Fish Health Inspection History for Michigan State Fish Hatcheries and Wild Salmonid Stocks for the Period 1972-1991

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Annual Inspection History of State of Michigan Fish Hatcheries and Wild Salmonid Stocks for the Period 1972-1991

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The six state fish hatcheries and three anadromous salmonid species spawned for hatchery production were inspected on an annual basis for specific fish pathogens. The results permitted a hatchery classification system based on disease(s) detected, and served as a guideline for transfers between hatcheries, for stocking in the wild, and for shipment to other states for use in their hatchery programs. Using the hatchery classifications obtained, Michigan hatchery personnel were able to control the spread of certain infectious diseases to other stations, and prevent the stocking of fish carrying certain pathogens into waters not known to have these infectious agent(s).

Fisheries Division has a charge to "...protect the public trust in aquatic resources...." Part of that trust is to assure the optimum quality of fish health in hatchery-reared fishes destined for public waters. Since the continued success in management of the fishery resources of the state is strongly dependent upon hatchery-reared fish, the success of the hatchery program is of paramount importance. A part of the hatchery success depends upon the capability to rear healthy fish free from disease-induced mortalities, and to minimize the spread of diseases into natural waters.

The only effective way to control the spread of specific fish diseases is through wise management based upon annual fish health inspections of production fish and broodstocks to ascertain what diseases the stocks have, and thereby take appropriate control measures.

Since 1970, the State of Michigan in cooperation with the U. S. Fish and Wildlife Service, Fish Disease Control Center at Lacrosse, Wisconsin, has been inspecting Michigan hatcheries and anadromous salmonid stocks for specific serious fish diseases. In 1973, the Great Lakes Fishery Commission established a Fish Disease Control Committee to formulate a fish disease control policy and recommend measures to reduce disease-induced mortalities of hatchery stocks of fish, minimize the spread of fish diseases into the Great Lakes basin, and protect against the introduction of exotic fish diseases. The State of Michigan has endorsed these recommendations, (Hnath 1985) and has been working towards the goals established by the committee.

Methods

Each production fish hatchery and spawning population of anadromous salmonids was inspected annually for those specific pathogens of concern to the Great Lakes Fish Disease Control Committee. The pathogens examined for, are: viral hemorrhagic septicaemia virus, infectious hematopoietic necrosis virus, infectious pancreatic necrosis virus, whirling disease (*Myxobolus cerebralis*) bacterial kidney disease (*Renibacterium salmoninarum*), furunculosis (*Aeromonas salmonicida*), and enteric redmouth (*Yersinia ruckeri*). The inspection procedures used are described Hnath (1985) and McDaniel (1975).

Annually all lots of fish at each state fish hatchery were inspected for the presence of specific fish diseases as recommended (Hnath 1985). Each hatchery was classified on the basis of the inspection data, and an annual report was submitted to the Great Lakes Fishery Commission and all member agencies, in the United States and Canada.

All wild salmonid stocks used as egg sources for hatchery production were also inspected during the spawning period, with additional inspection of these stocks while they were in production hatcheries.

On-site diagnostic services were performed in cases of fish mortalities or disease problems at hatcheries, in order to keep abreast of problems, and to keep hatchery classifications current.

Diagnostic services were also performed for problems occurring in fish populations in the wild, and for private aquaculturists.

Results

One hundred and sixteen hatchery and field inspections were performed, and one complete hatchery disinfection. A summary of these follows (Tables 1 and 2).

Two hundred and forty-one diagnostic services were performed for state hatcheries, 232 diagnostic services on natural fish populations, and 101 diagnostic services for private fish farmers. A summary of these services follows Tables 3-5. Continued investigations were made on the mortality of chinook salmon in Lake Michigan. A preliminary report of the investigations on the chinook salmon mortality in Lake Michigan was published as Fisheries Division Technical Report No. 90-4 (Nelson and Hnath 1991), but since data is still being collected for this study, a final report is still pending

Discussion

Through the course of this study, annual fish health inspections of state fish hatcheries and anadromous salmonid spawning populations were performed. The results of these inspections enabled the State of Michigan to set up a hatchery classification system based on the history of fish health inspections. This hatchery and stock classification system has been useful in many ways.

1. The State of Michigan was able to manage its hatchery stocks in such a manner that certain diseases found in one station were not transferred to other stations without those diseases. Because of such restriction, Harrietta State Fish Hatchery is classified as a specific-pathogen-free hatchery. Likewise, the Marquette State Fish Hatchery was specific-pathogen-free until the advent of the epizootic epitheliotropic disease virus (EEDV) of lake trout.

2. Other states have used our the hatchery and stock classifications stocks to determine whether or not they wish to take any of our stocks for their needs, based upon the pathogen(s) involved and whether or not such uses would pose a risk to their fishery resources.

3. The diagnostic services provided identification of pathogens which led to treatment and/or control measures. In the case of the lake trout EEDV, the diagnostics eventually led to the identification by a university researcher of a new viral agent. And this knowledge led to stringent control measures, including station disinfections and stock destructions. Fish with signs of the viral

agent which caused high losses in lake trout production at the Marquette State Fish Hatchery in the past have not been seen at the hatchery since the last chlorine disinfection in the spring of 1989.

Two restricted diseases continue to be found in state fish hatcheries and some wild stocks: bacterial furunculosis and bacterial kidney disease. The latter continues to be found in stocks of chinook salmon from Lake Michigan and has been implicated in mortalities in the lake (Nelson and Hnath 1991). BKD has also been found in feral coho, steelhead, and brown trout from Lake Michigan. Control measures and strategies are now being developed and implemented to bring this disease under control.

Conclusions and Recommendations

Because of the enormous value of the Great Lakes fishery stocks, it is imperative that the State of Michigan be knowledgeable and current in its information about infectious disease(s) in its stocks. Therefore, a constant vigilance must be maintained on hatchery fish destined for Great Lakes plants in order to protect these resources from potentially serious diseases. In order to be knowledgeable and current, an annual fish health inspection program and fish health diagnostic services must be continued as they have been under this study.

Table 1.—Summary of fish health inspections performed and hatchery or stock classifications from October 14, 1970 through November 19, 1990.

Station/stock	Species of fish	Classification[1]	Date	Classification[1]	Date
Gull Lake Richland, Michigan	Atlantic salmon	B-(BF,BK)* B-BF,(BK) C-(BF,BK)	11-13-90 11-13-89 11-18-88		
*Since the stock is from the Wolf Lake State Fish Hatchery (B-BK,BF), it carries the parenthetical classification.					
Swan Creek Weir Rogers City, Michigan Lake Huron	Chinook salmon	C-BK,(BF) C-BK,(BF) one previous	10-08-90 10-04-89		
Pere Marquette River Lake Michigan	Steelhead	C-BK None previous	4-17-89		
Gilchrist Creek Lewiston, Michigan	Brown trout	C* None previous	11-05-90		
*Partial inspection, no ovarian fluids available.					
Harrietta State Fish Hatchery 6801 Thirty Mile Road Harrietta, Michigan	Several	A-1 A-1 A-1 A-1 A-1 B-(BF) B-(BF,BK) B-BK,BF,(VP) B-BK,BF,(VP) B-BK,BF,(VP) B-BK,BF,(VP)	3-19-90 3-27-89 3-14-88 3-02-87 3-18-86 4-25-85 5-03-84 3-03-83 3-08-82 2-19-81 9-22-80	Under construction " " B-BK,BF B-BK,BF B-BK,BF B-BF B-BF None previous	1979 1978 1977 10-12-76 11-04-75 10-07-74 11-02-73 7-11-72
Platte River State Fish Hatchery 15210 U. S.-31 Highway Beulah, Michigan 49617	Several	B-BK,BF B-BK,(BF) B-BK,(BF)* B-BK,BF B-BK B-BK,(VP) B-BK,(BF) B-BK,BF B-BK,BF,(VP) B-BK,BF,VP B-BK,(BF,VP)	5-01-90 4-11-89 4-18-88 3-24-87 3-26-86 4-18-85 4-18-84 4-26-83 4-20-82 3-17-81 4-29-80	B-BK,BF,VP B-BK,BF,(VP) B-BK,BF,VP B-BK,BF,VP,(SW) B-BK,BF,VP,SW B-BK,BF,VP B-VP B-VP None previous	5-01-79 5-16-78 2-09-77 2-10-76 7-07-75 8-19-74 2-02-73 1-31-72
*Although BF was not found in this inspection, it is known to be present in the fish stocks in the river which supplies water to the hatchery.					

Table 1.—Continued:

Station/stock	Species of fish	Classification[1]	Date	Classification[1]	Date
Oden	Several	B-(BK,BF)*	4-2/10-16-90	B-BK,(BF,VP)	9-12-79
State Fish Hatchery		A-2	4-19-89	B-BF,(BK,VP)	3-27-79
3377½ Oden Road		A-2	6-14-88	B-BK,BF,(VP)	10-31-78
Oden, Michigan		A-2	12-01-87	B-VP,BF,(BK)	4-19-78
		B-(BK,BF)	11-05-86	B-BK,(BF)	3-09-77
		B-BK,BF	11-06-85	B-BF,(BK)	3-03-76
		B-BK,BF	12-04-84	B-BK	2-12-75
		B-BK,BF	3-23-83	B-BK,(VP,BF)	2-13-73
		B-BK,BF	11-03-82	B-BF,VP,(BK)	2-18-72
		B-BK,BF	11-04-81	B-BK,BF	1-20-71
		B-BK,BF	8-25-81 (partial)		
		B-BK,BF	2-18-81 (partial)	None previous	
		B-BK,BF	11-20-80		
*Parenthetical BK,BF since transfers were made from Wolf Lake State Fish Hatchery, B-BK(BF).					
Thompson	Several	B-(BK)	4-25-90	B-BK	2-27-80
State Fish Hatchery		B-BK	5-02-89	C-(A-2)	9-10-79
R#2, Box 2555		B-BK,(BF)	5-03-88	C-(A-2)	5-22-79
Manistique, Michigan 49854		B-BK,BF	4-20-87	Under construction	1978
		B-BK	5-06-86	B-BK,(BF,VP)	11-01-77
		B-BK,(BF)	5-21-85	B-VP,(BF,BK)	8-10-76
		B-BF	5-17-84	B-VP,(BF)	8-12-75
		B-BF	5-17-83	B-BK,BF,(VP)	8-26-74
		B-BF,(BK)	5-05-82	B-VP,BK,BF	3-12-73
		B-BK	5-05-81	B-VP,BK,BF	5-31-72
				C-BK,BF	4-28-71
				None previous	
Marquette	Several	A-2,(*)	10-30-90	A-2	10-27-81
State Fish Hatchery		B-(BF,*)	4-24-90	A-2	10-22-80
488 Cherry Creek Road		Disinfected	6-15-89	A-2	10-23-79
Marquette, Michigan 49855		B-(BF)*	10-25-88	A-2	10-17-78
		B-BF*	10-20-87	A-2	10-18-77
		C-(A-2)*	10-28-86	A-2	10-19-76
		C-(A-2)	10-27-85	A-2	10-20-75
		A-2	10-23-84	A-2	10-23-74
		C-(A-2)	6-05-84	B-(BK)	10-17-73
		C-(A-2)	10-25-83	A-2	10-24-72
		C-(A-2)	6-05-83	C-(A-2)	10-19-71
		A-2	10-19-82	C-(A-2)	12-10-70
				None previous	
*High losses in production lake trout in 1986-88 were presumed to be due to EEDV, a newly discovered virus.					

Table 1.—Continued:

Station/stock	Species of fish	Classification[1]	Date	Classification[1]	Date
Wolf Lake	Several	B-BK,(BF)	2-07-90	B-VP,BF,(BK)	2-13-79
State Fish Hatchery		B-BK,BF	2-02-89	B-BF	7-17-78
34270 CR 652		B-BK,BF	2-23-88	B-BF,(BK,VP)	7-07-77
Mattawan, Michigan 49071		B-BK,BF,(BR)*	2-18-87	B-BF,BK,VP	11-23-76
		B-BF,(BK)	3-06-86	B-BF,(VP)	6-17-75
		B-BK,(BF)	11-14-85	B-VP,BF	11-05-74
		B-BK,BF	2-24-84	B-VP	8-20-73
		B-BF,(VP,BK)	2-04-83	B-BF	1-10-73
		C-(VP,BF)	2-22-82	B-VP,BF	5-18-72
		Under construction	1981	C-(A-2)	6-15-71
		"	1980	None previous	
Little Manistee Weir	Steelhead	B-BK	4-16-90	A-2	4-08-80
Manistee, Michigan		B-BK	4-17-89	A-2	4-11-79
Lake Michigan		B-BK	4-06-88	A-2	4-04-78
		A-2	4-04-87	B-(BF)	4-06-77
		A-2	4-08-86	B-BF,(VP)	4-06-76
		A-2	4-09-85	B-VP	4-07-75
		A-2	3-30-84	A-2	4-15-74
		A-2	3-23-83	A-2	4-02-73
		A-2	4-06-82	C-BK	4-06-72
		A-2	4-06-81	None previous	
	Chinook	B-BK,BF	10-01-90	A-2	10-10-79
		B-BK,BF	9-26-89	A-2	10-10-78
		B-BK,BF	10-04-88	A-2	10-05-77
		B-BK,(BF)	10-07-87	A-2	10-20-76
		B-BK,BF	9-30-86	A-2	10-14-75
		B-BF,(BK)	10-08-85	A-2	10-09-74
		B-(BF,BK)	10-03-84	A-2	10-10-73
		B-BF,(BK)	10-10-83	A-2	10-17-72
		B-BK,(BF)	10-08-82	A-2	11-16-71
		B-BF	10-12-81	C-(A-2)	10-14-70
		B-BF	10-08-80	None previous	
	Coho	B-BK,(BF)	10-19-88	B-VP	10-05-77
		B-BF,(BK)	10-19-81	A-2	10-24-73
		B-(BK)	10-07-80	C-(A-2)	11-08-72
		B-BK,(VP)	10-09-79	None previous	
Boardman River Weir	Chinook	B-BK,(BF)	10-03-90	C-BK,(BF)	10-12-88
Traverse City, Michigan		B-BK,(BF)	10-11-89	None previous	
Lake Michigan					

*Classified parenthetical BR because the enteric redmouth organism was detected by Canadian fish health officials in the Skamania steelhead spawners from Lake Michigan.

Table 1.—Continued:

Station/stock	Species of fish	Classification[1]	Date	Classification[1]	Date
Platte River Weir Platte River State Fish Hatchery 15210 U.S.-31 Highway Beulah, Michigan 49617	Chinook	C-BK,(BF)	10-18-88	None previous	
White River Cleveland Creek Lake Michigan (feral spawners) *This was a BKD exam only.	Chinook	C-BK*	10-13-88	None previous	
Platte River Weir Platte River State Fish Hatchery 15210 Honor Highway Beulah, Michigan 49617	Coho	B-BK,BF B-BK,(BF) B-BK,(BF) B-BK,BF B-BK,BF B-BF,(VP,BK) B-VP,(BK,BF) B-BK,BF B-BK,BF B-BF,(VP,BK) B-BF,VP,(BK)	10-23-90 10-17-89 10-17-88 10-13-87 10-22-86 10-17-85 10-23-84 10-17-83 10-26-82 10-14-81 10-28-80	B-BK,(VP) B-BK,VP,(BF) B-VP,(BF,BK) B-BK,VP B-VP B-BK,(VP) B-VP B-VP B-VP,BF C-(A-2) None previous	10-31-79 10-26-78 10-25-77 10-26-76 10-21-75 10-28-74 10-24-73 10-31-72 10-22-71 10-28-70
Charlevoix Great Lakes Station 97 Grant Street Charlevoix, Michigan 49712	Lake trout	A-2 C-(A-2) C-(A-2) C-(A-2) C-(A-2) C-(A-2) C-(A-2) C-(A-2) C-(A-2)	4-11-90 11-14-89 4-28-88 10-28-87 4-15-87 4-23-86 11-06-85 5-08-85 11-01-84	C-(A-2) B-(BK) B-(BK) B-(BK) B-BK A-2 A-2 A-2 A-2 None previous	1-19-84 2-21-78 9-14-77 3-22-77 3-03-76 2-12-75 10-29-74 2-13-73 1-29-71
Lake Superior State University Aquatics Lab Sault St. Marie, Michigan 49783	Several	B-BF B-BF B-BF	8-22-89 8-16-88 8-18-87	C-(A-2) None previous	9-03-86
Pigeon River Research Lakes Vanderbilt, Michigan	Brook trout	B-(BK) B-(BK,BF)	11-07-79 11-08-78	B-BK,(BF) None previous	3-07-77

Table 1.—Continued:

Station	Species of fish	Classification[1]	Date	Classification[1]	Date
Sturgeon River Rearing Station Wolverine, Michigan	Several	Abandoned due to SW C-VP,SW	 2-12-75	C-VP,BF,BK None previous	9-05-72
Thompson Creek Thompson, Michigan	Alaskan coho	B-VP,BF,BK B-VP,BF,BK	10-30-75 10-24-74	B-VP,BF,BK None previous	10-18-73

[1]Classification codes and abbreviations used:

A - Hatchery where all fish cultural water is fish free, enclosed and where none of the specified diseases have been found in a 2-year period of inspections.

B - Hatchery where one or more of the specified diseases have occurred within the past 2 years.

C - Hatchery where there is an unknown disease history or where only one or two complete annual inspections have been done.

A-1 - Hatchery with a 2-year history of being free of diseases, with a closed-water supply.

A-2 - Hatchery with a 2-year history of being free of diseases, but with an open-water supply or a closed-water supply harboring fish.

( ) - Parentheses are used to indicate diseases considered to be potentially present in a hatchery or stock for 2 years after disinfection, on last detection of those diseases.

Abbreviations:

BF - *Aeromonas salmonicida*
BK - *Renibacterium salmoninarum*
BR - *Yersinia ruckeri*
VE - Viral hemorrhagic septicaemia
VH - Infectious hematopoietic necrosis
VP - Infectious pancreatic necrosis
SC - *Ceratomyxa shasta*
SW - *Myxobolus cerebralis*

* - Broodstock were planted from Wolf Lake Hatchery, thus the parenthetical BF-BK.

** - BKD exam only.

*** - 1990 is the first year since the 1989 disinfection during which fish with clinical signs of EEDV have not been confirmed.

**** - Incomplete inspection.

Table 2.—Current station (and stock) fish health classifications.[1]

Facility name or stock and location	Disease classification	Date of inspection
Atlantic salmon		
Gull Lake	B-(BF,BK)*	11-19-90
Brown trout		
Gilchrist Creek	C-(A-2)****	11-05-90
Coho salmon		
Platte River Weir	B-BK,BF	10-23-90
Little Manistee Weir	B-BK,BF	10-19-88
Fall chinook		
Boardman River Weir	B-BK,(BF)	10-03-90
Platte Lower Weir	C-BK,(BF)	10-18-88
Little Manistee Weir	B-BK-BF	10-01-90
White River	C-BK**	10-13-88
Swan Creek (Lake Huron)	C-BK,(BF)	10-08-90
Harrietta State Fish Hatchery		
Harrietta	A-1	3-19-90
Lake Superior State University		
Aquatics Lab-Sault Ste. Marie	B-BF	8-22-89
Marquette State Fish Hatchery		
Marquette	A-2***	10-30-90
Oden State Fish Hatchery		10-16-90
Oden	B-(BK,BF)	& 4-02-90
Platte River State Fish Hatchery		
Beulah	B-BK,BF	5-01-90
Steelhead		
Little Manistee Weir	B-BK	4-16-90
Pere Marquette River	C-BK****	4-17-89
Thompson State Fish Hatchery		
Manistique	B-(BK)	4-25-90
Wolf Lake State Fish Hatchery		
Mattawan (includes Skamania steelhead)	B-BK,BF	2-21-90

[1]See Table 1 for classification codes and abbreviations used.

Table 3.—Diagnostic services for fish from natural waters, 1983-90.

Diagnostic services for:	Number of cases
Telephone inquiries or letter inquires	77
Parasitic infestations	38
Undetermined	25
Tumors	23
Physical injury or anomaly	11
Bacterial infections	17
Viral infections	10
Unprocessed samples	5
Environmental stress	6
"Natural causes"	4
Lesions in flesh	4
Suspected pollution	3
Nephrocalcinosis	2
Epithelial hyperplasia	1
Thyroid hyperplasia	1
Biliary stasis	1
Nonspecific anemia	1
Cystic gill disease	1
Midge larvae	1
Unsuitable for exam	1
Total	232

Table 4.—Diagnostic services for private aquaculture, 1983-90.

Diagnostic services for:	Number of cases
Telephone inquiries	43
Bacterial infections	18
Parasitic infections	15
Undetermined	8
Water quality problems	7
Skin lesions (nonspecific)	3
Viral infections	2
Bad feed	3
Granulomatous cysts	1
Identification of European rudd	1
Total	101

Table 5.—Diagnostic services for state fish hatcheries, 1983-90.

Diagnostic services for:	Number of cases
Bacterial infections	108
Water quality problems	58
Undetermined	37
Parasitic infestations	13
Viral infections	5
Physical injury or anomaly	5
Nonspecific bloating	4
Nutritional	3
Nephrocalcinosis	2
Smoltation	2
Nonspecific gill disease	1
Tumor in eye	1
Lens cataract	1
Kidney dysfunction	1
Total	241

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