ARKANSAS' CATCHABLE CHANNEL CATFISH PROGRAM*

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ABSTRACT

The discreet utilization of Arkansas' expansive hatchery system has become an integral tool of the management staff of the fisheries division as related to the manipulation of a given fish population in a desired direction.

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As attempts at population manipulation through mass stocking of fingerling fish within existing populations became more or less universally accepted as being ineffective and incongruent with sound management principles, hatchery production, particularly of channel catfish, was slanted toward rearing of larger and older fish which would not only be less susceptible to predation, but would also create an immediate fishery where stocked. Channel catfish reared to 10 inch average total length (approximately 0.3-0.5 pounds) meet these criteria of high survival rates after stocking and of making a substantial contribution to the fishery; these channel cat are referred to as "catchables."

This paper is concerned with production trends of catchable channel catfish in Arkansas' hatchery system and the correlation of this trend with an ecologically indoctrinated management program.

INTRODUCTION

The fisheries division of the Arkansas Game and Fish Commission has for some years been acutely aware of the potentialities of an ecologically indoctrinated fisheries management program. We feel that such a program indicates a distinctive approach to problems incurred in fish management with particular emphasis on maximum occupation or filling of possibly highly diversified niches within a given situation and an accurate summation of environment. Stocking, as an important tool of our management program, has necessarily been given ample consideration under this ecological approach.

Generally speaking, sport fishing retains a place of prominence over commercial fishing in Arkansas. Management efforts are ultimately concerned with manipulation of the total fish population in a direction which will provide maximum numbers of catchable size game fish and making these fish available to the sport fisherman. An earlier management approach involved the stocking of large numbers of hatchery fingerlings in an attempt to slant the overall fishery in the desired direction. To our knowledge, this type of "management" has never worked in established fish populations. Recruitment of the channel catfish, *Ictalurus punctatus* (Rafinesque) [1], which the Arkansas Game and Fish Commission has successfully propagated for 17 years, was initially attempted through the "fingerling approach."

It has been found that channel catfish, unlike other popular game fishes reared in Arkansas' hatcheries, can be held and fed out to "catchable" size in a feasible manner, both from an economical and a biological standpoint. This development has enabled us to utilize catchable channel catfish for maintenance and recruitment stockings in lakes and reservoirs where channel catfish fail to maintain their numbers through natural reproduction and their numbers must be supplemented to maintain a satisfactory fishery. "Catchable" channel catfish, where stocked for maintenance purposes within existing fish populations, do not experience the initial high mortality rate as where fingerlings are stocked under similar circumstances, and an "instant fishery" is created.

METHODS

This paper is concerned with production aspects of rearing and distribution of catchable size channel catfish in Arkansas, and as such, a method is reiterated which we have found to be most expedient in providing the desired quality and quantity of channel catfish in relatively limited rearing facilities.

Methods employed in feeding out channel catfish fingerlings to "catchable" size during their second growing season generally are consistent with schedules reported by Hulsey (1964, 1965). An informational publication of the Arkansas Game and Fish Commission based on earlier findings and experience and prepared in 1962 adequately depicts our annual feeding schedule for channel catfish (Table I).

[1] Nomenclature recommended by the committee on common and scientific names of fishes, Spl. Publ. No. 2, American Fisheries Society, 1960.

TABLE I

ARKANSAS GAME AND FISH COMMISSION

Joe Hogan State Fish Hatchery

Lonoke, Arkansas

Channel Catfish Feeding Schedule*

Period Dates	Pounds of feed per day Stocked at 300 per acre		Pounds of feed per day Stocked at 1,000 per acre		Pounds of feed per day Stocked at 1,500 per acre	
	Per Day	Per Period	Per Day	Per Period	Per Day	Per Period
May 1--15	1.0	15.0	3.0	45.0	4.5	67.5
May 16--31	1.0	16.0	4.0	64.0	5.0	80.0
June 1--15	1.5	22.5	5.0	75.0	7.5	112.5
June 16--30	1.5	22.5	7.5	112.5	10.0	150.0
July 1--15	2.0	30.0	10.0	150.0	12.5	187.5
July 16-31	2.0	32.0	12.5	200.0	15.0	240.0
August 1--15	2.5	37.5	15.0	225.0	17.5	262.5
August 16--31	2.5	40.0	17.5	280.0	20.0	320.0
Sept. 1--15	3.0	45.0	20.0	300.0	22.5	337.5
Sept. 16--30	3.5	52.5	22.5	337.5	25.0	375.0
Oct. 1--15	4.0	60.0	25.0	375.0	27.5	412.5
Oct. 16--31	2.0	32.0	27.5	440.0	30.0	480.0
	Totals:	405.0		2,604.0		3,025.0

During the period November to May channel catfish will eat very little except during warm spells. Feeding should be done during warm spells when the water temperature is rising. Since this occurs only periodically, very little feed (in relation to what is fed during the warm months) is needed in the winter. After November 1, we feed approximately the same amount per week as we were feeding per day before the water turned cold.

In ponds which are not operated on a modified raceway basis (i.e., ponds which do not have an adequate supply of inflowing oxygenated water) feeding rates should not exceed thirty pounds of pelleted feed per acre per day. At a predetermined point, where pounds of fish per acre exceed one thousand pounds and the rate of feeding curve intersects the standing crop of pounds of fish per acre, rates of feeding would fall below 3% of body weight and the length of time required to produce a fish of the desired size would increase correspondingly. At stocking rates of 2,000 per acre or less, however, this factor is generally of little concern in producing a "catchable" (preferred weight 0.5 pound) channel catfish during the second growing season from a year old fingerling, Figure 1A and 1B.

Fry are propagated at all of the Game and Fish Commission hatcheries, however, as fry production at the Centerton Hatchery usually exceeds carrying capacity for the Centerton rearing facilities, fry are routinely transported in polyethylene plastic bags with an oxygen at-

*This rate of feeding will produce a one or two pound (average about one and one-fourth pounds) channel catfish, from a fingerling in April or May by November; a period of six or seven months. Fishing for one pound catfish can begin about the middle of August. The higher rates of stocking and higher rates of feeding bring on more management problems, such as diseases, parasites, predators, oxygen depletions, sour water, etc. Where fresh water is available, the higher rates of stocking and feeding will produce on the average over 1,000 pounds of edible size catfish each year, from an acre pond.

Swingle's findings (1958) indicate inefficient feed conversion values at feeding rates in excess of 5% of body weight. Most efficient utilization of feed occurs between 2% and 4% of body weight, hence our empirically determined feeding schedule approximates 3% of body weight. Table II gives a feed formula fed to one-half of our channel catfish during the summer of 1967.

CHANNEL CATFISH FEED FORMULA

Poultry By-Product Meal	200 Pounds
Fish Meal	200 Pounds
Cottonseed Meal	340 Pounds
Soybean Meal (50%)	350 Pounds
Rice Brand	400 Pounds
Wheat Shorts	400 Pounds
Alfalfa Meal	60 Pounds
Di-Calcium Phosphate	25 Pounds
Trace Mineral Salt	20 Pounds
Vitamin Premix	5 Pounds
	2,000 Pounds

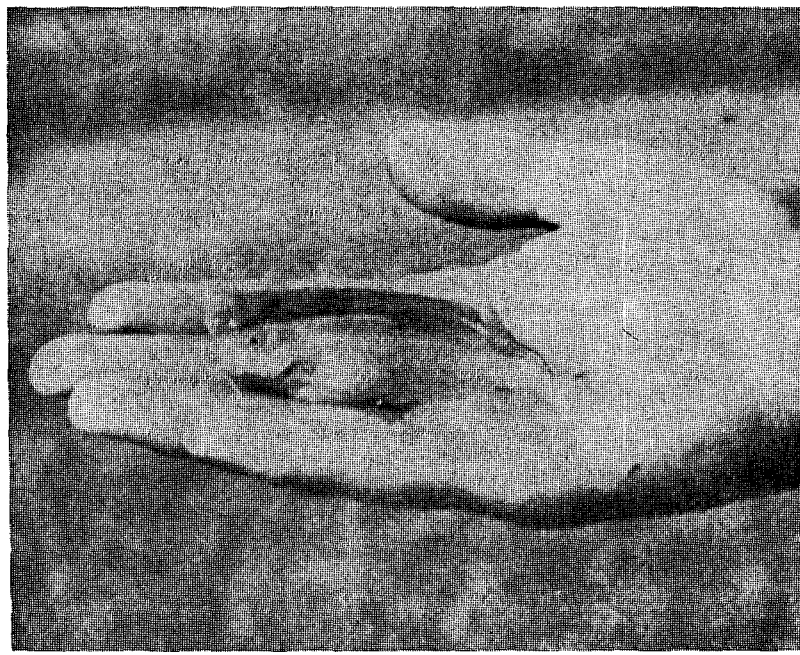

Figure 1A. Fingerling channel catfish (0.5 to 1.0 oz.) as stocked in rearing ponds at the beginning of second growing season.

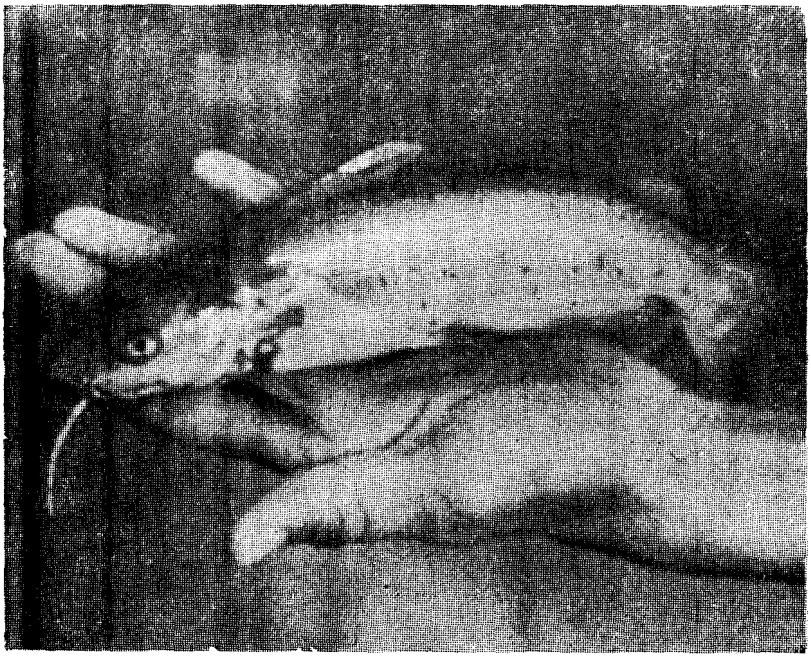

Figure 1B. "Catchable" channel catfish (0.5 pounds) as stocked in reservoirs after completion of second growing season.

mosphere to the Lake Hamilton State Fish Hatchery at Hot Springs and the Joe Hogan State Fish Hatchery at Lonoke. Approximately 10,000 fry are transported per 18 inches x 32 inches bag in 1½ gallons of oxygenated spring water. Fry are transported by both airplane and station wagon (Hulsey 1962).

Channel catfish fry are stocked at excessive rates (20,000-50,000 per acre) in ponds which, after one year's growing season, will provide a concentrated reserve of yearlings. Yearlings approximately one year old are transferred from these reserve ponds as rearing ponds are emptied and made ready throughout the second growing season. The yearlings are stocked in the rearing ponds at rates which will provide economical use of the rearing ponds and which will produce a catchable fish of the desired dimensions and weight by a predetermined target date, usually the end of the second summer.

Feed conversion rate is normally expressed as being indicative of efficiency as related to the total weight of fish produced by a given poundage of feed. However, as the total diet of channel catfish reared in hatchery ponds, as opposed to raceway systems, consists of natural forage supplemented with pelleted feed, certain difficulties would be experienced in computing C values for pond reared fish. Swingle (1958) has suggested that uncorrected C values for fish reared under these conditions be expressed as S where

$$S = \frac{\text{Pounds of feed added}}{\text{Total pounds of fish produced by natural plus added feeds}}$$

If for purposes of illustration a mean S value can be expressed as a constant, total expected poundage returns of fish could theoretically be considered a constant or nearly so. Other factors being equal our variable in the production of a "catchable" channel catfish would be

the effect of stocking rates on the average size of the individual fish, for, as in the production of a marketable fish, individual size is an important consideration.

Most efficient utilization of Arkansas' hatchery space in rearing a one-half pound "catchable" from a year old fingerling during the second growing season occurs at a stocking rate of 2,000 per acre. In lieu of a raceway system for rearing fingerlings to catchable size, the magnitude of Arkansas' hatchery system definitely has a direct effect on overall production as this principle of diminishing returns of stocking rates is considered.

APPLICATIONS

During the earlier history of fish management, manipulation of a given population in a desired direction was attempted primarily through mass stocking of fry and fingerling fish. Recruitment and maintenance stocking of fingerling channel catfish was conducted under this approach to management and, without exception, returns were low and, collectively speaking, this type of management was entirely ineffective.

Stocking of fingerling channel catfish in Arkansas' public and private waters is currently restricted to new or renovated lakes (lakes which have been chemically treated to eradicate the standing fish population) where predation is minimized and optimum survival can be achieved. Consequently, hatchery production has been slanted toward the "catchable" channel cat for maintenance and recruitment stocking in lakes supporting established fish populations containing adult predator species.

The combined total distribution from the Centerton, Lake Hamilton, and Lonoke Hatcheries displays this trend beginning as early as 1958, Table III; Fig. 2. The decline in production and distribution reflected during the stocking period 1965-66 is a result of hatchery renovation during the summer of 1965 when several ponds on all hatcheries were "dried up" for maintenance.

TABLE III—TOTAL DISTRIBUTION OF "CATCHABLE" CHANNEL CATFISH, 1958-67 (ALL HATCHERIES)

1958-59	16,759
1959-60	3,937
1960-61	37,330
1961-62	107,344
1962-63	177,106
1963-64	212,384
1964-65	222,413
1965-66	69,691
1966-67	304,007

"Catchable" channel catfish have, where stocked, shown up immediately in the sport fish catches and in annual rotenone population samples.

As increased survival over fingerling stocking showed up in fish population samples and creel reports a great deal of enthusiasm was generated in management biologists as well as Arkansas' fishermen by the contribution that the channel catfish could make in a lake with an otherwise satisfactory sport fish population. Stringers of other game fish were frequently "spiced" with channel catfish, a welcome addition to any man's creel with its tenacious fighting ability and superb table qualities.

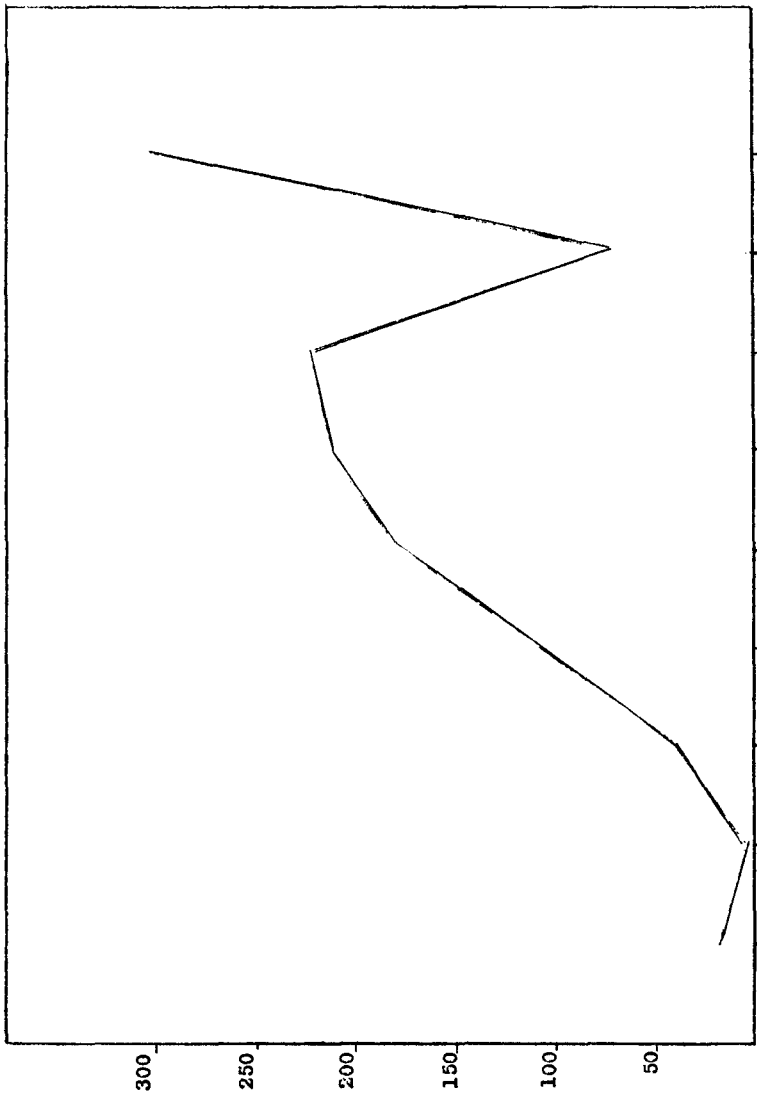

FIG. 2 - TOTAL DISTRIBUTION OF "CATCHABLE" CHANNEL CATFISH, 1958-67 (ALL HATCHERIES)

A stocking program of this nature exemplifies our ecological approach to fisheries management problems where we seek maximum occupation by a suitable fish of each niche within possibly highly diversified aquatic environments.

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EFFECTS OF SUPPLEMENTAL FEED AND FERTILIZER ON PRODUCTION OF RED SWAMP CRAWFISH, *Procambarus clarki*, IN POOLS AND PONDS

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ABSTRACT

Some effects of supplemental feed and fertilizer upon production of red swamp crawfish, *Procambarus clarki*, were measured during a five-month period at Baton Rouge, Louisiana. The tests, in vinyl-lined pools and earthen ponds, also evaluated stocking rates of 10,000 and 20,000 young per acre, effect of artificial cover on survival of young, and necessity of soil as substrate in crawfish production. The influence of feed, fertilizer, and soil on total hardness of well water was studied. The relationhip of total hardness of water to survival and growth of young crawfish was observed.

Survival of crawfish in pools with soil was: fed, 65 percent; fertilized, 56 percent; control, 78 percent. In pools with no soil, survival was: fed, 0 percent; fertilized, 32 percent; control, 0 percent. Survival in pools was apparently not affected by increasing the stocking rate from 10,000 to 20,000 per acre, or by adding artificial cover. Average net production in pools with soil ranged from 90 to 372 pounds per acre. Feeding significantly increased production, but fertilization did not.

Average net production in earthen ponds ranged from 107 to 251 pounds per acre. No significant increase was shown by feeding or fertilization, but many fed crawfish had matured and burrowed by draining time.

Total hardness of well water in pools was increased from approximately 6 ppm in controls to 7 ppm by feeding, to 17 ppm by fertilizing, and to 65 ppm by adding soil. Well water added to earthen ponds developed a total hardness similar to that of pools with soil. Survival and growth of young crawfish in pools was minimal at a total hardness of approximately 17 ppm, and best near 65 ppm.

Sex ratio of pool-reared crawfish was 1 male: 1.25 female. Sex ratio of pond-reared crawfish was 1.08 males: 1 female.

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