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(First)

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BIOLOGY SEMINAR
Des Moines, Iowa
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INTRODUCTION

This is the first of a series of quarterly seminars to be held by the Biology Department of the Commission. The purpose of this and subsequent meetings is to review certain phases of the work of the individual investigators in order that staff members and administrators will have an opportunity to become more familiar with the program and offer criticism on the various projects.

The papers presented on the first program will be simply a general resume of the work during the past six months. In the future definite assignments will be made and certain phases of the program will be reported upon much more specifically. These reports will be based on work in progress, or completed, and show their application to the fish and game management programs.

Broadly speaking, the department is primarily interested in populations, population trends and phenomenon of the major species of fish and game, the interpretation of these data and subsequent recommendations toward their management and harvest. Certain researches are obviously necessary to obtain this information. These are going forward at the present time. Basic and long-time researches, however, largely rests with the Cooperative Research Unit at the Iowa State College. There is little or no duplication of effort, and a splendid spirit of cooperation exists between the department and the college unit.

We realize the department has been far too lax in the past in reporting its findings inter-departmentally and disseminating this information to the public. There is grave danger of these studies becoming cold, and they are of little value when tucked away in the field books of the investigators. It is our plan to "gather up the loose ends", so to speak, and get the information in usable form at the earliest possible date. Some of the studies are completed, or nearing completion, and will be written up for practical application. Others will necessarily have to be continued, but progress reports will be prepared at regular intervals. Each project will be given a number and investigators will be assigned to the project and held responsible for its successful execution. The combined list of projects, together with other pertinent facts, will largely constitute the biology program for the calendar year of 1950.

Under the present plan a seminar will be held at quarterly intervals, probably on the 2nd Tuesday of January, April, July and October. These meetings will be held in Des Moines unless otherwise specified to take advantage of reports and materials on file and receive as large an attendance as possible from the administrative staff.

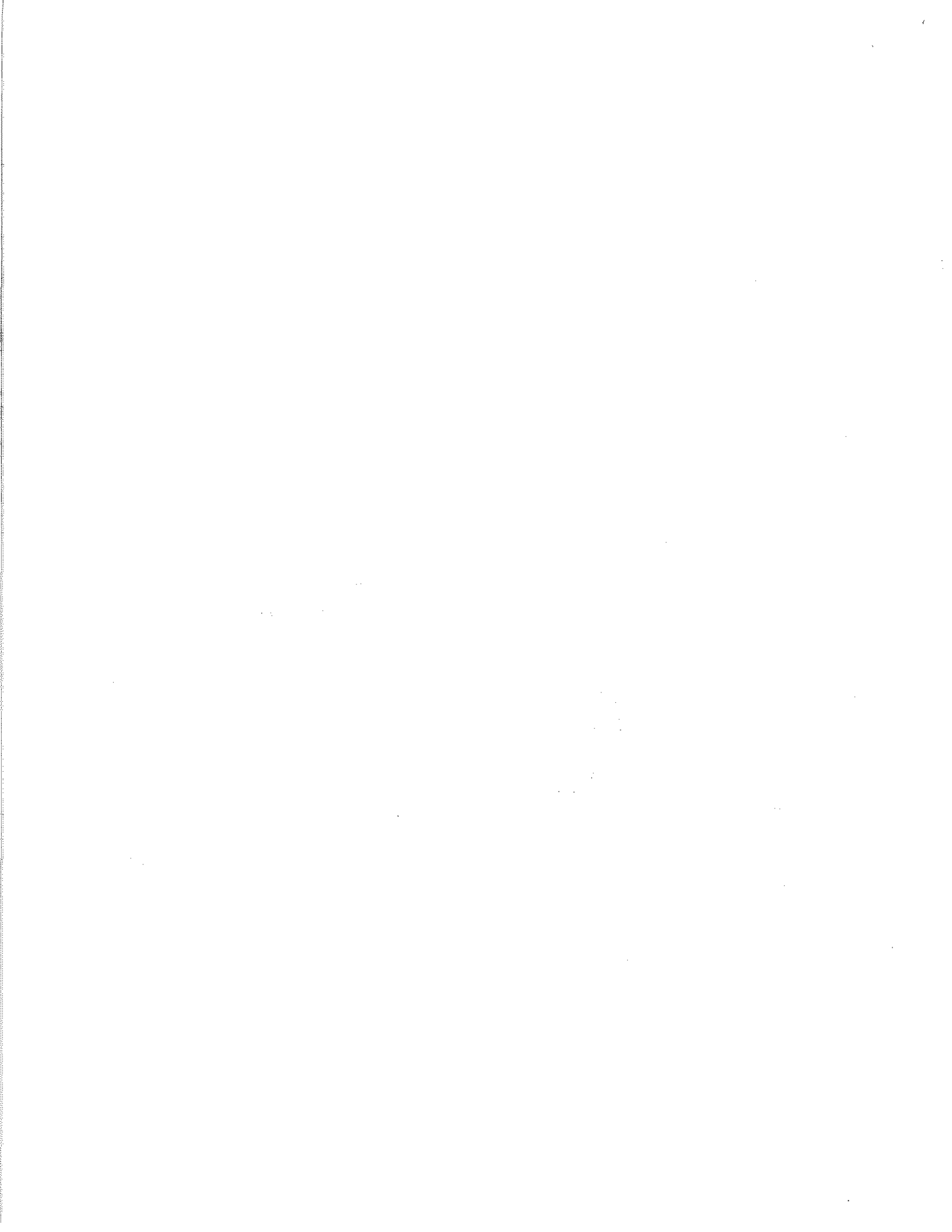
In the future an agenda will be prepared for the Chief of the Division well in advance of the meeting. Invitations for attendance will come through him unless otherwise instructed.

All of the biologists will appear on the program today with the exception of Harry Harrison, who is recovering from a serious accident. Each man was asked to prepare a brief summary of some of the high-lights of his work during the past six months. There will be a brief question and answer period following each paper, and ample time for more discussions between the two sessions.

The game section will start the program with reports from Nomsen, Stempel, Sich and Sanderson, in that order. Papers will require from 20 to 30 minutes for presentation. The fisheries section will follow with reports from Moon, Cleary and Rose.

It is our plan to mimeograph the proceedings of this meeting and send copies to all of the Conservation Officers who so graciously helped in these programs. In the future, if it seems desirable, we will at least submit an abstract to the field men to keep them abreast with the programs of this department.

E. B. Speaker
Superintendent of Biology Section



PROGRESS FISHERIES REPORT

by

Tom Moen

This discussion of my portion of the biology program is divided into two phases;

1. A brief discussion of major projects that have been assigned to me and the results obtained during the past six months;
2. A discussion of miscellaneous short term assignments for the period in question.

For the benefit of those who are relatively newcomers to our section and also as a review for myself and others present at this meeting, I would like to briefly mention the major projects assigned to me. As you might expect, I consider the studies on rough fish of first importance. Shortly after the organization of the biology section in 1946, this project was assigned to me with the title "Ecology of Rough Fish". In monthly reports during the past two years, I have changed the title somewhat to "Vegetation and Rough Fish Food Habits". Regardless of the title, the project concerns the study of carp, buffalo and sheepshead, and has grown to the point where one could call it a life history study of each species.

The accomplishments on this project during the past six months have been relatively minor. Most of the information gained or applied to this project came from observations and collections made during Lake Survey work. The main contribution from a personal standpoint was a broader viewpoint of the rough fish situation of the lakes and impounded waters of the State.

The next project of importance from a personal standpoint (but of first importance from a biological standpoint) is "Lakes Survey". This project actually belongs to Earl Rose, but during the past season we have shared the work involved in this netting survey of the natural lakes and artificial lakes of the State. Inasmuch as the two of us were working on one rather large project we decided to draw a convenient line and each report on a portion of the program. Earl will draw a convenient line and each report on a portion of the program. Earl will discuss the project as applied to natural lakes and I will attempt to tell you something of the survey of artificial lakes and other impoundments.

The Lake Survey project is primarily concerned with the "continuing inventory" part of the job assigned to the biology section. The purpose of this annual survey of the lakes is to determine reproduction, relative abundance, condition, growth rate, and etc., in order to have a better foundation for management plans. Although we are after the same kind of information, the methods and equipment used for artificial lakes differs considerably from those used on the natural lakes. The length of quarter inch seine used is cut from five hundred feet to two hundred feet for sampling small fish and two to four pond nets are used to sample adult fish. Even with this modified equipment the banks are so steep and shoal areas so limited that any type of netting is

often difficult. Bottom samples are taken in most of the lakes to determine the volume of potential fish food per square foot. Although fish sampling and bottom food studies are the principal activities, a number of other factors are recorded on mimeographed forms, including nearly everything a biologist could think of: turbidity, presence and abundance of aquatic vegetation, maps of the area showing hauls and other sampling stations, water levels, water temperatures and so forth. We have a few of these forms here for comment if you care to look them over.

There are nineteen state owned artificial lakes in Iowa having a total area of 1,614 acres. Individually they range in size from twelve to two hundred and eighty-seven acres, with about thirteen of the nineteen lakes falling between fifty and one hundred and fifty acres. In addition to the state owned artificial lakes, several privately owned reservoirs are checked during the course of the survey work. These include only those that are stocked by our department or where we have agreements.

During 1949, twelve state owned artificial lakes and five privately owned reservoirs were included in the survey.

The findings, except for two or three outstanding facts, were as varied as the lakes themselves. The species composition varied somewhat but not nearly as much as in natural lakes, with large mouth bass, bluegills, and crappies being the most consistent combination of species found. Potential bottom food was considered fair to good in all but one lake. Age and growth rates have not been compared too carefully as yet but preliminary examinations reveal what we consider an average or better growth rate for most of the species in most of the lakes. Crappies, particularly white crappies, were most often out of balance, stunted and overpopulated. Good sized crappies were associated with good growth and numbers of large mouth bass, and bluegills.

The one outstanding fact brought out in the survey of the artificial lakes was the apparent lack of substantial numbers of bullheads in spite of frequent stocking from northern waters. We have suspected for some time that bullheads in the artificial lakes were a put and take proposition but were rather reluctant to say too much before securing more data to support that viewpoint. This lack of substantial numbers is contrary to the reactions of bullheads in other waters. Bullheads are often the dominant species in natural lakes, farm ponds and often in rivers. Bennett (1943) in a discussion of bullheads in artificial lakes in Illinois stated that, "Large populations of stunted fish are common and often necessitate artificial thinning in order to produce bullheads of good size". He was working with a series of twenty-two lakes having a size range from .75 acre to twelve acres, which is considerably smaller than the artificial lakes studied in our survey.

Bullheads were found to be the dominant species in only one of the seventeen lakes checked in 1949. The one exception was Swan Lake near Carroll. This lake has more of the characteristics common to a shallow natural lake than an artificial lake. Bottom food in Swan Lake was far below the average for the lakes checked. No bullheads were collected in six of the lakes surveyed. In the remaining ten lakes they could be labeled scarce to common and in all cases they were large bullheads in excellent condition, some weighing as much as one pound eleven ounces

and weights of twelve to sixteen ounces were common. Thus in ninety per cent of the lakes where bullheads were collected they were found in excellent condition and were not over-populating the lakes. In one or two instances where no bullheads were collected the local residents reported small catches of large bullheads, indicating a comparatively low population.

It might be well to add here that we seldom caught bullheads in the two hundred feet of quarter inch web; most of the bullhead catches were made with pond nets set over night. A dozen bullheads for three pond nets would be enough to call them common for that lake. In a lake where bullheads are dominant, it is not unusual to fill a pond net during an over-night set.

An examination of survey records on file at Spirit Lake covering work as far back as 1940 (exclusive of 1949) reveal that twenty lakes were checked or surveyed thirty-one times. (1) For ten of these thirty-one surveys no bullheads were collected; fourteen recorded bullheads as scarce to common and large in size; two recorded bullheads as dominant (both records were from Swan Lake); five surveys recorded bullheads as scarce in numbers and small in size. This means that in sixty-six per cent of the surveys where bullheads were collected, there were small numbers of large fish recorded and even where they were small in size the population was low.

We also have two records of lake drainage to further emphasize the low populations of bullheads in artificial lakes. Speaker (1948) in reporting on the drainage of Beeds Lake, records forty-four pounds of bullheads collected in that one hundred and thirty acre artificial lake. The fact that carp made up over two-thirds of the total poundage of fish would seem to indicate that carp and bullheads do not run together in numbers in artificial lakes as they do so often in natural lakes. Speaker also states that during the years 1936-1945 inclusive, a total of 141,113 bullheads of various sizes were stocked in Beeds Lake.

In the drainage of Upper Pine Lake bullheads made up about one pound per acre with sixty-two pounds per acre of all species recorded. Here again carp made up the bulk of the fish removed.

To explain just why bullheads fail to "take over" the typical Iowa artificial lakes is rather difficult. Most likely, as with many other fisheries problems, the answer is the resulting combination of a large number of factors. Time will not permit even a brief discussion of these factors but a few of the more important items involved are: physical characteristics of the lake, including size, depth, chemistry, etc; species composition and fishing pressure.

Therefore with due consideration and examination of the data on hand we are of the opinion that moderate numbers of bullheads can be stocked in most of Iowa's artificial lakes and reservoirs without fear of over-populating the lakes.

A very similar discussion could be carried on in relation to channel catfish. Although channel catfish are often taken on pole and line in several of the artificial lakes we have failed to collect any with nets,

(1) See schedule A.

indicating low populations of relatively large fish.

The last project to be mentioned is the "Walleye Fingerling Studies". This project was assigned to me during the summer of 1940 and primarily concerns the artificial production or pond rearing of walleye fingerling. During the past six months this project has been in the hands of the management section. Information gained has come from their records, and can hardly be counted as work accomplished on my part.

Miscellaneous short term assignments of comparative importance during the past six months can be listed as follows:

The days spent at the State Fair need no further comment.

During the first part of October a clam survey was made on the Iowa and Shellrock Rivers. The crawfoot bar produced very few shells probably due to both low populations and to cold water. On the other hand, low turbidity and low water stages permitted a better than average survey through handpicking on the riffles. No large beds of clams, either beds large enough to be of commercial value, were found on either river, but several riffles in both streams were producing enough clams for bait fishermen. It appears from these clam surveys that of the two streams, the Iowa River has had the greatest reduction in population of clams during the last few years. Only the area between Steamboat Rock and Eldora retains the semblance of the old time clam beds. Even here it is felt that fishermen have kept the populations down since the area was opened to commercial clamming in 1946. The Shellrock River has a fairly scattered, but low, population from Greene to the Cedar river. Pocketbook clams were found to be the most abundant.

A brief survey and joint report, with E. T. Rose and Jim Sieh, was made on Ventura Marsh, covering the effects of water level control on vegetation and wildlife.

Assisted Jim Sieh and E. T. Rose in a biological survey of the Spring Run area in Dickinson County.

Literature Cited

Bennett, George W.

1943 Management of Small Artificial Lakes. A Summary of Fisheries Investigations, 1938-1942. Ill. Nat. Hist. Surv. Vol. 22, Article 3.

Speaker, E. B.

1948 A Fish Population Study of an Artificial Lake. Iowa Academy of Science, Vol. 55, pp 437-444

Schedule A: List of Artificial lakes and other impoundments; showing years in which survey or other type of netting was carried on. (This does not include lakes and years covered by rough fish crews).

Artificial Lakes-Water Area - 1940 - 1941 - 1945 - 1946 - 1947 - 1948 - 1949
(acres)

Swan Lake	130		XXXX	XXXX			XXXX
Osceola(East City Res.) 12						XXXX	XXXX
Lake Wapello	287				XXXX		XXXX
Beeds Lake	130		XXXX	(dr'd)	XXXX	XXXX	XXXX
Springbrook	27				XXXX		XXXX
Pine Lake (Lower)	63		XXXX		XXXX	XXXX	
Upper Pine Lake	70		XXXX		drained		
Lake McBride	138				XXXX		XXXX
Red Haw Hill	72				XXXX		XXXX
Lake Keomah	82				XXXX		XXXX
Mill Creek	25	XXXX		XXXX	XXXX	XXXX	XXXX
Union Grove	110		XXXX			XXXX	
Lake of Three Fires	125	XXXX				XXXX	XXXX
Lacey-Keosauqua	30		XXXX				XXXX
Lake Ahquabi	130				XXXX		XXXX
Allerton	106					XXXX	XXXX
Other Impoundments							
Mt. Ayr. Res.		XXXX				XXXX	
Chariton res.						XXXX	
Des Moines City Res. 90*						XXXX	XXXX
Osceola West City Re. 50*						XXXX	
Fisher Lake	50*						XXXX
Winterset Res.	50*						XXXX
Strip Mine (Konxville) 30*							XXXX

* Estimated

FISHERIES PROGRESS REPORT

by

R. E. Cleary

The opening phase of the 1949 field work entailed a survey of an important fishery resource in Northeast Iowa, the Smallmouth Bass streams. A survey similar to that proposed by Surber in 1938, but enlarged to give a fuller picture, was planned in conjunction with Wm. Tate of the Cooperative Fish Unit at Iowa State College. Early in the spawning season each of 17 well-known Smallmouth streams was covered over a designated distance of typical stream, in this case a mile. The number of Smallmouth nests were counted and in addition each brood bass seen was tallied. (A bass of 8 inches or more constituting a "brood bass".) The number of brood bass per mile gave a population indice and the number of nests per mile, a reproductive indice.

Since it is a known fact that only a small number of the eggs hatch and survive to fingerling size, a stretch of 560 feet, encompassing all types of favorable and unfavorable habitat was seined with a 30', $\frac{1}{4}$ " mesh sein. With the introduced error of bass evading the sein, and sein hauls being hung up, this gives, at best, a poor actual sample of the existing fingerling population. But these figures will act as a year to year comparative indice with the mechanical error remaining constant as it is assumed that each successive generation of Smallmouth fingerling will neither be more or less adept in net evasion tactics.

To compliment this investigation an age and growth study has been started with scale samples, totaling almost 200, taken in various numbers from each of the streams investigated. These were taken by various methods such as seines, frame nets, and angling to avoid the introduction of a sampling error.

Plans are underway to enlarge this investigation to include a gross fertility analysis on available plankton and bottom fauna during the latter part of the nesting period. Also considered is a stomach analysis of the food habits of the Smallmouth in these streams. Notes on minnow, crayfish and insect population are also being kept.

Some of this information may, at a glance, seem impractical and deviating from the present day fisheries survey techniques manifested by the one query, "How Many?", but through comparison of these streams, it is hoped that the compiled data will give us an idea on what constitutes a good Smallmouth stream in this area. At present we are getting the "Whats", in the future we hope to discover the "Whys", and at that time we can turn it over to the management section for the "wherefors" and possibly more important the "wherewiths". Then, if possible, effort can be expended to bring up to the norm, the sub par streams assuming we know the limiting factors in each specific case.

To give an insight as to some of the data obtained, the Volga River,

Fayette Co., led in the larger stream bracket with 38 nests and 87 brood bass seen per mile, with a reproductive count of 11 fingerling per 500 feet of stream. Of the smaller streams, Bear Creek in Buchanan County had 12.6 nests and 14.6 brood bass per mile. While Lime Creek in Buchanan County had exceptionally high yield of 32 fingerlings per 500 ft. of stream.

In an effort to provide a basis for a year to year quantitative and qualitative inventory of the fisheries resources of the major rivers of Northeast Iowa, a series of survey stations was arbitrarily chosen under the assumption that they embodied conditions typical of their respective reach of the river. These stations are to be in no way construed as true random samples of the stream, for several factors played an important role in determining location of the area.

The prime factor determining the choice was that of fishing pressure which in like manner embodied availability. It has just been in more recent years that river and stream surveys have doffed the academic interest in limnological aspects and gravitated more toward the practical problem of "what and how many" fish. In like manner the prime interest behind fisheries work is the ultimate recruitment by the fishermen. With this in mind, survey areas were chosen, which in the past had proven to be areas of better than average successful fishing. These were the populations and areas, which in effect would ultimately govern the river's management program, and neither the angler nor the Commission, in my estimation, is interested in inaccessible or little utilized areas and their populations.

Other determining factors, were morphometrical, and can be grouped as those which availed themselves to the demands of the survey equipment, which in this case was a series of 2' by 4' frame nets, (1" mesh) with 30' leads.

These nets were set in random fashion in the area so as to sample all available habitat without biasing the resultant data by favoring certain sets. The latter would result in taking large numbers of a limited group or single population. The nets were lifted every 24 hours for a five day period. All fish except commercial species were weighed, in many cases measured and scale samples removed, fin clipped, and returned to the water. Commercial species were weighed, counted and disposed of by various methods.

Daily population estimations were made on the resultant take of marked and unmarked fish and the total estimation was based on the daily average for the area. The take per net per hour was based on successful sets only. A set was arbitrarily deemed successful regardless of rat holes, water level, plugged throats, or mechanical malfunctions if there were only one specimen in the net. In like manner a set was considered in the final tabulation even though sans specimens, there was nothing physically wrong with the net or condition of the water.

To augment the survey data, brief limnological investigations into stream flow, water stage, daily maximum and minimum temperatures, cover, depth, bottom and shore types, forage species, and reproduction

were made.

As to be expected, inefficiency due to unfamiliarity of technique played a minor role in biasing these data, but much has been learned which in future year's surveys will tend to improve resultant data. Certain survey areas will be changed, additional areas investigated, and modifications of technique will be made so as to more fully sample the area.

These investigations will be so calendered as to approximate climatic and limnologic conditions of the previous year in order that comparative data be more exacting.

The three stations on the Cedar River averaged approximately .2 lb per game fish per net per hour and .43 lbs per net per hour total fish to lead the other 5 rivers in production. There was a definite downward trend at each successive station as the investigation proceeded through the summer months. This probably was due to the dropping water level which limited movement and in a small way to the recruitment by fishermen.

A rather interesting sidelight was brought out by these survey's in that areas which anglers hadn't taken a catfish in weeks would yield as high as 65 catfish in one net. This brings us back to the rather abstract problem of just what constitutes a harvestable surplus in our streams. We may have 200 catfish in a $\frac{1}{2}$ mile of stream, but if the fishermen cannot catch them, they are seemingly of no practical value as a resource.

In a rather faltering and fingers-crossed manner, we have decided to try an experiment on this harvestable surplus business by using a voluntary creel census of five "expert fishermen" contacts in each county. We hope to compare their catch statistics with our netting data to see if there is any correlation between takes in the net and corresponding takes by anglers. In that way we hope to get a lead on the possible fishing success, and by modification in the future arrive at some average take figure. The problem then being presented, it will be up to us to determine what procedures are to be taken to improve the situation - as it will no doubt need improvement.

In the fall of 1948, in an effort to determine a partial qualitative species list of some of the streams in northeast Iowa, several collections were made in some of the better known streams and rivers of the area. Rather than drop the data at just a qualitative venture, a minnow population dynamics project was established and the same stations visited in 1949 plus numerous other stations which in the course of other investigations provided an opportunity for minnow collections.

While this material may seem academic in nature, the practical potentialities are many. Much can be learned from forage fish as indicators of stream conditions and may, after this data is more complete, be analyzed into important management tools.

In 1948, all collections were made in the fall and while the 0 age class was very noticeable, there was a noticeable lack of the higher age groups in some instances. In 1949, with the collections being for the

most part in conjunction with other investigations, and over a period of four months, it was difficult to make age class comparisons with the 1948 data. This difficulty will be off-set in future years as the procedure will be constant with the 1949 time schedule. It may also be possible in future years to enlarge this investigation by more fully encompassing the major rivers and streams of the area.

In 1949, twenty eight collections were made on 21 separate streams. These collections totaled over 10,000 specimens of which approximately 7,000 were measured and the data analyzed for age class by the use of the Peterson length-frequency method. This age class determination was made by way of testing some of Starrett's hypotheses derived from his studies on the minnows of the Des Moines River concerning the effect of water stages and heavy adult populations on succeeding generations of forage fish. In like manner the species composition is very indicative of stream conditions. This is especially borne out in three streams in the area where Notropis lutrensis and Notropis spilopterus are the dominant species and appear in almost equal numbers. Knowing quite thoroughly the limnological characteristics of one of the streams, Prairie Creek in Benton County and also in Linn County, I assumed from the results of the collection that both Rock and Sugar Creek in Jones County were similar and upon a more thorough investigation my assumptions proved correct. These three streams all carry a heavy silt load, are subjected to very heavy flooding, have similar bottom and shore types, and are able to sustain an adult Small-mouth population but reproduction is inhibited by some of the above factors. In this case, indicator forage species could save much in the line of investigation when determining the streams potentialities. To date, 25 of the 43 cyprinidae listed for the State have been found to be present in the northeast. The four most common species in order of their occurrence in these collections are Notropis spilopterus, the yellow fin; Notropis cornutus frontalis, the common shiner; Notropis deliciosus, the sand shiner; and Hyborhynchus notatus, the bluntnose minnow.

As specific problems are brought out by this investigation, such as the apparent lack of forage fish populations in the Turkey River, a fuller investigation may result in a more profitable management program.

Special investigations were also made on various phases of fisheries techniques. In an effort to stem the lethal action of Furunculosis on brook trout in a large earthen pond at the Decorah hatchery it was decided to effect a sterilization of the pond with Chlorine. According to the latest information, a concentration of 200 ppm, held in solution for a period of time would do the trick.

The literature recommended the use of powdered Chlorine releasing compounds but on larger ponds the cost of the necessary amount is prohibitive. We decided to use liquid Chlorine in drums and since none of the available literature gave us any more than a clue on the procedure we were forced to experiment with various techniques and after using up 300 pounds of Chlorine where 150 would have accomplished the job, giving the shrubbery and other vegetation around the pond a good burning, keep ourselves constantly on the run escaping the choking effect of the

gas, we finally turned the trick. The details will be found in an article accepted by the Progressive Fish Culturist for publication and briefly entail the use of a self priming water pump which, when hooked up to the Chlorine drum, thoroughly mixed the Chlorine with the water in amounts large enough to bring the concentration up in a rapid manner without too much loss to the atmosphere. Outboard motors were used to distribute the Chlorine evenly throughout the pond. Reinfection was possible but the benefits of the operation made themselves known in a rather spectacular way when the pond mortality was compared with that in some of the unsterilized raceways.

By way of mention, 7 fish kills were investigated during the course of the summer. The cause of 90% of most fish kills is a matter of individual conjecture, but venturing a scientific opinion, it can be said that a pond was killed out by Toxaphene spray; two kills on the Winnebago and Mississippi were simple D. O. depletion due to cannary waste and broken sewage main respectively, Silver Lake in Delaware county winter killed; and two rather extensive kills on the Iowa River in Tama County were the possible results of either industrial waste or domestic sewage or a combination of both. In fact, conditions are so bad in this stretch of the river that the new warden in the territory, upon viewing the scene of the kill, remarked that a possible cause might have been the introduction of a bucket of clear water.

The most spectacular kill investigated was on the Cedar River, vicinity of Waterloo. This turned out to be caused by the introduction of several barrels of a 45% Chlordane distillate which proved upon experimentation to be lethal at .5 ppm.

A combination of publications dealing with the limitations of an alternating current shocker as a survey tool led to a recent experiment. A section of Trout Run near Decorah was cut off with barrier seines and three series of mixed and marked rainbow and brown trout were liberated in the area. We had three types of generators: a 500 watt A.C.; a 1500 watt D.C.; and a 2500 watt D.C. Each series of trout was marked differently from the others and the experiment was to test the comparative effectibility of each generator and also the possible desultory effect on an individual series of trout.

As to effectibility, determined by the percentage of recovered marked trout, the 2500 watt D.C. generator 66%; and the 500 watt A.C. generator 33% effective.

In order to test the possible harmful effects of each generator on their respective series, each recovered series of marked trout, plus a few resident specimens taken by each individual generator and marked accordingly, were placed in a raceway with a set of control specimens for observation. All trout, marked and controls, were subjected to the same amount of physical handling to rule out any possible introduced mechanical error and to date, as far as I know, only one specimen has died in the last two months and this rainbow was burned on the grids of the A.C. shocker and died before the completion of the experiment. The remaining trout will be held for observation until spring when they will be stocked in the streams along with the non-experimental specimens.

FISHERIES PROGRESS REPORT

By

E. T. Rose

At this time of the year, and particularly this year, which marks the end of a decade and the half-century mark, most business and large corporations are going over their records, completing inventories, and calculating debits and credits to determine their degree of success or failure for the past year. Enterprising executives with their staffs of statisticians are trying to determine possible trends in order to forecast what the coming year will hold in store for them. Their future policies are dependent upon correct interpretations of their accumulated data. Crystal balls and guess-work have no place in modern business methods. Weather observers are predicting weather from their accumulated past records, with surprising accuracy. These predictions and observations of trends of course are based on many decades of records which is necessary for accurate interpretation.

We, in the Conservation Commission, are accumulating data which will in time permit critical and accurate interpretation and aid significantly in formulation of policies in the State fisheries. For the past five years I have had the privilege of conducting creel census work on several major fishing lakes. This data, while meager insofar as the number of years is concerned, has now developed to the point where it can be of value in some instances in determining the effect of certain management policies. For the purpose of this report, it is necessary that I include the past years data together with the 1949 work in order to illustrate points of importance. During the past six months, all of the previous data has been recalculated from the complete open season records to coincide with the 1949 short census season from May 15 to July 1. Budgetary difficulties last spring prevented a full season census. Since one or two years records are of little consequence in establishing trends, we must insist that only by accumulation of facts year after year can we make predictions from them, and have any accurate knowledge of any influence our management policies have on fish populations or fishing success. I am convinced that only by the continuation and expansion of the creel census can we hope to determine the effects of rough fish removal, year-round open seasons on certain species, predator protection, and other management policies.

By far the most important index obtained from the creel census is the number of fish caught per unit of effort. This provides us with a standard of comparison which, when coupled with the test netting data, yields essential and critical information concerning populations and their exploitation.

METHODS

The mechanics of the creel census is well known to most of you. Briefly it consists of employing one census clerk for the following lakes: Spirit, Center, East Okoboji and West Okoboji. One clerk for

each of the following: Storm, Clear, Blackhawk, and Lost Island. The clerks contact all boat liveries daily and collect their catch data from the previous day and in addition, all contacted shore fishermen's catches are recorded. All cards are tabulated in 10 day intervals to determine seasonal catch frequencies. Some of this data has been published in the Conservationist. Admittedly the records are incomplete, since it is not possible to personally contact every private boat owner or dock and shore fishermen. However, the sample is adequate and directly reflects the fishing success of each body of water sampled. The histogram (omitted from this report) is designed to indicate the degree of success for each lake censused to date. The catch-per-hour is the index most relied upon by fishery biologists to determine angling success and harvests. The histogram data together with data on species taken provides a fairly accurate indicator of probabilities and trends in populations. When accompanied with our field netting surveys, I feel that we have our fingers on the pulse of our major fishing lakes and if the data is interpreted correctly, our recommendations will not be too far removed from requirements for good or improved fish populations.

A brief discussion of the fish-per-hour and other census data is presented for each of the lakes censused to date.

SPIRIT LAKE

This is one of the most important fishing lakes in Iowa. Our records show consistently large numbers of anglers using the lake year after year. With the exception of 1945, an average of well over 16,000 fishing trips has been recorded for the first 45 days of the season (Table 1). A considerable increase in the catch-per-hour is evident for last springs census. This is attributable to excellent crappie and bullhead fishing. Walleyes show a favorable increase. Perch fishing declined due to heavy catches in 1948 of the dominant 1944 year class. In view of the consistently good fish-per-hour record, it can be anticipated that good fishing will be had next season. This is especially evident since forage supplies are low at this time. Black bass fishing declined tremendously last year. Crappies, walleyes, bullheads and white bass will probably provide most of the good fishing next year.

EAST OKOBOJI

The graph (omitted in this report) indicates that this lake is producing consistently fair to good fishing. A five-year mean of one fish-per-hour indicates a healthy situation especially in view of the increase to 1.46 last year. Crappies show a vast decline since 1946 (Table 2) which may or may not reflect the policy of the pre-spawning open season established that year.

TABLE I
IOWA LAKES ~~CREED~~ CENSUS COMPARISON
~~SPIRIT LAKE~~
May 15 to July 1

SPECIES	1945	1946	1947	1948	1949
CRAPPIE	109	3,290	2,823	13,533	16,063
PERCH	614	5,921	2,019	32,958	3,802
N. PIKE	308	3,607	825	2,936	655
WALLEYE	70	12,917	7,685	4,185	6,923
L.M. BASS		483	219	357	105
BULLHEAD		57,019	41,691	69,227	82,157
WHITE BASS	1,444	11,262	2,189	5,091	1,004
BLUEGILL		1,530	314	2,544	1,337
TOTALS	2,545	99,121	59,217	132,753	112,372
No. Anglers	1,115	20,937	9,951	22,171	15,614
No. Hours	4,157	66,354	43,570	101,382	66,339
Fish per A.	2.28	4.73	5.95	5.98	7.19
Fish per Hour	0.61	1.49	1.36	1.31	1.69

TABLE II

IOWA LAKES CREEK CENSUS COMPARISON
EAST OKOBOJI

SPECIES	1946	1946	1947	1948	1949
CRAPPIE	6,904	22,899	9,704	4,660	2,637
PERCH	26	438	251	2,113	4,464
N. PIKE	93	247	126	294	117
WALLEYE	1,608	4,704	1,792	6,148	705
S.M. BASS		15	13	63	37
E.M. BASS	98	296	153	276	27
BULLHEAD		5,404	3,394	5,785	13,380
WHITE BASS	405	1,102	1,016	1,912	754
BLUEGILL		219	117	486	1,166
TOTALS	9,134	35,354	16,566	21,737	23,287
No. Anglers	2,759	9,119	4,725	6,125	3,789
No. Hours	9,080	31,346	18,566	25,947	15,566
Fish per A.	3.31	3.88	3.51	3.55	6.14
Fish per hour	1.01	1.13	0.89	0.84	1.46

In 1949 most excellent crappie fishing prevailed just prior to the census work, and many thousands were believed taken especially above the No. 9 highway bridge area. Consequently, it is difficult to appraise this policy at this time. Bullhead and perch fishing was good. Walleyes, white bass and black bass declined markedly last year, due to heavy reproduction in pan-fishes causing excessive forage. These game species should show an increase in catch next spring.

WEST OKOBOJI

As evident from the histogram (omitted from this report), fishing on West Okoboji is not on a par with either Spirit or East Okoboji during the early part of the season. Consistently fair results of a little less than one fish per hour of effort can be expected for this period. Perch fishing has increased considerably (Table 3) and can be expected to continue. Fall fishing, after harboring of speed boats for the winter, is excellent on this lake, especially for perch and walleyes. Sample census methods should be devised for this and several other lakes to include this fishing, and to provide a better index to the production from them. Black bass fishing is continuing good and reproduction is ample to insure future excellent populations.

LOST ISLAND

The history of this lakes' fishing is quite generally known. It is managed primarily for bullheads, and ranks second to Spirit Lake in popularity with Iowa anglers. After heavy stocking of small bullheads in 1941 to replace a winter freeze-out, little or no growth increment occurred in the small stocked fish. We were condemned for stocking "river-snapper bullheads" by the local citizenry. After a fairly complete biological survey, the commission removed the limits from the bullheads in this lake and removed nearly 200,000 pounds of carp. The histogram (omitted from this report) and Table 4 shows the striking decline in catch per hour, from 5.72 in 1946 to 2.98 in 1948. This is exactly as hoped for. The bullheads increased nicely in size and bottom foods began to re-appear. The 0.92 fish per hour for 1949 is a biased figure due to the closing of the principal spawning grounds (growing pond) to all fishing until July 1. This region was previously (1946, 47 and 48) fished heavily during the spawning season. The growth increment of the originally stocked and native fish has been very satisfactory, any exceeding 10 inches. Heavy reproductions in 1947 and 1949 will assure continued ample supplies. The 1947 year class entered into many of the catches in 1949 as keepers (6 to 7 inches). Bottom foods are continuing their increase, which will preclude stunting or starvation conditions of the former years.

CENTER LAKE

From 1946 to 1948, this was the best bullhead lake in Iowa. The vast decline in catch-per-hour from 3.35 in 1946 to 0.29 in 1949 indicates an unusual circumstance that can occur if ample successive year classes are not prevalent. From lake survey and census records it is obvious that the large year class of bullheads which provided

TABLE IV
IOWA LAKES CREEL CENSUS
~~LOST ISLAND~~

SPECIES	1946	1947	1948	1949
CRAPPIE	0	0	5	2
PERCH	56	51	285	19
N. PIKE	23	50	131	478
WALLEYE	130	359	760	106
L.M. BASS	0	0	0	2
BULLHEAD	100,111	169,344	346,954	51,482
TOTALS	100,320	169,804	348,135	52,089
No. Anglers	3,378	7,495	25,917	10,842
No. Hours	17,498	32,462	116,833	57,681
Fish per A.	29.69	22.61	13.42	4.81
Fish per Hour	5.72	5.23	2.98	0.92

the exceptionally good fishing has been depleted by over-fishing or by old age or from both factors. The lack of successful reproduction in 1946 and 1947 precluded good fishing in 1949 and as a consequence the fishing can be expected poor for at least another season. A large population of the 1948 year class is present, but are of small size. Largemouth bass and bluegill fishing will remain poor in 1950.

In view of the importance of the bullhead fishery in this lake, a population study was conducted using large hoop nets and the fin-mark and recapture method. The estimate of large bullheads as determined in June was between 13,000 and 15,000. This has not previously been publicised. Tom Moen and assistant Seth Shepard aided in this project.

CLEAR LAKE

With but two years of census work on Clear Lake, it is not possible to observe trends or make definite conclusions concerning populations and their fluctuations. However, it is apparent that the yellow perch adults are almost completely absent from the lake. Yellow bass and bullheads are dominant in the catches, and the walleyes provide consistently good fishing. A catch per hour of above 1 for the two years indicates good fishing generally. A continuation of the census is urged for this lake, especially since a heavy cropping off of carp is anticipated. See Table VI for catch records.

STORM LAKE

The Storm Lake data (Table 7) accurately reflects the fishing history during the census periods. Fishing last year was generally very poor as compared with the previous two years. Crappie, walleye, white bass and bullheads dominate the catches. Populations are known to be high in this lake and no reason can be attributed to the decline in catches last season. An early spawn of minnows may have influenced this somewhat, since many thousands of them were observed early in the spring in the trap region. It is expected that next seasons record will show improvement.

BLACKHAWK

This lake's fish population is unquestionably the most unique of any in Iowa. It more closely resembles the TVA reservoirs than any in the inland waters of this State. A monstrous population of gizzard shad dominates the lakes fish fauna. Prior to the spawning of the shad excellent catches are the rule each spring. However, after this time the lake is literally flooded with shad fry and fingerlings which puts an end to the pole and line fishing for the season. Early crappie fishing is usually good, and good populations of bass, bluegill, and channel catfish are present. Carp and shad control by traps and seines has been largely ineffectual in reducing their numbers sufficiently to reflect any improvement in fishing conditions. Bullhead fishing is declining (Table 8). Food supplies for bullheads are extremely scarce, but even so, the department continues to stock the lake with this species. It is hoped that satisfactory results will accrue from this.

TABLE V

IOWA LAKES GREEN CENSUS
CLEAR LAKE

SPECIES	1946	1947	1948	1949
L.M. BASS	39	0	30	29
BULLHEAD	30,648	20,463	28,433	3,098
BLUEGILL	0	1	841	24
TOTALS	30,687	20,464	29,304	3,151
No. Anglers	2,487	2,431	3,392	2,014
No. Hours	9,143	10,348	18,043	10,692
Fish per A.	12.27	8.42	8.64	1.56
Fish per Hour	3.35	1.90	1.62	0.29

TABLE VI

IOWA LAKES GREEN CENSUS
CLEAR LAKE

SPECIES	1948	1949
CRAPPIE	2,401	1,464
PERCH	3,541	250
N. PIKE	401	159
WALLEYE	2,299	2,004
YELLOW BASS	12,673	8,944
S.M. BASS	213	45
L.M. BASS	130	229
BULLHEAD	13,643	5,670
WHITE BASS	1,624	481
BLUEGILL	866	295
TOTALS	37,800	19,531
No. Anglers	10,216	6,253
No. Hours	30,463	17,523
Fish per A.	3.69	3.12
Fish per hour	1.24	1.11

TABLE VII
IOWA LAKES CREEL CENSUS
STORM LAKE

SPECIES	1947	1948	1949
CRAPPIE	6,241	5,313	2,109
PERCH	3	539	110
N. PIKE	12	46	32
WALLEYE	247	2,833	1,906
CHANNEL CAT		132	74
S.M. BASS	1	0	0
L.M. BASS	3	2	2
BULLHEAD	3,815	12,754	2,391
WHITE BASS	473	1,851	1,141
BLUEGILL	0	7	0
TOTALS	10,796	23,297	7,765
No. Anglers	2,092	7,756	5,784
No. Hours	7,574	24,104	21,871
Fish per A.	5.11	3.00	1.34
Fish per Hour	1.43	0.96	0.35

TABLE III

IOWA LAKES CREEL CENSUS
~~BLACKHAWK LAKE~~

SPECIES	1947	1948	1949
CRAPPIE	14,359	12,507	5,059
PERCH	1,924	2,014	406
CHANNEL CAT	14	333	201
CARP		2,477	491
WALLEYE		6	
S.M. BASS	2	5	22
L.M. BASS	34	390	476
BULLHEAD	4,649	2,422	1,250
WHITE BASS	5	11	3
BLUEGILL		1,140	388
TOTALS	20,987	21,305	8,296
No. Anglers	7,704	7,829	9,005
No. Hours	21,587	16,474	16,824
Fish per A.	2.76	2.68	0.92
Fish per Hour	0.97	1.37	0.49



CONCLUSIONS

It is believed that the foregoing account reflects the true evaluation of the fishing on each of the censused lakes. While many fisheries biologists draw inferences concerning population densities from creel census data, I am convinced that this is a misleading and dangerous practice. Large year-classes of adult fishes can be decimated in one seasons time by intensive exploitation and/or natural mortality, while an inference might be drawn that the population was still high. Test seining as in our survey investigations or population studies by the mark and recapture method are much more conclusive and reliable.

In this modern day of high tension existence and the vastly increasing numbers of recreation seekers, I feel that we in Iowa can be justly proud of our few fishing lakes and the production that is being recorded from them. We compare favorably in the catch-per-unit-effort with any state in the union. This, in my judgment, is the criterios upon which fishing must be evaluated. It is urged that the Commission continue the census and expand the work from year to year as a continuing policy. We should never return to the crystal ball days of the past.