Sea Scallop Demonstration Project
Final Programmatic Report
Submitted to National Fish and Wildlife Foundation

by
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Table of Contents

I Executive Summary

The Sea Scallop Demonstration Project was conducted from March 1, 1999 through July 31, 2000. The project was successful in designing and utilizing a benthic growout system that consisted of stackable trays in a steel framed cage. Forty-one thousand (41,000) young sea scallops were placed in four cages on the Cobscook Bay Aquaculture Inc. farm site in East Bay, Maine during August of 1999. 2000 scallops from previous trials were also placed in the project's cage system. A barge was successfully designed and built for the project to raise and lower the cages easily and cost effectively. Growth studies were conducted on two occasions to compare different stocking densities for juvenile animals. These studies found no significant differences in growth rates at the various densities employed. The project was responsible for developing a pilot program with the Maine Department of Marine Resources (DMR) for the testing and sale of whole scallops. The sale of whole scallops was previously prohibited in Maine due to public health concerns with biotoxins. Scallops were collected for biotoxin testing on a bi-weekly basis from June to October 1999. All samples tested below detectable levels for Paralytic Shellfish Poisoning (PSP) and Diarrheic Shellfish Poisoning (DSP). Water samples were also collected bi-weekly and found to contain no significant numbers of toxin causing plankton. Initial marketing trials for whole scallops were conducted in April 2000 and averaged $1.35 per animal. Dissemination of the project's accomplishments included presentations at the Cobscook Bay Fishermen's Forum and the Northeast Aquaculture Conference and Exposition, and articles appeared in the Quoddy Tides, Bangor Daily News, and the Working Waterfront.

II Project Team, Objectives, and Timeline of Accomplishments

The Sea Scallop Demonstration Project was coordinated by Thomas Pottle, President of Cobscook Bay Aquacutlure Inc., and Michael Hastings, Executive Director of the Maine Aquaculture Innovation Center. Collaborators included Will Hopkins and Heidi Leighton of the Cobscook Bay Resource Center; Dr. Brian Beal of the Beals Island Regional Shellfish Hatchery; Paul Anderson, Director of The DMR Public Health Division; Jim Dow with the Maine Chapter of The Nature Conservancy; and Chris Bartlett of the Maine Sea Grant Program. The project was funded in part by the National Fish and Wildlife Foundation; The Great Bay Foundation; and the Maine Community Foundation.

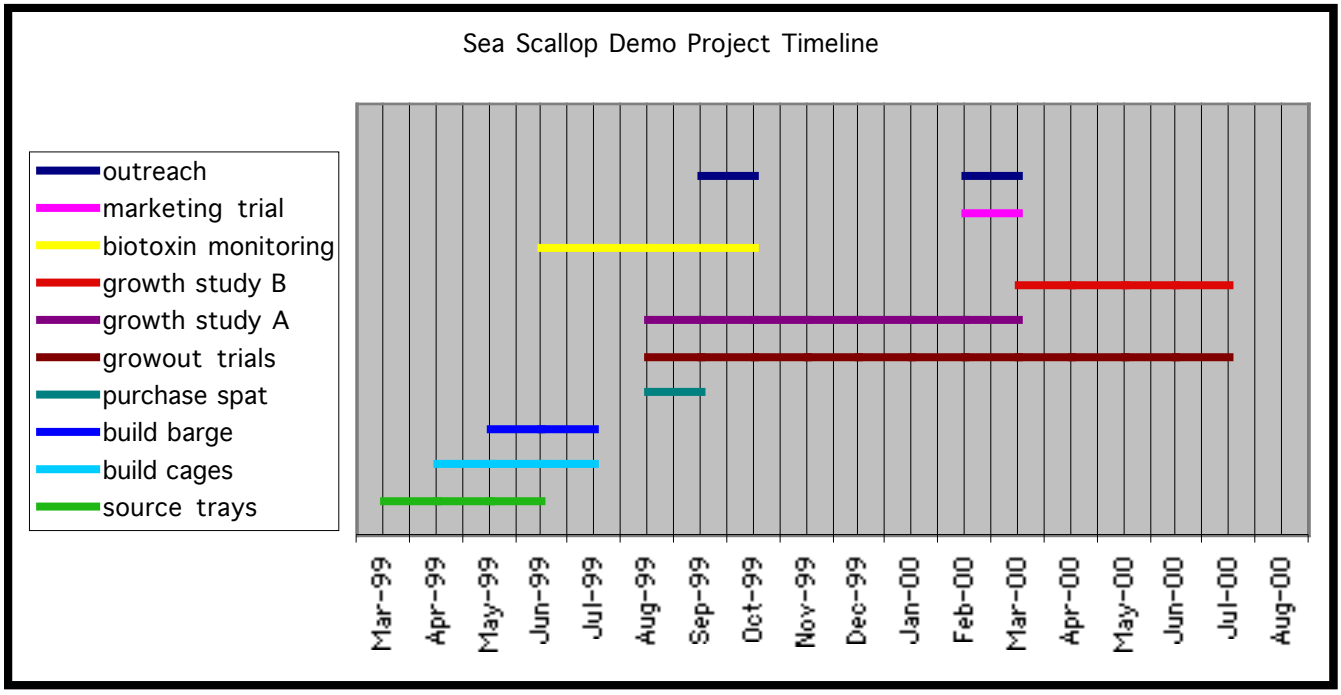
The project was conducted from March 1, 1999 through July 31, 2000 and was the result of previous trials by Tom Pottle and his partners of Cobscook Bay Aquaculture. The project had four specific objectives:

A) To design, build and test a system for growing sea scallops in bottom cages on a small-scale commercial basis.

B) To gather data on the growth rates of scallops at the project site that will be useful to aquaculture producers.

C) To gather and analyze biotoxin accumulation in sea scallop tissue at the project site that is useful in determining the potential for the whole scallop markets, and that will assist the State of Maine in formulating regulations for whole scallop sales.

D) To share the learning from this project with others interested in replicating this system.



III Why Sea Scallops

Sea Scallops, *Placopectin magallanicus*, are found along the Atlantic Coast of North America from Labrador to North Carolina. Cobscook Bay, located on the Canadian border in eastern Maine, is known for its relatively abundant stocks of scallops. Commercial harvesting of scallops is a mainstay among the local fishing boats in this region. The depletion of stocks in other parts of the State has made Cobscook Bay the primary target of the inshore scallop fleet, with 178 boats fishing on the first day of the season in 2000. The result has been that most of the scallops are harvested during the first week of December, with little remaining for the duration of the five-month season.

The productivity of scallops in Cobscook Bay combined with the increasing competition in the commercial fishery led Tom Pottle to investigate scallop culture in this region.

IV Site Selection

East Bay, located within Cobscook Bay, was chosen as the project site because the area was known to produce large scallops and yet was not favored by the commercial fleet because scallops were more plentiful in other areas. East Bay also contained a dormant salmon aquaculture lease that was permitted by the State of Maine and was available for transfer to Cobscook Bay Aquaculture Inc. for scallop production.

The 4.9 acre lease site was situated on a mud bottom in 35 feet of water at low tide. Some protection from the wind was provided by the surrounding shoreline from the east and west, and current speeds were steady but manageable.

V Growout Equipment

A) Tray Selection

Cobscook Bay Aquaculture's previous trials with rearing scallops resulted in the need for a stackable, rigid tray design that would lessen the time required to work with the shellfish. A variety of commercially available trays in North America were investigated but most were found to be too small to be cost efficient. A larger tray system from Australia was researched, and product samples convinced the investigators to purchase these trays for the project.

The Aquatray, manufactured by Tooltech Pty Ltd of Queensland, Australia, is made of UV resistant polyethylene plastic that measures 3' x 3' square and 4" high with 12 mm mesh. Each tray is partitioned into nine segments that measure one square foot. These partitions help to keep the scallops separated when the trays were tilted during handling. The trays were designed to stack on top of each other with two choices for the space between units (Appendix 1, photo 1). The trays also have a number of adaptable accessories to customize their use such as clips, lids, different stacking arrangements, and slots for mesh bags, to name a few.

B) Cage Design

A cube shaped cage frame was designed to hold 4 stacks of trays for the project. Each cage was constructed of 3" x 2 " angle steel and measured 6' high x 6'wide x 5' high. (Appendix 1, photo 2). A 17-inch space was provided at the bottom of the cage to keep the trays out of the mud.

Each cage was constructed to accommodate four stacks of trays either 17 high or 10 high depending on the desired stacking method. The top of the cage was cross-braced for strength and fitted with an eyehook for retrieval purposes. A length of 5/8 " polypropylene rope with a floating buoy was attached to the eye hook for raising and lowering the cage to the bottom. Zincs (3"x6") were attached along the steel frame to deter corrosion.

C) Barge Design

During the design phase of the project, investigators decided that it would be beneficial to have a small vessel designed specifically for the scallop farm. The result was the construction of a 20' long by 16' wide catamaran style barge. (Appendix 1, photo 3). Two pontoons, made of high-density polyethylene (HDPE) pipe, were purchased from Northern Plastics of Grand Manan, New Brunswick for this purpose. The pontoons measured 20' long by 32" diameter and were angled upward on the bow. A wooden deck was constructed of 6"x 6" stringers and decked over with 2" cedar planks. A 6.5' x 6.5' hole was cut into the center of the deck for the purposes of raising and lowering the cages. Above the hole was placed a cubical steel frame constructed of 2.5" square stock and measuring 7' wide x 7' long x 6' high. A hydraulic winch was attached to the top of the frame and run by an 11 hp portable power pack for lifting the cages. The barge was maneuvered by a 45-hp outboard with a standup console.

VI Scallop Spat

Scallop spat was purchased from Dr. Michael Dadswell in neighboring Passamaquoddy Bay, New Brunswick, Canada. Spat was collected from the wild with monofilament filled mesh bags that were deployed on horizontal long lines. Settlement in this region typically occurs in the months of August and September. On August 9, 1999, 41,000 year old scallops were gathered from Dr. Dadswell's bags and brought to the project site in Maine by boat. An importation permit was granted by The Maine Dept. of Marine Resources for this purpose. Scallops were temporarily stored in hanging pearl nets until transfer to the cages (Appendix 1, photo 4).

VII Growout methods and Growth Studies

The young scallops purchased from Dr. Dadwell were placed in the growout cages on August 10, 1999. A fine mesh (3.2mm) plastic netting was used to initially line the

bottom of each Aquatray so that the small scallop spat (8-15 mm) would not slip from one tray to the next(Appendix 1, photos 6, 7). It was decided to nest the aquatrays inside each other, allowing for 17 trays to fit in a stack on the cage. The project investigators theorized that water flow would be sufficient throughout the nested trays for these small scallops.

The initial stocking density used was 16 scallops per square foot, for a total of 144 per tray and approximately 9800 per cage. Two growth studies were designed by Dr. Brian Beal during the project. The first study looked at the significance of the initial stocking density on the animals within the growout system and the second study investigated the significance of different stocking densities on the population. Please reference the complete growth studies report attached to this document as Appendix 2.

On March 22, 2000 the scallops were divided into groups of 3, 6, 9, and 12 per square foot as part of the second growth study(Appendix 1, photos 8, 9). The animals measured an average of 41.12 mm at this time. Subsequently the flexible netting was removed from the trays. Survivorship from August 10, 1999 to March 22, 2000 was documented as 98.5%.

On July 22, 2000 samples were collected to analyze the results of the second growth study. The average shell length measured 51.88 mm and resulted in a 26.2% increase since March. Dr. Beal concluded that there were no significant differences between the different stocking densities employed, both in terms of growth or mortality. High mortalities, up to 30%, were apparent during this sampling and specimens were sent to Dr. Bruce Barber with the University of Maine Animal Health Lab for diagnosis. Dr. Barber found no clinical signs of disease by hystological exam and concluded that environmental stressors such as poor water quality most likely caused the damage. Project investigators rearranged the trays into stacks of 10 to increase the water flow between levels. Scallops were also graded into densities of four per square foot for the remainder of the project.

Two thousand older scallops from previous studies were also placed in the growout system on August 10, 1999. These shellfish were stocked at four per square foot and were not used for the growth and mortality studies. These animals were used for the basis of the biotoxin monitoring and marketing portions of the study.

IX Biotoxin Monitoring Program and Marketing Trial

Initial inquires about the whole scallop market by Tom Pottle found prices substantially higher than that paid for the adductor muscle only. Prior to this project, The State of Maine prohibited the sale of whole scallops because of the potential human health concern with paralytic shellfish poisoning and related biotoxins. Scallops accumulate these toxins at a higher rate than other shellfish and regulators could not be assured that wild scallop stocks were ever safe for human consumption. As part of this study, The Maine Dept of Marine Resources' Public Health Division drafted an Interim

Memorandum of Understanding (MOU) with the Project Coordinator, Tom Pottle, to allow for the sale of cultured whole scallops (Appendix 3).

The MOU included a biotoxin monitoring program that tested scallop meat samples from the farm for Paralytic Shellfish Poisoning (PSP), Diarrheic Shellfish Poisoning (DSP), and Amnesic Shellfish Poisoning (ASP). Six to twelve scallops were collected on a bi-weekly basis from June 1, 1999 to October 19, 1999 and sent to the DMR lab for analysis. All samples tested were below the level of detection for biotoxins during this time frame. Water samples were also collected bi-weekly by the Cobscook Bay Resource Center and found to contain no significant numbers of toxin causing plankton. Surface water temperatures were also collected during the monitoring program.

Whole scallops were sold in April, 2000 under the MOU program to seafood distributors in Portland and Boston(Appendix 1, photo 10,11). These shellfish, which remained from an earlier study, averaged 4-5 inches in length and sold for $1.35 apiece. In contrast, the adductor muscle market was averaging $5.50 per pound and would have yielded approximately $0.28 apiece for the same scallops. The seafood dealers were very pleased with the quality and size of the animals and encouraged Tom Pottle that he had a very marketable product.

X Outreach Activities

There have been several formal efforts to inform others about the sea scallop demonstration project and to learn about alternative culture methods. Four project collaborators including Pottle, Hastings, Hopkins, and Beal took part in a Maine Delegation to Aomori Prefecture, Japan to learn of that region's success with Japanese scallop culture from May 14-21,1999(Appendix 4). Articles on the demonstration project have appeared in the Bangor Daily News, The Quoddy Tides(Appendix 5), and The Working Waterfront(Appendix 6). Presentations on the achievements of the project were given by Tom Pottle at the Cobscook Bay Fishermen's Forum on February 26, 2000 and by Chris Bartlett at the Northeast Aquaculture Conference and Exposition on December 9, 2000(Appendix 7). Many informal discussions about the project's outcomes and farm tours (Appendix 1, photo 12) have also occurred with interested people throughout the course of the study.

XI Future Activities

Cobscook Bay Aquaculture Inc. will continue to cultivate the scallop year class started by the project for whole animal market opportunities. Biotoxin monitoring has continued and these shellfish were found to contain detectable levels of PSP during July, 2001. Monitoring will continue to assess the time needed for the scallops to purge themselves of PSP. Subsequent year classes are also intended to be placed in the growout cages on the farm site. Trials with purchasing larger spat from Canadian producers will be conducted in an effort to eliminate the use of the fine mesh tray lining. Efforts into controlling biofouling of the cages by marine organisms such as tunicates and mussels are expected to take place. Marketing opportunities will continue to be investigated that

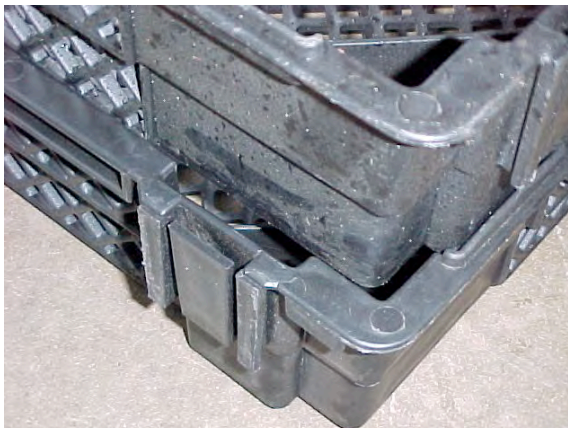
include whole scallops of various sizes. A manual of the project's accomplishments will be compiled by collaborators and distributed by the Maine Aquaculture Innovation Center

XII Outcomes and impacts

Specific outcomes of project include the design, construction, and successful trial of a new growout system for sea scallops in Maine. The project also established the basis for new State regulations regarding the sale of whole scallops in Maine and identified lucrative marketing opportunities for the sale of whole scallops in New England. Dissemination of the project's outcomes were accomplished, and further outreach efforts will be continued.

The overall impact of the project has yet to be fully realized. Tom Pottle and his collaborators have taken the first steps in demonstrating that small-scale commercial cultivation of sea scallops can be achieved in an economically and environmentally sustainable manner. This has been the first project of its kind in New England and has sparked considerable interest in scallop aquaculture by local fishermen and aspiring aquaculturists alike. The potential long term impact of the project is likely to be the establishment of other scallop farming efforts along Maine's coastline.

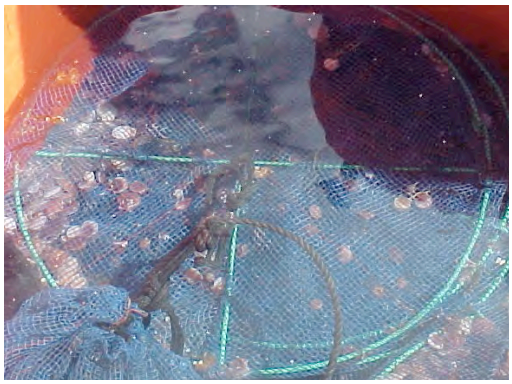
Appendix 1
Sea Scallop Demonstration Project
Final Programmatic Report
Photo Documentation



1. stacked aquatrays

2. Steel cage frame

3. Barge with loaded cage system



4. Spat transported in pearl nets

5. Spat ready for trays

6. Young scallops on lined trays

Appendix 1 continued

7. scallops on mesh lined tray

8. Grading for growth experiment

9. Grading for growth experiment

10. Scallops harvested for market

11. Scallops packed for shipping

12. Educational farm tour