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A PROGRESS REPORT ON RECENT EXPERIMENTAL PLANTINGS OF BLACK BASS,  
AND ASSOCIATED CONTROL EXPERIMENTS ON FIN REGENERATION

By

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During the years 1946, 1947 and 1948, most of the smallmouth black bass and some largemouth black bass stocked in Michigan lakes from hatcheries were fin-clipped prior to stocking. This policy was adopted by the Department of Conservation in an attempt to learn how many bass planted in lakes are eventually caught as fish of legal length.

These bass have been young-of-the-year stock, planted in the lakes in the fall. Different fins were removed in the various years and the fin-clipping has been done by personnel from the Institute for Fisheries Research and the hatcheries.

From 1946 to 1948, inclusive, totals of 110,556 smallmouth bass and 5,705 largemouth bass have been stocked under this experimental program. Relatively small numbers of marked bass were planted in previous years. The major share of the plantings have been made in four lakes, namely, Birch, Fife, Louise, and Whitmore. All of the marked largemouth bass dealt with in this report were stocked in Gun Lake, Barry and Allegan counties. Detailed stocking data on the smallmouth bass are given in Table 1.

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Table 1. Fin-clipped smallmouth black bass stocked in some Michigan lakes within recent years.

Lake	Location	Date of planting	Number planted	Average length	Age	Fin removed	Origin of fish
Adrian	Lenawee County T6S, R3E, S35	1946, Nov. 8 and 12	7,018	3.7 in.	5 mo.	Right pectoral	Adrian Rearing Pond #1
Birch	Cass County T7S, R13W, S5,6,7,8	1945, Oct. 11	1,000	2.8 in.	...	Left pectoral	Wolf Lake Hatchery
		1946, Oct. 28	3,499	5.6 in.	4 mo.	Right pectoral	Lydell Hatchery
		1947, Nov. 24	6,000	2.35 in.	6 mo.	Right pelvic	Lydell Hatchery
		1948, Sept. 30 and Oct. 7	10,000	3.36 in.	4 mo.	Left pelvic	Lydell Hatchery
Clear	Jackson County T1,2S, R2E, S35,36,1,2	1946, Oct. 16	3,000	3.2 in.	4 mo.	Right pectoral	Lydell Hatchery
Crooked	Washtenaw County T2S, R3E, S5,6,7,8	1946, Oct. 22	2,600	3.7 in.	4 mo.	Right pectoral	Lydell Hatchery
Fife	Grand Traverse and Kalkaska counties T25N, R9,8W, S11,12,13, 14,18	1946, Oct. 21	9,848	3.4 in.	4 mo.	Right pectoral	Lydell Hatchery
		1947, Nov. 25	5,861	2.75 in.	6 mo.	Left pectoral	Lydell Hatchery
		1948, Oct. 8 and 22	10,000	3.29 in.	5 mo.	Left pelvic	Lydell Hatchery
Gun	Barry and Allegan counties T2,3N, R10,11W, Smany	1947, Oct. 13	2,158	3.88 in.	5 mo.	Left pectoral	Gun Lake Rearing Pond
		1948, Sept. 24	950	3.6 in.	4 mo.	Right pelvic	Gun Lake Rearing Pond
Louise (Thumb)	Charlevoix County T32N, R4W, S1,2,3,10,11	1942, Nov.	5,000	?	4 mo.	Soft dorsal	Wolf Lake Hatchery
		1946, Oct. 18	8,000	3.3 in.	4 mo.	Right pectoral	Lydell Hatchery
		1947, Nov. 25	5,861	2.75 in.	6 mo.	Left pectoral	Lydell Hatchery
		1948, Oct. 22	10,000	2.7 in.	5 mo.	Left pelvic	Lydell Hatchery
Whitmore	Livingston and Washtenaw counties T1N, 1S, R6E, S32,5	1946, Oct. 22	9,900	3.7 in.	4 mo.	Right pectoral	Lydell Hatchery
		1947, Nov. 24	5,861	2.75 in.	6 mo.	Left pectoral	Lydell Hatchery
		1948, Oct. 15	10,000	3.7 in.	4 mo.	Left pelvic	Wolf Lake and Drayton Plains

Previous Institute reports dealing with this experimental stocking of fin-clipped bass are No. 1083, "Experiments in Anesthetizing Smallmouth Bass for Fin Clipping" by L. R. Anderson, and No. 1120, "Smallmouth Bass Experimental Plantings from Lydell Hatchery" by G. P. Cooper.

Since recovery of these marked fish by anglers has been so small up to now, this phase of the experiments will be handled in a later report. Intensive creel censuses are in progress on Birch, Fife and Whitmore lakes where a majority of the marked bass have been planted.

In conjunction with the stocking of fin-clipped bass, several lots of marked bass have been set aside for observations on fin regeneration. The procedure has consisted of putting a definite number of the marked fish in a hatchery pond around the time the lakes were stocked. The plan has been to examine these fish the following spring and again in the fall. This examination stresses observation for evidence of fin regeneration, and measurements and weights also are taken.

The first lot of control smallmouth bass (1,000 fish) was put in Pond No. 21 at the Lydell Hatchery in October, 1946. The following April the pond was drained and 914 bass were recovered (see Report No. 1120). A random sample of 100 fish from this lot was measured and observed for fin regeneration. Only little regrowth was noted. Following examination, 908 of these fish were deposited in Pond No. 16 at the Lydell Hatchery for additional observations in the fall. However, a flash flood subsequently "washed out" the pond, allowing the fish to escape into Mill Creek.

During the fall of 1947 two more lots of fin-clipped bass were set aside to serve as controls, one lot at the Lydell Hatchery and the

other at the Hastings Hatchery. At Hastings, 100 smallmouths and 200 largemouths having the left pectoral fin removed were put into Pond No. 12. These fish were chosen at random from lots prepared for stocking in Gun Lake. The smallmouth bass averaged 3.9 inches in length, the largemouth bass averaged 3.0 inches, and both groups were deposited in the pond on October 13.

At the Lydell Hatchery, 1,000 smallmouths having the left pectoral fin removed were put into Pond "X" on November 21 (1947). The controls were chosen from a lot of fish that was being prepared for Lake Louise, Fife Lake, and Whitmore Lake. A random sample from these controls gave an average length of 3.2 inches. Particular care was taken to clip the fin close on these 1,000 bass.

At this point something should be said about the policy that has been followed in removing fins from the control bass. Except for the instance cited in the preceding paragraph, the controls have been handled like the experimental stocking fish--that is, with no more than reasonable regard for thoroughness in clipping. By using the same operating technique for both the control stock and the planting stock, the comparability of regeneration in the two groups will be maintained. The special care given the control lot mentioned above obviously deviated from the procedure that has been followed in general. It was thought that this variation would be of value later for comparing the degree of regeneration on fish that have been routinely handled and those on which great care was exercised in removal of the fin. In other words, it served as a further check on the other control experiments.

The control lots both at Hastings and Comstock Park (Lydell Hatchery) were examined on May 5, 1948. At Hastings, 158 largemouth bass and 39 smallmouth bass had survived. All of the fish were weighed by lots and were individually measured and examined for fin regeneration. The largemouths weighed  $2 \frac{3}{4}$  pounds and the smallmouths weighed  $1 \frac{1}{4}$  pounds. The largemouth bass averaged 3.4 inches and the smallmouth bass averaged 4.1 inches; the average lengths of fish from sample lots the previous October were 3.0 and 3.9 inches, respectively.

Forty-one largemouths (26%) showed varying amounts of the left pectoral fin present; these consisted of 21 fish with about  $\frac{1}{10}$ , 8 with  $\frac{1}{4}$ , 10 with  $\frac{1}{2}$ , and 2 with  $\frac{2}{3}$  of a fin. Of the smallmouths, 8 (20%) revealed some of the left pectoral fin present; these were comprised of 6 fish with about  $\frac{1}{10}$ , 1 with  $\frac{1}{4}$ , and 1 with  $\frac{1}{3}$  of a fin. Presence of fin growth where the fin had been removed was either due to regeneration, to incomplete removal, or to a combination of both conditions. For some of the personnel involved, it was their first experience at fin-clipping, and it is quite conceivable that a close clip may not have been made on some fish. Even experienced persons may not clip all specimens closely while working at a production rate.

All specimens possessing appreciable areas of the appendage have been regarded as exhibiting regeneration. It has been apparent, though, that an unclipped portion of a fin can be differentiated from a regenerated portion. One of the most useful identifying characters for this on bass is the appearance of the fin rays. In normal fins, or portions thereof, the rays are generally straight; in regenerated fin growth the rays usually take a distinctly wavy course. Also, the marginal outline

usually shows marked irregularities lacking in a normal fin. Despite the occurrence of such differentiating characters, it still is understandable that these may not be observed in all instances by anglers, hence at least the more extensive examples of regeneration should be regarded as failing to show the result of clipping.

The fish at Hastings were handled in May by R. G. Fortney, Clifford Fuller, and G. P. Cooper, and following examination they were returned to Pond No. 12. The plan for going over these controls again in the fall of 1948 was not carried out, but another check on the survivors is to be made in the spring of 1949.

At the Lydell Hatchery, on May 5, 1948, only 74 smallmouth bass were found of the 1,000 put into Pond "X" in the fall of 1947. This extraordinary extent of mortality quite likely is explained by the failure of the water supply to this pond for a period between the times of stocking and draining. Winterkill may also have played a part.

The 74 bass from Pond "X" weighed 15 1/2 ounces. The average length was 3.2 inches, the identical average length shown by a random sample of 100 fish the preceding fall. Four fish (5%) showed some of the left pectoral fin present, and on each of them about 1/10 of the appendage was represented. As mentioned previously, particular care had been taken to cut the fin of these fish close to the body, and all of them were clipped by one person.

The examination at the Lydell Hatchery was made by Claude Lydell and G. P. Cooper. Following this handling, the fish were put into No. 2 display pond.

These fish at Lydell Hatchery were examined again on October 6, 1948. Sixty-five smallmouth bass were recovered when the pond was drained. They weighed an even 7 pounds. Of the 65 fish, 3 possessed the entire left pectoral fin. It seemed likely that these specimens were not of the control lot put into the pond in the spring. Mr. Lydell thought it quite possible that they represented different stock. The remaining 62 smallmouths included 16 fish (26%) that showed varying degrees of fin regeneration. Individual measurements (total length) and the extent of regeneration are listed in Table 2.

The above examination was made by F. E. Simonis and C. M. Taube. After this examination, 19 of the bass possessing none or various portions of the left pectoral fin were preserved in formalin for future study, and the rest of the fish were released in Mill Creek on the hatchery grounds. Photographs have been taken of specimens from the collection saved for study and these are on file at the Institute.

At the Wolf Lake Hatchery on October 7, 1948, a lot of 100 fin-clipped smallmouth bass was put into Pond No. 11, and 200 bass from the Lydell Hatchery were added around the same time. This population will afford additional observations on fin regeneration. At the time of introduction, these were four-month-old fish having the left pelvic fin removed. The lot of 100 bass was a sample from the smallmouth planting stock for Birch Lake in 1948; the lot weighed 1 1/2 pounds and a random sample of 50 specimens averaged 3.3 inches in length. The 200 fish from Lydell Hatchery averaged 3.0 inches and were of the population which provided planting stock for the experimental lakes in the fall of 1948. The former group was fin-

Table 2. The lengths and the extent of fin regeneration (left pectoral) on 62 smallmouth black bass about 11 months after having the fin removed.

Total length	Approximate extent of fin regeneration	Total length	Approximate extent of fin regeneration
5.2	None	6.0	One-half
5.2	Slight	6.0	One-fourth
5.3	None	6.1	None
5.4	Slight	6.1	None
5.5	None	6.1	None
5.5	Three-fourths	6.1	None
5.6	Slight	6.1	None
5.6	None (right pectoral)	6.1	None
5.6	None	6.2	None
5.6	None	6.2	None
5.6	Four-fifths	6.2	None
5.6	Three-fourths	6.2	None
5.7	One-half	6.2	Three-fourths
5.7	Slight	6.3	None
5.7	None	6.3	None
5.7	None	6.3	None
5.7	None	6.4	None
5.7	None	6.4	None
5.8	Slight	6.4	One-tenth
5.8	None	6.5	None
5.8	None	6.5	None
5.8	None	6.6	None
5.8	None	6.6	Three-fourths
5.9	None	6.6	None
5.9	None	6.6	Three-fourths
5.9	One-third	6.7	None
5.9	None	6.9	None
5.9	None	7.0	None
6.0	None	7.4	None
6.0	None	7.6	None
6.0	None	7.6	None



clipped by Wolf Lake Hatchery personnel and the latter by Claude Lydell. All of the marked bass planted in lakes during the fall of 1948 were fin-clipped by Mr. Lydell.

These control fish will be examined in the spring of 1949 and probably again in the fall. It may prove advisable to hold them an additional year for further observations on fin regeneration.

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Table 3. Length-frequency distribution of random samples of fin-clipped smallmouth black bass stocked in various Michigan waters.

Total length in inches	Whitmore and Crooked lakes, 1946	Whitmore and Crooked lakes, 1946	Lake Louise, 1946	Fife Lake, 1946	Birch Lake, 1946	Birch Lake, 1946	Clear Lake, 1946	Lydell Hatchery, Pond Number 21, 1946	Four lakes, 1946	Wolf Lake Hatchery, Pond Number 11, 1948
2.4	...	...	...	...	...	...	1	...	...	...
2.5	...	6	...	...	...	...	...	...	...	...
2.6	...	8	...	...	...	...	17	...	1	...
2.7	...	5	...	...	...	...	10	...	6	...
2.8	2	13	1	...	...	...	31	1	17	...
2.9	1	9	8	...	...	...	22	2	12	...
3.0	1	16	21	...	...	...	15	17	26	2
3.1	2	9	37	1	...	...	18	25	23	5
3.2	2	5	28	1	...	...	9	19	15	10
3.3	9	10	43	4	...	...	14	15	5	11
3.4	4	13	22	6	...	3	7	8	11	7
3.5	9	19	13	13	...	...	8	6	19	10
3.6	11	24	10	8	...	...	11	2	12	5
3.7	23	30	6	15	...	1	16	2	13	...
3.8	24	13	3	10	...	...	13	2	9	...
3.9	20	10	1	5	...	1	2	1	1	...
4.0	17	2	2	3	...	1	1	...	10	...
4.1	25	4	...	3	...	3	1	...	2	...
4.2	16	1	2	6	...	...	...	...	4	...
4.3	10	2	1	4	1	1	2	...	3	...
4.4	7	...	1	4	3	...	...	...	3	...
4.5	6	1	1	1	1	1	...	...	1	...
4.6	3	...	...	3	7	5	1	...	1	...
4.7	4	...	...	3	4	4	1	...	3	...
4.8	3	...	...	7	5	7	...	...	...	...
4.9	...	...	...	...	1	5	...	...	1	...
5.0	...	...	...	1	5	13	...	...	...	...
5.1	...	...	...	1	3	8	...	...	1	...
5.2	...	...	...	...	10	16	...	...	...	...
5.3	...	...	...	...	3	16	...	...	...	...
5.4	...	...	...	...	8	19	...	...	...	...
5.5	...	...	...	1	3	9	...	...	...	...
5.6	...	...	...	...	4	13	...	...	...	...
5.7	...	...	...	...	6	13	...	...	1	...
5.8	...	...	...	...	5	6	...	...	...	...
5.9	...	...	...	...	7	9	...	...	...	...
6.0	...	...	...	...	2	4	...	...	...	...
6.1	1	...	...	...	3	7	...	...	...	...
6.2	...	...	...	...	2	1	...	...	...	...
6.3	...	...	...	...	5	1	...	...	...	...
6.4	...	...	...	...	1	1	...	...	...	...
6.5	...	...	...	...	5	1	...	...	...	...
6.6	...	...	...	...	2	...	...	...	...	...
6.7	...	...	...	...	2	...	...	...	...	...
6.8	...	...	...	...	1	...	...	...	...	...
6.9	...	...	...	...	...	...	...	...	...	...
7.0	...	...	...	...	...	...	...	...	...	...
7.1	...	...	...	...	1	...	...	...	...	...
Mean length	3.9	3.4	3.3	3.9	5.5	5.3	3.2	3.2	3.4	3.3
Total fish in sample	200	200	200	100	100	169	200	100	200	50
Total fish in lot sampled	6,750	5,750	8,000	1,758	1,700	1,799	3,000	1,000	40,000	100

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1 Individual figures on measurements taken in 1947 not available.  
 2 Two lots of fish were combined for the plantings in Whitmore and Crooked lakes in 1946; the same applies to Birch Lake in 1946.  
 3 Birch, Fife, Louise, and Whitmore lakes.

Table 4. Length-frequency distribution of three<sup>1</sup> control lots of black bass when examined for fin regeneration.

Total length in inches	Largemouth bass Hastings Hatchery May 5, 1948	Smallmouth bass Hastings Hatchery May 5, 1948	Smallmouth bass Lydell Hatchery May 5, 1948	Smallmouth bass Lydell Hatchery October 6, 1948
2.9	...	...	1	...
3.0	...	...	3	...
3.1	4	...	21	...
3.2	9	...	24	...
3.3	31	...	13	...
3.4	44	...	3	...
3.5	34	...	1	...
3.6	21	...	2	...
3.7	9	...	2	...
3.8	3	3	2	...
3.9	2	6	...	...
4.0	...	7	1	...
4.1	1	10	...	...
4.2	...	3	...	...
4.3	...	4	...	...
4.4	...	2	1	...
4.5	...	2	...	...
4.6	...	2	...	...
4.7	...	...	...	...
4.8	...	...	...	...
4.9	...	...	...	...
5.0	...	...	...	...
5.1	...	...	...	...
5.2	...	...	...	2
5.3	...	...	...	1
5.4	...	...	...	1
5.5	...	...	...	2
5.6	...	...	...	6
5.7	...	...	...	6
5.8	...	...	...	5
5.9	...	...	...	5
6.0	...	...	...	5
6.1	...	...	...	6
6.2	...	...	...	5
6.3	...	...	...	3
6.4	...	...	...	3
6.5	...	...	...	2
6.6	...	...	...	4
6.7	...	...	...	1
6.8	...	...	...	...
6.9	...	...	...	...
7.0	...	...	...	1
7.1	...	...	...	1
7.2	...	...	...	...
7.3	...	...	...	...
7.4	...	...	...	1
7.5	...	...	...	...
7.6	...	...	...	2