NRAC Publication No. 218-2010

University of Maryland, 2113 Animal Science Building
College Park, Maryland 20742-2317
Telephone: 301-405-6085, FAX: 301-314-9412
E-mail: nrac@umd.edu Web: http://www.nrac.umd.edu

An Overview of Baitfish Aquaculture in the Northeast

Dennis Mcintosh, Delaware State University, Dover DE

Nationally, baitfish farming represents a relatively small portion of total aquaculture production, although the average sales per farm tend to be higher for baitfish growers than some other sectors of the industry. Food fish and molluskan shellfish farms dominate the industry in terms of both farm numbers and overall value. However, Lazur *et al*. (2003) and others have concluded that "Bait production represents a major opportunity for small and medium-sized growers in the region." Production statistics from the 2005 Census of Aquaculture illuminate this point. According to the Census, there were 62 baitfish farms in the northeast region in 1998 and only 39 by 2005 (USDA-NASS 2006). The decrease is farm numbers is at first a bit misleading, and if that were the end of the story, would be discouraging. However, when one looks at the value of baitfish production in the Northeast during this same period, we see a 71% increase in farm gate sales between 1998 and 2005, with the value of baitfish sales increasing from $275,000 to $470,000 in the region, indicating that there is a strong and growing demand for aquacultured baits.

By all accounts, demand remains strong for baitfish in the Northeast. Even though baitfish aquaculture is currently limited in the region, the popularity of recreational fishing along the Atlantic coast coupled with population growth in this area provides significant market potential. To date, this demand has been filled through a combination of wild caught and aquacultured fish from other regions, primarily the southeast, and limited local production. New York state has almost half (18 out of 39) of the farms in the region, followed by Pennsylvania, with eight farms (USDA-NASS 2006). Regionally, baitfish aquaculture is focused on two freshwater species, golden shiners (*Notemigonus crysoleucas*) and fathead minnows (*Pimephales promelas*) (Lazur *et al*. 2003), though there are several other freshwater and a few marine species currently being cultured in the region (Table 1).

Table 1. Some of the more common species of bait being cultured in the northeast region. All except bull minnows and spot are freshwater species used in freshwater fishing.

Common Name	Scientific Name
Bluntnose minnow	*Pimephales notatus*
Bull minnow	*Fundulus heteroclitus*
Common shiner	*Luxilus cornutus*
Crayfish	*Procambarus acutus acutus*, and various others
Fathead minnow	*Pimephales promelas*
Golden shiner	*Notemigonus crysoleucas*
Goldfish	*Carassius auratus*
Spot	*Leiostomus xanthurus*
White sucker	*Catostomus commersoni*

Although the majority of the regional bait producers are currently growing two primary species, golden shiners and fathead minnows (Lazur *et al*. 2003), opportunities exist in the mid-Atlantic to grow saltwater bait (Oesterng *et al*. 2005, Ozbay *et al*. 2007), such as the mummichog (*Fundulus heteroclitus*), white river crayfish (*Procambarus acutus acutus*), or spot (*Leiostomus xanthurus*). Daniels (2004) summarized research results describing the production potential of white river crayfish in the mid-Atlantic. Additionally, a survey of retail bait dealers in Delaware was conducted to obtain demand and value parameters for crayfish as saltwater bait (Ozbay *et al*. 2007).

While baitfish production in the Northeast is limited, two white papers published by the Northeastern Regional Aquaculture Center (Lazur *et al*. 2003; NARC 2003) identify numerous opportunities and challenges to baitfish culture in the region. Locally produced baitfish are thought to have advantages over both wild caught bait and baitfish transported from other states which may allow them to command a higher price in the market. For example, locally produced baitfish may be hardier, of better quality, and size graded for a specific market and/or season. Also, locally produced baitfish will not have the added stress of enduring long transport times. Furthermore, as restrictions on interstate shipping and

Golden Shiner - The golden shiner (*Notemigonus crysoleucas*), naturally have a wide distribution in the eastern United States, ranging from Mexico to Canada, and have been introduced west of the Rocky Mountains. The species grows quickly and is capable of reaching 4 inches in the first year (Lazur and Chapman 1996). Market size of golden shiners is from 2 to 6 inches. Traditionally, golden shiner production was conducted exclusively in ponds, though in recent years the industry has begun to adopt indoor hatchery technologies to increase production efficiency. Juveniles are generally stocked at a rate of 50,000 to 300,000 per acre for growout. This species grows best when water temperatures are between 65 °F and 80 °F. Image credit: Hugh Thomforde.

Fathead Minnow - Fathead minnows (*Pimephales promelas*) have a similarly wide distribution as golden shiners. Fathead minnows are smaller than golden shiners, with a market size of 1 to 3 inches. Pond production remains the most common production method for this species. Fish spawn when water temperatures reach 65 °F, and grow best in 70 °F water. Females lay between 200 and 500 eggs per spawn and can spawn repeatedly during a spawning season. Common pond stocking rates for growout are 50,000 to 300,000 juveniles per acre. Image credit: Hugh Thomforde.

Spot - Spot (*Leiostomus xanthurus*) are a popular marine baitfish species that has been identified as showing significant culture potential by Oesterling *et al*. (2004). This species is a member of the sciaenid family of fishes that also includes drum and croaker, and is common from Cape Cod to the Gulf of Mexico. It is a catadromous fish, meaning that it spawns offshore in high salinity water and uses lower salinity estuarine areas for nursery and juvenile habitat. This lifecycle makes their culture somewhat more difficult than other bait species. However, spot are highly fecund, with females laying between 30,000 and 60,000 eggs per spawn. Spot attain a size of up to 10 inches and are marketed as bait from 2 to 4 inches. Production of this species is currently limited to recirculating systems, though researchers are working on developing pond production techniques. Image credit: ©Virginia Institute of Marine Science.

wild capture intensify, additional market opportunities are likely to arise. Similarly, seasonal variations in supply and demand play a role in the baitfish market, and wild harvests are frequently impeded by weather and natural abundances.

Baitfish generally require less space for growout and offer a higher market price than foodfish crops such as catfish or hybrid striped bass (Lazur *et al*. 2003), making them amenable to production in smaller facilities. Therefore, baitfish aquaculture has the potential to provide an additional revenue source for existing farms on a small scale. Wholesale prices for foodfish range from $0.70–$2.60/pound, while bait is sold at $4.00–$10.00/pound depending on species, sizes and time of year (Lazur *et al*. 2003). Like any manufactured good, baitfish may be sold many times before it reaches the final consumer and consequently, the corresponding price increases with each sale. For example, golden shiners from Arkansas in 1999 were bringing $3.25/pound (farm gate), while the wholesale price was approximately $7.00/pound. It can be expected that retail prices were even higher (NRAC 2003). Small-scale, local producers may increase profit margins by shortening the supply chain between grower and end user by selling directly to retail outlets or fishermen.

When combined, these factors suggest that baitfish aquaculture has significant growth potential in the Northeast region. While culture methods and markets for freshwater bait species are well established, less is known about the culture of many marine bait species, few of which are currently produced commercially. Markets for marine baitfishes are strong, the product is familiar to anglers and supplies are currently limited by variable catches, seasonal availability and weather. Baitfish aquaculture has the potential to offer consistent, high-quality product to these existing markets.

To learn more about baitfish aquaculture, contact your local extension office.

Acknowledgments

This work was conducted with the support of the Northeastern Regional Aquaculture Center, through grant number 2006-38500-17605 from the National Institute of Food and Agriculture (NIFA), U.S. Department of Agriculture. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not necessarily reflect the view of the U.S. Department of Agriculture.

References

Daniels, W. H. 2004. Small-Scale Production of Crawfish for Either Bait or Food Markets. Pages 24-26 in P. Perschbacher, editor. *Small-Scale Aquaculture: Proceedings of a Special Session of Aquaculture America 2002*. Association of 1890 Research Directors, Inc.

Lazur, A. M. and F. A. Chapman. 1996. *Golden Shiner Culture: A Reference Profile*. University of Florida Cooperative Extension, FA-34, 4 pp.

Lazur, A., J. Goldman, K. J. Semmens and M. B. Timmons. 2003. *Aquaculture White Paper No. 2 - Land-Based Aquaculture Production Systems, Engineering and Technology: Opportunities and Needs. NRAC Publication No. 03-002*. Northeastern Regional Aquaculture Center, University of Massachusetts - Dartmouth, North Dartmoth, MA.

NRAC (Northeastern Regional Aquaculture Center). 2003. Aquaculture White Paper No. 3 - *Aquaculture Marketing Analysis and Opportunities in the Northeast Region*. NRAC Publication No. 03-003. Northeastern Regional Aquaculture Center, University of Massachusetts - Dartmouth, North Dartmoth, MA.

Oesterling, M. J., C. M. Adams and A. M. Lazur. 2004. *Marine Baitfish Culture: Workshop Report on Candidate Species & Considerations for Commercial Culture in the Southeast U.S*. Virginia Sea Grant, VSG-04-12, 27 pp.

Oesterling, M. J., D. G. Sennett and D. P. Kilduff. 2005. *Production of Spot as Live Bait for Recreational Angling*. Virginia Sea Grant, VSG-05-08, 17 pp.

Ozbay, G., C. Masten and C. Starke. 2007. Market demands for baitfish supplies and future aspects in Delaware. *World Aquaculture* 38(3): 40-42.

USDA-NASS (United States Department of Agriculture, National Agriculture Statistics Service). 2000. *1997 Census of Agriculture (AC97-SP-3)*, Volume 3, Special Studies Part 3 - 1998 Census of Aquaculture. U. S. Department of Agriculture, National Agriculture Statistics Service, Agricultural Statistics Board, Washington D. C.