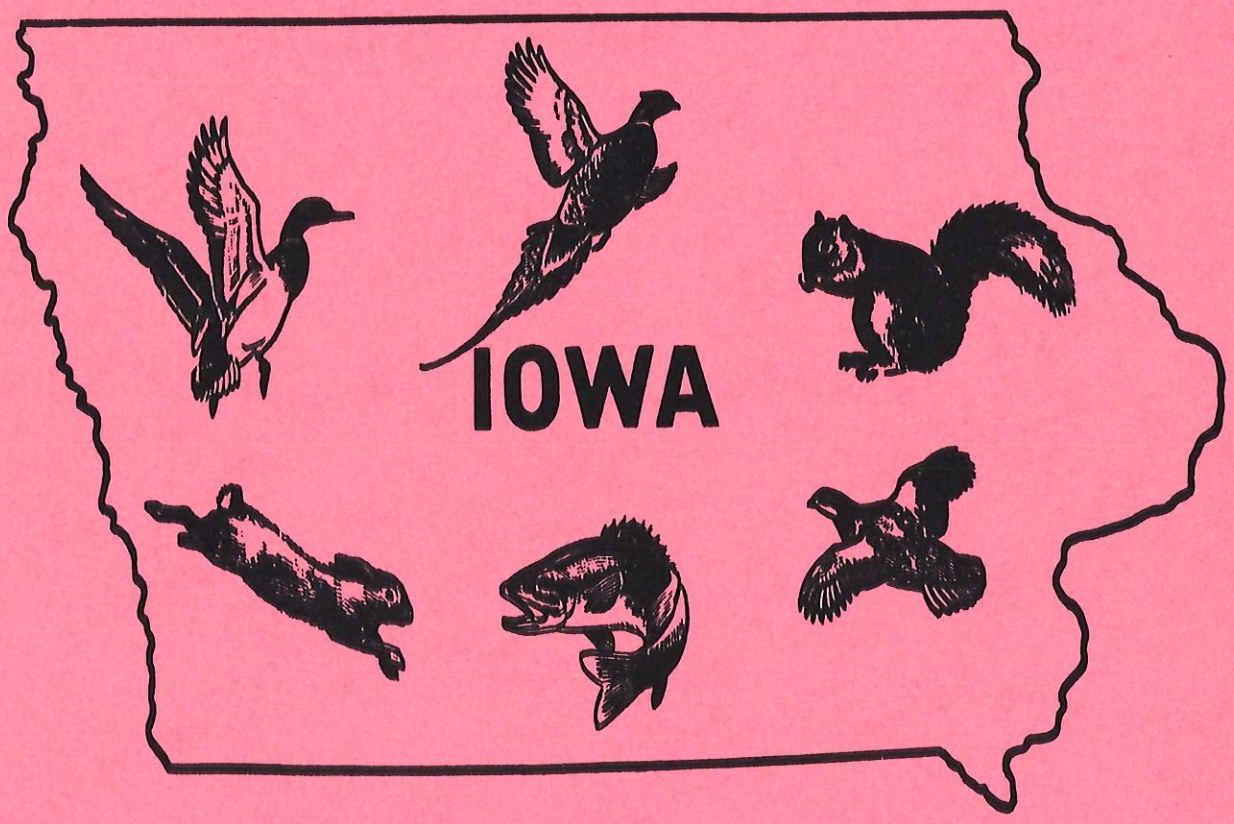
1960
Complete

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

QUARTERLY BIOLOGY REPORTS

April, May, June

1960

VOL. XII NO. 2

Submitted by

Biology Section
E. B. Speaker, Supt.

State Conservation Commission
Glen G. Powers, Director

Fish and Game Division
Earl T. Rose, Chief

East 7th and Court Avenue
Des Moines, Iowa

TABLE OF CONTENTS

ABSTRACTS OF QUARTERLY BIOLOGY REPORTS

COMPARISON OF THE SPECIES COMPOSITION INDICATED BY SHOCKING AND CHEMICAL TREATMENT IN CENTRAL IOWA STREAMS

by
Harry M. Harrison
Fisheries Biologist

The species composition determined by electro-fishing is compared to that determined by chemical eradication. The results were very similar by both methods, and indicate that electro-techniques adequately reveal species composition for central Iowa streams.

THE ERADICATION OF A FISH POPULATION IN A SMALL ARTIFICIAL LAKE

by
Jim Mayhew
Fisheries Biologist

East Osceola Reservoir was treated with Chem-Fish, a rotenone bearing fish toxicant, in the spring of 1960. The lake was treated in two different segments with a combined concentration of 1.5 p.p.m. A total of seven species of fish were recovered during the project. The total population was estimated at 52,279 fish, weighing 7,063 pounds. Bluegills comprised 93.6 per cent of the population by number, and 80.2 per cent by weight. Largemouth bass, warmouth, black crappie, channel catfish, and golden shiners ranked next in importance.

Age composition and growth of the major species was determined for comparison with other artificial lakes.

MISSISSIPPI RIVER TRAP NET CATCHES AT LANSING, IOWA, 1955-1959

by
John Spinner and Robert Cleary
Fisheries Foreman - - Fisheries Biologist

The catch in a group of thirty trap nets set to collect brood fish for inland hatcheries and stocking inland waters indicates a persistent increase in crappies, bluegills and yellow perch populations, despite relaxed sport fishing regulations.

Further analysis of the annual catch indicated a wariness or avoidance of nets set in a general locality for long periods of time.

This phenomenon is important to the fish manager in that nets set over two weeks in one location lost 50% of their effectiveness. It also is important to the biologist attempting to fix population estimates on long-term mark and recapture project. The wariness of a fish taking a fixed net the second time after an initial capture would tend to swell the estimated size of the population.

REPORT ON THE MISSOURI RIVER COMMERCIAL FISHERIES FOR 1959

by
Delmar J. Robinson
Fisheries Biologist

A comparison of the 1959 and the 1958 commercial fishing data shows few changes. In 1959, 220 residents and six non-residents licensed 670 items of commercial gear for use in the Missouri River.

Hoop nets (317), basket traps (143), and trot lines (125) were the most common types of commercial gear licensed.

The county with the largest amount of licensed gear and the most commercial fishermen was Harrison County, with 79 operators from that county using 200 pieces of equipment.

A commercial catch of 17,347 pounds was reported from the Missouri River in 1959.

ED'S TWENTY-THREE YEARS OF FISHING ON SPIRIT LAKE

by
Tom Moen
Fisheries Biologist

The personal fishing record of Mr. Ed Andreas, a long time resident and guide on Spirit Lake, was summarized and presented in standard creel census terminology. This 23-year record made it possible to determine that he and his parties made 2,551 boat trips involving 6,810 fisherman trips during which 53,046 fish were caught at the rate of 7.94 fish per man. Twelve species of fish were reported in the catch over the years, walleyes ranking as the number one game fish. Yellow perch and crappies were about equally important as the most important pan fish.

Various comparisons are made regarding species composition, number of fish per year, and population trends.

PHEASANT CROWING COUNT AND HEN INDEX SPRING, 1960

by
Richard C. Nomsen
Game Biologist

The 1960 spring crowing count indicated a 14 per cent decrease in the number of hens when compared with the record high population in 1959. The decrease was most noticeable in the northeast and north central districts where production was lowest in 1959. Populations remained stable in northwest and west central Iowa. Counts from central and southern Iowa were lower; probably due to losses during the severe winter and below normal production last year.

III

WINTER COUNT OF IOWA QUAIL

by
M. E. Stempel
Game Biologist

Each year during February and March a quail count is made by Conservation Officers. Additional checks are made by the biologists. The 1959-1960 winter count was completed March 26, 1960. Throughout the census period there was deep snow in the main quail range of southern Iowa. More quail were counted than in a similar count in 1958-1959. The harsh weather that followed the census period may have reduced the number of quail.

ANALYSIS OF DATA OBTAINED FROM DEER CHECKING STATIONS, 1959

by
Eldie W. Mustard
Game Biologist

Deer checkers collected biological data from 532 deer during Iowa's seventh open season, which was held on December 12-13, 1959.

Analysis of the data indicates that the Iowa deer herd is in excellent condition and has a high rate of reproduction. The average weight for all deer was 142.7 pounds in 1959, compared to the 1958 average of 136.6 pounds. Fawns comprised 38.3 per cent of the kill, for an indicated reproduction rate of 62.3 fawns/100 adults. An average reproduction rate of 1.52 fawns/female was recorded in 1959.

COMPARISON OF THE SPECIES COMPOSITION INDICATED BY SHOCKING AND CHEMICAL TREATMENT IN CENTRAL IOWA STREAMS

by
Harry M. Harrison
Fisheries Biologist

The use of the electrical shocker for inventorying stream fish in Iowa dates back to the early 1950's. At first, shocker data were used only to supplement information gathered by conventional nets and seines, but through improved techniques the shocker has advanced to the point that it is now the main, and in many cases, the only gear employed to census Iowa streams. It has replaced nets and seines because of its greater effeciency, its low selectivity for species, and takes more fish per unit of effort.

Experience has shown that the shocker is of little value for indicating total populations unless marking and recovery work is included. This is time consuming, and if carried on dictates that only a few areas could be censused in the course of a year's work. In Iowa's warm-water streams, a knowledge of total populations would be of great value, but for management purposes, it is not essential. In most instances it can be assumed that our streams are carrying maximum poundages of fish. Iowa streams are fertile; they are free of severe limiting factors; they all contain fish populations consistant with the habitat available. Effective stream management in this state is largely a matter of species manipulation or rough fish control. The need for management can be determined by an adequate knowledge of the species composition.

Since the electrical shocker is our primary censusing device, it would be of value to know how well it reveals species composition with respect to our waters.

During the past four years, surveys employing the shocker have been carried on in several areas prior to chemical eradication of the fish population. This paper compares the species composition determined by the shocker with that revealed by chemical treatment.

The pertinent information resulting from this study is given in Tables 1 and 2. Table 1 shows the number of individual fish upon which the species composition was established by shocking and by chemicals. Table 2 compares the species composition determined by those methods.

The determinations established by chemicals are the best measure of the true species composition; counts were made on dead fish which facilitated accuracy; the kills were almost complete, alleviating any bias due to selectivity; and either all fish were counted or where samples were used, the counts were made far beyond the point where the percentage of any given species compared to the others changed.

The species composition, based upon shocker results compared to that of chemical kills, do not reveal any very significant difference in central Iowa streams. The greatest differences occur in the case of the abundant species (carp and carpsuckers-Carpiodes sp.). This results from the fact that accurate tallies of those species are difficult to make when shocking because there may be so many fish in view at a single instant that precise counts cannot be made.

Data pertaining to fish populations revealed by electro-fishing has been recognized as containing various biases. Among others, species reaction to electrical stimuli has been regarded as serious. For example, catfish do not react violently to electricity, but tend to remain in place on the bottom when shocked and are thought not to be seen in their true proportion to the whole population. Walleye pike, on the other hand, do react violently to electro-stimuli. They literally "pop" to the surface when shocked and remain stunned much longer than other species. Because of this, they are thought to occur in a lesser proportion in the over-all population than their counts indicate. Fish which are species of the open water and strong swimmers, notably the buffalo, are considered better able to avoid the electrical field which lends bias to their numbers.

The results of the present work are not adequate to prove, disprove, or indicate the magnitude of the fore-going contentions. Our eradication projects are run in areas known to be grossly overpopulated with rough fish (carp and/or carpsuckers). Consequently, we do not have accurate information regarding the true species composition in areas containing larger or better components of game fish.

The channel catfish is the only more desirable fish occurring in significant numbers in chemically treated areas. The results of shocking (Table 2) shows a lower frequency of occurrence than indicated by chemical treatment, but the difference is not great.

In general, the data collected for and presented in the present paper indicates that the electrical shocker does an adequate job of indicating the species composition in central Iowa streams.

Table 1. Sample Size by Chemicals and Electro-fishing Upon Which Species Composition Was Established.

	Shocker Sample	Chemical Sample
Humboldt	2096	3544
Rutland	3187	3765
Maple River	94	155
Middle Coon (partial)	795	3296
Middle Coon (complete)	795	7476
Willow Creek	79	610
Winnebago River	188*	2160

*Shocker survey ran 7 months prior to chemical kill

Table 2. Comparison of Species Composition Determined from Chemical Kills and Electro-fishing.

AREA	Carp		Carpioe's		C.catfish		Suckers		Bullheads		Shad		Walleye		S.M. bass	
	Shock	Chem	Shock	Chem	Shock	Chem	Shock	Chem	Shock	Chem	Shock	Chem	Shock	Chem	Shock	Chem
Humboldt	54	44	25	29	12	21	9	4	-	1	-	-	Tr.	Tr.	Tr.	-
Rutland	77	82	18	14	1	2	3	Tr.	Tr.	2	-	-	Tr.	Tr.	-	-
Maple River	71	57	-	-	4	4	2	6	3	8	18	25	-	-	-	-
Middle Coon*	88	82	4	2	6	15	1	1	2	-	-	-	-	-	-	-
Middle Coon	88	91	3	4	5	3	1	4	2	-	-	-	-	-	-	-
Willow Creek	87	82	2	1	-	1	6	1	5	15	-	-	-	-	-	-
Winnebago River	96	95	Tr.	1	-	-	3	4	-	-	-	-	-	-	-	-

*Partial Chemical kill

THE ERADICATION OF A FISH POPULATION IN A SMALL ARTIFICIAL LAKE

By Jim Mayhew
Fisheries Biologist

East Osceola Reservoir, a 24-acre municipally-owned recreational Lake, was chemically treated to eradicate the fish population in the spring of 1960. Poor fishing, an abundance of stunted bluegills, and increasing numbers of worthless fish necessitated a complete renovation of the impoundment. This project was of particular importance because it was the first opportunity to obtain absolute population data on a lake used for reserve municipal water supply.

The reservoir was constructed in 1922 for water supply to the city of Osceola. In approximately 1946 an additional and larger reservoir was constructed. After this time East Osceola lake was used only for emergency water supply and recreational activities.

The reservoir is a typical small southern Iowa impoundment. It is located in a relatively long narrow valley with approximately 2,000 acres of watershed. Only limited agricultural practices are conducted on lands not controlled by the city water board. Bottom contours are relatively steep at the lower end of the lake, but siltation has reduced the upper end to a massive mud shoal area. Maximum depth is 20 feet. Severe chemical and thermal stratification are present during summer months, with oxygen less water quite common below 12 feet. Surface waters are well protected from intense wind action by climax woodlands on the immediate shoreline.

Preliminary surveys of the fish population by electro-fishing and trap netting indicated seven species of fish in the lake. Segments of the largemouth bass, bluegill and crappie populations were marked by removing the left pelvic fin. This was two-fold in purpose; first, to determine the success of the eradication, and second to test the reliability of the mark and recapture methods of population estimates.

Complete eradication projects of this type are extremely valuable in studying population structures in various types of lakes. Since this was the first water supply reservoir treated with a fish toxicant, particular attention was directed toward population structure and species composition. Most of the water supply reservoirs in southern Iowa are treated with copper sulphate to control filter-clogging algae. East Osceola was treated with this chemical in a routine manner until 1953. The overall effects of these treatments to fish populations and welfare are not completely understood. Hence, this study was expedient to obtain basic information.

METHOD OF TREATMENT AND POPULATION ESTIMATE

The reservoir was treated in two different segments with a combined concentration of 1.5 p.p.m. Chem-Fish. This toxicant contained 2.5 per cent rotenone and 2.5 per cent sulfoxides as a synergizing agent. A concentration of 1.0 p.p.m. was applied to the surface by portable power spraying units mounted in boats. An additional concentration of 0.5 p.p.m.

was applied in a layer by an underwater discharging apparatus. This application was necessary because of the thermal stratification to insure equal lateral distribution of the toxicant.

The total number of fish killed by the chemical treatment was recorded by counting the individuals by species as they were picked up by personnel cruising the lake in boats. Approximately 15 per cent of the fish were recovered within eight hours after the chemical was applied. The remainder of the fish were counted two days later when they floated, were picked up and disposed of by burying. Gross population weights were estimated by using random scale samples and representative length frequencies to determine the age composition of a specific population and applying the mean weight of each age group to the total number calculated within the group.

FISH POPULATIONS

A total of seven species of fish were recovered in the treatment of East Osceola Reservoir. Bluegill, largemouth bass, and warmouth comprised the major species in the impoundment. Small indigenous populations of black crappie, channel catfish, black bullhead, and golden shiner were also present.

In all, a total of 52,279 fish, weighing 7,063 pounds were recovered. Table 1 lists the number and weight of individual fish populations. Mean weight of fish per acre was estimated at 290 pounds. There were no species of rough fish found in the lake during the project.

Table 1. The estimated fish population by number and weight in East Osceola Reservoir.

Species	Total Number	Per cent Composition	Total Weight	Per cent Composition
Largemouth Bass	314	0.6	722	10.2
Bluegill	48,932	93.6	5,657	80.2
Crappie	219	0.4	59	0.8
Warmouth	2,236	4.3	160	2.3
Channel Catfish	104	0.2	338	4.9
Black Bullhead	214	0.4	107	1.5
Golden Shiner	260	0.5	20	(T)
Grand Total	52,279		7,063	

LARGEMOUTH BASS

A total of 314 largemouth bass, weighing 722 pounds were recovered during the operation. By number, this species represented only 0.6 per cent of the population, but by weight, the bass ranked second in importance. Approximately 45 per cent of the largemouth bass population was made up of three year old fish; whereas, age groups I, II, IV and V were equally represented in age group composition (Table 2). Mean total length was 4.6, 8.0, 10.1, 13.5, 15.0, 16.7, 19.0, and 21.4 inches in the first eight years of life. This is considered normal growth for impoundments of this type. Average weight of 109 specimens was 2.3 pounds.

Prior to the chemical eradication, 113 largemouth bass were marked by removing the left pelvic fin. This was done to determine the success of chemical eradication on this species, and the reliability of the mark and recapture method of population estimates on this species. Of the marked fish, 109 were recaptured during the operation. The four remaining marked fish could have either been caught by anglers during the time elapsing after they were marked and the lake was treated, or carried off by spectators during the project.

Table 2. Age composition of the major fish populations in East Osceola Reservoir.

Species	No. in Sample	Per Cent in Age Group							
		I	II	III	IV	V	VI	VII	VIII
Largemouth Bass	109	10.0	10.0	45.0	19.8	10.0	5.0	(T)*	(T)
Bluegill	1,799	(T)	16.2	31.8	25.9	25.9	(T)		
Crappie	54	13.1	8.7	17.3	60.7	0.2			
Warmouth	67	8.1	56.8	18.9	17.2				

*T - less than 0.1 per cent

Table 3. Mean total length and weight at each year of life of four major species of fish in East Osceola Reservoir.

Species	No. in Sample	Age Group						
		I	II	III	IV	V	VI	VII
Largemouth Bass	40	4.6	8.0	10.1	12.5	15.0	16.7	19.0
		(1.5)	(4.5)	(11.0)	(1.1)*	(2.3)*	(3.4)*	(5.4)*
Bluegill	154	1.8	2.5	4.0	5.0	5.5	6.4	----
		----	(0.5)	(1.5)	(2.0)	(2.2)	(3.0)	----
Black Crappie	22	4.5	6.5	8.0	9.5	----	----	13.1
		(1.0)	(2.3)	(4.6)	(8.7)	----	----	(26.0)
Warmouth	37	2.0	2.0	4.0	5.5	----	----	----
		(0.5)	(0.5)	(2.1)	(4.7)	----	----	----

*Largemouth bass weighed in tenths of pounds, all other fish weighed in tenths of ounces.

BLUEGILL

Bluegill were by far the most abundant species of fish in the reservoir. This species comprised 93.6 per cent of the standing crop by number, and 80.2 per cent by weight. Age groups II, III, IV and V represented 99 per cent of the population. Growth and physical condition of the population were extremely poor. Mean total length for the first six years of life was 1.8, 2.5, 4.0, 5.0, 5.5, and 6.4 inches respectively. This is far below the growth expected in this type of impoundment.

Attempts to increase the growth of bluegills by chemical population manipulation in 1959 met with failure. Recruitment of growth into the remaining population was insignificant because abnormal magnitude of the population, and recruitment of a new year class into the existing population.

CRAPPIE

The crappie population was composed mostly of black crappie. The number of white crappie was so insignificant that no attempt was made to differentiate between the two species. Crappie comprised only 0.4 per cent of the total population by number, and 0.8 per cent of the population by weight. Age group IV made up 60.7 per cent of the population. The remaining year classes were evenly distributed. Mean total length for the first, second, third and fourth years of life was 4.5, 6.5, 8.0, and 9.5 inches respectively. One specimen, seven years old and 13.1 inches long, was recovered. Growth was above average for this type of impoundment.

WARMOUTH

This species is usually not important to the fishery of a southern Iowa reservoir. It is also considered unimportant to the angler because of its small size and poor angling quality. In East Osceola Reservoir this species ranked second in abundance, comprising 4.3 per cent of the population by number.

Due to the relative scarcity of warmouth, studies of the year class structures within warmouth populations and growth studies have not been extensive for this species. In this study Age Group II made up 56.8 per cent of the population. Three and four year old fish comprised the re-

mainder of the population. Growth for the first four years of life was calculated at 2.0, 3.0, 3.9 and 5.5 inches total length.

MISCELLANEOUS SPECIES

Other species of fish present in the reservoir included channel catfish, black bullhead, and golden shiner. Channel catfish was the only species among this group that represented more than one per cent of the standing crop by weight. Twenty-two catfish were salvaged during the project for restocking. Although bullheads were stocked annually, they were insignificant to the total fish population.

SUMMARY

East Osceola Reservoir was treated with a fish toxicant to eradicate the fish population in the spring of 1960. An abundance of stunted bluegill and poor angling success necessitated the renovation project. This was the first opportunity to obtain absolute population data on a former water supply reservoir.

The total fish population was estimated at 52,279 fish with a combined weight of 7,063 pounds. Bluegills comprised 93.6 per cent of the population by number and 80.2 per cent by weight. Largemouth bass, warmouth, black crappie, channel catfish, black bullheads, and golden shiners ranked next in importance. Growth and age composition of the most important species were determined for comparison with other renovated impoundments.

MISSISSIPPI RIVER TRAP NET CATCHES AT LANSING, IOWA, 1955-1959

by
John Spinner and Robert E. Cleary*
Iowa Conservation Commission

As a part of routine hatchery procedure, the Fisheries Management Section annually fishes from 20 to 30 trap nets in the slough areas of the Mississippi River north of Lansing, Iowa. The same general area is fished each year and portions of the catch serve as a source of brood fish for jar and pond production, as well as adult transfers to inland rivers.

Trap nets, constructed of 1 1/2 inch and 1 3/8 inch mesh, having 6 feet by 3 feet frames, and hoops 33 inches in diameter are used. Since the river conditions are quite similar year to year, and since the nets are fished in the same locality, annual data are comparable on a broad basis. In addition, the netting is done in April and the catch is not likely to be biased by the addition of a size class which grew too large to pass through the web during the netting period. Since the number of nets fished range from 20 to 30, and they are usually run for a period of 30 days, this index of abundance is probably the most accurate of any attempted in either inland or boundary waters of the state.

Catches of certain species varied quite radically in numerical abundance from one year to another; others exhibited a constant catch figure (Table 1).

Table 1. Average Numerical Catch Per Net Lift[1] in Mississippi River, Vicinity of Lansing, Iowa, 1955-1959.

Species	Year 1955	1956	1957	1958	1959
Crappie	7.1	11.2	34.1	53.5	84.1
Bluegill	6.8	12.6	22.8	20.3	83.4
Largemouth Bass	0.6	0.6	0.9	0.6	2.5
Northern Pike	3.4	1.8	2.8	1.1	3.0
Walleye	0.3	0.2	0.2	0.1	0.1
Yellow Perch	2.2	2.5	3.6	6.0	12.6
Bullhead	1.9	2.8	2.2	2.6	2.3
Carp	-[2]	3.6	2.6	4.3	8.0
Buffalo	-	1.9	0.4	0.3	0.2
Sheepshead	-	0.8	0.2	0.2	0.5
Suckers	-	1.2	0.9	1.4	2.5
Bowfin	-	2.5	2.2	1.1	2.4

1/ Trap nets are lifted each 24 hours.
2/ Bar indicates no catch data kept on these species in 1955.

*John Spinner, Fisheries Foreman
R. E. Cleary, Fisheries Biologist

Even with this magnitude of fish-taking devices, much of the catch fluctuation might be attributed to mechanical and/or ecological variables affecting netting efficiency rather than fluctuations in numerical abundance. However, certain species such as crappies, bluegills and yellow perch are definitely on the increase in this area. Admittedly, 1959 saw an increase in the catch of most species, but this phenomenon was not apparent in 1956 through 1958. And, despite fluctuating catches of other species during the five-year period, the catch rate of crappies, bluegills, and yellow perch almost doubled each successive year.

This netting program has, as a primary purpose, the objective of securing brood northern pike for the Lansing Hatchery. With this in mind, the nets are set each year as soon as the river is clear of ice, a period during which the northern pike commonly makes its spawning run. This procedure tends to assure a minimum fluctuation in water temperature between each of the annual netting periods. Average monthly pool stage did not vary over one-half inch in the last three years of netting and not over two inches in the five-year sequence. No measurement of turbidity is available.

This ecological stability leads us to believe that the increase in the panfish population is a true manifestation of increased numbers rather than more effective netting conditions.

Some have had serious doubts as to the accuracy of basing opinions of the size of river fish populations on numerical catches in fixed entrapment devices. From a technical standpoint, this operation offered a chance of evaluating the accuracy of the typical short-term netting survey.

Since many species in the Lansing catch had their population altered by removal from the area (either to the hatchery or inland waters), only those species which were caught and subsequently released in the netting area figure in the catch statistics of Table 2.

Table 2. Average Weekly Catch, Per Net Hour, in Trap Nets on the Mississippi River in the Vicinity of Lansing, Iowa, in April, 1955-1959

Species	Year 1955 Week				1956 Week				1957 Week		1958 Week				1959 Week			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th	1st	2nd	1st	2nd	3rd	4th	1st	2nd	3rd	4th
Yellow Perch	2.2	1.5	1.0	.5*	2.3	2.0	1.0	1.3*	1.2	1.8	3.7	4.8	2.7	.9*	4.5	10.7	8.2	3.6*
Bullhead	1.6	2.0	.6	.4*	3.8	1.9	.6	.7*	1.0	.8	1.5	1.8	1.1	.9*	2.7	1.2	.7	.5*
Carp	-	-	-	-	2.2	2.4	2.0	3.6	1.0	1.1	1.9	2.6	2.3	2.0*	12.0	4.0	1.3	.8*
Buffalo	-	-	-	-	1.0	1.2	1.2	2.0	.2	.1	.7	.1	.1	.1*	.2	.1	.1	.1*
Suckers	-	-	-	-	1.2	.8	.4	.5*	.4	.4	1.2	.9	.3	.4*	2.3	1.4	1.2	.1*
Bowfin	-	-	-	-	2.5	1.7	1.2	1.0*	.7	1.2	.3	.4	.7	.8	2.6	1.2	.8	.7*

* Indicates possible wariness and/or avoidance of net.

Disregarding 1957, a short netting year, one can observe that 17 of 20 distinct, 4-week, "species" sequences show what may be construed as evidence of "net avoidance." These sequences, marked with an asterisk in Table 2, generally decrease in weekly catch rates from an initial or early peak. Consequently, population estimates of certain species based on a "catch and release" system may be inordinately high due to the fishes' growing wariness and avoidance of entrapment devices set in the same area for a period of time.

A second, but equally evident, bias in estimating fish populations on this "catch and release" basis in fixed entrapment devices, finds its source in the unknown factors influencing trap-net catches.

Despite several investigational projects on factors affecting trap net catches (Kelly, 1953 and Glovic, MS) no single, or even group, of apparent ecological variables have been definitely determined as the cause of catch fluctuations. Attempts to establish cause and effect relationships between net catches and turbidity; water temperatures; water level; dissolved oxygen; nebulosity; and barometric pressure were unsuccessful. Either the methods of measuring the range of a single variable lacked refinement, or the true motivating force or forces was overlooked.

Referring again to Table 2, and specifically to the 1958 and 1959 catch of yellow perch, some unknown factor caused the second week's catch to almost double that of the first week during both years. The catch then falls off each successive week, indicating a possible growing wariness of the nets. This particular phenomenon is also apparent in the 1958 bullhead and carp catches, indicating that for the above species, at least, conditions for movement into the nets during the second week of the survey were especially propitious but undetected.

These data also indicate there is a point after which additional netting in the same area may be unproductive or wasted effort. This is an important consideration in many fish management projects. In other words, decreasing catches in fixed gear may be simply a case of net avoidance rather than drop or rise in water temperature or water stage, or the many other natural phenomena that are blamed for a reduction in netting success after a period of time. Our data indicate that the first week of any netting period accounts for 36 per cent of the four weeks' catch, with 67 per cent being taken the first two weeks.

Literature Cited

Glovic, Karl L.
MS An Evaluation of Certain Factors Thought to Influence Net Catches of Fish in Eastern Iowa Rivers. 26 pp

Kelly, D. W.
1953 Fluctuations in Trap Net Catches in the Upper Mississippi River. U.S.D.I. Spec. Sci. Report; Fisheries No. 101 37 pp

REPORT ON THE MISSOURI RIVER COMMERCIAL FISHERIES FOR 1959

by
Delmar J. Robinson
Fisheries Biologist

Data on the commercial fishing industry of the Iowa waters of the Missouri River were collected and tabulated in 1959 for the second consecutive year. It is hoped that this information will be of value in determining the significance of the commercial fisheries of the Missouri River, and act as an aid in formulation regulations governing this industry.

Information on the types and amounts of gear licensed for use in 1959 was obtained from the files of the License Section of the Iowa Conservation Commission. Data on the reported catch of fish were obtained from the monthly reports filed by the licensed commercial fishermen.

For the 1959 license year, 220 Iowa residents obtained commercial fishing licenses to fish the Missouri River. This compares quite favorably with 1958 when 210 resident commercial licenses were sold. Six nonresident commercial licenses were issued in 1959, while only four were issued in 1958. No mussel licenses were sold in this area during either year. Twenty-six wholesale fish peddler licenses and fourteen wholesale fish peddler certificates (for employees) were obtained by fish markets or individual fishermen in 1959; this information was not obtained in 1958.

As shown in Table 1, the centrally located Missouri River counties dominated the license sales, with Harrison County having 79 licensed commercial operators, or more than twice the number of any other county. No major change was noted in the number of commercial licenses sold per county in the last two years except Fremont County. This county dropped from third place in 1958 to fifth place in 1959 in numbers of licenses sold. A decline of 27% in the commercial operators in that area was noted.

Table 1. Commercial Fishing License Holders, by County, Missouri River 1958 and 1959.

County	Number of License Holders 1958	1959
Harrison	79	79
Pottawattamie	39	34
Monona	27	25
Woodbury	25	24
Fremont	22	30
Mills	17	11
Page	3	4
Ida	2	2
Audubon	1	0
Boone	1	0
Buena Vista	1	0
Montgomery	1	0
Sioux	1	1
Union	1	0
Total	220	210

Six hundred and seventy pieces of commercial gear were licensed for use in the Missouri River in 1959. This was an increase of 128 items over 1958 when 542 items of gear were licensed (Table 2). The increased use of wooden basket traps accounted for most of the increase in numbers of gear over 1958. Fifty-six baskets were licensed in 1958, while 143 were in use in 1959. Hoop nets are by far the most popular item of commercial gear, with 317 licensed. Trot lines, trammel nets, and the miscellaneous entrapment devices remained approximately the same in number, indicating little change from year to year in the personnel licensing them.

Examination of the catch reports received showed that 22% or 49 of the 220 licensed operators, reported their 1959 commercial catch as required by Iowa law. This is somewhat better than 1958 when only 13% reported their catch. Of the 49 who reported in 1959, 19 did not fish, while the remaining 30 reported a catch. Table 3 shows the breakdown of the catch by species.

Table 2. Licensed Commercial Fishing Gear, by County, Missouri River, 1959 and 1958

Type of Gear	Number Licensed		County													
	1959	1958	Audubon	Boone	Buena Vista	Fremont	Harrison	Ida	Mills	Monona	Montgomery	Page	Pott.	Sioux	Union	Woodbury
Hoop Net	317	286	0	0	0	75	45	2	44	18	0	4	80	0	0	49
Basket Net	143	56	0	0	0	1	104	3	0	5	0	1	21	0	2	6
Trot Line	125	127	1	0	2	20	35	2	12	11	1	0	25	3	4	9
Trammel Net	61	61	0	1	0	8	14	0	4	11	1	0	14	0	0	8
Fyke Net	8	2	0	0	0	0	1	0	0	0	0	0	5	0	0	2
Fiddler Net	7	0	0	0	0	0	0	0	0	2	0	0	0	0	0	5
Dip Net	3	3	0	0	0	0	1	0	0	0	0	0	0	0	0	2
Seine	3	3	0	0	0	0	0	0	2	0	0	0	0	0	0	1
Gill Net	2	3	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Pound Net	1	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Total	670	542	1	1	2	105	200	7	62	47	2	5	145	4	6	83

Table 3. Commercial Fishing Catch by Pounds and Species, Missouri River, 1958 and 1959.

Species	Reported Catch in Pounds 1958	1959
Carp	11,483	10,550
Catfish	4,664	4,695
Buffalo	499	2,458
Sucker and Redhorse	265	449
Sheepshead	190	221
Hackleback Sturgeon	100	130
Paddlefish	18	0
Bullhead	3	92
N. Pike	0	52
Miscellaneous	125	30
Totals	17,347	18,677

Individual commercial fishing operations on the Missouri River are quite small in scope. The largest amount of gear licensed to one man in 1959 was twelve hoop nets, five basket traps, and one trammel net. Ten trot lines were the most that any one man licensed. The largest reported catch from any one man consisted of 2,192 pounds of catfish and 4,240 pounds of carp.

Based on the catch reports received and the amounts of gear licensed to individuals, it is doubtful if there is a single "full-time" fisherman on the entire River.

ED'S TWENTY-THREE YEARS OF FISHING ON SPIRIT LAKE

by
Tom Moen
Fisheries Biologist

Fisheries workers and others interested in the pole and line harvest of sport fish seldom, if ever, have a chance to work with results other than those that depict the average fisherman. We hear about the good fisherman, the expert who never goes home "skunked," and the guide that "knows the lake like the palm of his hand," but records of the actual success of any one of these fishermen over a period of time are indeed rare. Carlander (1954) was able to locate a limited number of accounts of individuals that bothered to record their catch as they fished the Upper Mississippi River. The best of these reports concerned a diary kept by one ardent fisherman covering a period of eighteen trips during the summer of 1878.

It has been my pleasure and good fortune to examine the personal fishing record of Mr. Ed Andreas, a long time resident and guide on Spirit Lake. Mr. Andreas has fished the Dickinson County lakes since the early 1900's, including a number of years fishing for the market.

For many years in his long career as a guide he kept track of the number and species of fish he and his parties caught during the fishing season. Although a number of the note books have been misplaced, he has accurate records that cover the 23 year period from 1937 to 1959. In all but four of these years he noted the catch in monthly totals, and in all but three years he wrote down the date and name of the party or parties for which he acted as guide.

Mr. Andreas' note books made it possible to determine that in this 23 year period he made 2,551 boat trips involving 6,810 fisherman trips during which 53,046 fish were caught at the rate of 7.94 fish per man and an estimated one fish per hour.

Basis of Calculations

Number of fish. This was simply a matter of tabulating the total fish by species for each season or month as they were recorded by Mr. Andreas.

Number of trips. As mentioned above, Mr. Andreas jotted down the names of all fishing parties that he guided during this period except in 1937, 1938, and 1939. For purposes of this paper the total fishing trips involved in each of these years were assumed to be equal to the average calculated for the following twelve year period.

Hours of fishing. This item presented the most difficult problem. Ed considered guiding as you and I consider our jobs. The normal working day started at eight in the morning and ended about 4 or 5 in the afternoon if the limit of fish was not boated prior to that time. He worked longer if his party insisted but at the same time he charged for only a half-day if the limit was taken before noon. With this in mind, each trip was designated as either of eight or four hours duration. Total hours and fish per hour calculations were then based on this assumption. There is little doubt that such an assumption hides period of exceptionally good or poor fishing, but there is good visual correlation between fish per man and fish per hour figures even at monthly intervals.

The Catch

Species composition: During the 23 years covered by this census there were twelve species recorded: yellow perch, crappie, walleye, white bass, bullhead, sheepshead, northern pike, bluegill, largemouth bass, smallmouth bass, rock bass, and channel catfish in that order of abundance.

On Spirit Lake the average fishing party hires a guide with the intention of catching walleyes, then if the walleyes are not cooperating they turn their attention to other species. Several interesting and informative bits of information can be pointed out in regard to walleye fishing over the years. The yearly catch of walleyes fluctuated less than any other species, varying from a low of 142 fish in 1944 to a high of 809 fish in 1953, for an average of 426 walleyes per year and a grand total of 9,852. The 1941, 1945, 1958, and 1959 seasons were also below average in walleye catches, totaling 225, 222, 229, and 250 respectively. But when we compare the number of walleyes caught per man we find the walleye fishing in 1958 was nearly three times as good as it was in 1944 and about equal to fishing 20 years ago (1940) which was recorded by Ed as an average year, as far as total catch was concerned.

Yellow perch and crappies were about equally important as the number one pan fish, each making up about 28 per cent of the grand total for the 23 year period. Crappies appeared to be consistent in the catch over the years, but there was one peak from 1947 through 1950. This correlates with known high populations of crappies in Spirit Lake as determined through other fisheries work. Yellow perch demonstrated little or no pattern with 100 per cent increases or decreases in total catch from one year to the next. Yellow perch catches were consistently below average in each of the last ten years. Late summer and early fall fishing was best for perch fishing; September was the top month except in a few instances.

The white bass catch correlates quite well with the known population trend during the census period. The 1937 catch of white bass indicates a peak at that time with a decline to 1941 followed by an increase that reached a peak in 1945. The extreme low in the white bass catch was reached in 1952 when 232 trips produced only two of these popular fish. A slight, but unimportant, increase has been recorded each year since 1952.

Northern pike were never important in the catch. The best year was 1945 when 56 northerns were taken by Ed and his parties. A recent high in the northern catch was recorded in 1953 when 42 were reported as part of the total catch.

Mr. Andreas was not a bullhead fisherman and his notes seem to indicate that he probably took most of them by accident while trolling with night crawlers. The 1940 season marked the all time high in bullheads when he took 534, nearly one-third of the total catch of bullheads in 23 years.

Yearly totals and fish per man. Ed's yearly catch ranged from 1,070 in 1959 to 4,313 fish in 1939. There is a general trend toward fewer fish in recent years but not a drop of 400 per cent as indicated in the above comparison. Since the advent of the private boats and motors, guiding has not kept pace. Although Ed can be classed as one of the best guides on the lake, the number of trips and the number of men guided has shown a sharp decline (35 per cent) since 1951. Thus a decline in the total number of fish taken in recent years is not representative of poor fishing.

Comparing fish per man over the years presents a more reasonable and accurate picture of the situation. In this category there is a range from 4.77 fish per man in 1955 to 12.46 fish per man in 1939, for an average of 7.94. There were several years when the fish per man catch was below average even though the total catch was twice that of an apparently poor year in recent times. For example, in 1957 Ed and his parties caught 6.23 fish per man and a total of 1,289 fish; in 1945 they caught 2,600 fish at the rate of 6.55 fish per man.

There is one more point that should be made in defense of poorer fishing in recent years as indicated by Ed's record. During the period of 1937 to the late 1940's white bass and yellow perch accounted for a consistently high percentage of the catch. In recent years white bass have composed less than five per cent of the catch each year while in the 1940's this species alone often made up 25 to 40 per cent of the yearly totals. Perch have not dropped to the extreme lows experienced by the white bass, but as mentioned earlier they leveled off at about one perch per man from highs of 2.5 perch per man in the 1940's.

Fish per hour. Although this expression of the rate of catch was calculated for each year it is essentially an estimate and a generalized figure that has relatively little value for comparative purposes.

Literature Cited

Carlander, Harriet Bell,
1954 History of Fish and Fishing in the Upper Mississippi River. Upper Mississippi River Conservation Committee, 96 pp

PHEASANT CROWING COUNT AND HEN INDEX
SPRING, 1960

by
Richard C. Nomsen
Game Biologist

The annual spring pheasant crowing count was taken by conservation officers during the month of May. Results of this survey indicated changes in the spring breeding population and pheasant distribution.

Special routes were checked by biologists to determine the seasonal peak of crowing activity. This peak occurred during the last week of April. At that time, officers were notified to begin counts and were requested to complete them as soon as weather conditions permitted.

A total of 152 routes was completed with officers recording 31,198 calls at 2,994 stops (Table 1). Although crowing intensity decreased eleven per cent, the state average of 10.4 calls per stop was slightly above the previous five-year average. These results indicated an adequate population of cocks in all areas of the pheasant range.

The statewide hen index indicated that the 1960 population of hens was fourteen per cent lower than the record high population in 1959, but was above the previous five-year average (Table 2). The spring hen index was determined by multiplying the observed sex ratio from winter counts by the average number of calls heard per stop. Therefore, the spring breeding population was somewhat lower than the record 1959 spring population, but was slightly above the average for the years 1955-1959.

Major changes in spring populations occurred within the various agricultural districts (Table 3). The most noticeable change was recorded in northeast Iowa where reproduction counts were lowest in 1959. The spring hen index decreased 44 per cent in this part of Iowa's primary pheasant range due to the low production last year. The hen index also decreased in north central Iowa, but the highest population was again recorded in this district.

Spring populations were good in the two primary western districts. The hen index increased seven per cent in the northwest Iowa, and indicated a five per cent loss in the west central area. The 1959 production of young was best in these two districts and, as a result, spring populations remained stable this year.

Results of counts taken in the other central and southern districts indicated decreases except in south central Iowa. Most of this area was subjected to severe winter storms and deep snow. An unknown number of birds was killed during these blizzards as they roosted in inadequate winter cover. Reproduction during 1959 was also below normal in some areas which, in part, accounted for the lower spring populations.

Table 1. District Results of the 1960 Crowing Count and Hen Index

District	Number of Calls Heard	Number of Stops	Average Number of Calls per Stop	Sex Ratio	Spring Hen Index
1. Northwest	8,827	400	22.1	2.9	64.1
2. North central	8,546	334	25.6	2.6	66.6
3. Northeast	3,541	302	11.7	3.6	42.1
4. West central	3,668	312	11.8	3.1	36.6
5. Central	2,901	358	8.1	2.8	22.7
6. East central	1,671	274	6.1	3.3	20.1
7. Southwest	969	340	2.9	2.8	8.1
8. South central	903	360	2.5	3.3	8.2
9. Southeast	172	314	0.5	2.0	1.0
State	31,198	2,994	10.4	3.0	31.2

Table 2. Statewide Results of the Crowing Count and Hen Index

Year	Average Number of Calls per Stop	Sex Ratio Hens per Cock	Spring Hen Index
1955	8.5	3.6	30.6
1956	8.4	3.3	27.7
1957	7.9	3.3	26.1
1958	12.1	2.3	27.8
1959	11.7	3.1	36.3
1960	10.4	3.0	31.2

Table 3. Comparison of Crowing Count Results and Spring Hen Index 1958 - 1960

Districts	Year	Average Number of Calls Heard	Spring Hen Index
1. Northwest	1958	22.9	48.1
	1959	24.0	60.0
	1960	22.1	64.1
2. North central	1958	32.2	64.4
	1959	30.7	92.1
	1960	25.6	66.6
3. Northeast	1958	24.3	58.3
	1959	15.3	75.0
	1960	11.7	42.1
4. West central	1958	10.1	20.2
	1959	12.9	38.7
	1960	11.8	36.6
5. Central	1958	9.2	28.5
	1959	9.0	27.0
	1960	8.1	22.7
6. East central	1958	8.2	25.4
	1959	8.6	28.4
	1960	6.1	20.1
7. Southwest	1958	3.5	10.9
	1959	2.6	10.9
	1960	2.9	8.1
8. South central	1958	3.0	4.2
	1959	2.0	6.0
	1960	2.5	8.2
9. Southeast	1958	0.5	1.4
	1959	0.8	1.6
	1960	0.5	1.0

WINTER COUNT OF IOWA QUAIL

by
M. E. Stempel
Game Biologist

The annual count of Iowa quail that survived the winter was taken by conservation officers in February and March, 1960. Biologists made additional counts.

This is one of several counts taken each of the four seasons of the year. These counts are founded on: (1) spring observations of pairing by quail; (2) summer calling by cocks; (3) fall take by hunters; and (4) winter survival in southern, western and eastern Iowa. Each count is influenced by seasonal changes, however, each yields useful information.

An unusual weather pattern will influence the results of a census. The 1959-1960 count of quail is an example of this. The work was done after a prolonged period of snow cover, and more snow fell after the field work was completed. Futhermore, the fields were too muddy to permit enough walking to get a large amount of good information. Finally, the covey breakup took place before the ground was dry enough to permit making extensive checks with bird dogs. Usually there is little extremely unfavorable weather after the census period.

Winter counts indicate the brood stock present. When the spring and summer weather favor production, the fall population of mature and young birds can be predicted from the gains or losses found in the wintering quail. This early information is needed since hunting regulations are made in August. Usually the extremely unfavorable cold weather and the deep snow are gone by late February. However, in 1960, the winter became even more harsh following the count; this adverse weather may further reduce the number of breeding quail. For this reason it is desirable to regard the winter census as one part of the perpetual inventory.

Investigations on the effects of winter on quail have been carried out by many workers. Errington (1934) wrote that egress and starvation were two causes of winter loss in quail coveys. Green and Beed (1936) found that winter loss was due to a combination of unfavorable weather, hunger and cold. Mangold (1951) believed that to an extent a 33.8 per cent loss in the number of quail was due to a food crisis.

Effects of winter have always been considered when calculating survival. Each year since 1949, Iowa has had some form of planned, coordinated winter census of quail surviving the winter.

There is no doubt that there are always some areas in which quail suffer unusual losses. Since our counts are confined to selected areas, some localized losses are not indicated by the winter count.

METHODS

On February 14, 1960, letters were mailed to officers in 39 counties in the Iowa quail range. Instructions for making the count were included, and there were data sheets for recording results of quail counts in selected counties. The counts were to be made in likely range along one mile of cover edge adjoining grain fields. Three such areas were to be checked in the counties previously chosen. These areas were to be in the northern, central, and southern part of each county. The snow condition was to be recorded along with the number of quail flushed or tracked, number of roosts seen, and amount of time used. In a few cases an officer was asked to check two counties. The counts were to be completed by March 15.

RESULTS

Statewide

The earliest count was made February 16, the latest was March 26. There was some snow throughout the state during the period when the count was in progress. In a few areas checked in northern Iowa there was no snow on the day the count was made. From Allamakee county two inches of snow was reported. There was six inches in Lee county, 16 in Fremont and many conservation officers described the snow condition as "deep" or "heavy" in their respective territories. Temperatures were cold.

During the census, 105 areas were checked for quail and for signs of quail. A total of 404 quail were seen and 439 were tracked. There were 49 roosts and 59 potential quail covey ranges occupied. The job required 58 man-hours in the field.

I made many trips on skis to check and recheck conditions. One officer also used skis.

Weakened quail were reported to the officer in Osceola, but he did not see the quail. In Greene county, the officer reported seeing where one quail had been eaten by a fox. In one range in Carroll county and one in Fremont county, the snow was too deep to walk in the fields and the checks could not be made.

Agricultural Districts and Border Counties

The results of the 1959 and 1960 winter quail counts by district, as well as by region of low quail population are given in Table 1.

THE RETURN OF THE REDHEADS (AYTHYA AMERICANA) TO IOWA AS SUMMER RESIDENTS IN 1960

by
James G. Sieh
Game Biologist

In 1960, Redheads returned to Iowa as common summer residents following the normal ecological sequence (dry to wet) in their ancestral marsh habitats. These diving ducks have been absent during the nesting season from Iowa's sloughs and marshes for almost a decade. A small residual population of redheads prevailed during the early fifties, but disappeared following the period of high water from 1951-1953. Around our marshes the peripheral stands of emergent vegetation formerly used by the redheads as nesting cover dwindled, and many dense stands out in the marshes disappeared during this period of "open water". Classic examples of this open water period included Dan Greene Slough in Clay County and West Swan Lake in Emmet County. Following the very wet years of the early fifties, which eliminated many dense stands of emergent aquatics, a steady decline in water levels continued until many marshes, sloughs, and shallow lakes were dry during all or part of the late-fifties. Under these drought conditions, nesting redheads in Iowa became only a memory during the middle and late-fifties.

The influx of redheads utilizing optimum habitats in Iowa in 1960 illustrates how rapidly a resident redhead population will re-establish itself if conditions are suitable and seed stock is available. The redhead is a species which seeks out suitable habitat and shifts its summer residence over great distances from year to year to find desirable locations. This does not infer that the species does not tend to return to the vicinity of its natal marsh, but it does indicate a preference for recently flooded dry or semi-dry areas with suitable stands of vegetation.

The influx of redheads, canvasback (Aythya valisineria), and ruddy duck (Oxyura Jamaicensis)into Iowa in 1960 following the inundation of dry sloughs again illustrates the often ignored, but very important concept of "Dispersion" (Table 1).

Table 1. Diving Ducks Observed or Reported in Iowa During the Summer of 1960.

Area	Date	Species Observed Or Reported
Dewey's Pasture Clay County	6-10-60	6 male redheads
Opedahl Area Palo Alto County	6-10-60	3 male redheads
McClelland Slough Dickinson County	6-12-60	3 male redheads (Reported by Frank Nelson)
Slough (East Side) Silver Lake-Palo Alto County	6-16-60	14 Redheads (Reported by Seth Shepard)
Diamond Lake Dickinson County	6-20-60	1 pair redheads
West Swan Lake Emmet County	6-21-60	1 pair ruddy ducks
Horseshoe Lake Dickinson County	6-27-60	1 female canvasback
Ingham Lake Emmet County	6-28-60	4 male redheads 6 ruddy ducks (Reported by Seth Shepard)
Eagle Lake [1] Hancock County	7-27-60	1 female redhead with 7 young. 1 female redhead with 4 young. 2 ruddies with 9 young. 1 ruddie with 4 young.
High Lake [2] Emmet County	8-18-60	1 female canvasback with 7 young. 1 female canvasback with 8 young. 1 brood of 4 young canvasback without an adult. 1 brood of 3 young can- vasback without an adult.

[1] Unit Manager Guy Krall reported many broods of ruddies on Eagle Lake and one brood of canvasback on Rice Lake in Worth-Winnebago Counties.

[2] Area Game Manager Harold Johnson reported several redhead broods on the Ingham-High Lakes areas in Emmet County.

Dispersion occurs during major droughts or the elimination of local habitats. This "Dispersion concept" was aptly demonstrated during the invasion of nesting waterfowl into Iowa and the Dakotas in the spring of 1936 following the heavy run-off and subsequent inundation of shallow lakes, dry sloughs and potholes following a major drought period.

Under conditions of duress, a waterfowl population or a species forced out of a suitable area by the elimination of wetlands due to major drought tends to disperse beyond local or flyway boundaries in search of suitable habitat. This "Dispersion" can result in a wholesale re-distribution of a species within or between flyways and may temporarily nullify the Biological flyway concept. It was questionable waterfowl management to ignore this principle when duck populations were declining due to major drought in the North American Prairies. It was likewise questionable to permit variable bag limits between neighboring flyways while this dispersion was imminent or in progress. Under conditions of an increasing or stable population there is no biological objection to variations in bag limits between flyways.

ANALYSIS OF DATA OBTAINED FROM DEER CHECKING STATIONS, 1959

by
Eldie W. Mustard
Game Biologist

INTRODUCTION

Iowa's seventh deer season was statewide in scope and was held December 12 and 13, 1959, with regulations unchanged from those of the previous year. As in past seasons, hunters were permitted to harvest deer of either sex and any age.

Permanent check stations were operated during the deer season at two locations: Lansing, in Allamakee County, and Cherokee in Cherokee County. Personnel at these stations also manned vehicles equipped to weigh deer in the field. Roving field checkers were headquartered in 13 additional locations throughout the state: Council Bluffs, Marengo, Osceola, Sioux City, Ruthven, Boone, Guthrie Center, Decorah, Forest City, Waverly, Monticello, Mount Pleasant, and Davenport. These checkers gathered biological information from deer found in locker plants and from deer they located in the field.

The following data were collected from deer checked during the 1959 season: age, sex, weight, location of kill, number of antler points, beam diameter, and length of the hindfoot. In addition, deer reproductive tracts, stomach samples, and blood samples were taken whenever possible.

I wish to take this opportunity to thank those who manned the permanent check stations and those who served as roving field checkers. I also wish to acknowledge the excellent cooperation extended by the Conservation Officers in aiding the field checkers to locate deer; without their assistance many deer would never have been checked.

RESULTS

Complete or partial data were obtained from 532 of the 2,731 deer killed during the 1959 deer season. This was the greatest number of deer checked since the advent of Iowa's deer seasons, and it is believed to be an adequate sample of the Iowa deer herd, at least for age and sex ratio data.

For comparative purposes, the state is divided into four regions (Figure 1). These regions are based on ecological differences as suggested by Kline (1958).

SEX RATIOS

Females comprised 43.0 percent of all deer checked, with a sex ratio for all deer of 132 males: 100 females. For the years 1953-1958, the percent of females in deer checked was 46.0, 42.0, 47.6, 45.9, 46.9, and 47.1, respectively. The observed sex ratio in the fawn class was 133 males; 100 females, essentially the same as that for all deer.

AGE RATIOS

Table 1 indicates that 38.3 percent of the deer checked in 1959 were fawns, for an indicated fawn; adult ratio of 62.3; 100. This means that over 62 fawns were produced for each 100 adult deer in the breeding population, and that 1.52 fawns were produced for each adult doe 1.5 years of age or older.

It is significant that this figure, which in itself indicates excellent reproduction, was obtained at a time when much of the fawn mortality due to natural causes should have already occurred. It is common knowledge that the young of most wildlife species suffer tremendous losses early inlife, and the Iowa deer are probably no exception. It is, therefore, felt that the indicated reproductive rate is a minimum figure which in actuality is much greater.

As shown in Table 1, 92.5 percent of the deer aged were 3.5 years of age or younger, with 85 percent 2.5 years or younger. Deer 1.5 years old or younger comprised over 67 percent of the deer checked, which indicates that Iowa hunters are apparently not overharvesting on a statewide basis.

Two deer 8.5 years or older were checked from Region I in 1959. Kline (1958) stated that only two deer older than 7.5 years had been checked previously.

WEIGHTS

Weights were obtained for 158 of the 532 deer checked during the 1959 season. The majority of these were "hog dressed", i.e., the body cavity was completely empty; however, a few were "field dressed", i.e., the heart, liver, and/or lungs were left in the body cavity. (Terminology after Mosby and Cowan, 1960.)

The average calculated liveweights by sex, age class, and region of all deer weighed in 1959 are given in Table 2. Liveweights were calculated from hog dressed weights using the formula suggested by Hornaday (1935). Corrections for heart, liver, and/or lungs left in the body cavity were made in accordance with Park and Day (1942).

The average calculated liveweight for all deer in 1959 was the heaviest in the seven years these data have been taken, 142.7 pounds. Average weights for the years 1953-1958 were as follows: 130.4, 131.6, 140.0, 139.2, 136.1, and 136.6 pounds.

Regionally, the average calculated weight for all deer was as follows: Region I, 144.6; Region II, 150.8; Region III, 134.1; and Region IV, 142.8 pounds.

The average liveweight for all male deer in 1959 was 151.4, and for all females, 124.8 pounds. Male fawns averaged 101.0 pounds compared to 102.9 pounds in 1958, while female fawns averaged 89.3 pounds in 1959 compared to 94.0 pounds in 1958.

In the near future it is hoped that time can be spared to analyze much of the above data statistically so that more valid conclusions concerning weights can be made. One step toward this goal has been achieved; the data on each deer checked since 1953 have been placed on McBee Keysort cards to facilitate statistical analysis, and many of the cards have been keyed, or punched. Only through statistical analysis will we be able to determine if deer weights are truly different among the regions and years, or if these apparent differences show up only because of variation due to an inadequate sample size.

POINTS PER ANTLER

As shown in Table 3, 1.5 year old bucks averaged 3.35 points per antler in 1959, which is greater than the 3.00 average found in 1958. One and one-half year olds from Region I averaged 0.64 fewer points per antler than the statewide average for all deer in this age class. Two and one-half year old deer averaged 4.38 points per antler, and again this average was greater than that of the preceeding year, when it was 3.86 points per antler in this age group.

Region I bucks, when all age classes are considered, had fewer points than deer from other regions, averaging 3.62 points per antler compared with the state average of 3.94 points per antler (Table 3).

BEAM DIAMETER

Beam diameter measurements were obtained from 289 antlers and averaged 1.10 inches for all deer. Deer from Region I had the smallest average size, 1.03 inches, while Region IV bucks had the largest with 1.17 (Table 4). The statewide average for this measurement of all 1.5 year old deer in 1959 was 0.90 inches compared with the 1958 average of 0.98 inches.

HINDFOOT MEASUREMENTS

Following a technique described by Park and Day (1942), measurements of one hindfoot were made on a number of the deer checked. Olson (1938), and Park and Day (1942), indicated that deer continue to grow until about five years of age. Thus, it is thought that hindfoot measurements may someday serve as a check on the ageing technique used in Iowa, which is based on dental characteristics after Severinghaus (1949). Our data, however, must first be statistically analyzed and the confidence intervals calculated for each age class before this is possible.

Hindfoot measurements have been taken in Iowa for three seasons, 1957-1959. The data tend to support the contention of earlier workers that certain long bones continue to develop, and that growth continues, for several years in the whitetail deer. Our data on deer over 1.5 years old are very sparse; however, statistical analysis of several years of grouped data may be quite revealing, even though the sample size for a specific year is relatively small. Much, of course, depends on variation, both among the deer of a given age class, and among the individuals taking the measurements.

The progressive lengthening of the hindfoot with age is shown on a statewide basis in Table 5. On a regional basis the sample size, in most instances was too small, especially for deer older than 1.5 years, to clearly show the relationship between age and growth of the hindfoot.

SUMMARY

1. Iowa's 1959 deer season was of the any-deer type and was held statewide, December 12 and 13.

2. Technicians, located at Lansing and Cherokee, and roving field checkers in 13 locations throughout the state, collected biological data from 532 of the deer harvested.

3. To facilitate comparison, much of the data were analyzed on a regional basis in which the state was divided into four regions based on ecological differences.

4. Forty-three percent of all deer checked were females, and a sex ratio of 132 males; 100 females was observed. A predominance of males in the Iowa herd has been noted since the first open season was held in 1953, so this is not a typical situation. A sex ratio of 133 males; 100 females was found in the fawn class.

5. The data showed that 38.3 percent of deer checked were fawns. This gave a fawn; adult ratio of 62.3; 100. Adult does produced an average of 1.52 fawns, and this is thought to be a minimum reproduction figure.

6. The calculated liveweight for all deer checked was 142.7 pounds, and this is the heaviest average weight noted in seven years of deer checking in Iowa. Regionally, deer from Region III were lightest and those from Region II heaviest.

7. The number of points per antler, a condition factor, was generally greater in 1959 than in 1958. Region I deer had fewer points, with a 3.62 average, than did deer from other regions.

8. Deer from Region I had a smaller beam diameter, 1.03 average, than did deer from other regions.

9. Sample sizes for the hindfoot measurement were too small to be conclusive regionally, however, a progressive increase in length was noted on a statewide basis through the 3.5 year age class. Statistical analysis of these data are needed to adequately describe the relationship between hindfoot length and age.

LITERATURE CITED

Hornaday, W.T. 1935, American Natural History. Charles Scribner's Sons, New York, 16th ed., revised. 449pp.

Kline, P.D. 1958. A report of the 1958 deer season based on data from checking stations. Iowa Conservation Commission, Quarterly Biology Reports X (4); 19-26.

Mosby, H.S. and I Mt. Cowan. 1960. Preserving biological materials in: Manual of Game Investigational Techniques. 8:1-8:14 p. Edwards Brothers, Inc. Ann Arbor, and the Wildlife Society.

Olson, H.F. 1938. Deer tagging and population studies in Minnesota. Trans. N. Amer. Wildlife Conf. 3:280-286.

Park, B.C. and B.B. Day. 1942. A simplified method for determining the condition of white-tailed deer in relation to available forage. U.S.D.A., Tech. Bul. 840. 60pp.

Severinghaus, C.W. 1949. Tooth development and wear as criteria of age in white-tailed deer. J. Wildl. Mgt. 13(2):195-216.

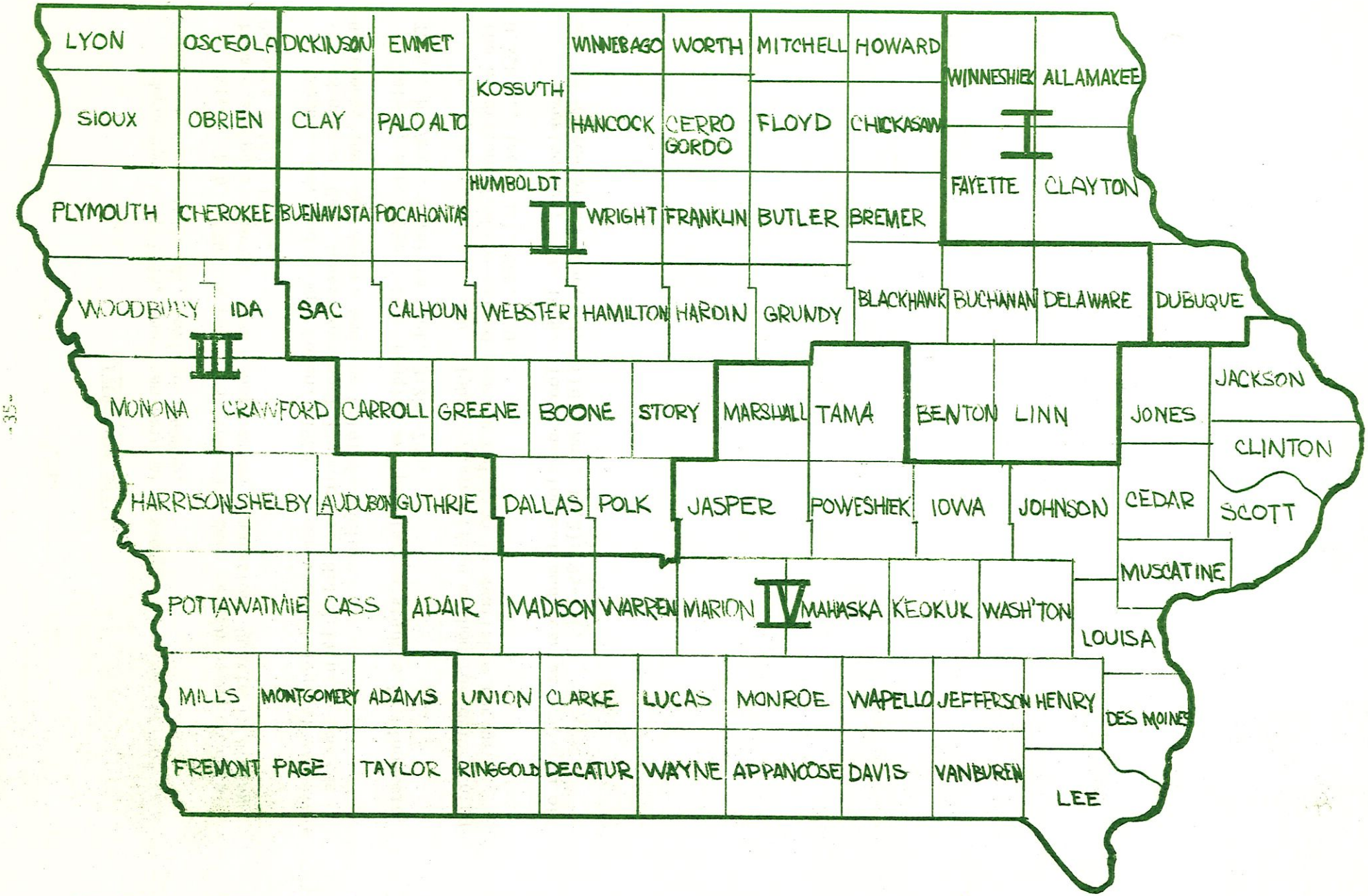


FIGURE 1. PRIMARY DEER REGIONS OF IOWA, AFTER KLINE (1958)

Table 1. NUMBER, SEX AND AGE COMPOSITION OF DEER CHECKED, IOWA, 1959

Age Class	Sex	Region					Statewide			
		I	II	III	IV	Unknown	Total by sex	Total	Percent of sample	Cumulative
Fawn	M	18	28	46	21	-	113	198	38.3	38.3
	F	16	21	29	18	1	185			
1.5	M	19	20	34	16	1	90	149	28.9	67.2
	F	13	14	18	14	-	59			
2.5	M	12	12	19	9	1	53	92	17.8	85.0
	F	2	7	15	14	1	39			
3.5	M	4	7	7	6	-	24	39	7.5	92.5
	F	2	7	2	4	-	15			
4.5	M	1	3	1	3	-	8	17	3.3	95.8
	F	2	1	4	2	-	9			
5.5	M	1	1	1	-	-	3	4	0.8	96.6
	F	1	-	-	-	-	1			
6.5	M	-	-	-	-	-	-	1	0.2	96.8
	F	-	-	-	-	1	1			
7.5	M	-	-	-	-	-	-	0	0.0	96.8
	F	-	-	-	-	-	-			
Over 7.5	M	1	-	-	-	-	1	2	0.4	97.2
	F	1	-	-	-	-	1			
Unknown Adults	M	1	-	3	5	1	10	14	2.7	99.9
	F	1	-	-	3	-	4			
Unknown	M	-	-	-	1	-	1	16	---	---
	F	-	1	2	11	1	15			
Sub-Total	M	57	71	111	61	3	303	--	---	---
	F	38	51	70	66	4	229			
Total		95	122	181	127	7	532	532	99.9	---

Table 2. CALCULATED LIVEWEIGHTS OF DEER CHECKED, BY AGE, SEX, REGION, AND FOR STATE, IOWA, 1959

Age Class	Sex	Region I	Region II	Region III	Region IV	Statewide Average	Statewide Sample size
Fawn	M	103.4 (10)	102.4 (9)	99.7 (20)	97.7 (4)	101.0	43
	F	90.4 (9)	80.1 (2)	93.0 (6)	84.8 (3)	89.3	20
1.5	M	153.6 (13)	167.9 (2)	154.5 (11)	166.6 (2)	155.9	28
	F	139.5 (10)	138.6 (2)	152.6 (4)	178.1 (1)	144.8	17
2.5	M	198.8 (6)	212.4 (5)	191.7 (7)	---------	201.1	18
	F	137.4 (1)	133.6 (2)	150.4 (5)	173.0 (1)	147.7	9
3.5	M	222.6 (3)	193.3 (2)	264.6 (1)	209.9 (1)	218.4	7
	F	162.9 (1)	153.9 (1)	----------	---------	158.4	2
4.5	M	232.8 (1)	254.4 (3)	----------	210.0 (1)	240.9	5
	F	157.1 (1)	---------	150.0 (1)	---------	154.8	3
5.5	M	226.4 (1)	---------	----------	---------	226.4	1
	F	----------	---------	----------	---------	-----	--
over 8.5	M	216.2 (1)	---------	----------	---------	216.2	1
	F	----------	---------	----------	---------	-----	--

1/ Calculated liveweight equals 1.272 X hog dressed weight (Hornaday, 1935).
2/ Number in parentheses ( ) indicates sample size.

Table 3. AVERAGE NUMBER OF POINTS PER ANTLER BY AGE, REGION, AND FOR STATE, IOWA, 1959

Age Class	Region I	Region II	Region III	Region IV	Unknown	Statewide Mean	Statewide Sample Size
1.5	2.71(28)	3.48(24)	3.34(58)	3.61(20)	3.50(2)	3.35	132
2.5	4.37(19)	4.38(18)	4.37(30)	4.55(11)	3.50(2)	4.38	80
3.5	4.66(6)	4.75(12)	4.22(14)	4.00(8)	-------	4.40	40
4.5	4.00(2)	4.00(4)	4.50(2)	5.50(4)	-------	4.58	12
5.5	4.50(2)	5.00(2)	5.00(2)	--------	-------	4.84	6
over 5.5	4.50(2)	--------	--------	--------	-------	4.50	2
Adult	3.00(1)	--------	3.42(5)	5.20(9)	4.00(2)	4.43	17
Mean	3.62(60)	4.10(60)	3.86(111)	4.28(52)	3.67(6)	3.94	289

1/ Number in parenthesis ( ) indicates sample size.

Table 4. AVERAGE BEAM DIAMETER MEASUREMENTS BY AGE, REGION, AND FOR STATE, IOWA, 1959

Age Class	Region				Statewide		
	I	II	III	IV	Unknown	Mean	Sample Size
1.5	0.81(28)	0.94(28)	0.92(58)	0.91(14)	0.84(2)	0.90	130
2.5	1.14(18)	1.23(20)	1.19(30)	1.22(12)	1.33(2)	1.20	82
3.5	1.38(6)	1.38(14)	1.44(14)	1.43(8)	-------	1.41	42
4.5	1.34(2)	1.01(4)	1.82(2)	1.74(2)	-------	1.48	10
5.5	2.28(2)	1.37(2)	1.73(2)	--------	-------	1.46	6
Over 5.5	1.28(2)	--------	--------	--------	-------	1.28	2
Adult	1.03(2)	--------	1.05(6)	1.15(7)	1.25(2)	1.11	17
Mean	1.03(60)	1.15(68)	1.09(112)	1.17(43)	1.14(6)	1.10	289

1/ Number in parenthesis ( ) indicates sample size.

Table 5. AVERAGE HINDFOOT MEASUREMENTS BY SEX, AGE, REGION, AND STATE, IOWA, 1959

Age Class	Sex	Region			Statewide Mean		
		I	II	III	IV	By Age and Sex	By Age
Fawn	M	18.0(10)	18.2(6)	18.4(13)	17.6(2)	18.2(31)	
	F	17.1(9)	16.3(4)	18.2(5)	17.9(1)	17.3(19)	17.8(50)
1.5	M	20.0(12)	20.0(8)	19.7(6)	-------	19.9(26)	
	F	18.9(9)	19.7(3)	18.8(3)	-------	19.0(15)	19.4(41)
2.5	M	20.0(6)	20.6(4)	21.4(2)	-------	20.4(12)	
	F	18.9(1)	--------	19.7(4)	19.0(1)	19.4(6)	20.0(18)
3.5	M	21.6(2)	20.1(1)	--------	21.1(1)	21.1(4)	
	F	18.6(2)	19.8(1)	--------	19.5(1)	19.2(4)	20.2(8)
4.5	M	20.2(1)	-------	--------	-------	20.2(1)	
	F	19.6(2)	-------	17.5(2)	-------	18.5(4)	19.4(5)
5.5 & Over	M	20.5(2)	-------	--------	-------	20.5(2)	
	F	--------	-------	--------	-------	--------	20.5(2)

1/ Number in parenthesis ( ) indicates sample size.