L-2406
SRAC Publication No. 181

Texas Agricultural Extension Service

Southern Regional Aquaculture Center

May, 1989

Feeding Intensively Cultured Catfish in Levee-type Ponds

Thomas L. Wellborn*

Feeding is the most important task in the intensive pond production of catfish, and the person responsible for feeding should be an experienced fish culturist. In a normal situation, catfish can be seen only when they are coming up to feed, and their feeding behavior can be an important clue to general health and the pond condition. Thus, the person doing the feeding must be able to tell whether or not the fish are feeding normally. If they are not, the feeder must inform the manager that a potential problem may be developing.

Nutritional requirements

Feed used in intensive pond culture of catfish must be nutritionally complete. Catfish feed that lacks all essential nutrients in the proper amounts is called supplemental feed and has no place in a production system where stocking rates exceed 1,200 fish per surface acre. Use of a supplemental feed when catfish are stocked at higher densities will, at best, result in poor growth and, at worst, death of the fish due to a nutritionally-induced disease. Feed must contain all essential nutrients at adequate levels to meet total nutritional requirements of catfish for normal growth and health (Table 1).

Most catfish feed manufacturers now use the "least cost", instead of "fixed feed" method of feed formulation where the formula varies, within limits, as ingredient prices change. Since the kind or amount of ingredients needed to provide essential nutrients for catfish is not secret, the feed manufacturer should be willing to reveal the type and amount of ingredients in his feed. If feed company officials are not willing to do this, consider buying feed from another company to get what you pay for.

Form and size

Not only must the feed contain all of the essential nutrients, it must also be palatable to the catfish and of a size that can be eaten. If they **don't** eat it or **can't** eat it, maximum growth is not achieved, costing the producer money. The feed must be offered in a way and at a time that promotes total consumption.

Form and size of feed available include four types:

- meal
- crumbles
- floating (expanded or extruded) pellets.
- sinking (hard or compacted) pellets

Feed size and form used depends on fish size, water temperature and type of management. Meal and crumbles are used for fry and small fingerlings. Although more expensive, extruded or floating feed is generally preferred when water temperatures are above 65° F (18° C) because feeding behavior is much easier to monitor. Most producers feel that seeing the fish when they are feeding is well worth the extra cost.

Sinking feed is used when the water temperature falls below 65° F (18° C), since catfish reduce their feeding activity at colder temperatures and seldom will come to the surface. Try to convert the fish to taking sinking feed while they are still feeding actively at 65° F (18° C) or slightly higher. If you wait until they

* University of Florida.

Table 1. Formula for a nutritionally complete 32 percent protein catfish feed suitable for pelleting or extruding.

Ingredient	Lbs/ton		Percent
Menhaden fish meal	160.0		8.00
Soybean meal, 48% protein	965.0		48.25
Corn	582.0		29.10
Rice bran or wheat shorts	200.0		10.00
Dicalcium phosphate	20.0		1.00
Pellet binder	40.0		2.00
Fat (sprayed on finished feed)	30.0		1.50
Trace mineral mix:	1.0		0.05
Manganese		23.00 gms/ton	
Iodine		5.00 gms/ton	
Copper		3.00 gms/ton	
Zinc		136.00 gms/ton	
Iron		40.00 gms/ton	
Cobalt		0.05 gms/ton	
Vitamin mix :	2.5		0.125
Thiamine		10.00 gms/ton	
Riboflavin		12.00 gms/ton	
Pyridoxine		10.00 gms/ton	
Pantothenic acid		32.00 gms/ton	
Nicotinic acid		80.00 gms/ton	
Folic acid		2.00 gms/ton	
Vitamin B-12		0.008 gms/ton	
Choline chloride (70%)		500.00 gms/ton	
Ascorbic acid		340.50 gms/ton	
Vitamin A (4,000,000 IU)			
Vitamin D3 (2,000,000 IU)			
Vitamin E		50.00 gms/ton	
Vitamin K		10.00 gms/ton	
Coated ascorbic acid	0.75		0.0375

completely quit feeding at the surface, usually about 60°-63° F (16°-17° C), it may be difficult to get them to accept sinking feed.

Since topping or multiple harvest is the most common production scheme used in intensive pond production of catfish, the size of catfish in a pond at any given time may vary from 4 inches to 2 pounds or larger. Since it is not practical to feed the catfish two or more sizes of feed every day, most farmers compromise by feeding a 3/16- to 3/8- inch pellet. This size pellet is too large for the small catfish to eat whole and is rather small for the larger fish, but in practice works well. For the appropriate size feed for fry and small fingerlings.

Feeders

Catfish may be fed by hand from the bank or a boat, or using some type of mechanical feeder. Hand feeding more than 10 acres of intensively cultured catfish ponds is too time consuming and laborious, thus some type of mechanical feeder must be used on larger farms.

The blower type feeder with a 1- to 3-ton hopper, mounted on a truck bed or pulled by a tractor, is best. The blower type feeder can be calibrated to blow a known amount of feed per minute or equipped with a scale that allows the operator to know the amount that has been fed. The hopper of the blower is filled from a bulk storage tank.

Two other types of mechanical feeders are the demand feeder and the automatic feeder. Neither has any place in intensive pond production of catfish because frequent observation during feeding is not possible. The demand feeder is activated by the catfish, thus allowing a few large, aggressive "hogs" to consume most of the feed. When demand feeders are used in intensive production ponds, there is a large difference in the size of the fish produced. Waterfowl, particularly coots, quickly learn to use demand feeders and may consume more feed than the catfish. The automatic feeder is program-med to release specific amounts of feed at predetermined times during the day. It must be carefully moni-tored to avoid over or underfeeding the catfish. Unless large numbers of automatic feeders are used, many catfish will not get enough feed while a small number of the more aggressive fish will eat most of the feed.

Feeding rates

Several factors affect the amount of feed a catfish will eat, such as:

- water temperature
- water quality
- size of the feed
- palatability or taste of the feed
- frequency of feeding
- the way fish are fed
- location of feeding sites
- type of pellet used (floating or sinking)
- health of the fish

Table 2 gives the amount to feed daily, based on average expected gains, at stocking rates of 1,000 5-inch fingerlings per acre. To get the amount to feed per acre at higher stocking rates, divide the number of catfish stocked per acre

by 1,000 and multiply the answer by the daily amount to feed per acre in Table 2.

To calculate the amount to feed different size catfish at water temperatures above 70° F (21° C), you can use the estimated feeding rates given in Table 3. You need a good estimate of the total weight of catfish in the pond to use the formula:

Amount to feed daily = % body wt fed × total wt fish in pond

Example: 40,000 pounds of catfish in pond are being fed at a rate of 2.5 % of their body weight daily.

Amount to feed daily = 0.025 × 40,000 lbs. = 1,000 lbs of feed

The amount fed daily must be adjusted at least every 2 weeks or the catfish soon will be underfed causing a reduction in both growth and profits. This is best done by taking a sample of fish from the pond, usually by seine, and counting and weighing them. Then use the formula given to calculate the total weight of catfish in the pond at that time.

Total weight in pond = wt. fish in sample × no. fish in pond ÷ no. fish in sample

Example: There are 45,000 catfish, being fed at 3% of their body weight daily, stocked in a 10-acre pond. To adjust the amount to be fed daily for the next 2 weeks, a sample of fish is seined, counted and weighed. The sample contains 200 fish weighing 80 pounds. The new amount to feed daily is calculated:

Total weight in pond = wt of fish in sample × no. fish in pond ÷ no. fish in sample = 80 lbs × 45,000 fish ÷ 200 fish = 18,000 lbs of catfish in the pond

Lbs. to feed daily for next 2 weeks = 3% × 18,000 lbs = 0.03 × 18,000 lbs = 540 lbs of feed

Table 2. Feeding guide based on average expected gains with a feed conversion of 1.75 at a stocking rate of 1,000 5-inch fingerlings per acre.

		Col. 1	Col. 2	Col. 3	Col. 4	Col. 5	Col. 6	Col. 7
Dates	Water temp° F	Wt of 1,000 fish at beginning	% of body wt fed daily	Wt of food fed/acre/day 1,000 fish	Feed conversion	Gain in lbs per day	No. of feeding days	Gain in lbs per period
3 /15-31	55-60	34.0	1.0	0.3	1.75	0.2	17	3.4
4 /1-15	60-65	37.4	1.5	0.6	1.75	0.3	15	4.5
4 /16-30	65-70	41.9	2.0	0.8	1.75	0.5	15	7.5
5 /1-15	70-75	49.4	2.5	1.2	1.75	0.7	15	10.5
5 /16-31	75-80	59.9	3.0	1.8	1.75	1.0	16	16.0
6 /1-15	80-85	75.9	3.0	2.3	1.75	1.3	15	19.5
6 /16-30	85-90	95.4	3.0	2.9	1.75	1.7	15	25.5
7 /1-15	90-95	120.9	3.0	3.6	1.75	2.1	15	30.9
7/16-31	90-95	151.8	3.0	4.6	1.75	2.6	16	41.6
8 /1-15	90-100	193.4	3.0	5.8	1.75	3.3	15	49.5
8 /16-31	90-95	242.9	3.0	7.3	1.75	4.2	16	67.2
9 /1-15	85-90	310.1	3.0	9.3	1.75	5.3	15	79.5
9 /16-30	75-85	389.6	3.0	11.7	1.75	6.7	15	100.5
10/1-15	65-75	490.1	2.5	12.3	1.75	7.0	15	105.0
10/16-31	60-65	595.1	2.0	11.9	1.75	6.8	16	108.8
11/1-15	55-60	703.9	1.5	10.6	1.75	6.1	15	91.5

Total expected weight of fish = 795.4 lbs

Total weight of food fed = 1,331.2 lbs

Method of calculating projected growth of fish during year:

(1) Column 1 × column 2 ÷ 100 = column 3

(2) Column 3 ÷ column 4 = column 5

(3) Column 5 × column 6 = column 7

(4) Column 7 + column 1 = column 1 next time period

Table 3. Estimated percent of body weight consumed daily by different size channel catfish at temperatures of 70° F (21° C) and above.

Average weight (pounds)	Pounds per 1,000 fish	Estimated % body weight consumed daily
0.02	20	4.0
0.06	60	3.0
0.25	250	2.7
0.50	500	2.5
0.70	750	2.2
1.00	1,000	1.6
1.50	1,500	1.3

Rather than seining a sample of fish and counting and weighing them every 2 weeks, growth of the fish can be estimated. Some assumptions can be based on your pond's historical data or on industry averages about the percent of body weight fed daily and feed conversion factors. Table 2 is a feeding guide which shows how to make these calculations. It can be used with good results, but it is much better to use feed conversion ratios and percent of body weight to feed daily which are valid for your ponds. It is a good practice to remove a sample of fish occasionally for counting and weighing to calculate the weight of fish present and see how close your growth estimates have been.

Another method of estimating the amount of feed to use daily when the water temperature is above 65° F (18° C) is to feed the fish what they will eat in 10 to 15 minutes. If feed is still floating on the surface at the end of 15 minutes, the fish are being overfed and increasing costs.

Feeding practices

Manner and time of feeding, as well as the amount and type of feed, can have a profound effect on the growth and size variation and the quality of the catfish produced. A large variation in the size of catfish produced usually is the result of underfeeding or feeding in a small area of the pond. In underfeeding, the larger, more aggressive catfish eat a larger share of the feed and become bigger at the expense of the smaller catfish. This also happens when feed is offered in only a small area of the pond since the larger, more aggressive catfish quickly learn where the feed will be put in the pond and are there waiting for it. Thus, to produce catfish uniform in size, and to maximize profits, it is equally important that catfish be fed the proper amount of feed daily and the food be distributed as evenly over the pond as possible. If time and labor prevent feeding entirely around the pond, feed at least two sides to ensure all catfish have an equal chance to eat.

Feeding twice daily, if possible, will usually improve feed consumption and feed conversion. This means that one-half of the daily allowance is fed in the early morning, and the other half in the late morning. If the catfish are fed only once a day, morning is the preferred time since feeding in the late afternoon increases the amount of fat deposited, and this can affect the quality of the processed fish. Feed should not be offered until the oxygen level of the pond water is at least 4 parts per million (ppm) or milligrams per liter (mg/l) or higher since feed consumption goes down dramatically at lower oxygen concentrations. Oxygen requirements for catfish increase greatly during feeding, so it is best not to feed in the late afternoon when oxygen concentrations in the water are decreasing.

It is important to feed 7 days a week in order to maximize growth. By doing so production time can be decreased by 4 weeks when compared to feeding only 6 days a week.

Winter feeding

The importance of winter feeding as a management practice cannot be overstressed. It means more profit for the farmer, and the catfish will be in better condition during the winter and spring to withstand stresses that can cause disease outbreaks. Research has shown when catfish are not fed from November 15 to March 15 (121 days), or when water temperatures are 60° F (16° C) or lower, they will lose about 9 percent of their body weight. However, when put on a winter feeding program, catfish can gain as much as 20 percent of their body weight from November 15 to March 15.

There are two basic winter feeding programs: (1) feed sinking feed at 0.5 to 1 percent of the body weight on alternate days when water temperature is above 49° F (9° C); or, (2) feed sinking feed at 0.5 to 1 percent of the body weight whenever the water temperature at a depth of 3 feet is 54° F (12° C) or higher.

This publication was supported in part by a grant from the United States Department of Agriculture, Number 87-CRSR-2-3218, sponsored jointly by the Cooperative State Research Service and the Extension Service.

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