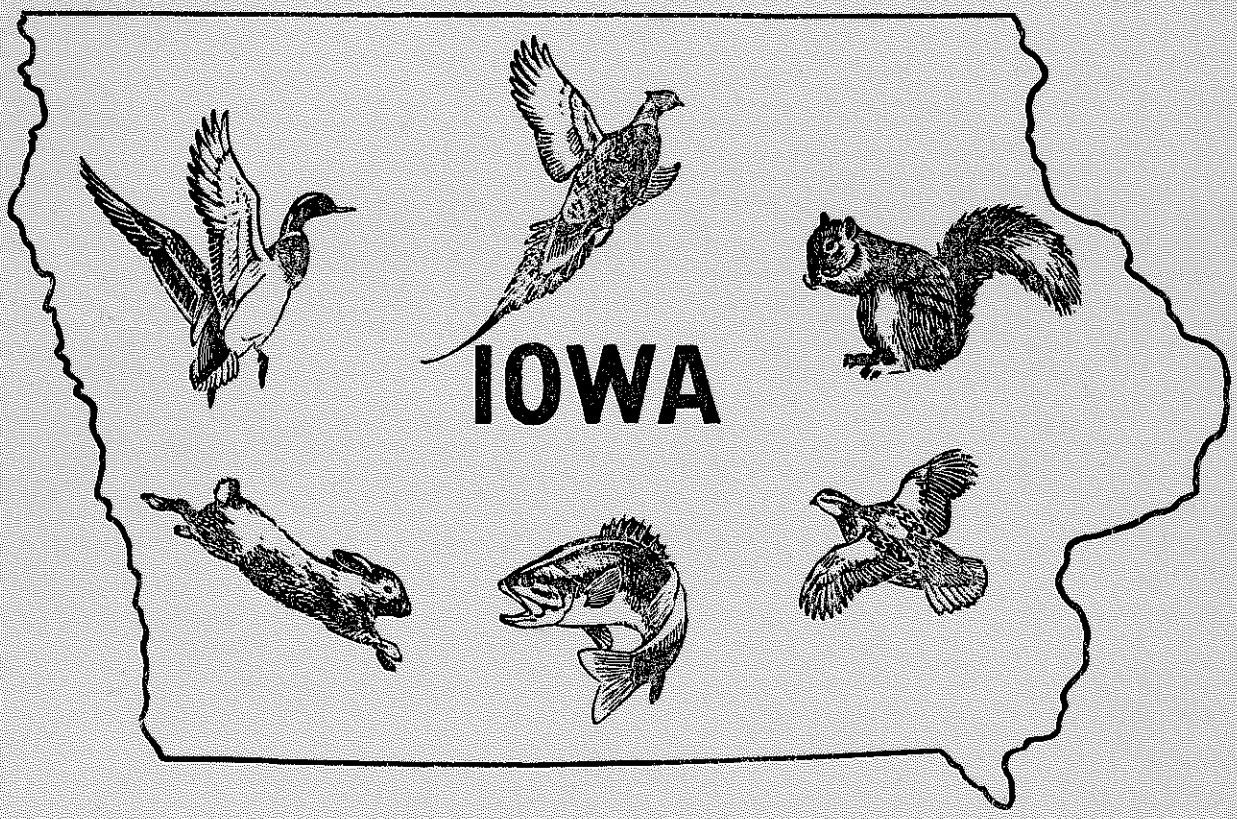
QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

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PROGRESS REPORT

CHANNEL CATFISH POPULATION INVESTIGATIONS AND HOOP NET STUDIES IN THE HUMBOLDT AREA ON THE DES MOINES RIVER IN IOWA

By Harry M. Harrison*

INTRODUCTION

As a progress report, this paper is intended to present the information secured to this time on the size of the channel catfish population in the Humboldt Area, and to continue the evaluation of the hoop net as a sampling device for catfish.

Of the many perplexing topics confronting the fisheries biologist, that of estimating the size of stream populations of fish approaches the inscrutable as near as any other. A knowledge of the size of the various segments of the population and the changes that take place therein, of course, precludes any appreciation of such factors as carrying capacity, population dynamics or the inter- and intra-specific relationship among the fishes occupying any body of water. The difficulties encountered in larger streams in shutting off areas of consequential size, coupled with the task of marking and recapturing significant numbers of fish from such inclosures, are almost insurmountable problems. Due largely to this, very little is yet known regarding the before-named factors in flowing waters. These are, however, basic to the better understanding of the life history and management of all fish species, and anything that can be learned along these lines hould be added to the pool of information accumulating in the field of fishery research.

The Humboldt Area, situated on the Des Moines River between the towns of Humboldt and Rutland, lends itself well as a place for the pursuit of such information. A reach of stream of considerable size, it is five and one-quarter miles in length and averages about 200 feet in width, while the main channel runs from three to over ten feet in depth. Additionally, the area is permanently inclosed by two hydro-electric dams. Because of the heighth of the dams and the operation of the hydro-electric plants associated with them, it is quite improbable that live fish ever enter the area. Although numerous observations during the past ten years have disclosed that movement by fish out of the area is a rare phenomenon, they may, however, leave the encincture. Fish very rarely pass through the hydro-plants as individuals, but upon occassion they do move through in masses. That which motivates the mass movement of fish through the turbines is not understood, but has been observed several times by the writer. Even though unexplainable, these downstream drifts are unique and of considerable interest. The migrations that have been witnessed have never involved more than a single species at a time but they may run into the thousands of individuals. These mass movements have always occurred in mid-spring, but usually no more often than once in three to five years.

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Since the fish moving out of the area must pass through the turbines, they are killed and, consequently, reported by the plant operators or indignant anglers. Subsequently, any such exodus of fish receives due consideration in our population studies.

As a flowing water habitat the Humboldt Area is somewhat unique in that about two-thirds of it is impounded. Nonetheless, studies in the past several years have revealed that even the impounded portion contains considerably more flowing than still water, and from its physical make-up, it is very typical of central Iowa streams. For instance it is populated with a complement of stream fishes. These, in their order of abundance, include: channel catfish, carp, a variety of suckers, walleye and northern pike. Pond or lake species, such as bluegill, crappies, largemouth bass and bullheads, although having been introduced in substantial numbers, are either entirely absent or poorly developed. The bottom fauna is composed of lotic forms, and there is no rooted vegetation. For these reasons, data collected from the area is believed to have considerable application to the flowing waters of the state and particularly so for central Iowa.

METHOD

The Petersen method is used for estimating the size of the channel catfish population. ($P = \frac{AB}{C}$, A is the number of marked fish in area, B is the number of fish taken, and C is the number of marked recaptures.)

Fish are marked in the fall of the year by fin-clipping. They are allowed to mingle over winter, and are then sampled by hoop nets the following spring.

POPULATION ESTIMATES

The first estimate of the channel catfish population in the Humboldt Area was for the fall of 1953. In that work, 14,889 fish were fin-clipped. In subsequent sampling of 6,681 fish captured, 951 had been marked. Applying these figures to the Petersen formula we arrived at a population estimate of 104,597 catfish in this five and one-quarter mile long reach of stream. On a per mile basis this amounted to approximately 20,000 catfish.

The estimate of the 1954 fall population involved the marking of 25,000 specimens and the subsequent recapture of 5,880 individuals of which 2,222 had been fin-clipped. Using the above formula, the 1954 fall population is calculated at 66,156 catfish, or 12,601 per mile of stream.

It is felt that a great deal of confidence can be placed on these estimates. In the sampling, the percentage of marked to unmarked fish was quite uniform. In addition, other factors that contribute to

systematic error were avoided. A large sample of fish was marked and a large number of them were recaptured. The marked fish had an ample opportunity to mingle homogenously with the unmarked segment of the population. Also, recruitment of smaller fish into the population would not be significant since catfish grow very little during cold weather. Finally, mortality should effect both marked and unmarked fish alike.

The estimates show a decline of 38,441 fish from the fall of 1953 to 1954. The reason for the drop is not known for certain, however, the disease, white spot, is prevalent in the area and may have contributed heavily to the loss. There were no reported movements of catfish out of the area during the interval, nor was there evidence of extensive kills between the time of the two estimates. White spot would tend to kill fish more or less gradually and decomposition would erase the signs of the kill before it built up sufficiently to be noticed. The body condition of the catfish in the area is at present noticably better than it has been for several years. This in itself may reflect a reduction in the catfish population and, together with a reduced rate of catch by our hoop nets, to be reported below, lends empirical support to the fact that the catfish population in the area has waned precipitously.

Rate of Catch by Hoop Nets

Hoop nets, baited with cheese, are the principal gear used to study catfish populations in Iowa streams. These are used for ease of handling and for their effectiveness in taking channel catfish. Following the netting operation, the population level or trend is then based on catch of catfish per net hour. This method shows only trends. Since it would be better to have some insite into the size of the population, and because it is virtually impossible to determine it in streams by the standard marking and recapture techniques, it would be of value, if possible, to make rough estimates from the number of fish caught per net hour. Before this can be done, however, it becomes necessary to establish whether or not a correlation exists between the number of fish caught and their vulnerability to hoop-netting in proportion to the size of the population.

The population studies at Humboldt offer a good opportunity to examine the plausibility of this as a census technique. There we have a continuing check on the size of the population and by observing the catch per hour we may be able, after several years of study, to establish at least a rough correlation between the catch per hour by hoop nets and the size of total populations.

Table I gives the catch statistics for the years 1954 and 1955. As suggested above, it will, of course, be necessary to assemble a much larger volume of data before any conclusions can be had. Nonetheless, the table does show the catch per hour to fall almost in a direct proportion with the size of the population. This is not only apparent in the total year catch but also for the individual samples.

Table 1

Samples of the catfish population from the Humboldt Area as secured by hoop netting expressed in catch per net hour, and giving totals caught in each sample and net hours fished for the years 1954 and 1955.

Sample No.	1953 Population--104,597			1954 Population--66,156		
	Number Caught	Net hrs. Set	Fish per Net Hr.	Number Caught	Net hrs. Set	Fish per Net Hr.
1	246	288	0.85	519	291	1.8
2	806	672	1.19	865	516	1.7
3	1344	288	4.50	468	1189	0.4
4	341	288	1.17	814	645	1.4
5	305	384	0.79	164	91	2.1
6	433	288	1.20	619	791	0.9
7	314	576	0.54	57	94	0.9
8	467	288	1.60	125	217	0.7
9	434	288	1.50	151	280	0.7
10	634	288	2.20	66	561	0.2
11	400	288	1.38	102	504	0.3
12	369	672	0.55	360	307	1.5
13	272	768	0.35	238	1727	0.2
14	316	388	0.81	88	590	0.2
15				693	568	1.5
16				273	946	0.3
17				175	510	0.5
18				13	141	0.1
19				10	279	0.04
Totals	6,681	5,664	1.18	5,800	10,247	0.63

WINTER CARRY-OVER TROUT STUDIES

By R. E. Cleary*

During the last two weeks in March of both 1954 and 1955, certain trout streams in northeast Iowa were surveyed with a 120-volt, D. C. electric shocker. All these streams had been checked in the same areas in November of 1953 and October of 1954. Weather, road conditions, and the press of other duties played an important part in how many of the streams which had been surveyed in the fall, could be resurveyed in the spring. In neither year was the complete complement of streams checked in the fall, rechecked in the spring.

These surveys have been carried on as a combined operation of the Biology and Fish Management section. Both plans and supervision, as well as the actual operation of the survey, have been a joint project.

On March 1st of 1954 a continuous open season on trout was inaufurated in Iowa. Plans for a February survey that year did not materialize, and small plantings of fish as well as two weeks of angling had been effected before the 1954 surveys could be made. In the 1954-55 winter, only one of the streams in the survey received any plantings of trout. In addition to this, winter angling was permitted in all the streams. Therefore comparison between these two years' surveys is definitely questionable because of the bias of different sets of conditions prevailing prior to the survey.

Table 1 presents the 1954 data. These streams had all received token "stockings" of trout and had been open to fishing for over two weeks prior to the survey. These data are of interest for, despite the "catchability" ratio which is generally known to favor the rainbow over the brown, there is a very close comparison between the percentage of marked specimens retaken in the spring. It would seem that when subjected to only natural decimating factors, the rainbow is as hardy a species as the brown. However, when angling is permitted, as it was in the winter of 1954-55, there is much greater winter reduction of rainbow trout (see Table 2).

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Table 1 - Winter Carry-over Surveys on Certain Northeast Iowa Trout Streams, March 1954.*

Stream	Percent of Fall Pop. Present in "Shocked" Area**	% Marked Rainbows Retaken	% Marked Browns Retaken	%of All Marked Trout Retaken
Big Mill	82 (33/40)	50 (8/16)	12 (4/24)	25 (12/40)
Buck Creek	183 (53/29)	11 (1/9)	40 (8/20)	31 (9/29)
Elk Creek	49 (42/86)	32 (15/46)	18 (9/40)	28 (24/86)
Swiss Valley	53 (43/81)	11 (8/75)	17 (1/6)	11 (9/81)
Mink Creek	20 (2/10)	00 (0/1)	11 (1/9)	10 (1/10)
Totals	74 (183/246)	22 (32/147)	23 (23/99)	22 (55/246)

* Figure in parenthesis is ratio of retakes to original number marked.
** All species combined, both marked and unmarked fish.

Table 2 presents the results of the 1955 spring survey. These surveys were carried on at the same time of the year as were the 1954 surveys. And they were also conducted over the same specific stream areas as were the 1954 surveys. However, no fish were stocked in these streams after September of 1954 with the exception of Swiss Valley, which received 750 rainbow trout Dec. 16, 1954. These streams were also open to fishing during the entire winter of 1954-55.

Table 2 - Winter Carry-over Surveys on Some Iowa Trout Streams, March 1955.

Stream	Percent Fall Pop. Present in "Shocked" Area*	% Marked Rainbows Retaken	% Marked Browns Retaken	% of All Marked Trout Retaken
Big Mill	30 (6/20)	0 (0/1)	16 (3/19)	16 (3/19)
Buck Creek	78 (29/37)	33 (3/9)	33 (9/28)	33 (12/37)
Elk Creek	55 (64/116)	0 (0/9)	36 (39/107)	34 (39/116)
Village Creek	69 (66/97)	5 (1/17)	25 (20/80)	22 (21/97)
Bloody Run	55 (26/47)	0 (0/3)	34 (15/44)	32 (15/34)
Swiss Valley	- This stream, having no trout in the "check" area in the fall survey, had 51 rainbows in March.			
Totals	60 (191/317)	11 (4/39)	31 (86/278)	28 (90/317)

* Includes both marked and unmarked trout of either species.

The areas covered by these surveys vary in length from 200 yards to 1.2 miles. The fish in these particular streams are all adults, 7 inches or over in total length. Column 1 of Table 2 indicates that there was an adequate winter carry-over, for despite winter angling and other decimating factors, the number of fish per given area in these streams was reduced only 40 per cent during the late fall and

winter. Nearly 30 per cent of the fish taken in the fall remained in their given territories, with browns being nearly three times more "home loving" than the rainbows.

In order to determine the accuracy of the spot-check method of estimating residual populations by electro-fishing, a complete census was attempted on French Creek in Allamakee County in October of 1954. Two features - first, the presence of two beaver dams making the water too deep to cover in about one-half mile of stream (a straightened portion); and second, the upper one-half mile of the stream being too small to float the shocking equipment limited the survey to 3½ of the 4½ miles of the potential trout water.

The total trout production in the area surveyed was 497 fish weighing 182.5 lbs. Of these, 85 were 3-5 inches long. This by no means represents the actual population since we could not run an accurate efficiency test. Projecting this figure, we arrived at an estimate of 145 trout (weighing 51.8 lbs.) per mile of stream. Recalculated and using an average width of 15 to 20 feet (approximately 2 acres of stream per mile), this amounts to approximately 25 lbs. of trout per acre. Even if this were an entirely true estimate and not a known low figure-per-mile, this would compare quite favorably with Michigan's 174 trout per mile of stream, and definitely better than their weight spread of 8.50 to 13.25 lbs. per acre.

Table 3 gives a comparison between the October, 1954, and the March, 1955, survey over the same stretch of water on French Creek. This stream received no additional fish after the fall survey and was opened to winter fishing.

Table 3 - Comparison Between Fall and Spring Surveys on French Creek, 1954-1955.

	Total Trout	Number Rainbow	Number Brown	Number Brook	Total Weight in lbs.
Fall	497	59	433	5	183.
Spring	319	36	282	1	142.
Per cent reduction	36%	39%	35%	80%	22%

Both total and specific population reduction figures from this "jumbo" sized smaple of French Creek compare very favorably with those derived by the spot-check method (Table 2). The per cent of reduction of the rainbow population in the spot-checked stream would probably have been more in line if the number of rainbows taken in the 1954 fall surveys had been higher.

In the fall survey, 85 of the 433 brown trout were fingerlings (3"-5" total length). In the spring survey the number had dropped to 34. In the fall the fingerling segment made up 20 per cent of the brown population, while in the spring it dropped to 12 per cent a 40 per cent reduction. In the adult trout, 8" and over in total length,

this fall-spring reduction was only 29 per cent. This probably accounts for the disparity between the reduction in total numbers and the reduction in weight (36 per cent as compared to 22 per cent).

THE POPULATION OF WALLEYES IN THE OKOBOJI LAKES

By E. T. Rose*

In view of the increasing significance of the walleye in the sport fishery of the lakes of Iowa, research and management efforts have been stressed in recent years to determine the status of and to improve angling for this highly esteemed species. Various studies have been published on age and growth, populations and dynamics of the walleye for Clear Lake, Spirit Lake and Storm Lake in Iowa; however, there has been no special emphasis on the walleyes of the Okoboji lakes. Since the species is important to the anglers here, being surpassed in total catch by only two or three other species, some basic information concerning them was deemed necessary for proper management. Probably foremost in this is some concept of the magnitude of the adult population and the degree of annual harvest by anglers. This paper presents the initial phases of an approach to these problems that can only be completed after the close of the winter fishing season on February 15, 1956.

The Okoboji lakes, located in Dickinson County, Iowa, consist primarily of two bodies of water known as West Okoboji and East Okoboji. They are connected by a narrow, deep channel which is bridged for highway travel (Fig. 1) through which fish migration from one lake to the other is readily available at all seasons of the year. West Okoboji is Iowa's second largest lake having a surface area of 3,788 acres. East Okoboji is much smaller with only 1,400 acres. The lakes are somewhat similar in outline, being long and narrow with irregular rocky and sandy shores. Topographically they are vastly different due principally to the depth variance--132 feet maximum for West and only 26 feet for East Okoboji.

The species composition of fishes in the two lakes is practically identical although the numberous large weedy bays, rock reefs and points of West Okoboji provide better environment and support larger populations of large and smallmouth black bass, northern pike, yellow perch and bluegills. These with the walleye, bullhead, crappie and white bass constitute the main game and pan fishes of the two lakes. Carp, buffalo, sheepshead and gar are controlled by intensive seining, trapping and electrofishing by the State Conservation Commission in an effort to provide more suitable environment for the more desirable species.

Tagging of Walleyes

In order to determine an estimate of the adult population of fish by sampling methods, it is necessary to mark or tag a known number and after sufficient time has elapsed to allow for equitable distribution among the unmarked individuals, samples are obtained and the ratio of tagged to untagged provides calculation data. This is the familiar Petersen method from which various modifications have been devised to accommodate various techniques.

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All of the adult walleyes tagged in the Okoboji lakes for this study were obtained by use of electric shockers at night during the spring spawning run. The procedure involved the use of a more or less standard shocking device which consists of a 220 volt generator placed amidships in a 16 foot work boat. Electrodes attached to out-riggers forward of and slightly to the side of the craft extended into water creating the electrical field. A strong light from the generator illuminated the entire forward area of the boat and the electrified region between the electrodes. Two or preferably three men operate each boat with one or two in the bow with dip-nets to capture the walleyes that are stunned and one man pilots the boat in the shoal areas of the lake. The fish were placed in a large tub of water and when about 25 were captured the craft was beached and they were tagged, measured and released. All the walleyes were tagged with No. 3 monel metal strap tags bearing serial numbers. These were clamped to the upper left jaw in the posterior region enclosing the maxillary bones. All walleye tagged were above 12 inches (except three or four which were about 11 inches) and mostly in a range of 15 to 18 inches in total length. A total of 511 fish were tagged, measured and recorded in 22 hours of work on East Okoboji and in West Okoboji a total of 502 were tagged in 39 hours. It was planned to tag an even 1,000 walleyes--500 in each lake; however a few extras were added to compensate for any mortality that might occur due to handling. After repeatedly searching lee shores, only two dead walleyes have been found that were tagged and none have been reported dead.

The catches of walleyes recorded in the creel census provided the means of sampling to calculate the population estimates. The creel census data, obtained primarily by personal contact of clerk and anglers and recorded on I.B.M. cards are tabulated each 10 days. This permits a regular comparison of ratios of tagged and untagged walleyes observed throughout the open season. This starts on May 15; consequently the estimates are based on the subsequent 10 days periods to the present time.

East Okoboji Walleye Population

The record of the walleyes observed by the clerk together with the number of tagged fish taken in each 10 day period is outlined in Table 1. The ratio of tagged recaptures to the untagged ("C" and "A" in the table) is included as an aid in calculating sampling error.

Table 1. Total catch of walleyes "A" and recaptures of tagged fish "C" as determined by creel census of East Okoboji during 1955.

Period	Total Catch (A)	Recaptures (C)	Ratio $\frac{C}{A}$
May 15-May 24	1,521	74	.048
May 24-June 3	769	23	.030
June 4-June 13	452	17	.037
June 14-June 23	392	10	.025
Totals or average	3,134	124	.039

Using the totals in Table 1, the populations estimate is calculated and is based on the presumed presence of 500 tagged walleyes in the lake at the start of the season on May 15, 1955 and the census data.

$$P = \frac{3,134 \times 500}{124} = 12,637$$

This is the estimate of the adult population in East Okoboji as of May 15, 1955, plus or minus sampling and systematic errors to be calculated in the final report at the end of the season on February 15, 1956. It is believed that systematic errors are of considerable magnitude since a number of tags were returned and included in this preliminary report without complete catch data or of untagged ones taken previously. A separate computation is planned for the final report using only the observed ratios and it is believed that the estimate will be considerably greater.

Harvest

The calculation of total harvest or annual yield is the most important phase of this work; consequently every effort is made to get as complete a record of tagged fish caught as possible. In all studies of populations using tags it is assumed that the tagged and untagged fish are equally vulnerable to catch by anglers, that behavior patterns are not altered and that the fish are randomly distributed in all regions frequented by the species. Since there have been 124 tags accounted for out of the 500 tagged, we must assume that the adult population has been harvested by at least 25 per cent in these first 40 days of the open season. This is extremely important, if true, and if angling for the walleyes remains fairly good through-

out the fall and winter periods, some thinking may be revised concerning the harvestability in this species by pole and line.

West Okoboji Walleye Population

The calculation of the walleye population in this lake was determined as for East Okoboji. Table 2 contains the data from the creel census together with the voluntarily reported tagged recaptures which could not be ingnorned in this preliminary estimate.

Table 2. Total catch of walleyes "A" and recaptures of tagged fish "C" as determined by creel census of West Okoboji.

Period	Total Catch (A)	Recaptures (C)	Ratio $\frac{C}{A}$
May 15-May 24	425	9	.024
May 25-June 3	455	11	.024
June 4-June 13	324	9	.028
June 14-June 23	412	9	.022
Total or average	1,615	38	.026

Using these totals in the Petersen formula we have:

$$P = \frac{1,615 \times 500}{38} = 21,250$$

This figure is the estimate of the adult population as of May 15, 1955, disregarding systematic or sampling errors. As with the calculation on East Okoboji, it is believed that the number is minimal due to the acceptance of some tags that were voluntarily provided. This will be compensated for in the final paper as described earliet.

Harvest

To date there has not been the degree of harvest that was observed in East Okoboji. A total of 38 tag returns indicates an exploitation of the adult crop of lightly less than 8 per cent in the 40 days considered here.

Fish Migration

So far the tag returns indicate that the populations of walleyes in the two lakes are quite distinct and that there is little actual interchange between lakes. Up to June 24, there have been 15 East Okoboji fish recaptured in West Okoboji and only 8 West Okoboji walleyes recaptured from East Okoboji. The map, figure 1,

indicates the locations of the recaptures that have migrated. Those marked "e" in West Okoboji were tagged in the East lake and those marked "w" were tagged in the West lake. Noteworthy distances travelled include recaptures of fish tagged at Manhattan Point and Pikes Point on West Okoboji from the region of Stony Point on East Okoboji. One tagged at Pillsbury Point, West Okoboji was recaptured at the north end of East Okoboji.

Discussion

A preliminary estimate of the walleye population in East and West Okoboji lakes indicates a rather low density in each body of water. The estimates are deemed lower than actual due to a disproportionately large number of voluntary tag returns that as yet have not been compensated for by complete catch data. Significant changes in the estimates may result from this or in the use of only the observed ratio in the final analysis. Voluntary tag returns will of course continue to be used in the total harvest computation and every effort is being made to obtain them for this purpose.

The harvest of walleyes in East Okoboji for the first 40 days of the open season seems excessive. A continuation of the present level of exploitation could conceivably result in a depression from which recovery would be difficult especially if the population estimate is about as low as indicated.

Fig. 1. Migrated recaptures. "o" in West Okoboji were tagged in East Okoboji and "W" in East Okoboji were tagged in West.

SUMMARY OF HATCHERY STUDIES, SPRING, 1955

By Tom Moen *1

Introduction

This is an annual report concerning certain phases of walleye and northern pike hatchery operation. As in 1954, investigations were carried on primarily at the Spirit Lake and Clear Lake hatcheries with limited checks at the Lansing station. The following discussion presents the highlights and results of routine studies and is concerned with both production and experimental work. The data concerning each station will be discussed under a separate heading.

Spirit Lake Hatchery

Northern Pike: The bulk of the adult northern pike used in the hatchery this year came from Trumbull Lake in Clay County. A water control structure near the mouth of the Smith's Slough inlet provided a convenient collecting area. About, 1,000 northerns were seined at this point and transported to the hatchery for spawn taking purposes. All Trumbull Lake fish were returned to Trumbull Lake. A few adults were collected from the local carp traps, but due to the lack of run-off the carp traps failed to produce the usual quota of northerns. For the most part the fish that were collected in the traps failed to rippen in the holding tanks and were returned to the lakes.

A total of 119 quarts of eggs was put up and 91 quarts were brought through to the eyed stage for a 76 per cent hatch. This is the highest per cent of hatch recorded in the past nine years that northerns have been handled at this station. The first eggs were put up on April 5 and the last on April 13. The first eggs started to hatch on the 15th of April.

Water temperatures during the incubation period ranged from 48°F to 59°F with an average of 53°F. Most of the eggs hatched in about 10 days for a hatching time of 530 day-degrees. This compares favorably with the hatching time of ten days noted at the Lansing station where artesian water supplies a constant water temperature of 54°F.

The female northerns from Trumbull Lake averaged about 2.5 pounds, the males two pounds. These small northerns produced nearly average sized eggs with 13 counts averaging 65,000 per quart. There was relatively little variation in the size of the eggs. The 91 quarts of eyed eggs thus produced 5,915,000 fry. The average female produced 0.28 of a quart or about 18,000 eggs (table 1). This is slightly better egg production than that recorded for small northerns at Clear Lake in 1953 where the average female (also weighing about 2.5 pounds) pro-

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1 The quthor wishes to express his appreciation for the help and/or data provided by Fay Fronk, Robert Cooper and John Spinner, superintendents of the Spirit Lake, Clear Lake and Lansing hatcheries respectfully.

duced slightly over 11,000 eggs, (Moen and Lindquist, 1954). By way of comparison a 12 pound female from East Okoboji Lake produced 1.5 quarts of eggs for a count of 93,000.

Table 1 - The number of female northern pike used, total quarts of eggs obtained, quantity and number of eggs obtained per female from Trumbull Lake during five days of operation at the Spirit Lake Hatchery, 1955.

Date		Number of females	Total quarts of eggs	Quarts per Female	Number of eggs per female*
April	5	12	4.2	0.35	22,750
	6	52	19.0	0.36	23,400
	7	100	22.0	0.22	14,300
	8	160	46.0	0.28	18,200
	9	90	24.0	0.26	16,900
Totals and/or averages		41.5	115.2	0.28	18,200

* at 65,000 per quart

At the Spirit Lake hatchery an estimated 75 per cent of the northerns (both males and females) were anesthetized in a 1:700 solution of chloretone prior to the spawn taking procedure. No mortality was noted in the six to 12 hours that these fish were held before returning them to the lake. Nine of these fish were tagged and placed in a pond. No mortality of the marked northerns has been observed to date. Although these fish were small and relatively easy to handle the chloretone treatment was considered worth the small amount of extra handling.

Northern fry were stocked in suitable locations in twenty lakes. Two nursery ponds were stocked and a limited amount of experimental stocking was carried out in small tributary streams.

Walleye: For the first season in nearly 45 years there was no gillnetting for walleyes in the Okoboji lakes. Through special arrangements all the walleye eggs were to be shipped in from Put In Bay, Ohio. These special arrangements included the assurance from the hatchery at Put In Bay that our quota of 800 quarts of eggs would be taken at the peak of the run, put up at the Ohio station and the first siphoning completed. This would permit our trucks to pick up eggs that would average about 50 per cent or better in fertility. Circumstances beyond control, primarily weather, prevented completion of the plan.

Instead of 800 quarts of 50 per cent fertile eggs there were something less than 600 quarts of mill-run eggs that were of about the same quality as those received at Put In Bay in 1954. The Spirit Lake hatchery received 420 quarts; only 36.5 quarts reached the eyed stage for less than a 10 per cent hatch. These eggs averaged 170,000 per quart. The 6,205,000 fry that resulted were distributed among six nursery units, one artificial lake and two natural lakes.

Clear Lake Hatchery

Northern Pike: Northern pike were hatched at the Clear Lake hatchery for the third year since initiaion of northern hatching at this station in 1953. All northerns used at this station were taken from the carp trap at the road grade between Clear Lake and the Ventura marsh. The first eggs were put up on April 5 and the last on April 11; the hatch was completed on the 19th of April. There was a total of 140 quarts taken for the season with the eggs averaging 62,000 per quart. Fifty quarts of eggs were hatched for a 36 per cent hatch and 3,100,000 fry. The fry were stocked in several lakes and marsh areas with the bulk of the fry going to Ventura marsh.

Walleye: This season marked an "off" year in the cooperative alternate year stocking program for Clear Lake. In order to more fully utilize the facilities of the Clear Lake hatchery the fish management section instituted an alternate year walleye fry stocking program for Storm Lake with the walleye fry to be hatched at the Clear Lake station in the years of no fry stocking for Clear Lake.

The Clear Lake hatchery received 142 quarts of walleye eggs from the shipment of Ohio eggs. Twenty-one and five-tenths quarts were brought through to the hatching stage representing slightly more than a 15 per cent hatch. These eggs averaged 174,000 per liquid quart. Thus 3,741,000 fry were produced.

Two million of these fry were stocked in Storm Lake to initiate the alternate year stocking program for this lake. About 150,000 fry were stocked at each of 12 river stations (experimental program in conjunction with biology survey stations) and 100,000 went to rearing ponds at Hampton.

Lansing Station

During the 1954 season considerable success was experienced in the use of chloretone for anesthetizing northern pike. In a limited experiment egg fertility was 13 to 26 per cent better than that for eggs taken from non-anesthetized fish. The experiments were repeated again this year on a slightly larger scale but the results were almost reversed. Only one group of eggs taken from anesthetized fish had better fertility than the controls. Since there was no evidence of a complete failure in the eggs from anesthetized fish it is quite certain that the chloretone had no definitely harmful effects. This fact is also bolstered by the high fertility of the eggs at the Spirit Lake hatchery where 75 per cent of the northerns were anesthetized.

LITERATURE CITED

Moen, Tom and Murhl Lindquist
1954 The Northern Pike Hatch at the Clear Lake (Iowa) Hatchery Progressive Fish-cult. 16(2) 89-90.

IOWA RACCOON DATA - 1954-55 SEASON

Glen C. Sanderson*

A raccoon project was initiated with hunter cooperators in 1949 and in 1950 the project was expanded to include information from a fur dressing station. Results of the first five years have been reported previously. The project was conducted in a similar manner each year; however, since hunter cooperation declined and the collection of data at Mr. Louis Lamb's fur buying establishment in Bloomfield, Iowa, increased, for the past few years most of the information was collected by the writer.

Each of approximately 165 potential cooperators was sent a letter which explained the purpose of the project and outlined the information the hunter was asked to report. A form for recording the information and a mimeographed summary of the results of the 1953-54 hunting season were mailed with the letter of instructions. Only those hunters who had replied in previous years and new prospects were contacted; all others were dropped from the old mailing list.

The 1954 opening date for raccoon hunting was October 10, the same as it was in 1953; however, the closing date was February 10, 1955, one month later than the previous year. This was the second change in Iowa's raccoon regulations since at least 1930-31. The open dates for this period have been November 10-January 10. The trapping season has remained unchanged during this entire time, with open dates November 10-January 10. There is no daily or seasonal bag or possession limit on the raccoon in Iowa, nor has there been during at least the past 25 years.

RESULTS--Less than 10 per cent of the hunting trips were made during the first 10 days of the 1954-55 season, about the same percentage of early hunting effort as was expended the first year with an October 10 opening date. Fifty-six per cent of the trips were made during the first 10 days of the 1952-53 open season. During the first half of the 1954-55 open season, hunters made 87 per cent of their trips, 10 per cent more than were made during the first half of the previous season.

A comparison of the average hunting success for the past season with the results of the previous five seasons shows that the success per hour remained virtually unchanged during the first five years but declined slightly last fall. Raccoon hunting parties bagged an average of 0.52 animal per hour last fall and winter.

Age-Ratio--The age ratio of the male segment of the harvest, as determined by 41 penis bones sent in by hunters and 472 bones collected by the writer at Bloomfield, was 2.11 young per adult (Table 1). To state it another way, 67.8 per cent of the male harvest were juveniles. Table 1 shows that this was only slightly lower than was reported one year earlier when juveniles comprised the highest percentage reported during the past six year.

The slight variations in age ratios from season to season can probably be explained by variations in the weather which affect the amount of hunting done in the various segments of the open season. Data from the past few years indicate that there is a somewhat greater percentage of juvenile animals bagged early in the season than are taken later.

Sex Ratio--A total of 1,112 raccoons were sexed during the past fall and winter--262 were examined at Lamb's in Bloomfield, 69 were reported by hunters, and 781 were examined at Oshman's Fur House in Cedar Rapids. Of these, 530 were males or 91.1 males per 100 females. In other words, females comprised 52.3 per cent of the 1954-55 harvest examined in Iowa. This represented a slight decline from the previous season; however, the percentage of females found in the carcasses examined at Bloomfield was virtually the same for the past two years (Table 2).

Table 1 - Age ratios of Iowa male raccoons taken during the 1949-50--1954-55 hunting seasons.

ORIGIN	SEASON	ADS	JUVS	TOTALS	%JUVS	JUVS / AD
Hunters	1949-50	92	163	255	63.9	1.77
Carcasses[1]	1950-51	35	59	94	62.8	----
Hunters		32	66	98	65.3	----
TOTALS		67	125	192	65.1	1.87
Carcasses	1951-52	239	388	627	61.9	----
Hunters		30	67	97	69.1	----
TOTALS		269	455	724	62.8	1.69
Carcasses	1952-53	100	171	271	63.1	----
Hunters		26	49	75	65.3	----
TOTALS		126	220	346	63.6	1.75
Carcasses	1953-54	158	337	495	68.1	----
Hunters		32	86	118	72.9	----
TOTALS		190	423	613	69.0	2.23
Cardasses	1954-55	154	318	472	67.3	----
Hunters		11	30	41	73.2	----
TOTALS		165	348	513	67.8	2.11

1 All carcasses examined at Lamb's, Bloomfield, Iowa.

Breeding history--Information in Table 3 indicates that the percentage of parous females in all females harvested has varied from 19.6 per cent in 1952-53 to 37.0 per cent in 1950-51. Parous females comprised 30.5 per cent of all the females checked during the 1954-55 hunting season. This is somewhat larger than was reported one year earlier. As was noted above, the percentage of juveniles in the male harvest was about the same for these two seasons. Data presented later in this report indicate that the average number of young per litter, as

determined by placental scar counts, has not varied substantially during the five year period, although there has been a slight average decline for the past four years.

Table 2 - Sex ratios of Iowa raccoons, 1949-50-1954-55

ORIGIN	SEASON	MALES	FEMALES	TOTALS	% FF	MM/100FF
Hunters	1949-50	416	424	840	50.5	98.1
Fur Houses		412	489	901	54.3	84.3
TOTALS		823	913	1,741	52.4	90.7
Carcasses[1]	1950-51	75	63	138	45.7	119.0
Hunters		160	170	330	51.5	94.1
Fur Houses		304	429	733	58.5	70.9
TOTALS		539	662	1,201	55.1	81.4
Carcasses	1951-52	272	283	555	51.0	96.1
Hunters		130	108	238	45.4	120.4
Fur Houses		665	995	1,660	59.9	66.8
TOTALS		1,067	1,386	2,453	56.5	77.0
Carcasses	1952-53	117	145	262	55.3	80.7
Hunters		121	134	255	52.5	90.3
Fur Houses		396	611	1,007	60.7	64.8
TOTALS		634	890	1,524	58.4	71.2
Carcasses	1953-54	103	95	198	48.0	108.4
Hunters		115	130	245	53.1	96.2
Fur Houses		299	438	737	59.4	68.3
TOTALS		517	663	1,180	56.2	78.0
Carcasses	1954-55	136	126	262	48.1	107.9
Hunters		30	39	69	55.1	76.9
Fur Houses		364	417	781	53.4	87.3
TOTALS		530	582	1,112	52.3	91.1

1 All carcasses examined at Lamb's, Bloomfield, Iowa.

Information from the past seasons indicates that adult males showed some signs of sexual activity in southern Iowa during November and December but information from past years indicates that they probably do not become fully sexually active until January. During the past season, 15 juvenile males showed indications of becoming sexually active in southern Iowa during November or December. Of these, 10 had penis bones in the intermediate group which probably belong to the juvenile age group (Dellinger, 1954). Possibly a few yearling males do become sexually active during the peak of the breeding season in southern Iowa.

Table 3 - Percentage parous and non-parous females in the Iowa raccoon harvest 1949-50-1954-55 and the computed number of young per parous female in the harvest.

ORIGIN	SEASON	PAROUS	NON-PAROUS	TOTAL	%PAROUS	YG/PAROUS F[1]
Fur Houses	1949-50	116	373	489	23.7	4.96
Carcasses[2]	1950-51	30	33	63	47.6	----
Fur Houses		152	277	429	35.4	3.07
TOTALS		182	310	492	37.0	3.12
Carcasses	1951-52	76	146	222	34.2	----
Fur Houses		206	789	995	20.7	----
TOTALS		282	935	1,217	23.2	4.93
Carcasses	1952-53	34	110	144	23.6	----
Fur Houses		114	497	611	18.7	----
TOTALS		148	607	755	19.6	5.44
Carcasses	1953-54	41	53	94	43.6	----
Fur Houses		100	338	438	22.8	----
TOTALS		141	391	532	26.5	4.59
Carcasses	1954-55	47	77	124	37.9	----
Fur Houses		118	299	417	28.3	----
TOTALS		165	376	541	30.5	4.27

1 Computed by dividing the number of parous females into the product of the total number of raccoons examined, multiplied by the percentage of juveniles in the harvest.
2 All carcasses examined at Lamb's, Bloomfield, Iowa.

There were 182 placental scars representing 54 litters observed in the uteri of 47 parous females examined at Bloomfield, Iowa during the past hunting season (Table 4). This gives an average of 3.37 placental scars per group which was the average number of young per litter. The number of scars per uterus ranged from one to seven, but five uteri showed evidence of two litters. The number of young per litter ranged from one to six during the past season (Table 4).

Placental scar counts for the past five seasons reveal that once a female raccoon mates successfully, the chances are that she will mate successfully each year thereafter. These counts also show that average raccoon litter sites in Iowa have varied from 3.37 to 3.96 during the past five years.

Table 4 - Placental scar counts made at Bloomfield, Iowa, 1950-51-1954-55 seasons.

No. scars per parous uterus	NUMBER OF UTERI				
	1950-51	1951-52	1952-53	1953-54	1954-55
0	0	1	2	2	0
1	2	0	0	3	1
2	4	4	2	1	2
3	13	23	10	14	15*9
4	5	15	10	8	19*10
5	1	13	4*4	7*8	5*8
6	1	3*3	1	2*3	4*11
7	2*1	4*1	1*5	1*5	1*12
8	0	1	0	2*6	0
9	1*2	1*2	0	0	0
10	0	0	0	1*7	0

SEASON	NO. PAROUS U T E R I	NUMBER GROUPS PLACENTAL SCARS	TOTAL NO. S C A R S	AV. NO. SCARS PER GROUP (AV LITTER SIZE)
1950-51	29	31	103	3.55
1951-52	65	67	265	3.96
1952-53	30	30	112	3.73
1953-54	41	45	159	3.54
1954-55	47	54	182	3.37

* Two distinct groups of scars. 1 One uterus with groups of 4 and 3. 2 One uterus with groups of 5 and 4. 3 One uterus with groups of 4 and 2. 4 One uterus with groups of 4 and 1. 5 One uterus with groups of 5 and 2. 6 Two uteri with groups of 4 and 4. 7 One uterus with groups of 6 and 4. 8 One uterus with groups of 3 and 2. 9 One uterus with groups of 2 and 1. 10 Two uteri with groups of 2 and 2. 11 Two uteri with groups of 4 and 2. 12 One uterus with groups of 4 and 3.

Harvest and Population--There was a decrease in the reported harvest from 79,939 pelts in 1953-54 to 49,592 in 1954-55, a 38 per cent decline. The 1953-54 bag was an all time high for Iowa (Table 5). During the past season, the average pelt value increased from $1.57 to $1.71 and the closing date extended from January 10 to February 10; however, it is not believed that either of these factors had an appreciable effect on the number killed.

Since weather conditions were somewhat similar during the past two seasons, possibly the smaller number harvested was a reflection of reduced numbers in the state. At the same time, data in Tables 1 and 2 indicate that the age and sex ratios of the harvest have not varied greatly since 1949-50. Juveniles have comprised a slightly greater percentage of the total harvest the past two seasons than they did for the four previous years. There was a slight decrease in the percentage of males in the hunter's bag for the past fall and winter but this figure was similar to the one found for the 1949-50 season. The average litter size also decreased slightly. All these changes were slight and probably were not significant.

The raccoon population has probably been at peak levels in Iowa since 1946. There were minor fluctuations in the Iowa harvest

since then, but the trend was gradually upward until the 1953-54 season when there was a substantial increase. The change for that year was probably a result of more liberal regulations and more favorable weather conditions during the hunting period rather than a major increase in numbers. As was mentioned above, the 1954-55 harvest was substantially lower than it was for the previous season, possibly reflecting a reduced population in some sections of the state. However, since the population data do not appear to reflect a decline in abundance at this time, it appears probable that any reduction in numbers would be slight.

Table 5 - Raccoon harvest and average value received per pelt in Iowa in 1954-55 compared with the highest, lowest and average figures for the past 25 years and the 1953-54 figures--as reported by fur buyers.

SEASON	Number of pelts bought by dealers	AVERAGE VALUE PER PELT	TOTAL VALUE
1932-33	10,468[1]	$ 2.60	$ 27,216.80
1943-44	38,303	7.25[2]	277,696.75
1953-54[5]	79,939[3]	1.57[4]	125,504.23
1954-55[5]	49,592 (-38.0%)	1.71	84,802.32
25 year totals	875,667		2,444,546.44
25 year average	35,027	2.79	97,781.85

1 Lowest number harvested.
2 Highest average value
3 Highest number harvested.
4 Lowest average value.
5. Season Oct. 10-Jan. 10, 1953-54 and Oct. 10-Feb. 10, 1954-55 instead of Nov. 10-Jan. 10 as it was in all other years.

Body Weights--Adult males ranged from 13.5 to 23.0 pounds in body weight while the juvenile males ranged from 7.0 to 17.0 pounds. Juvenile males averaged 12.1 pounds, adult males 17.3 pounds, and all males 13.4 pounds in body weight. Parous females averaged 15.4 pounds, non-parous females 12.0 pounds, and all females 13.3 pounds in body weight. On the whole these average weights are similar to the ones reported for the previous seasons (Table 6).

Table 6 - A comparison of the average body weights of Iowa raccoons taken during the 1950-51-1954-55 seasons.[1]

	SEASONS				
	1950-51	1951-52	1952-53	1953-54	1954-55
MALES:					
Adults	17.1	17.0	18.3	17.6	17.3
Juveniles	11.5	11.1	11.5	12.1	12.1
All Males	13.8	13.2	13.3	14.4	13.4
FEMALES:					
Parous Adults	15.4	14.4	15.1	15.2	15.4
Juvs & Non-P Ads.	11.8	10.6	11.0	11.1	12.0
All Females	13.5	11.9	11.9	12.9	13.3
ALL RACCOONS	13.7 (138)[2]	12.5 (441)	12.6 (186)	13.6 (180)	13.5 (230)

1 Weighed at Bloomfield, Iowa. 2 Number of raccoons weighed.

SUMMARY

1. Results of the 1954-55 hunter reports show that with the opening date October 10, as it was the previous year, but with a closing date of February 10 instead of January 10, less than 10 per cent of the hunting was done during the first 10 days of the open season. Approximately 10 per cent of the hunting trips were made the first 10 days of the previous season, but 56 per cent of the trips were made the first 10 days of the 1952-53 season.

2. The age ratio, as determined from 513 penis bones, was 2.11 young per adult, a slight reduction over one year earlier when juveniles comprised the highest percentage reported during the past six years.

3. The sex ratio of 1,112 raccoons, as reported by hunters, from checks in fur houses, and from carcass examinations, was 91.1 males per 100 females. This represented a slight decline in percentage of females from the previous season's harvest; however, the percentage of females found in the carcasses examined at Bloomfield was virtually the same for the past two years.

4. Parous females comprised 30.5 per cent of 541 females examined, a slight increase over one year earlier.

5. There were 182 placental scars representing 54 litters in the uteri of 47 parous females examined at Bloomfield, Iowa. Thus, the average number of young per litter was 3.37, a slight decrease over the previous year.

6. Iowa's raccoon population may have passed the peak although it is believed that it is still high in most sections of the state. The 1954-55 harvest was 38 per cent lower than was reported for the 1953-54 season, the highest harvest on record.

7. This decrease in numbers bagged occurred in spite of a slight increase in average pelt value and a closing date of February 10 instead of January 10. It is not believed that either of these factors had an appreciable effect on the size of the harvest; however, since weather conditions were somewhat similar during the past two raccoon seasons, it is possible that the smaller number taken is a reflection of a reduced population level.

8. Juvenile males averaged 12.1, adult males 17.3, non-parous females 12.0 and parous females 15.4 pounds in body weight. All males averaged 13.4 and all females 13.3 pounds. A total of 230 animals of both sexes and all ages averaged 13.5 pounds. Male weights ranged from 7.0 to 23.0 and female weights from 7.5 to 19.0 pounds.

REFERENCES CITED

Dellinger, George P. 1954. Raccoon--Age and sex ratios and resulting problems in the interpretation of harvest data. 16th Midwest Wildlife Conference.

PHEASANT CROWING COUNT & HEN INDEX SPRING 1955

By Richard C. Nomsen*

The spring pheasant crowing count, which was initiated in 1950, has become an important segment of Iowa's pheasant program. Changes in local pheasant abundance can be noted as well as population trends for the state as a whole. This report presents the results of the 1955 survey and compares them with figures obtained from previous counts. Procedure remained the same as for earlier surveys.

Weather conditions were generally more favorable than for either the 1953 or 1954 surveys. Temperatures were much above normal for April, with the result that crowing activity reached a peak nearly two weeks ahead of 1954. Rainfall was near normal. High winds delayed some counts early in May.

The statewide results of the crowing count are shown in Table 1 which lists the average number of calls heard, the observed sex ratio determined by winter counts, and the index of the spring hen population for the past six years. The 1955 census was started April 28 in southern Iowa and one week later in the northern half of the state. Officers heard 29,494 calls at 3,480 stops along the 176 routes completed. The state average of 8.5 calls per stop was the same as the 1954 figure and also equal to the previous five year average.

The spring hen index was determined by applying the observed sex ratio to the crowing cock count. Each year, sex ratios are obtained from the officers winter pheasant check. The 1955 spring hen index increased 28 per cent over the 1954 figure. This increase was probably due to better reproduction last year plus the fact that we again experienced a mild winter.

Part of the increase could possibly be the result of improved census conditions this year.

Table 1 - Statewide Results of the Crowing Count & Hen Index 1950-1955

Year	Av. No. of Calls Heard	Sex Ratio	Spring Hen Index [1]
1950	7.9	2.9	22.9
1951	8.1	2.9	23.5
1952	9.3	2.7	25.1
1953	9.4	2.2	21.7
1954	8.5	2.8	23.8
1955	8.5	3.6	30.6

1 Ave. calls times Sex Ratio

The results of the 1955 spring population check are listed for each district in Table 2 and a comparison of previous counts in each district is made in Table 2. Populations in each district will be discussed separately because pheasant populations vary a great deal from one part of the state to another and trends in the population for the state as a whole do not necessarily represent similar conditions for all parts of the state.

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Results from districts one and two in northwest and north central Iowa were nearly the same again this year. An increase was noted in the spring hen index for district two and results from northwest Iowa remained the same as 1954. Both are far above the state average.

A large increase was registered for district three in the northeast part of the state this spring. The population trend in this corner of Iowa has been up during the past few years. The 1955 spring hen index rose to a level comparable to districts one and two.

Population figures for west central and central Iowa also showed an increase this spring. Figures for these two districts have remained near the state average.

Spring hen population figures for the east central district remain below the state average although a slight increase occurred this year.

Records for southern Iowa have been difficult to obtain because of poor conditions for sex ratio counts. However, snow cover was adequate this past winter and for the first time since the start of the survey, comparable figures were obtained. The population figure for southwest Iowa was not far below the state average and was higher than the count taken in the east central district. Populations in the other two southern districts remain very low.

Table 2 - District Results of the 1955 Crowing Count & Hen Index

District	No. of Calls Heard	No. of Stops	Av. No. of calls per stop	Sex Ratio	Spring Hen Index
1 Northwest	6691	360	18.6	2.9	53.9
2 Northcentral	7982	394	20.3	2.7	54.8
3 Northeast	4804	430	11.2	4.4	49.3
4 West central	3999	440	9.1	4.1	37.3
5 Central	2981	460	6.5	4.8	31.2
6 East central	1390	358	3.9	4.5	17.6
7 Southwest	884	180	4.9	4.9	24.0
8 South central	610	440	1.4	3.3	4.6
9 Southeast	153	418	0.4	2.0	0.8
STATE	29,494	3,480	8.5	3.6	30.6

Table 3 - Comparison of Crowing Count Results & Spring Hen Index
1953 - 1955

District	Year	Average Number of Calls Heard	Spring Hen Index
1 Northwest	1953	19.8	39.6
	1954	17.6	54.6
	1955	18.6	53.9
2 North central	1953	26.6	55.9
	1954	21.0	42.0
	1955	20.3	54.8
3 Northeast	1953	7.8	21.1
	1954	8.0	20.8
	1955	11.2	49.3
4 West central	1953	10.2	25.5
	1954	9.1	22.8
	1955	9.1	37.3
5 Central	1953	6.2	19.2
	1954	6.6	21.8
	1955	6.5	31.2
6 East central	1953	5.1	16.3
	1954	3.6	16.2
	1955	3.9	17.6
7 Southwest	1953	5.7	11.4
	1954	6.2	12.4
	1955	4.9	24.0
8 South central	1953	1.1	2.2
	1954	1.5	3.0
	1955	1.4	4.6
9 Southeast	1953	0.6	1.2
	1954	0.5	1.0
	1955	0.4	0.8

SUMMARY

The 1955 spring crowing count was taken during the last week of April and the first half of May. The peak of crowing occurred two weeks earlier than in 1954, and indicated an early spring which is generally favorable for pheasant reproduction. Officers recorded 29,494 calls at 3,480 stops along the 176 routes completed. The average number of calls heard per stop was the same as 1954. Sex ratios obtained last winter indicated 3.6 hens per cock in our post-season population, compared with 2.8 hens a year ago. This change resulted in a 28 per cent increase in the spring hen population index. The most noticeable increase was recorded in northeast Iowa.

IOWA WINTER QUAIL COUNT
1955

By M. E. Stempel*

To secure data for the continuous inventory of quail populations in Iowa, counts are made in selected areas by Conservation Officers, and the quail biologist during late winter.

Method of Conducting the Count

Counts are made following procedures outlined in letters sent out to officers in the quail range. The letters are mailed during the winter, and each officer is requested to make a check in three populated covey ranges in one of his counties. One range is chosen in the north, one in the south and one in the central part of the county. If possible counts are to be made when there is snow. These are not to be estimates, but counts of quail. With good tracking conditions quail can be located more easily and often from the trails the number can be counted without flushing the covey. The completed forms are returned to the Des Moines office early in March.

Results: Statewide counts 1954-1955

From the entire quail territory 66 covey ranges were reported on in 1954, and 44 areas were found occupied; while in 1955, of 99 checked 73 contained quail. In 1954 there was a total of 544 quail reported. Nine hundred and forty-nine quail were counted in 1955. This amounts to 12.3 per range in 1954 and 13.0 per populated area covered in 1955. Using Errington's work as a basis, some very high counts were made in the following counties: Adams, Jasper, Louisa and Pottawattamie. These high counts in border counties totaled 354 quail or 37 per cent of the total number seen in all Iowa ranges. It is known that some reports are estimates because the officer gave farmer estimates when he was unable to find quail. Since it is known that these counties have never produced one third of the fall hunting, it is necessary to adjust the figure to make it useful.

The winter census should reveal any violent downward trend. Our most vital interest is in this direction. Thus we should be on the lookout for areas where there is likely to be extreme scarcity of quail in the fall.

Probably the proportion of ranges occupied is most important. Table one shows on a yearly basis the percentage of ranges occupied since 1951.

Table 1 - Percentage of Quail Ranges Occupied, 1951-1955

Year	Percentage of Ranges Occupied	Birds p r Occupied Covey range
1951	80	12.4
1952	69	8.8
1953	67	7.2
1954	67	12.3
1955	74	13.0

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AGE OF QUAIL IN THE HUNTER'S BAG
1954

By M. E. Stempel*

The age composition of the game take by hunters is one of the important factors in game management. This report is based on information obtained by examining 2,746 quail wings shot during the 1954 quail hunting season.

Following the procedures set up by Petrides and Nestler (1943) the wings of young quail can be classified as to days of age, thus the dates of hatching can be established, and the hatching cycle can be compared to the prevailing weather of the hatching period. Variation in calling by the male quail corresponds to the intensity of nesting, and looking back over data for previous years we can see that a long period of calling usually accompanies a long and successful hatching period and this usually results in a successful hunting season. Length of the calling season apparently is increased by good weather in the spring and in the fall.

Before the open season, letters are sent to Conservation Officers asking them to collect all quail wings from hunters contacted. In addition to this, ten volunteers cooperated by saving wings from each day's hunt. The wings were put in an envelope, and on the envelope was recorded the date of the hunt and the county in which the hunting was done. From this latter collection the data on hatch dates are obtained.

For study purposes the wings are first separated according to county of origin. Wings are then examined separately and the young to old ratio is derived. These data are shown in Table 1. Days of age, date of kill and the moult stage of adult wings are recorded elsewhere.

Table 1 - Percent of Young quail in the hunter's bag, 1946-1954

Year	Per Cent of Young Quail
1946	85.7
1947	82.7
1948	87.2
1949	88.2
1950	83.1
1951	85.6
1952	87.0
1953	83.4
1954	90.0

Of the 2,746 wings turned in from counties open to hunting there was information on date and place of kill for 538 kinds. Of these, 88.1 per cent were young. These dated wings were collected from Appanoose, Davis, Decatur, Lucas, Madison, Monroe, Linn, Ringgold, Van Buren, Wapello and Wayne counties. Data from the wings that were in good condition and that could be aged indicates that hatching got off to a slow start late in June.

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The 1954 spring was considered an early spring and although there was considerable warm weather, hatching became extensive at a later date than during some other years. Locally this is also demonstrated as in Lucas county where in 1953 there was in the kill for November first to 15th, a 53 per cent take of young over 150 days old, while in 1954 in the same period there was a kill of 45 per cent young in the same age group. Data indicates that hatching was begun in late June, reached a peak early in July, fell off gradually until the middle of August after which there was a rapid rise in hatching. This late activity reached its peak in early September. The percentage of quail in three age groups for the years 1950 to 1954 is given in Table 2.

Table 2 - Age variations in young quail bagged during November expressed as per cent of year class.

Hatching Year	1-120 days old	121 - 149 days old	150 days old or older
1950	39	24	37
1951	59	27	12
1952	40	11	48
1953	37	24	37
1954	32	11	57

Following is a brief discussion concerning some features of hatching that are peculiar to the various brooding months. Warm weather arrived late in 1950. Nevertheless, in the fall there was a good supply of older young, and the season proved a satisfactory one for the hunter. The 1951 spring was still later in arriving, also it was wet, cold and otherwise generally unsuitable so that as a result only 12 per cent of the bag of young was the desirable mature size quail hatched during the current year. Conversely, the 1952 growing period season was two weeks earlier, or it was considered about normal. Good shooting was represented in the take of quail by 48 per cent of the 150 day old, or older young. The 1953 hatching time was similar to that of the previous year. The hunting was good in some areas. It was poor in some places. This is believed to have resulted from locally heavy rainstorms during the height of the hatching when the downpours may have killed some of the newly hatched. In spite of the late production peak, more than half of the young were of adult size by November 15 as shown in table 3. Probably the November first to 15th harvest of younger birds is beneficial. The more mature quail in the 150 day old group should be better able to live through the winter months.

Table 3 - Per cent of matured-size young quail in the hunter's bag, by hunting periods during the 1953-1954 seasons.

Hunting Period	Per cent over 150 days old	1953	1954
Nov. 1-15		35	33
Nov. 16-30		53	61
Dec. 1-15		90	84

It is suggested by Thompson and Kabat (1950) that the stage of moult in the adult quail should correspond to the stage of moult in the young. Early moulting and early maturing of new primary feathers in both young and adults should follow an early hatching season. The percentage of adult wings with matured plumage was three per cent

in December 1954 bag of quail. In 1953 during the same time of year 14 per cent of the adults had mature wing primaries.

A partial record is available of the sex of quail killed by some cooperators in the dated wing project. From this partial record the take by sex was; in 1951, 92 hens per 100 cocks; in 1952 and 1953, 104 hens per 100 cocks; while in 1954 this figure was 90 hens per 100 cocks.

SUMMARY

1. In a sample of 2,746 quail wings from 23 counties 90 per cent of wings were from birds hatched in 1954.

2. Quail hunting was considered good over most of the quail range; this may have been partially due to the fact that there was a second and later quail hatching period.

3. A comparitively small per cent of adult quail had completed regrowth of primary feathers by December.

4. The small per cent of adults having matured plumage is in line with with the large per cent of immature young shot during the season since delayed moult accompanies a late hatch.

REFERENCES CITED

1. Petrides, George A. and Nestler, Ralph B.
1943 Age Determination in Juvenile Bob-White Quail, American Midland Naturalist, Vol. 30, No. 3 pp. 774-782.

2. Thompson, Donald R. and Cyril Kabat
1950 The Wing Moult of the Bob-White, Wilson Bulletin, Vol. 62, No. 1

3. Iowa Climatological Data, Summaries, 1950-54.