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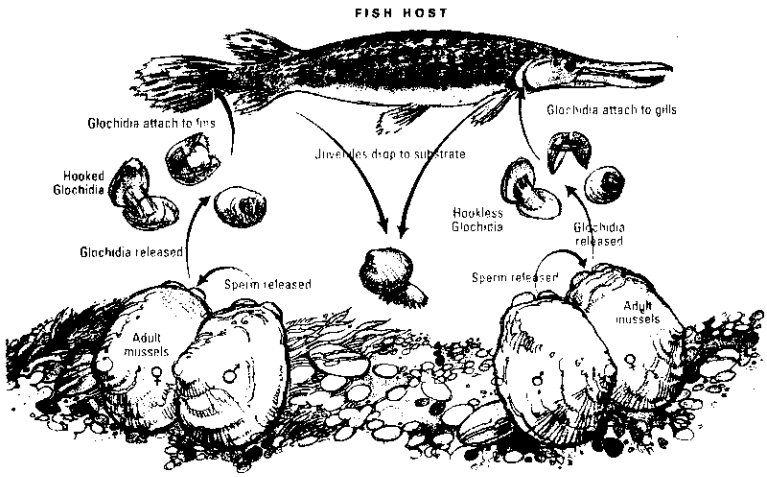
June 1, 2005 Volume 29, No. 6

MUSSELS, WORTH A LOT OF CLAMS

The southeastern United States, including Louisiana, has the biggest variety of freshwater clams, or mussels as they are more properly called, in the world. Even with some of them growing to 9 inches long and with whimsical names such as the pimpleback, monkeyface, pigtoe, elephant ear, washboard, wartyback, fatmucket, and heelsplitter, very few people are aware of them. Nearly 300 species live in the rivers of the southeast, and many are in trouble. In the U.S., 35 species have already gone extinct, and another 56 species are listed as federally endangered or threatened. Over 50 more species are waiting for review for listing. The major reasons for mussel decline have been the channelization, pollution, sedimentation, and damming of the rivers that they live in.



Like many other mollusks, freshwater mussels filter their food from the water around them. They have a most peculiar method of reproduction, however. Male mussels discharge their sperm into the water. Females siphon-up enough free-swimming sperm to fertilize their eggs, which they hold inside their shells until they hatch into larvae called glochidia. These glochidia cannot be discharged into the water to develop on their own. Rather, they must parasitize a fish, by either clamping onto its gills or fins, depending on the species.

The adult mussels attract fish close enough to parasitize by extending a specialized part of their body out of their shell as a lure. Some lures resemble moving worms and others look like small minnows. All are incredibly life-like. When a fish approaches to grab the worm or minnow lure, it gets a mouthful of glochidia discharged by the clam instead.

Once the glochidia latch onto fishes' gills or fins, they actively remove nutrients from the fish as a parasite. Any damage is minor, as some fish can carry as many as 5,000 glochidia with no apparent effect. Recent studies have shown that at least some fish species may actually benefit from the glochidia. It seems that when they attach to the gills of the fish, they stimulate an immune reaction which seems to guard against other infections. The parasitic stage for the mussel only lasts a few weeks, after which the glochidia have grown into juvenile mussels that can survive on their own. At this stage, they drop off of the fish, go to the bottom, and use their strong, muscular foot to dig into the bottom vertically.

Some mussels can live over 50 years, but all go through the parasitic stage. While some mussel species can use any fish species, others can only use a certain fish species as a host. If the fish disappears, for whatever reason, the mussels can no longer successfully reproduce, and will go extinct over time as the mature mussels die off.

All freshwater mussel shells have a shiny mother-of-pearl interior. This material, called "nacre", is the same material that pearls are made of. Nacre color varies from white, to pearly pink, purple, peach, or silver-gray, depending on the species of mussel. This nacre has been the basis of three different freshwater mussel fisheries in the U.S. over a 150-year period. The first fishery, producing what has been called "Pearl Fever", began in 1857 when a New Jersey shoemaker bit into a large pearl in some freshwater mussel meats that he was having for supper. After his find, mobs of people worked over the small creek that his mussels came from, producing $25,000 in pearls. Pearl fever spread to such places as Ohio, Texas, Vermont, Florida, and Tennessee.

Pearl Fever reached its peak in 1902 with two pearls found near Langsing, Iowa that were reportedly sold for $50,000 and $65,000. By that time, however, the number of large mussels of the right species to produce pearls were nearly fished out and pearling was declining.

The second fishery, the pearl button fishery began in 1891. Prior to this time, buttons, when they were used at all, were hand-carved of wood or made of very expensive ocean shell mother-of-pearl. In 1890, John Boepple, a German immigrant, with skills in making buttons, began experimenting with "river shell", the white-nacred shells of freshwater mussels. He quickly found that many freshwater mussel species had shells of good enough quality to have button "blanks" drilled from them. In that same year, U.S. Congress placed tariffs on many imports, including ocean shell mother-of-pearl.

Boepple began operating his river shell button factory on January 26, 1891 in Muscatine, Iowa. By 1897, there were three button factories in Muscatine alone. By the next year, 49 button factories were in operation in 13 states, with the industry centered in the midwestern states and the vast majority of mussels coming from the Mississippi River and its tributaries. Louisiana missed out on both the fishery and the button-making industry, even though a survey in 1914 reported large virgin beds of suitable mussels in the Tensas River.

At first, mussels were harvested by wading in shallow waters, but competition for these shallow-water mussels was fierce. In 1897, clammers began using a crowfoot bar, an iron bar dragged sideways on the bottom behind a boat, and rigged with many small trailing chains. When a chain crossed through the open shell of a mussel, the creature clamped on it and hung on until the crowfoot bar was retrieved.

Clamming for shells became a boom, larger than pearling ever was. Temporary clamming camps were set up on riverbanks, complete with rip-roaring riverfront saloons. Entire families followed the finding of new mussel beds. Some clammers defended their finds. One boat even mounted small cannon that the clammer used to defend his "claim". The fishery supported thousands of clammers and hundreds of millions of pounds of mussel shells were harvested during the 60 years that the fishery lasted.

The pearl button industry ended in the early-1950s, when cheaper, more durable plastic buttons took over the market. Readers over 55 years old can probably remember when most men's shirts had pearl buttons. Pearl buttons had a tendency to flake with time, or just break into two pieces, especially in wringer washing machines.

The last U.S. freshwater mussel fishery began about 1950, when it was discovered that if a round bead, called a nucleus, was cut from a freshwater mussel shell and inserted into an Asian pearl oyster, it would coat the nucleus with pearl nacre, producing a "cultured pearl". Again, a mini-bonanza fishery developed, but by this time most state fish and game agencies had stringent laws in place to prevent overfishing of these slow-growing creatures. Much of the harvest was done by hand by scuba divers who found, identified, and sized the animals by feel.

Louisiana did have commercial mussel shell production in this fishery, although its harvest regulations were not in place until 1992, near the end of the fishery. By 1995, the market for freshwater mussel shells to produce nuclei for cultured pearls declined to almost nothing, apparently due more to industry economics than to any other factor.

Source: *Save the Monkeyface.* Wendi Holtcamp. Texas Parks and Wildlife Magazine. Texas Parks and Wildlife Department. April 2005. *Illinois Mussel Men.* Bill Fritz. Outdoor Highlights. Illinois Department of Conservation. *Mussel Shell Game.* John Madson. Audubon. March 1995. *Mussel Resources of Louisiana.* Robert E. Coker. Report of the Conservation Commission of Louisiana, April 1st, 1914 to April 1st 1996. *The 'Queen of Gems' — Always Stunning and Now More Cultured than Ever.* Nigel Sitwell. Smithsonian. Vol. 15, No. 10, January 1985.

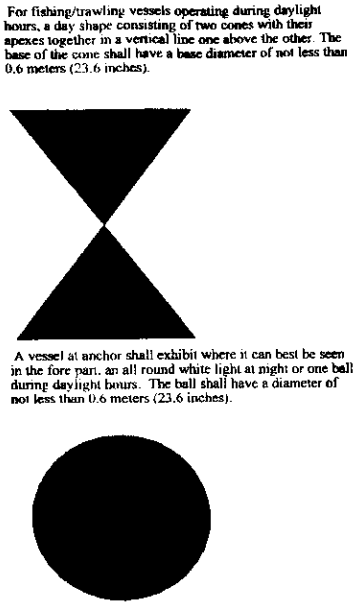
A. J. OVERFISHING RESCINDED

The National Marine Fisheries Service (NMFS) has withdrawn its announcement made two months ago to the Gulf of Mexico Fishery Management Council that greater amberjack were not only overfished as a stock, but that overfishing (harvesting over the

quota) was still going on. NMFS had said that the estimated 2003 harvest was 4.45 million pounds, well over the total allowable catch (TAC) of 2.91 million pounds. Such a notification would mean that the Council would have to come up with a plan to reduce harvests.

Now NMFS has re-examined the data and concluded that 2003 harvest was only 3.53 million pounds and that the estimated 2004 harvest was 3.08 million pounds, only a small amount over the quota. This means that amberjack regulations will stay stable until the results of the new stock assessment are released at the end of 2005. From the assessment, new catch quotas can be determined and the stock rebuilding plan modified if necessary.

SHOWING SHAPES



Recently, we have had calls from shrimpers questioning us about U.S. Coast Guard-required day shapes that should be displayed while trawling. The navigation rules book does indeed clearly show that vessels pulling trawls should display the day-shape on top at left. This day shape should be removed when the vessel is not actively trawling. At night, a vessel with trawls in the water should display two all-around lights, one over the other, with the top light being green and the bottom one white.

Another rule requires that an anchored vessel should display a round ball day shape, as shown at bottom left, during the day, and one all-around white light at night.

E.F.H. FOR SPECKS

In the Magnuson-Stevens Fishery Conservation and Management Act of 1996, Congress required the National Marine Fisheries Service and the eight regional fishery management councils to identify essential fish habitat (EFH) for all managed species. EFH is defined as "those waters and substrate necessary for spawning, breeding, feeding, or growth to maturity".

Identifying EFH sounds like a really neat idea. Everyone knows that without habitat no population of fish or wildlife can exist. As usual, though, the devil is in the details – deciding what habitat is essential to some part of a species' life cycle and what habitat is not.

In frustration, some scientists have turned to collecting a large number of samples spaced evenly over a grid of an area and where the species is most common,

that area is considered "more essential". Of course, different habitats are used at different stages in a species' life cycle. Even at the same stage of a species' life cycle, the areas that they most heavily use will change over time. Shrimp trawlers often note that areas inshore and offshore that once held shrimp no longer do, and areas once not worth trawling now hold shrimp. Because of currently used EFH definitions, most of the range that a species uses usually ends up being considered EFH.

In an attempt to refine the process further, some scientists have tried using generalized additive models. These are complex statistical equations that try to factor in a species' numbers as well as bottom type, depth, temperature, year, latitude and longitude, and error. The attempt here is to define EFH for a species based heavily on habitat characteristics.

No matter what method is used, determining EFH for a species is challenging. An effort to determine EFH for spotted seatrout, *Cynoscion nebulosus,* in Louisiana demonstrates the difficulties. Biologists at LSU sampled for the speckled trout in marsh edge, mud, and oyster shell habitats in the Barataria Bay system. Four sites ranging from low salinity in Little Lake, south to high salinity behind Grand Terre Island were sampled monthly for 13 months with gill nets. Temperature and oxygen levels were also recorded.

More and larger speckled trout were caught at temperatures 75°F and above. Average size was somewhat larger at the high-salinity site and smaller at the low-salinity site. They were also more abundant at the high and mid-salinity sites than at the low-salinity site.

There was no correlation between preferred habitat types at any certain salinity. Overall, speckled trout were more common at all salinities at the open-water mud and oyster shell sites than at the marsh edge. Food items in the trouts' stomachs were the same at all sites, indicating that either their prey species were widespread or that speckled trout travel a lot.

The biologists concluded that there was no clear evidence of any habitat being more essential than others for adult spotted seatrout. Other species besides speckled trout were also caught during sampling. The catch of all species combined was quite different between sites and habitats. This led the researchers to further conclude that a single species approach alone may not be enough for identifying EFH.

Sources: *A Community Approach to Identifying Essential Fish Habitat of Spotted Seatrout, Cynoscion nebulosus, in Coastal Louisiana.* Pamela S.D. MacRae and James H. Cowan. Louisiana Chapter of the American Fisheries Society, 26th Annual Meeting. February 3-4, 2005. *Defining Essential Fish Habitat: A Model-Based Approach.* Allison K. DeLong and Jeremy S. Collie. Rhode Island Sea Grant. 2004.

BANNING EXOTIC SPECIES

Exotic, alien or non-native fish and aquatic plant species have grabbed the attention of many people the last few years. Introductions of exotic species is high-profile throughout the world. For example, the Japanese government has launched an all-out war against an exotic fish species introduced from America.

Besides the fact that the species in question is non-native to Japanese waters, it is an aggressive predator fish that eats native food fish. The government is subsidizing gillnetters to remove the fish, and anglers are required to kill any that they land. The exotic species is the largemouth bass.

The largemouth bass has been in Japan for 81 years and is found in waters all over the country, including the moat around the Imperial Palace. But the fish has developed followers, as well as detractors — up to 3 million anglers.

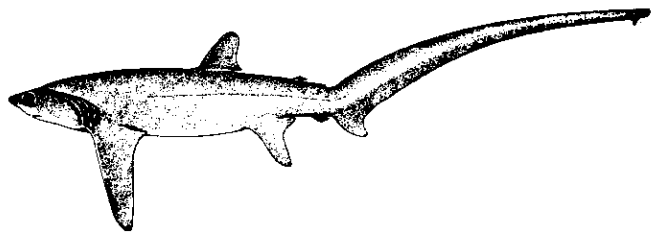
These anglers collected over a million signatures in an attempt to stop their government's policy of eradication. When that didn't work, they sued to overturn the ban on releasing captured largemouth bass. In dismissing the anglers' lawsuit, a district court judge ruled that while "enjoyment of fishing" may be a basic human right under Japan's constitution, that right did not include release of the fish.

Source: BoatUS Magazine. Boat Owners Association of the United States. Volume X. May 2005.

NIGHT TIME IS THE RIGHT TIME

The fact that in open ocean waters, small fishes and other sea creatures move nearer to the surface at night and deeper during the day is well-known. The layer of these animals that show this vertical movement can be so noticeable that they can be seen by echo-sounders and is called the "scattering layer". Following these small animals are the predators that feed on them.

In the early 2000s, scientists studied the vertical movement of one of these predator fish, the bigeye thresher shark, *Alopias superciliosus.* This shark and its two close relatives, the common thresher shark and the pelagic thresher shark make up the thresher shark family Alopiidae.



Thresher sharks of one or more species are found worldwide in tropical and sub-tropical waters. Both the common and the bigeye thresher shark are found in the Gulf of Mexico. Because of their habits, thresher sharks are seldom caught by sportfish-ermen, although they do turn up on longlines. Bigeye threshers are similar to common threshers, but have larger, upward-looking eyes, and grooves on top of the heads. All

thresher sharks have a very elongated upper lobe on their tail fin which they use to stun their prey.

The bigeye thresher is a little-studied shark. Tag-recapture studies have shown that they can move long distances. One bigeye thresher tagged off of New York was recaptured 1,719 miles away in the eastern Gulf of Mexico. When captured on longlines they are usually caught at night within 200 feet of the surface.

Scientists who have dissected bigeye thresher sharks have found that they have a rete mirable in the sinus near the eye. A rete mirable is a tangled-looking complex of blood vessels which serves as a heat exchanger that prevents the loss of heat created by working muscles to the water from the surface of the fishes' body.

Only a few fish, tunas, swordfish, billfish, and mackerel sharks, have been found to have the ability to keep their body temperature above the temperature of the surrounding waters. All of these fish have a rete mirable. Although the thresher shark's rete mirable is poorly developed, scientists speculate that it serves the same purpose as those in tunas, swordfish, billfish, and mackerel sharks. Indeed, one freshly caught bigeye thresher shark was found to have a deep-body temperature 39°F warmer than its surroundings. This rete mirable of the bigeye thresher may help protect the eyes and brain of the fish from large temperature changes when the fish migrates vertically on a daily basis.

For their study, the scientists captured two bigeye thresher sharks and tagged them with pop-up satellite archival tags. These tags recorded depth and temperature every few minutes and stored the data. They were set to release themselves from the fish after a period of time and float to the surface. There, they transmitted their data to a satellite.

One shark was captured by longline and tagged in the central Gulf of Mexico in 1,864 feet of water. The tag released itself from the shark 60 days later, 199 miles northeast of where tagged, 93 miles south of the Mississippi River delta in over 600 feet of water. The shark was 12 feet, 4 inches long and weighed 375 pounds.

A second shark, 13 feet, 2 inches long, and weighing 440 pounds, was caught by a recreational fisherman and tagged off the Kona coast of Hawaii. The tag released itself from the shark 27 days after tagging, 700 miles northeast near French Frigate Shoals. The tags were attached to the sharks near the base of their large dorsal fin.

Both sharks showed strong daily vertical movements. The Gulf of Mexico shark spent 84% of its time in the daytime below the thermocline (the dividing line between warmer waters nearer the surface and the cooler waters below), between 985 and 1,640 feet deep. At night it spent 80% of its time in the layer of mixing cooler-warmer water and above, between 33 and 330 feet. Temperatures in the waters where the shark spent the daytime were typically 43°F to 79°F. The coldest waters the shark dove to during the day were 39°F. Nighttime water temperatures were 68°F to 79°F.

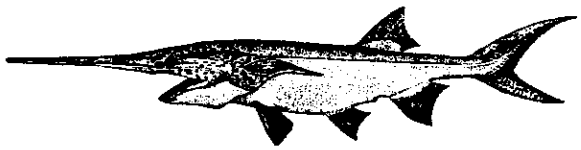
The Hawaii shark showed similar daily movements, most often found between 1,312 to 1,640 feet in the daytime and 33 to 164 feet at night. These daily movements exposed the shark to temperature differences of 41-61°F. While temperatures of bigeye thresher sharks' eyes and brains have not been directly measured to see if they are higher than those of the other parts of its body, the scientists said that the bigeye thresher's rete mirable is larger than that found in mackerel sharks, which have been proven to heat the eyes and brain of the fish. Since eyes and brains are very sensitive to temperature, warming them would allow the shark to hunt for food more efficiently in cold, deep water.

The bigeye thresher shark's large daily vertical movement is unusual for sharks When tracked by satellite or echo-sounding equipment, white, salmon, shortfin mako, blue, sixgill, tiger, Pacific angel, whale, and hammerhead sharks showed no such movements.

Source: *Diel Vertical Migration of the Bigeye Thresher Shark (Alopias superciliosus), a Species Possessing Orbital Retia Mirobila.* Kevin C. Weng and Barbara A. Block. Fishery Bulletin. Vol 102, No 1. January 2003

PADDLEFISH BIOLOGY

Louisiana Department of Wildlife and Fisheries biologist Bobby Reed has become something of a national expert in the biology of paddlefish. These primitive, freshwater fish with their lack of bones, huge mouth and large paddles on their snouts have more in common with sharks than boney fish. Their family tree has few branches, with their only close relative being another paddlefish species found in Chinese rivers.



Most of Reed's research on the species has been done in the rivers of southwestern Louisiana, such as the Mermentau. There, the spawning migration of male paddlefish from their summer habitat in natural marsh to the upstream reaches of Bayou Nez Pique begins in December/January. Males will move as much as 24 miles per day. Females migrate later and spawning occurs in February and March when water temperatures reach 55-59°F. On the spawning grounds, males outnumber females by 2 to 1 to over 5 to 1. This supports other research that indicates that females ony spawn once every 2-5 years and males spawn every year.

River flow levels seem to play a very important part in the spawning. Eleven radio-tagged fish gave up their spawning efforts in 1994 when the river didn't rise and water temperature rose to 65°F. Some males mature by age 4 and by age 7 all males are mature. Females can mature as early as age 7, with most of them maturing by age 10. Spawning females ranged from 18 to 33 pounds in weight. In fish hatcheries, females will produce between 38,400 and 226,800 eggs, with an average of 125,040 eggs per spawn.

In Louisiana, all take of paddlefish is prohibited. Populations of this unique fish seem to be increasing at this time.

Source: *The Life History of Paddlefish Polyodon spathula in the Mermentau River Basin, LA.* Bobby Reed. Silver Anniversary Meeting of the Louisiana Chapter of the American Fisheries Society. February 2004.

SEASONAL STRIPED BASS MOVEMENT

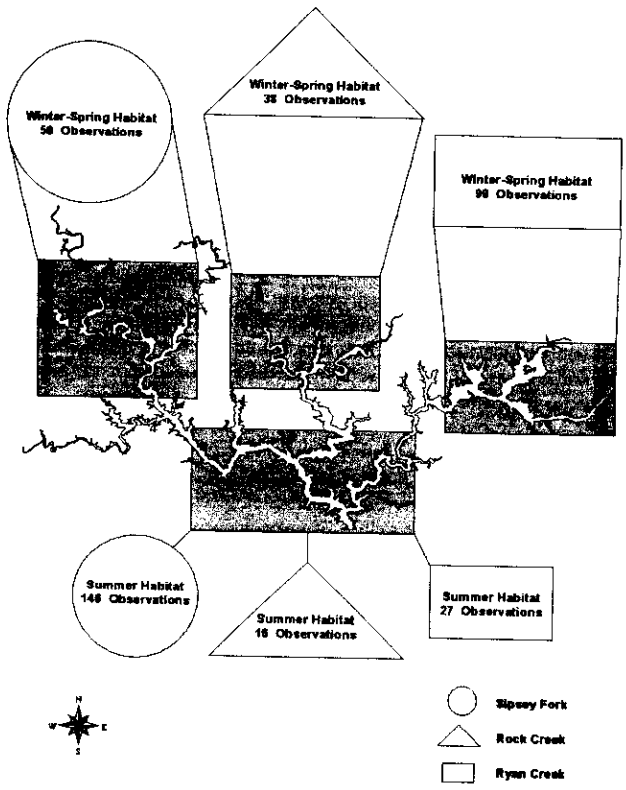
The striped bass, *Morone saxatilis,* is the largest member of the temperate bass family Percichthyidae. It is an anadromous species, meaning that it spends much of its life in coastal estuaries and salt water, but goes up freshwater rivers to spawn. Historically, the species was found on the Atlantic Coast, at least from New York south to central Florida. A separate strain of the same species was found on the Gulf Coast from the Florida panhandle west to the Lake Pontchartrain drainage in Louisiana.

Striped bass became an extremely popular inland reservoir gamefish when it was found how well they did in reservoirs in South Carolina. In Louisiana, the Department of Wildlife and Fisheries maintains a striped bass population in Toledo Bend Reservoir. Striped bass are cool-water fish and don't do well in many of the Louisiana's other lakes and reservoirs, which are mostly shallow. In some of these lakes, the Department stocks white bass/striped bass hybrids. Such hybrids were stocked in the following lakes in 2004: Cross, Claiborne, Cane River, Concordia, Bruin, St John, and Lafourche.

The fact that striped bass dislike warm water during the high summer temperatures of the South is well-known. Also known is that striped bass will move around in a reservoir looking for cooler water. Some research has indicated the Gulf-strain striped bass are better adapted to higher water temperatures and not as likely to die from them as Atlantic Coast-strain fish are.

Alabama biologists studied the movement patterns of Gulf-strain stripers stocked in Lewis Smith Reservoir to see if they were less likely than Atlantic-strain stripers to move to deeper, cooler waters in the summer. Lewis Smith Reservoir is a three-armed, 21,200-acre reservoir on the Black Warrior River in north Alabama.

Reservoir waters begin to layer (stratify), with warmer water on top and cooler water below, by May. The deepest part of the reservoir is 288 feet. The dividing line (thermocline) between the two layers is 23–82 feet deep. The lower layer begins to experience oxygen declines by late June in the upper part of the lake, and by mid-July in the lower lake. Stratification begins to break up by mid-October and temperature and oxygen equalize at all depths by December.



The biologists captured 22 striped bass and implanted ultrasonic transmitters inside their body cavities. Nine fish were from the Ryan Creek arm of the lake, 7 were from Rock Creek arm, and 6 from Sipsey Fork arm. The location of each fish was tracked every two weeks. One striper died shortly after being implanted and released and 6 of the transmitter-equipped fish were confirmed caught by fishermen during the 3 year study. Three of these transmitters were put in other striped bass. Seven other fish in the study may have been caught by anglers.

The striped bass in the study spent the cooler months of winter and spring mainly in the upper portions of the lake, and were widely distributed. During this period the fish tended to move around a lot. They began moving downstream toward the lower part of the reservoir when water temperatures in the upper 50 feet of water approached 77°F and dissolved oxygen concentrations went under 4 parts per million.

As the summer progressed and the water stratified, the stripers clustered in the lower part of reservoir, where water quality and oxygen were higher. When water temperatures reach 86°F and higher, the fish moved very little and when they did, it was usually less than 1 mile.

In October, when the water cooled and the layers broke up, the fish began to move back to their original home ranges in the upper reservoir. The fish showed a tendency to return to the area where they spent the previous winter and spring.

This study showed that Gulf-strain striped bass had the same movement patterns in southern reservoirs that Atlantic-strain stripers have.

Source: *Seasonal Distribution and Movement of Striped Bass in Lewis Smith Reservoir, Alabama.* Jerry L. Moss, Keith B. Floyd, J. Chris Greene, Jim M. Piper, Traci D. Berry, and Philip D. Ekema. Proceedings of the Fifty-Seventh Annual Conference. Southeastern Association of Fish and Wildlife Agencies. October 2003.

UNDERWATER OBSTRUCTION LOCATIONS

The Louisiana Fishermen's Gear Compensation Fund has asked that we print the coordinates of sites for which damage has been claimed in the last month. The coordinates are listed below:

Loran Sites

None

Lat. & Long. Sites

29 00.560	89 05.700	LAFOURCHE
29 15.392	90 05.652	LAFOURCHE

Lat. & Long. Sites

29 15.630	89 55.770	JEFFERSON
29 16.750	90 22.111	TERREBONNE
29 25.465	91 46.700	VERMILLION
29 28.667	90 08.504	LAFOURCHE
29 51.836	93.20.671	CAMERON

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THE GUMBO POT

Brown Gravy Oyster Spaghetti

This is another recipe from Larry Roussel, who has contributed to the Gumbo Pot twice before. Many of the oystermen who now work the waters of southeastern Louisiana have family histories from the Croatian part of the former country of Yugoslavia. Oyster spaghettis are a favorite dish of these hard-working oystermen. Unlike Croation oyster spaghettis, which are usually some shade of red or cream, this is a brown spaghetti. The sauce is good enough to sop up with bread.

¼	cup cooking oil
2	medium onions (chopped)
1	bell pepper (chopped)
2	sticks of celery (chopped)
½	cup flour
1	can Rotel tomatoes
1	small can of mushroom stems & pieces
1	can condensed mushroom soup
1	can condensed cream of celery soup
1	qt of shucked oysters with liquor
4	cups water
4	tbsp of Kitchen Bouquet
1	tsp of Creole seasoning
2	tsp salt
1	tsp black pepper
1	tsp garlic powder
1	heaping tbsp dried parsley flakes
1	pound spaghetti

Combine oil, onions, bell pepper and celery in a large pot. Sauté for 5 minutes. Add flour and stir into seasoning. Add tomatoes, mushrooms, mushroom soup, and celery soup. Strain oyster liquor from oysters and add oyster liquor to pot. Sauté for 5 minutes. Add water and bring sauce to a boil, then add Kitchen Bouquet. Add oysters and cook uncovered for 20-30 minutes. Prepare spaghetti while sauce cooks. Serves 8.

Sincerely,

Jerald Horst
Professor, Fisheries