

2009 ANNUAL CASE SUMMARY REPORT
AQUATIC RESEARCH & DIAGNOSTIC LABORATORY

Mississippi State University
College of Veterinary Medicine
Thad Cochran National Warmwater Aquaculture Center
Stoneville, MS 39776
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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.

2009 CVM AQUATIC RESEARCH & DIAGNOSTIC LABORATORY SUMMARY

Diagnostics

In 2009, the Aquatic Research & Diagnostic Laboratory (ARDL) at Stoneville received a total of 596 fish diagnostic cases. These cases were received from 97 different farms. This is a 5% increase in the number of submissions over the 554 cases in 2008. There were 865 water quality samples that were analyzed representing a 22.5% decrease from the 1117 samples received in 2008.

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 32 cases but in combination with multiple diseases was seen in 167 submissions, a 27.7% decrease from the previous year. There were 16 cases of Enteric Septicemia of Catfish by itself and in combination with

other diseases was seen in 102 of submissions, a 12.8% decrease from 2008. 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. In addition a few of the resistant bacteria reported below were not isolated from catfish but from other species.

Proliferative gill disease (PGD) remained the most commonly diagnosed parasitic disease at 145 submissions or 21.5% of the total cases, down from 33.7% in 2008. Other parasitic diseases were seen less frequently. *Ichthyophthirius multifiliis* (Ich) was only 3.1% which higher than the previous year (0.8%) while *Bolbophorus* trematode cases comprised 1.8% of cases submitted, which was a higher than the previous year (0.3%). 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* 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 9.4% of the cases submitted, essentially the same as in 2008 – 9.22%. There were 49 Channel catfish virus (CCV) disease cases last year and no cases of CCV were submitted in 2008. In 2009, we were concerned that there might be another viral disease because of a few atypical changes seen when fish samples were incubated on the Channel Catfish Ovary cell line. These are reflected as virus positive (unknown in our case summary below). However, with the assistance of colleagues (Dr. Larry Hanson Mississippi State University, College of Veterinary Medicine and Dr. Andy Goodwin, University of Arkansas – Pine Bluff), we were able to ascertain that there is no new virus. The number of Anemia cases decreased to 2.8% of the cases submitted and Visceral Toxicosis of Catfish (VTC) made up 3.4% 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>
<i>Henneguya</i> infestation “blister disease”	1
No infectious disease agent	2
Toxin “over spray suspect”	1
Total	4

Hybrid catfish

<u>Disease Name</u>	<u>Number of cases</u>
<i>Aeromonas hydrophila</i> , Columnaris, Saprolegnia	1
Algal toxin	1

Columaris, CCV	1
<i>Edwardsiella tarda</i>	1
<i>Edwardsiella tarda</i> , anemia	1
<i>Edwardsiella tarda</i> , Columnaris	1
<i>Edwardsiella tarda</i> , Saprolegnia	1
ESC	3
ESC <i>Aeromonas hydrophila</i> , virus positive unknown	1
ESC, CCV	2
ESC, Columnaris, <i>Aeromonas</i> sp., virus positive unknown	1
ESC, Columnaris, CCV	5
ESC, Columnaris, CCV, <i>Aeromonas</i> sp.	2
ESC, Columnaris, virus positive unknown	5
ESC, PGD	1
ESC, virus positive unknown	6
No infectious disease agent	11
PGD	3
PGD, <i>Edwardsiella tarda</i>	1
Total	48

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.

The faculty at the ADL has continue research in understanding of the both *Edwardsiella ictaluri* and *Flavobacterium columnare* in the pond environment. This will allow for predicting outbreaks and better management schemes for these diseases. Molecular methods of determining these bacterial pathogens in pond water are also in the final stages of development.

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 where we do not know the 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:

Griffin MJ, Khoo L, Torrains L, Bosworth B, Quiniou S, Gaunt P, Pote L. (2009) New Data On *Henneguya Pellis* (Myxozoa: Myxobolidae) Parasitizing Blue Catfish *Ictalurus furcatus*. *Journal of Parasitology*. 95: 1455–1467.

Griffin M, LM Pote, AC Camus, MJ Mael, TE Greenway, DJ Wise. (2009). Application of a real-time polymerase chain reaction assay for the detection of *Henneguya ictaluri* in commercial channel catfish ponds. *Diseases of Aquatic Organisms*. 86:223-233

Griffin, M. J., D. J. Wise and L. M. Pote. (2009). Morphology and small-subunit ribosomal DNA sequence of *Henneguya adiposa* (Myxosporea) from *Ictalurus punctatus* (Siluriformes). *Journal of Parasitology*. 95: 1076-1085.

Li, MH, Robinson EH, Tucker CS, Manning, BB, L Khoo. (2009) Effects of dried algae *Schizochytrium* sp., a rich source of docosahexaenoic acid, on growth, fatty acid composition, and sensory quality of channel catfish *Ictalurus punctatus*. *Aquaculture*, 292:232-236.

Welch, T. J., J. Evenhuis, D. G. White, P. F. McDermott, H. Harbottle, R. Miller, M. Griffin and D. Wise. (2009). IncA/C plasmid-mediated Florfenicol resistance in the catfish pathogen *Edwardsiella ictaluri*. *Antimicrobial Agents and Chemotherapy*. 53: 845-846.

Presentations, Abstracts and Posters:

Gaunt PS (2009) An Overview of Florfenicol Use in Catfish: Studies in Efficacy, Safety, and Pharmacokinetics Intervet-Schering Plough Animal Health Aquaculture Technical Services Meeting January 19-20, 2009, Summit New Jersey

Gaunt PS, Wrzesinski C, Langston C, Crouch L, Polk R, Gao D, Endris R. (2009) Pharmacokinetics of Aquaflor in Channel Catfish Midcontinent Warmwater Workshop Meeting February 2-4, 2009. Council Bluffs, Iowa

Gaunt PS, Wrzesinski C, Langston C, Crouch L, Polk R, Gao D, Endris R. (2009) Pharmacokinetics of Aquaflor in Channel Catfish Aquaculture America Feb 2009 Seattle WA

Gaunt PS, Gao D, Sun F, Endris R (2009) Efficacy Of Florfenicol (Aquaflor®) Administered To Channel Catfish For Control Of Mortality Associated With *Flavobacterium columnare* Catfish Farmers of America March 6-7 2009 Natchez, MS

Gaunt PS, Kalb SR, and Barr JR (2009) Catfish Neutralization and Endopep Mass Spectrometric Assays to Detect the Presence of Botulinum in Catfish. Paper #269 AGRO 238th American Chemical Society National Meeting Washington DC. Aug 16-20, 2009.

Gaunt PS and Khoo L (2009) Proper Use of Antimicrobials in Catfish Aquaculture National Warmwater Aquaculture Center Fall Seminar 2009 Capps Center, Stoneville, Mississippi, December 4, 2009.

Gaunt PS and Khoo L (2009) Proper Use of Antimicrobials in Catfish Aquaculture Thad Cochran National Warmwater Aquaculture Center Winter Seminar 2009 Noxubee County Civic Center, Macon, Mississippi, December 4, 2009.

Griffin MJ, DJ. Wise, MJ. Mael, LM. Pote, A. Camus, C. Ware, C. Doffitt, M. Yost, TE. Greenway and L. Khoo. 2009. Real-Time PCR Detection of Water-Borne Pathogens from Commercial Catfish Ponds. Annual Meeting Fish Health Section of the American Fisheries Society, Park City, UT, June 8-10, 2009.

Griffin MJ, MJ. Mael, C. Ware, L. Khoo, TE. Greenway, and DJ. Wise. 2009. A Real-time Polymerase Chain Reaction Assay for the Detection of *Edwardsiella ictaluri* in Pond Water. 34th Annual Eastern Fish Health Workshop. Lake Placid, NY, April 27 – May 1, 2009

Khoo, L, Wise DJ, Pote LM, Mitchell AJ, Byars TS, Yost MC, Doffitt CM, Dorr BS, George BA, King DT, Hanson TR, Tucker CS, Greenway TE, Griffin MJ, Camus AC, Panuska CC. Ameliorating the effects of the digenetic trematode, *Bolbophorus damnificus* on the channel catfish industry. Third Bilateral Conference on Aquatic Animal Health between Russia and the United States, p. 17 Shepherdstown, WV, July 12-20 2009

Marancik, D., M. Griffin, A. Camus. Characterization of a novel *Myxobolus* sp. infecting the gills of a koi *Cyprinus carpio*. In proceedings of the Eastern Fish Health Workshop. Lake Placid, NY, April 27 –May 1, 2009.

Mississippi State University - College of Veterinary Medicine
Aquatic Research & Diagnostic Laboratory - Stoneville, MS
2009 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
<i>Acinetobacter</i> spp.				1									1
<i>Aeromonas hydrophilia</i>						2		3	5	1			11
Anemia					1		1	4	2				8
Anemia, <i>E. tarda</i>								1					1
Anemia, Columnaris, Enteric Septicemia (ESC)									3				3
Anemia, Columnaris, ESC, PGD									1				1
Anemia, Columnaris (Col)						1	1	1		2			5
Anemia, ESC									1				1
Brown Blood			1							3			4
CCV, <i>Aeromonas</i>							1						1
CCV, Branchiomycosis						1							1
CCV, Columnaris						1	14	2					17
CCV, Columnaris, <i>Aeromonas</i>							1	1					2
CCV, Columnaris, <i>Aeromonas</i> , ESC							1	2					3
CCV, Columnaris, ESC								11	4				15
CCV, ESC								2	1	1			4
CCV, ESC, PGD									1				1
Chanel Catfish Virus (CCV)							3	2					5
Columnaris			6	15	3	3	1	5	1				34
Columnaris, <i>Aeromonas</i>						2	1		1				4
Columnaris, <i>Aeromonas</i> , PGD										1	3		4
Columnaris, <i>Aeromonas</i> , Saprolegnia										1	1		2
Columnaris, <i>E. tarda</i>							1						1
Columnaris, ESC						3			1				4
Columnaris, ESC, PGD, Saprolegnia						2							2
Columnaris, ESC, PGD, Trematode						1							1

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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, Gas Bubble Disease										1	2		3
Columnaris, <i>Ichthyophthirius</i> (Ich)				2									2
Columnaris, PGD			1	11			1						13
Columnaris, PGD, <i>Ichthyophthirius</i>				1									1
Columnaris, PGD, Saprolegnia			1	3									4
Columnaris, <i>Plesiomonas Shigelloidies</i>							1						1
Columnaris, Saprolegnia	4		9								1		14
Columnaris, Saprolegniosis, <i>Ichthyophthirius</i>			1										1
Columnaris, Trematode				1									1
Columnaris, Viral Infection							1						1
<i>E. tarda</i>								1					1
<i>E. tarda</i> , <i>Aeromonas</i>						1							1
<i>E. tarda</i> , PGD					7						1		8
<i>E. tarda</i> , PGD, ESC					1								1
<i>E. tarda</i> , Trematode						1							1
Enteritis									4				4
Enteritis, <i>Acinetobacter Iwoffii</i>									1				1
Enteritis, <i>Aeromonas hydrophilia</i>									1				1
Enteritis, <i>Shigella dysenteriae</i>									1				1
<i>Enterobacter cloacae</i>								1					1
Epitheliocystis, Hepatic Lipidosis										2			2
ESC					1	6	2	2	3		2		16
ESC, Gas Bubble Disease				1									1
ESC, PGD				2	4	3							9

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Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total
PGD, VTC, suspect				1									1
<i>Plesiomonas shigelloides, Ichthyophthirius</i>				1		1	1						3
Research							1			3			4
Saprolegnia	4	9	12										25
Saprolegnia, <i>Ichthyophthirius</i>			1										1
Saprolegnia, PGD, <i>Aeromonas</i>			1										1
Saprolegnia, VTC suspect				2									2
Saprolegnia, VTC suspect, <i>Columnaris</i>			1										1
Steatitis				2									2
Steatitis, PGD					1								1
Systemic Scuticociliatosis						1							1
Toxin (overspray, suspect)						1							1
Toxin, algal							1						1
Toxin, algal, PGD								1					1
Trematode						4		1					5
Trematodes (non-Bulbophorus)							1						1
Undetermined		1	1										2
VHS testing			44								30	9	83
<i>Vibrio</i>				1									1
Virus pos.,unknown, <i>Columnaris Aeromonas</i>								1					1
Virus pos.,unknown,ESC, <i>Columnaris,Aeromonas</i>								3					3
Virus pos.,unknown, ESC, <i>Columnaris, Saprolegnia</i>								1					1
Virus positive unknown, <i>Aeromonas</i> ,ESC									2	1			3
Virus positive unknown, <i>Columnaris</i>									4	2			6
Virus positive, unknown									13	1			14

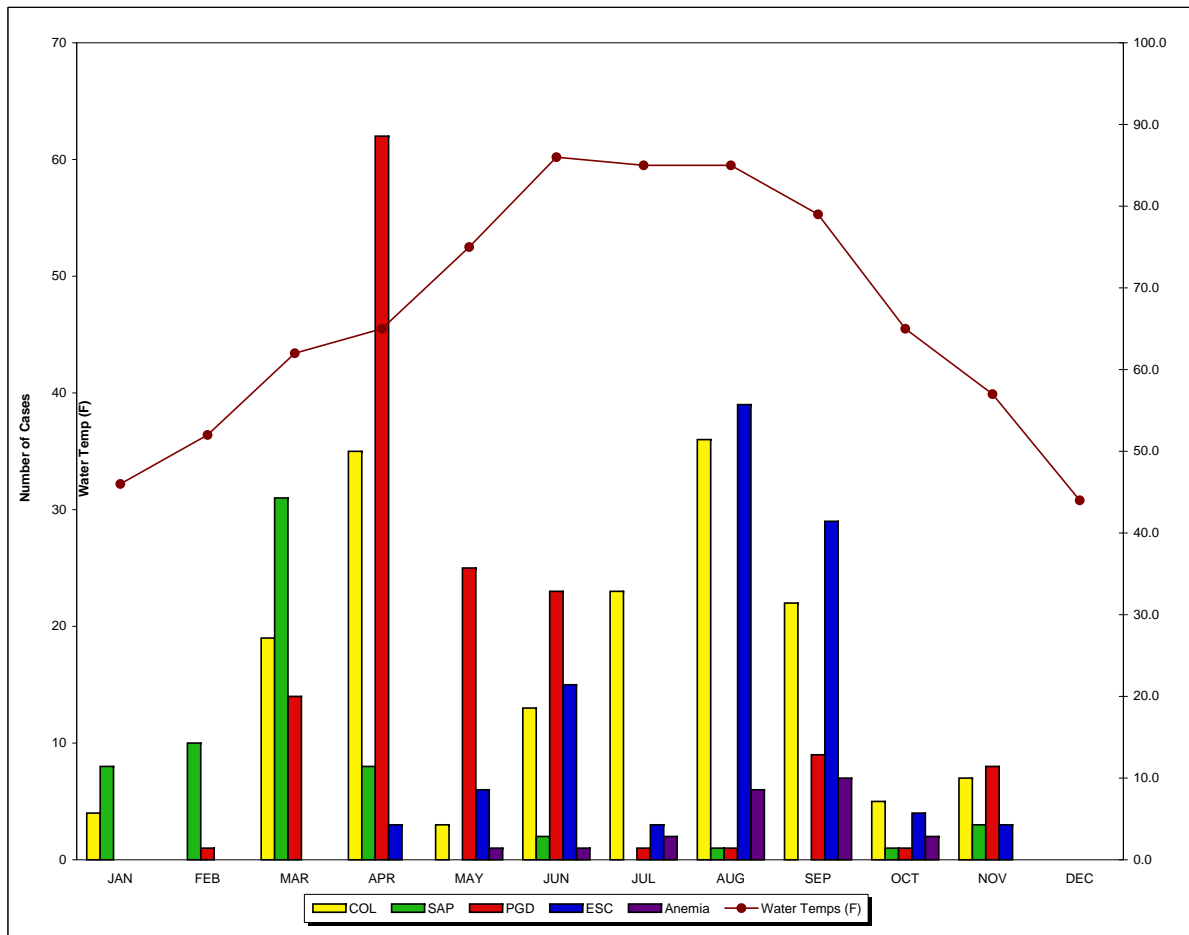
**Mississippi State University - College of Veterinary Medicine
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Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	
Virus positive, unknown , <i>Klebsiella oxytoca</i>								1					1	
Virus positive, unknown, <i>Acinetobacter lwoffii</i>										2			2	
Virus positive, unknown, <i>Aeromonas</i>									1	1			2	
Virus positive, unknown, ESC								8	5	2			15	
Virus positive, unknown, <i>Aeromonas</i> , PGD										1			1	
Virus positive, unknown, ESC, Columnaris								9	7				16	
Visceral Toxicosis of Catfish, confirmed	1		2	2									5	
VTC suspect, PGD, Columnaris				1									1	
VTC suspect, PGD, Columnaris, Saprolegnia				1									1	
VTC, Saprolegnia			2										2	
VTC, suspect			4	4									8	
Summary														
Cases submitted by Farmers	11	12	119	108	31	48	39	68	78	13	48	11	586	
Cases submitted for Research	0	0	2	4	6	21	13	4	15	23	4	0	92	
Channel Catfish														
Channel catfish cases	11	11	116	110	36	62	43	44	73	32	46	10	594	
Blue catfish cases	0	0	0	1	0	1	2	0	0	0	0	0	4	
Hybrid catfish cases	0	0	1	0	0	2	4	25	12	1	3	0	48	
Other Species	0	1	4	1	1	4	3	3	8	3	3	1	32	
TOTALS													678	
Water Quality														
Water Farms	6	8	12	16	6	14	15	6	13	6	3	2	107	
Quality Ponds	30	36	36	174	176	115	76	23	72	57	44	26	865	

**Mississippi State University - College of Veterinary Medicine
 Aquatic Research & Diagnostic Laboratory - Stoneville, MS
 2009 Annual Case Summary
 Seasonal Occurrence of Major Farm Diseases**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
COL	4	0	19	35	3	13	23	36	22	5	7	0	167
SAP	8	10	31	8	0	2	0	1	0	1	3	0	64
PGD	0	1	14	62	25	23	1	1	9	1	8	0	145
ESC	0	0	0	3	6	15	3	39	29	4	3	0	102
Anemia	0	0	0	0	1	1	2	6	7	2	0	0	19
Water Temps (F)	46.0	52.0	62.0	65.0	75.0	86.0	85.0	85.0	79.0	65.0	57.0	44.0	



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Aquatic Research & Diagnostic Laboratory - Stoneville, MS
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Major Disease Diagnoses as a Percentage of Diagnostic Case Submissions^(*1)

Disease	Total # Disease Cases	% Total Disease Cases
Columnaris	167	24.6%
ESC	102	15.0%
PGD	145	21.4%
Saprolegnia	64	9.4%
CCV	49	7.2%
Anemia	19	2.8%
Brown Blood	4	0.6%
Ich	21	3.1%
VTC	23	3.4%
Health Check ^(*2)	2	0.3%
Bolbophorus	12	1.8%

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

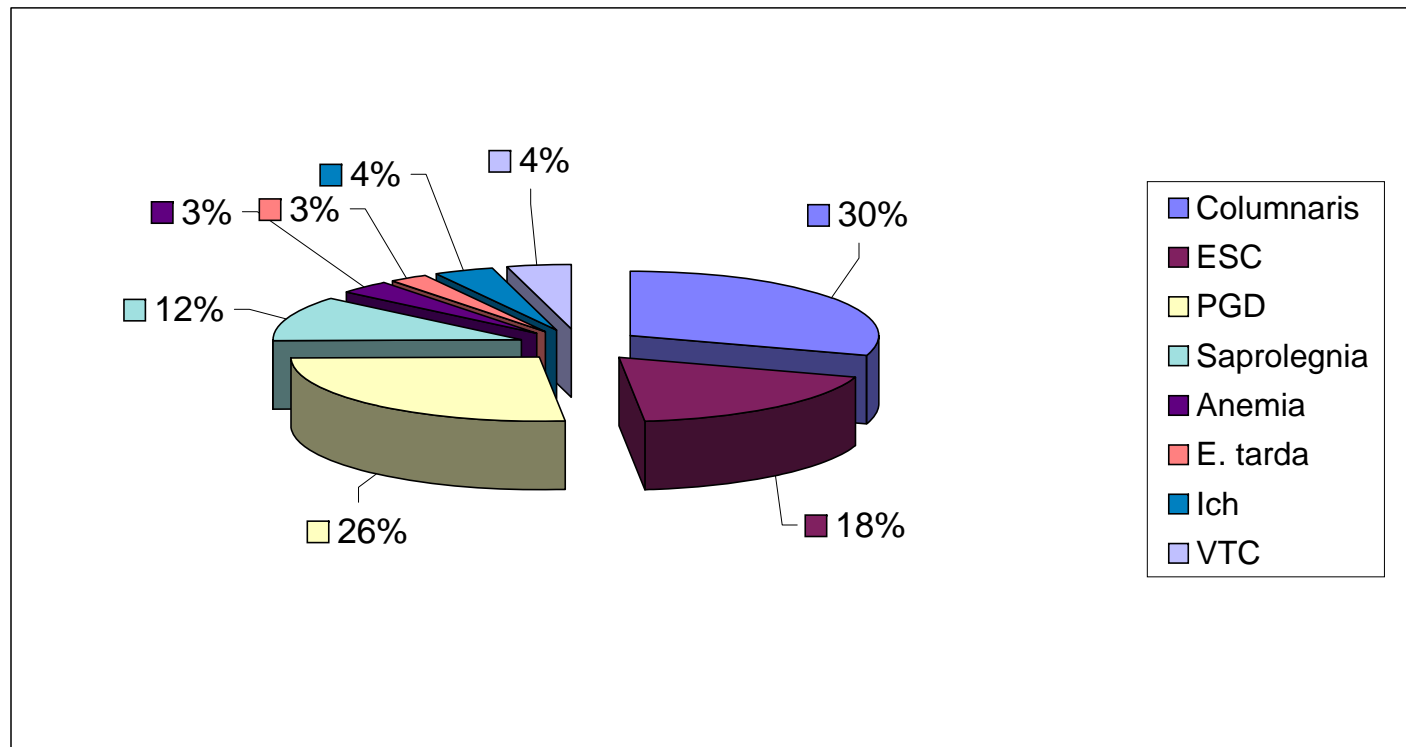
(*2) Cases from healthy ponds for monitoring/pre-purchase exams.

**Mississippi State University - College of Veterinary Medicine
 Aquatic Research & Diagnostic Laboratory - Stoneville, MS
 2009 Annual Case Summary
 Incidence of Antibiotic Resistance**

Organism	# Tested	Romet (%)	Terramycin (%)	Aquaflor® (%)	Romet & Terramycin (%)	Romet & Aquaflor® (%)	Terramycin & Aquaflor® (%)
<i>Flavobacterium columnare</i>	167	0	0	0	0	0	0
<i>Edwardsiella ictaluri</i>	102	0	0	0	0	0	0
<i>Edwardsiella tarda</i>	14	0	0	0	0	0	0
<i>Aeromonas spp.</i>	38	0*	7(18%)	0	0*	0*	0
<i>Acinetobacter spp.</i>	4	0*	2(50%)	0	0*	0*	0
<i>Plesiomonas shigelloides</i>	4	0	1(25%)	0	0	0	0
<i>Klebsiella spp.</i>	3	0	0	0	1(33%)	0	0
<i>Shigella dysenteriae</i>	1	0*	0	0	0*	0*	1 (100%)

* several not tested for Romet as disks were not available

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Major Disease Diagnoses as a Percentage of Diagnostic Case Submissions



**Mississippi State University - College of Veterinary Medicine
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 Yearly Trends in Disease Diagnosis as a Percentage of Submissions**

Disease	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Average
Columnaris	42.6	37.2	44.5	44.7	40.9	48.3	68.4	37.5	36.7	24.6	42.5%
ESC	33.5	36.4	39.8	34.7	30.8	33.8	56.5	32.8	18.6	15.0	33.2%
PGD	29.8	20.1	16.3	10.8	10.7	8.9	17.8	18.4	33.7	21.4	18.8%
Saprolegnia	10.5	10.4	10.1	5.3	3.7	4.1	8.4	8	9.2	9.4	7.9%
CCV	2.3	7.3	5.8	8.9	10.8	9.2	5.9	2	0	7.2	5.9%
Anemia	4.9	5	5.3	5.2	2.1	4.6	4.9	10.7	2.7	2.8	4.8%
Ich	2.7	1.8	2.2	0.5	5	1.3	0.8	0.6	0.8	3.1	1.9%
Bolbophorus	5.6	4.4	2	1.1	2.6	3.6	0.7	1.5	0.3	1.8	2.4%
VTC		2.5	2	3.7	3.2	1.0	3.1	1.3	5.4	3.4	2.6%
No Pathogens	15	19.2	16.2	18.3	20.8	12.4	20.3	17.1	17.5	16.1	17.3%
Number of Cases	2189	1602	1057	832	778	602	845	1144	630	678	1036