Fish Division
Education-Game
William C. Beckman

INSTITUTE FOR FISHERIES RESEARCH
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ALBERT S. HAZZARD, PH.D.
DIRECTOR

ADDRESS
UNIVERSITY MUSEUMS ANNEX
ANN ARBOR, MICHIGAN

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THE AGE AND GROWTH OF THE BLUEGILL FROM SIX MICHIGAN LAKES

by

William C. Beckman

Introduction

In connection with the intensive creel census which was conducted during 1939 and 1940 on Bear Lake, Hillsdale County; Craig Lake, Branch County; Christiana Lake, Cass County; Hamlin Lake, Mason County; Paw Paw Lake, Berrien County; and Stearn's Bayou, Ottawa County, 1,642 scale samples were taken from bluegills by creel census clerks and members of the staff of the Institute for Fisheries Research. Most of the scale samples were taken from fish caught by anglers whose cooperation is gratefully acknowledged.

Distribution of Age-Groups

Age-groups I to X are represented in the collection. Age-group IV has the largest number of specimens, which is in agreement with the state

distribution. Age-groups I and X are not used in the discussion because of the small number of specimens in each group. The number of fish in each age-group is given in Table 1.

Age-groups III to VI furnish the majority of the fish caught. This is clearly shown in Table 1 by the very sudden drop in the number of fish from age-group VI to age-group VII.

Rate of Growth

The rate of growth of the bluegill varied from lake to lake. Bear Lake had the best growth of the lakes, with Christiana Lake second. Bluegills from Craig Lake showed the poorest growth up to the sixth summer when they were larger than the bluegills of the same age from Stearn's Bayou.

Differences in the rate of growth between the lakes are shown in Graph 1. The averages are based on actual lengths for each age-group and the number of specimens on which this average is based is given in Table 1. The specimens were taken throughout the year and all collections were combined in the average. The state average is based on the average actual lengths of 4,184 bluegills from lakes distributed over the state. This state average shows that bluegills reach legal size (6 inches) in their fourth summer of life.

Bluegills reached legal size in Bear Lake during their second summer, while in Paw Paw Lake, Christiana Lake and Stearn's Bayou they reached legal size in their third summer of life. In Craig Lake legal size was reached during the fourth summer of life.

The fish in Bear Lake were 1 3/4 inches larger than the state average at four years of age. The greatest increment for any year occurred in Christiana Lake where the average increment for the third year of life was 2 1/4 inches.

Hamlin Lake was peculiar in that the smallest and youngest fish caught in our samples was $7\frac{1}{2}$ inches long and was seven years old. The bluegills in Hamlin Lake averaged 8.1 inches for the year, according to the creel census records.

Table 1

Distribution of Age-groups of Combined Summer and Winter Bluegills

Lake	Age-group II	III	IV	V	VI	VII	VIII	IX
Craig	30	49	133	141	133	25	16	..
Christiana	15	121	93	87	85	29	9	3
Bear	96	49	66	24	18	1	2	..
Stearn's Bayou	26	38	42	28	34	13	2	..
Paw Paw	1	37	43	29	18	4	2	3
Hamlin	..	..	..	...	..	13	59	25
Total	168	294	377	309	288	85	90	31
Percentage	10%	18%	23%	19%	18%	5%	5%	2%
Total for all lakes in State represented by scale samples	375	876	1,025	757	511	169	130	34
Percentage	10%	23%	26%	20%	13%	4%	3%	1%

Size of Fish Taken in Summer and Winter Fishing

It has long been contended that the larger fish are caught in winter, thus making summer fishing poorer in regards to size of fish caught. This, however, was found not to be true. A comparison of the size of summer and winter caught fish can be made on Tables 2-7. In making this comparison the summer fish of one age-group must be compared with the winter fish of the next older age-group. For example, the summer fish of age-group IV must be compared with the winter fish of age-group V. The reason for this is that the winter fish have completed their season's growth and have had that year's growth added to their age, even though their next year mark has not formed on the margin of the scale.

The small differences in size which occur between the summer and winter caught fish of the same age-group can be explained by the fact that the summer average is based on fish which have grown varying amounts; that is, some of the fish were caught in June when their season's growth had just begun, and others were taken later in the summer when varying percentages of their growth were completed, while the winter average is based on fish having completed their season's growth.

Table 2

Size in Millimeters of Bluegills at Various Ages

Equivalent size in inches given for combined size of sexes

CRAIG LAKE, BRANCH COUNTY, MICHIGAN

Season	Sex	I	II	III	IV	V	VI	VII	VIII	IX
Winter	Male	...	...	...	161(36)*	171(16)	191(15)	203 (3)	208 (2)	...
	Female	...	...	117 (2)	143(10)	167(28)	175(30)	192 (4)	225 (5)	...
	Sex ?	...	...	124 (8)	174(27)	185(64)	197(65)	199(15)	202 (8)	...
	Combined	...	...	122(10)	163(73)	178(108)	190(110)	198(22)	210(15)	...
				4 7/8	6 3/8	7	7 1/2	7 3/4	8 1/4	...
Summer	Male	...	101 (4)	...	171 (4)	...	...	...	...	...
	Female	...	120 (4)	147 (6)	160(10)	174 (7)	175 (2)	189 (1)	...	...
	Sex ?	...	141(22)	150(33)	172(46)	193(26)	196(21)	207 (2)	227 (1)	...
	Combined	...	132(30)	149(39)	170(60)	189(33)	194(23)	201 (3)	227 (1)	...
			5 1/4	5 7/8	6 3/4	7 1/2	7 5/8	7 7/8	9	...
Year Average	Combined	...	132(30)	143(49)	166(113)	180(141)	190(133)	198(25)	211(16)	...
		...	5 1/4	5 5/8	6 1/2	7 1/8	7 1/2	7 3/4	8 3/8	...

*Figures in parentheses indicate number of specimens.

Table 3

Size in Millimeters of Bluegills at Various Ages

Equivalent size in inches given for combined size of sexes

BEAR LAKE, HILLSDALE COUNTY, MICHIGAN

Season	Sex	I	II	III	IV	V	VI	VII	VIII	IX
Winter	Male	148 (1)	162 (5)	155 (7)	231 (1)	203 (1)	...	...	241 (1)	...
	Female	...	153 (7)	158 (4)	206 (2)	...	...	...	...	...
	Sex ?	...	...	200 (1)	...	229 (1)	216 (1)	...	...	...
	Combined	148 (1) 5 7/8	156 (12) 6 1/8	160(12) 6 3/8	214 (3) 8 1/2	216 (2) 8 1/2	216 (1) 8 1/2	... ...	241 (1) 9 1/2	... ...
Summer	Male	141 (1)	169(27)	195(12)	216(23)	234 (7)	230 (5)	...	...	...
	Female	133 (7)	162(47)	183(15)	220(14)	218 (6)	235 (8)	228 (1)	241 (1)	...
	Sex ?	...	142(10)	183(10)	214(26)	223 (9)	237 (4)	...	...	...
	Combined	134 (8) 5 1/4	161(84) 6 3/8	187(37) 7 3/8	216(63) 8 1/2	225(22) 8 7/8	234(17) 9 1/4	228(1) 9	241(1) 9 1/2	... ...
Year Average	Combined	136 (9) 5 3/8	160(96) 6 3/8	180(49) 7 1/8	216(66) 8 1/2	224(24) 8 7/8	233(18) 9 1/4	228 (1) 9	241 (2) 9 1/2	... ...

Table 4

Size in Millimeters of Bluegills at Various Ages

Equivalent size in inches given for combined size of sexes

HAMLIN LAKE, MASON COUNTY, MICHIGAN

Season	Sex	I	II	III	IV	V	VI	VII	VIII	IX	X
Winter	Sex ?	...	...	...	...	...	...	210(13)	214(59)	216(25)	225 (2)
								8 1/4	8 3/8	8 1/2	8 7/8

Table 5

Size in Millimeters of Bluegills at Various Ages

Equivalent size in inches is given for combined size of sexes

STEARN'S BAYOU, OTTAWA COUNTY, MICHIGAN

Season	Sex	I	II	III	IV	V	VI	VII	VIII	IX
Winter	Male	...	...	160 (1)	173(11)	183 (4)	187 (1)	192 (4)	...	...
	Female	...	...	...	150 (1)	200 (1)	...	199 (2)	...	...
	Sex ?	...	102 (1)	152(10)	166(30)	178(16)	188(28)	197 (4)	192 (2)	...
	Combined	...	102 (1) 4	152.7(11) 6	167.4(42) 6 5/8	180(21) 7 1/8	188 (29) 7 3/8	195.4(10) 7 3/4	192 (2) 7 5/8	... ...
Summer	Male	...	154 (6)	166(14)	173(10)	182 (4)	178 (1)	194 (1)	...	...
	Female	...	155 (1)	164 (9)	170(10)	174 (3)	177 (4)	203 (2)	...	...
	Sex ?	89 (1)	111(18)	136 (4)	...	...	...	...	...	...
	Combined	89 (1) 3 1/2	123(25) 4 7/8	161(27) 6 3/8	171.5(20) 6 3/4	178.5 (7) 7	177.2(5) 7	200 (3) 7 7/8	... ...	... ...
Year Average	Combined	89 (1) 3 1/2	122(26) 4 7/8	158(38) 6 1/4	168(62) 6 5/8	179(28) 7 1/8	186(34) 7 3/8	196(13) 7 3/4	192 (2) 7 5/8	...

Table 6

Size in Millimeters of Bluegills at Various Ages

Equivalent size in inches given for combined size of sexes

PAW PAW LAKE, BERRIEN COUNTY, MICHIGAN

Season	Sex	I	II	III	IV	V	VI	VII	VIII	IX
Winter	Male	...	...	154 (7)	173(17)	195 (8)	215 (2)	221 (1)	...	...
	Female	...	...	146 (3)	175(10)	187 (6)	206 (9)	207 (2)	...	231 (1)
	Sex ?	...	...	136 (4)	164 (5)	206 (5)	218 (2)	226 (1)	223 (2)	241 (1)
	Combined	...	...	147(14)	172(32)	195(19)	209(13)	215 (4)	223 (2)	236 (2)
		...	...	5 3/4	6 3/4	7 3/4	8 1/4	8 1/2	8 3/4	9 1/4
Summer	Male	...	106 (1)	180(17)	199 (9)	216 (8)	225 (4)	...	...	...
	Female	...	...	160 (4)	230 (2)	203 (1)	241 (1)	...	...	...
	Sex ?	...	...	156 (2)	...	216 (1)	...	...	...	...
	Combined	...	106 (1)	174(23)	204(11)	214(10)	228 (5)	...	...	...
		...	4 1/4	6 7/8	8	8 1/2	9	...	...	...
Year Average	Combined	...	106 (1)	164(37)	180(43)	202(29)	214(18)	215 (4)	223 (2)	236 (2)
		...	4 1/4	6 1/2	7 1/8	8	8 1/2	8 1/2	8 3/4	9 1/4

Table 7

Size in Millimeters of Bluegills at Various Ages

Equivalent size in inches given for combined size of sexes

CHRISTIANA LAKE, CASS COUNTY, MICHIGAN

Season	Sex	I	II	III	IV	V	VI	VII	VIII	IX
Winter	Male	...	...	181 (3)	200(30)	210(27)	230(41)	237 (6)	245 (2)	...
	Female	...	91 (1)	160(36)	192(47)	209(46)	224(40)	238(20)	239 (7)	239 (3)
	Sex ?	...	100 (3)	143(12)	183 (4)	200(11)	222 (1)	231 (3)	...	...
	Combined	...	98 (4)	157(51)	194(81)	208(84)	227(82)	237(29)	240 (9)	239 (3)
		...	3 7/8	6 1/4	7 5/8	8 1/4	9	9 3/8	9 1/2	9 1/2
Summer	Male	...	114 (3)	193(13)	218 (3)	228 (2)	241 (2)	...	...	...
	Female	...	119 (6)	186(38)	212 (8)	242 (1)	233 (1)	...	...	...
	Sex ?	...	155 (2)	186(19)	212 (1)	...	...	...	...	...
	Combined	...	124(11)	187(70)	213(12)	232 (3)	237 (3)	...	...	...
		...	4 7/8	7 3/8	8 3/8	9 1/4	9 3/8	...	...	...
Year Average	Combined	...	117(15)	174(121)	196(93)	209(87)	227(85)	237(29)	240 (9)	239 (3)
		...	4 5/8	6 7/8	7 3/4	8 1/4	9	9 3/8	9 1/2	9 1/2

Sex Ratio

There has been much discussion on the ratio of the sexes caught during winter. It has been argued that more females are taken in winter than males, and that this situation makes poorer fishing as time progresses. The number of bluegills of each sex caught during summer and winter are given in Table 8. A more detailed comparison by age groups can be made from Tables 2-7. The ratio of males to females is 1 to 1.32 in winter, and in summer the ratio is 1 to 1.21 for the combined ratios of the lakes. The ratio for the year is 1 to 1.27. For the entire state the ratio of males to females is 1 to 1.12.

On a percentage basis, the ratio of males to females is 47 per cent males to 53 per cent females for the entire state. These figures are based on 3,450 specimens. The combined total for the lakes under discussion gives a percentage of 44 per cent males to 56 per cent females. The winter ratio is 43 per cent males to 57 per cent females, compared with a summer ratio of 45 per cent males to 55 per cent females.

The difference between the yearly ratio of the lakes and the state ratio is 3 per cent more females in the lakes under study. There are 2 per cent more females caught in winter than in summer, but this difference is less than the difference between the lakes' ratio and the state ratio and is therefore of questionable significance.

Christiana Lake, Stearn's Bayou and Paw Paw Lake showed abnormal populations of bluegills. In Christiana Lake the ratio was about two females to one male, both in summer and winter catches. In Paw Paw Lake the males were dominant.

Table 8

Number, Ratio, and Percentage of Each Sex Caught in Summer and Winter

Lake	Season	Male	Female
Craig	Winter		
	Number	72	79
	Ratio	1	1.09
	Percentage	48%	52%
	Summer		
	Number	8	30
	Ratio	1	3.75
	Percentage	21%	79%
	Year		
	Number	80	109
	Ratio	1	1.36
	Percentage	42%	58%
Stearn's Bayou	Winter		
	Number	21	4
	Ratio	1	0.19
	Percentage	84%	16%
	Summer		
	Number	36	29
	Ratio	1	0.81
	Percentage	55%	45%
	Year		
	Number	57	33
	Ratio	1	0.57
	Percentage	59%	41%
Christiana	Winter		
	Number	103	200
	Ratio	1	1.94
	Percentage	44%	66%
	Summer		
	Number	23	54
	Ratio	1	2.34
	Percentage	30%	70%
	Year		
	Number	126	254
	Ratio	1	2.01
	Percentage	33%	67%
Paw Paw	Winter		
	Number	35	31
	Ratio	1	0.88
	Percentage	53%	47%
	Summer		
	Number	38	8

	Percentage	33%	67%
Paw Paw	**Winter**		
	Number	35	31
	Ratio	1	0.88
	Percentage	53%	47%
	Summer		
	Number	39	8
	Ratio	1	0.21
	Percentage	83%	17%
	Year		
	Number	74	39
	Ratio	1	0.53
	Percentage	65%	35%
Bear	Winter		
	Number	16	13
	Ratio	1	0.81
	Percentage	55%	45%
	Summer		
	Number	75	99
	Ratio	1	1.32
	Percentage	43%	57%
	Year		
	Number	91	112
	Ratio	1	1.23
	Percentage	45%	55%
Total	Winter		
	Number	247	327
	Ratio	1	1.32
	Percentage	43%	57%
	Summer		
	Number	181	220
	Ratio	1	1.21
	Percentage	45%	55%
	Year		
	Number	428	547
	Ratio	1	1.27
	Percentage	44%	56%
State	Year		
	Number	1,625	1,825
	Ratio	1	1.12
	Percentage	47%	53%

In winter, in Paw Paw Lake there was one male to 0.88 females in the catch, but in summer there was one male to 0.21 females. The year average was about two males to one female. Stearn's Bayou also had a dominance of males. In winter there was one male to 0.19 females, while in summer there was one male to 0.81 females. The yearly average was about two males to one female.

While individual lakes may have abnormal sex ratios, the abnormality may be in favor of either sex, and naturally under this abnormality one sex will dominate the catch.

Contrary to general opinion, it has been shown that in average waters there is no great difference between the number of males and females caught in summer and in winter.

Differences in Rate of Growth between Sexes

A further examination of Tables 2-7 will show that in general the male bluegills grow a little faster than the females of the same age-group. This difference is not great and in some age-groups in some lakes the females were larger than the males, but generally the males were larger.

INSTITUTE FOR FISHERIES RESEARCH

By William C. Beckman

Report approved by: A. S. Hazzard

Report typed by: Alma Hartrick

Graph 1

GROWTH CURVES SHOWING THE AVERAGE TOTAL LENGTHS (in inches) FOR EACH AGE GROUP OF BLUEGILLS