STUDY PERFORMANCE REPORT

State: Michigan | **Project No.:** F-35-R-23

Study No.: 669 | **Title:** Prey selection and predation rate of piscivorous fish

Period Covered: April 1, 1997 to March 31, 1998

Study Objective: To estimate survival of juvenile bluegills in ponds as a function of bluegill size and density and predator size and density, and to concurrently measure predator survival and growth.

Summary: During fall 1997 a 6-week experiment was conducted evaluating predation by juvenile walleye on juvenile bluegills. The purpose was to measure growth of walleye as a function of bluegill density. Eight ponds were stocked in October with a single size of juvenile bluegills (24.6±3.6 mm, 0.17±0.09 g, mean±SD, *N* = 200). Bluegill stocking densities were in the ratios 0, 1, 2, 4, 8, and 16 in six ponds with walleye, and 5.6 in two control ponds without walleye, where a value of 1 represented 449 g/ha, an estimated 2,583 bluegill per hectare (1,046 per acre). Six ponds were stocked with 10 juvenile walleye (203±10 mm, 62.5±9.3 g, *N* = 60) per pond. Predators were given individual marks by clipping one or two rays of the soft dorsal fin. Marks persisted to the end of the experiment. Predator survival was poor. Of the original 60 walleye, the numbers recovered per pond were (in order of bluegill stocking density) 9, 4, 0, 3, 2, 8, for a total of 26. It is believed that most missing walleye were consumed by great blue herons as the pond level was lowered for draining. The average change in weight of recovered walleye increased with bluegill stocking density.

Job 1. Title: <u>Stock ponds with bluegills and predators.</u>

Findings: Ponds were stocked with juvenile bluegills and walleye in October 1997. Bluegills were stocked in the ratios 0, 1, 2, 4, 8, and 16 into six treatment ponds containing walleye, and 5.6 in two control ponds without walleye, where a value of 1 represented 449 g/ha, an estimated 2,583 bluegill per hectare (1,046 per acre) (Table 1). The six treatment ponds were stocked with 10 juvenile walleye (203±10 mm, 62.5±9.3 g, *N* = 60) per pond. Predators were given individual marks by clipping one or two rays of the soft dorsal fin

Job 2. Title: <u>Determine rate of predation.</u>

Findings: Despite a low walleye recovery (26/60, or 43% survival), marking of individual predators make it possible to demonstrate that the average change in weight of walleye increased with bluegill stocking density (Table 2). The average change in walleye weight was negative at the two lowest bluegill stocking densities, but was positive at the three highest bluegill stocking densities. The change in walleye weight corresponded roughly with the reduction in bluegill biomass, suggesting that it was the difference in consumption of bluegill that produced the change in weight. The three ponds that lost the most bluegill biomass during the experiment (ponds 7, 5, and 16) were ponds where the average change in walleye weight was positive; the two walleye ponds that lost the least bluegill biomass (ponds 9 and 15) were ponds where the average change in weight was negative. The two control ponds without walleye had changes in bluegill biomass of 8.6% and -2.8%..

Job 3. Title: Drain ponds.

Findings: The experiment was terminated by draining the eight ponds in late November and early December, 1997 (Table 2). The clipping of soft dorsal fin rays produced a visible mark that persisted to the end of the experiment. The recovery of walleye was low (26/60, or 43% survival). I believe that most losses were caused by heron predation during the period just before pond draining when the water level was low. In future experiments we will attempt to reduce the duration of low water levels prior to draining to minimize predation by great blue herons.

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Table 1.–Total weight and estimated number of juvenile bluegills and average weight (W) and length (L) of juvenile walleye stocked into eight ponds on October 13, 1997. Average size of bluegills was 24.6±3.6 mm, 0.17±0.09 g, mean±SD, N = 200. Ten walleye were stocked into each treatment pond.

Relative bluegill density	Pond number	Area (ha)	Bluegill: Total weight (g)	Bluegill: Estimated number	Walleye: Mean W±SD (g)	Walleye: Mean L±SD (mm)
			Control			
5.6	6	0.28	709	4082		
5.6	10	0.25	628	3615		
			Treatment, with 10 walleye per pond			
0	9	0.27	0	0	60.1±8.8	200±8
1	15	0.29	129	743	60.1±8.1	200±9
2	8	0.25	224	1290	66.4±9.7	207±9
4	7	0.26	470	2706	60.8±8.4	200±8
8	5	0.30	1071	6166	62.7±9.8	203±11
16	16	0.24	1708	9833	65.1±9.0	205±9

Table 2.–Biomass of juvenile bluegills and number and average change in weight of walleye recovered at draining for ponds stocked with different densities of bluegills in fall, 1997. Change in bluegill biomass is final biomass minus initial biomass. Mean ΔW is the average (±SE) change in weight of marked individual walleye recovered in each pond.

Relative bluegill density	Pond number	Date drained	Bluegill biomass: Recovered (g)	Bluegill biomass: Change (g)	Walleye: N	Walleye: Mean ΔW±SE (g)
			Control			
5.6	6	11/29/97	770.2	61.2	0	
5.6	10	12/3/97	610.6	-17.4	0	
			Treatment, with 10 walleye per pond			
0	9	12/8/97	0.0	0.0	9	-3.3±1.7
1	15	11/26/97	24.0	-105.0	4	-1.0±1.9
2	8	11/29/97	28.2	-195.8	0	
4	7	11/29/97	90.5	-379.5	3	1.8±1.2
8	5	11/26/97	823.1	-247.9	2	3.2±3.0
16	16	11/26/97	1414.4	-293.6	8	0.8±1.4