Proceedings of the Iowa Academy of Science

Volume 64 | Annual Issue Article 86

1957

# Growth of the Channel Catfish, Ictalurus punctatus (Rafinesque), In Some Iowa Waters

Harry M. Harrison
*Iowa Conservation Commission*

# Growth of the Channel Catfish, *Ictalurus punctatus* (Rafinesque), In Some Iowa Waters

By Harry M. Harrison

## Introduction

The channel catfish, *Ictalurus punctatus* (Rafinesque), ranks first on the preferred list of the Iowa stream angler. It abounds everywhere in those streams of the state which have permanent or year around flows. Also, it is the only game species of economic importance that has state-wide distribution in our flowing waters. Because of its unchallenged popularity and wide spread distribution, the species has been accorded considerable attention in the study and management of Iowa streams. Many phases in the life history of the channel catfish are being explored with the hope that as answers are found and are coordinated, that constructive efforts can be inaugurated toward accomplishment of our ultimate goal of more catfish for more catfishermen.

One phase of this work involves the study of the growth of the channel catfish in Iowa waters. The primary intent of this inquiry is to discover the time required for channel catfish to reach creel size in typical Iowa waters; how the growth rate compares with other areas in the Mid-west; whether there is periodicity in the growth pattern; and whether certain observable circumstances such as fish kills, prolonged floods or droughts have any effect upon the growth of the species.

## Methods

The portion of the Des Moines River lying between the city of Des Moines and town of Bradgate was set up as a key area for intensive study. This area of approximately 150 stream miles was selected because it was known to be well populated with channel catfish, and in addition is quite representative of a large number of other Iowa streams and rivers. In particular, the area contains a wide variety of physical, chemical and biotic features common to many other flowing waters in this state.

During the years 1953 through 1956, the channel catfish population in the study area was sampled in various areas at various times throughout the open water seasons. In the selection of the specimens for growth study, emphasis was placed upon securing a cross section of sizes. The size of the series selected for aging in a particular in-

stance, depended upon a variety of conditions. The numbers of individuals in the various series varied from ten or twelve specimens up to several hundred. The date, place, weight, sex, total and standard lengths of each individual were recorded on conventional scale envelopes in which was placed the right pectoral spine of that particular fish.

The technique employed for preparing the spines for study and that for assessing age follow quite closely those described by Sneed (1951). The main exception being that the spine sections were read on a Master Model "20" Bioscope and growth was determined on the basis of average lengths for given ages instead of by the system of back-calculation. Marzolf (1955) showed that the spine method applied to channel catfish embodies in inherent error that causes the calculated lengths to be short. Additionally, the projection equipment used in this work produces a distortion of the bigger spines near the perimeter of the field that are disproportional to the distances at or near the center of the projected image. This would add to the inherent error if lengths were calculated. The Bioscope, however, provides an easy, quick and accurate method for aging fish with a minimum necessity for discarding unreadable sections.

To check whether or not the findings in the Des Moines River were applicable to other waters in Iowa, collections have been made over wide areas of the state for comparison with fish from the area of intensive study.

## Results

During the period 1954 to 1956 inclusive, 2,084 channel catfish from the Des Moines River were processed for age. The individual stations are indicated by the number and the locality of each is shown in figure 1. The average lengths attained by channel catfish for the various ages are quite similar from station to station (Table 1). Growth was slow at Station 14 and may be slightly above average in the middle reaches of the study area. The exceptions result from small samples or occur in the older age groups where a combination of small sample size and overlapping in lengths between age groups are most apparent.

Regarding the slower growth at station 14, it is pointed out that this area is unique compared to the others. The river at this station is impounded and closed off at either end by hydro-electric dams which are almost impassable to fish. Large populations of fish have developed in the area and stunting is common among several varieties living there. As for the slightly better growth of fish in the middle reaches of the study area, a heavy kill of all species in the winter of 1955-56, reduced the fish population there to a point where some increased growth could be expected.

**Table 1**

Average Observed Total Lengths for Channel Catfish at Various Ages from Various Collecting Stations on the Des Moines River, Iowa, 1954-1956

| Station No. | Year of Capture | No. Specimen in Series | Age Groups | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | I | II | III | IV | V | VI | VII | VIII | IX | X | XI |
| 1 | 1955 | 177 | | 5.4 | 7.9 | 10.0 | 11.4 | 13.9 | | 17.1 | 18.7 | | |
| 1 | 1956 | 65 | 2.8 | 5.0 | 8.2 | 9.8 | 13.6 | | 17.1 | | | | |
| 2 | 1955 | 20 | 2.2 | 5.0 | | 10.1 | 13.6 | 15.7 | 16.7 | | | | |
| 3 | 1955 | 13 | 2.7 | 6.8 | 7.6 | 10.3 | 12.5 | 13.9 | | | | | |
| 3 | 1956 | 14 | | | 8.3 | 10.9 | 12.5 | 14.5 | | | | | |
| 4 | 1955 | 21 | 2.1 | 6.6 | 8.4 | 13.1 | 14.1 | 16.8 | | | | | |
| 4 | 1956 | 18 | | | | 11.2 | 14.0 | 14.9 | 22.0 | | | | |
| 5 | 1955 | 13 | | | 8.5 | 12.2 | 13.2 | | | | | | |
| 6 | 1955 | 12 | | 6.5 | 8.0 | | | | | | | | |
| 7 | 1955 | 10 | | 6.0 | 9.1 | 14.2 | | | | | | | |
| 8 | 1956 | 191 | 3.6 | 6.6 | 8.8 | 10.8 | 12.7 | 13.8 | | 18.0 | 15.5 | | |
| *9 | 1956 | 227 | 3.5 | 7.6 | 8.6 | 10.1 | | | | | | | |
| 10 | 1955 | 34 | | | 10.2 | 12.2 | 13.3 | 15.8 | 16.1 | 19.2 | | | |
| 11 | 1956 | 16 | | | 9.8 | 12.2 | 13.4 | 13.9 | 18.8 | 22.7 | | | |
| 12 | 1955 | 29 | 3.0 | 7.5 | 8.9 | 12.0 | | | 19.0 | | | | |
| 13 | 1955 | 31 | 2.9 | 6.8 | 8.7 | 11.9 | | 16.4 | | | | | |
| 16 | 1956 | 16 | | 6.1 | 8.4 | | | | | | | | |
| *14 | 1954 | 655 | | 5.5 | 7.0 | 8.6 | 9.4 | 11.9 | 12.1 | 13.6 | 14.3 | 14.5 | 17.6 |
| *14 | 1955 | 355 | 3.4 | 5.6 | 7.8 | 9.3 | 9.6 | 11.6 | 11.7 | 12.9 | 11.3 | 12.8 | |
| *15 | 1956 | 167 | | 6.2 | 8.6 | 10.0 | 13.1 | 15.3 | 23.0 | 25.2 | 25.5 | | |

*Impounded Areas.

The growth pattern of the Des Moines River channel catfish follows that described by Appelget and Smith (1951), Finnell and Jenkins (1954), and Marzolf (1955), in that growth is rather slow throughout life but continues at an almost even rate for a longer time than for most other species.

Regarding the rapidity of growth, fish from the Des Moines River paralleled that recorded by Appelget and Smith (op.cit) for the upper Mississippi. They grew considerably faster than reported by Marzolf (1955) for the Lake of the Ozarks, but slower than for Oklahoma waters (Finnell and Jenkins, 1954). Iowa fish took an average of four years to reach creel size; whereas, in Oklahoma an equal length was attained in three years' time. Lake of the Ozarks catfish required five growing seasons to reach a similar size. (Creel size for the purposes of this paper is considered as ten inches in total length or longer.) The faster growth for channel catfish in Oklahoma may be due to a longer growing season in that state. As for the slower growth in the Lake of the Ozarks, this lake is a relatively old impoundment and slow growth of fish in aged impoundments is not uncommon.

It should be noted that our investigation was made during a prolonged and severe drought in Iowa. Stream flows were below normal during the entire study period time. It cannot be overlooked that this situation may have had a measure of influence upon the growth of the catfish. Just how much influence drought conditions may exert cannot be determined now, but it is pointed out that those specimens collected and aged early in the study which had lived under previous conditions of normal stream flow did not show a significantly better growth than those collected during or toward the end of the study time. As a matter of fact, some of the best growths observed occurred in 1956, which was the year of one of the most severe droughts in Iowa history. An explanation of this phenomenon may be correlated with population dynamics embracing total fish populations.

In connection with the rapidity of growth, it should be mentioned that individual fish and in some instances whole populations grow decidedly faster than indicated by the averages cited in this paper. Populations of catfish in some Oklahoma impoundments, Jenkins and Leonard (1952), averaged as much as 13 inches in length at one year of age and up to 18 inches in three years' time. This suggests that average growths found in Iowa and reported elsewhere are much below the potential of the species. The difference between fast and slow growing individuals and/or populations suggests a possibility that management may increase the growth of channel catfish to a considerable extent.

Since most of the fish used in this study were selected by size groups, a treatment of the subject year class dominance is not com-

pletely possible. However, a few of the series of fish collected for this investigation included all of the channel catfish taken at that particular time and place. In those cases, dominant year class would be expected to be revealed. In a total of eight such samples, involving 845 fish, there were no instances in which a dominant year class appeared. The abundance of fish by age decreased uniformly as they became older.

For comparative purposes, collections of catfish were made at widely scattered points in the state and processed for age in a manner identical to that for the Des Moines River. These stations are located geographically by letter in Figure 1. Much the same pattern

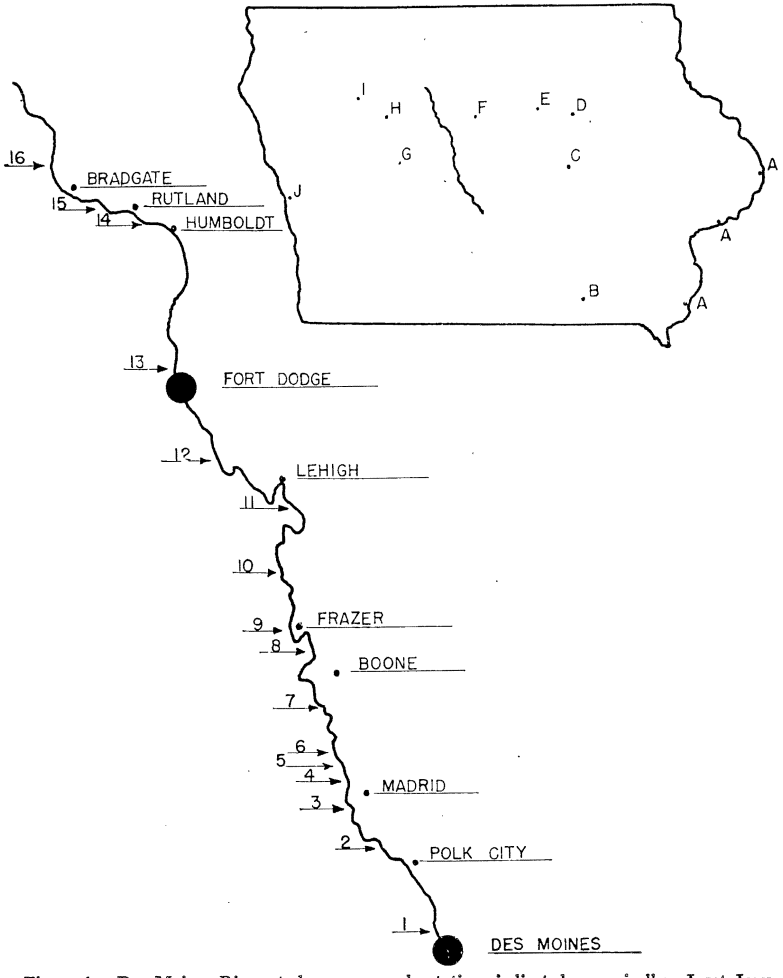


Figure 1. Des Moines River study area, sample stations indicated numerically. Inset Iowa map locates area geographically, and shows location by letters where specimens were taken for comparative purposes.

**Table 2**

Average Observed Total Lengths in Inches of Channel Catfish of Different Age Groups from Various Iowa Waters

| Station | Name of Water and Locality | Number of Specimens Examined | Age Groups | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | I | II | III | IV | V | VI | VII |
| a | Mississippi River, Subula Andalusia, Burlington | 48 | 3.3 | 7.6 | 10.7 | 13.6 | 19.0 | | 26.4 |
| b | Des Moines River Bonaparte | 26 | 3.0 | 5.6 | 8.2 | 9.8 | | 17.0 | |
| c | Cedar River Vinton | 12 | 3.2 | 5.3 | 8.8 | 10.1 | | | |
| d | Cedar River Waterloo | 4 | | | 8.6 | 9.8 | | | |
| e | Iowa River Alden | 12 | | | 8.8 | 9.0 | 12.1 | | |
| f | Boone River Webster City | 93 | | 7.5 | 8.5 | 11.8 | 13.8 | 16.5 | 17.2 |
| g | Black Hawk Lake Lake View | 5 | | | 11.6 | 12.9 | 18.1 | | |
| h | Storm Lake Storm Lake | 40 | | 5.7 | 7.5 | | | 24.7 | 25.5 |
| i | Little Sioux River Linn Grove | 31 | 2.8 | 7.1 | 8.5 | 10.3 | | | |
| j | Missouri River Mondamin | 16 | | 7.1 | 8.9 | 10.0 | | | 18.4 |

and rate of growth is shown in the other Iowa waters (Table 2), as in the special study area. An exception to this appears in the case of Mississippi River catfish which demonstrated a growth of approximately 25 per cent in excess of that for the other points of collection. The Mississippi fish reach a foot in length during their fourth year of life; whereas, five years are required to attain that length in most other areas.

Part of the work on the growth of channel catfish has been directed toward determination of whether or not the species exhibits any seasonal periodicity in its growing pattern. The amount of growth attained in any growing season up to time of capture may be obtained through calculation by using the distances between the last annulus and the edge of the spine.

In general, the annulus is formed in late April or early May. This is followed by a rather slow rate of growth until June, at which time growth accelerates at rapid rate until July, after which it then levels off and proceeds at a relatively slow rate for the remainder of the year (Figure 2). A similar pattern of growth found by Appelget and Smith (1951), for they state, "A tendency does appear, however, for younger fish to grow more rapidly during the early part of the growing season and have the major portion (approximately 95%) of their annual increment attained by midsummer." However, Jenkins and Leonard (1952), found that catfish impounded by closure of the gates in the Tenkiller Reservoir made 40% of their growth after July 1. This suggests that the reduced growth from midsummer on is not an inherent characteristic of the species but is, on the other hand, a result from a suppressive force within the environment.

In the course of this investigation, it was adjudged that channel catfish in Iowa water, if not perhaps stunted, were most certainly growing slower than the potential for the species. It is well known that our waters are rich in the nutriments required for fish life. Fertile waters should produce large populations of healthy, fast growing fish. Stream surveys during the past eleven years in the state reveal excessive populations of rough fish. These findings suggest at least one field of exploration, that of the suppressive effect of rough fish on the growth of channel catfish.

Two extensive fish kills were observed in the study area during the time of study. Where these occurred, special emphasis was placed upon finding out whether or not a response in growth in the remaining catfish resulted from a reduction in population of the coarse fishes.

The first kill occurred on station 15, known as the Rutland Impoundment, in the early summer of 1955. The second kill extended over stations 8, 9, and 10, and took place in the winter of 1955-1956.

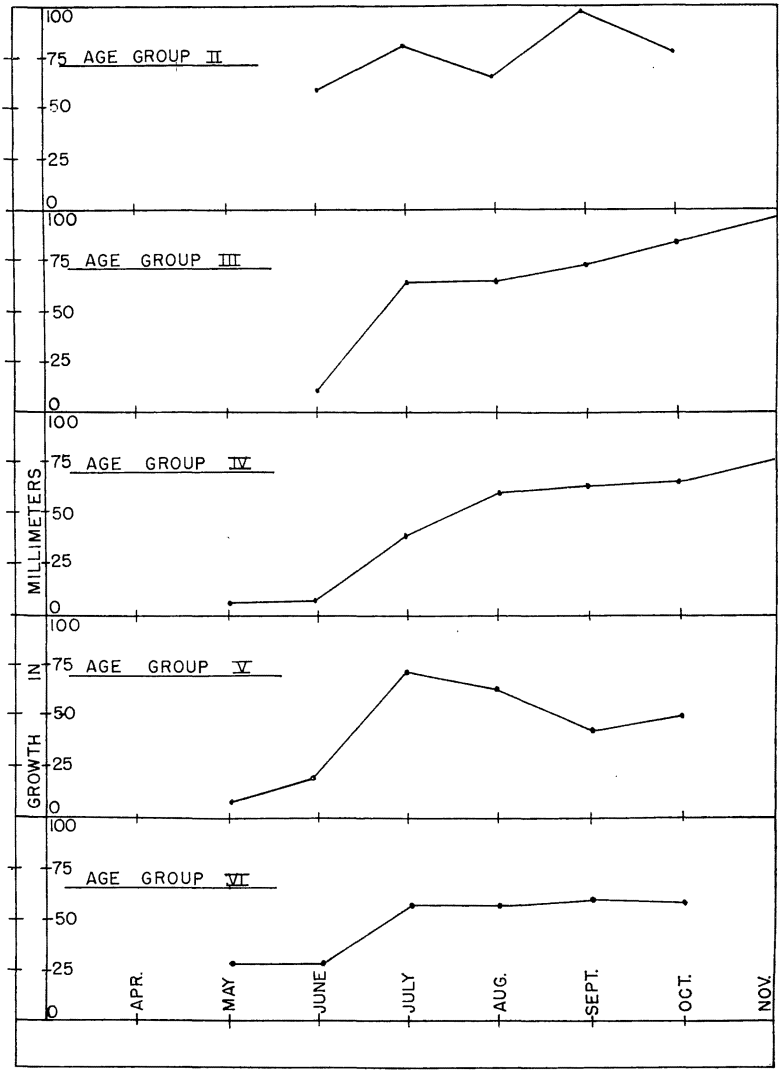


Figure 2. Seasonal growth of channel catfish by different age groups from the Des Moines River study area, by monthly periods.

At these stations, a large series of catfish, having completed their growth for 1956, were processed for growth. The average annual increment of growth for each age group was determined by the method of back calculation for the years 1955 and 1956 (Figure 3).

Both studies show an increase in growth following the extensive kills. In connection with the Rutland Impoundment, it should be stressed that the kill there occurred early in the summer of 1955, and

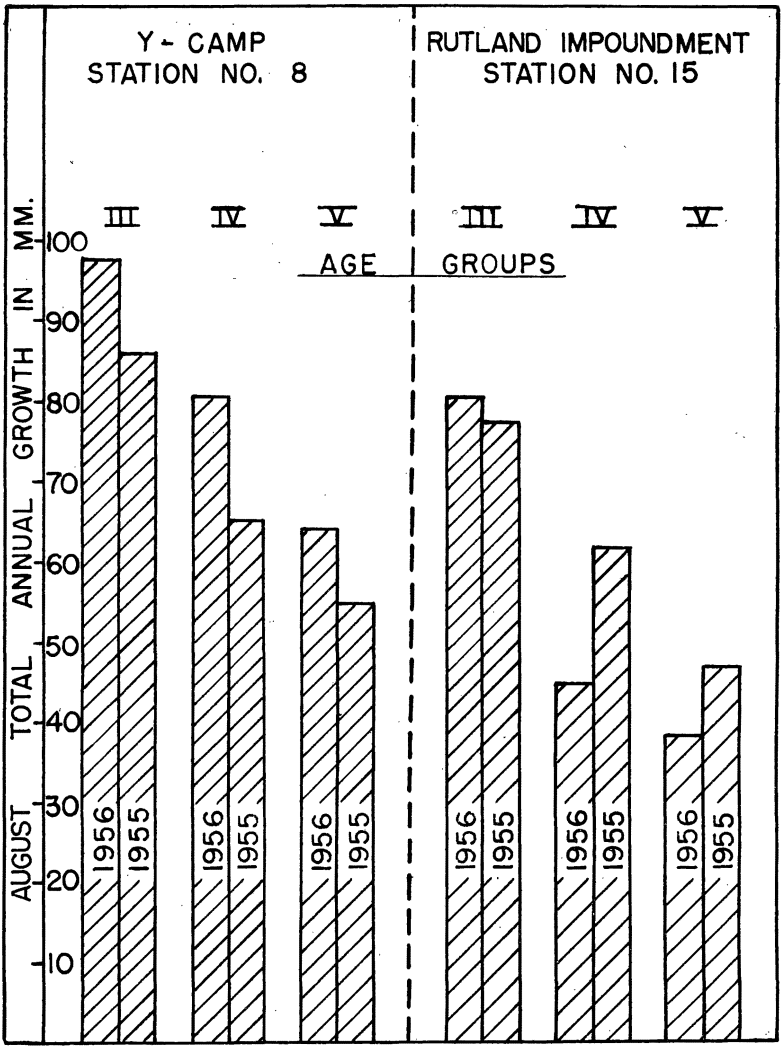


Figure 3. A comparison of the average total annual growth of channel catfish by different age groups from the Des Moines River inhabitating areas of known fish kills.

that the increased growth followed immediately. By the following year (1956) the area was again glutted with rough fish, which are believed to have had a suppressive effect upon the growth of the catfish for that season. It would seem from this, that any benefits derived from a fish kill are immediate, and that the suppressive influence of the coarse fish will return at a rate comparable to that of the return of the rough species.

SUMMARY

The findings are as follows:

1. The time required for catfish to reach creel size (ten inches) in Iowa is approximately four years.

2. Growth of Iowa catfish is somewhat slower than that reported for Oklahoma. In our inland streams growth is quite slow as compared with that of the Mississippi River.

3. A large portion of the annual growth of the Des Moines River catfish and very possibly those from other areas of the state occurred during the months of June and early July. This is not believed to be an inherent characteristic of the species, but rather to result from environmental stresses.

4. No consistent difference in the rate of growth was found between catfish raised during normal water flow and those raised during drought years.

5. A substantial reduction of the standing population of all fish was in two instances followed by an accelerated growth rate of channel catfish.

## Literature Cited

Appelget, John, and Lloyd H. Smith, Jr. 1951. The determination of age and rate of growth from vertebrae of the channel catfish, *Ictalurus lacustris punctatus*. Trans. Am. Fish Soc., Vol. 80, 1951, pp. 119-139.

Finnell, Joe C., and Robert M. Jenkins. 1954. Growth of channel catfish in Oklahoma waters; 1954 Revision. Okla. Fisheries Research Laboratory Report. No. 41, p. 1-37.

Jenkins, Robert M., and Edgar M. Leonard. 1952. Initial effects of impoundment on the growth-rate of channel catfish in two Oklahoma reservoirs. Proc. Okla. Acad. Sci., Vol. 33, p. 79-86.

Marzolf, Richard C. 1955. Use of pectoral spine and vertebrae for determining age and rate of growth of the channel catfish. Jour. of Wildlife Management. Vol. 19, No. 2, 1955, p. 243-249.

Sneed, Kermit E. 1951. A method for calculating the growth of channel catfish, *Ictalurus lacustris punctatus*. Trans. Am. Fish Soc., Vol. 80, 1951, p. 174-183.

IOWA CONSERVATION COMMISSION
DES MOINES, IOWA