One Fish, Two Fish

Taking a closer look at MDWFP's fish hatchery system

By Christian Shirley

Have you ever wondered how fish make it to your favorite lake? Often, their journey starts at a fish hatchery, where fish are kept, spawned, and eventually transported to public fisheries.

So, what is a fish hatchery?

By appearance, a hatchery looks similar to catfish farms seen throughout Mississippi. However, the hatcheries operated by Mississippi Department of Wildlife, Fisheries, and Parks (MDWFP) do not produce fish for food, but rather to be stocked in our public waters. The hatchery staff maintains the facilities, collects broodstock, spawns fish, rears and raises juvenile fish, transports, and stocks the fish.

MDWFP operates two hatcheries to produce a variety of freshwater species found throughout the state: the North Mississippi Fish Hatchery (NMFH) in Enid and Turcotte Fish Hatchery (TFH) in Canton. The NMFH produces Northern largemouth bass, Gulf Coast walleye, bluegill, koi, and various minnow species, along with threadfin and gizzard shad. The Turcotte hatchery produces striped bass, white bass, hybrid striped bass, bluegill, redear sunfish, grass carp, threadfin and gizzard shad, as well as the Florida largemouth bass.

Now that we know the what and where of a hatchery, let us delve into the how. And to do that, we must examine three basic components: fish, water, and equipment.

Stocking fish at Holmes County State Park / Photo by Blythe Summers

Aerial view of the North Mississippi Fish Hatchery

Fish

Mississippi is home to a variety of fish, most of which can be found at our hatcheries. Fish in all life stages, from eggs to adults, can be found at the hatcheries throughout the year.

To produce fish for stocking, hatcheries are designed to spawn and raise fish. In nature, spawning is when a female fish releases her eggs to be fertilized by the male. In a hatchery, this is accomplished in two ways: extensive spawning and intensive spawning. While both techniques share the same goal, they differ drastically in the way the goal is accomplished.

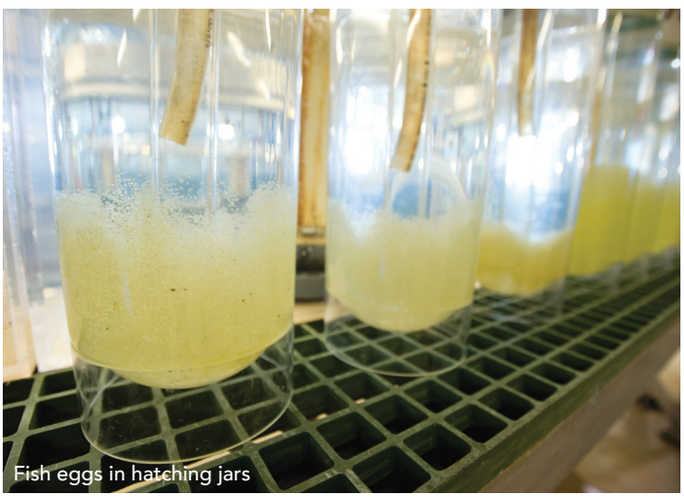
Extensive spawning is the practice of allowing sexually mature fish (broodstock or brood fish) to naturally spawn in the hatchery ponds. To accomplish this, hatchery personnel often place spawning substrates, such as rocks, sand, or trees, in the ponds to mimic a natural spawning habitat. Brood fish are placed into ponds, and fish will spawn unassisted during their naturally occurring spawning season. The fish are left in the ponds until harvest, at which time adult fish and the offspring are separated. This is typically done with largemouth bass, bluegill, redear sunfish, shiner species, and shad (recent work at NMFH indicates that crappie can be pond-spawned).

Intensive spawning is a more hands-on procedure and is utilized when fish will not or cannot spawn in the ponds. Crappie and walleye are normally spawned in this manner. Intensive spawning is accomplished by putting adult fish in tanks and manipulating water temperature and photoperiod to mimic their natural spawning conditions. Fish are then given a hormone dose to induce ovulation. Once fish are deemed ready, the eggs and sperm are manually stripped into a bowl. This is done by gently applying pressure to the abdomen, which releases eggs or sperm in the bowl. The eggs and sperm are then gently mixed using a turkey feather. Special care is taken to ensure the fragile eggs are in the best condition possible. Fertilized eggs are then placed in hatching jars, where they develop and eventually hatch.

Naturally, eggs are where a fish's life begins. Most eggs are collected between March and June. Just like fish, eggs vary in size, ranging from 0.9 mm to 4.0 mm. In intensive spawning, eggs are treated to prevent them from sticking together and smothering each other. Eggs are placed in incubation jars and are gently tumbled with a slow and steady water flow. Here they develop into larval fish, which is the next life stage.

Larval fish, which generally have two eyes, a tail, and a small yolk sac, are unable to swim because of undeveloped fins, so the yolk sac is consumed to pro-

AQUACULTURE
The hatching process is uniquely different for each species of fish.



Fish eggs in hatching jars

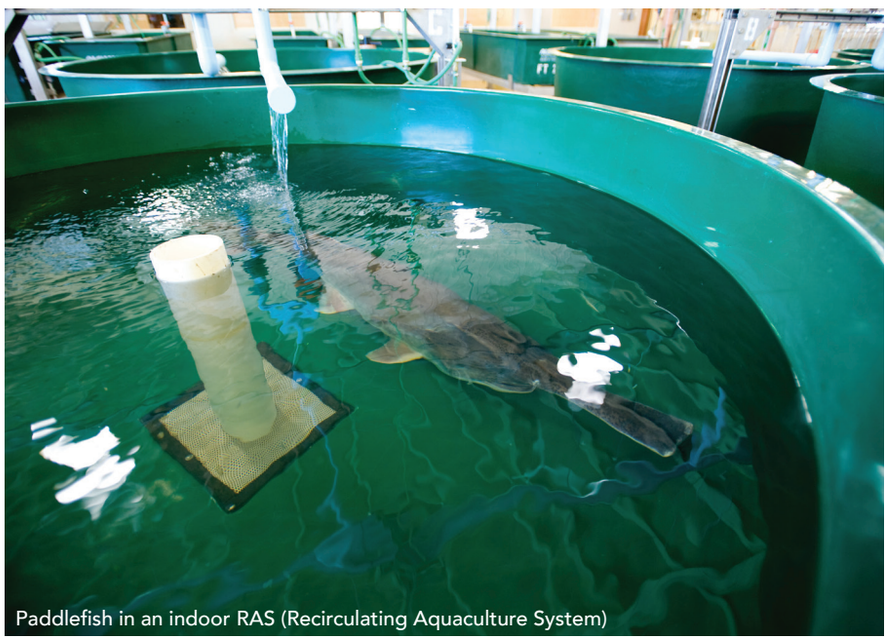
Fingerlings

Photo by Blythe Summers

vide energy for growth and development. Once the yolk sac is absorbed, the fish is called a fry, which is more active and searches for its own food. Fry, which are about a quarter-inch long, are transferred to production ponds. These ponds are fertilized to provide enough food so that fish can grow to fingerlings, their next size classification.

During the next several weeks, fish dramatically grow. Depending on the species and the available food, fish will reach the size of 1-2 inches in about 25-45 days. When fish reach the target size, they must be harvested before exhausting their food supplies. After harvest, fingerlings are weighed, counted, and loaded into live haul tanks to be stocked throughout the state. Tanks are filled with high-quality water and aerated to ensure fish reach their stocking location in good condition.

Adult fish are fish that have reached sexual maturity, which varies greatly from species to species. Bluegill often are considered adults in year 1, crappie in years 1-2, largemouth bass in years 2-4, and paddlefish in years 6-10. Some species, including redear sunfish, bluegill, and largemouth bass, can be seen as adults at MDWFP hatcheries throughout the year. These broodstock are used to help produce the fish needed to fulfill stocking requests from year to year.



Paddlefish in an indoor RAS (Recirculating Aquaculture System)

Water

Water is a necessity, but not just any water will do. Fish require high-quality water, and it is the primary responsibility of hatchery personnel to maintain that level of quality. The water used at the state hatcheries comes from two different sources: groundwater and surface water.

Groundwater is found beneath the earth's surface, often in saturated soil or rocks known as aquifers. To access this water, a well is drilled into the aquifer and then pumped to the surface. Groundwater, the main water source for both MDWFP hatcheries, is preferred because the quality and temperature remain consistent throughout the year. Depending on the depth of the well, groundwater temperatures can vary from 66-82 degrees Fahrenheit.

Surface water has its benefits, too. It can be used to provide water that already has established phytoplankton and zooplankton populations, which are food for fry of all species.

The most noticeable features of any hatchery are often the ponds that sprawl across the lands. MDWFP uses two types of ponds: lined ponds and earthen ponds. Both types are equipped with plumbing for filling the ponds and a kettle (a catch-basin at the base of the pond). While lined ponds and earthen ponds feature similar fish collection troughs or kettles, there are some differences between the two. By

completely covering the pond's bottom, the liner prevents water seepage in areas where soil content will not allow for water retention. Lined ponds, which limit the aquatic growth and terrestrial vegetation, also can be beneficial when harvesting fish, as they help the pond drain evenly into the kettle. Earthen ponds are used in areas where soil composition does allow for water retention. It is normally easier to establish and maintain phytoplankton and zooplankton blooms in an earthen pond because of the naturally occurring microorganisms in the pond. The NMFH utilizes lined ponds, while TFH uses a combination of both.


Outdoor raceways

Tanks also are important water-holding structures found at hatcheries. Tanks, which at MDWFP's hatcheries are made of fiberglass or plastic, are broken into two groups: flow-through and recirculating. As the name infers, flow-through tanks allow water to flow through a series of sand filters and screens before entering the tank and exiting through a drain, maintaining a continuous flow of new water. Recirculation tanks utilize the same water continuously by pumping it back into the tank. Tanks can be used to hold smaller fish to determine accurate fish counts or larger fish in preparation for spawning.

Equipment

A variety of equipment measures water quality parameters, including dissolved oxygen, ammonia and nitrite levels, organics, and unwanted particles. Water-quality equipment includes bead and sand filters, UV sterilization lights, aerators, and meters to monitor these parameters. Bead and sand filters build a biofilm that helps remove unwanted pollutants and filter out larger solid waste. UV lights are extremely beneficial to maintaining water quality by sterilizing bacteria, fungus, viruses, and algae.

Dissolved oxygen levels are maintained through the use of aerators in ponds and by air stones via hoses in tanks. Meters that measure dissolved oxygen, salinity, ammonia, and other components are used daily to ensure quality water is being maintained.

Hatchery staff members work closely with MDWFP fisheries biologists to help maintain and preserve Mississippi's wonderful sportfish populations. In Mississippi's public waters, our mission is to maintain high water quality, produce healthy fish, meet stocking goals, and uphold facilities to provide ample opportunities for anglers.

Christian Shirley is an Assistant Hatchery Manager for MDWFP.


Kettle on a liner pond


Earthen pond at Turcotte