

TR 73-30

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Fisheries Division

Technical Report: 73-30

December, 1973

REARING OF WALLEYE IN THE MOSS LAKE
AND RAPID RIVER BORROW PITS

Jerome H. Peterson, Fisheries Biologist

SUMMARY

Walleye fingerlings were successfully raised in the Moss Lake borrow pit in 1971 and 1972; another borrow pit, at Rapid River, Delta County, was put into operation during 1973.

Moss Lake received 250,000 fry and Rapid River borrow pit received 200,000 fry on May 4, 1973. The fingerling walleye were removed by seine beginning in late June. Zooplankton populations were monitored throughout the spring and summer of 1973. In general, zooplankton populations remained high through June possibly enhanced by the periodic addition of torula yeast to the pond. Total walleye production in 1973 for Moss Lake was 70,692 and for Rapid River, 37,619 at a cost of \$1,380.06 and \$1,136.75 respectively.

REARING OF WALLEYE IN THE MOSS LAKE AND RAPID RIVER BORROW PITS

Jerome H. Peterson, Fisheries Biologist

INTRODUCTION

The Moss Lake Borrow Pit, Section 5, T 40 N, R 19 W, seven acres in size was utilized in 1971 and 1972 to raise walleye to the fingerling stage. Outstanding success was obtained with 38,663 fingerlings or 25.7 percent return in 1971 and 52,075 or 20.8 percent in 1972. With knowledge and experience gained from these years of operation, plans were made to continue the program in 1973.

The Rapid River Borrow Pit, Section 5, T 40 N, R 21 W, was created during the summer of 1972, as sand was needed as fill on U.S. Highway #2. Pine Plains and sandy soil are found in the area near the body of water.

The Rapid River Borrow Pit was mapped in the winter of 1972-73 and found to approximate six (6) acres in area and eight (8) feet in maximum depth. The substrate is of soft sand and vegetation non-existent. The bottom is quite irregular due primarily to the recent origin of the pit. Ownership is entirely by the United States Forest Service.

Outstanding success with minimum time and effort in the Moss Lake Borrow Pit in 1971 and 1972 prompted utilization of this newly created body of water.

METHODS

Preparation of Moss Lake Borrow Pit

Residual walleye and black bullheads necessitated chemical reclamation on July 26, 1972, with 5.0 ppb Antimycin. All walleye were killed but the black bullheads were unaffected. Several thousand were removed by seine on September 8, 1972, and it was felt the remainder did not constitute a competition or predator problem.

To enhance the bacterial, zooplankton and other invertebrate populations, twenty-five (25) bales of hay were manually spread over the surface on September 8, 1972. Adequate sinkage and dispersal occurred within three days.

Zooplankton population were monitored with a Wisconsin Style Plankton Net borrowed from the Fisheries Research Station at Marquette. Cyclopoid coepods dominated plankton net tows on April 9, 1973. By April 17, 1973, cladoceran (Daphnia spp.) began to increase significantly. To enhance and maintain the developing cladoceran

and copepod population, torula yeast was added at a rate of approximately 30# per acre. Two hundred pounds were introduced on April 17, 25 and May 2 while one hundred pounds were added on May 17 and June 1 due to diminishing supplies. By late April Daphnia longispina comprised some 60 percent of a typical plankton tow with Daphnia pulex making up the remainder. Cyclopoid copepods were also numerous. By early May Daphnia longispina populations began to wane and Daphnia pulex numbers literally exploded. Cyclopoid copepod populations continued high.

Preparation of Rapid River Borrow Pit

Zooplankton populations were monitored throughout the spring and summer with a Wisconsin Style Plankton Net. Good numbers of cyclopoid copepods and fair numbers of cladocerans were found on April 9, 1973. To enhance and maintain these populations torula yeast was added on April 25, May 2 & 17 and June 1, 1973, at a rate that varied from 20 to 35 pounds/acre. Zooplankton populations responded accordingly with the cladoceran Daphnia longispina and cyclopoid copepods dominating plankton samples from late April through late May. By this time Daphnia longispina began decreasing rapidly but the copepods remained numerous throughout the summer. Minor pulses of Chydoridae and Bosminidae were noted in May.

RESULTS IN MOSS LAKE BORROW PIT

Walleye Fry Stocking, Spring - Summer Observations

On May 4, 1973, 250,000 swim-up walleye fry resulting from eggs taken from wild adult fish in Upper Little Bay De Noc were introduced into the borrow pit.

Daphnia pulex populations continued at a very high level throughout May and June quite probably sustained by the periodic addition of torula yeast. Ehippial eggs were first observed during the middle of June and by the first of July they were present in nearly every female. Populations began to wane dramatically in early July. Cyclopoid copepod numbers remained high throughout May and June. Minor pulses of cladocerans (Chydoridae and Bosminidae) were observed in June.

Filamentous algae was not encountered during operations in 1973. Unicellular algae blooms did occur from time to time.

An initial attempt to capture walleye was made on June 6, 1973. Significant numbers were taken but due to the small size (20 mm.) harvest operations were postponed. It should be borne in mind that water temperatures did not rise significantly from late April through May and early June and may have partially accounted for the slow growth.

All things considered, prospects appeared good for another successful year and plans were made to commence harvest operations during the last week of June.

Harvest Operations

From experience gained by using several techniques for harvesting fish over the preceding two summers, the seine was found to be the most effective and efficient. The success of the program prompted the purchase of two 150' long, 12' deep, ¼" mesh nylon seines in the early spring of 1973. Removal operations commenced on June 21, 1973, and terminated on July 25, 1973. Total yield for seven (7) days of harvest was 70,692 fingerlings. At the beginning of removal, fish averaged 1.63" and had attained an average of 2.73" when operations ceased. Cannibalism appeared non-existent.

Growth and Harvest of Walleye Fingerlings - Moss Pond, 1973

<u>Date</u>	<u>Average Length</u>	<u>Average Weight</u>	<u>Number of Fish Harvested</u>
5/4/73	250,000 swim-up fry planted		
6/21/73	1.70"	.71 grams	17,203
6/22/73	1.63"	.66 grams	18,043
7/11/73	2.25"	1.20 grams	4,458
7/12/73	2.28"	1.30 grams	7,523
7/17/73	2.33"	1.70 grams	9,900
7/18/73	2.50"	1.70 grams	10,628
7/25/73	2.73"	2.00 grams	2,937

Number Planted:	250,000 swim-up fry
Weight Planted:	2.5 pounds
Number Harvested:	70,692
Weight Harvested:	177.0 pounds
Percent Harvested:	28.2

Number of walleye fingerlings removed by chemical reclamation	3,500
Total number of walleye produced in the Moss Lake Borrow Pit	74,192
Percent produced during 1973	29.7

Food habit analysis indicates walleye feed intensely on what was available, namely cladocerans and midge larvae. Examination on June 6 & 22, 1973 revealed total reliance on adult and various instar stages of Daphnia pulex. Chironomid larvae and occasional pupae were the preferred food item on July 11 & 18, 1973.

No parasites were encountered on or in walleye during food habitat analysis. General condition appeared good and a thin strip of fat occurred frequently along the intestine.

Post Harvest Operations

The presence of residual walleye fingerlings and an expanding black bullhead population necessitated chemical reclamation. Successive failures in 1971 and 1972 to remove black bullheads with Antimycin prompted use of rotenone.

Total reclamation at a concentration of one (1) part per million occurred on September 11, 1973. An estimated kill of 3,500 walleye pike (38 pounds), 20,000 black bullheads (220 pounds) and a negligible amount of yellow perch and smallmouth bass was realized.

A sufficient quantity of partially decomposed hay exists on the bottom to provide a nutrient source for future bacterial, zooplankton and phytoplankton populations.

Economics

1. Spring and summer observations and harvesting operations

Man-days expended:	8 biologist	
	4 fish area manager	
	10 fisheries aides	
	3 force account	
	6 Lake Superior College students	972.10
Yeast:	800 pounds @ \$0.16/lb.	128.00
Vehicle expense		<u>143.56</u>
	Subtotal	\$1,243.66

2. Chemical reclamation

Rotenone	12 gallons @ \$6.00/gallon	72.00
Man-days expended:	1 biologist	
	2 Lake Superior College students	58.00
Vehicle expense		<u>6.40</u>
	Subtotal	\$136.40
	GRAND TOTAL	\$1,380.06

RESULTS IN RAPID RIVER BORROW PIT

Spring - Summer Observations

On May 4, 1973, 200,000 swim-up walleye fry were introduced to the borrow pit. These fish were part of a lot of eggs taken from wild fish in Upper Little Bay De Noc in April. These fry were introduced into a good population of Daphnia longispina and cyclopoid copepods ensuring good survival. These cladocerans declined markedly by early June but the copepods continued numerous. Chironomid midges were also very numerous from the middle of May through June.

Unicellular algae blooms occurred periodically but filamentous algae were never encountered.

Initial observations of walleye fingerlings were made on June 6, 1973. Good numbers of fish were taken but their size was too small (22 mm.) to allow a harvest to commence. This slow growth was not entirely unexpected due to the five to six week period where the water did not warm above 50°F.

Based on information gathered on June 6, 1973, and past experience plans were made to commence harvest operations during the last week of June.

Harvest Operations

Due to the "virgin" nature of the borrow pit and the unevenness of the bottom a 100' long, 6' deep, 1/4" mesh deep nylon seine was used to harvest fish. Removal operations commenced on June 18, 1973, and terminated on July 24, 1973. Total yield for four (4) days of harvest was 37,619 fingerlings. At the beginning of removal fish averaged 1.50" and attained an average of 3.2" when operations ceased. Cannibalism appeared non-existent.

Post-Harvest Operations

The presence of residual walleye fingerlings necessitated chemical reclamation. Treatment with rotenone at a concentration of one (1) part per million occurred on September 10, 1973. An estimated 4,000 walleye fingerlings (53 pounds) were killed.

Some twenty (20) bales of hay will be spread over the surface of the borrow pit prior to freeze up to enhance redeveloping bacterial, zooplankton and phytoplankton populations.

Data Summary

Number Planted:	200,000 swim-up fry
Weight Planted:	2.0 pounds
Number Harvested:	37,619
Weight Harvested:	42.0
Percent Harvested:	18.8

Number of walleye fingerlings removed by chemical reclamation	4,000
Total number of walleye produced in the Rapid River Borrow Pit	41,619
Percent produced during 1973	20.8

<u>Date</u>	<u>Average Length</u>	<u>Average Weight</u>	<u>Number of Fish</u>
6/18/73	1.50"	0.55 grams	5,847
6/19/73	1.60"	0.55 grams	19,331
6/20/73	1.63"	0.55 grams	12,246
7/21/73	3.20"	4.20 grams	<u>195</u>
			37,619

Stomach analysis indicates that the walleye pike utilized about what was available, namely cladocerans, cyclopoid copepods and midge larvae. Examination on June 6 & 20, 1973, showed a definite selection for chironomid midge larvae but also considerable numbers of cladocerans and cyclopoid copepods.

The general condition of the walleye pike was very good. All possessed a significant strip of fat along the intestine and showed good growth. Parasitism was not noted during analysis.

Economics

1. Spring & summer observations & harvesting operations

Man-days expended:	9 biologist	
	1 fish area manager	
	1 fisheries aide	
	3 force account	
	1 Lake Superior College student	816.55
Vehicle expense		75.00
Yeast 600 pounds @ 16¢/lb.		<u>96.00</u>
		\$987.55

2. Chemical reclamation

Rotenone 8 gallons @ \$6.00/gallon	48.00
Man-days expended: 1 biologist	58.00
1 fish area mangager	40.00
Vehicle expense	<u>3.20</u>
Subtotal	\$149.20
GRAND TOTAL	\$1,136.75

DISCUSSION

Moss Lake Borrow Pit

For the third consecutive year it has been demonstrated that walleye fingerlings of a desirable size and quantity can be produced for the fishery manager. This borrow pit continues to produce more fingerlings each year with a very minimum of cost, time and effort.

As with the preceeding two years chemical, physical and biological parameters were conducive to a high survival of fingerlings. It is becoming more evident that our direct feeding of torula yeast is in part responsible for the maintenance of high populations of desired zooplankters such as Daphnia pulex and Daphnia longispina.

Growth of the walleye fingerlings was good but definitely inhibited by the tremendous numbers of 2-3" black bullheads. The removal of these bullheads should ensure better growth and survival in the future.

The new 150' long, 12' deep, $\frac{1}{4}$ " mesh nylon seines proved quite effective for harvesting fish with a minimum of time and effort. It also contributed materially to a more complete harvest of fish.

Stocking rates should continue at the 250,000 level.

Rapid River Borrow Pit

Although sterile and unproductive, this newly created borrow pit has demonstrated the ability to produce a significant number of walleye fingerlings of a desirable size.

Zooplankton populations were maintained by direct feeding with Torula yeast thus aiding in the survival of fish. Growth of the fingerlings was quite satisfactory considering the "virgin" nature of the borrow pit and nearly five weeks of cool spring weather.

The unstable irregular sand bottom that created some harvesting problems this year should stabilize in time. This character is common in newly created borrow pits and each succeeding year should see an amelioration of the situation.

In 1973, fingerlings were harvested at a length of 1.5-1.6 inches. This appears to be the size where survival is the greatest and where maximum harvest is attained.

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

*Region III
Walleye*

INTEROFFICE COMMUNICATION

01164

January 28, 1974

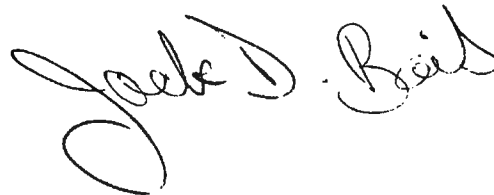
TO: Regions, Districts, Hatcheries, Research Stations
and Great Lakes Stations

FROM: Jack D. Bails, Research and Evaluation Specialist,
Fisheries Division

SUBJECT: Corrected Pages for Technical Report #73-30,
Rearing of Walleye in the Moss Lake and Rapid River
Borrow Pits

Enclosed please find a corrected title page, page 3-4 and page
7-8 for technical report #73-30, Rearing of Walleye in the Moss
Lake and Rapid River Borrow Pits.

Please insert these pages in your original report.



JDB:dp
Enclosures
cc: Fisheries Division Staff

MICHIGAN DEPARTMENT OF NATURAL RESOURCES

Fisheries Division

Technical Report: 73-30

December, 1973

REARING OF WALLEYE IN THE MOSS LAKE
AND RAPID RIVER BORROW PITS

Jerome H. Peterson, Fisheries Biologist

SUMMARY

Walleye fingerlings were successfully raised in the Moss Lake borrow pit in 1971 and 1972; another borrow pit, at Rapid River, Delta County, was put into operation during 1973.

Moss Lake received 250,000 fry and Rapid River borrow pit received 200,000 fry on May 4, 1973. The fingerling walleye were removed by seine beginning in late June. Zooplankton populations were monitored throughout the spring and summer of 1973. In general, zooplankton populations remained high through June possibly enhanced by the periodic addition of torula yeast to the pond. Total walleye production in 1973 for Moss Lake was 70,692 and for Rapid River, 37,619 at a cost of \$1,380.06 and \$1,136.75 respectively.

All things considered, prospects appeared good for another successful year and plans were made to commence harvest operations during the last week of June.

Harvest Operations

From experience gained by using several techniques for harvesting fish over the preceding two summers, the seine was found to be the most effective and efficient. The success of the program prompted the purchase of two 150' long, 12' deep, ¼" mesh nylon seines in the early spring of 1973. Removal operations commenced on June 21, 1973, and terminated on July 25, 1973. Total yield for seven (7) days of harvest was 70,692 fingerlings. At the beginning of removal, fish averaged 1.63" and had attained an average of 2.73" when operations ceased. Cannibalism appeared non-existent.

Growth and Harvest of Walleye Fingerlings - Moss Pond, 1973

<u>Date</u>	<u>Average Length</u>	<u>Average Weight</u>	<u>Number of Fish Harvested</u>
5/4/73	250,000 swim-up fry planted		
6/21/73	1.70"	.71 grams	17,203
6/22/73	1.63"	.66 grams	18,043
7/11/73	2.25"	1.20 grams	4,458
7/12/73	2.28"	1.30 grams	7,523
7/17/73	2.33"	1.70 grams	9,900
7/18/73	2.50"	1.70 grams	10,628
7/25/73	2.73"	2.00 grams	2,937

Number Planted:	250,000 swim-up fry
Weight Planted:	2.5 pounds
Number Harvested:	70,692
Weight Harvested:	177.0 pounds
Percent Harvested:	28.2

Number of walleye fingerlings removed by chemical reclamation	3,500
Total number of walleye produced in the Moss Lake Borrow Pit	74,192
Percent produced during 1973	29.7

Food habit analysis indicates walleye feed intensely on what was available, namely cladocerans and midge larvae. Examination on June 6 & 22, 1973 revealed total reliance on adult and various instar stages of Daphnia pulex. Chironomid larvae and occasional pupae were the preferred food item on July 11 & 18, 1973.

No parasites were encountered on or in walleye during food habitat analysis. General condition appeared good and a thin strip of fat occurred frequently along the intestine.

Post Harvest Operations

The presence of residual walleye fingerlings and an expanding black bullhead population necessitated chemical reclamation. Successive failures in 1971 and 1972 to remove black bullheads with Antimycin prompted use of rotenone.

Total reclamation at a concentration of one (1) part per million occurred on September 11, 1973. An estimated kill of 3,500 walleye pike (38 pounds), 20,000 black bullheads (220 pounds) and a negligible amount of yellow perch and smallmouth bass was realized.

A sufficient quantity of partially decomposed hay exists on the bottom to provide a nutrient source for future bacterial, zooplankton and phytoplankton populations.

Economics

1. Spring and summer observations and harvesting operations

Man-days expended:	8 biologist	
	4 fish area manager	
	10 fisheries aides	
	3 force account	
	6 Lake Superior College students	972.10
Yeast:	800 pounds @ \$0.16/lb.	128.00
Vehicle expense		<u>143.56</u>
	Subtotal	\$1,243.66

2. Chemical reclamation

Rotenone	12 gallons @ \$6.00/gallon	72.00
Man-days expended:	1 biologist	
	2 Lake Superior College students	58.00
Vehicle expense		<u>6.40</u>
	Subtotal	\$136.40
	GRAND TOTAL	\$1,380.06

2. Chemical reclamation

Rotenone 8 gallons @ \$6.00/gallon	48.00
Man-days expended: 1 biologist	58.00
1 fish area mangager	40.00
Vehicle expense	<u>3.20</u>
Subtotal	\$149.20
GRAND TOTAL	\$1,136.75

DISCUSSION

Moss Lake Borrow Pit

For the third consecutive year it has been demonstrated that walleye fingerlings of a desirable size and quantity can be produced for the fishery manager. This borrow pit continues to produce more fingerlings each year with a very minimum of cost, time and effort.

As with the preceeding two years chemical, physical and biological parameters were conducive to a high survival of fingerlings. It is becoming more evident that our direct feeding of torula yeast is in part responsible for the maintenance of high populations of desired zooplankters such as Daphnia pulex and Daphnia longispina.

Growth of the walleye fingerlings was good but definitely inhibited by the tremendous numbers of 2-3" black bullheads. The removal of these bullheads should ensure better growth and survival in the future.

The new 150' long, 12' deep, $\frac{1}{4}$ " mesh nylon seines proved quite effective for harvesting fish with a minimum of time and effort. It also contributed materially to a more complete harvest of fish.

Stocking rates should continue at the 250,000 level.

Rapid River Borrow Pit

Although sterile and unproductive, this newly created borrow pit has demonstrated the ability to produce a significant number of walleye fingerlings of a desirable size.

Zooplankton populations were maintained by direct feeding with Torula yeast thus aiding in the survival of fish. Growth of the fingerlings was quite satisfactory considering the "virgin" nature of the borrow pit and nearly five weeks of cool spring weather.

The unstable irregular sand bottom that created some harvesting problems this year should stabilize in time. This character is common in newly created borrow pits and each succeeding year should see an amelioration of the situation.

In 1973, fingerlings were harvested at a length of 1.5-1.6 inches. This appears to be the size where survival is the greatest and where maximum harvest is attained.