stocking into the wintering pond. Raw spots or ulcers should be swabbed with cotton dipped in 20 per cent potassium permanganate.

3. Stock into wintering ponds in the fall at rates of 1,000 to 2,000 pounds fish per acre and feed at 1 per cent of their body weight per day while water temperatures are above 55° F., using Auburn No. 1 feed.
4. When water temperatures in the spring rise to between 65° and 70° F., fill the spawning pond with fresh water from a well or a pond or stream which does not contain buffalo fish. Disinfect the brood buffalo with 10 p.p.m. potassium permanganate for 1 hour and stock at the rate of 50 per acre.
5. Eggs are usually laid the next day after brood fish are stocked into spawning ponds, but egg-laying may be delayed for a week if unsuitable temperatures occur or the eggs are not fully mature. If eggs are not laid within a week, drain out almost all the water and refill with fresh water. Eggs hatched in about 5 days at 65°-70° F. The number of young produced per acre averaged between 30,000 and 100,000 per acre.
6. Brood fish should be removed from the nursery pond by seining shortly after the young fish hatch. This is to reduce danger of transmission of parasites and disease to the young fish. After the fry reach a size of 1 inch, they may be stocked into nursery ponds at rates up to 10,000 per acre or left in the brood ponds to grow to a larger size. Prior to stocking into the nursery pond the young buffalo fish should be disinfected with 15 p.p.m. formalin plus 1 p.p.m. acriflavine for 2 to 4 hours.
7. Fertilize the pond containing the small buffalo with 100 pounds 8-8-2 once monthly until October. The fingerlings should be 4 to 5 inches long by October and may be stocked into large growing ponds during the fall, winter or following spring.
8. The rate of stocking into growing ponds varies depending upon the size of fish desired for market, the productivity of the ponds and the length of the growing period. In ponds at Auburn, stocking at the rate of 250 bigmouth buffalo fingerlings per acre into fertilized ponds produced fish of an average size of 1.3 pounds in 6 months, 2 pounds in 1 year and 2.4 pounds in 18 months. Stocking at the rate of 120 per acre yielded fish averaging 1.3 pounds in 6 months and 3.6 pounds in 18 months.
9. After stocking the buffalo fingerlings, growing ponds should be stocked with 25 to 50 largemouth bass fingerlings per acre to feed upon any wild fish present and thus reduce their competition with the buffalo.
10. Ponds may be drained and fish harvested at any time of the year after the fish have reached a suitable size for sale. Production has varied in fertilized ponds from 600 pounds per acre with an average size of 1.3 pounds to 432 pounds per acre averaging 3.6 pounds. When larger sizes were produced, the pounds of fish per acre decreased.

PROPAGATION OF CHANNEL CATFISH IN ARKANSAS

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ABSTRACT

The propagation of most game fish and the methods used in producing them have been more or less established; and with the exception of small details are relatively the same throughout most of the South.

The propagation of Channel Catfish (*Ictalurus lacustris*) has from all appearances been more difficult, because of the wide range of methods used and the wide range in cost of production.

The demand for Channel Catfish in the state of Arkansas was increasing steadily, and upon my return from the armed services, Mr. Joe Hogan of

Lonoke, Ark., encouraged me to try setting up a method of production that would coincide with our hatchery work and at a minimum cost.

INTRODUCTION

Mr. Hogan and myself contacted several persons who were propagating Channel Catfish; with reference to the methods they were using and as to the cost of production. By using certain points derived from this information and adding our own experiences, the following program was established for use in Arkansas.

MATERIAL AND METHODS

All of our hatching is done in pens. These pens are placed in the shallow area of the pond where we can have a maximum depth of thirty inches and tapering up to the shoreline. These pens are from five to six feet wide and ten feet long. We have pens constructed of welded muskrat wire and also concrete blocks. The blocks are so placed as to leave a one-inch space between them to allow for water circulation. Either type of pen is successful. However, with wire pens, it is necessary to fasten the bottom securely to discourage the fish from working their way under. We recommend fencing the shallow end of the pond to hold out turtles. Catfish, if excited, will eat their eggs; and turtles will definitely cause this condition.

We use nail kegs as a spawning location for the fish, and they have proven to be satisfactory as well as economical. These kegs are placed in water eighteen inches deep, submerged in the soil sufficiently to have the kegs even with the soil level. Failure to do this, allows the male to work fry under the keg thus causing a loss. These kegs are fastened securely with stakes and wire to prevent disturbance from wave lash. A pint of course sand or gravel is placed insde the keg. This serves as a sign, for the male will move this sand or gravel to the front of the keg when preparing the nest for spawning.

The selection of brood stock is very important. I have had the best results with fish from three to seven years of age. The age is a far more important factor than the size. For I have learned from experience that the older females produce the larger nests. It is also very important that the male be slightly larger than the female.

The sexing of Channel Catfish is, for the most part, rather simple. There are two methods that can be used. One method is that the male in good condition for spawning will have well developed head muscles and a slender body. While on the other hand, the female will have a slender head and a well-rounded body. The other method, which is the most accurate, is by the sexual organs. The male genital organ will stand out slightly and have opening only at the posterior; while the female will be rounded, inflamed and with opening from front to back of ventral.

When paired, these fish are placed in pens. The water temperature at this time should be sixty degrees fahrenheit. The placing of these pens in as large a pond as possible has been a definite asset due to a smaller fluxuation of water temperature. The excess brood fish are sexed and placed in separate ponds to prevent fighting, and fed well. The fact of placing only one pair to the pen or pond, as the case may be, cannot be overly emphasized. For the males will fight ferociously thus leaving the nests unattended. Under these conditions the female will destroy the eggs. While the fish are in the pens, they should be fed two or three times a week with an amount of feed that can be consumed over night. Until they become accustomed to the pens, they will do most of their feeding at night. The feed used, can be any type of forage fish, crawfish or mixed feed containing at least thirty per cent animal protein.

When the water temperature reaches 68 to 70 degrees, which is approximately the twenty-first of May in this section, the male will compel the female to deposit her eggs in the nest; after which he fertilizes and cares for them throughout the incubation period. The fact he compels the female and cares for the nest brings about the necessity of him being the larger of the two. I have found it satisfactory to check the nests every three days until the first eggs are found, then continuing with a daily check of those nests without eggs. The pens are numbered, thus affording an accurate record as to the time the fry should be moved. The following scale for checking nests is quite satisfactory. The first day, eggs are clear; second day, a small white stripe (similar to a hair) forming on the yolk. Third day, the white stripe has several small stripes

on either side. The fourth day, these stripes have a slight pink color; fifth day, there will be two dark spots which are eyes. Sixth day, the stripes are red and the eyes are very prominent; and by close observation there will be a slight movement. Seventh day, action is very noticeable; eighth day, the fish will appear to turn over in the egg, and if squeezed until broken, the fish will swim out. Ninth day, the eggs should be hatched and ready to move to rearing pond. (The above scale is based on 70 degree water and would be slightly advanced in higher temperature or retarded with lower.)

I have tried holding fry in vats then moving to rearing ponds; but this method was not satisfactory. For I found with less handling there was a greater survival. When the eggs are hatched, we loosen the keg, raise it gently and slowly pour the fry into a square tub containing water of the same temperature. By the use of the hand, all fry can be removed from the keg. The tub is then placed inside a guard, made of one-half inch hardware cloth, in the rearing pond. The tub is submerged, with the water reaching a depth of from one to two inches above. It is quite important to temper the fry when changing water temperatures. The reason for using the square tub is to make possible a more solid station. This tub should be tipped facing North. The reason for this being, Catfish prefer a shaded area, therefore, the fry will remain in the tub longer since all feeding is done in the tub. After the fry begin to leave the tub, tubs are removed and each location marked. These locations will serve as feeding stations in the future.

After the fry have been removed to the rearing pond, the keg may be replaced into its former position and replenished with sand or gravel. Remove the spent female and replace with a female which has not spawned. In most instances, the male will take care of the second spawn. This will reduce the number of male fish needed, the number of pens required and also reduce the feeding cost.

The conditioning of the rearing pond is very important. The pond must be free of any foreign fish. The best success is had by drying the pond completely before introducing the Channel Catfish fry. We find the fry to be very susceptable to any type of parasite. The most crucial period in the life of the fry is the first two weeks. And during this time, the feeding program is very important. Their feed should also be a high protein feed; and for best results the protein being of animal origin. The feeding program will definitely determine the quality of the fingerlings. Water conditions in the rearing pond will also be an asset or a detriment. Experience has proven that fresh flowing water pays off in good dividends.

The following comparison scale shows fish production and feed costs for the period of 1951 through 1953.

Year	*Pond No. Area*	*Spawns No. Stocked*	*Fish Reared*	*Total Weight (Lbs.)*	*Feed Consumed (Lbs.)*	*Cost of Feed*	*Cost Per Lb.*	*Cost Per Fish*
1951	5.76	16	104,100	1,542	3,173	$ 426.18	.13	.0040
1952	5.2	42	406,180	3,704	16,572	1,409.35	.38	.0035
1953	13.2	50	563,956	12,199	12,062	1,954.12	.162	.0035

It was during the above-mentioned time, that I operated the State Fish Hatchery at Centerton, Arkansas. The water at this hatchery was derived from a spring and carried a pH of from 6.8 to 7.4. Spawning and hatching results in this water were good. During the years of 1954 and 1955, I was contracted to construct and operate a commercial hatchery. The water at this location carried a pH of 8.5 to 10.0. Though we had a large number of brood fish that were conditioned for spawning, we hatched only two nests. It is quite possible that the pH of the water would be a factor for consideration when planning the propagation of Channel Catfish.

In an effort to eliminate crawfish, and at the same time maintain or grow brood stock; fingerlings were stocked on the basis of two hundred per acre. This type of stocking has been tried with Bass, Bream, and Crappie. This method has also been used with bait minnows, the results of which have been very good. For while the other types of fish consume the feed on top of the water; the catfish is principally a bottom feeder. Thus the Catfish is grown to an edible size with very little cost or effort, and the detriment of the crawfish is reduced or eliminated. I have not had an opportunity to raise

Catfish commercially to edible size, but by growing them with other species of fish, they have had a growth of 1¼ to 2 pounds in a twelve-month period.

Due to the demand of Channel Catfish fingerlings, the decision was made this year to produce them commercially. At present, we are located in Huntsville, Ark., where the pH of the water ranges from 6.8 to 7.5. This year's hatch of twenty-four spawns out of a possible twenty-eight, consumed 1,100 pounds of feed at a cost of sixty dollars. At the age of two months, they were five inches long and weighed 36.5 pounds per thousand. We had an oddity in our hatch this year, in that we had one complete nest of white Channel Catfish; or perhaps you could call them Golden Channel Cat as their color has a slight golden tinge. They are a sturdy fish and have developed as well as any of the others. They have no dark color pigment in the skin, and upon close examination the texture of the meat can be seen. We have approximately seven thousand of these white fish; and plan to retain one thousand of them for further experiments in reproduction. We hope to obtain more information on them during the next two or three years.

SUMMARY

In summarizing the above paper and from observations made over the past few years, I feel the Channel Catfish needs more artificial propagation than any other species. This is due primarily to their spawning habit. It is also necessary because of the demand for this fish for table use. The propagation of this fish is a full-time job. For best results require much attention during the spawning season, and until they reach the age of three weeks. If routine feeding and water level is maintained, the mortality after the three-week period is very low.

TECHNICAL EDUCATION SESSION

DEVELOPING A SUSTAINED TV CONSERVATION PROGRAM—AND POSSIBLE COOPERATING AGENCIES AVAILABLE

By FRANK L. HAYNES

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The potential for telling the conservation story to America presents a challenge, an obligation, and an opportunity to State Conservation agencies that is almost infinite in its scope.

It is a challenge because the success of any great movement or program with far-reaching and continued results must have public approval and individual participation. It is an obligation because the welfare of generations yet unborn will depend on how well we who are paid to sell the conservation idea do our work.

It is an opportunity because there are in excess of 80 million television sets in daily use in America and a good television program will be more effective than a personal visit into these homes because you can carry with you the story in picture as well as in words. It would be impossible to carry the props with you personally that you are able to carry with you on a well-planned and photographed conservation program.

The old methods of communication are no more adequate to tell a needed story than is the horse and buggy adequate for modern transportation.

The first creation of a sustained television program should be truth and its first casualty should be ignorance and falsehood. As the old country philosopher said, "America's greatest fault is not ignorance. It is the fact that we know so much that ain't so." A television program should not preach doom but should try to show the relation of man to his environment and how he can help to improve that enviroment. The programs should be specialized in terms of subject-matter. Do not try to cover every field in each program. But the