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FISHERIES DIVISION

TECHNICAL REPORT

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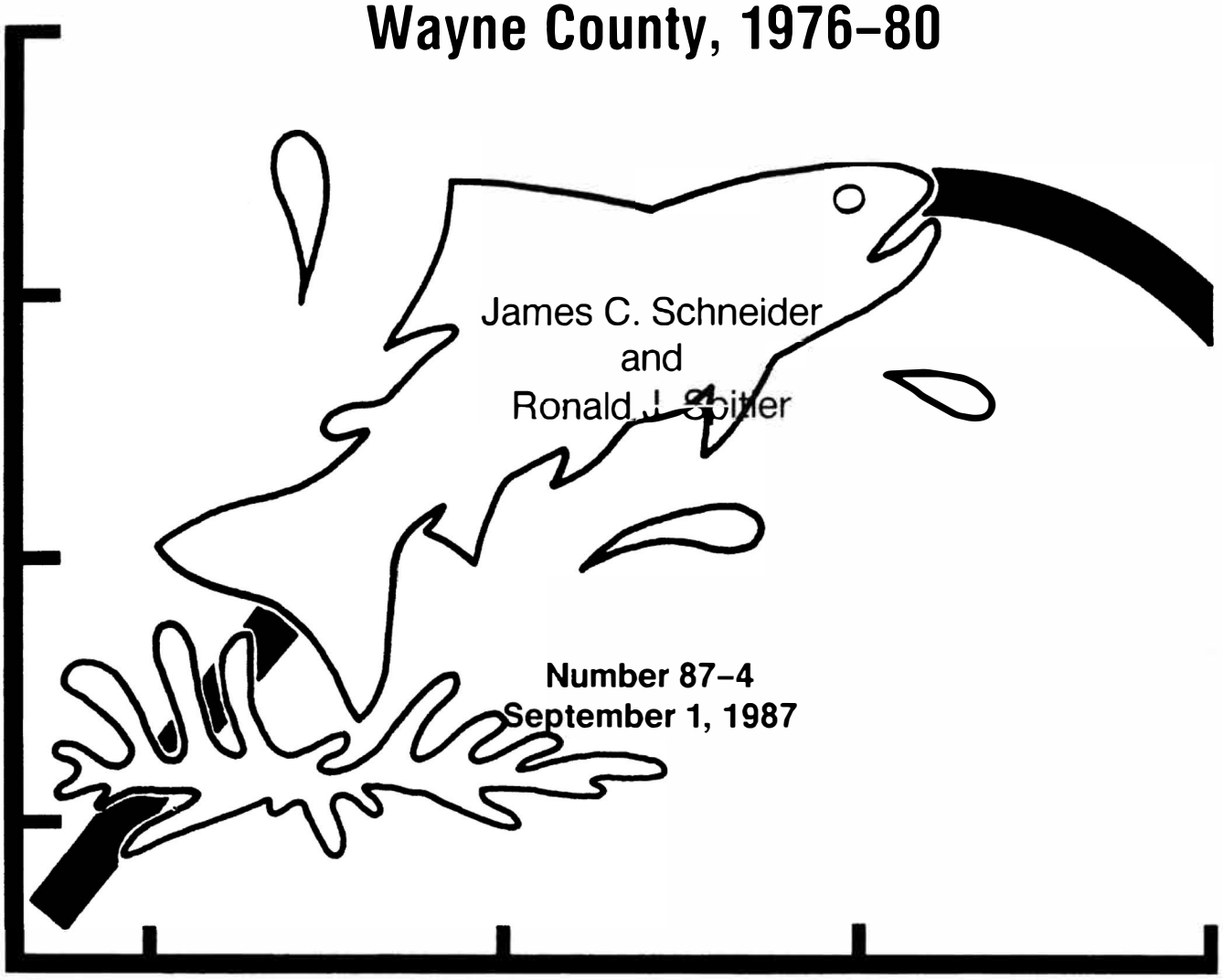

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A STUDY OF WALLEYE IN BELLEVILLE LAKE, WAYNE COUNTY, 1976-80

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INTRODUCTION

Belleville Lake is a 1,270-acre impoundment on the Huron River in Wayne County which has a maximum depth of about 29 feet. It was one of seven impoundments plus 40 miles of river treated with rotenone in 1972 and 1973 to eliminate excessive carp populations and then restocked with sport fish. Reports by Spitler (1978) and Laarman (1979) summarize the details of treatment and restocking and describe changes in fish populations and fishing. This report summarizes the results of a walleye tagging study at Belleville Lake in 1976–78.

The greatest management success was experienced at Belleville Lake. Fishing pressure increased by about 83,000 angler trips per year and the cost:benefit ratio was 25:1 (Laarman 1979). A good community of sport fish was established which has remained remarkably stable. This has probably been due to a combination of improvement in water quality, carp removal, and establishment of many piscivors.

Although the walleye is native to the Huron River system and was common to Belleville Lake, its population probably increased greatly after treatment in October 1973. A sampling-type creel census estimated the walleye sport catch at 16,436 in 1975; 1,550 in 1976; 1,952 in 1977; and 1,580 in 1978 (Laarman 1979). No pre-data are available for comparison. The greatly reduced catch in 1976–78 relative to 1975 was in part due to the raising of the minimum size limit from 13 to 15 inches statewide.

The increase in walleyes can be attributed to a combination of restocking and natural reproduction. In 1973–75, 16,568 walleye fingerlings and 4.35 million walleye fry were stocked. Another 2.6 million fry were stocked in 1982. Age analysis of scale samples collected in 1976, 1977, 1978, and 1982 indicates that recruitment occurred every year from 1973 through 1981. Walleyes in the 1973–75 year classes originated from stocking, whereas those in the 1976–81 cohorts must have originated from natural reproduction as no walleyes were stocked in the lake or upstream waters those years. Beginning in 1976, large numbers of walleyes moved through the upper end of Belleville Lake, up 1 mile of river, and congregated over the cobble-gravel substrate below the Ford Lake Dam to spawn. Many of these walleyes were captured in dip nets set for spawning suckers, causing a law enforcement problem. Subsequent sampling confirmed the presence of large numbers of ripe and spent walleyes in the run and, in 1976 and 1978, some developing walleye eggs were scooped from the river bottom. The highest concentration of eggs was found just below the first bend of the river. Based on age composition of the 1982 sample, the 1978 and 1979 native year classes were abundant.

METHODS

The walleye spawning run was sampled with a 220-volt AC boomshocker on April 6–9, 1976; April 22 and 26, 1977; April 13 and 17, 1978; and April 22, 1980. The objectives of this

sampling were to document the size-age structure of the run and, secondarily, by means of tagging, to estimate the size of the population, its exploitation rate, and its movements. Monel metal tags, size no. 3, imprinted with a number and "MICH", were applied to the upper jaw of walleyes larger than 11.0 inches, total length. Tag numbers bracketed these ranges: 115,002–115,326 in 1976; 115,327–115,400 and 115,601–115,655 in 1977; and 115,656–116,050 in 1978. Tagged fish were sexed by external examination into male, female, or unknown groups, and random scale samples were taken from 72–204 fish for age and growth analysis before they were released on site. Mature males could be sexed with a high degree of confidence because sperm could be squeezed from them. Some mature females were obvious because they emitted eggs or had distended bellies. The "unknown" group probably included mostly immature and green females.

RESULTS

The spawning runs in 1976–78 consisted entirely of relatively young walleyes corresponding in age to the first 4 years of stocking, 1973–76 (Table 1). Some females matured at a surprisingly small size (11.4 inches) and young age (II). Males predominated, as is usual for the species while on the spawning ground, but high proportions of them, 62% to 83%, were less than 15 inches long (Table 2). Of the total of 848 walleyes 11 to 23 inches long that were tagged over the 3 years, only 193 (23%) were of legal size (>15.0 inches).

Walleye growth was very rapid initially but abruptly declined in 1977 (Table 3). The average length of age-III fish declined from 17.9 inches in 1976 to 16.0 inches in 1977 to 13.4 inches in 1978. For the 1975 cohort, the apparent growth rate was slow from 1977 to 1978: the average length of males increased only from 12.9 to 13.4 inches and the average length of females increased only from 13.7 to 13.8 inches. This could be due, in part, to the selective harvest of larger, faster-growing individuals by anglers. However, a slow growth rate is also indicated by tag return data for 21 fish at large for 1 to 5.5 growing seasons. On average, males grew only 1.0 inches per year and females grew only 1.8 inches per year.

Tagged walleyes were recaptured for up to 9 years after their release; the last report was in 1987 (Table 4). Angler returns were slightly lower than expected—5.9% for walleyes of all sizes. This was probably due to non-reporting of recaptures by anglers, emigration of tagged fish, and tag loss by fish. The reporting rate probably could have been improved with more publicity. Personal contacts by census clerks in 1975–78 and a sign and tag return box posted below Ford Lake Dam were the primary means of publicity. Just two tagged fish were actually observed during the random census. Considering only the walleyes which exceeded the minimum size limit when tagged, 13 out of 193 were caught within the first 12 months after release. Thus, the rate of exploitation was, at a minimum, 6.7%. Comparable estimates for other Michigan walleye stocks have usually ranged from 1.5 to 10.4%, but have been as high as

20% (Schneider and Crowe 1977; Norcross 1986; Keller et al. 1987). At Belleville Lake, fishing occurred primarily from mid-May to October because winter ice conditions were unstable.

Walleye movements in Belleville Lake were typical of those in other reservoirs (Schneider and Crowe 1977). After spawning at the upstream barrier (Ford Lake Dam) in April, nearly all fish dropped down to the impoundment prior to the opening of the walleye fishing season in mid-May. Some apparently reascended the river in September and October and either remained upriver all winter or moved up again next spring to spawn. About 8% of the walleyes passed downstream through the Belleville Dam and were lost from Belleville Lake. Out of 53 total recaptures, 2 were taken just below Belleville Dam, 1 was caught below Flat Rock Dam, and 1 was caught from the St. Clair River near Walpole Island (over 80 miles away). These reports came in 1976, 1977, 1982, 1983, and 1987 and bear no relationship to the 10-foot lowering of the lake level for dam repair in 1980.

Very few walleyes were recaptured during electrofishing or netting surveys. This attests to how large the walleye population must have been. Subsequent electrofishing over the spawning grounds recaptured only 2 fish in 1977 (released in 1976), 1 fish in 1978 (released in 1977), and no fish in 1980. One tagged walleye and 54 untagged ones were captured in netting at Belleville Lake in August 1979. Furthermore, only a few walleyes were recaptured immediately after they were tagged, even though the same areas were electrofished repeatedly on the same day. Three fish were observed with deformed maxillary bones in 1977, suggesting that some fish tagged in 1976 may have lost their tags. These recapture data are not adequate for a reliable estimate of walleye abundance. However, given that the sport catch in 1976–78 was about 1,700 walleyes per year (1.3/acre) and the true exploitation rate was probably about 10%, the fishable stock must have been roughly 17,000 walleyes (13/acre). These statistics indicate that Belleville Lake had a better walleye population and fishery on a per acre basis than the famous Lake Gogebic (Norcross 1986).

ACKNOWLEDGMENTS

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Table 1. Age composition of walleyes in the spawning runs from Belleville Lake (below Ford Lake Dam), 1976–78.

Age	Number of fish		
	1976	1977	1978[1]
I	12	1	—
II	147	69	—
III	45	59	59
IV	—	4	10
V	—	—	3

[1] An additional 38 large walleyes were scale sampled in 1978. None were older than age V (1973 year class).

Table 2. Length and sex distributions (numbers of fish) of walleyes tagged in the spawning runs from Belleville Lake (below Ford Lake Dam), 1976–78 and 1980.

Inch group[1]	1976			1977			1978			1980
	Male	Female	Unknown[2]	Male	Female	Unknown[2]	Male	Female	Unknown[2]	All
11	2	—	10	7	1	1	4	—	3	1
12	19	—	37	16	3	13	64	26	18	1
13	50	2	41	12	1	7	100	43	11	1
14	57	9	28	8	7	3	25	27	—	3
15	13	4	6	12	3	—	15	11	—	5
16	13	1	—	10	3	2	12	2	—	5
17	5	5	—	4	8	1	8	7	—	—
18	2	10	—	1	3	—	2	3	—	2
19	—	9	1	—	1	—	2	2	—	2
20	—	1	—	—	—	—	—	3	—	1
21	—	—	—	—	2	—	1	—	—	—
22	—	—	—	—	—	—	—	3	—	—
23	—	—	—	—	—	—	—	2	—	—
Total	161	41	123	70	32	27	233	129	32	21

[1]The 11-inch group includes fish 11.0–11.9, etc.

[2]The unknown column includes fish could not be readily sexed by external examination—mostly immature females.

Table 3. Average length at age of Belleville Lake walleyes sampled on the spawning run, 1976–78. (Number of fish sampled in parentheses.)

	1976			1977			1978		
Age	Male	Female	Unknown	Male	Female	Unknown	Male	Female	Unknown
I	—	—	8.2	—	—	9.5	—	—	—
	—	—	(12)	—	—	(1)	—	—	—
II	13.8	14.6	13.2	12.8	13.7	12.6	—	—	—
	(61)	(7)	(76)	(38)	(10)	(20)	—	—	—
III	16.3	18.5	—	15.8	16.6	15.5	13.2	13.8	12.7
	(10)	(16)	—	(30)	(19)	(10)	(23)	(30)	(6)
IV	—	—	—	—	19.9	—	12.8	17.9	—
	—	—	—	—	(3)	—	(3)	(8)	—
V	—	—	—	—	—	—	19.9	18.7	—
	—	—	—	—	—	—	(2)	(1)	—

Table 4. Number of walleyes caught and tagged while spawning below Ford Lake Dam and number (all sizes) recaptured by anglers.

Release data		Year of recapture								
Year	Number	1976	1977	1978	1979	1980	1981	1982	1983	1987
1976	325	10	4	2	—	—	—	—	—	—
1977	129	—	5	2	1	—	—	—	—	—
1978	394	—	—	8	6	3	1	5	2	1

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