KENTUCKY
AQUATIC FARMING

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

VOLUME 21, NO. 1 SPRING 2008

INSIDE . . .

Aquaculture Program
Kentucky State University
www.KSUAquaculture.org

LIVE HAULERS WANTED!!

Kentucky Aquaculture Association is looking for live haulers who are interested in purchasing channel catfish from Kentucky fish farms for pay lake sales. Please contact Ms. Angela Caporelli with the Kentucky Department of Agriculture at 502.564.0290 extension 259 or at angela.caporelli@ky.gov

BUY AND SELL AQUACULTURE PRODUCTS AT THE NEW ONLINE MARKETING WEB SITE

KENTUCKY MARKETMAKER™

The following description of Kentucky MarketMaker™ is taken directly from excerpts of their web site: http://ky.marketmaker.uiuc.edu/

The goal of MarketMaker™ is to make the site a resource for all businesses in the food supply chain. We are as interested in helping a grocery store find farm-fresh eggs as we are helping the farmer find a place to sell them.

For example, a user can request lists of federally inspected packing plants along with a map that identifies their locations. If you are a grocery store manager looking for the closest producer of organic vegetables, you can query the website to find names and contact information.

Census data is also a feature of the site. For example, a producer wanting to sell meat to Hispanic consumers can request a map showing the greatest concentration of upper-income Hispanic households, then request a complete demographic profile of those locations.

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Buy and Sell Aquaculture Products at the New Online Marketing Web Site
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How to "Find a Business"
When searching by **Find a Business,** you are able to query the database for food-related businesses in the following areas:
- Producers/Farmers
- Processors
- Wholesalers
- Retailers - Groceries and Eating/Drinking Places
- Farmers Markets

How to "Find a Market"
When searching in **Find a Market**, you are able to query the database for census data in the following areas:
- Household Type
- Education
- Foreign Born
- Race
- Income
- Income by Race

For more information, please contact:
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Paddlefish *(Polyodon spathula)* Caviar Processing in Kentucky's Mobile Processing Unit (MPU)

Brandon Williams and Steven D. Mims
Kentucky State University, Frankfort, KY 40601, 502-597.8103

Caviar is the salted roe (eggs) from sturgeon and paddlefish, which are closely related species. Traditionally, sturgeon caviar from the Caspian Sea provided 90% of the world supply, but recently it has been banned from international sale due to over-harvesting and poaching. Hence, interest in alternative sources of quality caviar, such as paddlefish, has dramatically increased. Paddlefish caviar brings wholesale prices of more than $100/lb (retail prices over $288/lb) and is highly sought after by high-end restaurants, gourmet shops, and other niche markets. Recent regulatory changes by the Kentucky Department of Fish and Wildlife Resources have enabled paddlefish reservoir ranching, a sustainable production system in public water supply lakes for their culture over a long-term lease basis, across the state. This type of culture holds promise as a sustainable source of high quality Kentucky-grown caviar which will benefit growers and communities, as well as potentially alleviate fishing pressure on wild caught paddlefish.

The mobile processing unit (MPU), maintained by KSU's Land Grant program, is a FDA and HACCP-approved, easy to operate, low-cost option that is available for rent.[1] The MPU has been used to process paddlefish products such as caviar and meat. The MPU rental fee is $100 per day, which includes product liability insurance coverage. To be an operator, you must take a one time training course (cost: $75 and $50 for annual renewal) to learn safe and sanitary operations management procedures.

To produce quality caviar, females must be sacrificed to remove the ovaries which are processed immediately. The processing steps are illustrated in Figure 1. Proper processing ensures high quality caviar by removing excess tissue and broken eggs (screening) and adding salt, which acts as a preservative and flavor enhancer.

Based on interviews with KY and IN caviar processors, we developed an algebraic model of caviar processing. In this model, a processing day is an 8-hour operating shift with 30

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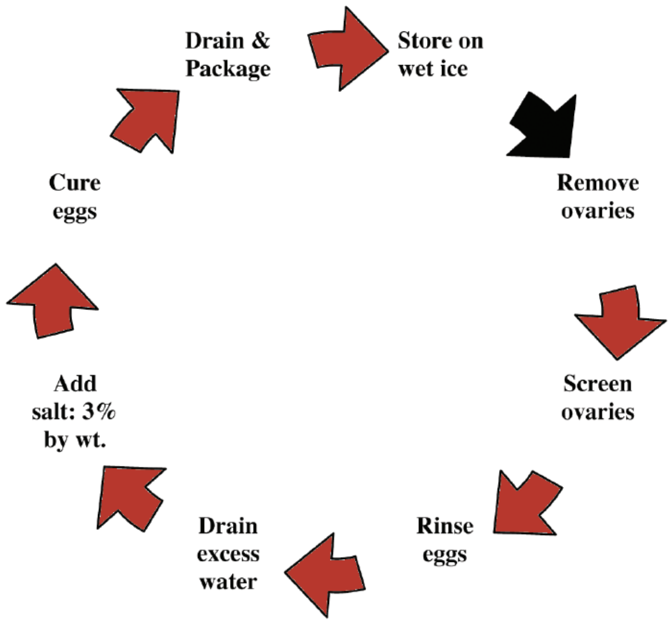

Figure 1. Processing stages for producing caviar.
The black arrow indicates the start of a new fish for processing.

minutes before and after for chill-kill tank setup and breakdown, pressure washing, and sanitizing the MPU. Offal, the leftover fish waste, is buried at the end of a processing day. There were two types of packaging: bulk packaging in sealed plastic buckets (2 lb capacity) and individual 1-oz packaging in traditional metal caviar tins. We collected information on fish weights, caviar yields, and processing times from current micro-scale caviar processors, summarized in Table 1.

Using the management model, we determined the maximum number of paddlefish that can be processed per day based on MPU capacity.

Results

Processing cash costs are presented in Table 2. For bulk packaged caviar production, 236 paddlefish (30 fish/hr) can be processed per day with one employee at each processing stage (Figure 2). This resulted in a daily production level of 954 lbs of caviar with a processing cost of $3.27/lb. The maximum price a processor can pay a producer per lb of whole paddlefish is $18.70/lb.[2] At least 3 fish are necessary to breakeven on cash costs. Using bulk packaging, the MPU can service 232 ac/day of reservoir-ranched female paddlefish at stocking rates from Onders et al. (2001).

For individual 1-oz packaged caviar production, 190 paddlefish (24 fish/hr) can be processed per day. This results in 761 lbs of caviar at a processing cost of $11.14/lb. The maximum price a processor can pay a producer per lb of whole paddlefish is $51.21/lb.[3] The minimum number of fish necessary to breakeven is 2. With individually packaged caviar tins as the output type, the MPU can service 188 ac/day of all female, reservoir-ranched female paddlefish at stocking rates from **Onders et al. (2001).**

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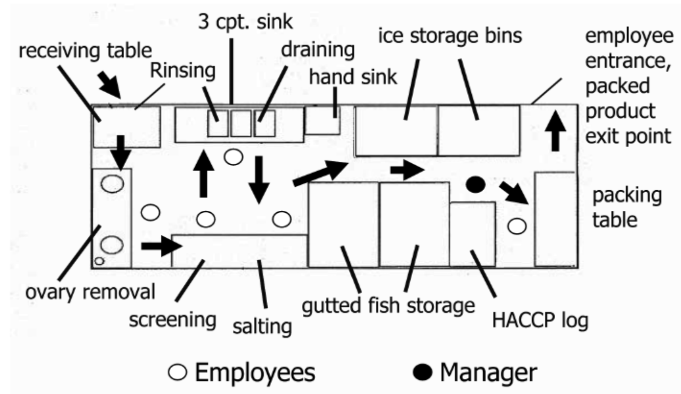

Figure 2. Product flow through the MPU

TABLE 1.
Micro-scale caviar processing technical coefficient data.

Average whole fish weight	21 lbs
Dress out (caviar yield)	19.03% of whole live fish weight
Ovary removal time	0.505 minutes/fish/person
Ovary screening time	2.02 minutes/fish/person
Egg rinsing time	2.03 minutes/fish/person
Draining time	5 minutes/fish
Egg salting time	0.57 minutes/fish/person
Curing time	5 minutes/fish
Bulk packaging time	0.38 minutes/fish/person
Individual packaging time	4.42 minutes/fish/person
Labor	$8/hr
Management	$10/hr

TABLE 2.
Processing cash costs per day.

MPU rental fee	$100
MPU training fee (annual)	$75
Holding tanks (2 inflatable, vinyl)	$170
Knives, aprons, etc	$50
Caviar screen	$25
Strainers	$30 (3 at $10 ea.)
Stainless steel bowls	$160 (10 at $16 ea.)
Labor	$388
Management	$85
Electricity	$5.13
Salt (1-50 lb. bag)	$10
Water (1200 gallons)	$6.42
Ice (2,000 lbs)	$300.11
Bulk packaging costs	$1,715
Individual packaging costs	
(12,500 tins at $0.57 each)	$7,073
Total costs (bulk packaging)	$3,119.66/day
Total costs (individual packaging)	$8,477.54/day

Production of Pan-size (Whole-dress) Sunshine Bass in a Short 13-Month Growing Season in Cages and Fed Diets with Decreasing Levels of Fish Meal

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Production of sunshine bass (female white bass *Morone chrysops* X male striped bass *M. saxatilis)* is one of the fastest growing segments of U.S. aquaculture and is now 5th in volume and 4th in value (US$28 million in 2005) among all food fish grown in the USA. However, a producer faces high production costs which is a major limitation to this industry. The continued expansion of sunshine bass farming depends in part on reducing diet cost, and one way of reducing diet costs is to decrease or eliminate marine fish meal which is the most expensive macro-ingredient (>US$800 per ton) in an aquaculture diet. Currently, commercial sunshine bass producers use feeds that contain moderately high fish meal levels (up to 30%). With the declining fish populations that are used to make fish meal, any negative disturbance, supply disruption, or availability problems, can lead to dramatic increases in the commodity price. Further, the capture of wild fish used to feed cultured fish is thought to be

unsustainable by many critics of aquaculture. One approach we have embraced in reducing fish meal from sunshine bass

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Paddlefish (Polyodon spathula) Caviar Processing in Kentucky's Mobile Processing Unit (MPU)

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Conclusions

The MPU is an efficient, low-cost option for processing caviar. Compared to the price of caviar, processing is inexpensive, hence, rational producers should not "cut corners" by processing in unapproved locations. Clearly, even if a produced only has a few fish, it is worth renting the MPU to ensure product quality. Since even a few bad batches of farmed caviar could cause a bad reputation for this new crop, producers should take due diligence and follow HACCP processing protocols to prevent improperly handled caviar from entering the marketplace.

Processing caviar into individually packaged tins allows fewer fish to be processed per day and raises costs significantly. The packaging items, plastic buckets and metal tins, are the most costly disposable variable cost at $3.63 and $0.57 each, respectively. Bulk purchasing may reduce these per-unit costs.

Whole, live, egg-bearing female paddlefish are worth $18.70/lb based on caviar yields and the costs that processors incur to produce bulk packaged caviar. These high-value fish are a diminishing wild resource that can be produced by sustainable culture methods like reservoir ranching. For more information, contact Dr Steve Mims at steven.mims@kysu.edu or consult the references below for more information on paddlefish production methods.

References

Mims, S. D. Aquaculture of Paddlefish in the United States. 2001. *Aquatic Living Resources*; No. 14: 391-398. Available free online at: http://www.edpsciences.org/articles/alr/pdf/2001/06/alr1114.pdf

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Onders, R. J., S. D. Mims, C. Wang, and W. Pearson. Reservoir Ranching of Paddlefish. 2001. *North American Journal of Aquaculture 2001;* 63:179–190.

[1] Call Steve Skelton (KSU) at (502) 597-7501 or Angela Caporelli (KDA) at (502) 564-4983 for further information.

[2] Based on bulk packaged caviar wholesale prices of $100/lb, assuming normally distributed caviar yields. For example, a female paddlefish weighing 35 lbs would be worth $654.85.

[3] Based on individually packaged 1-oz caviar tins at retail prices of $18/oz or $288/lb, assuming normally distributed caviar yields.

diets is to replace it with alternative animal and/or plant protein ingredients which will reduce dependence on marine-derived protein sources and help decrease diet costs and thereby potentially increase profits for sunshine bass producers.

Soybean meal (SBM) is widely known to be a cost-effective alternative for high-quality fish meal in diets for many aquaculture species because of its high protein content, relatively well-balanced amino acid profiles, reasonable price, and steady supply. It has been reported that soybean meal has one of the best amino acid profiles of any plant protein feedstuff. However, sunshine bass diets containing soybean meal as the sole protein source might be nutritionally inadequate because methionine and lysine are the most limiting amino acids in high- soybean meal diets. Other negative factors that may reduce growth when dietary fish meal is completely replaced with soybean meal are decreased digestibility of nutrients and reduced palatability if soybean meal is used at high percentages. Thus, inclusion of an animal protein source, combined with soybean meal, may assist in the formulation of diets involving total replacement of fish meal

KSU aquaculture researchers carry buckets of feed to hybrid striped bass in cages at the end of the pier.

Combining plant and animal source proteins with complimentary amino acid profiles may help avoid any deficiency or limitation that could negatively impact fish performance.

Poultry by-product meal (PBM) is one animal by-product feedstuff that is effective for fully or partially replacing fish meal in aquaculture diets. A study we conducted in 1999 found that growth was similar between sunshine bass fed a diet containing poultry by-product meal and soybean meal as complete replacements for menhaden fish meal from those fish fed a control diet containing 30% fish meal. However, a similar study we conducted in 2000 found that sunshine bass fed a diet with poultry by-product meal and soybean meal had significantly lower growth than fish fed a 30% fish meal diet. Researchers at KSU concluded that the two studies may have had conflicting results due to different poultry meal sources and/or processing methods and quality. In a recent study conducted in 2006, we found turkey meal (TM), a by-product of the U.S. turkey industry, may be good ingredient for fish meal replacement due to its excellent nutritional composition, quality, and lower cost (when available) than fish meal. At the time, little published data was available on the use of turkey meal in aquaculture diets and none with hybrid striped bass.

Sunshine bass has diversification and can be grown in a variety of culture systems, which includes ponds, tanks, or cages. Although cage culture represents a small percentage (<5%) of the total U.S. sunshine bass production, it is an intensive production method that allows for growing of fish in ponds that may otherwise be difficult to harvest, either due to irregularly-shaped pond bottoms, shoreline contour, or presence of debris and obstacles. Previous research at KSU in cages has reported acceptable growth rates and high (>85%) percentage survival of sunshine bass.

Cages have several advantages over open-pond culture systems for growing sunshine bass: low initial investment, reduced labor, and more efficient use of existing pond space. However, use of cages reduces the availability of natural foods and may alter nutritional specifications of the diet. Thus, reduction or elimination of fish meal in diets fed to cage-grown sunshine bass could adversely affect growth.

In a recent 2006 survey, small (350-450 g) sunshine bass were presented to chefs in Kentucky; many chefs liked the smaller fish, particularly whole-dressed fish, which are considered to be more of a specialty item than fillets. This would allow Kentucky producers to market fish in a shorter period (approx. 13 months), which could assist in cash flow and reduce liability (fish die offs). We have found that most farmers in Kentucky prefer that they harvest their aquaculture crop in a reasonable amount of time and so, sunshine bass may be attractive in this regard. The objective of this study was to evaluate growth, feed efficiency, and body composition of sunshine bass grown in cages within a short 13 month growing season and fed practical diets in which turkey meal progressively replaced fish meal.

Materials and Methods

Sunshine bass were fed four diets consisting of 2.0 mm floating pellets produced by extrusion at Integral Fish Foods, Inc. (Grand Junction, Colorado). All diets were formulated to be 40% crude protein, same available energy levels, and to meet the known amino acid requirements of sunshine bass. The four experimental diets were formulated to contain decreasing fish meal amounts and increasing turkey meal

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amounts. The ingredient compositions of the diets are presented in Table 1.

Diet 1 was formulated to be similar to a commercial high-quality finfish diet containing 0% turkey meal and 30% menhaden fish meal, diet 2 contained 9.7% turkey meal and 20% fish meal, diet 3 contained 17.5% turkey meal and 10.0% fish meal, and diet 4 contained 26.4% turkey meal and 0% fish meal.

The feeding trial was conducted in 12 floating cages (8x4x4ft;L:W:H) placed over the deepest area (12 ft) of a 2.2 acre pond (average depth = 6 ft) located at the Agricultural Research Farm, Kentucky State University, Frankfort. Each cage had a frame made of polyvinylchloride (PVC) tubing with a removable lid and was constructed of 10-mm polyethylene mesh. A panel of polyethylene mesh (0.2-mm mesh, 20 cm high) was installed around the top of the inside of each cage to prevent loss of floating diet, even during aggressive feeding periods. Cages were anchored to a floating dock; the distance between cages was 6 feet.

Juvenile sunshine bass were stocked at an average weight of 36.2 g in early June. We stocked 100 fish into each of the 12 cages (i.e. 4 diets, 3 replicate cages/diet). For a period of 391 days (at 8:00 am and 4:00 pm each day) fish were given all the feed they would consume in 30 min.

The amount of diet fed per cage was weighed (nearest 0.1 g) during the entire production cycle. At the conclusion of the feeding trial, 10 fish per cage were randomly sampled and chill-killed by lowering the body temperature in an ice bath for body composition analysis. Whole-body weight was measured (nearest 0.1 g), abdominal fat was removed and weighed separately, and fillets were removed from the backbone (no skin and ribcage) and weighed.

Table 1

Ingredient composition (%) of four practical diets containing different levels of turkey meal as a replacement for fish meal fed to cage-grown sunshine bass.

Ingredient	1 (control)	2	3	4
Menhaden fish meal	30.0	20.0	10.0	0.0
Soybean meal	31.5	30.6	31.9	31.8
Turkey meal*	0.0	9.7	17.5	26.4
Wheat flour	10.0	10.0	10.0	10.0
Corn meal	20.6	21.8	22.7	23.9
Menhaden oil	4.0	4.0	4.0	4.0
Vitamin C	0.2	0.2	0.2	0.2
Vitamin and mineral mix	2.0	2.0	2.0	2.0
Other	1.70	1.70	1.70	1.70

Table 2

Growth, feed efficiency, and body composition of sunshine bass grown in cages for 391 days and fed practical diets containing different levels of turkey meal as a replacement for fish meal..

Variable	1 (control)	2	3	4
Final weight (g)	548[a]	483[ab]	463[b]	510[ab]
Weight gain (%)	1,414[a]	1,235[ab]	1,179[b]	1,310[ab]
SGR (%/day)	0.69[a]	0.66[ab]	0.65[b]	0.68[ab]
Diet fed (g/fish)	1,295[a]	1,146[a]	1,206[a]	1,140[a]
FCR	2.53[a]	2.59[a]	2.65[a]	2.59[a]
Survival (%)	90.3[a]	86.7[a]	88.7[a]	87.0[a]
Abdominal fat (%)	4.4[ab]	4.0[b]	5.0[a]	4.6[ab]
Fillet yield (%)	28.6[a]	28.0[a]	29.1[a]	28.0[a]
HSI	1.63[a]	1.67[a]	1.77[a]	1.87[a]

Growth performance, feed conversion, and body analysis were measured in terms of percentage weight gain (PWG), specific growth rate (SGR; % change per day), percent survival, feed conversion ratio (FCR), percentage abdominal fat (IPF), percentage fillet weight (PFW), and hepatosomatic index (HSI).

Results

After 391 days, significant differences were found in growth performance. Fish fed diet 1 (control, with 30% fish meal and 0% turkey meal) had a higher individual final weight, percent weight gain, and specific growth rate than fish fed diet 3 (with 10% fish meal and 17.5% turkey meal) (Table 2). However, fish fed the high fish meal diet did not differ from fish fed diet 2 (with 20% fish meal and 9.7% turkey meal) or diet 4 (with no fish meal and 26.4% turkey meal) (Table 2). Overall, there were no significant difference among treatments in amount of diet fed (1,196.5 g/fish), FCR (2.59), and survival (88.2%) at harvest (Table 2).

Fillet yield was not significantly different among treatments and averaged 28.4% of body weight. Likewise, HSI (wet weight of liver/wet weight of fish X 100) was not significantly different among treatments and averaged 1.74. However, the abdominal fat percentage in sunshine bass fed diet 3 (5.0%) was significantly higher than fish fed diet 2 (4.0%), but not significantly different from fish fed diet 1 (4.4%) or diet 4 (4.6%) (Table 2).

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Discussion

Results show that after 13 months in cages, mean final individual weight, fillet yield, specific growth rate, amount of diet fed, feed conversion ratio, and percent survival of sunshine bass fed a diet containing 26.4% turkey meal, 32.0% soybean meal, and 0% fish meal were similar to fish fed a diet containing 30% fish meal and 32% soybean meal. Fish fed diet 4 (containing no fish meal) grew rapidly and had good survival in a short growing season. Furthermore, little to no differences in abdominal fat percentage, fillet percentage, and HSI were found among treatments. Our study indicates that turkey meal is a suitable ingredient for use in sunshine bass diets and may, when combined with soybean meal, serve as an alternate protein source to completely replace fish meal. Results agree with our recent 2006 study which found that tank-grown sunshine bass could be fed a diet in which turkey meal totally replaced fish meal, without adverse effects on growth, feed efficiency, and body composition. However, that study was of a shorter duration and the fish were smaller at the conclusion of the feeding trial (maximum average weight =375 g, and 548 g in the present study). Because new markets appear to be emerging in Kentucky for smaller (<550 g) sunshine bass, our study may assist those producers who supply these markets in providing a lower cost, nutritious diet option that has the potential to increase profitability.

Conclusion

Results show that sunshine bass fed a diet containing 40% crude protein and no fish meal was sufficient for sunshine bass; that is, the diet did not produce adverse effects on growth, survival, or body composition of fish grown in cages. In diet 4, turkey meal and soybean meal replaced 100% of the fish meal, yet this formulation appeared to meet nutrient requirements for sunshine bass because growth, body composition, and feed efficiency were similar to those produced by a high fish meal diet. Diet 4 (no fish meal) seemed to be palatable and provided good digestibility of protein and energy. The turkey meal we used may be a suitable alternative ingredient to fish meal. Our findings may help reduce diet costs for U.S. sunshine bass producers, thereby lowering production costs. Likewise, this study may be a benefit for Kentucky producers targeting pan-size or whole-dress sunshine bass, which are considered a specialty item by some chefs in the USA. Reducing production costs may allow for industry expansion in Kentucky and throughout the U.S.

Linda Metts feeds hybrid striped bass in one of the twelve floating research cages at the KSU research farm.

2007 Fish Disease Cases Diagnosed at the Kentucky State University Fish Disease Diagnostic Laboratory

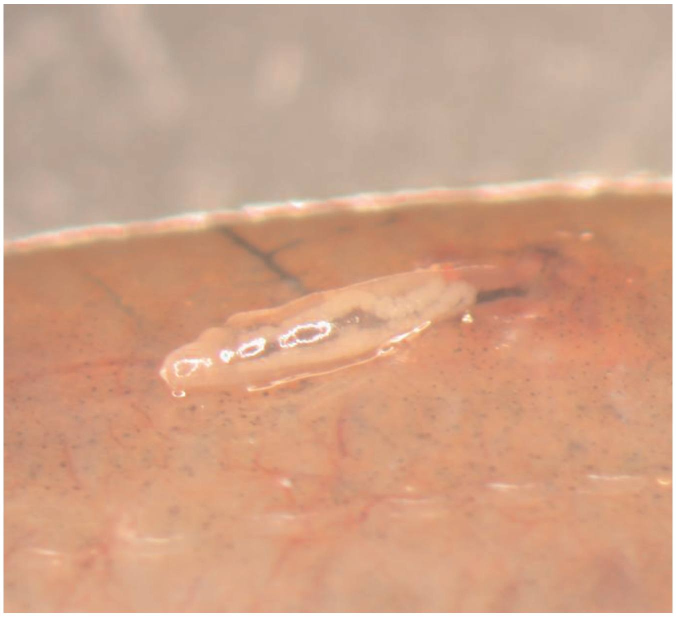
Robert M. Durborow, Ph.D., Professor and State Extension Aquaculture Specialist
Aquaculture Research Center, 103 Athletic Road, Kentucky State University, Frankfort, KY 40601

The Kentucky State University Fish Disease Diagnostic Laboratory diagnosed 52 cases last year submitted from Kentucky and Ohio. Samples were tested for bacterial, parasitic, and/or water quality causes of fish mortality. The following tabulates species examined, identity of the pathogens contributing to mortality, and antibiotic resistance.

Fish Species	Number of Cases
Largemouth Baass	23
Rainbow Trout	9
Bluegill	5
Black Crappie	4
Koi	3
Pacific White Shrimp *Litopenaeus vannamei*	2
Hybrid Striped Bass	2
Striped Bass	1
Smallmouth Bass	1
Yellow Perch	1
Fathead Minnows	1
Paddlefish	1
Sturgeon	1
Channel Catfish	1

Bacterial Species *contributing to mortality*	Number of Cases
Aeromonas hydrophila	11
Flavobacterium columnaris (external columnaris)	9
Pseudomonas sp.	3
P. fluorescens	1
Vibrio alginolyticus	1
V. vulnificus	1
Plesiomonas shigelloides	1
Edwardsiella tarda	1
Leucothrix mucor	1
Proteus mirabilis	1
Klebsiella sp.	1
Bacteria suspected	1

Number of Cases Involving Internal Bacteria	**17**
Number of Internal Bacterial Isolates	**22**
Resistance of bacteria to antibiotics	
Isolates resistant to Terramycin	**13**
Isolates resistant to Romet-30	**4**
Isolates resistant to Aquaflor	**1**



Anchor parasite attached to the skin of a fathead minnow submitted to the KSU Fish Disease Diagnostic Laboratory in 2007.

Bacterial lesions caused by *Aeromonas* sp. on largemouth bass in the summer of 2007.

Aeromonas **bacteria caused ascites (fluid build-up) in this largemouth bass' body cavity.**

This largemouth bass has pop-eye (exophthalmia) and skin lesions also caused by ***Aeromonas*** **bacteria.**

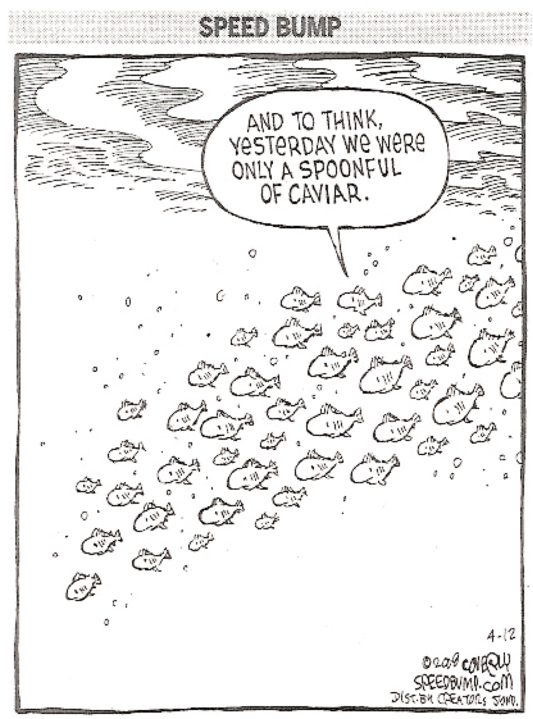
Parasite Species *contributing to mortality*	Number of Cases
Ich *(Ichthyophthirius multifiliis)*	8
Gill Monogenes (gill flukes)	4
Ichthyobodo sp. (formerly *Costia* sp.)	2
Heteropolaria sp.	1
External Fungus (saprolegniasis)	2
Trichophrya sp.	2
Trichophrya sp.	1
Lernaea sp (anchor parasite)	1

Lateral sores caused by ***Pseudomonas*** **and** ***Proteus*** **bacteria on a bluegill sunfish.**

Miscellaneous	Number of Cases
Vitamin C Deficiency	3
Routine Check	3
Unknown	3
Inadequate Nutrition	1
Gut occluded with artemia egg cases causing nutritional deficiency	1
Bacteria originating in tygon tubing from tank water supply	
Chemical Overdose (Betadine for egg treatment)	1
Lymphocystis	1
Inadequate Sample	1

Clientele Base	Number of Cases
Private Fish Owners	24
University and Government	28

State of Origin *of Disease Case*	Number of Cases
Kentucky	47
Ohio	5



The National Aquaculture Association has released the following information on the National Oceanic and Atmospheric Administration 2007 Aquaculture Summit which deals primarily with marine (ocean) aquaculture, but its impact could benefit freshwater aquaculture as well:

Summary of NOAA 2007 Aquaculture Summit

A summary of the 2007 National Marine Aquaculture Summit is now available. The document highlights the opportunities and challenges for U.S. marine aquaculture as identified by summit participants, including seafood and other industry leaders, investors, policy experts, government officials, researchers, and representatives of non-government organizations. On balance, the summit panelists concluded that the United States is poised and ready to expand ecologically responsible marine aquaculture. They also concluded that legislation should provide for the development of an environmentally responsible and sustainable aquaculture industry, while also providing the framework for regulatory certainty that will aid development and growth of new business.

Summary of the 2007 National Marine Aquaculture Summit (pdf 796kb)

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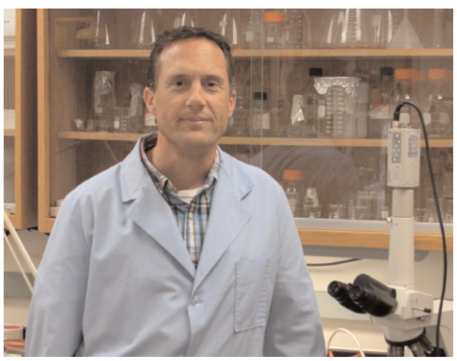

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This newsletter also available on the web at
www.aquanic.org/newsltrs/state/kentucky.htm
and at www.ksuaquaculture.org

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