TRANSACTIONS, ILL. STATE ACAD. SCI.
Vol. 68, No. 4 (1975)

SPECIFIC GROWTH RATES OF CHANNEL CATFISH (ICTALURUS PUNCTATUS) IN PONDS

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ABSTRACT - Channel catfish were stocked at two densities: 25/pond and 100/pond. Each pond was 0.06 hectares. The specific growth rates, after 53 days, were 0.010 and 0.015 for ponds with 100/pond and 0.021 for ponds with 25/pond. Growth is compared to that found in natural populations and specific growth rates with those found for supplementary-fed catfish.

INTRODUCTION

Studies on channel catfish culture involving supplementary feeding have stimulated further research into growth rates of this species. The purpose of this project was to measure specific growth rates for channel catfish which were feeding on pond organisms and to compare these rates with those in the literature on supplementary-fed channel catfish.

MATERIALS AND METHODS

Four ponds located near Carbondale, Illinois were used. They were several years old but had never been treated with fertilizers, and each had an area of 0.06 hectares. Water from a nearby reservoir filled the ponds in mid-April, 1969. The ponds had a gentle slope so that depth varied; the depth at the drain ranged from 1.32 to 1.45 m ($\bar{X}$ = 1.37). The water was filtered so that larval fishes could not easily enter and the ponds were treated with rotenone to eliminate fish.

Channel catfish were stocked on June 3, 1969. There were two ponds which contained 25 catfish (417/hectare) and two ponds with 100 catfish (1667/hectare). Channel catfish do not ordinarily breed in ponds so their number will not increase after stocking. The fish weighed 25.3 $\pm$ 5.5 g ($\bar{X} \pm$ S.D.), and the average length was 12.7 cm.

On July 26, as many fish as possible were removed from the pond to measure growth and calculate specific growth rates. At the end of August, the ponds were drained so that surviving catfish or any contaminating fish species could be counted. The ponds could not be drained earlier because of other studies on pond benthos.

Some of the fish captured on July 26 were used for stomach analyses. Stomachs were placed in 10% formalin and were later opened, emptied, and flushed with a small amount of water. Each individual food item was counted.

RESULTS

Specific growth rates were calculated using the average weights when fish were stocked and average weights when fish were removed at the end of July. The calculation of these rates follows Cushing (1968, p. 107) and was originally formulated by Medawar (1945). The formula is:

$$V = \frac{1}{t_1 - t_0} \log_e \frac{W_1}{W_0},$$

where W_1 is the weight at t_1 and W_0 is the weight at t_0 with t measured in days. V is the specific growth rate. The two ponds containing 25 catfish had identical rates, 0.021; and ponds stocked with 100 catfish had rates of 0.010 and 0.015 (Table 1). Ponds stocked with 100 catfish had 1740 and 3180 g total weight gain, ponds with 25 catfish had 1148 and 1253 g weight gains. The average length at the end of the study was 18.1 and 19.0 cm for the lower density ponds and 15.8 and 17.4 cm for the higher density ponds.

Forty-five channel catfish stomachs were collected; 8 did not contain food. There were 346 *Chaoborus punctipennis* found in 62.2% of the stomachs that contained food. Of these, 75% were 4th instars and only 3% were pupae; the remainder were early instars. The second most abundant food organisms were mayflies, some of which were *Hexagenia* sp. A total of 46 mayflies were found in 51.6% of the stomachs and most of these were small nynphs.

When the ponds were drained at the end of August, all of the channel catfish were accounted for; there was no mortality during the two month period of the study. However, there was contamination by other fish species. One of the ponds stocked with 100 catfish had 3 adult brown bullheads (*Ictalurus nebulosis*), 2 bluegills (*Lepomis macrochirus*), 4 pumpkinseed sunfish (*Lepomis gibbosus*), and one green sunfish (*Lepomis cyanellus*); the other pond stocked with 100 catfish had 6 gizzard shad (*Dorosoma cepedianum*), one green sunfish, and one pumpkinseed sunfish.

DISCUSSION

Green (1973) fed channel catfish, stocked at nearly 5000/hectare, a floating type ration and obtained specific growth rates of 0.019. Channel catfish raised in cages have specific growth rates of 0.016 (Andrews *et al.*, 1971) and 0.017 (Andrews *et al.*, 1972). These growth rates would fall between those obtained at the two densities in this experiment. The average rate at the higher density was 0.013, and, at the lower density, 0.021. Assuming a linear relationship between specific growth rates and channel catfish density and extrapolating

catfish density for fish without supplementary feeding, from specific growth rates, Green's (1973) rates would be comparable to those for 1350 channel catfish/hectare and Andrew's (1971) rates to 883/hectare.

The growth of the fish in these ponds was similar to those found for natural populations of channel catfish. Appelget and Smith (1950) found that the greatest growth, 7.9 cm, occurred in Age Group II and the average increment was over 5.1 cm a year up to Age Group VIII. Sneed (1950) found that the range in length for Age Group I channel catfish was 10.0 to 15.9 cm and 12 to 29.9 cm for Age Group II in Grand Lake, Oklahoma; this is an average increase of 8 cm between Age Group I and Age Group II. The average growth in this study was 3.1 cm to 6.3 cm depending on channel catfish density. This growth is slightly less than that found by Appelget and Smith (1950) and Sneed (1950). The growth results may have more closely approached those of Appelget and Smith (1950) and Sneed (1950) if the fish were studied during an entire growing season instead of 53 days.

The highest specific growth rates were found at the lowest catfish density; assuming a constant conversion of food to catfish growth, this would indicate that the total number or biomass of prey organisms per catfish was greater at this lower density. At the higher catfish density the specific growth rates were lower, but the total increase in fish biomass was greater at the higher fish density. Again, assuming a constant efficiency of utilization of food for growth, catfish at the higher density must feed on a larger number or biomass of prey organism than fish at the lower density to achieve this greater overall increase in fish biomass.

Hoopes (1960) found that 68% of channel catfish stomachs contained the mayfly, Hexagenia sp.; other organisms found in the stomach were immature Plecoptera, Diptera, clams, and snails. Hexagenia sp. and other mayflies made up an important part of the channel catfish diet in this study. Though the total number of mayflies in stomachs was considerably lower than Chaoborus punctipennis, the fish received a substantial portion of their energy requirements from mayflies since each mayfly has a greater biomass than individual C. punctipennis. In their natural environment, channel catfish would not ordinarily come into contact with large populations of C. punctipennis. However, they do feed on other dipterans, and it is not surprising that when exposed to large populations of C. punctipennis, they would feed on them.

ACKNOWLEDGEMENTS

I express appreciation for the help and advice given by Vicki Savitz, Dr. William M. Lewis, Sr., Dr. Roy Heidinger, and Dr. John Stahl.

TABLE 1. SPECIFIC GROWTH RATES OF CHANNEL CATFISH IN PONDS

Pond	Initial No. of Fish Stocked	Days of Growth	Initial Average Weight in Grams and Standard Deviation	No. of Fish Captured on July 26	Final Average Weight in Grams and Standard Deviation	Specific Growth Rate
1	25	53	22.5 ± 3.0	19	68.4 ± 9.3	0.021
2	25	53	24.9 ± 4.4	15	75.0 ± 12.6	0.021
3	100	53	26.0 ± 6.2	90	43.4 ± 11.9	0.010
4	100	53	25.2 ± 6.3	90	57.0 ± 12.1	0.015

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