Winter Feeding of Fingerling Channel Catfish in Kentucky

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ABSTRACT

Two feed regimes were evaluated for overwintering fingerling channel catfish (*Ictalurus punctatus*) in Kentucky. Fish in 3 ponds were fed throughout the winter regardless of water temperature (control ponds) and fish in 3 ponds were not fed when water temperatures fell below 7.2°C (treatment ponds). Fish survival and net pond production were not significantly different ($P > 0.05$) with the 2 feeding regimes. Feed conversion in fish fed throughout the winter was 7.4 compared to 3.4 for fish not fed below 7.2°C. This difference was statistically significant ($P < 0.05$) and indicates feed wastage with low-temperature feeding. Winter feeding of catfish fingerlings in Kentucky appears to promote growth at water temperatures above 7.2°C. Below 7.2°C, feeding may be discontinued to prevent feed wastage and water quality deterioration.

INTRODUCTION

Channel catfish (*Ictalurus punctatus*), like all fish species, are poikilotherms. Water temperature has a profound effect on body metabolism and, consequently, on food consumption. In production situations, catfish are fed daily at water temperatures between 14.4°C and 32.0°C. Below 14.4°C food consumption decreases to the point that daily feeding is usually impractical during the winter months (1). However, some feed input during this cool period has been shown to be beneficial in maintaining health and condition of fingerling and market-size channel catfish (2). Fingerling catfish not fed during the cool period have been reported to lose up to 34.5% of body weight in overwintering ponds (3).

Winter feeding of fingerling channel catfish in the deep south was evaluated by Reagan and Robinette (4) who found that during a mild winter (mean temperature = 12.8°C) fish fed 6 days per week gained significantly more weight than fish fed 3 days per week with no significant difference in feed conversion. However, during a severe winter (mean temperature = 7.7°C) there was no significant difference between feed regimes in weight gain or feed conversion. Robinette et al. (4) found that when water temperature was below 7.2°C feed conversion could be improved by feeding only every third day and stated that low-temperature feeding schedules needed refinement, based on feed conversions.

Kentucky has a limited growing season of 180–200 days, thus large stocker fingerlings (27–64 g) are required for fish to be grown-out to market size in one year (5). Fingerlings of the required size have been, in the past, prohibitively expensive in regions outside the deep south. Methods of compensation for this limited growing season have been examined. Techniques include increasing growth rates by density manipulation and functionally extending the fingerling growing season by early import of eggs or fry from the deep south (unpubl. data). However, all these techniques require that fingerlings be overwintered in ponds before growout to market sizes.

Winter feeding of fingerling channel catfish in ponds has not been evaluated in Kentucky. Winter water temperatures are usually below 7.2°C for 60–90 days from mid-December through mid-March. Because winters are more severe in Kentucky than in the deep south, development of a winter-feeding program for these conditions could prove beneficial to the channel catfish fingerling industry in the Commonwealth. The objective of this study was to refine low-temperature feeding schedules based on fingerling growth and feed-conversion ratios. Fish were fed according to 2 feed regimes; (a) fed below water temperatures of 7.2°C throughout the winter (control) and (b) not fed below a water temperature of 7.2°C (treatment). Catfish not fed all winter were not evaluated since such fish are known to lose weight (4), making calculation and comparison of feed-conversion ratios impossible.

MATERIALS AND METHODS

On 30 October 1986, channel catfish averaging 33 g were stocked into 6 0.04-hectare

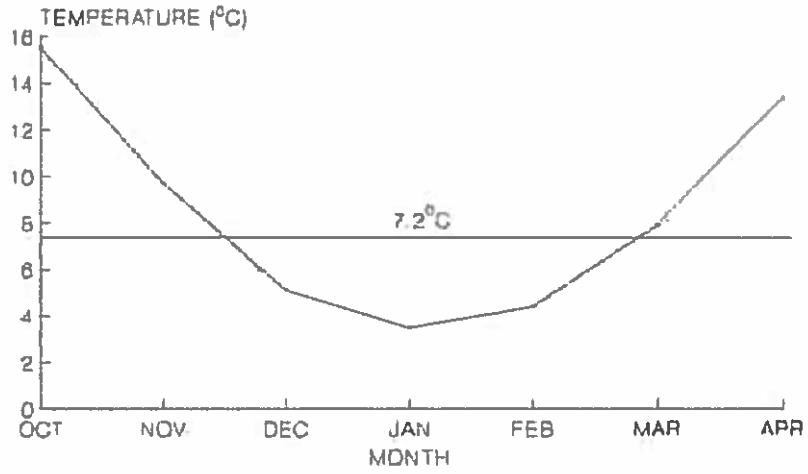

FIG. 1. Mean monthly water temperatures for fingerling channel catfish ponds. Above horizontal line (7.2°C), both treatments followed the same feeding schedule. Below 7.2°C, feed schedules differed by treatments.

ponds at a rate of 24,700 per hectare at the Aquaculture Research Center, Kentucky State University, Frankfort. Fish were fed a 30% crude protein sinking commercial catfish feed (Ralston Purina Co., Richmond, Indiana). Feeding rates were based on water temperatures and per cent body weight as described by Reagan and Robinette (4), Robinette et al. (3), and Dupree and Huner (1). Fish in 3 randomly selected control ponds were fed according to Table 1 (accepted feeding practice) throughout the winter. Fish in 3 randomly selected treatment ponds were fed according to the table down to 7.2°C; below 7.2°C no feed was given. Water temperatures were taken at 1 m depth at 0800 hours. On 27 April 1987, the fingerlings were harvested, counted, and weighed. The Student's *t*-test was used for 2 mean comparisons of survival, harvest weights, net-pond production, and feed conversion (6).

RESULTS AND DISCUSSION

During the winter of 1986–1987, surface water temperatures averaged 7.3°C from 30 October 1986 through 27 April 1987 (Fig. 1). There was a total of 69 feeding days for fingerlings fed throughout the winter and 37 feeding days for fingerlings not fed below 7.2°C. This represents 46% fewer feedings for the fingerlings not fed below 7.2°C than for fingerlings fed throughout the winter.

Fish in both treatments were observed to be in good condition at harvest. Mean survivals of fingerlings fed throughout the winter and not fed below 7.2°C were 98.5% and 99.2%, respectively, and were not significantly different ($P > 0.05$) (Table 2). Net-pond production and percentage weight gain of fingerlings fed throughout the winter and not fed below 7.2°C were 4.9 kg/hectare and 14.5% and 5.1 kg/hectare and 15.8%, respectively. These differences were not significant ($P > 0.05$). There was, however, a significant difference ($P < 0.05$) in feed-conversion ratios. Fish fed throughout the winter averaged 7.4 (kg of feed fed/kg of fish gain) and fish not fed below 7.2°C averaged 3.4.

Data from this study indicate that fingerlings not fed below 7.2°C gained as much weight as fish fed throughout the winter. We attribute the higher feed-conversion ratio in fingerlings fed throughout the winter to be the result of uneaten feed. This represents an un-

TABLE 1. Winter feeding rates and frequencies of fingerling channel catfish in earthen ponds.[a]

Water temperature (°C)[b]	Feeding frequency	Feeding rate (% body weight/day)
26.1–20.0	2 times/day	3.0
19.4–14.4	1 time/day	1.5
14.3–10.0	alternate days	2.0
9.9–4.4	every third day	1.0
4.3 and below	every fourth day	1.0

[a] Adapted from Reagan and Robinette (4), Robinette et al. (3), and Dupree and Huner (1).
[b] Water temperature was taken in the morning at 1 m depth.

TABLE 2. Effects of two feeding regimes on winter survival, weight gain and feed conversion of channel catfish fingerlings. Values are means (SE). An asterisk within a column indicates that the two means are significantly different (Student's *t*-test, $P < 0.05$).

Treatment[a]	Survival (%)	Mean harvest weight per fish (g)	Net pond production (kg/hectare)	Feed conversion[b]
Fed all winter	98.5 (0.8)	38.7 (1.7)	4.9 (1.3)	7.4 (2.0)
Not fed below 7.2°C	99.2 (0.5)	37.3 (2.5)	5.1 (0.2)	3.4 *(0.3)

[a] Complete data information per pond are available from the authors.
[b] Feed conversion = weight of feed/fish weight gain.

necessary expense to producers and an accumulation of uneaten feed in overwintering ponds which can have a negative effect on fish growth and health through the deterioration of water quality (2). This is most often noticed as the water temperatures increase in the spring and could cause poor health and even fish loss (1).

We conclude that feeding fingerling channel catfish according to the above feeding table should promote growth at water temperatures above 7.2°C. When water temperatures fall below 7.2°C, we suggest that feeding be discontinued. This feeding practice should eliminate the expense of uneaten feed and maintain good water quality without affecting weight gain.

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