

B E R L I N   R E S E R V O I R

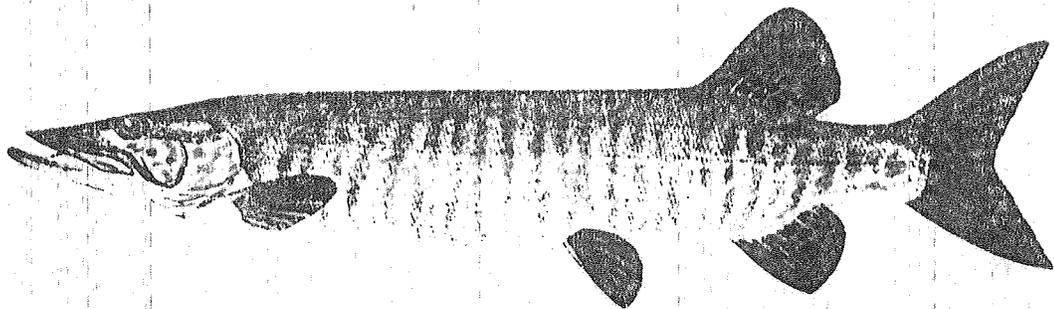
A NATURALLY-REPRODUCING MUSKELLUNGE FISHERY

BY

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#### ABSTRACT

The abundant native Mahoning River muskellunge fishery was extirpated by the early 1900's as the result of habitat degradation and pollution. Muskellunge were reintroduced into the impoundments of the East Branch of the Mahoning River during 1955-1972 by means of fry and fingerling stockings at Deer Creek Reservoir. During the nine year period following termination of the Deer Creek stockings the Deer Creek muskellunge fishery significantly deteriorated while a Berlin Reservoir muskellunge fishery developed and expanded resulting in the establishment of a "fishable population." Age-growth analysis of Berlin Reservoir muskellunge caught by sport anglers during the 1981 season revealed that 92 percent were from non-stocked year classes. Annual trap net surveys from 1975-80 captured age II and III (24-30 inches) muskellunge which could not be explained from the stocking records. Young-of-the-year surveys in 1975 and 1979-80 captured yearling and young-of-the-year muskellunge that either could not be explained from the stocking records or were believed not to be the result of upstream fry stockings. The available evidence indicates that a naturally-reproducing muskellunge fishery has developed within Berlin Reservoir.

## Introduction

The East Branch of the Mahoning River has its headwaters in Columbiana County and flows northeast through Stark, Portage, and Mahoning Counties, joining the West Branch of the Mahoning River in Trumbull County near the town of Newton Falls. The Mahoning then flows into the state of Pennsylvania and joins the Shenango River to become Beaver River, which eventually empties into the Ohio River near Beaver Falls, Pennsylvania. Four on-stream impoundments have been constructed on the East Branch of the Mahoning River (Figure 1): Lake Milton - 1916 (water supply for Youngstown, Ohio), Berlin Reservoir - 1943 (low flow augmentation and flood control), Deer Creek Reservoir - 1954 (water supply for Alliance, Ohio), and Dale Walborn Reservoir - 1971 (water supply for Alliance, Ohio).

The Mahoning River was once well known for its fisheries resource, including the native Ohio muskellunge (*Esox masquinongy ohioensis*). Trautman in his text "Fishes of Ohio" documents the existence of muskellunge in the Ohio River and its tributary, the Mahoning River. Trautman stated that Kirtland first described the Ohio muskellunge in 1854, naming it *Esox ohioensis*; the type specimen was collected from the Mahoning River. Trautman also noted the decline of the Mahoning River muskellunge after 1850, following the construction of dams. In addition to these on-stream impediments, the development and expansion of the Youngstown, Ohio steel industry resulted in a significant decline in the water quality of the lower Mahoning River. Largely because of these adverse factors the muskellunge have disappeared from this stream system.

It wasn't until the late 1950's that the presence of muskellunge in the upper Mahoning and its impoundments was again documented (the result of muskellunge fry and fingerling stockings at Deer Creek Reservoir). Reports of captured muskellunge continued through the 1960's and early 1970's. Then, in 1972, Deer Creek muskellunge stocking program was terminated. This should have resulted in the gradual disappearance of the muskellunge from the stream system. But, quite to the contrary, the number of muskellunge reported has continued, and has even increased in some areas, giving rise to speculation about muskellunge natural reproduction somewhere within the system.

## Muskellunge Stocking History

The reintroduction of muskellunge into the Mahoning River System began in 1955 with the initiation of a stocking program at Deer Creek Reservoir (Table 1). Deer Creek was one of 39 lakes selected for stocking in the 1950's as part of Ohio's early attempts at muskellunge management. Specific Deer Creek muskellunge stocking history is as follows:

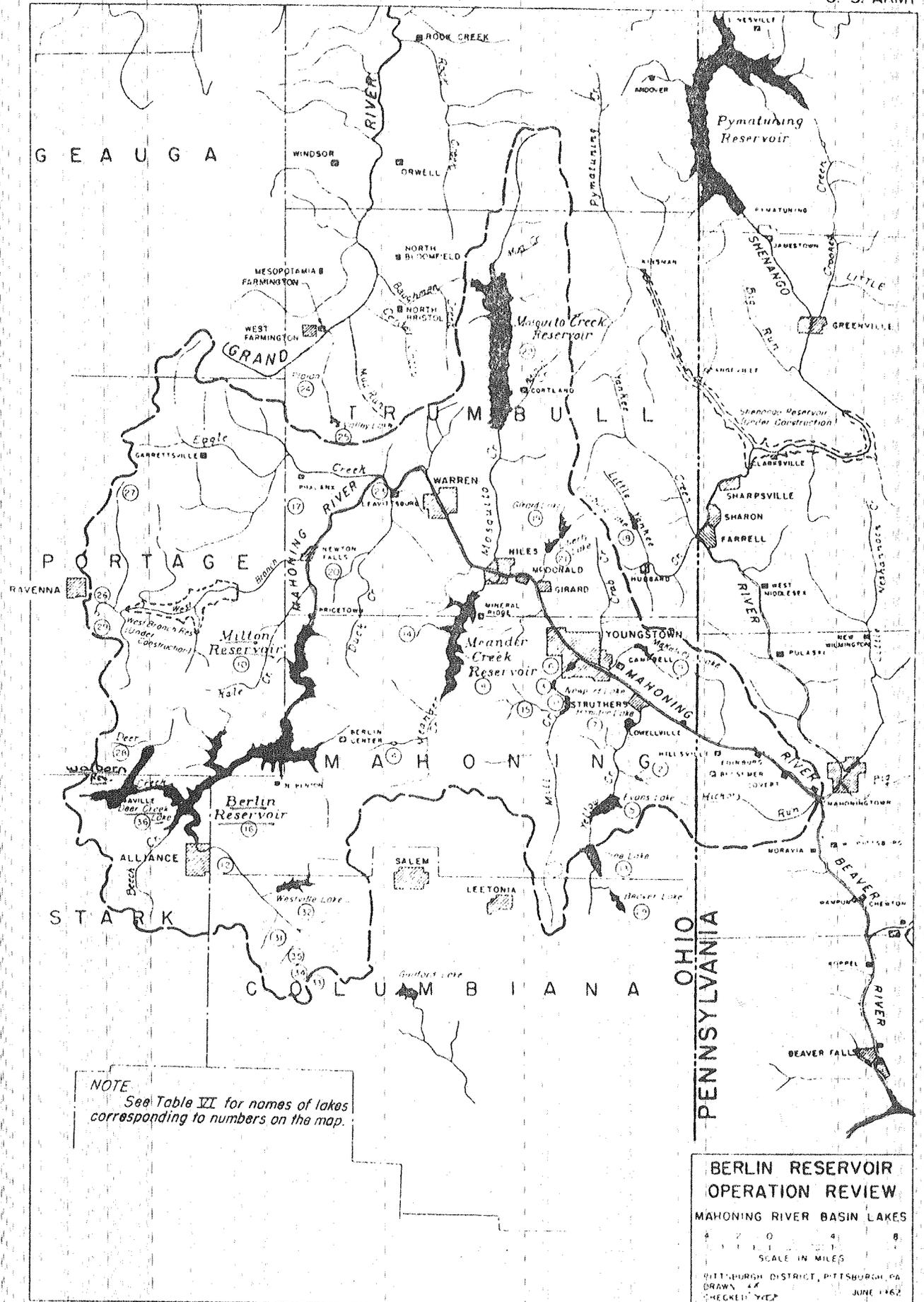


FIGURE 1.

TABLE 1

Deer Creek Reservoir Muskellunge Stocking History

<u>Date</u>	<u>Number</u>	<u>Size</u>	<u>Source</u>
5-6-55	2,000	fry	Kincaid Fish Hatchery
5-19-56	1,030	1" fingerlings	Kincaid Fish Hatchery
5-13-57	3,000	fry	Kincaid Fish Hatchery
5-14-58	10,000	fry	Kincaid Fish Hatchery
5-15-59	3,000	fry	Kincaid Fish Hatchery
10-26-60	189	fingerlings	Akron Fish Hatchery
- -61	328	fingerlings	Akron Fish Hatchery
7- -62	614	fingerlings	Akron/Kincaid Fish Hatcheries
- -63	415	fingerlings	Akron Fish Hatchery
6-19-64	313	fingerlings	Akron Fish Hatchery
7-21-65	133	3"-9" fingerlings	Akron Fish Hatchery
7-30-65	64	4"-9" fingerlings	Akron Fish Hatchery
7-15-66	114	3"-6" fingerlings	Akron Fish Hatchery
7-22-66	108	3"-8" fingerlings	Akron Fish Hatchery
8-16-66	169	5"-10" fingerlings	Akron Fish Hatchery
7-27-67	278	4"-8" fingerlings	Akron Fish Hatchery
8-1-67	35	8" fingerlings	Akron Fish Hatchery
6-30-70	275	3"-6" fingerlings	Akron Fish Hatchery
7-7-71	250	3"-7" fingerlings	London Fish Hatchery
9-20-72	12	12" fingerlings	Huskie Muskie Club

The original egg source for all but the 1972 stocking was Leesville Lake, Carroll County, Ohio (Esox masquinongy ohioensis). Stocking of muskellunge at Deer Creek was discontinued in 1972 in an effort to concentrate the available fingerlings and management efforts on a few proven muskellunge lakes.

Dale Walborn Reservoir was selected in 1980 as a stocking site for surplus muskellunge fry as per the following stocking history:

Dale Walborn Reservoir Muskellunge Stocking History

<u>Date</u>	<u>Number</u>	<u>Size</u>	<u>Source</u>
5-22-79	50,000	fry	London Fish Hatchery
5-9-80	14,800	fry	Akron Fish Hatchery
5-20-80	80,000	fry	London Fish Hatchery

Neither Berlin Reservoir nor Lake Milton have ever been stocked with muskellunge.

Survey/Harvest Results and Discussion

Extensive netting efforts at Berlin Reservoir (1947-55) and Lake Milton (1938-55) document the absence of muskellunge from this area subsequent to 1938 and prior to the 1955 stocking. Annual creel census activities conducted at Berlin Reservoir (1949-63) and Lake Milton (1951-55) also failed to record any muskellunge.

Survey/Harvest Results and Discussion - Continued

After the initiation of the Deer Creek stocking program, the first known capture of a muskellunge occurred at Deer Creek Reservoir during a trap net survey conducted October 23-24, 1956 (Table 2). Three muskellunge were captured measuring between 27.0 and 27.5 inches, presumably all age one plus fish from the 1955 fry stocking. The first known capture of a muskellunge at Berlin Reservoir occurred during a trap net survey conducted April 1-10, 1958. One 29.0 inch muskellunge was captured and presumed to be an age two fish resulting from the 1956 fingerling stocking at Deer Creek. The first known trap net capture of a muskellunge at Lake Milton occurred during a May 10-12, 1978 survey. Two muskellunge, 29.0 and 39.0 inches were captured.

TABLE 2

Historical Muskellunge Trap Net Capture

<u>Season</u>	<u>Deer Creek #Captured: Size Range (Inches)</u>	<u>Berlin Reservoir #Captured: Size Range (Inches)</u>	<u>Lake Milton #Captured: Size Range (Inches)</u>
1956	3 fish: 27.0-27.5		0 fish
1957	12 fish: 25.5-33.0		0 fish
1958	8 fish: 34.5-38.0	1 fish: 29.0	0 fish
1959	1 fish: 35.0	---	---
1960	22 fish: 34.0-39.0	---	0 fish
1961	16 fish: 14.3-41.5	---	0 fish
1962	23 fish: 19.5-33.0	---	0 fish
1963	13 fish: 21.3-35.2	4 fish: 30.0-36.0	0 fish
1965	8 fish: 27.6-39.5	0 fish	---
1966	---	---	0 fish
1967	0 fish	---	---
1968	---	0 fish	0 fish
1969	---	---	---
1970	---	0 fish	---
1971	---	0 fish	---
1972	4 fish: 23.5-47.0	0 fish	---
1973	9 fish: 28.5-39.0	0 fish	0 fish
1974	---	2 fish: 32.0 & 38.0	0 fish
1975	---	1 fish: 33.0	---
1976	1 fish: 40.0	1 fish: 24.5	0 fish
1977	---	1 fish: 46.0	---
1978	2 fish: 40.5 & 41.0	3 fish: 25.0-39.0	2 fish: 29.0 & 39.0
1979	---	2 fish: 25.0 & 27.5	---
1980	---	5 fish: 26.0-33.0	---
1981	---	6 fish: 25.0-35.0	---

\*No netting survey these seasons.

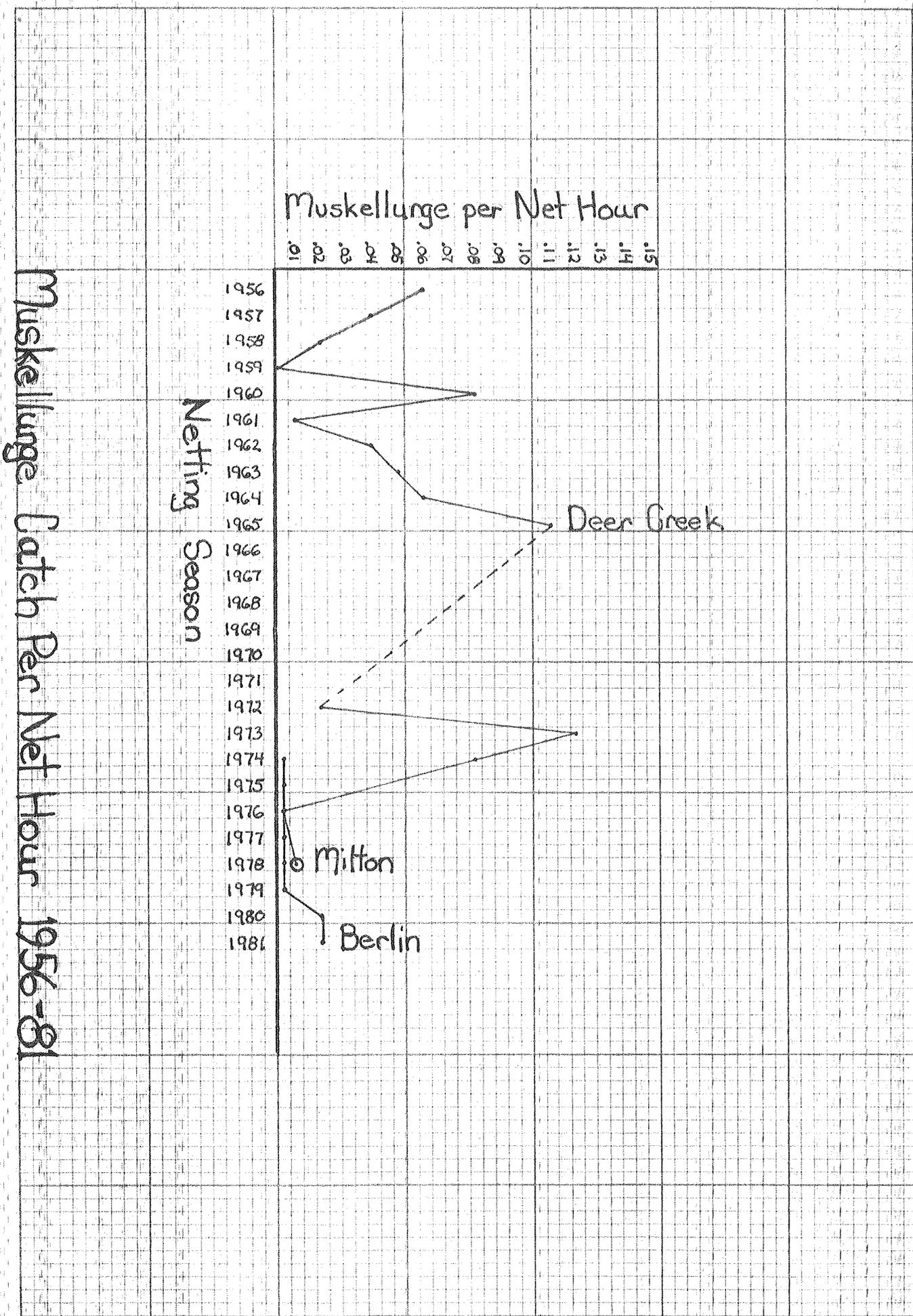


FIGURE 2.

Muskellunge Catch Per Net Hour 1956-81

Number Muskellunge Reported Harvested

60  
50  
40  
30  
20  
10

1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981

Fishing Season

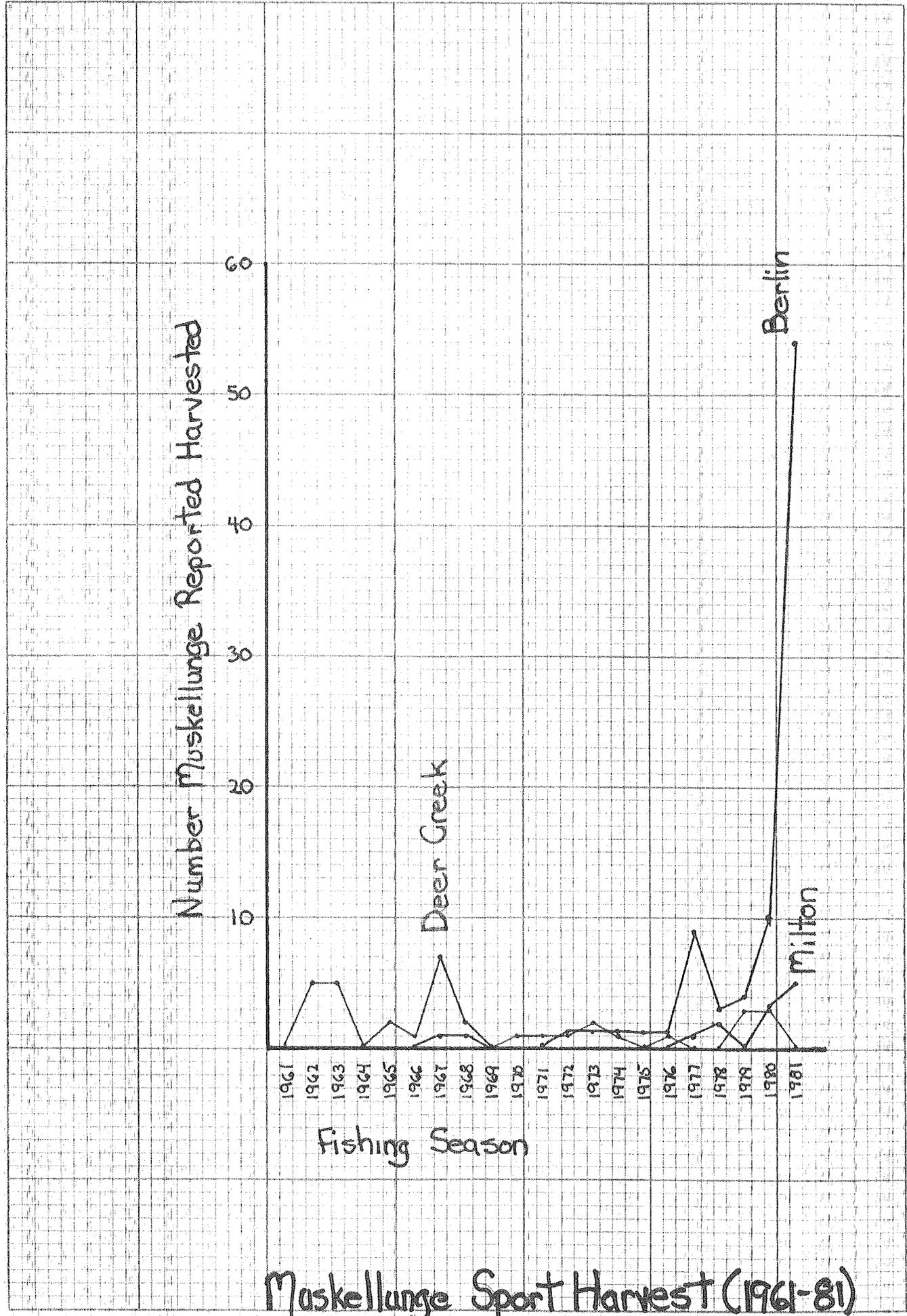
Deer Creek

Milton

Berlin

# Muskellunge Sport Harvest (1961-81)

FIGURE 3.



Survey/Harvest Results and Discussion - Continued

Muskellunge catch per net hour declined significantly at Deer Creek in the late 1970's while it improved at Berlin and Milton (Figure 2). Of particular interest in the Berlin and Milton fisheries were the numbers of age II and III (24.0-30.0 inches) muskellunge present in net catches. These net catches of young muskellunge aroused speculation that natural reproduction could be occurring within the Berlin-Milton system.

Sport harvest data for the 1961-1981 period, obtained through the Ohio Huskie Muskie Club format, illustrates the dramatic increase in the Berlin muskellunge fishery from 1979-1981, contrasted to a relatively insignificant fishery from Deer Creek Reservoir (Figure 3).

Scale samples were provided through voluntary returns of harvested muskellunge. Since muskellunge stockings were discontinued in 1972 a great many "smaller" muskie unexpectedly began showing up in the harvest. The analysis of the 1981 Berlin Reservoir angler-harvested muskellunge scale samples (W.A.R. Age-Growth Form W-236 in appendix) is as follows:

TABLE 3  
Age - Growth Analysis

1981 Berlin Reservoir Muskellunge Sport Harvest

<u>Year Class</u>	<u>Age</u>	<u>Number of Muskellunge</u>	<u>Average Calculated Length at Age (Inches)</u>	<u>Stocking History</u>
1981	0	0	--	no stocking
1980	I	0	12.1	Stocked year class: Walborn 94,800 fry
1979	II	3	24.1	Stocked year class: Walborn 50,000 fry
1978	III	9	30.8	no stocking
1977	IV	13	34.7	no stocking
1976	V	7	37.3	no stocking
1975	VI	7	39.6	no stocking
1974	VII	6	41.5	no stocking
1973	VIII	4	44.4	no stocking
1972	IX	1	49.2	Stocked year class: Deer Creek 12 fingerlings
Total		50		

Of the 50 scale samples analyzed, 46 (92%) were aged back to years when no muskellunge stockings occurred anywhere within the watershed.

A closer examination of the historical Berlin Muskellunge trap net catch during the years 1975-80 reveals the presence of 7 age II and III (24-30 inch) muskellunge. Fish of this age and size would have to come from non-stocked year classes. A single age III muskellunge was captured at Lake Milton during this period, while none of this size were captured or reported from Deer Creek. These smaller fish could not be explained through the stocking history of this area.

## Survey/Harvest Results and Discussion - Continued

Even more significant than the reports of age II and III muskellunge was the capture of one yearling and three young-of-the-year muskellunge during scheduled young-of-the-year walleye surveys as seen from the following (Table 4).

TABLE 4

### Muskellunge Collected by Electrofishing and Trawling Between 1975 and 1980 in

#### Berlin Reservoir:

<u>Date</u>	<u>Number of Muskellunge</u>	<u>Size (Inches)</u>	<u>Method of Capture</u>	<u>Location</u>
8-1-75	1	19.5	Trawl	Near the Bonner Road Boat Ramp
8-21-79	1	10.0	Trawl	Near the Bonner Road Boat Ramp
9-5-79	1	10.2	Trawl	Bay Northwest of State Rout 224 Bridge
9-11-80	1	10.0	Electrofishing	Bay Northwest of Penn-Central R.R. Bridge

Stockings of muskellunge fry were made in 1979 and 1980 in Dale Walborn Reservoir but the likelihood that the captured young-of-the-year muskellunge were of these stockings is doubtful. These fry would have had to first survive, then move through the 800-acre Walborn Reservoir, pass over the dam and move one mile downstream to Deer Creek Reservoir. After traveling through this 400-acre reservoir the fish would have to pass over another dam and then swim to the lower end of 3500-acre Berlin Reservoir (within three months) to be captured by our survey gear. Annual shore-seining surveys conducted at Berlin Reservoir from 1974-81 have not captured any young-of-the-year muskellunge. Young-of-the-year muskellunge have never been captured at Lake Milton, Deer Creek Reservoir, or Walborn Reservoir.

A summary of the evidence is as follows:

- 1) The abundant native Mahoning River muskellunge fishery (Esox masquinongy ohioensis) was extirpated by the early 1900's as the result of habitat degradation and pollution.
- 2) Muskellunge (Esox masquinongy ohioensis) were reintroduced into the impoundments of the East Branch of the Mahoning River by means of fry and fingerling stockings in Deer Creek Reservoir 1955-1972.
- 3) During the nine-year period following termination of the Deer Creek stockings the Deer Creek muskellunge fishery significantly deteriorated while a Berlin muskellunge fishery has expanded. Documented sport harvest at Deer Creek declined to an insignificant level while sport harvest increased 5,300 percent (1972-81) at Berlin Reservoir and 500 percent (1972-81) at Lake Milton. A "fishable" muskellunge population has now developed at both Berlin Reservoir and Lake Milton in the absence of stocking.

## Survey/Harvest Results and Discussion - Continued

- 4) Age-growth analysis of Berlin muskellunge caught by sport anglers during the 1981 season revealed that 92 percent were from non-stocked year classes. Annually scheduled trap net surveys from 1975-80 captured age II and III (24-30 inch) muskellunge which could not be explained from the stocking records.
- 5) Young-of-the-year surveys in 1975 and 1979-80 captured yearling and young-of-the-year muskellunge either could not be explained from the stocking records or were believed not to be the result of upstream fry stockings.

All available evidence indicates that a naturally-reproducing muskellunge fishery has developed within the Berlin Reservoir - Lake Milton area. Declining net and sport harvest reports would indicate no significant muskellunge natural reproduction occurs at Deer Creek. The sport harvest and survey capture of all age classes of muskellunge indicates active and extensive spawning success at Berlin Reservoir. A lack of numbers and some age classes captured at Milton would suggest these fish are probably not resulting from natural reproduction, but rather are being passed over the Berlin Dam into Lake Milton.

Berlin muskellunge are believed to be using the extensive areas of flooded willows and terrestrial vegetation as spawning habitat. The U.S. Corps of Engineers conducts an annual drawdown of 24 feet, commencing in August each season. This encourages the growth of terrestrial vegetation on the exposed portion of the lake bottom each season. Full pool is achieved again by April 1st each year. In years of high spring rainfall Berlin will exceed normal summer pool by two-three feet of elevation since the relatively small water release system at the downstream Lake Milton Dam does not permit a rapid release of water from Berlin Reservoir. As a result, many additional acres of potential muskellunge spawning habitat is inundated during April (peak of the muskellunge spawning season in northeastern Ohio). Potential muskellunge spawning areas are indicated on (figure 4) appendix. These habitat conditions do not exist to any significant degree at either Deer Creek Reservoir or Lake Milton.

## EPILOGUE

The "secret" of the Berlin Reservoir - Lake Milton muskellunge fishery was discovered by the anglers in 1981 and the "word" passed through the state of Ohio rapidly at the Ohio Huskie Muskie Tournament at Pymatuning Lake. As a result, the muskie angling pressure at Berlin Reservoir and Lake Milton is expected to dramatically increase beginning with the 1982 season.

The confirmation of natural reproduction, development of a fishable population, and anticipated increase in muskellunge fishing pressure requires the development and implementation of a long range management plan designed to insure continuation of this unique (and possibly one-of-a-kind in Ohio) natural fishery. Therefore, future management efforts at Berlin Reservoir will be directed toward continuing (and improving if possible) the status of the muskellunge along with the two other naturally-reproducing coolwater fish species (walleye and smallmouth bass). Management efforts will be directed at: 1) a continuation of the present annual drawdown to encourage invasion of terrestrial plants on to the exposed lake bottom (possibly even attempting to influence the Corps of Engineers to begin its annual drawdown in July to give terrestrial vegetation some additional growing time), 2) increase the amount of terrestrial vegetation present through annual rye grass plantings on the exposed lake bottom, and 3) institution of muskellunge harvest regulations to insure an ample breeding population.

A review of the literature attests that every state which has documented natural reproduction of muskellunge has imposed some form of harvest regulation for sustaining a breeding population and a quality fishery. In view of the existing literature, the extensive boat access and likely increase in muskellunge fishing pressure at Berlin Reservoir a need exists for some form of harvest regulation to be implemented in the near future.

Literature Cited

Trautman, Milton B.

1957. The Fishes of Ohio. The Ohio State University Press: pp. 683.

I would like to acknowledge the editorial assistance of Phil Hillman, Doug Henley, John Golz, and Paul Moser provided during the development of this report.

W. A. R. AGE GROWTH

BERLIN RESERVOIR

Mahoning

(WATER AREA)

(COUNTY)

SPECIES Muskellunge			SCALES READ TO: <input type="checkbox"/> LAST ANNULUS <input checked="" type="checkbox"/> EDGE OF SCALE		FISH LENGTH: <input type="checkbox"/> STANDARD <input checked="" type="checkbox"/> TOTAL	
YEAR 1981	MON. Season	DAY(S)	COLLECTION METHOD(S) Sport Harvest		SCALE METHOD Direct Proportion	
PERSON(S) CONDUCTING ANALYSIS Vince LaConte						SEX OF FISH Mixed

AGE CLASS	NO. FISH	ANNULUS											MEAN LENGTH	AGE CLASS LENGTH RANGE	
		0	1	2	3	4	5	6	7	8	9	10			
81 yc	0														
80 yc	0														
79 yc	3		12.9	26.0										28.3	26.3-30.25
78 yc	9		11.8	22.9	29.3									32.7	30.5-35.0
77 yc	13		12.0	24.8	31.6	34.6								35.0	32.5-37.5
76 yc	7		12.4	25.4	30.7	34.0	36.7							38.6	37.5-39.75
75 yc	7		10.7	21.4	29.7	34.5	37.0	39.4						40.2	38.5-42.0
74 yc	6		12.1	24.2	31.0	34.4	36.5	38.4	40.3					40.2	36.5-44.0
73 yc	4		12.2	24.9	32.1	35.8	38.5	40.4	41.9	43.5				44.7	41.0-48.4
72 yc	1		15.1	29.0	37.4	41.1	44.1	45.8	47.2	48.0	49.2			49.2	49.2
Total	50														
	AVG. LENGTH		12.0	24.1	30.8	34.7	37.3	39.6	41.5	44.4	49.2				
	AVG. ANNUL INC.		12.0	12.1	6.7	3.9	2.6	2.3	1.9	2.9	4.8				