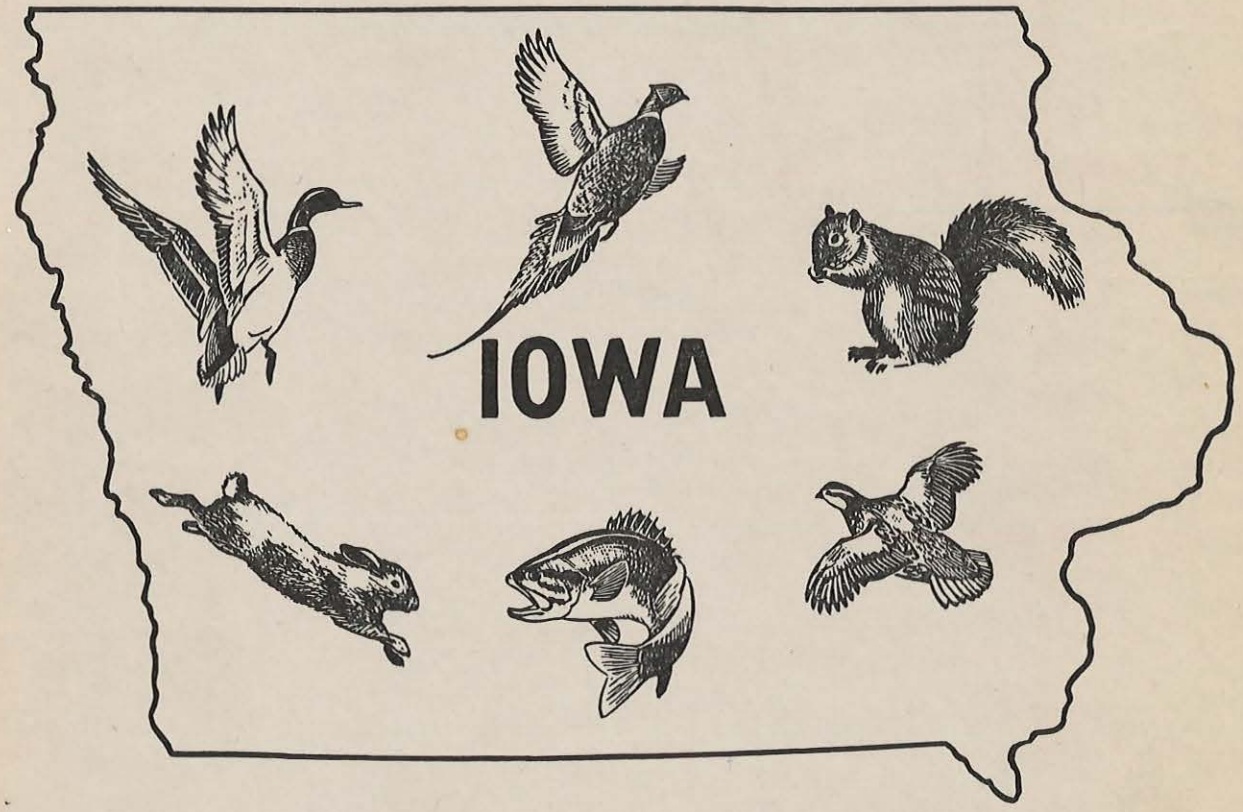
1954

QUARTERLY BIOLOGY REPORTS



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IOWA RACCOON DATA 1953 - 1954 SEASON

by Glen C. Sanderson *

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

Approximately 320 potential cooperators were contacted by letter which explained the purpose of the project and outlined the information the hunters were asked to report. A form for recording the information was sent with the letter and in addition each hunter received a one-paged mimeographed summary of the 1952-53 results.

Because of raccoon hunter demands for an earlier open date and farmer demands that something be done to reduce the numbers of raccoons, the 55th General Assembly extended the raccoon season open dates from November 10-January 10 to September 1 - March 1. The Conservation Commission then set the dates for 1953-54 as October 10-January 10 for dog hunting. The trapping season remained unchanged with the open dates November 10-January 10. This is the first change in Iowa's raccoon regulations since 1930-31. The open dates for this period have been November 10-January 10. There is no daily or season bag limit or possession limit on the raccoon in Iowa, nor has there been during at least the past 24 years.

Some Iowa fur buyers did not start buying raccoon pelts until November 10 last fall even though hunting did begin one month earlier than usual. It should be noted that the winter of 1953-54 was much milder and more open than "average." Probably the raccoon harvest in Iowa would have increased substantially during the past season over the 1952-53 harvest had the open dates been the same for the two seasons. Thus, it is impossible to determine how much effect the earlier opening date had on the numbers of raccoons harvested.

RESULTS -- With an earlier opening date, only 10 per cent of the hunting trips were made during the first 10 days of the season compared to 56 per cent made during the first 10 days of the 1952-53 season. During the first half of the 1953-54 season hunters went on 77 per cent of their hunts compared to 94 per cent during the first half of the 1952-53 open season. A comparison of the results for the past season with

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the results for the previous four years shows that the hunting success per hour has remained virtually unchanged during the five years. Raccoon hunting parties bagged an average of 0.60 animal per hour last fall and winter.

Age-Ratio-- The age-ratio of the male segment of the harvest, as determined by 118 penis bones sent in by hunters and 495 bones collected by the writer at Bloomfield, is 2.23 young per adult (Table 1). To state it another way, juveniles comprised 69.0 per cent of the male harvest. Table 1 shows that this is the highest percentage of juveniles reported in the harvest during the past five years.

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

Table 1
Age ratios of Iowa male raccoons taken during the 1949-50-1953-54 hunting seasons.

ORIGIN	SEASON	ADS	JUVS	TOTALS	%JUVS	JUVS/AD
From Hunters	1949-50	92	163	255	63.9	1.77
Lamb's-Bloomfield	1950-51	35	59	94	62.8	----
From Hunters		32	66	98	65.3	----
TOTALS		67	125	192	65.1	1.87
Lamb's-Bloomfield	1951-52	239	388	627	61.9	----
From Hunters		30	67	97	69.1	----
TOTALS		269	455	724	62.8	1.69
Lamb's Bloomfield	1952-53	100	171	271	63.1	----
From Hunters		26	49	75	65.3	----
TOTALS		126	220	346	63.6	1.75
Lamb's-Bloomfield	1953-54	158	337	495	68.1	----
From Hunters		32	86	118	72.9	----
TOTALS		190	423	613	69.0	2.23

Sex-Ratio-- A total of 1,180 raccoons were sexed during the past fall and winter-198 were examined at Lamb's in Bloomfield, 245 were reported by hunters and 737 were checked at Oshman's Fur House in Cedar Rapids. Of these, 653 were males or 78.0 males per 100 females. In other words, females comprised 56.2 per cent of the 1953-54 season's harvest in Iowa. This is a slight decline in the percentage of females from that determined for the previous season's harvest, but it is virtually the same as was reported for the 1951-52 season(Table 2).

Breeding History-- Information in Table 3 indicates that the percentage of parous females in all females harvested has varied from 19.6 per cent in 1952-53 to 37.0 per cent in 1950-51. Parous females comprised 26.5 per cent of all females checked during 1953-54. This is somewhat larger than the percentage of parous females reported for the previous year. As was noted above, the percentage of juveniles in the bag was also somewhat higher during the past season than it was in 1952-53. Data presented later in this report indicates that the average number of young per litter (placental scar counts) has not varied significantly for the past few years.

Table 2.
Sex ratios of Iowa raccoons, 1949-50--1953-54.

ORIGIN	SEASON	MALES	FEMALES	TOTALS	%FF	MM/100 FF
Hunter Returns	1949-50	416	424	840	50.5	98.1
Fur Houses		412	489	901	54.3	84.3
TOTALS		828	913	1,741	52.4	90.7
Carcasses-Lamb's	1950-51	75	63	138	45.7	119.0
Hunters Returns		160	170	330	51.5	94.1
Fur Houses		304	429	733	58.5	70.9
TOTALS		539	662	1,201	55.1	81.4
Carcasses-Lamb's	1951-52	272	283	555	51.0	96.1
Hunter Returns		130	108	238	45.4	120.4
Fur Houses		665	995	1,660	59.9	66.8
TOTALS		1,067	1,386	2,453	56.5	77.0
Carcasses-Lamb's	1952-53	117	145	262	55.3	80.7
Hunter Returns		121	134	255	52.5	90.3
Fur Houses		396	611	1,007	60.7	64.8
TOTALS		634	890	1,524	58.4	71.2
Carcasses-Lamb's	1953-54	103	95	198	48.0	108.4
Hunter Returns		115	130	245	53.1	96.2
Fur Houses		299	438	737	59.4	68.3
TOTALS		517	663	1,180	56.2	78.0

Table 3.
Percentage parous and non-parous females in the Iowa raccoon harvest 1949-50--1953-54 and the computed number of young per parous female in the harvest.

ORIGIN	SEASON	PAROUS	NON-PAROUS	TOTAL	%PAROUS	YgPAROUS F[1]
Fur Houses	1949-50	116	373	489	23.7	5.0
Carcasses-Lamb's	1950-51	30	33	63	47.6	2.9
Fur Houses		152	277	429	35.4	3.1
TOTALS		182	310	492	37.0	3.1
Carcasses-Lamb's	1951-52	76	146	222	34.2	- -
Fur Houses		206	789	995	20.7	- -
TOTALS		282	935	1,217	23.2	5.1
Carcasses-Lamb's	1952-53	34	110	144	23.6	- -
Fur Houses		114	497	611	18.7	- -
TOTALS		148	607	755	19.6	5.4
Carcasses-Lamb's	1953-54	41	53	94	43.6	- -
Fur Houses		100	338	438	22.8	- -
TOTALS		141	391	532	26.5	2.4

1 Computed by dividing the number of parous females into the product of the total number of raccoons examined, multiplied by the percentage of juveniles in the harvest.

Information from the past several years indicates that adult males show some signs of sexual activity in southern Iowa during November and December but data from these seasons also show that they probably do not become fully sexually active until January. During the past season, only one juvenile male showed any signs of becoming sexually active in southern Iowa during November or December.

There were 159 placental scars representing 45 litters observed in the uteri of 41 parous females examined at Bloomfield, Iowa during the past hunting season. This is an average of 3.54 placental scars per placental scar group or an average of 3.54 young per litter. The number of scars per parous uterus ranged from none, for a non-breeding adult, to ten, but five uteri showed evidence of two litters. The number of young per litter ranged from one to six during the past season (Table 4).

Placental scar counts for the past three years reveal that once a female raccoon mates successfully, the chances are that she will mate successfully each year thereafter

(Table 4). These counts also show that average raccoon litter sizes in Iowa have varied from 3.54 to 3.96 during the past four years.

Harvest and Population -- There was an increase in the reported harvest from 62,356 in 1952-53 to 79,939 in 1953-54, this was an increase of 28.2 per cent and an all time high for Iowa (Table 5).

It is believed that this marked increase in the number of raccoon bagged was only partially the result of the earlier opening date. Even had the 1953-54 opening date been November 10 (as it was in past years) instead of October 10, the harvest would probably have been substantially higher than the 1952-53 bag because of the milder, more open winter of 1953-54. This allowed 'coon hunters more time for hunting 'coons with dogs than they have during a "normal" winter. Trapping regulations were unchanged, but in recent years raccoon trapping has contributed only an insignificant percentage to the harvest.

The raccoon population is believed to have been at peak levels since 1946 in Iowa and elsewhere on the North American continent. There have been minor fluctuations in the Iowa harvest since then, but the trend has been gradually upward until the 1953-54 season when there was a substantial increase. The increase in the 1953-54 harvest was probably caused by the above mentioned factors rather than by a major shift in raccoon numbers. Data in Tables 1 and 2 show that the age and sex ratios of the Iowa raccoon harvest have remained essentially unchanged since 1949-50. There was a slight increase in the percentage of juveniles in the past season's harvest but there was also a slight decrease in the percentage of females in the bag.

The average litter size also decreased very slightly but all of these changes were slight and are probably not significant.

Body Weights--Adult males varied from 13.0 to 25.0 pounds in body weight while juvenile males ranged from 8.0 to 15.0 pounds during the past season. Parous females weighed from 10.5 to 19.0 pounds and non-parous females from 6.0 to 19.0 pounds. On the whole the average body weights for the past year were similar to the ones reported previously. The average weights for the past four seasons are shown in Table 6.

Table 4

Placental scar counts made at Bloomfield, Iowa, 1950-51 1953-54 seasons.

Number of Scars per parous uterus	Number of Uteri 1950-51	1951-52	1952-53	1953-54
0	0	1	2	2
1	2	0	0	3
2	4	4	2	1
3	13	23	10	14
4	5	15	10	8
5	1	13	4*4	7*8
6	1	3*3	1	2*3
7	2*1	4*1	1*5	1*5
8	0	1	0	2*6
9	1*2	1*2	0	0
10	0	0	0	1*7

SEASON	Number parous uteri	Number groups of placental scars	Total Number scars	Average number scars per group (av. litter size)
1950-51	29	31	103	3.55
1951-52	65	67	265	3.96
1952-53	30	30	112	3.73
1953-54	41	45	159	3.54

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

Table 5.
Raccoon harvest and average value received per pelt in Iowa in 1953-54 compared with the highest, lowest and average figures for the past 24 years and the 1952-53 figures as reported by fur buyers.

SEASON	Number of pelts bought by dealers	Average value per pelt	Total Value
1932-33	10,468[1]	$ 2.60	$ 27,216.80
1943-44	38,303	7.25[2]	277,696.75
1951-52	67,211[3]	2.67	179,435.37
1952-53	62,356	1.72[4]	107,252.32
1953-54[5]	79,939 (↗ 28.2%)	1.57	125,504.23
24 year totals	826,075		2,359,744.12
24 year average	34,198	2.86	98,322.67

1 Lowest number harvested. (prior to '53-54).
2 Highest average value. (prior to '53-54).
3 Highest number harvested
4 Lowest average value
5 Hunting season opened Oct. 10 instead of Nov. 10 as in all other years.

Table 6.
A comparison of the average body weights of Iowa raccoons taken during the 1950-51--1953-54 seasons.

	1950-51	1951-52	1952-53	1953-54
	Average Weight in Pounds			
MALES:				
Adults	17.1	17.0	18.3	17.6
Juveniles	11.5	11.1	11.5	12.1
All males	13.8	13.2	13.3	14.4
FEMALES:				
Parous Adults	15.4	14.4	15.1	15.2
Juvs&Non-P ads	11.8	10.6	11.0	11.1
All Females	13.5	11.9	11.9	12.9
ALL RACCOONS	13.7 (138)[2]	12.5 (441)	12.6 (186)	13.6 (180)

SUMMARY

1. Results of the 1953-54 hunter reports show that with the opening date October 10, instead of November 10 as in past years, only 10 per cent of the hunting was done during the first 10 days of the open season instead of 56 per cent as was reported for the 1952-53 season.

2. The age ratio, as determined from 613 penis bones, was 2.23 young per adult, a moderate increase over the previous season.

3. The sex ratio of 1,180 raccoons, as reported by hunters, from checks in furhouses, and from carcass examinations, was 78.0 males per 100 females.

4. Parous females comprised 26.5 per cent of 532 females examined, a substantial increase over the previous year.

5. There were 159 placental scars representing 45 litters in the uteri of 41 parous females examined at Bloomfield, Iowa, for an average of 3.54 scars per group of placental scars. Thus, the average number of young per litter was 3.54, a slight decrease over the previous year.

6. Iowa's raccoon population still appears to be at peak levels.. The 1953-54 harvest was the highest on record, and was 28.2 per cent higher than the harvest reported for the 1952-53 season.

7. It is believed that the marked increase in the raccoon harvest was only partially the result of the earlier opening date. The milder weather conditions during the 1953-54 hunting season allowed hunters more time for dog hunting than they have during a "normal" winter. The increased 1953-54 harvest was probably caused by these two factors rather than by a marked increase in raccoon numbers.

8. Juvenile males averaged 12.1 pounds, adult males 17.6 pounds, non-parous females 11.1 pounds, and parous females 15.2 pounds in body weight. All males averaged 14.4 pounds, and all females 12.9 pounds. A total of 180 animals of both sexes and all ages averaged 13.6 pounds. Male weights ranged from 8.0 to 25.0 pounds and female weights from 6.0 to 19.0 pounds.

The Spring Mail Carrier's Count of Quail

by M. E. Stempel *

Usually at the biology seminars a report is made on work completed at the time of the meeting. At this time an officer's statewide count of whistling quail is in progress, and this paper is on the spring survey of quail made by cooperating rural letter carriers. Inventory of the quail population is taken each quarter of the year. The officer's winter check of quail gives an indication of the number of quail available as brood stock. The census of whistling quail gives us the distribution of the summer breeding population, and fall harvest estimates and age data are collected by department personnel. Information in the following report is obtained from mail carriers who during one week in the spring give information on the game species seen. Findings from this survey give an idea of the distribution of the spring quail population.

In the summer of 1954 the cooperating postmen recorded seeing a total of 638 quail during the week of May 13 to May 22. These birds were listed as having been observed in 59 counties where there are fair populations of quail.

Participating carriers drove 74,720 miles during the time the count of game was in progress. It is known that weather conditions do have an effect on the amount of game seen during the day, however, no extensive study is made of the weather at the time the count was in progress, but it is known that general weather conditions were about the same during the checking periods in 1953 and 1954. Although the amount of game seen is figured both as units per one hundred miles, and units per report card, we will here consider only the amount of game seen per card. In table one below, is given the number of quail that has been seen during the spring count for the years 1948 through 1954.

Table 1

No. of Quail per Card, Mail Carrier's Count of Game
1948 to 1954

Year	No. of Quail per Card
1948	3.9
1949	--
1950	3.1
1951	2.1
1952	2.0
1953	1.7
1954	2.3

* Game Biologist, 446 So. Schuyler, Ottumwa, Iowa

The 3.9 item for the year 1948 was obtained during the spring of a year that developed into a very good quail hunting season. The year 1949 was generally unfavorable for the production of quail, but no figure was kept on birds seen. During the census period in 1950 the cooperating mail carriers saw 3.1 quail per card, and it was during the following fall that quail hunting success was higher than during any recent season. Since this kind of data has been kept, cooperators reported that there was an average of 2.1 quail seen per card during the 1951 counting period, and this low preceeded one of the worst hunting seasons, from the viewpoint of the hunter, that has been encountered in late years.

In the 1952 period for censusing quail the men participating saw an average of 1.7 quail per report unit. Although this is a low figure, and might have been cause for some concern, a close inspection of other data revealed that there were good populations of birds in some of the best range according to to the previous winter census made by officers.

In the primary range as high as 2.4 birds were seen per mile in the southeast. Since the mail carrier counts of animals are made during the middle of the day and it is at that time that the least game is seen in good weather, it follows that slight changes in temperature, or moisture conditions might change the amount of game seen. In 1953 the spring count by men on rural letter delivery routes was 1.7 quail per card. This increased to 2.3 birds per card in 1954. Before the rural letter carrier's census was made, a conservation officer's count of wintering quail indicated that there had been since the 1952-1953 winter, a slight decrease in the number of quail per covey range, but more ranges were occupied.

Hunting during the coming autumn will depend first on the number of quail available as brood stock. Much time, and many possible weather changes intervene between counting date, and harvest date. If there are good hatching conditions throughout most of the summer then even a minimum brood stock will provide birds in all good coverts.

In the south-central part of Iowa rural mail carriers cooperating in the spring count of quail reported that each had seen an average of 1.7 quail in 1953, while in 1954 in the same section of the state they had seen 5.3 quail per card. This latter count is high, and is due to a very high count in only one county.

The southeast part of the quail range was lower with 2.4 quail seen per man in 1953, and 3.9 birds per card in 1954. Although these district averages are influenced by

high counts in one or two places the state-wide figures average higher in the 1954 census.

The spring mail carrier's count of quail is the highest it has been in four years. It is our latest figure to be used in estimating the population. This is an increase over last year, and no other estimates indicate a decrease; therefore, we can expect repopulation of most good coverts. During some years of the census it has not followed that increase or decrease was shown in the fall numbers of birds by the amount of game in the spring. Much of the reproduction depends on favorable weather. Therefore, a hatching period that is not too adverse will provide ample quail for a successful hunting season.

PHEASANT CROWING COCK COUNT
SPRING 1954

Richard C. Nomsen *

The annual spring pheasant brood stock survey has been completed by conservation officers. This makes the fifth consecutive year that the crowing cock count has been used for this census. This report presents the results of this spring population study. Material from the crowing cock count is also used to construct a map illustrating pheasant distribution and densities.

Weather conditions were generally unfavorable for the 1954 count - about the same as during the 1953 survey. Variable weather conditions delayed the counts in some areas and was responsible for a late start in southern Iowa. Temperatures were above normal in April and the pheasants apparently started mating and nesting activity earlier than in 1953. However, the first part of May was much colder than average. In some areas of northern Iowa, below freezing temperatures were recorded for several nights.

The statewide results of the crowing cock count are shown in Table 1 which lists the average number of calls heard, the observed sex ratio, and the index of the spring hen population for the past five years. The 1954 census was started May 12 and a total of 186 routes were checked during the survey. Officers heard 31,174 calls at 3,686 stops for the state average of 8.5 calls per stop. The average in 1953 was 9.4. The observed sex ratios were obtained from our winter surveys and must be applied in order to complete the spring count. The 1954 spring hen index increased 10 per cent over the 1953 figure. Our reproduction last year was below average which lowered the fall population figures. However, the past winter was mild and open so it is possible that a higher percentage of the pheasants was able to survive through the winter months. The 1954 spring hen index is also slightly higher than the five year average.

Table 1
Statewide Results of the Crowing Cock Count

Year	Average No. of Calls Heard	Sex Ratio	Spring Hen Index Av. Calls x Sex Ratio
1950	7.9	2.9	22.9
1951	8.1	2.9	23.5
1952	9.3	2.7	25.1
1953	9.4	2.2	21.7
1954	8.5	2.8	23.8

* Game Biologist, R. R. # 2, Hampton, Iowa

The results of the 1954 count are listed for each district in Table 2 and a comparison of the district results is made in Table 3 with previous counts. Districts one and two in northwest and north-central Iowa of course had the highest figures with district one leading this year. Northwest Iowa reversed a downward trend of a year ago to a level similar to 1952. The results from the north-central part of the state indicated a downward trend which began in 1953. Results from both districts are much higher than the state average.

The next three districts, namely, the northeast, west-central and central Iowa districts remained near the state average. The results obtained from the west-central district were the third highest in the state even though they dropped slightly from the 1953 figures. The results from northeast Iowa were very nearly the same as in 1953. The index of spring hens increased in central Iowa to a figure similar to that in 1952.

Spring hen population figures from east-central Iowa were the same for the last two years. Their count remains below the state average.

The records from southwest Iowa indicate a continued increase in the pheasant population as well as an increase in the primary range. The average for this district however is somewhat below the state average.

South-central Iowa recorded an increase in the number of birds this year and the southeast experienced a decrease. Both of the last two districts remain well below the state average.

No attempt was made this year to compare the results of those counts repeated by the same officers with those of all officers. Previous checks have shown very little or no difference in the two.

Table 2
Results of the 1954 Crowing Cock Count

District	No. of Calls Heard	No. of Stops	Av. No. of calls per stop	Sex Ratio	Index of Spring Hens
1 NORTHWEST	7310	415	17.6	3.1	54.6
2 NORTH-CENTRAL	9128	435	21.0	2.0	42.0
3 NORTHEAST	3224	401	8.0	2.6	20.8
4 WEST-CENTRAL	3969	435	9.1	2.5	22.8
5 CENTRAL	3157	480	6.6	3.3	21.8
6 EAST-CENTRAL	1356	380	3.6	4.5	16.2
7 SOUTHWEST	2238	360	6.2	2.0	12.4
8 SOUTH-CENTRAL	610	420	1.5	2.0	3.0
9 SOUTHEAST	182	360	0.5	2.0	1.0
STATE	31,174	3686	8.5	2.8	23.8

Table 3

Comparison of Crowing Cock Count Results
1952 - 1954

District	Year	Average Number of Calls Heard	Index of Spring Hens
1 Northwest	1952	18.7	50.5
	1953	19.8	39.6
	1954	17.6	54.6
2 North-central	1952	20.0	60.0
	1953	26.6	55.9
	1954	21.0	42.0
3 Northeast	1952	7.7	17.7
	1953	7.8	21.1
	1954	8.0	20.8
4 West-central	1952	10.5	21.0
	1953	10.2	25.5
	1954	9.1	22.8
5 Central	1952	7.6	22.0
	1953	6.2	19.2
	1954	6.6	21.8
6 East-central	1952	7.1	14.9
	1953	5.1	16.3
	1954	3.6	16.2
7 Southwest	1952	6.7	10.1
	1953	5.7	11.4
	1954	6.2	12.4
8 South-central	1952	2.6	3.9
	1953	1.1	2.2
	1954	1.5	3.0
9 Southeast	1952	0.7	1.1
	1953	0.6	1.2
	1954	0.5	1.0

The Status of the Wood Duck in Iowa and in the Mississippi Flyway

By James Sieh *

In some areas of the Mississippi Flyway the wood duck population has drastically declined during the last few years. This decline may be temporary in nature, but it is paramount that waterfowl workers endeavor to evaluate the extent of the population change, and if possible, determine what has caused or is continuing to cause a downward trend in wood duck numbers in recent years.

Only one of the fourteen states (Mississippi) in the Mississippi Flyway has not made general observations on wood duck populations in recent years.* The report further stated that three states, Indiana, Iowa, and Missorui have used stream surveys to determine numbers of breeding adults and to evaluate brood production. Four states, Alabama, Kentucky, Ohio, and Minnesota planned to begin similar stream surveys in 1954. Five states, Louisiana, Illinois, Ohio, Iowa, and Michigan have information on the comparative use of nesting boxes by wood ducks as a means of determining trends. Three states, Alabama, Tennessee, and Minnesota plan to erect numbers of wood duck nesting boxes in 1954.

According to the same report, wood ducks in Illinois began to decrease in numbers in the mid-forties coincident with an increase in raccoon numbers. This mammal was thought responsible for depressing the wood duck population over large areas of its range. Commencing in 1951, unusually high kills of wood ducks occurred in the Mississippi Flyway, largely from hunting. The average mortality rate was 56.4 per cent for all year classes of wood ducks banded in Illinois from 1941 to 1947. The average mortality rate increased to 63.0 per cent for wood ducks banded in Illinois from 1950 to 1952. In comparison the mallard in the Mississippi Flyway has maintained an annual mortality rate of approximately 44 per cent. These figures indicate that even with the one-in-possession law, the loss of wood ducks from hunting has been most serious.

In general the Iowa status of the wood duck closely paralleled the population changes within the Mississippi Flyway. Population studies of the wood duck in Iowa do not date back to the mid-forties, but it is well known that raccoon numbers in Iowa were relatively low during the thirties, rapidly increasing during the mid-forties, and reached a previously unrecorded population highs during the late forties which have continued until the present time (Sanderson, 1951). It has been the studied opinion of some waterfowl workers in the Mississippi Flyway that the decline in wood duck numbers moved progressively northward, with the decline in Missouri and Illinois preceeding that in Iowa,

*1 Game Biologist, State Biology Bldg., Okoboji, Iowa *2 report of the status of the wood duck in the Mississippi Flyway by the technical section of the Mississippi Flyway Waterfowl Council, 1954.

Minnesota, and Wisconsin.

Annual stream surveys in Iowa were begun in 1953 to determine the number of breeding wood ducks present on selected sections of streams having good wood duck nesting habitat. Repeat brood surveys over the same selected survey routes complete the annual stream surveys and provide information on breeding pairs and brood production. Comparison of the data gathered during stream surveys in 1953 and again in 1954 indicated fewer adult wood ducks were present on each of the five routes censused (table 1). Repeat brood surveys in 1954 have not been completed and no broods were seen in 1953; consequently, the wood duck production in Iowa from 1953 to 1954, according to stream survey data available, would indicate a downward trend.

Wood duck nesting box data from Iowa likewise indicate that there has been less utilization of nesting boxes in the Odessa area and elsewhere (table 2.). At the present time the decreased population of wood ducks in southeastern Iowa has been noted by most observers in 1954. Up until 1954 in the Odessa area there was not always unanimous agreement that the population trend was downward; this year there was no dissent. Wood duck nesting boxes checked at Little Spirit Lake in northwest Iowa indicated no nesting use in 1954; however, in 1953 two of nine boxes checked had been occupied by wood ducks. Routine field observations likewise indicated reduced wood duck populations in northeast Iowa in 1954.

Kill sampling figures indicated an increased state-wide harvest of wood duck from 1948-1951; however, in the ten Iowa counties bordering the Mississippi River the increased harvest continued an additional year from 1948-1952(Table 3). These figures probably indicate the hunting pressures on the wood duck during a population decline tend to first show up as reduced numbers in the hunters bag in areas where the species is neither concentrated nor abundant during the open season. During the hunting season of 1951 it is the writer's opinion that had not this season been unusually successful for waterfowling in general, the kill sample of wood ducks in the ten Mississippi River counties in 1951 would have exceeded the 1952 kill sample. In other words, in 1951 many hunters did not kill wood ducks because they could kill other species instead. In 1952, which was not nearly as successful a season for waterfowling in general, the kill of wood duck in the ten Mississippi River counties increased because the wood ducks were more available, comparatively speaking, than were other species of waterfowl. In 1953

Table 1.- Wood Duck Stream Survey in Iowa (1953-54)

Census Route	Wood Ducks Counted	Date of Census
Des Moines River, Webster County (Kalo Bridge to Lehigh, 11 miles)	May 13, 1953	May 6, 1954
Males	3	2
Females	2	2
Number of pairs	6	
Number unidentified as to sex		2
Total Wood ducks	17	6
Des Moines River, Polk County (Del Rio Bridge to Sycamore Park Bridge, 13 miles)	May 14, 1953	May 13, 1954
Males	1	1
Females		1
Number of pairs	3	
Number unidentified as to sex		
	7	2
Cedar River, Linn County (Center Point Bridge to Palo Bridge, 18 miles)	May 5, 1953	May 7, 1954
Males	6	1
Females	5	
Number of pairs		1
Number unidentified as to sex	4	5
	15	8
Wapsipinicon River, Buchanan County (Littleton Dam to Independence Dam, 9 miles)	May 6, 1953	May 5, 1954
Males	1	
Females		1
Number of Pairs	1	
Number unidentified as to sex		
	3	1
Des Moines River, Emmet County (Petersburg, Minn. Bridge to first bridge in Iowa, 8 miles)	May 9, 1953	May 11, 1954
Males		
Females		1
Number of pairs		1
Number unidentified as to sex	4	
	4	2

Table 1.

Wood Duck Stream Survey in Iowa (1953 - 1954) (continued)

Census Route	Wood Ducks Counted	Date of Census
Little Sioux River, Cherokee County (Laurence Davis farm to Brash Bridge, 7 miles)		May 11, 1953. In 1954 census route abandoned due to channel straightening.
Males		
Females		
Number of pairs		
Number unidentified as to sex	4	
Total wood ducks	4	
Little Sioux River, Buena Vista County (Sioux Rapids to Linn Grove, 7 miles)		May 11, 1954
Males	1	
Females		
Number of pairs	2	
Number unidentified as to sex		
	5	
Skunk River, Keokuk County (Manhattan Bridge to state road #77, 12 miles)		May 10, 1954
Route not established in 1953.		
Males	3	
Females		
Number of piars		
Number unidentified as to sex	1	
	4	

Table 2.— Wood Duck Nesting Box Success at Lake Odessa Louisa County, Ia.

Years	1950	1951	1952	1953	1954
Number of nesting boxes available	26	36	24	30	72 (22 old wood type) (50 metal type)
Number of nesting boxes occupied	18	13 pre-flood 9 post flood	18	15	11 (7 wood duck) (4 merganser)
Number of nests destroyed by flood	0	13	0	0	0
Number of eggs destroyed by flood	0	108 wood duck	0	0	0
Total number of potentially sucessful eggs	158	72 0	237*wood duck 38 merganser	111 wood duck est. 17 merganser est.	not estimated insufficient evidence
Number of successful nests	11	6	**?	**?	**?
Number of ducklings successfully hatched	129	68	**?	**?	**?

*Abnormal success in 1952 was caused by flooding of other nesting cavities and subsequent large scale dump nesting in these nesting boxes raised up above the flood crest; the success does not indicate production trend.

** Student observer not available on full time basis and consequently data not available.

Table 3.-- Recorded Kill Samples of Wood Ducks in Iowa since 1948.

Years	1948	1949	1950	1951	1952	1953
Number of WD* reported from all Iowa counties	114	133	148	464	427	321
Percentage of WD in total mixed bag sampled in all Iowa counties	1.9%	2.3%	3.2%	3.3%	6.8%	3.7%
Number of WD reported from ten Miss. Rv. Counties	50	44	81	138	223	154
Number of Miss. Rv. counties reporting	8	5	7	9	9	8
Percentage of total WD sample from the Miss. Rv. counties	43.8%	33.0%	54.7%	29.7%	52.2%	47.9%
Opening dates of waterfowl seasons: October	29	21	20	12	8	8

* WD abbreviated to indicate wood ducks.

the state-wide kill sample and the sample in the ten river counties both indicated a considerable decrease in the wood duck harvest. This decrease probably represented a smaller population of wood ducks available to hunters in Iowa during 1953 compared to the 1951 and 1952 figures, and may represent overharvest of a declining population.

The most important conclusion from studying kill samples of wood ducks in Iowa since 1948 is the clear-cut indication that roughly three times as many wood ducks have been reported in the kill samples when the waterfowl season in Iowa opened on October 12th or earlier compared with the number taken when the season opened on October 20th or later. (table 3). These facts are important in the wise management of a vulnerable species of waterfowl such as the wood duck.

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AN ESTIMATE OF THE POPULATION OF CHANNEL CATFISH IN THE HUMBOLDT AREA WITH NOTES ON THE HOOPNET AS A SAMPLING INSTRUMENT

by
Harry M. Harrison*

The purpose of this paper is twofold. First, it is intended to report the results of a catfish population study in the Humboldt area. Its second purpose is to explore the possibility of using the rate of catch of hoopnets as a factor to indicate the size of catfish populations.

Hoopnets baited with cheese are the principle gear used to study channel catfish populations in the Des Moines River. These are used since they take more catfish with less effort than any other device available under the particular conditions present in that body of water. The criterion used to measure the population level has been based on the number of fish caught per net hour during the spring and early summer months, and comparing that figure from one year to the next. This method, of course, shows only trends, and does not in any way indicate the size of the population. The size of the population, however, is important from a management point of view. Because of the virtual impossibility of making river-wide population estimates by the usual marking and recapture techniques in streams as large as the Des Moines River, it would be of value, if possible, to make at least a rough estimate of the size of the population from the number of fish caught per net hour.

To accomplish this, it is first necessary to establish the effectiveness of baited hoop nets to take catfish. It follows then, that such a study must, by necessity, be made upon an area where the size of the population is known or can be determined, and furthermore that population should not be subject to change by the free movement of catfish into or out of the area.

Studies near Humboldt since 1946 have revealed that the area between the towns of Humboldt and Rutland offers a site suitable for such an investigation. The area is enclosed by dams and these are not easily, or at least not usually, negotiated by catfish. First of all, fish cannot get into from below or out of the area above because of impassible dams. Furthermore, finclipping experiments conducted both inside of and below the area show no appreciable movement out of the area by catfish falling downstream over the dam. In addition, it is unlikely that many catfish come into the area from above. The area above the Rutland dam is typical of other river reaches above dams in that catfish are not attracted to the type of habitat found there, and in such areas catfish populations are always at a minimum. Then too, except for high water periods, the river runs through a hydro-electric plant at Rutland before entering the study area.

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This factor alone precludes the possibility of fish entering the area from above for the most of the year. Finally it seems doubtful that fish would fall down stream over the Rutland dam in significant numbers if they do not pass downstream over the dam at Humboldt.

In the course of our studies on the Humboldt area, three attempts have been made to get a population estimate of the catfish in the area. The first two of these failed largely because of poor success in recapturing marked individuals. The third attempt has, however, produced figures believed to be reliable, and has in addition, answered to some extent, the cause of our other failures. The reason for failure in our initial attempts is believed to have been because we did not allow a time interval to elapse between marking and that of recapture. Perhaps the disturbance to an individual fish that accompanies netting, handling, marking and so forth, tends to cause that individual to shy away from traps for a considerable time.

Just how long marked fish avoid being retrapped is not known. Our experience has been that recaptures in significant numbers cannot be expected for at least a month and possibly more.

Work on the population estimate reported upon here was begun in the fall of 1953. At that time 14,889 channel catfish taken in the Humboldt area were fin-clipped and returned to the water at the point of capture. In the spring of 1954, from April 6 to June 4, at the same river locations, the area was sampled with hoop nets. The results of that sampling are given in Table 1, which indicates the total number of catfish caught on each of 14 lifts of the hoop-nets together with the number of marked fish recaptured and the percentage of each haul made up of fin-clipped fish. In addition the table includes the number of hours fished between each lift and the number of catfish caught per hoop-net hour.

The Peterson method was used for estimating the population ($P = \frac{AB}{C}$, where A is the number of marked fish in the area: B, the number of fish taken and C, the number of recaptures). The number of catfish residing in the area is thus calculated at 104,597 individuals. The study area is five and one-quarter miles long and reducing the estimated population to a fish-per-mile basis would indicate 19,923 catfish per mile of stream.

It is felt that a great deal of confidence can be placed on this estimate. In the 14 different lifts of the nets the percentage of marked to unmarked fish was uniform, and in most instances it did not vary more than two per cent. In addition, other factors that contribute toward systematic error were avoided. A large sample of fish were

marked and large numbers of them were recaptured. The marked fish had a ample opportunity to mingle homogenously with the unmarked segment of the population. Also, recruitment of smaller fish into the population would not be significant since catfish grow very little during cold weather. Finally, mortality would be slight as catfish are a hardy species, but if present, should effect both the marked and unmarked fish alike.

Probably the estimate of 104,579 catfish is approximately close for the fall of 1953 population. But since a part of this study was to evaluate the effectiveness of hoop nets to take fish in our annual surveys which are run in the spring and early summer, the question arises as to what changes may have taken place in the population from the fall of 1953 to the spring of 1954.

There is no question but what there was a decline in the population from fall to spring. Certainly there is continued mortality among fish, and as pointed out above there would be no recruitment from smaller individuals to compensate for this loss. In addition, the population would decline through angling pressure.

Regarding natural mortality, there is no way for arriving at a definite figure for the fall to spring loss. However, since the population studied here was principally young fish averaging 10 to 14 inches in total length there was probably no loss from old age. With respect to epizootics, the disease white spot was found on catfish in the area. However, the incidence of this parasite was low and no fish were found dead on the river banks or on the hydro-electric plant screens, it is doubtful that many catfish actually died from that disease or for any other reason between the time of marking and re-sampling.

The question of loss to the population by angling probably constitutes the most significant decline in the population. This pressure is exerted primarily in the spring for several weeks after the season opens. A check on the fish being caught in the river is a part of a creel census project being carried on separately from this study. From that work it is estimated that probably no more than 2,000 fish have been taken from the area by fishermen.

Regarding the above, it seems improbable that the loss of catfish to the population from fall to spring would exceed no more than four to five thousand individuals. This from all causes including angling, death from disease, natural mortality or drifting downstream over the dam at the lower end of the area. Percentage wise, such a loss is quite insignificant. Taking the loss into account, however, and

subtracting it from the fall population, it is believed that an estimate of approximately 100,000 fish would be fairly accurate for the spring population of catfish in the Humboldt area.

Comes now a discussion of the possibility of using the rate of catch by baited hoopnets in estimating the size of catfish populations. Referring to Table 1 and the portion dealing with the rate of catch, it is significant to note that the hoopnet is not too effective as a device for taking catfish. In this area, where the population is approximately 20,000 catfish per mile of stream, the average catch was only 1.18 fish per net hour.

If the rate of catch data in Table 1 is examined, it will be noted that wide variations occured in the catch. For instance, the catch between the 16th and 19th of April was 13 times as great as that for the period between the 1st and 4th of June. These figures are, of course, the extremes but they show very definitely the impossibility of using rate of catch as a factor to estimate the size of populations on the basis of short time sampling intervals. On the other hand, if the average rate of catch, (1.18), is compared with each of the individual samples, we see a rather close relationship. In fact, three of the fourteen samples are almost identical with the over-all average and in seven other cases the rate of catch varied less than a half a fish per hour. From this it would appear that the catch by hoopnets is rather constant. Certainly the present study is not conclusive, never-the-less, it indicates that there is a possibility of estimating catfish populations by the catch of hoopnets.

Other data which tends to substantiate this can be taken from our annual surveys conducted in the upper reaches of the Des Moines River. The results of these surveys have been given in previous reports. In those reports our hoopnet catches present the same picture as that given above. That is, during the course of any one year the rate of catch fluctuates considerably but when all netting is averaged together a constant figure results. This figure runs approximately .35 - .45 fish per net hour and in nine years of study that value has remained fairly constant. From our annual netting surveys, creel censuses and reports of fishermen there is good evidence that the river population has not changed appreciably in the time of study. In addition, the river population level, although not known, is felt to be considerably lower than that found in the Humboldt Area. This smaller population is indicated by smaller rate of catch.

What the figures .35 - .45 for the rate of catch per net hour in the river would indicate as compared to the figures obtained for the Humboldt area is a matter for conjecture. The magnitude of the population may not be

directly proportional to those in the area where the size of the population has been determined, but, present evidence points toward this possibility.

Plans are now being made to explore this problem further, and it is hoped that work on the Humboldt Area can be continued to further substantiate the feasibility of using the rate of catch as a factor to evaluate the size of the catfish populations.

Table 1.

Samples of the Catfish Populations in the Humboldt Area as Secured by Baited Hoopnets.

	CATCH		RATE OF CATCH		
Date	Total No. Fish Taken	Total No. Marked Fish	% of Fish Marked in Haul	Net Hours	Fish Caught per Net Hour
4/9/54	246	24	10	288	.85
4/16/54	806	97	12	672	1.19
4/19/54	1,344	182	13	288	4.50
4/22/54	341	46	13	288	1.17
4/26/54	305	63	20	384	.79
4/29/54	433	73	16	288	1.20
5/5/54	314	34	11	576	.54
5/8/54	467	70	15	288	1.60
5/11/54	434	56	12	288	1.50
5/14/54	634	100	15	288	2.20
5/17/54	400	75	16	288	1.38
5/24/54	369	62	17	672	.55
6/1/54	272	26	9	768	.35
6/4/54	316	43	13	388	.81
Totals	6,681	951	13.7	5,664	1.18

SUMMARY OF HATCHERY STUDIES, SPRING OF 1954

by
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This is the annual report concerning certain phases of walleye and northern pike hatching. Investigations involving these fish were carried on during the spring of 1954 at the Spirit Lake and Clear Lake hatcheries and to a limited extent at the Lansing station. The following discussion presents the highlights and results of the routine studies, which are concerned primarily with production, at the Spirit and Clear Lake stations. The special or experimental work will be discussed under a separate heading.

Spirit Lake Hatchery

Northern Pike: Adult northerns were collected from carp traps and held at the hatchery for stripping. The first northern eggs were "put up" on April 3 and the last on April 23. A total of 32 quarts, averaging 60,000 per liquid quart, were stripped from 39 fish for an average of 0.82 quart per female. Twenty-one quarts were brought through to the hatching stage (65 per cent) resulting in 1,260,000 fry. These fry were stocked in shallow weedy areas adjacent to or a part of fishing waters where additional predator fish were needed.

Walleyes: Gillnetting crews started fishing on April 5 and finished on April 22, catching 3,511 walleyes from four lakes for an average of 25 fish per crew-night. Of this total there were 1,295 females that produced 486 quarts of eggs for an average of 0.37 quart per female. Slightly more than 390 quarts of eggs became eyed for an 80 per cent hatch representing 56,222,000 fry. Water temperatures during the incubation of both northern pike and walleye eggs averaged about 50 degrees F (range 42 degrees to 58 degrees F).

For the first time in recent years the Conservation Commission imported walleye eggs from Put-in-Bay, Ohio. A shipment of 275 quarts of eggs were iced down and hauled by truck. This shipment produced only 29 quarts of eyed eggs, equivalent to a 10.6 per cent hatch. Twelve fertility checks were made on these eggs as they were "put up" at the Spirit Lake hatchery. These checks indicated a fertility of 5 to 40 per cent with an average of about 25 per cent. A

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‡ The author wishes to express his appreciation for the help given by Fay Fronk, Muhrl Lindquist and John Spinner, superintendents of the Spirit Lake, Clear Lake and Lansing hatcheries respectively.

pint of eggs was placed in formalin at the Ohio station in an attempt to compare fertility before and after shipment. These eggs had a maximum fertility of 40 per cent, but of course they represented a comparatively small sample and thus may not be a truly representative sample.

The 29 quarts of eyed eggs from Ohio provided an additional 4,176,000 fry, bringing the total fry production for the Spirit Lake station to 60,398,000. Both the Ohio and Spirit Lake eggs averaged approximately 144,000 per liquid quart. Approximately seven million fry were placed in 13 nursery units, over six million were stocked at 18 stations on the Des Moines River and its tributaries and over 45 million were stocked in 15 natural lakes. A few fry were stocked experimentally in artificial lakes and gravel pits.

Fifteen million fry were stocked in Spirit Lake, marking the sixth year of stocking at this rate.

Clear Lake Hatchery

Northern Pike: The 1954 season was the second year for hatching northern pike at the Clear Lake hatchery. Although the 1954 run did not follow the same pattern in all respects as that of the 1953 season, the fish were composed largely of the same age class. Northerns used during the 1953 season were from an unusual run of two year old fish (Moen and Lindquist, 1954). Since 1953 the males had increased 3.4 inches in length and 0.8 pounds in weight. The females increased 5.6 inches in length and 1.5 pounds in weight. The average size of the eggs had increased from 75,000 per liquid quart in 1953 to 60,000 per quart in 1954. There was little or no variation in the size of the eggs during the 1953 season but during the 1954 operations the eggs had a range of 58,456 to 67,670 per quart.

A total of 52 quarts of eggs was "put up" and 23 quarts reached the eyed or hatching stage thus producing 1,380,000 fry for a 44 per cent hatch. The bulk of the fry were stocked in the connecting Ventura marsh.

Walleyes: The 1954 season was a "hatching" year for walleyes at Clear Lake in the alternate-year fry stocking experiment being conducted in cooperation with the Iowa State College Fisheries Research Unit. This is the seventh year of this program. The gillnetting crews fished from April 5 to April 22 inclusive and caught 1,582 walleyes for hatchery use, thus averaging 23.9 fish per crew-night. Of the fish netted 610 were females from which 200 quarts of eggs were obtained for an average of 0.32 quart per female. Approximately 82 per cent of the eggs hatched, yeilding a total production of 23,640,000 fry. Except for a few thousand fry for nursery ponds the entire production was stocked in Clear Lake. Most of the fry were stocked from a boat. This was the first time for this procedure at Clear Lake, previously all stocking had been completed from shore.

Experimental Studies

Anesthetizing Preliminary work at the Spirit Lake hatchery in 1953 indicated that the use of a solution of chloretone (1:700) an anesthetic would be a helpful aid in the stripping of large northern pike. No ripe females were available in 1953 but during 1954 several large females were stripped after being anesthetized. Egg fertility was equal to or better than that for eggs taken in the normal manner. No attempt was made to anesthetize all the fish, just those that were difficult to handle.

At the Lansing station about 50 northerns were anthetized in a solution of 1:500. The water temperature remained at 54 degrees F. Thirty-two of these northerns were part of an egg fertility experiment and were handled by hatchery personnel as a demonstration of the technique. Data from this limited check indicated that the fertility of eggs from anesthetized fish ran from 13 to 26 per cent higher than those taken in the conventional manner.

The technique consisted of anesthetizing several fish of one sex at a time, then placing them in a dip net in fresh water for use by the spawn-taken. Treated fish remained relaxed for 15 minutes to as much as one hour. This allowed the operator plenty of time to complete the spawn taking procedure before the fish became active again.

Anesthetizing by means of an electric shock proved successful but not as practical as chloretone. In using the electrical method the fish were placed in a tub of water followed by application of a standard 110 volt electrical current through two small wooden paddles wound with about two feet of bare copper wire. The electrodes were kept in the water only long enough to produce electronarcosis. Northern pike thus anesthetized were inactive from 10 to 20 minutes. After the fish recovered from the initial muscular contraction they remained in a relaxed condition suitable for spawn taking operations. Eggs collected from four females and fertilized by the sperm of six males all of which had been "shocked" ran slightly higher in fertility than for eggs taken in the normal manner. One jar of walleye eggs taken from "shocked" fish had a fertility of 75 per cent. This was slightly less than the average for normally taken eggs.

Two major disadvantages in the use of the electrical method were noted. The most important was the danger involved when hatchery visitors were present; wet feet and electricity are a poor combination. The second disadvantage was the fact

that ripe females had a tendency to lose a portion of their eggs during the initial shock period. There may be instances where electrical methods could be used to an advantage in the field through the use of a portable generator.

Malachite green and fungus: Malachite green has been used as a fungicide in the treatment of fish for a number of years, but apparently it has not been used too often as a fungicide for fish eggs. Schenberger (1941) reported the use of copper sulphate in the control of fungus on trout eggs but more recently Robertson (1954) used malachite green in the treatment of lake trout eggs and Cummins (1954) used malchite green in reducing the fungus problem associated with the incubation of walleye eggs at the Put-in-Bay hatchery. Although fungus on the walleye eggs at the Spirit Lake hatchery is serious during years of warm water temperatures it has never been considered a major problem but rather one that has been accepted as part of the normal operating loss. Nevertheless, each year, considerable time is spent siphoning dead eggs and fungus. During the past season several small scale experiments were conducted with malachite green at the Spirit Lake hatchery.

Cummins (op. cit.) treated an entire battery of eggs at one time, by dissolving two grams of malachite green in a quart of water and pouring this along the top of each trough, thus six grams were used in the treatment of the battery. Several factors connected with the operation of the Spirit Lake hatchery prevented carrying out this method. After several trials the best application was obtained by adding 0.5 gram of malachite green (from a stock solution of 1:200) to a tub of green eggs (12 to 15 quarts) and enough water to make a solution of about 1:800,000. The eggs were allowed to remain in this solution for two minutes then they were rinsed three times and "put up" in the regular way. Although only one treatment was given any one group of eggs the fungus was reduced sufficiently to save two to three siphoning operations. An additional bath of malachite green would likely carry the eggs through to hatching time without fungus but the method of application of the second or third treatment has not been determined. The use of malachite green on green eggs prior to formation of any fungus proved more successful than application after formation of fungus. This applies particularly to the latter part of the season when water temperatures are higher. Water temperatures averaged about 50 degrees F during the period of the experiments, slightly higher than those reported by Cummins.

Walleye fry: Several short studies invoked in 1953 were repeated this year. These investigations were primarily concerned with ascertaining limitations of stocking walleye fry in relation to temperature and method of handling. It was again determined that walleye fry are hardy. They were dumped into water six degrees warmer, nine degrees cooler and from heights of three to six feet without benefit of any special considerations. These fry were then ob-

served for period of two to five days. One group of 100 fry in a two quart jar, provided with a screen lid, was lowered to a depth of 100 feet and left there for 48 hours. These fry were transferred from 61 degrees F water to the West Okoboji water at 55 degrees F. They were lowered to the 100 foot level within a 20 minute period. The water temperature at 100 feet was 46 degrees F. At the end of the 48 hours the jar was raised in 2½ minutes. There was only one dead fish, the others appeared to be in good condition.

During the hatching season considerable time is spent tempering fry and in finding suitable stocking areas free from "on-shore" winds. Stocking from a boat that docked at one central location would not only save time but provide a better method of distribution.

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ELECTRO-FISHING SURVEYS - NORTHEAST IOWA TROUT STREAMS, 1953 and 1954

by
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Preparatory to changing Iowa's trout fishing to a continuous open-season basis, surveys conserned with post-season populations and the winter carry-over of these populations were instigated. In March of 1953, four of Iowas 44 trout streams were spot-checked with a 120-volt D. C. shocker in an effort to gain information on their winter carry-over of trout. These initial surveys were more or less experimental in nature. In addition to actual data on residual populations (Table 1), observations as to mechanical improvements on the fishing gear and shocker as well as its limitations in various stream habitats were made.

Table 1 - Number of Trout taken during winter carry-over surveys, March 1953

Stream	Area Shocked	No. Fish
Mink Creek	1.50 miles	16
Elk Creek	.25 "	82
Trout River	2.00 "	14
South Bear	1.50 "	133

It is unfortunate that an exact record of the species composition was not kept for each stream during the 1953 spring surveys. However, in the future this species delineation will be made since it is believed that the residual number of brown or rainbow trout may be indicative of stream conditions.

In order to supplement these data with a pre-winter index which, in effect, would give us some idea as to the number of trout present in certain reaches of these streams prior to natural winter and spring losses, it was decided to rework these streams in the fall and to increase the coverage to 13 streams. The surveys were begun in early November, 1953, since it was assumed that angling and the subsequent angling loss of trout in these streams would be minimal at this time of year. Either of two considerations were met in the choice of streams to be surveyed: 1) that the stream be a "problem" stream; or 2) that it be one of the heavily utilized streams of the area.

Table 2 lists the streams, the areas covered, and the number of trout taken at each station during the 1953 fall

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surveys. The "shocking" stations, varying in length according to accessibility, are arranged with the upstream stations listed first.

Table 2 - Geographical Location, Length of Area Covered, and Trout Taken During the Post-season Electrofishing in Northeast Iowa Trout Streams, November 1953.

Stream	Township	Section	Estimated Coverage in Miles	Trout R.B.	Trout Brown
Big Mill[2]	Bellevue	7	1.20	16	24
Big Mill	Bellevue	10	.25	0	0
Swiss Valley[1,2]	Table Mound	20	.33	0	0
Swiss Valley	Table Mound	16	.25	75	6
Buck Creek [1]	Garnavillo	16	.50	0	1
Buck Creek	Garnavillo	9	.25	9	20
Elk Creek [2]	Elk	15	.25	46	40
Bloody Run [2]	Giard	9	.50	19	39
Bloody Run	Mendon	19	.50	10	16
Bloody Run	Mendon	16	.50	2	12
Livingsgood Spr.[1]	Post	3	.25	4	6
Village Creek [2]	Center	19	.50	4	12
Village Creek	Center	21	.50	1	1
French Creek [2]	French Creek	14	.25	0	79
French Creek	French Creek	11	.50	9	66
Mink Creek [1]	Illyria	14	1.00	1	9
Waterloo Cr. [2]	Waterloo	9	.25	1	3
Waterloo Cr.	Waterloo	16	.75	3	9
Waterloo Cr.	Waterloo	24	.25	22	24
Trout River [2]	Glenwood	21	1.75	4	2
South Bear Cr.[2]	Highland	28&33	1.50	13	30
Bohemian Cr. [1]	Sumner	17	.50	1	23
		Totals	12.53	240	422

1 - "Problem" stream
2 - Heavily utilized stream

Using the "Totals" from Table 2 as a sample estimate of the residual trout population in 146.1 miles of designated "Trout Water" in the State of Iowa (calculated at 52/miles of stream), indications are that 95.7 per cent of the trout stocked annually are either creeled or otherwise "lost" through natural causes such as disease, "wash-out", or similar calamities. This statistic is based only on the number of trout stocked in 1953 and does not take into account the the residual trout from previous years' stocking. The product is also based on the premise that the "shocker is 100

per cent effective, which it is not. However, in previous tests as to its effectiveness, the machine ranged from 50 to 100 per cent effective on the recovery of known numbers of marked fish. Assuming that the 1953 calculated trout per mile of stream constitutes an average residual population and that the "shocker" is only 50 per cent effective, 91.8 per cent of the total trout population, residual and stocked, was either creeled or "lost" naturally during 1953.

Table 3 lists the spring and fall comparable data as to number of trout taken in the same reach of stream, the data indicate some constancy of a standing crop in the first two streams, but do not hold up in the latter two streams. The discrepancy in the assumed standing crop of Trout River and South Bear may well have been caused by extremely heavy flooding on these streams during July, 1953. Elk Creek and Mink Creek were not subjected to these same heavy floods.

Table 3 - Number of Trout taken at identical stations in March and November 1953 on certain streams in northeast Iowa.

Stream	Length of Section	Total Number of Trout	
		March	November
Elk Creek	.25 miles	82	86
Mink Creek	1.5 mi. & 1.0 mi.*	16	10
Trout River	2.0	14	6
South Bear	1.5	133	43

* Only 1 mile of 1.5 miles covered in the spring of 1953 was covered in the fall of 1953.

Table 4 shows the ratio in which rainbow were stocked to browns and also the recovery ratio of the same two species. The latter figure is based on actual recovery with the shocker, while the former covers the year's stocking ratio over the entire stream. Using the recovery ratio as an index to both ecological and/or angling survival, the results seemingly indicate a highly disproportionate ratio on four of the five so-called "problem streams": Swiss Valley, Mink, Livingsgood Spring, and Bohemian Creek.

Assuming that brown trout are more difficult for the average angler to creel and are better able to withstand the rigors of adverse physical conditions such as floods and limited cover, the remaining streams covered during the survey are not too badly out of line with the expected survival ratio.

The average stocking ratio for all streams covered was 1.4 rainbow trout to 1.0 brown trout. The post season recovery ratio was 1.0 rainbow to 2.2 browns, which when projected gives a utilization and/or loss ratio of 3.1 rainbows to one brown.

Table 4 - Comparison of 1953 Stocking Ratio and Survival Ratio of Rainbow and Brown Trout on Certain Streams in Northeast Iowa.

Stream	Stocking Ratio Rainbow/Brown	Recovery Ratio Rainbow/Brown
Big Mill	5/3	2/3
Swiss Valley	6/5	11/1
Buck Creek	3/1	1/2
Elk Creek	2/3	11/10
Bloody Run	10/9	1/3
Livingsgood Spring	3/1	2/3
Village Creek	1/1	2/5
French Creek	1/1	1/16
Mink Creek	2/1	1/9
Waterloo Creek	9/4	2/3
Trout River	7/6	2/1
South Bear	3/2	2/5
Bohemian Creek	1/2	1/23

Previous commitments and adverse weather allowed for only 5 of the 12 "test streams" to be resurveyed with the shocker in March of 1954. In two of these streams, Big Mill and Elk Creek, road work with its accompanying stream straightening and habitat spoiling, greatly reduced the natural cover and in doing so likely reduced the residual population of trout. Mink Creek still was 25 to 30 per cent ice-covered, and coverage was reduced by that percentage.

Table 5 lists the findings of the spring survey. All of these streams had received token "stockings" and had been open to fishing for over two weeks prior to the survey.

It is of interest to note that the winter carry-over of both brown and rainbow trout are practically the same. Therefore it would seem that the resistence to natural calamities is quite similar in the two species. The disproportionate post-season recovery ratio could then be the result of the difference in angling susceptibility with the rainbow trout being more susceptible to angling than the brown.

With the exception of an occasional large specimen, pools over 3 feet depth and 50 feet by 20 feet in length and width, were mostly barren of trout. Observations indicate that over 95 per cent of the trout taken were found in shallow, rocky waters, good bank and mar cover, or in small, deep pools with either or both aforementioned features. Admittedly, the shocker functions best in shallow waters, but despite its limitations, the relative efficiency

Table 5 - Winter Carry - over Surveys on Certain Northeast Iowa Trout Streams, March 1954

Stream	Per cent of Fall Pop. Present in "Shocked" Area[1]	%Marked Rainbows Retaken	%Marked Browns Retaken	% of All Marked Trout Retaken
Big Mill	82.5	50.0	12.5	25.0
Buck Creek	183.0	11.1	40.0	31.0
Elk Creek	49.0	32.0	18.0	28.0
Swiss Valley	53.0	10.7	16.8	11.1
Mink Creek	10.0	00.0	11.0	10.0
Totals		21.8	21.5	21.7

1 All species combined, both marked and unmarked fish.

Was the same in both habitats except in pools too deep to wade. Visual indications on reactions to fish taken and those seen but not taken, point out the fact that water should be below 50 degrees F for the efficient operation of the present sized shocker.

IOWA LAKES CREEL CENSUS

by
Earl T. Rose *

Creel census work in some of the major northern Iowa natural lakes has been conducted by the Conservation Commission for the past ten years. These records are becoming more and more useful in comparing angling success, evaluating certain management practices and in providing factual information on each lake's angling history. Prior to 1953, much of the data were obtained through voluntary reporting by boat liveries; however, due to errors involved in some of these reports the past two season's records have been obtained almost entirely by personal contact with anglers in boats and on shores.

This report covers briefly the usual 45 day census from May 15 to July 1, on Spirit, East and West Okoboji, Clear, Storm, Blackhawk and Lost Island lakes. The census on the first three lakes is on a year-round basis; however, for comparitive purposes, the May 15, July 1 data are tabulated with the other lakes in which the census is completed. Heretofore each season's catch record was presented together with the previous records in appendix tables. Since these data are becoming too lengthy, reference is made to former July seminar reports for this comparative information.

Following is a consideration of this season's catch record on each of the above lakes.

Spirit Lake

This is the tenth season of creel census on this lake and the second in which no voluntary reports are included in the data. All of the records from May 15 to July 1 have been compiled in Table 1, together with the data from all other lakes, as season totals. Inasmuch as comparitive data is probably valid only for the past two seasons, comparisons will be confined to these periods.

A total recorded catch of 23,092 fish this year is only slightly lower than the record in 1953; however, the unit effort was somewhat less than in 1953 indicating better fishing in the 1954 period. The average catch-per-hour in 1954 was 1.23, whereas in 1953 it was 0.97. The ten year average catch-per-hour for this lake (including the eight years of voluntary records) is 1.41. The 1.23 fish-per-hour for the 1954 period indicates about average angling for this lake. As may be noted in the table, crappie, perch, walleye and bullheads provided the bulk of the angling for this time of year.

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West Okoboji

As in Spirit Lake, census work has, for the past two years, been confined solely to personal contact with anglers and no voluntary records are taken. The records this year (May 15-July 1) are included in Table 1. Angling was considerably better this year than last. The total catch was somewhat larger than last, and, as noted for Spirit Lake, fishing pressure was considerably reduced. The average catch-per-hour for the past nine years (including seven of voluntary records) is 0.97 This season's record of 1.20 fish-per-hour indicates a considerable improvement in angling.

Significant increases in catches of crappie, walleye, bullhead, white bass and sheepshead occurred over last season while declines were noted in perch, northern pike, large and smallmouth bass and bluegill. It is emphasized that catch data do not necessarily reflect magnitudes of populations or changes in relative abundances. So long as the catch-per-unit-effort remains high and the species composition is favorable, too great a concern about one or two species is unwarranted.

East Okoboji

The record of this season's angling is included in Table 1. Highlights of the record include very good early crappie fishing and a rapid decline after the first few weeks of the census period (Reports are tabulated in 10 day intervals but to save space only the 45 day summary is included in this report). Walleye and white bass fishing were the best in four years (including two of the seasons of voluntary reports). The white bass increase is unquestionably due to the very large 1951 year-class. The 1953 year-class is also very large thus practically insuring a continuing good crop of these popular "summer-biters". Bullhead fishing pressure dropped recipitously this spring due, primarily to their unpleasant flavor imparted by a heavy growth of the blue-green alga, Phormidium, during the mild winter. This is believed to be responsible for the taste and odor which was repugnant to many people. Recent catches are free of taint and the Phormidium has practically disappeared.

Clear Lake

More crappie, walleye, bullhead and bluegills are recorded caught this season than in 1953. Due to illness of the census clerk only 33 days of the 45 day season were sampled; however, it is felt that the record represents a fair picture of the angling success. If the data are calculated on a catch-per-day basis, there were more northern pike taken than in 1953 during this period. The most sign-

ificant item perhaps is the vast decline in yellow bass catch. Last season a total of 10,310 were reported caught whereas this year only 1,916 were taken. Since the average catch-per-hour of 1.18 this season indicates about normal fishing for this lake (previous six-year average 1.19) this decline in yellow bass catch is not overly important. The data for this year are included in Table 1.

Storm Lake

Fishing at this lake followed the usual pattern of excellent early season angling and a rapid decline after the first couple of weeks. The catch was considerably greater this season than last especially for the crappie, walleye and channel catfish. The total catch and per unit effort showed some improvement over last season; however, the average for previous seven seasons is 0.75 fish-per-hour which indicates a considerable over-all decline. It is entirely possible that the population of gizzard shad in this lake has increased to the point where early spring fishing will be all that can be expected until control measures are effective. The total catch data for this season are included in Table 1.

Blackhawk Lake

This lake is becoming famous for its splendid early season crappie fishing. Since our usual census period starts on May 15, much of this early good fishing period is not recorded resulting in a poor record for the season. In order to obtain a more accurate appraisal of production, the census this year was started earlier by L. D. Wright and Verl Holmes and a portion of their data was obtained for this record. Table 1 includes the partial census of these men taken from May 6 to May 15. From this date on, the regular clerk completed the census to the usual July 1.

The 10 day summaries (not included here) show that crappie fishing held up well for the first four periods and declined sharply thereafter. Walleyes, white bass and northern pike also followed the same pattern. Presumably this coincided with the hatch of gizzard shad, which abound in the lake, reaching forage size.

Fishing pressure was intense this season. A total of 8,566 anglers were contacted and this number has been exceeded only once previously in 1949 when 9,005 anglers were checked Even though more fish were recorded caught this season than last, the catch-per-unit-effort was considerably less--a reduction from 0.75 last year to 0.48 fish-per-hour. The seven year average for this lake is 0.90 fish-per-hour. Consequently, even though much of the early good angling was recorded, we must conclude that there was poorer fishing this year.

Lost Island Lake

The census this year was conducted primarily by Conservation Officer Harold Johnson, although some data were collected by Conservation Officer Basil Downing and the author. The data are tabulated in Table 1 and represents but a small sampling of the angler's catches on this lake; however it is believed that the record reflects the good fishing at the lake.

A total of 1,701 anglers were contacted in 34 days from May 14 to July 1. Their catch of 10,687 fish in 6,612 hours gives an average of 6.28 fish-per-angler at the rate of 1.62 fish-per-hour. This is slightly above the average of 1.26 fish-per-hour for the previous five seasons.

Previous to this season a full time census clerk had been employed on Lost Island during our usual census period. The census was started in 1946 to evaluate certain management practices designed to improve bullhead fishing. Since these have largely been concluded, the need for the employment of a clerk has not been so necessary.

Conclusions

The annual creel census records of seven important Iowa fishing lakes from May 15 to July 1 is outlined in basic form. We have now from eight to ten seasons of angling records for these major lakes which provide factual data on the history of angling and results of management practices that otherwise could not be evaluated. It is apparent that even though our fishing pressure has increased tenfold, within the past ten years our angling success has been maintained and in some cases improved. Thus it would appear that our bio-management* program is basically sound and is fulfilling the increasing demands for better fishing.

Combined data from all the lakes is included in Table 1. A total of 31,027 fishing trips were recorded and fish were caught at the average rate of 0.98 fish-per-hour. Major components of the catch were bullheads, crappie, and walleye (56, 19 and 12 per cent respectively)

*The close cooperation between the biology section and the fish-management section suggests the use of this term as useful in certain instances.

Table 1. Iowa Lakes Creel Census, May 15 to July 1, 1954*

LAKE	SPIRIT	WEST OKOBOJI	EAST OKOBOJI	CLEAR	STORM	BLACKHAWK* May 6-July1	LOST ISLAND	TOTAL ALL LAKES
CRAPPIE	5,126	1,014	1,410	984	1,198	5,897	10	15639
PERCH	1,755	334	617	707	118	18	27	3576
N.PIKE	218	96	46	796	33	72	110	1371
L.M. BASS	21	105	16	3		176	1	322
WALLEYE	3,743	618	849	784	3,710	687	61	10452
S.M. BASS	8	18	12		1			39
BULLHEAD	12,118	4,208	12,186	6,001	851	2,178	10,477	48019
WHITE BASS	29	62	262	1		149		588
BLUEGILL	13	807	104	307	3	123		1357
YELLOW BASS				1,916				1916
CHANNEL CAT				13	202	154		369
SHEEPSHEAD	50	262	356					668
CARP	11	1	1			16	1	30
SEASON TOTALS	23,092	7,525	15,889	11,512	6,201	9,470	10,687	84,346
TOTAL ANGLERS	6,698	2,212	3,952	3,462	4,436	8,566	1,701	31,027
TOTAL HOURS	18,771	6,246	11,775	9,772	13,129	19,843	6,612	86,148
AVERAGE FISH/HOUR	1.23	1.20	1.34	1.18	0.49	0.48	1.62	0.98