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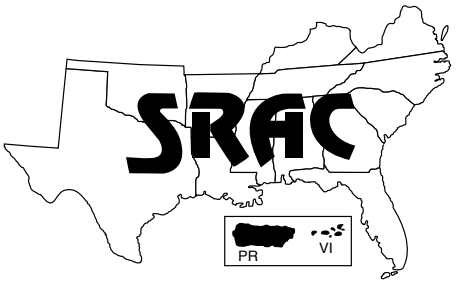

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Restricted Feeding Regimes Increase Production Efficiency in Channel Catfish

The success of channel catfish culture depends on maximizing production in a cost-effective manner. The greatest costs are those associated with feed and feeding. Producers and researchers are constantly seeking new ways of lowering these costs. One way of reducing feed costs is to take advantage of the phenomenon of compensatory growth.

Research has shown that various animals (including some fish) temporarily deprived of feed will grow more rapidly when feeding is resumed and "catch-up" with animals that were not deprived of feed. This phenomenon, known as compensatory growth, can be demonstrated by an increase in both growth rate and efficiency of feed utilization during the refeeding period. Development of feeding regimes that take advantage of compensatory growth will improve the efficiency of fish growth.

Restricted feeding regimes during spring and summer

In a study conducted at Auburn University, channel catfish weighing 90 pounds per 1,000 fish were stocked into ponds at commercial densities in the spring. Fish were either fed daily to apparent satiation (fish were given as much feed as they would consume within a 30-minute period) or restrictively fed for 3, 6, or 9 weeks, during which time they were fed to apparent satiation only once every 3 days. Following the restriction periods, fish were fed as much as they would consume within a 30-minute period once daily for the remainder of the 18-week period. Fish that were restricted from feed for 3 weeks exhibited compensatory gain during the 3 weeks of feeding to apparent satiation. Their weight was similar to that of fish fed to apparent satiation daily

The Southern Regional Aquaculture Center supported a regional research project, "Improving Production Efficiency of Warm Water Aquaculture Species through Nutrition" to determine the most appropriate feeding methods to achieve optimal yields from intensive catfish production in ponds. This publication was compiled by Wendy M. Sealey, James T. Davis, and Delbert M. Gatlin III, based on research conducted as part of that project by investigators at Auburn University and Texas A&M University.

Winter weather conditions often make it difficult for feed trucks to drive on levees.

during the entire period. At the end of the experimental period, fish which were restricted from feed for 6 or 9 weeks weighed 90 percent and 86 percent, respectively, as much as those fed to apparent satiation throughout. Feed conversion, dressing yield and body composition values over the duration of the experiment were the same for fish subjected to all feeding regimes.

At Texas A&M University, fingerlings (50 pounds per 1,000 fish) were stocked at 8,000 fish per acre into each of 12 ponds. Fish in one treatment (four ponds per treatment) were fed once daily to apparent satiation by allowing them to consume as much feed as they would over a 2-hour time period. Fish in a second treatment were alternated between being fed to apparent satiation once every third day for 3 weeks and being fed daily to apparent satiation for 3 weeks. Fish in a third treatment alternated between being unfed for 3 weeks and being fed daily to apparent satiation for 3 weeks. These feeding patterns were continued throughout the 27-week study. Ponds were sampled at the end of each 3-week period to determine average fish weight, dressing yield and body composition.

Fish fed to apparent satiation throughout the study gained more weight than fish restricted in feed. Fish that were alternated between being fed every third day for 3 weeks and then being fed daily for 3 weeks gained more weight than fish that were alternated between being unfed for 3 weeks and then fed daily for 3 weeks (Figure 1). Feed conversion was not different among the groups of fish over the entire experiment. However, fish that had been restricted in their feed intake consumed more feed per body weight and gained more weight during the refeeding period than fish that had not been restricted (Figures 2 and 3). After the first 9 weeks of the study, fish that were restricted in feed intake and fish that were unfed at 3-week intervals did not weigh as much as fish fed continuously.

This research indicates that channel catfish on restricted feeding for a relatively short period exhibit compensatory gain during subsequent refeeding under optimum growing conditions if they are fed to apparent satiation during the

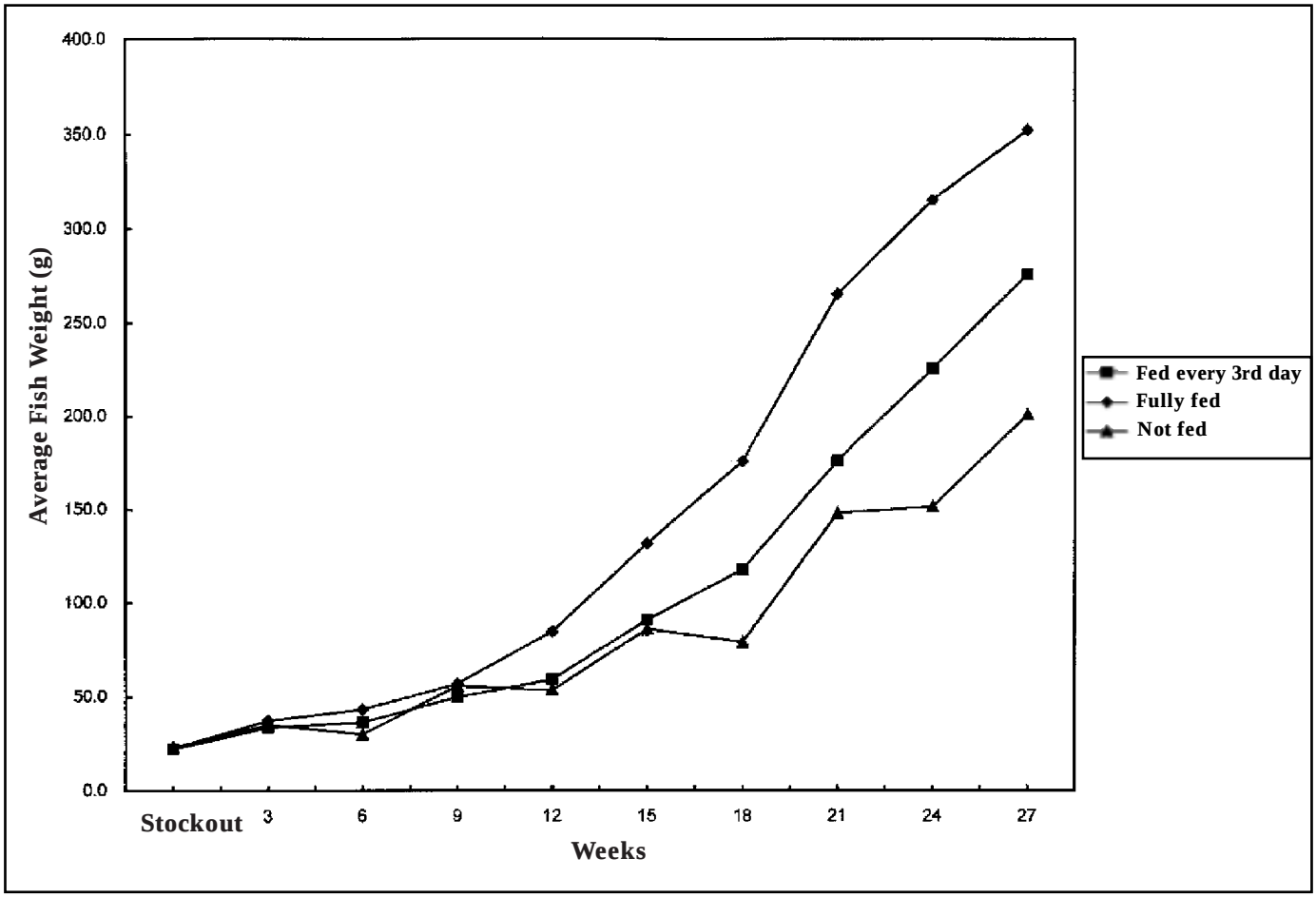

Figure 1. Channel catfish alternated between being fed every third day for 3 weeks and being fed daily for 3 weeks (fed every third day) gained more weight than fish alternated between being unfed for 3 weeks and then fed for 3 weeks (not fed), but not more than those fed daily throughout the experiment (fully fed).

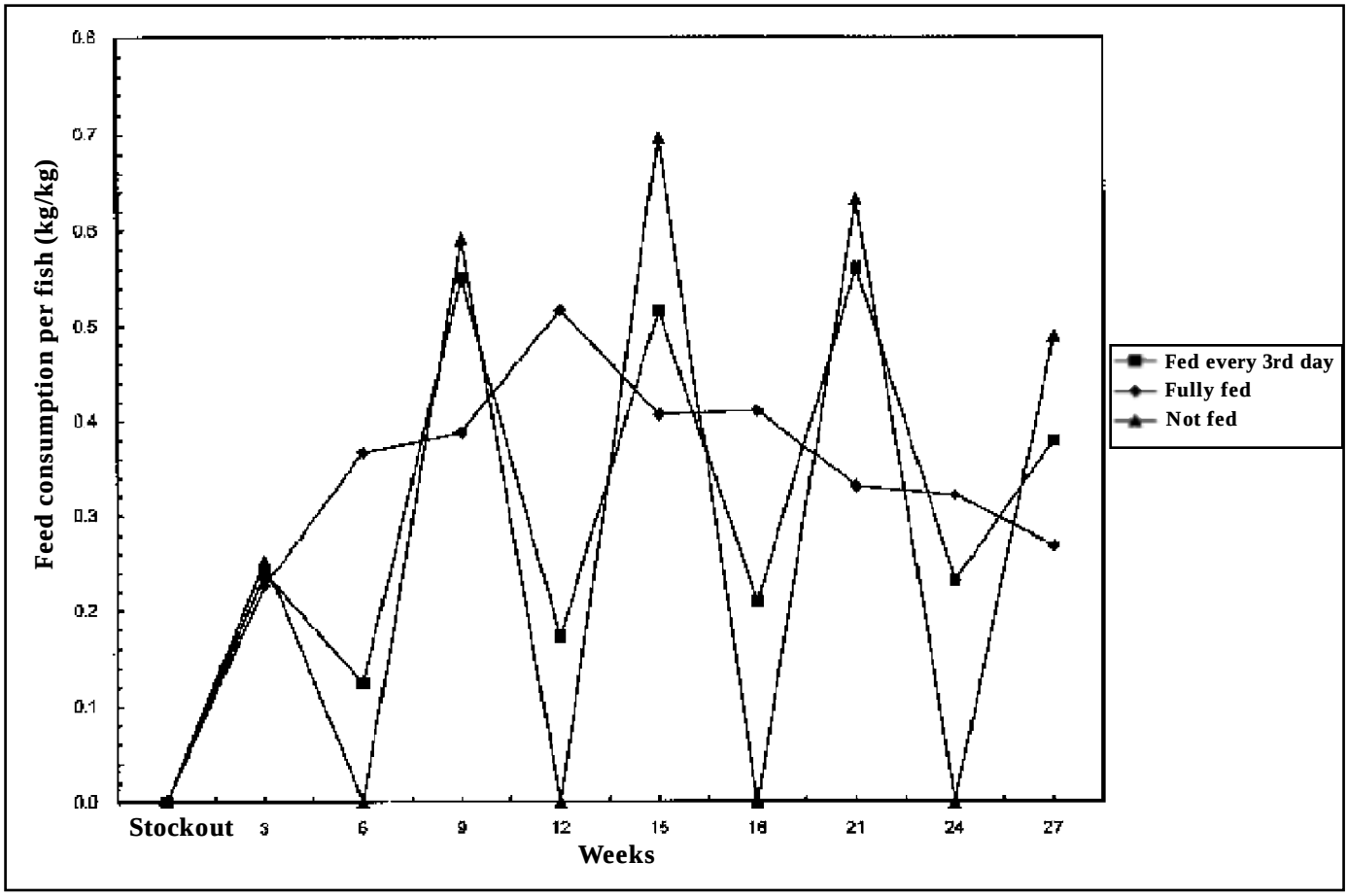

Figure 2. Channel catfish previously unfed for 3 weeks (not fed) or fed every third day for 3 weeks (fed every third day) consumed more feed during the refeeding period than those fed daily throughout the experiment (fully fed).

refeeding period. Therefore, if the aquaculturist is unable to feed for a short period because of disease or adverse pond conditions, the fish can compensate for this deprivation if fed to satiation when feeding is resumed. These experiments also suggest that improvements in growth rate and feed efficiency may occur only for a limited time upon refeeding. Therefore, additional study is needed to determine what length of feed deprivation will optimize compensatory gain.

Restricted feeding regimes during winter

Winter feeding regimes are of interest because when temperatures fall below optimum, a fish's metabolism, feed intake, digestion, and immune responses decrease, which may reduce the efficiency of channel catfish production. Because of this, and because inclement winter weather often makes feeding fish in ponds difficult, fish often are fed less in winter. Several studies have been conducted to determine if restricted feeding during the winter can be manipulated so that compensatory gain may be optimized the following spring.

Two overwintering studies at Auburn University examined the effects of no feeding, partial feeding (no feeding during December, January and February), and continuous feeding during cool weather on year 1 (initial weight 0.09 pound) and year 2 (initial weight 1.5 pounds) chan-

A successful restricted feeding regime is dependent on feeding the fish as much as they will consume after restriction.

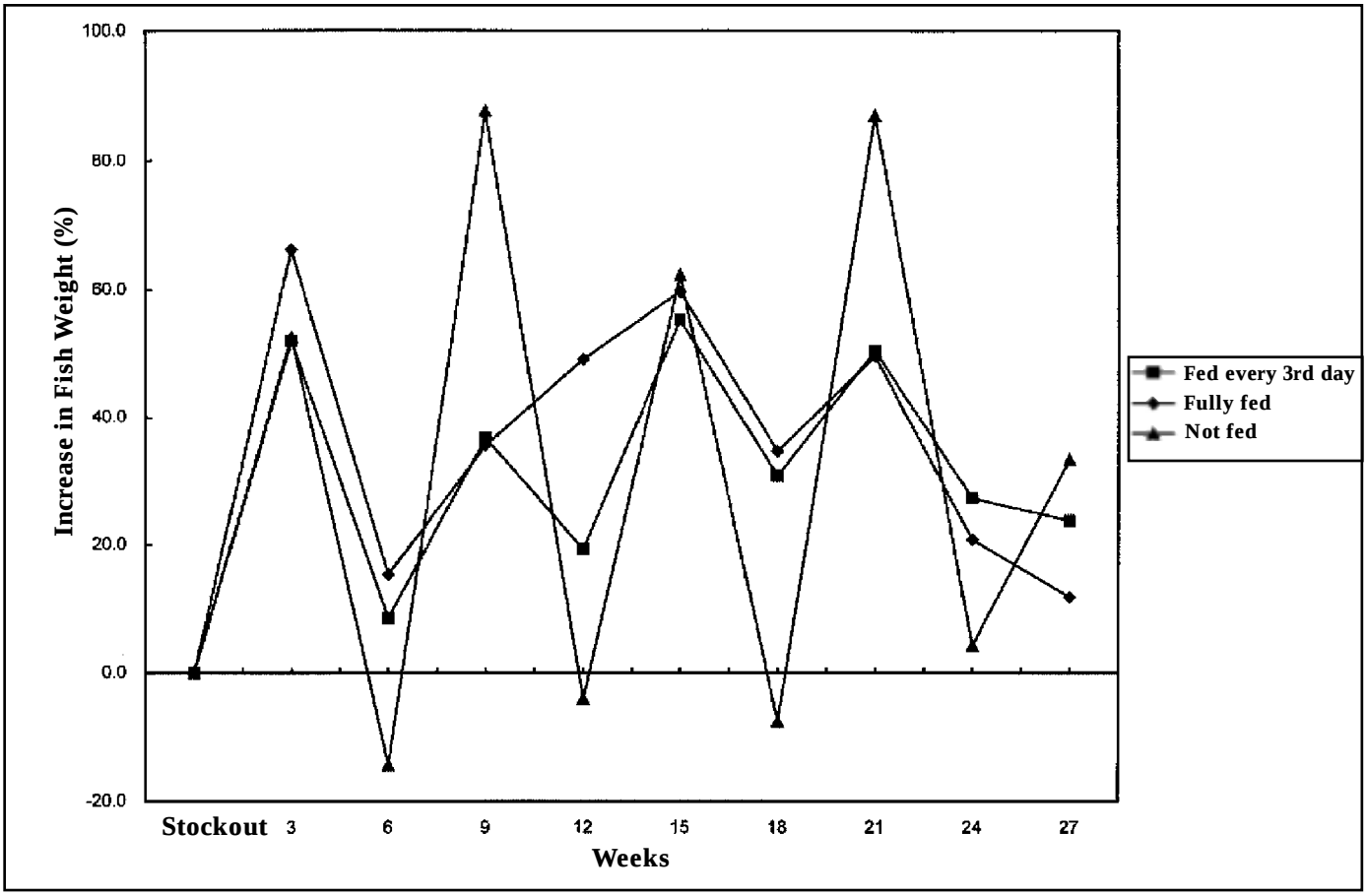

Figure 3. Channel catfish previously unfed for 3 weeks (not fed) gained more weight during the refeeding period than those fed daily throughout the experiment (fully fed).

nel catfish. Each size class was stocked separately into ponds at commercial densities in October and harvested in late April. At the end of the experiment, weight of the partially fed fish was not different from that of the continuously fed fish, even though they were fed only about 60 percent as much feed. Non-fed fish lost weight and were significantly smaller than the continuously fed and partially fed fish. This study shows no advantage with regard to weight gain in feeding channel catfish during December, January and February because fish not fed during that period exhibited compensatory gain the following spring.

A similar overwintering study was conducted at Texas A&M University in which channel catfish (initial weight 0.4 pound) were stocked into six ponds in early December. Fish in three ponds were fed as much as they would consume whenever the water temperature was above 55 degrees F. Fish in the other three ponds were not fed at all from December through March. Feeding was resumed to the unfed fish at the beginning of April and continued through August to correspond to a normal growing season. Fish fed over the winter months had significantly greater weight gain than the unfed fish. Following refeeding, however, no significant differences in percent weight gain, feed conversion, or survival were evident between the continuously fed and previously unfed fish.

These studies indicate that channel catfish not fed over the cold winter months (December, January and February) may be able to exhibit compensatory gain once they are fed in the spring. Compensatory growth achieved from restricting winter feeding is dependent on various factors such as fish size, length of feed deprivation, and harshness of the winter. These studies have practical implications in that producers who choose not to feed their fish in the winter may be able to elicit partial compensatory gain during the spring feeding period. Further research is needed to determine the optimum length of time to deprive fish of feed during the winter in order to maximize the compensatory growth in the spring without decreasing total yields.

Disease resistance

Another practical implication of restricted feeding is its effect on fish health. Traditional thought is that fish fed over the winter months are healthier and better

able to survive disease outbreaks that occur in the spring. Recent research suggests that this may not always be the case.

In the previously mentioned study at Auburn University which examined winter feeding regimes, disease resistance also was examined. Following winter feeding, fish in each size class from the continuous, partial, and unfed groups were removed and infected with *Edwardsiella ictaluri*, the causative agent of enteric septicemia of catfish. Mortality due to enteric septicemia was higher in the unfed year-1 fish; however, in the year-2 unfed fish, mortality due to enteric septicemia was lowest. There was no difference in mortality rate between the partially fed and continuously fed fish from both age groups. These results indicate that while feed deprivation increased disease susceptibility in small channel catfish it enhanced resistance in larger fish. More research is needed to determine the effects of fish size and length of feed deprivation period on resistance of channel catfish to bacterial infection.

Conclusions

Restricted feeding regimes may be promising tools for increasing the efficiency of fish production. By not feeding or by limiting feed during the winter, producers can save money by reducing feed and-labor costs, and possibly decreasing disease losses as well. Further research is needed to determine the optimum length of time to restrict feeding for different sizes of fish in order to maximize the effects of compensatory growth and optimize disease resistance. In addition, satiation feeding may cause severe deterioration in water quality.

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