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Extension Contacts

Larry Dorman
Extension Fisheries Specialist
870-265-8055/870-489-1115
ldorman@uaex.edu
Martha Fitts
Extension Assistant
870-265-8055
mfitts@uaex.edu
Andy Goodwin
Extension Fish Pathologist
870-575-8137/870-540-7811
agoodwin@uaex.edu
David Heikes
Extension Aquaculture Specialist
870-575-8143/870-489-1083
dheikes@uaex.edu
Wes Neal
Assistant Professor, Small Impoundments
870-575-8136
wneal@uaex.edu
Melanie Newman
Extension Associate
501-676-3124
mnewman@uaex.edu
Steeve Pomerleau
Research Associate (Aquaculture Verification)
870-575-8139/870-692-3709
spomerleau@uaex.edu
Jo Sadler
Extension Fish Health Specialist
501-676-3124/870-489-1544
jsadler@uaex.edu
George Selden
Extension Aquaculture Specialist
870-512-7837/870-540-7805
gselden@uaex.edu
Nathan Stone
Extension Fisheries Specialist
870-575-8138/870-540-7810
nstone@uaex.edu
Hugh Thomforde
Extension Aquaculture Specialist
501-676-3124/870-692-3398
hthomforde@uaex.edu
Jeremy Trimpey
Research Associate, Aquaculture Verification
870-575-8140
jtrimpey@uaex.edu

Web address:
www.uaex.edu/aqfi/

Making Payments, Making Money--Rapid Evaluation of Variation in Prices and Feeding Strategies

Carole R. Engle
Director, Professor of Economics

Winter is an excellent time to plan for the upcoming production season. An analysis of profit or loss (from the income statement), changes in net worth and financial position (from the balance sheet) and cash flow for the year (from the cash flow budget) should be done at the end of the fiscal year to understand the strengths and weaknesses of the business. We have self-guided tutorials available on request (on disk and in notebook form) to assist in conducting this analysis each year.

Once the financial performance of the business over the past year is understood, the next step is to plan for improving the farm business over the next year. The cash flow budget is the best tool to use to compare different stocking, feeding and harvesting strategies to improve financial performance over the next year. However, it can be difficult to come up with the numbers for the pounds of fish to be harvested and feed fed in each month. These numbers are needed to do the kind of comprehensive cash flow analysis that is needed to make good management decisions.

David Heikes and Steeve Pomerleau, of the UAPB Aquaculture/Fisheries Center, have come up with a catfish growth model developed as an EXCEL spreadsheet that may be of help. This spreadsheet is available upon request. The model is based on an inventory estimate for each pond by size group. Since many banks required catfish farmers to obtain inventory estimates this past year, a number of farms have this information. If your farm has not had an inventory estimate done, you can contact Extension personnel for assistance. The model tracks growth and feed for each size group of fish.

Table 1 shows the summary table in the spreadsheet. The starting or ending date, the price of catfish, the price of feed, the market size and the percent of satiation feeding can be changed in the spreadsheet to see what effect these changes will have. When any of these values is changed (in EXCEL), the summary table immediately shows the resulting changes in the quantity of feed required, the feed cost, the quantity of fish ready to be sold and the revenue for each month. These values are what is needed for the cash flow budget and, when the best options are found, can be copied and pasted into the cash flow budget for the upcoming year. For example, Table 1 shows the results for feeding fish from April 1 through the end of December 31, 2005. Table 1 is based on feeding to satiation, with an FCR of 2.0, a feed price of $267/ton, and selling fish at a price of $0.67/lb. In this case, 14,760,277 lb of feed are fed and net returns above feed costs are $2,676,014.

What happens if feed price increases to $285/ton? Then, net returns above feed costs drop to $2,543,172 (Table 2). What if we restrict feeding to 75 percent of satiation at feed prices of both $267/ton and $285/ton? At the higher feed price of $285/ton, with 75 percent restricted feeding, net returns are $2,244,342 (Table 2). At the lower feed price of $267/ton, net returns with a 75 percent restricted feed are $2,335,483. The higher feed price results in a 5 percent decrease in net returns. Net returns also decrease with the 75 percent satiation feeding. For the same feed price, net returns are 12-13 percent lower if feed is restricted to 75 percent of satiation. It is important to note from Table 2 that the net returns were higher at the higher feed price fed to 100 percent satiation than at the lower feed price, when feeding to 75 percent satiation. Even at higher feed prices, it is more profitable to feed close to satiation than to drastically restrict feeding.

Farmers with substantial debt loads may have difficulty obtaining enough capital to

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feed all their fish to satiation. How should a farmer manage ponds if capital is lacking? Our catfish growth spreadsheet can demonstrate the effects of satiation feeding of selected ponds but restricted rationing of other ponds. For the example used above, if feed were severely limited, at only 3,000,000 lb for the same time period (20 percent of satiation feeding), net returns would be negative, at -$38,025. However, by targeting full feeding rates to those ponds with fish close to market size, and feeding others at lower, maintenance rations, a positive net return of $15,508 was obtained even at this highly restrictive feed limit. By raising the feed limit to 6,000,000 lb, net returns of $96,472 were obtained from spreading feed equally across all ponds. Then, by using the spreadsheet to allocate feed money to the ponds with fish close to market size, net returns were increased to $503,258. Feed funding can be assigned to individual ponds on the EXCEL spreadsheet, and the effect on net returns viewed immediately. Thus, for farms with limited money to spend, the best feeding schedule can be determined.

The values from these spreadsheets can be entered into the cash flow budget to further consider how the best feeding pattern affects cash flow, including loan payments. For copies of these spreadsheets, contact Cassandra Hawkins-Byrd at (870) 575-8123 or email her at cbyrd@uaex.edu. For further explanation of financial analysis on catfish farms, contact Dr. Carole Engle, at (870) 575-8523, or email her at cengle@uaex.edu. For technical assistance with the catfish growth spreadsheets, contact either Steeve Pomerleau at (870) 692-3709, or email him at spomerleau@uaex.edu or David Heikes at (870) 489-1083, or email him at dheikes@uaex.edu.

Table 1. Summary sheet for the catfish growth and feeding spreadsheet.

Values to change			Feed fed		Fish sold		Net returns above feed cost
Growing period		Month	Pounds	Dollar	Pounds	Dollar	
Starting date	4/01/05	Jan.	0	0	0	0	
Ending date	12/31/05	Feb.	0	0	0	0	
No. of days	273	March	0	0	0	0	
Prices		April	1,831,770	244,541	333,124	223,193	
Catfish ($/lb)	0.67	May	2,344,844	313,037	980,000	656,600	
Feed ($/ton)	267	June	2,237,672	298,729	1,099,429	736,617	
Feeding information		July	1,165,316	155,570	2,413,714	1,617,189	
Market size (lb)	1.6	Aug.	803,238	107,232	677,313	453,813	
FCR	2.0	Sept.	849,942	113,467	0	0	
% satiation	100	Oct.	1,286,401	171,735	0	0	
% bodyweight/day	2.5	Nov.	1,821,959	243,232	0	0	
		Dec.	2,419,135	322,955	1,431,491	959,099	
		TOTAL	14,760,277	1,970,497	6,935,092	4,646,512	2,676,014

Table 2. Effect of varying feed priceand percent satiation of feeding on net returns above feed cost.

Percent satiation of feeding	Feed price	
	$267/ton	$285/ton
100% satiation	$2,676,014	$2,543,172
75% satiation	$2,335,483	$2,244,342

Jar Hatching of Catfish - A Good Alternative

Bauer Duke, Aquaculture Research Station Manager

The catfish hatchery at the UAPB Aquaculture Research Station is a small unit capable of handling one million eggs and raising them to 21-day fry. The unit uses eight 10'x2'x10" troughs to hatch and raise these fry. Two of the troughs are standard configuration paddlewheel troughs with baskets for holding the egg masses.

Due to the small area allocated to the unit, de-sticking catfish eggs and moving to McDonald egg jars for hatching has been considered. Past experience has shown very little disease potential and iodine or any other prophylaxis has not been used for five spawning seasons. In the instance of occasional fungal infection, eggs from the infected baskets have been removed and de-stuck using sodium sulfite solution and then put in a McDonald jar. This process allows the heavier eggs to roll on the bottom of the jar while the lighter fungal globs are caught in the current and moved out of the jar. Sometimes the fungal globs do not exit the jar, but simply float over the eggs. Although never quantified, the fungi never seemed to spread down to the rolling eggs. Additionally, this separation allows the fungus to be siphoned out of the jar.

This spring a non-replicated comparative study of the two different incubation systems was completed. The hatching troughs hold six baskets. Catfish fry were hatched in six baskets and six McDonald jars loaded to the same densities. See Table 1.

Forty-four catfish spawns were collected and weighed. Each spawn was divided in two with half going to a basket and half going to a McDonald jar. All weights were taken before any sodium sulfite was used.

The egg masses were divided in two, and each half was weighed in a bucket until approximately the same weight of eggs was present in each bucket. One bucket of eggs was placed in a standard hatching basket and the second bucket of eggs went into a hatching jar. Before moving to these assigned hatching units, the bucket of jar eggs was drained of water and one gallon of sodium sulfite solution added to those eggs. All volumes were measured after de-sticking of the eggs with sodium sulfite. Sodium sulfite solution was prepared in one gallon batches at the rate of 57g sodium sulfite per gallon of water. During the sodium sulfite bath, the bucket of basket-bound eggs remained undisturbed in their original weighing water. When the jar-bound eggs were de-stuck, they were volumetrically measured in a graduated pitcher and loaded into a McDonald jar. Then the basket eggs were loaded into the basket. This sequence was repeated for each basket and jar pair.

Sodium sulfite caused high pH fluctuations, which were monitored but not controlled. See Tables 2 and 3. All buckets with egg masses exhibited a pH of about 7.4 after weighing. During de-sticking in sodium sulfite solution the pH rose to 9.2. Basket masses remaining in their bucket waiting for the jar masses to de-stick had a pH of 7.4.

After de-sticking 5 pounds of eggs are held in each jar.

When those eggs were moved to the basket in the trough, the pH was 7.3. When fresh water rinsed away the sodium sulfite solution from eggs in the jar, the pH was 7.3. In general, jar eggs had a pH of 7.3 at time 0, when eggs were sorted into buckets but no sodium sulfite was yet added. The pH was about 9.2 at 5 minutes after adding sodium sulfite. The pH dropped back to about 7.3 after completion of the 10 minute bath and 5 minute rinse in fresh water.

All eggs were collected May 22, 2004. The first eggs hatched May 25 from baskets, and on May 26 from jars. Well water was used to hatch the eggs in both systems. Water temperature was approximately 76˚F.

No preventative chemical baths were used on any treatments this year and a much higher than normal rate of fungal infection was experienced in the baskets. In contrast, almost no fungus was observed in the jars. On the occasion that fungus was observed in a jar, it seemed to grow only on bits of egg mass matrix that were not flushed out, rather than on the eggs themselves. No attempt was made to treat any fungus in this study.

Fry were counted after they turned gray. Fry counts were volumetric. Three counts of 5ml of fry were made to determine the average number of fry per milliliter. Fry were then placed in a graduated pitcher, the volume recorded and the number calculated. On May 30, the fry from the basket-hatched trough were collected and quantified and 188,150 fry were recovered. On May 31 and June 1, the fry from the jar-hatched trough were collected and quantified and 361,900 fry were recovered. About twice as many fry were recovered from the jar hatch method as the basket hatch method.

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Important points:

1. Two McDonald jars can fit in the same hatchery space as one hatching basket.
2. Hatching rate from the jars was almost twice that of the baskets.
3. Given 1 and 2, the jar method may render four times as many fry as the basket method when no prophylactic chemicals are used.
4. Prophylactic chemical treatments did not appear to be necessary with the jar-hatched eggs.
5. The newer the eggs at collection, the longer the time needed in the sodium sulfite bath for proper de-sticking.
6. Eggs were checked twice per day, at 7:30 a.m. and 4:30 p.m.
7. Moving the new fry to a rearing trough from a jar is easier than siphoning from a hatching trough.

Previous experience indicates, by observation only, that fry hatched in jars survived better if they were poured from the jar after they turn gray than when they are still pink, as they are when they fall through the basket mesh.

Table 1. Weights and volumes of eggs used after splitting spawns in half.

Group	Basket weight (lbs)	Jar weight (lbs)	Jar volume (ml)
1	4.77	4.74	2100
2	4.66	4.68	1750
3	4.90	4.92	2000
4	4.93	4.98	2100
5	5.02	4.98	2200
6	4.67	4.72	2000

Table 2. pH changes in the eggs destined for *jars* after weighing in the bucket, during the sodium sulfite solution bath in the bucket and after 5 minutes of rinsing in the McDonald jars.

Jar number	pH after weighing (eggs in weighing water) (time = 0)	pH during sodium sulfite bath (time = 5 min)	pH 5 minutes after rinse in McDonald jar (time = 15 min.)
1	7.8	9.3	7.2
2	7.0	9.2	7.4
3	7.4	9.2	7.2
4	7.4	9.1	7.4
5	7.3	8.9	7.3
6	7.4	9.2	?

Table 3. pH changes in the eggs destined for *baskets* after weighing, while waiting for jar eggs to de-stick and after loading into the basket.

Basket number	pH after weighing (eggs in weighing water) (time = 0)	pH during sodium sulfite bath (eggs still in weighing water) (time = 5 min)	pH in the basket trough (time = 15 min)
1	7.8	7.4	7.2
2	7.0	?	7.3
3	7.3	7.3	7.2
4	7.4	7.3	7.4
5	7.2	7.4	7.3
6	7.4	7.4	?

Treating Eggs with Hydrogen Peroxide

Nathan Stone, Extension Fisheries Specialist

Now that the spawning season is approaching, how did your hatching go last year? Did you obtain satisfactory hatching rates? If not, it would be good to consider making some changes in the hatchery.

Disinfecting eggs daily to improve hatch by reducing fungus and bacterial infections is a recommended practice. Research has shown that a number of compounds are effective disinfectants, but farmers are restricted to those chemicals in the FDA approved or "low regulatory priority" categories: povidone iodine, formalin (approved brands) and hydrogen peroxide.

Iodine is commonly used as a dip for eggs before they are placed in troughs. Formalin is effective (Rach et al. 1997) but produces a strong smelling noxious gas. OSHA recommends handled formalin in the workplace as a potential occupational carcinogen (Lee and Radtke 1998) with protective gear required during handling. Hydrogen peroxide, H_2O_2, is an attractive alternative because it is odorless and breaks down into oxygen and water. A 3 percent hydrogen peroxide solution is widely used in homes for treatment of minor wounds or as a gargle. It is also relatively inexpensive. Stock solutions come as 35 - 50 percent hydrogen peroxide, and adequate care must be taken in handling and storage. Stock hydrogen peroxide is a strong oxidizer. It will burn you, on contact! Protective gear is required. See the label and MSDS sheet.

Research by Brian Small of the ARS Catfish Genetics Research Unit, Thad Cochran National Warmwater Aquaculture Center (Small 2002, Small and Wolters 2003) has shown that daily 15-minute baths of hydrogen peroxide at a rate of 250 ppm are effective at improving the hatching success of channel catfish eggs. Alternatively, hydrogen peroxide can be added all-at-once to in-flow end of the hatching troughs, as a flow-through treatment, at 70 ppm. Rach et al. (2004) found that a 15 minute flow-through treatment of hydrogen peroxide at 500 to 750 ppm was effective for controlling fungus on catfish eggs. This was true whether the eggs were still within the gelatinous matrix or sodium sulfite-treated. Water temperature during the study was 79 to 84˚F (26 to 29˚C).

Before treating with hydrogen peroxide, it is critical to consider two important factors: water temperature and exposure time. Hydrogen peroxide is more toxic at higher temperatures and a lower rate should be used (Rach et al. 1997, Small 2004). Even a minor temperature change makes a big difference. Small found that hatching success at 75˚F (24˚C) was greatest when eggs were treated with 250 - 500 ppm hydrogen peroxide (15-minute bath). At 82.4˚F (28˚C), hatching success was best at 100 to 250 ppm. At this higher temperature, the hatching rate decreased for eggs treated with 500 ppm. The toxicity of hydrogen peroxide is also greater at longer exposure times, so be sure to respect the time limits on the bath treatments. Before adopting a hatchery-wide program, first test hydrogen peroxide on small batches of eggs to determine a suitable concentration of hydrogen peroxide for your particular hatchery's conditions (Small 2004).

Previous work (Rach et al. 1998) on hydrogen peroxide for egg treatments was done in cooler water. Channel catfish were treated at 72˚F (22 ± 2˚C), lake sturgeon, paddlefish and common carp at 63˚F (17 ± 2˚C), and northern pike, walleye yellow perch and white sucker eggs at 54˚F (12 ± 2˚C). Mean hatch for eggs of a variety of fish species was greatest when treated daily for 15 minutes at 1,000 ppm.

Hydrogen peroxide can also be used to treat baitfish eggs during jar hatching. No formal studies have been done on eggs of these species as yet. Based on the typical range of incubation temperatures for golden shiner and goldfish eggs, an effective and safe rate is probably 1,000 ppm (at 65˚F) and 250 ppm (at 75˚F). Because baitfish eggs are only about 1 mm in diameter, hydrogen peroxide treatment will cause some eggs to float, buoyed by the temporary attachment of small bubbles. Jars must have a fine screen installed, of less than 1,000 microns, or eggs will be lost from the hatching jar.

Factors other than disease can result in poor hatch. Low dissolved oxygen or high ammonia levels are sometimes the cause. Mechanical shock and temperature shock can kill eggs as well, so eggs must be treated with care (like the babies they are) on the way to the hatchery.

Lee, S., and T. Radtke. 1998. Exposure to formaldehyde among fish hatchery workers. Case Studies. Dawn Tharr, Column Editor. Applied Occupational Environmental Hygiene 13(1):3-6.

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Small, B. 2002. Treating channel catfish eggs with hydrogen peroxide can improve hatching success. Thad Cochran NWAC News, 5(2):6-7.

Small, B., and W. R. Wolters. 2003. Hydrogen peroxide treatment during egg incubation improves channel catfish hatching success. North American Journal of Aquaculture 65:314-317.

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Upcoming Events

Fish Farming Trade Show
February 3-4, 2005. Regional trade show and conference. Annual event. Washington County Convention Center, Greenville, Mississippi. The event is sponsored by Catfish Farmers of Arkansas, Catfish Farmers of Mississippi, Alabama Catfish Producers and Louisiana Catfish Farmers Association. Contact Mike McCall, (601) 714-5327.

Mid-Continent Warmwater Fish Culture Workshop
February 7-9, 2005. Blue Springs, Missouri. The workshop is primarily intended for public fish hatchery employees. It will be held in conjunction with the Missouri Aquaculture Association Annual Meeting, which will take place on February 9, 2005. For more information, go to http://www.moaa.pond.org/newsletters/4.4/volume4_issue4.htm or contact Tommie Crawford at (660) 438-4465.

Arkansas Bait and Ornamental Fish Producers
February 10, 2005. Lonoke Agricultural Center, Lonoke, Arkansas. Annual educational meetings. For more information contact Hugh Thomforde at (501) 676-3124.

Texas Aquaculture Association Annual Conference and Trade Show
February 8-11, 2005. Texas A&M University, Corpus Christi, Texas. For more information go to http://www.texasaquaculture.org/id3.htm or call Michael Masser at (979) 845-7473.

Arkansas Chapter of the American Fisheries Society
February 23-25, 2005. Arkansas Tech University, Russellville, Arkansas. Joint meeting of Arkansas AFS, TWS, SAF and the USFS. Days two and three of this meeting will feature presentations on a variety of fisheries, wildlife and forestry topics. Day one will focus on the proposed ten-year plans for the Ouachita and Ozark-St. Francis National Forests. For further information contact Joe Stoeckel at (479) 964-0852.

Catfish Farmers of America Annual Convention
February 24-26, 2005. Renaissance Arts Hotel, New Orleans. For hotel reservations call (800) 468-3571. Contact Mike McCall for more details, (601) 714-5327.

Catfish Research Verification Program Update

Steeve Pomerleau and Jeremy Trimpey,
Research Associates (Aquaculture Verification)

The essence of the Catfish Research Verification Program is to provide intensive monitoring of commercial ponds in which research-based management recommendations are implemented. The program was initiated in April 2004 and will end in the fall 2005. The program focuses on the traditional multiple-batch catfish growout. The main recommendations are stocking fingerlings, larger than 5 inches, at a density of 6,000 head/acre, and feeding daily to satiation. Research conducted at UAPB clearly indicated that stocking smaller fingerlings or feeding every other day negatively influenced net returns. The UAPB in-pond grader is used to grade fish at harvest to reduce the number of sub-marketable size catfish sent to the processing plant.

There were five verification ponds monitored, in Ashley and Woodruff Counties. Results of two ponds for which the recommendations were best followed are presented here. See Table 1. More results and details of the recommended management practices are available on the Catfish Research Verification web site at www.uaex.edu/aquaculture.

The average feeding rates increased from 19 and 24 lb/acre/day in April, to 108 and 117 lb/acre/day in August, and started decreasing in September. See Table 2. The total monthly aeration levels ranged from 56 to 100 hp-hour/acre. One hp-hour/acre of electric aeration is the equivalent of one hour of aeration for one 10-hp paddlewheel on a 10-acre pond. One harvest was conducted in each pond. Fish averaged 2 lb and the percentage of fish smaller than 1.25-lb averaged 9 percent by weight and 17 percent by heads. See Table 3.

Three aeration efficiency ratios were estimated. See Table 4. Monthly electric aeration was 77 to 258 hp-hour per ton of feed. The ratio of fish production over electric aeration was 10.6 and 12.0 lb of fish per hp-hour of aeration. The monthly cost of electricity for aeration ranged from 0.7 to 2.2 cents/lb of fish production. Catfish farmers are encouraged to calculate those efficiency ratios for their own farms and compare results with the verification ponds, and consider what you could do to improve performance.

The catfish verification committee is considering modular management strategies in which fingerlings are raised to stocker size before transfer to growout ponds. If you are interested in being a cooperator in the 2005 program, contact Steeve Pomerleau at (870) 692-3709.

Table 1. Inventory and stocking at the start of the program

CHARACTERISTICS	UNITS	Pond A1	Pond A2
<u>INITIAL INVENTORY</u>			
Date		04/06/04	04/07/04
Weight	lb/acre	1,008	1,367
Number	heads/acre	1,209	2,140
Average size	lb/fish	0.8	0.6
<u>STOCKING</u>			
Date		04/23/04	04/20/04
Number	heads/acre	5,986	5,192
Size	lb/1,000 fish	43	88
Length	inches	5.7	6.6

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Table 2. Monthly feed and aeration inputs.

	Average Feeding Rate (lb/acre/day)		Total Electric Aeration [1] (hp-hour/acre)		Total Tractor Aeration (tractor-hour/acre)	
Month	Pond A1	Pond A2	Pond A1	Pond A2	Pond A1	Pond A2
Apr	19	24	0	0	0	0
May	25	31	100	56	3	0
Jun	49	67	122	102	1	0
Jul	78	89	148	102	0	0
Aug	108	117	140	140	3	1
Sep	97	112	199	199	4	2
Oct	49	37	84	75	0	0
Nov	2	2	0	0	0	0
Dec	0	0	0	0	0	0

[1] One hp-hour/acre of aeration is the equivalent of one hour of aeration for one 10-hp paddlewheel on a 10-acre pond.

Table 3. Harvests

CHARACTERISTICS	Pond A1	Pond A2
Harvest Date	08/30/04	10/21/04
Total Weight (lb/acre)	1,837	4,821
Average Weight (lb)	2.1	2.0
Under-sized Fish (< 1.25 lb)		
Weight	5%	12%
Heads	10%	23%
Over-sized Fish (> 4.00 lb)		
Weight	14%	9%
Heads	6%	4%

Table 4. Electric aeration efficiency estimates.

	Aeration per unit of feed (hp-hour/ton of feed)		Production per unit of aeration[1] (lbs produced/hp-hour)		Electricity Costs[2] (cents/lb produced)	
Period	Pond A1	Pond A2	Pond A1	Pond A2	Pond A1	Pond A2
Apr	0	0	-	-	0.0	0.0
May	258	117	3.5	7.6	2.2	1.0
Jun	167	103	5.3	8.7	1.4	0.9
Jul	122	74	7.3	12.0	1.1	0.6
Aug	84	77	10.6	11.5	0.7	0.7
Sep	137	118	6.5	7.5	1.2	1.0
Oct	111	129	8.0	6.9	1.0	1.1
Nov	0	0	-	-	0.0	0.0
Dec	0	0	-	-	0.0	0.0
Annual	123	93	7.2	9.5	1.1	0.8

[1] Assuming a feed conversion ratio of 2.25

[2] The energy consumption of a 10-hp aerator was estimated at 8.47 kwh/hour, and electricity cost was $0.09/kwh. Fish production was estimated assuming an FCR of 2.25.

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Salt Containing Yellow Prussiate of Soda

Nathan Stone, Extension Fisheries Specialist

FDA considers salt a "low regulatory priority" drug. Salt is frequently used in holding vats and transport tanks to minimize fish stress. Some salt contains the anti-caking agent yellow prussiate of soda, or YPS, also known as sodium ferrocyanide decahydrate. The FDA permits the use of YPS as an additive in food grade salt and in animal feed and drinking waters at a level not to exceed 13 parts per million (ppm). Road salt used for deicing typically contains the additive YPS and/or prussian blue (ferric ferrocyanide).

An article in *Arkansas Aquafarming* in the early 1970s warned against use of salt containing YPS, based on the report of an unexpected kill in Lonoke of fish in a salt bath. Nevertheless, in other cases, salt with YPS has been used on fish with no ill effects. Why the difference? Robin Calfee and Edward Little of the USGS Columbia Environmental Research Center conducted research on fire-retardant chemicals containing YPS as a corrosion-inhibitor. They found that the ultraviolet light in sunlight transforms YPS into toxic forms of cyanide. Cyanide is quite toxic to fish even at very low concentrations. A review by Ronald Eisler of the U.S. Geological Survey indicates fish die rapidly from free cyanide concentrations above 200 parts per billion, or 0.2 mg/L, and long exposure to 50 - 200 ppb is lethal to sensitive species. As little as 10 ppb impairs the ability of some fish to swim.

Salt is normally used for fish as an indefinite bath treatment at 1 - 3 parts per thousand (ppt). If YPS were present at the maximum allowable level (13 ppm), a 3 ppt salt treatment would result in 0.039 ppm of YPS (39 ppb) in the water. Only a certain fraction of this would become free cyanide, depending upon the amount of sunlight and other factors. Thus under typical indoor vats conditions and treatment levels, it is unlikely that enough YPS is present to cause a fish kill. Nevertheless, there are sublethal effects from cyanide exposure, and it would seem wise to avoid salt containing YPS, especially in outdoor facilities.

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Hugh Thomforde
Dr. Hugh Thomforde
Extension Aquaculture Specialist
Technical Editor

County Extension Agent

Debbie Archer
Debbie Archer
Communications Specialist
Copy Editor

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