Lack of product development

Dealing effectively with the impediments that face New Jersey production will require a well-structured educational and marketing program focused on improving the public perception the local harvest. The program will also have to develop strategies for moving product into the market in a configuration to achieve the best possible returns for the industry. This will require re-education of the harvest sector to develop new marketing structures. Ultimately, the best market access will be achieved through the development of value-added products.

APPENDIX 4f

FUNDING NEEDS

Recovery of the oyster industry in Delaware Bay requires supplementing current funding with additional dollars to enhance production, support capacity building within the existing oyster resource management program, and to expand market development. These activities will provide the greatest economic return to the industry in the short term and establish the basis for a sustained, economically viable industry/government/academia program. The oyster industry currently provides program support through harvest fees, shellfish tag purchases, license fees and lease fees. Recovery of the industry will lead to increased private industry support for oyster programs. The industry has already indicated a willingness to increase some fees. In other cases, the industry has provided direct cash and in-kind contributions to help sustain programs. Currently, the industry provides in-kind goods and services in terms of boats, equipment and labor to maintain the programs. It is anticipated that a 3-5 year input of supplemental state/federal funds will bolster the industry and support increased production. Increased production will, in turn, generate greater industry support through increased landing fees and, eventually, a higher landing fee. Given the depressed economic state of the industry and the region, additional inputs of federal and state money will be required to jump-start the production enhancement process. These funds should be used to effect lasting and efficacious changes in operational strategies.

In 1997, additional sources of funding for oyster resource management were made available. The Department of Community Affairs pledged \$25,000. Through the Agricultural Business Incentive Grant Program, the New Jersey Department of Agriculture made an additional \$25,000 available. The Coastal Zone Management Program, under Section 306A, provided another \$60,000. Funds to support oyster research at the Haskin Shellfish Research Laboratory (HSRL) have been secured through a variety of federal sources.

Additional sources of outside funding such as those available through Section 306A and Section 309 of the Coastal Zone Management Program will be investigated. Inclusion of the oyster industry within the purview of the state's aquaculture industry will allow access to additional potential sources of funding through United States and New Jersey Departments of Agriculture.

Many of the research programs at the Haskin Shellfish Research Laboratory (HSRL) are funded by federal and regional grants. It is anticipated that this outside federal/regional/private funding will continue and be expanded.

Revitalization of the Delaware Bay oyster industry will not only provide direct economic returns to the community as a whole, but will also serve to provide intangible returns. The maritime way of life will be sustained along the Bayshore and quality of life along the waterfront will be improved. There are several private initiatives to support

these efforts including the restoration of the *A.J. Meerwald*, a sailing oyster vessel, by a non-profit group. An industry member, Bivalve Packing, is currently restoring another historic oyster vessel. These vessels will help develop a greater appreciation of the Delaware Bay among the public at large. Additional economic returns may be achieved through ecotourism and a greater appreciation of New Jersey's maritime heritage. The development of a sense of pride and ownership of the Bay will serve the entire population of the state.

To support the revitalization of the industry, funding is required for the following programs:

I. Shell Planting and Transplant (Appendix 4b).

Oyster production can be significantly increased through the maintenance and enhancement of the natural oyster seed beds. The simplest, and probably most efficient, means of maintaining and enhancing these beds is by planting clean oyster shell or other (cultch) material on the beds during spawning season. This material provides an ideal attachment surface for the setting oyster larvae. If the timing and quality of this material is appropriate, setting can be very intense due to a variety of factors.

The cost/benefit ratio for the shell planting program can also be quite favorable. Currently, the cost of the shell delivered to the seed beds is approximately \$0.67 per bushel. With an estimated set potential of 1,000 + spat to the bushel and assumed mortality rate of 50 %, the market potential of each bushel of cultch is 1.67 bushels (@ 300 oysters/bushel). At the current average market price of \$21 per bushel, the potential economic yield of each \$0.67 bushel of cultch is approximately \$35.00; a cost/benefit of 52.

Selected areas of the seeds beds, e.g. the direct market harvest areas, can also be enhanced by supplementing these areas with oysters from underutilized beds of the upper bay. The removal of these oysters must be balanced by returning spat to these beds. These (upper bay) stocks reside in lower salinity waters where growth is usually retarded and meat quality is inferior. Moving these oysters into higher salinity waters has been demonstrated to enhance growth and meat quality. Most of these oysters will attain market size within one or two growing seasons. The use of the upper bay stocks to supplement the harvested areas on the lower beds has been previously demonstrated to be a practical means of enhancing the economic return to the industry.

This transplanting strategy is contingent upon maintaining a delicate balance since transplanting the oysters too far into the lower bay, the area of the leased grounds, exposes the to disease parasites such as MSX and Dermo. Disease losses are exacerbated by the presence of predators such as oyster drills.

Current level of funding: \$0
Supplemental funding required \$324,000

Projected funding levels assume the availability and use of a private oyster suction dredge at cost:

Shell Recovery (incl. On shore storage operation) 3,200 bushels per day @ \$1,000 per day

Shell Planting (two trips per day) 7,000 bushels per day @ \$1,000 per day

Seed transfer on Natural Seed Beds (depends on distance between beds):

One trip per day @ 3,000 bushels

Two trips per day @ 2,500 bushels=5,000 bushel per day

Cleaning of Bottom: 6-7 acres per day @ \$1,000 per day:

Total days required: 150 @ \$1,000 per day = \$150,000

Delaware Bay Oyster Industry Manager \$40,000 (annual salary)

II. Shellfish Resource Development.

As a unit within the Department of Environmental Protection's Division of Fish, Game and Wildlife, the Bureau of Shell Fisheries Council is ultimately responsible for the protection and management of the state's shellfish resources, including the oyster resource within Delaware Bay. As such, the Bureau should be funded at a level that would allow it to meet this basic responsibility. Such funding has not been provided for many years. Despite the dedication of existing personnel, staff reductions and diversions of staff time to other issues, over the years, have prevented the Bureau from providing the field and office personnel necessary to best manage the oyster resource and serve the needs of industry to the extent required. It is difficult to effectively manage the seed beds with a staff of three. At the present time, the office is only open to the public three days per week due to insufficient clerical staff. Current staff available for fieldwork and other Bureau responsibilities includes a biologist and a technician.

Capacity building within the Oyster Resource Management program is critical to the successful revitalization of the Delaware Bay oyster industry. In order to enhance the Oyster Resource Management Program's efforts and to staff the office five days per week, the following additional personnel and associated salary costs (rounded to the nearest dollar) would be required.

The current funding level is	\$141,542.
Supplemental Funding Required:	\$105,784

Position	Fiscal Year 1998 Base Salary	
Assistant Biologist		\$29,439
Technician II		\$22,150
Clerk Typist		\$15,984
	Subtotal	\$67,573
Fringe (26.95%)		\$18,211
Total Personnel Costs		\$85,784
Additional Operating Costs	\$20,000	
Total Funding Required		\$105,784

These three positions would supplement the existing full time staff (i.e., Principal Biologist, Principal Environmental Technician and Principal Clerk Typist) and result in increased resource management and industry support.

III. Commercial Scale Planting/Harvest on Cape Shore (Appendix 4a).

Although a significant natural oyster set consistently occurs on the intertidal flats of the Delaware Bay shore of Cape May County, there has traditionally been a reluctance by the oyster industry to use it as a source of commercial seed. This reluctance is due to the perception that it is costly to collect this seed from the shallow intertidal zone. Experimental plantings of cultch during several seasons have demonstrated the feasibility of depositing loose shell directly on the surface of the flats and recovery of the newly set oysters.

Current level of funding:	\$0
Supplemental funds required:	\$30,300
	for each harvest cycle

Projected Costs for the first year of proposed seed production:

Surf clam shell; 15,000 bushels @ \$0.40 per bushel	\$6,000
Planting of shell; 15 boat days @ \$600 per trip	\$9,000
Preparation of intertidal ground (lease, survey, stakes, crew, transportation)	\$2,100
Harvest of spatted shell (estimate for first year 4,000-5,000 bushels) 500-600 bushels per vessel operation unit @ \$800 per unit; 8-9 units	\$7,200
Planting of spatted shell (coincident with harvest activity) -----	
Total first season operating costs	\$24,300

Projected costs for season two

Thinning and replanting during second season 10 days @ \$600 per day	\$6,000
Total estimated cost	\$30,300

During the third season, oysters will be harvested for market sale.

Expected Return on Investment at dockside: \$5.78 for every \$1.00 invested

(This figure reflects only the direct return at dockside and does not include any value-added components nor return to the regional economy)

IV. Demonstration Planting with Multiple Transfers of Spatted Cultch (Appendix 4b).

In order to avoid excessive mortality, maximize growth rates and increase the harvest of marketable oysters it is possible to develop a system of rotational harvest and transplant. To assure the industry that such a program will work at a commercial scale, demonstration of the techniques are necessary. Once the concept has been demonstrated, industry participation should make this program self-sustaining. To maximize the return on these dollars, the bulk of the funds should be used for shell planting, the transplanting of spatted shell and the intermediate transfer of developing oysters. In order to provide the most efficient use of the allocated funds, all monies should be disbursed through the Oyster Resource Development Account commonly referred to as the "cultch fund."

Current level of funding: \$0

Supplemental funding required: \$562,000

Assumes 50% loss from time of seed planting with minimum 600 count per bushel

Anticipated production: 200,000 bushels of market oysters @ 300 count per bushel

Requires three spat collection grounds of 47 acres each =131 Acres

Clean bottom prior to shelling, 20 days @ \$1,000 per day	\$20,000
Collect/Land Storage of Shell 218 days @ \$1,000 per day (\$0.31 per bushel)	\$218,000
Plant shell 100 days (\$0.14 per bushel)	\$100,000
Clean bottom prior to first transplant 100 Acres =14 days	\$14,000
Transplant 200,000 bushels seed 57 days	\$57,000
Clean bottom prior to second transplant 166 Acres =23 days	\$23,000
Transplant 200,000 bushels seed 57 days	\$57,000
Clean bottom for final grow-out 166 acres =23 days	\$23,000
Plant for grow-out conditions 50 days	\$50,000
Operational costs invested in production	\$562,000
Anticipated Revenues:200,000 bushels (300 count) @ landed value of \$21 per bushel	\$4,200,000

Expected Return on Investment at Dockside: \$7.47 for every \$1.00 invested

(This figure reflects only the direct return at dockside and does not include any value-added components nor return to the regional economy)

V. Purchase of suction dredge.

\$1,400,000

This type of vessel makes bed cleaning, shell recovery, shell planting and transplanting large volumes of oysters on the seed beds significantly more efficient. It eliminates reliance on subsidized use of out-of-state vessel. There are a number of mechanisms that can be used to acquire this vessel including:

1. Formation of an industry co-operative that would serve as the owner/operator,
2. Private ownership/operation with a long term industry contract,
3. Direct ownership by a public agency such as the Delaware River Bay Authority with an industry or third party operator.

Sources of funding or a guaranteed loan agreement to support such a venture might be via a public corporation such as the Delaware Bay Authority, a publicly funded business development agency or a mixed private/public venture.

The actual amortized cost of this vessel over its expected useful life of 20 years is approximately \$3,242,500 (based on a 10% interest rate and a 20-year term). Monthly debt service would be \$13,510.

Additional funding would be required for vessel operation; however, ownership of the vessel would eliminate dependence on an out-of-state vessel for shell planting, transplanting, and survey operations as discussed in Appendix 4c.

VI. Oyster Bed Survey/Technical Assistance (Appendix 4c).

Haskin Shellfish Research Laboratory of Rutgers University maintains a long-term database on the oyster population in Delaware Bay. It also provides essential services to the State and oyster industry through providing an unbiased annual survey of the general condition of the seed beds and a diagnostic capability to assess oyster disease levels. Both of these capabilities are utilized to provide seed bed information to the Delaware Bay Section of the New Jersey Shell Fisheries Council which recommends harvest seasons to the State. The laboratory also provides advice on experimental methodologies and models that evaluate the effectiveness of management strategies, innovative culture techniques (including the maintenance and development of disease resistant stocks), and a world-renowned molluscan disease diagnostic center. The State appropriation supports the oyster industry through the annual population survey, disease diagnostics and reporting of the data to the State and the Shellfish Council.

Current appropriation: \$97,000

VII. Aquaculture and Disease Resistant Seed (Appendix 4d).

Currently, the oyster industry is dependent upon the natural set of oysters. Although there are at least two US models that show that hatchery production of oyster seed can be the basis for a successful business, seed are generally not available in quantity on the East Coast. The alternative to the use of hatchery seed is the use of natural set. This is the basis for the dramatic restoration of the Connecticut oyster industry, however, natural set was coupled with intensive bed management techniques. A few suppliers have quoted prices. Eyed larvae are available at \$0.50 per 1,000 and 12-20 mm oysters are being offered at \$15.00 per 1,000. On the West Coast, eyed larvae are available at \$0.10 per 1,000. We anticipate that East Coast prices could approximate those on the West Coast if production is increased. The broad outlines of a means of enhancing or stabilizing seed production, and introducing disease resistance to the Delaware Bay industry through aquaculture technology are provided in Appendix 4d. When this program is initiated (several years into the rehabilitation program) estimated expenses of incorporation and demonstration of aquaculture techniques would be \$50,000 per year for 4 years. Because of the experimental nature of this endeavor only a fraction of the expense could be recovered, but following this demonstration the industry would be expected to assume the funding of seed production.

Current level of funding: \$0

Supplemental funding required: (\$50,000 per year for 4 years) \$200,000

VIII. Mapping and Definition of Oysters Beds (Appendix 4c).

If the current direct market allocation system is continued and enhanced, the mapping and definition of the oyster beds is critical to developing optimal utilization of these resources. It is estimated that this one time cost would provide a detailed Geographic Information System (GIS) based map of all oyster and near surface shell resources in the Delaware Bay seed beds. There are a number of groups in the state with capabilities to perform this task (Appendix 4c).

Current level of funding: \$0

Supplemental funding required: \$250,000

IX. Interstate Shellfish Sanitation Conference and Water Quality Monitoring.

Ability to market oysters within the United States and overseas is dependent upon active participation in the Interstate Shellfish Sanitation Conference (ISSC) and water quality monitoring in shellfish growing areas. In order to protect the public health, the New Jersey Department of Environmental Protection regularly tests thousands of water samples to ensure that water quality standards meet the federal and state regulations for the safe harvesting of shellfish. To help assure consumers that clams, oysters and mussels are harvested from areas of the state that are safe, New Jersey is a participant in the Interstate Shellfish Sanitation Conference. The ISSC is the formally recognized body responsible for formulating guidelines for the [international] cooperative shellfish sanitation program administered by the U.S. Food and Drug Administration (FDA); the

National Shellfish Sanitation Program (NSSP). The function of this group is to provide for the uniform adoption and enforcement of a comprehensive set of guidelines and regulations for production, processing and shipping practices to minimize public health risks associated with the consumption of bivalve molluscan shellfish. Supplemental funding will allow responsible state agencies (Departments of Health and Environmental Protection) to more actively participate in the ISSC and help to ensure that personnel remain current with advances in inspection and shellfish safety through education and training initiatives. It is also recommended that an emergency fund be established to respond to ad hoc problems as they arise and support special shellfish growing water quality issues.

Current level of funding: \$100,000

Supplemental funding required: \$10,000+ \$25,000 emergency fund

X. Oyster Marketing and Promotion/Advocacy/Technical Support.

The Department of Agriculture under the mandate of the Aquaculture Development Act will provide these services. To expand these activities to focus specifically on the oyster industry and to meet its specific needs will require additional support. Such funding will focus on the development of a proactive campaign to help improve the market identity and acceptance of locally harvested oysters. Because of potential economic ramifications, emphasis will be placed on market development for shell oysters and value-added products. (Appendix 4e). Successful development of these products will significantly increase the market value of the harvest and generate additional employment opportunities in the region.

Current level of funding: 0

Supplemental funding required: \$25,000

FUNDING REQUIREMENTS SUMMARY

Annual Minimum Base Support Required: (not including special projects)
 Current water quality monitoring program in Delaware Bay \$100,000*

Shell planting & transplant	\$324,000
Oyster bed survey/technical assistance	\$97,000*
Current Shellfish Program budget line	\$142,000*
Capacity building within shellfish Program	\$106,000
ISSC participation costs (e.g., special water quality studies et al.)	\$35,000
Oyster advocacy/marketing/technical support NJDA	\$25,000

	Total	\$829,000
*Funded currently through the state budget		(\$339,000)

Additional Annual Base Funding Needed: \$490,000

Annual Private Industry Contribution:

Oyster Resource Recovery Account (variable estimate) \$50,000

Special Projects: (Costs reflect multi-year term of each project)

Commercial scale planting on Cape Shore Flats	\$31,000/harvest cycle
Demonstration planting with multiple transfers	\$562,000
Purchase of suction dredge	\$1,400,000
Mapping and definition of oyster beds	\$250,000

Aquaculture Seed Development	\$200,000
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TOTAL FUNDING REQUIRED TO SUPPORT SPECIAL PROJECTS: \$2,443,000

Estimated Return on Investment

Coastal towns edging the Delaware Bay developed as a direct result of the healthy oyster industry. Subsequent decline of the industry in the Bay led to a high rate of unemployment and a drastic decline in the standard of living for many families with established roots in the region.

It is anticipated that given an initial input of state funds to bolster the industry, within a five-year period, production can increase to between 200,000 and 330,000 bushels per year. It is anticipated that stabilization of supply and increased market development activities will result in a higher ex-vessel price (\$21 per bushel). Using a *extremely conservative* annual value for both harvest and ex-vessel landings and applying the standard seafood economic multiplier of six (6), the oyster industry's potential annual contribution to the state's economy is \$24 million. This contribution is especially critical because these economic gains can be achieved in an area of the state that is under severe economic stress. The value of the industry extends well beyond the oyster industry. The effects of a prosperous oyster industry will be felt in other waterfront activities such as shipbuilding, maintenance and repair, support services (equipment,

fuel, materials and supplies) and ecotourism, it will also help to preserve New Jersey's maritime heritage and coastal way of life.

Given changes in environmental conditions and other natural variables, it is difficult to develop accurate projections of return on investment. However, even under the most conservative estimates, return on investment in the state's oyster industry is substantial.

COST BENEFIT ANALYSIS*

Program	State Funds Required	Ex-Vessel Value	Total Return	Taxes Generated	Return on Investment
Base Support	\$829,000	\$7,000,000	\$42,000,000	\$2,940,000	\$51
Cape Shore Planting	\$ 31,000/cycle	\$175,000/cycle	\$1,050,000	\$73,500	\$34
Multiple Transfers	\$562,000	\$3,265,920	\$19,595,520	\$1,2371,686	\$35

**The cost/benefit calculations are based on recovery from spatting shell. With an estimated set potential of 1000+ spat to the bushel and assumed mortality rate of 50%, the market potential of each bushel of cultch is 1.67 bushels (300 oysters per bushel). At the current market price of \$21 per bushel, the potential yield of each bushel of cultch is approximately \$35.00. A standard seafood economic multiplier of 6 is applied to determine the overall return to the State economy. The composite value of federal (income), state (income and sales) and local property taxes generated is estimated at 7%.*

Employment

Traditional oyster farming in the Mid-Atlantic States and southern New England uses a highly mechanized low-density form of culture. A typical large oyster production and distribution system could yield 10,000 bushels per person per year. Thus, a harvest of 250,000 bushels would directly provide 24 person years of employment. Since a healthy oyster industry would create many additional ancillary jobs of a seasonal nature, it is most likely that the revitalization of this fishery will lead to a much greater workforce participation than the original numbers would indicate. In a recent study conducted by the Virginia Institute of Marine Sciences, it was found that it is the household expenditures by individuals employed in processing and related support businesses which generate the largest impacts on output, income and employment (Kirkley 1997). By increasing the harvest and providing an atmosphere that fosters processing, significant employment gains can be achieved in New Jersey. Employment will be created in the distribution, foodservice (e.g. oyster shuckers), and retail sectors in addition to the opportunities generated in the harvesting and processing sectors.

Additionally, aquaculture producers will create jobs in shoreside industries such as seafood processing, marketing, transportation and vessel maintenance. Ancillary jobs would be created in professions such as law, accounting, consulting, insurance, etc. and, also, in industries that supply materials to the aquaculture businesses such as

outboard motors, plastic mesh, and piping, etc. The economic multiplier effects for seafood industries are especially important in economically stressed areas because the majority of the income stays within the local area and supports local businesses, institutions and families.

APPENDIX 4g

IMPLEMENTATION OF TASK FORCE RECOMMENDATIONS

Review and revision of laws and regulations

Although part of the Task Force's responsibilities was to address the regulatory and legal problems of the oyster industry, this committee did not feel that it had adequate time to conduct a thorough review of, and recommend changes to, existing statutes and regulations. The Task Force did recognize, however, that some changes in the current rules and regulations affecting the oyster industry will be needed to implement some of the Task Force's recommendations. The laws and regulations governing the oyster industry in New Jersey are contained in N.J.S.A. Titles 28 and 50, and the New Jersey Administrative Code (N.J.A.C.) 7:25A. During discussions of the Task Force and its working subcommittees, several components of these documents were identified as potentially in need of revision or elimination. The Task Force agreed that the applicable statutes and regulations should be reviewed and revised, where necessary, to allow the Shell Fisheries Council increased flexibility to implement those recommendations of the Task Force which have been accepted by the industry. Further, the review should be conducted in conjunction with a similar review of state agency policies that will be initiated by the New Jersey Aquaculture Act. The latter review, to be undertaken by the Aquaculture Advisory Council, when it is designated, will be directed at many of the same concerns raised by the Oyster Revitalization Task Force.

Although it is not intended to be a complete list of all the issues that should be considered, the following is a list of elements contained within the statutes and regulations which should be reviewed and modified, if necessary, for the oyster revitalization program:

- Saturday harvesting
- Rough cull law
- Importation of oysters and oyster seed
- Change in leaseable areas
- Shipping of seed out of state
- Quantification of seed bed oysters taken for market or transplant

Shell Fisheries Council-Designated Liaison

The Task Force felt it would be important to assure that its recommendations were implemented in a timely fashion after acceptance of its report by the Administration. Consequently, its final recommendation is that the Shell Fisheries

Council designate an individual to serve as a liaison between the Council, the Administration, and the Legislature. This individual would have the task of keeping track of headway being made on implementing the recommendations and reporting back to the Council and the Administration on progress or problems. This individual would not usurp, in any way, the role of the Shell Fisheries Council or have responsibility for anything other than tracking Task Force recommendations.

APPENDIX 5

SENATE JOINT RESOLUTION No. 19

**A Joint resolution establishing a task force to study the
revitalization of the oyster industry**

SENATE JOINT RESOLUTION No. 19

STATE OF NEW JERSEY

INTRODUCED FEBRUARY 26, 1996

By Senator CARDINALE

1 **A JOINT RESOLUTION** establishing a task force to study the
2 revitalization of the oyster industry.
3 **WHEREAS**, The culture of oysters in New Jersey estuarine areas is the
4 oldest type of aquaculture practiced in the State; and
5 **WHEREAS**, This practice gave rise to a very significant industry for
6 more than one hundred years; however, in the last forty years the
7 production of oysters has steadily declined to an average value of
8 less than ten percent of the levels previously achieved; and
9 **WHEREAS**, This decline is attributable to a complex set of factors,
10 many of which are beyond the control of the practitioners of this
11 type of culture; and
12 **WHEREAS**, There is ample evidence that the biological potential for
13 oyster production, especially in the Delaware bay, remains high; and
14 **WHEREAS**, The persons involved in the shellfish industry clearly
15 recognize the need for the introduction of innovative changes in
16 culture practices in order to again realize this potential; and
17 **WHEREAS**, Such innovation, including commercial scale trials of new
18 operational strategies, is seriously impeded by the current
19 antiquated statutory and regulatory structure controlling the use of
20 this natural resource; and
21 **WHEREAS**, Reformulation of the regulatory structure is urgently
22 needed to permit the technological updating of oyster culture
23 practices that will permit the circumvention of the current adverse
24 conditions and foster the revitalization of the New Jersey oyster
25 industry; now, therefore,

26
27 **BE IT RESOLVED** by the Senate and General Assembly of the State
28 of New Jersey:

29
30
31 1. There is established a task force to be known as the "Oyster

EXPLANATION - Matter enclosed in bold-faced brackets [thus] in the above bill is not enacted and intended to be omitted in the law.

Matter underlined thus is new matter.

**Matter enclosed in superscript numerals has been adopted as follows:
Senate SSV committee amendments adopted March 7, 1996.**

1 Industry Revitalization Task Force." The task force shall consist of 13
2 members each having expertise in oyster culture to be appointed by
the
3 Governor as follows: two representatives from the Department of
4 Environmental Protection, two representatives from the Department
5 of Agriculture, one representative from the Delaware Bay Section of
6 the Shell Fisheries Council, three representatives from the Haskin
7 Shellfish Research Laboratory, three representatives from the oyster
8 industry, including at least one member from the New Jersey Oyster
9 Planters and Packers Association, the marine science representative
10 of the Statewide Advisory Committee of the New Jersey Agricultural
11 Experiment Station Board of Managers, and one member from the
12 New Jersey Aquaculture Association. Appointments to the task force
13 shall be made within 60 days of the effective date of this joint
14 resolution.

15
16 2. It shall be the duty of the task force to examine the status of
17 oyster culture as currently practiced in New Jersey. The task force
18 shall evaluate the technological, sociological and regulatory aspects
of
19 the harvesting and culture of oysters in the Delaware bay and
adjacent
20 waters. The task force shall define the problems confronting the
21 oyster industry, including the causes for its reduced production and
22 diminished economic return, examine feasible alternative strategies
23 that might be utilized in reversing the negative trend in the industry,
24 and provide a comprehensive plan of action for revitalization of the
25 industry, including recommendations for actions to be taken by the
26 Legislature and the Governor to address the technical, regulatory, and
27 legal problems impeding the proper utilization of this valuable natural
28 resource. The task force shall present a final report of its findings and
29 recommendations to the Governor and the Legislature no later than
30 180 days following the appointment of the members of the task force.
31 The task force shall dissolve upon the issuance of its final report.

32
33 3. The members of the task force shall serve without
34 compensation.

35
36 4. This joint resolution shall take effect immediately and shall
37 expire upon the submission of the report required pursuant to section
38 of this act.

39
40
41

42 Establishes "Oyster Industry Revitalization Task Force."

APPENDIX 6
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