

2010 ANNUAL CASE SUMMARY REPORT
AQUATIC RESEARCH & DIAGNOSTIC LABORATORY

Mississippi State University
College of Veterinary Medicine
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MISSION STATEMENT

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 affect profitability. These goals can only be accomplished through mutual respect, cooperation, and the maintenance of a close supportive relationship with our clients.

**2010 CVM AQUATIC RESEARCH & DIAGNOSTIC LABORATORY
SUMMARY**

Diagnostics

In 2010, the Aquatic Research & Diagnostic Laboratory (ARDL) at Stoneville received a total of 523 fish diagnostic cases. These cases were received from 52 different farms. This is a 10.23 % decrease in the number of submissions over the 596 cases in 2009. There were 1341 water quality samples that were analyzed representing a 55.0% increase from the 865 samples received in 2009.

Individual case submissions represent a composite sample of fish collected from a single pond on a given day. The numbers reported are derived solely from submissions processed by the ARDL 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 examination for signs of disease, bacterial and viral cultures, histopathology, and water quality evaluation. The ARDL works closely with Mississippi Agriculture Forestry and Experiment Station (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 ARDL supports the research efforts of other National Warmwater Aquaculture Center (NWAC) units, including MAFES, Mississippi State University -Extension Service, College of Veterinary Medicine, and United State Department of Agriculture – Agriculture Research Service (USDA/ARS) Catfish Genetics Research Unit. Furthermore, the laboratory provides an outlet for the dissemination of information gained from research efforts back to producers.

Bacterial diseases dominated the number of cases submitted as in previous years. Columnaris as a single disease by itself accounted for 58 cases but in combination with multiple diseases was seen in 167 submissions, which is exactly the same number of submissions from the previous year (or an increase of 2.2% as percentage of case

submissions). There were 46 cases of Enteric Septicemia of Catfish by itself and in combination with other diseases was seen in 113 of submissions. The seasonal prevalence of these diseases together with Saprolegnia and Proliferative Gill Disease (PGD) is charted below. There were no incidences of antibiotic resistance for the two major bacterial diseases in catfish. The three instances of antibiotic resistance was for *Aeromonas* sp. and *Plesiomonas shigilloides* (the later is believed to be an opportunistic pathogen).

Proliferative gill disease (PGD) remained the most commonly diagnosed parasitic disease and was seen in 99 submissions. Other parasitic diseases were seen less frequently. *Ichthyophthirius multifiliis* (Ich) was only 0.5% of case submission while *Bolbophorus* sp. trematode cases comprised 1.8% of cases submitted which was the same as the previous year. Farmers are encouraged to continue surveillance efforts and to control rams horn snails (intermediate host of the parasite) with lime or copper sulfate treatments, particularly if pelicans have been observed visiting their ponds. *Bolbophorus* sp. trematodes are capable of killing fingerlings and increasing susceptibility to ESC, as well as decreasing feed consumption in larger fish. This can result in significant economic losses even with mild infestations.

Saprolegnia was seen in 4.5% of the cases submitted, which was lower than the previous year (9.4%). There were 29 Channel catfish virus (CCV) disease cases last year. The number of anemia cases increase to 5% of the cases submitted and visceral toxicosis of catfish (VTC) made up 1.9% of cases submitted. These last two diseases are still diseases of research interest because of the economic impact. Producers are highly encouraged to submitted cases of these diseases

With the interest in hybrid catfish, we listed the numbers of hybrid as well as blue catfish cases submitted by month. Listed here are the specific diseases for each of those catfish since that specific data is not separated out in the comprehensive table below.

Blue catfish

<u>Disease Name</u>	<u>Number of cases</u>
Anemia	3
Total	3

Hybrid catfish

<u>Disease Name</u>	<u>Number of cases</u>
<i>Aeromonas</i> sp., Columnaris external	1
Anemia	5
Bacterial myositis, anemia	1
Bulbophorus	1
Columnaris external	1
Columnaris external, Saprolegnia	1
Columnaris	18
Columnaris, Channel catfish virus	4
Columnaris, <i>E. tarda</i>	1

Columnaris, <i>E. tarda</i> , saprolegnia	1
Columnaris, <i>Plesimonas shigilloides</i>	1
<i>Edwardsiella tarda</i>	4
Enteric Septicemia of Catfish	4
Enteric Septicemia of Catfish, Anemia	1
Enteric Septicemia of Catfish, Columnaris	1
Gas bubble disease	2
Myositis, hepatitis	1
No infectious disease identified	24
Proliferative Gill Disease	2
Saprolegnia	5
Urinary Bladder obstruction	1
VHS testing	30
Total	100

We are here to serve the industry and encourage producers to continue to take advantage of the diagnostic service.

Highlights

Research continues on the antibiotic florfenicol (Aquaflor®). The drug's sponsor Intervet/Schering-Plough Animal Health has funded studies to pharmacokinetic studies to help determine the drug's duration in catfish and give us a better understanding of its ability to control ESC and Columnaris Disease.

Results from the "Efficacy of florfenicol for the control of mortality caused by *Flavobacterium columnare* infection in channel catfish" were accepted by FDA late 2010. This study along with one conducted by the USFWS in Bozeman cleared the way for an all freshwater-reared warmwater fish columnaris claim for florfenicol.

With help from MAFES researchers, faculty at the ARDL are currently investigating the life stages and biology of *Henneguya ictaluri*, the causative agent of proliferative gill disease (hamburger gill). In addition to the biology of the parasite, researchers are also investigating novel management strategies to reduce the impact of proliferative gill disease on catfish production.

Faculty of the ARDL are also cooperating with researchers from Alabama, Arkansas and Louisiana to develop rapid diagnostic methodologies for an unusually virulent strain of *Aeromonas hydrophila*, which has been implicated in significant losses in Alabama.

Research is also being conducted on the life cycle of another digenetic trematode, *Drepanocephalus spathans*, that has demonstrated the ability to infect juvenile channel catfish. The impacts this trematode has on catfish production are being investigated.

Work also continues on the development of molecular based assays to detect and quantify *Edwardsiella ictaluri*, *Edwardsiella tarda*, and *Flavobacterium columnare* in the pond environment. This will provide methods to better evaluate management schemes aimed at controlling diseases caused by these bacteria.

Visceral Toxicosis of Catfish continues to be an area of active research. We would like to continue to enlist the assistance of farmers to bring suspect VTC fish to the ARDL. Ongoing VTC research requires a supply of blood from affected fish and submission of affect fish to the ARDL will help us understand how widespread the disease is and what pond factors may be triggering outbreaks.

We also solicit producers help with anemia in our efforts to understand its cause. Although there are several diseases and toxins can result in an anemic condition in fish, the etiology of the profound anemia that is seen typically foodfish is unknown. Producers with anemic fish are also highly encouraged to submit those fish and keep accurate records on pond information.

Scientific Publications:

Beecham R V, Griffin MJ, LaBarre SB, Wise DJ, Mauel MJ, Pote LM, Minchew CD. 2010. The effects of proliferative gill disease (PGD) on the blood physiology of channel, blue and hybrid (blue x channel) catfish fingerlings. *North American Journal of Aquaculture* 72:213-218.

Gaunt P, Endris R, McGinnis A, Baumgartner W, Camus A, Steadman J, Sweeney D, and Sun F. 2010. Determination of Florfenicol Dose Rate in Feed for Control of Mortality in Nile Tilapia (*Oreochromis nilotica*) Infected with *Streptococcus iniae*. *Journal of Aquatic Animal Health*. 22:158-166.

Gaunt PS, Gao D, Sun F, Endris R. 2010 Efficacy of florfenicol for control of mortality caused by *Flavobacterium columnare* infection in channel catfish, *Ictalurus punctatus* (Rafinesque) *Journal of Aquatic Animal Health*. 22:115-122.

Griffin MJ, Camus AC, Greenway TE, Wise DJ, Mauel MJ, Pote LM. 2010. Variation in susceptibility to *Henneguya ictaluri* infection by two species of catfish and their hybrid cross. *Journal of Aquatic Animal Health*. 22:21-35.

Griffin MJ, Wise DJ, Yost MC, Doffitt CM, Pote LM, Greenway TE, Khoo LH. 2010. A multiplex real-time polymerase chain reaction assay differentiates between *Bolbophorus damnificus* and *Bolbophorus* type II sp. *Journal of Veterinary Diagnostic Investigation* 22:615-622.

Griffin MJ, Camus AC, Greenway TE, Wise DJ, Mauel MJ, Pote LM. 2010. Variation in susceptibility to *Henneguya ictaluri* infection by two species of catfish and their hybrid cross. *Journal of Aquatic Animal Health*. 22:21-35.

Camus AC, Griffin MJ. 2010. Molecular characterization and histopathology of *Myxobolus koi* infecting the gills of a koi *Cyprinus carpio*, with an amended morphologic description of the agent. *Journal of Parasitology*. 96:116-124.

Khoo LH, Rommel FA, Smith SA, Griffin MJ, Pote LM. 2010. *Myxobolus neurophila*: Morphologic, histopathologic and molecular characterization. *Diseases of Aquatic Organisms*. 89:51-61.

Book chapters:

Mauel, MJ. 2010. Francisellosis. *Fish Health Section Blue Book; Suggested Procedures for the detection and identification of certain finfish and shellfish pathogens.*

Presentations, Abstracts and Posters:

Chatla K, Gaunt PS, Hanson L . Development of a Challenge Model for Visceral Toxicosis of Catfish. *International Symposium on Aquatic Animal Health*. September 5-9, 2010. Tampa, FL.

Doffitt CM, Yost MC, Khoo L, Pote LP Histopathological comparison of experimental infections of two different digenetic trematodes in channel catfish *Aquaculture 2010*, Abstract #793, San Diego, CA, Mar 2-5, 2010.

Gaunt PS. Assessing the benefits of medicated catfish feeds. 2010 NWAC Fall Seminar and TAA Intensive Training Capps Center, Stoneville, Mississippi November 09, 2010 and Starkville, December 2, 2010.

Gaunt PS. Correlation of Minimal Inhibitory Concentrations and Pharmacokinetics in the Aquaculture Drug Approval Process. Presentation to USFDA CVM March 29-30, 2010 Rockville, MD.

Gaunt PS. Medicated feed treatments for *Aeromonas hydrophila* outbreaks in catfish. August 24, 2010. *Aeromonas outbreak Videoconference Meeting*. DREC Capps Center, Stoneville, MS.

Gaunt PS. Mississippi State University College of Veterinary Medicine Aquatic Diagnostic Laboratory Leland Rotary Club, Leland MS April 23, 2010.

Gaunt PS. Musings of a lady catfish doctor. *Aquaculture America* Mar 1-5 2010. San Diego, CA

Gaunt PS. Correlation of Minimal Inhibitory Concentrations and Pharmacokinetics in the Aquaculture Drug Approval Process AADAP Meeting, Aug 3-5, 2010. Bozeman, MT.

Gaunt PS. Perspective on Aquaculture Drug Approval Research from a University Researcher *Aquaculture America* Mar 1-5 2010. San Diego, CA.

Gibbs GD, Mauel MJ, Griffin MJ, Lawrence ML. A Real-time Polymerase Chain Reaction for Detection and Quantification of *Flavobacterium columnare* from Two Different Genomovars. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-9. Tampa, FL, USA. September 2010.

Greenway T, Griffin M, Wise D, Byars T, Walker J. Antibiotic Intervention: Timing and the affect on the generation of *Edwardsiella ictaluri* specific antibody. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-47. Tampa, FL, USA. September 2010.

Greenway T, Griffin M, Wise D, Byars T, Walker J. Immune Responses of Channel Catfish Following Exposure to a Temperature Tolerant Strain of *Edwardsiella ictaluri*. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-48. Tampa, FL, USA. September 2010.

Greenway T, Wise D, Griffin M, Byars T, Walker J. Longitudinal Analysis of Anti-*Edwardsiella ictaluri* antibody response in channel catfish fingerlings in the pond environment. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-49. Tampa, FL, USA. September 2010.

Greenway T, Wise D, Griffin M, Walker J, Byars T. Solid Phase ELISA for Quantification of Antigen-specific antibody responses in channel catfish: Analysis of antibody dilution curves following multiple antigen exposures, acute and chronic infections. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-50. Tampa, FL, USA. September 2010.

Griffin M J, Wise DJ, Yost MC, Doffitt CM, Pote LM, Greenway TE, Khoo LH. A duplex real-time polymerase chain reaction assay for differentiation between *Bolbophorus damnificus* and *Bolbophorus* type II sp. cercariae. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-62. Tampa, FL, USA. September 2010.

Griffin M J, Wise DJ, Yost MC, Doffitt CM, Pote LM, Greenway TE, Khoo LH. A real-time polymerase chain reaction for differentiation between *Bolbophorus damnificus* And *Bolbophorus* Type II sp. cercariae. In proceedings of the 35th Eastern Fish Health Workshop. p. 24. Shepherdstown, WV, USA. May 2010.

Griffin MJ, Pote LM, Camus AC, Mauel MJ, Greenway TE, Wise DJ. Application of a real-time PCR assay for the detection of *Henneguaya ictaluri* in channel catfish ponds. In proceedings of the 6th International Symposium on Aquatic Animal Health. S3-4. Tampa, FL, USA. September 2010.

Griffin MJ, Wise DJ, Mauel MJ, Pote LM, Camus AC, Doffitt CM, Yost MC, Greenway TE, Khoo LH. Real-time PCR detection of water-borne pathogens from commercial catfish ponds. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-24. Tampa, FL, USA. September 2010.

Khoo L, Hemstreet B, Greenway T, Wise D, Steadman J. Pathology associated with atypical *Aeromonas hydrophila* infection. Proceedings of the 35th Eastern Fish Health Workshop, p.101, Shepherdstown, WV May 24-28, 2010

Wise DJ, Griffin MJ, Greenway TE. Acute toxicity of copper sulfate to *Bolbophorus* sp. cercariae. In proceedings of the 6th International Symposium on Aquatic Animal Health. P-61. Tampa, FL, USA. September 2010.

**Mississippi State University - College of Veterinary Medicine
Aquatic Research & Diagnostic Laboratory - Stoneville, MS**

2010 Annual Case Summary

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

Disease/Diagnosis	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
<i>Aeromonas hydrophila</i>						1	1	1	2			1	6	0.96%
<i>Aeromonas</i> sp., Costia						1							1	0.16%
<i>Aeromonas</i> sp., Columnaris (Col) external				1									1	0.16%
Algal toxin suspect						2							2	0.32%
Anemia						1		3	5	8	2		19	3.05%
Anemia, Columnaris external									1				1	0.16%
Anemia, VTC suspect				1									1	0.16%
Bacterial epicarditis, Meningoencephalitis									1				1	0.16%
Bacterial myositis							1	1					2	0.32%
Bacterial septicemia						1							1	0.16%
<i>Bolbophorus</i>						6	1						7	1.12%
Branchitis		1											1	0.16%
Chanel Catfish Virus (CCV)						4	2						6	0.96%
Columnaris (Col), <i>Edwardsiella tarda</i> , Anemia											1		1	0.16%
Columnaris (Col)					1	1	2	18	17	18	1		58	9.31%
Columnaris (Col), Anemia										2			2	0.32%
Columnaris (Col), CCV						6	13	1	3				23	3.69%
Columnaris (Col), <i>E. tarda</i>					1								1	0.16%
Columnaris (Col), <i>Plesiomonas shigelloides</i>								1					1	0.16%
Columnaris (Col), Saprolegnia					1	1			1			1	4	0.64%
Columnaris external			1		1	2	1	2	1	2			10	1.61%
Columnaris, Saprolegnia, <i>E. tarda</i>				1									1	0.16%
Dermatitis, Stomatitis, Parasitism				1									1	0.16%
<i>E. tarda</i>				1				1	1	1			4	0.64%
<i>E. tarda</i> , Columnaris external										1			1	0.16%
ESC		2	1	3	8	4	11	5	3	9			46	7.38%
Enteric Septicemia of Catfish (ESC), Anemia						1			2	1			4	0.64%

Mississippi State University - College of Veterinary Medicine
Aquatic Research & Diagnostic Laboratory - Stoneville, MS
2010 Annual Case Summary
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Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
ESC, Columnaris (Col)					5	5	5	5	9	8			37	5.94%
ESC, Columnaris external								3					3	0.48%
ESC, Columnaris external, Anemia					1								1	0.16%
ESC, PGD				2	2	2	1			2		1	10	1.61%
ESC, PGD, Anemia									1				1	0.16%
ESC, PGD, Columnaris external									1				1	0.16%
ESC, PGD, Saprolegnia												1	1	0.16%
ESC, PGD, VTC suspect												1	1	0.16%
ESC, Saprolegnia												1	1	0.16%
Ganglioneuroma, Gastric granuloma (parasite)						1						1	1	0.16%
Gas bubble disease						1				1			2	0.32%
Granulomas multisystemic (parasite), Epitheliocystis						1							1	0.16%
Health check	1												1	0.16%
Histology only					1	8	2	1			1		13	2.09%
<i>Ichthyophthirius</i>								1					1	0.16%
Myositis, Hepatitis								1					1	0.16%
Nematodes													1	0.16%
No evidence of infectious disease			5	2	13	15	13	14	19	5		8	94	15.09%
Parasitism	1				1								2	0.32%
Parasitism, Endophthalmitis					1								1	0.16%
PGD		1		36	11	2	1		1			2	54	8.67%
PGD, <i>Aeromonas hydrophila</i>					1								1	0.16%
PGD, Anemia					1								1	0.16%
PGD, <i>Bolbophorus</i>				3		1							4	0.64%
PGD, Columnaris				1	2				5	1	1		10	1.61%
PGD, ESC, Columnaris				1	1	1				3	1		7	1.12%
PGD, Saprolegnia		2										2	4	0.64%

Mississippi State University - College of Veterinary Medicine
Aquatic Research & Diagnostic Laboratory - Stoneville, MS
2010 Annual Case Summary
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Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%	
PGD, Saprolegnia, Columnaris external		1											1	0.16%	
PGD, Saprolegnia, VTC suspect												1	1	0.16%	
<i>Plesiomonas shigelloides</i>						1							1	0.16%	
Research					1		1						2	0.32%	
Saprolegnia				3									1	4	0.64%
Saprolegnia, Brown blood disease												1	1	0.16%	
Saprolegnia, Columnaris external			5	1									9	1.44%	
Saprolegnia, <i>Ichthyophthirius</i>													2	0.32%	
Steatitis				1									1	0.16%	
Toxin								1					1	0.16%	
Urinary Bladder obstruction										1			1	0.16%	
VHS Testing		4	27								69	28	128	20.55%	
VTC, confirmed											1	5	6	0.96%	
VTC, PGD											1	1	2	0.32%	
VTC, suspect	1			1									2	0.32%	
TOTALS	8	11	39	59	55	68	55	55	77	63	78	55	623		
Cases submitted by Farmers	5	9	38	57	48	48	39	47	62	58	77	47	535	85.87%	
Cases submitted for Research	3	2	1	2	7	20	16	8	15	5	1	8	88	14.13%	
Channel catfish cases	8	6	33	49	48	63	50	36	55	44	47	54	493	79.1%	
Blue catfish cases	0	0	0	0	0	0	0	2	0	1	0	0	3	0.5%	
Hybrid catfish cases	0	4	4	9	5	3	5	16	22	18	26	1	113	18.1%	
Other Species	0	1	2	1	2	2	0	1	0	0	5	0	14	2.2%	
TOTALS													623		
Water	Farms	5	5	6	10	18	15	16	11	15	11	5	5	122	
Quality	Ponds	55	51	59	209	213	166	131	85	112	170	51	39	1341	

**Mississippi State University - College of Veterinary Medicine
Aquatic Research & Diagnostic Laboratory - Stoneville, MS
2010 Annual Case Summary**

Major Disease Diagnoses as a Percentage of Diagnostic Case Submissions^(1)**

Disease	Total # Disease Cases	% Total Disease Cases
Columnaris	167	26.8%
ESC	113	18.1%
PGD	99	15.9%
Saprolegnia	28	4.5%
CCV	29	4.7%
Anemia	31	5.0%
Brown Blood	1	0.2%
Ich	3	0.5%
VTC	12	1.9%
Health Check ^(**2)	1	0.2%
Bolbophorus	11	1.8%

^(**1) A case may be represented by more than one disease.

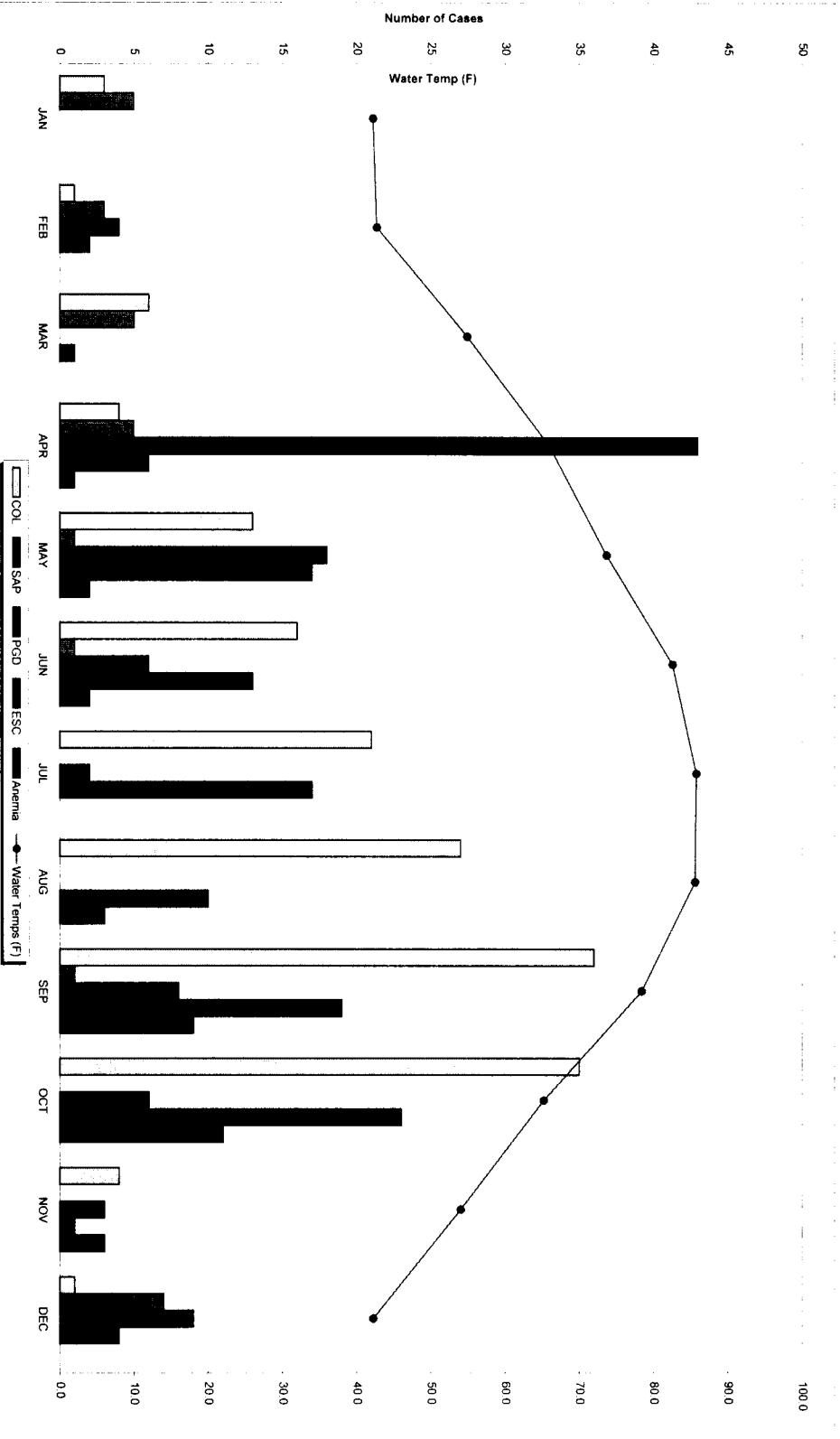
^(**2) Cases from healthy ponds for monitoring/pre-purchase exams.

**Mississippi State University - College of Veterinary Medicine
Aquatic Research & Diagnostic Laboratory - Stoneville, MS
2010 Annual Case Summary
Incidence of Antibiotic Resistance**

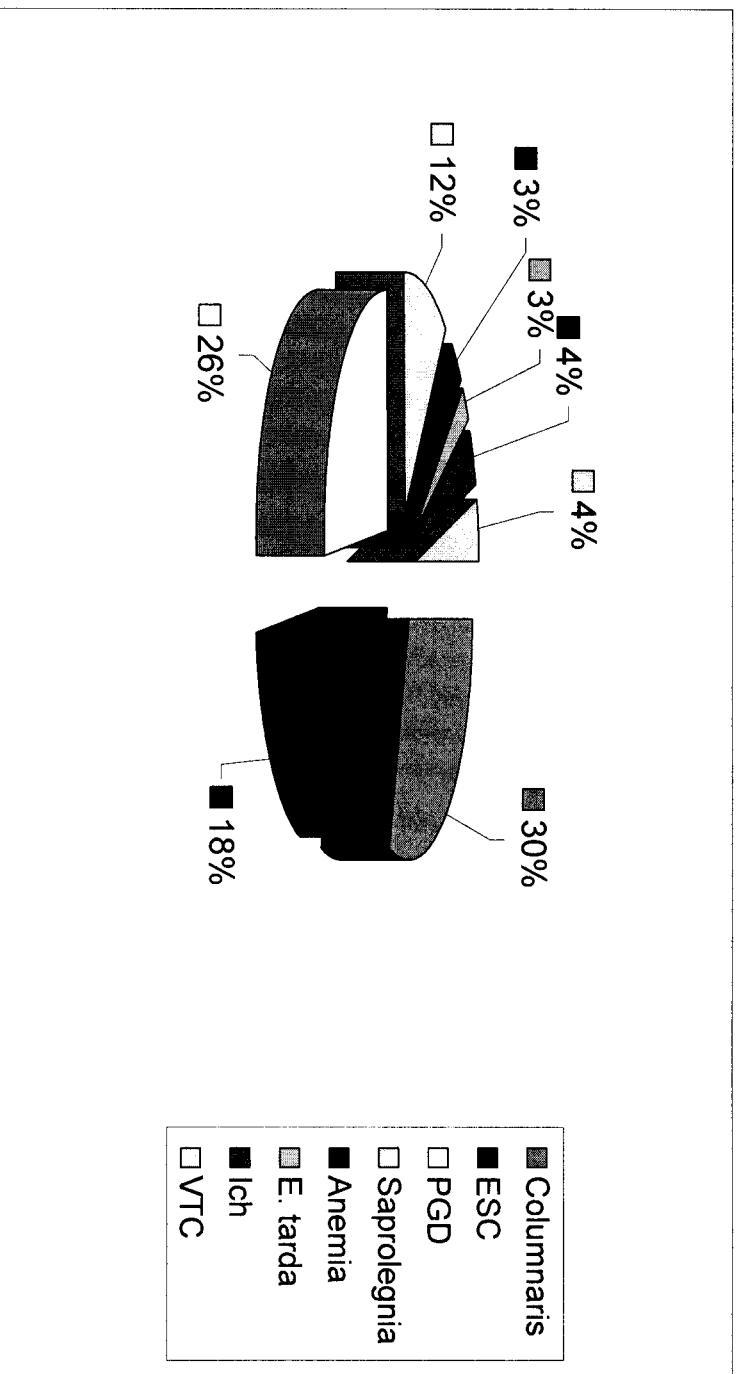
Organism	# Tested	Romet (%)	Terramycin (%)	Aquaflo® (%)	Romet & Terramycin (%)	Romet & Aquaflo® (%)	Terramycin & Aquaflo® (%)	All 3 Abx (%)
<i>Flavobacterium columnare</i>	167	0	0	0	0	0	0	0
<i>Edwardsiella ictaluri</i>	113	0	0	0	0	0	0	0
<i>Edwardsiella tarda</i>	7	0	0	0	0	0	0	0
<i>Aeromonas spp</i>	9	0	2(22%)	0	0	0	0	0*
<i>Plesiomonas shigelloides</i>	2	1(50%)	0	0	0	0	0	0

Mississippi State University - College of Veterinary Medicine
 Aquatic Research & Diagnostic Laboratory - Stoneville, MS
 2010 Annual Case Summary
 Seasonal Occurrence of Major Farm Diseases

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
COL	3	1	6	4	13	16	21	27	36	35	4	1	167
SAP	5	3	5	5	1	1	0	0	1	0	0	7	28
PGD	0	4	0	43	18	6	2	0	8	6	3	9	99
ESC	0	2	1	6	17	13	17	10	19	23	1	4	113
Aereria	0	0	0	1	2	2	0	3	9	11	3	0	31
Water Temps (F)	42.2	42.7	54.9	66.0	73.7	82.6	85.8	85.6	78.4	65.2	54.0	42.2	



Mississippi State University - College of Veterinary Medicine
Aquatic Diagnostic Laboratory - Stoneville, MS
2009 Annual Case Summary
Major Disease Diagnoses as a Percentage of Diagnostic Case Submissions



**Mississippi State University - College of Veterinary Medicine
Aquatic Research & Diagnostic Laboratory - Stoneville, MS
2010 Annual Case Summary**

Yearly Trends in Disease Diagnosis as a Percentage of Submissions

Disease	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	Average
Columnaris	37.2	44.5	44.7	40.9	48.3	68.4	37.5	36.7	24.6	26.8	41.0%
ESC	36.4	39.8	34.7	30.8	33.8	56.5	32.8	18.6	15.0	18.1	31.7%
PGD	20.1	16.3	10.8	10.7	8.9	17.8	18.4	33.7	21.4	15.9	17.4%
Saprolegnia	10.4	10.1	5.3	3.7	4.1	8.4	8	9.2	9.4	4.5	7.3%
CCV	7.3	5.8	8.9	10.8	9.2	5.9	2	0	7.2	4.7	6.2%
Anemia	5	5.3	5.2	2.1	4.6	4.9	10.7	2.7	2.8	5	4.8%
Ich	1.8	2.2	0.5	5	1.3	0.8	0.6	0.8	3.1	0.5	1.7%
Bolbophorus	4.4	2	1.1	2.6	3.6	0.7	1.5	0.3	1.8	1.8	2.0%
VTC	2.5	2	3.7	3.2	1.0	3.1	1.3	5.4	3.4	1.9	2.8%
No Pathogen	19.2	16.2	18.3	20.8	12.4	20.3	17.1	17.5	16.1	15.1	17.3%
Number of Cases	1602	1057	832	778	602	845	1144	630	678	623	879