Bowen, J. T. 1970. A history of fish culture as related to the development of fishery programs. Pages 71-93 *in* N. G. Benson, ed. A century of fisheries in North America. American Fisheries Society, Washington, D. C.
Carlander, K. D. 1969. Handbook of freshwater fishery biology. Iowa State University Press, Ames, Iowa. 752 pp.
Dupree, H. K., and J. E. Halver. 1970. Amino acids essential for the growth of catfish (*Ictalurus punctatus*). Trans. Amer. Fish. Soc. 99:90-92.
Hair, J. A. 1964. Sterilization of the face fly, *Musca autumnalis* De Geer, with Apholate and Tepa. M.S. Thesis, Clemson University, 63 pp.
Hastings, W. H. 1973. Phase feeding for catfish. Prog. Fish-Cult. 35:195-196.
Hastings, W. H. 1974. Use of cheap proteins in fish feeds. FAO Aquaculture Bulletin. 6(2-3):6.
Heidinger, Roy C. 1971. Use of ultraviolet light to increase the availability of aerial insects to caged bluegill sunfish. Prog. Fish-Cult. 33:187-192.
Hickling, C. F. 1962. Fish Culture. Faber and Faber, London. 295 pp.

COMPARISONS OF ALBINO AND NORMAL CHANNEL CATFISH GROWN IN CAGES IN A POND

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ABSTRACT

Albino and normal channel catfish, *Ictalurus punctatus* (Rafinesque), were stocked in suspended cages in a pond at densities of 11.1, 13.9 and 16.7 fish per ft^3, respectively, with two replications of each. There were no apparent growth or survival differences between the albino and normal channel catfish. Mean gain/fish and mean gain/cage/day were significantly different (P 0.01) between the two higher stocking densities with both types of fish. These data indicate that a standing crop of about 15 lb per ft^3 of cage is the maximum which can be grown in still water ponds.

INTRODUCTION

Cage culture of channel catfish, *Ictalurus punctatus* (Rafinesque), has been investigated by a number of researchers in this country in recent years. Schmittou (1969) listed several advantages of cage culture in certain situations and demonstrated that standing crops in excess of 400 lb per m^3 could be produced. Collins (1970) compared the growth of channel and blue catfish, *Ictalurus furcatus* (LeSeuer) when cultured as single and mixed populations in cages. One purpose given by Hatcher (1971) for the use of cages was to rear catfish to be stocked into existing populations of fish to a large enough size that predation by large bass would not be a problem.

Prather (1961) compared the production of albino and normal color (gray) channel catfish in production ponds. The higher mortality experienced by the albino fish in his study was attributed to their susceptibility to predators and was considered to be a distinct disadvantage. Some fish farmers who operate fee fishing ponds attribute additional value to albino catfish as a novelty for their customers.

It was the purpose of this study to determine differences in performance of albino and gray channel catfish when grown in cages at three high stocking densities.

METHODS AND MATERIALS

The 12 cages utilized in this study were constructed of 2 inch X 2 inch creosote treated pine for frames with tar treated 1/2 inch nylon netting insets with a volume of 36 ft^3. Styrofoam billets 3 ft X 1 ft X 2 inches thick were attached to each end of a cage for flotation. The cages were arranged in two batteries with six cages each separated

and anchored by rope with concrete blocks tied to the end cages. Covers were constructed of 2X2 inch treated pine and aluminum roofing material. A 1 X 1½ ft opening with a 12 inch deep feeding well of 1 inch treated pine was built into the center of each cage lid and covered with ½ inch mesh hardware cloth. The two batteries of cages were located in a five surface acre pond a distance of about 20 yd apart with a water depth of 10 ft under the cages. The pond contained largemouth bass and bluegill.

The cages were stocked with albino and normal channel catfish fingerlings in the 7-8-inch groups on 17 March, 1971, at densities of 11.1 (400 per cage), 13.9 (500 per cage), and 16.7 (600 per cage) per ft^3, respectively. Each density for either fish was included in both batteries. Cage location in a battery was randomly assigned.

The fingerlings were fed terramycin (4.5 gm active ingredient per 100 lb fish) treated commercial trout feed (size 5106) for five days pre- and post-stocking. They were held in a 150 ppm formalin bath for one hr immediately before stocking into the cages for parasite control. They were transferred in a five ppm acriflavin solution from the formalin bath to the cages.

Trout feed was fed once per day six days per week at the rate of 3% of the estimated body weight of the fish during the culture period of 202 days. They received feed on only 174 days. The fish were sampled for weight increase once each month and feed was increased accordingly. The feed was weighed into paper bags and delivered to the cages in a small boat. Feeding of the fish was stopped after 5 October and harvest was finished during the following three days.

Water quality parameters measured periodically were total hardness, CO2, pH and dissolved oxygen. Maximum and minimum temperatures of the water at a depth of 2 1/2 ft were recorded when the fish were fed each day.

Production data were analyzed by least squares analysis of variance tests described by Harvey (1960).

RESULTS AND DISCUSSION

Results obtained in this experiment showed no apparent difference in performance of albino and normal channel catfish. Survival was good in all cages and there were no significant differences in survival of albino and normal fish or among the three densities (Table 1).

Table 1. Production Data* Comparisons of Albino and Normal Channel Catfish Grown in Suspended Cages in a Pond, Tifton, Georgia, 1971.

	Albino			Normal		
Number Stocked	400	500	600	400	500	600
Number Recovered	387	490	585	389	490	588
Percent Survival	96.7	98.1	97.5	97.2	98.1	98.0
Weight Stocked	65.1	57.1	82.9	47.1	76.2	98.5
Weight Harvested	388.5	481.0	522.0	386.0	495.5	538.0
Weight Gained	323.4	423.9	439.5	338.8	419.3	439.5
Mean Weight Stocked	0.16	0.11	0.14	0.12	0.15	0.16
Mean Weight Harvested	1.00	0.98	0.89	0.99	1.01	0.91
Total Feed Consumed	533.7	720.5	725.8	525.1	712.9	747.2
Conversion	1.6:1	1.7:1	1.7:1	1.5:1	1.7:1	1.7:1

*Figures are averages of two replications of each stocking density. Culture period was 202 days. / Weights are in pounds.

Fig. 1

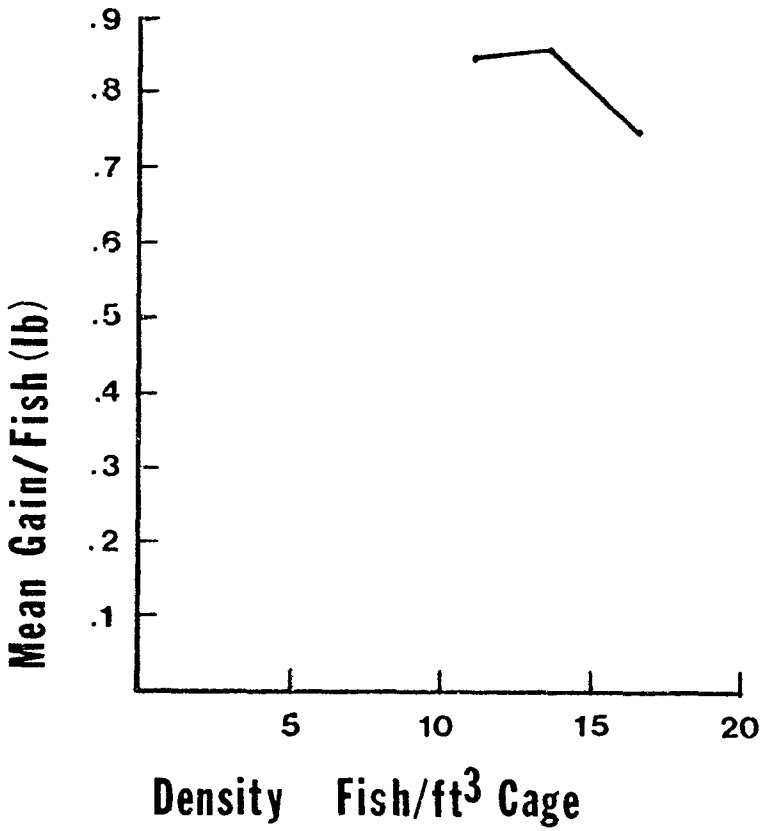

Figure 1. The relationship between mean gain per fish and density of fish per ft^3 of cage.

There were no significant differences in gain per fish between the two types of fish or between the stocking densities of 11.1 fish per ft^3 and 13.9 fish per ft^3. However, there was a significant difference (P 0.01) in gain per fish of both types between stocking densities of 13.9 fish per ft^3 and 16.7 fish per ft^3 (Figure 1). There was a slight increase in mean gain per fish between the lower and middle densities, but a sharp decrease from the middle to higher density. This data indicates that for cages of the size utilized in this study 600 fish/cage is approaching carrying capacity if each fish is expected to reach a harvestable weight of more than 0.8 lb within a growing season.

Similar statistics were obtained when gain/cage/day between the types of fish and stocking densities were compared. There was no significant difference in gain/cage/-day between the albino and normal fish. Also, there was no significant difference in gain/cage/day between cages containing 400 fish and those containing 500 fish. There were significant differences (P 0.01) with both types in gain/cage/day between cages containing 500 fish and those containing 600 fish.

Cages containing 500 fish gained 0.44 lb more per day during the 202 day culture period than did cages with 400 fish. Cages which contained 600 fish gained only 0.09 lb more weight per day than did those stocked with 500 fish (Figure 2). This data indicates that a standing crop slightly in excess of 500 lbs is the maximum which can be grown in 36 ft^3 cages with good results. The cage with 600 normal fish had 542 lb harvested from it. This was the largest production of any cage in the experiment.

Fig. 2

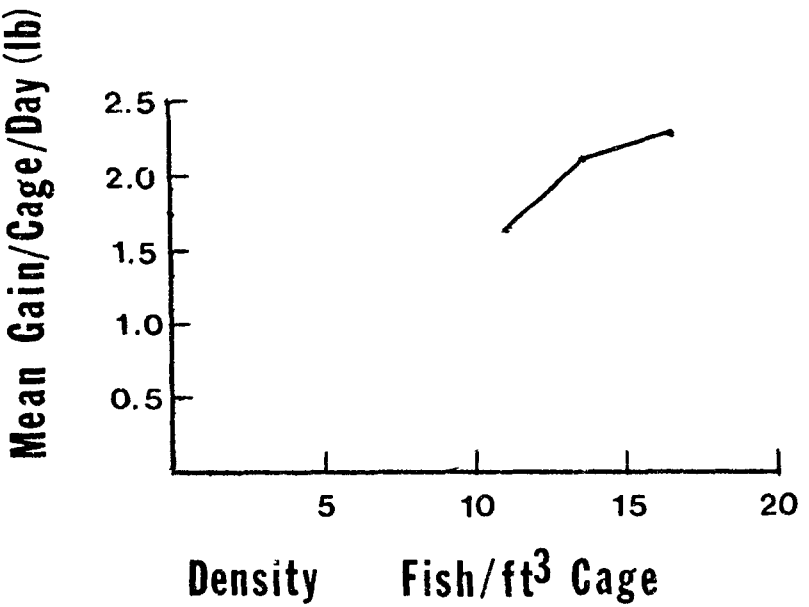

Figure 2. The relationship between mean gain per cage per day and density of fish per ft^3 of cage.

Mean feed conversions ranged from 1.5:1 to 1.7:1 and were not significantly different. Since all the fish were fed 3% body weight and survival was similar for all cages, this was to be expected. The feeding wells in the center of the cage tops functioned properly and a minimal amount of feed was lost to the outside. The weight of a cage and cover allowed only about six inches to be exposed above the surface of the water. The cages were satisfactory in every respect and were in good condition when the experiment was terminated.

In a study where some quality comparisons of albino and normal channel catfish were made, Heaton et al (1973) reported preference on appearance and color of albino fish by a six-member panel of judges. Since albino fish do survive and grow as well as normal catfish in cages and are preferred because of their whiter flesh. they should be considered as another product for processers to use for increased sales.

The concentrations of water quality parameters measured were not considered detrimental to the fish (Table 2). Additionally, no problems were experienced with bacterial diseases or parasites infestation.

Table 2. Means and Extreme Variations of Water Quality Parameters Measured in a Pond During Cage Culture of Albino and Normal Channel Catfish, Tifton, Georgia, 1971.

	Mean	Range	
Dissolved Oxygen (PPM)	6.5	4.6	8.5
Free Carbon Dioxide (PPM)	4	0	10
Total Hardness (PPM)	55	45	60
pH	7.1	6.1	9.0
Temperature (°F)	77	56	88

LITERATURE CITED

Collins, R. A. 1970. Cage culture of catfish in reservoir lakes. Proc. Twenty-fourth Ann. Conf. S. E. Assn. Game and Fish Comm. 24:489-496.

Harvey, W. R. 1960. Least-squares analysis of data with unequal subclass numbers. USDA ARS 20-8. 157p.

Hatcher, R. M. 1971. Cage culture of channel catfish. Conference Proceedings: Producing and Marketing Catfish in the Tennessee Valley. Tennessee Valley Authority. Bulletin Y-38. 96p.

Heaton, E. K., T. S. Boggess, Jr., R. E. Worthington, and T. K. Hill. 1973. Quality comparisons of albino and regular (gray) channel catfish. J. Food Sci. 38:1194-1196.

Prather, E. E. 1961. A comparison of production of albino and normal channel catfish. Proc. Fifteenth Ann. Conf. S. E. Assn. Game and Fish Comm. 15:302-303.

Schmittou, H. R. 1969. Developments in the culture of channel catfish, *Ictalurus punctatus* (Rafinesque), in cages suspended in ponds. Proc. Twenty-third Ann. Conf. S. E. Assn. Game and Fish Comm. 23:226-244.

MACROPHYTE CONTROL BY GRASS CARP IN CATFISH PONDS

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ABSTRACT

Macrophyte standing crop (primarily *Eleocharis* and *Utricularia*) was reduced nearly 90% in two catfish ponds after introduction of grass carp *(Ctenopharyngodon idella).* Abundant vegetation remained in 1-m² exclosures placed in the ponds as controls. The stocking ratio of grass carp (live weight) to macrophyte standing crop (dry weight) that resulted in vegetation control within 1 year was 0.15 in the pond is which the fish were fed pelleted food and 0.06 in the pond in which the fish were not fed. Scattering of feed over the entire pond rather than confining it to a few locations may have discouraged grass carp from feeding on pellets and contributed to the success of vegetation control.