KENTUCKY
AQUATIC FARMING
A Newsletter for Kentuckians Interested in Improving Fish and Shellfish Production, and Pond Management.

VOLUME 20, NO. 2 SUMMER 2007

INSIDE . . .

Aquaculture Program
Kentucky State University
www.KSUAquaculture.org

Kentucky Aquaculture Association (KAA), Workshop and Annual Meeting

On Friday, October 19, 2007

From 9:00 AM until 3:30 PM

At the Kentucky State University Aquaculture Research Center
103 Athletic Drive, Frankfort, KY 40601

The day's agenda will include Educational sessions on Largemouth Bass and Paddlefish production, Tours, and the KAA Annual Business Meeting. Speakers from the Texas and Arkansas aquaculture industries are also on the schedule.

Lunch will be served at noon

Please fill out the registration form below:
Friday, October 19, 2007 Aquaculture Statewide Workshop and Kentucky Aquaculture Association (KAA) Annual Meeting

REGISTRATION FORM

Name: _____

Street Address: _____

City: _____ County: _____ State: _____ Zip: _____

Phone: _____ Cell Phone: _____

Fax: _____ Email: _____

KAA Member? ❑ Yes ❑ No ***(See form on the back to join for 2006 for just $25)***

___ $20 per person enclosed for Workshop and Meeting registration (for KAA members)
___ $30 per person enclosed for Workshop and Meeting registration (for non-members)

PLEASE MAIL REGISTRATION FORM TO: KAA Statewide Workshop and Meeting, c/o Shiela McCord, 4258 Lexington Road, Winchester, KY 40391, (859)744-4860.

Please call Karla Johnson at (502)597-8106 for any workshop questions that you might have.

KENTUCKY STATE UNIVERSITY/UNIVERSITY OF KENTUCKY
U.S.D.A. COOPERATIVE EXTENSION SYSTEM AND KENTUCKY COUNTIES COOPERATING

Koi Production Demonstration

Dr. Bob Durborow and Dr. Boris Gomelsky

Domestic fish producers are facing extremely urgent marketing pressures from foreign fish producers who can produce, process, freeze, and ship their fish to the U.S. and sell them for about half the price as our growers can. We feel that producing fish that can be sold live may be the only way that aquaculture can remain economically viable in Kentucky. Live sales can involve fish sold for food, sport fishing, or ornamental purposes. One of the most popular ornamental species is koi (ornamental common carp, *Cyprinus carpio).*

On March 29, 2007 we stocked 2,868 koi in a 1/3-acre Boone County aquaculture pond owned by Mr. Preston Art for a pond production demonstration. Their average length was 9.18 cm (about 3 1/2 inches), and they averaged 15.5 g (about 29 fish per pound) in weight (Figure 1). These fish were produced by artificial spawning at the Kentucky State University Aquaculture Center hatchery in May 2006.

Figure 2. *This koi pond in Boone County, Kentucky maintains a brownish-green turbidity which acts as a deterrent for submersed and emergent aquatic weeds by shading the pond bottom.*

Koi have a high value to fish producers who make pond-bank sales to retail outlets. In addition, koi appear to prevent unwanted aquatic weeds from growing in production ponds and "clogging" the water column (making seining and other pond management practices difficult). It was our objective that field results from a koi demonstration project would provide helpful information to determine the best approach for improving real-world success of koi aquaculturists.

In the first week in July (after about 3 months of growth), 282 koi weighing 60 pounds were harvested and sold to a retailer that sells koi, water garden supplies, and other fish species. Mr. Art received $9 per pound for the koi (averaging about 1/5 pound each). The weight per fish was probably biased toward the bigger fish, because the largest fish were selected for sale to the retailer.

Figure 1. *Koi fingerlings stocked in a pond owned by a Kentucky aquaculturist in Boone County.*

At the end of July (July 25), a random sample of 60 koi was weighed and measured. They averaged 18.3 cm (about 7 inches) in length and 98.1 grams (about 5 per pound). So in about 4 months (April through July) the koi increased about 9 cm (3.6 inches) and 82 g (0.18 lb). Please see the table below:

The food conversion ratio was approximately 0.9 (i.e., the koi gained 1 pound for every 0.9 pounds of food consumed) which indicates that the koi were consuming natural foods in the pond in addition to the feed they received. They were fed mostly catfish feed.

Koi maintained brownish-green turbidity in the pond water due to their typical carp behavior of "rooting-around" on the pond bottom. The turbidity is probably a combination of muddiness and a release of nutrients from the bottom mud, supplying a steady amount of nutrients for the green phytoplankton bloom (Figure 2). Turbidity prevented weed growth by blocking sunlight from the pond bottom and not allowing the germination of submersed or emergent vegetation.

We will report updates on this koi demonstration project in future newsletter issues and on our website, www.ksuaquaculture.org

Date	Activity	Average Length *in inches*	Average Weight *(number/pound)*
March 29, 2007	2,868 koi stocked	3 1/2 inches	29 fish/pound
July 3, 2007	282 koi weighing 60 pounds sold to retailer for $9/lb		5 fish/pound
July 25, 2007	60 koi were sampled	7 1/8 inches	5 fish/pound

2006 Fish Disease Cases Diagnosed at the Kentucky State University Fish Disease Diagnostic Laboratory

Robert M. Durborow, Ph.D., Professor and State Extension Aquaculture Specialist
Aquaculture Research Center, 103 Athletic Road, Kentucky State University, Frankfort, KY 40601

The KSU Fish Disease Diagnostic Laboratory diagnosed 48 cases in 2006. Fish samples were submitted by private fish owners as well as those working at universities and government agencies from three different states. Several fish health inspections required to transport live trout into certain states (e.g. Ohio and Colorado) were also conducted by the lab in 2006. Following are tables with figures summarizing the species examined as well as the pathogen(s) or situation(s) identified as causing disease.

Fish Species	Number of Cases
Paddlefish	9
Largemouth Bass	8
Koi	7
Channel Catfish	6
Bluegill	3
Hybrid Bluegill	3
Black Crappie	3
Freshwater Prawn	2
Goldfish	2
Bottlebrush Crayfish	2
Striped Bass	1
White Bass	1
Hybrid Striped Bass	1
Yellow Perch	1
Golden Shiner	1
Israeli Carp	1
White Shrimp – marine	1

Bacteria Species *Causing or Contributing to Mortalities*	Number of Cases
Aeromonas hydrophila	8
Flavobacterium columnare (external columnaris)	5
Aeromonas sobria	3
Edwardsiella ictaluri	1
Pseudomonas fluorescens	1
Pseudomonas sp.	1
Plesiomonas shigelloides	1
Vibrio sp.	1
Acinetobacter sp.	1
Flavobacterium indologenes	1
Alcaligenes faecalis	1
Unidentified Species	1

Number of Cases Involving Internal Bacteria	**17**
Number of Internal Bacterial Isolates	**20**

Parasite Species *Causing or Contributing to Mortalities*	Number of Cases
Ich *(Ichthyophthirius multifiliis)*	5
Ichthyobodo sp. (formerly *Costia* sp.)	3
Gill Monogenes (gill flukes)	3
External Fungus	2
Leeches	2
Trichophrya sp.	1
Argulus sp.	1
Yellow Grub	1
Unidentified Nematode	1

Yellow perch with an internal bacterial infection.

Other Factors *Causing or Contributing to Mortalities*	Number of Cases
Routine Check	5
Unknown	4
Copper Sulfate Toxicity	3
Dissolved Oxygen Depletion	2
Inadequate Sample	2
High pH	1
Inadequate Nutrition	1
Nutritional Problem: excessive protein in diet	1
Cannibalism Caused by Crowding and Inadequate Feeding	1
Bird Puncture Wound	1

Clientele Base	Number of Cases
Private Fish Owners	30
University and Government	18

State of Origin *of Disease Case*	Number of Cases
Kentucky	37
Ohio	9
Indiana	2

NEWS RELEASE

Schering-Plough

New AQUAFLOR®-CA1 Conditionally Approved By FDA for Controlling Columnaris in Catfish

First and only catfish antibiotic approved for highly prevalent and costly bacterial disease

KENILWORTH, N.J., April 18, 2007 — Schering-Plough Animal Health Corporation has introduced AQUAFLOR®-CA1 (florfenicol), the first and only in-feed antibiotic conditionally approved for the control of mortality in catfish due to columnaris disease associated with the bacteria *Flavobacterium columnare*.

The U.S. Food and Drug Administration granted a conditional approval — the first of its kind for any food-animal therapeutic — to AQUAFLOR-CA1, a Type A medicated article, pending full demonstration of effectiveness.

The expedited approval process was done in compliance with the Minor Use and Minor Species (MUMS) Animal Health Act of 2004, which was passed by Congress to increase the availability of new therapeutics for farmed fish and other minor species.

Same ingredients, different label

In terms of active ingredient and formulation, AQUAFLOR-CA1 is the exact same product as AQUAFLOR® (florfenicol), a broad-spectrum antibiotic that FDA approved in October 2005 for the control for control of catfish mortality due to enteric septicemia (ESC) associated with *Edwardsiella ictaluri*. However, because AQUAFLOR-CA1 is a conditionally licensed product, FDA requires the product to be packaged separately with its own name and indications.

"The conditional approval of AQUAFLOR-CA1 gives the catfish industry a new and desperately needed antibiotic for managing columnaris," says Richard Endris, Ph.D., Aquaculture Research Program Manager for Schering-Plough Animal Health. "We have columnaris efficacy studies under way and the claim will be added to the indication for AQUAFLOR after we have satisfied FDA's efficacy criteria."

Like AQUAFLOR, AQUAFLOR-CA1 is a Veterinary Feed Directive (VFD) drug, meaning that users must receive a signed VFD order from a licensed veterinarian before obtaining the drug through normal feed-distribution channels. VFD is a category established by FDA in 1996 to help the agency more closely control new therapeutic products, primarily antimicrobials, and their use in food animals.

Columnaris, ESC highly prevalent

Columnaris is a leading bacterial disease of catfish and can cause significant losses in performance. The presence of brown to yellowish-brown growth of bacteria on the mouth, gills, skin or fins usually indicates an infection, but fish specialists recommend getting a positive diagnosis before beginning treatment.

In 2006, columnaris "singly accounted" for 13.7 percent of catfish disease diagnostic cases submitted, according to a report issued recently by the Aquatic Diagnostic Laboratory (ADL), Thad Cochran National Warmwater Aquaculture Center, Mississippi State University, Stoneville.

However, the report notes that the prevalence of columnaris was significantly higher — 68.4 percent in 2006 vs. 49.4 percent in 2005 — when the pathogen was presented in combination with other pathogens such as ESC. Likewise, the causative pathogen for ESC was seen alone in 10.7 percent of the cases. However, in combination with other agents, the ESC bacterium was seen in 56.5 percent of the cases compared to 31.3 percent in 2005.

Overall, the total number of diagnostic cases submitted to ADL in 2006 rose 39 percent. "The surge in cases is attributable in part to the introduction of the new antibiotic, florfenicol [AQUAFLOR], which…can only be dispensed by a Veterinary Feed Directive order from a licensed veterinarian," the report noted. "Therefore, producers are encouraged to submit fish immediately if they suspect disease is occurring in a pond and they intend to use any medicated feed."

Fish stay on feed

Palatability trials show that fish consume feed medicated with AQUAFLOR at the same rate as unmedicated feed — even when AQUAFLOR was used at 10 times the recommended dose rate. A recent analysis using an enterprise model developed by Mississippi State University showed that providing feed medicated with AQUAFLOR during a disease outbreak provided greater receipts and net returns compared to the use of non-medicated feed or not feeding at all.

"Palatability is extremely important because it minimizes waste and ensures optimum feed and antibiotic intake during the critical treatment period," Endris says. "It also helps fish stay on feed in the face of a severe disease challenge."

He notes that in a December 2006 survey, U.S. catfish farmers reported 100 percent satisfaction with AQUAFLOR treatment.

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FDA Detains Imports of Farm-Raised Chinese Seafood

Products Have Repeatedly Contained Potentially Harmful Residues

The Food and Drug Administration (FDA) today announced a broader import control of all farm-raised catfish, basa, shrimp, dace (related to carp), and eel from China. FDA will start to detain these products at the border until the shipments are proven to be free of residues from drugs that are not approved in the United States for use in farm-raised aquatic animals.

This action by FDA, a part of the U.S. Department of Health and Human Services, will protect American consumers from unsafe residues that have been detected in these products. There have been no reports of illnesses to date.

"We're taking this strong step because of current and continuing evidence that certain Chinese aquaculture products imported into the United States contain illegal substances that are not permitted in seafood sold in the United States," said Dr. David Acheson, FDA's assistant commissioner for food protection. "We will accept entries of these products from Chinese firms that demonstrate compliance with our requirements and safety standards."

During targeted sampling from October 2006 through May 2007, FDA repeatedly found that farm-raised seafood imported from China were contaminated with antimicrobial agents that are not approved for this use in the United States.

The contaminants were the antimicrobials nitrofuran, malachite green, gentian violet, and fluoroquinolone. Nitrofuran, malachite green, and gentian violet have been shown to be carcinogenic with long-term exposure in lab animals. The use of fluoroquinolones in food animals may increase antibiotic resistance to this critically important class of antibiotics.

None of these substances is approved for use in farm-raised seafood in the United States, and the use of nitrofurans and malachite green in aquaculture is also prohibited by Chinese authorities. Chinese officials have acknowledged that fluoroquinolones are used in Chinese aquaculture and are permitted for use in China.

The levels of the drug residues that have been found in seafood are very low, most often at or near the minimum level of detection. FDA is not seeking recall of products already in U.S. commerce and is not advising consumers to destroy or return imported farm-raised seafood they may already have in their homes FDA is concerned about long term exposure as well as the possible development of antibiotic resistance.

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New AQUAFLOR®-CA1 Conditionally Approved By FDA for Controlling Columnaris in Catfish

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AQUAFLOR has been shown to be a highly stable product, both as a packaged premix and following high-temperature extrusion at feed mills. AQUAFLOR or AQUAFLOR-CA1 can be used in a floating feed at any stage of production, from fingerlings to food fish. Schering-Plough Animal Health recommends using feed medicated with AQUAFLOR or AQUAFLOR-CA1 as the sole ration for 10 consecutive days. Treatments should be discontinued 12 days before marketing. AQUAFLOR and AQUAFLOR-CA1 are not approved for use in breeding stock.

For more information on AQUAFLOR and AQUAFLOR-CA1, producers should contact their extension specialist, veterinarian, diagnostician or feed company representative. Information also may be obtained at www.AQUAFLOR-USA.com or by calling Schering-Plough Animal Health 1-800-521-5767.

Schering-Plough Animal Health Corporation is the worldwide animal health business of Schering-Plough Corporation (NYSE: SGP) of Kenilworth, N.J. Schering-Plough is a global science-based health care company with leading prescription, consumer and animal health products. Through internal research and collaborations with partners, Schering-Plough discovers, develops, manufactures and markets advanced drug therapies to meet important medical needs. Schering-Plough's vision is to earn the trust of the physicians, patients and customers served by its more than 33,500 people around the world. The company is based in Kenilworth, N.J., and its Web site is www.schering-plough.com.

CAUTION: ***Federal law limits this drug to use under the professional supervision of a licensed veterinarian. Animal feed bearing or containing this veterinary feed directive drug shall be fed to animals only by or upon a lawful Veterinary Feed Directive (VFD) issued by a licensed veterinarian in the course of the veterinarian's professional practice.***

Keeping Ponds Pretty (and Usable)

The Ongoing Battle With Unwanted Aquatic Vegetation

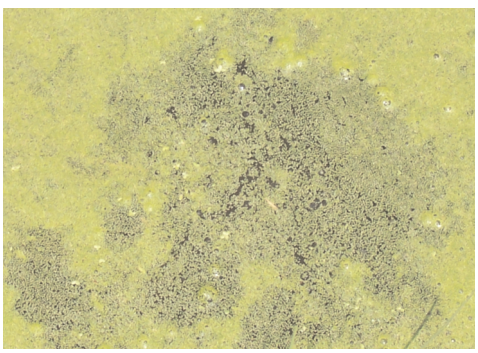
by Dr. Bob Durborow

Lots of folks want their fishing pond to be pristine and ultra-clear (just like those Colorado Rocky Mountain lakes!). But Kentucky's climate and altitude don't provide the right environment for that kind of lake. Those lakes have cold water most of the year, especially at greater depths, and they really are deep lakes, often exceeding 50 feet. They are also low in nutrients. Our Kentucky ponds are just the opposite: they're filled with warm water much of the year, they are not all that deep (maybe averaging 6 to 10 feet), and they contain more nutrients. If we allow our ponds to remain clear, we're soon going to have a big problem on our hands—unwanted aquatic vegetation … WEEDS!

Willows are an emergent plant that grows along the shoreline.

University of Kentucky Cooperative Extension County Agents around the state get asked about how to control aquatic weeds more than any other pond-related question. The weeds aren't good for a lot of reasons. They snag the hook when you're fishing, they provide a place for the small bluegills to hide, preventing the largemouth bass predators from catching them to prevent overpopulation, and they are basically not very attractive to look at. So why does clear water bring on weeds? Clear water allows sunlight to penetrate easily to the pond bottom, encouraging vegetation to start growing there. Once it's established, some weeds grow up through the water column, and some break off at the bottom and float to the pond surface. When clear water combines with an overly shallow pond, the problem gets even worse.

How can a pond owner prevent this from happening? The best ponds do not have shallow zones less than 21/2 feet deep, and their pond bank slope is moderately steep (approximately a 3-to-1 slope; that is, three feet out toward the middle of the pond for each foot in drop toward the pond bottom). This increases the pond depth around the edge, which helps to prevent the scrubby growth that tends to grow there. Also, the pond owner should not allow the water to be clear. Fertilizing can create a phytoplankton bloom (tiny, microscopic plant life that gives water its green color). This bloom does two good things: first, it shades the pond bottom, blocking the sunlight that would ordinarily stimulate weed growth, and, second, it provides a food source for the pond's tiny animal life (zooplankton). The bloom is the foundation of the pond's food chain that ultimately provides adequate nutrition for the bass, bluegill, and catfish that we catch and eat. Be careful, though; don't fertilize if you already have weeds in your pond. That will just make matters worse. A common fertilization plan is to start fertilizing in the spring when water temperatures reach 60° to 65°F; make three applications at two-week intervals, then three more applications at three-week intervals, and then approximately once a month after that; stop fertilizing in September. Older ponds are often deficient mostly in phosphorous, so applying triple super phosphate (0-46-0) at 20 lb/surface acre is commonly done, or some people prefer a liquid fertilizer such as 11-37-0 or 10-34-0 (percentage of nitrogen-phosphorus-potassium) at 1 gallon/surface acre.



Watermeal floats on the pond surface and feels gritty like corn meal.

Some newer ponds need a more balanced fertilizer because the potassium is usually lower than in older

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FDA Detains Imports of Farm-Raised Chinese Seafood

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The FDA action includes conditions under which an exporter can be exempted from FDA's detention action by providing specified information to the agency This information must demonstrate the exporter has implemented steps to ensure its products do not contain these substances and that preventive controls are in place. The additional import controls placed on seafood from China will last as long as needed.

FDA may allow the entry into the United States and subsequent distribution into the marketplace of individual shipments of the Chinese farm-raised seafood products if the company provides documentation to confirm the products are free of residues of these drugs.

Keeping Ponds Pretty (and Usable)

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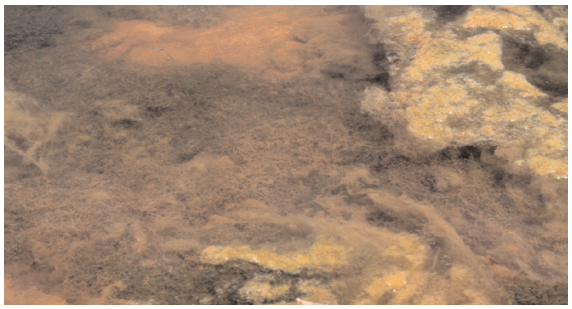
ponds.Before starting a fertilization program, it's probably best to check first with a fisheries biologist for the many minute details regarding fertilizing. Some ponds, for example, need to be limed with pulverized agricultural limestone, or calcium carbonate (calcite) in the fall in preparation for the upcoming spring when fertilization starts.

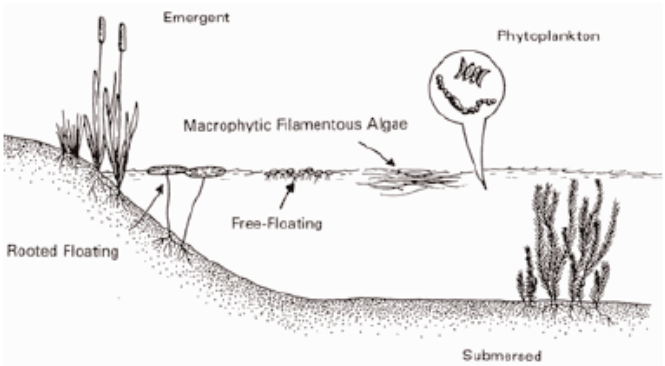
Another way to prevent weeds from appearing in your pond is to stock triploid grass carp (which are sterile because they have three sets of chromosomes instead of the usual two). They have bony plates in their pharynx that they use to grind up many kinds of weeds. A preventive stocking density would be about 5 to 10 per acre. And if weeds are already there, you can stock 10 to 15 per acre for moderate infestations and 15 to 25 (or more) for heavy weed growth.



The filamentous algae Pithophora starts growing like a mat on the pond bottom and then breaks off and floats into the water column.

Another approach to getting rid of established weeds is to use herbicides. They are, however, very expensive and not always effective. It's far better to prevent aquatic weeds than to have to treat them, but if you need to use herbicides, the table below gives some generalized recommendations for herbicides to use on some kinds of weed species in the categories filamentous algae, submersed weeds, emergent weeds, and floating weeds. Herbicides are more effective in spring when weeds are actively growing. Herbicides are not used during the hot time of year (July and August) due to the risk of low dissolved oxygen occurring.

General Weed Category	Recommended Herbicides
Filamentous algae (excluding Pithophora spp.) and musk grass (Chara spp.)[1]	Copper Sulfate Chelated Copper such as Cutrine®, Cutrine Plus®, K-Tea®, Komeen®, Captain®, AlgaePro®, Agritec®, Cleargate®, Nautique®; Percarbonate such as GreenCleanPRO® can be used in small garden ponds
Pithophora spp.	Hydrothol 191®
Many (but not all) submersed weeds[1]	Diquat such as Reward® and Weedtrine D®; Aquathol®, Aquathol K®, Aquathol® Super K®; Fluridone such as Sonar®, Avast®; Triclopyr such as Renovate 3® and Garlon 3A®
Many (but not all) emergent weeds[1]	Glyphosate such as Rodeo®, Aquamaster®, AquaNeat®, Eraser AQ®, Eagre®, AquaPro®, Glypro®, Aquastar®, Shore-Klear® 2,4-D liquid such as Navigate®, WeedRhap®, Weedar 64®, Aqua-Kleen® Imazapyr such as Habitat®
Many (but not all) floating weeds[1]	Diquat such as Reward® and Weedtrine D®; 2,4-D liquid such as Navigate®, WeedRhap®, Weedar 64®, Aqua-Kleen®; Fluridone such as Sonar®, Avast®; Triclopyr such as Renovate 3®, Garlon 3A®; Imazapyr such as Habitat®



This figure shows examples of the weed groups represented in the table above.

[1] Check with the author of this article for specific species of weeds that will respond to the recommended herbicides. The 2007 booklet Aquatic Weed Control in Ponds published by Kentucky State University offers more detailed and specific recommendations for certain weed species. Check with an aquatic biologist before administering any herbicide for tips on safety and making the treatment most effective. Some of these herbicides require a chemical applicator's license for the person purchasing and applying them. If you want to find out more details on keeping your pond weed-free, contact your County Extension Agent and ask for assistance. Also ask for a copy of the 2007 edition of *Aquatic Weed Control in Ponds*.

Rick Onders with a mature, wild-caught paddlefish.

Culturing Paddlefish Fingerlings at Kentucky Wastewater Treatment Plant

by Dr. Steven Mims, Richard J. Onders and Timothy Parrott

Aquaculture is "the world's fastest growing food producing sector" according to the United Nation's Food and Agriculture Organization, and nearly half of the food fish consumed in the world are now grown rather than captured in the wild. This trend will likely continue since it is predicted that by 2030, an additional 40 million metric tons of aquatic food will be required just to maintain current consumption levels. The only option that can meet this demand is aquaculture.

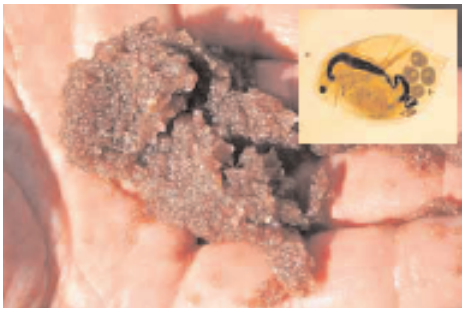
However, some potential bottlenecks to large scale production include the high cost of capital investment compounded with a lack of interest by investors, shortage of land and freshwater, increasing demand and competition for price and availability of fish meal (a limited resource), rising energy costs, and environmental impacts. Recognizing these concerns, the aquaculture industry must seek alternative species and production strategies consistent with goals for sustainable development. One such species suitable for US growers is the paddlefish *Polyodon spathula,* because of its filter feeding capabilities that enable it to grow in existing water bodies.

Paddlefish are valued for their white boneless meat and highly prized black roe (caviar). They are native only to the Mississippi River basin and adjacent Gulf drainages of the United States. Paddlefish grow rapidly especially under lake conditions where zooplankton is plentiful. (See *Hatchery International,* Vol. 2/1, January, 2001; Vol. 5-4, July 2004)

Two production strategies, polyculture with channel catfish, and reservoir ranching, rely on stocking phase II fingerlings that are 35 cm long and weigh 150-250 g (see www.sare.org/publications/ factsheet/0705.htm for more information.) Stocking paddlefish with channel catfish is a suitable method for producing meat without incurring additional feed costs. Reservoir ranching is suitable for producing both meat and caviar. Paddlefish filter out natural foods and grow until reaching sexual maturity in 8-12 years. The main bottleneck for both systems is a reliable supply of phase II fish.

Traditionally, in tank culture larval fish diets are used during the first 30-40 days after hatching, until the fish reach about 7.5 cm, or phase I. At this size they can be trained to take a 1.5 mm floating pellet, and are usually stocked into ponds for further grow out over the next 90 days to phase II. Unfortunately, currently available diets are not species-specific for larval paddlefish and are not economical, mostly due to low survival rates of 10 to 20%. Live *Daphnia* (water fleas) are known to be the first food of choice for larval paddlefish, but obtaining a large supply is difficult.

Hence, the benefits of using a waste-water facility for aquaculture generally and for paddlefish specifically.



Clump of Daphnia for feeding to paddlefish larvae. Inset shows close-up.

Digester tank ready for paddlefish. The aerator is in the center.

Fingerlings feeding on pelleted food.

Modern sewage oxidation ditches with an old digester tank in the foreground.

Why Use Wastewater?

Wastewater treatment plants are today integral parts of any urban community. However, at the beginning of the 20th century, only a few US cities and industries had sewage treatment facilities. During the 1950s and 1960s, the U.S. government provided funds for constructing municipal waste-treatment plants, technical training and assistance, and water-pollution research. However, in

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Culturing Paddlefish Fingerlings at Kentucky Wastewater Treatment Plant

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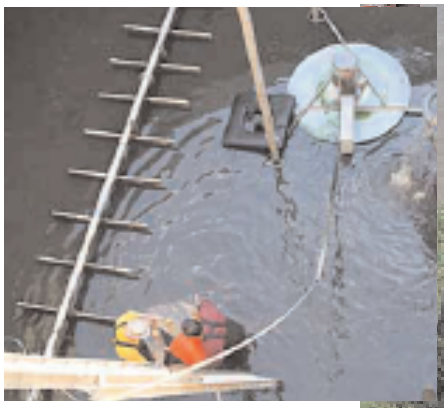
spite of these efforts, expanding population and industrial and economic growth caused both pollution and public health issues to increase. In response, the National Environmental Policy Act (NEPA) was enacted, and the Environmental Protection Agency (EPA) created to oversee pollution-control programs. The Water Pollution Control Act Amendments of 1972 expanded the federal government's role in water pollution control and significantly increased funding for waste-treatment works.



Harvesting paddlefish fingerlings prior to stocking

Stocking paddlefish juveniles.

With better methods for processing wastewater now available, many municipalities are now building new, larger facilities, and decommissioning the old ones, many of which include sedimentation ponds and tanks that could easily and economically be converted for fish culture. Many are being needlessly demolished, when recycling them as fish hatcheries could avoid demolition costs, create new jobs, and generate revenue. Most of the new facilities are being built adjacent to the old, and would conveniently allow processed wastewater to be used in the hatchery, provided it meets EPA water quality criteria safe for humans, wildlife and aquatic life. Which brings us to experiments ongoing in Kentucky.

Pilot Study

Staff at the municipal sewage treatment plant located in Frankfort, the Capital City of Kentucky, in collaboration with Kentucky State University Aquaculture Research Center, began evaluating the growing of paddlefish fingerlings using three, on-site, sustainable resources:

1) Tanks —two circular 1125 m^3 digester tanks and a 135 m^3 circular sludgethickener tank) that were no longer used in daily operations,
2) Ozone-disinfected wastewater that is otherwise released into the Kentucky river, and
3) *Daphnia* (commonly called water fleas), a food source for larval paddlefish, that grow naturally in four 1500 m^3 clarifier tanks.

The plant processes on the average 22,500 m^3/day of wastewater that is disinfected with ozone before it is released into the Kentucky River. By using the plant's pumping infrastructure, processed water can be delivered to the fish tanks then returned to the head of the plant once more for treatment. This source of water is potentially very valuable since only limited ground water is available in many parts of Kentucky. Furthermore, the water is saturated with oxygen, pH is 7.0-7.2, total ammonia nitrogen is below 1.0 mg/l, nitrite is below 0.1 mg/l, and chloride levels are 6-10 mg/l.

Daphnia, optimum food for phase I larvae, are available in large numbers. In other circumstances, *Daphnia* can be a nuisance because in large numbers their swimming movements disrupt the sludge blanket in clarifier tanks, causing total suspended solids to increase and often causing discharge permit violations. Since chemicals may not be used at this stage in processing, mechanical removal is the only option for solving this problem. Feeding them to paddlefish turns waste into a new resource. In mid-April, 2006, 15,000 paddlefish fry were stocked into the 135 m^3 circular sludge tank supplied with processed wastewater at a flow rate of 100 l/min. They were bred, incubated and hatched at KSU Aquaculture Research Center, then stocked at the waste water plant 6 days after hatching when they were ready to start feeding.

Live *Daphnia* collected daily from the clarifier tanks with hand-pulled plankton nets were fed to the paddlefish. Fish grew to phase I size in about 4 weeks. Thereafter, from mid-May to mid-June they were fed a 1.5 mm, 45% protein, floating salmonid diet. Suitable oxygen levels (> 4 mg/l) were maintained with a 0.1 hp (75-w) surface aerator and air diffusion. Nitrite was the only parameter that exceeded acceptable levels of < 0.1 mg/l, but the chloride level of 6-10 mg/l naturally blocked the uptake of nitrite via the gills, to potentially prevent brown blood disease. By mid June fish measured 12-14 cm and weighed 30-45 g. More than12,000 fish were harvested, giving a survival rate of over 80%. In mid-June, the two 1125-m^3 digester tanks were stocked respectively with 3,000 and 7,000 phase I fish (harvested from the 135 m^3 circular sludge tank), and filled with processed water. Water was static during the culture period, but each tank was supplied with one 0.33-hp (250-w) surface aerator and air diffuser to provide oxygen and prevent stratification. Again, all water quality parameters

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Aquaculture Safety & Health: *A 5-Year Study Launched*

Southeast Center, Melvin L. Myers, MPA

Aquaculture is a growing sector of U.S. agriculture and had annual sales of more than $1 billion in 2005. Fish farming has many of the same hazards as other types of farming, but has the added circumstances of water impoundments and night-time work. For example, fish ponds pose potential drowning, electrocution, vehicle overturn, and slip (mud and slime) hazards. Other possible hazards include punctures or cuts from fish teeth or spines, exposure to low temperatures, and bacterial and parasitic infections.

The Southeast Center has launched a new 5- year study entitled Aquaculture Safety and Health, led by Melvin L. Myers, MPA. Myers is a retired Captain of the U.S. Public Health Service and an Associate Professor at the University of Kentucky College of Public Health. The transdisciplinary team assembled for this study includes Drs. Terrill Hanson and Gregory Idendahl, who are agricultural economists at Mississippi State University, and Dr. Robert Durborow, a fishery biologist at the Kentucky State University Aquaculture Research Center.

In this study, occupational risk factors are being identified through the systematic review of nearly 500 OSHA inspections of animal and vegetation aquaculture farms. The results of this systematic analysis will be used to develop a fish farm best-practices and a walk-through survey instrument. In addition to these surveys, the study team will develop and implement a national telephone survey of fish farms to describe the agricultural population at risk and its exposures to hazards, injuries, and illnesses related to aquaculture work. Concurrently, the team will integrate the occupational hazard results into a Farm Planning Tool to help differentiate severe hazards from trivial ones and will aid in the development of engineering controls and other countermeasures to eliminate or reduce occupational hazards in fish farming with an emphasis on simple solutions.

West Virginia Trout School Set for September 17 and 18, 2007

These two educational days are designed for present and future trout farmers, agriculture instructors, students, and any organization or individual interested in culturing trout in a sustainable manner.

Presented by WVU Extension and the Davis College of Forestry Agriculture and Consumer Sciences, the Trout School will be a hands-on experience including how to grade, handle, feed, release, and move trout with minimum stress. One of the state's most experienced filleter (Rodney "El Zoro" Kiser) will be on hand for trout processing demonstrations.

The design, management, and economics of flowing water systems will be covered in detail. Advantages of raising rainbow, brook and brown trout will be discussed as well as the marketing of each of these species. Get a first hand look at West Virginia University's trout research facilities, located in Hardy County.

For information on location, directions, etc., please contact Dr. Ken Semmens or Mr. Dan Miller at (304)293-6131, extension 4211, or email ksemmens@wvu.edu.

Freshwater Prawn Harvest Dates

Information provided by:

Angela Caporelli

Kentucky Department of Agriculture

1. **Tim Alexander**
   Double A Farms
   9489 US 41 A
   Henderson, KY 42420
   (270) 869-0942
   SEPT. 15

2. **Rocky Allen**
   4111 S.Highway 53
   Crestwood, KY 40014
   (502) 222-2352
   SEPT. 15, 22

3. **Glenn Berger**
   G & R Freshwater Shrimp
   3972 Levee Road
   Mt. Sterling, KY 40353
   (859) 498-4158
   SEPT. 8, 22

4. **Tom Britz**
   (606) 723-6363
   CALL FOR DATE

5. **Tim Buck**
   880 McDonald Road
   Fountain Run, KY 42133
   (270) 434-3000
   SEPT. 29, OCT. 6

6. **Shawn Coyle**
   Fish Ponds, Etc.
   8715 US 421 North
   Frankfort, KY 40601
   (502) 875-2461
   Sale of Shrimp for Stocking

6. **Billy Doolin**
   (859) 792-2248
   CALL FOR DATE

7. **Allen F. Hanson**
   Walnut Grove Farm
   2564 Old US 25
   South Shore, KY 40403
   (606) 932-6966
   CALL FOR DATE

8. **Susan G. Harkins**
   Bubbasue Shrimp
   Dunreath,4954 Paris Pike
   Lexington, KY 40511
   (859) 299-2254
   Sale and Processing of Freshwater Prawn

9. **Nat & Hoppy Henton**
   Henton Farms Inc.
   6749 Frankfort Road
   Versailles, KY 40383
   (859) 983-8148
   SEPT. 21

10. **Randy Kendall**
    6505 Flat Creek Road
    Frankfort, KY 40601
    (502) 875-9040
    CALL FOR DATE

11. **Paul Kohler**
    390 Larmon Mill Rd.
    Bowling Green, KY 42104
    (270) 781-6753
    CALL FOR DATES

12. **Mark Lowe**
    (859) 432-0318
    CALL FOR DATE

13. **Sheila & Joe McCord, Jr.**
    Avalon Farm
    4258 Lexington Road
    Winchester, KY 40391
    (859) 744-4860
    Sale and Processing of Freshwater Prawn
    SEPT. 2, 8, 15, 22, 29

14. **Terry Metcalf**
    (859)653-6048
    CALL FOR DATE

15. **Daniel R. Moreland**
    Route 2 Box 245
    Butler, KY 41006
    (859) 472-2622
    CALL FOR DATE

16. **Billy Peale**
    North Point Corrections
    (859) 583-7523
    SEPT. 15TH

17. **Stephen or Kyle Price**
    Bluegrass Shrimp & Fish Farm
    4425 Ernst Bridge Road
    Covington, KY 41015
    (859) 356-6485
    (859) 356-8662
    (859) 635-9046
    SEPT. 15-23

18. **Shuckman Fish Co.**
    3001 West Main St.
    Louisville, KY 40212
    (502) 775-6478
    Sale and Processing of Freshwater Prawn

19. **Steve Smith**
    Fish Market
    1032 West Market
    Louisville, KY 40202
    (502) 589-6636
    Sale and Processing of Freshwater Prawn

20. **Charles Stone**
    3898 Yeaman Rd.
    Caneyville, KY
    (270) 879-9617
    CALL FOR DATE

21. **Charlie Stuckwisch**
    Richard Deye
    Springwater Shrimp Farm
    1220 Clark Road
    Morgantown, KY 42261
    (270) 526-6090
    (270) 526-3313
    CALL FOR DATE

22. **John Tacket**
    (859) 509-5862
    CALL FOR DATE

23. **Brian Terry**
    2850 Union Temple Rd.
    St. Charles, KY 42453
    (270) 669-4475
    CALL FOR DATES

24. **John Vanhorn**
    1070 Tabb Rd.
    Cecilia, KY 42724
    (270) 862-2701
    CALL FOR DATE

25. **Ricky Winn**
    P.O. Box 42
    Guthrie, KY 42234
    (270) 483-1314
    CALL FOR DATE

26. **David Willson**
    402 Danville St.
    Lancaster, KY 40444
    (859) 792-3232
    SEPT.15, 29

27. **Mark Zerger**
    5586 Bradford Rd.
    West Paducah, KY 42086
    (270)488-2967
    SEPT. 29

**** PLEASE NOTE**

Most growers sell whole on the pond bank on the day of harvest. Sale and Processing of freshwater prawn is done in certified facilities under strict Department of Health and FDA standards for HACCP.

Culturing Paddlefish Fingerlings at Kentucky Wastewater Treatment Plant

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were within acceptable levels for paddlefish except nitrite, which was near 2 mg/l and required additional sodium chloride (i.e. 50 mg/l of chloride) to be added to block lethal uptake of nitrite by the fish. Of 3,000 fish in tank 1, 2,959 survived, (98.6%). These fish averaged 35 cm total length, and 225 g. Survival in tank 2 was 6,389 of 7,000 fish (91.3%). These fish measured 30-35 cm and averaged about 150 g. The fish were then stocked into two watersupply lakes for harvesting as mature fish for meat and caviar in 10 years time. This pilot study has successfully produced phase I and II paddlefish at high survival rates for further grow-out. Other species such a largemouth bass and hybrid striped bass fingerlings are scheduled for testing under similar conditions in spring, 2007. Additionally, other wastewater treatment plants in Kentucky that have decommissioned old facilities are now interested in exploring their potential for aquaculture. Such sustainable resources could be useful in advancing aquaculture and the supply of seed stock for production of a number of suitable species. Dr. Steven D. Mims is aPrincipal Investigator at Kentucky State University Aquaculture Research Center. For more information contact him at: steven.mims@kysu.edu

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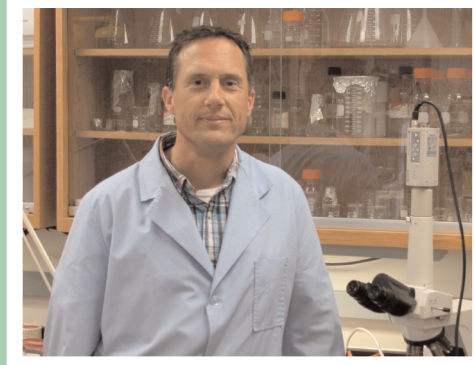

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This newsletter also available on the web at
www.aquanic.org/newsltrs/state/kentucky.htm
and at www.ksuaquaculture.org

KENTUCKY AQUACULTURE ASSOCIATION
Membership Application

Do you give permission to display the following information in an Agricultural Directory? ❑ *Yes* ❑ *No*

AQUACULTURE BACKGROUND *(check more than one where appropriate):*
❑ Producer ❑ Live Hauler ❑ Processor ❑ Pay Lake Owner
❑ Feed Mill ❑ Extension/Research
❑ Other (explain) _____

SPECIES
❑ trout ❑ minnows ❑ largemouth bass ❑ catfish ❑ bluegill
❑ hybrid striped bass ❑ freshwater shrimp ❑ red claw crayfish
❑ paddlefish
❑ Other (explain) _____

WATER SOURCE *(if applicable):*
❑ well ❑ spring ❑ watershed pond ❑ stream or lake
❑ Other (explain) _____
Number of ponds or raceways: _____
Total acreage (if ponds) _____
Comments (e.g. issues you want the Association to address): _____
_____

Name: _____
Street Address: _____
City: _____ County: _____
State: _____ Zip: _____
Phone: _____
Cell Phone: _____
Fax: _____
Email: _____

MEMBERSHIP DUES
Kentucky Aquaculture Association Dues: $25.00
Student KAA Dues: $5.00 School: _____
Current Project: _____

Please return this application to the address listed below:
Kentucky Aquaculture Association
c/o Shiela McCord
4258 Lexington Road
Winchester, KY 40391