NRAC **Fact Sheet No. 130-1992**

Northeastern Regional Aquiculture Center

University of Massachusetts
Dartmouth
North Dartmouth
Massachusetts 02747

Aquculture Species for the Northeast

Joe Buttner, SUNY College at Brockport
GeFlimlin, New Jersey Sea Grant Marine Advisory Service
Don Webster, Cooperative Extension Service, University of Maryland System

Introduction

Many aquatic animals and plants are cultured commercially in the northeastern United States, while others have been grown for research or demonstration. No one species is appropriate for all situations. Species cultured successfully in one area may prove impractical or unprofitable in another.

Information on species that are appropriate for your area may be obtained from your University Extension agents and specialists. These individuals can also identify contacts for permits and regulations which will apply to your proposed operation.

Species Cultured

Finfish, shellfish, and aquatic plants are cultured commercially and recreationally for food, bait, stocking, research, bioassay tests, ornamental markets, and as instructional aides. The following species have culture potential for the northeastern United States.

Fish and Freshwater Crustaceans

A. Cultured Commercially

1. Rainbow, brown, and brook trout *(Oncorhynchus mykiss, Salmo trutta,* and *Salvelinus fontinalis,* respectively) are cold water fish which require well oxygenated water below 65°F. They are cultured commercially in many northeastern states. Pennsylvania and New York are the leading producers in the region.

Most trout are grown in flow-through systems; although some culturists currently reuse their water and a few use cages or net pens, Rainbow trout are marketed for stocking and as food fish. Brown and brook trout are stocked for recreational fishing; some are also sold as food fish.

2. Atlantic salmon *(Salmo salar)* are native to the eastern United States and better suited to aquiculture conditions than their Pacific coast relatives. The Atlantic salmon has become an important aquaculture species. Most commercial aquiculture in the Northeast is located in New England, particularly Maine.

Atlantic salmon are released as smelts in streams to enhance natural populations and cultured in cages or net pens placed in areas with substantial flushing. Smelts may be produced in freshwater hatcheries or purchased.

3. Fathead minnows *(Pimephales promelas are the* most important live bait produced in the region. They are usually raised in ponds. Culture ponds are typically fertilized with a vegetable material such as soybean meal or wheat sorts which stimulates the growth of algae. The re-resultant plankton bloom is eaten by the fish. Some growers use a low protein, commercial fish feed. Potential markets exist for fathead minnows as bioassay and research animals.

4. Channel catfish *(Ictalurus punctatus) are the* most important fish currently cultured in the United States. Both fingerlings and feeds are commercially available. Most channel catfish are raised in the southern United States in ponds one-half to ten acres in size. Cage and net pen culture are also practiced. In an existing pond, cage culture represents one way for those considering fish farming to try their hand at fish culture with a minimal cash investment.

Catfish can survive a wide range of temperatures and will tolerate brackish water. Commercial culture in the Northeast may be limited to the mid-Atlantic region because catfish grow best above 80°F. Throughout much of the Northeast the culture season is too short for commercial success.

5. Striped bass *(Morone saxatilis)* and its hybrids *(M. saxatilis x M.* sp.) have recently been cultured commercially. They are raised as striped bass or, more commonly, hybridized with other fish in the genus *Morone* such

as the white bass (M. chrysops), white perch (M. *americana),* or yellow bass (M. *mississippiensis). The* most commonly cultured fish are the female striped bass x male white bass hybrid (also known as the Palmetto Bass) and the reciprocal cross, female white bass x male striped bass (also known as the Sunshine Bass). Hybrids usually have a deeper body, shorter tail, and more sloped head than the striped bass.

Striped bass and its hybrids tolerate a wide range of temperatures and salinities, from fresh to salt water. They are a warm water species and grow best at 75-83° F. The length of the growing season is one factor that determines where they can be raised profitably.

Striped bass and its hybrids are cultured commercially in ponds, flow-through systems, and cages. Work is being done with culture in recirculating systems. Striped and hybrid bass culture are still in development and many questions require additional research.

6. Goldfish *(Carassius auratus)* and ornamentals are commonly cultured in small ponds or tanks. Because of their high value, recirculating systems have commercial potential. Outdoor culture units maybe covered in winter to protectt fish from the cold. Ornamentals are marketed live so surrival in transport is very important. The market is highly competitive and well established.

7. Several species of gamefish are cultured commercially in the northeastern United States. Included in this group are sunfish *(Lepomis* sp.), black bass *(Micropterus sp.), walleye (Stizostedion vitreum),* yellow perch *(Perca flvescens),* trout, and Alantic salmon. Culture methods vary considerably between species. In most cases the fish fanner purchases or hatches eggs and rears the fry to fingerling size. Fingerlings are then sold and stocked for recreation; some are rearedred in growout operations for market.

Fingerling sunfish, bass, and walleye are normally produced in ponds, while fingerling salmonids (trout and salmon) are produced in raceways or tanks. Culture procedures for some species such as bass, sunfish, trout, and salmon are better known than for others, such as walleye and yellow perch.

8. Crawfish Orconectes sp. and Procambarus sp.) are crustaceans; they represent a significant aquiculture industry with substantial growth potential in the Northeast. Most culture occurs in small, shallow ponds where the animals feed on natural vegetation that maybe supplemented with hay or other grain by-products. Though more correctly characterized as a shellfish, crawfish are grown in concert with minnows. In New York, for instance, crawfish are raised with fathead minnows and marketed as bait. Crawfish may be harvested with traps or a seine.

Procambarus are cultured in the mid-Atlantic region as a human food for local markets. Several species of *Orconectes are grown in the* Northeast. Some potential exists to market these as human food, particularly in Europe. *Orconectes* more closely resembles the traditional "noble crayfish" *(Astacus astacus)* and are more readily accepted by European consumers than the red swamp crawfish (F'. *clarkii)* and the white river crawfish *(P. zonangulus).*

B. Potential Commercial Species:

1. Tilapia *(Tilapia* sp.) have been cultured commercially in the United States. They are hardy, grow rapidly, and are acceptable, though not well known to consumers. *Tilapia* are tropical fish and require warm water to survive. If water temperatures fall below approximately 50-55° F, they will die. In this region, most *Tilapia* culture has occurred in ponds during summer or in heated units such as recirculating systems. Commercial culture in the Northeast has not been demonstrated on a sustained basis.

2. Golden shiners *(Notemigonus crysoleucas)* are the mainstay of the live-bait industry in Arkansas, although some are cultured commercially in the Northeast. Usually cultured in ponds, golden shiners are less hardy than the fathead minnow. In much of the Northeast, they require two growing seasons in order to reproduce. However, the golden shiner is more appealing to the angler and attains a larger size than the fathead minnow.

3. White suckers *(Catostomus commersoni)* are captured during their spring spawning run by some bait producers in the Northeast. Eggs are striped and incubated; hatched fry are reared in ponds. Suckers grow faster than golden shiners and in one growing season attain a size desired by bass and pike anglers. Market size and culture details require further research.

4. Bullhead *(Ameiurus* sp.) are a popular recreational and food fish in the Great Lakes basin. Experimental work indicates that black bullhead *(A. melas)* survives and grows well in ponds or cages. They do best in turbid waters. Farmers are growing and marketing bullhead in upstate New York, but the economics are inconclusive.

5. Carp *(Cyprinus carpio), an* important finfish in the world, has minimal but growing demand in the United States. Technology to culture carp in ponds is well known and the fish is suited to conditions throughout the Northeast. The principal obstacle is poor consumer acceptance. Carp could provide a dependable supply of fish for use in value-added products such as surimi and fish sausage.

6. Grass carp or White amur *(Ctenopharyngodon idella)* are occasionally stocked in ponds to control aquatic vegetation. The sterile triploid is most commonly used. The fish survives well and grows rapidly. Laws regulating its importation and use vary between states. Culturists should consult their Department of Natural Resources or its equivalent before stocking fish.

C. Experimental Species

1. Walleye are prized throughout the northern United States as a premier food fish. Fingerlings can be trained to accept pelleted food, but the procedure requires special skills. A few growers are producing walleyes in ponds and cages. Most are marketed as advanced finger-

lings, although some are sold as food fish. Growers in the northeastern United States could benefit from advances in walleye culture.

2. Yellow perch are extremely popular food fish in the northern United States. They are hardy, can be trained to accept pelleted feeds, and are grown in a variety of systems such as single-pass and recirculating systems. At present neither the technology nor the economics of their culture beyond fingerling stage have been adequately developed.

3. Recently, significant advances have occurred in the culture of sturgeon *(Acipenser sp.).* White sturgeon *(A. transmontanus)* are now being raised and sold by western producers. They are typically marketed at 8-12 pounds as food. Other potential markets include roe as caviar and small fingerlings for the aquarium trade. The culture technology has not yet been transferred to other geographic areas or to other sturgeon species.

4. Arctic char *(Salvelinus alpinus)* are an attractive, hardy, and rapid growing relative of the brook and lake trout. Arctic char tolerate cold temperatures and grow best below 50°F. They have been grown successfully in flow-through, cage and net pen systems that use marine or fresh water. Limited availability of fingerlings, regulatory problems, and lack of marketing information are major constraints.

5. Prawns and shrimp *(Macrobrachium sp.* and *Penaeus* sp.) are subtropical crustaceans that do not survive when water temperatures fall below approximately 55°F. Post larval *Macrobrachium* are grown in fresh water penaeids are cultured in brackish water. In the Northeast their culture potential is limited and the technology has not been adequately demonstrated. Those interested in the culture of these crustaceans should consider crawfish cul ture as a more likely alternative.

6. Several species of marine finish are~ being viewed as potential aquaculture candidates. Included in this group are halibut *(Pleuronectidae),* cod *(Gadidae),* turbot *(Pleuronectidae), and* flounder *(Bothidae* and ***Pleuronectidae).*** Many problems exist and culture techniques need further development before these fish can be considered for commercial aquacultyre.

Shellfish

A. Cultured Commercially

1. Northern quahog or Hard clams *(Mercenaria mercenaria) are* one of the most widely cultivated molluscs in the region. An established market exists and the product is ***recognized*** as a moderate to high priced item in the restaurant trade. The smallest, legally marketable clams bring the highest price. They are hardy and have been cultivated successfully throughout the region.

The best results have been achieved in coastal waters off Massachusetts and south to Florida. Adult clams are spawned under controlled conditions. Larvae are fed a specially prepared algal diet and raised in land-based upwellers, tanks, or raceways. The nursery phase can be on land or in the water.

Spat or seed are stocked on the bottom in coastal waters and grown to market size. Time to market size is extremely site specific. Typically it takes three to five years to attain this size, but with improved strains, a preferred site, and good management culture time can be reduced.

2. Eastern oysters *(Crassostrea virginica)* have been cultured in the Northeast for over 100 years and are grown commercially throughout the eastern United States, including the Gulf Coast. Techniques through the nursery phase are well-documented. Oyster seed or eyed larvae maybe purchased and *'set" on appropriate substrate. Oysters may be cultured directly on the bottom or in racks off the bottom. Management includes predator cent.ml, grading, and cleaning. Good water flow is essential. The greatest impediments to oyster culture are disease, restrictive laws, and regulations (Federal, State, local, etc.). Prospective culturists should thoroughly research sites that they are considering.

3. Blue mussels *(Mytilus edulis) are* increasingly pop ular. Through aggressive marketing in the early 1980s, the demand and retail price for mussels has improved steadily. Therer is no hatchery phase for commercial cultivation. Seed is collected from nature and replanted on the bottom at a density much lower than that found in natural beds, or placed in long mesh sleeves suspended in the water column. Most mussels are cultured in Maine.

B. Potential Commercial Species

1. Soft clams or Softshells *(Mya arenaria)* can be prooduced in large numbers by using hatchery techniques. Although the market is strong for steamed or fried product, little work has been done to develop effective growout methods. A relatively low price when compared to other bivalves has contributed to this neglect. Maine is currently culturing soft clams for restocking in public waters. Although used successfully in stock enhancement, the potential for commercial cultivation of soft clams is not considered promising at this time.

2. Bay scallops *(Argopecten irradians)* can be cul tured in the hatchery or obtained from the wild. However, relatively little attention has been directed to their culture. The scallop can move, so containing them is a challenge. Lantern nets have been used to culture scallops in the Orient, but similar efforts in the United States have proven too labor intensive for commercial success. Markets exist for a half-shell product in upscale restaurants, although the demand currently appears small. Prospective culturists should carefully assess the management and economics of scallop culture before proceeding.

3. Blue crabs *(Callinectes sapidus)* for steaming have long been popular in the marketplace. Their abundance in coastal waters south of Long Island provides sufficient numbers to meet market demand and reduces the need for culture. However, a market exists for "soft shell" crabs

which occur immediately after a molt and are considered a delicacy. Crabs with body marks indicating an imminent molt are collected from nature and held in shallow tanks until they emerge from their shell. These shedding systems are fairly simple and the potential for commercial success is good, provided an adequate supply of high quality and reasonably priced crabs is available.

C. Experimental Species

1. Atlantic clams or Surfclams (Spisula *solidissimia)* are being cultured experimentally in Maine. Hatchery seed and hard clam growout technology are being used. The project is on-going and, at this time, it is unclear how or whether techniques can be applied commercially.

2. American lobster *(Homarus americanus)* are often regarded as animals with great potential for aquiculture because of their high price. Lobsters have been cultured only to a juvenile stage for release to nature. Public hatcheries are operated for enhancement stocking. Private attempts at culture are not recommended at this time.

References

Aquaculture Information Center, National Agricultural Library, Rm. 111, Beltsville, MD 20705. Several up-to-date bibliographies are available on the culture of different species. (free)

Acknowledgments

This work was supported by the Northeastern Regional Aquaculture Center through grants number 89-38500-4356 and 90-38500-5211 from the Cooperative State Research Service, U.S. Department of Agriculture. Any opinions, findings, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the views of the U.S. Department of Agriculture.