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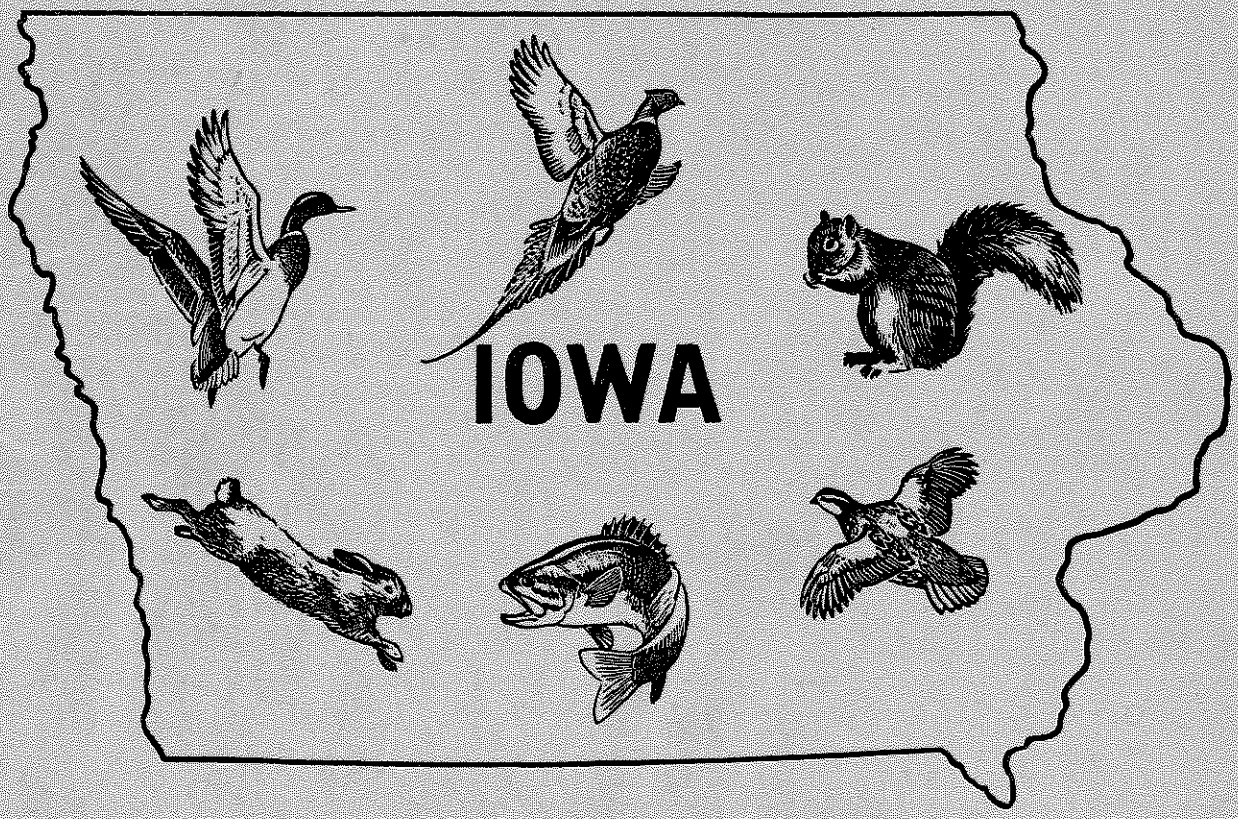

FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

Q U A R T E R L Y B I O L O G Y R E P O R T S

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Des Moines, Iowa

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OFFICER'S WINTER COUNT OF IOWA QUAIL
1953

Elden Stempel
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To secure data for estimating quail populations, counts of quail are made in selected areas, by officers, and the quail biologist during the winter and the summer season. Figures from rural mail carrier counts of game are also used.

Method of Conducting the Count

During the winter, letters are sent out to officers in the quail range requesting a count of quail in three populated covey ranges in one of the officer's counties. One range is chosen in the north, one in the central, and one in the south part of the county. If possible, counts are made when there is snow so that tracks can be found and the number of quail counted without locating the covey. Census forms are returned early in March.

Results of the Officer's Winter Count of Quail

Over the entire state, ninety quail ranges were checked by officers. Sixty-two ranges were reported as occupied at the time of the 1953 winter count of quail. Fifty-two ranges were found occupied during the 1952 check when officers covered 75 covey ranges.

Seven hundred sixty-two quail were counted in 1953, as compared to 730 in the 1952 count. Pottawattamie county had an unusually high count of 130 quail. The officer attributed this to the extremely limited range of the birds in planted areas. This count is not used in making further computations as it would throw the statewide count out of balance.

Table 1

Percentage of Quail Ranges Occupied, 1951-1953

Year	Percent of Ranges Occupied	Birds per Covey Range
1951	80%	12.4
1952	69%	8.8
1953	67%	7.2

Data in table 1 indicate a 19 per cent decrease in the number of quail per covey range since 1952. The decrease in ranges occupied is slight, and the most noticeable decrease is in the south-central and east-central portion of the state. The southeast, and the border counties showed an increase in the number of birds per range. In all of the important hunting areas the population was above the minimum necessary to restock the range. In the main quail range no barren areas were reported.

1952-1953 Weather and Quail Activity

The past winter was mild with February and March temperatures above normal, but April temperatures were below normal. Calling by cock quail began in April, however the

calling was sporadic because of changeable weather, and successful counts of calling quail were few until July. On twelve mile long routes in Wapello, Washington and Davis counties, the number of calling quail was slightly above the number heard in 1952.

Since the beginning of the normal June hatching period weather has not been cold, but there have been some unusually heavy winds and rains that could kill small quail.

Sight Reports of Quail

In the spring, Conservation Officers reported seeing an unusually high number of adult quail along the roadsides in southern Iowa. This may, in part, be due to extremely heavy dew, however, as many as six cock quail were seen in the early morning on a six mile stretch of road, and this is unusual.

Five early broods of quail have so far been reported from Wapello, Lucas, and Appanoose counties. Eight young were observed in each brood. No great number of broods is usually seen until late August.

Mail Carrier Reports of Quail

The winter report on game seen by mail carriers showed a 35 per cent increase in quail per report card as compared to 1952. The average for the state was 1.5 birds per card in 1952, and 2.3 birds per card in 1953. South-central and east-central Iowa showed increases, while the south-east was about the same as 1952.

Spring Mail Carrier's Count

In the spring count of game, the mail carrier count showed about the same number of birds in the southeast, less quail in the south-central, and about the same in the east-central. Data for central Iowa indicated a decline, while the northeast and the southwest portions of the state showed an increase in the number of quail.

Table 2

Officer's Winter Count of Iowa Quail by County 1951-1953

County	Ranges Checked			Ranges Occupied			No. of Quail			Quail per Winter Covey
	51	52	53	51	52	53	51	52	53	Range 1953
Adair	3	3	3	3	3	2	8	77	39	13
Adams	3	3	3	3	3	3	31	31	37	12.3
Appanoose	3			3			76			
Blackhawk	3	3			1			20		
Bremer	3		3	2			12			
Buchanan	3	3	3	2	1	2	47	20	38	12.6
Cass			3			2			27	9.
Cedar	3	3	3	3	3	2	76	83	26	8.6
Clarke	3	3	3	3	3	3	24	43	33	11.
Clayton		3	3		2	2		14	27	9.
Clinton			3			2			33	11.
Dallas	3	3	3	3	3	3	75	41	29	9.6
Davis	3	3	3	3	3	3	76	33	40	13.3
Dubuque			3							
Fremont			3							
Grundy	3	3	3	3	1	2	13	7	31	10.3
Jackson	3	3	3	3	2	3	20	25	30	10.
Jasper	3	3	3	3	1	2	60	8	14	4.6
Jefferson	3	3	3	3	1	3	24	30	37	12.3
Lee	3	3	3	3	1	3	52	24	37	12.3
Linn	3	3	3	3	3	3	47	47	41	13.6
Louisa	3	3	3	3	3	3	76	34	21	7.
Mahaska	3	3	3	3	1	1	12	12	8	2.6
Monroe		3	3		3	2		36	39	13.
Page	3	3	3	3	3		8	24		
Polk			3			2			14	4.6
Pottawattamie*			3			3			130	43.3
Scott	3	3	3	3	1	2	38	11	21	7.
Story	3	3	3	3	2	2	23	10	16	5.3
Tama	3			2			19			
Warren	3	3	3	3	2	1	16	29	17	5.6
Wayne	3	3	3	3	3	3	43	27	27	9.
Winneshiek	3	3	3	3	1	1	13	8	5	1.6
Totals	72	75	90	58	52	62	893	730	762	

1951-80% of ranges occupied 1952-69%---1953-67%.

*The count in Pottawattamie county is thought to be abnormally high, and is not used in making computations.

Table 3

Officer's Winter Count of Iowa Quail
by Agricultural Districts
1952 and 1953

Agricultural District	No. of Quail 1952	No. of Quail 1953	No. of Ranges 1952	No. of Ranges 1953	Average Number Quail per Winter Range 1952	Average Number Quail per Winter Range 1953
Northeast	62	70	12	12	5.1	5.8
Central	66	104	12	15	5.5	6.9
East-Central	202	137	15	15	12.4	9.1
Southwest	132	206	9	12	14.7	**17.1
South-Central	135	116	12	12	11.2	9.6
Southeast	133	143	15	15	8.8	9.5

** Southwest, birds per range without the high counts in Pottawattamie and Adair, 1952, 9.1, and 1953, 12.6.

12.4 quail were counted per average winter covey range in 1951. In 1952 8.8 quail were counted per winter covey range. In 1953 7.2 quail were counted per winter covey range.

Condition of snow during winter count of quail

Percentage of ranges having good, poor, or fair tracking conditions.

	Good	Fair	Poor
1951	14%	8%	76%
1952	41%	17%	40%
1953	47%	31%	22%

Summary

1. Conservation officers in Iowa made a count of quail on 90 covey ranges last winter, and found 67 per cent of the ranges occupied.
2. Seven and two-tenths quail were counted on the average covey range.
3. Southeast Iowa showed an increase in quail per covey range.
4. South-central Iowa showed a decrease in the number of quail per covey range.
5. A sample route in Wapello and Davis counties shows an increase in calling quail over 1952.

IOWA RACCOON DATA--1952-53 SEASON

Glen C. Sanderson
Game Biologist

Introduction

In 1949 a raccoon project was initiated with hunter cooperators and in 1950 the project was expanded to include information from a fur dressing station. Results of the first three years have been reported previously. The project is run 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. Hunters who cooperated in previous years, plus new names furnished by conservation officers and other hunter cooperators made up the list of prospective cooperators for the 1952-53 season. Approximately 305 hunters and Commission employees 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-page mimeographed summary of the 1951-52 results.

Raccoon hunting success was somewhat abnormal and unpredictable during the past season and in addition, states surrounding Iowa opened their raccoon seasons earlier last fall

than they have in the past. This latter factor caused a decreased demand for Iowa raccoon carcasses. For these two reasons, less information was collected at Mr. Lamb's in Bloomfield during the past season than was obtained the previous year; however, his place continued to be the best source of information and the writer spent several days during the hunting season with Mr. Lamb examing dead raccoons as they were being pelted. Penis bones, body weights, uteri, ovaries, skulls, age and sex ratio information and other information were collected from these carcasses. As in past seasons, Mr. Lamb cooperated whole-heartedly with the project and his interest and help are greatly appreciated.

Results

Only 21 of the 305 hunters contacted, or approximately seven per cent, returned the forms. For the previous season approximately eight per cent of the hunters contacted returned the forms. The hunters who did report saved 75 penis bones and contributed other valuable information to the project so their efforts were worthwhile and should be continued even though the percentage of returns was small.

A comparison of the hunting success for the past season and the previous three seasons reveals that the hunting success per hour has varied but little during the four years. The average number of times each hunter hunted remained fairly constant for the first three years but dropped considerably for

the past season. The distribution of hunting pressure and the percentage of total harvest taken at various times of the season varies somewhat from season to season, probably due to weather conditions, but does not depart markedly from the average condition.

Now that the Conservation Commission has been granted the authority to open the 'coon season from the first of September to the first of March instead of the previous dates of November 10 to January 10, it should be possible to increase the harvest slightly by having an earlier opening date when the weather will be more favorable for hunting. It should be remembered that some raccoons do not have fully prime pelts in Iowa until the middle of November or later; however, the low pelt value prevailing at the present time keeps this consideration from becoming too important. The lower value of pelts from raccoons taken prior to November 10 will be compensated for by the increased sporting value which will come with weather conditions more favorable for hunting.

Age-Ratio

The age-ratio of the male segment of the harvest, as determined by 75 penis bones sent in by hunters and 271 bones collected by the writer at Bloomfield, is 1.75 young per adult (Table 1). To state it another way, juveniles comprised 63.6 per cent of the male harvest. Data in Table 1 reveal that the

age ratio has varied but little during the past four years.

Table 1

Age ratios[1] of Iowa Male Raccoons
taken during the 1949-50--1952-53 Hunting Seasons.

Origin	Season	Ads	Juvs	Totals	% Juvs	Juvs / Ads
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

1 Age determined by the penis bone criterion.

The slight fluctuations in age ratios from season to season can probably be explained by differences in the weather which affect the amount of hunting done during the early, middle, and late part of the open season. Data collected during this study show that there is a greater percentage of juvenile animals taken during the first one-third of the open season than are taken later. There is also a slight decline in the percentage of juveniles taken from the middle to the last third of the season.

Sex-Ratio

A total of 1,524 raccoons were sexed during the past fall and winter--262 were examined at a dressing station, 255 were

reported by hunters, and 1,007 were examined at a fur house. Of these, 890 were females and 634 were males or 71.2 males per 100 females. To state it another way, females comprised 58.4 per cent of the harvest in 1952-53 in Iowa. Table 2 reveals a slight but steady increase in the percentage of females in the harvest since the project was started in 1949.

Table 2 shows an unexplained difference in the sex ratios obtained from various sources. Hunter reports and examinations at the dressing station show variations from year to year, but pelt checks in fur houses consistently give figures with a larger proportion of females than are found elsewhere. Perhaps the pelts checked at fur houses came from a different population than the other figures although it appears that they should be from the same population as the hunter reports. When considered separately (Table 2) the sex-ratio figures from the fur houses also show a slight but consistent increase in the percentage of females for the four year period.

Weather conditions during the hunting season may have some effect on the sex ratios. Data from this study show a slight decrease in the percentage of females in the harvest as the season progresses. This change is not large in Iowa probably because little hunting is done late in the season when the males are more active than the females with the onset of breeding activities.

Table 2

Sex ratios of Iowa Raccoons, 1949-50--1952-53.

Origin	Season	Males	Females	Totals	% FF	MM/100FF
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	52.5	90.7
Carcasses-Lamb's	1950-51	75	63	138	45.7	119.0
Hunter 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

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. These figures have been fairly constant except for an unexplained increase in the percentage of parous females in the 1950-51 harvest. This increase was noted in both carcass and pelt examinations. The larger percentage of parous females in that season resulted in only a slightly higher percentage of juveniles in the harvest than in the other three years (Table 3). Data presented later in this report indicates that the average number of young per litter

(placental scar counts) did not vary significantly in 1950-51. The data appear to indicate that for some reason a larger than usual percentage of yearling females conceived in the spring of 1950 (nearly all adult females breed each year), but that they produced litters that were only slightly smaller than average. This must have been followed by a higher than average mortality rate since the fall harvest showed only slightly more juveniles than usual. As mentioned above, the female segment of the harvest contained more parous females than usual but since the percentage of juveniles was only slightly higher than average, the number of young per parous female was considerably lower than in other years.

Table 3

Percentage parous and non-parous females in the Iowa Raccoon Harvest 1949-50--1952-53 and the computed number of young per parous female in the harvest.

Origin	Season	Parous	Non-Parous	Total	%Parous	Yg/Parous F[1]
Fur Houses	1949-50	116	373	489	23.7	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

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 collected by this project for the past four years indicates that adult males show some signs of sexual activity in southern Iowa during November and December, but information from past years indicates that they probably do not become fully sexually active until January. For the past season, no juvenile males showed any signs of becoming sexually active in southern Iowa during November of December.

There were 112 placental scars representing 30 litters observed in the uteri of 30 parous females examined at Bloomfield, Iowa for an average of 3.75 placental scars per group of placental scars (average litter size) (Table 4). The number of scars per uterus ranged from none (non-breeding adult) to seven, but two uteri showed evidence of two litters. The actual litter sizes ranged from three to six for the past season (Table 4).

Placental scar counts for the past three seasons reveal that nearly all females that have bred once mate successfully each year thereafter (Table 4). The data also show that average litter sizes in Iowa have varied from three and one half to nearly four during the past three years. Litter sizes ranged from one to eight, with three, four, and five the most common numbers per litter.

Table 4

Placental scar counts made at Bloomfield, Iowa
1950-51--1952-53 seasons.

Number of scars per parous uterus	Number of Uteri 1950-51	1951-52	1952-53
0	0	1	2
1	2	0	0
2	4	4	2
3	13	23	10
4	5	15	10
5	1	13	4[6]
6	1	3[3]	1
7	2[1]	4[4]	1[7]
8	0	1	0
9	1[2]	1[5]	0
10	0	0	0

Season	No. of parous uteri	No. of groups of placental scars	Total No. scars	Average Number scars per group (Average litter size)
1950-51	29	31	103	3.55
1951-52	65	67	265	3.96
1952-53	30	30	112	3.73

1 One uterus with two sets of scars (4 light and 3 dark).
2 Two sets of scars (5 light and 4 dark).
3 One uterus with two sets of scars (2 small dim, 4 larger, blacker).
4 One uterus with two sets of scars (4 dark, 3 light).
5 Two sets of scars (5 small, 4 large).
6 One uterus with two sets of scars (4 dark, 1 light).
7 Two sets of scars (2 dark, 5 light).

Harvest and Population

Table 5 reveals a decrease in the reported harvest from 67,211 in 1951-52, an all time high, to 62,356 in 1952-53, a decrease of 7.2 per cent. Except for the 1951-52 harvest, the 1952-

53 harvest is higher than has been reported in the past twenty-four years.

Table 5

Raccoon harvest and average value received per pelt in Iowa in 1952-53 compared with the highest, lowest and average figures for the past 20 years and the 1951-52 figures-- as reported by fur buyers.

Season	Number of pelts bought by dealers	Av. 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
1949-50	58,527	1.95[3]	114,127.65
1951-52	67,211[4]	2.67	179,435.37
20-year totals*	560,404		1,782,130.95
20-year average*	28,025	3.18	89,106.95
1952-53	62,356 (- 7.2%)	1.72	107,252.32

* Does not include 1950-51--1952-53 figures.
1 Lowest number harvested. 3 Lowest average value.
2 Highest average value. 4 Highest number harvested.

It is believed that the slight decrease in the harvest over the previous year was due to uncertain hunting success early in the season (extremely dry), rather than to a decrease in the population. Perhaps the decrease in average pelt value from $2.67 for 1951-52 to $1.72 for the past season had some small effect on the harvest although it has been shown in the past that pelt value has very little effect on the size of the harvest.

Nearly three fourths of the hunters thought that there were more raccoons last fall than there were the previous season;

however, it is believed that the raccoon population has been at peak numbers since 1946. There have been minor fluctuations in the harvest since that time, with a slight gradual increase. That the population may be increasing slightly is indicated by figures presented in Tables 1 and 2 which show that the age and sex ratios of the population have remained essentially unchanged since 1949-50. There has been a slight gradual increase in the percentage of females in the harvest but this has not been accompanied by a similar consistent increase in the percentage of juveniles in the harvest. The slight increase in average litter size indicated in Table 4 should also favor an increasing population.

Table 6 shows the average weights of 82 male and 104 female raccoons. On the whole these average body weights are similar to the ones reported for the previous two seasons.

Table 6

Average body weights of Iowa raccoons taken during the 1952-53 hunting season, grouped according to age, sex, and breeding history.[1]

MALES:		
22 adults	18.3 lbs	(12.6-23.6)
60 juveniles	11.5 lbs	(6.4-16.4)
82 males (all males)	13.3 lbs	(6.4-23.6)
FEMALES:		
24 parous adults	15.1 lbs	(10.7-19.5)
80 juveniles and non-parous adults	11.0 lbs	(7.1-18.1)
104 females (all females)	11.9 lbs	(7.1-19.5)
ALL RACCOONS:		
186 animals weighed	12.6 lbs	(6.4-23.6)

SUMMARY

1. Results of the 1952-53 hunter reports reveal that the hunting success per hour has varied but little during the past four years and that the average number of times each hunter hunted remained fairly constant for the first three years but dropped considerably for the past season. The distribution of the hunting pressure and the harvest varies somewhat, but does not depart markedly from the average.

2. The age-ratio, as determined from 346 penis bones, is 1.75 young per adult, a slight increase over the previous season.

3. The ex ratio of 1,524 raccoons, as reported by hunters, from checks in fur houses, and from carcass examinations, is 71.2 males per 100 females, a continuation of the slight increase in females reported for the previous three seasons.

4. Parous females comprised 19.6 per cent of 755 females examined, a slight decrease over the previous year.

5. There were 112 placental scars representing 30 litters in the uteri of 30 parous females examined at Bloomfield, Iowa, for an average of 3.73 scars per group of placental scars (average litter size), a slight decrease over the previous year.

6. Iowa's raccoon population appears to be still near a peak in numbers, but is perhaps increasing gradually. The 1952-53 harvest was the second highest since 1930-31 but was 7.2 per cent lower than the all time high reported for 1951-52.

7. Juvenile males average 11.5 pounds, adult males 18.3 pounds, non-parous females 11.0 pounds, parous females 15.1 pounds in body weight. All males averaged 13.3 pounds, and all females 11.9 pounds in body weight. A total of 186 raccoons of both sexes and all ages averaged 12.6 pounds in body weight.

WATERFOWL PRODUCTION AND MARSH CONDITIONS, 1953

James G. Sieh
Game Biologist

Breeding pair studies have been made during on-the-spot check counts in the prairie marsh areas of northwestern Iowa since 1949 to determine the trend of nesting waterfowl other than wood ducks. For the first time, in 1953 wood duck surveys have been initiated state-wide along lineal stream transects from six to eighteen miles in length in optimum habitat to try to determine wood duck production trend. Repeat brood surveys along the identical transect routes are in progress. Wood duck nesting box checks have been completed on the Lake Odessa area in Louisa county to determine nesting success data since 1950. Wood duck nesting box checks have been made intermittently in northwest Iowa since 1949. Aerial survey of the prairie marshes was first attempted in northwest Iowa in 1952 using a modified lineal census technique which proved ineffective. In 1953 another aerial census attempt was made using a modified total count on individual lakes, sloughs, and marshes with moderate success. These techniques, methods, and changes in methods, are designed and revised to obtain breeding pair and brood data indicative of production trends in Iowa.

On-the-spot check counts on the prairie marshes in northwest Iowa since 1949 plus aerial coverage of the same marsh

units since 1952 have roughly indicated production trends. The waterfowl counts on the marshes studied were subjected to sampling errors which excluded statistical measurement. The validity of these trend data and interpretation rely on the experience of qualified observers, and leave much to be sought for from the scientific viewpoint.

Data indicated, with the exception of increased production in 1951 which resulted from optimum water levels and excellent nesting and survival conditions, that the production trend of ground nesting species, especially blue-winged teal and mallards, has remained about the same under average phenological conditions in Iowa. Annual rainfall and marsh conditions in northwest Iowa do not vary or change as rapidly as they do farther west in the Dakotas or in the prairie provinces. In the five years of systematic observation 1951 marks the only year when a large increase of breeding stock occupied the many temporary potholes in Iowa and nested successfully. In years of normal rainfall both breeding stock and production trend indicated little change.

Among the diving ducks only the redheads and ruddies continue to nest in small numbers each year. These species are so few in number that trend has meant little or nothing during the past five years. Some adult lesser scaup have remained in northwest Iowa throughout the nesting season, but no nests, broods, nor young have been observed. A few pintails, shovellers, gadwall, and canvas-back nest in the state, but too few to indicate a trend.

Wood ducks have again become an important nesting species in Iowa during the last 15 years. Iowa's contribution to the overall production of this species is important and the state is reputed to contain from 11,000 to 16,000 miles of stream. Rough estimates from the lineal stream transects indicated about one pair of wood ducks to about every two to four miles of good stream habitat in 1953. Of course, much of the stream habitat is not considered good wood duck nesting habitat. Repeat brood surveys along the identical transect routes are not completed. The productive potential of the wood duck in Iowa is not well understood, nor is the size of the standing crop. The nesting density of the species and its range have increased throughout the state during the last ten years, but it is probable that 1949 or 1950 may have been peak years for wood duck production, and that the trend since then has been slightly downward, or at least without any increase. Unfortunately, this contention is not supported by data of any kind.

The percent of wood ducks in the waterfowl kill samples has increased from 1.9 percent in 1948 to 6.8 percent of the sample recovered in 1952 in Iowa. The kill of wood ducks in Iowa may not be excessive, but certainly the kill of 28.2 percent of the waterfowl bag sampled in northeastern Louisiana in 1952 represented heavy losses of this species (Yancey, 1953); however, the statewide average kill of wood ducks in the state of Louisiana was placed at 7.4 percent of the total kill. In the state of

Louisiana as a whole the estimated size of the wood duck population comprised only two percent of the total. The highest percentage of kill as well as the largest number of wood ducks in the bag would be expected along the Mississippi River in Iowa, and harvest figures from kill samples indicated that in 1951 only 4.3 percent of the sample were wood ducks, and in 1952 the percentage jumped to 15.0 percent of the total sample bag checked in the ten Mississippi River counties. At this time, with the data available, it is impossible to determine if an over-harvest of wood duck has taken place in this state or elsewhere; however, the possibility exists.

No one wants to over-harvest the wood duck and damage the breeding stock or the current population potential of the species. There were many years when the wood duck was considered a rarity, and the season was closed on this magnificent duck. No other species of waterfowl has responded so admirably to management as has the wood duck, or shall we say made such extraordinary recovery against all odds. In any event, it is now obvious that the wood duck can and has provided a harvestable surplus for the waterfowl hunter under wise management.

The State Conservation Commission Biology Section has undertaken the task of trying to determine the production trend of wood ducks within the state of Iowa. To determine production trends breeding pair counts were taken along lineal stream transects. Counts were begun at daylight moving downstream with two-man teams using boat and motor, canoes, etc. The sex of the

birds was recorded when identified. It was assumed that all wood ducks seen were resident birds. Trial and error will determine accurate calendar dates to begin the stream transects throughout the state so as to avoid counting as many migrant or non-resident birds as possible.

Sanderson and Kiefer censused approximately 18 miles of the Cedar River from the Center Point Bridge to Cedar Rapids, and counted 6 male, 5 female, and 4 wood ducks unidentified as to sex on May 5, 1953. Cleary and Pierce censused approximately 8-10 miles of the Wapsipinicon River from the Littleton Dam to Independence Dam in Buchanan county. They counted one pair and a lone drake on May 6, 1953. Moen and Sieh paddled about an eight mile stretch of the Des Moines from the Petersburg Bridge near the Minnesota line south to the first bridge in Iowa and counted 4 wood ducks unidentified as to sex on May 9, 1953. Harrison censused two transects on the Des Moines River. In Webster County from the Kalo Bridge to the bridge at Lehigh, a stretch of approximately 10 miles, they counted six pairs, plus one flock of two males and two females, and a lone drake. In Polk County on the transect from the Hanley Bridge in Madison Township to the Euclid Avenue Bridge in Des Moines, approximately 18 river miles, Harrison counted seven wood ducks consisting of three pairs and a lone male. Rose and Starr counted four wood ducks on a transect coverage of approximately seven miles on the Little Sioux River in the northeast corner of Cherokee County from the Laurence Davis

farm downstream to the Brash Bridge. Sieh and Beneke made an afternoon reconnaisance on the North Skunk River just above the forks of the North and the South Skunk rivers which did not meet the qualifications of the census and no wood ducks were counted.

Disregarding the Skunk River reconnaissance which did not meet the qualifications of the census, the five transects totaled approximately 50 lineal miles in aggregate. A total of 50 wood ducks, 22 males, 17 females, and 12 unidentified as to sex were counted. The observed sex ratio approximated 1:1 assuming the females were somewhat more difficult to observe and identify. It was concluded that during these surveys a wood duck per mile, or a pair per two miles of good stream habitat approximated the state average in 1953 on the lineal stream transects. Furthermore, the appraised number of one pair of wood ducks to about every two to four miles of good stream habitat in the state in 1953 should not be far wrong. These data give us a better idea of the size of the standing crop in Iowa, and at least force us to consider the important responsibility Iowa has in the production of wood ducks in continental North America, as well as in the harvest of this magnificent species. If we are going to hunt them we must continue to produce them.

Before leaving the wood duck and turning to marshes a few words must be mentioned concerning the voluntary wood duck nesting box checks. The nesting box checks initiated on the Lake Odessa area by the Cooperative Wildlife Unit, Iowa State College

(Schreiner and Hendrickson, 1951 and Dreis and Hendrickson, 1952), have been carried on by Fred Schwob, Dan Nichols, and Fritz Pierce on a part time basis. Without their help and initiative the accumulative data since 1952 would not be available (Table 1).

TABLE 1

Wood Duck Nesting Box Success
Lake Odessa
Louisa County, Iowa

Years	1950	1951	1952	1953
Number of nesting boxes available	26	36	24	30
Number of nesting boxes occupied	18	13 pre-flood 9 post-flood	18	15
Number of nests destroyed by flood	0	13	0	0
Number of eggs destroyed by flood	0	108 wood duck	0	0
Total number of potentially successful eggs	158	72 wood duck 0 merganser	237 wood duck* 38 merganser	111 wood duck est. 17 merganser est.
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.

Sanderson, Berkely, and M. Johnson checked and numbered 33 wood duck boxes on Dudgeon Lake in Benton County on May 25, 1953. These boxes were of miscellaneous construction and none were occupied by nesting wood ducks on the date of inspection. B. I. Severson checked seven lake and marsh areas in northwest Iowa and a total of 43 nesting boxes. Only two of the nine boxes checked on Little Spirit Lake in Dickinson County contained nesting wood ducks. The two boxes used were two of four old weathered boxes. None of the other boxes were occupied, and all the 39 others were new boxes, 10 inches shorter than the old boxes, and contained a tunnel opening 10 inches long to keep raccoon out.

Studies of the prairie marshes in northwest Iowa have continued throughout the spring of 1953. Ample rainfall and excellent growing conditions have maintained the marshes in good shape. Special emphasis has been placed on the study of Rush Lake in Palo Alto County because the lake is undergoing active management in a drainage, rehabilitation, and revegetation program. Emergent aquatic plants in 1953 had a head start over the seedling plants of 1952. Practically all perennial aquatics survived the winter of 1952 and sprouted early from rootstocks developed the year before. These larger two-year old plants have now occupied the same space where seedling plants had grown in such abundance a year ago. For instance, on May 11, 1952 drainage of Rush Lake had not yet begun and there were no seedling plants growing. On May 11, 1953 an excellent growth and dense

cover crop of two-year old hardstemmed and softstemmed bulrush (Scirpus acutus and S. validus) cat-tail (Typha angustifolia), and river bulrush (Scirpus fluviatilis) were flourishing. Leaf stalks of these species varied in height from approximately six inches to as much as 36 inches in height. Competition of the individual perennial plants with one another had reduced the density of the whole, and occupied much of the area which last season produced a bumper crop of smartweed (Polygonum lapathifolium) which is an annual. Square yard and square foot quadrats of lake bottom were sampled on July 16, 22, and 25, 1952. Again in 1953 similar quadrats are to be sampled in the same geographic areas on approximately the same dates to provide data on the rate of plant succession in Rush Lake.

Torrential wind plus an eight-inch downpour in less than 24 hours in northwest Iowa on June 7, 1953 caused local flooding. On June 9, 1953, two days later, Rush Lake was inspected to evaluate the effect of flooding upon the aquatic emergent cover plants. Before the heavy rains the lake contained approximately 18-30 inches of water out in the lake, and only a few inches of water and exposed wet lake bottom along much of the shoreline. Prior to this flooding, growing conditions were excellent for practically all emergent aquatic species. On June 9, 1953 following the heavy rains the lake was entirely filled with water, and estimated depths in the center of the lake had increased to 3-5 feet. Water depth in the shallower shoreline areas had

increased from several inches to as much as two feet in less than 48 hours. The lake level was still 4-6 inches below the top of the spillway on the outlet control structure or dam. The stop log by-passes were open permitting excess water rapid escape into the outlet. Apparently the lake level had reached its crest, and was maintaining a depth of 4-6 inches below the top of the spillway.

Inspection of plants revealed that a heavy growth of sedge (Carex spp.) previously growing on the drier edges of the lake were now under as much as six inches of water. Stands of river bulrush, hardstemmed bulrush, and cat-tail previously growing in only a few inches of standing water or growing in wet mud along shore were now covered by an average of 12-18 inches of water. In most cases leaves or plant stalks of the bulrush and cat-tail averaged only 6-12 inches above the water surface. Previously, only the roots and lower portions of the stems or plant stalks were beneath the surface of the water. Some of the two-year old duck potatoe (Sagittaria latifolia) still had green leaves up above the water surface and exposed to the air, but many of the Sagittaria were under 12-18 inches of water, especially at the east end of the lake.

Water clarity was noteworthy. In areas where aquatic plants were numerous the water was crystal clear almost without exception. Only near the outlet control structure where current riled the water, and in open water areas where wave action was not

held in check by vegetation was the water turbid. The extremes between water clarity with vegetation, and the excess turbidity without vegetation was indeed striking.

Inspection of the shore areas revealed large rows of aquatic seeds along the south shore. Sometimes these seeds were in floating masses, and at other times cached in clumps of vegetation. Patches of these floating seeds were observed intermittently for more than one-half mile along the south shore. A 1,500 ml sample (a two pound coffee can full) of these seeds was scooped up along shore and a two ml sample counted and identified (Table 2). The two ml sample contained a calculated estimate of 2,280 seeds and the 1,500 ml sample a calculated 1,710,000 seeds. There were many billions of seeds in the lake, and it was assumed that the sudden flooding floated away many of these air dried seeds and piled them up in windrows and floating patches on the water surface along shore. It is probable that the aquatic seeds heavier than water sank, unlike the floating sample collected and examined, and remained out in the lake. In any event these figures are added evidence that in our prairie marshes ample natural reproduction of aquatic plants have provided abundant seed crops.

Table 2

Aquatic Seed Sample from Rush Lake, Palo Alto County, Iowa
collected June 9, 1953

Contents of 2 ml sample:

520	Sagitaria latifolia seeds counted
63	Bidens spp. seeds counted
4	Scirpus spp. seeds counted
3	Rumex spp. seeds counted
1690	calculated estimate of the remainder of the seed sample including terrestrial, unidentified aquatics, and some of those identified above.
2280	total calculated estimate of the number of seeds in 2 ml sample

2280 x 750= 1,710,000 seeds in 1500 ml sample.

LITERATURE CITED

Dreis, Robert E. and George O. Hendrickson.
1952. Wood Duck Production from Nest-Boxes and Natural Cavities on the Lake Odessa Area, Iowa, in 1951. Iowa Bird Life. 22(2):18-22.

Schreiner, Keith M. and George O. Hendrickson.
1951. Wood Duck Production Aided by Nesting Boxes, Lake Odessa, Iowa, in 1950. Iowa Bird Life. 21(1):6-10.

Yancey, Richard K.
1953. The Louisiana Waterfowl Kill. Louisiana Conservationist. 5(7):7-10.

PHEASANT CROWING COCK COUNT
SPRING 1953

Richard C. Nomsen
Game Biologist

The 1953 spring crowing cock count was taken this year by conservation officers during the month of May. The peak crowing period was reached at approximately the same date as in 1952.

Procedures for the check routes and census routes were the same as during previous surveys. Weather conditions were most unfavorable for this count. Storm centers were continually crossing the state bringing above normal precipitation and below normal temperatures. Wind that accompanied the changeable weather was of course the most serious factor as far as the crowing count was concerned. In some cases, weather conditions delayed the count until after the period of peak crowing. However, this report covers all routes taken this spring.

A total of 183 routes were checked. Officers heard 34,233 calls at 3,624 stops for an average of 9.4 calls per stop. In 1952, the average for the state was 9.3. Table 1 lists the average number of calls heard, the observed sex ratio, and the index of the spring hen population for the past four years.

Table 1

Statewide Results of 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

Although the average number of calls per stop increased about 2 percent, the spring hen population figure dropped 14 percent from the 1952 figures because of the fewer number of hens per cock seen during the winter months.

Results by districts are listed in Table 2 for the 1953 survey. Table 3 compares the results obtained from the last four years.

Table 2

Results of Crowing Cock Count 1953

District	No. of Calls Heard	No. of Stops	Av. No. of Calls per stop	Sex Ratio	Index of Spring Hens	Total No. of Birds for Count
NORTH WEST	9,125	460	19.8	2.0	39.6	27,375
NORTH CENTRAL	10,102	379	26.6	2.1	55.9	31,316
NORTH EAST	3,369	430	7.8	2.7	21.1	12,455
WEST CENTRAL	4,023	395	10.2	2.5	25.5	14,080
CENTRAL	2,986	480	6.2	3.1	19.2	12,243
EAST CENTRAL	2,050	400	5.1	3.2	16.3	8,610
SOUTH WEST	1,814	320	5.7	2.0	11.4	5,442
SOUTH CENTRAL	545	400	1.1	2.0	2.2	1,635
SOUTH EAST	219	360	0.6	2.0	1.2	657
STATE	34,233	3,624	9.4	2.2	21.7	113,813

Table 3

Comparison of Crowing Count Results
1950-1953

District	Year	Average Number of Calls Heard	Index of Spring Hens
I North West	1950	18.7	44.9
	1951	19.4	46.6
	1952	18.7	50.5
	1953	19.8	39.6
II North Central	1950	18.7	56.1
	1951	19.1	59.2
	1952	20.0	60.0
	1953	26.6	55.9
III North East	1950	7.6	25.8
	1951	7.5	26.3
	1952	7.7	17.7
	1953	7.8	21.1
IV West Central	1950	7.7	15.4
	1951	8.3	18.3
	1952	10.5	21.0
	1953	10.2	25.5
V Central	1950	7.2	23.0
	1951	5.5	15.4
	1952	7.6	22.0
	1953	6.2	19.2
VI East Central	1950	6.8	23.8
	1951	5.6	19.6
	1952	7.1	14.9
	1953	5.1	16.3
VII South West	1950	2.3	3.6
	1951	3.0	4.5
	1952	6.7	10.1
	1953	5.7	11.4
VIII South Central	1950	1.6	2.4
	1951	2.3	3.5
	1952	2.6	3.9
	1953	1.1	2.2
IX South East	1950	0.8	1.2
	1951	0.6	0.9
	1952	0.7	1.1
	1953	0.6	1.2

Discussion will be made for each district as listed in Table 3 because pheasant populations vary a great deal from one part of the state to another and trends in the population for the state as a whole do not necessarily represent similar conditions for all parts of the state.

Districts I and II in northwest and north-central Iowa have annually reported figures far above the state average. In both of these districts, the population trend had been up slightly each year until this spring when the counts indicated a decrease in the hen index figure.

Population figures for northeast, west-central, and central Iowa have remained near the state average each year. The population trends in northeast and central Iowa have been up and down during the four years. This spring data for the northeast district indicated an increase while the central Iowa population level dropped slightly. The population trend in district IV in the west-central part of the state has continued to show a gradual increase each year.

Spring hen population figures for east-central Iowa have been lower than the state average for the last two years. The figure this year indicated a slight recovery from the downward trend during the three previous years..

Records from southwest Iowa again indicated an increase in the pheasant population of that district. Population figures for southwest Iowa are now far above those of south-central and

southeast Iowa. Districts VIII and IX remain much below the state average.

This spring 90 percent of all routes were repeated by the same officer who made the count the previous year. A check of these routes showed exactly the same results as did the complete survey.

ANGLING SUCCESS ON NORTHEAST IOWA RIVERS AND COMPARISON BETWEEN NET CATCHES AND ANGLING, 1950-52

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Fisheries Biologist

The annual Voluntary Creel Census carried on in the rivers of northeast Iowa lends itself quite successfully to a comparison of angling trends. In order to refine the data and reduce the human error, the data which comprise Table 1 were drawn from the creel statistics of 33 anglers who have turned in their reports annually since the inception of the project in 1950. The variations in fish caught per hour then become more a product of angling conditions and shifts in harvestable surplus rather than variations in angling skill.

Table 1

Angling Success and Effort on Northeast Iowa Streams, 1950-52.

Species	Year	Hours	No.	Calculated Weight	No./Hr.	Wt./Hr.
Trout	1950	495	629	179.4	1.27	.36
	1951	690	1183	369.2	1.71	.54
	1952	390	595	250.4	1.53	.64
Catfish	1950	688	544	754.6	.79	1.10
	1951	1070	647	1045.1	.60	.98
	1952	1455	881	1315.95	.61	.90
Smallmouth Bass	1950	385	203	228.6	.52	.59
	1951	190	71	70.4	.37	.37
	1952	318	174	249.05	.55	.78
Largemouth Bass	1950	243	181	270.5	.74	1.11
	1951	125	89	112.35	.72	.90
	1952	88	89	121.9	1.01	1.39

Table 3-Continued

Species	Year	Hours	No.	Calculated Weight	No./Hr.	Wt./Hr.
Crappie	1950	122	118	47.3	.97	.39
	1951	131	131	54.55	1.00	.42
	1952	97	108	36.6	1.11	.38
Mixed Creel	1950	451	389	344.2	.86	.76
	1951	191	276	282.05	1.44	1.48
	1952	743	821	911.45	1.11	1.22
Total of	1950	1889	1435	1645.2	.75	.87
Warm-water	1951	1707	1214	1664.45	.71	.96
Fish	1952	3090	2667	2634.95	.76	.85

Adverse angling conditions in 1951, with the rivers high and turbid during the major portion of the angling season, did not cause an appreciable drop in angling success. The smallmouth bass catch was reduced both in fish per hour and calculated weight per hour. There was a reduction in the hourly take of catfish and largemouth bass but in the former, the fish were heavier. This is generally true for most warm-water species in 1951. Although there was a slight reduction in the hourly take, this was more than compensated for by an increase in the average fish's weight. Successful anglers took advantage of the brief periods during which angling conditions were favorable during 1951 and compensated for generally adverse conditions by increasing their catch during these brief periods.

Using the angling statistics of these same 33 cooperators, an annual comparison was made against the catch of the survey trap nets on the same river to determine if there was any correlation

between changes in populations as evidenced in trap net catches and corresponding changes in angling success. Table 2 indicates that there is a slight correlation on the Maquoketa in catfish per hour as well as the pounds per hour category, but there is no apparent correlation in either category on the Wapsie and Cedar Rivers.

Table 2

No. and Wt./Rod Hr. Compared with No. and Wt./Trap Net Hr. (x 10) of Catfish in Some Rivers in Northeast Iowa, 1950-1952.

River	Year	No./Rod Hour	No./Net Hr. x10	Weight Lbs./Rod Hour	Weight Lbs./Net Hour x10
Wapsie	1950	.41	.48	.60	.41
	1951	.44	.48	.84	.35
	1952	.65	.12	1.00	.09
Maquoketa	1950	1.15	.58	1.73	.93
	1951	.61	.43	.76	.52
	1952	.51	.10	.72	.21
Cedar	1950	.68	.86	.93	.95
	1951	.60	1.53	1.13	3.01
	1952	.70	.46	1.20	.76

Since only in the Cedar River are crappies taken by our cooperators in suitable numbers, an angling/net comparison, worked out for this river alone, failed to show any correlation. (Table 3).

Table 3

No. and Wt./Rod Hour Compared with No. and Wt./Net Hour x 10 of Crappie Taken in Cedar River, 1950-52.

Year	No./Rod Hr.	No./Net Hr. x 10	Wt./Rod Hr.	Wt./Net Hr. x 10
1950	1.04	1.00	.44	.17
1951	1.13	.45	.50	.10
1952	1.17	.47	.24	.13

While trap net/angling comparison for catfish and crappie, the two most abundant species in our net catches, indicated little correlation, a comparison between the net and rod catches on a total game-fish basis did indicate some correlation in both numbers and weights on the Wapsie and Maquoketa Rivers. However, the rod-net comparison on the Cedar showed practically no correlation. (Table 4).

No. and Wt./Rod Hour Compared with No. and Wt./Net Hour of Total Game Fish Catch in Some Northeast Iowa Rivers, 1950-1952.

River	Year	No./Rod Hour	No./Net Hour	Wt./Rod Hour	Wt./Net Hour
Wapsie	1950	.78	.28	.72	.09
	1951	.44	.15	.56	.07
	1952	.82	.10	1.13	.10
Maquoketa	1950	1.15	.57	1.73	.20
	1951	.61	.33	.76	.13
	1952	.51	.07	.72	.04
Cedar	1950	.73	.57	.72	.13
	1951	.74	.33	1.15	.34
	1952	.63	.07	1.10	.09

Indications are, therefore, that trap net catches are not too indicative of corresponding angling success when comparing catches of specific fish. However, they do merit some consideration when comparing over-all game-fish catches. There are many factors which would tend to affect a possible correlation; however, there are two which are the most important. First, as pointed out by Starrett (MS.), there seems to be a division in a specific population of fish, those which can be or are taken by angling and those which can be or are taken in nets. There is undoubtedly a lapping over of the two portions of the population, but one may still remain separate and distinct from the other. The second governing factor being selectivity, in which one species or groups of species may be more susceptible to being taken by a specific piece of gear (angling or survey gear) than other species found in the same area. It is felt that under similar river conditions, these two factors are the major determinents in any correlation between net and angling catches.

Since smallmouth bass are not taken in suitable numbers for comparison on any of the netting surveys, it was decided to use the average number of nests per mile found on the test streams in the watershed as a basis for comparison with angling success. While there is some correlation between these two factors (see Table 5), it would appear that the number of nests per mile of stream is more indicative of the quality of nesting habitat surveyed in the drainage system than the population of

brood or legal bass in the system.

Table 5

Number of Smallmouth Bass/Rod Hr. Compared with Average Nests/Mile on Some River Systems in Northeast Iowa 1950-1952.

River	Year	No./Rod Hour	Av. No. Nest/Mile
Turkey	1950	.57	31.0
	1951	.50	30.5
	1952	.41	23.0
Cedar	1950	.50	16.3
	1951	.47	17.3
	1952	.60	19.5
Wapsie	1950	.25	16.0
	1951	.43	24.0
	1952	.40	7.5

SUMMARY

1. The annual catch data of 33 stream anglers who voluntarily reported their catches for the years 1950 to 1952 were compared on a number and weight per rod hour basis.
2. Physical changes and poor angling conditions in the rivers did not cause appreciable drops in angling success during the year they were evident.
3. Reduction in the number of fish per rod hour usually resulted in a catch adjustment in which the fish taken were of a larger size.
4. Comparison between net and angling success on the same river for specific fish showed little, if any, correlation.

There was, however, a correlation on certain rivers between angling and net catches when the game fish were grouped together as a whole.

5. The number of smallmouth nests per mile of stream showed little correlation when compared with angling success. It is thought that this survey index is more indicative of the quality of nesting habitat than the population of brood or "legal" bass in the drainage system.

PROGRESS REPORT ON LAKES CREEL CENSUS

E. T. Rose
Fisheries Biologist

Angling success in the major fishing lakes of northern Iowa is again being appraised by means of the creel census. The census began on May 15 and closed on June 30 in five of the lakes and following our enlarged program, is being continued on three lakes until November 1. However, for comparative purposes the reports have been tabulated to the usual seasonal summaries and presented for all eight of the lakes.

Formerly, the census clerks on all eight lakes obtained part of their data from boat liveries who voluntarily recorded catches that came over their docks. This year as an experiment on Clear, Spirit, East Okoboji and West Okoboji lakes the clerks obtained all of their data by personal contact of the anglers on the lakes. Usually the clerk made two complete trips by boat daily over the lake contacting all anglers in boats, recording catches by species and time spent in fishing. Also, dock fishermen inaccessible by car, were contacted on these boat trips. In addition, clerks usually made two trips by car around the lake each day contacting shore and dock anglers, and especially the major concentration areas. The boat angler's and shore angler's data were compiled separately to determine variance in success, and have been combined for total catch and comparative purposes.

At Blackhawk, Storm, Lost Island and North Twin the usual type census was continued this season and cooperating boat liveries data used in the tabulations. All of the data were tabulated at 10 day intervals and submitted to the central office as usual; however, for purposes of this report, only the seasonal summaries with comparisons of past data are presented (appendix) and comments made concerning the angling success on each lake.

Spirit Lake

It is difficult to appraise this season's angling if we compare it with past data. Here, as in the Okobojis and Clear Lake, all of the information was obtained by personal contact of anglers and no voluntary reports were involved; whereas all previous season's data included livery reports, some of which were erroneous. However, since the data are partially comparable the summary of catches from May 15 to June 30 are presented in Table 1 of the appendix. This is a combined shore and boat contact record of the census clerk. Basically, we find a total of 7,715 fishermen contacts and 24,405 fish taken by them in 25,061 hours of effort. The average angler caught 3.16 fish per trip at the rate of 0.97 fish per hour. Walleye fishing was especially good with 40 percent of the total catch in this species. This increased harvest was anticipated since the population has increased very satisfactorily. There was also a decided increase in catches of northern pike and some increase in the white bass and black basses. There was a significant decline in the catch

of bullheads during the census period. Of course catches of fis are not necessarily a function of population density.

Anglers and livery operators have been well pleased with the fishing this year and this turn of events was exceedingly well timed in view of last year's adversities. It was expected that some opposition would be met by having the clerk check anglers in their boats; however, by using a sensible approach no ill feeling was engendered and cooperation was excellent.

West Okoboji

Results of the census of this lake are included in Table 2 (appendix). Here again, comparing our personal contact of anglers in boats and on shore with the previous seven seasons of voluntary census is questionable procedure, especially in view of the known false reports submitted in the past by livery operators. However, it is common knowledge that angling was poor this year, and the census certainly yields tangible evidence thereto. The record this season is accurate and reflects the opinion of most anglers--"poor fishing". Bluegill fishing has been fairly good and the good fishermen continue to take walleyes and black bass in areas that are not so accessible to the vast fleet of high-speed boats.

East Okoboji

To indicate some of the clerical difficulties involved in this year's census, the following is pointed out. The clerk on Spirit Lake included in his work a census of the north portion of

East Okoboji from the Orleans fish hatchery down to the "narrows". The clerk on West Okoboji also included the lower region of East Okoboji, or from the "narrows" to West Okoboji. Each 10 days their records were tabulated separately as to lake, boat and shore contacts, and finally a combined report for boat and shore contacts to complete the picture of total catch. Thus each 10 days for the three lakes there were prepared 12 separate reports in duplicate. For this report the separate seasonal totals were combined for comparative purposes in Table 3 of the appendix.

The errors in comparisons of this season's catch with the previous eight years record are of course manifest here. A glance at the table indicates good fishing with a considerable increase in crappies and walleyes over the 1951 and 1952 seasons. Bullheads, a major item in this lake, compared well with the previous seasons even though padding by some liveries was reported last year. The catch per hour of 1.56 fish is well above the average of the eight seasons of censusing on this lake.

Clear Lake

The personal contact record of boat and shore fishermen is included in Table 4 of the appendix for this lake. Previous season's records included of course the usual voluntary census by the livery operators. This season was very poor for walleye fishermen, further indicating a decline in this species. A considerable increase in perch and northern pike has occurred and was reflected in the census. Yellow bass, a favorite at this lake held up well in the record (61 percent of total catch). The catch

per trip and per hour is about average for this lake.

The census clerk submitted several hundred total lengths on the fishes taken here this year and from these calculated weights were determined of the harvest poundage (Carlander, 1950). Combining these weights the entire catch totaled 11,064 pounds of fish in the 45 day census period, or about three pounds per acre.

North Twin Lake

This is the second season of census on this small lake (573 A.). The census clerk contacted most of the anglers reported since the livery operators were un-cooperative. The comparative record of the past two seasons is included in Table 5 (appendix). Although more fish were caught this season than last, more than twice the effort was expended thus reducing the average catch considerably. Bullheads and perch constituted the major species in the catch. Walleyes believed to be well established last year showed a significant decline indicating that the lake is probably not suitable for this species.

Storm Lake

The census at this lake was operated as formerly and cooperation continued to be fairly reliable from the major liveries. The most significant item indicated by the record this season (Table 6, appendix) is the precipitous decline in the white bass catch. The average seasonal catch over the past six census periods is 1,493 white bass (range 473 to 2,343). This season the total reported catch of nine white bass indicates

further the cyclic tendencies of this splendid game fish. The survey data of 1952 indicated a decline in abundance, also, there was some evidence of "winter-kill" during the past winter.

There is some feeling locally that fishing pressure declined this year due to the toxic blue-green algae problem of last fall; however, census data indicated about a normal complement of anglers on the lake this year. Walleyes are still holding their own, with a better than average catch reported this season.

Blackhawk Lake

A significant increase in crappies and walleyes occurred this season along with some increase in catches of white bass and northern pike. The census was operated as formerly with practically no cooperation with the liveries. The bullhead catch was the lowest on record. The average catch-per-hour over the past six seasons of census is 0.92, and this season's record of 0.75 fish-per-hour indicates continued low success. However, since the vast majority of the fish taken were game fish (few bullheads and carp), most of the anglers were fairly well pleased with the season. The seven seasons of records are included in Table 7 of the appendix.

Lost Island Lake

Fishing success on this lake was the best this season since 1948. A tremendous increase in the bullheads and increasing numbers of walleyes, northern pike and perch all contributed

toward one of the best seasons on record. The census operated as before with fair cooperation from liveries. Insofar as is known this is the only lake in Iowa where violations for exceeding the daily catch limit presented a problem--which is further evidence of good fishing. Since bullheads are the major species and the lake is managed primarily for them, the catch per man and hour was the highest for any lake censused this season. The lake had the greatest fishing pressure of any lake in Iowa, with 14,711 fishing trips recorded. The next highest record was for Spirit Lake with 7,715 recorded trips. This again bears out our contention that the bullhead is not to be viewed with contempt in Iowa, and the inference is, logically, that better bullhead management means more bread and perhaps a little butter for us all.

The comparative season totals are included in Table 8 of the appendix.

Summary

A summary of creel census work on eight Iowa lakes indicates an overall improvement in angling this year. The lakes censused are of various sizes and types, ranging from 500 acres to over 5,000 acres and from typical bullhead to borderline walleye waters.

If we combine all of the catch data from the eight lakes for this 45 day census period some interesting facts are revealed. There were 47,120 fishing trips recorded by the clerks. These

anglers fished a total of 130,911 hours and caught a total of 208,083 fish. Thus the average angler fished 2.8 hours each trip and caught 4.42 fish at the rate of 1.5 fish per hour. This of course was the average angler which included the unfortunate and unskilled as well as the expert. The most important species insofar as numbers is concerned remains the bullhead. Of the total number of fish caught from the eight lakes (208,083) there were 176,183 bullheads, or 84 per cent of the total.

We can conclude from this that either the Iowa fisherman prefers the bullhead, or he doesn't know how to catch other so-called more desirable species, or would rather catch bullheads than nothing. We believe that the former premise is true. Iowa anglers will travel long distances to Lost Island or other good bullhead lakes. The bullhead is Iowa's "family fish".

New census techniques were utilized on four lakes (continuing on three) to obtain accurate records. It was hoped to devise a sampling system whereby total catch could be computed, but due to intensive night fishing and several other obstacles the plan did not materialize. Principal obstacles toward the calculation of total catch in the natural lakes are: the many access regions, many boat liveries, private boats, docks, and the lack of uniform dispersion of angling (fishing pressure is often confined to various concentration points depending upon wind direction and other unpredictable variables). Our new method of actually contacting the anglers in the boats, counting their fish and checking their time spent in angling is unquestionably far

more accurate than depending upon voluntary assistance from boat liveries.

Literature Cited

Carlander, Kenneth D.

1950. Handbook of Freshwater Fishery Biology. William C. Brown, Dubuque, Iowa.

APPENDIX

Table 1-SPIRIT LAKE

IOWA LAKES SURVEY

SPECIES	1945	1946	1947	1948	1949	1950	1951	1952	1953**
CRAPPIE	109	3,390	2,823	13,533	16,063	13,298	6,933	1,730	783
PERCH	614	5,921	2,019	32,958	3,802	656	1,856	3,428	1,381
N. PIKE	308	3,607	825	2,936	655	178	56	492	1,014
WALLEYE	70	12,917	7,685	4,185	6,023	4,091	2,204	1,413	9,814
L. M. BASS		3,092	1,452	1,922	326	94	134	73	139
S. M. BASS		493	219	357	105	6	21	7	93
BULLHEAD		57,019	41,601	69,227	82,157	84,642	79,068	25,935	10,911
WHITE BASS	1,444	11,262	2,189	5,091	1,004	152	94	61	183
BLUEGILL		1,530	314	2,544	1,337	245	223	49	3Sheephead* 75
YEARLY TOTAIS	2,545	99,121	59,217	132,754	112,372	103,316	90,589	35,191	24,405
NO. ANGLERS	1,115	20,937	9,951	22,171	15,614	8,896	9,553	6,990	7,715
NO. HOURS	4,157	66,354	43,570	101,382	66,339	41,939	45,210	34,773	25,061
FISH/MAN	2.28	4.73	5.95	5.98	7.19	11.62	9.47	5.03	3.16
FISH/HOUR	0.61	1.49	1.36	1.31	1.69	2.46	2.01	1.01	0.97

* 9 Sheephead and 3 carp caught 1953
**All personal contacts with anglers

APPENDIX

Table 2-WEST OKOBOJI

IOWA LAKES SURVEY

SPECIES	1946	1947	1948	1949	1950	1951	1952	1953*
CRAPPIE	5,310	2,661	3,682	2,405	1,421	1,889	1,279	600
PERCH	876	2,589	4,217	6,815	1,001	1,437	1,156	566
N. PIKE	924	646	1,160	658	657	439	740	344
WALLEYE	1,599	1,073	4,018	1,956	1,270	2,357	1,628	525
L. M. BASS	706	613	581	650	710	777	690	283
S. M. BASS	113	39	425	329	321	194	285	99
WHITE BASS	125	79	405	242	158	265	19	10
BULLHEAD	456	1,496	1,756	3,721	2,062	8,051	29 8,192	Sheephead** 3,356
BLUEGILL	313	350	1,339	1,601	583	1,280	1,399	1,226
YEARLY TOTAIS	10,422	9,546	17,583	18,583	9,187	16,689	15,418	7,221
NO. ANGLERS	3,292	2,417	5,860	5,975	3,540	3,987	4,010	3,469
NO. HOURS	9,878	8,942	21,485	21,192	11,145	16,416	15,815	8,511
FISH/MAN	3.19	3.95	3.00	3.07	2.60	4.19	3.60	2.08
FISH/HOUR	1.03	1.06	0.82	0.86	0.82	1.02	0.97	0.84

*Sheepshead
**116 Sheepshead Caught

APPENDIX

Table 3-EAST OKOBOJI

IOWA LAKES SURVEY

SPECIES	1945	1946	1947	1948	1949	1950	1951	1952	1953
CRAPPIE	6,904	22,899	9,704	4,660	2,637	3,562	660	395	2,196
PERCH	26	433	251	2,113	4,464	742	1,376	366	715
N. PIKE	93	247	126	294	117	55	40	95	171
WALLEYE	1,608	4,704	1,792	6,148	705	1,120	490	225	832
S. M. BASS		15	13	63	37	29	14	12	46
L. M. BASS	98	296	153	276	27	47	37	52	63
BULLHEAD		5,404	3,394	5,785	13,380	5,072	31,036	31,657	24,897
WHITE BASS	405	1,102	1,016	1,012	745	428	67	31	117
BLUEGILL		219	117	486	1,166	1,184	127	278	184
ROCK BASS								51	
CHANNEL CAT						1	1 Sheepshead		411
YEARLY TOTALS	9,134	35,354	16,566	21,737	23,287	12,240	33,848	33,162	29,641
NO. ANGLERS	2,759	9,119	4,725	6,125	3,789	2,812	3,232	4,005	6,049
NO. HOURS	9,080	31,346	18,566	25,947	15,566	11,143	15,195	20,824	19,108
FISH/MAN	3.31	3.88	3.51	3.55	6.14	4.35	10.47	8.28	4.90
FISH/HOUR	1.01	1.13	0.89	0.84	1.46	1.09	2.23	1.59	1.56

APPENDIY

Table 4-CLEAR LAKE

IOWA LAKES SURVEY

-SPECIES	1948	1949	1950	1951	1952	1953
CRAPPIE	2,401	1,464	1,151	3,597	3,991	597
PERCH	3,541	250	39	47	892	1,547
N. PIKE	401	159	17	10	191	927
WALLEYE	2,299	2,004	468	7,908	1,860	460
YELLOW BASS	12,673	8,944	3,764	4,376	11,900	10,301
S. M. BASS	213	45	21	3	8	7
L. M. BASS	130	229	126	214	8	94
BULLHEAD	13,643	5,670	9,379	28,973	16,038	2,915
WHITE BASS	1,624	481	259	51	38	11
					9 Channel	34
BLUEGILL	866	295	134	67	217	97
YEARLY TOTALS	37,800	19,531	15,359	45,247	35,152	16,990
NO. ANGLERS	10,214	6,253	4,169	8,003	7,184	4,969
NO. HOURS	30,463	17,523	13,722	32,176	31,462	14,539
FISH/MAN	3.69	3.12	3.68	5.65	4.89	3.42
FISH/HOUR	1.24	1.11	1.12	1.41	1.12	1.17

APPENDIX

Table 5-NORTH TWIN LAKE

IOWA LAKES SURVEY

SPECIES	1952	1953
CRAPPIE	84	26
PERCH	3,116	6,280
N. PIKE	23	23
L. M. BASS	14	1
WALLEYE	119	38
BULLHEAD	24,473	31,385
YELLOW BASS	13	61
TOTALS	27,842	37,816
NO. ANGLERS	3,597	7,867
NO. HOURS	8,893	18,248
FISH/MAN	7.74	4.90
FISH/HOUR	3.13	2.07

APPENDIX

Table 6-STORM LAKE

IOWA LAKES SURVEY

SPECIES	1947	1948	1949	1950	1951	1952	1953
CRAPPIE	6,241	5,313	2,109	1,077	1,083	502	369
PERCH	3	539	110	79	30	119	38
N. PIKE	12	46	32	13	7	7	16
WALLEYE	247	2,833	1,906	1,906	4,207	2,847	2,823
CHANNEL CAT	0	132	74	183	62	172	108
S. M. BASS	1	0	0	0	0	0	0
L. M. BASS	3	2	2	17	13	2	0
BULLHEAD	3,815	12,754	2,391	5,065	519	868	1,474
WHITE BASS	473	1,851	1,141	1,370	1,779	2,343	9
BLUEGILL	0	7	0	0	0	0	0*
YEARLY TOTALS	10,796	23,297	7,765	11,431	7,700	6,860	4,838
NO. ANGLERS	2,092	7,756	5,784	5,396	4,090	4,197	3,973
NO. HOURS	7,574	24,104	21,871	10,142	14,217	13,613	11,083
FISH/MAN	5.11	3.00	1.34	2.12	1.69	1.63	1.22
FISH/HOUR	1.43	0.96	0.35	1.03	0.56	0.50	0.44

*Carp

APPENDIX

Table 7-BLACKHAWK LAKE

IOWA LAKES SURVEY

SPECIES	1947	1948	1949	1950	1951	1952	1953
CRAPPIE	14,359	12,507	5,057	6,977	4,590	1,837	5,836
PERCH	1,924	2,014	406	21	344	95	48
CHANNEL CAT	14	333	201	63	131	113	52
CARP	2	2,477	491	499	255	182	87
WALLEYE	0	6	0	0	0	640	800
S. M. BASS	2	5	22	0	1	18	2
L. M. BASS	34	390	476	72	141	345	238
BULLHEAD	4,649	2,422	1,250	1,844	1,625	818	760
WHITE BASS	5	11	3	5	1	19	74
BLUEGILL	0	1,140	388	64	150	60	85
N. PIKE	0	0	0	1	2	2 33	Yellow Pass 81
YEARLY TOTALS	20,987	21,206	9,296	9,646	7,240	4,162	8,063
NO. ANGLERS	7,704	7,829	9,005	7,338	6,939	6,353	6,087
NO. HOURS	21,587	16,474	16,824	11,395	5,648	7,209	10,724
FISH/MAN	2.76	2.68	0.92	1.31	1.04	0.65	1.33
FISH/HOUR	0.97	1.37	0.49	0.85	1.30	0.57	0.75

APPENDIX

Table 8-LOST ISLAND

IOWA LAKES SURVEY

SPECIES	1946	1947	1948	1949	1950	1951	1952	1953
CRAPPIE	0	0	5	2	250	3	9	44
PERCH	56	51	285	19	22	25	60	1,001
N. PIKE	23	50	131	479	366	121	305	540
WALLEYE	130	359	760	106	2,266	531	647	1,444
L. M. BASS	0	0	0	2	0	1	2	0
BULLHEAD	100,111	169.344	346,954	51,482	87,646	15.427	20,455	100,485
YEARLY TOTALS	100,320	169,804	348,135	52,089	90,554	16,108	21,478	103,514
NO. ANGLERS	3,378	7,495	25,017	10,842	12,753	8,821	6,730	14,711
FISH/MAN	29.69	22.61	13.42	4.81	7.02	1.83	3.20	7.04
FISH/HOUR	5.27	5.23	2.98	0.92	2.03	0.53	0.89	2.13

CREEL CENSUS OF THE UPPER DES MOINES RIVER FOR THE SPRING AND EARLY SUMMER OF 1953

Harry Harrison
Fisheries Biologist

At the beginning of the present fishing season a creel census for the Des Moines River was inaugurated. The overall purpose of this study was to establish a means of comparing pole and line fishing from one year to the next in a representative Iowa stream, and, in addition, to compare angling results with our population studies. For the first year, the investigation has been set up primarily to determine the possibilities that might from a study of the anglers catch, and further, to work out some of the problems attending such an endeavor.

Inasmuch as our foremost work is that of stream inventories, it follows then that the anglers catch studies must be carried on along with, but secondary to, our regular surveys. This limitation will always restrict the volume of catch data that can be obtained and furthermore, it will restrict the information to those areas that are being currently surveyed.

The method employed in making the study has been one of personal contact with fishermen on the stream. Usually this was accomplished by driving the river roads to and between survey stations. Fishermen seen on these trips were contacted and questioned about their fishing results. The information sought from

each fisherman included the date and time of day fished, the number and kind of fish caught, their size range, the number of hours or length of time fished, where the fish were caught, and to some extent the type of bait used and what the person was fishing for or wanted to catch.

The present report summarizes the data collected for the year 1953 up through the first week in July, and it comes from fishermen contacts made on that reach of the Des Moines River lying between the town of Madrid and the Iowa-Minnesota state line. In the work 480 fishermen were interviewed. They had fished a total of 883 hours up to the time of the contact and had caught a total of 733 fish. This gives an overall average of .83 fish per hour of fishing. The average length of time fished by each fisherman prior to the time of contact was approximately two hours, and he had caught an average of about 1.5 fish. Of the 733 fish examined, 390 were channel catfish, 138 bullheads, 72 carp, 49 northerns, 45 crappie, 31 walleyes, 2 smallmouth bass, and 6 miscellaneous species including buffalo, suckers, and stone cats. Of the 480 fishermen that were interviewed, 328 expressed a desire and were fishing for channel catfish, while 106 others were after game fish including walleye, northern pike, crappie and bass, 27 were fishing carp, and 19 were fishing for bullheads. On a time basis, 622 hours of the 883 hours fished were for catfish, 183 hours for other game species, 43 hours for carp and 35 hours for the bullhead. Breaking these figures down to a time factor, it took approximately 1.6 hours to catch a channel catfish, 1.4 hours

to get either a walleye, northern, crappie or bass, 0.6 of an hour for a carp and 0.3 of an hour for a bullhead.

Comparing these figures to the voluntary creel census carried on in several northeast Iowa streams where only the good and expert fishermen were censused, and compared with the census carried on in the northern Iowa lakes, it would appear that fishing this year in the Des Moines River has been very good. The opinion of the fishermen largely substantiated this conclusion. The majority of the few complaints encountered were from fishermen who were obviously inexperienced or who had not learned to fish in spite of the fact that they had been trying to do so for a good many years. The successful fisherman seemed to know that it is occasionly possible to catch a good string of fish in a short time, but more often than not, it will take a whole day to get a limit.

Because of the length of stream involved in this study, it is of course, impossible to even venture a guess as to what per cent of the Des Moines River fishermen were contacted. There is no doubt but that it was a small percentage of them. The sample by its smallness alone does point up the fact that there are a lot of people fishing on the stream and that the stream is producing a goodly number of fish.

Just what correlation exists between the anglers catch and the results of our netting surveys for the present year have not been determined. This is because our 1953 netting activities have not been completed. One thing is certain, the catch of fishe

by anglers does not in any way reflect the species composition the fishable population in the river. The census may, however, if continued from year to year show a trend in the population of the various species. For instance the 1.4 hour figure required to catch a game fish is believed to be high. Our netting surveys and other work for the past two years have demonstrated a very definite build-up of the northern and walleyed pike and crappies with a decrease in smallmouth bass. The angler's catch based only on the immediate season, of course, cannot reflect population trends, but for this year, at least, it has measured the game fish population as it now stands. Substantially it is a poor or low population of smallmouth bass with good stream populations of northerns, walleyes, and crappies.

With the channel catfish our netting surveys for the past seven years have indicated a rather stable population, and because we do not have any precise catch data for that time it is impossible now to assume any significance in the case of the 1.6 hours required by the average catfisherman to string a channel catfish. Purely and simply on the basis of experience and memory alone it seems that the 1.6 figure would not be far off from the time required to catch a channel cat at any time since our Des Moines River work begun in 1946. Over the entire length of the stream, the years 1948 - 1950 might have required a little more time to catch a catfish particularly in some reaches of the river, such as in Boone and Polk counties.

As pointed out above, the study as it is now being pursued may be inadequate, in that other work has limited the amount of time available for creel censusing. The study does, however, have some merit and it is believed to be worthwhile to continue. Of first importance, it will give an idea as to what the fishing success is or has been and thus provide a tool to dispel or even substantiate the public's evaluation of angling success. In addition, the type of information being gathered by the study should, after several years, give some very definite data on how's, when's and where's for catching fish. Fisheries workers pretty well agree that the problem at hand is one of teaching the public how to fish. This is a point well worth remembering.

SUMMARY OF HATCHERY STUDIES AT SPIRIT AND CLEAR LAKE HATCHERIES, SPRING OF 1953

Tom Moen
Fisheries Biologist

Introduction

Each year, commencing in 1946, the author has assisted in certain phases of the operation of the Spirit and Clear Lake pike (northern and walleye) hatcheries. Most of the work has been routine, such as determination of egg fertility, number of eggs per quart, per cent of hatch, and compilation of general data on temperatures, dates of operation, netting results, and stocking records. From time to time special investigations are carried on in conjunction with the routine work. Two such special studies, success of natural spawning of walleyes and walleye egg predation, have appeared in the Biology Seminar Reports.

During the spring of 1953 several short informal experiments were conducted in addition to the normal or routine work. These experiments were of a preliminary nature, conducted primarily as a lead toward further investigation. The following discussion concerns only the highlights of both routine data collected and results of experimental work.

Spirit Lake Hatchery

Both northern pike and walleyes were hatched at Spirit

Lake this spring. Even though there was a population of northerns in the lakes that was considered above average there was a very poor "run", and the northerns that were held in the hatchery failed to ripen. A prolonged cool spell following an early "warm-up" was believed to be the causitive factor. Only four and one-half quarts of eggs were put up (average is about 50 quarts for this station) which produced approximately 125,000 fry.

On the brighter side, the walleye hatch was one of the best on record for this station. The gillnetting crews caught over 4,000 walleyes of which 1,586 were females that produced 642 quarts for an average of 0.45 quarts per female[1]. The over-all per cent hatch was computed at 86 per cent resulting in some 78 million fry.

About seven million fry were stocked in nursery units, three million at various river stations (experimental stocking) and the remainder directly into fishing waters. Fifteen million fry were stocked in Spirit Lake completing the fifth year of a special study on the value of fry planting. The five years of fry planting were preceeded by five years of "no" fry stocking.

Clear Lake Hatchery

The 1953 season was an "off" year for walleye hatching in the alternate-year fry stocking experiment being conducted at Clear Lake in cooperation with the Iowa State College Fisheries

1 - No attempt was made to set a record; previous record 682 quarts

Research Unit.

Northern pike were hatched at the Clear Lake station for the first time, and the operation was unusual in several respects. All adults used were collected in the Ventura carp trap, and were largely fish with two years growth. The females averaged 2.5 pounds and the males 1.5 pounds. Relatively good results were obtained from these fish, considering the size and age. The 540 females from which eggs were stripped produced 81 quarts of eggs for an average of 0.15 quarts per fish. Egg counts (Von Bayer method) indicated that these eggs were quite small, averaging approximately 75,000 per quart. Thus the average female produced about 11,000 eggs. An actual count of the eggs stripped from one 2.5 pound female was 22,745.

The over-all hatch was computed at 52 per cent, thus a production of 3,165,000 fry. The greater share of these fry were stocked in Clear Lake proper and the connecting Ventura marsh.

Experimental Studies

Anesthetizing: The use of various chemicals in anesthetizing fish has become a fairly standard practice among fisheries workers, particularly for trout. Inasmuch as large female northerns are difficult to handle while stripping it appeared logical that anesthetizing would greatly assist in these spawn taking operations.

During the 1949 season an unsuccessful attempt was made to anesthetize northerns using a recommended 0.5 per cent solution

(1:190) of urethane. During the 1953 season anesthetizing was again attempted, this time using chloretone. Cope (1953) and Nelson (1953) have recommended a concentration of 1:2000 while working with various species of salmonoid fishes. At a concentration of 1:2000 with water temperatures of 35 to 55°F cutthroat trout turned over in one to two minutes. Using this concentration with water temperatures of 46°F five to seven minutes were required to turn northerns over and three minutes for walleyes. The concentrations were gradually increased until a ratio of 1:600 was reached; at this point female northerns were completely relaxed after an immersion of 2.5 minutes. At a concentration of 1:700, female walleyes turned over in slightly less than two minutes, males in 45 seconds to two minutes.

Two to three fish of each species were treated at each concentration; all fish were immediately returned to fresh water. Although the recovery rate varied from 15 minutes to over one hour, no mortality was recorded in the 23 fish handled in the experiments. Nelson (on. cit.) indicated that there was only a small latitude in concentrations that could be used and still maintain low mortality rates.

The size range of both species varied from two to six pounds. Males of both species were anesthetized and recovered more rapidly than the females. No ripe female northerns were available at the time of these experiments. Anesthesia failed to induce egg flow in females that could not be stripped prior to

treatment. Although ripe female walleyes were available no stripping of anesthetized fish was attempted. Milt from anesthetized males ran freely when the fish were handled.

Walleye fry: Depth - What happens to walleye fry that start life in a hatchery jar and suddenly find themselves in 10, 25 or even 100 feet of water? This may sound like a relatively academic question but the apparent good results of the fry stocking in Spirit Lake during the past five years may, in part at least, hinge on this question. The normal stocking procedure consists of dumping the fry along windward sand beaches in two to four feet of water. During the past five years, fry stocking in Spirit Lake has been accomplished from a boat, siphoning the fry out of the can into 10 to 25 feet of water.

The next question then, do fry go to the bottom when stocked in deep water? If so, are they crushed by the pressure of the water? In an attempt to answer these questions, eleven feet of one-half inch hose with a glass tube at one end was suspended vertically. Fry introduced at the upper end appeared in the glass tube 20 to 30 minutes later. No difference in activity could be noted between the fry in the glass tube and those in a hatching jar (used as a control) after two hours of observation. The same observations were made using 27 feet of hose. The fry took one hour to make the 27 foot decent, arriving at the bottom in good shape.

Another depth experiment consisted of attaching a series of pint jars (provided with screen lids) to a 50 foot line at 10

foot intervals. Fry (about 500) were put in each of these jars, the line was then suspended in about 60 feet of water and allowed to remain for a period of two hours. At this period about one-tenth to one-third of the fry in each jar were dead but there was no correlation with depth. As a matter of fact the jar held at 50 feet contained the smallest number of dead fish. Another jar containing 25 fry was lowered to 100 feet at the rate of 20 feet per minute, retained at that level for 10 minutes and decompressed in three minutes. No mortality or ill effects were noted. Following this all jars and fish were placed in a holding tank. An examination three days later revealed that there were only three dead fry in the jar that had been lowered to 100 feet and a few live fry in the other jars, with the greatest number of live fish in the jar that had been at the 50 foot level. The high mortality in the fry was attributed to the excess number in all but the container holding the 25 fry (100 foot level). The screen lids were partially clogged with rust and debris, preventing adequate aeration. The fry that had survived the 100 foot depth lived to be used in a $CuSO_4$ experiment seven days later.

It is doubtful that siphoning is necessary to protect fry from shock of handling or stocking. A large dipper of several thousand fry were dumped into a tub of water from a three foot elevation with no apparent ill effects after six hours of observation.

Temperature: Apparently the tempering of walleye fry to a temperature within one or two degrees of the water to be

stocked is not entirely necessary. A check on temperature tolerance was set up using three hatching jars with water at 46°F, 58°F, and 67°F. The 58°F temperature corresponded with the temperature in the holding tanks and thus served as a control. The water in all three jars was from the same source as that of the holding tanks. About 300 fry were placed in each of the three jars without benefit of any tempering. No harmful effects were noted after a five hour period of observation.

It appeared from this experiment that walleye fry could be stocked in water eight to nine degrees warmer or into water ten to twelve degrees colder without benefit of tempering but more intensive experiments should be made.

Miscellaneous: In addition to the investigations discussed above, additional data were gathered on egg size in relation to the size of fish in an attempt to explain the difference in average egg size from year to year or between stations.

A start was made toward evaluating the egg enumeration methods used at the present time.

Literature Cited

Cope, Oliver B.

1953. Chloretone as an anaesthetic for adult cutthroat trout. Prog. Fish-Cult. 15 (1) : 35.

Nelson, P. R.

1953. Use of three anesthetic on juvenile salmon and trout. Prog. Fish-Cult. 15 (2) : 74.