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NORTHERN PIKE EXPERIMENTS CONDUCTED AT THE

DRAYTON PLAINS HATCHERY FROM 1937-1939

by

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Because of the increasing importance of the northern pike, sportsmen and fish culturists have been interested in doing everything possible to improve fishing for this species. In order to obtain further information on artificial propagation and on the rate of growth of this species, a series of experiments were planned. The opportunity for conducting these experiments was presented when Mr. A. B. Cook, then Field Supervisor of Fish Culture, and Mr. A. T. Stewart, Superintendent of Fisheries Operations, expressed their willingness to cooperate.

Not much information has been published in the past on northern pike propagation. Minnesota, Wisconsin, and New York have been actively engaged in northern pike propagation in past years, but none of these states has, to my knowledge, released any information on the subject.

On October 29, 1935, Dr. A. S. Hazzard, Director of the Institute, wrote to Dr. G. C. Embury, of Cornell University, concerning the propagation of the northern pike. The following is quoted from the letter of Dr. Embury to Dr. Hazzard, dated October 31, 1935:

"As you probably know, I put in a considerable amount of time studying the pike in Cayuga Lake way back in 1909-10, but never published the results.

"We found them easy to capture in seines and traps; very easy to strip by the ordinary trout method and the eggs easy to develop in hatching jars.

"The stripping ought to be done in the shade, never in direct sunlight, otherwise the eggs rupture badly when washed.

"The eggs may be hatched in jars but the fry, like those of the Muskallonge, have large sacs and have much difficulty in swimming over the top of the jar. Hence, just before hatching, they are sometimes poured in trays.....and allowed to hatch in troughs of running water.

"They can be reared to a length of about two inches on Daphnia magna, but thereafter they must have available plenty of small fish.

"We found them somewhat easier to raise than Muskallonge, though they are terribly cannibalistic and the mortality is so high that it may not pay to attempt rearing.

"Young pike grow rapidly in the presence of an abundance of minnows, reaching lengths from eight to twelve inches the first year."

Northern pike will start on their spawning run long before the ice has completely disappeared from the lakes. In permanent streams, this migration may start as much as a month before the complete break-up of the ice. In smaller streams and in ditches draining marshes, the pike usually start to run as soon as the water from the stream or ditch opens a hole in the ice and also melts the ice offshore so that in the shoal area an open space exists between the bottom of the lake and the under surface of the ice.

Northern pike eggs are slightly adhesive and it is necessary to "chalk" the eggs when stripping. Mr. Stewart used cornstarch in 1937 to prevent adhesion. That "chalking" is necessary was proven when the writer and Mr. H. L. Peterson failed to "chalk" a batch of eggs taken on Denton Creek in 1938. All of the eggs in this stripping adhered to one another and to the bottom of the pan.

The eggs of all northern pike females do not mature at the same time. For this reason it may be necessary to take eggs over a period of several weeks. It may also be to the advantage of the hatchery man to have a large number of male fish on hand before egg-taking begins.

Northern pike fry do not "chain-up" as do walleyed pike fry. The main reason that northern pike fry adhere to the sides of the hatching jar after they hatch is because of large yolk sac and the fact that an adhesive organ is present on the head of each fry. Northern pike fry have been observed, in the wild, to hang from plants by means of threads from these adhesive organs.

Young northern pike will start to feed upon one another when they reach a length of $3/4$ of an inch. It is for this reason that an abundant supply of food is necessary.

In early April, 1937, Mr. Stewart had a weir installed on the "Fly" at Walled Lake, Oakland County. The "Fly" drains a large marsh area adjacent to Walled Lake which large numbers of adult northern pike usually enter in the early spring on their spawning migration. On the nights of April 7 and 8, Mr. Stewart collected nine quarts of northern pike eggs, which were taken to the Drayton Plains Hatchery where they were placed in regular hatchery jars. All of the eggs were "chalked". By actual count, there were 1,650 eggs to the ounce, or 52,800 per quart. Mr. Stewart observed at the time these eggs were secured that the males did not contain as much milt as did males of other species of fish that are usually stripped. The temperature of the water at Drayton Plains remained at an average of 42° during hatching. The eggs eyed in 15 days and hatched on April 27 after an incubation period of 19 days. Approximately three quarts of eggs hatched. The fry upon hatching were not free-swimming

and did not rise and pass over the edge of the jar as walleyes do. Instead, the northern pike remained near the bottom of the jar with the unhatched eggs, or else hung to the sides of the jar. Because of this, a number of the fry died.

Because of the difficulties involved in holding northern pike fry in hatchery troughs at Drayton Plains in 1937, it was decided that the fry should be planted before the yolk sac was absorbed. Therefore, on May 3, 1937, approximately 150,000 fry (or three quarts) were placed in the Ortonville (Davis) Rearing Pond. This pond is located in Brandon Township, Oakland County, near Ortonville, Michigan, and is usually used as a largemouth bass rearing pond. The pond is situated immediately below Phipps Lake. A small dam backs up the water in Phipps Lake and the overflow from this dam flows directly into the Ortonville Pond. There are no screens in the dam; consequently, at periods of high water, it is possible for fish in Phipps Lake to swim over the dam and thereby gain access to the Ortonville Pond. This migration of fish from the lake to the rearing pond occurs each year, which makes it impossible to keep a pure stock of fish in the pond.

The Ortonville Pond is slightly less than three acres in area, has a maximum depth of eight feet and an average depth of about two and a half feet. The bottom of the pond is composed of muck and fibrous peat. Approximately two-thirds of the bottom area was covered by a dense growth of Chara in 1937. Potamogeton (pondweeds) and Polygonum (smartweeds) were also abundant in the pond.

It was rather difficult to obtain small minnows to feed to the pike during the spring of 1937. On June 2, a total of 6,200 small common shiners and river chubs, averaging 310 to the pound, were planted in

the Ortonville Pond as forage for the pike. On June 16, a stocking of 30,000 largemouth bass fry was made. These were the only plantings of fish other than northern pike that were made during the summer.

Collections of northern pike were made at intervals during the summer of 1937. The dates of collection and the number of northern pike taken at each collection date is summarized below.

June 25, 1937-----40 northern pike

July 14, 1937-----21 northern pike

August 17, 1937---12 northern pike

During the latter part of the summer it was extremely difficult to obtain an adequate sample of fish because of the difficulties involved in seining (soft bottom and dense weed growth). We had originally planned to drain the Ortonville Pond soon after Labor Day, but because Mr. Stewart desired to plant out the other ponds first, the Ortonville Pond was not drained until October 14, 1937. Because of the expectation that the pond would be drained early in the fall, additional collections were not made between August 17 and October 14.

When the pond was drained on October 14, 1937, the following species of fish were removed from the pond:

1. Northern pike - 362
2. Largemouth bass - 950 fingerlings
3. Bluegills - 3,600 fingerlings

Bluegills - 850 yearlings, average length 5 inches.

4. Yellow perch - common
5. Pumpkinseed sunfish - common
6. Walleyed pike - few
7. Mud pickerel - about 20
8. Black crappie - common

9. Green sunfish - few
10. Long-eared sunfish - few
11. Warmouth bass - few
12. Common sucker - few
13. Chub-sucker - common
14. Darters - few
15. Blunt-nosed minnow - few
16. Fat-headed minnow - few
17. Golden shiners - common
18. Common shiner - few
19. River chub - few
20. Mudminnows - few
21. Crayfish - few

Of the 21 species of fish that were recovered when the pond was drained, only four species were actually stocked in the pond. Obviously many fish found their way into the pond from Phipps Lake, above. Some of the larger bluegills probably came in from this lake and apparently spawned in the pond, as indicated by the presence of a large number of small fingerlings. Each year since 1937, the writer has managed to be on hand when this pond was drained. In each of these years (1938 to and including 1941) about the same species were taken from the pond. However, northern pike have not been taken since 1937. According to the employees at the Drayton Plains Hatchery, northern pike were not taken in any year previous to 1937. It may therefore be assumed that the pike recovered in this year resulted entirely from the planting of 150,000 fry. In order to definitely confirm this, however, it would be necessary to determine whether northern pike are present in Phipps Lake.

A total of 362 northern pike were removed from the Ortonville Pond when it was drained. This represents a survival of 0.24 per cent of the approximately 150,000 fry with which the pond was stocked. An ample supply of minnows, bass and bluegills was present throughout the summer. Of course, it is entirely possible that most of the cannibalism occurred between the time that the northern pike were planted in the pond and on June 2, when the first forage fish were placed in the pond.

In 1940 a similar northern pike experiment was undertaken in one of the experimental minnow ponds at Drayton Plains. A total of 185 pike were stocked in this pond, and we had a survival of 5.4 per cent. But in this experiment, an ample supply of small minnows was present from the time the northern pike were large enough to feed upon fish until the pond was drained.

The survival that was obtained at the Ortonville Pond is probably very close to that obtained in nature.

Individual lengths and weights were taken from all of the northern pike when the pond was drained.

The growth of the northern pike during the summer of 1937 is presented in the following Table, and in Figures 1 and 2.

Date collected	Number of days old	Smallest fish (T. L. mm.)	Largest fish (T. L. mm.)	Average (T. L. mm.)	Growth in mm. per day		
					Smallest fish	Largest fish	Average
June 25, 1937	60	50	135	72.6	0.67 ¹ / ₂	2.08	1.04
July 14, 1937	79	62	222	107.0	0.66	2.68	1.23
Aug. 17, 1937	113	79	263	171.0	0.61	2.24	1.42
Oct. 14, 1937	171	83	446	207.2	0.43	2.55	1.15

¹/₂ Fry are approximately 10 mm. long when they emerge from egg.

The presence of two or more different size groups of northern pike was found on each of the two collection dates and when the pond was drained on October 14, 1937 (Figure 2). The variation in size between the smallest fish and the largest fish became greater as the season progressed (Figure 1).

That the great variation in the sizes of the young northern pike occurred early in the summer can be seen from an examination of the above table. (Also refer to Figures 3, 4 and 5). There are several explanations for this variation in growth. Probably the most important was the competition for food. Because there was probably a difference of several days between the time that the first and last pike hatched, some pike no doubt started to feed earlier than others. Therefore, these fish had the jump on the other pike and no doubt were able to maintain it. By the time that the others started to feed, there might have been a shortage of the proper-sized food organisms. That the lack of the proper-sized food organisms cannot fully explain this is further borne out by the fact that 30,000 bass fry were placed in the pond on June 16, and that young bluegills were produced in the pond and were present when the pond was drained. In other words, some of the northern pike apparently never learned to feed properly.

The best growth that was made by any of the northern pike in the Ortonville Pond was 446 millimeters (17.6 inches) in the 171 days from the time of hatching until the pond was drained on October 14. This fish grew at an average rate of 2.55 millimeters (0.1 inches) per day. This might be considered as excellent growth for northern pike. In fact, some people may think that it would be impossible for a pike to make such rapid growth. Therefore, the growth of the northern pike at the Ortonville

Pond will be compared with that obtained in other northern pike experiments. At Houghton Lake during the summer of 1939, the writer found that young northern pike increased on the average of 1.5 millimeters per day during the month of May, 3.3 millimeters per day during June and 0.4 millimeter per day during July. These young northern pike averaged 1.8 millimeters growth per day during the 82 days that observations were made. One northern pike grew at an average rate of 3.2 millimeters (0.12 inches) per day over a period of 69 days. In 1940 at Houghton Lake, the young northern pike increased at an average rate of 1.3 millimeters per day over a period of 85 days. In 1939, another northern pike feeding experiment was conducted at the Drayton Plains Hatchery. In this experiment the average daily growth of the young northern pike was 1.85 millimeters per day over a period of 161 days. The biggest pike in this experiment grew at the rate of 2.12 millimeters per day.

Scale studies were made on the northern pike that were raised in the Ortonville Pond. No definite annuli were found on any of the scales. This further indicates that all of these northern pike were young-of-the-year and did not enter the pond from Phipps Lake.

It was decided that part of the northern pike raised at Ortonville should be held over in Pond No. 3 at Drayton Plains, where their growth could be checked for a period of two years.

Of the 362 northern pike taken from the Ortonville Pond, 77 of the 140 smaller pike, 83 to 101 millimeters, total length, died during and immediately after the pond was drained. The other 63 small pike were placed in experimental pond no. 9, which was stocked with small minnows. Five days later only six of these pike were still alive. The dorsal fin was clipped on each of these six pike and they were placed in Pond No. 3.

Dr. David Shetter and the writer jaw tagged 100 of the larger pike (average size 280.4 millimeters (11.0 inches) total length) which were planted in Walled Lake, Oakland County. The tags used were part of a shipment that were of inferior quality. Dr. Shetter found that 95 per cent of the tags from the same shipment that were used on trout would not stay on the fish, as the tags apparently disintegrated upon use in water. We never did get any returns from this planting of tagged pike.

The remaining 103 large northern pike were fin-clipped (right pelvic) and placed in Pond 3.

The 19 fish unaccounted for in the above experiment were preserved as samples.

On December 13, 1937, a shipment of 60 young-of-the-year northern pike, 8 1/4-12 inches in length was received at Drayton Plains from the Belle Isle Aquarium. The right pectoral fin was clipped on 51 of these fish, which were then placed in Pond No. 3.

A summary of the minnows that were placed in Pond No. 3 during the course of this northern pike experiment is presented in the following table:

Date of planting	Species	Source	Number	Total weight in pounds
Nov. 16, 1937	Golden shiners	Drayton Plains	2,000	4.0
Dec. 16, 1937	Lake emerald shiners	Grand Haven	7,675	64.3
Jan. 31, 1938	Lake emerald shiners	Grand Haven	27,800	150.0
Nov. 22, 1938	Yellow perch	Cass River at Frankenmuth	6,750	75.0
March 20, 1939	Lake emerald shiners	Grand Haven	12,500	25.0
April 27, 1939	Lake emerald shiners	Grand Haven	8,570	30.0
Total			65,295	348.3

It was impossible to obtain an estimate of the numbers of these minnows that died after planting, because most of the minnows were planted after the ice had formed over the pond. Because of this and the fact

that counts could not be made on the number of minnows that survived, we were unable to correlate the growth of the pike with the number and pounds of minnows consumed.

Sometime during the late spring of 1938, Mr. Stewart placed a number of adult bluegills in Pond 3. These bluegills spawned during the summers of 1938 and 1939 and the young bluegills were available as food for the pike.

On May 26, 1938, Pond 3 was partially drained. All of the northern pike were removed by use of seines. Scales, weights and measurements were secured and the pike were returned to the pond. During the draining operations an undetermined number of minnows died or were killed. The growth of the pike over winter will be discussed later.

On November 9, 1938, the pond was partially drained again. Some minnows, young and adult bluegills were still present in the pond when it was drained.

Because of the pressure of other duties, we were unable to drain Pond 3 during the spring of 1939. The pond was completely drained on October 17, 1939, and all of the pike were removed.

Survival and Growth--October 15, 1937-October 17, 1939

The summary of the survival and growth of the northern pike during the course of the feeding experiment is presented in Table No. 1.

As mentioned above, only 6 of the 140 small northern pike that were removed from the Ortonville Pond survived the draining. The dorsal fin was clipped on each of these 6 fish. On October 15, 1937, these fish averaged 95.6 millimeters (3.8 inches), total length, and 4.1 grams in weight (Table 1, and Figure 6). When the pond was drained on May 26, 1938, all 6 of the fish had survived the winter and had gained an average of 84.1 millimeters in length and 27.5 grams in weight. The average length of these 6 fish was 179.7 millimeters (7.1 inches). This is remarkable

growth for fish to make over winter. No losses occurred between May 26 and November 9, 1938, when the pond was drained again. During this period these 6 fish had gained an average of 127.5 millimeters in length and 113.6 grams in weight. They now averaged 307.2 millimeters in length (12.1 inches). Between November 9, 1938, and October 17, 1939, one of the six pike either died or was eaten. The five pike that survived now averaged 363.8 millimeters (14.3 inches) in length, having gained an average of 84.8 millimeters.

The growth that was made by these small, dwarfed northern pike is a perfect illustration of the law of growth compensation. These fish that were small at the end of their first summer of life grew, on the average, faster than the pike that were large at the end of the first summer, as will be discussed below. Eventually, these small and large fish would have reached a more or less uniform size, because the differences between the small and large individuals diminished each year. This also indicates that when an ample supply of the proper-sized food is present, the small fish will grow, and that stunting in this case was due to a lack of food.

The 103 large pike that were removed from the Ortonville Pond and placed in Pond No. 3 had their right pelvic fins clipped so that they could be separated from the other pike (Table 1 and Figure 7). These 103 fish had an average length of 274.1 millimeters (10.8 inches) and an average weight of 101.3 grams on October 15, 1937. On May 26, 1938, it was found that none of these fish had died over the winter. These fish had increased on the average of 65 millimeters in length during this period and had more than doubled their weight. The average total length of the 103 fish was 339.1 millimeters (13.4 inches) and the average weight

was 227.5 grams. By November 9, 1938, only 85 of these pike were still alive. This represents a loss of 18 fish (17.5 per cent) over a period of 168 days. During the summer period between May 26 and November 9, the pike grew less (average of 54.9 millimeters) than they had the previous winter period (Table 1). During this same period the 6 dorsal fin-clipped fish had grown on the average of 127.5 millimeters. When pond no. 3 was drained on October 17, 1939, only 60 pike had survived. This represents a loss of 25 fish (29.4 per cent) over a period of 343 days. A total of 41.7 per cent of the 103 northern pike had died over a period of 735 days.

On December 15, 1937, a total of 51 northern pike from the Belle Isle Aquarium were placed in pond no. 3. These northern pike grew less, on the average, over winter than any of the other pike in the pond, and four of the pike died over this period. Four more pike died over the summer period (May 26 - November 9). The average increment in length over this period was exactly the same for these right pectoral fin-clipped fish as for the right pelvic fin-clipped fish. Both of these groups of fish were of about the same average length. On October 17, 1939, only 28 of these fish were alive. This represents a total loss of 45.1 per cent during the 674 days that they were in the pond. At this final draining, these 28 fish averaged 384.3 millimeters (15.1 inches) in length.

Tagging Experiment

A total of 93 northern pike were taken from pond no. 3 on October 17, 1939. These pike were jaw-tagged by Dr. David Shetter and the writer and were planted in Walled Lake.

In the early spring of 1939, Mr. A. T. Stewart built another weir on the "Fly" at Walled Lake to trap northern pike spawners. A total of 36 northern pike were jaw-tagged and returned to Walled Lake as summarized in Table 2.

Of the total of 129 tagged northern pike in Walled Lake, to date (March 20, 1942) nine recoveries have been reported. The summary of these recoveries is presented in Table 3.

The records of recovery were turned in by fishermen and conservation officers. A creel census was not in operation at Walled Lake, and it is possible that other tagged fish were recovered but were not reported to the Conservation Department. Posters describing the tagging and the type of data required for each tagged fish captured were placed at several conspicuous points about the lake.

The number of days between tagging and recovery varied from 30 to 824 days (Table 3) and averaged 384.9 days for the nine recoveries to date. One fish exhibited a negative growth but this can probably be attributed to a mistake in measuring made by the fisherman (failure to take greatest total length) or to shrinkage after death.

The writer wishes to express his thanks to Mr. A. T. Stewart, Supervisor of Fisheries Operations, and to members of the staff of the Drayton Plains Hatchery for their kindness and cooperation during the course of this investigation.

Summary

1. Northern pike are very easy to strip by the ordinary trout method. The eggs can be hatched by the jar method. Thirty-three per cent of the eggs hatched at the Drayton Plains Hatchery in 1937.

2. A very small percentage of the total number of pike fry stocked in a rearing pond survive one summer, despite the presence of an ample supply of food. The greatest loss of young northern pike probably occurs soon after the pike begin to feed on fish. An ample supply of the proper-sized food and more pond space would probably increase the yield of northern pike.

3. A great variation in the size of the largest and smallest fish was obtained at the end of the first summer. This variation in size occurred early in the summer, and is probably due to the abundance of the proper-sized food at the time that the pike start to feed on fish and that some pike apparently failed to learn to feed properly during the first summer. A total of 95.7 per cent of the runts died during the first five days after the pond was drained (October 14, 1937).

Malnutrition was the major cause of this loss.

4. During the second season the pike made excellent growth and the mortality was low. This was due to the presence of large numbers of forage fish.

5. The growth during the third summer was less than the growth during either the first or second summers despite a liberal amount of forage fish present in the pond. The mortality was extremely high during this period. This mortality was partially due to the fact that the pike were larger and required (or preferred) larger fish for food.

6. To date, 8 (8.6 per cent) of the 93 pike that were raised at Drayton Plains have been recovered in Walled Lake. One pike was caught by a fisherman 824 days after tagging and had grown 9.8 inches in length and 43.8 ounces in weight during this period.

INSTITUTE FOR FISHERIES RESEARCH

By W. F. Carbine

Report approved by: A. S. Hazzard

Report typed by: R. Bauch

Table 1

Summary of the survival and growth of the northern pike
in Drayton Plains Hatchery Pond No. 3.

Date	Number of fish	Average total length in millimeters (inches)	Minimum and maximum total length (mm.)	Average weight in grams	Average increment in length (mm.)	Average increment in weight (grams)	Number of days
Dorsal Fin-Clipped Fish							
Oct. 15, 1937	6	95.6 (3.8)	87 - 107 (167) ¹ ↓	4.1	85.6 ² ↗	4.1	172 ² ↗
May 26, 1938 ³ ↘	6	179.7 (7.1)	160 - 197	31.6	84.1	27.5	224
Nov. 9, 1938 ³ ↘	6	307.2 (12.1)	254 - 336	145.2	127.5	113.6	168
October 17, 1939	5	363.8 (14.3)	356 - 373	230.0	56.6	84.8	343
Right Pelvic Fin-Clipped Fish							
Oct. 15, 1937	103	274.1 (10.8)	195 - 371	101.3	264.1 ² ↗	101.3	172 ² ↗
May 26, 1938 ³ ↘	103	339.1 (13.4)	297 - 385	227.5	65.0	126.2	224
Nov. 9, 1938 ³ ↘	85	394.0 (15.5)	347 - 535	319.2	54.9	91.7	168
Oct. 17, 1939	60	417.1 (16.4)	260 7 - 652	361.7	23.0	42.5	343
Right Pectoral Fin-Clipped Fish							
Dec. 15, 1937	51	245.2 (9.6)	209 - 305	61.9	...	...	...
May 26, 1938 ³ ↘	47	301.6 (11.9)	272 - 326	168.4	56.4	106.5	163
Nov. 9, 1938 ³ ↘	43	356.5 (14.0)	324 - 396	234.0	54.9	65.6	168
Oct. 17, 1939	28	384.3 (15.1)	357 - 420	267.3	27.8	33.3	343

¹↓ One fish, 167 mm. long, was over 107 millimeters long.

²↗ The eggs hatched on April 27, at which time the fry were 10 millimeters long.

³↘ The ponds were not completely drained. The water was lowered sufficiently to permit seining. It is possible that not all of the pike were removed from the pond at this time.

⁴↘ A random sample of the fish were measured; all fish were weighed.

Table 2

Northern pike tagged at the weir on the "Fly"
 at Walled Lake, Oakland County, Michigan,
 3/27/39 - Crowe and Beckman.
 Stripped fish tagged on maxillary

Number	Standard length	Total length	Weight	Tag number
1	456	530	2# 2 oz.	28175
2	630	732	5# 2 oz.	28174
3	595	690	4 3/4#	28176
4	495	577	3#	28177
5	465	530	2 1/4#	28179
6	470	540	1# 15 oz.	28180
7	520	600	2# 10 oz.	28181
8	505	582	2# 15 oz.	28182
9	450	520	2#	28183
10	400	465	1# 4 oz.	28184
11	410	480	1# 5 oz.	28185
12	410	485	1# 7 oz.	28186
13	495	575	2# 8 oz.	28187
14	460	525	1# 15 oz.	28188
15	415	492	1# 7 oz.	28189
16	445	516	2#	28190
17	470	540	1# 15 oz.	28191
18	510	595	3# 4 oz.	28192
19	495	582	2# 15 oz.	28193
20	495	565	2# 5 oz.	28194
21	440	510	1# 9 oz.	28195
22	475	545	2# 6 oz.	28196
23	460	540	2# 6 oz.	28197

(Continued)

28,178 destroyed.

Scale samples taken.

Table 2
(continued)

Adult Esox lucius tagged on maxillary,
Walled Lake, Oakland County, Michigan, 3/29/1939
Air 33°F., water 36°F.
Crowe and Perry

Number	Standard length	Total length	Weight	Tag number
24	650	745	5# 9 oz.	28198
25	540	605	2# $8\frac{1}{2}$ oz.	28199
26	510	580	2# 5 oz.	28200
27	510	570	2# 2 oz.	51353
28	475	525	2# 2 oz.	Preserved
29	480	540	2# 1 oz.	51355
30	425	475	1# 9 oz.	51354
31	500	560	2# $\frac{1}{2}$ oz.	51356

(continued)

Table 2
(continued)

Adult Esox lucius tagged on maxillary,
Walled Lake, Oakland County, Michigan, 4/2/1939
Air 37°F., water 41°F.

Number	Standard length	Total length	Weight	Tag number
32	460	530	...	51357
33	485	560	...	51359
34	475	545	...	51360
35	475	545	...	51361
36	465	540	...	51362

Table 3

Tagging recoveries of northern pike reared at Drayton Plains
and planted in Walled Lake, Oakland County, Michigan

Tag number	Date recovered	Date planted	Total length on recovery (inches)	Total length when tagged (inches)	Growth (inches)	Weight on recovery (ounces)	Weight when tagged (ounces)	Gain in weight since tagging (ounces)	Total days out between tagging and recovery	Growth/day	
										Inches	mm.
11562	Nov. 15, 1939	Oct. 17, 1939	17.00	17.75	0.75	20	15.0	5.0	30	...	...
11516	Jan. 6, 1940	" " "	26.50	25.70	0.80	76	62.0	14.0	82	0.010	0.25
11533	June 29, 1940	" " "	19.50	16.25	3.25	25	11.3	13.7	257	0.013	0.32
11517	June 30, 1940	" " "	22.00	16.10	5.90	40	11.0	29.0	258	0.023	0.58
11546	July 4, 1940	" " "	18.25	17.00	1.25	24	13.4	10.6	262	0.005	0.12
51361 ↓	Oct. 26, 1940	April 2, 1939	28.00	21.50	6.50	...	...	...	574	0.011	0.29
4134	Jan. 26, 1941	Oct. 17, 1939	23.00	16.50	6.50	...	11.6	...	468	0.014	0.35
11532	Sept. 24, 1941	" " "	26.00	16.50	9.50	...	12.2	...	709	0.013	0.34
11541	Jan. 17, 1942	" " "	24.50	14.70	9.80	52	8.2	43.8	824	0.012	0.30
Total	...	...	...	...	42.75	...	...	116.1	3,464	...	...
Average	...	...	...	...	4.75	...	...	19.35	384.9	...	...

↓ Tagged at "Fly" on east shore of Walled Lake.

FIGURE 1

ORTONVILLE N. PIKE EXP. 1937

Size of N. Pike at each collection period

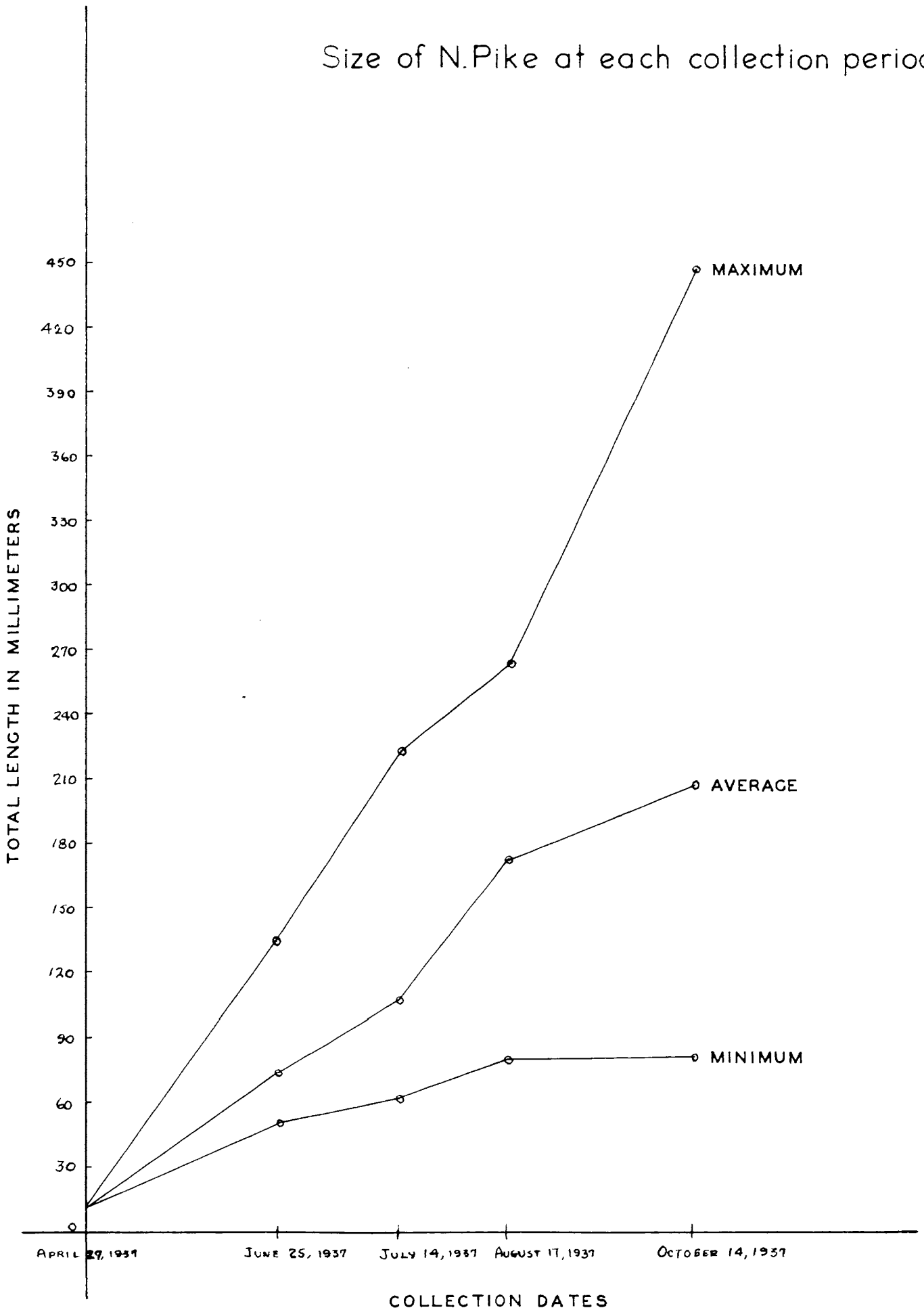


FIGURE 2 GROWTH OF NORTHERN PIKE DURING SUMMER AT THE ORTONVILLE POND

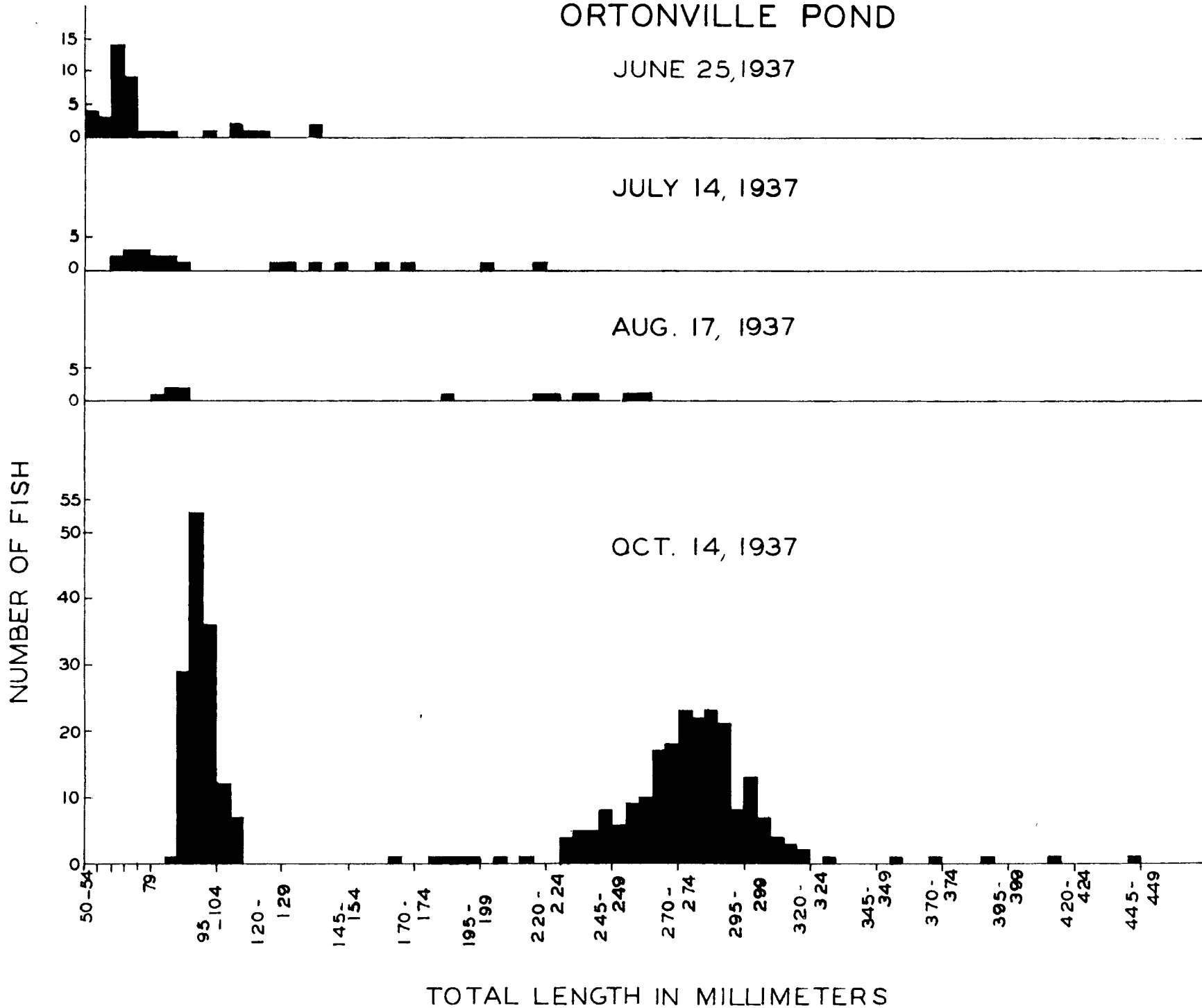




Figure 3

Size range of the northern pike collected at the Ortonville Pond on June 25, 1937. Smallest fish is 50 mm. T. L. and largest fish is 135 mm. T. L.

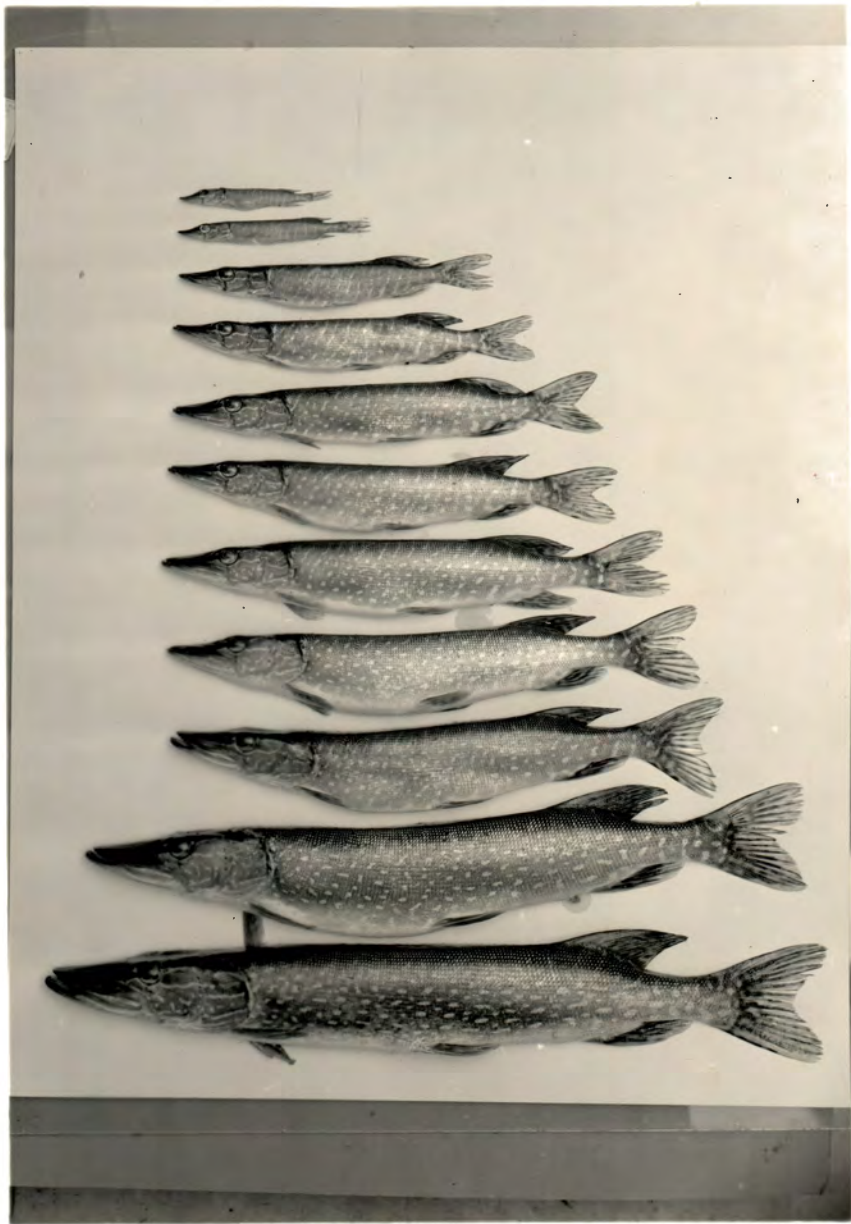


Figure 4

Size range of the northern pike taken when the Ortonville Pond was drained on October 14, 1937. Smallest fish is 83 mm. T. L. and largest fish is 446 mm. T. L.

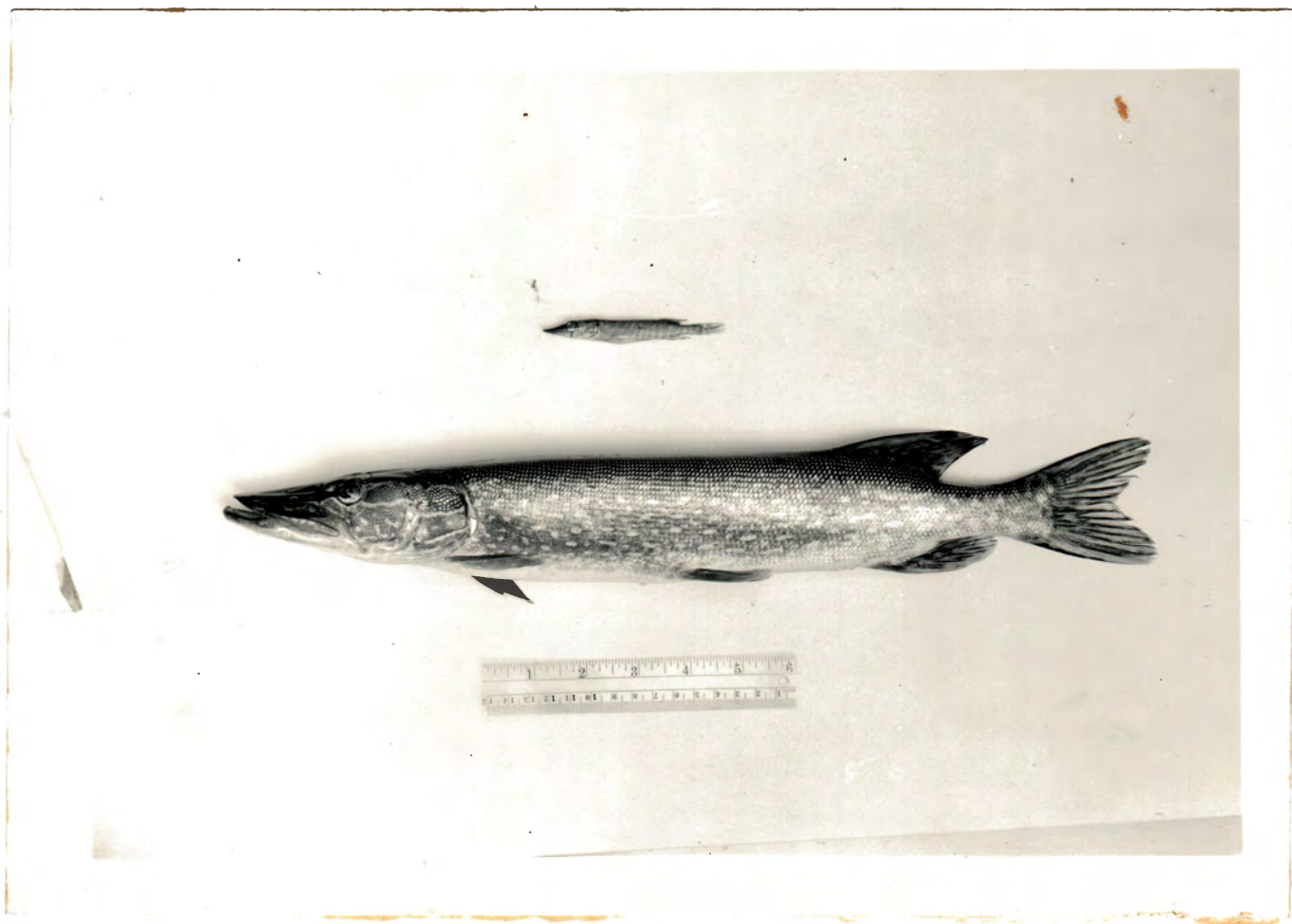


Figure 5

The largest (446 millimeters) and smallest (83 millimeters)
northern pike taken from the Ortonville Pond when it was
drained on October 14, 1937.

FIGURE 6 GROWTH OF THE DORSAL FIN-CLIPPED NORTHERN PIKE HATCHED AT THE DRAYTON PLAINS HATCHERY FROM APRIL 27, 1937 TO OCT. 17, 1939.

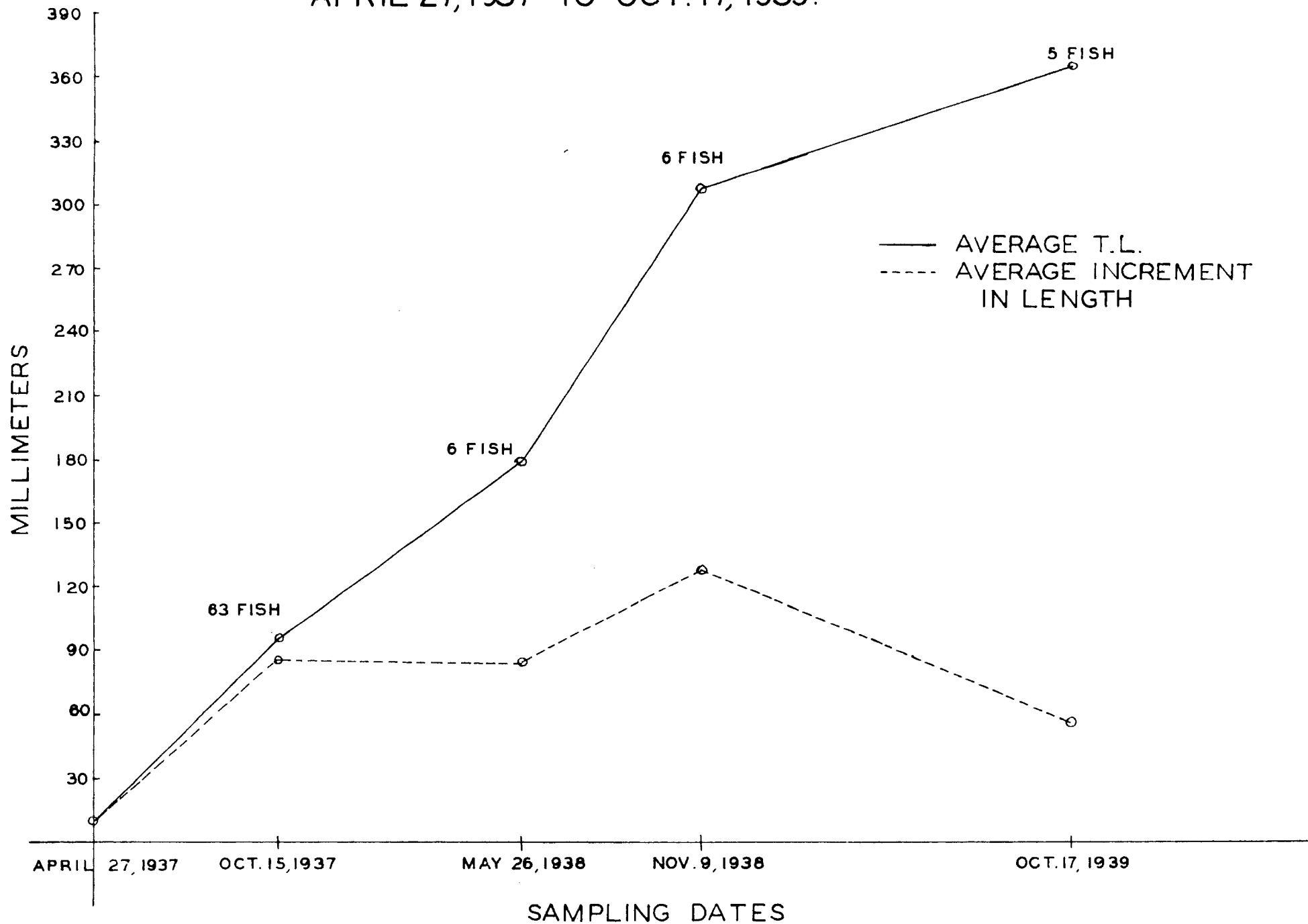


FIGURE 7 GROWTH OF THE RIGHT-PELVIC FIN-CLIPPED NORTHERN PIKE

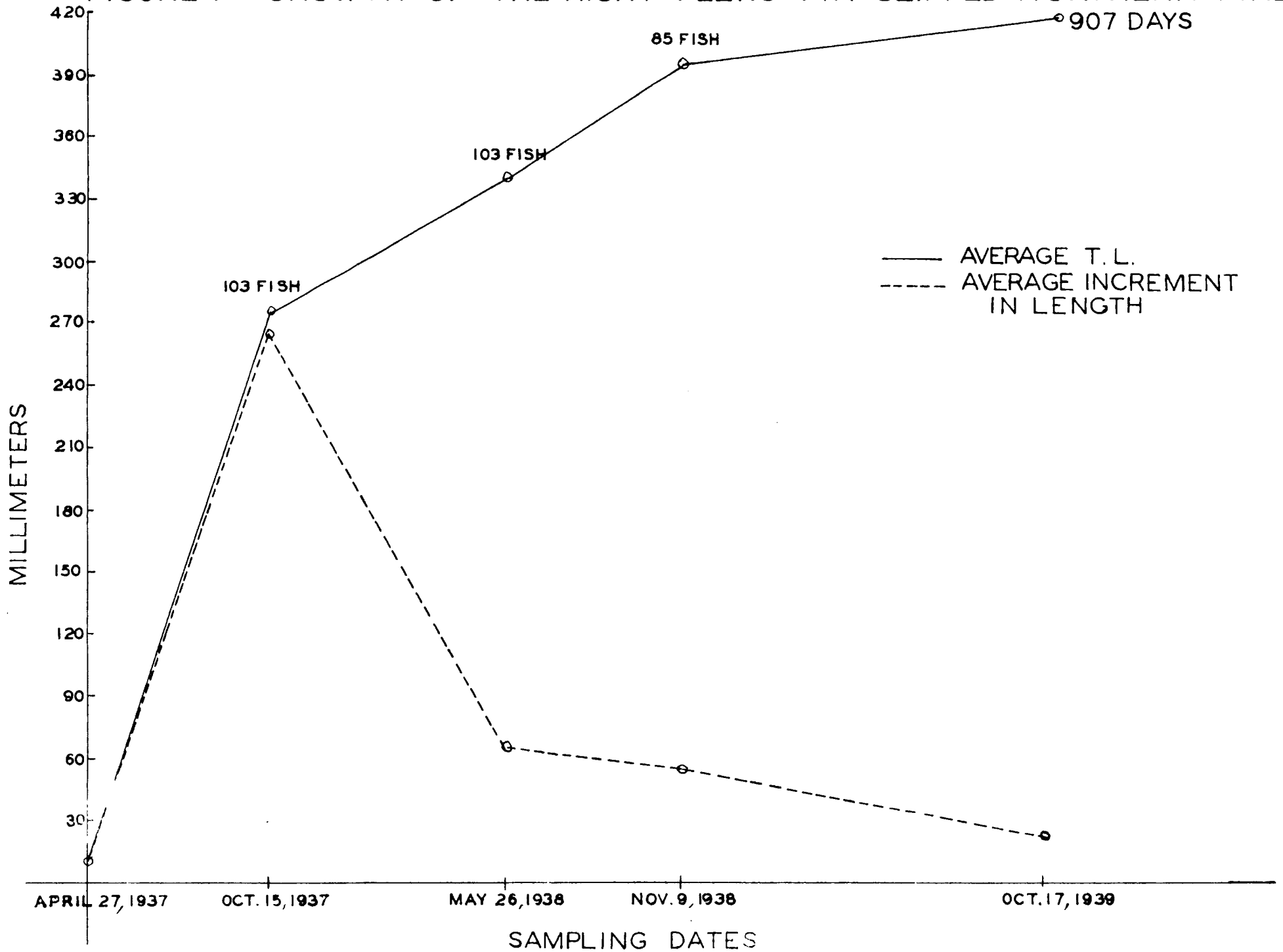


FIGURE 8 GROWTH OF THE RIGHT-PECTORAL FIN-CLIPPED NORTHERN PIKE

