

## **2006 ANNUAL CASE SUMMARY REPORT AQUATIC 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 effect profitability. These goals can only be accomplished through mutual respect, cooperation, and the maintenance of a close supportive relationship with our clients.

### **2006 CVM AQUATIC DIAGNOSTIC LABORATORY SUMMARY**

#### **Diagnostics**

In 2006, the Aquatic Diagnostic Laboratory (ADL) at Stoneville received a total of 845 fish diagnostic cases. These cases were received from 73 farms which represents approximately 20% of the Mississippi industry. This is a 39% increase in the number of submissions over the 607 cases in 2005. There were 954 water quality samples from 226 farms analyzed. This number represents a 38% increase over the 681 samples received from 186 farms submitted in 2005.

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.

The bacterial diseases enteric septicemia of catfish (ESC) and columnaris 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

10.7% of cases, but in combination with other agents was diagnosed in 56.5% of cases (31.3% in 2005). The surge in cases is attributable in part to the introduction of the new antibiotic, florfenicol, which is labeled for the control of mortality of ESC and can only be dispensed by a Veterinary Feed Directive order from a licensed veterinarian. Therefore, producers are encouraged to submit fish immediately if they suspect disease is occurring in a pond, and they intend to use *any* medicated feed. Columnaris singly accounted for 13.7% of cases, but in combination with other pathogens, columnaris was present in 68.4% of all cases (49.4% in 2005), making it the most common disease seen by the ADL. ESC and columnaris were diagnosed together in 14.8% 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 37.2% and columnaris in 44.1% 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 17.8% of cases (8.4% in 2005). Saprolegnia, the cause of winter fungus, was present in 8.4% of cases, up from 4.0% in 2005. The number of channel catfish virus (CCV) disease cases decreased from 9.2% in 2005 to 5.9% in 2006 but remained above the 10-year average of 4.6%. The number of channel catfish anemia (CCA) cases rose from 4.6% in 2005 to 4.9% for 2006 and remained above the 10-year average of 4.0%. *Ichthyophthirius multifiliis* (Ich) cases decreased from 1.3% last year to 0.8% in 2006, below the 10-year average of 1.3%. Cases of visceral toxicosis (VTC) increased to 3.1% in 2006 from 0.9% in 2005.

The number of *Bolbophorus* trematode cases decreased to 0.7% for 2006, and 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.

In June 2006 the ADL laboratory director Dr. Al Camus left MSU for the University of Georgia, and Dr. Pat Gaunt assumed the role of interim director. Dr. Lester Khoo will return to MSU as laboratory director in the summer of 2007.

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 service offered at no cost to them.

## Highlights

The antibiotic florfenicol (Aquaflor®) was approved for use in catfish to control mortality associated with ESC in October of 2005. Beginning Spring 2006, Veterinary Feed Directive (VFD) orders were written by licensed veterinarians for fish showing signs of ESC. Veterinarians in the ADL instructed producers and veterinary practitioners on the correct use of the drug. Florfenicol-medicated feed is fed for 10 days and a

withdrawal time of 12 days must be observed prior to processing. The drug's sponsor Schering–Plough Animal Health 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) seen in the early spring and late fall has determined that it is caused by botulinum toxin present in aquatic habitats under certain environmental conditions. Farmers are encouraged to bring fish suspected of dying from VTC to the Aquatic Diagnostic Laboratory in Stoneville. Ongoing VTC research requires a supply of blood from affected fish. Future studies are planned to determine the exact source of the toxin.

Research into the cause of channel catfish anemia demonstrated a rapid and complete resolution of the condition in affected fish following the administration of parenteral iron in two separate trials. Collaborative research efforts with Auburn University College of Veterinary Medicine demonstrated the antimicrobial peptide, hepcidin, was regulated by iron levels and anemia in catfish.

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.

A species of trematode, *Bolbophorus* sp. was identified as a cause of fish losses, reduced feed consumption, and poor production efficiency. Economic analysis of these data estimated the disease costs the catfish industry \$45 million annually. Experimental and commercial field trials demonstrated trematode infections can be effectively controlled with the strategic use of hydrated lime and copper sulfate.

To support diagnostic and research efforts, a new epidemiology program has begun to investigate new and emerging diseases, identify environmental and management factors that influence disease outbreaks, and to identify risk factors that effect production efficiency.

### **Scientific Publications:**

Gaunt P. 2006. Veterinarians' role in the use of veterinary feed directive drugs in aquaculture. *Journal of the American Veterinary Medical Association*. 229 (3):1-3.

Gaunt, P., McGinnis, A., Santucci, T., Cao, J., Waeger, P., Endris R. 2006. Field efficacy of florfenicol for control of mortality in channel catfish, *Ictalurus punctatus* (Rafinesque), caused by infection with *Edwardsiella ictaluri*. *Journal of the World Aquaculture Society*. 37 (1):1-11.

Wrzesinski, C., Crouch, L., Gaunt, P., Holifield, D., Bertrand, N., and Endris, R. 2006. Florfenicol residue depletion in channel catfish, *Ictalurus punctatus* (Rafinesque). *Aquaculture*. 253: 309-316.

### **Technical Bulletins/Popular Articles:**

Camus, A.C., Gaunt P., Mauel M.J. 2006. 2005 CVM Aquatic Diagnostic Laboratory Summary. *The Catfish Journal* 19 (12): 8-10.

Camus, A.C., Gaunt P., Mauel M.J. 2006. 2005 CVM Aquatic Diagnostic Laboratory Summary. *NWAC News* 9:6-7.

Gaunt P and Kingsbury S. 2006. Tim Santucci leaves mark on Stoneville diagnostic lab. *The Catfish Journal* 19 (10): 9. Reprinted with permission in: *The Leland Progress*. June 22, 2006:8

### **Presentations, Abstracts and Posters:**

Gaunt, P. Catfish Botulism. NWAC Fall Seminar 2006. November 10, 2006, Stoneville, MS.

Gaunt, P. Overview of florfenicol (Aquaflor®) research in channel catfish: efficacy, safety, residue depletion studies, and implication for the catfish industry. *Catfish Marketing Association Meeting*, April 4, 2006, Greensboro, AL.

Gaunt, P., Gaikowski, A., Wrzesinski, M., McGinnis, C., Endris, R., Khoo, L., Santucci, T., and Endris, R. 2006.

Overview Of Aquaflor® research in channel catfish: Efficacy, Safety, And Residue Depletion Studies. Catfish Farmers of America.

Gaunt, P., Kalb, S.R., and Barr, J.R. Catfish neutralization and endopep mass spectrometric assays to detect the presence of botulism in catfish. 43rd Interagency Botulism Research Coordinating Committee Meeting November 14-17, 2006, Silver Spring, MD.

Griffin, M, Camus, A.C., Pote L.M., Mael, M.J., and Wise, D.J. 2006. Evaluation of a real-time polymerase chain reaction assay for the detection of myxospore stages of *Henneguya ictaluri*. Fifth International Symposium on Aquatic Animal Health, San Francisco, CA.

Soto, E., Lawrence, M., Karsi, A., and Mael, M.J. 2006, Genetic diversity of *Flavobacterium columnare* strains from the Southeast U.S. demonstrated by Pulsed Field Gel Electrophoresis, Fifth International Symposium on Aquatic Animal Health, San Francisco, CA

Wise, D.J., Li, M.H., Camus, A.C., and Robinson, E.H. 2006. Effects of variable periods of feed deprivation on the development of enteric septicemia of catfish. 2006 Catfish Farmers of America Research Symposium. Feb 24-26. 2006, Hyatt Regency, San Antonio, Texas .

### **Grants and Contracts:**

Catfish Health Research Initiative. Sponsor: USDA-ARS. Investigators: A Camus, M Mael, and P Gaunt. 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.

Mississippi State University - College of Veterinary Medicine

Fish Diagnostic Laboratory - Stoneville, MS

2006 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	4	53	31	4	34	4	16	1	3	5	155	13.66%
Col, Enteric Septicemia (ESC)	0	0	0	3	11	12	44	20	65	12	1	0	168	14.80%
Col, Channel Catfish Anemia (CCA), ESC	0	0	0	0	1	0	0	0	0	2	0	0	3	0.26%
Columnaris, ESC & Saprolegnia	0	0	0	1	0	0	0	0	0	0	0	0	1	0.09%
Columnaris, Parasitism	0	0	0	0	0	0	1	1	0	0	0	0	2	0.18%
Columnaris, Saprolegnia, CCA	0	0	1	0	0	0	0	0	0	0	0	0	1	0.09%
ESC	0	0	4	3	13	13	17	20	34	14	3	0	121	10.66%
ESC, Columnaris, Parasitism	0	0	0	0	0	1	0	0	0	0	0	0	1	0.09%
CCV	0	0	0	0	0	4	6	1	0	0	0	0	11	0.97%
CCV & Columnaris	0	0	0	0	0	7	12	2	0	0	0	0	21	1.85%
CCV, ESC, & Columnaris	0	0	0	0	0	0	2	1	0	0	0	0	3	0.26%
CCV & PGD	0	0	1	0	0	0	0	0	0	0	0	0	1	0.09%
CCA	1	1	0	0	1	0	0	4	2	3	0	0	12	1.06%
CCA & Columnaris	0	0	0	1	0	0	0	1	0	0	0	1	3	0.26%
CCA & ESC	0	0	0	0	1	0	0	0	2	6	1	0	10	0.88%
VTC & ESC	0	0	1	0	0	0	0	0	0	0	0	0	1	0.09%
Visceral Toxicosis of Catfish (VTC)	0	0	0	1	0	0	0	0	0	0	1	0	2	0.18%
VTC (presumptive)	0	1	5	4	0	0	0	0	0	0	2	0	12	1.06%
VTC & Columnaris	0	0	0	3	0	0	0	0	0	0	0	0	3	0.26%
VTC, Saprolegnia	0	0	0	0	0	0	0	0	0	0	1	0	1	0.06%

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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	%
Saprolegnia	8	3	13	1	0	0	0	0	0	0	0	1	26	2.29%
Saprolegnia, PGD	0	0	4	0	0	0	0	0	0	0	2	0	6	0.53%
Saprolegnia, Columnaris, PGD	0	0	2	0	0	0	0	0	0	0	0	0	2	0.18%
Saprolegnia, Columnaris	0	2	9	1	0	1	0	0	0	0	0	1	14	1.23%
PGD	0	0	2	21	8	3	0	0	1	3	4	4	46	4.05%
PGD, Columnaris	0	0	1	16	2	0	0	0	0	0	1	0	20	1.76%
PGD, ESC	0	0	0	3	2	0	1	0	3	3	3	2	17	1.50%
PGD, Trematode	0	0	0	0	0	1	0	0	0	0	0	0	1	0.09%
Parasitism	0	0	2	3	1	0	0	1	0	0	0	0	7	0.62%
PGD, ESC, Columnaris	0	0	0	4	3	1	0	0	4	2	1	0	15	1.32%
<i>E. Tarda</i>	0	0	0	0	1	0	0	0	0	0	0	0	1	0.09%
Parasitism, ESC, Col	0	0	0	0	0	0	0	0	2	0	0	0	2	0.18%
<i>E. Tarda</i> & Columnaris	0	0	0	0	0	0	0	0	0	1	0	0	1	0.09%
<i>Vibrio</i>	0	0	0	0	4	0	0	0	0	0	0	0	4	0.35%
<i>Aeromonas hydrophilia</i>	0	0	0	0	0	0	0	1	0	0	1	1	3	0.26%
Ich	0	0	5	0	0	0	0	0	0	0	0	0	5	0.44%
Death by Trauma	0	0	0	0	0	1	0	0	0	0	0	0	1	0.09%
Death by Starvation	0	0	0	2	0	0	0	0	0	0	0	0	2	0.18%
Branchiomyces	0	0	0	0	0	4	5	0	0	0	0	0	9	0.79%
Health Check	6	4	9	8	12	27	14	8	13	8	11	3	123	10.84%

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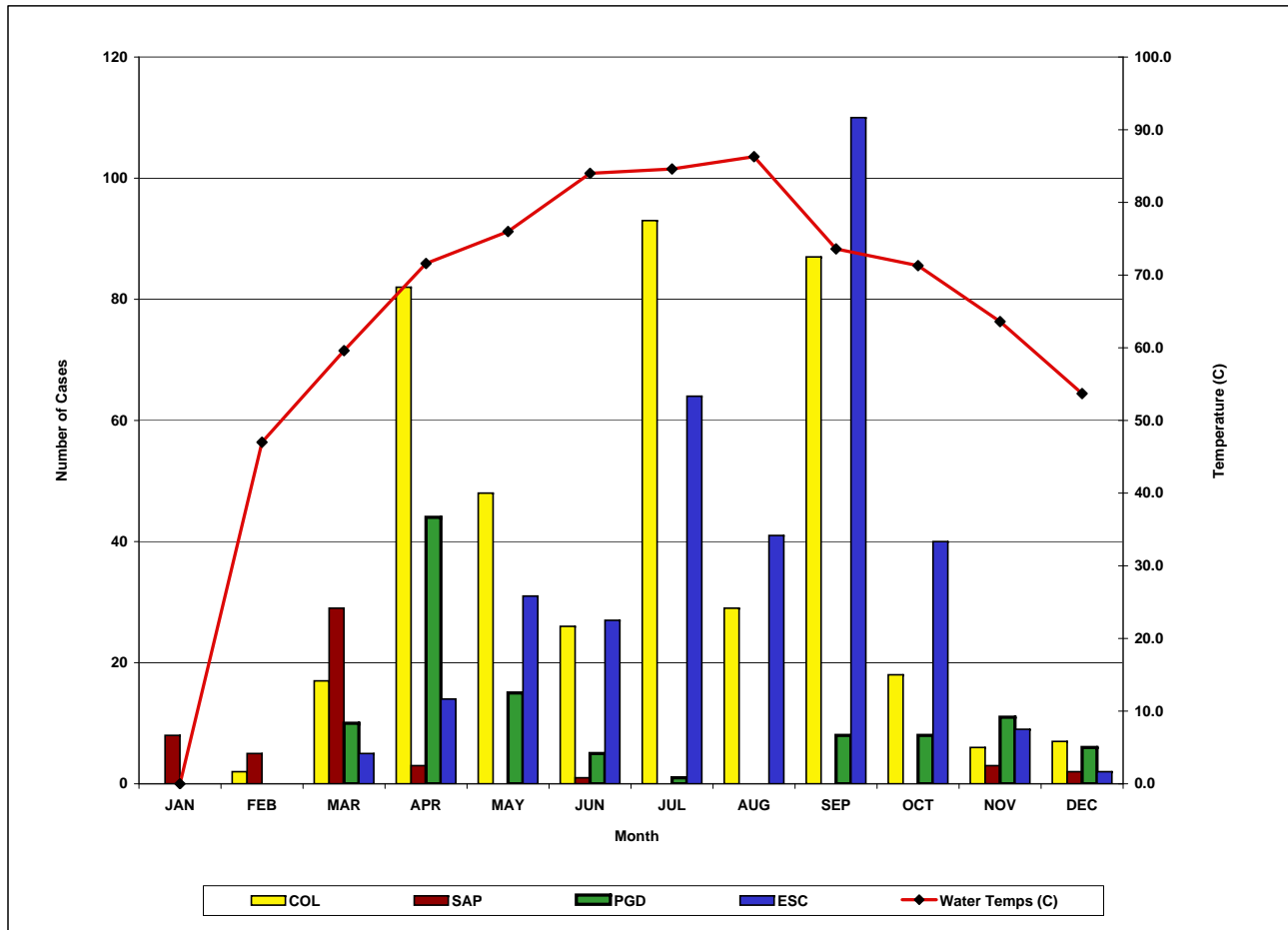
Disease Diagnoses as a Percentage of Total Case Submissions (Diagnostic & Research)

Disease	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Total	%
Undetermined	0	0	0	1	1	1	0	0	1	2	1	0	7	0.62%
ESC,CCA & E. tarda	0	0	0	0	0	0	0	0	0	1	0	0	1	0.09%
													0	0.00%
													0	0.00%
													0	0.00%
													0	0.00%
													0	0.00%
													0	0.00%
													0	0.00%
Research	0	0	23	21	16	13	5	111	93	5	2	1	290	25.55%
													0	0.00%
													0	0.00%
Cases submitted by Farmers	15	11	63	129	92	80	136	64	143	58	36	18	845	74.45%
Cases submitted for Research	0	0	23	21	16	13	5	111	93	5	2	1	204	25.55%
Catfish Cases	15	11	86	149	118	92	141	165	234	61	36	19	1127	99.3%
Other Species	0	0	0	1	0	1	0	0	2	2	2	0	8	0.7%
<b>TOTALS</b>	<b>15</b>	<b>11</b>	<b>86</b>	<b>150</b>	<b>118</b>	<b>93</b>	<b>141</b>	<b>165</b>	<b>236</b>	<b>63</b>	<b>38</b>	<b>19</b>	<b>1135</b>	<b>100%</b>
<b>Water</b> Farms	<b>6</b>	<b>3</b>	<b>10</b>	<b>24</b>	<b>22</b>	<b>26</b>	<b>23</b>	<b>31</b>	<b>31</b>	<b>27</b>	<b>17</b>	<b>6</b>	<b>226</b>	
<b>Quality</b> Ponds	<b>27</b>	<b>4</b>	<b>41</b>	<b>120</b>	<b>120</b>	<b>139</b>	<b>106</b>	<b>57</b>	<b>106</b>	<b>135</b>	<b>71</b>	<b>28</b>	<b>954</b>	



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 Seasonal Occurrence of Major Farm Diseases

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTALS
<b>COL</b>	0	2	17	82	48	26	93	29	87	18	6	7	<b>415</b>
<b>SAP</b>	8	5	29	3	0	1	0	0	0	0	3	2	<b>51</b>
<b>PGD</b>	0	0	10	44	15	5	1	0	8	8	11	6	<b>108</b>
<b>ESC</b>	0	0	5	14	31	27	64	41	110	40	9	2	<b>343</b>
<b>Water Temps (C)</b>	51.6	47.0	59.6	71.6	76.0	84.0	84.6	86.3	73.6	71.3	63.6	53.7	



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**Major Disease Diagnoses as a Percentage of Diagnostic Case Submissions<sup>(\*1)</sup>**

<b>Disease</b>	<b>Total # Disease Cases</b>	<b>% Total Disease Cases</b>
Columnaris	415	68.4%
ESC	343	56.5%
PGD	108	17.8%
Saprolegnia	51	8.4%
CCV	36	5.9%
Anemia	30	4.9%
Brown Blood	0	0.0%
Ich	5	0.8%
VTC	19	3.1%
Health Check <sup>(*2)</sup>	123	20.3%
Bolbophorus	4	0.7%

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

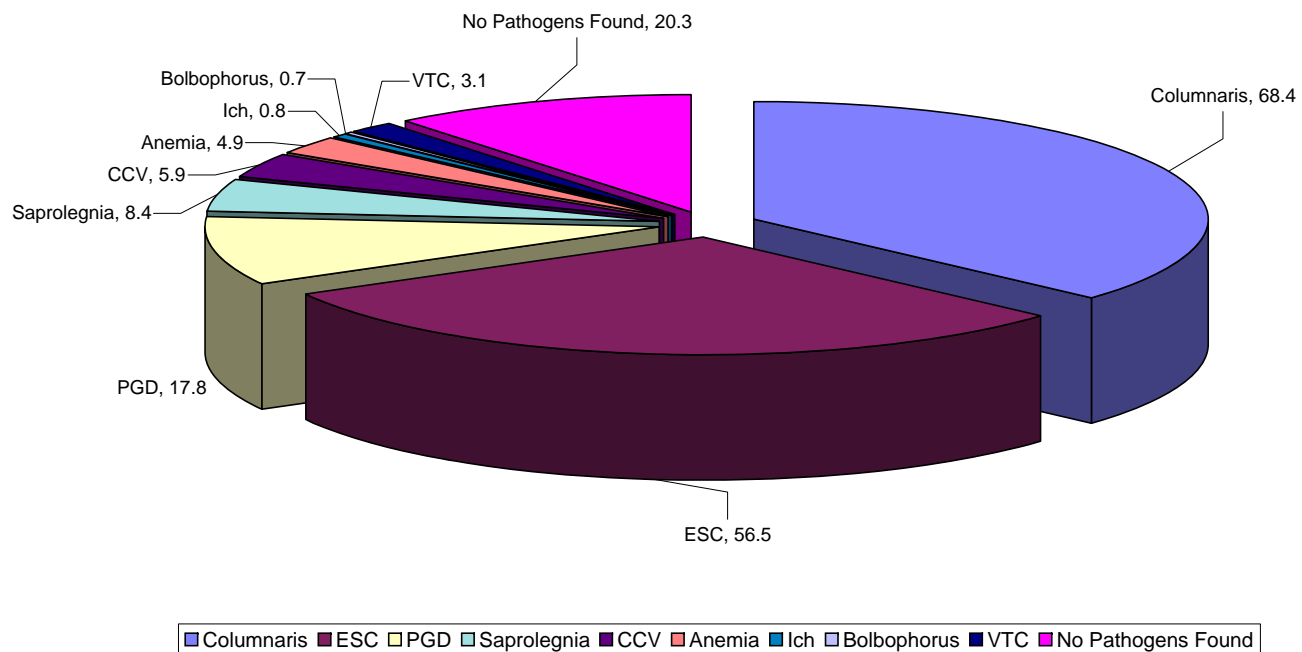
(\*2) Cases from healthy ponds for monitoring/pre-purchase exams.

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 Incidence of Antibiotic Resistance

Organism	# Tested	Romet Only	Percent	Terramycin Only	Percent	Florfenicol Only	Percent	All three	Percent
<i>Flavobacterium columnare</i>	415	0	0.0%	1	0.0%	N/A	N/A	0	0.0%
<i>Edwardsiella ictaluri</i>	343	0	0.0%	0	0.0%	0.0%	0.0%	0	0.0%
<i>Edwardsiella tarda</i>	3	0	0.0%	1	33.3%	N/A	N/A	0	0.0%
<i>Aeromonas</i>	3	0	0.0%	0	0.0%	N/A	N/A	0	0.0%

*N/A: Florfenicol not approved and not tested for sensitivity in Flavobacterium columnare, Edwardsiella tarda, or Aeromonas*

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Major Disease Diagnoses as a Percentage of Diagnostic Case Submissions



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**Trends in Disease Diagnoses as a Percentage of Diagnostic Case Submissions Over Time**

<b>Average</b>	<b>Disease</b>	<b>2006</b>	<b>2005</b>	<b>2004</b>	<b>2003</b>	<b>2002</b>	<b>2001</b>	<b>2000</b>	<b>1999</b>	<b>1998</b>
44.1%	Columnaris	68.4	48.3	40.9	44.7	44.5	37.2	42.6	45.5	44.8
37.2%	ESC	56.5	33.8	30.8	34.7	39.8	36.4	33.5	41.2	41.2
21.7%	PGD	17.8	8.9	10.7	10.8	16.3	20.1	29.8	30	16.3
8.6%	Saprolegnia	8.4	4.1	3.7	5.3	10.1	10.4	10.5	8.7	8.6
4.6%	CCV	5.9	9.2	10.8	8.9	5.8	7.3	2.3	1.8	3.1
4.0%	Anemia	4.9	4.6	2.1	5.2	5.3	5	4.9	2.8	3.0
1.3%	Ich	0.8	1.3	5	0.5	2.2	1.8	2.7	0.7	0.5
2.9%	Bolbophorus	0.7	3.6	2.6	1.1	2	4.4	5.6	1.5	
2.7%	VTC	3.1	1.0	3.2	3.7	2	2.5			
16.1%	No Pathogens Found	20.3	12.4	20.8	18.3	16.2	19.2	15	15.2	11.4
1339	Number of Cases	845	602	778	832	1057	1602	2189	2007	1647