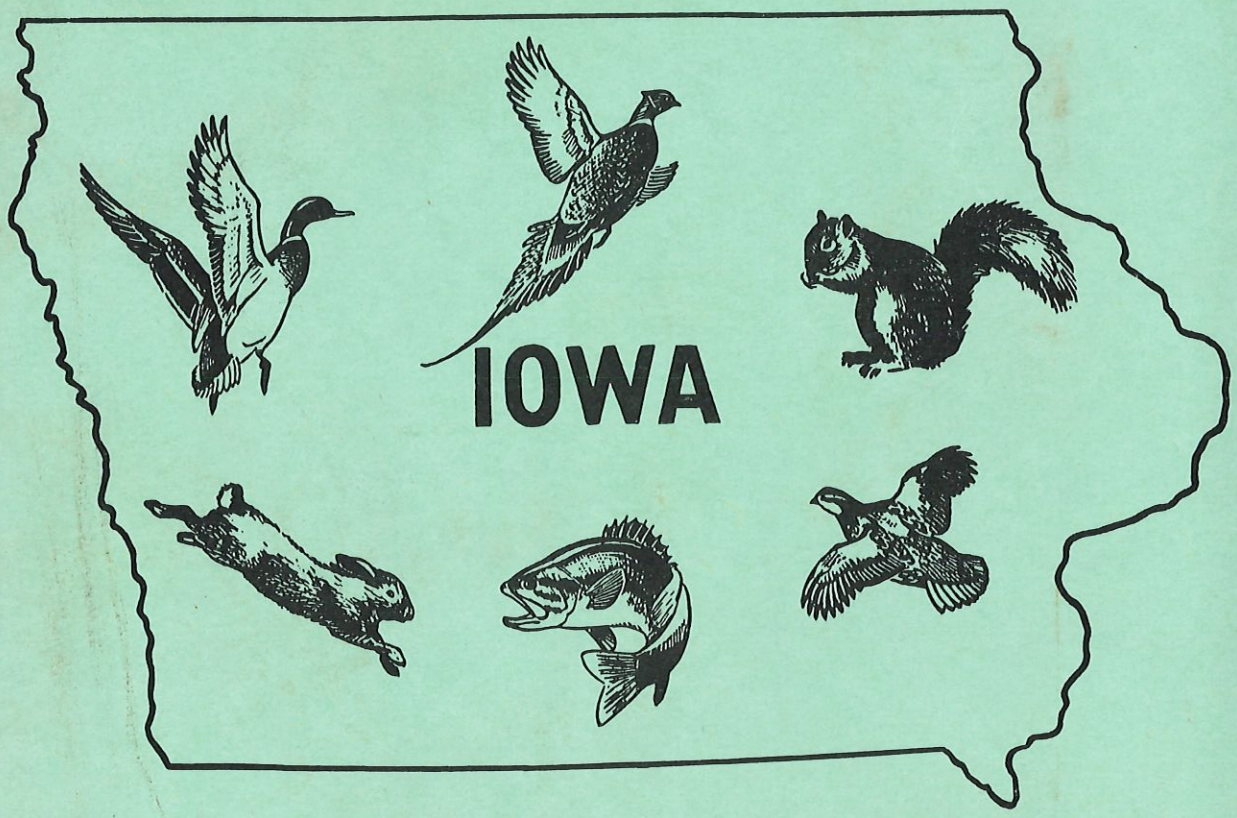
1960

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

TABLE OF CONTENTS

ABSTRACTS OF QUARTERLY BIOLOGY REPORTS

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THE INCREASED GROWTH OF BLUEGILLS IN A SMALL ARTIFICIAL LAKE FOLLOWING THREE YEARS SUCCESSIVE REDUCTION IN THE POPULATION DENSITY

by
Jim Mayhew
Fisheries Biologist

Williamson Pond, a 27 acre state-owned recreational lake in Lucas County was used for an experimental fish management area from 1957 to 1959. The purpose of this project was to improve growth, physical condition, and angling success in a stunted bluegill population by manipulation of the population. The population density was reduced in three successive years by mechanical and chemical means in an effort to accomplish these purposes.

Prior to the reduction of population density the adult bluegill population was estimated at 58,594 fish. Lowering the water level by approximately five feet reduced this population by 48 percent. The following summer the population was reduced an additional 32 percent by rotenone treatment of two small bays. In 1959 the population was reduced an additional five percent by rotenone treatment of isolated spawning beds. Total reduction over the three-year period was approximately 64 percent.

Growth increments before the first chemical treatment were extremely slow, averaging 2.9, 1.3, and 0.8 inches for the first three years of life. Within four months following the first rotenone treatment in 1958 the growth increment increased to 1.8 inches. Further reduction of the population density in 1959 failed to increase growth significantly.

SURVIVAL OF STOCKED SMALLMOUTH BASS IN IOWA NATURAL LAKES

by
Tom Moen
Fisheries Biologist

Stocking records indicate that smallmouth bass have been stocked in only five of the natural lakes of Iowa in the past 30 years. This species is native to the lakes draining into the streams of the Mississippi River but not in those draining into the Missouri River. The smallmouth bass in Spirit Lake and West Okoboji Lake were established by a planting of about 1,000 fingerling in each of the lakes in 1934. Data is presented for each lake concerning the number and size of the bass stocked, numbers taken by survey sein hauls, and by anglers. Aside from the fact that the species was established by stocking in two instances, there appears to be little or no correlation between stocking and an increased population or an increase in the creel, unless heavy plantings are made in several consecutive years.

CREEL CENSUS OF THE DES MOINES, BOONE, NORTH RACCOON AND SKUNK RIVERS, 1960.

by
Harry M. Harrison
Fisheries Biologist

A creel census was conducted on the Des Moines, Boone, Raccoon, and Skunk rivers in 1960. The method involved conservation officers interviewing anglers engaged in fishing. The information gathered included kind and number of fish caught, and the number of hours the angler had fished. This information is tabulated to show the number of contacts made, the total number of hours fished, the number and kind of fish caught and the number of fish caught per hour. Channel catfish were the most abundant species taken. These were followed in order by carp, bullhead and sheephead. Smallmouth bass, walleye, bluegill, crappie and suckers were also present in the creel, but in small numbers.

MISSOURI RIVER CREEL CENSUS - 1960

by
Delmar Robinson
Fisheries Biologist

Six hundred fishermen, who had fished a total of 1,417 hours, were contacted during a "spot check" creel census conducted on the Missouri River in Iowa during 1960. These fishermen had caught 1,042 fish at a rate of 0.74 fish per hour.

Fishermen in the main river caught fish at a rate of 0.58 fish per hour and expressed little interest in the scaly "game" fish, preferring catfish, carp, and sturgeon.

Fishermen in Decature Lake, an ox-bow lake of the Missouri River caught fish at a rate of 1.13 fish per hour and expressed considerable interest in fishing for sauger, crappie and bass.

COMPARISON OF PHEASANT REPRODUCTION INDICES IN IOWA COUNTIES

by
Eugene D. Klonglan
Game Biologist

The last 7 years of August roadside pheasant counts were analyzed for indices to reproductive success, with three county groupings--northern, central and southern--and three subdivisions within these groups--counties with low, medium and high pheasant populations being used. Counties with low pheasant populations had below average indices of percent of hens successful in raising broods, percent juvenile birds in the population, young-per-hen, and young-per-adult. The percent of young birds in the population was lowest in northern Iowa, indicating that the birds are grossly underharvested in this area. Lower than average indices to reproductive success observed in counties with low pheasant populations, particularly in southern Iowa, indicates the existence of some depressant factor, or factors, which is not simply an expression of a lower carrying capacity as ordinarily expressed in terms of cover, food, etc. Observed sex ratio indices showed that hunting had not unbalanced the ratio in counties with low populations, and there was no biological reason for having shorter seasons in these counties.

A RECORD OF WATERFOWL MIGRATION THROUGH IOWA DURING THE FALL OF 1960.

by
James G. Sieh
Game Biologist

Waterfowl migration into and through Iowa during the fall of 1960 included a number of small flights of ducks. Flights were observed and reported from several locations on October 18-19, October 28, November 4-5, and on November 8-9. A forecast of the "Grand Passage" was not released to departmental personnel because flights of ducks preceding the semi-severe weather of November 8-9, reduced the probability of a spectacular mass fall migration into Iowa on November 8-9. The exodus of most remaining ducks from northern Iowa occurred during the November 28th blizzard. A late freeze up flight of mallards was reported on December 13, and several other mallard movements were reported along the Missouri River, probably originating from the large concentrations of mallards on the upstream reservoirs in the Dakotas.

ANALYSIS OF SQUIRREL HUNTING REPORTS FROM HUNTERS FOR 1957 THROUGH 1959 SEASONS

by
Paul D. Kline
Game Biologist

Squirrel hunting success in Iowa varied from 0.69 squirrels bagged per hour of hunting in 1959 to 0.77 in 1957, and 0.82 in 1958 as reported by hunter cooperators. The Missouri loess area provided better than average hunting each of the three seasons. In 1959, when hunting was comparatively poor, production of squirrels was low, especially in the driftless area of northeast Iowa. Leg bone analysis of 391 fox squirrels in 1957 gave 56.0 percent juveniles. Of 33 grays examined, 57.6 percent were juveniles. In 1958, 1,015 fox squirrels were aged; 51.6 percent of which were juveniles. Of 251 grays, 52.6 percent were juveniles. In 1959, 50.1 percent of 1,053 fox squirrels were juveniles. Only 48.4 percent of 157 grays were young-of-the-year. Average male population over a 10-year period is 54.2 and 53.1 percent respectively for fox and gray squirrels. Most hunters reportedly used .22 caliber rifles for squirrel hunting.

FORTY-ACRE METHOD OF COLLECTION 1960 DATE ON IOWA QUAIL

by
M. E. Stempel
Game Biologist

During the past 5 years the 40-acre method of gathering information on Iowa quail population has been used to determine the percentage of occupied fields. It is an objective means of gathering data upon which to base forecasts of hunting success. These data show fairly good populations in 1956, 1957, 1958 and 1959 and low populations in 1960.

PHEASANT NESTING SUCCESS IN ROADSIDE COVER FRANKLIN COUNTY, IOWA

by
Richard C. Nomsen
Game Biologist

Results of the roadside nesting study in Franklin County indicated a high density of pheasant nests. It was estimated that 5.3 nests were established per mile. Thirty-three percent of the nests hatched successfully and produced an average of 16.4 chicks per mile. Fifty-four percent of the nests were destroyed by predators early in the nesting season.

RESULTS OF THE 1960 BOW SEASON FOR DEER

by
Eldie W. Mustard
Game Biologist

Bow hunters harvested 277 deer and had a hunter success ratio of 16.0 percent during the 44-day season, which was the eighth consecutive bow season. The bow hunters hunted 86,123 hours or about 49.8 hours per hunter. An average of 311 hours of hunting was required to reduce a deer to possession during the 1960 season.

The sex ratio of 251 males: 100 females and an age ratio of 28 fawns: 100 adults indicated that bow hunters are selective toward adult bucks.

Bow hunters reported sighting 23,674 deer or about 0.27 deer per hour of hunting. At this rate, one deer was sighted for each 3.8 hours of hunting. The average bow hunter saw 13.1 deer during the course of the 1960 bow season for deer.

THE INCREASED GROWTH OF BLUEGILLS IN A SMALL ARTIFICIAL LAKE FOLLOWING THREE YEARS SUCCESSIVE REDUCTION IN THE POPULATION DENSITY

by
Jim Mayhew
Fisheries Biologist

The stunting of fish due to interspecific population stresses and overabundance is a common fisheries management problem in Iowa artificial lakes. Fish that fail to attain normal growth ultimately result in poor angling success and a quality of fish unsatisfactory to the angler. This study was designed to determine the method and magnitude of mechanical and chemical manipulation of a stunted bluegill population to improve the quality of fish for angling.

Williamson Pond is a 27 acre state-owned recreational lake located three miles east of Williamson in Lucas County, Iowa. The lake was constructed in 1910 by the Rock Island Railroad Company for commercial water supply. It was purchased in 1952 by the State Conservation Commission.

The lake is located in an elongated, deep basined valley which divides into two arms at the upper portion of the basin. Maximum water depth is 24 feet. Thermal and chemical stratification are present from May to October. The upper limit of the thermocline is normally located from eight to 16 feet below the surface, with dissolved oxygen capable of supporting fish life seldom found below 12 feet. The immediate watershed is covered with oak-hickory woodland, but the majority of the watershed is under general agricultural practices with little regard to soil conservation or management. Consequently, the lake is subject to inorganic turbidity and siltation during period of abnormal high precipitation.

In 1954 the lake was partially drained and the fish population eradicated with rotenone. Unfortunately no records were made of the original species stocked in the impoundment, but largemouth bass, crappie, bluegill, carp, bigmouth buffalo, channel catfish, common sucker, bullhead, and warmouth were noted during the eradication. Restocking was confined to largemouth bass, bluegill, and channel catfish. Northern pike were also planted during the second year of reimpoundment, but there is no record of one of these fish being recaptured by any method.

Manipulation of the stunted bluegill population was initiated in 1957 and continued through the next two years. Mechanical manipulation was tested in 1957; whereas, chemical reduction was tested during the latter two years of the study.

Method of Population Estimates

Estimates of the adult portion of the bluegill population were completed in all three years by the mark and recovery method. The estimates were necessary to determine the population magnitude before and after reductions in population density. All estimates were computed by applying the Peterson formula:

$$P = \frac{A\ B}{C}$$

where
P = Population
A = Number of fish sampled
B = Number of fish marked
C = Total number of marked fish in the sample.

Sampling error involved in estimating the population was determined by using the 95 percent confidence interval of the recaptured number.

1957 Studies

A total of 1,084 adult bluegills were marked by removing the left pelvic fin. These fish were returned to the water and allowed to intermingle with unmarked fish for approximately 45 days. During four sampling periods in the next four months, 8,864 bluegills were captured. Of these, 164 were marked (Table 1). Substituting these figures for the values in the Peterson formula, the population was estimated at 58,594 fish with confidence intervals of 49,782 to 69,627 at the 95 percent level.

Table 1. Sample size of recaptured bluegills, and population estimate of adult bluegills in Williamson Pond, 1957.

Date	Sample Size (A)	No. Marked Fish Captured (C)	Ratio C/A
June 18	4,336	72	.016
July 15	1,508	20	.013
August 19	1,396	40	.028
September 3	1,624	32	.018
Total	8,864	164	
Total No. Marked:	1,084		
Total Population:	$\frac{8,864 \times 1,084}{164}$	- - - - - - -	58,594
		CI = 49,782 - 69,627	

After the estimate was completed, an attempt was made to remove a considerable portion of the population with fyke nets. This was not successful because of poor netting conditions, and only 1,700 fish were caught. As an alternate plan the water level was reduced 20 percent in order to increase predation on the bluegill. At the same time 9,600 fin clipped fingerling (4 to 6 inch) large-mouth bass were planted to relieve interior population pressure from younger bluegills.

1958 Studies

An estimate of the population was repeated in the early summer of 1958 to determine the results of drawdown and netting the previous year. A total of 1,000 adult bluegills were marked by removing the right pectoral fin. Chemical treatment of 1.0 p.p.m. of emulsified rotenone was used in two small bays isolated with block nets to obtain a sample and further reduce the population. The total sample of 10,942 fish produced 319 recaptures, or a 31.9 percent return of marked fish. An additional 41 bluegills were recaptured from the previous year. Substituting these figures for the values in Peterson formula the population was estimated at 34,736 fish with confidence intervals of 30,736 to 38,125. A natural fish kill of undetermined origin occurred in the spring of 1958 prior to the population estimate. This may have contributed more to the population reduction than realized by casual observation following the discovery of dead fish.

Between 1957 and 1958 the bluegill population was reduced by 48 percent. The chemical reduction in two small bays further reduced this population by 32 percent. Over the two year intensive management period the original population was reduced a minimum of 24,293 fish or approximately 60 percent of the original standing crop. Using the average weight of fish sampled in 1957 the original population weight was approximately 7,200 pounds or 270 pounds per acre. By two successive reduction this was reduced by approximately 4,300 pounds. At the end of 1958, using the mean weight of individual samples, recruitment of weight into the population increased the population to approximately 5,400 pounds or 217 pounds per acre. Undoubtedly, the 1957 stocking of largemouth bass absorbed the remaining portion of weight recruitment. Electro-fishing runs while marking bluegills indicated the yearling largemouth bass very abundant (2.1 observed per minute of shocking time).

1959 Studies

During 1959 both population studies and reduction were curtailed because of extreme water turbidity. A total of 600 adult bluegills were marked by removing the right pelvic fin. Chemical treatment of several spawning beds, 30 days after the fish were marked, produced a sample of 5,021 fish. Of these, 143 were marked. An additional 34 were recaptures of the previous two years. The total adult bluegill population was estimated at 21,067 fish at the conclusion of the three-year management period. Total population reduction was approximately 64 percent from the original population.

Changes in Growth Following Reduction of the Population Density.

Scale samples were obtained from 420 fish of the same year class each year after the population was reduced. Of these, 200 were obtained in 1957, 168 in 1958, and 52 in 1959. Magnification of the scale image was used to assess the age of individual samples, and each annulus marked on an oak tagboard strip. Total length at the end of each year of life was calculated by using a straight line nomograph with the intercept on the abscissa at 0.7 inches. Annual growth increments were computed for each sampling year as an individual unit.

Fish collected in 1957 were all offspring from the original adults stocked or three years old. Samples in the following summers were from the identical 1953 year class. During the first two years of the study, this year class dominated the samples, with over 77 percent of the fish captured being three years old. However, during the 1959 studies, this year class was replaced in abundance by the 1958 year class.

Prior to the initial reduction in the population density mean total length for the first three years of life was 2.8, 4.2, and 5.1 inches respectively. In 1958, four months after the population was reduced with rotenone, the average total length was 3.0, 4.2, 5.0 and 6.6 inches for the first four years of life. Samples in 1959 showed a mean total length of 2.8, 4.0, 5.0, 6.8 and 7.1 inches for the first five years of life.

As indicated by the growth studies, the greatest increase in growth increment occurred in the fourth year of life. This followed immediately after the reduction of population density in 1958. Normally, annual growth increments increase in bluegills until the second or third year of life and decrease thereafter. Additional reduction of population density in 1959 increased the mean total length by only 0.5 inches, which is not considered significant. There was also no significant change in the average weight of bluegill captured after the 1959 reduction.

Project Conclusions and Recommendations for Management Techniques

Several conclusions and recommendations for future management of stunted bluegill populations through population manipulation are listed below. They are as follows:

1. Both mechanical manipulation, through water level drawdown, and controlled chemical eradication were successful in reducing the bluegill population.

2. A minimum of 60 percent of the population was removed before significant increases in growth occurred.

3. Further reduction of the population failed to improve bluegill growth significantly.

4. Chemical manipulation of population densities appear more desirable because the population void is created more abruptly than any other method causing immediate reaction in increased growth and weight recruitment. Chemical manipulation is also superior to other methods due to the control over the number of fish removed.

5. For population manipulation to be effective within a specific population, that population must be the dominant species. If it is not, recruitment of growth and weight will be absorbed by the dominant species, although there was no manipulation of the dominant population.

SUMMARY

Williamson Pond was used to determine the effects of population manipulation on growth in a stunted population of adult bluegills. Water level drawdown and chemical treatment of isolated bays were used to reduce population densities over a three-year period. Prior to the reduction the adult bluegill population was estimated at 58,594 fish. Water level drawdown reduced this population by 48 percent. Chemical treatment with fish suffocants the following year reduced the population density by 32 percent. In 1959 the population was reduced further, with five percent of the population removed by chemical treatment of isolated spawning beds. Total reduction of the population density over the two years was 64 percent.

Growth was calculated by the scale method before the population manipulation and after each successive reduction. No significant changes in growth occurred until the second population reduction, or until 60 percent of the population had been removed. Fish of the same age increased 1.8 inches in total length within four months after the second manipulation of the bluegill population. Further reduction of the population density failed to increase the size of adult bluegills significantly.

SURVIVAL OF STOCKED SMALLMOUTH BASS IN IOWA NATURAL LAKES

by
Tom Moen
Fisheries Biologist

Survival of stocked smallmouth bass in the natural lakes has not been subject to special investigation or study. This paper evolved from a routine question about the success of such plantings. Stocking information was taken from biennial reports, the survival was taken from two routine inventory techniques that are conducted by the biology section. These provide only limited answers. One technique is the annual lakes survey and the other is creel census. The lakes survey probably provides the most reliable and consistent information. The creel census data presents a picture of the end product, fish on the stringer.

Stocking of smallmouth bass in the Iowa natural lakes has been limited. Biennial reports of the State Conservation Commission indicate that during the past thirty years smallmouth bass have been stocked in only five of the 65 or so natural lakes of the state. During this period about 130,000 fingerling, 5 yearling and 25 adults were planted in these five lakes (Table 1).

From the standpoint of habitat for smallmouth bass, these five lakes provide a wide range of conditions. North Twin Lake is very poor in smallmouth habitat with only a small shoal area of sand, the rest of the lake bottom (85 to 90%) is composed of mud, silt and organic detritus. East Okoboji could be called marginal habitat with 25 to 30 percent of the bottom in sand and gravel shoals. Boulder reefs or bars occur in few localities. Clear Lake, Spirit Lake and West Okoboji have good to excellent habitat, with extensive sand and gravel shoal areas plus numerous boulder reefs and bars. Of the latter three, West Okoboji Lake provides nearly ideal conditions.

Smallmouth bass are native to the tributary streams of both North Twin Lake and Clear Lake but there is no evidence that smallmouth were present in Spirit Lake, prior to introductions made in 1934, and there are no records of native smallmouth bass in the streams of northwest Iowa that drain into the Missouri River. A limited population has been established in the Rock River through stocking efforts.

Table 1. Number of Smallmouth Bass stocked in five Natural Lakes of Northwest Iowa in the past Thirty Years.

LAKE	SURFACE ACRES	YEAR STOCKED	NUMBER STOCKED	SIZE
North Twin	569	1949	5,000	Fingerling
Clear Lake	3,643	1944	500	"
		1948	100	"
East Okoboji	1,400	1955	4,500	"
Spirit Lake	5,684	1934	1,090	"
		1940	2	Yearling
			14	Adults
		1948	3	Adults
		1952	5,000	Fingerling
		1955	13,000	"
West Okoboji	3,939	1934	1,025	"
		1935	70	"

Table 1. (Con't.)

LAKE	SURFACE ACRES	YEAR STOCKED	NUMBER STOCKED	SIZE
West Okoboji			3	Yearling
			8	Adults
		1937	223	Fingerling
		1952	54,000	"
		1953	5,500	"
		1954	13,000	"
		1955	11,400	"
		1960	15,000	"

The biology section has conducted an inventory type survey on most of the natural lakes since 1940. This survey is based primarily on the use of 500 feet of 1/4-inch seine. Hauls are made in the same area on each lake each year. All fish collected are counted, weighed, and sub-sampled for age and growth. The catch of each species id divided into young and adult, thus stocking of fingerlings should be followed the next year or so with an increased catch of adults in the survey hauls if the planting was successful. Fingerling stocking is normally carried on in the fall of the year following completion of the survey work. Thus all fingerling or young recorded in the survey represents natural reproduction.

There appears to be little or no correlation between stocking and increased catches of adult bass in the survey hauls in any of the lakes except West Okoboji (Table 2). There are no records of smallmouth bass in the survey hauls made at North Twin Lake. Clear Lake records are rather meager, but the available data seems to indicate that smallmouth have never been common in this lake. East Okoboji presents about the same picture with only 10 smallmouth of any size taken in the survey hauls. Seine hauls in 1956, 1957, and 1958 failed to show any survival of 4,500 fingerling stocked in the fall of 1955. In Spirit Lake there were as many or more smallmouth taken in the years of no stocking (1940 through 1951) as there were in the period that followed years of planting fingerling (1952 and 1955). West Okoboji figures provide a better basis for analyzing the effect of stocking. From 1940 to 1951 inclusive, there were no records of stocking. During this period plus 1952, 46 adults and 125 young smallmouth were taken in 102 seine hauls. From 1952 to 1955 inclusive, 84,400 fingerling were stocked. A total of 104 hauls were made from 1953 to 1960. These hauls captured 305 adults and 503 young, a considerable increase over the non-stocking years. If this increase is significant, it may indicate relatively heavy stocking in consecutive years in necessary before real increased can be brought about.

The creel census information is not as complete as the survey data, but it does serve to shed a little light on the problem, but again there is little or no correlation between the number of smallmouth bass in the creel and the stocking record (Table 2). There are no records of smallmouth bass being taken on hook and line from North Twin Lake. The Clear Lake census shows 84 bass taken from 1949 through 1953. East Okoboji census records indicate that 58 smallmouth bass were taken in 1953, 103 in 1957, and 48 in 1958. A few of those caught in 1957 and 1958 could have come from the stocking of 4,500 fingerling in 1955. Spirit Lake and West Okoboji Lake have furnished the bulk of the fishing for this species in the natural lakes. Some type of fisherman harvest data have been collected on these two lakes each year since 1946. As was collected on these two lakes each year since 1946. As was noted in the survey data, the creel census figures indicate that smallmouth bass fishing was rather erratic in Spirit Lake,

varying from one bass for every 42 fishermen checked to one for every 4,000 fishermen. Fishing was actually less rewarding in the years following stocking than it was prior to stocking. The bass fishing in West Okoboji Lake has been amazingly consistent with the bass-per-fishermen ratio ranging from one bass for every 11 fishermen to one bass for every 70 fishermen. Smallmouth bass fishing was just about as good (one bass for every 34 fishermen) prior to stocking as it was in the years following the fingerling plantings (one bass per 31 fishermen.)

It would appear from these data that once the species becomes established, either as a native or through introductions, additional stocking does not contribute a great deal to the population unless by heavy plantings in consecutive years.

Table 2. Number of Smallmouth Bass stocked since 1940, number and size taken in survey hauls and the number taken by fishermen as determined by creel census.

LAKE	YEAR	FINGERLING STOCKED	SURVEY CATCH NO. HAULS	SURVEY CATCH YOUNG	SURVEY CATCH ADULT	CREEL CENSUS NUMBER SM BASS	CREEL CENSUS FISHERMEN	CREEL CENSUS RATIO*
North Twin	1949	5,000	(No records of a smallmouth taken by survey or creel)					
Clear Lake	1940	0	4	14	1			
	1944	500	No Survey					
	1945	0	6	6	0			
	1948	100	4	0	0			
	1949					45	5,112	1/113
	1950					21	4,169	1/198
	1951					3	8,003	1/2668
	1952					8	7,184	1/898
	1953					7	4,969	1/709
	1959	0	4	1	0			
East Okoboji	1947	0	9	0	1			
	1952		6	0	1			
	1953		7	2	2	58	15,671	1/270
	1954		6	0	3			
	1955	4,500	3	0	1			
	1956		4	0	0			
	1957		3	0	0	103	65,887	1/600
	1958		6	0	0	48	46,106	1/960
Spirit Lake	1940		22	0	22			
	1941		9		18			
	1942		10		5			
	1943							
	1944		11	6	11			

Table 2 (Continued

LAKE	YEAR	NUMBER FINGERLING STOCKED	SURVEY CATCH NO. HAULS	YOUNG	ADULT	CREEL CENSUS NUMBER SM BASS	NO. FISHERMEN	RATIO*
Spirit Lake	1945		20	2	10			
	1946		15		8	493	20,937	1/42**
	1947		14	5	20	219	9,951	1/45
	1948	(3 adults)	10	1	6	357	22,171	1/61
	1949		10		10	105	15,614	1/150
	1950		9	21	9	7	9,002	1/1300
	1951		11		11	22	9,736	1/440
	1952	5,000	7		1	7	7,541	1/1080
	1953		10		1	188	26,481	1/140
	1954		10		10	15	22,228	1/1500
	1955	13,500	10		10	8	32,075	1/4000
	1956		12		12	155	94,230	1/600
	1957		11	11		67	80,947	1/1200
	1958		14	1	5	82	64,159	1/780
	1959		14		4	179	66,035	1/360
	1960		14		4	23	81,000	1/3520
West Okoboji	1940		17	17				
	1941		9		1			
	1942		8	1				
	1943	No survey or creel census						
	1944		6					
	1945		6	30	6			
	1946		9		9	204	6,620	1/32
	1947		12	1	1	344	9,695	1/28
	1948		7	14	1	1,113	12,243	1/11
	1949		6	12	1	329	5,975	1/18
	1950		5	5	10	322	5,165	1/18
	1951		8		16	211	11,287	1/53

Table 2. (Continued)

LAKE	YEAR	NUMBER FINGERLING STOCKED	SURVEY CATCH +NO. HAULS	SURVEY CATCH YOUNG	SURVEY CATCH ADULT	CREEL CENSUS NUMBER SM BASS	CREEL CENSUS NO.FISHERMEN	CREEL CENSUS RATIO*
West Okoboji	1952	54,500	9	45	1	292	11,451	1/40
	1953	5,500	11	77	22	325	22,541	1/70
	1954	13,000	14	28	56	389	16,863	1/43
	1955	11,400	13	39	52	644	19,039	1/30
	1956		12	156	36	178	10,327	1/14
	1957		11	25	45	3,339	100,131	1/30
	1958		15	60	30	3,123	109,642	1/35
	1959		15	92	39	3,468	81,531	1/23
	1960	15,000	13	26	26	17	581	1/40

*Number of bass per fisherman checked.

**Creel census figures on Spirit Lake were expanded for 1956, 1957, 1958, 1959 and 1960; those for West Okoboji were expanded for 1957, 1958, 1959; all others are based on personal contacts.

CREEL CENSUS OF THE DES MOINES, BOONE, NORTH RACCOON AND SKUNK RIVERS, 1960

by
Harry M. Harrison

A creel census in central Iowa streams has been taken annually since 1953. Prior to 1960, this work was carried on wholly within the biology section of the Iowa Conservation Commission. In 1960, assignments to Conservation Officers requiring certain records be kept as they contacted sportsmen afield made it possible to get creel information comparable to that collected previously. As a result, we have dropped the field work part of the census by biology personnel and now obtain our creel data from the conservation officers' contact records. By utilizing these records, we have been able to expand the census from one involving only the middle reaches of the Des Moines River to one including the entire lengths of the Des Moines, Raccoon, Skunk, and Boone Rivers.

Briefly, the census involves interviews in the field with fishermen at frequent and irregular intervals throughout the main fishing season (April to October). The information secured from each angler includes: the date, time, and place of the interview; the length of time spent fishing up to the time of contact; and the kind and number of fish caught. This information is tabulated by stream for each officer for the territory which he covers. From that tabulation the catch per hour is determined. The resulting figure becomes an index indicating angler success for the particular reach of stream.

The data obtained for 1960 are given in Tables I and 2. Table I shows the total number of contacts made my stream for each officer by county territories, the total hours fished, and fish caught per hour. Table 2 gives the species composition of the catch by stream and officer territory.

Since this census has been used for only one year, its value as a technique cannot yet be fully appraised. Although some shortcomings are apparent, most indications are that the method has considerable merit.

In extensive creel census work on Iowa's inland streams carried on by Cleary between 1950 and 1955, and by the writer from 1953 through 1959, catch per hour on an annual basis averaged between 0.4 and 0.7 fish. In addition, but depending upon local conditions, occasions arise where higher or lower rates of catch show up.

Reviewing the catch per hour for the officer census conducted in 1960, Table 1, it is apparent that the results fit well with information found in previous censuses, and also with that which would be expected. That is, in most of the officer territories the catch was between, or at least close to the 0.4-0.7 fish per hour average. In two instances where a significant number of contacts were made, the catch was considerably higher; and especially good catfishery at Ottumwa and a good bullhead fishery at Humboldt accounted for these.

The problem of bias being introduced by neglecting to record proportionate numbers of unsuccessful fishermen was a suspected possibility at the beginning of the census period. To check on the significance of this, a separate creel census on the Raccoon River was performed by biology personnel concurrently

with that of the conservation officer census. A comparison of the two censuses, Table 3, shows almost identical results and that the suspected bias did not materialize.

From the standpoint of cost, the officer creel census is far more economical than one involving census clerks. The officer census operates as a part of routine license patrol; for that reason little extra cost accrues which is chargeable to the census.

Since specific areas and numbers of contacts were not specified in the first year of this creel census, there were obviously some gaps or too few contacts resulting in inadequate samples in some areas. This could easily be corrected in the future by more specific assignments.

On the basis of the information that was available and from my personal knowledge of angling success in central Iowa streams, I am satisfied that the 1960 census was worthwhile. With a little additional effort, the technique could provide adequate and needed catch statistics. If continued, the census should reflect significant changes in angling success, will provide a good historic record of stream angling, and will, in addition, show the need for and the successes or failures of fishery management projects.

TABLE 1. Number Fishermen contacted, total hours fished, total fish caught and fish caught per hour by streams and conservation officers territories.

Stream	County	Number Contacts	No. Hours Fished	Tot. Fish Caught	Fish Caught Per Hour
West Fork	Emmet				
Des Moines River	Palo Alto	2	2	11	5.50
	Pocahontas				
	Humboldt	178	235	337	1.43
	Webster	47	69	30	0.43
Main Stem	Boone	208	376	146	0.39
	Dallas	14	116	23	0.19
Des Moines	Polk	285	431	210	0.48
	Warren	135	242	134	0.55
River	Mahaska	22	54	48	0.90
	Wapello	245	351	621	1.80
	Van Buren	52	219	106	0.49
	Lee	28	9	7	0.80
East Fork					
Des Moines River	Kossuth	13	12	12	1.00
Boone River	Hamilton	22	47	17	0.36
	Sac	65	189	61	0.37
North	Carroll				
Raccoon	Greene	189	418	163	0.39
River	Dallas	195	470	150	0.32
	Polk	129	212	62	0.29
	Story	6	7	12	1.7
South	Mahaska				
Skunk	Keokuk	16	17	4	0.25
River	Washington				
	Jefferson	65	99	21	0.21
	Henry				
	Des Moines	198	332	185	0.56

Table 2. Species Composition of Fish caught by streams and conservation officers territories.

Stream	County	Tot. Caught	Fish-Channel Cat	Carp	Bull-head	S.M. Bass	Wall-eye	Blue-gill	Crap-pie	Suckers	Sheep head	Misc.
West Fork Des Moines River	Emmet											
	Palo Alto	11			11							
	Pocahontas											
	Humboldt	337	37	80	195	2	4	6	3			4
Main	Webster	30	20	5						1		2
	Boone	146	57	63	19		1			5		
Stem	Dallas	23	21	2								
	Polk	210	140	65		1			7			7
Des Moines	Warren											
	Marion	134	108	22	2							1
River	Mahaska	48	42	6								
	Wapello	621	385	140	24						97	5
	VanBuren	106	27	22	9						23	
	Lee	7										7
East Fork Des Moines River	Kossuth	12		2	12							
Boone River	Hamilton	17		2	10							
	Sac	61	36	13		7				3		2
Raccoon	Carroll											
	Greene	136	78	61	3	5				4		12
River	Dallas	150	101	26	12	2	1		5			1
	Polk	62	30	10	8				9		1	3
	Story	12	4		4					3		
South	Mahaska											
	Keokuk	4	1		3							
Skunk	Washington											
	Jefferson	21	14	5	2							
River	Henry											
	Des Moines	185	77	57	33						14	3

Table 3. Comparison of Creel Censuses conducted by Conservation Officers and Biology Personnel North Raccoon River 1960.

	Number Contacts	Total Hours Fished	Total Fish Caught	Fish Caught Per Hour	Catfish	Carp	Bull-head	Sheep-head	Wall-eye	Crappie	S.M. Bass	Sucker	Misc.
Officer Census	587	1,289	433	0.33	245	110	23	1	1	9	14	12	18
Biology Census	159	250	76	0.30	43	19		1		3	2	5	3

MISSOURI RIVER CREEL CENSUS - 1960

by
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For the second consecutive year a "spot check" type creel census was conducted on the Iowa waters of the Missouri River during the open water months. This project was initiated in September of 1958 and will be continued in the future. The purpose of the project is to obtain basic information on the sport fishery of the Missouri River, including angler catch by numbers and species, angler preference by species, and angler utilization of the river. A creel census program carried out over a period of years will help to detect any major change in the composition of the fish populations as the quality of the river water improves due to channel stabilization efforts by the Army Engineers.

The method employed was an incomplete sampling method in which the person conducting the creel census (biologist or biologist aids) made contacts in the field with fishermen actively engaged in fishing or just completing a fishing trip to the river. Information obtained from each angler was recorded on individual census cards and includes the following: date, time, and place of the interview; the amount of time spent fishing up to the time of the interview; the number and kind of fish caught; principal species being fished for; bait used; and the approximate distance the fishermen had traveled to fish. To insure coverage of both the boat and the bank angler, a boat equipped with an outboard motor was used extensively to contact anglers fishing from boats as well as those fishing in areas not readily accessible by car.

In an attempt to increase the number of fishermen contacted and to include areas of the river not otherwise sampled, field contact records of Conservation Officers located in the Missouri River counties were included in the totals. Through this system of reporting, Conservation Officers, on a state-wide basis, record species and catch data on a standard form as they make routine license and bag checks of sportsmen in their assigned areas. By checking through the reports of officers located in areas of particular interest, much valuable information can be obtained on hunter or fishermen activities and success during any particular period of time. The conservation officers are to be commended for their part in this worthwhile program.

Difficulty in contacting significant numbers of fishermen was encountered again in 1960, as was true in 1959. (Robinson, 1959). To overcome this problem, special effort was extended to contact anglers during week-ends, on holidays, and near areas of known heavy angler use. One area of particularly heavy angler use was at the confluence of the Big Sioux River and the Missouri River. The entire Missouri River area near Sioux City, Iowa, was heavily utilized in 1960, and many of the contacts were made in this area.

In reporting the 1959 creel census (op.cit.) all contacts were included in one group, while in the 1960 report a distinction is made between contacts made in the main stem of the river and those made in the associated "cut-off" lakes. For comparative purposes Table 1 shows the rate of catch for the two years in the manner that it was reported in 1959.

Table 1. Rate of catch of fish from the Missouri River and Decatur Lake for the years of 1959-1960.

Year	Fishermen Contacted	Total Hours Fished	Total Fish Caught	Rate of Catch Per Hour
1959	724	1,726	1,194	0.69
1960	600	1,417	1,042	0.74

Results of Creel Census on the Main River: During 1960, 430 anglers were contacted while fishing in the main channel of the Missouri River. These anglers had caught 592 fish in 1,021 hours of fishing for a rate of catch of 0.58 fish per hour.

An examination of the information contained on the individual creel census cards shows that 35 percent of the Missouri River fishermen in 1960 were seeking catfish, 30 percent had no species preference, and 10 percent would like to catch carp. Only a very small percentage of the fishermen were seeking the "game" or "Pan fish" species (Table 2). Although only six percent of the fishermen were seeking the crappie, that species was very important in the catch, amounting to 17 percent of the total. No other game fish were of any significance in the reported catch.

A brief period in late May accounted for most of the reported catch of sturgeon. During this period, there was considerable activity of fishermen in the Sioux City area who were fishing for this species. Most of the catches were made in deep sandy areas of the river with common garden worms as bait.

Table 2. Angler Preference and Species Composition of the Catch in the Missouri River - 1960.

Species	Number of Anglers Seeking	Percent of Total	Number Caught	Per Cent of Total
Catfish	124	35	116	20
No Preference	106	30	-	-
Carp	34	10	126	21
Sturgeon	32	9	48	8
Sauger	22	6	38	6
Crappie	22	6	108	18
Bullhead	8	2	56	9
LM Bass	2	1	6	1
Freshwater Sheepshead	0	-	62	11
Goldeye	0	-	22	4
Walleye	0	-	4	Tr.*/
Sucker sp.	0	-	4	Tr.
American Eel	0	-	1	Tr.
Gar	0	-	1	Tr.

*/ Tr. - less than 1%

Results on Creel Census on Decatur Lake

Decatur Lake was created in 1956 as a "cut-off" from the relocated river channel when the U.S. Army Corps of Engineers straightened Tieville Bend of the Missouri River.

During the census period, the lake had a surface area of approximately 1,000 acres. Maximum summer depths of the lake are 30 feet, with an average depth of five feet. The bottom is gently sloping and quite sandy. Emergent vegetation is common over one-half of the lake.

Although the lake is cut off completely from the river, it is separated from the main river channel by only a single, low, rock dike located along one side. Consequently, the lake is subject to periodic flooding in times of high river stages.

Previous creel census work and fish population studies of the area have shown that a fishery different from that of the main river has developed here, both in the structure of the fish populations and in the angler efforts and successes.

Rate of catch of fish here was almost double that of the main river, with 170 anglers catching 450 fish in 396 hours of fishing for an average of 1.13 fish per hour.

Decatur Lake fishermen expressed more interest in the "game" fish species. Almost one-half of the anglers who were interviewed were fishing for sauger, crappie, or bass. Bass fishing, which is almost negligible on the main river, accounted for 10 percent of the fishing and 24 percent of the catch (Table 3). Only 13 percent of the fishermen were seekingcatfish or carp and the catch of these two species was minor.

Table 3. Angler Preference and Species Compositinn of the Catch in Decatur Lake - 1960.

Species	Number of Anglers Seeking	Percent Of Total	Number Caught	Per Cent Of Total
No Preference	48	34	-	-
Sauger	34	24	70	16
Crappie	18	13	146	33
LM Bass	14	10	100	24
Catfish	10	7	4	1
Carp	8	6	5	1
Bullhead	6	4	6	1
Bluegill	0	0	40	9
Freshwater Sheepshead	0	0	34	8
Walleye	0	0	26	6
Gr. Sunfish	0	0	10	2
Perch	0	0	8	1
Sucker Sp.	0	0	1	Tr. */

*/ Tr. - less than 1 %

SUMMARY

1. A "spot check" creel census was carried on in the Iowa waters of the Missouri River in 1960; this has been done for the last two years.

2. Sport fishing on the Missouri River can only be considered to be fair at this time.

3. No significant differences in the composition of the angler's catch and the catch per unit-of-effort are apparent between the first two years of this study.

4. It is apparent that two distinct sport fisheries have developed, one in the newly created "cut-off" lakes, and the other in the main river.

5. In general, angler use of the river is not heavy at this time.

6. This study will be continued in the future.

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COMPARISON OF PHEASANT REPRODUCTION INDICES IN IOWA COUNTIES

by
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A comparison of relative pheasant populations in Iowa's 99 counties (Klonglan 1960) showed that large differences existed among the counties. The northern Iowa counties with the heaviest pheasant populations had 300-400 times as many pheasants as many of the sparsely populated southern counties. When one considers the tremendous biotic potential of the pheasant in relation to the low populations of the bird in southern Iowa, it is obvious that something is holding the population at a level much lower than would be expected with seemingly suitable habitat visible at a cursory glance.

In an effort to uncover a clue to the reason why the birds do not do better in this area, a compilation of several indices to pheasant reproduction was undertaken on a county by county basis. Since the factor or factors limiting southern Iowa pheasant populations seems to be closely linked to the reproductive season, any differences that might be uncovered between northern and southern counties, or between high population and low population counties, might be indicative of the cause of the population variations.

The reproductive success achieved by a pheasant population during a particular season may be expressed in various terms. Among the most commonly used indices are: percent of hens successful, percent of juvenile birds in the population, young-per-hen, young-per-adult, and average brood size. It is possible to compute an index to each of these population characteristics for each county from data collected by the Conservation Officers during their annual August roadside counts. However, when the data from the last seven annual counts (1954-1960) were analyzed, it was found that the number of birds observed in many counties was too small to give an adequate sample.

Thus, it was necessary to group the counties by some logical classification. Since a primary objective of the study is to uncover differences between northern and southern Iowa, the state was divided into three approximately equal areas--south, central and north--with three tiers of counties being included in each group. Also, the fact that certain southwestern Iowa counties, particularly Adair, have higher pheasant populations than the rest of the southern counties furnished a reason for further dividing the counties on another basis--low, medium, and high pheasant populations. The divisions between the three levels were made to coincide with those outlined in the preceding Quarterly Biology Report (Klonglan 1960). Therefore, the 37 counties with a pheasant population index exceeding the state mean of 100 were classified as high; the 31 counties with an index between 25 and 100 were classified as medium; and the 31 counties with an index below 25 were classified as having low populations. See (Klonglan 1960).

To give an idea of the sample sizes from which the reproduction indices for the different classifications were computed, the pertinent raw data from all August roadside counts conducted during the period from 1954 to 1960 were tabulated (Table 1). It is evident that the number of birds in the various categories is more than adequate in most instances, with the possible exception

Table 1. Compilation of data from August roadside pheasant counts used in computing indices to reproductive success in Iowa's 99 counties, 1954-1960.

Groups of Counties(see Fig.1)	Number of Counties	Average* State Index	No.of Cocks	No.of Hens	No.Of Broods	No.of Chicks	Total No. of Birds	Hens w/o ** Broods
Southern 3 Tiers	32	26	915	1,400	1,014	6,870	9,185	386
Low Population	24	9	336	368	216	1,450	2,154	152
Medium Population	7	57	474	715	515	3,346	4,535	200
High Population	1	223	105	317	283	2,074	2,496	34
Central 3 Tiers	37	79	2,729	4,413	3,170	20,561	27,703	1,243
Low Population	5	12	89	80	50	302	471	30
Medium Population	22	61	1,350	2,071	1,444	8,983	12,404	627
High Population	10	151	1,290	2,262	1,676	11,276	14,828	586
Northern 3 Tiers	30	203	7,523	10,486	7,461	42,172	60,181	3,025
Low Population	2	20	56	37	14	101	194	23
Medium Population	2	89	159	241	188	1,158	1,558	53
High Population	26	226	7,308	10,208	7,259	40,913	58,429	2,949
Entire State	99	100	11,167	16,299	11,645	69,603	97,069	4,654
Low Population	31	10	481	485	280	1,853	2,819	205
Medium Population	31	62	1,983	3,027	2,147	13,487	18,497	880
High Population	37	205	8,703	12,787	9,218	54,263	75,753	3,569

*See preceding Quarterly Biology Reports (Vol. XII, No. 3, pp. 25-29)
**Number of hens with broods is taken as equal to number of broods.

of the low population groups in the central and northern regions. It will be shown, though, that even here the results from the available data fit the projected patterns quite well.

It must be remembered throughout the following discussion that we are dealing with indices and not the true condition in the population. The actual relationship between the two is unknown, though it is hoped the differences are not too great. It is the yearly change in each index that tells us what condition the population is in and what has happened in the interval that elapsed between the counts from which the index is computed. Thus, it is the trend more than the actual index number in which we are usually interested.

DISCUSSION OF RESULTS

A comparison of the percent of hens successful in raising a brood showed no differences between the three regions of the state (Table 2), with observed percentages of 72, 71 and 71 percent in the southern, central and northern regions of the state, respectively. The over-all state average was 71 percent. However, when the data were analyzed for the low, medium and high population counties, marked differences were found. Particularly noticeable was the much lower percent of successful hens in the counties with low populations. The state average of the 31 low counties was 58 percent, with regional averages of 59, 62 and 38 percent. The percent successful hens observed in medium population counties did not differ much from the high counties, though the general trend was to be somewhat lower.

As might then be expected, a similar trend was found in the index to the percent of juvenile birds in the population (Table 2). Significantly lower percentages occurred in those counties with low populations, while no important differences existed between the medium and high counties. In fact, the statewide average for the medium counties exceeded the high ones by one percent! In the high counties in northern Iowa, the best of the state's pheasant range, 70 percent of the birds observed on the roadside counts were young-of-the-year, compared to 76 percent in the 10 high counties in the central group and 83 percent in the one high county in the southern group (Adair). This can be taken as further evidence that we are underharvesting our pheasant crop in our best pheasant range, the large number of adult birds carrying over from one year to the next contributing to the lower percentage of young observed.

The trends in percent of hens successful and percent of juvenile birds are of particular significance in the southern and central groups of counties, because it is here that pheasants are doing the poorest in maintaining a satisfactory population. In the southern counties the successful hens percentages in the high, medium and low categories decline from 89 to 72 to 59, respectively. In the central counties the corresponding decline is from 74 to 70 to 62. Corresponding figures for percent juveniles are 83-74-67 and 76-72-64 (Table 2). This seems to indicate some depressant factor or factors exist in the counties with low populations and that these low populations are not simply an expression of a lower carrying capacity as ordinarily expressed in terms of cover, available food and other habitat requirements. Even the two northern counties with low populations (Allamakee and Clayton) follow this trend, with only 38 percent of hens successful and 52 percent juveniles. The comparison of medium to high counties in this region does not hold up because the two indices of the former slightly exceed those of the latter. However, only two counties are included in

Table 2. Indices to pheasant reproductive success as computed from August roadside counts in Iowa's 99 counties 1954-1960.

Groups of Counties(see Fig.1)	No. of Counties	Average* State Index	% of Hens Successful	Percent Juvenile Birds	Average Brood Size	Young Per Hen	Young Per Adult	Sex Ratio M:F
Southern 3 Tiers	32	26	72.4	74.1	6.78	4.91	2.97	1:1.5
Low Population	24	9	58.7	67.3	6.71	3.94	2.06	1:1.1
Medium Population	7	57	72.0	73.8	6.50	4.68	2.81	1:1.5
High Population	1	223	89.3	83.1	7.33	6.54	4.91	1:3.0
Central 3 Tiers	37	79	71.8	74.2	6.49	4.66	2.88	1:1.6
Low Population	5	12	62.5	64.1	6.04	3.78	1.79	1:0.9
Medium Population	22	61	69.7	72.4	6.22	4.34	2.63	1:1.5
High Population	10	151	74.1	76.0	6.74	4.98	3.17	1:1.8
Northern 3 Tiers	30	203	71.2	70.1	5.65	4.02	2.34	1:1.4
Low Population	2	20	37.8	52.1	7.21	2.73	1.09	1:0.7
Medium Population	2	89	78.0	73.7	6.16	4.80	2.90	1:1.5
High Population	26	226	71.1	70.0	5.64	4.01	2.34	1:1.4
Entire State	99	100	71.4	71.7	5.98	4.21	2.53	1:1.5
Low Population	31	10	57.7	65.7	6.62	3.82	1.92	1:1.0
Medium Population	31	62	70.9	72.9	6.28	4.45	2.69	1:1.5
High Population	37	205	72.1	71.6	5.89	4.24	2.53	1:1.5

*See preceding Quarterly Biology Reports (Vol. XII, No. 3: p.p. 25-29.)

the medium classification so the sample size may be too small to give an accurate picture.

However, if we accept the probability that something is adversely affecting reproduction in the counties with low population, as indicated by the trends observed in the indices previously discussed, a disturbing note is interjected when the index to average brood size is examined. The highest average brood size was recorded in the southern part of the state, the 6.8 chicks per brood counted here contrasting to the 6.5 in the central region and the 5.7 of the northern region (state average 6.0). This is just the reverse of what we would expect if reproduction is being subjected to unusual stress in southern Iowa. With over 1000 broods sampled in the southern region, over 3000 in the central region and nearly 7500 in the northern region (Table 1), these differences are definitely significant.

A comparison of the low, medium and high population counties gave a rather conflicting picture. The high southern county gave a higher brood size than the lower ones though the trend was of much smaller magnitude than the similar trends in percent hens successful and percent juveniles. A similar trend from high to low was found in the central region, but the reverse occurred in the northern regions. However, only 14 broods were sighted in the two low northern counties in the 7 years, so the rather high average brood size of 7.2 reported for them rests on a rather shaky foundation. On a statewide basis, the low counties had a higher index (6.6) than did the medium (6.3) or high (5.9) counties.

What might be the reason, or reasons, for the significantly higher brood size reported in southern Iowa? Though no definite answer can be given at the moment, several can be projected. Perhaps this is a true difference resulting from the development of a tendency for southern Iowa hens to lay larger clutches and thus raise larger broods. However, there is probably more to the picture than this. It is known that clutches laid early in the nesting season average a larger number of eggs than those laid late in the season, primarily because renests contain fewer eggs than initial attempts. Evidence exists to show that renests are responsible for a very significant portion of the hatch in northern Iowa. Evidence, likewise, shows that this is generally not true in southern Iowa. Thus it is quite likely the average brood size index from southern Iowa was derived for the most part from broods that hatched from early nests, while the index from northern Iowa contained many broods that hatched from renests. If this is true, it would not be surprising that the latter brood size would average smaller.

Another possibility cannot be discounted. Individuals making the counts in high pheasant population counties are accustomed to seeing large numbers of broods along their routes. The reverse, of course, would be true in the low population counties. It would not be surprising if counting of the chicks in each brood would become rather routine for one used to seeing a brood per mile, or more, along his 30-mile route. However, if broods are scarce and the observer is used to seeing only two or three and perhaps none in some years, it would be only natural that he make a more concerted effort toward counting the number of chicks when he sights a brood. This would then result in a higher average brood size index in the low counties. It seems doubtful, however, that this alone could account for the observed differences.

Though there is some evidence that the average brood size is higher in southern Iowa and this would appear, on the surface at least, to indicate satisfactory reproduction in this area, it is seen that this is not necessarily true when considered in the light of the over-all picture. If the majority of the southern broods are from the early part of the nesting season, the resultant index does not take into account possible unfavorable aspects of the remainder of the nesting season, the existence of which is indicated by the lower percent of successful hens and percent juveniles.

If the total number of chicks observed is divided by the total number of hens sighted, both with and without broods, a young-per=hen index is obtained. A comparison of trends between and within regions shows that a higher index was obtained in the southern part of the state, as was true with average brood size, but that there was a definite trend toward a lower index in the low counties within regions, as was true with the percent of successful hens. This is not surprising, however, since the young-per-hen index can also be computed by multiplying the average brood size by the percent of hens successful. Thus this particular index combines features of both the latter indices.

Another index somewhat similar to the young-per-hen is the young-per-adult. Trends depicted by this index followed the patterns previously described (Table 2). The advantage of the young-per-adult index is that it takes into account the sex ratio, inasmuch as the number of cocks observed is used in its computation. The differences in observed sex ratios in the different county groups were not enough to change the earlier mentioned trend patterns, though the magnitude of difference was sometimes changed. For example, Adair County (the high in the southern group) had a sex ratio showing considerable fewer cocks than the other groups and its young-per-adult index was correspondingly higher in comparison with the other groups.

The differences observed in the sex ratios in the different county groups merits some discussion here, though it is not actually an index to reproductive success. There was little variation between the three regions, ranging from 1 cock: 1.4 hens to 1:1.6, with a statewide mean of 1:1.5 (Table 2). Once again, however, a difference between high and low counties existed. The ratio of cocks to hens was almost equal in counties with low populations; in fact, the state average of all such counties was exactly 1:1. The lowest ratio occurred in the two low counties in the northern region, 1:0.7, while cocks also exceeded hens in the five low counties in the central region, 1:0.9. The ratio was 1:1.1, in the 24 low southern counties. The differences might indicate less hunting pressure in the low northern and central counties, probably because hunters here have only a short distance to go to find much better hunting territory. In southern Iowa this is not true. Also, there are more quail and rabbit hunters in southern Iowa and they no doubt pick up many cock pheasants. The only ratio greatly exceeding the others is the 1:3.0 of the high southern county (Adair). This is no doubt indicative of the heavier hunting pressure exerted here in comparison with other areas in the state.

Since the observed sex ratio indices (remember, this is not the true sex ratio in the population!) in the low counties shows a higher ratio of cocks to hens than in the counties with higher pheasant populations, the indication is that hunting has definitely not unbalanced the sex ratio in these low counties--in fact, it apparently has had little effect. Thus there would be little biological reason to maintain short season zones in these counties, and there was sound basis for the elimination of the short zone in southern Iowa when the Commission set the 1960 hunting regulations.

SUMMARY

1. Data from 7 years of August roadside pheasant counts were analyzed for indices to reproductive success in Iowa counties.

2. Counties were divided into three regional groups--northern, central, and southern--and each region subdivided into three pheasant population level groups--low, medium and high.

3. Over 97,000 pheasants, including about 11,000 cocks, 16,000 hens and 70,000 juveniles, were included in calculating the indices.

4. Counties with low pheasant populations had below average indices to percent of hens successful in raising a brood, percent juveniles in the population, young-per-hen, and young-per-adult.

5. The percent of young birds in the population was lowest in northern Iowa, the best pheasant range, indicating that the birds are grossly under-harvested in this area.

6. The lower than average indices to reproductive success observed in counties with low pheasant populations, particularly in southern Iowa, indicates the existence of some depressant factor, or factors, which is not simply an expression in terms of cover, food, etc.

7. The average brood size index was greatest in the southern part of the state, but it was shown that this did not necessarily mean satisfactory reproduction had occurred.

8. Observed sex ratio indices showed that hunting had not unbalanced the ratio in counties with low populations, and there was no biological reason for having shorter seasons in these counties.

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A RECORD OF WATERFOWL MIGRATION THROUGH IOWA DURING THE FALL OF 1960

by
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Waterfowl migration into and through Iowa during the fall of 1960 included a number of small flights of ducks without any spectacular mass fall migration. In general, these flights appeared to have been initiated by a series of weather sequences of small size and moderate severity, rather than severe continental weather patterns. Information gathered during the last decade indicates the importance autumn weather plays in the movements of waterfowl into Iowa (Hochbaum, 1955; Bellrose, 1957; Sieh, 1958; Bellrose and Sieh, 1960).

Suitable weather conditions for fall migration into Iowa were successfully determined several times during the autumn of 1960 via Mr. Ivory Rennels, M.I.C., of the U. S. Weather Station in Sioux City. A forecast of the "Grand Passage" was not released to departmental personnel because flights of ducks preceding the semi-severe weather sequence of November 8-9, 1960, reduced the probability of large scale or spectacular fall migration into Iowa on November 8-9. Flights of waterfowl were observed and reported from several locations in Iowa on October 18-19, October 28, November 4-5, and November 8-9. The exodus of most remaining ducks from northern Iowa occurred during the November 28th blizzard. A late freeze-up flight of mallards was reported on or about December 13, and several additional waterfowl flights were reported along the Missouri River, probably originating from the large concentrations of mallards on the upstream reservoirs in the Dakotas.

A telephone call from the Sioux City Weather Station during the morning of October 18, 1960, indicated suitable conditions for small scale migration during the ensuing 24 hours. Observations made at the Spring Run area in Dickinson County during the late afternoon and evening of October 18th revealed 15 migrating flocks of ducks. Over one-half of these flocks were diving ducks, probably ring-necked or scaup. The remainder were largely mallards. On the morning of October 19th, ten flocks of migrants were observed and a large percentage of these were divers. During the afternoon, observations were shifted to West Hottes Lake in Dickinson County where only three flocks of migrants were tallied; however, no migration was observed during late afternoon or evening. On these same dates an influx of mallards into the Lake Odessa Area in Louisa County was reported by the Unit Manager, Bill Aspelmeier, and further corroborated by his kill data on the 19th.

Mr. Kenneth Blizek reported a migration of ducks, (mostly mallards) observed at West Swan Lake in Emmet County on October 28, 1960. On this same date, from 5:00 - 5:15 P.M., Thomas Moen estimated 1,500-2,000 divers in about 13 flocks leaving the south shore of Spirit Lake in Dickinson County. He also observed with binoculars from 5:15 - 5:20 P.M., a line of ducks one-half mile long out in

the lake. It was probable that most of these ducks also left the lake and resumed migration on this date. Consistent kills of mallards at Lake Odessa in Louisa County during the period of October 24-31 indicated recruitment of mallards into this area, but there was no indication of any large or spectacular movement.

In northwest Iowa another flight of diving ducks was witnessed in Dickinson County leaving the south shore of Spirit Lake on November 4, 1960. Approximately 5,000 ducks, mostly lesser scaup and a few ring-necked ducks and other miscellaneous species, left the lake in 100-150 flocks and groups of flocks between 4:30 - 5:30 P.M. These birds were resuming their migration in a south-southeasterly direction.

On the morning of November 7, Mr. Rennels reported a large low pressure ridge in Canada with cold and snow in the prairie provinces moving toward Iowa. This was sufficient information to indicate suitable conditions for migration into northwest Iowa the following morning. A call from Mr. Frank Bellrose in Illinois corroborated the assumption that many ducks had left Canada prior to November 7th, and that no spectacular migration was reported in progress in Canada on this date. Mr. William Tate reported migration in progress along the West Fork River in Butler County during the afternoon of November 7th. Reports from local duck hunters in Clay, Dickinson and Palo Alto Counties indicated that migration was in progress during the morning of November 8, 1960. During the afternoon of November 8th an estimated 4,000 ducks, mostly mallards, were observed in the vicinity of Barringer's Slough in Clay County. Practically all of these birds were migrants, and ten of the larger flocks contained 150-200 birds each. Duane Peterson, who was on duty at the Lake Odessa checking station, reported migration in progress there on November 8th, and during the following morning.

Migration continued in northwestern Iowa during the morning of November 9th, but at a much reduced rate. Only 15 migrating flocks were observed from daylight until noon at Barringer's Slough. At noon, observations were shifted to Silver Lake near Ayrshire in Clay County. Migration had practically ceased by 2:00 P.M., but the lake was covered with waterfowl of almost every species. An estimated 1,000 or more canvasback were present, with lesser numbers of scaup and redhead indicating a sizable diver flight had been in progress during the night hours of November 8-9. An estimated 5-15 thousand mallards were on the lake, with a sprinkling of baldpate, shoveler, pintail, golden-eye and bufflehead. During the evening of November 9th, Thomas Moen reported ten flocks of divers leaving the south shore of Spirit Lake between 4:45 - 5:30 P.M.

Weather conditions in northwest Iowa on November 8-9 were characterized by sustained northwest winds, overcast skies, and falling temperatures which formed thin ice on the marshes during the night of November 8th. During the night of November 9th, temperatures fell to 12° F. and November 10th was clear and cold. This weather sequence is characteristic of the freeze-up of shallow waters in the prairies and coincides with the major exodus of migrant waterfowl except for field feeding mallards remaining in open water areas, especially on the deeper lakes and reservoirs.

A warming trend began on November 11th and continued until the blizzard conditions of November 28th forced out almost all remaining waterfowl from northern Iowa. A late season influx of mallards, estimated at 10,000 or more, were reported on West Okoboji Lake on December 8th. Another influx on December 13th increased the number present on West Okoboji, and a large influx was also reported at the Coralville Reservoir in Johnson County on December 13th by

Thomas Berkley. The concentration on West Okoboji, or part of it, remained in the local area until the final freeze-up on December 18th.

Weather conditions and subsequent fall migrations of waterfowl into Iowa during 1960 resulted in a series of small flights. The flight of November 8-9 was considered the most important period of fall migration. Large scale or spectacular mass fall migration did not materialize in 1960 because the preceding small flights reduced the total aggregate of migrants north of Iowa by November 8-9; and, the mallards population within the Mississippi Flyway was reported as low.

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ANALYSIS OF SQUIRREL HUNTING REPORTS FROM HUNTERS FOR 1957 THROUGH 1959 SEASONS

by
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Records of squirrel hunting success in Iowa have been accumulated each season, starting in 1950 through the cooperation of hunters. Questionnaires are mailed before the start of squirrel hunting each fall to more than 400 squirrel hunters distributed throughout Iowa. These hunters are selected as potential cooperators by Conservation Officers or have known records of past cooperation. They record for each hunting trip of which they are a party such information as: number of squirrels killed, crippled, and observed; sex of squirrels; size of hunting party; hours spent hunting; county hunted in; use of dogs; and type of guns used. In addition,they are asked to venture their opinions regarding overall abundance of squirrels as compared to the previous seasons. Also, each hunter is asked to save one front leg bone from each squirrel. From examination of the distal ends of the radius and ulna, young squirrels can be distinguished from adults. This report includes data derived from these hunter reports for the 1957, 1958, and 1959 seasons, which has not previously been published. The data has, however, been compiled and used in making recommendations for hunting seasons each year.

Hunter Success

On a statewide basis squirrel hunting for the three years was best in 1958 when 0.86 squirrels were killed of 1.93 seen per hour of hunting (Table 1). In 1959, only 0.69 were killed and 1.76 seen per hour. During 1957, 0.77 were bagged and 1.82 observed per hour. In 1957 the best hunting was reported from the Wisconsin drift area where 1.1 squirrels were bagged per hour. Poorest hunting occurred in the Iowan drift: 0.56 squirrels per hour. In 1958, the best hunting apparently was found in the Missouri loess and southern loess areas where the kill per hour was 0.98 and 0.97 respectively. Poorest hunting for that year seems to have been in the Mississippi loess: 0.62 squirrels bagged per hour. In 1959 the Missouri loess again led all other areas in hunting success with 0.95 killed per hour. Poorest hunting in 1959 was reported from the driftless area of northeast Iowa where only 0.40 squirrels were bagged per hour.

Of the total number seen while hunting, hunters bagged 42.3, 44.6, and 39.2 percent in 1957, 1958, and 1959, respectively.

In 1957, 20 of 29 reporting hunters thought there were more squirrels than in 1956. Twenty-six of 35 hunters though there were more squirrels in 1958 than 1957. However, in 1959, only 17 of 34 thought there were more squirrels than in 1958. The remaining 17 thought there were fewer. These opinions correspond to the comparatively poor hunting of 1959.

The writer believes that these opinions give an indication of hunting success as experienced by individual hunters, and that good hunting is expressed as "more squirrels", while, in fact, there may actually be no more squirrels than in previous years. During each of these years, except 1959, the majority of hunters expressed a belief there were more squirrels. This, possibly, is the normal opinion of reporting hunters. The opinions bring out an interesting possibility: Are we receiving cooperation from some persons who bother to report only when hunting success is good?

SEX AND AGE RATIOS

Three hundred and ninety-one fox squirrels were aged in 1957 by examination of leg bones. Of these, 56.0 percent were juveniles (Table 2). Of 33 gray squirrels aged, 57.6 percent were juveniles. With the added cooperation of Conservation Officers in 1958 and 1959 a greater number of leg bones were submitted for examination. Of 1,015 fox squirrels aged in 1958, 51.6 percent were juveniles. Of 251 grays, 52.6 percent were juveniles. In 1959, 50.1 percent of 1,053 fox squirrels were juveniles with 48.4 percent of 157 grays classified as juveniles. Production in 1959, therefore, was the poorest on record (Table 3).

The average fall juvenile population over a 10-yaar period has been 54.8 percent for fox squirrels and 55.4 percent for grays (Table 3). Leg bone analysis of squirrels from the driftless area, where hunting was especially poor in 1959, indicated especially poor production in that area.

Male fox squirrels have always outnumbered females in the bag as reports by hunters (Table 3). The 10-year average sex ratio gives 54.2 percent males. Only in 1959 did female gray squirrels outnumber the males. In other years males were more commonly bagged. For gray squirrels the average bag over a 10-year period was 53.1 percent males.

Gray squirrels comprised 16.9, 15.1 and 14.8 percent, respectively, of the bag for the three seasons. Gray squirrels have always been in the minority of squirrels taken in Iowa. Only in the driftless area and southern loess are they especially significant in the bags of hunters. Many portions of Iowa are devoid of gray squirrel populations.

Miscellany

For the 1957 through 1959 seasons respectively, 415, 407, and 408 prospective cooperators were contacted. Of these, 47, 57, and 52 returns were received for percentages of 11.4, 14.0, and 12.5. Total hunting trips recorded were 303 in 1957, 356 in 1958, and 299 in 1959.

During the three seasons 112 hunters reported using .22 caliber rifles, 13 used .410 shotguns, 12 used 12 gauge shotguns, and 21 used other weapons. The writer does not believe these figures to be truly representative of squirrel hunters in Iowa. Probably the cooperators of this project represent the better and more specialized squirrel hunters who tend to use .22 caliber rifles more than normal.

Table 1. Statewide success of squirrel hunters: 1957 through 1959 seasons.

Area	Season	Hours of Hunting #/	Squirrels Killed Fox	Squirrels Killed Gray	Squirrels Killed Per hour	Squirrels seen/hr*/
Missouri Loess	1957	199¼	188		0.94	1.93
	1958	168 3/4	164		0.98	2.05
	1959	171¼	163		0.95	2.01
Wisconsin Drift	1957	63	70		1.11	2.79
	1958	193	168		0.87	1.65
	1959	160 3/4	121		0.75	1.87
Iowan Drift	1957	207½	109	7	0.56	1.19
	1958	322	219	49	0.83	2.21
	1959	277½	164	32	0.71	1.83
Driftless Area	1957	310	123	103	0.73	1.47
	1958	366½	195	122	0.86	1.84
	1959	248½	46	53	0.40	0.89
Mississippi Loess	1957	295	217	8	0.76	1.93
	1958	186½	116		0.62	1.75
	1959	295½	199		0.67	1.79
Southern Loess	1957	223½	128	52	0.81	2.35
	1958	262 3/4	231	23	0.97	1.95
	1959	167	79	49	0.77	2.48
Statewide	1957	1,298¾	835	170	0.77	1.82
	1958	1,499½	1,093	194	0.86	1.93
	1959	1,320½	772	134	0.69	1.76

#/ Hours of hunting means man hours recorded
*/ Squirrels seen includes all those observed, killed, or crippled while hunting.

Table 2. Age ratios of squirrels: 1957 through 1959 seasons.

Area	FOX SQUIRRELS						GRAY SQUIRRELS					
	Total Examined			Percent Juveniles			Total Examined			Percent Juveniles		
	1957	1958	1959	1957	1958	1959	1957	1958	1959	1957	1958	1959
Missouri Loess	73	172	120	54.8	52.9	44.2		1	2		00.0	50.0
Wisconsin Drift	57	112	89	54.4	52.7	59.6	8			62.5		
Iowan Drift	111	150	161	59.5	54.0	52.8	8	24	29	50.0	58.3	55.1
Driftless Area	3	169	104	33.3	62.7	42.3	9	197	104	66.7	51.3	44.2
Mississippi Loess	95	127	225	54.7	45.7	57.8			2			00.0
Southern Loess	52	239	347	55.8	42.3	46.4	8	29	20	50.0	58.6	65.0
Statewide	391	1,015	1,053	56.0	51.6	50.1	33	251	157	57.6	52.6	48.4

Table 3. Sex and age ratios of squirrels in Iowa for 10 recent seasons.

Season	Percent Males		Percent Juveniles	
	Fox	Gray	Fox	Gray
1950	56.6	53.2	57.2	54.0
1951	54.3	52.7	52.5	50.9
1952	53.7	53.6	56.4	38.1
1953	53.3	63.0	59.0	59.4
1954	55.9	56.9	53.2	48.6
1955	55.3	51.5	55.9	78.3
1956	52.5	51.3	56.1	65.7
1957	53.5	52.4	56.0	57.6
1958	51.9	50.7	51.6	52.6
1959	55.4	46.0	50.1	48.4
10-year Average	54.2	53.1	54.8	55.4

FORTY-ACRE METHOD OF COLLECTION 1960 DATA ON IOWA QUAIL

by
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During the past 5 years the 40-acre method of gathering information on Iowa quail was used to determine the percentage of 40-acre fields occupied. It is an objective means of gathering data on which to base forecasts of hunting success. These data represent the fairly good populations of 1956, 1957 and 1959 as well as the good populations of 1958 and the low of 1960. Minor variations may not be important to management or to hunters. Major variations in the number of quail are important, either from year to year or over a long period of years.

This report covers the data gathered during the three types of seasons mentioned (fairly good, good, low) and attention is given to various aspects of changes indicated in the fall and winter quail population. Later the data can be used in calculating effects of hunting when the quail numbers are low. The method used to collect the information and the results of this project are discussed below.

METHOD

The 40-acre method of determining percentage of occupancy by quail is fully described by Kozicky, Jessen, Hendrickson and Speaker (1956). It is based on field work to determine whether statistically selected fields are occupied by quail.

Areas were classified by examining aerial photographs available in ASC offices. These areas were classed as: A, the best quail habitat; B, second rate habitat, and C, poor habitat.

The work was carried out in 10 southern Iowa counties. Quail were reported present on an area when the officer saw quail or if there was evidence of their presence. Two of each cover type (A, B and C) were assigned in each county sampled. One 40 of each classification had been checked in a previous year while one of each was newly selected in 1960.

Each officer taking part received a set of instructions and 12 data sheets. Six of these were to be filled out and retained while the other six were to be filled out and returned to the Des Moines office. Each sheet had spaces for three types of information. In the first spaces the biologist wrote the necessary description of the 40 and its classification. Following this were spaces for entering information on temperature and precipitation. Part Two called for information from the farm operator; this included data on quail observed and their age (adult, young, or unknown). In Part Three the name of the checker was entered together with the time the check was begun. Next, spaces were provided for entering data on quail seen, sign noted, and whether quail were heard. Temperature was recorded at the end of the check. A place was provided for entering the classification of the area if it varied from the original A, B or C rating.

RESULTS

Conditions Reported During the 1960 Check Period

In 1960 an extensive decrease in occupied areas were indicated when 10 counties were censused by this method. Fifty-seven selected 40-acre fields were covered by officers and by the biologist. The work was done in the following counties: Appanoose, Clarke, Davis, Henry, Jefferson, Taylor, Union, Wapello and Wayne.

Earliest count was completed on October 19. Thirty-eight were completed in October, seven in November, eight in December and four in January. Late counts were due to loss of original records or to misunderstanding concerning the deadline.

In two instances there was rainfall during the period 48 hours previous to the count. Most of the work was performed when the temperature was between 20° F. and 60° F. Two counts were made when the temperature was between 10° and 20° F. and two were made when temperature was 70° to 80° F. Dew was present when 12 counts were made. Seven areas were reclassified after the checker completed his task and found that the assigned A, B or C rating was now incorrect.

Reports from Farm Operators

The 1960 check included interview with farmers using the land which was checked (Table 1). Fifty-two percent of these men reported a decrease in the quail seen compared to the same period in 1959. One farmer saw four adult quail. No one saw young birds, while 12 said they had seen birds of unknown age on the 40 concerned. Forty-four indicated they did not believe there were quail on the areas chosen for the census.

Observations by Officers and Biologist

Examination of an area was discontinued when quail or sign were found. In 1960, 21 quail were seen, while in 1959 the checkers counted 179. Occupancy, indicated by officers' observations, was 39 percent under that for 1959 (Table 1). (In this case, occupancy was determined by sighting quail, or by signs which included droppings, feathers, tracks, etc.)

After reclassification of areas, the number visited in each category was 19 in the A class, 17 in the B class and 21 in the C class. A total of 46 hours was required for the 1960 checks. The most time reported spent in one field was 2 hours and 30 minutes. Average time per 40 was 0.8 hour. Majority of work was carried on between 9 a.m. and 2 p.m. Earliest count was begun at 6:45 a.m. and the latest at 4 p.m. Earliest completion time was 7 a.m. Latest finishing hour was 5 p.m. Working time was fairly well distributed throughout the indicated period.

Results Since 1956

Officers' and biologists' counts indicated that during the 5 years the highest percentage of occupany of 40-acre fields was 64 percent while the lowest was 39 percent in 1960. (Table 2). During this 5-year period some of

the officers checked two counties each, but in 1960 each officer concerned was asked to complete only one county (six 40-acre fields).

While counts were originally taken during late summer, it was believed that more benefit would accrue if the counts were delayed until some of the heaviest vegetation was thinned by freezing and by corn and bean harvest.

In 1956, fifty-three percent of areas were occupied by quail. The following counties were checked: Appanoose, Clarke, Davis, Decatur, Henry, Jefferson, Monroe, Ringgold, Taylor, Union, Van Buren, Wapello and Wayne. Since 1956 several counts were made each fall. Thus we had supplemental data for comparison with other findings when the slump came in 1960. The same seven counties were censused in 1959 and in 1960 (Table 4), and, in addition, other counties were included. Occupancy decreased from 64 percent in 1959 to 39 percent in 1960 (Table 2).

Quail Population Indicated in 1958, 1959 and 1960

Officers' counts indicated 64 percent occupancy of all classes of areas in 1958, the rate was 64 percent in 1959 and 39 percent in 1960 (Table 2). In order to compare various aspects of these seasons so that full importance of the fall counts on 40-acre areas can be better understood, it is pointed out that the 1957-1958 winter was favorable for survival of quail. An early spring encouraged nesting, and summer counts of whistling cock quail revealed a high number of males. During the period required for the 40-acre count the checkers reported seeing 164 quail plus three coveys or a total of about 200 quail.

In the 1959 season, weather was average, that is the winter was not unduly harsh, spring was moderate, and the number of calling quail was high. Production was fairly good and checkers saw 179 quail.

The year 1960 began with storms, cold and snowfall. The winter lasted until April. Spring weather ranged from cool to cold. The number of whistling quail was low. Hunting was poor. All this was reflected in the 40-acre count when only 21 quail were seen.

SUMMARY

1. The 40-acre method of obtaining data on quail has been conducted in Iowa since 1956.

2. The census is based on percentage of occupancy of statistically selected fields.

3. Percentage of occupancy of selected 40-acre fields of all classes was 64 percent in 1959 compared to 39 percent in 1960.

4. In the best (A grade) areas the occupancy was 84 percent in 1959 compared to 63 percent in 1960.

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Tables for the 40-acre Method of Collecting 1960 Iowa Quail Data

Table 1. Results of Checks and Interviews

	OFFICER OBSERVATION					FARMER REPORT				
Year	1956	1957	1958	1959	1960	1956	1957	1958	1959	1960
Total Areas Occupied	41	18	30	29	22	22	10	16	22	13
Total Not Occupied	36	10	17	21	35	42	17	28	24	44
A Type Areas Occupied	17	7	17	11	12	10	3	7	12	8
B " " "	13	9	8	13	9	7	6	5	8	4
C " " "	11	2	5	5	1	7	1	3	2	1
A Type Unoccupied	6	2	3	2	7	10	5	11	2	11
B " "	15	2	6	2	8	16	5	6	7	13
C " "	17	6	9	12	20	16	7	11	15	20

Table 2. Percentage of Areas Found Occupied by Checkers and Reported Occupied by Farmers.

Date	Origin of Report	Total Areas Checked	% of Occupancy
1956	Officer	78	53
	Farmer		34
1957	Officer	30	64
	Farmer		37
1958	Officer	48	64
	Farmer		36
1959	Officer	48	64
	Farmer		48
1960	Officer	57	39
	Farmer		23

Table 3. Percentage of Occupancy of Classified Areas (Officer County Only)

Year	1956	1957	1958	1959	1960
% Class A Areas Occupied	74	78	85	84	63
% Class B Areas Occupied	46	82	60	15	53
% Class C Araas Occupied	40	25	36	29	05

Table 4. Seven Counties Checked in October and November 1959 and 1960.

Year	1959	1960	1959	1960
County	No. Checked		No. Occupied	
Clarke	6	6	3	1
Davis	6	6	6	3
Jefferson	6	6	6	3
Henry	6	6	2	2
Monroe	6	3	2	1
Taylor	6	6	3	3
Wayne	6	4	5	0
Totals	42	37	27	13

PHEASANT NESTING SUCCESS IN ROADSIDE COVER FRANKLIN COUNTY, IOWA

by
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Safe nesting cover is becoming a critical problem for pheasants in the intensively farmed areas of Iowa. Complete nesting studies by the Cooperative Wildlife Research Unit have shown the importance of chick production in small grain fields, but Iowa's oats acreage has decreased over 30 percent in the past ten years. These studies and work in neighboring states also indicated the importance of roadsides as nesting cover and in the production of young. As our small grain acreage is reduced, the roadsides become more important as nesting sites for hen pheasants.

The primary objective of the roadside study was to collect additional information concerning the use and value of roadside nesting cover. Iowa's system of secondary roads is extensive and proper management of this sizable and well distributed cover type could be a very important addition to Iowa's upland game program.

The study area occupies nine sections in the southeast corner of Wisner Township, Franklin County. The topography is level to very gently rolling and 95 percent of the land is intensively farmed. Clarion loam is the most extensive soil type, with Webster soils in the flat or depressed areas. In 1959, 60 percent of the area was planted to corn and soybeans, 18.5 percent oats, 9.4 percent hay and 6.6 percent was in pasture.

Roadsides occupied less than 1.5 percent of the total acreage. Each mile contained slightly more than four acres of nesting cover for a total of 72 acres. Ground cover varied from sparse to heavy, but was generally light during the initial search for nests.

Counts during the winter of 1960 indicated a population of 18 cocks and 54 hens per section. These birds were well distributed as they were found in 17 of the 25 farm groves on the area.

Four search plots were selected at random around each section or a total of 36 one-quarter mile plots. These areas were thoroughly searched for nests during the period of May 20-31 and again the last week in June. Each active nest was checked at least twice a week until hatched or destroyed.

A total of 24 pheasant nests was found including four which has recently been destroyed by predators, one accidentally destroyed by the observer, and one by burning. Of the remaining 18 nests, 8 (33 percent of all nests) hatched and 9 were destroyed by predators. One nest was abandoned. Of the 84 eggs checked in the successful nests, 74 hatched, 7 contained dead embryos and 3 were infertile.

Nest establishment along the roadsides began the first week of May and reached a peak during the third week. Nest destruction by predators was most serious during the last week of May. Only one nest was destroyed by predators after the first week of June.

Results indicated a high density of nests along Iowa's secondary roads. It was estimated that 5.3 nests were established per mile of roadside or an average of one nest per 0.7 acres. These nests produced 16.4 chicks per mile for an estimated 296 chicks hatched along roadsides on the nine sections of farmland.

This study will continue in 1961 and should be expanded to include intensively farmed areas in other districts of the state. Most counties have at least 1000 miles of secondary roads which should not be mowed or sprayed until these early nests have hatched.

RESULTS OF THE 1960 BOW SEASON FOR DEER

by
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INTRODUCTION

Resident Iowa bow hunters were permitted to participate in the 1960 deer season for the eighth consecutive year. Hunting was allowed on a statewide basis during the 44-day season which extended from October 15 through November 27. Shooting hours and other regulations were unchanged from these governing the 1959 bow season for deer.

All licensed bow hunters were required to submit a hunt report card from which the data presented in this report were obtained.

Results

Card Returns

A total of 1,772 bow permits were issued for the bow portion of the 1960 deer season. Hunt reports were filed by 1,705 of the permitees for a 96.2 percent return. It was, however, necessary to send a reminder letter to over 700 of the license holders to secure their hunt report.

Forty-three bow permit holders said they did not hunt during the 1960 season. These were subtracted from the total number of permit holders in the calculation of hunter success, etc. It is further assumed that the 67 license holders who failed to submit hunt reports did, nowever, take part in the 1960 deer season. This would leave a total of 1,729 bow hunters who presumably took part in the recent deer season.

Total Kill and Hunter Success Ratio

Iowa bow hunters enjoyed a very successful deer season in 1960 with a total reported kill of 277 deer. A hunter success ratio of 16.0 percent was obtained which is almost as great as the 16.2 percent success ratio in 1959. Total kills and hunter success ratios for the eight years Iowa has held a deer season may be found in Table 1.

Top Counties

The nine top counties, as determined by the number of deer harvested, are given in Table 2. Thirty-four percent of the total kill came from these counties which comprise only 9.9 percent of the 99 counties in Iowa. In 1959, 40 percent of the deer harvested by bow hunters came from the top nine counties. Hunters in the top nine counties had a hunter success ratio of 18.6 percent compared to the statewide average of 16.0 percent.

The 1960 bow-kill and the number of hunters hunting in each county are indicated in Figure 1. A hunter success ratio may be computed for each county from the data included in Figure 1.

Hours of Hunting and Hours of Hunting Per deer Harvested

The 1,729 bow hunters who reported they hunted during the 1960 deer season

spent 86,213 hours engaged intheir sport. All hunters averaged 49.8 hours of hunting, with the 277 successful hunters averaging 56.3 hours and the unsuccessful 48.6 hours.

During the 1960 bow season, 311 hours of hunting were required for each deer bagged. This is somewhat greater than the 252 hours of hunting per deer bagged in 1959, but is considerably less than the time required in previous years (Table 1).

Deer Observed

Bow hunters reportedly sighted 23,674 deer while hunting, or an average of 13.1 deer observed per hunter during the course of the season. These deer were seen at a rate of 0.27 deer per hour; this compares quite favorably with the same figure for different years bow seasons have been held in Iowa (Table 1). It required an average of 3.8 hours of hunting to sight a deer during the 1960 season.

Successful bow hunters observed an average of 19.1 deer during the season compared to 12.6 deer sighted by the unsuccessful hunters for the same period.

Sex and Age Ratios of Harvested Deer

The deer harvested, as reported by the bow hunters, consisted of 196 bucks and 78 does for a sex ratio of 251 males:100 femals. These data indicate that Iowa bow hunters are apparently selective and prefer to bag a buck over a doe. This has also been the case in our other bow seasons for deer.

Bow hunters said they harvested 215 adult deer and 60 fawns for an age ratio of about 28 fawns:100 adults. A selectivity toward adult deer is apparently practiced by the bow hunters.

Time of Day and Portion of Season Deer Were Harvested

Bow hunters reported taking 48.5 percent of their deer during the morning period from 0630 hours to 1200 hours, and 51.5 percent from 1200 hours to 1730 hours. Essentially, it amounts to about 50 percent being killed in each of the two periods which has been the situation in the past also.

The 44-day season was divided into three periods of as nearly equal length as possible: October 15-29, October 30-November 13, and November 14-27. The first two period contained five week-end days (Saturdays and Sundays), while the third period had four such days. A breakdown of the kill, by period, is given in Table 3.

Deer Hit but not Retrieved

Hunters were asked whether they hit, but did not retrieve any deer during the 1960 season. A total of 196 (11.3 percent) of the bow hunters reported they had hit, but failed to retrieve at least one deer. It should be realized also that (1) all deer which are hit do not die and (2) some wounded deer are recovered by other hunters. In view of this, I do not believe the wounding losses due to bow hunting are too excessive or important.

Hunter Experience

All hunters were asked to indicate how many years they had hunted deer in Iowa previous to the 1960 season. This type of question is, of course,

subject to memory bias, but it is assumed that this bias operates equally in both successful and unsuccessful hunters.

Collectively, Iowa bow hunters averaged 1.9 years of hunting experience in Iowa prior to the recent season. Unsuccessful hunters averaged 1.4 years of experience, while the successful hunters had 2.6 years of experience.

DISCUSSION

The number of bow permits issued in 1960, 1,772, was only slightly greater than the 1,627 issued in 1959. It was thought that the increase in the length of the bow season would encourage more sportsmen to participate in bow hunting for deer, but apparently it did not have that effect. If this sport is to expand, it will probably do so only when clubs composed of bow enthusiasts are formed. Formation of such groups seems to greatly stimulate more active participation by its members and encourage converts to join in the sport.

Bow hunting does make good recreational use of our limited deer resources. As an example of this, it required 311 hours of bow hunting to reduce each deer harvested in 1960 to possession, with bow hunters spending over 86,000 hours engaged in their sport. Even though the 1960 bow season was about one-third longer than the previous year, the number of deer harvested by bow hunters was not appreciably greater.

On a strictly biological basis a longer season could be granted for bow hunting. However, I feel that for purely psychological reasons, there should be an interval of one or two weeks between the end of the bow portion of the deer season and the beginning of the shotgun portion. We have been very fortunate in Iowa in avoiding most of the conflicts between bow hunters and gun hunters, and I feel that the interval of time we have allowed between the two types of seasons has been of primary importance in averting these conflicts. Any future plans to increase the length of the bow season should take this, as well as the biological aspects, into consideration before allowing such an increase.

SUMMARY

1. The eight consecutive bow season for deer was 44 days in length and was held from October 15 through November 27, 1960. The season was statewide in scope.

2. Bow permits were issued to 1,772 applicants; of this number 1,729 participated in the season and harvested 277 deer for a hunter success ratio of 16.0 percent.

3. Bow hunters reportedly spent 86,213 hours hunting, for an average of 49.8 hours. It required 311 hours of hunting to reduce a deer to possession in the 1960 bow season.

4. The hunters reported sighting 23,674 deer for an average of 13.1 deer observed per hunter during the course of the season. These deer were sighted at the rate of 0.27 deer per hour, or about one deer for every 3.8 hours of hunting.

5. A sex ratio of 251 males:100 females and an age ratio of 28 fawns; 100 adults were reported by the bow hunters when indicating the sex and age of the deer they harvested. This indicates that bow hunters are apparently selective toward adult bucks.

6. Bow hunters shot 48.5 percent of their deer during the morning period and 51.5 during the afternoon period.

7. The 44-day season was divided into three periods of approximately equal length. Bow hunters killed 15.3 percent of their deer during the first period, 33.0 percent during the second, and 51.7 percent during the third.

8. Deer were wounded by 196 or 11.3 percent of the bow hunters. These hunters reportedly wounded 227 deer.

9. Iowa bow hunters averaged 1.9 years of experience prior to the 1960 deer season, with the successful hunters averaging 2.6 years of experience and the unsuccessful hunters averaging 1.4 years.

Table 1. Summary of Data from Bow seasons for Deer, Iowa, 1953-1960

Item	YEAR							
	1953	1954 1/	1955	1956 2/	1957	1958	1959	1960
Number of Permits Issued	10	92	414	1,280	1,228	1,380	1,627	1,772
Deer Kill	1	10	58	117	138	162	255	277
Hunter Success Ratio (%)	10.0	10.9	14.0	9.1	11.4	12.4	16.2	16.0
Hours Hunted/Deer Bagged	---	---	---	432	370	363	252	311
Deer Observed/Hour Hunted	---	---	---	0.12	0.29	0.34	0.33	0.27
Length of Season (Days)	5	12	23	31	31	30	31	44

1/ first extended bow season for deer
2/ first year a special permit was required to hunt deer with bow and arrow.

Table 2. Counties reporting seven or more deer killed by bow hunters and the number of hunters hunting in each, Iowa, 1960

County	Number of Deer Killed	Number of Hunters
Pottawattamie	21	121
Emmet	14	38
Delaware	12	69
Woodbury	10	65
Black Hawk	9	95
Monona	8	21
Clay	7	37
Hardin	7	31
Shelby	7	28

Table 3. Deer Kill by Period, Iowa, 1960

Period	Week-End Days			Percent of Total Kill During Period
	Saturday	Sunday	Total	
October 15-29	3	2	5	15.3%
October 30-November 13	2	3	5	33.0%
November 14-27	2	2	4	51.7%

CONSERVATION OFFICERS' DEER KILL REPORT - 1960

by
Eldie W. Mustard
Game Biologist

Last year a total of 753 deer were reported killed by traffic, dogs, illegally, and by miscellaneous agents (Table 1). As in previous years, traffic accidents claimed the majority, with 546 deer reported killed in deer-traffic accidents (Table 2).

Damages to the vehicles involved in 334 of these accidents were reported and amounted to $37,155.50, or an average of $111.24 for each accident.

As shown in Table 3 the number of dead deer reported has been increasing for the past several years. This may be because the deer population is increasing, but such factors as super-highways, faster automobiles, and more automobiles, to name a few, cannot be discounted as having a direct bearing on the increase in deer-traffic accidents.

It can be pointed out that the number of deer reported killed closely parrallels the trend of the deer population as it has been reported annually by the Conservation Officers. However, these same officers also report the dead deer found in their territories, and the number of these deer reported may greatly influence the annual population estimates, thus the population trend. In effect, these two reports are not independent in that the number of dead deer found may or may not influence the population estimates.

As in previous years, a spring peak and a fall peak in the number of deer killed can be noted. Both peaks are probably associated with the reproductive activities of the deer, i.e., fawning in the spring and breeding in the fall.

The loss of 753 deer is a great recreational loss to the people of Iowa. In 1960 Iowa bow hunters harvested 277 deer and hunted an average of 311 hours for each deer bagged. Just the traffic-killed deer alone equaled twice the number of deer harvested by the bow hunters.

What can be done to reduce these losses? The Conservation Commission has suggested that deer crossing signs be placed near areas where deer-traffic accidents happen each year. Some have said, however, that deer crossing signs would create additional hazards because people would slow down and look for deer.

Practically speaking, it would seem that the purpose of the signs would be to make people slow down and look for deer.

Mr. E. T. Rose, Chief, Division of Fish and Game, has suggested that the signs be constructed with a material which would show only when illuminated by the headlights of a car. As most deer-auto accidents occur during the hours when most drivers are using their headlights, this seemingly novel idea would have some merit and should be considered. At any rate, we should somehow warn the drivers that a dangerous situation exists so they can be prepared when a deer jumps in front of their vehicle.

Table 1. Conservation Officers' 1960 Deer Kill Report

County	Dog	Traffic 1/	Illegal	Misc. 2/	Total	Auto Damage and No. Autos Involved
1. Adair		1			1	$ 50.00 (1)
2. Adams						
3. Allamakee						
4. Appanoose	2	6			8	290.00 (6)
5. Audubon		4		1	5	550.00 (4)
6. Benton		1	5	2	8	150.00 (1)
7. Black Hawk		6		1	7	75.00 (2)
8. Boone		6	1	2	9	2.50 (2)
9. Bremer	1	8			9	670.00 (7)
10. Buchanan		2	1		3	310.00 (2)
11. Buena Vista		2		2	4	50.00 (1)
12. Butler		2			2	170.00 (2)
13. Calhoun						
14. Carroll		3	2	1	6	70.00 (3)
15. Cass		13			13	1,125.00 (10)
16. Cedar						
17. Cerro Gordo		8		1	9	350.00 (5)
18. Cherokee		10	1	1	12	605.00 (6)
19. Chickasaw		1	1	2	4	5.00 (1)
20. Clarke	1	10		3	14	505.00 (7)
21. Clay		2		1	3	00.00 (1)
22. Clayton		9			9	105.00 (1)
23. Clinton		1	1	1	3	150.00 (1)
24. Crawford		2	3		5	
25. Dallas		8	1		9	965.00 (7)
26. Davis		3	1		4	350.00 (2)
27. Decatur		13		1	14	1,145.00 (9)
28. Delaware		4	1	1	6	90.00 (4)
29. Des Moines		5		3	8	355.00 (6)
30. Dickinson						
31. Dubuque		11		2	13	695.00 (7)
32. Emmet		6	3	4	13	550.00 (3)
33. Fayette		10	2	9	21	170.00 (5)
34. Floyd		4		2	6	325.00 (4)
35. Franklin		2	1		3	50.00 (1)
36. Fremont		4			4	50.00 (3)
37. Greene		8	1	2	11	635.00 (4)
38. Grundy						
39. Guthrie		2	1		3	250.00 (2)
40. Hamilton		4	1	2	7	525.00 (4)
41. Hancock		4			4	
42. Hardin		5	1	1	7	100.00 (2)
43. Harrison						
44. Henry		2			2	140.00 (2)
45. Howard		6		1	7	350.00 (5)
46. Humboldt				3	3	
47. Ida		4		1	5	180.00 (3)
48. Iowa		10	1		11	1,600.00 (7)
49. Jackson		4			4	400.00 (3)
50. Jasper		4			4	300.00 (1)

Table 1. Conservation Officers' 1960 Deer Kill Report (Con't)

County	Dog	Traffic	Illegal	Misc.	Total	Auto Damage and No.Autos Involved
51. Jefferson		3			3	$1,320.00 (3)
52. Johnson		9		2	11	300.00 (4)
53. Jones		3			3	100.00 (2)
54. Keokuk	2	3	3		9	470.00 (4)
55. Kossuth		6	2		8	500.00 (4)
56. Lee		10		1	11	850.00 (9)
57. Linn		3		1	4	130.00 (3)
58. Louisa		3	1	2	5	
59. Lucas	1	10		1	12	875.00 (8)
60. Lyon		7		3	10	265.00 (4)
61. Madison	1	11		3	15	1,215.00 (8)
62. Mahaska		8	1		9	675.00 (5)
63. Marion		5	1		6	775.00 (4)
64. Marshall		5			5	750.00 (5)
65. Mills		18	2	2	22	1,115.00 (15)
66. Mitchell		3	1	5	9	350.00 (3)
67. Monona		9	1		10	550.00 (2)
68. Monroe	2	2		1	5	450.00 (2)
69. Montgomery		5	1	4	10	275.00 (5)
70. Muscatine		7	3	1	11	275.00 (5)
71. O'Brien		1			1	000.00 (1)
72. Osceola		3		1	4	
73. Page		1			1	15.00 (1)
74. Palo Alto		1		4	5	50.00 (1)
75. Plymouth		30		4	34	1,190.00 (14)
76. Pocahontas						
77. Polk		28		2	30	1,125.00 (9)
78. Pottawattamie		22	2	1	25	300.00 (1)
79. Poweshiek						
80. Ringgold		2	2		4	128.00 (2)
81. Sac		1	2	1	4	50.00 (1)
82. Scott		3	1	1	5	
83. Shelby		1			1	50.00 (1)
84. Sioux		8		5	13	695.00 (3)
85. Story		7			7	725.00 (5)
86. Tama		8	12	1	21	1,250.00 (6)
87. Taylor						
88. Union		7			7	515.00 (5)
89. Van Buren		2	4	2	8	10.00 (1)
90. Wapello				4	4	
91. Warren		15	2	4	21	1,090.00 (8)
92. Washington		4		3	7	555.00 (2)
93. Wayne		1			1	200.00 (1)
94. Webster		4			4	150.00 (1)
95. Winnebago		4	1	2	7	125.00 (2)
96. Winneshiek	1	13			14	1,335.00 (10)
97. Woodbury	1	26	5	3	35	1,750.00 (15)
98. Worth		1		3	4	
99. Wright		3		2	5	150.00 (2)
Totals	12	546	76	119	753	$37,155.50 (334)

1/ Includes auto, truck, and train-caused fatalities

2/ Includes fatalities, caused by farm operations, wounding during hunting season, deer caught in fences, unknown, etc.

Table 2. Reported Deer Deaths By Month and Cause, Iowa, 1960.

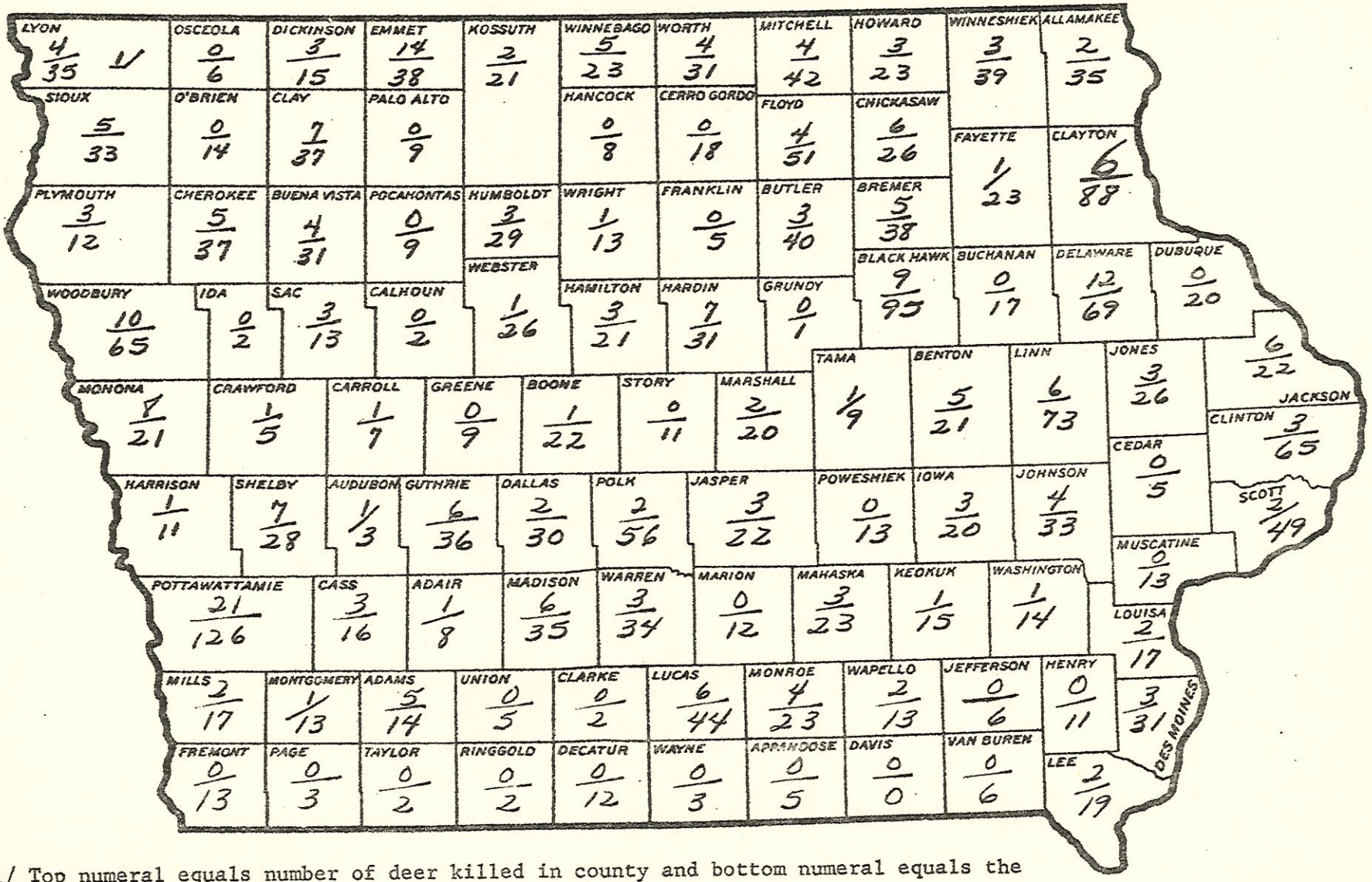
Month	Dog	Traffic 1/	Illegal	Misc. 2/	Total
January	1	18	6	3	28
February	0	21	7	1	29
March	5	19	4	1	29
April	0	41	0	11	52
May	1	63	1	9	74
June	1	30	0	11	42
July	2	18	2	5	27
August	1	25	1	1	28
September	0	33	3	2	38
October	0	65	3	8	76
November	1	154	13	19	187
December	0	58	18	53	129
Unknown			14		
Totals	12	546	76	119	753

1/ Includes auto, trucks, and train-caused fatalities.

2/ Includes fatalities caused by farm operations, wounding during legal hunting season, deer caught in fences, unknown, etc.

Table 3. Reported Dead Deer, Iowa, 1951-1960.

Year	Total Reported
1951	192
1952	256
1953	393
1954	310
1955	306
1956	419
1957	345
1958	438
1959	508
1960	753
TOTAL	3,920



1/ Top numeral equals number of deer killed in county and bottom numeral equals the number of hunters who reported hunting in the county.

$$\text{Hunter Success Ratio} = \frac{\text{Number of Deer Killed}}{\text{Number of Hunters}}$$

Figure 1. Number of deer killed and number of hunters reporting hunting in each county as reported from bow hunter card reports, Iowa, 1960.