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Private Marine Finfish
Aquaculture Industry
in the Northeast

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Aquaculture Industry
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Northeast Region National Marine Fisheries Service
Under Contract with

PROFILES RESEARCH AND CONSULTING GROUPS, INC.
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NOTICE

The findings, and conclusions contained are not necessarily those of the National Marine Fisheries Service, and do not endorse any product or entity. All names and organizations contained herein, are essential to the objective of this report.

1.0 EXECUTIVE SUMMARY

1.1 Introduction

This final report is based on a three month study of the private marine finfish aquaculture industry in ten coastal states from Maine down to Virginia.

The study was conducted by Profiles Research and Consulting Groups, Inc. in the fall of 1980 under its contract with the National Marine Fisheries Service in Gloucester, Massachusetts.

The overall purpose of this study was to compile, for the year 1979, information on: the number of producers, the quantity and value of products, water resources used, acreage used, facilities, employment, and manpower needs.

1.2 Summary for this Study

This section, briefly, summarizes the major findings and conclusions which are presented in detail throughout this report. By this study, it was determined that the community of interest involved in private marine finfish aquaculture is considerably smaller than was predicted by the National Marine Fisheries Service. At present, less than five small businesses are pursuing marine finfish aquaculture as producers in the states designated to be surveyed. Although indications are that perhaps two or three times that number were in operation three years ago.

1.3 Conclusions

The major conclusions of this study, in brief, are as follows:

- Most finfish aquaculture activity in the Northeast is in the research and development area, with universities being on the forefront.
- Finfish production in 1979 was less than 90,000 pounds and resulted in revenues less than \$231,000.
- The marine finfish aquaculture industry in the Northeast is more in the stage of developing technology than of producing finfish products.
- The allure of an "open" market is overshadowed by high risks in production and unproven profitability for large scale production.
- There is a wide diversification of methods for marketing and production, with the production of bioassay and research specimens being the most attractive at this time.
- The state of Maine will most likely have the highest number of private aquaculture endeavors in the next five years due to its receptivity to aquaculture activity.
- The most critical missing element in the development of the marine finfish aquaculture industry in the Northeast is the proof of its profitability for commercial ventures.

1.4 Acknowledgements

Profiles wishes to express its appreciation for the cooperation received throughout this study from the National Marine Fisheries Service, state agencies, universities and associations.

We would especially like to thank Dr. Robert Hanks and Anthony Bocelle, who served as our Technical Advisor and Contracting Officer. Without their support and assistance, we would have been unable to complete our work.

Profiles hopes this survey has been of assistance to the National Marine Fisheries Service in this important effort.

2.0 INTRODUCTION

2.1 Background and Purpose

In September, 1980, Profiles Research & Consulting Groups, Inc. was commissioned by the National Marine Fisheries Service to conduct a three month study of the Private Marine Finfish Aquaculture Industry. The ten coastal states of Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, New York, New Jersey, Delaware, Maryland, and Virginia formed the surveyed area. The study was concluded in December, 1980.

The purpose of this study was to compile information on:

1. The number of producers, 1979 (by state and by species);
2. The quantity and value of products, 1979 (by state and by species);
3. Water resources used, 1979;
4. Acreage used, 1979 (by state and by species);
5. Facilities used in private marine finfish aquaculture, 1979;
6. Employment, 1979 (by state and by species); and
7. Present and future manpower and training needs.

For the purpose of our survey, the term "Private Marine Finfish Aquaculture" was defined as any business facility, including cooperatives and similar enterprises, which propagates and/or rears finfish in controlled marine or brackish water environments. Ornamental fish, eel ponds where no feedings are done, and hatcheries for lake stocking were excluded.

2.2 Tasks by Methodology for this Study

The study by approach involved four (4) basic tasks:

- . Formation of the community of interest,
- . Formation of a questionnaire,
- . Conducting interviews, and
- . The tabulation and presentation of findings.

The most critical and difficult task was the identification of a community of interest. Preliminary research indicated that there was no single or direct source for compiling a comprehensive listing of finfish aquaculture entities. In addition, initial contacts revealed that the actual community of interest was much smaller than the 25 to 50 entities as estimated by the National Marine Fisheries Service.

As a result, Profiles developed a multiple reference grid method which first consisted of the following nine(9) sources:

1. National Trade Associations
 - American Salmon Growers' Association
 - American Fisheries Society
 - World Mariculture Society
 - United States Aquaculture Council
2. State and Regional Associations
 - New England Collaborative for Aquaculturists
 - Maine Aquaculture Association
 - Rhode Island Aquaculture Association
 - New England Fisheries Steering Committee
3. State Departments of Fish and Game, Commerce, and Agriculture
4. State Agents
5. Federal Government Agencies
 - U.S. Department of Agriculture, Science and Technology Division
 - National Marine Fisheries Service
6. Trade Journals and Directories
 - Aquaculture Magazines' Buyers Guide
 - The Directory of Aquaculturists in the Northeast
 - Aquaculture Digest
7. County Seats
8. Universities
 - University of Rhode Island
 - Virginia Institute of Marine Science
 - University of Maryland
 - University of Delaware
 - University of New Hampshire.
9. Vendors and Competitors

2.3 Formation of the Community of Interest

Because the community of interest, by research, indicated the industry to be smaller than projected, considerably more effort was made in refining an identification methodology. This extra step would not have been necessary if the community of interest had been larger and consequently more accessible. Therefore, Profiles includes in this report two(2) lists which should be of benefit to those doing future studies of marine finfish aquaculture businesses.

The first of these lists is of aquaculture entities (Exhibit E) which did not qualify for an interview at this time, but would have in the past, or will in the future. The second list is of contacts or references by state (Exhibit F) which knew something of the aquaculture activity within the state.

Both these lists are annotated and the list of contacts and references indicates those of high quality. They are found in the Appendix Section of this report.

Although Profiles began its investigation expecting trade associations and state licensing agencies to be the most fruitful sources of information, neither of these sources ended up being highly informative.

At one point, despairing of finding a truly definitive reference, Profiles went so far as to identify some 80 coastal counties in the ten states included in the survey and began to call representatives in each county. However, these representatives seemed to have no clearer knowledge of aquaculture activity within their bounds than did the large trade associations.

The most helpful sources proved to be the Coastal Information Center at the University of Rhode Island which is in the process of compiling what will

in the future no doubt be an invaluable body of information for studies such as this, and the New England Collaborative for Aquaculture, which along with the Coastal Information Center, provided the best information on the area north of New York. Marine advisory agents were high quality sources for the four more southerly states in our surveyed area.

2.4 Formation of Questionnaire

The edition of the questionnaire which Profiles received was evaluated as being unusable in its received form. (For a copy of this questionnaire see Exhibit F in the Appendix.) Consequently, a revised form of the questionnaire was prepared to facilitate its administration.

2.5 Conducting the Interviews

Profiles contacted identified members of the community of interest by phone to arrange appointments, sent a letter confirming the appointment date, and then met with the representatives of the aquaculture entities for a personal interview.

Although the representatives of the aquaculture entities were all well-educated biologists who were familiar with the information requested in the questionnaire and fully capable of completing it on their own in its revised form, the quality of information received by Profiles was greatly enhanced by the personal interview situation.

By using this method, the interviewers were able to rephrase and clarify questions and discuss aspects of the entity's production which were not directly solicited by the questionnaire. Also the production facilities were visited as a by-product using this approach.

As a result, Profiles' interviewers evaluated all the interviews as being of high quality. The responses were clear, appropriate and provided data with the necessary value needed to complete this study.

3.0 FINDINGS

3.1 Major Findings and Producers

The most significant finding of the survey is that, at the present time, there are very few private commercial entities involved in marine finfish aquaculture (as producers) in the states surveyed in the Northeast. Only five entities qualified to be interviewed for this study, as shown in Exhibit A. Upon being interviewed, two of them were deemed to be somewhat peripheral to a strict interpretation of the study's qualifications (Sea Run, Maine, and Cecil-Harford County Watermen's Association, Maryland).

Sources familiar with the long-term fluctuations of the aquaculture industry indicate that this finding conforms with their knowledge of cyclical peaks and valleys. Profiles has apparently conducted this study during a low in activity commercial marine finfish aquaculture.

For example, our search uncovered the fact that four marine finfish aquaculture entities folded in Maine in 1978 and 1979 (Maine Sea Farms, 1978; Blue Mountain Salmon Farms, February, 1979; Wiscasset Salmon Farms, June, 1979; and Maine Salmon Farms, December, 1979).

3.2 Trends Within the Industry

By far, the largest marine finfish aquaculture activity in the Northeast seems to be in the research and development area. Many of the aquaculturists contacted by Profiles cited recent efforts in several New England States to re-develop an Atlantic Salmon Industry.

Some of these efforts cited were small commercial ventures (e.g. Sea Run, Incorporated, Maine), but, typical of the industry, the big efforts being made are public/governmental endeavors (e.g. the Connecticut River Cooperative plan involving Vermont, New Hampshire, Massachusetts, and Connecticut)

at the State Government levels. Although this effort to restore the population of the Atlantic Salmon in the Connecticut River for sport fishing and ecological balance purposes has no commercial intentions, it will no doubt have a commercial impact.

3.3 Facilities Used by Producers

Even among the small community of five(5) aquaculture entities which participated in the study, the wide variety of market ends and production means of the marine finfish aquaculture industry was exhibited.

For example, Multi-Aquaculture Systems on Long Island uses pools and cages in which it rotates stocks of Striped Bass and Northern Blowfish to produce processed and frozen products for human consumption. Fox Island Fisheries in Vinalhaven, Maine, produces live trout for human consumption using pens and pools.

3.4 Water Resources Used

The Cecil-Harford County Watermen's Association in Elkton, Maryland, has begun to produce Striped Bass, White Shad, and a hybrid of these two which they then release into the upper regions of the Chesapeake Bay. From one perspective, this seems to be a non-commercial stocking endeavor; however, the watermen receive an indirect commercial benefit-- they took up the project as a means of protecting their livelihood (i.e. commercial fishing) against state prohibitions when fish stocks seem to be dwindling.

Sea Run in Kennebunkport, Maine has been producing rainbow trout in carefully controlled systems. Presently, most of the trout are produced in fresh-water systems and sold as live juveniles to other aquaculturists. In the very near future, Sea Run will be attempting Atlantic Salmon production which will include, as part of its process, releasing the salmon to the sea and harvesting them upon their return.

Sea Plantations in Salem, Massachusetts has found a unique market. It produces Silversides, Sheepshead Minnows, and Mummichog in controlled systems to be used as research organisms for bioassay purposes (e.g. the detection, evaluation and abatement of water pollution). Strict culture controls are used to produce a comparably high-value product in a relatively short time (a one gram specimen goes for about \$.90).

3.5 Quantity and Value of Products

State and species totals are not difficult to derive from Exhibit A. Of the ten states included in the study, only four produced marine finfish aquaculture products. Maine produced 60,000 trout (30,000 juveniles, and 30,000 adults), Massachusetts produced 14,900 Silversides, 11,200 Sheepshead Minnows, and 5,290 Mummichog.

New York produced 22,000 pounds of Northern Blowfish and 34,000 pounds of Striped Bass. Maryland produced 290,000 Striped Bass (190,000 larvae and 100,000 live juveniles), 150 White Shad, and 50,000 shad-bass.

Of the ten species produced, only Striped Bass was produced in two different states (34,000 pounds processed and frozen in New York and 290,000 live juveniles and larvae in Maryland).

3.6 Employment and Manpower Needs

Present employment and future manpower needs are low. Presently, the five aquaculture businesses represented in this study employ only 11 people (7 laborers, 2 technologists, and 2 scientists). While the projected manpower need for the next two years is expected to double that figure (i.e. 22), most of that growth is expected by one entity (Sea Plantations, from 3 to 12) and most of that growth is in the laborer category. Bob Valenti of Multi-Aquaculture Systems indicated that, although he doesn't look for college graduates, they're easy to come by and work for laborer's wages as they come out of a Marine Sciences program at a nearby college.

EXHIBIT A

Compiled Data on Marine Finfish Aquaculture Entities in the Northeast

COMPILED DATA ON MARINE FINFISH AQUACULTURE ENTITIES IN THE NORTHEAST

STATE	PRODUCER	Species	PRODUCT Quantity	Form	Value
MAINE	1. Fox Island Fisheries, Inc.	Rainbow Trout	20,000 lbs	Live Adults	\$53,000
			10,000 lbs	Live Adults	\$26,500
	2. Sea Run, Inc.	Rainbow Trout	30,000	Live Juveniles	\$ 9,000
NEW HAMPSHIRE	None				
MASSACHUSETTS	1. Sea Plantations, Inc.	Silversides	12,000	Fingerlings	\$10,800
		"	1,500	Fingerlings	\$ 1,350
		"	1,000	Broodstock	0
		"	400	Broodstock	0
		Sheepshead	6,000	Fingerlings	\$ 5,400
		"	4,000	Fingerlings	\$ 3,600
		"	1,200	Fingerlings	\$ 1,580
	Mummichog	5,250	Fingerlings	\$ 3,675	
	Mummichog	40	Broodstock	0	
RHODE ISLAND	None				
CONNECTICUT	None				
NEW YORK	1. Multi-Aquaculture Systems	Striped Bass	34,000 lbs	Proc./Froz.	\$68,000
		Northern Blowfish	22,000 lbs	Proc./Froz.	\$22,000
NEW JERSEY	None				
DELAWARE	None				
MARYLAND	1. Cecil-Harford County Watermen's Association	Striped Bass	190,000	Larvae	---
		Striped Bass	100,000	Live Juveniles	\$27,000
		White Shad	150	Live Juveniles	---
		(Hybrid)Shad/Bass	50,000	Live fingerlings	----
VIRGINIA	NONE				

--- Data Not Available

COMPILED DATA ON MARINE FINFISH AQUACULTURE ENTITIES IN THE NORTHEAST

FACILITIES	ACREAGE	WATER RESOURCE	EMPLOYMENT*				MANPOWER NEEDS			
			L	TN	T	S	L	TN	T	S
6 - 15' dia. x 30' pens 2 - 30' dia. x 5' pools	1/4 acre	- Tidal 25 - 30 gal/min	3	0	0	0	4	0	0	0
4 - 12' dia. x 3' tanks		15 - 48 gal/min	1	0	0	0	0	1	1	0
24 - 200 gallon tubs 3 - 300 gallon raceways 20 - 40 gallon tanks 20 - 20 gallon tanks 12 - 200 gallon tanks 40 - 20 gallon tanks 6 - 40 gallon tanks 7 - 200 gallon tanks 4 - 20 gallon tanks		100 gal/min/tub 10 gal/min/raceway 1-3 gal/min/tank 1-3 gal/min/tank 10 gal/min/tub 1-3 gal/min/tub 1-3 gal/min/tub 10-15 gal/min/tub 1-3 gal/min/tub	0.5	0	1	0	8	0	4	0
			0.3	0	0.6	0				
			0.2	0	0.4	0				
			(1	0	2	0)				
11 - 26' x 4' x 3' pools 6 - 12' x 12' x 9' cages		700 gal/min	1	0	0	0	1	0	0	0
Northern										
11 - 26' x 4' x 3' pools 6 - 12' x 12' x 9' cages		700 gal/min	1	0	0	0	1	0	0	0
			(2	0	0	0)				
8 - 10' x 5' tanks 7 - 300' x 80' ponds 1 - 150' x 30' pond 1 - 300' x 80' pond		--- --- --- ---	0	0	0	0	0	0	0	0

* L = Laborer
 TN = Technician
 T = Technologist
 S = Scientist

--- Data Not Available

EXHIBIT B

Value of Marine Aquaculture Products by Species

For a listing of the value of the Marine Finfish Aquaculture products of species, see the table below.

Value of Marine Aquaculture Products
By Species

Species	Quantity	Form	Value
1. Trout	60,000	live juvenile & adults	\$ 88,000
2. Striped Bass	290,000	live larvae & juveniles	\$ 27,000
	34,000lbs.	processed, frozen	\$ 68,000
3. Northern Blowfish	22,000lbs.	processed, frozen	\$ 22,000
4. Silversides	14,900	live fingerlings, broodstock	\$ 12,150
5. Sheepshead	11,200	live fingerlings	\$ 10,080
6. Mummichog	5,290	live fingerlings, broodstock	\$ 3,675
7. White Shad	150	live juveniles	--
8. Shad-Bass Hybrid	50,000	live fingerlings	--
			<hr/>
			\$230,905

4.0 CONCLUSIONS

4.1 Major Conclusions

Aquaculture in general in the United States is apparently far behind countries such as Japan and China. In the United States 45-48 states currently have some type of aquaculture industry, with the southeastern states leading in overall capacity. This study of marine finfish aquaculture in the Northeast yielded the following conclusions:

- Most marine aquaculture in the Northeast is that of shellfish and other non-fish species. The basic reason for this is the mobility of finfish organisms, their higher susceptibility to diseases, and harsh weather conditions in the Northeast.
- The community of interest was much smaller than previously estimated by the National Marine Fisheries Service. The number of commercial entities presently engaging in aquaculture within the ten state area is less than five.
- Presently the marine finfish aquaculture industry in the Northeast is more in a stage of developing technology than of producing finfish products. The largest body of those interested in marine finfish aquaculture are grouped around the periphery of commercial endeavor. Even those who have taken the plunge into a commercial effort are first and foremost marine biologists and only secondarily entrepreneurs.
- There was an overall lack of marine finfish aquaculture production in 1979. Less than 90,000 pounds of finfish products were produced in 1979, and none of this was salmon.
- There was a wide diversification of methods for marketing and production exhibited by the five entities identified. Two produced finfish products for human consumption; one supplied specimens for research and bioassay purposes; one was a supplier of juveniles for other aquaculturists; and one engaged in a stocking process, the commercial aspects of which were akin to ranching.
- The total revenues from finfish aquaculture were less than \$231,000.

- The industry uses a part-time workforce and employs less than fifteen full-time personnel.

- Maine will most likely have the highest number of private aquaculture endeavors in the next five years. This is due to the perception that many aquaculturists have that Maine's regulations allow more aquaculture activity and that the state has industry development plans which are more receptive to aquaculture.

- Floating net cages, rearing silos, and other costly and elaborate facilities were all but absent from the Northeast marine finfish aquaculture scene.

One indication of an industry's growth and development is its ability to find new markets. This study identified one budding enterprise (Sea Plantations) which has found a healthy market-- the production of bioassay organisms. The combination of increasing legislation for water pollution controls/testing and the comparable short investment-to-income term for producing specimens makes this a very attractive approach to commercial aquaculture.

4.2 Future Trends and Indications

Marine finfish aquaculture activity in the Northeast portends good development (e.g. the re-establishing of the Atlantic salmon on the Connecticut River), but the future of the marine finfish aquaculture industry is difficult to foresee.

Judging by the amount of interest exhibited by marine biologists, it will burst into growth when certain technological keys are uncovered. Judging by the amount of dollars being expended, it will remain the pastime of the independent biologist's fancy.

The most critical missing element in the development of this industry is the proof of its profitability in the Northeast. Three critical factors affecting profitability are the risks involved in production, the term of investment and the return on investment.

The allure of a somewhat "open" market is overshadowed by the considerably high risks. Faulty valves and severe weather conditions have been known to cause the loss of all or a large portion of the aquaculturist's stock--stock it has taken him/her months to bring to that point of development.

Indications are that the technology for substantially reducing these risks are already present in other regions (e.g. the Pacific Northwest) and in the shellfish aquaculture industry. For example, a New Hampshire company was able to protect its 34,000 lobster in an experimental facility from several oil spills by converting to a closed system when water conditions would have otherwise destroyed its stock. But the equipment requires the size of investment which small businesses cannot afford.

Larger companies, which would have the requisite capital, can be deterred by the fact that they would have to wait, on the average, one to three years before they could begin to harvest and appreciate some return on their investment.

A final deterrent is the fact that marine finfish products have not risen in market value as consistently as shellfish products have, and the per pound value of finfish products has remained below shellfish products. Consequently, the added difficulty of producing finfish products does not have a commensurate return as a private commercial venture.