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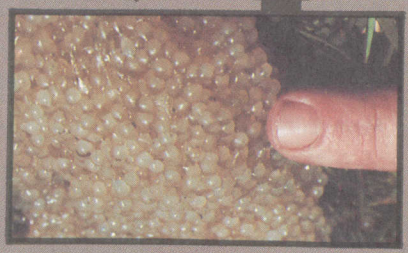

Ancestry and Breeding of Catfish in the United States

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CONTENTS

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ANCESTRY AND BREEDING OF CATFISH IN THE UNITED STATES

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INTRODUCTION

CATFISH have been important commercial and sport fish for several years. The first known spawning of channel catfish, *Ictalurus punctatus,* in captivity was reported in 1892 *(40).* Bullheads were cultured on a large scale in the late 1800's or early 1900's *(41).* The Kansas State Fish Hatchery at Pratt began propagating channel catfish as early as 1910.

Recently, catfish has become the major aquaculture species in the United States. Seven catfish species are propagated by government or private hatcheries. They are black bullhead, *I. melas,* blue catfish, *I. furcatus,* brown bullhead, *I. nebulosus,* channel catfish, flathead catfish, *Pylodictus olivaris,* white catfish, *I. catus,* and yellow bullhead, *I. natalis.* The channel catfish is the primary species propagated because it has superior culture traits.

The main objective of our survey was to document the origin, history, and breeding of various strains and stocks of catfish cultured at federal, state, university, and private hatcheries. Hopefully, this will enable determination of genetic diversity in current hatchery stocks. Information presented should indicate the relationships among various hatchery stocks. Another objective of this effort will be to document differences in performance of various stocks of catfish.

There are 315 entries in the description of stocks. This represents entries from 192 farms, 58 state and federal hatcheries, and 10 research institutions. Response by government and research agencies was nearly 100 percent. The 192 private hatcheries represent approximately 19 percent of all catfish farms; these hatcheries comprise 60 percent of the farms producing catfish fingerlings.

[1] Respectively, Assistant Professor and Professor of Fisheries and Allied Aquacultures.

DEFINITIONS

Crossbred catfish—Catfish produced by mating individuals from two different strains or lines of the same species (intraspecific). Crosses in this text are all listed female x male.

Domestic strain—Catfish grown at farms or hatcheries that are at least two breeding generations (F_2) removed from a wild strain of catfish.

Environment—The collective circumstances and conditions in which an individual or population lives.

F_1 generation—The first filial generation, or the first-generation progeny following the parental, or P_1 generation.

F_2 generation—The second filial generation, or the second-generation progeny following the parental, or P_1 generation.

Family selection—A selection program in which individuals are chosen for brood stock based on the performance of their family (full-sibs).

Full-sibs—Brothers and sisters.

Half-sibs—Half brothers and sisters (having one but not two common parents).

Heterosis (hybrid vigor)—Performance of hybrids or cross-breeds that exceeds that of both parent types.

Hybrid catfish—Catfish produced by mating individuals from two different species (interspecific).

Inbreeding—The production of offspring by parents more closely related than the average of the population, e.g. brother-sister, father-daughter, uncle-niece matings.

Karyotype—The sum of the specific characteristics of a cell nucleus including chromosome number, form, size, and points of spindle attachment.

Line—A breeding population produced by one or more of the following directed breeding programs: mass selection, family selection, or inbreeding.

Mass or individual selection—Selection of brood stock for the next generation which is based solely on the individual's performance.

Stock—A fish population living and acting as a breeding unit at a single location (hatchery, stream, lake).

Strain—A breeding population having a similar history and possessing unique characteristics.

Wild strain—A self-perpetuating strain in a natural environment (lake, reservoir, pond, or stream).

DESCRIPTIONS OF MAJOR CATFISH SPECIES

Channel Catfish

Channel catfish *(42,47)* are native to the Mississippi-Missouri river system southward into northeastern Mexico, but their range has been expanded through introductions to almost all parts of North America where there are suitable waters. Channel catfish were introduced into California and into the Potomac River in the late 1800's.

Channel catfish are the most commonly cultured catfish. This species grows faster to a harvest size of 1-2 pounds, and has more disease resistance than other species. Channel catfish become sexually dimorphic in size by 6 months of age *(7)*.

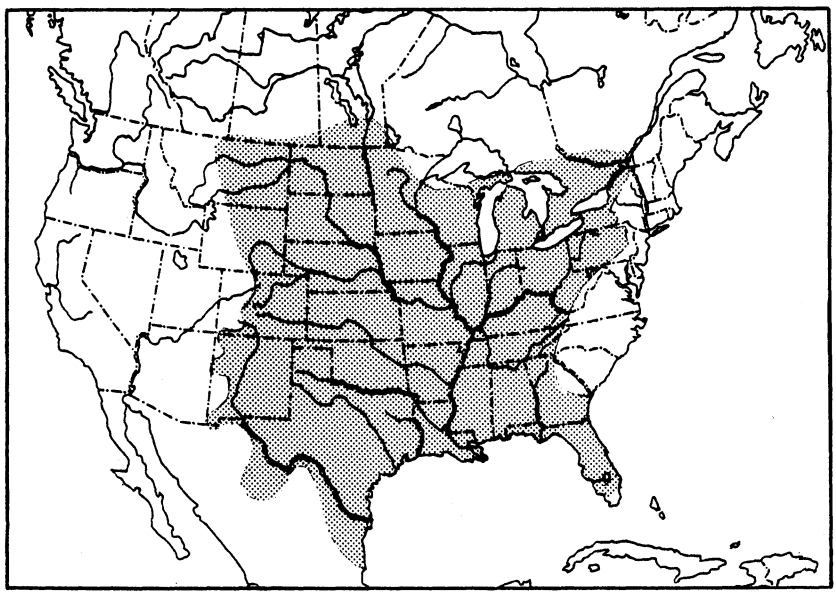

FIG. 1. Native distribution of channel catfish.

Blue Catfish

Blue catfish *(42,47)* are native to the main channels of the Mississippi River and its major tributaries from Minnesota and South Dakota southward into Mexico. Blue catfish have been introduced to California and to the Santee-Cooper River system, South Carolina.

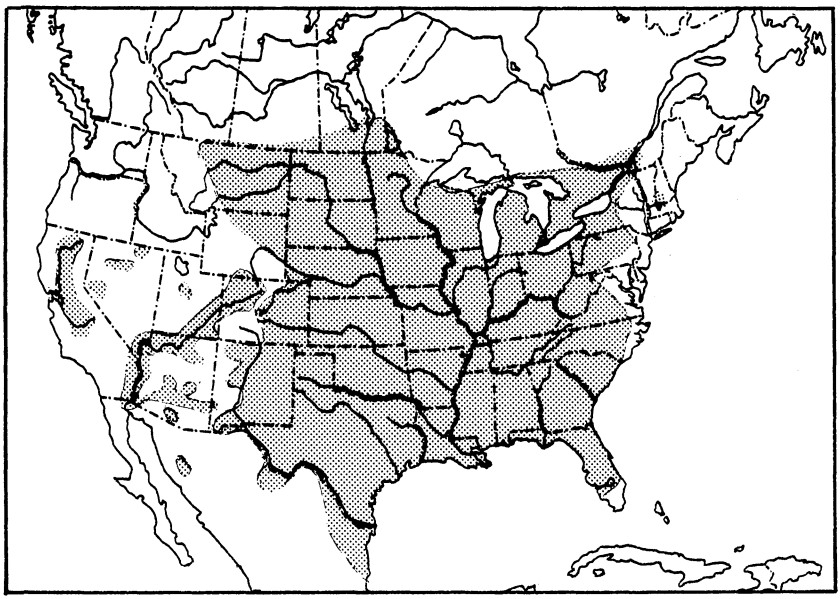

FIG. 2. Present distribution of channel catfish.

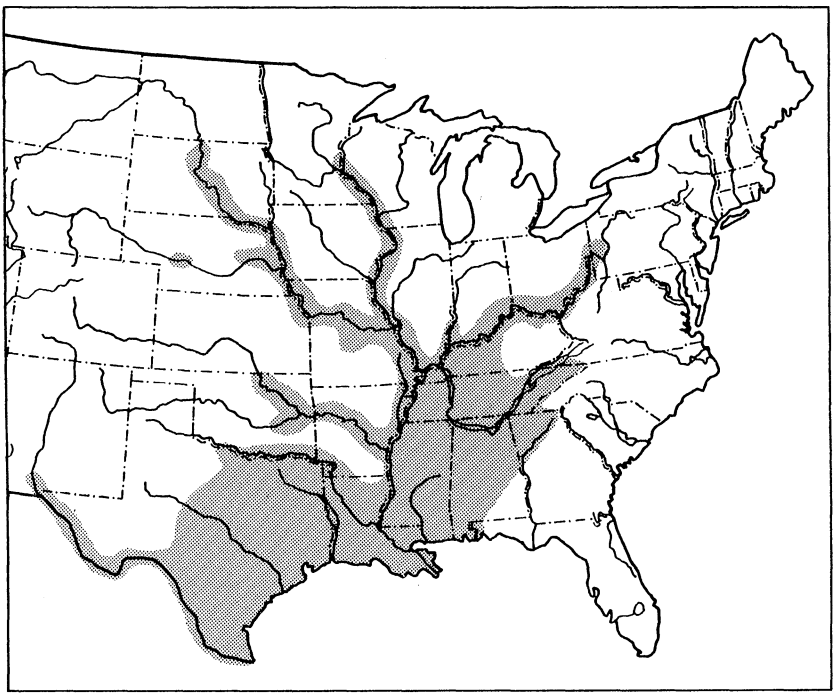

FIG. 3. Native distribution of blue catfish.

Blue catfish are the second most commonly cultured catfish. Positive attributes include relatively uniform growth and body conformation *(23)*, high dressing percentage, and high vulnerability to seining *(59)*. Detrimental culture traits of blue catfish include poor tolerance of low oxygen, poor disease resistance, and extremely sharp spines. They do not become sexually dimorphic in size before 3 years of age.

White Catfish

White catfish *(42,47)* are native to lower reaches of coastal streams from Delaware and New Jersey south into Florida, including a few streams entering the Gulf of Mexico. They were introduced to California in 1874.

White catfish grow rapidly as fingerlings, but begin maturing sexually at 1 year of age which slows their growth. They become sexually dimorphic in size by 6 months of age. White catfish tolerate low oxygen but have poor resistance to bacterial

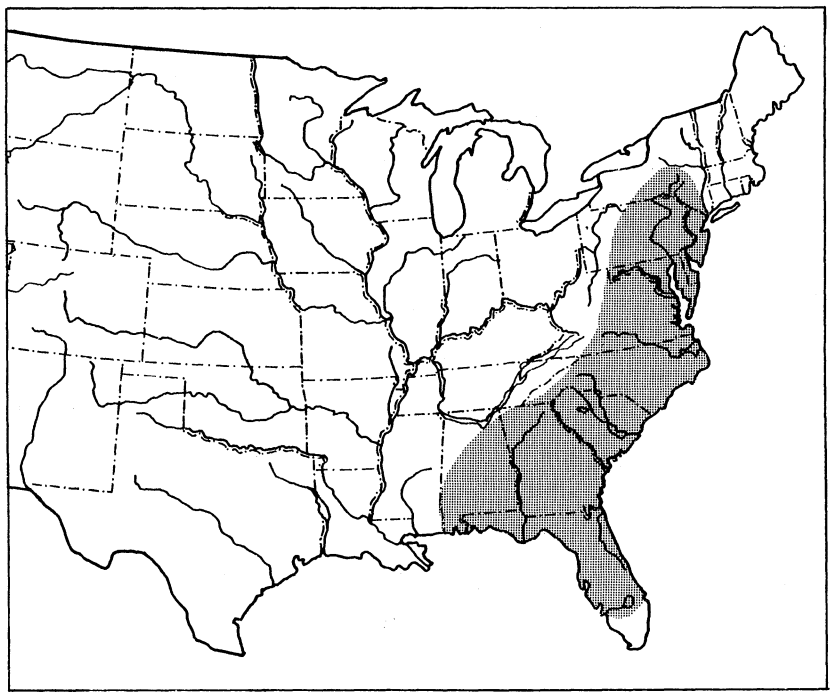

FIG. 4. Native distribution of white catfish.

diseases. They also have large heads, resulting in poor dressing percentage *(59)*. White catfish are more active, more difficult to catch with seines, less difficult to catch by angling, and grow faster than blue or channel catfish at 50-60°F.

Flathead Catfish

Flathead catfish *(42,47)* are native to large rivers of the Mississippi, Missouri, and Ohio basins, and south into Mexico. Recently, they were reported west of Point Pelee, Ontario.

Flathead catfish are cultured at several state and federal hatcheries for release as sport fish. They are difficult to culture because of their piscivorous and cannibalistic nature, and are difficult to seine.

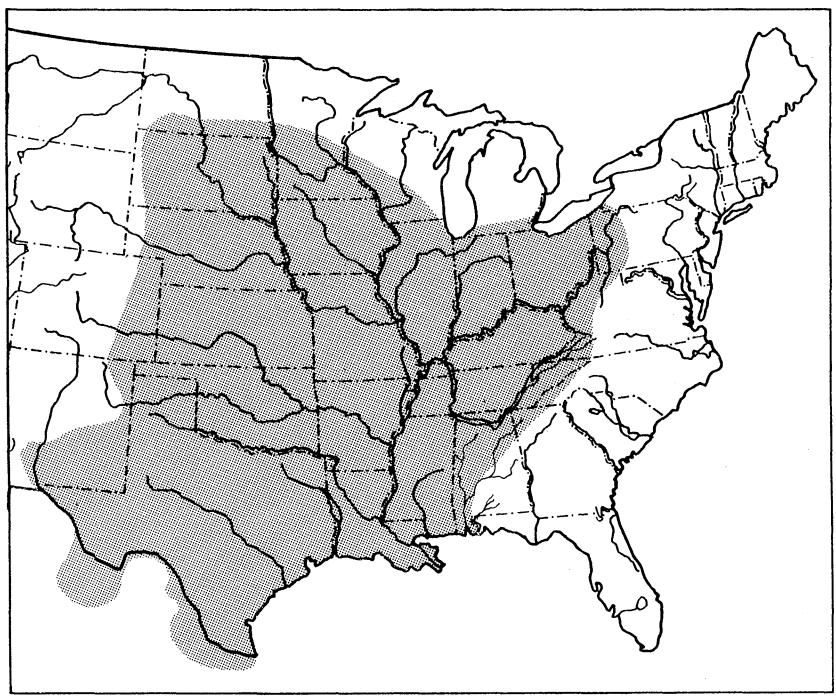

FIG. 5. Native distribution of flathead catfish.

Bullheads

There are three major species of bullheads—black, brown, and yellow—found in the United States.

Black bullheads *(42,47)* are native to much of eastern North America and to most of the Mississippi drainage system *(35)*. They have been successfully introduced into most of the continental United States.

Brown bullheads are native to the United States east of the Missouri River, as well as to southeastern Canada, the Dakotas, and Oklahoma.

Yellow bullheads are native to the United States east of the Rocky Mountains and south from the Great Lakes.

Bullheads grow slowly. They also have large heads and poor resistance to bacterial pathogens. Bullheads tolerate low oxygen levels and polluted environments. They mature at a relatively young age and have high reproductive rates.

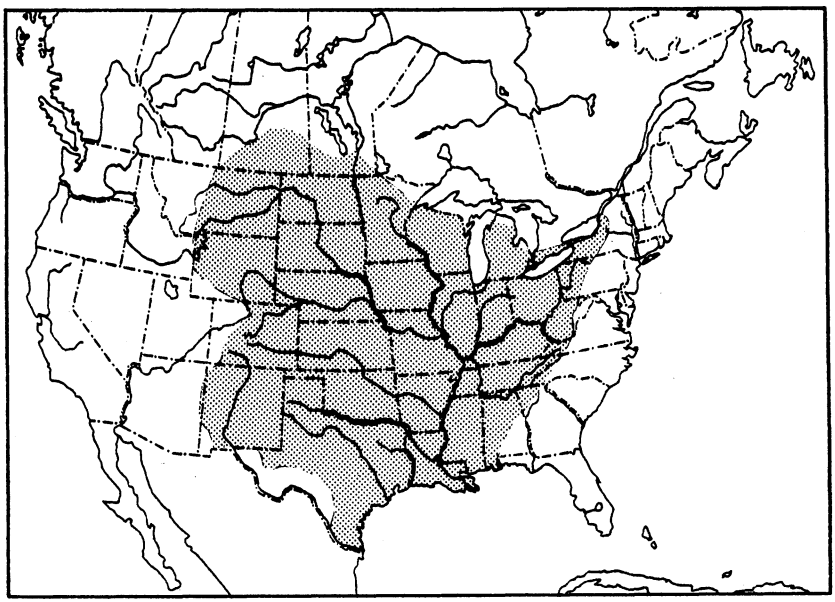

FIG. 6. Native distribution of black bullheads.

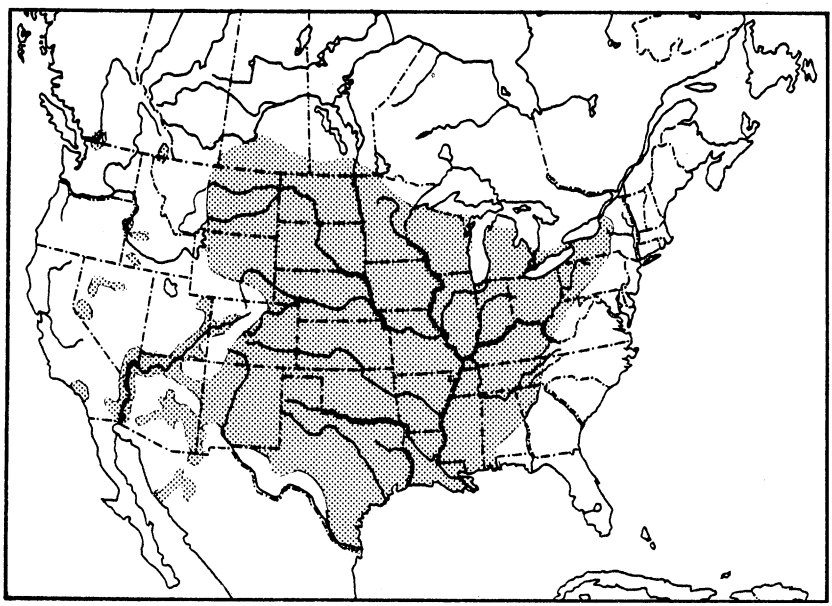

FIG. 7. Present distribution of black bullheads.

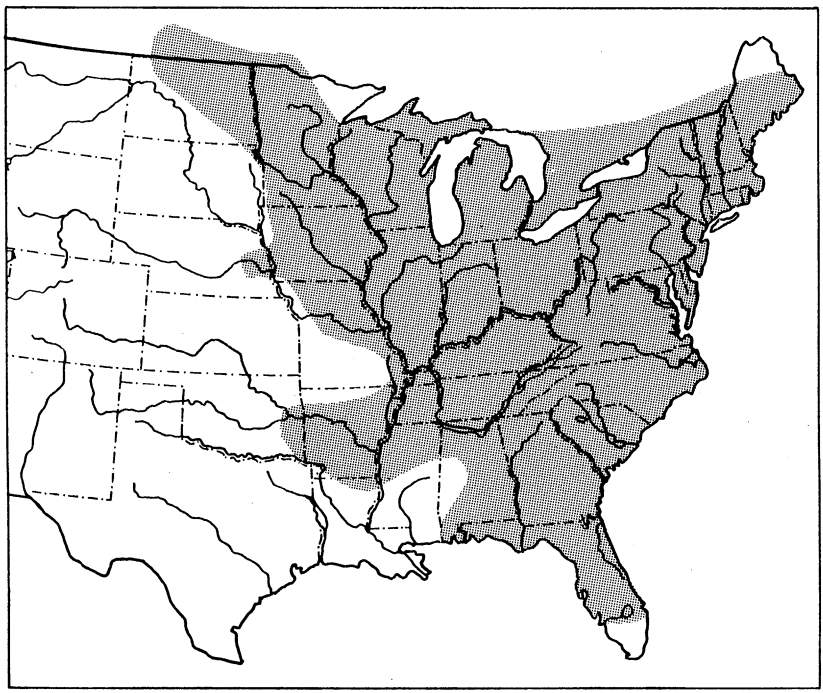

FIG. 8. Native distribution of brown bullheads.

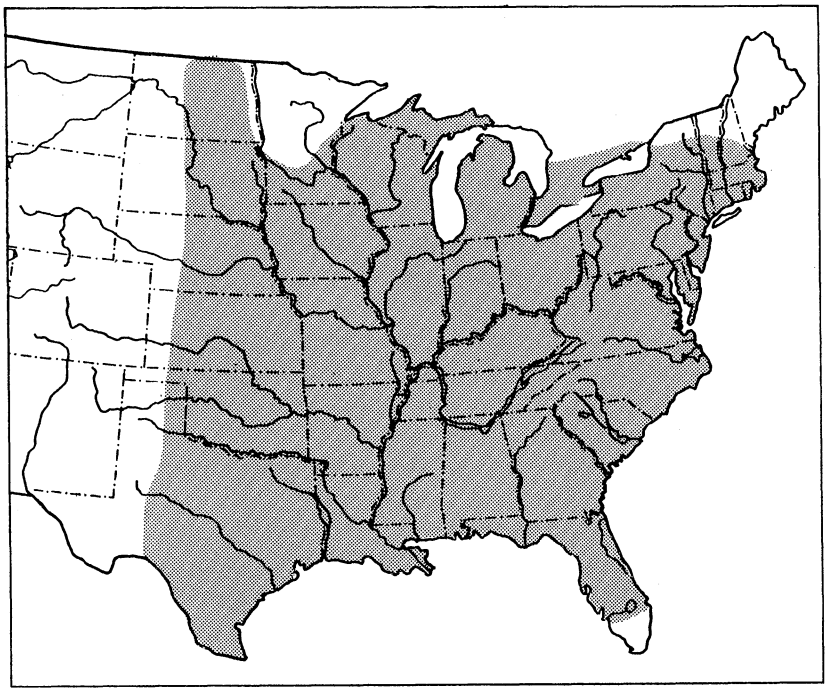

FIG. 9. Native distribution of yellow bullheads.

HISTORY OF PROPAGATED CATFISH

One of the major goals of this survey was to determine the ancestry of catfish cultured in the United States. Although it was found that channel catfish having ancestry from many river systems are currently propagated, the majority of them originated near the Denison Dam, Lake Texoma, Oklahoma. These fish were captured in 1949 by the Arkansas Game and Fish Commission in pools formed in the Red River behind Denison Dam after its construction. The fish were spawned in the Arkansas state hatchery system and were the basis of brood stock for some of the earliest catfish farms such as Leon Hill, Edgar Farmer, Anderson-Nelson, and War Eagle Minnow. These fish were also some of the founder stocks in federal hatcheries and research institutions in Alabama, Arkansas, Louisiana, and Mississippi. They were widely distributed in Arkansas and Mississippi via the Hill and Farmer operations. Probably one-half the Auburn University founder

stock and all of the Marion National Fish Hatchery and Stephens, Inc., founder stock came from Anderson-Nelson or War Eagle Minnow Farm. In turn, Auburn University, Marion National Fish Hatchery, or Stephens, Inc., provided stock for the majority of channel catfish farms in Alabama. Thus, the ancestry of stocks for the majority of catfish cultured in Alabama, Arkansas, Louisiana, and Mississippi, locations of 95 percent of the United States acreage devoted to catfish farming, can be traced to a single source of fish: Red River, Denison Dam, Oklahoma.

A number of other stocks have had major impact on the gene pools in Arkansas and Mississippi. Two major fingerling farms in Mississippi, Thompson-Anderson and Transfisheries, have widely distributed fish traced primarily to the Yazoo River and to a lesser degree Red River and Kansas. Several farmers have also obtained stock from the Rio Grande River, Texas, or from the Mississippi River, Mississippi. The first catfish farm in Mississippi (V. C. Hammett) used fish captured from the Mississippi River. This influx of "new blood" and

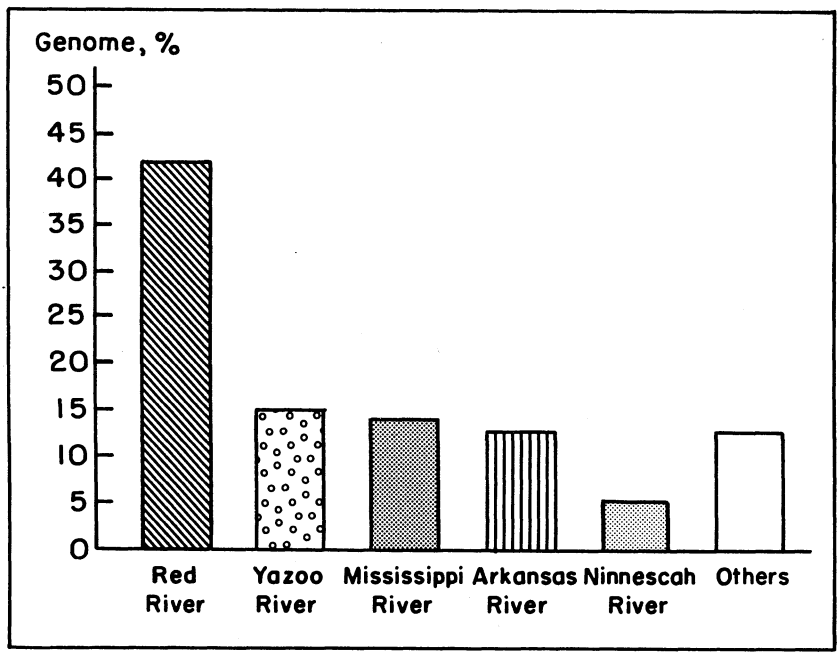

FIG. 10. Origin of channel catfish cultured in the United States.

the large brood populations used by commerical operations has probably minimized inbreeding in commercial operations.

Another widely distributed stock originated from the state and federal fish hatcheries in Kansas, Oklahoma, and Texas. These fish came from many rivers within each state and were exchanged among hatcheries. This stock is common in Kansas, Oklahoma, and Texas and is closely related to Alabama stocks via distribution by Auburn University.

The most widely distributed strain in commercial farms in California is from the Mississippi River, via Osage Fisheries, Missouri. Some contribution from Kansas exists also.

The majority of blue catfish cultured in the United States originated from the Alabama River, Alabama, Arkansas River, Arkansas, Mississippi River, Mississippi, and Red River, Oklahoma. Some stocks are also derived from rivers in Texas and Oklahoma. Most cultured bullheads originated in the Mississippi River. Hatcheries propagating flathead catfish utilize fish from local streams. Most stocks of white catfish were obtained in North Carolina or South Carolina; however, all white catfish in California originated from the Raritan River, New Jersey.

A map illustrating the streams and lakes from which cultured catfish originated follows.

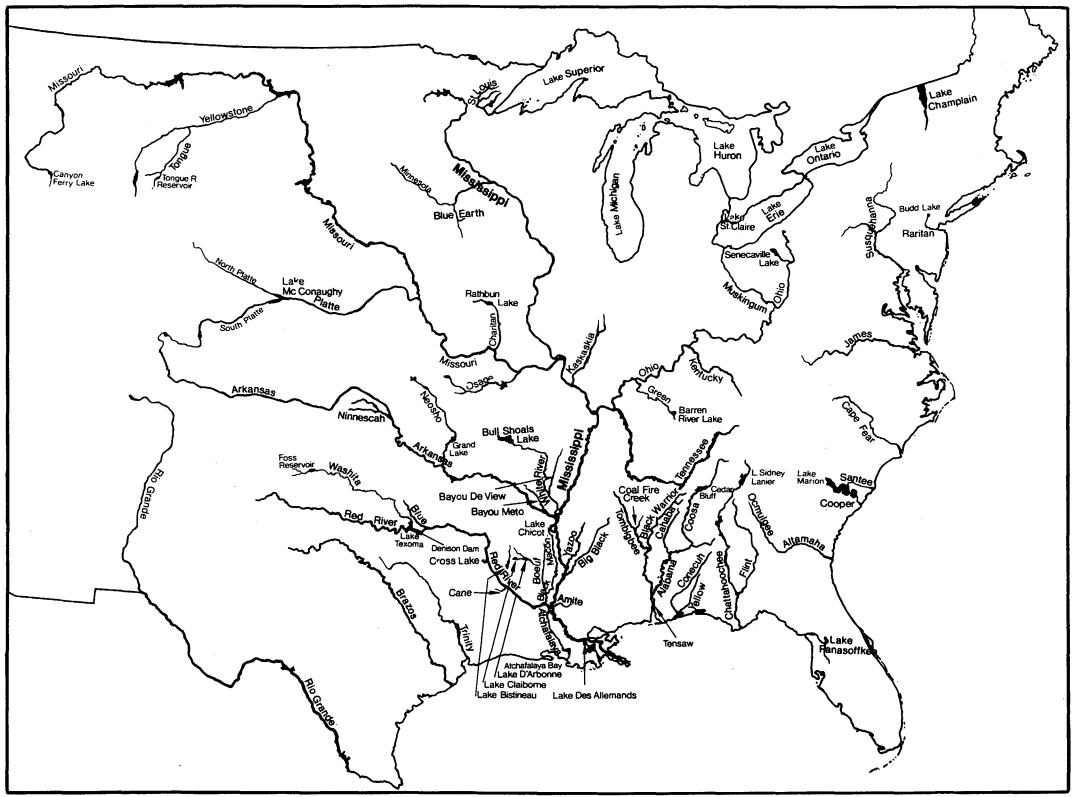

FIG. 11. Streams and lakes from which cultured stocks of catfish originated.

DESCRIPTIONS OF CATFISH STOCKS

Farm Stocks

Channel Catfish

Stock: *Abaloso*
Farm or Hatchery: Centro Acuicola 'Vincente Guerrero' in Abaloso, Tamaulipas, Mexico
Origin: Falcon Reservoir, Rio Grande River (Texas-Mexico) in 1976, Fish Breeders Cal in 1978, Yazoo in 1979, and Hill in 1981
Brood Population: 800 pairs
Breeding and Traits: Mass selection for body weight

Stock: *Acadiana*
Farm or Hatchery: Acadiana Fish Farm, Ltd., Branch, Louisiana
Origin: Bayou in the Atchafalaya River basin in 1970. F_2 were mixed with Nathan Cormie stock, Lake Charles, Louisiana, in 1977. Progeny from 1977 year class were selected as fingerlings and again as food fish. This stock was mixed with Edwards and reciprocal crossbreeds were made with Henderson.
Brood Population: 100; increased to 400 in 1981
Breeding and Traits: Random mating

Stock: *Adams*
Farm or Hatchery: Adams Farm, Andalusia, Alabama
Origin: Easterling in 1967
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Aqua Enterprise*
Farm or Hatchery: Aquaculture Enterprises, Seguin, Texas
Origin: This stock was procured from an Arkansas live hauler, Wade Finley, Lonoke, Arkansas, and is probably a commercial Arkansas stock.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Aquafarms*
Farm or Hatchery: Aquafarms, Leland, Mississippi
Origin: Commercial Mississippi stocks
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Arant*
Farm or Hatchery: Arant Farms, Sunflower, Mississippi
Origin: Dumas, Finch, and commercial Mississippi stocks
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Arizona*
Farm or Hatchery: Arizona Fish Growers, Camp Verde, Arizona
Origin: Fish Breeders Cal in 1978
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Arkansas*
Farm or Hatchery: Flickner Farm, Moundridge, Kansas (no longer propagated)
Origin: Arkansas River in 1978
Brood Population: Not applicable (NA)
Breeding and Traits: Random mating

Stock: *Atlantis*
Farm or Hatchery: Atlantis Aquatics, Inc., Zephyrillis, Florida
Origin: Lake Panasoffke in 1981
Brood Population: 1,500
Breeding and Traits: Random mating

Stock: *Bain*
Farm or Hatchery: Bain Fish Hatchery, Remlap, Alabama
Origin: Mississippi stocks, Pine Hill, Rainbow, Williams, Tombigbee River, Alabama, and Coal Fire Creek, Alabama
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Battle*
Farm or Hatchery: Paul Battle Farm, Mississippi
Origin: Hill, Yazoo, and King-Anderson Farm, Clarksdale, Mississippi, in 1969
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Bay*
Farm or Hatchery: Bay Farm, Lake Waccamaw, North Carolina
Origin: Mississippi commercial stock, Georgia commercial stock, and Cape Fear River, North Carolina

Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight

Stock: *Black*
Farm or Hatchery: Nail Catfish Farm, Kilmichael, Mississippi
Origin: Big Black River, Mississippi, in 1970
Brood Population: 500; brood are replaced every 5 years
Breeding and Traits: Mass selection for small heads and thick bodies

Stock: *Black Bottom (Dumas)*
Farm or Hatchery: Black Bottom Farms, Swifton, Mississippi
Origin: Dumas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Black Bottom (Finch)*
Farm or Hatchery: Black Bottom Farms, Swifton, Mississippi
Origin: Finch
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Black Warrior*
Farm or Hatchery: Jay's Angus Ranch, Greensboro, Alabama
Origin: Black Warrior River, Alabama
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Boyd*
Farm or Hatchery: Boyd Farm, Livingston, Alabama
Origin: Spree and commercial Alabama stocks
Brood Population: 20 pairs
Breeding and Traits: Random mating

Stock: *Bradshaw*
Farm or Hatchery: Bradshaw Farms, Arkansas
Origin: L & W, commerical Mississippi stock, and some albino catfish from Kentucky
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Bradshaw E*
Farm or Hatchery: Bradshaw Farms, Arkansas
Origin: Dumas and Stuttgart in the 1960's. Native fish from local Arkansas rivers were added to the stock.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Bulger*
Farm or Hatchery: Escambia Farms, Florida
Origin: Martin and a few individuals from the Yellow River, Alabama
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Burns*
Farm or Hatchery: Burns Farm, Jonesboro, Arkansas
Origin: Nelson-Anderson
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Butterfield*
Farm or Hatchery: Dan Butterfield Farm, Tuscaloosa, Alabama
Origin: Rainbow, Doughty, and Frog Ridge
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Byars*
Farm or Hatchery: Byars Fish Farm, Pine Apple, Alabama
Origin: Pearce in 1978
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Calaqua*
Farm or Hatchery: Calaqua Farms, California
Origin: Osage, Fishery, and California
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Canaday*
Farm or Hatchery: Canaday Farm, Corning, Arkansas
Origin: Kieffer
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Catfish*
Farm or Hatchery: Catfish Hatchery, Altha, Florida
Origin: Dover
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Catfish Acres*
Farm or Hatchery: Catfish Acres, Shawnee, Oklahoma

Origin: Commercial Arkansas stock (including Dumas) bought from live haulers in Arkansas, and Oklahoma rivers
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Chappell (Hill)*
Farm or Hatchery: Chappell Farm, Hopkins, South Carolina
Origin: Hill in 1981
Brood Population: 100
Breeding and Traits: Random mating

Stock: *Chappell (Kansas)*
Farm or Hatchery: Chappell Farm, Hopkins, South Carolina
Origin: Auburn University in 1978
Brood Population: 100
Breeding and Traits: Random mating

Stock: *Chappell (Marion)*
Farm or Hatchery: Chappell Farm, Hopkins, South Carolina
Origin: Marion in 1977
Brood Population: 100
Breeding and Traits: Random mating

Stock: *Chico*
Farm or Hatchery: Chico Farms, California
Origin: Osage
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Clayton*
Farm or Hatchery: Clayton Farm, Tupelo, Mississippi
Origin: Wayne Hare pond (18 fish) in Planterville, Mississippi. Miscellaneous stocks have been added
Brood Population: 500
Breeding and Traits: Random mating

Stock or Strain: *Clements*
Farm or Hatchery: Clements Farm, Sawyerville, Alabama
Origin: Montz
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Cloverleaf*
Farm or Hatchery: Cloverleaf Farm, Arkansas
Origin: Husky in 1978
Brood Population: Undetermined
Breeding and Traits: Random mating; some albinism

Stock: *Coleman*
Farm or Hatchery: Coleman Farm, Yazoo City, Mississippi
Origin: Dumas or Hill in the early 1970's. McDonald, Farm Fish, commercial Arkansas, and Arkansas River, Arkansas, stocks were added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Con Agra (Auburn)*
Farm or Hatchery: Con Agra Farms, Isola, Mississippi
Origin: Auburn in 1980
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Covington*
Farm or Hatchery: Covington Fish Hatchery, Daleville, Mississippi
Origin: Arkansas in 1966
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Cowarts*
Farm or Hatchery: Cowarts Fish Hatchery, Valdosta, Georgia (no longer propagated)
Origin: Dumas and Cletus Noland, Douglas, Georgia
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Crescent*
Farm or Hatchery: Crescent Valley Fish Farm, Walker County, Alabama
Origin: Walker County Lake (Marion) and commercial Alabama stocks
Brood Population: 350-500
Breeding and Traits: Random mating

Stock: *Crowson*
Farm or Hatchery: Crowson Farm, Baker, Florida
Origin: Bulger
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *D & B*
Farm or Hatchery: D & B Fish Farms, Crockett, Texas
Origin: Sooner (probably Dumas strain) in 1964. Fish were added from commercial Arkansas and Texas stocks.

Brood Population: 100
Breeding and Traits: Mass selection for body and dress-out weight, 1-2 percent selected under forage conditions; some albinism occurs

Stock: *Darty*
Farm or Hatchery: Darty Fish Farm, Greensboro, Alabama
Origin: Miller and Easterling in 1978-1980
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Day*
Farm or Hatchery: Day Farm, Stuttgart, Arkansas
Origin: Missouri, possibly Osage strain in 1964. A stock from a southern Louisiana farm was added in 1972. L & W was also added in the early 1970's.
Brood Population: 200
Breeding and Traits: Random mating

Stock: *Delta*
Farm or Hatchery: Con Agra Fish Hatchery, Tippo, Mississippi
Origin: Reed, Hill, and Con Agra farms at Tippo and Greenville, Mississippi, in 1974-1978
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Denton*
Farm or Hatchery: Denton Fish Farm, Harrisburg, Arkansas
Origin: Findley, Tennyson, Kieffer, and Digman
Brood Population: 300 pairs
Breeding and Traits: Mass selection for small heads

Stock: *Dewease*
Farm or Hatchery: Dewease Catfish Farm, Union, Mississippi
Origin: Sides in 1978
Brood Population: Undetermined, brood are replaced every 3-4 years
Breeding and Traits: Random mating

Stock: *Diamond*
Farm or Hatchery: Diamond Fisheries, Brooksville, Mississippi
Origin: Fishery in 1981
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Digman*
Farm or Hatchery: Digman Lakes, Walnut Ridge, Arkansas

Origin: Norris in 1962
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Doughty*
Farm or Hatchery: Doughty Farm, Reform, Alabama
Origin: Major contribution from Henderson and some fish from Auburn, Kansas, and Tombigbee River, Alabama
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Dover*
Farm or Hatchery: Dover Catfish Hatchery, Havana, Florida
Origin: Lindsey in 1967. Fish have subsequently been exchanged with several Mississippi hatcheries.
Brood Population: 2,000 pounds
Breeding and Traits: Mass selection for body weight

Stock: *Dumas*
Farm or Hatchery: Edgar-Kelley Farmer Hatchery, Dumas, Arkansas
Origin: Arkansas River, Dumas, Arkansas, in the mid-1950's. Nelson-Anderson was added.
Brood Population: Several hundred
Breeding and Traits: Random mating

Stock: *Dycus*
Farm or Hatchery: Dycus Farm, Greenville, Mississippi
Origin: Mississippi River
Brood Population: Undetermined; brood replacements come from both the Dycus farm-raised fish and from the Mississippi River
Breeding and Traits: Random mating

Stock: *Easterling*
Farm or Hatchery: Easterling Farm, Clio, Alabama
Origin: Auburn in 1964; 50 pairs of brood fish were obtained
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight

Stock: *Edwards*
Farm or Hatchery: Edwards Farm, Winnie, Texas
Origin: Dumas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Farm Fish*
Farm or Hatchery: Farm Fish, Louise, Mississippi
Origin: McDonald, Coleman, commercial Arkansas stocks, and Arkansas River, Arkansas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Farm-Fresh-G*
Farm or Hatchery: Farm-Fresh, Greensboro, Alabama
Origin: Commercial Alabama stock
Brood Population: Several hundred
Breeding and Traits: Random mating

Stock: *Farm-Fresh-M*
Farm or Hatchery: Farm-Fresh, Montrose, Arkansas
Origin: Hill, Dumas, and Finch in 1978-1980
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Farquhar*
Farm or Hatchery: Farquhar Farm, Huntsville, Alabama
Origin: Farm-Fresh-G
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Finch*
Farm or Hatchery: Finch Farm, Fortland, Arkansas
Origin: Boeuf River, Arkansas, and Rio Grande River, Texas, in 1967-68
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Findley*
Farm or Hatchery: Findley Farms, Gunnison, Mississippi
Origin: Boeuf River, Arkansas (Finch), Peaster, and Fratizi
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Fish Breeders Cal*
Farm or Hatchery: Fish Breeders of California, Niland, California
Origin: Farm near San Francisco in 1969. These fish were replaced with fish from Slim Holden's Farm (Wehau), Bakersfield, California. Fish from the California Department of Fish and Game, Elk Grove, California, were added in 1981.
Brood Population: Undetermined

Breeding and Traits: Mass selection on the basis of thick bodies and their reaction to CCV antibody test

Stock: *Fish Breeders Ida*
Farm or Hatchery: Fish Breeders of Idaho, Buhl, Idaho
Origin: California stock derived from Osage and Hartley in 1982. These fish have been supplemented with more Osage, Hartley, and commercial Mississippi stock.
Brood Population: 150 males and 300 females; 75 fish are replaced each year
Breeding and Traits: Mass selection for body weight and small heads; some albinism

Stock: *Fishery*
Farm or Hatchery: Fishery, Sacramento, California
Origin: Wehau. Stocks from other California farms have been added. Beginning in 1980 replacements were produced at Fishery.
Brood Population: 1,000; 1/3 replaced each year
Breeding and Traits: Mass selection for body weight, body conformation, and sex characters

Stock: *Flowers*
Farm or Hatchery: Flowers Fish Farms, Dexter, Missouri
Origin: Canaday, Husky and Lake Michigan
Brood Population: Several hundred
Breeding and Traits: Random mating; Canaday stock have a brown yellow color

Stock: *Fratizi*
Farm or Hatchery: Fratizi Farms, Indianola, Mississippi
Origin: Williamson, Transfisheries, and Tom Ellis Farm, Shaw Exchange, Mississippi
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Fresh Water*
Farm or Hatchery: Fresh Water Fisheries, Silver City, Mississippi
Origin: Williamson and James Doler, Calhoun City, Mississippi, in 1980
Brood Population: 4,000; brood replacement at 3-4 year intervals
Breeding and Traits: Random mating

Stock: *Frog Ridge*
Farm or Hatchery: Frog Ridge Catfish Farm, Ralph, Alabama
Origin: Doughty in 1977
Brood Population: Undetermined; generation interval is 4-5 years
Breeding and Traits: Mass selection for body weight

Stock: *Gant*
Farm or Hatchery: Gant and Sons Farm, Cleveland, Mississippi
Origin: Hammett D in 1980 and Findley in 1981
Brood Population: 300-400; brood stock $\geq$ 8 pounds are replaced
Breeding and Traits: Random mating

Stock: *Gills Gulch*
Farm or Hatchery: Gills Gulch Farm, Florida
Origin: Bulger in 1971. Eighty-three brooders were added from Prime-Line Inc., (Easterling) Andalusia, Alabama, in 1980.
Brood Population: 163
Breeding and Traits: Mass selection for thick bodies

Stock: *Goldkist*
Farm or Hatchery: Goldkist Farms, Quitman, Georgia, and Humphries, Mississippi (no longer propagated)
Origin: Commercial Mississippi stock, Yazoo, Gerard Harrison and Wesson Farms, Victoria, Arkansas, in 1968. Goldkist (Quitman) was heavily supplemented with Easterling in 1971.
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Granja*
Farm or Hatchery: Granja Acuicola Calderon, Guadalajara, Jalisco, Mexico
Origin: Abaloso
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Graves*
Farm or Hatchery: Graves Farm, Goodwater, Alabama
Origin: Doughty and Tifton
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Green*
Farm or Hatchery: Green Farm, Jackson, Alabama
Origin: Farquhar and Easterling

Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Grizzell*
Farm or Hatchery: Grizzell Farm, Monticello, Arkansas
Origin: Dumas in 1978
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Gro-Moore*
Farm or Hatchery: Gro-Moore Farms, Merigold, Mississippi
Origin: Reed
Brood Population: 460
Breeding and Traits: Mass selection for body conformation

Stock: *Gum Springs*
Farm or Hatchery: Gum Springs Hatchery, Stewart, Mississippi
Origin: Black in 1980
Brood Population: 1,200
Breeding and Traits: Random mating

Stock: *H & I*
Farm or Hatchery: H & I Farms, Isola, Mississippi
Origin: Hill Fish Farm, Isola, Mississippi, Digman, Nerren, Tuggle I or II, King Fish Farm, Inverness, Mississippi; and Hawkins. These fish were obtained from 1977-1982.
Brood Population: Undetermined
Breeding and Traits: Males are selected for musculature and females for total length

Stock: *Hammett D*
Farm or Hatchery: Dan Hammett Farm, Cleveland, Mississippi
Origin: Mississippi River in 1952. Many commercial Mississippi stocks have been added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Hammett H*
Farm or Hatchery: Henry Hammett Farm, Greenville, Mississippi
Origin: Hammett V, Dycus, and commercial Arkansas stock
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Hammett V*
Farm or Hatchery: V. C. Hammett Farm, Greenville, Mississippi

Origin: Mississippi River in 1950-51
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Harris*
Farm or Hatchery: Harris Fish Farm, Tuckerman, Arkansas
Origin: Tuggle II
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Hartley*
Farm or Hatchery: Hartley Farms, Kingman, Kansas
Origin: Ninnescah River, Kansas, in 1945; Krehbiel was added in 1984.
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight and stockiness

Stock: *Hawkins*
Farm or Hatchery: Hawkins Farm, Isola, Mississippi
Origin: Well-fed in 1973 and Tuggle I in 1981
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Henderson*
Farm or Hatchery: Rodney Henderson Farm, Yazoo City, Mississippi
Origin: Rio Grande and Yazoo in 1971
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Hendry*
Farm or Hatchery: Hendry Correctional Institute, Immokalee, Florida
Origin: Majority from Ken's. Seminole and stock from Glades Aquafarms, Homestead, Florida, have been added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Hill*
Farm or Hatchery: Leon Hill Farm, Lonoke, Arkansas
Origin: Lonoke (Red River only) and Battle. Norris was added in 1983.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Hill-I*
Farm or Hatchery: Hill Farms, Indianola, Mississippi
Origin: Reed
Brood Population: 2,000-3,000
Breeding and Traits: Random mating

Stock: *Hill-M*
Farm or Hatchery: M. P. Hill Farm, Jackson County, Alabama
Origin: Undetermined Mississippi stock in 1980
Brood Population: 55
Breeding and Traits: Mass selection for small heads and stocky bodies

Stock: *Hurricane*
Farm or Hatchery: Hurricane Hill Fish Farm, Ripley, Tennessee
Origin: Tennessee State Fish Hatchery System in 1967. Two commercial Arkansas stocks have been added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Husky*
Farm or Hatchery: Husky Farm, Strawberry, Arkansas
Origin: Burns
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *J & J*
Farm or Hatchery: J & J Fish Farm, Harviell, Missouri
Origin: Canaday in 1979; Digman in 1980
Brood Population: Undetermined
Breeding and Traits: Random mating; some of the brood fish (Canaday) had black splotches that were inherited by their young

Stock: *Jolliff*
Farm or Hatchery: Jolliff Springs Fish Farm, Koshkonog, Missouri
Origin: Canaday and Moon Fish Farm, Little Egypt, Arkansas, in 1970. Digman and fish from Current River Lakes, Corning, Arkansas, were added.
Brood Population: Undetermined
Breeding and Traits: Mass selection for deep bodies

Stock: *Jones*
Farm or Hatchery: Jones Fish Farms, Angleton, Texas

Origin: Brazos River in 1976. Albino stock from Auburn (3 individuals) were added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Ken's*
Farm or Hatchery: Ken's Fish Hatchery, Alapaha, Georgia
Origin: Undetermined sources in Arkansas and Mississippi in 1966, McDonald in 1968, Georgia Fish and Game in 1970, Cowart in 1972, and Tifton in 1980-82
Brood Population: Several thousand
Breeding and Traits: Random mating

Stock: *Kieffer*
Farm or Hatchery: Kieffer Fish Farms, Weiner, Arkansas
Origin: Bayou Deview River, Arkansas, in 1956 and Burns in 1968
Brood Population: Undetermined; 100 pairs added annually
Breeding and Traits: Mass selection for body conformation

Stock: *Krehbiel*
Farm or Hatchery: Krehbiel Farm, Pretty Prairie, Kansas (no longer propagated)
Origin: Ninnescah River in 1911
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Kurtz*
Farm or Hatchery: Kurtz Fish Farm, Elverson, Pennsylvania
Origin: Hill in 1965. Sassafras River at Georgetown, Maryland, in 1970
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight and small heads

Stock: *Kyser*
Farm or Hatchery: W. T. Kyser Hatchery, Greensboro, Alabama
Origin: Warrior River, Alabama, and from commercial Mississippi stocks
Brood Population: Undetermined; brood are replaced annually with a complete exchange every 3 years
Breeding and Traits: Random mating

Stock: *Kyser (Auburn)*
Farm or Hatchery: W. T. Kyser Hatchery, Greensboro, Alabama

Origin: Auburn in 1980
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *L & W*
Farm or Hatchery: L & W Fish Farm, Greenville, Mississippi (no longer propagated)
Origin: Mississippi River and Dumas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Lake Village*
Farm or Hatchery: Sidney Farm, Lake Village, Arkansas
Origin: Transfisheries, Henderson and Digman in 1980. 15,000 pounds of brood were mixed.
Brood Population: 3,000
Breeding and Traits: Mass selection for body weight and body conformation

Stock: *Lakeland*
Farm or Hatchery: Lakeland Farms, Marion, Alabama
Origin: Experimental fish of unknown origin at the Southeastern Fish Cultural Laboratory, Marion, Alabama, in the early 1970's
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Lewis*
Farm or Hatchery: Fountain Bluff, Illinois
Origin: Henderson and other undetermined sources
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Lindsey*
Farm or Hatchery: Lindsey Farm, Ozark, Alabama
Origin: Auburn (majority) in 1963. Easterling, Yazoo, Chattahoochee River, Alabama, Flint River, Georgia, and Ed Williams Fish Hatchery, Cordele, Georgia, were added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *MK (Farm Fresh)*
Farm or Hatchery: Farm Fresh, Greensboro, Alabama
Origin: Derived from MxK F_1 brood stock (Auburn University in 1977)

Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *MK (Pearce)*
Farm or Hatchery: Pearce Farm, Browns, Alabama
Origin: Derived from MxK F_1 brood stock (Auburn University in 1977)
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *MM & P*
Farm or Hatchery: MM & P Fish Farms, Fredonia, Kansas
Origin: Bonglet Farm in Arkansas
Brood Population: 100-200
Breeding and Traits: Random mating

Stock: *Mac's*
Farm or Hatchery: Mac's Fish Farm, Opelika, Alabama
Origin: Easterling in 1979
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Martin*
Farm or Hatchery: Martin Farm, Brewton, Alabama
Origin: Conecuh River, Alabama, Newbern, and commercial stocks in Alabama, Louisiana, and Mississippi
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *McDonald*
Farm or Hatchery: McDonald's Fish Farm, Carthage, Mississippi
Origin: Hammett V, Arkansas River, Arkansas, and commercial Arkansas stocks in 1969
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *McNulty*
Farm or Hatchery: Ted McNulty Farm, Pine Bluff, Arkansas
Origin: Dumas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Merrill*
Farm or Hatchery: Merrill Farm, Andalusia, Alabama
Origin: Adams

Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Miller*
Farm or Hatchery: Miller Farm, Safford, Alabama
Origin: Experimental fish (probably Warrior River) at the Southeastern Fish Cultural Laboratory, Marion, Alabama. Dumas was added in 1972. Fish were exchanged with Newbern.
Brood Population: Approximately 100,000 pounds
Breeding and Traits: Random mating

Stock: *Missouri*
Farm or Hatchery: Con Agra Fish Hatchery, Tippo, Mississippi
Origin: Unknown Missouri source
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Moats*
Farm or Hatchery: Moats Farm and Hatchery, Remlap, Alabama
Origin: Easterling and Bain
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Montz*
Farm or Hatchery: Montz Farm, Greensboro, Alabama
Origin: Easterling, Yazoo, Farm Fresh G, and commercial Mississippi stocks
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Mull*
Farm or Hatchery: Mull Farm, Marceline, Missouri
Origin: Hill in 1982
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Nelson-Anderson*
Farm or Hatchery: Nelson-Anderson Farm, Arkansas (no longer propagated)
Origin: Lonoke in the mid 1950's or early 1960's. At this time all of the Lonoke strain were descendants of the fish collected from the Red River in 1949.
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Nerren*
Farm or Hatchery: Nerren Bros., Isola, Mississippi
Origin: Dumas, Yazoo, and Evans Farm, Moscow, Arkansas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Newbern*
Farm or Hatchery: Newbern Fish Hatchery, Newbern, Alabama
Origin: Southeastern Fish Cultural Laboratory, Marion, Alabama, (probably Warrior River), Auburn, Nelson-Anderson, and Miller
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Norris*
Farm or Hatchery: Norris Fish Farm, Cash, Arkansas
Origin: Black River, Arkansas, and Lake Erie. Fish from Lake Erie were acquired in 1963, 1976, and 1981.
Brood Population: Undetermined; brood replacements come from fingerlings raised on farm; native Arkansas stock are also added
Breeding and Traits: Random mating

Stock: *Ople*
Farm or Hatchery: Ople Farm, Warden, Illinois
Origin: Commercial Arkansas stock
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Osage*
Farm or Hatchery: Osage Fisheries, Osage Beach, Missouri
Origin: Mississippi River in 1953. During the first 12-15 years brood replacements were obtained from the Mississippi River. Brood replacements are now selected from farm stock.
Brood Population: Undetermined; brood replaced every 4-6 years
Breeding and Traits: Random mating

Stock: *Osage Springs*
Farm or Hatchery: Osage Springs Minnow Farm, Rogers, Arkansas (no longer propagated)
Origin: Nelson-Anderson
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Parker*
Farm or Hatchery: Parker Farms, Drew, Mississippi
Origin: Reed
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Pearce*
Farm or Hatchery: Pearce Farm, Browns, Alabama
Origin: Kyser, commercial Mississippi stocks, and experimental stocks from the Southeastern Fish Cultural Laboratory, Marion, Alabama
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight and body conformation

Stock: *Peaster*
Farm or Hatchery: Peaster Farm, Yazoo City, Mississippi
Origin: Yazoo in 1965 and White River, Arkansas in 1972
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Penn*
Farm or Hatchery: Pennsylvania Power and Light, York Haven, Pennsylvania
Origin: Osage and Susquehanna River, Pennsylvania, in late 1970's
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight and resistance to disease

Stock: *Pickering*
Farm or Hatchery: Pickering Brothers, Laurel, Mississippi
Origin: Hammett V and commercial Mississippi stocks in the 1960's
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Pine Hill*
Farm or Hatchery: Pine Hill Catfish Farm, Aliceville, Alabama
Origin: Warrior River, Alabama, Coosa River, Alabama, Cahaba River, Alabama, and Northwest Alabama River drainage
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight

Stock: *Plank*
Farm or Hatchery: Plank Farm, Greensboro, Alabama

Origin: Commercial Alabama stock and possibly Warrior River, Alabama. AR F_2, MK F_2, ARMK, and Tifton research stocks were added in 1984.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Pope F*
Farm or Hatchery: Frank Pope Farm, Opelika, Alabama
Origin: Auburn
Brood Population: 26 pairs
Breeding and Traits: Random mating; albinism common

Stock: *Pope M*
Farm or Hatchery: Pope Farm, Piney Hills, Alabama
Origin: Auburn in 1962 and 1970
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Racoon*
Farm or Hatchery: Racoon Valley Fish Farm, Pleasant Hill, Missouri
Origin: Central Arkansas farms, Mississippi farms, and the Rio Grande River, Texas
Brood Population: Undetermined
Breeding and Traits: Random mating; some albinism exists

Stock: *Rainbow*
Farm or Hatchery: Rainbow Ranch, Calhoun City, Mississippi
Origin: Dumas, W. S. Gooch Farm (Biffle Farm), Mississippi, and Charles Files Farm, Arkansas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Reed*
Farm or Hatchery: Tom Reed Farm, Belzoni, Mississippi
Origin: Tupelo in 1966 and Coleman
Brood Population: 1,000-2,000
Breeding and Traits: Random mating

Stock: *Riverside*
Farm or Hatchery: Riverside Fish Farm, Silver City, Mississippi
Origin: Farm Fish in 1981 and S & S in 1982
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Roam*
Farm or Hatchery: Roam Fish Farm, Woodlake, California

Origin: Wehau
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Roberts*
Farm or Hatchery: Roberts Fish Farm, Hartselle, Alabama
Origin: Auburn in early 1970's
Brood Population: 1,000-1,200
Breeding and Traits: Mass selection for body weight

Stock: *S & M*
Farm or Hatchery: S & M Fish Company, Homeplace, Mississippi
Origin: Coleman in 1980
Brood Population: 4,700
Breeding and Traits: Random mating

Stock: *S & S*
Farm or Hatchery: Sandling & Stephens, Inc., Silver City, Mississippi
Origin: Digman in 1980 and Harris in 1983; stock was mixed, but one group of Digman kept separate
Brood Population: 3,000 pairs
Breeding and Traits: Random mating

Stock: *Santee-Cooper (Gasaway)*
Farm or Hatchery: Gasaway Farms, Athens, Georgia
Origin: Santee-Cooper Reservoir, South Carolina, in 1950 (41 pairs)
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Saul*
Farm or Hatchery: Saul Fish Processors, Macon, Mississippi
Origin: Flowing Water Catfish Farm, Mozelle, Mississippi
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Schroeder*
Farm or Hatchery: Schroeder Farm, Carlisle, Arkansas
Origin: Dumas and commercial Mississippi stocks in 1965. Santee-Cooper (Auburn) research stock was added in the early 1980's.
Brood Population: Undetermined.
Breeding and Traits: Random mating

Stock: *Seminole*
Farm or Hatchery: Seminole Tribe, Okeechobee, Florida

Origin: Welaka, Millen, Tupelo, and Orangeburg
Brood Population: Undetermined
Breeding and Traits: Mass selection for stocky fish

Stock: *Sequoia*
Farm or Hatchery: Sequoia Fisheries, California
Origin: Wehau
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Shepherd*
Farm or Hatchery: Shepherd Farm, Rosehill, Mississippi
Origin: Yazoo and Meridian
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Sides*
Farm or Hatchery: Sides Catfish Farm, Tupelo, Mississippi
Origin: Tupelo in 1964
Brood Population: Undetermined; brood are replaced every 3-4 years
Breeding and Traits: Random mating

Stock: *Sierra*
Farm or Hatchery: Sierra View Farm, Three Rivers, California
Origin: Roam
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Simmons*
Farm or Hatchery: Simmons Farm, Yazoo City, Mississippi
Origin: Yazoo River, Mississippi, and Yazoo. Henderson was added in 1980-81
Brood Population: 4,000
Breeding and Traits: Random mating

Stock: *Sooner*
Farm or Hatchery: Sooner Fish Farms, Washington, Oklahoma
Origin: Dumas, Hartley, Hill, and commercial Arkansas stocks
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *South Alabama*
Farm or Hatchery: South Alabama Fish Hatcheries, Andalusia, Alabama
Origin: Adams; Don Hardy, Baker, Florida; and Merrill in 1982

Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Southwest*
Farm or Hatchery: Southwest Fish Hatchery, Terrell, Texas
Origin: War Eagle (300) and a tributary of the Mississippi River (300) in northern Minnesota in 1978
Brood Population: 600
Breeding and Traits: Mass selection for body weight, body conformation, and sexual characteristics

Stock: *Spartan*
Farm or Hatchery: Spartan Enterprises, Spartanburg, South Carolina
Origin: Local farm ponds stocked by Cheraw NFH, South Carolina, and from Lake Marion, Santee, South Carolina
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Spears*
Farm or Hatchery: Spears Catfish Farm, Montgomery, Alabama
Origin: Auburn and Pine Hill in 1976
Brood Population: 300-600
Breeding and Traits: Random mating

Stock: *Spree*
Farm or Hatchery: Thed Spree Farm, Boligee, Alabama
Origin: Hill in 1978. Diamond added for crossbreeding in 1984.
Brood Population: 5,500
Breeding and Traits: Mass selection for body weight, body conformation, and crossbreeding

Stock: *Stallings*
Farm or Hatchery: Stallings Farm, Gant, Alabama
Origin: Crossing of Triple M, Adams, and Easterling in 1980
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Stearns*
Farm or Hatchery: Stearns Hatchery, Wetumpka, Alabama (no longer propagated)
Origin: Covington in 1967
Brood Population: NA
Breeding and Traits: Mass selection for body weight and lack of deformities

Stock: *Steele*
Farm or Hatchery: Steele Farm, Laurel Hill, Florida
Origin: Easterling, Crowson, and Triple M in 1980
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Stephens*
Farm or Hatchery: Stephens Industries, Selma, Alabama
Origin: Auburn and Nelson-Anderson in 1961. Nelson-Anderson albinos were added in 1962.
Brood Population: 100 pairs
Breeding and Traits: Mass selection for body weight and body conformation

Stock: *Stringer*
Farm or Hatchery: Stringer Farm, Coffeeville, Alabama
Origin: Pearce in 1978
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Sulick*
Farm or Hatchery: Sulick Farm, Shelbyville, Kentucky
Origin: Streams in Virginia
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Sulphur*
Farm or Hatchery: Sulphur Fish Hatchery, Oklahoma
Origin: Dumas, Hill, Sooner, Spitz Farm (Hill strain), Oklahoma, and Catfish Acres, Shawnee, Oklahoma
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Sunflower*
Farm or Hatchery: Sunflower Catfish Farm, Anguilla, Mississippi
Origin: Tupelo, Sam Harris Fish Farm, Mississippi, and undetermined farms.
Brood Population: Undetermined
Breeding and Traits: Tupelo is maintained separately and crossed to other Sunflower stock

Stock: *Tennyson*
Farm or Hatchery: Tennyson Farms, Grubbs, Arkansas
Origin: Norris
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Thomas*
Farm or Hatchery: Kindle Thomas Farm, Kentucky
Origin: Ohio River, Nelson-Anderson, Schroeder, and commercial stocks
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Tombigbee*
Farm or Hatchery: Patrick Farm, Lisman, Alabama
Origin: Tombigbee River, Alabama, in 1979
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Transfisheries*
Farm or Hatchery: Transfisheries, Moorehead, Mississippi
Origin: Dumas, a stock from Kansas (Farm Fish, Louise, Mississippi), McDonald, and Buddy Morrison, Yazoo, Mississippi, in 1971
Brood Population: Undetermined
Breeding and Traits: Random mating; originally all strains were kept separate, selected for growth rate and crossbred

Stock: *Triple M-1*
Farm or Hatchery: Triple M Catfish Farm, Georgiana, Alabama
Origin: Produced through crossing Goldkist (Quitman, Georgia) females with Goldkist (Humphries, Mississippi) males in 1966-67
Brood Population: Undetermined
Breeding and Traits: Selected for reproductive performance

Stock: *Triple M-2*
Farm or Hatchery: Triple M Catfish Farm, Georgiana, Alabama
Origin: Unknown source in Louisiana
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Tuggle I*
Farm or Hatchery: Tuggle Farm, Lake Village, Arkansas (no longer propagated)
Origin: Dumas, Day, and Lake Chicot, Arkansas. This stock was replaced in 1979.
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Tuggle II*
Farm or Hatchery: Tuggle Farm, Lake Village, Arkansas
Origin: Primarily Arant and Farm Fresh-M; a small contribution from Finch
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Uvalde (Studdard)*
Farm or Hatchery: Studdard Fish Farm, Moore, Texas, formerly Texas Fish Ranches
Origin: Uvalde. One hundred brood of Uvalde stock were included with the farm. Uvalde stock from Cypress Creek Fish Ranches, Sabinal, Texas, was mixed with this stock to reduce inbreeding in 1978.
Brood Population: 100
Breeding and Traits: Random mating; relatively fast growing fish

Stock: *Valley*
Farm or Hatchery: Valley Fish Farms, Imperial Valley, California
Origin: Wehau in 1974, Chico in 1979-80, Calaqua in 1980, Fish Breeders Cal in 1980, and Sequoia in 1980
Brood Population: 300
Breeding and Traits: Random mating

Stock: *Wallace*
Farm or Hatchery: Wallace Fish Farm, Senatobia, Mississippi
Origin: Williams Fish Farms, Oklona, Mississippi, in 1978, Biffle Fish Farm, Pomtock, Mississippi, in 1979, and Battle in 1979
Brood Population: 450; brood are replaced when they reach 8-9 pounds
Breeding and Traits: Mass selection for body conformation

Stock: *War Eagle*
Farm or Hatchery: War Eagle Minnow Farm, Huntsville, Arkansas
Origin: White River, Arkansas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Watkins*
Farm or Hatchery: Watkins Farm, Elmore, Alabama
Origin: Dumas in 1970-72, Yazoo and commercial Arkansas stock have been added

Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Wehau*
Farm or Hatchery: Wehau Fish Farms, Richdale, California (no longer propagated)
Origin: Osage
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Well-Fed*
Farm or Hatchery: Well-Fed Farms, Mississippi
Origin: Yazoo River, Mississippi, many commercial stocks have been added
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Western*
Farm or Hatchery: Western Farms, Texas
Origin: Fletcher Adams Farm, Mississippi
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Whiskers*
Farm or Hatchery: Whiskers Catfish Farms, Bowling Green, Kentucky
Origin: Barren River, Kentucky
Brood Population: Undetermined
Breeding and Traits: Replacements from Barren River, Kentucky

Stock: *Wilkerson*
Farm or Hatchery: Wilkerson Catfish Farm, Greensboro, Alabama
Origin: Wynn Coleman III ponds (Newbern) in 1978
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Williams*
Farm or Hatchery: Mac's Fish Farm, Opelika, Alabama, from 1976-1978 (no longer propagated)
Origin: Son Williams Farm, Greenwood, Mississippi
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Williamson*
Farm or Hatchery: Williamson Farm, Kilmichael, Mississippi

Origin: Mississippi River and Aquafarms in 1976-1977
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Willow*
Farm or Hatchery: Willow Branch Fish Farm, Tahlequah, Oklahoma
Origin: Hill in 1980-1982 and commercial Arkansas stock
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Wilson*
Farm or Hatchery: Wilson Fish Farm, Herrick, Illinois
Origin: Sulick in 1971, Ople in 1972, and J & J 1978. Old stock were sold in 1980 and replaced with progeny from the original stock
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight

Stock: *Wisner*
Farm or Hatchery: Wisner Minnow Hatchery, Wisner, Louisiana
Origin: LSU
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Wood*
Farm or Hatchery: Wood Farm, Selma, Alabama
Origin: Stephens, Tombigbee River, Alabama, and commercial Arkansas stock
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Woodard*
Farm or Hatchery: Woodard Farms, Holly Bluff, Mississippi
Origin: Farm Fish (600 females) and Coleman (Arkansas River) in 1980 (800 males) and from Woodard production ponds (400 males)
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Yazoo*
Farm or Hatchery: Thompson-Anderson Farm, Yazoo, Mississippi
Origin: Yazoo River, Mississippi, in mid-1960's
Brood Population: Undetermined
Breeding and Traits: Random mating

Blue Catfish

Stock: *Bradshaw*
Farm or Hatchery: Bradshaw Farms, Arkansas
Origin: Arkansas River
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Coosa*
Farm or Hatchery: Moats Farm, Remlap, Alabama
Origin: Coosa River, Alabama, below Weiss Dam
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *D & B*
Farm or Hatchery: D & B Fish Farms, Crockett, Texas
Origin: Females came from the Trinity River in Texas and the males from the Mississippi River in 1963
Brood Population: Undetermined
Breeding and Traits: Mass selection for small heads; fish from Trinity River had much larger heads than those from Mississippi River

Stock: *Dumas*
Farm or Hatchery: Edgar Farmer, Dumas, Arkansas (no longer propagated)
Origin: Arkansas and Mississippi Rivers
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Edwards*
Farm or Hatchery: Edwards Farm, Winnie, Texas
Origin: Rio Grande and Dumas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Fish Breeders Ida*
Farm or Hatchery: Fish Breeders, Buhl, Idaho
Origin: D & B and Dumas
Brood Population: Undetermined
Breeding and Traits: Random mating; survive and grow better than channel catfish (Fish Breeders Ida) at 70-80°F in raceways

Stock: *Gasaway*
Farm or Hatchery: Gasaway Farm, Athens, Georgia
Origin: Dumas

Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Jones*
Farm or Hatchery: Jones Fish Farm, Angleton, Texas
Origin: Mississippi River (Leon Horne) in 1972
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Rio Grande*
Farm or Hatchery: Finley Co., Lonoke, Arkansas
Origin: Rio Grande River, Texas
Brood Population: Undetermined
Breeding and Traits: Random mating; has speckles on its body, hemoglobin patterns are identical to those of blue catfish from the Mississippi River

Stock: *Rio Grande (Hill)*
Farm or Hatchery: Leon Hill Farm, Lonoke, Arkansas
Origin: Rio Grande
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Shepherd*
Farm or Hatchery: Shepherd Farm, Rosehill, Mississippi
Origin: Auburn
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Silver Streak*
Farm or Hatchery: Pine Hill Catfish Farm, Aliceville, Alabama
Origin: F_2 stock was derived from original crossbreeds {(Mississippi River x Alabama River) x (Warrior River x Cahaba River)}
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Tombigbee*
Farm or Hatchery: Patrick Farm, Lisman, Alabama
Origin: Tombigbee River in 1979
Brood Population: Undetermined
Breeding and Traits: Random mating

Black Bullhead

Stock: *Jolliff*
Farm or Hatchery: Jolliff Springs Fish Farm, Koshkonog, Missouri

Origin: A farm pond in Alton, Missouri
Brood Population: Undetermined
Breeding and Traits: Random mating

White Catfish

Stock: *Bradshaw*
Farm or Hatchery: Bradshaw Farms, Arkansas
Origin: North Carolina
Brood Population: Undetermined
Breeding and Traits: Random mating

Hatchery and Introduced Stocks

Channel Catfish

Stock: *Bubbling Springs*
Farm or Hatchery: Bubbling Springs State Hatchery, Arizona
Origin: Imperial in 1977
Brood Population: 220 pairs
Breeding and Traits: Random mating

Stock: *California*
Farm or Hatchery: NA
Origin: Introduced from the Mississippi River Valley into the Sacramento River, California, in 1874 and 1890, and into the Colorado River in the 1920's
Brood Population: NA
Breeding and Traits: NA

Stock: *Carbon Hill*
Farm or Hatchery: Carbon Hill NFH, Alabama
Origin: Tupelo, Mammoth Springs, and Corning
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Cedar Bluff*
Farm or Hatchery: Cedar Bluff NFH, Kansas (no longer propagated)
Origin: Uvalde, Fort Worth, Inks Dam, Tishomingo, Farmington, and local rivers
Brood Population: NA
Breeding and Traits: Some albinism

Stock: *Cheraw*
Farm or Hatchery: Cheraw NFH, South Carolina

Origin: Ponopolis Dam, Santee-Cooper Reservoir in the late 1950's and Marion NFH in the mid 1960's. McKinney, Frankfort, Orangeburg, Millen, and Marion (NFHs) have been added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Chesapeake*
Farm or Hatchery: Chesapeake State Fish Hatchery, Mt. Vernon, Missouri
Origin: Osage River near Osceola, Missouri
Brood Population: 200; 1/8 of the stock are replaced annually
Breeding and Traits: Mass selection of fingerlings for body weight

Stock: *Cohutta*
Farm or Hatchery: Cohutta NFH, Dalton, Georgia
Origin: Arrowhead State Fish Hatchery, Georgia, which had obtained those fish from Auburn in 1958-59. Stock from undetermined sources has been added.
Brood Population: 200
Breeding and Traits: Random mating

Stock: *Cordele*
Farm or Hatchery: Cordele State Fish Hatchery, Cordele, Georgia
Origin: Flint River, Georgia, in 1968 and Tifton 1978. Some brood stock may have also come from the Ocmulgee River, Georgia, and Chattahoochee River (Lake Eufaula), Alabama. This stock was transferred to Skidaway Institute and was ancestral to the Tifton strain.
Brood Population: 300 brooders; are replaced when 6 years old
Breeding and Traits: Random mating

Stock: *Corning*
Farm or Hatchery: Corning NFH, Arkansas
Origin: Tupelo, Lonoke, Mammoth Springs, Marion in 1974, Carbon Hill, Meridian, Stuttgart, and a commercial farm in Stuttgart, Arkansas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *DOC*
Farm or Hatchery: Little Grassy Fish Hatchery, Carbondale, Illinois
Origin: Tif, Tif+, Tif−, Tif Prop+, Osage, native Illinois

fish from Lake Carlyle (Kaskaskia River), Bull Shoals Lake, Arkansas, S & S in 1983, Powerton Lake, Illinois River, Illinois, in 1983
Brood Population: 100
Breeding and Traits: Random mating

Stock: *Dakota*
Farm or Hatchery: Yankton NFH, South Dakota (no longer propagated)
Origin: Missouri River, South Dakota, Tongue River, Montana, and Lake McConaughy, Platte River, Nebraska. Fingerlings were distributed throughout the Dakotas, Nebraska, and Montana.
Brood Population: NA
Breeding and Traits: Random mating; strain from the Missouri River had thick skin

Stock: *Dexter*
Farm or Hatchery: Dexter NFH, New Mexico (no longer propagated)
Origin: Never spawned their own stock. Distributed fish from National Fish Hatcheries in Kansas, Oklahoma, and Texas.
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Durant*
Farm or Hatchery: Durant State Fish Hatchery, Bryan County, Oklahoma
Origin: Uvalde in 1967, Tishomingo in 1967, Fort Worth, and local Oklahoma Rivers
Brood Population: Undetermined; brood replaced every 3 to 4 years
Breeding and Traits: Mass selection of 1 percent of the fastest growing fingerlings

Stock: *Farmington*
Farm or Hatchery: Farmington NFH, Kansas (no longer propagated)
Origin: Cedar Bluff, Tishomingo, Inks Dam, Gerard River, Kansas, and local rivers
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Fort Worth*
Farm or Hatchery: Fort Worth NFH, Texas (no longer propagated)

Origin: Lake Texoma, Uvalde, Imperial (NFH), Dexter, Tishomingo, Cedar Bluff, San Marcos (State), Farmington, and Durant
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Frankfort*
Farm or Hatchery: Frankfort NFH, Frankfort, Kentucky
Origin: Undetermined source in 1961. Fish from the National Fish Hatchery System and Cohutta have been added.
Brood Population: 100
Breeding and Traits: Random mating; 50 percent of brood develop good external sexual characteristics

Stock: *Harrison*
Farm or Hatchery: Harrison NFH, Charles City, Virginia
Origin: James River, Virginia, in 1962. This stock was supplemented with catfish from two Virginia lakes, James River drainage in 1977. Albino stock from Frankfort have been added.
Brood Population: 300; replaced every 4-5 years
Breeding and Traits: Mass selection for body weight (largest 10-30 percent); do not spawn until 5 or 6 years old; albinism common

Stock: *Imperial*
Farm or Hatchery: Imperial Valley Fish Hatchery, Niland, California
Origin: Lower Colorado River, California
Brood Population: Undetermined
Breeding and Traits: Selected for spawning early in the year, spawning at young age, fast growth, and good sexual characters

Stock: *Imperial (Uvalde)*
Farm or Hatchery: Uvalde NFH, Texas
Origin: Imperial in 1977; 220 pairs originally
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Inks Dam*
Farm or Hatchery: Inks Dam NFH, Burnet, Texas (no longer propagated)
Origin: Lower Colorado River, Lake Buchanan, Fort Worth, Lake Texoma, Uvalde
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Inks Dam (Imperial)*
Farm or Hatchery: Inks Dam NFH, Burnet, Texas
Origin: Imperial in 1978; 560 original stock
Brood Population: 450; replaced every 4-6 years
Breeding and Traits: Random mating

Stock: *Lonoke*
Farm or Hatchery: Arkansas Fish and Game Hatcheries, Arkansas
Origin: Pools in the Red River below Denison Dam, Lake Texoma, Oklahoma, in 1949. These fish and their progeny were transported, reared and exchanged at State and private hatcheries in Huntsville, Lonoke, Centerton, Smith, and War Eagle Farm, Arkansas, in the mid-1950's. Stock was added from University of Arkansas at Pine Bluff, Stuttgart, and Corning.
Brood Population: Undetermined
Breeding and Traits: Random mating; reported to perform well in cage culture

Stock: *Lyman*
Farm or Hatchery: Lyman Fisheries Station, Gulfport, Mississippi
Origin: Marion (NFH) in 1966
Brood Population: 200
Breeding and Traits: Random mating; albinism is not found in this Marion stock

Stock: *Mammoth Spring*
Farm or Hatchery: Mammoth Spring NFH, Arkansas
Origin: Marion (NFH) in 1974. Stock was added from Corning and Tupelo.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Marion (Carbon Hill)*
Farm or Hatchery: Southeastern Fish Cultural Laboratory, Marion, Alabama
Origin: Carbon Hill in 1983
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Marion (NFH)*
Farm or Hatchery: Marion NFH, Alabama (no longer propagated)

Origin: Nelson-Anderson in the mid-1950's or early 1960's. Thirty pairs were obtained. Marion (NFH) and Auburn exchanged some brood stock in 1963 and 1965. A few individuals were added to increase population size when brood population was low.
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Marion (State)*
Farm or Hatchery: Marion State Fish Hatchery, Marion, Alabama
Origin: Marion (NFH) in early 1970's. Brood population was 12 in 1976.
Brood Population: 200
Breeding and Traits: Mass selection for body weight

Stock: *McDuffie*
Farm or Hatchery: McDuffie State Fish Hatchery, Georgia
Origin: Chattahoochee River at Eufaula, Alabama, and from an unknown hatchery in Arkansas (probably Lonoke in 1962, 1964, and 1967)
Brood Population: 200-250
Breeding and Traits: Thirty-four brood replacements are selected annually from largest fish left in Georgia public fishing lakes

Stock: *McKinney*
Farm or Hatchery: McKinney Lake NFH, Hoffman, North Carolina
Origin: Marion (NFH) and Cheraw in 1969
Brood Population: 250; 20 percent of the stock is replaced annually
Breeding and Traits: Random mating; 1 percent albinism observed

Stock: *Meridian*
Farm or Hatchery: Meridian NFH, Mississippi
Origin: Tupelo, Stuttgart, Mammoth Springs in 1972-73, Tupelo in 1975, and Lyman in 1975-78
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Millen*
Farm or Hatchery: Millen NFH, Georgia
Origin: Tupelo

Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Natchitoches*
Farm or Hatchery: Natchitoches NFH, Louisiana
Origin: Cane River, Louisiana, Black River, Louisiana, and bayous of Louisiana
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Orangeburg*
Farm or Hatchery: Orangeburg NFH, South Carolina
Origin: Ponopolis Dam, Santee-Cooper Reservoir, South Carolina, in the late 1950's and Marion (NFH) in the mid-1960's
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Pratt*
Farm or Hatchery: Pratt State Fish Hatchery, Pratt, Kansas
Origin: Kansas rivers in 1911. Approximately 60 Lonoke brood fish were added in the mid-1960's.
Brood Population: 1,144; 1,827 replacements from 4-year classes are maintained to replace brood culled at 8-10 years of age
Breeding and Traits: Random mating

Stock: *Rathbun*
Farm or Hatchery: Rathbun State Fish Hatchery, Moravia, Iowa
Origin: Corning (84 percent), Easterling (14 percent), and Rathburn Reservoir (Chariton River Drainage), Iowa (2 percent)
Brood Population: 1,000
Breeding and Traits: Random mating

Stock: *San Marcos (NFH)*
Farm or Hatchery: San Marcos NFH, San Marcos, Texas (no longer propagated)
Origin: Lake Texoma, Texas, Inks Dam (NFH), San Marcos (State), Uvalde, Trinity River, Texas
Brood Population: NA
Breeding and Traits: Random mating

Stock: *San Marcos (State)*
Farm or Hatchery: San Marcos State Fish Hatchery, Texas
Origin: Lake Texoma, San Marcos (NFH), Texas, and Okla-

homa streams, Trinity River, Texas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Seneca*
Farm or Hatchery: Senecaville NFH, Senecaville, Ohio
Origin: Seneca Lake, Ohio, an undetermined Arkansas source, and Tupelo
Brood Population: 400; 10 percent are replaced annually
Breeding and Traits: Mass selection for body weight and resistance to stress; stumpy individuals observed in progeny of Seneca Lake stock

Stock: *Tenn State*
Farm or Hatchery: Tennessee State Fish Hatchery System, Tennessee
Origin: Tennessee River, Tennessee, and commercial Arkansas stock
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Texas State*
Farm or Hatchery: Texas State Fish Hatchery System, Texas
Origin: Trinity River, Texas, Texas streams, Oklahoma streams, San Marcos (NFH), and San Marcos (State)
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Tishomingo*
Farm or Hatchery: Tishomingo NFH, Oklahoma
Origin: Blue River, Oklahoma in 1930's; Washita River, Oklahoma; Grand River, Fort Gibson, Oklahoma; Red River (Lake Texoma), Oklahoma; Fort Worth, Pratt, and Durant in 1950's and 1960's
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Tupelo*
Farm or Hatchery: Tupelo NFH, Mississippi
Origin: Tombigbee River, Mississippi, in the 1960's. Lonoke, Lyman, Meridian, Stuttgart, and fish from the Santee-Cooper Reservoir, South Carolina, were added.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Uvalde*
Farm or Hatchery: Uvalde NFH, Texas (no longer propagated)
Origin: Fort Worth, Imperial
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Waterville*
Farm or Hatchery: Waterville State Fish Hatchery, Minnesota
Origin: St. Louis River, Minnesota (34), Blue Earth River, Minnesota (10), and Mississippi River (Lake Pepin), Minnesota (118), in 1979-81
Brood Population: 162
Breeding and Traits: Random mating

Stock: *Welaka*
Farm or Hatchery: Welaka NFH, Florida
Origin: St. John's River, Florida (one spawn, 1960's), however, most fingerlings distributed from this station were Millen or Orangeburg.
Brood Population: NA
Breeding and Traits: NA

Blue Catfish

Stock: *Arkansas*
Farm or Hatchery: Arkansas State Fish Hatcheries, Arkansas
Origin: Pools in the Red River, Oklahoma, below Denison Dam after its construction in 1949. Auburn was added in the 1970's.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Blind Pony*
Farm or Hatchery: Blind Pony State Hatchery, Sweet Springs, Missouri
Origin: Auburn University in 1972
Brood Population: Approximately 1/2 the brood fish are replaced every 5 years
Breeding and Traits: Mass selection for body weight

Stock: *California*
Farm or Hatchery: NA
Origin: Introduced (Stuttgart) into Lake Jennings, Sutherland Reservoir, El-Capitan Reservoir, San Vincente Reservoir, and Santee Lake chain, California, in 1969 (1,990 original stock)
Brood Population: NA
Breeding and Traits: NA

Stock: *Marion*
Farm or Hatchery: Marion State Fish Hatchery, Alabama
Origin: Auburn
Brood Population: 80
Breeding and Traits: Mass selection for body weight

Stock: *Oklahoma*
Farm or Hatchery: North Platte State Fish Hatchery, Nebraska
Origin: Oklahoma rivers
Brood Population: 25 pairs
Breeding and Traits: Random mating

Stock: *Texoma*
Farm or Hatchery: Durant State Fish Hatchery, Oklahoma
Origin: Lake Texoma, Oklahoma
Brood Population: 100 pairs
Breeding and Traits: Random mating

Black Bullhead

Stock: *California*
Farm or Hatchery: NA
Origin: Introduced to California in 1874 from the Mississippi River Valley, these fish are common in Kern Kings and Delta Rivers
Brood Population: NA
Breeding and Traits: NA

Stock: *Lake Mills*
Farm or Hatchery: Lake Mills NFH, Lake Mills, Wisconsin
Origin: Mississippi River
Brood Population: Undetermined
Breeding and Traits: Random mating

Brown Bullhead

Stock: *California*
Farm or Hatchery: NA
Origin: Introduced into California from Lake Champlain, Vermont, in 1874, these fish (70) were planted in the Sacramento River Basin and are widespread in California
Brood Population: NA
Breeding and Traits: NA

Flathead Catfish

Stock: *California*
Farm or Hatchery: NA
Origin: Arizona Fish and Game introduced flathead catfish into the Colorado River in 1962 and these fish are now found in the Imperial Valley
Brood Population: NA
Breeding and Traits: NA

Stock: *Cape Fear*
Farm or Hatchery: McKinney Lake NFH, Hoffman, North Carolina
Origin: Cape Fear River, North Carolina in 1978
Brood Population: 30 (P_1 generation)
Breeding and Traits: Random mating

Stock: *Monroe*
Farm or Hatchery: Monroe Fish Hatchery, Monroe, Louisiana
Origin: Lakes in Louisiana; Lake Bussey (20), Lake D'Arbonne (3), Lake Claiborne (3), Lake Bistineau (12), and Cross Lake (4)
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Seneca*
Farm or Hatchery: Senecaville NFH, Ohio
Origin: Muskingum River
Brood Population: Undetermined (F_1 generation)
Breeding and Traits: Random mating

Stock: *Tishomingo*
Farm or Hatchery: Tishomingo NFH, Oklahoma (no longer propagated)
Origin: Lake Texoma
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Waterville*
Farm or Hatchery: State Fish Hatchery, Waterville, Minnesota
Origin: Lake Pepin, Mississippi River (64) in 1979-82. Two individuals from the Minnesota River were added in 1981.
Brood Population: 66
Breeding and Traits: Random mating

White Catfish

Stock: *California*
Farm or Hatchery: NA
Origin: Introduced from the Raritan River, New Jersey. Fifty-four were planted in the San Joaquin River near Stockton, California, in 1874. Now located in every major California river drainage except Klamoth and Colorado.
Brood Population: NA
Breeding and Traits: NA

Stock: *Millen*
Farm or Hatchery: Millen NFH, Georgia (no longer propagated)
Origin: Auburn II
Brood Population: NA
Breeding and Traits: NA

Yellow Bullhead

Stock: *California*
Farm or Hatchery: NA
Origin: Introduced in the Sacramento-San Joaquin Delta from the Mississippi Valley in 1874. Common only in Colorado River and in Lost River, Modoc County.
Brood Population: NA
Breeding and Traits: NA

Research Stocks

Channel Catfish

Stock: *AR-3*
Farm or Hatchery: Auburn University, Alabama
Origin: Mating 6 Auburn females with 6 Rio Grande males (AR). Three AR F_2 spawns were obtained. The largest 10 percent of the F_2 were selected as brood stock and they produced eight F_3, AR-3 spawns.
Brood Population: 100
Breeding and Traits: Mass selection for body weight

Stock: *ARMK-3*
Farm or Hatchery: Auburn University, Alabama
Origin: Same six A x R pairings as AR-3 and 6 Marion females with 6 Kansas males (MK). Three pairings each of AR x MK and MK x AR (ARMK) were accomplished in next generation.

Largest 10 percent of these 4-strain F_1 crossbreeds were selected as brood stock. These fish were then mated (33 pairings); largest 10 percent of resulting fingerlings were selected to form the base for ARMK-3.
Brood Population: 70
Breeding and Traits: Mass selection for body weight

Stock: *Aquafarms (Auburn)*
Farm or Hatchery: Auburn University, Alabama
Origin: Aquafarms (MSU) in 1983; two sib lots totalling 10,000 fry were obtained
Brood Population: 100
Breeding and Traits: Mass selection for body weight

Stock: *Aquafarms (MSU)*
Farm or Hatchery: Mississippi State University, Mississippi
Origin: Aquafarms
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Auburn*
Farm or Hatchery: Auburn University, Alabama
Origin: Rivers in Arkansas, Kansas, Oklahoma, and Texas. Original stock came from Osage Springs in 1956. More fish were brought to Auburn from Osage Springs, Marion (NFH), and Fort Worth in 1957. Additional NFH stock were introduced to Auburn from Burnet, Texas, and Uvalde, Texas, in 1958. Some stock was exchanged between Auburn and Marion (NFH) in 1963 and 1965.
Brood Population: 100
Breeding and Traits: Random mating; excellent dressing percent (*13*), difficult to seine (*13*), females produce fast growing F_1's when crossbred, albinism common, growth rate is moderate.

Stock: *Auburn (T A & M)*
Farm or Hatchery: Texas A & M University, Texas
Origin: Auburn in early 1970's
Brood Population: Undetermined
Breeding and Traits: Random meeting

Stock: *Auburn S*
Farm or Hatchery: Auburn University, Alabama
Origin: Auburn
Brood Population: 100

Breeding and Traits: Mass selection (2 generations) for body weight, disease resistance, tolerance of low dissolved oxygen. No albinism observed for two generations.

Stock: *FFES-1*
Farm or Hatchery: Stuttgart Fish Farming Experimental Station, Stuttgart, Arkansas
Origin: Schroeder Farm, Arkansas, in 1979. Fry were obtained from 213 spawns. This stock originated from Dumas and commercial Mississippi stocks.
Brood Population: Several hundred
Breeding and Traits: Random mating

Stock: *Illini x Tifton Prop+*
Farm or Hatchery: Auburn University, Alabama
Origin: Reciprocal crossbreeds were made between Tifton Prop+ and Illini. Illini is a wild stock that came from Carlyle and Shelbyville Reservoirs, Kaskaskia River, Illinois.
Brood Population: 20 pairs
Breeding and Traits: Random mating

Stock: *Kansas*
Farm or Hatchery: Auburn University, Alabama
Origin: Krehbiel in 1970. This fish originated (30-50 original fish) from the Ninnescah River, Pratt, Kansas, in 1911. Stock at Auburn University was derived from 6-8 pairings in 1976.
Brood Population: 120
Breeding and Traits: Random mating; resistant to disease, grows rapidly, matures sexually at four years of age.

Stock: *Kansas S*
Farm or Hatchery: Auburn University, Alabama
Origin: Kansas
Brood Population: 70
Breeding and Traits: Selected for body weight (two generations); resistant to disease, grows rapidly

Stock: *Kentucky*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Kentucky River, Kentucky
Brood Population: NA
Breeding and Traits: Random mating

Stock: *LSU*
Farm or Hatchery: Louisiana State University, Baton Rouge, Louisiana
Origin: Eggs from 4 different geographic locations were collected in 1969 (Lake des Allemands, Louisiana, Amite River, Louisiana, and 2 stocks from commercial farms, Dumas and Yazoo). They were crossbred (5 spawns 1972). Two spawns were obtained in 1974 to produce the F_2 generation. Parentage is uncertain, present brood stock is F_2 whose genes could be any combination of the above.
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *LaCrosse*
Farm or Hatchery: LaCrosse Research Station, USDI, LaCrosse, Wisconsin
Origin: Imperial
Brood Population: 20-30 pairs
Breeding and Traits: Selected against shortened caudal peduncles

Stock: *Lake Village (MSU)*
Farm or Hatchery: Mississippi State University, Mississippi
Origin: Lake Village
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *M x K*
Farm or Hatchery: Auburn University, Alabama
Origin: Crossbreed between Marion females and Kansas males
Brood Population: 50 pairs
Breeding and Traits: F_1 fingerlings are fast growing and become excellent brood stock that readily spawn

Stock: *MK-3*
Farm or Hatchery: Auburn University
Origin: Six M x K spawns were produced in 1976. Eleven F_2 spawns were produced in 1979. The largest 10 percent of the F_2 were selected for future brood stock in 1980. Thirteen F_3 spawns were produced in 1982. The largest 10 percent were chosen for future brood stock.
Brood Population: 100
Breeding and Traits: Mass selection for body weight; rapid rate of growth

Stock: *MSU*
Farm or Hatchery: Mississippi State University, Mississippi
Origin: Developed by crossing Lake Village with Aquafarms, selecting the largest F_1's and producing 3 F_2 spawns.
Brood Population: Undetermined
Breeding and Traits: Mass selection for body weight

Stock: *Marion*
Farm or Hatchery: Auburn University, Alabama
Origin: Marion (NFH) in 1970. Was perpetuated in 1976 with 6 pairings.
Brood Population: 120
Breeding and Traits: Random mating; highly seinable, relatively large head, very poor disease resistance (*13, 59*), albinism common, growth rate moderate, a brassy color, prefeeding behavior in small ponds resulting in schooling and swimming rapidly causing a rippling effect on the pond surface.

Stock: *Marion (Kyser)*
Farm or Hatchery: Southeastern Fish Cultural Laboratory, Marion, Alabama (no longer propagated)
Origin: Kyser in mid-1970's. Stock was eliminated in 1982.
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Marion S*
Farm or Hatchery: Auburn University, Alabama
Origin: Marion
Brood Population: 60
Breeding and Traits: Mass selection (2 generations) for body weight; highly seinable, relatively large head (*13, 59*), albinism common, rapid growth, brassy color, prefeeding behavior in small ponds resulting in schooling and swimming rapidly causing a rippling effect on the pond surface.

Stock: *Minnesota*
Farm or Hatchery: Auburn University, Alabama
Origin: St. Louis River, Minnesota
Brood Population: 8 males, 2 females
Breeding and Traits: Mass selection for body weight; spawn early in season, produce large eggs and fry (*19, 59*), poor resistance to disease

Stock: *Pine Bluff*
Farm or Hatchery: University of Arkansas Pine Bluff, Arkansas

Origin: University of Arkansas-Pine Bluff, Schroeder, Hill, McNulty, and Lonoke
Brood Population: Undetermined
Breeding and Traits: Random mating; the Lonoke strain performed well in cages

Stock: *Purdue*
Farm or Hatchery: Purdue University
Origin: Farm-Fish and Osage
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Rio Grande*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Rio Grande River, Falcon Reservoir, Texas-Mexico; brood stock was captured from the reservoir in 1970 as subadults, reared to maturity in ponds at Texas A & M University, and transported to Auburn University in 1971
Brood Population: NA
Breeding and Traits: Random mating; excellent dressing percentage (*13, 59*). They spawn late, exhibit poor growth, very susceptible to channel catfish virus disease, columnaris, and *Ichthyopthirius,* more sensitive to $KMn0_4$ than other strains of channel catfish, mature at 2 years of age.

Stock: *Rio Grande S*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Rio Grande
Brood Population: NA
Breeding and Traits: Mass selection for body weight, excellent dressing percent (*13, 59*). They spawn late, exhibit poor growth, very susceptible to channel catfish virus disease, columnaris and *Ichthyopthirius,* more sensitive to $KMnO_4$ than other strains of channel catfish, mature at 2 years of age.

Stock: *Santee-Cooper (Auburn)*
Farm or Hatchery: Auburn University, Alabama
Origin: Stock two generations removed from native fish captured in the Santee-Cooper Reservoir, South Carolina; had been previously cultured at Kerr Foundation and Stuttgart Fish Farming Experimental Station
Brood Population: 9 males, 18 females
Breeding and Traits: Random mating

Stock: *Stoneville*
Farm or Hatchery: Stoneville Experiment Station, Stoneville, Mississippi
Origin: Farm Fresh-M
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Stuttgart*
Farm or Hatchery: Stuttgart Fish Farming Experimental Station (USDI) Stuttgart, Arkansas (no longer propagated)
Origin: Arkansas River, Arkansas, White River, Arkansas, and Dumas in the late 1960's. Additions were made from Lonoke and commercial Arkansas stock.
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Tennessee*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Tennessee River, Kentucky Dam, Kentucky
Brood Population: NA
Breeding and Traits: Random Mating

Stock: *Tifton*
Farm or Hatchery: Auburn University, Alabama
Origin: Tifton strain was developed at the Coastal Plains Experiment Station, Tifton, Georgia—derived by crossbreeding following stocks: Goldkist I from Goldkist, Inc., Quitman, Georgia, in 1973, Cordele in 1969; Goldkist II from Goldkist Inc., Quitman, Georgia, in 1970; Marion (albinos), Auburn in 1973, and Pickering in 1973. Crossbreeding resulted in 30 spawns. After one generation, the proportion of the genome contributed by these strains was Goldkist I, 13 percent; Cordele, 5 percent; Goldkist II, 11 percent; Marion, 21 percent; Pickering, 21 percent; and Auburn, 29 percent.
Brood Population: 100
Breeding and Traits: Random mating

Stock: *Tifton CV*$^{+}$
Farm or Hatchery: Tifton Agricultural Experiment Station, Tifton, Georgia (no longer propagated)
Origin: Tifton was base population. After one generation of selection for uniformity of growth proportion of genome from each population was Marion, 28 percent; Pickering, 28 percent; Auburn, 11 percent; Cordele, 11 percent; Goldkist II, 11 percent; and Goldkist I, 11 percent. After two generations

of selection (second generation selected for fast growth rate), proportion of genome from each population was Pickering, 34 percent; Marion, 29 percent; Auburn, 9 percent; Cordele, 9 percent; Goldkist II, 9 percent; and Goldkist I, 9 percent.
Brood Population: NA
Breeding and Traits: Selection for variability and increased body weight.

Stock: *Tifton CV*$^{-}$
Farm or Hatchery: Tifton Agricultural Experiment Station, Tifton, Georgia (no longer propagated)
Origin: Tifton was the base population. After one generation of selection for growth variability, proportion of genome from each population was Marion, 37 percent; Auburn, 20 percent; Goldkist I, 13 percent; Pickering, 13 percent; Goldkist II, 13. percent; and Cordele, 4 percent. After two generations (second generation selected for rapid growth), the proportion of genome from each population was Marion, 19 percent; Auburn, 19 percent; Goldkist I, 25 percent; Pickering, 19 percent; Goldkist II, 11 percent; and Cordele, 6 percent.
Brood Population: NA
Breeding and Traits: Selection for uniformity and increased body weight

Stock: *Tifton Prop*$^{+}$
Farm or Hatchery: Tifton Agricultural Experiment Station, Tifton, Georgia (no longer propagated)
Origin: Tifton was the base population. After one generation, proportion of genome from each population was Marion, 33 percent; Auburn, 22 percent; Pickering, 16 percent; Cordele, 12 percent; Goldkist II, 12 percent; and Goldkist I, 5 percent. Family records were not kept after this time.
Brood Population: NA
Breeding and Traits: Mass selection for body weight

Stock: *Tifton*$^{+}$
Farm or Hatchery: Auburn University, Alabama
Origin: Tifton^{+} originated from the same base population as Tifton. Largest individuals of those crossbred populations were chosen as brood stock. After the first generation of selection, proportion of genome from each stock was Auburn, 29 percent; Pickering, 31 percent; Goldkist I, 6 percent; Goldkist

II, 11 percent; Marion, 20 percent; and Cordele, 3 percent. After the second generation, these crossbred families were selected for body weight and outcrossed to produce the third generation. At this time, the genome represented Auburn, 16 percent; Marion, 16 percent; Pickering, 28 percent; Goldkist II, 28 percent; Goldkist I, 6 percent; and Cordele, 6 percent. Stock was transferred to Auburn University during the third generation and the largest Tif^+ and Tif $Prop^+$ selected for brood stock
Brood Population: 70
Breeding and Traits: Mass selection for body weight

Stock: *Tifton*$^-$
Farm or Hatchery: Tifton Agricultural Experiment Station, Tifton, Georgia (no longer propagated)
Origin: Tifton was the base population. After the first generation of selection for decreased body weight, proportion of genome from each population was Cordele, 31 percent; Auburn, 31 percent; Goldkist I, 19 percent; Goldkist II, 6 percent; Marion, 6 percent; and Pickering, 6 percent. After two generations of selection, proportion of genome was unchanged. Family records are not available for the next generation.
Brood Population: NA
Breeding and Traits: Selection for decreased body weight

Stock: *Uvalde (A & M)*
Farm or Hatchery: Texas A & M University
Origin: Uvalde
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Warrior*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Warrior River, Alabama
Brood Population: NA
Breeding and Traits: Random mating

Blue Catfish

Stock: *Auburn*
Farm or Hatchery: Auburn University, Alabama
Origin: Tensaw and Warrior Rivers, Alabama, reared to maturity at the Southeastern Fish Cultural Laboratory, Marion, Alabama, and transported to Auburn University in 1975
Brood Population: 60

Breeding and Traits: Mass selection for body weight; blue catfish from Tensaw River mature at earlier age and smaller sizes than other strains of blue catfish

Stock: *Purdue*
Farm or Hatchery: Purdue University
Origin: D & B
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Stuttgart*
Farm or Hatchery: Stuttgart Fish Farming Experimental Station (USDI), Arkansas (no longer propagated)
Origin: Arkansas River, Arkansas, and Dumas
Brood Population: NA
Breeding and Traits: Random mating

Brown Bullhead

Stock: *Auburn*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Streams in Lee County, Alabama. Stock was cultured in the 1950's and early 1960's at Auburn University. This stock was also cultured at Stearn's Farm, Wetumpka, Alabama, and Millen NFH, Georgia, in the early 1960's.
Brood Population: NA
Breeding and Traits: Random mating

Flathead Catfish

Stock: *Stuttgart*
Farm or Hatchery: Stuttgart Fish Farming Experimental Station (USDI), Arkansas (no longer propagated)
Origin: Arkansas River and Bayou Meado in Arkansas
Brood Population: NA
Breeding and Traits: Random mating

White Catfish

Stock: *Auburn I*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Santee-Cooper River system, South Carolina, reared to maturity at the Southeastern Fish Cultural Laboratory,

Marion, Alabama, and transported to Auburn University in 1975
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Auburn II*
Farm or Hatchery: Auburn University, Alabama (no longer propagated)
Origin: Hoffman, North Carolina, in the late 1950's
Brood Population: NA
Breeding and Traits: Random mating

Stock: *Purdue*
Farm or Hatchery: Purdue University, Indiana
Origin: Bradshaw and Gould Farm, Arkansas
Brood Population: Undetermined
Breeding and Traits: Random mating

Stock: *Stuttgart*
Farm or Hatchery: Stuttgart Fish Farming Experimental Station (USDI), Arkansas (no longer propagated)
Origin: Orangeburg, South Carolina
Brood Population: NA
Breeding and Traits: Random mating

CATFISH BREEDING PROGRAMS

A variety of breeding programs can improve culture traits such as growth rate, reproductive performance, dressing percentage, catchability (seining, trapping, and angling), resistance to disease, and tolerance to low oxygen. These programs can be as simple as choosing strains that already possess superior traits or can be more complex such as crossbreeding, hybridization, polyploidization, mass selection, or family selection programs which alter the traits of existing stocks.

Strain Evaluation

Channel catfish strains originating from different geographic locations within the United States grow at different rates and domesticated strains grow faster than native strains *(11, 13, 19, 33, 68)*. Differences exist in growth rate during winter *(19)* as well as during summer. Strains also differ in disease resistance *(22, 50)*, morphometrics *(17, 60)*, length variation *(8)*, hemoglobin *(63)*, resistance to parasites *(55)*, dressing percentage *(13)*, seinability *(13)*, feed conversion efficiency *(13)*, spawning date, reproductive performance, and age of maturity *(25)*.

Some of these strains exhibit various anomalies. Smitherman et al. *(59)* found stump-bodied fish within the Auburn strain. This anomaly was caused by compressed vertebrae; dressing percentage and filet percentage were reduced in the stump-bodied fish. It is not known whether this trait is genetically or environmentally determined. Albino catfish are common and grow at the same rate as normally pigmented catfish *(51)* but are more vulnerable to predation. Bondari *(5)* demonstrated that albinism in catfish is a simple recessive trait.

Crossbreeding

Crossbreeding is a mating method designed to produce immediate improvement through hybrid vigor. Intraspecific crossbreeding in channel catfish usually increases growth rate *(21)*, disease resistance *(22, 55)*, and reproductive performance *(25)*. The best crossbreeds grow 10-15 percent faster than their best parent strain. Reciprocal crossbreeds do not grow at the same rate *(21, 23)*. The spawning rate between strains to produce crossbreeds may not be as efficient as pure strain matings *(58)*.

Hybridization and Polyploidization

Different species of catfish have distinct culture traits. Attempts have been made to take advantage of these specific characteristics and find crosses exhibiting heterotic growth rates through hybridization. Dupree and Green *(27)* artificially hybridized the seven major Ictalurid species and produced 21 of their hybrids. They found that the channel x white was the only hybrid that grew at heterotic rates in aquarium studies. However, Chappell *(13)* found that the channel x white hybrid catfish grew slowly from fingerlings to harvestable size in ponds. He also found that the number of fertile and viable channel x white and white x blue eggs was extremely low. The hybrids blue x channel, channel x white, and white x blue have large fat deposits in the viscera *(13)* that cause poor dressing percentage in these hybrids and are associated with abnormal sexual development. The white x blue results in all female progeny.

Giudice *(31)*, Yant et al. *(67)*, Chappell *(13)*, and Tave et al. *(61)* found that the hybrid channel x blue grew approximately 18 percent faster than channel catfish. Yant et al. *(67)* found dressing percentage was higher in the channel x blue hybrid than in channel catfish. The hybrid was also more catchable by angling *(61)* than channel or blue catfish, and hybrids with blue parentage were more seinable than channel or white catfish *(13)*. Hybridizing channel and blue catfish does not increase resistance to channel catfish virus disease *(49)*. The channel x blue hybrids tolerate lower oxygen concentrations than channel catfish *(26)*. The reciprocal hybrid, blue x channel, does not exhibit heterotic growth or dressing percentage *(13)*.

The channel-blue hybrids exhibit paternal predominance, possessing the appearance and traits of their male parent *(23)*. The channel x blue hybrid inherits the desirable traits of growth uniformity, body conformation, morphometric uniformity, and seinability from its male parent, the blue catfish.

Channel x blue hybrid catfish are not presently used in commercial culture because of the lack of consistency in hybridization success *(62)*. Tave and Smitherman *(62)* determined hormone injection of 1100 IU human chorionic gonadoptropin per kilogram female increased the hybridization rate between channel catfish females and blue catfish males, and use of crossbred channel catfish females increases the hybridization

rate with blue catfish *(25)*. Tave and Smitherman *(62)* found that hybrid eggs hatched normally and hybrid fry had normal viability.

Wolters et al. *(66)* indicate induction of triploidy may also increase growth rate in channel catfish which may be a result of lack of normal gonadal development in triploid individuals.

Mass Selection and Inbreeding

Mass selection has been an effective breeding program to increase body weight in channel catfish *(6, 22)*. One generation of mass selection upon Rio Grande, Marion, and Kansas strains of channel catfish at Auburn University resulted in responses to selection and realized heritabilities of: 63 grams, .24 ± .06; 73 grams, .50 ± .13; and 54 grams, .33 ± .10, respectively *(22)*. Pooled response was 64 grams and pooled realized heritability was .34 ± .07. Males and females had similar responses to selection. Selection for body weight at 500 grams improved body weight of fingerlings at 30 grams *(59)*. Selection for body weight did not affect dressing percentage, visceral percentage, head percentage, or seinability *(59)*. Increased fecundity (Rio Grande, Kansas) and survival (Rio Grande, Marion) were correlated with increased body weight.

Within crossbred populations [Marion x Kansas, (MK), and Auburn x Rio Grande, (AR)], certain individuals grew faster than the remainder of the population *(19)*. The largest MK and AR were mated in all four possible combinations to determine if there were any additive effects that made them larger than the remaining crossbreds. Mean body weights of various F_2 combinations were that of the mid-parent value. This indicated dominance genetics had made these larger individuals superior to the remaining crossbred catfish.

Bondari *(6)* obtained a 20 percent increase in body weight after one generation of selection with the Tifton strain (University of Georgia), but a much lower realized heritability, 0.14, than obtained by Dunham and Smitherman *(22)*. The difference in results might be explained by the mating scheme of the Tifton experiment. The breeding program implemented was a combination of family selection, mass selection, and crossbreeding with the major effects probably attributable to crossbreeding.

A concern in selection programs is the potential of detrimental effects through inbreeding. One generation of full-sib

mating did not affect reproductive performance or growth rate in the Tifton strain of channel catfish; however, two generations of inbreeding decreased growth rate of the Tifton strain *(59)*.

Cellular Genetics

The cytology of catfish is increasingly important as modern genetics and genetic engineering gain prominence. Since the makeup of chromosome complement may considerably affect the mechanics of inheritance, cytogenetic information on species utilized for selective breeding and aquacultural studies is of potentially great importance to fish geneticists and breeders. A basic understanding of the karyotype may be useful in determining the mechanics of linkage groups, explaining hereditary abnormalities, elucidating sex-determining mechanisms, facilitating genetic improvement through hybridization, and explaining hybrid fertility problems *(60)*.

The study of biochemical genetics and isozymes has applications similar to karyology. In addition, isozymes can be a tool used to identify specific stocks and measure changes in variation. Data on karyology and biochemical genetics of catfish are in tables 1-4.

GENETIC DATA AND PERFORMANCE RECORDS FOR RESEARCH STRAINS OF CATFISH

The relative performance of some of the previously described strains and crosses are reported in this section. The data were obtained at Auburn University, Kerr Foundation, Stuttgart Fish Farming Experimental Station, and Texas A & M University.

TABLE 1. SUMMARY OF KARYOTYPE DATA FOR 26 SPECIES OF ICTALURID CATFISH[1]

Species	No.	2N	FN	LC	LM	LC + 2N	Formula	HoM%	M%	HrM%
Ictalurus. punctatus	4	58	92			58	34msm,24stt	25.8	74.2	0.0
Ictalurus furcatus	6	58	84							
Ictalurus natalis	2	62	84	2	2	64	22msm,40stt	30.5	67.8	1.7
Ictalurus melas	3	60	76			60	16msm,44stt	38.9	58.3	2.8
Ictalurus brunneus		62	96-106							
Ictalurus nebulosus	9	60	76			60	16msm,44stt	31.5	64.5	4.0
Ictalurus platycephalus		54	92							
Ictalurus serracanthus	1	52	90	8	6	60	38msm,14stt	33.4	53.3	13.3
Ictalurus catus	3	48	64-68							
Pylodictis olivaris	3	56	82	4	2	60	26msm,30stt	31.1	67.2	1.5
Noturus gilberti	2	54	82	4	2	58	28msm,26stt	34.7	65.3	0.0
Noturus insignis	6	54	74	4		58	20msm,34stt	27.4	71.0	1.6
Noturus exilis	2	54	68	6		60	14msm,40stt	43.0	57.0	0.0
Noturus nocturnus	10	48	72	10	8	58	24msm,24stt	24.1	75.1	0.8
Noturus leptacanthus	10	46	72	16	12	62	26msm,20stt	24.5	75.5	0.0
Noturus funebris	2	44	68	14	12	58	24msm,20stt	48.7	51.3	0.0
Noturus phaeus	3	42	68	14	12	56	26msm,16stt	23.3	73.4	3.3
Noturus gyrinus	11	42	72	14	10	56	30msm,12stt	26.6	71.2	2.2
Noturus lachneri	9	42	72	12	10	54	30msm,12stt	34.8	63.0	2.2
Noturus flavus (Cooper Cr.)	2	50	70	6		56	20msm,30stt	44.8	52.6	2.6
Noturus flavus	8	48	70	8	2	56	22msm,26stt	27.8	71.2	1.0
Noturus flavipinnis	2	52	82	10	4	62	30msm,22stt	38.7	59.6	1.7
Noturus miurus	11	50	74	12	8	62	24msm,26stt	39.6	58.6	1.8
Noturus albater	13	66-72	82	4						
Noturus elegans	3	46	82	8	8	54	36msm,10stt	46.7	53.3	0.0
Noturus h. hildebrandi	15	46	80	12	10	58	34msm,12stt	35.7	61.1	3.2
Noturus hildebrandi lautus	6	46	80	12	10	58	34msm,12stt	33.8	64.2	2.0
Noturus flavater	1	44	64	14	10	58	20msm,24stt	33.3	66.7	0.0
Noturus eleutherus	7	42	66	16	10	58	24msm,18stt	32.7	63.6	3.7
Noturus stigmosus	1	42	62	12	8	54	20msm,22stt	26.7	73.3	0.0
Noturus munitus	8	42	62	16	10	58	20msm,22stt	42.4	57.6	0.0
Noturus taylori	9	40	63-64	16	12	56	24msm,16stt	40.1	59.4	1.4

[1]Abbreviations: number of specimens (N), diploid number (2N), fundamental number (FN), number of large chromosomes (LC), number of large msm's (LM), percent of hypomodal counts (HoM%), percent of modal counts (M%), percent of hypermodal counts (HrM%). (Adapted from [43]).

TABLE 2. ALLELE FREQUENCIES AT BIOCHEMICAL LOCI OF SEVERAL STRAINS AND LINES OF BLUE, CHANNEL, AND WHITE CATFISH

Allele	Frequency, by stock														
	M	MS	K	KS	MK-4	ARMK	AR-3	A	AS	R	RS	Tif	Tif+	ABL	AIWH
AAT-A-1	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.00
AAT-A-2	.00	.00	.00	.00	—	.00	—	.00	.00	.00	.00	.00	.00	.00	1.00[5]
AAT-B-1	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.00
AAT-B-2	.00	.00	.00	.00	—	.00	—	.00	.00	.00	.00	.00	.00	.00	1.00
AAT-M	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
ADH-1	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	—	1.00	1.00	1.00	1.00	1.00
ALD-B	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	—	1.00	1.00	1.00	1.00	1.00
CA-1	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	—	1.00	1.00	1.00	.00	.00
CA-2	.00	.00	.00	.00	—	—	—	.00	.00	—	.00	.00	.00	1.00	1.00
CK-A-1	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	—	1.00	1.00	1.00	.00	1.00
CK-A-2	.00	.00	.00	.00	—	.00	—	.00	.00	—	.00	.00	.00	1.00	.00
CK-B-1	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	—	1.00	1.00	1.00	1.00	1.00
CK-C-1	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	—	1.00	1.00	1.00	1.00	1.00
EST-A-1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
EST-B-1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.00
EST-B-L-1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	1.00[1]	.00
EST-D-1	.00	.00	.00	.00	.00	.00	.00	.00[2]	.05	.00	.00	.00	.00	.00	.00
EST-D-2	1.00	.90	1.00	1.00	1.00	1.00	1.00	1.00	.95	1.00	1.00	1.00	1.00	1.00	1.00
EST-D-3	.00	.10	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
EST-E-1	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.95	1.00	1.00	1.00	1.00	1.00	.00
EST-E-2	.00	.00	.00	.00	.00	.00	.00	.00	.05	.00	.00	.00	.00	.00	.00
EST-C-1	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.00
GAPDH	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
GPI-A-1	.37[3]	.45	.84	.80	1.00	1.00	1.00	.87[4]	.73	.94	1.00	.90	1.00	.73	1.00
GPI-A-2	.63	.55	.16	.20	.00	.00	.00	.13	.27	.06	.00	.10	.00	.27	.00
GPI-B-1	.50	.63	1.00	1.00	1.00	1.00	1.00	1.00	.80	—	1.00	1.00	.86	.00	1.00
GPI-B-2	.50	.37	.00	.00	.00	.00	.00	.00	.20	—	.00	.00	.14	1.00	.00
IDH-A-1	.00	.00	.00	.00	—	—	—	.00	.00	.00	.00	.00	.00	1.00	.00
IDH-A-2	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	1.00	.00	1.00	1.00	.00	.00
IDH-A-3	.00	.00	.00	.00	—	—	—	.00	.00	.00	.00	.00	.00	.00	1.00
IDH-B-1	.00	.00	.00	.00	—	—	—	.00	.00	.00	.00	.00	.00	1.00	1.00
IDH-B-2	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	1.00	1.00	1.00	1.00	.00	.00
LDH-A-1	.00	.05	.03	.12	.15	.25	.05	.00	.02	.00	.00	.00	.00	.00	.00

Continued

TABLE 2 (Continued). ALLELE FREQUENCIES AT BIOCHEMICAL LOCI OF SEVERAL STRAINS AND LINES OF BLUE, CHANNEL, AND WHITE CATFISH

LDH-A-2	1.00	.95	.97	.88	.85	.75	.95	1.00	.98	1.00	1.00	1.00	1.00	1.00	1.00
LDH-B-1	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MDH-A-1	.00	.00	.03	.00	.00	.00	.00	.00	.04	.00	.00	.02	.00	.00	1.00[5]
MDH-A-2	.23	.60	.90	1.00	1.00	1.00	1.00	.98	.71	1.00	1.00	.78	.75	1.00	.00
MDH-A-3	.76	.40	.06	.00	.00	.00	.00	.02	.25	.00	.00	.20	.25	.00	.00
MDH-B-1	.00	.00	.00	.00	—	.00	—	.00	.00	.00	.00	.00	.00	.00	1.00
MDH-B-2	1.00	1.00	1.00	1.00	—	1.00	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.00
MPI-1	—	—	—	—	—	—	—	1.00	—	—	—	—	—	.00	1.00
MPI-2	—	—	—	—	—	—	—	.00	—	—	—	—	—	1.00	.00
PEP-A-1	.00	.00	.06	.00	—	—	—	.00	.07	.00	.00	—	—	.00	.00
PEP-A-2	.00	.00	.10	.00	—	—	—	1.00	.86	1.00	1.00	—	—	1.00	.00
PEP-A-3	1.00	.90	.68	1.00	—	—	—	.00	.07	.00	.00	1.00	—	.00	1.00[6]
PEP-A-4	.00	.10	.16	.00	—	—	—	.00	.00	.00	.00	—	—	.00	.00
PEP-B-1	—	—	—	—	—	—	—	1.00	—	—	—	—	—	1.00	.00
PEP-B-2	—	—	—	—	—	—	—	.00	—	—	—	—	—	.00	1.00
PEP-C-1	—	—	—	—	—	—	—	.00	—	—	—	—	—	1.00	.00
PEP-C-2	—	—	—	—	—	—	—	1.00	—	—	—	—	—	.00	1.00
PGM-A-1	.93[3]	1.00	.74	.68	1.00	1.00	1.00	1.00[7]	.91	1.00	1.00	.42	.89	.00	.00
PGM-A-2	.07	.00	.26	.32	.00	.00	.00	.00	.09	.00	.00	.58	.11	1.00	1.00
SDH-A-1	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
SOD-AI-1	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.00
SOD-AI-2	.00	.00	.00	.00	—	—	—	.00	.00	.00	.00	.00	.00	.00	1.00
SOD-AII-1	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.00
SOD-AII-2	.00	.00	.00	.00	—	—	—	.00	.00	.00	.00	.00	.00	.00	1.00
XDH-A-1	—	—	—	—	—	—	—	1.00	—	—	—	—	—	1.00	1.00
∞PGDH-A-1	1.00	1.00	1.00	1.00	—	—	—	1.00	1.00	—	1.00	1.00	1.00	1.00	1.00
6PGDH-A-1	.00	.00	.00	.00	.00	.00	.00	.00[8]	.00	.00	.00	.00	.00	.00	1.00
6PGDH-A-2	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	.90	.80	1.00	.00
6PGDH-A-3	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.10	.20	.00	.00

[1]Is only expressed on LiOH gels. [2]This allele had a frequency of .03 the previous generation. [3]This allele had a frequency of .28 the previous generation. [4]This allele had a frequency of .30 the previous generation. [5]This may not be the same A-1 allele as possessed by the channel catfish. [6]May be a distinctive white catfish allele. [7]This allele had a frequency of .89 the previous generation. [8]This rare allele, which had a frequency of .06 the previous generation, is probably different from the A-1 white catfish allele.

M=Marion, MS=Marion S, K=Kansas, KS=Kansas S, A=Auburn, AS=Auburn S, R=Rio Grande, RS=Rio Grande S, Tif=Tifton, ABL=Auburn Blue, AIWH=Auburn I White.

TABLE 3. ALLELE FREQUENCIES AT SERUM ESTERASE-5 AND TRANSFERRIN LOCI FOR CHANNEL CATFISH (ADAPTED FROM [57])

Strain	Allele						
	Esterase-5			Transferrin			
	F	I	S	A	B	C	D
Minnesota	0.00	0.00	1.00	0.32	0.35	0.32	0.00
Rio Grande	.11	.42	.46	.02	.15	.48	.35
Trinidad	.13	.03	.84	.01	.14	.63	.21
Stuttgart	.05	.00	.95	—	—	—	—
Buckholts	.58	.00	.42	—	—	—	—
Arkansas							
Marketable	.46	.00	.54	—	—	—	—
Cull	.15	.00	.85	—	—	—	—
Auburn	.09	.00	.91	.19	.15	.40	.25
Uvalde	.16	.01	.83	.12	.15	.41	.31

TABLE 4. GENE FREQUENCIES AT SIX VARIABLE GENE LOCI IN 10 CHANNEL CATFISH HATCHERY STRAINS[1,2] (ADAPTED FROM [48])

Allele	Strain[3] (number of fish assayed)									
	FFES1 (50)	FFES2 (62)	FFES3 (40)	FFES4 (44)	FFES6 (55)	FFES7 (40)	FFES8 (40)	BON1 (20)	BON2 (24)	BON3 (20)
Gpi-1										
(100)	0.73	.84	0.83	0.79	0.63	0.69	0.73	0.81	1.00	0.90
(200)	.25	.16	.16	.21	.37	.29	.27	.19	.00	.10
(−100)	.02	.00	.01	.00	.00	.02	.00	.00	.00	.00
Idh-2										
(100)	1.00	1.00	1.00	.88	1.00	1.00	1.00	1.00	1.00	.98
(157)	.00	.00	.00	.12	.00	.00	.00	.00	.00	.02
Ldh-3										
(100)	.88	.76	1.00	1.00	.81	1.00	1.00	1.00	1.00	1.00
(157)	.12	.24	.00	.00	.19	.00	.00	.00	.00	.00
Pgm-1										
(100)	.85	.82	.60	.94	.86	.83	.86	.80	1.00	.73
(340)	.13	.18	.39	.05	.14	.16	.13	.20	.00	.27
(175)	.02	.00	.00	.01	.00	.01	.01	.00	.00	.00
(85)	.00	.00	.01	.00	.00	.00	.00	.00	.00	.00
Pgd-1										
(100)	.97	1.00	.89	.96	1.00	1.00	1.00	1.00	.60	1.00
(130)	.03	.00	.11	.04	.00	.00	.00	.00	.40	.00
Mdh-3										
(100)	.94	1.00	1.00	.90	.92	.93	.97	1.00	.87	.69
(127)	.06	.00	.00	.10	.08	.07	.03	.00	.13	.12
(50)	.00	.00	.00	.00	.00	.00	.00	.00	.00	.19

[1]Electrophoretic techniques of Allendorf et al. *(1)*.
[2]Allele nomenclature of Allendorf and Utter *(2)*.
[3]FFES = Fish Farming Experimental Station; Bon = Tifton.

TABLE 5. RELATIVE BODY WEIGHT OF CHANNEL CATFISH STRAINS GROWN IN EARTHEN PONDS STOCKED AT 7410/HA (ADAPTED FROM [*22, 59*])

Strain	Weight (g)	Strain	Weight (g)
Experiment 1		**Experiment 2**	
Kansas S[1]	513	ARMK—2[1]	513
Kansas	459	MK—3[1]	513
Marion S[1]	486	Kansas S[2]	495
Marion	413	Tifton+	373 (403)[3]
Auburn (Auburn)	322	FFES—1	361
Rio Grande S[1]	436	M x K	360
Rio Grande	295	Auburn (Texas A & M)	342
		Mississippi (commercial)	307
		MSU—F_2	299
		LSU—F_2	294

[1] One generation of selection.
[2] Two generations of selection.
[3] 403, mean weight of fish without caudal deformities.

TABLE 6. RELATIVE BODY WEIGHT OF CATFISH SPECIES AND HYBRIDS GROWN IN CAGES AND PONDS (ADAPTED FROM [*16, 59*])

Stock	Weight (g)	Stock	Weight (g)
Experiment 1		**Experiment 4**	
Lonoke channel	363[1]	Auburn channel	482[3]
Arkansas blue	344	Auburn blue	436
Experiment 2		Auburn I white	397
Lonoke channel	451[2]	Auburn blue x Auburn channel	501
Arkansas blue	322	Auburn channel x Auburn blue	563
Experiment 3		Auburn I white x Auburn blue	292
Federal channel	568[3]	Auburn channel x Auburn I white.	468
Auburn blue	389		
Auburn II white	361		

[1] Restricted feeding regime in cages.
[2] Ad-libitum feeding in cages.
[3] In ponds.

TABLE 7. MEAN HARVEST WEIGHTS OF PARENT STRAIN AND CROSSBRED CHANNEL CATFISH AND THE RELATIONSHIP OF THE CROSSBREED TO THE BEST PARENT STRAIN (ADAPTED FROM [21])

Strain	$\bar{X}$ weight (g)	Percent increase or decrease
Experiment 1		
Marion x Kansas	294 a	1.0
Marion x Marion	291 a	—
Kansas x Kansas	261 b	—
Experiment 2		
Auburn x Kansas	294 a	13.0
Kansas x Kansas	261 b	—
Experiment 3		
Marion x Kansas	336 a	9.1
Marion x Marion	308 b	—
Kansas x Kansas	300 b	—
AR x MK	310 b	.0
MK x MK	308 b	—
Experiment 4		
Marion x Kansas	694 a	6.9
Marion x Marion	649 b	—
Kansas x Kansas	620 b	—
Experiment 5		
Auburn x Rio Grande	494 a	7.9
Rio Grande x Rio Grande	458 b	—
Auburn x Auburn	454 b	—
Experiment 6		
Auburn x Auburn	489 a	—
Rio Grande x Rio Grande	413 b	—
Rio Grande x Auburn	398 b	18.0
Experiment 7		
Auburn x Uvalde	639 a	8.2
Uvalde x Auburn	497 c	15.9
Uvalde x Uvalde	591 b	—
Auburn x Auburn	514 c	—

Means followed by the same letter were not significantly different ($P > 0.05$), Duncan's Multiple Range test.

TABLE 8. MEAN WEIGHTS OF PARENT STRAIN AND CROSSBRED CHANNEL CATFISH FINGERLINGS AND THE RELATIONSHIP OF THE CROSSBREED TO THE BEST PARENT (ADAPTED FROM [21])

Strain	$\bar{X}$ weight (g)	Percent increase or decrease
Experiment 1		
Warrior x Commercial	127 a	14.4
Commercial x Commercial	111 b	—
Warrior x Warrior	75 c	—
Experiment 2		
Commercial x Tennessee	89 b	20.0
Commercial x Commercial	111 a	—
Tennessee x Tennessee	57 c	—
Experiment 3		
Marion x Kansas	142 a	31.0
Kansas x Marion	118 b	8.4
Kansas x Kansas	109 c	—
Marion x Marion	96 d	—
Experiment 4		
Marion x Kansas	51 a	17.7
AR x MK	44 b	2.3
Kansas x Kansas	43 b	—
Marion x Marion	43 b	—
MK x MK	39 b	—
Experiment 5		
AR x AR	20 a	—
MK x AR	20 a	11.1
AR x MK	18 a	0.0
MK x MK	18 a	—
Rio Grande x Rio Grande	8 b	—

Means followed by the same letter were not significantly different ($P > 0.05$) Duncan's Multiple Range test.

TABLE 9. PRODUCTION OF 8 GENETIC GROUPS OF CHANNEL CATFISH IN 3 DIFFERENT ENVIRONMENTS—PONDS, CAGES, AND AQUARIA (ADAPTED FROM [33])

Cross	Production (g)		
	Ponds	Cages	Aquaria
Marion x Marion	19733 a	2686 a	799 a
Warrior x Commercial	18383 b	2542 a	486 c
Rio Grande x Rio Grande	14779 bc	2271 a	600 b
Commercial x Commercial	13961 cd	2418 a	554 b
Tennessee x Yazoo	12589 de	1613 b	334 e
Warrior x Warrior	10381 f	2498 a	457 cd
Kentucky x Kentucky	8222 g	1784 b	414 d
Tennessee x Tennessee	7920 g	1484 b	294 e

Means followed by the same letter are not significantly different ($P > .05$).

TABLE 10. COMPARISON OF GAIN, FEED CONVERSION, AND VISCERAL FAT PERCENTAGE IN BLUE, CHANNEL, WHITE, AND HYBRID CATFISH (ADAPTED FROM [13])

Cross	Gain (g)	Feed conversion	Visceral fat (pct. body weight)
Channel x Channel (Auburn)	482 bc	1.36 abc	3.5 ab
Channel x Blue	563 a	1.21 a	3.8 ab
Blue x Channel	501 b	1.41 bc	7.0 bc
Blue x Blue (Auburn)	436 cd	1.51 c	4.6 abc
White x Blue	292 e	2.24 e	12.1 d
White x White (Auburn I)	397 d	1.99 d	5.3 abc
Channel x White	468 bcd	1.49 c	8.4 c

Means followed by the same letter are not significantly different ($P > .05$).

TABLE 11. PERCENT GAIN OF INITIAL BODY WEIGHT (1 G) AND FEED CONVERSION EFFICIENCY (S) FOR FINGERLINGS OF DIFFERENT SPECIES AND HYBRIDS OF CATFISH FED AT 3 PERCENT OF BODY WEIGHT OR AD-LIBITUM IN AQUARIA (ADAPTED FROM [27])

Species or hybrid[1]	Experiment 1		Experiment 2		Experiment 3	
	Feeding rate 3 pct. of body weight		Feeding rate 3 pct. of body weight		Ad-libitum feeding	
	S	*Pct. gain*	*S*	*Pct. gain*	*S*	*Pct. gain*
Channel	0.9	302	1.0	189	1.2	448
White x Channel	1.1	242	1.1	188	1.6	319
Blue x Channel	1.3	212				
White	1.4	194	.9	247	1.3	422
Blue x White	1.4	186	1.0	200		
Channel x Black	1.4	186				
White x Black	1.5	176				
Blue	1.6	164	1.1	180	1.7	298
Yellow	1.9	144	1.2	159	1.6	256
Blue x Yellow	2.3	116				
White x Yellow	3.2	85				
Channel x White	—	—	.9	264	1.2	508
Channel x Yellow	—	—	.9	237	1.2	402
Channel x Blue	—	—	1.0	173	1.7	258
Brown x White	—	—	1.1	191	1.6	300
Black	—	—	1.1	157	2.3	181
Brown x Channel	—	—	1.2	161	2.2	196
Channel x Blue F_2	—	—	1.3	123	2.3	203
Yellow x White	—	—	1.5	165	2.1	230
Blue x Brown	—	—	1.5	122	3.1	143
Brown	—	—	1.6	103	3.1	143
Brown x Yellow	—	—	1.8	93	4.6	89
White x Brown	—	—	1.9	85	2.6	173

[1] Black = Black Bullhead, brown = Brown Bullhead, yellow = Yellow Bullhead.

TABLE 12. FEED CONVERSION EFFICENCY OF 12 GENETIC GROUPS OF CATFISH STOCKED SEPARATELY IN 0.04 HA EARTHEN PONDS AND OFFERED 4890 KG/HA OF FEED (ADAPTED FROM [13])

Group	Feed conversion efficency
Channel x Blue	1.21 a
Marion x Kansas	1.22 a
Marion	1.26 ab
Kansas	1.26 ab
Auburn x Rio Grande	1.27 ab
Auburn	1.36 abc
Blue x Channel	1.41 bc
Rio Grande	1.42 bc
Channel x White	1.49 c
Blue	1.51 c
White	1.99 d
White x Blue	2.24 d

[1] Means followed by the same letter are not significantly different ($P > 0.05$). Duncan's MRT. Blue, channel, and white are Auburn strain. All other strains are channel catfish.

TABLE 13. PARASITIC LOAD ON CATFISH FINGERLINGS GROWN IN PONDS AT 146,000/HA (ADAPTED FROM [55])

Strain	Parasites[1]				
	Trichodina	Scyphidia	Trichodinella	Cleidodiscus	Ichthyopthirius
White	3, (0-15)	120, (40-200)	0	0	0
Kansas	3, (0-10)	34, (15- 60)	0	5, (0- 15)	0
White x Blue	3, (0-10)	32, (20-100)	0	8, (6- 10)	166, (70-270)
Blue	1, (0- 5)	28, (15- 30)	3, (0-13)	4, (0- 10)	0
Blue x Auburn	4, (0- 9)	115, (70-190)	0	30, (5-120)	0
Auburn x Blue	1, (0- 5)	145, (60-300)	0	11, (0- 20)	0
Auburn x White	1, (0- 5)	0	0	16, (7- 32)	0
Auburn	14, (0-80)	556, (150-950)	0	30, (2-120)	0
Auburn x Rio Grande	1, (0- 4)	160, (0-800)	0	25, (0- 90)	0
Rio Grande	9, (0-22)	800, (600-1000)	0	11, (0- 30)	0
Marion	0	89, (15-160)	0	46, (15-70)	0
Marion x Kansas	14, (0-35)	22, (0-200)	0	10, (0- 30)	0

[1] Numbers outside parenthesis are average numbers for each fish and those within parenthesis are range of parasitic load. Blue and white catfish are Auburn strain. All other strains are channel catfish.

TABLE 14. SUSCEPTIBILITY OF SIX GENETIC GROUPS OF CHANNEL CATFISH EXPERIMENTALLY INFECTED WITH FLEXIBACTER COLUMNARIS

Experiment 1		Experiment 2	
Genetic group	Percent mortality	Genetic group	Percent mortality
Auburn	33	Marion	0
Marion	63	Marion x Kansas	0
Dakota x Rio Grande	50	Auburn x Rio Grande	11
Auburn x Rio Grande	75	Rio Grande	25
Rio Grande	63		

TABLE 15. MORTALITY OF EIGHT GENETIC GROUPS OF FINGERLING CHANNEL CATFISH FED CHANNEL CATFISH VIRUS (ADAPTED FROM [*50*])

Group	$\bar{X}$ percent mortality
Rio Grande	72 a
Kentucky	43 b
Marion	33 c
Warrior	29 c
Tennessee	12 d
Yazoo	13 d
Tennessee x Yazoo	10 d
Warrior x Yazoo	9 d

Means followed by the same letter are not significantly different ($P > .05$).

TABLE 16. MORTALITY OF CHANNEL x BLUE HYBRID AND CHANNEL CATFISH IN PONDS, CAGES, AND TANKS WHEN OXYGEN CONCENTRATIONS WERE REDUCED BELOW 1.0 MG/L (ADAPTED FROM [*26*])

Environment	Number of catfish		Percentage mortality (SD)	
	Hybrid	Channel	Hybrid[1]	Channel
Ponds	500	500	7.5 (0.7)	50.5 (0.7)
Cages	600	600	51.0 (4.2)	87.5 (2.1)
Tanks	500	500	33.0 (—)	100.0 (—)

[1] Mortality of the hybrid catfish was significantly lower than that of channel catfish ($p < .01$).

TABLE 17. DRESS-OUT PERCENTAGE OF CATFISH GROUPS GROWN IN EARTHEN PONDS AT 7410/HA (FROM [*17*])

Group	Number dressed	Dress-out percentage[1]
Blue	15	64.3 a
Rio Grande	15	64.0 a
Auburn	15	63.3 a
Channel x Blue	15	62.0 b
Auburn x Rio Grande	10	61.5 b
Marion x Kansas	15	60.0 c
Kansas	15	59.3 c
Marion	15	59.3 c
Blue x Channel	15	59.0 c
White x Blue	10	59.0 c
Channel x White	10	56.5 d
White	15	55.0 e

[1] Means followed by the same letter are not significantly different ($P > .05$). Duncan's MRT. Blue, channel, and white are Auburn strain. All other strains are channel catfish.

TABLE 18. MORPHOMETRIC RATIOS (BODY CONFORMATION) FOR NINE GENETIC GROUPS OF CHANNEL CATFISH FINGERLINGS (ADAPTED FROM [32])

Trait	Group								
	Marion	Auburn	Warrior	Kentucky	Yazoo	Tennessee	Rio Grande	Tennessee x Yazoo	Warrior x Yazoo
PDL[1]	0.272	0.260	0.257	0.264	0.275	0.269	0.274	0.269	0.278
BD	.153	.150	.148	.148	.162	.153	.160	.149	.151
G	.056	.055	.050	.053	.059	.057	.060	.059	.060
HL	.195	.184	.182	.186	.192	.191	.192	.187	.193
HD	.132	.125	.125	.126	.129	.128	.130	.128	.130
HW	.149	.140	.132	.142	.148	.145	.147	.141	.149
CPD	.078	.077	.080	.076	.077	.075	.078	.074	.076
CPW	.037	.037	.034	.035	.036	.034	.035	.037	.037

[1] PDL = predorsal length/total length, BD = body depth/total length, G = gape/total length, HL = head length/total length, HD = head depth/total length, HW = head width/total length, CPD = caudal peduncle depth/total length, CPW = caudal peduncle width/total length.

TABLE 19. HEAD LENGTH, HEAD DEPTH, HEAD WIDTH, CAUDAL PEDUNCLE WIDTH, CAUDAL PEDUNCLE DEPTH AND BODY DEPTH TO TOTAL LENGTH RATIOS OF BLUE, CHANNEL, WHITE, AND HYBRID CATFISHES (ADAPTED FROM [17])

Group	HW[1]	HL	HD	CPD	CPW	BD
White x White	0.173b[2]	0.212b	0.112b	0.083b	0.037b	0.205b
Auburn x Rio Grande	.143c	.203d	.104d	.073c	.032c	.164c
Marion x Marion	.143c	.204cd	.106c	.069dc	.031d	.165c
Kansas x Kansas	.138c	.202d	.100ef	.069de	.030d	.165c
Marion x Kansas	.141d	.204cd	.097gh	.069de	.032c	.157de
Rio Grande x Rio Grande	.138e	.207c	.101e	.070d	.029ef	.151f
Auburn x Auburn	.135f	.198c	.099f	.068e	.029fg	.160cd
Blue x Channel	.132g	.193f	.096hi	.064f	.028gh	.154ef
Channel x Blue	.124i	.192f	.095e	.064f	.027gh	.156de
Blue x Blue	.127i	.183g	.095i	.063f	.026f	.162c

[1]HL—head length/total length, HD = head depth/total length, HW = head width/total length. CPD = caudal peduncle depth/total length, CPW = caudal peduncle width/total length and BD = body depth/total length. Blue, channel and white are Auburn strain. All other groups are channel catfish.

[2]Means followed by the same superscript are not significantly different (P > .001).

TABLE 20. MORPHOLOGICAL COEFFICIENTS DESCRIBING THE OVERALL DIFFERENCES IN SHAPE OF CHANNEL, BLUE, WHITE, AND HYBRID CATFISH (ADAPTED FROM [17])

Strain	Body conformation coefficient	Coefficient of head size	Coefficient of caudal size
White x White	0.822 a[1]	0.497 a	0.120 a
Auburn x Rio Grande	.719 b	.450 bc	.105 b
Marion x Marion	.717 bc	.453 b	.100 cd
Kansas x Kansas	.704 bcd	.440 de	.099 cd
Marion x Kansas	.700 cd	.442 cd	.101 c
Rio Grande x Rio Grande	.696 d	.446 bcd	.099 cd
Auburn x Auburn	.689 d	.432 e	.097 d
Blue x Channel	.667 e	.421 f	.092 e
Channel x Blue	.663 e	.416 f	.091 e
Blue x Blue	.656 e	.405 g	.089 e

[1] Means followed by the same letter are not different (P> .01). Channel, blue, and white are Auburn strain. All other groups are channel catfish.

TABLE 21. SEINABILITY (CATCH PER UNIT EFFORT)[1] OF SEPARATELY STOCKED CATFISH GROUPS AT THREE SAMPLE PERIODS (ADAPTED FROM [13])

Group	Percent population captured			
	June 16	July 30	Aug. 31	Season mean
White x Blue	88.3 a[2]	56.7 abc	74.3 a	73.1 a
Channel x Blue	83.2 a	71.0 a	39.7 cd	64.6 ab
Channel x White	77.3 a	42.0 cd	50.0 cd	56.4 ab
Blue	57.0 ab	68.4 ab	79.9 a	68.4 a
Blue x Channel	52.6 ab	49.4 bc	55.0 b	52.3 b
Kansas	51.6 ab	13.2 e	8.3 f	24.3 cd
Marion	45.9 ab	34.7 cde	25.8 de	35.4 c
Marion x Kansas	44.2 ab	19.8 de	12.8 ef	25.6 cd
White	36.9 b	23.3 de	29.1 d	29.8 cd
Rio Grande	34.4 b	25.2 de	27.9 d	29.2 cd
Auburn x Rio Grande	28.4 b	21.6 de	12.4 ef	20.8 d
Auburn	27.2 b	17.4 e	10.9 f	18.5 d

[1] Catch per unit effort is expressed as mean catch from three replicates having 300 fish per replicate.

[2] Means followed by the same letter are not significantly different ($P > .05$). Duncan's MRT. Blue, channel and white are Auburn strain. All other crosses are channel catfish.

TABLE 22. RELATIVE ABUNDANCE IN THE POPULATION VS. PROPORTION CAUGHT BY ANGLING FOR BLUE CATFISH, CHANNEL CATFISH, AND THEIR RECIPROCAL HYBRIDS (FROM [61])

Group	Relative abundance (pct.)		Proportion in catch (pct.)	
	Number	Weight	Number	Weight
Channel catfish	9.07	9.23	2.67	1.53
Blue catfish	32.82	28.65	22.67	17.32
Channel x Blue	29.54	37.44	57.33	63.85
Blue x Channel	28.57	24.68	17.33	17.30
Total	100.00	100.00	100.00	100.00
Parent species	41.89	37.88	25.34	18.85
Hybrids	58.11	62.12	74.66	81.15
Total	100.00	100.00	100.00	100.00

TABLE 23. SPAWNING PERIODS OF FOUR STRAINS OF CHANNEL CATFISH DURING 1976 AND 1977 SPAWNING SEASONS AT TEXAS A & M UNIVERSITY, COLLEGE STATION, TEXAS (FROM [10])

Strain	Spawning period	
	1976	1977
Minnesota	May 5 - May 9	May 5 - May 12
Uvalde	May 22 - July 7	May 16 - June 9
Auburn	May 17 - June 19	May 28 - June 18
Rio Grande	June 15 - August 30	June 18 - June 27

TABLE 24. REPRODUCTIVE PERFORMANCE BY STRAINS AND CROSSBREEDS OF CHANNEL CATFISH[1]

Pairing	Age of parents	Number of pairings	Number of spawns	Spawning rate, pct.	Spawning day[2]	Number of eggs per kg female parent (CV)[3]	Survival of progeny to 45 days, number per kg female parent
Group 1: Marion (M), Kansas (K), and crossbred (MK) strains, 1979							
M x M	3	32	9	28 a	4.0 a	5,104 (19) a	440 a
K x K	3	50	2	4 b	10.0 b	6,934 (6) b	44 b
MK x MK	3	21	13	62 c	2.7 a	7,764 (17) b	2,423 c
Group 2: Marion (M), Kansas (K), and crossbred (MK) strains, 1980							
M x M	4	24	13	54 a	2.8 a	8,081 (37) a	1,504 a
K x K	4	39	19	49 a	10.0 b	8,006 (49) a	1,755 b
MK x MK	4	17	9	53 a	2.9 a	8,111 (24) a	1,800 b
Group 3: Rio Grande (R) and Auburn (A) x R crossbred (AR) strains, 1979							
R x R	3	25	8	32 a	10.8 a	6,061 (30) a	776 a
AR x AR	3	18	7	39 a	4.0 b	7,480 (15) b	1,158 b
Group 4: Second generation two-way (F_2) and four-way crossbred strains, 1982							
F_2MK x F_2MK	3	41	21	51 a	14.3 a	8,248 (27) a	2,185 a
F_2AR x F_2 AR	3	13	8	62 ab	17.0 b	7,375 (18) ab	2,331 a
ARMK x ARMK	3	41	27	66 b	9.9 c	6,540 (32) b	2,272 a

[1] Chi-square contingency test for spawning rate, chi-square test for juvenile survival, Duncan's multiple-range test for spawning day and fecundity. Within each group separately, values in a column with a letter in common are not significantly different ($P > 0.05$)[1] (from [25]).

[2] Days from the first spawning within a group.

[3] Coefficient of variation: CV = 100(SD)/mean.

TABLE 25. MEAN WEIGHT (G), PERCENT SURVIVAL, YIELD PER HA, AND FEED CONVERSION EFFICIENCY OF FISH FROM SIX CHANNEL CATFISH STRAINS EVALUATED AT THREE DENSITIES AFTER 150 DAYS (PERSONAL COMMUNICATION, [48])

Per hectare density	Strain[2]					
	FFES-1	FFES-2	FFES-3	FFES-4	FFES-6	FFES-8
			Weight (g)[1]			
4970	399	378	420	380	377	345
7410	359	384	406	352	378	315
9850	326	303	343	331	351	261
			Percent Survival			
4970	78.1	96.2	79.9	85.6	89.9	94.5
7410	86.3	96.1	86.5	88.7	79.4	96.3
9850	87.2	94.5	82.4	68.3	83.7	98.1
			Yield (kg/ha)			
4970	3115	3953	3439	3624	3343	3260
7410	5157	5864	5312	5150	4470	4552
9850	5504	6026	5529	4696	5705	4991
			Feed Conversion Efficiency			
4970	1.35	1.62	1.46	2.18	1.09	1.30
7410	1.29	1.59	1.47	2.05	1.19	1.37
9850	1.39	1.85	1.68	2.46	1.27	1.56

[1] Adjusted for initial weight.
[2] FFES = Fish Farming Experimental Station.

TABLE 26. GENETIC GROUPS EXPRESSING IMPROVED PERFORMANCE FOR COMMERCIAL TRAITS IN RESEARCH TESTS (FROM TABLES 5-25)

Traits	Genetic group[1]
Body weight	ARMK-2
	MK-3
	Kansas select
	Marion x Kansas
	Channel x Blue
Resistance to Disease	Channel x Blue
	Kansas
	Kansas select
Tolerance of Low Oxygen Concentration	Channel x Blue
Seinability	Blue catfish
	Channel x Blue
	Marion
	Marion select
Hook and Line Vulnerability	Marion x Kansas
	Channel x Blue
Dressing Percentage	Blue catfish
	Channel x Blue
	Auburn
	Minnesota
	Rio Grande
	Uvalde
Spawning Rate	Marion x Kansas (brood)
Early Spawning, Large Eggs and Fry	Minnesota

[1] Each genetic group is ranked 1 or 2 in research tests.

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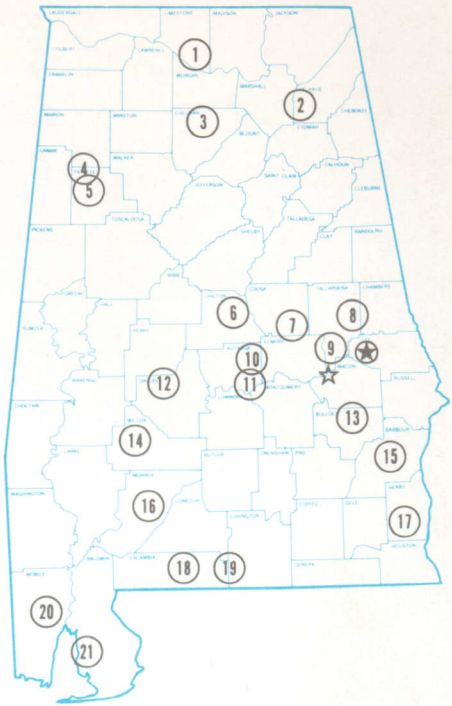

Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.
☆ E. V. Smith Research Center, Shorter.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Chilton Area Horticulture Substation, Clanton.
7. Forestry Unit, Coosa County.
8. Piedmont Substation, Camp Hill.
9. Plant Breeding Unit, Tallassee.
10. Forestry Unit, Autauga County.
11. Prattville Experiment Field, Prattville.
12. Black Belt Substation, Marion Junction.
13. The Turnipseed-Ikenberry Place, Union Springs.
14. Lower Coastal Plain Substation, Camden.
15. Forestry Unit, Barbour County.
16. Monroeville Experiment Field, Monroeville.
17. Wiregrass Substation, Headland.
18. Brewton Experiment Field, Brewton.
19. Solon Dixon Forestry Education Center, Covington and Escambia counties.
20. Ornamental Horticulture Substation, Spring Hill.
21. Gulf Coast Substation, Fairhope.