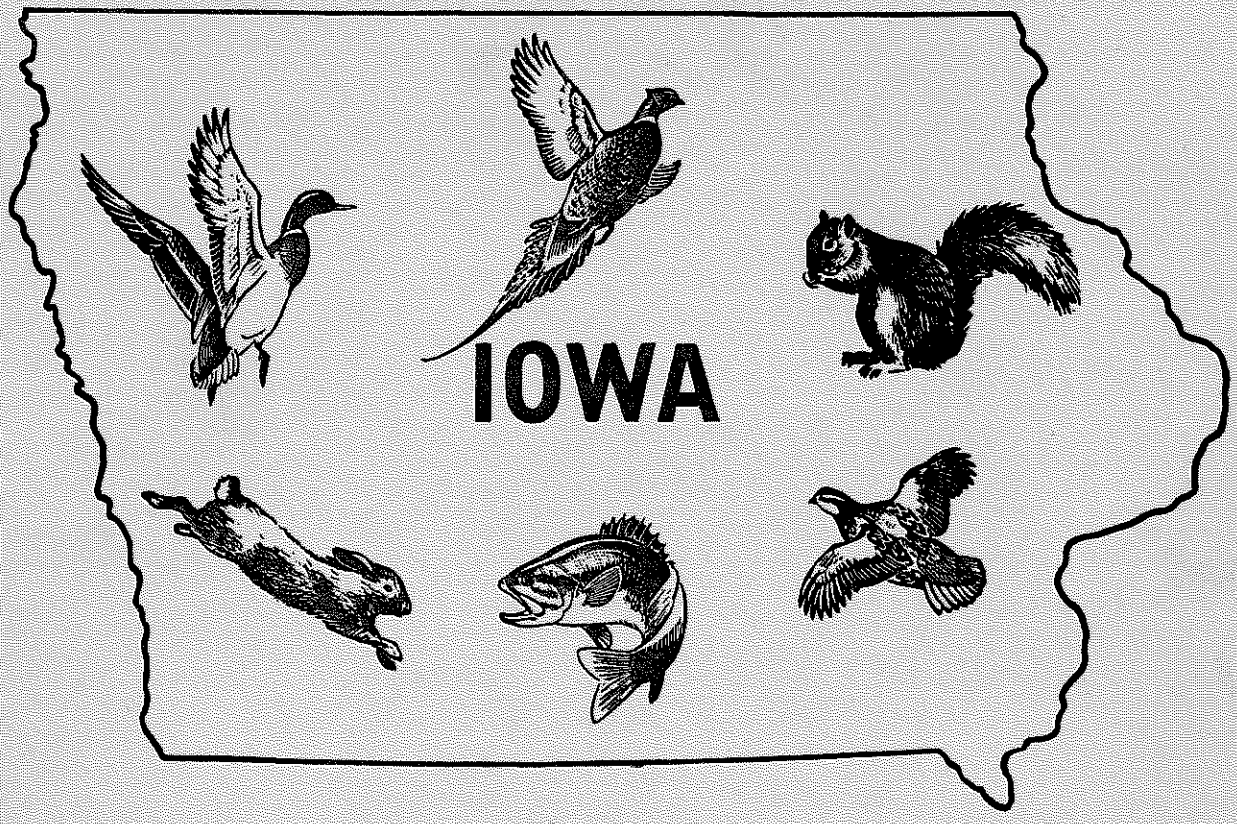
1956

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

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THE 1956 QUAIL SEASON

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Some features of each quail hunting season are similar to those of other seasons and in order to always have on hand sufficient reference material to make comparisons, pertinent data are recorded in the form of reports. Herein is contained a summary of information gathered up to the time that work began on this paper. Comparisons are also made with the success of quail hunters during some previous seasons. Other significant data gathered from the collection of quail wings will appear in a later report.

On Saturday, November 8, 1956, the quail season opened in 63 counties. In 48 of these it lasted for 44 days and closed on December 15, while in another 15 counties the season lasted for 15 days. Legal shooting ended on November 17 in the short season zone.

Because of a policy inaugurated in 1954 the season opened on Saturday, but the December 15 closing date is the same as for many years; whereas, the November 17 date was changed from last year to provide for a full two weeks of hunting in the short season zone. Shooting hours were from 8:30 a.m. to 4:30 p.m. Six birds was the possession limit which was the same as the daily bag limit.

Method

Data are compiled from census cards provided the conservation officers by the Biology Section. These cards were filled out by the officers as they contacted hunters. Information sought included: Date of hunt, County hunted, Number of hunters, Whether or not a party had travelled more than 25 miles to hunt, Hours hunted by the party, and whether a dog was used. The number of coveys flushed was recorded as well as the number of quail that were bagged. Hunters were asked whether they thought the season was the same, better or poorer than in 1955. The minimum number of contacts requested from an officer was 20 for each county having a long season and ten for each county that was in the short season zone.

Results

Statewide Success.

The 324 report cards returned in 1956 indicated that the average party size was 2.3 hunters. The majority travelled less than 25 miles to hunt. The season was described as the same as 1955 by 41 per cent of the men, while 35 per cent thought it was better, and 24 per cent believed it was poorer than the previous fall. In 1955 it was indicated by 354 report cards that the average party size was 2.4, the majority of whom travelled less than 25 miles to hunt; 41 per cent thought the season was the same as the previous year, 39 per cent thought it was better and 20 per cent believed it was poorer than the previous year. Results of party hunting appear on the following Table.

Table 1. Party hunting success, 1954, 1955, 1956 quail hunting seasons.

Year	Hr. per Covey	No. Coveys Flushed	Birds Shot per Covey	Hr. per Quail	No. Quail per Trip
1954	1.8	1.9	2.7	.6	5.3
1955	1.8	1.9	2.6	.7	5.0
1956	1.5	2.3	2.3	.6	5.3

There was a decrease in the number of quail shot per covey in 1956 but this was compensated for by the flushing of more coveys per trip. This may be an indication that though there were more coveys, they were matured in experience, and readily escaped.

The hours afield per covey flushed decreased. This indicated that either there were more quail in the fields or conditions favored the hunter. The significance of the trend will be further revealed when wing samples are examined later. A comparison of the weather trends of the two years may further explain the changes.

Success per Period.

During most autumns early corn husking reduces cover by mid-November, and throughout the fall there is a progressive loss of other vegetation because of freezing weather. The hunting of 1956 and 1955 will be compared during three periods which represent advancing deterioration of cover. In 1956 during the first period which ended November 15, concealment thinned rapidly and at this time, the officers reported on a little over one-third the total number of parties interviewed during the entire season. These 125 parties hunted 462 hours, took 686 quail and spent an average of 1.5 man-hours per quail. In 1955 the success during a like period amounted to 1.7 man-hours per bird.

During the November 16 to 30 period, trees lost most of their leaves and weed collapsed. One hundred one parties were contacted who had been afield 339 party hours to get 510 quail. Gunners averaged 1.5 man-hours per quail while in 1955 they averaged 1.4 man-hours per bird bagged.

During the December 1 to 15 part of the shooting season only the woody types of cover remained. At this time an experienced hunter had little difficulty identifying the type of cover used by quail; and although shooting had by now reduced populations in most areas, 98 groups of hunters reported spending 314 party hours in search of quail and they took 529. Success was highest during this time when it took 1.3 man-hours per quail.

Hunting Success by Districts.

Highest quail populations are in the extensive brushy coverts of south-central and southeastern Iowa. During the 1956 hunting the best shooting was in these sections. In the south-central area 336 men spent 442 party hours in the field to bag 851 quail, while in the east-central portion of the range 26 men spent 28 hours taking 53 quail. In the southeast 138 men were afield 442 hours to get 395 birds.

In border counties 246 individuals hunted 428 hours to take 450 birds.

Areas ranked as follows in man-hours per quail shot: south-central Iowa, 1.2; east-central, 1.2; southeast, 1.4; while border, or low population counties reported spending 2.2 hours per bird. Gunners in general thought that in the main quail range the season was as good or better than it had been in 1955 while in border counties the opinions were about equally divided on whether the season was the same, better, or poorer than in 1955. This indicated that hunting tended to be most productive in the main range or that the most experienced men were not in border areas.

Table 2, below, gives results of hunting in various parts of the quail territory: This work as been carried out since 1950, but results below are only from 1952 to 1956.

Table 2. Hunting success in hunter hours per quail by agricultural districts, 1952 through 1956.

District	1952	1953	1954	1955	1956
South-central	1.3	1.7	1.4	1.6	1.2
Southeast	1.3	1.4	1.4	1.4	1.4
East-central	3.5	2.1	1.5	2.9	1.2
Border counties	1.8	1.8	1.8	1.9	2.2

After the first week of the season few hunters complained of scarcity. Those who kept records of past seasons thought that 1956 was one of the best in the last five.

Counties Recently Opened to Hunting of Quail.

Hunting was light in Cass, Chickasaw, Fremont, Harrison, Howard, Mills, Monona, Montgomery, Page, Pottawattamie, and Story Counties. In 1956 Fremont, Montgomery, Mills and Page counties were placed in the long season zone where hunting was legal until December 15.

A limited number of hunters took advantage of this longer shooting period.

Results of Using Dogs.

The 1956 interviews revealed that dogs were used by 250 parties made up of 576 men who spent 905 party hours to flush 662 coveys and kill 1,458 quail. Eighty per cent of interviewees used dogs while eighty-one per cent used dogs in 1955. This group spent 1.1 man-hours in the field for each bird bagged.

Those not using dogs made up 74 parties in which there were 172 men. They spent 210 party hours to flush 95 coveys and get 267 quail. This group spent 1.8 man-hours per bird. Table 3 illustrates the results of using dogs.

Table 3. Quail hunting success in hours per bird for hunters using dogs, hunters not using dogs, and for all hunters, 1953 through 1956.

Year	Hunters Using Dogs	Hunter not Using Dogs	All Hunters
1953	1.4	2.9	1.6
1954	1.5	1.7	1.5
1955	1.6	2.7	1.7
1956	1.4	2.8	1.5

Record of Selected Hunters

In 1955 an attempt was made to find a better method of sampling the take of quail. This was done experimentally by contacting hunters on certain days and only in their homes or in their places of business if they preferred.

Some advantages of this type of procedure were; it was the means of getting a sample of the success of experienced shooters, and some reasons for hunting failures could be established. Definite information was obtained on the length of time required to bag one quail, or to flush one covey.

The method was not used in 1956 because experienced men to some extent adjusted their hunting to weather conditions so that there was little variation in success. Thus the take by average hunters did not appear to be wholly reflected. Furthermore, the interviewer had the problem of reaching contacts on the day specified. In additon no practical method was found to insure uniformity of data gathering so personal bias would be avoided. For maximum usefulness data should be classified as to weather, temperature, type of cover where quail were found, experience of the dog used, and numerous other factors.

SUMMARY

1. This report is based on data from 324 quail hunter reports.

2. Of the past three seasons it took the least time to find a covey in 1956.

3. Hunting success was highest late in the season.

4. In south-central and east-central Iowa success was higher than in southeastern Iowa.

5. Not much hunting was done in southwestern Iowa counties which were placed in the long season zone in 1956 for the first time in recent years.

6. Hunters using dogs had greater success bagging quail than hunters not using dogs; but the dog owners may be more experienced hunters.

THE 1956 PHEASANT SEASON

Richard C. Nomsen

Game Biologist

The 1956 pheasant season opened Saturday noon, November 10 for 24 days in 70 counties and for 11 days in 22 southern Iowa counties. Shooting was allowed each day from noon to 4:30 P.M. and the daily bag and possession limit remained at three cock birds.

The following report includes the results of field checks by conservation officers. The cards and procedure were the same in previous years.

Hunters had to spend more time in the field to bag a bird this year than they needed in 1955. The 4,246 hunters contacted had bagged 3,600 cocks while hunting a total of 13,053 hours. Each bird bagged, therefore, required 3.6 hours of effort which was considerably above the 2.9 hours spent in 1955. Only 85 birds were checked per 100 hunters compared with 108 cocks recorded a year ago.

In addition to the birds checked last fall, 700 cocks were reported shot down but lost. This crippling loss was higher than that reported in 1955.

Cover conditions were light and normal weather prevailed for opening day. All crops had been harvested because of below normal rainfall and extremely favorable fall weather. The birds were soon well scattered and difficult to find until later in the season when several light snows forced the birds into heavy cover.

Hunting success figures from the nine agricultural districts varied considerably (Table 1). The time required to bag a bird in northcentral and northeast Iowa was much lower than for the other areas of the state and only slightly higher than in 1955. Western and southern Iowa districts showed the greatest increase in average time per bird bagged. Hunting effort expended for each rooster increased 58 per cent in northwest Iowa and 40 per cent in the westcentral district.

Table 1. Average Hunting Success by Districts 1953-1956

District	Hours per bird Bagged			
	1953	1954	1955	1956
1. Northwest	3.3	3.4	2.5	3.9
2. Northcentral	2.4	2.8	2.4	2.7
3. Northeast	2.8	2.6	.26	2.9
4. Westcentral	3.8	3.7	3.0	4.2
5. Central	5.5	7.5	3.7	4.7
6. Eastcentral	5.4	4.9	4.8	5.5
7. Southwest	2.4	2.4	3.2	4.0
8. Southcentral	3.4	3.3	2.4	3.5
9. Southeast	5.5	4.8	3.0	6.2
State Average	3.5	3.4	2.9	3.6

More hunters traveled to hunt pheasants in 1956 (Table 2). The percentage of non-local hunters increased in all parts of the state except southwest Iowa. Northeast Iowa again attracted an increased number of shooters this year and was high for the state. Non-local hunters required 3.8 hours per bird bagged compared with 3.5 for the local nimrods.

Table 2. Per Cent of Non-local Hunters - by Districts 1954 - 1956.

District	1954	1955	1956
1. Northwest	48%	32%	52%
2. Northcentral	54	48	57
3. Northeast	46	55	66
4. Westcentral	39	44	48
5. Central	59	60	64
6. Eastcentral	41	15	35
7. Southwest	67	63	58
8. Southcentral	55	48	60
9. Southeast	50	39	42
State Average	50	48	55

Only two per cent of all hunters checked were residents of other states. They spent an average of 3.6 hours for each bird - the same as for Iowa hunters.

No change was indicated in the use of dogs. One-fourth of the parties contacted used dogs and as usual their success was much better (Table 3). They averaged a bird every three hours and lost only 9 per cent of all birds shot down. Parties with dogs had taken 36 per cent more cocks at the time of contact than those without dogs.

Table 3. Comparison of Hunter Success and Birds Lost - Parties With and Without Dogs.

	With Dogs		Without Dogs	
	1955	1956	1955	1956
Hours per bird bagged	2.3	3.0	3.1	4.0
Birds in bag for each bird lost	16.5	9.6	6.5	4.3
Per cent of birds shot down and lost	6%	9%	13%	19%

Labradors and pointers were again the most popular pheasant dogs (Table 4). These two along with setters and chesapeakes lost fewer birds than the average for all dogs.

Table 4. Hunting Data Collected From Parties Using the Following Types of Dogs.

Type of Dog	Hours Hunted	Birds Bagged	Birds Shot Down and Lost	Percent of Birds Lost
Labrador	558	242	13	5.1%
Chesapeake	115	42	3	6.7%
Pointer	553	191	14	6.8%
Setter	283	86	8	8.5%
Springer Spaniel	414	153	19	11.0%

ANALYSIS OF PHEASANT AGE RATIO STUDY IN IOWA

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Presented at the Eighteenth Midwest Wildlife Conference, Lansing, Michigan - 1956

Pheasant feet were collected in Iowa during the seasons 1949-1955 for the purpose of obtaining additional information concerning reproduction success. Several aging techniques were employed and other corrections made, but, results seemed to be inconsistent and highly variable. Further study indicated that the proportion of cocks shot during the season apparently influenced the age ratio results.

Feet collected during the 1949, 1950 and 1951 seasons were aged by spur length and the age ratios adjusted for sex ratios of the brood stock. Results were just the opposite of what could be expected when compared with other reproduction surveys.

Therefore, beginning in 1952, two methods of aging were used. The legs were first classified as young or adult by spur length as during previous seasons. All legs in the 20, 21 and 22 millimeter groups were saved and also aged according to their appearance. This same procedure was followed in 1953.

The discrepancy between the two methods was much greater in 1952 (an early hatch) than in 1953 (a late hatch). A further check showed that in 1952, 59 per cent of all legs in the 21 millimeter group were classed as young by appearance compared with only 24 per cent in 1953. The figures for the 22 millimeter group were 27 and 10 per cent respectively. Therefore, it was apparent that when the legs were aged according to spur length, a higher proportion of juveniles was classed as adults following an early hatch, and as a result, lowered the age ratio. The adjusted age ratios by appearance seemed compatible with earlier reproduction counts (Table 1).

Table 1. Comparison of Age Ratios and Reproduction Success

	Reproduction Success	Adjusted Age Ratios	
Year	Young per Hen	By Spur Length	By Appearance
1952	4.3	2.2	2.8
1953	3.4	2.5	2.6

Accordingly, all feet collected during the 1954 season were classified as adult or juvenile by appearance. Reproduction studies had shown a better hatch and fall population surveys indicated a population increase which substantiated the earlier results. However, the age ratio obtained was noticeably lower. Only 2.2 young per adult appeared in the sample compared with 2.6 the previous year.

Winter sex ratio studies revealed that the percentage kill differed from year to year. During the period 1952-1954, as the proportion of cocks shot increased, the age ratios decreased (Table 2).

Reproduction was excellent in 1955 and population counts indicated a 40 per cent increase in the fall population. The adjusted age ratio increased noticeably over the results of the previous year (2.2 to 2.9) but was only slightly better than the 2.8 young per adult cock in 1952. Season regulations were the same each year.

Table 2. Comparison of Reproduction Success, Age Ratio and Percentage of Cocks Shot 1952-1955

Year	Young per Hen	Adjusted Age Ratio by Appearance	Percentage of Cocks Shot
1952	4.3	2.8	46%
1953	3.4	2.6	58%
1954	3.7	2.2	66%
1955	5.2	2.9	62%

An attempt was made with the limited data to try and determine what proportion of the cocks should have been harvested during the period 1952-1954 in order to obtain an age ratio compatible with the estimated true age ratio. Cock age ratios were calculated for each year from the young per hen figures obtained in the summer. In each case, the fall bag check age ratio was higher than the calculated figure. After comparing the two sets of ratios, it was estimated that an annual harvest of 80 per cent should have been taken in order to obtain a reasonably accurate age ratio.

It is the author's opinion that the bias caused by young birds being more easily shot than adults, and the change in percentage of harvest resulted in extreme variations of the age ratio values. Results indicated that the bias decreased as the proportion of cocks shot increased, and that the harvest necessary to obtain an accurate age ratio was influenced by the true age ratio and the size of the population. An increase in either would require an increase in the percentage kill in order to obtain comparable results.

A REPORT OF THE 1956 DEER SEASON BASED UPON DATA FROM CHECKING STATIONS

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Game Biologist

Iowa's fourth deer season in modern times was held December 8 and 9, 1956. Hunting was permitted throughout the entire state the second consecutive year. During 1953, 41½ counties were open to deer hunting; while in 1954, hunting was allowed in 51½ counties. Gun hunting regulations were unchanged except a two day season was granted instead of the three day season held in 1955.

As in past years, in order to facilitate collection of age, sex, and weight data and secure certain information from hunters, checking stations were established near locations where hunter concentrations were expected. Three stations were manned in 1956 as compared to four in 1955 and eight each in 1954 and 1953. These three were located at Lansing, Cherokee, and Hamlin. In addition to checking stations, six field checkers were stationed one each at Sioux City, Council Bluffs, Osceola, Marengo, Maquoketa, and Ruthven. Their task was to examine as many deer as possible at nearby locker plants, in the field, or wherever they could be found.

The stations were manned by members of the Biology, Federal Aid, and Game Sections. In addition, conservation officer, Charles Olofson, gathered considerable data. In all, 233 usuable reports were returned. Assistance of all personnel who participated in gathering the following information was greatly appreciated.

To facilitate comparisons between herd conditions and hunter success from various parts of Iowa, the state was divided into six areas (Figure 1). In deciding just how to divide the state to best utilize the available data, it was first assumed there might be a difference between north and south regions, and the state was divided accordingly.

The territory including the Cedar and all rivers emptying into the Mississippi northward was selected as one area. This area included all counties lying north of Muscatine and Poweshiek counties and east of Marshall and Worth counties.

Those streams draining into the Missouri on the west formed two areas. The northwest area included two columns of counties bounded on the south by Harrison and Shelby counties. The southwest area included three columns of counties bounded on the north by Monona and Crawford counties. Division of the other areas can best be seen by reference to Figure 1.

Results

Sex ratios - As Table 1 indicates, more bucks (125) than does (106) were checked. This probably represents hunter selectivity, as most hunters given a choice would probably shoot a buck before a doe. Thirty nine (50.6 percent)

of 77 fawns were females as compared to 47.5 percent female fawns in 1955, and 48 percent in 1954. Of all deer 2½ years old or older, 21 more bucks than does were examined. Even 1½ year old bucks outnumbered the does. In all, 54.1 percent of the deer examined were males. For the years 1953 through 1955 bucks comprised respectively 54.0, 58.0, and 52.4 percent of the deer checked at stations.

Age classes - Age as determined from examination of dental characteristics was obtained from 212 deer. Of these, 77 or 36.3 percent were fawns.

Table 1. Sex and Age of deer checked from six areas.

Age Class	Area 1		2		3		4		5		6		Unknown		Statewide		
	M*	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	Total
Fawn	7	9	1	-	3	3	3	2	4	5	9	13	11	7	38	39	77
1½	5	2	2	1	2	2	1	2	1	1	4	6	7	4	22	18	40
2½	6	6	2	3	3	1	1	3	2	2	12	1	9	2	35	18	53
3½	6	1	-	-	1	3	-	-	2	1	4	4	2	2	15	11	26
4½	-	5	-	-	-	-	-	1	-	-	2	1	-	-	2	7	9
5½	1	-	-	-	-	-	1	-	-	-	2	1	-	-	4	1	5
7½	-	-	-	-	-	-	-	-	-	-	2	-	-	-	2	-	2
Unknown	2	1	-	1	-	-	-	-	2	8	-	1	3	1	7	12	19
Totals	27	24	5	5	9	9	6	8	11	17	35	27	32	16	125	106	231
2½ or Older	13	12	2	3	4	4	2	4	4	3	22	7	11	4	58	37	95

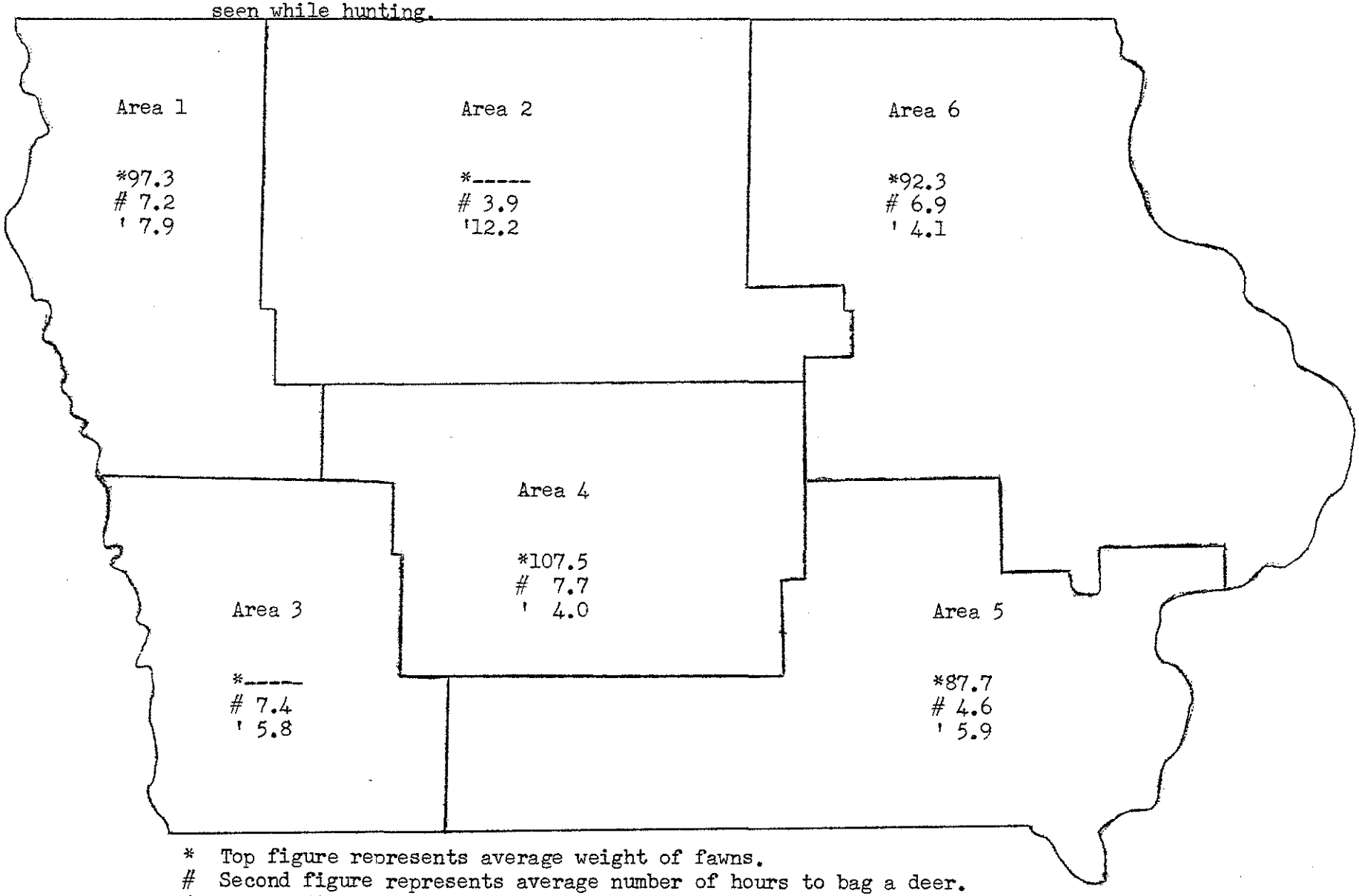
* "M" represents males; "F" represents females.

In 1955, 34.7 percent of the deer were fawns; in 1954, 41.7 percent; and in 1953, 27.4 percent of all deer were fawns. The percent of fawns indicates 57 young were produced by every 100 adult deer in 1956.

The 1½ year old age class was not nearly as large as the 2½. This descrepancy is believed due to errors in aging which arise from early replacement of the third premolars in 1½ year old deer. When the third premolar is fully erupted as sometimes happens with yearlings they can easily be mistaken for 2½ year old deer. Numbers of deer in the various age classes can be seen in Table 2.

The oldest deer examined were two at 7½ years of age. None of 6½ were examined.

Figure 1. Delineation of areas, area numbers, average weights of fawns, average number of hours to bag a deer, and number of deer seen while hunting.



* Top figure represents average weight of fawns.
\# Second figure represents average number of hours to bag a deer.
' Bottom figure represents average number of deer seen while hunting.

Table 2. Age classes of deer examined at checking stations during the 1953 through 1956 seasons.

Age Class	1953		1954		1955		1956	
	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total	Number	Percent of Total
Fawn	135	27.4	125	41.7	59	34.7	77	36.3
1½	109	22.1	58	19.7	37	21.7	40	18.9
2½	120	24.3	62	21.0	38	22.4	53	25.0
3½	65	13.4	35	11.8	24	14.1	26	12.3
4½	43	8.7	10	3.4	7	4.1	9	4.2
5½	11	2.2	4	1.4	1	0.6	5	2.3
6½	4	0.8	-	---	2	1.2	-	---
7½	4	0.8	1	0.3	2	1.2	2	0.9
8½	1	0.2	-	---	-	---	-	---
Total Number	493		300		170		212	

Body Weights - Average weights (139.2 pounds) of all deer examined compared quite closely with 1955 when they averaged 140 pounds (Table 3). The slight difference can be attributed to the larger proportion of fawns examined in 1956. Fawns averaged 92.7 pounds live weight or one pound less than in 1955. There was no difference between male and female fawns.

The calculated live weights of all bucks was 157.9 pounds as compared to 155.4 for 1955, 136.9 for 1954, and 148.2 for 1953. Does averaged 117 as compared to 122 pounds in 1955, 124.2 pounds in 1954, and 108.7 pounds in 1953. These weights do not show significant variation from 1955. However, they are well above those of 1953 when deer from overcrowded ranges may have included in average weights.

Table 3. Computed* live weights of deer based on sex and age classes for 1956 compared to 1955 average.

Age Class	Males	Females	1956 Average	1955 Average
Fawn	17#- 93	23 - 93	40 - 92.7	46 - 93.7
1½	8 - 159	14 - 130	22 - 141.0	27 - 145.0
2½	21 - 170	5 - 151	26 - 166.0	28 - 160.7
3½	8 - 212	4 - 133	12 - 185.4	16 - 196.0
4½	-- ---	5 - 151	5 - 151.0	6 - 194.1
5½	3 - 243	1 - 130	4 - 183.1	1 - 252.0
7½	1 - 151	-- ---	1 - 151.0	1 - 201.0
Unknown	4 - 194	-- ---	4 - 194.0	-- -----
Statewide Average	62 - 157.9	52 - 117.0	114 - 139.2	127 - 140.0

* Live weight in pounds was computed by multiplying hog-dressed weight by 1.272.

\# Figures preceding dashes in all cases represent the number of deer used in determination of average.

The smallest deer was a 53 pound male fawn. A 3½ year old buck taken from northwest Iowa weighed 254 pounds and was the largest examined at checking stations. Another 5½ year old buck from Allamakee county tipped the scales at 252 pounds.

Deer from Area 5 in south and southeast Iowa and Area 3 from the southwest averaged smaller than the statewide average. Fawns from Area 5 averaged 87.7 pounds, five pounds less than the state average. Weights of bucks from Areas 3 and 5 respectively 13 and 54 pounds less than the state averages. Deer from Areas 1 and 4 appeared to be larger than statewide averages. Weights of fawns can be seen on Figure 1.

Points per antler beam circumferences - On the basis of statewide average measurements yearling bucks had three points per antler (Table 4) with beam circumferences of 2.9 inches (Table 5). Bucks 2½ years old had 3.7 points per antler with beam circumferences of 3.6 inches. Bucks of 3½ years or more had five points per antler and beam circumferences of 4.7 inches. Little comparison could be made between various areas with the available data.

Table 4. Average number of points per antler for bucks of all age classes from six areas.

AGE	1	2	3	4	5	6	Un-known	State Wide
$1\frac{1}{2}$	9* -3.3	4-2.5	4-3.5	2-3.5	2-2.0	6-2.5	8-3.3	35-3.0
$2\frac{1}{2}$	11-3.5	4-3.7	6-3.7	1-2.0	4-3.8	22-3.9	15-3.7	63-3.7
$3\frac{1}{2}$	11-4.0	-----	2-5.5	-----	4-4.3	6-5.0	4-4.7	27-4.5
$4\frac{1}{2}$	------	-----	-----	-----	-----	4-6.7	-----	4-6.7
$5\frac{1}{2}$	2-5.0	-----	-----	2-6.5	-----	4-5.5	-----	8-5.6
$7\frac{1}{2}$	------	-----	-----	-----	-----	2-6.5	-----	2-6.5

* Figures preceding dashes in all cases represent the number of deer used in determination of average.

Hunter effort and success - For the two day season average successful hunter required $1\frac{1}{2}$ days to bag a deer (Table 6). Area 2 in north central Iowa varied most from this mean. Hunters from that area required 1.2 days. On an hourly basis Area 2 was again the best place to hunt as only 3.9 hours of hunting brought the average successful hunter a deer as compared to 6.5 hours statewide average (Figure 1). Hunters in Area 4 required 7.7 hours, more than any other area.

Table 5. Average antler beam circumference measurements in inches for bucks of various age classes from six areas.

Age	1	2	3	4	5	6	Un-known	State-wide
$1\frac{1}{2}$	7*-2.6	4-2.8	4-3.4	-----	-----	6-2.6	9-3.1	30-2.9
$2\frac{1}{2}$	11-2.7	4-3.0	6-3.6	-----	2-3.8	20-3.7	14-3.9	57-3.6
$3\frac{1}{2}$	11-4.5	-----	2-5.0	-----	4-4.7	2-3.9	4-4.3	23-4.5
$5\frac{1}{2}$	2-5.7	-----	-----	2-5.6	-----	4-4.7	-----	8-5.2

* Figures preceding dashes in all cases represent the number of deer used in determination of average.

Six, or 0.9 per hour, was the average number of deer seen by successful hunters over the state. However, Area 2 again was tops with 12.2 deer seen per successful hunter for the season. Fewest deer were seen in Areas 4 and 6 with 4 and 4.1 respectively seen. In Area 6 these low figures could be attributed to heavy wooded cover, and in Area 4 to a relative scarcity of deer.

Hunters fired at 1.5 deer during the season. Surprisingly enough, more deer were killed on the second day than the first. Perhaps this phenomenon attributed to bitter cold on the first day and mild temperatures for the second. Also, on the second day a good tracking snow was available in the southern two-thirds of the state. In all, 49.1 percent of the deer were killed on the opening Saturday as compared to 60.3 percent in 1955 and a three day season.

Table 6. Average hunter effort as reported by successful hunters from six areas.

AREA	Number Days Hunted	Number Hours Hunted	Number Deer Seen Before Kill	Number Deer Shot At	Per Cent Deer Killed First Day
1	44*1.5	38-7.2	37- 7.9	37-2.0	39-43.6
2	8-1.2	8-1.2	8-12.2	8-1.3	8-62.5
3	13-1.6	12-7.4	12- 5.8	12-1.3	13-38.5
4	12-1.6	12-7.7	11- 4.0	12-1.2	11-41.7
5	29-1.5	28-4.6	27- 5.9	27-1.3	28-53.6
6	55-1.5	50-6.9	49- 4.1	48-1.5	55-52.7
Unknown	5-1.0	2-5.0	2- 4.0	2-1.0	2-50.0
State Average	163-1.5	150-6.5	146- 6.0	146-1.5	157-49.1

* Figures preceding dashes in all cases represent the number of deer used in determination of average.

In 1955, 60.9 percent of all interviewed hunters killed deer in their home counties. Hunters travelled slightly more in 1956 as 57.9 percent killed deer in their home counties (Table 7). In southeast Iowa (Area 5), 79.3 percent of the hunters bagged deer in their home counties, while in Area 6 only 38.3 percent were local residents.

Table 7. Number of hunters who killed deer in their home counties.

	1	2	3	4	5	6	State Wide
Number Records	51	10	14	14	29	60	178
Percent Yes	70.6	80.0	50.0	42.8	79.3	38.3	57.9

Farmers comprised the largest occupational group as they made up 48 percent of all hunters as compared to 42 percent in 1955. Ninety-five and two-tenths percent of successful hunters reportedly shot as the first deer they saw in range. Of the guns used the 12 gauge was the most popular (79.3 percent), 16 gauge next (14 percent), and 20 gauge least popular (6.7 percent).

Summary

1. Iowa's deer season was held December 8 and 9 in 1956. Statewide hunting was permitted.

2. One hundred and twenty five (54.1 percent) of 231 deer sexed were bucks. Thirty nine (50.6 percent) of 77 fawns were females.

3. Of 212 deer aged by teeth criteria, 77 (36.3 percent) were fawns. This indicates reproduction of 57 percent for 1956. The $1\frac{1}{2}$ year age class was much smaller than the $2\frac{1}{2}$ year class. This descrepancy was believed due to errors in the aging technique.

4. Average live weights for all deer was 139.2 pounds as compared to 140 pounds for 1955. Fawns, all males, and all females weighed 92.7, 157.9, and 117 pounds respectively. Deer from southern Iowa generally weighed less than statewide averages.

5. Number of points per antler for $1\frac{1}{2}$, $2\frac{1}{2}$, and $3\frac{1}{2}$ or older bucks were 3.0 3.7, and 5.0 respectively. Average antler beam circumferences for the same age groups were 2.9, 3.6, and 4.7 inches respectively.

6. The average successful nimrod required 1.5 days or 6.5 hours of hunting to bag a deer. During that time he saw six deer, or 0.9 per hour, and shot at 1.5.

7. More deer were killed on the second day (50.9 percent) than on the first.

8. Hunters reported killing 57.9 percent of the deer in their home counties.

9. Forty eight percent of all hunters were farmers.

WATERFOWL BAG CHECKS - 1956

James G. Sieh

Game Biologists

The State Conservation Commission requested conservation officers and other field personnel to make waterfowl bag checks and complete tally cards during the 1956 open season. This was the ninth consecutive year this program was undertaken to sample waterfowl harvested in Iowa. Commission personnel reported checking 6,567 waterfowl hunters in 55 counties who had hunted 15,513 hours (appendix tables 1 and 2). These nimrods harvested 7,452 ducks and 512 geese. These figures do not indicate all the waterfowl killed in Iowa during the 1956 season; however, they provide a sample of the kill and the data obtained were comparable with similar data collected from 1948 through 1955.

Sixteen species of ducks, mergansers, and three species of geese were taken by wildfowlers. The Iowa hunter bagged one duck in 2.1 hours of hunting in 1956 indicating a slightly better than average duck-per-hour kill figure (Table 1). Goose hunting was much better than usual requiring only 30.2 hunting hours afield to average one goose in the bag. Unsuccessful hunters averaged 2.2 hours in the field when checked in 1956.

Table 1 (1948-1956)

YEAR	1948	1949	1950	1951	1952	1953	1954	1955	1956
Av. Hunt. Hours Per Duck Killed	2.3	3.2	4.1	1.9	3.2	3.2	3.6	3.2	3.2
Av. Hunt. Hours Per Goose Killed	67.6	25.4	41.1	52.0	183.7	27.1	81.7	114.8	30.2
Av. Hunt. Hours Per Unsuc'ful Hunter	2.2	2.8	3.3	2.1	2.4	2.8	2.8	2.7	2.2

Mallards totaled 40.2 percent of the ducks examined and this sample comprised 2998 birds in the bag in 1956. Difficulty in contacting hunters in the cornfields where many of the mallards are killed reduced the number and percentage of mallards tallied in 1956. This species has averaged 50 percent of the total duck harvest in Iowa since 1948.

Blue-winged teal reached an unprecedented 36.7 percent,(2736 birds), of the aggregate kill in 1956. This increased kill was the result of an early opening date coinciding with a large number of blue-wings present within the state, and a continuing migration for several days, thereafter.

On a percentage basis the green-winged teal harvest (9.6 percent) remained within the limits of samples recorded during the past eight years. Pintails accounted for 4.5 percent of the take, and lesser scaup only 2.3 percent of the tally. These percentages approximated figures for previous years for green-wings and pintails; however, the tally of lesser scaup was the lowest on record.

The season on wood duck was closed in 1956, but field personnel were requested to record all known dead wood ducks. Eighty-one or 1.1 percent, were tallied during the 1956 closed season as compared to 217 or 3.1 percent tallied during the 1955 open season on this species. The figures do

not adequately represent all wood ducks disgarded by the hunters in 1956, however, they provide an indication of the kill during a closed season.

The remaining ten species of ducks and mergansers in aggregate totaled only 5.6 of the kill sampled in 1956. These same ten species contributed 11.8 percent in 1948; 12 percent in 1949; 10.6 percent in 1950; 11.8 percent in 1951; 8.7 percent in 1952; 6.4 in 1953; 9.5 percent in 1954and 8.7 percent in 1955. None of these ten species of ducks and mergansers exceeded 3.2 percent of the aggregate during the nine years of study. There has been little change in the percentages in the samples; and the black duck, gadwall, baldpate, shoveller, redhead, ring-necked duck, canvas-back, golden-eye, bufflehead, ruddy duck and mergansers, have comprised a very small fraction of the annual waterfowl harvest.

Bluegeese approximated 33 percent of the total goose sample in 1956. Snow geese contributed 39 percent, while Canada geese and their subspecies contributed 27 percent. No white-fronted geese were reported in 1956; however, a few white-fronts have been reported during five of the nine years on record.

RECAPITULATION OF DUCK KILL BY COUNTY

Table 1.

	Allamakee	Blackhawk	Bremer	Buchanan	Buena Vista	Butler	Calhoun	Cerro Gordo	Clarke	Clay	Clayton	Clinton	Dallas	Decatur
Total Number Hunters Checked	236	49	523	142	299	30	110	256	45	208	127	191	35	10
Total Number of Hours Hunted	929	105	1601	186	237	44	192	279	71	411	306	541	58	10
None Taken													17	4
Number of Hunters	65	17	254	72	45		46	120	6	29	22	43	29	5
Hours Hunted	230	38	609	82	33		78	121	11	37	47	109	8	3
Mallard	138	47	126	12	129	20	9	86	20	54	23	58		
Black Duck	7		2					2			1	1	1	
Gadwall	1		2		5				2		1			
Baldpate	8	1	7				1	4						
Pintail	23	2	10	1	1			9	4	13	1	8	6	
G. W. Teal	14	14	48	10	4		11	21	3	36	29	49	19	
B. W. Teal	69	5	75	65	69	30	14	68	10	250	56	144	1	
Shoveller	3	2	2	2		1		1		1	4	4		
Wood Duck	8		13		1						18			
Redhead				8	4		1	2	1	3				
Ring-necked											2			
Canvas-back	4		3					1	1	10				
Lesser Scaup	7		10	8	39			1		10		10	1	
Golden-eye								1				1		
Bufflehead														
Ruddy Duck			2	4	2									
Merganser			1									1		
TOTAL DUCKS	282	71	301	110	254	51	36	196	41	378	135	188	36	3
Canada Geese	9			3	26		1	2	2			4	1	
Blue Geese	4				36	4	10	5		7				
Snow Geese			1		43	2	8	10		5				
White Fronted Geese														
Other Geese					105			5						
TOTAL GEESE	13		1	3		6	19	22	2	12		4	1	
Coots			28	1							14	1		

RECAPITULATION OF DUCK KILL BY COUNTY

Table 1. continued-

	Des Moines	Dickinson	Dubuque	Emmet	Floyd	Grundy	Hancock	Humboldt	Jackson	Jasper	Jefferson	Johnson	Kossuth	Lee
Total Number Hunters Checked	196	20	77	358	4	24	11	23	180	156	41	82	61	70
Total Number of Hours Hunted	653	50	283	650	8	73	24	40	854	428	78	248	69	134
None Taken														
Number of Hunters	53		16	54		6	1		77	84	12	20	11	6
Hours Hunted	176		27	56		17	4		330	204	26	53	15	15
Mallard	97	22	23	78	7	22		16	58	12	9	30	33	38
Black Duck	1								2					
Gadwall	3			1					2				1	3
Baldpate	14		2	1				1	4					1
Pintail	11	6	5	9			1		9	4		5	8	7
G. W. Teal	18	11	26	46		2	1		7	7	2	3		34
B. W. Teal	46	21	68	292	2		21	12	51	31	23	46	1	56
Shoveller				2					1	1				1
Wood Duck			7	3					19			2		1
Redhead										3				2
Ring-necked	2													
Canvas-back	2			5					1					1
Lesser Scaup	11			11					4	1			1	
Golden-eye	1													
Bufflehead														
Ruddy Duck	1													
Merganser														
TOTAL DUCKS	207	60	131	448	9	24	23	29	158	59	34	86	44	144
Canada Geese	3			30				1	5	4		6		
Blue Geese	1			16		2		7		3		1	7	2
Snow Geese	3			49		3		5	1	2			3	
White Fronte Geese														
Other Geese						2							1	
TOTAL GEESE	7			95		7		13	6	9		7	11	2
Coots	9			5			1		10	1				35

RECAPITULATION OF DUCK KILL BY COUNTY

Table 1. continued-

	Louisa	Lucas	Madison	Marion	Marshall	Mills	Mitchell	Montgomery	Muscatine	Palo Alto	Plymouth	Pocahontas	Polk	Poweshiek
Total Number Hunters Checked	746	134	17	54	227	155	10	52	7	160	56	43	208	33
Total Number of Hours Hunted	1734	278	30	140	635	490	15	183	71	419	183	125	226	88
None Taken														
Number of Hunters	84	54	9	8	105	44		24		5	3		20	23
Hours Hunted	224	91	10	15	309	150		85		10	8		22	46
Mallard	1104	32	1	14	63	5	20	55	2	17	171	2	65	
Black Duck	2	1			2								3	
Gadwall	9	5			2	24				1	1			
Baldpate	10		1		11	3			4	1			2	
Pintail	56	3		6	10	12			4	21		5	23	1
G. W. Teal	16	20	4		8	2				79	1	5	8	
B. W. Teal	46	39		53	17	74			7	354		39	60	13
Shoveller	2	4	1							1		1	8	
Wood Duck		1							2				3	
Redhead	1		3		1	10							1	
Ring-necked	12						3					1	1	
Canvas-back														
Lesser Scaup	5	4	2	10	1	4				9	2		5	2
Golden-eye														
Rufflehead														
Ruddy Duck		4												1
Merganser					3						1			
TOTAL DUCKS	1263	113	12	83	118	134	23	55	19	483	176	53	179	17
Canada Geese	1					7		1	1			2	2	
Blue Geese		4			2	26						11	2	
Snow Geese		7			2	25						8	1	
White-Fronted Geese														
Other Geese														
TOTAL GEESE	1	11			4	58		1	1			21	5	
Coots	1				2								10	

RECAPITULATION OF DUCK KILL BY COUNTY

Table 1. continued-

	Ringgold	Sac	Scott	Sioux	Tama	Union	Warren	Washington	Wayne	Webster	Winnebago	Winneshiek	Worth
Total Number Hunters Checked	20	316	103	60	28	47	37	42	32	16	183	88	19
Total Number of Hours Hunted	39	512	337	132	56	103	90	90	43	34	434	203	57
None Taken													
Number of Hunters	5	142	48	20	6	12	7	20	1	8	56	22	
Hours Hunted	7	204	186	53	14	12	10	44	3	31	100	57	
Mallard		82	24	36	9	19	19	28		5	23	18	3
Black Duck													
Gadwall	1	6	1	2							1		
Baldpate						9							
Pintail	3	3	30	3	1	3	2	3			2	8	1
G. W. Teal	2	32	15	6		10		1	17	2	57	12	23
B. W. Teal	13	87	7	15	27	11	25	3	68	3	151	35	34
Shoveller	2		1	3		5					1		
Wood Duck												3	
Redhead		18		5		3	2						
Ring-necked		9										3	
Canvas-back			7					1					
Lesser Scaup						8			2			7	
Golden-eye													
Bufflehead				4									
Ruddy Duck													
Merganser													
TOTAL DUCKS	21	237	88	74	37	68	48	36	87	10	235	86	61
Canada Geese		12	9						1				
Blue Geese		14	1										
Snow Geese		20	1								3		
White Fronted Geese													
Other Geese													
TOTAL GEESE		46	11						1		3		
Coots						1							

COMBINED TOTALS AND PERCENTAGES

Table 2.

	TOTAL RECORDED KILL BY SPECIES						
	1950	1951	1952	1953	1954	1955	1956
Hunters Seen							
Bags Not Checked	2,807	6,800	2,163	4,222	3,266	3,678	1,498
Size of Hunting Party 1.	572	1,198	969	993	899	830	751
(man) 2.	979	1,907	1,367	1,464	1,556	1,264	1,253
(man) 3.	434	800	551	1,644	631	577	542
(man) 4.	192	362	232	266	312	228	223
Five or more than 5.	91	207	93	133	121	121	136
Total Number of Hunters	5,170	9,955	6,838	7,839	7,887	6,776	6,567
Total Hours Hunted	19,132	25,419	20,141	27,484	26,472	22,523	15,513
None Taken:							
Number of Hunters	1,921	2,368	2,557	2,474	2,848	2,333	1,889
Hours Hunted	6,340	5,029	6,184	7,000	8,012	6,431	4,167
Mallard	2,344	7,354	2,698	4,121	3,916	3,673	2,998
Black Duck	71	168	54	27	37	19	24
Gadwall	98	207	56	80	62	92	76
Baldpate	50	231	71	59	97	83	88
Pintail	291	1,252	634	477	382	345	337
G. W. Teal	399	885	697	523	860	656	717
B. W. Teal	637	1,502	810	2,013	736	966	2,736
Shoveller	91	244	110	118	94	62	56
Wood Duck*	148	464	427	321	7	217	81
Redhead	62	264	71	60	76	157	68
Ring-necked	26	138	35	68	90	37	33
Canvas-back	43	229	77	72	104	74	36
Lesser Scaup	351	787	468	557	649	459	175
Golden-eye	9	36	8	8	13	10	3
Bufflehead	9	10	9	19	5	17	4
Ruddy Duck	19	70	45	34	58	49	14
Merganser	18	29	19	19	14	15	6
TOTAL DUCKS	4,666	13,870	6,289	8,594	7,200	6,931	7,452
Canada Geese	73	127	54	297	66	95	136
Blue Geese	181	214	21	309	115	39	171
Snow Geese	180	128	32	353	139	53	197
White Fronted Geese	7			6	3	4	
Other Geese			2	48	1	5	8
TOTAL GEESE	441	469	109	1,013	324	196	512
Coots	63	344	185	42	282	229	130
Parties With Dogs	240	601	316	437	246	266	205
Unretrieved Ducks & Geese	45	187	69	62	46	58	57
Parties Without Dogs	2,028	3,873	2,896	3,064	3,273	2,754	2,700
Unretrieved Ducks & Geese	508	1,680	658	779	548	465	557
TOTAL PARTIES CHECKED	2,268	4,474	3,212	3,501	3,519	3,020	2,905

* There was a closed season on wood duck in 1956, but the figures indicate known dead wood ducks.

COMBINED TOTALS AND PERCENTAGES

Table 2.
continued

SPECIES	1950	1951	1952	1953	1954	1955	1956
Mallard	50.2%	53.0%	42.9%	47.9%	54.4%	53.0%	40.2%
Black Duck	1.5	1.2	0.9	0.3	0.5	0.3	0.3
Gadwall	2.1	1.5	0.9	0.9	0.9	1.3	1.0
Baldpate	1.1	1.7	1.1	0.7	1.3	1.2	1.2
Pintail	6.2	9.0	10.1	5.5	5.3	5.0	4.5
G. W. Teal	8.6	6.4	11.1	6.1	11.9	9.5	9.6
B. W. Teal	13.7	10.8	12.9	23.6	10.2	14.0	36.7
Shoveller	1.9	1.8	1.8	1.3	1.3	0.9	0.8
Wood Duck*	3.2	3.3	6.8	3.7	0.1	3.1	1.1
Redhead	1.3	1.9	1.1	0.7	1.1	2.2	0.9
Ring-necked	0.6	1.0	0.5	0.8	1.3	0.5	0.4
Canvas-back	0.9	1.6	1.2	0.8	1.4	1.1	0.5
Lesser Scaup	7.5	5.7	7.5	6.8	9.0	6.7	2.3
Golden-eye	0.2	0.3	0.1	0.1	0.2	0.1	0.1
Bufflehead	0.2	0.1	0.1	0.2	0.1	0.2	0.1
Ruddy Duck	0.4	0.5	0.7	0.4	0.8	0.7	0.2
Merganser	0.4	0.2	0.3	0.2	0.2	0.2	0.1
TOTAL DUCKS	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Canada Geese	16.6	27.2	49.5	29.3	20.4	48.5	26.6
Blue Geese	41.7	45.6	19.3	30.5	35.5	19.9	33.4
Snow Geese	41.5	27.2	29.4	34.9	42.9	27.0	38.5
White Fronted Geese	0.2			0.6	0.9	2.0	0.0
Other Geese			1.8	4.7	0.3	2.6	1.5
TOTAL GEESE	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
Banded Ducks Shot Previous Year	8	6	2	5			
Opening Dates							October 6
Closing Dates							December 14

* There was a closed season on wood duck in 1956, but the figures indicate known dead wood ducks.

CONTROLLED HUNTING RESULTS ON BIG MARCH

Jach McSweeny *

Introduction

A controlled and supervised hunting program was initiated on the Big Marsh Game Management Area from November 17th through December 3rd, 1956, to permit harvest of a pheasant crop on a wildlife refuge. The area was set up as a refuge to establish a live decoy flock of 200 Canada Geese early in 1956. The geese created the situation of a live decoy flock and late in the year resulted in a baited area problem preventing the harvest of any waterfowl on the area. Contacts with the Game Management Agent for Iowa provided the stimulus to control a hunting program. All hunting done on the area would have to be closely supervised in spite of the existing Game Management Section in the Code of Iowa. It was assumed that all but the 50 wing-clipped geese would leave the area and join the migration 12 to 13 weeks after their primary feathers were pulled. (Except during the annual molt geese cannot regenerate primary feathers except those lost); However, 170 geese remained on the area on November 17th, most of them capable of flight.

The late opening was selected for several reasons. First to allow the geese an extra week to migrate, second to make certain enough help could be gathered to operate the hunt in an orderly manner and third to allow enforcement and supervisory personnel a chance to spend as much time as necessary on the area after dispersal of the initial pheasant season rush. Besides allowing harvest of many pheasants and rabbits on the area this was an opportunity to really determine hunting values. Dry conditions throughout the last four years have made the value of this area, under state ownership, somewhat controversial.

Big Marsh is a 2600 acre area located six miles north of Parkersburg and six miles south of Allison in Butler County west of and adjacent to Highway 14. Vast tracts of dense cover, grass and mixed cropland provide excellent range and habitat for deer, pheasants, rabbits, and other game species. (During normal rainfall periods excellent waterfowl habitat has existed here). Excellent upland game hunting was enjoyed on that portion owned by the state in previous years. However, this is the first year of ownership for the entire tract as the northwest 670 acres came under state possession March 1, 1956. This area is made accessable by a road system that borders three sides of the area. Another road divides the area in the middle. Basically, the area is a large island of habitat in the vicinity of intensely farmed land lacking in game cover except along the West Fork River which forms much of the northern boundary.

Data Collection

Excellent newspaper coverage from Conservation Commission news releases and accelerated news items from local papers made a good background for the actual hunt. Road barricades, special signs explaining the program and directional signs indicating the headquarters area, insured full understanding and cooperation and made data collection and supervision quite simple. The utility building was set up as headquarters. Hunters walked in the entrance single file and exchanged

* Special paper by Unit Manager, Sweet Marsh Game Management Unit, Tripoli, Ia.

their licenses for permits to hunt on the refuge. The permits were bound in book form and the perforated bottom section was torn off with restrictions and explanations clearly printed. At the beginning of the hunt the hunters name and address and the time were written on this stub. The upper stub, with matching numbers, was filled out with most of the data copied from licenses. Often the hunter's occupation and distance from home had to be asked of him. After the hunt the hunter again went through the line so his card could be filled out by commission employees and his license returned. All game was exhibited and during rush periods the pheasants were aged on a separate sheet. Delays were few and no hunter waited over 10 minutes for his permit. On opening day registration started before 10:00 a.m. and was continuous for five workers through 11:55 a.m. Access roads were patrolled throughout the hunt to make sure hunters didn't attempt to hunt the area without permits. The hunters were a very complimentary group and appreciated the opportunity to hunt this refuge area.

Harvest

Hunting was allowed from 12:00 noon until4:30 p.m. and restricted to upland game because of the live decoy situation previously mentioned. Tables showing the data gathered follow this report. The tables reveal many interesting things assuming this is a cross section of our Iowa hunters. November 20th through the 23rd presented the most ideal pheasant hunting conditions the area afforded, with snow, cold weather, high winds and heavily overcast skies. The roads were so bad during this period that few hunters could get to the area and the hunters didn't seem interested in hunting when rugged conditions prevailed. Hunting success decreased as the season progressed, but great daily variations can be seen by comparing the tables of data. The advantages of hunting with a dog are well defined in computing the hour success of hunters using dogs and those not using dogs. However, some dogs are definitely not an asset to the hunter. The crippling loss was much lower when dogs were used. How many of the crippled birds later showed up in harvest cannot be determined by the sampling method used and it would be most difficult to work out a proper method to do this.

Excellent cooperation by the Biology Section produced the following interesting data. On opening day November 17th, 230 young cock birds were weighed. These birds averaged two pounds and twelve ounces, but varied from two pounds four ounces to three pounds and six ounces. Seventy six adult cock birds averaged two pounds and fifteen ounces and varied from two pounds seven ounces through three pounds eight ounces. This average weight factor reveals over 1,310 pounds of pheasant were harvested from the area. Aging was accomplished by checking spurs for length, hardness and shape; not merely for length.

Early in the season many pheasants were flying out of the area about noon and setting on adjoining hillsides during the shooting hours watching the hunters. They returned to the cover sections of the area later in the day. Large concentrations of pheasants remain on the area and large flocks are seen during rugged weather. No sex ratio counts have been made since the hunt. An attempt will not be made at thime of this writing to evaluate the data collected in detail, but some definite conclusions can be presented. People willingly accepted this controlled hunting project. Hunting is a very sociable sport for less than 3.5% of the hunters hunted along. Parties of two, three and four were most common with 30.7 per cent of the total hunters included in the three men catagory. An unusually large number of hunters had not hunted pheasants before their trip to Big Marsh even though statewide season had been open seven days. Some of these hunters indicated they had difficulty in 1956 finding area of cover dense enough

to work their dogs and found Big Marsh the ultimate in this respect. Hunters will travel long distances to hunt pheasants as 47 percent of the hunters lived over 100 miles from the area. Most hunters have to hunt weekends to get their party organized if they came from long distances. Complete amazement was shown by many hunters at the size of the Big Marsh Area and many hunters were unfamiliar with state ownership of public hunting and refuge lands. Hunters indicating the most previous pheasant hunts this year hunted weekdays while the weekend hunters had hunted few times. No explanation can be given for the few hunters coming from the 26-50 mile radius. This is a high population area including the towns of Waterloo, Cedar Falls, Marshalltown, Hampton, Waverly and many smaller ones.

In addition to harvest data various other types of information were collected. The results of these efforts are on hand in some detail but to save space here only general comments are presented.

Age of 800 hunters:
16% under 20 years of age; 39% 21-35 years; 29% 36 to 50; 14% 51-65; 2% over 65 years.

Weather data was kept including temperatures, wind velocity, barometric pressure, snow cover and precipitation and degree of cloud cover. No interpretation of the data has yet been made.

Hunting party size was recorded with 3 - 4 - 2 numbers per party most common in the order listed.

Hours per trip were recorded by one - two - three - four hour lengths. Average length was 2-5 hours. This table showed a distant relationship to weather and average age.

Data was collected on type and action of guns used. The 12 gauge pump was most common with 12 gauge automatic second.

Records were kept on distance traveled to hunt and occupation of hunters.

Data is also available on how many times a hunter hunted the area and how many total pheasant hunting trips he had made during the 1956 season.

Suggestions

Future hunts could be set up similarly with much less manpower needed to operate them. During the most intensive hunting periods registration and processing takes about seven minutes per hunter. Seven men were needed for the opening day and about four men were needed on all weekends. Three men could handle things on weekdays. A split season would possibly account for the harvest of more birds, as would an alternate day or a four day hunting period over each weekend. An IBM card would allow greater use of collected data and cutdown operational time. Late in the season releases of pen raised birds would give great satisfaction to many hunters and bring more hunters to the area. Expense of future hunts would be less as the special signs, barricades, miscellaneous equipment and permits could be used.again.

Table 1.

TOTAL HARVEST OF ALL HUNTERS

DATE	HUNTER CARDS	HOURS HUNTED	RABBIT HARVEST	PHEASANTS BAGGED	PHEASANTS LOST	HOURS PER BIRD	AGE OF BIRDS YOUNG	AGE OF BIRDS OLD	AGE OF BIRDS UNKNOWN
Nov. 17	405	1000	44	322	80	3.10	240	80	2
Nov. 18	157	377.1	11	68	11	5.54	42	26	
Nov. 19	20	45.5	1	7	3	6.50	5	2	
Nov. 20	2	8.0	0	1	0	8.00	1	0	
Nov. 21	10	28.1	1	9	0	3.12	7	2	
Nov. 22	10	22.7	0	12	0	1.89	6	6	
Nov. 23	12	31.2	2	13	0	2.40	7	6	
Nov. 24	29	88.8	12	8	2	11.10	1	7	
Nov. 25	28	82.6	7	12	3	6.88	8	4	
Nov. 26	0	0	0	0	0	0	0	0	
Nov. 27	8	23.5	0	4	0	5.87	0	0	
Nov. 28	3	3.6	0	3	0	1.20	3	0	
Nov. 29	2	4.6	0	0	0	0	0	0	
Nov. 30	10	25.4	0	5	1	5.08	4	1	
Dec. 1	47	107.8	16	3	1	35.93	1	2	
Dec. 2	39	98.3	5	7	0	14.43	6	1	
Dec. 3	10	22.9	1	2	0	11.45	0	2	
	792	1970.1	100	476	101	4.13 Ave.	333	141	2

Table 2.

PHEASANT HARVEST WITH DOG HUNTERS

DATE	HUNTERS USING DOGS	HOURS HUNTED	PHEASANTS BAGGED	PHEASANTS LOST	HOURS PER BIRD
Nov. 17	103	254.9	105	16	2.42
Nov. 18	34	98.2	22	2	4.46
Nov. 19	13	34.0	7	3	4.85
Nov. 20	2	8.0	1	0	8.0
Nov. 21	5	14.1	7	0	2.01
Nov. 22	4	11.2	6	0	1.86
Nov. 23	6	19.0	6	0	3.16
Nov. 24	15	51.6	7	1	7.37
Nov. 25	9	30.1	4	1	7.52
Nov. 26	0	0	0	0	0
Nov. 27	0	0	0	0	0
Nov. 28	3	3.6	3	0	1.20
Nov. 29	0	0	0	0	0
Nov. 30	8	22.6	4	1	5.65
Dec. 1	20	38.5	1	0	38.5
Dec. 2	14	46.0	4	0	11.5
Dec. 3	1	2.0	1	0	2.0
		633.8	178	24	3. 56 Ave.

Note - 556 hunters not using dogs hunted 1,336.3 hours, harvesting 298 birds, ave. 4.48 hours per bird.

The 1956 Artificial Lakes Creel Census

Jim Mayhew

Fisheries Biologist

During the past year an experimental sampling design for creel census was initiated on six state-owned artificial lakes in southern Iowa. These impoundments were: Nine Eagles Lake, Green Valley Lake, Lake Ahquabi, Lake Keomah, Lake Wapello, and Red Haw Hill Lake. Angler catch data had previously been recorded by the boat concession on each of these lakes. After detailed consideration it was thought this type of sampling should be improved upon because of several essential reasons. Paramount among these were: (1) the harvest by shore anglers was not included. (2) many concessions contacted only successful fishing parties regardless of instructions, and (3) in several instances censusing was negligible for long periods of time. The new method was designed to alleviate as many of these vagaries as possible, and in particular measure the importance of shore fishing.

Briefly, the experimental sampling design was as follows: the fishing day was divided into two hour time intervals from 8 A.M. to 8 P.M. To distribute time equally to all lakes involved, three lakes were censused in one day. Each time period was prorated to individual lakes over an eleven week period. Censusing was completed twice each six days. Thus, each lake was checked 12 times, or two complete 12 hour fishing days. (Mayhew, 1956).

By and large, this year could not be considered typical for southern Iowa. Most of the area has been in considerable drought since 1955. The lakes involved in this study were affected to various degrees, but in one impoundment (Green Valley Lake) the water level was approximately 12.5 feet below crest elevation in July. Coincident with the rapidly receding water levels was the development of immense submergent vegetation beds. Obviously, the growth of such dense vegetation greatly affected shore anglers by early June.

In all, during the eleven weeks of censusing on the six impoundments 1,552 anglers were contacted while fishing. This is a means of slightly more than 42 fishermen at each lake per visit. An additional 682 boat anglers were interviewed by boat liverymen during this period.

Nine Eagles Lake

Nine Eagles Lake is located in Decatur County only a few miles from the state line. In this locality there are very few areas of large populations, and the lake does not receive as much fishing pressure as most state-owned artificial lakes.

During 1956, commission personnel interviewed 162 people on this lake. (Table 1). Approximately 60 per cent of these anglers were fishing from shore. The average fishermen caught slightly more than 2.3 fish each trip at a rate of 1.07 fish per hour. Bluegills made up about 87 per cent of the number of fish harvested. Largemouth bass, crappie, and channel catfish were next in order of importance.

The miscellaneous data received from anglers revealed that the average fishing party traveled was about 41 miles to the lake, with 91 per cent driving more than 20 miles.

Table 1. The recorded angler catch in Nine Eagles Lake from May 1 to July 8,1956. Boat livery census data in parentheses.

Contact	Total Man	Total Hours	Total Fish	Per Cent of Species Composition				
				Bass	Bluegill	Crappie	Bullhead	Catfish
Boat	64	156	137	12.4	81.7	3.0	T	2.2
	(82)	(250)	(669)	(1.2)	(83.5)	(12.5)	(2.4)	(T)
Shore	98	200	242	7.0	89.7	T	1.2	1.2
Combined	162	356	379	8.9	86.8	1.6	1.0	1.6

Green Valley Lake

This artificial lake was considerably affected by drought conditions most of the year. Twice during the past year water was drained from the lake for public water supply purposes in the city of Creston.

During the census period a total of 376 boat and shore anglers were interviewd while fishing. These fishermen caught 394 fish in slightly more than 731 hours (Table 2). The boat livery concession interviewed 104 anglers in this same period of time, and recorded 284 fish caught at a rate of 0.68 fish per hour.

Although the bullhead is the most preferred species in this area, largemouth bass were the most frequently caught in 1956. Bluegills and bullheads followed in that order of importance. However, this is without doubt partly due to the high catchability of bass during June and July. By comparison, the boat livery listed bass, bullheads, and bluegill as the most abundant species respectively.

Unlike most of the artificial lakes the majority of the fishermen at Green Valley Lake were from the local area. The average distance driven to fish in the lake was 18 miles.

Table 2. The recorded angler catch in Green Valley Lake from May 1 to July 8, 1956. Boat livery census data in parentheses.

Contact	Total Men	Total Hours	Total Fish	Per Cent of Species Composition					
				Bass	Bluegill	Crappie	Bullhead	Catfish	Walleye
Boat	138	295.5	139	41.7	23.7	2.1	27.3	1.4	3.6
	(104)	(414)	(284)	(53.8)	(7.7)	(T)	(39.0)	(1.5)	(1.4)
Shore	233	437	255	36.4	35.7	-	29.4	1.5	T
Combined	376	731.5	394	38.3	31.5	T	28.7	1.5	1.8

Lake Ahquabi

Lake Ahquabi has long been regarded as one of the most important artificial lakes in southern Iowa. This is primarily because of its relative closeness to metropolitan Des Moines. From the miscellaneous data received in the interviews, 81 per cent of the fishermen indicated that they lived in Des Moines or vicinity. The average distance driven to the lake was 27 miles.

In all, 288 fishermen were contacted during the 12 visits to this impoundment. The average angler caught 1.3 fish after fishing slightly over two hours (Table 3). Bluegills were by far the most important fish in the creel, and made up 65.6 per cent of the total harvest. Largemouth bass and crappie were the second and third most abundant species making up 14.1 and 17.1 per cent of the catch respectively. Other species noted in the creel were northern pike, bullhead, channel catfish, and perch; but were not significant in the overall harvest.

Table 3. The recorded anglers harvest in Lake Ahquabi from May 1 to July 8, 1956. The boat livery census in parentheses.

	Total	Total	Total	Percent of Species Composition					
Contact	Men	Hours	Fish	Bass	Bluegill	Crappie	Bullhead	Catfish	Perch
Boat	194	365.5	252	10.5	67.0	21.0	T	T	T
	(122)	(559.5)	(610)	(34.9)	(58.3)	(17.2)	(3.3)	-	T
Shore	94	220.5	123	23.8	62.6	10.0	3.2	-	1.6
Combined	288	586	375	14.1	65.6	17.1	1.6	T	1.0

Lake Keomah

Despite the fact that low water level and submergent vegetations beds concentrated fishing pressure, success remained relatively good in Lake Keomah. As in the past few years, crappie dominated the anglers catch (Table 4). Bluegill and bullheads were the second and third most important species respectively. The average fisherman caught 2.84 fish per trip at a rate of 1.67 fish per hour.

A comparison with the boat livery census cannot be made since the cards filled out by these people were accidently destroyed at the end of the season.

Table 4. The recorded angler catch in Lake Keomah from May 1 to July 8, 1956.

	Total	Total	Total	Per Cent of Species Composition					
Contact	Men	Hours	Fish	Bass	Bluegill	Crappie	Bullhead	Catfish	Perch
Boat	44	75.5	55	16.5	83.6	1.8	-	-	-
Shore	145	246	482	2.9	19.7	49.6	24.9	2.2	T
Combined	189	321.5	537	4.3	26.4	44.7	22.3	2.0	T

Lake Wapello

During the census period at Lake Wapello a total of 332 fishermen were contacted by commission personnel. The boat livery also interviewed an additional 137 boat anglers. Bluegills were the most frequently caught fish averaging over 36 per cent of the recorded catch. Crappie, bullheads, and yellow perch were about equally divided in the species composition of anglers harvest. The average fishermen took home 1.2 fish each trip after fishing 2.7 hours (Table 5).

Mean distance driven to the lake was 28 miles, with 70 per cent of the interviewed anglers driving over 30 miles. Fifty-two per cent of these

fishermen lived in Ottumwa or vicinity.

Table 5. The recorded angler catch in Lake Wapello from May 1 to July 8, 1956. Boat livery census in parentheses.

	Total	Total	Total	Per Cent Species Composition					
Contact	Men	Hours	Fish	Bass	Bluegill	Crappie	Bullhead	Catfish	Perch
Boat	205	585	233	14.2	37.7	12.4	12.4	T	21.4
	(137)	(566)	(515)	(8.7)	(48.7)	(14.0)	(14.6)	(T)	(13.6)
Shore	127	228	146	7.5	33.6	25.3	21.2	T	11.7
Combined	332	817	379	11.8	36.1	17.9	16.1	T	17.7

Red Haw Hill Lake

Fishing in Red Haw Hill Lake was considered by most people as only fair this year. The early appearance of dense vegetation beds concentrated the fishing pressure to the deeper areas of the lake. Data was received from 205 incomplete and 237 completed fishing trips. A total of 225 fish were recorded on imcompleted trips and 884 by the latter group. Catch per unit effort averaged 0.66 and 1.16 fish per hour respectively for the two groups (Table 6). As in most lakes during the year, bluegills were the most abundant fish noted in the creel. Largemouth bass and crappie were next in order of occurance.

The miscellaneous data received in the interviews revealed several interesting facts. One of the most interesting facts was that although the lake is considerable distance from Des Moines (54 miles) 60 per cent of the interviewed persons indicated they were from Polk County. Only 28 per cent of the anglers contacted were classed as local. Average driving distance to the lake was 35 miles.

Table 6. The recorded angler catch in Red Haw Hill Lake from May 1 to July 8, 1956. Boat livery census in parentheses.

	Total	Total	Total	Per Cent of Species Composition					
Contact	Men	Hours	Fish	Bass	Bluegill	Crappie	Bullhead	Catfish	Perch
Boat	105	160	173	10.4	76.8	12.1	T	-	T
	(237)	(758)	(884)	(10.2)	(50.1)	(36.6)	(1.5)	(T)	(T)
Shore	100	183	52	32.7	53.8	3.9	7.9	1.9	-
Combined	205	343	225	15.5	7.15	10.2	2.2	T	T

Discussion

In general, this year proved to be a fair year for the average southern Iowa angler. Adverse weather conditions and drought certainly affected the overall angler success. The abnormal growth of submergent vegetation undoubtedly concentrated fishing pressure in unfavorable areas of the lakes involved. This particular condition seemed to curtail the bullhead and catfish fisherman more than any other group.

Bluegills, with only two exceptions were the most frequently caught fish in the artificial impoundments. The per cent of bluegills caught ranged from 26 per cent at Lake Keomah to 87 per cent in Nine Eagles Lake. Largemouth bass were the most caught species at Green Valley Lake ; whereas, Lake Keomah produced more crappies than any other kind of fish. Yellow perch were relatively unimportant in the species composition except at Lake Wapello where they constituted 18 per cent of the recorded catch. The important species in order of occurrence were bluegill, crappie, largemouth bass, and bullheads. Other species recorded in the creel census were channel catfish, yellow bullhead, green sunfish, warmouth, walleye, northern pike, and yellow perch, but were seldom of any signifiance.

The fish caught per unit effort varied considerably in the lakes censused. Fish caught per hour ranged from 0.45 at Lake Wapello to 1.67 at Lake Keomah. The average fisherman caught about 0.90 fish per hour in the six lakes.

After tabulating the data of both sampling methods, a large deviation was noted in the relative success of the fishermen sampled. Part of this variance is undoubtedly due to two principal factors. The first involved the comparison of two totally different types of sampling methods, one based on incomplete trips and the other on completed trips. Secondly, and probably the most important factor, is that the boat livery census contacted very few unsuccessful fishing parties. As an example, 86 percent of the parties interviewed by the Red Haw Lake boat concession were successful. Approximately 70 per cent of these anglers caught more than five fish. In the personal contact census on the same lake only 54 percent of the parties interviewed were successful. Of this number 42 percent had more than three fish.

Although a significant variance in fish caught per unit effort was revealed in the two methods, species composition was very similar. The order of occurrence in the species composition was reversed or different in very few instances.

During the census period very few changes were made in the operation of the experimental sampling design. Perhaps the largest change was the postponement of the starting date from April 15 to May 1. In future years if this design isused it is recommended that the starting date could be even later. The creel census was without doubt very successful for its initial year. Of course, there are several additional features that could be easily included in the general pattern of interviewing. Among these, additional data could include scale samples, length frequency, and weight of fish caught. The primary purpose of such a study would be to sample the age groups of each species which are supporting the annual harvest by sport anglers. As a management tool this seems an important step to population balance and stocking problems in artificial lakes. The age analysis study of the adult populations could feasibly be of value to the summer fisheries survey in that sub-dominant age groups are often not sampled with present gear.

Summary

During the summer fishing season a total of 2,234 anglers were interviewed at six artificial lakes to determine the relative fishing success. From this number 1,552 anglers were interviewed by commission personnel while they were fishing. The remaining 682 were contacted by boat concessionaires upon return of rental boats.

The lakes censused during the course of the study were Nine Eagles Lake, Green Valley Lake, Lake Ahquabi, Lake Keomah, Lake Wapello, and Red Haw Hill Lake.

Fishing success varied greatly between lakes, but generally was considered satisfactory. The catch per unit effort ranged from 0.45 fish per hour at Lake Wapello to 1.67 at Lake Keomah.

In all but two lakes bluegills were the most frequently caught species. Crappie, largemouth bass, and bullheads were next in order of abundance. Walleye, yellow perch, yellow bullheads, channel catfish, warmouth, green sunfish, and northern pike were also recorded but were not caught in significant number.

The boat livery census fishing success was considerably higher than the personal contact census; however, this is apparently due to the number of unsuccessful parties interviewed. Species composition of the catch was about the same for the two different types of sampling.

Miscellaneous data obtained from the anglers revealed the average distance traveled to fish was about 31 miles. Only 15 percent of the anglers interviewed were classed a local fishermen or drove less than 10 miles to a lake.

In general, the creel census proved to be very successful for its initial year, and is recommended to be continued next year. Recommendations for the recording of additional data is discussed.

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DES MOINES CREEL CENSUS, 1956

Harry Harrison

Fisheries Biologist

The study of angler's success and catch of fish on the Des Moines River was carried on in 1956. This continues a project initiated in 1953, and reported upon annually since that time.

The method of study involves fishermen interviews in the field at frequent but irregular intervals throughout the open water season. The information sought from each angler is logged on individual census cards, and includes the following: the date, time and place of the interview; the amount of time spent fishing up to the time of contact, and how much longer he intended to fish; the kind and number of fish caught; the kind of fish that the contactee wanted to catch; the number of fishing trips made each week; the value of the tackle being used; and the distance that the contact traveled to fish. All interviews are made by Biology Section personnel, and for the most part the work is carried on in conjunction with, but secondary to other duties. Because of this, it is not possible to creel census areas or reaches of stream with a great deal of uniformity which makes it impossible to compare fishing success by locality. Since, however, our other work takes us to about the same areas year after year at or near the same time each season and for about the same amount of total effort, it is felt that the creel census does enable us to make annual comparisons.

The catch statistics assembled for the present year are given in Table I and II, which also include the related data gathered for each year since the inception of the project. Table I summarizes the total number of contacts made each year, together with the total hours fished, the total number of fish caught and the fish caught per rod hour. Table II, on the other hand, shows the rate of catch by species for the four years of study.

Table 1. Rate of Catch of Fish From the Des Moines River for the Years 1953 through 1956.

Year	Fishermen Contacted	Total Hrs. Fished	Total Fish Caught	Fish Caught Per Rod Hr.
1953	884	1847	1142	.61
1954	648	1421	1073	.75
1955	797	1588	581	.37
1956	1050	1510	595	.39

Table 11. A Comparison of Species of Fish Caught From the Des Moines River for the Years 1953 through 1956.

Species	1953 884 anglers fish 1847 hrs.		1954 648 anglers fish 1421 hrs.		1955 797 anglers fish 1588 hrs.		1956 1050 anglers fish 1510 hrs.	
	No. Caught	Caught/hrs.	No. Caught	Caught/hrs.	No. Caught	Caught/hrs.	No. Caught	Caught/hrs.
Catfish	602	.33	424	.29	200	.13	245	.16
Carp	237	.13	150	.11	265	.16	611	.40
Bullheads	141	.08	407	.28	68	.04	127	.08
Walleye pike	61	.03	25	.02	2	--	--	---
Crappie	45	.02	36	.03	13	.01	--	--
N. pike	49	.02	3	--	3	--	--	--
Miscellaneous	7	--	28	.02	30	.02	12	.01

Starting with 1953, Table 1 shows the rate of catch to be .61, .75,.37 and .39 fish per rod hour in that orde for the past four years. By way of comparison, it will be noted that the angling success was at approximately the same level in 1953 and 1954. It then dropped appreciably in 1955 and remained at that level through 1956. This pattern, it is believed, is quite likely a reflection of the drought conditions prevailing in the Des Moines watershed for the past two years. Along with the drought, abnormally high water temperatures were particularly prevalant in the summer of 1955, and in connection with this fish losses ascribed to the extremes of low water stage and high temperatures were a common occurance. In addition, water stages continued low into the winter of 1955-56. Coincident with this circumstance, conditions of low dissolved oxygen developed, which resulted in added fish loss. In their combined effect, the adverse conditions of 1955 reduced some fish populations to virtual extinction in many reaches of the stream. The most notable example of this occurred in the West Fork of the Des Moines from the town of bradgate to the Minnesota state line. That area which furnished excellent walleye and channel catfishing in 1953-54 was reduced to a few scattered pools in 1955 in which only a few individuals composed of the rough varieties survived. At the close of the 1956 season, young rough fish principally carp and quillback were the only species of importance to be found in the area. The loss of this excellent fishing area in itself would certainly contribute significantly to the poorer angling success of the last two seasons.

As regards the catch by species, Table 11 shows the catch of channel catfish and other species except the carp to follow the pattern demonstrated in Table 1. That being a comparable catch at a relative high level for the years 1953 and 1954, after which the success fell abruptly in 1955 and continued so through 1956.

The take of carp, on the other hand, did not follow the pattern of the cat-- fish and other species. The harvest of carps remained quite even but low through 1955, after which it advanced considerably. Here again, it is supposed that the effects of the drought may be seen. The carp, a very formidable species in Iowa waters, are believed to have dominated the shrinking habitat brought about by receding water levels, and in so doing, were able to crowd the more desirable but weaker species into marginal and submarginal habitats where they perished.

Our annual surveys tend to support the feasibility of this contention. In that work species other than the carp are found in fewer numbers and in fewer places than they were before the drought. Carp, on the other hand, seemed more abundant, or if not more numberous they are congregrated in the pools where they are more readily observed than they were up until two years ago.

The actuality that the carp were concentrated in easily defined areas may have made it wasier for the fishermen to locate and catch them. Furthermore, their food supply must have been reduced by crowding which could contribute to their taking bait more readily. And, by token of the fact that game fish populations were low, some of the astute fishermen may have turned their attention to fishing carp. These are ideas that may, in part, explain the increase catch of carp for the season of 1956.

It was mentioned above that certain data relating to the fishermen is also taken at the time of the census interview. By topics, this information follows:

Length of Time Fished per Trip: At the time of contact, fishermen were asked how long they had fished and how much more time they expected to continue on that particular trip. Of 436 replies, 74 said they would fish less than two hours; 112 would fish two or three hours; 95, three or four hours; 58, four or five hours; 62, five to seven hours; and 31, seven to ten hours. Four said that they would fish more than ten hours.

Value of the Tackle: During the time of interview, the census clerk made an estimate of the "on the spot" value of the equipment being used. These estimates are subject to some error but in all cases they were held conservative. In all, 397 appraisals were made and of these, 14 outfits were considered to be worth less than five dollars; 30 rigs were appraised between five and ten dollars; 265 between ten and twenty dollars; 85 between twenty and fifty dollars; and three outfits in excess of $50.00. The most expensive gear was surmized to be worth over $1,000.00. Only in sight equipment was appraised and in addition to actual fishing gear such thin s as boats, motors, tents, car-top carriers, trailers, etc., were included.

Round-trip Distance Traveled: Four hundred thirty-seven parties were interviewed with respect to the round trip distance between the port of fishing and their residence. Of these, 159 parties traveled less than five miles; 115, from five to ten miles; 85, eleven to twenty-five miles; 63, twenty-six to fifty miles; 10, fifty-one to one hundred miles and five parties had traveled over 100 miles to fish on the Des Moines River. These figures show that the bulk of fishing is quite local, but on the other hand, the stream attracts a few fishermen from considerable distance.

Principal Species Contact Wanted to Catch: Four hundred and thirty-six fishermen replied. Of these, 186 expressed a desire to catch catfish, 117 carp, 7 bullheads, 4 walleye, 2 flatheads and wanted smallmouth bass. The remainder wished to catch combinations of species as follows: 97 catfish or carp, 6 catfish or bullheads, 2 catfish or bass, 1 carp or bullheads and 1 pike or bass. Twelve anglers were after "anything that will bite".

NORTHERN IOWA LAKES CREEL CENSUS

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Most progressive states employ trained biologists who conduct periodic surveys of their best fishing waters. These efforts determine a background of information for proper fish management so that fish populations or the environment can be altered to obtain a maximum carrying capacity of the species of fish most suitable for the waters involved. This is as it should be. However, without further investigation these efforts cannot be evaluated. The management efforts to improve populations are for one purpose only and that is to improve angling. So another step must be taken-- an appraisal of the pole and line fishery by means of the creel census.

The Iowa Conservation Commission has been conducting creel censuses on several important fishing lakes for over ten years. Each year it becomes more and more apparent that this program is vitally important and must be considered an integral part of the overall fisheries planning for the state. This is especially important where fish management operations are in progress and a statistical analysis of the results is desired or imperative. Creel censuses are costly, consequently there is a great need for improvements in techniques whereby personnel can be reduced and more adequate sampling accomplished. Statisticians, fish managers and biologists working together will eventually solve this difficult problem.

This report includes data from the "spot" or incomplete type census on West Okoboji and East Okoboji from July 15, 1955 to July 15, 1956; Spirit Lake from July 15, 1955 to May 12, 1956; and Storm Lake, Blackhawk and Clear Lake from May 12, 1956 to July 15, 1956. At Spirit Lake from May 12, 1956 a complete, or quantitative, type census is being conducted on a year-round basis, and this report includes the data up to August 1, 1956. A brief statement concerning the census and tabulated data are included for each of the lakes listed.

Results

West Okoboji.

This is the deepest lake in Iowa, with a maximum depth of about 130 feet. It is highly irregular in outline and covers a total of 3,939 acres at crest elevation.

Included in Table 1, are the results of the year-round spot census from July 15, 1955 to July 15, 1956. The open water periods of summer and fall census are combined with the following spring for comparison with intervening winter angling to determine relative seasonal success. The categories such as dock, shore, boat, wader and ice fishing which were previously itemized are combined here into open water and ice fishing only.

Table 1. Creel census record of West Okoboji from July 15, 1955 to July 15, 1956.

Species	Open Water (9 mo. app.)	Winter Angling (3 mo. app.)	Total Record	Percent of Total	Species Percentage by Season Open Water	Winter
Crappie	1,982	162	2,144	3.4	92.5	7.5
Perch	23,702	17,796	41,592	65.4	57.2	42.5
N. Pike	437	211	648	1.0	67.4	32.6
L. M. Bass	232	55	287	0.4	81.0	19.0
Walleye	3,454	2,215	5,669	8.9	60.9	39.1
S. M. Bass	627	47	674	1.0	93.0	7.0
Bullhead	6,857	1	6,858	11.1	100.0	0.0
White Bass	1,056	25	1,081	1.7	97.7	2.3
Bluegill	3,028	47	3,075	4.8	98.5	1.5
Sheepshead	1,683	0	1,683	2.6	100.0	0.0
Totals	43,152	20,559	63,711			
Total Anglers	14,558	6,570	21,128			
Total Hours	31,590	16,022	47,612			
Fish/Angler	2.9	3.2	3.0			
Fish/Hour	1.4	1.3	1.3			

Significant features of the census include the dominance of perch in the catch composition and their high percentage during both open water and ice fishing. Bullheads, walleyes and bluegills follow respectively in numerical importance. Of the total winter catch, over 86 per cent was of perch and 11 per cent walleyes. This is about the same as indicated by previous winter censuses.

The 21,128 anglers contacted throughout the year caught a total of 63,711 fish at an average rate of 1.3 fish per hour, or about the same as last year which was a record high. Open water anglers caught fish at a slightly higher rate than the winter fishermen.

A comparison of this year's data with those of former years indicates a steady improvement in angler success. Since 1950 (first legal winter angling) the average catch per hour has varied annually as follows: 0.9, 0.8, 0.9, 1.1, 1.1, 1.3, and 1.3.

This year's recorded catch of perch is the highest on record, indicating that winter angling has not had a depressing effect on the perch population as had been predicted by some groups.

A total of 26 winter-caught walleyes were aged at three years and ranged in total length from 13.0 to 14.4 inches. A total of 113 perch taken in winter had an average length of 8.0 inches at three years and 10.5 inches at four years.

Walleye population and harvest. In the spring of 1955, a total of 500 adult walleyes was taken by shocker on spawning runs for tagging. The ratio of tagged to untagged fish examined during the fishing season by the census clerk indicated a population of approximately 60,000 adult at that time $(3,259 \times 500)$. Exactly 100 tag returns have been accounted for (to July 15, 1956) which indicates a harvest of about twenty per cent.
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East Okoboji (Dickinson County, 1875 acres).

Angling during the past year on this lake has been very poor comparatively, due to a severe kill during the winter of 1955-56. Practically the entire population in the northern portion of the lake was exterminated by low dissolved oxygen. Some mortality occurred even in the lower and deeper sections of the lake where oxygen content was fairly high all winter.

Census results for the dates included in the project are outlines in Table 2. There was practically no ice fishing except spearing during the past winter. The upper portion of the lake was opened to "promiscuous" fishing due to low oxygen. A concentration here of yearling and two year old walleyes, and adult perch provided a considerable amount of spearing and dip-netting. Of twenty seven walleyes aged, twenty were yearlings and seven were two-year fish. Average lengths were 10.9 and 12.8 inches respectively.

Bullheads as usual were dominant in the catch on this lake as is evident in Table 2. Walleye angling was very poor in comparison with last year(3265 to 401). This may have been due to the heavy winter mortality.

Table 2. Creel Census record of East Okoboji, July 15, 1955 to July 15, 1956.

Species	Number	Percent of Total
Crappie	360	1.1
Perch	1,367	5.5
N. Pike	43	0.2
L. M. Bass	57	0.2
Walleye	401	1.6
Bullhead	22,061	88.6
W. Bass	47	0.2
Bluegill	197	0.8
Sheepshead	457	1.8
Total	24,909	
Total Trips	7,722	
Total Hours	18,498	
Av. Fish Per Hour	1.4	

Spirit Lake (Dickinson County 5,684 acres).

The census data presented in Table 3 includes the dates from July 15, 1955 to May 12, 1956. The results are separated into open water and winter angling to indicate seasonal catch variance.

Like the neighboring West Okoboji, it is evident that perch dominate the catch composition (54.2 per cent) in the creel. Over 70 per cent of the perch recorded were taken in open water. However, this period was over twice as long and more than twice as many anglers were recorded than during winter. Nearly 80 per cent of the total winter catch was composed of perch as has been customary. Bullheads, walleyes, white bass and crappie followed the perch in numerical importance. Open water angling was more effective per unit effort than in winter (0.5 fish per hour variance); however, this does not include one of the best seasons, the spring angling, thus for the entire year the variance could have been higher. The average catch over the entire census period of 1.3 fish per hour is about normal for this lake. Wading fishermen continued to catch fish at a higher rate than all other types (data not included.)

Table 3. Creel census record of Spirit Lake from July 15, 1955 to May 12, 1956.

SPECIES	Open Water (6 months app.)	Winter Angling (3 months app.)	Total Catch	Percent of Total	Species Percentage by Season Open Water	Winter
Crappie	4,339	202	4,541	6.6	95.6	4.4
PERCH	26,669	10,304	39,973	54.2	72.1	27.9
N. PIKE	394	171	565	0.8	69.7	30.3
L. M. BASS	145	0	145	0.2	100.0	0.0
WALLEYE	4,833	2,258	7,091	10.4	68.2	31.8
BULLHEAD	11,769	5	11,774	17.2	99.9+	T
BLUEGILL	1,277	0	1,277	1.8	100.0	0
W. BASS	4,554	0	4,554	6.7	100.0	0
S. M. BASS	250	0	250	0.4	100.0	0
SHEEPSHEAD	1,072	0	1,072	1.6	100.0	0
TOTALS	55,302	12,940	68,242	100.0		
TOTAL TRIPS	13,981	5,060	19,041			
TOTAL HOURS	34,981	15,443	50,424			
AV. FISH/Angler	4.0	2.6	3.6			
AV. FISH/Hour	1.3	0.8	1.2			

Short Term Census Lakes

For the past ten years, the Iowa Conservation Commission has conducted short term creel censuses during a selected period of the year (May 15 to July 1), on Clear, Blackhawk and Storm Lakes. The period was extended to July 15 last year. Basic information from the census is included in the following Table 4 for all three lakes.

Table 4. Creel census of Clear, Blackhawk, and Storm Lakes, May 15 to July 15, 1956.

SPECIES	Clear (Cerro Gordo Co.)	Blackhawk (Sac County)	Storm (Buena Vista Co)
Crappie	3,911	273	764
Perch	76	11	162
N. Pike	51	8	1
Walleye	806	696	81
Bullhead	30,106	1,559	3,423
Bluegill	2,575	105	38
Yellow Bass	2,638	0	0
L. M. Bass	31	139	11
White Bass	0	108	101
Carp	80	583	0
Ch. Catfish	0	168	108
Totals	40,274	3,368	4,689
Total Trips	9,366	4,906	2,099
Total Hours	31,008	13,386	5,678
Av. Fish/Man	4.2	0.7	2.2
Av. Fish/Hour	1.3	0.3	0.8

Obviously fishing was very poor in all three of these lakes during the past season. Bullheads comprised 75 per cent of the catch on Clear Lake and 73 per cent on Storm Lake. About 60 per cent of the catch from Blackhawk was of bullheads and carp.

The average catch per hour on Clear Lake of 1.3 indicates fair fishing; however, since this was mostly of bullheads, this index loses its significance especially for this lake. In the seven previous years of census periods an average of over 8,000 yellow bass has been recorded and, since this is the local favorite, it's a poor year when the "streakers" aren't hitting. Lake surveys indicate a declining population of the yellows.

If an attempt had been made to select the poorest season of the year to sensus, much success would have attendedthese efforts at Blackhawk. The average catch of 0.3 fish per hour is the lowest in the past ten seasons of census work on the lake. This is attributed partially to the infestation of gizzard shad in 1947, after which there has been a steadily declining sport fishery. In previous years, much of the good angling, particularly for crappies occurred prior to the census period. This year, excellent angling for walleyes occurred after the season. This points up the very real need for a census, even if only partial, to encompass the entire open water period. This is especially true where special emphasis is being made toward better management and an appraisal of their efforts desired.

The biological imbalances that exist at Blackhawk are magnified many times at the neighboring Storm Lake. This 3,000 acre body of water has had practically no angling since the gizzard shad "took over" in 1952. Only 2,099 anglers were contacted in the 1956 census whereas by contrast in 1948, the last season of good angling, over 10,000 fishermen were recorded. Here is just an indication of recreational potential and the incidental license revenues being scuttled by this plague of virtually uncontrollable shad. As further examples of the shad effect on angling, average catches of over 2,000 crappies and 3,000 walleyes were recorded in the census seasons prior to 1954 (first large year-class development of shad); whereas, this year and last, had insignficant numbers of game fish recorded.

Rotenone was sprayed on the lake by planes in September, 1956 and a preliminary report has been printed in a previous Seminar paper.

Quantitative Creel Census of Spirit Lake.

This report contains a compilation of the census data from May 12 to July 31, 1956, in Table 5. This is our first attempt at quantitative censusing by using sampling methods, and doubtlessly will be revised to improve the techniques in the future projects.

For this small segment of the year in which the census has been in operation it is not possible to determine many factors concerning the productivity of the lake or angler harvest. At the end of a complete year--May 12, 1957, a complete appraisal can be made. If the census ca be continued year after year, comparative productivity can be assayed and managment practices evaluated that will have much more validity and usefulness that previous censusing methods.

In table 5, the numbers of fish of each species is recorded for each method of take--boat and shore fishing. Shore fishing includes those on docks, banks and waders. Also, the weights of each species by method, total weight of each species, the average weight and grand total weight of all are recorded.

Table 5. Creel census of Spirit Lake, May 12, 1956 to July 31, 1956. Totals calculated.

SPECIES	NUMBER BOAT	NUMBER SHORE	TOTAL NUMBER	PERCENT TOTAL	WEIGHT BOAT	WEIGHT SHORE	TOTAL WEIGHT	AV. WEIGHT
PERCH	4,365	567	4,932	4.5	2,284	292	2,576 lb.	.52 lb.
CRAPPIE	2,774	1,046	3,820	3.5	1,479	616	2,095 lb.	.55 lb.
BULLHEAD	32,585	36,300	68,885	62.4	16,306	18,777	35,083 lb.	.51 lb.
SUNFISH	132	61	193	0.1	40	20	60 lb.	.30 lb.
WALLEYES	28,074	1,894	29,968	27.2	39,167	2,125	41,292 lb.	1.38 lb.
WHITE BASS	579	562	1,141	1.0	435	302	737 lb.	.65 lb.
N. PIKE	350	130	480	0.4	871	390	1,261 lb.	2.63 lb.
L. M. BASS	345	472	817	0.8	520	614	1,134 lb.	1.38 lb.
S. M. BASS	26	38	64	T	33	39	72 lb.	1.12 lb.
CARP	19	41	60	T	152	57	209 lb.	3.5 lb.
SHEEPSHEAD	50	20	70	T	82	35	117 lb.	1.68 lb.
TOTALS	69,389	41,132	110,430		61,369	23,267	84,636 lb.	
TOTAL ANGLER TRIPS	35,871	22,898	58,769					
TOTAL ANGLER HOURS	131,964	56,392	188,356					
AV. NUMBER OF FISH PER ANGLER.	1.9	1.8	1.9					
AV. NUMBER OF FISH PER HOUR	0.5	0.7	0.6					

Bullheads and walleyes were most numerous in the creel during this season. Although 62 per cent of the total catch in numbers was of bullheads and only 27 percent walleyes, in weight walleyes exceeded the bullheads by over 6,000 pounds. On a poundage basis, of the total catch, 49 percent were walleyes and only 41 per cent were bullheads.

Of the 110,430 calculated total catch of all species, 62.8 per cent were taken by boat angling and 38.2 by shore methods, and of the 58,769 angling trips calculated, 61 percent were by boat and 39 from shore. Also, of the 84,636 pounds of fish recorded, 72.4 per cent were taken by boat anglers.

The average boat angler fished 3.7 hours each trip and the shore anglers averaged 2.5 hours. Boat anglers averaged 1.9 fish per trip which weighed on the average 1.7 pounds. Shore fishermen averaged slightly less, with about 1.8 fish per trip weighing 1.0 pounds. Shore anglers caught fish at a rate of 0.7 fish per hour (average), while boat fishermen averaged only 0.5 fish per hour. Heretofore we have maintained that unless success equalled at least 1.0 fish per hour, fishing was poor. Most anglers contacted in this period felt that fishing was very good at Spirit Lake. Consequently, and index must be considered relative. Since walleye fishing was good this spring anglers were satisfied. If only bullheads had been taken at about 0.5 fish per hour, angling would have been considered very poor indeed.

Conclusion

It is believed that this initial phase of a quantitative, or complete type creel census has been successful and that at the end of the year on May 12, 1957, some very valuable information will have been collected.

Some problems concerning adequate sampling have developed particularly in the season of heavy fishing pressure. For instance, during the census period in May, 1,028 anglers were interviewed who had completed their trips. This was expanded to a calculated total of 12,908, or 7.9 per cent of the total. This, while a low percentage, is far better than the month of June when only 918 anglers were contacted. This was expanded to a calculated total of 27,540 anglers, or 3.3 per cent which may be too low. In July, the fishing pressure dropped and 13.1 per cent of the calculated total was interviewed. If the clerk had two lakes with equal size and fishing pressure to that of Spirit Lake it is doubtful that sufficient interviews could be made to permit reliable expansions.

SUMMARY OF HATCHERY STUDIES, SPRING, 1956

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This is an annual report concerning certain phases of walleye and northern pike hatchery operations. Each year, routine data are collected as they apply to production. These data are primarily from work at the Spirit and Clear Lake hatcheries. Only limited checks and some experimental studies, particularly those dealing in techniques, are also important part of the hatchery studies each spring. The production material concerning each station will be presented under separate headings with the progress of experimental studies treated in a separate discussion.

Spirit Lake Hatchery

Northern Pike: Low water levels and a relatively small amount of run-off prevented a successful spawning run of northern pike in the Dickinson County lakes. Trumbull Lake experienced a severe winter kill during the winter of 1955-56. Hence no northerns were collected although over 1,000 had been removed the year before. Most of the northerns used at the Spirit Lake hatchery were collected in the carp trap at the outlet of Hottes Lake (Spirit Lake fish). Trapped northerns were removed to the hatchery for spawn taking operations.

A total of 65 quarts of eggs was put up and 52 brought through to the eyed stage for an 80 per cent hatch. This extremely high hatching success is subject to question due to the fact that fertility checks during the incubation period indicated a hatch of about 60 per cent. This discrepancy was not noted at the time the eyed eggs were totalled.

The average number of eggs per quart decreased somewhat from last year when small females (2.5 lbs.) from Trumbull Lake were used. The females from Spirit Lake (collected in the Hottes Lake trap) averaged about five pounds and had a considerable range in size. The eggs from the Spirit Lake northerns averaged 53,700 while the eggs from the Trumbull Lake fish (1955) averaged 65,000 per quart. The first northern eggs were put up on April 13 and the last on April 17. There was slush ice in Spirit Lake on April 17. About two and three-quarter million northern pike fry were stocked in suitable areas adjoining natural lakes (normal spawning sites.

Walleye: The normal walleye hatching routine was resumed at the Spirit Lake hatchery in 1956 after an unsuccessful attempt to truck walleye eggs to Spirit Lake from Put In Bay, Ohio during the 1955 season.

Gillnetting started on April 13 in East Okoboji Lake, April 16 in Spirit Lake and April 23 in West Okoboji. There were 12 nights of gillnetting (57 crewnights) in East Okoboji, eleven nights (63 crew-nights) in Spirit Lake

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

and only four nights (13crew-nights) on West Okoboji.

The gill-net crews caught a total of 3,480 walleyes for an average of 26 fish per crew-night. A total of 660 quarts of eggs were taken from 1,831 females for an average of 0.36 quart per female. Five-hundred and forty-three quarts were brought through to the hatching stage representing an 82 per cent hatch and 77,100,000 fry.

A prolonged, cool, spring brought a long season. The first eggs were put up on April 16 and the last eggs did not hatch until May 17. Water temperatures during the incubation period averaged 47 F° (range 38 to 59).

Walleye fry stocking from the Spirit Lake hatchery covered a wide range of areas. Many small lakes received walleye fry for the first time in many years. Low water levels and severe winter kills during the winter of 1955-56 put many small lakes on the possible walleye nursery lake list. Stocking of walleye fry would provide fingerling fish for fall removal and use in larger lakes if low water levels persisted and a predator population to help control undesirable fish in case water levels returned to normal. Approximately 20 million walleye fry were distributed among 21 of these nursery-freeze-out lakes. Several million fry were stocked at some 20 stations on the Des Moines River and its tributaries in the alternate-year stocking program to test the advisability of stocking fry in the river. Among the remaining fry stocked in walleye fishing lakes were 15 million fry planted in Spirit Lake. This number of fry were stocked each year during the six-year period of 1949-54. No fry were stocked in Spirit Lake in 1955.

Clear Lake Hatchery

Northern Pike: Northern pike were hatched at the Clear Lake Hatchery for the fourth consecutive year. All northerns used at the station were taken from the carp trap at the road grade separating Clear Lake and Ventura Marsh. The first northerns were noted in the trap on April 6 while the lake was still covered with ice. The first ripe fish was taken April 9. The lake was still partially ice-covered on this date. The peak of the run occurred on April 12 with the lake just cleared of ice. Hatchery personnel put up 85 quarts of eggs stripped from 272 females. These eggs averaged 59,000 per quart, thus an average of 0.36 quart per female and about 20,000 eggs per female.

Early fertility checks indicated that 45 to 55 per cent of the eggs were fertile but a failure in the hatchery water supply system left the eggs without aeration for several hours, killing nearly every egg. No further attempt was made to hatch the remaining few eggs.

Walleye: the 1956 season was a "hatching" year for walleyes at the Clear Lake station in the alternate-year fry stocking program being conducted in co-operation with the Iowa State College Fisheries Research Unit. This is the ninth year of this program.

The gillnetting crews fished 44 crew-nights from April 12 to 23 inclusive, catching 2,425 walleyes for an average of 55 fish per crew per night. There were 671 females netted that produced 250 quarts of eggs, an average of 0.37 quart.

per female. The first eggs were putup on April 18 and the last on April 25. Hatching was completed about May 12. Approximately 83 per cent of the eggs hatched producing 27.5 million fry (132,000 per quart). Clear Lake proper received 25.5 million fry, the remainder were stocked in nursery ponds and at one river station.

Lansing Station

Most of the work at the Lansing hatchery consisted of experimental studies and will be discussed below. Routine checks were completed on both walleye and northern pike eggs but final results are not included in this report.

Experimental Studies

Anesthetizing: The use of Chloretone as an anesthetizing agent was continued on a small scale at Spirit Lake and Lansing. No additional conclusions were reached beyond those determined during the past three years. Anesthetizing large northerns is definitely an advantage but anesthetizing all sizes is not considered necessary by the hatchery personnel. The important point seems to be concerned with having a tub of chloretone mixture (1:700 for water at 45 to 55 F^{o}) ready for anesthetizing fish that are large and/or difficult to handle.

Pituitary injections: A few preliminary experiments were conducted in an effort to determine the possible value of the use of pituitary injections in the release of eggs in females that fail to ripen. Each hatching season there are a number of females (both northern and walleyes) that are held for a period of time in the hatchery tanks and then returned to the lake because they could not be stripped. At the present time this is not a serious problem with walleyes but with the possible exception of the Lansing station the hatcheries can usually handle more eggs than they strip. In addition to this the northern is an important predator fish which should be given additional attention.

In order to gain some preliminary information and become acquainted with the technique, one experiment with walleyes was conducted at the stripping station at Arnolds Park and two brief experiments were conducted with northern pike at the Lansing station. Material and technique used was almost identical with that described by Ball and Bacon (1954) in their work with minnows.

The walleye trial was conducted with three groups of females, five in each group. The walleye experiment started with 25 green females that were held for one week following completion of the normal spawn taking season. Ten of these fish were considered ripe or showed evidence of egg flow. The remaining 15 fish were divided into three groups. Group one received no pituitary inject material, each of group two were injected with one gland and those of group with two glands. All fish in group three showed evidence of egg glow twenty-four hours later but only one fish was considered ready to strip. There were no ripe fish among those of the other two groups. After a 48 hour period there were no changes. Two of the fish in group three were given another injection of pituitary material. These two fish could be stripped 24 hours later. One fish in group two was ripe after an elapsed time

of 72 hours. Five days after injection one of the two remaining fish in group three was ripe; two fish in group two showed evidence of egg flow; all fish in group one were green. It appears that three pituitary glands may be needed to bring on a satisfactory egg flow in walleyes.

The trial injections of pituitary material in female northern pike were not nearly as conclusive as those involving walleyes. In two different attempts involving a total of 21 fish only one female could be stripped following injections of pituitary material. Additional trials may offer a lead as to the reasons for this apparent failure.

Application of fungicide material: Malachite green was applied to about one-third of all the walleye eggs at the Spirit Lake hatchery as a prophylactic measure. Due to consistent low water temperatures very little fungus developed on either treated or untreated eggs.

Walleye fry stocking: Previous experiments have indicated that walleye fry are really quite hardy individuals. Stocking methods for the 15 million fry planted each year in Spirit Lake during the past 6 years has consisted of dipping fry from a collecting tank by means of ten-gallon milk cans and transporting these cans to the stocking site where they are transferred to a boat. They were then siphoned from individual cans as the boat moved over the desired stocking area. During the 1956 season the fry destined for Spirit Lake were piped directly from the battery to a tank located just outside the hatchery building. Once or twice each day these fry were concentrated and transferred to a tank on a truck and hauled to the lake. At the lake they were piped by gravity to a tank on a barge. The barge was then towed to the general stocking area. The valve of the tank could be opened to allow the fry to be distributed at about any rate desired and those over a very large expanse of water. The technique needs further refinements but promises to eliminate a lot of back breaking labor connected with ten-gallon cans and provides a good distribution of fry.

Evidence of good initial survival of fry was obtained by collecting several thousand Fry in a bucket at the outlet of the barge tank. These fry were returned to the hatchery where no losses were noted in a four day holding period.

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