

# Practical Channel Catfish Brood Stock-Selection and Management

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## Introduction

The economic impact of commercial aquaculture of channel catfish (*Ictalurus punctatus*) in the southern region exceeds \$2.5 billion. A variety of products originating from this culture is marketed in all 50 states as well as internationally. Employment within the primary, secondary and tertiary levels of the industry approaches 10,000 people. For the industry to remain economically competitive, ever-greater efficiencies at all production levels is required. Very early in the value chain is the efficient production of seed-stock, that is, the juveniles required by all production systems for grow-out animals. The selection of adult fish used to produce the seed are the focus of this brief. At least a portion of the success achieved to date by the catfish industry is due to improved genetics from selection from within the original stocks of wild fish. However, to build upon the success of the industry, quality brood fish must be continually selected, maintained in proper sex ratios, fed and conditioned for high quality egg development and ultimately the output of highly viable fry. Reliable production of industrial levels of fry and robust fingerlings will make certain that fingerling pricing will remain stable and will allow grow-out production levels the capability of rising.

## Selection

Channel catfish begin maturing sexually after their second summer of growth. Females generally begin maturing ahead of males by at least 6 months. While some females are mature during their third summer, most males are not. Typically the best selection for channel catfish is begun during winter or early spring after their third summer. Usually males and females are 3-6 pounds in size. Mature appearing fish are selected as potential brood fish within three months of their normal spawning window. Fish in the 4- to 6-pound range are preferred. If you are beginning a fingerling production operation the cheapest and most reliable source of potential brood fish is large food fish purchased from food fish producers. Secure potential stock from growers who know the genetic origin of their fish, who manage well and consistently supply high quality fish to market. Hatcheries are often reluctant to sell to potential competitors. If hatcheries offer brood fish for sale, they are usually overpriced, and they may be culls from their stock. So be cautious when purchasing stock from any source especially other hatcheries.

Individually check potential brood fish meticulously before buying any. Reject all fish with hemorrhages or sores, or fish in poor physical condition. Avoid fish or a possible source of fish having a known history of channel catfish virus disease (CCVD). Although CCVD is spread throughout the industry production areas by movement of all stages of stock, it's always best to avoid purchasing a known problem. Diagnostic services are available to help avoid CCVD.

Desirable sex ratios within brood stock are three females for each two males or two females to one male. Don't make the mistake of purchasing potential brood stock without individual selection. Even though channel catfish offspring are produced at a 50:50 ratio, larger un-graded food fish usually contain a significantly higher percentage of males since they grow somewhat faster than females. It's a good practice to determine the sex of each potential adult you buy. Because they understand the impact of inbreeding some successful operators secure males from one source and only females from another to insure that in a practical sense they practice avoidance of inbreeding.

Catfish strains with improved growth capabilities and increased disease resistance are sometimes available from fishery research facilities but, more often, commercial hatcheries secure potential stocks from grow-out operation or produce their own. Fingerlings or brood fish from selected strains may cost more than average food fish; but since one spawning female can produce 10,000 to 20,000 offspring per season, the price difference is not significant.

The prudent catfish fingerling producer should initiate his own selective breeding program. This is generally accomplished by choosing the fastest-growing fingerlings or food-size fish for future brood stock. If fingerlings are selected for further growth and potential selection for breeding, more fingerlings are retained than is necessary. This practice assures that an adequate number of the best females are selected because of the disproportionate growth rate of males. Sourcing potential broodstocks from other skilled fingerling producers especially in a mutually beneficial single sex "swap" arrangement can sometimes be helpful.

### **Determining Sex**

Secondary sex characteristics are often used in sex determination with mature adults. These characteristics include body shape and coloration. Males are usually larger and have broader heads than females. As spawning season approaches, males become leaner, develop even larger, muscular heads, and turn a dark bluish to black color.

Females' heads are narrower than their bodies when viewed from the top. As spawning season approaches, they develop soft, swollen bellies. Their color remains gray to olive.

### **Genital Examination**

Turn the fish belly up. Two or three openings are present. The opening nearest the head is the anus. The one nearest the tail is the genital opening.

**Males:** The genital opening is at the end of a fleshy, nipple-like structure. It is called the genital papilla. It becomes more visible, swollen and rigid as spawning season approaches. Selection of robust males is based on those with a thick well muscled body and head, dark coloration especially on the usually white underside and with a well-defined papilla. Males will have only two openings.

**Females:** The vent or genital area is oval and flat. There are two obvious openings separated by a third one covered by a small flap of skin. A slit or groove is located at the head end of the genital area. The urinary opening is located at the tail end of the genital area. The genital area becomes swollen and reddish in color as spawning time approaches. The swollen vent characteristic only indicates spawning season is approaching and is not a trait for selection. The soft swollen abdomen and general body shape are the best characters for selecting brood females.

With immature fish or fish not yet mature or in spawning condition, the following method will assist in determining sex of selected. Two people are required to rapid handling and determination of sex. Fish are firmly held in a belly-up position. Grasp the head with one hand and firmly clasp the tail with the other. With the fish's head just below your chest and the tail away from your body, gently arch the fish's belly upward. This causes the male papilla or the female genital slit to become distended and more visible. On fish with less pronounced genital development have your assistant slide a probe (or blunt pencil) over the genital area toward the tail. If the probe catches in the genital opening, the fish is female.

## **BROOD STOCK MANAGEMENT**

### **Nutrition**

Adequate nutrition is essential for successful spawning and viable fingerling operations. During warm weather (water temperature 70 to 85 degrees F), offer a complete diet feed containing 30 to 36 percent crude protein. Feed 1.5 percent of the fish's body weight per day. Spread the feed out as more dominant and larger males will out-compete females for feed. Some hatcheries will separate males and females after spawning season to avoid excessive competition.

At water temperatures between 50 and 70 degrees F, feed  $\frac{3}{4}$  -1 percent of the fish's body weight two to three days per week. At this water temperature, 28 to 30 percent crude protein may be used. Fish need more non-protein energy, such

as is found when fish meal is replaced by soybean meal and oilseed meals, at cooler temperatures. As water temperatures dip below 50 degrees, don't feed.

It's important to often watch the feeding behavior of your brood fish. In warm weather, offer all the fish will eat in 10 minutes. Add just a little more if the fish are still trying to feed when the 10 minutes are up. Feeding activity typically diminishes with the onset of spawning.

Some hatchery operators practice supplemental feeding with forage species such as fathead minnows, threadfin shad or Tilapia. Ponds are stocked in April with threadfin shad and with Tilapia or fathead minnows after spawning ceases. Tilapia offers the advantage of frequent reproduction through September and by late November they begin to die from low water temperature and are readily consumed by the catfish. The forage fish provides supplemental but essential nutrition not typically found in commercial feeds. Proper nutrition at this time is critical for egg development. Many researchers report that brood fish fed supplementally with forage fish the previous fall produced larger spawns with larger eggs and better fry survival than non-forage fed fish.

### **Stocking Densities**

The total weight of brood fish should never exceed 1000-1200 pounds per acre or 50 to 100 pairs. Growth of brood fish during the year must be considered when stocking, so stock 500 to 800 pounds per acre, not 1200. Healthy, well fed adult catfish should gain 50 percent of their weight from one season to the next. Although the goal is not to necessarily grow larger brood fish, they should be offered a well-balanced diet for good health and reproductive success.

### **When to Cull Brood Fish**

Brood fish need culling when they reach the 12-14 pound size. Larger adults for culling will be removed from the brood pool during fall or early winter. Some producers cull brood fish as small as 6 to 8 pounds. Some reasons for keeping or culling are as follows:

1. Large spawns are hard to manage if they are maintained whole. Egg masses larger than six inches in diameter or 2 inches thick should be gently pulled apart and incubated in pieces in hatchery baskets.
2. Because larger and older males can be aggressive and occasionally kill each other or can injure the female during courtship, it's most successful to stock older fish at less density than younger adults. Your youngest stock should be the most densely stocked.
3. Larger, older fish require larger spawning areas so be sure to put containers of appropriate size within spawning ponds

## **Tips for Successful Spawning**

Another consideration concerning successful spawning is pond size. Fish in smaller ponds (1 to 5 acres) demonstrate better spawning success than fish in larger ponds. This may be due to fewer male and female contacts or reluctance of the fish to come to the feed area in a larger pond. Adult catfish respond and spawn best in ponds with relatively low pH (<7.5). Higher pH associated often with more dense blooms usually are the least successful spawning ponds. Also, hot water limits successful spawning, so ponds with greater depth are more successful in younger spawners prone to spawn in late season.

An often overlooked but critical management element for successful spawning is moving brood fish into a previously drained, dried and recently filled pond prior to spawning. A far greater percentage of spawning females or egg masses will be harvested if you remember this simple tip. Very poor spawning success results when brood fish remain in the same pond for successive years.

## **Suggested Additional Reading**

Wellborn, T.L. 1988. Channel Catfish Life History and Biology. SRAC Publication 180. Mississippi State University.

Kelly, A.M. 2004. Channel Catfish Broodfish Management. SRAC Publication 1803. Mississippi State University.

Steeby, J. and J. Avery. 2005. Channel Catfish Broodfish and Hatchery Management. SRAC Publication 1803. Mississippi State University.

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