

# IN BRACKISH WATER CATFISH CULTURE STUDIES IN LOUISIANA



Dr. James W. Avault, Jr. received a B.S. degree at the University of Missouri in 1961 and M.S. in 1963 and Ph.D. in 1966 at Auburn University. Currently he is an assistant professor of fisheries at Louisiana State University where he also conducts research in fish culture. Dr. Avault has worked in fish culture for thirteen years and has published over thirty articles. He is a member of numerous professional organizations and is listed in Who's Who for: Leaders in American Science, American Men of Science, 2,000 Men of Achievement, Royal Blue Book and Dictionary of International Biography. Currently he is secretary-treasurer of the World Mariculture Society. Practical experience in fish culture was obtained at National Fish Hatcheries in Florida, Louisiana, and Kentucky.



W. Guthrie Perry is a fisheries biologist with the Refuge Division of the Louisiana Wild Life and Fisheries Commission, Grand Chenier, Louisiana.

He received his B.S. degree in biology from Northeast Louisiana in 1964, and his M.S. degree in fisheries from Louisiana State University in Baton Rouge, Louisiana in 1966.

He has been with the Louisiana Wild Life and Fisheries Commission since his graduation and he has conducted research and published several articles relating to the ecology and culture of various estuarine species. Most of his work has been in the coastal marshes of Southeast Louisiana.

By **W. GUTHRIE PERRY**  
and  
**JAMES AVAULT**

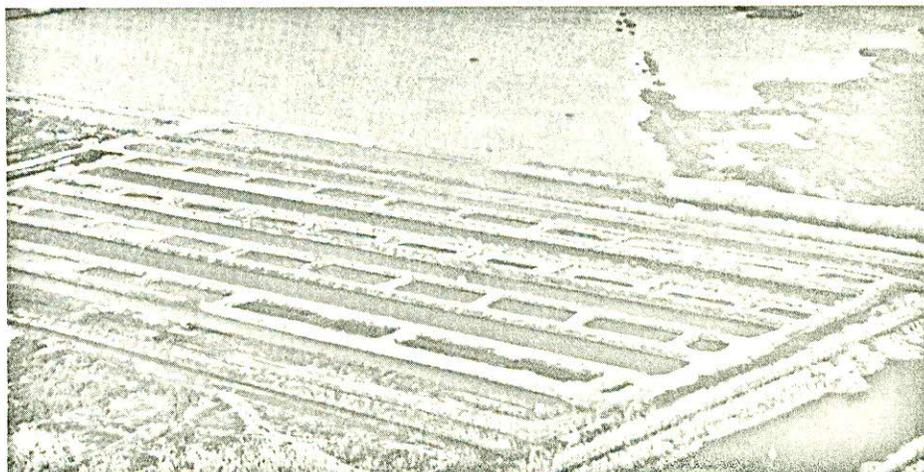
Three years ago the Refuge Division of the Louisiana Wild Life and Fisheries Commission began research relating to the ecology and culture of various estuarine species. A total of 51 ponds were constructed on Rockefeller Wildlife Refuge in Grand Chenier, Louisiana for these studies. Research was not limited to salt water or marine fish, but also included fresh-water fishes. Catfish, pompano, crawfish, mullet and croaker projects are currently under study in these ponds.

The coastal prairie marsh ponds range in size from 0.1 acre to 5.0 acres. Average depth of the ponds was four feet and the bottoms were high in organic matter. Water had to be pumped to and from the research ponds as the levees were still settling and would not permit the

placement of permanent water lines. Gravity drainage was impossible since many of the older ponds were below sea level. The construction is in such a manner as to allow salt water collection from a tidal saline bayou leading to the Gulf of Mexico

or freshwater from a canal draining the freshwater marshes.

Many persons located along the coastal waters of Louisiana have expressed interest in catfish culture and have asked our advice as to the possibilities since the advent of the re-



A total of 51 ponds have been constructed on the Rockefeller Wildlife Refuge for fishery studies. These ponds, ranging in size from 0.1 to 5.0 acres, are constructed in such a manner as to allow salt water collection from a tidal bayou leading to the Gulf of Mexico or fresh water from a canal draining the fresh water marshes. Marsh pond construction is unlike any other. Note the dragline on mats.

cent catfish farming boom. Naturally, they did not wish to go to the expense of beginning a fish farming operation only to find that their fish grow slowly or die because of the presence of salt in their water supply.

Until these studies were initiated, the production of freshwater catfish in brackish waters on an experimental basis had not been tried, and until recently fish culturists believed that freshwater catfish would not grow in salinities of over 1.5 ppt (parts per thousand), but no conclusive research had been conducted.

The warmer climate of Louisiana's vast coastal marshlands could offer longer growing seasons. Also, farmers with water supplies containing certain amounts of salt may be more fortunate than we had once believed. Saline water may prove to have some degree of therapeutic effect against the more common freshwater parasites and diseases. If freshwater catfish can be grown in brackish waters unsuitable for any other crops, then a whole new industry awaits Louisiana. The Louisiana Wild Life and Fisheries Commission, in cooperation with the L. S. U. Agricultural Experiment Station, has conducted studies in 18 ponds over the past two years to determine the effects of these marsh waters upon growth, survival, food conversion and palatability. The channel, blue and white catfish were selected for this study, being the most logical species.

### STOCKING

In the spring of 1967, nine ponds were stocked at a rate of 2,000 fish per acre with catfish obtained from freshwater hatcheries. Only one species was placed in each pond resulting in three replications. Blue catfish fingerlings came from Dumas, Arkansas, white catfish from Auburn, Alabama and channel catfish were obtained in Louisiana. In order to eliminate parasite problems the fingerlings were transported to the refuge in water containing 15 ppm formaldehyde and 1 ppm acriflavine. The freshwater catfish were stocked with an equal amount of acclimatization in the brackish water ponds. Water from the ponds was added little by little to the 150 gallon transport tank until the temperatures and salinities were in close agreement. The water temperature and the salinity gradient from the tank to the ponds were 74° F., freshwater to 78° F., 2.4 ppt salinity.

Initially, fish were fed 10 per cent of body weight per day for approxi-

mately a month and a half. At this time it appeared that they were used to the sinking fish pellets and the ration was cut to the standard 3 per cent body weight. The fish were fed seven days a week during early morning hours in order to catch oxygen depleted ponds before mass mortality set in. The ponds were seined every two weeks to check growth and to adjust feeding rates.

In 1968 the experiment was conducted again, but with the stocking rate increased to 2,500 per acre. Also, a floating feed was used since it was felt that a good portion of the sinking feed used in the earlier study was not eaten by the fish because of the very mucky nature of the pond bottoms and because of the presence of an oxygen-deficient layer in the deeper areas.

Salinities in ponds during the two year experiment ran from a low of 1.8 ppt to a high of 11.2 ppt. Normally, the salinity ranged from 3 to 7 ppt. This variation is, in part, due to the heavy annual rainfall of this section of Louisiana and the greater amount of freshwater draining from the large northern Grand Lake-White Lake complex. By comparison, salinity of ocean water is around 36 ppt. The water temperatures in the relatively shallow marsh ponds tended to fluctuate rather closely with fluctuations in atmospheric temperatures. The waters were always above 41° F. and below 96° F. Pond pH values influenced by such factors as pond soil and water chemistry, pond biological content and the intensity of photosynthesis and respiration varied from 7.5 to 9.0. The readings were constantly in the 8.0 to 8.5 range.

### RESULTS

Tables 1 and 2 indicate that the channel catfish proved to be the best suited for commercial production in coastal areas of one or two year old fish for the following reasons: (1) The channel catfish proved to be the most rapid growing and the most hardy both years; maximum production of almost one ton per acre was obtained in a pond containing channel catfish. (2) The channel catfish had the lowest food conversion values ( $S = \text{feed added} \div \text{harvest lbs.}$ ) of the three. (3) Survival was highest for channel catfish. (4) It is already accepted as a commercial pond species and is also tolerant of many of the conditions experienced in coastal waters. Results in 1967 and 1968 agreed very closely. However,

the average sizes were larger, as were the S-factors, in the initial study, which was distorted because of poor survival due to predation and low oxygen. Upon a closer analysis of the data it was obvious that the 1967 fish remained in the ponds over a much longer period than those in 1968. Thus these were able to forage for themselves on natural foods and attained a larger size. This factor alone should dispense with any theory that the floating feed was inferior to the sinking ration used in 1967 and perhaps the larger stocking rates of 1968 may be permissible, particularly when predation is a problem.

### TASTE TEST

Pond-reared catfish are generally considered the most delicious of freshwater fish. Catfish obtained from the wild sometime possess a strong odor or taste reflecting the environment from which they were taken. With this in mind, some of the catfish were eaten after termination of the study, since it was feared that they might possess an odor characteristic of the marsh. The results of these tests were excellent, with no objectionable flavor or odor noted.

### PROBLEMS

Several problems arose during the study, but none would prohibit catfish culture in the marsh. Two of the major problems encountered included pond construction. Ponds had to be dug, using either pontoon draglines or conventional draglines on mats, because of the fluid nature of the marsh soil. In our particular area it was found necessary to build the levees with soil obtained from outside the ponds. Disturbing the pond floor resulted in a bog in which it was impossible to work.

Coastal Bermuda grass was found to give best results in holding the levee soils together. Also as much as a 60 per cent shrinkage due to the semi-fluid nature of the soil, was experienced with the marsh pond levees, a factor to be considered before any permanent water lines are laid.

Gravity drainage was practically impossible if the ponds were equal to or below sea level. Thus, we tried to locate the newer ponds above marsh level.

Oxygen depletions, like anywhere else, were a problem whenever we were lax in surveillance of pond

**TABLE 1. GROWTH DATA FOR BLUE, CHANNEL AND WHITE CATFISH GROWN IN 0.1 ACRE BRACKISH WATER PONDS, ROCKEFELLER WILDLIFE REFUGE, 1967**

Pond Number	White Catfish				Channel Catfish				Blue Catfish			
	B-7	B-8	B-11	Avg.	B-9	B-14	B-15	Avg.	B-10	B-12	B-13	Avg.
Number Stocked	200	200	200	200	200	200	200	200	200	200	200	200
Weight Stocked (lbs.)	14.5	4.6	4.9	8.0	7.4	7.0	7.0	7.1	5.6	5.8	5.5	5.6
Average Size Stocked (lbs.)	0.07	0.02	0.02	0.04	0.04	0.04	0.04	0.04	0.03	0.03	0.03	0.03
Number Recovered	71	107	58	78.17	93	112	117	107.3	102	85	17	68.0
Weight Recovered (lbs.)	82.1	107.8	52.8	80.9	99.2	142.2	161.8	134.4	53.6	62.5	13.0	43.0
Average Size Recovered (lbs.)	1.16	1.00	0.91	1.0	1.07	1.3	1.4	1.3	0.52	0.74	0.76	0.6
Survival Percent	35.5	53.5	29.0	39.3	46.5	56.0	58.5	53.6	51.0	42.5	8.5	34.0
Lbs. feed/lb. gain	7.4	3.7	8.0	5.8	4.5	3.0	2.7	3.2	8.1	6.9	47.8	10.1

waters and did not circulate or freshen them. Oxygen was increased in the ponds by recirculating the water with pumps, and by the addition of water already saturated with oxygen.

Predation was a problem both years. Otters, mink, frogs and snakes

made serious inroads upon the fish. Predation by alligators was not as serious as we had once believed. However, it is a fact that they do eat fish. Of the animals listed, otters were the most detrimental to our fish. Several catfish heads were found

*(Continued on Page 47)*



*Predation was a problem both years. Otters, mink, frogs, and alligators made serious inroads upon the fish. Predation by alligators was not as serious as we once believed. However, it is a fact that they do eat catfish.*

**TABLE 2. GROWTH DATA FOR BLUE, CHANNEL AND WHITE CATFISH GROWN IN 0.1 ACRE BRACKISH WATER PONDS, ROCKEFELLER WILDLIFE REFUGE, 1968**

Pond Number	Blue Catfish				Channel Catfish				White Catfish			
	B-13	B-14	B-15	Avg.	B-8	B-9	B-11	Avg.	B-7	B-10	B-12	Avg.
Number Stocked	250	250	250	250	250	250	250	250	250	250	250	250
Weight Stocked (lbs.)	10.3	9.2	13.0	10.8	6.9	7.1	7.9	7.3	9.1	9.0	9.0	9.0
Average Size Stocked (lbs.)	0.04	0.04	0.05	0.04	0.03	0.03	0.03	0.03	0.04	0.04	0.04	0.04
Number Recovered	0	188	161	116	233	233	218	228	231	232	183	215
Weight Recovered (lbs.)	0	126.3	97.9	112.1	196.0	175.8	170.7	180.8	171.8	163.8	117.8	151.1
Average Size Recovered (lbs.)	0	0.67	0.61	0.64	0.84	0.75	0.78	0.79	0.74	0.71	0.64	0.70
Survival Percent	0	75.2	64.4	46.4	93.2	93.2	87.2	91.2	92.4	92.8	73.2	86.0
Lbs. feed/lb. gain	0	3.4	4.7	4.0	2.1	2.4	2.5	2.3	2.5	2.6	3.7	2.9

# FOR SALE

## Channel Catfish

- SWIM-UP FRY
- ALBINO FINGERLINGS

*in 10-gal milk cans  
from the*

# WORLD'S LARGEST CATFISH FARM

*"1600 Acres of Ponds"*

— o —

Contact

Radford E. DuBois, Jr.  
(601) 746-1799  
Yazoo City, Miss.



Greater Business & Industrial  
Development Corp.

## FISH HARVESTING EQUIPMENT

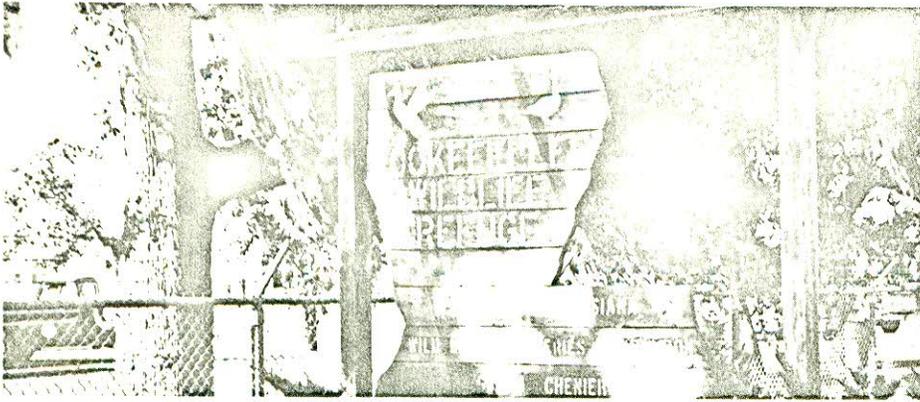
*Here's the index from our  
New 24-page Catalog!*

AGITATORS..... 17	Flag..... 5
APRONS..... 22	Gill..... 4
BAGS..... 11	Hoop..... 6
Bail..... 11	Miscellaneous..... 8,9
Floating..... 8	Trammel..... 2,3
Laundry..... 9	NETTING..... 14,15,16
Wire..... 8	OARS..... 19
BAIT, Trot Line..... 21	Ordering Information..... 23
BOATS..... 19	PADDLES..... 19
BOOTS..... 22	PINCHERS..... 21
BOXES, Brooder..... 17	PRESERVATIVES..... 11
BOXES, Holding..... 8	PRESERVERS, Life..... 19
CLOTHING..... 22	ROPE..... 13
COUPLINGS..... 11	SCALES..... 17
CUSHIONS, Boat..... 19	SCOOPS, Shad..... 8
FEEDERS..... 17	SEAT COVERS..... 18
FIDS, Splicing..... 13	SEINES..... 7
FILTER CLOTH..... 17	SLICKER SUITS..... 22
FLOATS..... 11	STEEL..... 11
GLOVES..... 22	SWIVELS..... 21
GRADERS..... 17	TANKS, Transport..... 17
HATS, Rain..... 22	TARPAULINS..... 18
HOOPS..... 20	TRAPS..... 18
HOOPS..... 21	Animal..... 18
KITS, Net..... 10	Minnow..... 9
KNIVES..... 24	TRAWLS, Shrimp..... 8
LEADS & SINKERS..... 11	Trot Line Supplies..... 20,21
LINES..... 13	TWINE..... 12
MOTORS, Outboard..... 19	WADERS..... 22
NEEDLES..... 11	WALLING..... 14
NETS..... 11	WEBS, Hoop Net..... 6

*Get Your Free Copy Today!*

Memphis NET & TWINE CO., INC.

2481 MATTHEWS AVENUE  
POST OFFICE BOX 8331  
MEMPHIS, TENNESSEE 38108  
PHONE (901) 323-4832



In 1966 the Refuge Division of the Louisiana Wild Life and Fisheries Commission began research relating to the ecology and culture of various estuarine species. These studies are conducted on the 85,000 acre Rockefeller Wildlife Reserve in the coastal marshes of South-west Louisiana.

## IN BRACKISH WATER

(Continued from Page 23)

on the pond levees. These heads were separated from the fish immediately posterior to the dorsal spine. At first we found from two to five heads until the end of the month when as many as 20 were found on a single pond levee. Otters traverse a vast territory and evidently a family had included our ponds in their route.

## THERAPEUTIC VALUE

As suggested by numerous early observers, catfish grown in saline ponds have thus far been free of the more common freshwater parasites and diseases that often plague fish growers, possibly because of a therapeutic effect of the salt on the fish. However, it is still too early in our studies to make any definite statements to this effect. It is highly probable that parasite species not yet described could possibly cause future problems in brackish water aquiculture. Presently there is a PhD candidate, Mr. Ken Allen, at L. S. U. in Baton Rouge working with this problem and his results look promising. Also, a marine parasitologist working out of the marine laboratory in Ocean Spring, Mississippi has agreed to monitor our fish throughout the pond studies.

It should be pointed out that all saline water, including brackish and oil brines, will not contain the same proportions of salts as the waters in which our studies were conducted. Possible interactions of these may exist, causing a difference in their toxicity to fish. Therefore, persons interested in farming fish in waters of unknown toxic effects should conduct detailed bio-assays or further studies before constructing an elaborate operation.

Data collected thus far is still too inconclusive to give results of salinity upon reproduction. However, fish population data collected in connection with other studies indicates that catfish may not be able to spawn successfully in waters containing salinities in excess of 2.0 ppt. One inland catfish farmer whose operation we have recently been observing has deep water wells that have salinity concentrations ranging from 1.6 ppt to 5.4 ppt. He had reproduction last year in a brood pond which apparently contained 1.6 ppt salinity.

(Continued on Page 49)

# NOW...

## A SELF FEEDER

FOR

HUNGRY FISH

ANY SIZE

ANY TIME

SIMPLE • EFFECTIVE

VERSATILE

See it replace food as you operate it yourself at P.F.I. SELF FEEDERS Booth.



# Poirot Farms, Inc.

Golden City, Missouri 64748

Phone 417/537-4347

## IN BRACKISH WATER

(Continued from Page 47)

### SUMMARY

In summary, our studies indicated that channel, blue and white catfish may be successfully grown in coastal waters which will not exceed 8.0 ppt salinity for any extended period. Even though these fish have tolerated up to 11.0 ppt in our ponds, it is felt that these higher salinities may not produce optimum growth. The channel catfish proved to be the best suited of the species tested for commercial production of one or two year old fish in coastal areas.

## PRESIDENT'S MESSAGE

(Continued from Page 5)

In America, with rare exceptions, the farmer has overproduced. We of CFA must not presume this industry will be a historic exception.

Faced with a possibility of overproduction, The Catfish Farmer magazine will print those facts indicating the likelihood or actuality of overproduction. The magazine committee plans to call it like it is — the facts will determine the content on this subject.

The Catfish Industry is not, and does not wish to be, subsidized—like much of the seafood industry—but CFA does think that research, diagnostic, and extension work are proper activities of the

Federal and State governments. At present the Catfish Industry is not getting its fair and proper share of Federal appropriations — and without the exceptional dedication and ability of the members of the Bureau of Commercial Fisheries and the Bureau of Sports Fisheries and Wildlife, this Industry would not be where it is today.

As members of this Industry and Organization you may be called upon to exert yourself on behalf of additional governmental appropriations.

The Catfish Industry is healthy — its organization is well conceived, staffed, and membered. There is no doubt to me, the 70's are for catfish.

Thank you.

## Pond and Regular Agitators

Graders — Pumps

Motors — Power Plants

Seines — Catfish

Dip Nets and Other

Supplies.

Send for Catalog.

## CRESCENT MFG. CO.

P. O. Box 3303  
Fort Worth, Texas 76105  
Area Code 817 451-0112

## PROCESSORS AND PRODUCERS

CATFISH

BLUES, CHANNEL, ALBINOS

## CRESWELL'S HOLIDAY LAKES

27 Lakes—170 Acres Water

Milan, Tennessee

Phones: Farm 662-3110

Office 686-1164

Office 686-3119

WE BUY—FOODFISH

WE HAVE FOR SALE—

(All kinds of catfish FOODFISH  
Channel, Blues, FINGERLINGS  
Albinos) BROOD FISH

In Business since 1966

## CATFISH HAVEN

*Selling Fingerlings and  
Mature Fish of all sizes . .  
any quantity. Best quality  
brood fish available. In-  
spection before purchase  
invited.*

Also  
White Catfish  
For Sale

FOR INFORMATION

Write

Ernest Bradshaw

204 West Bowles

Dumas, Arkansas 71639

OR CALL

AC 501-382-4927

# THINK CATFISH!

THE MINER-OL CO., INC. ■ WARSAW Big "W" FEEDS, WARSAW, ILL. ■ PAUL FORNELL - Member Catfish Farmers of America

For Prices  
on Quantity  
Feed Shipments  
Call Collect  
217-256-4218