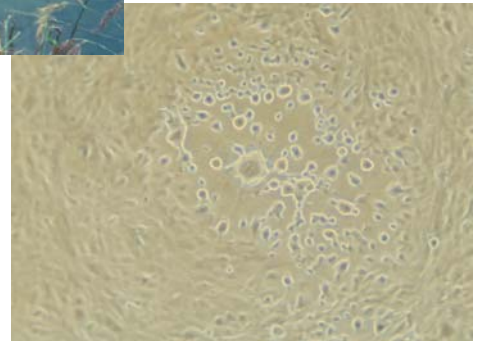
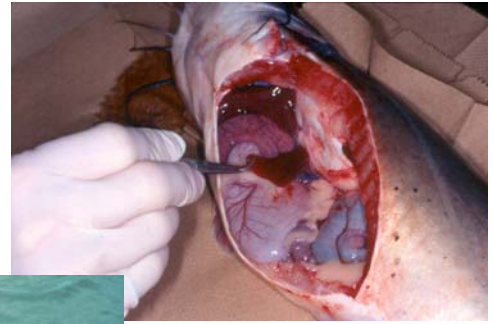
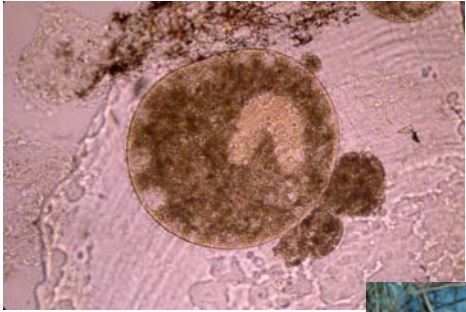


2005 ANNUAL CASE SUMMARY REPORT

AQUATIC DIAGNOSTIC LABORATORY



Mississippi State University
College of Veterinary Medicine

Thad Cochran National Warmwater Aquaculture Center

Stoneville, MS 39776
662-686-3302

2005 CVM AQUATIC DIAGNOSTIC LABORATORY SUMMARY

Diagnostics

In 2005, the Aquatic Diagnostic Laboratory (ADL) at Stoneville received a total of 607 fish diagnostic cases. Diagnostic cases were received from 77 farms, or approximately 20% of the Mississippi industry. In addition, 681 water quality samples from 186 farms were analyzed. Compared to 2004, the total number of case submissions decreased from 778. In 2005, the total number of water quality samples processed decreased from 851, while the numbers of farms submitting samples increased significantly from 60. The ADL staff would like to stress that we are here to serve the industry and encourage producers to continue to take advantage of this valuable free service.

As in the past, individual case submissions represent a composite sample of fish collected from a single pond. The numbers reported are derived solely from submissions processed by the ADL and do not necessarily reflect actual disease incidence in the field. Routine diagnostic procedures include evaluation of gill clips and skin scrapes for parasites, external and internal inspection for signs of disease, bacterial and viral cultures, histopathology, and water quality evaluation. The ADL works closely with MAFES fish health professionals to offer treatment recommendations, monitor disease trends, provide surveillance for new and emerging diseases, provide field service investigation, and maintain a database of epidemiologic information on diseases of catfish. The ADL supports the research efforts of other NWAC units, including MAFES, MSU-Extension Service, College of Veterinary Medicine, and USDA/ARS Catfish Genetics Research Unit. Furthermore, the laboratory provides an outlet for the dissemination of information gained from research efforts back to producers.

As in previous years, the bacterial diseases enteric septicemia of catfish (ESC) and columnaris disease dominated the numbers of producer submitted cases. (The seasonal incidence of the four major diseases is presented in Figure 1.) Examined as a single disease, ESC accounted for 14.3% of cases, but in combination with other agents was diagnosed in 31.1% of cases (30.7% in 2004). Alone, columnaris accounted for 20.8% of cases, but in combination with other pathogens, columnaris was present in 49.4% of all cases (40.9% in 2004), making it the most common disease seen by the ADL. ESC and columnaris were diagnosed together in 15.1% of case submissions. The incidence of these two diseases have remained relatively consistent over the past 9 years, where on average ESC was diagnosed in 35.8% and columnaris in 44.3% of all cases. Table 1 contains a summary of disease trends from 1997 to the present.

Proliferative gill disease (PGD) remained the most commonly diagnosed parasitic disease, representing 8.4% of cases (10.7% in 2004). Saprolegnia, the cause of winter fungus, was present in 4.0% of cases, up from 3.7% in 2004. The number of channel catfish virus (CCV) disease cases decreased from 10.8% in 2004 to 9.1% in 2005 and remained above the 9-year average of 5.8%. The number of channel catfish anemia (CCA) cases rose from 2.1% in 2004 to 4.6% for 2005 and remained below the 9-year average of 3.8%. *Ichthyophthirius multifiliis* (Ich) cases decreased from 5.0% last year to 1.3% in 2005, below the 9-year average of 1.8%. Cases of visceral toxicosis (VTC) decreased to 0.9% in 2005 from 3.2% in 2004.

The number of *Bolbophorus* trematode cases rose to 3.4% for 2005, but remained below the high of 5.6% seen in 2000. Farmers are encouraged to renew surveillance efforts and to control ram's horn snails (intermediate host of the parasite), particularly if pelicans are visiting their ponds. *Bolbophorus* trematodes are capable of killing fingerlings and increasing susceptibility to ESC, as well as decreasing feed consumption in larger fish. Control of the parasite can be accomplished through the use of copper sulfate or lime.

Highlights

The antibiotic florfenicol (Aquaflor®) was approved for use in catfish in October of 2005. Trials conducted at the ADL indicate the drug is highly efficacious against ESC when the drug is fed early in the course of an outbreak. Producers are encouraged to submit cases immediately if they suspect the disease is occurring in a pond. Currently, the drug is only approved for use in catfish against ESC and can only be obtained through the use of a veterinary feed directive order (VFD) signed by a licensed veterinarian. Before a VFD order can be written, diseased fish must be examined to confirm signs compatible with ESC. Medicated feed containing florfenicol is fed for 10 days and a withdrawal time of 12 days must be observed prior to processing. Following the success of ESC trials, the Schering-Plough pharmaceutical company has funded new studies to evaluate the effectiveness of florfenicol against columnaris infections. The results of these trials will be submitted to the FDA as a component of the drug approval application process against this disease agent.

Continued research into the cause of visceral toxicosis of catfish (VTC) has focused on a naturally occurring biological toxin present in aquatic habitats under certain environmental conditions. Additional test results are pending and confirmation is expected during 2006.

Research continues into the cause of channel catfish anemia (CCA), a well-known but poorly understood cause of mortalities. Although researchers have suggested a number of possible causes in the past, including various vitamin deficiencies and toxin exposures, work at the ADL indicates that the disease is caused by iron deficiency. The role of hepcidin, a recently identified regulator of iron metabolism in animals, has been investigated and shown not to be involved in the development of the disease. Research into other potential causes for the development of iron deficiency anemia is ongoing.

A previously unknown streptococcal bacterial infection causing mortalities, spinal deformities, and reproductive failure in catfish broodstock was reported last year (NWAC News April 2005). Work conducted with the Centers for Disease Control in Atlanta has confirmed that this is a previously unknown species of bacteria and will be named *Streptococcus ictaluri*. To date, four outbreaks have been confirmed, but no additional cases were seen in 2005. At present the significance of this emerging disease is unclear. Producers noting emaciation, humped backs, and bloody sores along the jaw at the time of broodstock selection are encouraged to contact the ADL.

Figure 1. Seasonal incidence of major catfish diseases in 2005.

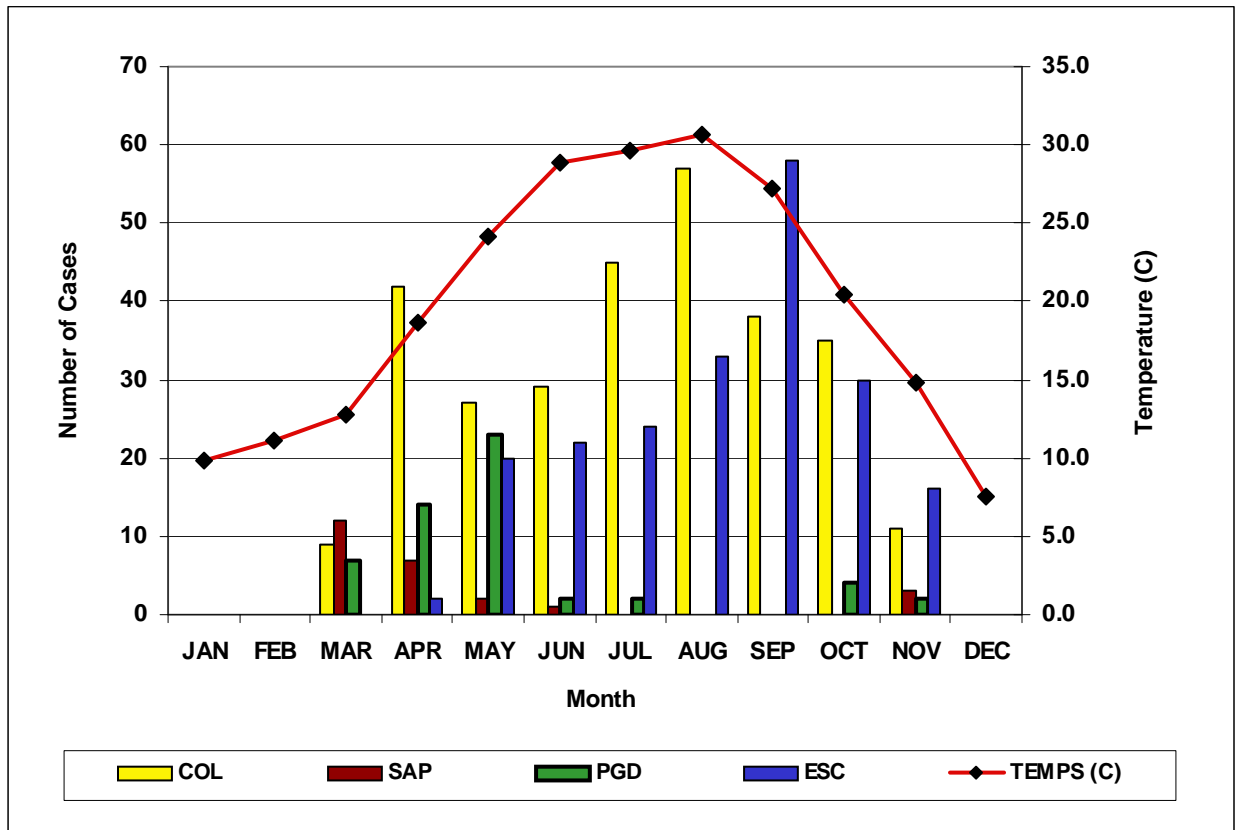
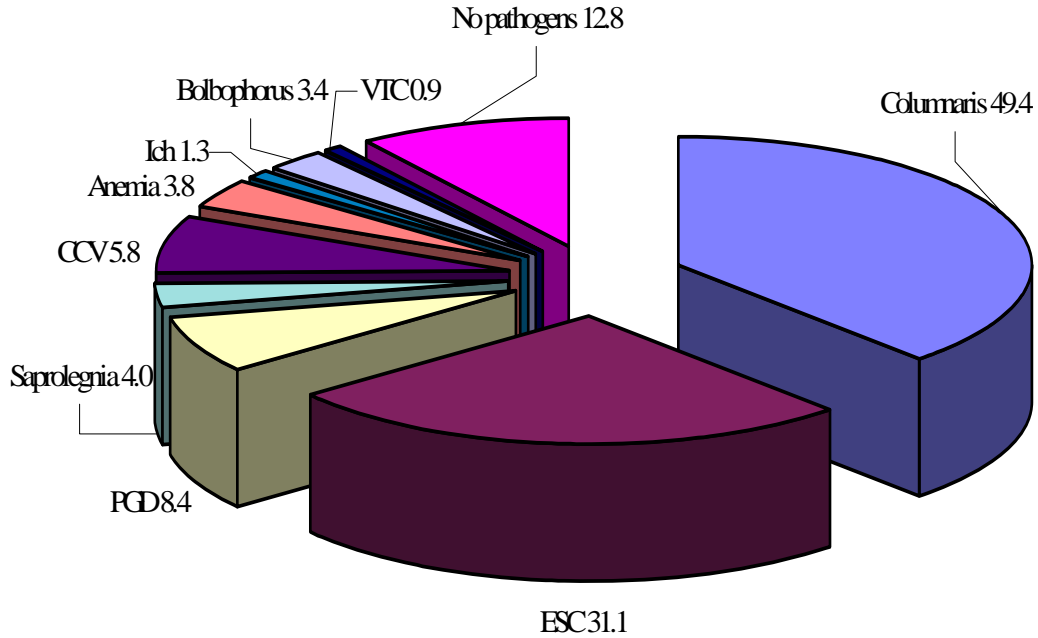


Table 1. Trends in disease diagnoses as a percentage of diagnostic case submissions over time.

Disease	Average	2005	2004	2003	2002	2001	2000	1999	1998	1997
Columnaris	44.3%	49.4	40.9	44.7	44.5	37.2	42.6	45.5	44.8	49.1
ESC	35.8%	31.1	30.8	34.7	39.8	36.4	33.5	41.2	41.2	33.6
PGD	19.0%	8.4	10.7	10.8	16.3	20.1	29.8	30.0	16.3	28.6
Saprolegnia	7.5%	4.0	3.7	5.3	10.1	10.4	10.5	8.7	8.6	6.4
CCV	5.8%	9.1	10.8	8.9	5.8	7.3	2.3	1.8	3.1	3.0
Anemia	3.8%	4.6	2.1	5.2	5.3	5.0	4.9	2.8	3.0	1.7
Ich	1.7%	1.3	5.0	0.5	2.2	1.8	2.7	0.7	0.5	0.8
Bolbophorus	2.9%	3.4	2.6	1.1	2.0	4.4	5.6	1.5	-	-
VTC	2.5%	0.9	3.2	3.7	2.0	2.5	-	-	-	-
No Pathogens	15.8%	12.8	20.8	18.3	16.2	19.2	15.0	15.2	11.4	13.6
No. of Cases	1283	607	778	832	1057	1602	2189	2007	1647	831

Major disease diagnoses as a percentage of diagnostic case submissions in 2005



Incidence of antibiotic resistance among common catfish bacterial pathogens

Organism	# Tested	Romet Only	Percent	Terramycin Only	Percent	Both	Percent
<i>Flexibacter columnare</i>	293	0	0.0%	0	0.0%	0	0.0%
<i>Edwardsiella ictaluri</i>	205	1	0.5%	0	0.0%	0	0.0%
<i>Aeromonas sp.</i>	5	0	0.0%	1	20.0%	0	0.0%

Mississippi State University - College of Veterinary Medicine

Fish Diagnostic Laboratory - Stoneville, MS

2005 Annual Case Summary

Disease Diagnoses as a Percentage of Total Case Submissions (Diagnostic & Research)

Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
Columnaris (Col)	0	0	3	31	13	9	21	25	5	17	2	0	126	15.83%
Col, Enteric Septicemia (ESC)	0	0	0	0	5	11	8	13	27	16	3	0	83	10.43%
Col, Channel Catfish Anemia (CCA), ESC	0	0	0	0	0	1	0	0	3	1	1	0	6	0.75%
Columnaris & Ich	0	0	0	2	1	0	0	0	0	0	0	0	3	0.38%
Columnaris, Parasitism	0	0	0	0	0	1	0	0	0	0	0	0	1	0.13%
Columnaris, Saprolegnia, Trauma	0	0	1	0	0	0	0	0	0	0	0	0	1	0.13%
ESC	0	0	0	2	4	6	12	17	28	9	9	0	87	10.93%
ESC, Columnaris, Parasitism	0	0	0	0	0	1	1	0	0	0	1	0	3	0.38%
CCV	0	0	0	0	0	5	12	8	0	0	0	0	25	3.14%
CCV & Columnaris	0	0	0	0	0	3	6	14	0	0	0	0	23	2.89%
CCV, ESC, & Columnaris	0	0	0	0	0	0	1	3	0	0	0	0	4	0.50%
CCV & ESC	0	0	0	0	0	0	0	0	0	2	1	0	3	0.38%
CCA	0	0	0	1	0	1	0	4	3	0	2	0	11	1.38%
CCA & Columnaris	0	0	0	0	0	0	3	2	2	1	1	0	9	1.13%
CCA & ESC	0	0	0	0	0	0	0	0	0	0	1	0	1	0.13%
Brown Blood & Columnaris	0	0	0	1	0	0	0	0	1	0	0	0	2	0.25%
Visceral Toxicosis of Catfish (VTC)	0	0	1	2	0	0	0	0	0	0	0	0	3	0.38%
VTC (presumptive)	0	0	0	0	0	0	0	0	0	0	1	0	1	0.13%
VTC, CCA, COL	0	0	0	0	0	0	0	0	0	0	1	0	1	0.13%
VTC, Saprolegnia	0	0	1	0	0	0	0	0	0	0	0	0	1	0.06%

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2005 Annual Case Summary

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Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
Saprolegnia	0	0	5	0	0	0	0	0	0	0	1	0	6	0.75%
Saprolegnia, Parasitism	0	0	0	0	0	0	0	0	0	0	1	0	1	0.13%
Saprolegnia, Columnaris, PGD	0	0	3	1	0	0	0	0	0	0	0	0	4	0.50%
Saprolegnia, Columnaris	0	0	2	6	2	0	0	0	0	0	1	0	11	1.38%
PGD	0	0	4	7	9	2	1	0	0	2	2	0	27	3.39%
PGD, Columnaris	0	0	0	6	4	0	0	0	0	0	0	0	10	1.26%
PGD, ESC	0	0	0	0	8	0	0	0	0	2	0	0	10	1.26%
PGD, Trematode	0	0	0	0	0	0	1	0	0	0	0	0	1	0.13%
Parasitism	0	0	0	0	0	5	0	0	0	0	0	0	5	0.63%
Parasitism, Starvation	0	0	1	0	0	0	0	0	0	0	0	0	1	0.13%
Parasitism, CCV, Sap	0	0	0	0	0	1	0	0	0	0	0	0	1	0.13%
Parasitism, ESC, Col			0	0	0	0	0	0	0	0	0	0	0	0.00%
<i>Aeromonas hydrophila</i> , <i>A. sobria</i> , Col	0	0	0	0	0	0	1	0	0	0	0	0	1	0.13%
<i>Aeromonas hydrophila</i> , Columnaris	0	0	0	1	0	0	0	0	0	0	0	0	1	0.13%
<i>Aeromonas hydrophila</i>	0	0	0	0	0	0	0	0	1	1	0	0	2	0.25%
Motile <i>Aeromonas</i> septicemia	0	0	0	0	0	0	0	0	1	0	0	0	1	0.13%
Eye Flukes, Columnaris	0	0	0	0	0	0	0	0	0	0	1	0	1	0.13%
Ich	0	0	4	1	0	0	0	0	0	0	0	0	5	0.63%
Deformed	0	0	0	0	0	0	0	1	0	0	0	0	1	0.13%
Mycobacteriosis	0	0	0	0	0	0	1	0	0	0	0	0	1	0.13%

Mississippi State University - College of Veterinary Medicine

Fish Diagnostic Laboratory - Stoneville, MS

2005 Annual Case Summary

Disease Diagnoses as a Percentage of Total Case Submissions (Diagnostic & Research)

Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
Death by Trauma	0	0	1	0	0	0	0	0	0	0	0	0	1	0.13%
Death by Starvation	0	4	0	1	0	0	0	0	0	0	0	0	5	0.63%
Autolyzed	0	0	0	1	0	1	0	1	0	0	0	0	3	0.38%
Branchiomyces	0	0	0	0	0	8	5	0	0	0	0	0	13	1.63%
Trematode & ESC	0	0	0	0	1	0	1	0	0	0	0	0	2	0.25%
Trematode, Columnaris	0	0	0	0	0	0	3	0	0	0	0	0	3	0.38%
Trematode	0	0	0	0	0	8	1	0	0	0	0	0	9	1.13%
Trematode, Col, ESC	0	0	0	0	0	3	1	0	0	0	0	0	4	0.50%
Trematode & Grub	0	0	0	0	0	3	0	0	0	0	0	0	3	0.38%
Research	0	0	3	16	14	15	37	54	9	7	32	2	189	23.74%
Health Check	10	0	3	6	5	11	11	11	5	10	3	0	75	9.42%
Undetermined	0	0	2	1	0	0	0	0	0	0	0	0	3	0.38%
Cases submitted by Farmers	10	4	31	70	54	80	90	99	76	61	32	0	607	76.26%
Cases submitted for Research	0	0	3	16	14	15	37	54	9	7	32	2	189	23.74%
Catfish Cases	1	4	30	83	68	94	126	153	85	68	64	2	778	97.7%
Other Species	9	0	4	3	0	1	1	0	0	0	0	0	18	2.3%
TOTALS	10	4	34	86	68	95	127	153	85	68	64	2	796	100%
Water	Farms	1	3	12	21	19	25	27	26	20	16	12	4	186
Quality	Ponds	66	45	22	45	31	135	68	40	68	99	45	17	681

Scientific Publications:

Shi J and AC Camus. Hepcidins in amphibians and fishes: Antimicrobial peptides or iron regulatory hormones? *Journal of Developmental and Comparative Immunology*. In press.

Hu X, Camus AC, Aono S, Morrison EE, Dennis J, Nusbaum KE, Judd RL, and J Shi. Regulation of hepcidin expression by infection and anemia in channel catfish. *Journal of Developmental and Comparative Immunology*. In review.

Camus AC, Mael MJ, and DJ Wise. Streptococcal arthritis, osteolysis, myositis, and spinal meningitis in channel catfish *Ictalurus punctatus* broodstock. *Journal of Aquatic Animal Health*. In review.

Wise DJ, Li MH, AC Camus and EH Robinson. Effects of variable periods of feed deprivation on the development of enteric septicemia in channel catfish prior to and following exposure to *Edwardsiella ictaluri*. *Journal of Aquatic Animal Health*. In review.

Technical Bulletins/Popular Articles:

Tucker, C.S., P. Silverstein, A. Camus, L. Bilodeau, D. Wise, and G. Waldbieser. 2005. Channel catfish virus disease and NWAC 103 catfish. *The Catfish Journal* 19(5):8.

Camus, A., P. Gaunt, and M. Mael. 2005. 2004 CVM Aquatic Diagnostic Laboratory Summary. *NWAC News* 8(1):6.

Camus, A. and D. Wise. 2005. Streptococcosis, a previously unknown disease of channel catfish broodstock. *NWAC News* 8(1):8.

Gaunt P and Hale B. Delta Community College aids Hispanic workers. *The Catfish Journal* 19 (11): 12, 2005

Gaunt P. and Schnick R Industry researchers gather to discuss aquaculture drug status. *The Catfish Journal* 20(2):21, 2005.

Invited Participation:

A Camus. National Risk Management Feasibility Program for Aquaculture Catfish Disease Modeling Workshop. USDA-Colorado State University, Animal Population Health Institute. Tunica, Mississippi. 2005.

Gaunt P. "Mycotoxins in Aquaculture." American Fisheries Society Fish Health Section Continuing Education Session. July 30, 2005. Minneapolis, MN.

Presentations, Abstracts and Posters:

Camus A, Wise D, Mauel M and P Shewmaker. Streptococcal arthritis, osteolysis, myositis, and spinal meningitis in channel catfish *Ictalurus punctatus* broodstock. Annual Meeting of the American Fisheries Society, Fish Health Section. Minneapolis, Minnesota. 2005.

Pote, L.M., M.C. Yost, Doffitt, B.S. Dor, D.T. King, A. Camus A and D. Wise. Further elucidation of the life cycle and pathology of the digenetic trematode, *Bolbophorus damnificus*. 30th Eastern Fish Health Workshop. Kearneysville, West Virginia. 2005.

Wise D, Mischke C, Byars T and A Camus. Evaluation of copper sulfate to control snail numbers in catfish ponds affected by *Bolbophorus* trematodes. 30th Eastern Fish Health Workshop. Kearneysville, West Virginia. 2005.

Hu X, Aono M, Camus AC, Morrison EE, Dennis J, Nusbaum KE, Judd RL, and J Shi. Regulation of channel catfish hepcidin expression by infection and anemia. Conference of Research Workers in Animal Disease. St. Louis, MO. 2005.

Wise DJ and AC Camus. 2005. Control of bacterial infections in channel catfish *Ictalurus punctatus* Fingerlings using medicated feeds and restricted feeding practices. Aquaculture America 2005. January 17-20, 2005. New Orleans, LA.

Thorp E, Wagner B, Huston C, Salman M, Van Metre D, and A Camus. Characterization of Current Pond Management and Environmental Parameters Associated With Infectious Disease in Catfish Aquaculture. Conference of Research Workers in Animal Disease. St. Louis, MO. 2005.

Wise D, Mischke C, Byars T and A Camus. Evaluation of copper sulfate to control snail numbers in catfish ponds affected by *Bolbophorus* trematodes. 30th Eastern Fish Health Workshop. Kearneysville, West Virginia. 2005.

Pote LM, Yost MC, Doffitt, Dorr BS, King DT, Camus A and D Wise. Further Elucidation of the life cycle and pathology of the digenetic trematode, *Bolbophorus damnificus*. 30th Eastern Fish Health Workshop. Kearneysville, West Virginia. 2005.

Griffin M, Camus AC and LM Pote. Detection of *Aurantiactinomyxon ictaluri* from pond water samples using real-time polymerase chain reaction (PCR). Southern Conference of Researchers in Aquatic Disease. Blacksburg, Virginia. 2005.

Gaunt P, A McGinnis, W Baumgartner, A Camus, J Cao, and R Endris.

“Assessment of florfenicol (Aquaflor[®]) against *Streptococcus iniae* *in vitro* and *in vivo* in Nile tilapia (*Oreochromis niloticus*).” Aquaculture America 2005. Jan 17-20, 2005, New Orleans, LA.

Gaunt P. Overview of florfenicol (Aquaflor[®]) research in channel catfish. Catfish Farmers of Arkansas. October 6, 2005. Pine Bluff, AR.

Gaunt, P. Using Veterinary Feed directives in Aquaculture. NWAC Fall Seminar 2005. November 10, 2005, Stoneville, MS.

Grants and Contracts:

Catfish Health Research Initiative. Sponsor: USDA-ARS. Investigators: A Camus, P Gaunt, and M Mael. 2004-2005. \$2,106,950 (\$421,390 annually).

Characterization of Disease and Validation of Best Management Practices on Catfish Operations. Sponsor: National Risk Management Feasibility Program for Aquaculture. Investigators: C Huston, D Wise and A Camus. 2004-2005. \$22,358.

Total Pond Management. Sponsor: USDA-APHIS-VS. Investigators: Alvin Camus and Fred Cunningham. 2004-2005. \$15,600.

Efficacy of florfenicol for control of mortality associated with *Flavobacterium columnare* in channel catfish (*Ictalurus punctatus*): a tank study. (2005) Received from Schering-Plough Animal Health, Inc. Role: Principal Investigator and Study Director: PS Gaunt.

Efficacy of florfenicol vs. withholding feed for control of mortality associated with *Edwardsiella ictaluri* in channel catfish (*Ictalurus punctatus*): a tank study. (2005) Received from Schering-Plough Animal Health, Inc. Role: Principal Investigator and Study Director: PS Gaunt.

The Interactions and Pathology Associated With Life Stages of Digenetic Trematodes Infecting Channel Catfish and Wild Fish-Eating Birds. USDA. Co-investigator: AC Camus. \$313,070, three-year duration. 2006. In review.

Hepcidins in Amphibians and Fish. NIH R21 Proposal. Co-investigator: AC Camus. \$ 292,000, three-year duration. 2005. In review.

MISSION

The Aquatic Diagnostic Laboratory is dedicated to the success of Mississippi's commercial catfish industry through service, research, and teaching. Our staff and fish health professionals strive to support the industry's efforts to produce a high quality, economical and profitable product. Our goals are derived from the needs of the industry and aimed at developing management strategies for controlling the impact of diseases that effect profitability. These goals can only be accomplished through mutual respect, cooperation, and the maintenance of a close supportive relationship with our clients.