Vol. 3 No. 2 1951 April to June 1951

2

Vol. III No 2

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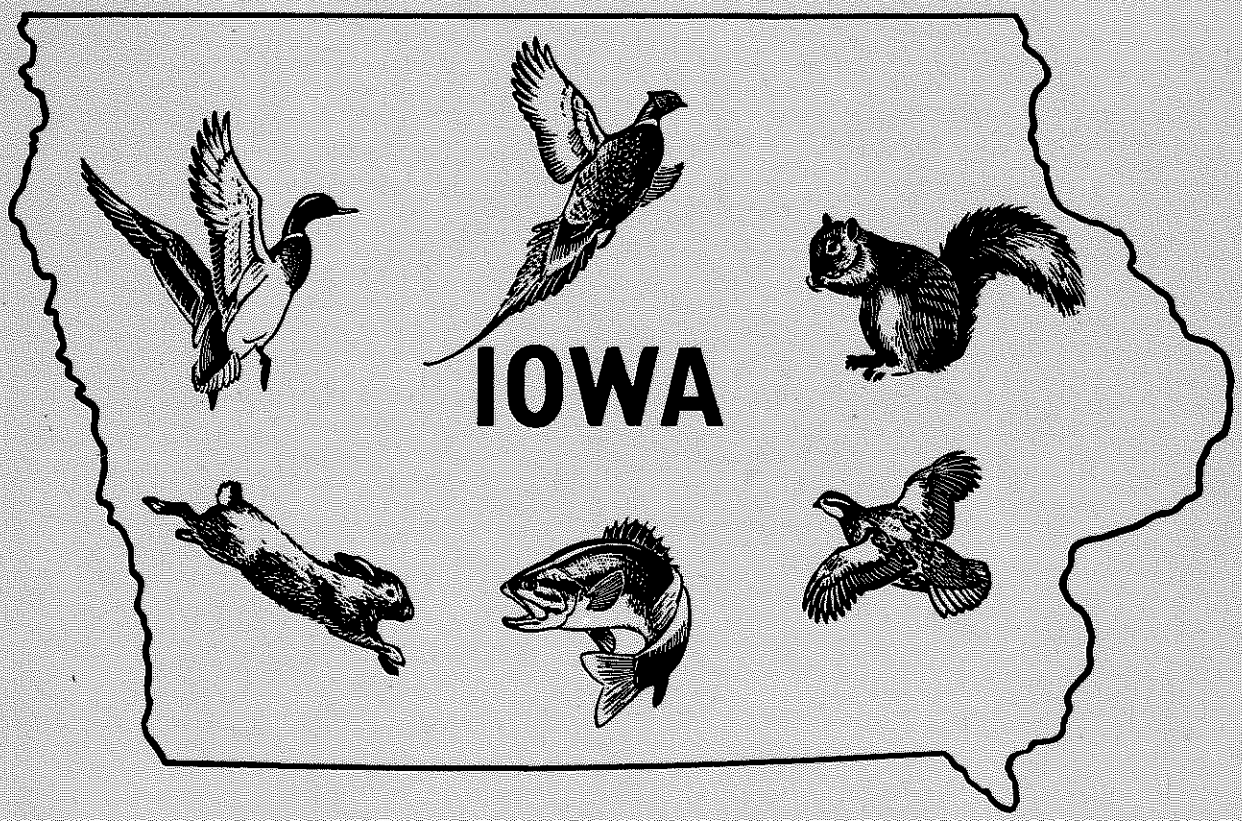

FISH AND GAME DIVISION — BIOLOGY SECTION

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

April, May and June, 1951

Vol. III No. 2

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TABLE OF CONTENTS

IOWA STATE CONSERVATION COMMISSION
DIVISION OF FISH AND GAME

Seventh Biology Seminar
July - 1951

THE 1951 IOWA LAKES CREEL CENSUS and BULLHEAD POPULATIONS IN LOST ISLAND AND CENTER LAKES

by E. T. Rose

Fisheries Biologist

The 1951 creel census has just been completed and tabulations for each lake compared with past years to show fluctuations in catches from year to year. Previous seminar reports have explained the full mechanics of the census so duplication here is not deemed necessary. Briefly however, it consists of employing one census clerk for each of the following areas: LostIsland, Storm, Black Hawk, Clear, and one clerk for all of Spirit, East and West Okoboji, and Center Lakes. Daily contact of shore fishermen and boat liveries provide the required catch data which is tabulated in ten-day periods throughout the forty five day season which starts May 15, and ends July 1. Annual comparisons reported here are compiled from the ten day tabulations as grand totals for the season. Since the census is conducted in the same manner from year to year, and during the same period of time and usually by the same clerk, it is felt that the records provide an accurate index of the angling success and a true basis for comparison. Significant changes or trends in the status of the sport fishery on each lake is readily illustrated in the annual comparisons. Brief comments and a table of each lake's record are prepared in similar form to last season's report.

Clear Lake

Clear Lake, in Cerro Gordo County, produced the most satisfactory improvement in angler success of all the important Iowa fishing areas censused. A glance at the table illustrates significant increases in particularly the walleye and bullhead catches over the previous three years. Most gratifying was the recording of the walleye catches. Of the 7,908 walleyes reported caught, 5,210 were taken in the first ten days and 1,383 in the second ten day period. Yellow perch, northern pike, white bass, smallmouth bass and bluegills continue to be relatively unimportant in the total picture. Of the total catch (45,247) of fish recorded, sixty eight per cent were bullheads and seventeen percent walleyes. The major balance of the remaining fifteen per cent were yellow bass and crappies.

Perhaps needless to say, the vast improvement in fishing this year over the previous three years is most encouraging. It

is believed that the shortage of natural forage induced hunger particularly in the walleye. Last year's survey records show comparatively much less natural reproduction than formerly in forage species as well as the pan fishes.

Table 1

IOWA LAKES CREEL CENSUS
CLEAR LAKE

SPECIES	1948	1949	1950	1951
CRAPPIE	2,401	1,464	1,151	3,597
PERCH	3,541	250	39	47
N. PIKE	401	159	17	10
WALLEYE	2,299	2,004	468	7,908
YELLOW BASS	12,673	8,944	3,764	4,376
S.M. BASS	213	45	21	3
L.M. BASS	130	229	126	214
BULLHEAD	13,643	5,670	9,379	28,973
WHITE BASS	1,624	481	259	51
BLUEGILL	866	295	134	67
YEARLY TOTALS	37,800	19,531	15,359	45,247
No. Anglers	10,214	6,253	4,169	8,003
No. Hours	30,463	17,523	13,722	32,176
Fish/Angler	3.69	3.12	3.68	5.65
FISH/HOUR	1.24	1.11	1.12	1.41

Spirit Lake

Angling on Spirit Lake this year has been considerably below the average of the past several years, especially for the important crappie, walleye, northern pike and white bass. The following percentage declines from last year's record are noted: crappie 48 percent, walleye 47 percent, northern pike 32 percent and white bass 16 percent. Of the total recorded catch this year of 90,589 fish, 87 percent were bullheads, about 7 percent were crappie and about 2 percent walleyes. The large sustained yields of bullheads

in the last six years indicates that angling cannot adequately harvest the species in this lake and that further controls should be considered. A total of 9,553 fishing trips were recorded and the average angler caught 9.47 fish per trip at the rate of 2.0 fish per hour.

The striking declines in white bass, walleye, northern pike, largemouth and smallmouth black bass catches in this lake during the past few years must be commented on since it is readily apparent that this important lake is not producing. The magnitude of declines in these game species is very suggestive of continuations from now on unless intensive efforts are made to avoid them. Carp control is of paramount importance, and every effort is being made to increase and speed up the reduction in its numbers. Serious consideration should be given to increasing the exploitation of bullheads. These two factors, while in themselves not wholly responsible for the declining catches certainly are contributing toward them. Lake surveys since 1948 have shown two large hatches of white bass that have survived to advanced fingerling sizes, and these have literally disappeared contrary to all expectations. These are just a few of the problems that prevail which require attention in the immediate future.

Table 2

IOWA LAKES CREEL CENSUS
SPIRIT LAKE

SPECIES	1945	1946	1947	1948	1949	1950	1951
CRAPPIE	109	3,390	2,823	13,533	16,063	13,298	6,933
PERCH	614	5,921	2,019	32,958	3,802	656	1,856
N. PIKE	308	3,607	825	2,936	655	178	56
WALLEYE	70	12,917	7,685	4,185	6,923	4,091	2,204
L.M.BASS		3,092	1,452	1,922	326	94	134
S.M.BASS		493	219	357	105	6	21
BULLHEAD		57,019	41,691	69,227	82,157	84,642	79,068
WHITE BASS	1,444	11,262	2,189	5,091	1,004	152	94
BLUEGILL		1,530	314	2,544	1,337	245	223
YEARLY TOTALS	2,545	99,121	59,217	132,754	112,372	103,316	90,589
No. Anglers	1,115	20,937	9,951	22,171	15,614	8,896	9,553
No. Hours	4,157	66,354	43,570	101,382	66,339	41,939	45,219
Fish Per Angler	2.28	4.73	5.95	5.98	7.19	11.62	9.47
Fish Per Hour	0.61	1.49	1.36	1.31	1.69	2.46	2.001

Lost Island Lake

It is indeed unfortunate that high sustained yields cannot be maintained when fish populations are known to be high. However, as has been clearly demonstrated at Clear Lake with the walleyes, an over supply of forage will produce poor angling. This lake, managed primarily for bullheads had the poorest fishing this year of probably any year within the memory of man, and certainly much poorer than any year of our census work. This year, bottom foods have increased significantly over the previous several years and this is deemed largely responsible for the poor fishing. A population study completed this spring indicates that ample numbers are present to provide excellent fishing (See separate report).

Table 3

IOWA LAKES CREEL CENSUS, LOST ISLAND

SPECIES	1946	1947	1948	1949	1950	1951
CRAPPIE	0	0	5	2	250	3
PERCH	56	51	285	19	22	25
N. PIKE	23	50	131	478	366	121
WALLEYE	130	359	760	106	2,266	531
L.M. BASS	0	0	0	2	0	1
BULLHEAD	100,111	169,344	346,954	51,482	87,646	15,427
TOTALS	100,320	169,804	348,135	52,089	90,554	16,108
No. Anglers	3,378	7,495	25,917	10,842	12,753	8,821
Fish per Angler	29.69	22.61	13.42	4.81	7.02	1.83
Fish per Hour	5.27	5.23	2.98	0.92	2.03	0.53

West Okoboji

Angling results in this lake were somewhat improved over last year, with notable increases in walleye and bullhead catches. A total of 16,689 fish were taken in the forty five day period by 3,987 anglers for an average catch of 4.19 fish per man and 1.02 fish per hour. Of the total catch, 48 percent were bullheads and 14 percent walleyes. The remaining 38 percent were largely crappie, perch, bluegill and largemouth bass.

Table 4

IOWA LAKES CREEL CENSUS
WEST OKOBOJI

SPECIES	1946	1947	1948	1949	1950	1951
CRAPPIE	5,310	2,661	3,682	2,405	1,421	1,889
PERCH	876	2,589	4,217	6,815	1,001	1,437
N. PIKE	924	646	1,160	658	657	439
WALLEYE	1,599	1,073	4,018	1,956	1,270	2,357
L.M.BASS	706	613	581	650	710	777
S.M.BASS	113	39	425	329	321	194
WHITE BASS	125	79	405	242	158	265
BULLHEAD	456	1,496	1,756	3,721	2,062	8,051
BLUEGILL	313	350	1,339	1,601	583	1,280
TOTALS	10,422	9,546	17,583	18,377	9,187	16,689
No. Anglers	3,292	2,417	5,860	5,975	3,540	3,987
No. Hours	9,878	8,942	21,485	21,192	11,145	16,416
Fish/Angler	3.19	3.95	3.00	3.07	2.60	4.186
Fish/Hour	1.03	1.06	0.82	0.86	0.82	1.016

East Okoboji

Except for excellent bullhead fishing this lake was practically a blank this year. A total of 33,848 fish were recorded taken by 3,232 anglers. The average catch per trip was 10.47 fish at the rate of 2.32 fish per hour. Of the total fish taken however, 92 percent were bullheads and only 4 percent were perch, 2 percent crappie and 1 percent walleyes. The remaining 1 percent was divided among several species. The crappie, formerly a very important species in this lake has dwindled down to the point where protection may be necessary.

A very heavy kill of game fish occurred last winter which doubtless influenced the poor fishing considerably.

Table 5

IOWA LAKES CREEL CENSUS
EAST OKOBOJI

SPECIES	1945	1946	1947	1948	1949	1950	1951
CRAPPIE	6,904	22,899	9,704	4,660	2,637	3,562	660
PERCH	26	438	251	2,113	4,464	742	1,376
N. PIKE	93	247	126	294	117	55	40
WALLEYE	1,608	4,704	1,792	6,148	705	1,120	490
S.M.BASS		15	13	63	37	29	14
L.M.BASS	98	296	153	276	27	47	37
BULLHEAD		5,404	3,394	5,785	13,380	5,072	31,036
WHITE BASS	405	1,102	1,016	1,912	745	428	67
BLUEGILL		219	117	486	1,166	1,184	127
Rock Bass							1
CHANNEL CAT						1	
YEARLY TOTALS	9,134	35,354	16,566	21,737	23,287	12,240	33,848
No. Anglers	2,759	9,119	4,725	6,125	3,789	2,812	3,232
No. Hours	9,080	31,346	18,566	25,947	15,566	11,143	15,195
Fish/Angler	3.31	3.88	3.51	3.55	6.14	4.35	10.47
Fish/Hour	1.01	1.13	0.89	0.84	1.46	1.09	2.23

Black Hawk Lake

This was another extremely poor fishing season for anglers in the Lake View community. As explained in previous seminar reports, the lake is over-populated with gizzard shad whose annual reproduction is so heavy that the lake is flooded with forage precluding the possibility of good angling. Stocks of game fishes are plentiful, particularly crappies. A heavy stocking of walleye fingerlings last fall was made to partially aid in the control of excessive shad young. A total of 20,116 pounds of adult shad were removed this spring to decrease the spawning population. It is expected that the continual reduction of adult shad may curtail reproduction sufficiently to produce more favorable angling during this and the years to

come. Many local anglers prefer that this lake be managed for bullheads exclusively; however due to the scarcity of bottom fauna and overabundant forage fish, it is deemed advisable to continue the present policy in order to build up the bottom fauna sufficiently to support a self-sustaining bullhead population. The alternative can only be a Dalton pond or the "kids fish day" types of management.

A total of 7,240 fish were recorded caught this year by 5,648 anglers. The average angler caught 1.04 fish per trip at the rate of 1.28 fish per hour. Of the 7,240 fish taken, 63 percent were crappies, 22 percent were bullheads and the remaining 15 percent were primarily perch, channel catfish, carp, largemouth bass and bluegill.

It is believed that biological conditions have improved considerably during the past year in Black Hawk, but that another year or so will be needed to have these improvements reflected in the catch records.

Table 6

IOWA LAKES CREEL CENSUS, BLACK HAWK LAKE

SPECIES	1947	1948	1949	1950	1951
CRAPPIE	14,359	12,507	5,059	6,977	4,590
PERCH	1,924	2,014	406	21	344
CHANNEL CAT	14	333	201	63	131
CARP	2	2,477	491	499	255
WALLEYE	0	6	0	0	0
S.M. BASS	2	5	22	0	1
L.M.BASS	34	390	476	72	141
BULLHEAD	4,649	2,422	1,250	1,944	1,625
WHITE BASS	5	11	3	5	1
BLUEGILL		1,140	388	64	150
N. PIKE	0	0	0	1	2
TOTALS	20,987	21,206	8,296	9,646	7,240
No. Anglers	7,704	7,829	9,005	7,338	6,939
No. Hours	21,587	16,474	16,824	11,395	5,648
Fish/Angler	2.76	2.68	0.92	1.31	1.043
Fish/Hour	0.97	1.37	0.49	0.85	1.282

Storm Lake

Another very successful season was experienced at Storm Lake this year, especially in the walleyes. The largest number of walleyes taken in the past five years of census records was obtained this year. White bass and crappie fishing remained fairly good. The bullhead catches were poor during the census period, but had been excellent prior to May 15.

A total of 7,700 fish were recorded by 4,090 anglers at the rate of 1.69 fish per man and 0.56 fish per hour. Of the total catch recorded nearly 55 percent were walleyes and nearly the entire balance in fine game species with only seven percent being bullheads. The extremely adverse weather conditions prevalent during the entire census period doubtless reduced the catches considerably on all lakes, but more particularly at Storm Lake. The heavy flowage of turbid water at the inlet and high winds on the open lake restricted fishing to a very great extent.

IOWA LAKES CREEL CENSUS
STORM LAKE

SPECIES	1947	1948	1949	1950	1951
CRAPPIE	6,241	5,313	2,109	1,277	1,083
PERCH	3	539	110	79	30
N. PIKE	12	46	32	13	7
WALLEYE	247	2,833	1,906	1,906	4,207
CHANNEL CAT		132	74	183	62
S.M. BASS	1	0	0	0	0
L.M.BASS	3	2	2	17	13
BULLHEAD	3,815	12,754	2,391	5,065	519
WHITE BASS	473	1,851	1,141	1,370	1,779
BLUEGILL	0	7	0	0	0
YEARLY TOTALS	10,796	23,297	7,765	11,431	7,700
No. Anglers	2,092	7,756	5,784	5,396	4,090
No. Hours	7,574	24,104	21,871	10,142	14,217
Fish/Angler	5.11	3.00	1.34	2.12	1.69
Fish/Hour	1.43	0.96	0.35	1.03	.56

Population Estimate of Lost Island Lake Bullheads

In view of the importance of Lost Island Lake to many thousands of Iowa anglers who favor the "mud-pokers" over the fancy fishes, every consideration is given toward maintaining ample numbers and sizes in the lake for them. The vast reduction in numbers by angling during the past several years produced a steady decline in total numbers caught and also the desired increase in size of the once stunted population. In order to determine whether or not angling pressure had been too excessive particularly from 1948 through 1950 (see table 3 of Creel Census Report, 1951) a population analysis was made using the mark and recapture method.

In the fall of 1950, after most of the bullhead fishing had ceased, a total of 3,499 large adult bullheads were caught in four pond nets set in the deep water of the lake. The adipose fin was removed from these and the fish returned to the lake by scattering them over large areas of the lake. This work was completed by October 7, 1950. From May 1 of 1951 to May 5, the pond nets were again set in the lake. In this period a total of 3,614 unmarked bullheads were caught together with a total of 12 recaptures of the marked bullheads. Using the Peterson formula, the estimated large adult population was 1,053,780 (plus or minus sampling error) as of May 5,1951. The size range of these fish was from 7-7/8 inches to 11¼ inches, and the average weight around eleven ounces each. The following table contains the essential data from which the estimate was made. (See page 10)

An estimate was attempted on a smaller size group (5¼-7½inch) bullheads, but due to a high magnitude of systematic and sampling error involved the estimate of approximately 500,000 is considered invalid.

Utilizing only the adult population estimate and multiplying it by the average weight of eleven ounces, the rather astounding total weight of 724,474 pounds of bullheads in the large adult size was present at the time the estimate was made. This would mean an average of 604 pounds per acre, exclusive of the smaller size ranges which are known to be plentiful.

That angling could have been as poor as prevailed throughout the census period is hardly conceivable, if this population estimate approaches the correct figure. It is understood however, that the recent warmer weather or some other factor, has brought a return of good bullhead angling in the lake.

LOST ISLAND BULLHEAD POPULATION ESTIMATE

DATE	Total fin-clipped in lake (Oct.7, 1950) "A"	Total caught "B"*	Recapture "C"	$\frac{AB}{C}$	Estimate
5/1/51	3,499	399	1	$\frac{1,396,101}{1}$	1,396,101
5/2/51	"	339	0		
5/3/51	"	818	7	$\frac{2,862,182}{7}$	408,883
5/4/51	"	1,486	2	$\frac{5,199,514}{2}$	2,599,757
5/5/51	"	572	2	$\frac{2,101,428}{2}$	1,050,714
	" TOTALS	3,614	12	$\frac{12,645,386}{12}$	1,053,780

*Note-- All fish caught scattered widely over lake each day.

Population Estimate of Center Lake Bullheads

This once popular bullhead fishing lake, located in the center of the Iowa Great Lakes Region, has been managed primarily for this species for many years. An exceptionally large hatch occurred in 1947, overpopulating the lake. These have not grown sufficiently to interest anglers, and the old brood stock have largely disappeared due to mortality from old age and angling. In view of the slow growth increment of the 1947 year class, and an obvious overcrowding problem, an estimate was made to determine the magnitude of the population prior to the formation of corrective management plans. The estimate was made by following methods used in the Lost Island study.

Four pond nets were set in the deepest water of the lake from October 5 to 12, 1950, and a total of 10,232 bullheads caught and fin-clipped. These fish are all of very uniform size, averaging 6.5 inches in total length, and weight of 2¼ ounces. On April 24th, 1951, the nets were again set in the lake and checked each day for marked and unmarked bullheads. All fish captured were transferred by hatchery crews to their holding ponds. On April 28th the nets were removed and the estimate calculated on the basis of the grand averages at 1,503,959 bullheads. To insure adequate growth over half of this population should be transferred to areas of need, or disposed of in some other manner. The following table includes the data from which the population estimate was made.

The primary purpose of the determination of this was to provide a figure so that if a reduction in the population was indicated as necessary for improvement, a known number could be retained as deemed adequate.

CENTER LAKE BULLHEAD POPULATION ESTIMATE

DATE	TOTAL NUMBER MARKED IN LAKE "A"	TOTAL CAUGHT AND REMOVED "B"	MARKED RECAPS "C"	$P = \frac{AB}{C}$
Oct. 12, 1950	10,232			
April 24, 1951	10,232	492	4	1,253,536
April 25, 1951	10,228	1,584	13	1,246,242
" 26, 1951	10,215	661	6	1,125,353
" 27, 1951	10,209	2,903	23	1,288,554
" 28, 1951	10,176	4,796	25	1,952,124
Average Estimate	10,232	10,436	71	1,503,959

IOWA STATE CONSERVATION COMMISSION
DIVISION OF FISH AND GAME

Seventh Biology Seminar
July 1951

NOTES AND SUMMARY OF HATCHERY OPERATIONS SPIRIT LAKE HATCHERY SPRING OF 1951

by Tom Moen
Fisheries Biologist

As you know, the Spirit Lake Hatchery is devoted to the artificial propagation of two species, the walleye, (Stizostedion v. vitreum, Mitch) and northern pike, (Esox lucius Linn.). With the ever-increasing emphasis on predator species in fisheries management it is only reasonable that a fair share of the emphasis should be placed on the artificial propagation of these predator fish. I'm not inferring here that we should increase or decrease this portion of the fisheries program but rather that we should increase our knowledge of the many small items that enter into this artificial spawning of fish so that as we increase our knowledge of other phases of fisheries management we can better evaluate the output of our hatcheries. A year to year record of these items helps to build a backlog of knowledge and thus a source of information for future evaluations.

Following the 1941 season and each year since 1946 a routine report covering the operations of the Spirit Lake Hatchery has been completed. These report on the hatchery operations only as the hatchery is concerned with the artificial hatching and stocking of walleye and northerns. These reports record the number of eggs taken, egg fertility, number of eggs per quart, percent of hatch, number of fry and place of stocking, number of adult fish used for spawning purposes, number of other species of fish taken by the gill net crews, water and air temperatures and any pertinent information relative to the business of artificial spawning of fish. All of these items are not present in the early reports and additional notes, including data from the Clear Lake hatchery , will be added to future reports. Since some of this information comes directly from the management section, it might seem as though there was a duplication of effort, but at the present time these summaries are the only place where all the above information is assembled in one report. The data involving each species will be discussed separately.

Northern Pike

Adult northern pike used in the hatchery were collected from the various carp traps during the northern pike spawning run. The 1950 spawning run was considered unusually "late", with northerns being stripped April 4 to 16 but the 1951 season was nearly two weeks later with the first fish being stripped April 14 and the last one April 26.

Although the spawning run was unusually late, a warm spell brought the water temperature up and the eggs hatched almost a week earlier than they did in 1950 with most of the eggs hatched by May 3. The average water temperature during incubation was 47.4°F, slightly less than one degree warmer than the 1950 average temperature and in turn the 1950 temperature was higher than that for 1949. Thus we have the situation of increasingly late seasons, but higher average water temperatures during incubation periods.

The eggs were checked to determine numbers per quart and fertility with twenty five counts completed. The average number per quart was 54,301. This is 3,300 less than the figure of 1950. A run of larger females seems to be the only answer at this time. The hatchery crews agreed that the northerns run larger this year than last and the amount of eggs per female increased from 0.5 quart per fish to 1.31 quart per fish indicating that considerable larger females were used.

A total of 59 quarts of eggs were put up, with thirty nine quarts brought through to hatching time. This represents a 66 per cent hatch and 2,117,000 fry. This figure is slightly less than the 2,230,000 fry (Table 1) recorded in the distribution books due to the fact that the figure of 60,000 eggs per quart (instead of 54,301) was used for setting aside eyed eggs so that specific numbers of fry could be collected for stocking.

Table No. 1 Location and number of Northern Fry stocked from the Spirit Lake Hatchery

Humboldt Hatchery	-	10,000
Lake View Hatchery	-	35,000
Hampton Hatchery	-	110,000
Lansing Station	-	100,000
East Twin (Kanawah)	-	100,000
Blue Lake	-	100,000
High Lake	-	750,000
Rice Lake	-	100,000
Silver Lake (Ayrshire)	-	55,000
Spirit Lake (Hales Slough)	-	435,000
West Okoboji Lake (Crescent Beach)		435,000
		2,230,000

WALLEYES

Gill netting for walleyes commenced on April 20 and terminated on May 7; both dates are inclusive for West Okoboji. Spirit and East Lake gill netting fell between these dates. All fish taken by gill net crews were transported to the hatchery. There were relatively few eggs taken in the field by the gill net crews. The first walleye eggs were put up on April 25

and the last one May 8. The first eggs hatched on May 7 and the last on May 18. Although the hatching season got off to a late start, the water temperatures during the incubation period were above normal with an average temperature of 54.8°F. The previous high average temperature was 52.6° F recorded in 1949. This warm water hurried the hatching to the extent that the last jars of eggs put up hatched out in about ten days.

A total of 280 quarts of walleye eggs were put up and 161 quarts of eyed eggs brought through to hatching time. This represents a 57.5 per cent hatch and probably the poorest percentage hatch within the last ten years. Fertility checks indicated that this low figure was due to the condition of the eggs at the time of fertilization. In other words the eggs did not die after incubation had started. Just what caused this condition remains a big question. Several ideas and theories have been forwarded but comparatively little proof can be found. First of all there was no change of personnel or methods that might have influenced the results. There was some evidence to indicate that the nets were set too late to catch the main portion of the walleye "run" in Spirit and West Okoboji Lakes even though the first crews were operating when a large part of the lakes were covered with ice. The number of walleyes taken per crew in Spirit Lake dropped rather sharply after the first night (Appendix Table B-1). East Okoboji also failed to show a peak in fish per crew as it usually has shown. In West Okoboji the spawning run was reached the fourth and fifth day following the break up period. This lends weight to the old argument that walleyes will spawn under the ice when the ice break up is delayed beyond the normal or average date. This still fails to explain the low egg fertility.

During routine fertility checks, it was noted that the groups of eggs having the lowest fertility had the greatest size differential among the eggs. A size differential has been noted in past years (Moen 1950) but in this case the difference was much more extreme and the small eggs were consistently infertile.

This leads to the theory that the prolonged ice cover caused a large percentage of the walleyes to spawn prior to or during ice break up, at least in East Okoboji and Spirit Lakes. Then due to a rather quick rise in the water temperature the fish that had not spawned were ripe but the eggs were poorly developed. These fish would not be taken by gill net crews in normal years but were taken in some numbers this year due to the unusual weather conditions.

The small eggs that seemed to make up most of the infertility were reflected in the average number of eggs per quart. Although the female walleyes apparently ran as large as last year, the number of green eggs per quart went from 145,000

as determined in 1950 to 156,600 for this season. Being infertile the small eggs were largely eliminated from the eyed egg count and the average number of eyed eggs per quart dropped to 151,000. At the last July seminar, I mentioned the fact that any data seemed to indicate that larger fish of the same species had larger eggs. Now in addition to that we have this matter of infertility entering the picture. From at least a theoretical standpoint, everything else being equal, the poorer the hatch the greater the difference in size between green and eyed eggs. Thinking one step further we might surmise that a difference in the two groups of eggs i.e. green and eyed, even at times of a good hatch, would indicate that at least a few of these fish with small infertile eggs had entered the gill net catch. This of course is purely a matter of thinking out loud and should receive more careful consideration.

The 280 quarts of walleye eggs put up represent slightly more than one-half of a normal year's production. This also points to the fact that the main "run" had taken place before gill netting commenced. I should mention here that the usual effort was expended in gill netting operations.

As mentioned above, 161 quarts of eggs were hatched, producing 24,343,000 fry. The appendix table A-1 gives the location and number of fry stocked from the Spirit Lake hatchery.

The data from the daily gill netters' reports appears as Appendix Tables B-1,2 and 3. Although these reports are subject to obvious inaccuracies they do add a great deal to other observations in evaluating the population status of various species. We often have the situation where certain species have failed to appear in the angler's catch. Examination of the spring gill net catches coupled with other observations will usually help us fill in the picture.

Appendix Table A-1

Walleye Fry Stocking from Spirit Lake Hatchery for Spring 1951

NURSERY PONDS

Humboldt Hatchery ponds	-------	50,000	
Lake View Hatchery ponds	-------	30,000	
Lanesboro pond	-------	300,000	
Lansing Station	-------	30,000	
Pickerel Lake	-------	300,000	
Lizzard Lake	-------	600,000	
Lake Park Pond	-------	25,000	
Pleasant Lake	-------	300,000	
Total		1,635,000	1,635,000

Appendix Table A-1 Continued

RIVERS

Cedar River (Vinton) --------	250,000	
" (Janesville) --------	250,000	
" (Waverly Pool) --------	250,000	
" (Upper Palisades)-------	250,000	
Wapsie River -------	250,000	
Maquoketa River --------	250,000	
Hartwick Lake --------	250,000	
Iowa River (Iowa Falls) --------	250,000	
" (Coralville) --------	250,000	
" (Marshall County) --------	250,000	
Des Moines River (Camp Dodge)--------	250,000	
" (Ft. Dodge)--------	250,000	
	3,000,000	3,000,000

LAKES

Spirit Lake --------9,000,000*		
East Okoboji, Lake --------2,750,000		
West Okoboji Lake --------2,750,000		
Iowa Lake -------- 540,000		
Tuttle Lake --------1,800,000		
Lost Island Lake --------1,800,000		
	18,640,000	18,640,000
Totals		23,275,000**

* This represents the third consecutive year in which a special effort has been made to stock walleye fry in Spirit Lake as part of a five year program. The total of 15,000,000 fry were stocked each of the previous years but due to lack of available fry only 9,000,000 were stocked in 1951.

** Due to difficulties in setting aside specific numbers of eggs for special stocking there is a discrepancy between the total fry stocked as shown by the distribution books and that shown by percent of hatch.

APPENDIX B-1

Spirit Lake

Fish Catch Compiled from Gill-netter's Reports for 1951

NUMBER OF YELLOW-PIKE-PERCH

Date	Males	Females	Total	No. of Crews	Fish per Crew
April 28	23	21	44	2	22.0
29	21	36	57	5	11.4
30	12	20	32	4	8.0
May 1	20	11	31	5	6.2
2	4	11	15	5	3.0
3	11	15	26	5	5.2
4	0	30	30	2	15.0
5	3	6	9	3	3.0
6	7	16	23	4	5.7
7	11	6	17	4	4.2
TOTALS	112	172	284	39 Crew nites	7.2

TOTALS OF OTHER FISH CAUGHT DURING GILL-NETTING

GAME FISH

Northern Pike	19	
White Bass	23	
L.M.Bass	6	
Yellow Perch	64	
Bullhead	121	
Crappie	2	
Sucker	306	
Redhorse	37	
Bluegill	1	
Total	579	14.8 fish/crew nite

ROUGH FISH

Carp	572	
Buffalo	9	
Sheepshead	85	
Gar	3	
Total	669	17.1 fish/crew nite

APPENDIX B-2

East Okoboji

Fish Catch Compiled from Gill-netter's Reports for 1951

NUMBER OF YELLOW-PIKE-PERCH

Date	Males	Females	Totals	No. of Crews	Fish per Crew
April 21	7	5	12	1	12
22	4	8	12	1	12
23	5	3	8	1	8
25	2	4	6	1	6
26	11	3	14	1	14
27	3	11	14	1	14
28	23	46	69	4	17.2
29	26	28	54	4	13.5
30	4	16	20	4	5
May 1	1	5	6	3	2
2	2	3	5	1	5
TOTALS	88	132	220	22 Crew Nites	10.0

TOTALS OF OTHER FISH CAUGHT DURING GILL-NETTING

Game Fish

Northern Pike	--23	
White Bass	--38	
L.M.Bass	-- 0	
Yellow Perch	--46	
Bullhead	-- 7	
Crappie	-- 0	
Sucker	-176	
Redhorse	- 2	
Total	292	13.2 fish/crew nite

Rough Fish

Carp	---204	
Buffalo	--- 5	
Sheepshead	-- 0	
Total	209	9.5 fish/crew nite

APPENDIX B-3

West Okoboji

Fish Catch Compiled from Gill-netter's Reports
for 1951

NUMBER OF YELLOW-PIKE-PERCH

Date	Males	Females	Total	No. of Crews	Fish per Crew
April 20	5	20	25	1	25
21	9	22	31	1	31
22	8	30	38	1	38
23	6	22	28	1	28
24	7	25	32	2	16
25	4	20	24	1	24
26	5	16	21	1	21
27	3	5	8	1	8
ice)28	6	22	28	1	28
breakup)29	4	7	11	1	11
30	2	2	4	1	4
May 1	2	9	11	2	5.5
2	177	109	286	4	71.5
3	255	117	372	5	74.4
4	69	27	96	5	19.3
5	46	14	60	5	12
6	88	12	100	5	20
7	67	15	82	4	20
TOTALS	763	494	1257	42 Crew nites	29.9

TOTALS OF OTHER FISH CAUGHT DURING GILL-NETTING

GAME FISH

Northern pike	--32	
White Bass	--82	
L.M.Bass	-- 2	
Yellow Perch	--160	
Bullhead	--368	
Crappie	-- 0	
Sucker	--497	
Redhorse	-- 36	
Channel Catfish	- 1	
Total	1,178	27.0 fish/crew nite

ROUGH FISH

Carp	-- 590	
Buffalo	-- 8	
Sheepshead	-- 685	
Gar	-- 2	
Total	1,285	30.6 fish/crew nite

IOWA STATE CONSERVATION COMMISSION
DIVISION OF FISH AND GAME

Seventh Biology Seminar
July 1951

FISH POPULATIONS-TODAY AND YESTERDAY

By Harry M. Harrison
Fisheries Biologist

Recent fisheries investigations of a continuing nature over wider areas of the state compared with work of sixty years earlier and other facts of science involving game cycles or simply population fluctuations when critically examined, indicate that fish populations may be as good today as they were in "the good old days."

This is admittedly a provocative statement and a radical departure from the ideas now in vogue and because of this, something to substaintiate the hypothesis should be introduced before proceeding further. My whole argument is based first upon the precept that the major changes that have taken place must have been subsequent to the expanded drainage program in the early 1900's and the intensification of farming after that, and secondly upon the following: (1) The species depletion that has taken place since Meek (1890), is insignificant and involves fish of little or no economic importance; (2) That rich fish faunas both from a species and poundage standpoint exist at the present time; (3) That the number of individuals within a species are subject to wide variations; (4) That populations fluctuate radically in both turbid as well as in clear water habitats; (5) That fish as a whole are hardy animals and can take the rigors presented them by the environment, and (6) That good pole and line fishing is no more phenomenon of the "good old days", than it is today. Comes now a discussion of each of the above points.

1. THE SPECIES DEPLETION THAT HAS TAKEN PLACE SINCE MEEK (1890) IS INSIGNIFICANT AND INVOLVES FISH OF LITTLE OR NO ECONOMIC IMPORTANCE. A full treatment of this topic alone would take up more time than is alloted to me for this seminar, so for the sake of brevity, the remarks on this subject will be limited and will consist of broad statements of fact that could be documented if time and space permitted.

Recent surveys conducted in Western Iowa Streams reveal that long species lists are non-existant and especially so in the lower reaches of the streams draining the Missouri slope. In fact, few stations lying within 35 miles of the Missouri River contained more than five species, and many, no more than two. These streams are extremely turbid after rains, and for this reason it is felt by some people that the number and kinds of fish residing there, are limited by siltation. Be this as

it may, when comparing species lists and numbers of fish present with those sixty years ago it is found that the area never has been too productive. This can mean only one of two things: either siltation limited fish formerly as well as today or that some other factor or factors are causative of low fish populations in that area.

Over a wider area of the state, Table 1 compares the number of species of fish living in the Skunk, Des Moines, Soldier, Boyer and Big Sioux Rivers in 1890 with that of 1950, and in addition, it shows the number of species found in 1890 but not found in 1950, with those found in 1950 but not in 1890. An examination of the Table exhibits three streams having more kinds of fish in 1950 than in 1890, while the other two had fewer kinds in 1950 than in 1890. The difference in the total number of species is only significant in the case of the Des Moines River where eleven more kinds of fish were found in 1950. This difference is explained by the fact that much more effort was expended in the recent work than by Meek. The striking differences exhibited by the table involves species found in 1890 but not in 1950 and visa versa. These, when examined, except for the carp, concern species of little significance to us. For example, the occurance of the Muskellunge based on only one known specimen from the Skunk River in 1890 was of no consequence to the river then and its disappearance since can not be counted as an important change to the stream over the sixty year interval. Likewise, the dissapearance of the already rare brook lamprey, big jawed sucker, black chinned shiner, longeared sunfish, and top minnows since 1890, or in the addition of the rarely collected brown bullhead and fan tailed darter since then, cannot be regarded as changes of significance for either better or worse. In sum and substance, the fish that we are interested in namely the catfish, bass, pike and so forth are present today as well as formerly. It will not be denied that the species still persist but the question of abundance today as compared to the so-called "good old days", is immediately brought to mind. This will be discussed in another section to follow.

Table 1. NUMBERS OF SPECIES OF FISH BY RIVERS PRESENT IN 1890 COMPARED WITH 1950, ALSO COMPARING THE NUMBER OF SPECIES FOUND IN 1890 BUT NOT IN 1950 AND VISA VERSA.

River	Species Present 1890	Species Present 1950	No. Species found 1890 not in 1950	No. Species found 1950 not in 1890
Des Moines	59	71	11	22
Skunk River	49	45	18	13
Soldier River	6	10	2	7
Boyer River	15	18	3	3
Big Sioux River	33	31	13	10

Findings such as the above are not unique to this study nor to the state of Iowa. In 1887, Williamson and Osborn identified 35 species of fish from Blacklick Creek, a stream only thirty miles long, near Columbus, Ohio. Forty-five years later, Whickliff collected fifty-five species from the same stream. These include the thirty-five collected by Williamson and Osborn plus twenty additional forms. At one place on the same creek, Williamson and Osborn collected seventeen species, twenty-three years later Wickliff and Edwards took eighteen species at the spot including the same seventeen reported in 1887, in 1943, forty years later, all eighteen species were still present.

Trautman (1939), studying present and past abundances of fish in Lost and Gordon Creeks in Ohio, found little change in the numerical abundance of the various fish species between 1887 and 1938. This, inspite of the fact, that in the region the forest cover had been removed and the area heavily grazed and cultivated and the soils readily eroded.

2. RICH FISH FAUNAS BOTH IN SPECIES ALL POUNDAGES PERSIST AT THE PRESENT TIME. Statewide surveys of recent date indicate that stream environments are carrying close to capacity fish populations. A species list numbering in the high seventies exist in the large streams such as the Cedar and Des Moines Rivers, and lists numbering in the fifties are found in the middle sized streams like the Little Sioux, Skunk, Iowa and Raccoon Rivers. In all of these, 60 to 70 percent of the species present will rank common to abundant at least in a few areas. Comparing this to sixty years previous no reduction in the number of species manifests itself.

With regard to poundages, no comparative data is available, but it cannot be denied that we have high poundages of fish in our streams today. Witness the following; Harrison (1949) took 14,000 pounds of fish from a single fish trap near Fort Dodge. Catfish populations, from current surveys, numbering in the thousands per mile of stream in the upper reaches of the Des Moines River in Humboldt county. The Boone River with hundreds of small mouth bass per mile of stream, the Raccoon River with its large concentrations of fish seen each year under ice cover, and the astronomical numbers of fish that turn up at the sites of pollution kills. All of these offer evidence aplenty that our streams are well stock with fish, and the instances of such examples are too numerous to be cast aside as purely happenstance. The only conclusion that can be arrived at is that our streams are carrying about all the fish that is possible and no matter how much better conditions could be made, it is doubtful that many more fish could be produced per volume of water.

3. NUMBERS OF INDIVIDUALS WITHIN A SPECIES ARE SUBJECT TO WIDE VARIATIONS. This topic is of the utmost importance in explaining the often expressed idea that fish were formerly more abundant. Fishermen of the "old school"- those who have been fishing for fifty years or so often tell of the big catches of their younger days. These may be undeniable truths. However, there arises the unanswerable question of how many times and in how many years did their fishing efforts meet with failure. The clammor for fish hatcheries in the 1880's is evidence alone to prove that there were many fishermen unsatisfied with their fishing success before intensification of agriculture and the great draining program at the turn of the century.

In the writer's short experience with fisheries investigations, dating back to about 1937, many examples of population fluctuations have been observed. Had these not have been recorded, it is entirely probable that a conclusion would have been reached to the effect that fish were disappearing from our flowing water. To mention some of these; Channel catfishing in central Iowa streams at least was good to excellent from 1940 to 1946. This has been followed by a steady decline in some of the streams since then. Walleyed pike over the upper reaches of the Des Moines River have declined since 1940, but are showing some signs of recovery in the past two years. Northern pike abundant in local areas in 1946 have virtually disappeared since. In the case of some minnows and other forage fish, decline has been much more sharply defined.

On the other hand, some species have made remarkable gains during the same period. To mention but a few, the smallmouth bass has risen from a point of obscurity in 1947 to one of abundance in 1950. The northern redhorse and golden mullet from common in 1946 to very abundant in 1950. The black bull-

head from rather uncommon in the Des Moines River in 1949 to very abundant in 1951. The crappie from rare in 1946 and 1947 to common by 1950, and the brassy and bullhead minnor from common and rare respectively in 1948 to abundant in 1950.

Because of such circumstances, many anglers fishing for catfish today remember the good fishing of the early 1940's, and think now that catfish are approaching extinction. On the other hand, the smallmouth bass fisherman of a few years hence, when bass populations have dropped, may well entertain the same feeling as respects the smallmouth bass, and then reminiscence of the excellent smallmouth fishing of 1950.

E. B. Speaker of this department, who has followed the smallmouth from an anglers point of view for the past twenty-five years, informs me that at least three times in his tenure with the Conservation Commission he has seen the smallmouth virtually disappear in central Iowa. Each time they were given up as a hopeless case for recovery. Yet each time they have made comebacks of no small consequence.

4. FISH POPULATIONS FLUCTUATE RADICALLY IN BOTH TURBID AND CLEAR WATER HABITAT. Fish populations fluctuate in our Iowa lakes where neither floods or siltation present a problem comparable to the streams. Witness the silver bass and buffalo populations in several of our northern Iowa lakes and the yellow bass and perch population in Clear Lake to mention but a couple of cases. If, then, fish population vary in clear waters, it is unfair to argue that siltation alone is responsible for low populations of any given species inhabitating flowing waters. It will not be denied that floods often destroy complete hatches of stream fishes. However, floods have always been with us, and through the course of evolution many fish seem to have arranged their spawning periods to come at the time of year when flooding is not too pronounced. Smallmouth bass usually spawn after the spring floods have subsided while the channel catfish usually breeds subsequent to the June floods.

In short, it is believed that any fair analysis of this subject will have to conceed that factors other than siltation are just as important in limiting stream populations of fish.

5. FISH ARE HARDY ANIMALS AND CAN TAKE THE RIGORS PRESENTED THEM BY THE ENVIRONMENT. The direct effect of turbidity on fish received quite thorough treatment in Oklahoma by Wallen, 1951. In that work sixteen species were tested for their tolerance to turbidity in varying amounts up to lethal concentrations. The results of the work showed the average fatal turbidity to range from 38,250 ppm for the rock bass to 222,000 ppm for the black bullhead. The lowest lethal turbidity for any fish was 16,500 ppm while 52,000 ppm was the lowest average lethal turbidity for all fish.

Crawford (1949) reporting on the Iowa floods of June, 1947, these regarded as among the most severe in the history of the state, found in a statewide survey only five cases of turbidities necessary to kill fish found by Wallen in Oklahoma. Only in one case was the turbidity higher than the average lethal turbidity in that same study. This was a concentration of 225,000 ppm, and was caused by a bank cave-in. The next highest turbidity recorded by Crawford was 37,900 ppm followed in succession by 23,000 ppm, 18,000 ppm, 18,000 ppm, 16,000 ppm, and 10,000 ppm. Eighty-six other stations scattered over the state had turbidities of less than 10,000 ppm with 73 of these less than 5,000 ppm, and 37 stations with less than 1,000 ppm.

Most of the fish studied in Oklahoma are species generally regarded tolerant to silty conditions, and the question of how clear water forms, especially the young, would stand up under similar experiments, immediately comes to mind. Griffin (1938) subjected young trout and salmon, species considered to be sensitative to environmental changes, to turbidities ranging from 400-6,000 ppm, and concluded from that work that young trout and salmon were not injured by living for a considerable period in extremely muddy and opaque waters. He also found that cutthroat and chinook salmon fed and grew in waters much muddier than those ordinarily found in muddy streams.

No information is at hand as regards just how much silt that smallmouth bass, walleyes or northern pike can take, but from the above studies, it is very possible that it ranges well above the silt loads carried by streams now inhabited by these fish.

Summarizing this section, it again seems very unlikely that silt is the single factor limiting fish in most Iowa streams.

6. GOOD POLE AND LINE FISHING IS NO MORE A PHENOMENON OF THE "GOOD OLD DAYS" THAN IT IS TODAY. In considering fishing success, only the total number of fish caught is a fair appraisal of the production of any water. Of course, only fragmentary data is available comparing the fishing of sixty years ago with that of today. However, conclusions drawn from the knowledge at hand is as much in line with the problem as simply casting it aside by saying that angling today does not compare with that of several decades ago.

From license sales alone, we know that fishing pressure is greater today than at any time in the distant past. Furthermore, because of the ever increasing amount of time available for fishing which has resulted from shorter work days and weeks, the pressure is infinitely higher. Because of this, the available fish must not only be divided among more fishermen, but also among more fishing trips. Looking at it from this angle, it is entirely possible that more fish are being caught at this time than in any other. This, purely and simply, because our waters are being more thoroughly fished.

And, in addition to the foregoing, many good catches of catfish as well as smallmouth bass, crappies and walleyes have been observed on the Des Moines River in the last five years. In another instance several thousand bullheads were seen caught this spring from a small river area of no more than three acres in extent.

Swingle and Smith working in the south and others who have experimented with species combinations are unanimous in their conclusions that the best conditions for fishing concerns areas where the species list are at a minimum, (bass-bluegill combinations with no other species present and the like).

Rough fish removal is a proved management practice for our lakes. It is possible, therefore, a reduction of species for our streams is also feasible. In rivers such as the Des Moines, we have as many as fifty species of fish all struggling for dominance. As different factors present themselves, first one species and then another dominate the habitat, and through the course of years, the desirable kinds have to take turns with the undesirable at the top. If the species lists were reduced by one-half, by chance alone, the fishing should be good twice as often. I would merely like to point out that we are living in the so-called atomic age, yet our means of taking or controlling fish, namely by the means of nets and traps, date back to the dawn of history. Something new and better is certainly possible and a search for new methods of control is deemed advisable.

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IOWA STATE CONSERVATION COMMISSION
DIVSISION OF FISH AND GAME

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July 1951

MONTHLY SUCCESS AND EFFORT ON STREAM FISHING IN N. E. IOWA

By Robert E. Cleary
Fisheries Biologist

In the 1950 voluntary creel census in N. E. Iowa the comparative monthly catch per unit effort of various species avails itself as a useful tool to determine both trends in angling pressure and in success. Since this data is based on anglers reports from 27 counties, it is felt that the findings are valid and not exceptionally biased due to a stream proximity factor. From field observations we have always assumed that trout fishing received an initial splurge the first two weeks or so and slowing dwindled away to almost nothing. The reports validate our assumption with 61% of the time devoted to trout fishing and 58% of the total catch being made during the month of May. Each successive month shows a drop in the number of hours fished and the number of trout caught. For all intents and purposes the trout season ends in September with only the die hard persisting in diminishing numbers to the November 30 deadline. The month of August produced the highest rate catch with 1.55 trout per hour.

Smallmouth bass angling builds up from June in numbers of fish taken and hours spent fishing to the peak month of August and then tapers off. October and November show little pressure but reasonably high returns. Again it is only the specialist who persists in fishing in the late fall and this may be the cause of the higher take per hour.

Catfish, with an April 15th opening, builds up to a peak catch and effort in July and then tapers off to practically nothing. In 1950 May was the best month for catch per unit effort with .98 fish per hour while July was next with .73 fish per hour.

Largemouth bass fishing, done chiefly in the Mississippi River and lower reaches of the Wapsi was fairly static in both catch and time expended. July was the peak month for both catagories but September produced the best catch per unit effort.

If we were to graph crappie fishing pressure it would closely approximate that of our lake walleye fishing with both a spring and fall peak and summer doldrums. May and June are the peak months with much less fishing in October but a high success-effort ratio.

Walleye fishing in the rivers is primarily a fall project with more fish being caught and more time expended in September and October than all other months combined. The accompanying table shows July as a peak month for catch per unit effort but this is based on returns from the Mississippi River only. October is the best month for all rivers in the district.

Species	April	May	June	July	Aug.	Sept.	Oct.	Nov.
Trout								
Number		829	236	118	113	93	33	18
Hours	*	741.75	164.5	106.25	72.75	73.25	40.0	16.5
Fish per hour		1.12	1.43	1.11	1.55	1.27	.83	1.09
S.M. Bass								
Number			81	110	130	92	15	5
Hours	*	*	163.75	175.5	185.25	148.25	20.5	7.5
Fish per hr.			.49	.63	.70	.62	.73	.67
Catfish								
Number	66	211	150	274	116	91	54	7
Hours	122.75	215.5	233.75	372.5	185.25	148.5	100.5	22.0
Fish per hr.	.54	.98	.64	.73	.62	. 61	.54	.32
L.M. Bass								
Number	*	*	53	67	48	46	26	
Hours			78.75	96.25	72.25	51.5	25.0	
Fish per hour.			.67	.70	.66	.89	1.04	
Crappie								
Number		73	58	20	3	19	25	
Hours		50.5	34.0	25.0	7.0	16.5	15.5	
Fish per hour		1.45	1.71	.80	.43	1.15	1.61	
Walleye								
Number		1		13	2	23	41	3
Hours	*	11.0		12.0	3.5	37.0	62.75	11.0
Fish per hour		.09		1.08	.57	.62	.65	.27

* - Closed Season

THE AGE AND GROWTH OF THE SMALLMOUTH BASS IN THE STREAMS OF NORTHEAST IOWA

During field surveys in the years 1949 and 1950, 206 smallmouth bass were collected by various methods; sein, trap nets, wier and angling, from 19 streams in northeast Iowa. Scales and other standard growth data were taken from these fish and each fish was aged and growth at each annulus was calculated according to accepted procedures.

This data, when combined with additional years' data, will be used to determine a potential for growth comparisons on the 17 smallmouth test streams in the area.

The calculated growth was determined on a direct proportion basis using the Dahl-Lea formula. The year's growth was determined on a nomograph, using 0 as the y-axis intercept.

All fish were measured in inches and .10's of inches and for practicality the total length, that from the tip of the nost to the tips of the caudal lobes, adpressed, was used.

In aging fish taken early in the season, an arbitrary birthday was accorded them if the annulus had not been formed. From observations the annulus was laid down in the latter part of May.

The data indicates a normal age class composition. Growth also presents a normal picture with Lea's phenomenon apparent in almost all age classes. The six year old fish, however, deviate from the normal and are larger at all ages than the rest of the sample. Since this marked deviation is not present in fish hatched the following year, and since both specimens were taken from rivers in the northmost tier of counties, this increase in growth seemingly cannot be attributed to better climatic or longer growing seasons. Likely it is a case of a habitat conducive to good growth as older fish on a population sample usually exhibit slow growth.

To date two other investigations into the growth of the Iowa Smallmouth Bass have been made by Tate (1950, and unpublished Ph. D. thesis) on streams of northeast Iowa. For the sake of comparisons, his findings are shown in Table II. In both Tate's papers growth was calculated using Lea's method and growth was calculated from a point on the y-axis above 0. Most other states in this region reporting on S.M. growth have combined their river and lake specimens and therefor a comparison would be biased by the inclusion of lake S.M. which usually run larger for their age than do the stream specimens.

Table 1.- THE AGE AND GROWTH OF THE SMALLMOUTH BASS IN THE STREAMS OF NORTHEAST IOWA

Age Class	Number Examined	Total Length in Inches and .10's at each Annulus 1	2	3	4	5	6
I	68	3.8					
II	73	3.6	6.5				
III	35	3.5	6.5	9.2			
IV	20	3.0	5.8	8.6	11.0		
V	8	3.0	5.9	8.4	11.0	13.3	
VI	2	4.1	7.1	9.0	12.4	15.2	17.0
Totals (L)	206	3.6	6.9	8.8	11.1	13.7	17.0

Table 2. - ADDITIONAL GROWTH DATA ON SMALLMOUTH BASS N.E. IOWA STREAMS

* TATE (1950)	104	3.7	5.7	7.8	9.8	11.7	14.0
** TATE (Unpb. PHD Thesis)	627	3.3	6.3	8.9	10.4	14.1	

* Creeks averaging 30 feet in width
** Streams averaging 50 to 70 feet width

Literature Cited

Tate, William Harold, 1949.

Growth and Food Habit Studies of Smallmouth Black Bass in Some Iowa Streams. Iowa State College, Journal Science 23(4): 343-354.

Unpub. PhD. Thesis

IOWA STATE CONSERVATION COMMISSION
DIVISION OF FISH AND GAME

Seventh Biology Seminar
July 1951

PHEASANT CROWING COCK COUNT -- Spring 1951

By Richard Nomsen
Game Biologist

The Crowing Cock Count was used again this year to obtain information on Iowa's Spring pheasant population.

A letter of instructions and county maps showing routes were mailed to all Officers in March. All routes were the same as in 1950 with the exception of a few which had to be changed because of bad roads or washed out bridges.

Check routes were begun early in April to determine the peak crowing period. Three routes were used in the following counties; Linn county checked by Glen Sanderson- Franklin, by R. C. Nomsen- and Dickinson, by Jim Sieh. Road conditions limited the number of checks on these routes, but counts showed the peak crowing period was reached about the first of May in the Southern half of Iowa and about May 7th in Northern Iowa. Conservation Officers were notified to begin counts as soon as maximum crowing was established.

Officers began their counts May 3rd and completed the survey by May 29th. Last year, counts were taken between April 20th and May 22nd. Maximum crowing began about 10 days earlier in 1950.

Weather conditions during the survey were much the same each year. Temperatures averaged below normal, and moderate to heavy showers were recorded in most parts of Iowa during the period. Field work was delayed again this Spring -- about the same as last year. Road conditions were very poor due to the late Spring and wet weather.

Officers were instructed to use the same two routes for each county, use the same stops, and to travel the same direction on each route as they did in 1950. Twenty stops were made on each 20 mile route. Counts were not to be taken during periods of unfavorable weather or when the wind velocity exceeded 8 miles per hour.

In order to compare results from year to year-- records are kept for individual counts and of the Officer taking the counts. Comparisons will be made first for all counts repeated

by the same Officers- using the same routes and stops and traveling in the same direction both years.

There were 145 routes checked by the same Officers in 1950 and 1951. Of these, 81 routes showed an increased number of calls; two remained the same and 61 decreased. The average for the 145 routes was 8.0 calls per two minute stop compared with 7.5 calls in 1950- and increase of 7%. Most of this increase was recorded in our best pheasant range in North West and North Central Iowa. Table 1 lists the total number of repeated routes in each district, the number of routes that had increased counts and those that decreased.

Table 1

SUMMARY OF 145 ROUTES REPEATED BY THE SAME OFFICERS FOR YEARS 1950 and 1951

District	Total Number of Routes	No. of Routes That Had a Higher Count	No. of Routes That Had a Lower Count
1. North West	14	11	3
2. North Central	14	11	3
3. North East	17	10	7
4. West Central	16	11	5
5. Central	22	9	13
6. East Central*	16	3	12
7. South West	16	12	4
8. South Central	18	11	7
9. South East *	12	3	8
STATE	145	81	61

* Total includes one route that remained the same.

Table No. 2 lists the population data obtained from these 145 routes. It shows the average number of calls heard per stop; the sex ratio obtained from the Winter count given as hens per cock; and the sum of the average number of calls per stop plus the number of hens represented by those calls.

Table 2

RESULTS OF 145 ROUTES REPEATED BY THE SAME OFFICERS FOR 1950 and 1951

Dist.	1950 Aver. No. of calls per stop	1950 Hens per cock	1950 Aver. No. of calls plus hens	1951 Aver. No. of calls per stop	1951 Hens per cock	1951 Aver. No. of calls plus hens	Percent change
1.NW	17.8	2.4	60.5	20.2	2.4	68.9	plus 14%
2.NC	21.2	3.0	84.8	24.0	3.1	98.4	plus 16%
3.NE	6.2	3.4	27.3	6.3	3.5	28.4	plus 4%
4.WC	9.1	2.0	27.3	9.7	2.2	31.0	plus 13%
5.C	6.0	3.2	25.2	5.2	2.8	19.8	minus 21%
6.EC	5.2	3.5	23.4	4.4	3.5	19.8	minus 15%
7.SW	1.5	1.5	3.8	2.2	1.5	5.5	plus 45%
8.SC	1.8	1.5	4.5	2.6	1.5	6.5	plus 44%
9.SE	1.4	3.5	6.3	1.0	3.5	4.5	minus 29%
STATE	7.5	2.9	21.8	8.0	2.9	23.2	plus 7%

Table No. 3 lists the results by districts for all counts taken in 1951. All Officers recorded a total of 31,340 calls at 3,887 stops for an average of 8.1 calls per stop. The average in 1950 was 7.9 calls per stop.

A pheasant distribution map was constructed from the results of this survey and presented at the Conservation Employees Spring School. The intervals used for the pheasant distribution map of Iowa are:

Averaged less than one call per two minute stop.
Averaged between one and nine calls per stop
Averaged between ten and nineteen calls per stop.

Lines are drawn along these intervals to enclose areas of different population densities.

Table 3

CROWING COCK COUNT
Spring 1951 Pheasant Census

District	Date	Part of County Checked	Number of Crowing Cocks	Number of Stops	Average Number of Calls per stop	Weather			Wind		Sex Ratio of winter count hens per cock	Total Number of birds represented by count
						Clear	Part Cloudy	Cloudy	Vel-: ocity	Direc-tion		
1 North West			8947	460	19.4						2.4	30,420
2 North Central			8238	432	19.1						3.1	33,776
3 North East			3068	409	7.5						3.5	13,806
4 West Central			3899	471	8.3						2.2	12,477
5 Central			2629	479	5.5						2.8	9,990
6 East Central			2215	398	5.6						3.5	9,967
7 South West			1082	360	3.0						1.3	2,488
8 South Central			1015	438	2.3						1.3	2,334
9 South East			247	440	0.6						3.5	1,111
STATE			31,340	3,887	8.1							116,369

RURAL MAIL CARRIERS PHEASANT COUNT - SPRING 1951

The Rural Mail Carrier Spring Count was taken during the week of May 7th-12th. Weather conditions were about the same as last year. The average temperature was below normal and precipitation was light over most of the pheasant range.

Table 1 compares the results of the last two Spring counts taken by the Carriers. Results by districts were; North West and West Central Iowa showed a decrease- the South East Iowa district remained the same and the other 6 districts showed increases. There were 516 cards returned this Spring and 550 last year.

For the State as a whole, this survey indicated an increase of 15%. Last Fall, their count showed a decrease of 40%. The Winter count increased 28% over the 1950 count.

Table 1

Rural Mail Carriers Spring Pheasant Count
Results from 1950 and 1951

District	Year	Birds Seen Per 100 Miles	Percentage Change
1 North West	1950	24.6	minus
	1951	23.3	minus 5%
2 North Central	1950	28.5	
	1951	38.6	plus 35%
3 North East	1950	6.8	
	1951	10.1	plus 48%
4 West Central	1950	12.3	
	1951	11.4	minus 7%
5 Central	1950	10.3	
	1951	12.5	plus 21%
6 East Central	1950	8.5	
	1951	10.3	plus 21%
7 South West	1950	3.6	
	1951	4.4	plus 22%
8 South Central	1950	1.5	
	1951	2.3	plus 53%
9 South East	1950	2.4	
	1951	2.4	no change
STATE	1950	12.4	
	1951	14.3	plus 15%

IOWA STATE CONSERVATION COMMISSION
DIVISION OF FISH AND GAME

Seventh Biology Seminar
July 1951

IOWA QUAIL CALLING ACTIVITY 1951

By M. E. Stempel
Game Biologist

In 1951 whistling by bob-whites first was reported in late March. Not much calling was heard until April 20. Most of the calling seemed to be in the evening. The first nice weather occurred on April 27, and following that date, calling became more common.

Some of the earliest calls recorded were at the rate of three per minute by a single bird. Quail cocks are frequently observed to be calling, in June, at the rate of six calls per minute by one bird.

In the spring, 1951, by April 7, there had been one day of springlike weather, and on the 7th enough quail cocks were heard calling to indicate that calling had become general.

Pairing

Pairing of quail was first observed in 1951 on April 15. In 1950, the first pair of quail was seen the first week in May.

By May 16 in 1951, cock quail were usually observed alone. By the 29th of May in the early morning, as many as 6 cock quail had been heard at one stop. Before that date two was the most that had been heard at one station.

Results from a whistle count route in Wapello County, 1951. 4 stops were made at mile intervals.

May 15, 1951	1 calling cock quail
May 29, 1951	2 calling cock quail
June 19, 1951	6 " "
June 23, 1951	7 " "
July 9, 1951	12 " "

Results from the same route 1950
July 14, 1950 — 11 calling cock quail

Wapello County Check Area

Good weather for counting whistling quail was rare in 1951. Roads were bad, and often the wind was too strong to

hear quail at any distance.

The Wapello county area was checked on good mornings between 5:30 and 6:30. The peak of the calling usually is around 6 a.m. By the time the count had been made on the area the wind had risen to over 10 miles per hour. On the area enough time was spent at each stop to make sure that all birds were heard, and that all were accurately located, and on the area.

Results of whistle counts on the Wapello county area.

1950		1951	
Date	No. of Quail	Date	No. of Quail
May	4	May 16	0
June 1	3	June 6	1
June 6	6	June 13	1
June 27	8	June 16	3
July 3	8	June 23	5
		June 30	7
		July 1	8

Because of the bad roads the area has not been checked since July 1. There is an all weather road around the area, but accurate location, and count of the quail is only possible when the dirt road through the center can be used.

Although the volume of calling is later in 1951 than in 1950, Klimstra found that the birds nested or paired at about the same time regardless of the lateness of the season.

However, in 1947, in the western Iowa quail counties, hunters did say that there was an unusual number of immature quail when the season opened. The spring of 1947 was similar to spring 1951.

No record was made of the number of squealers found in 1947, but in 1949 and 1950 there was one covey of immature quail in early November, to every seven coveys of quail, that were found by the biologist.

Summary

1. Whistling of male quail was general in 1950, by April 7. In 1951 general calling by bob-whites, was not recorded until April 27.

2. Pairing was observed on April 15 in 1950, and in early May in 1951.

3. On a check area in Wapello County, general calling by quail was later in 1951 than in 1950.

4. By July 1, calling of male quail reached the same volume as the higest in 1950.

5. In 1947, a similar season to 1951, the quail crop was good, but many immature birds were reported by hunters during the early part of the hunting season.

IOWA STATE CONSERVATION COMMISSION
DIVISION OF FISH AND GAME

Seventh Biology Seminar
July 1951

IOWA RACCOON DATA--1950-51 SEASON

By Glen C. Sanderson
Game Biologist

The raccoon project was initiated in the fall of 1949 and the results for the first year have already been reported (Sanderson, 1950b). The project was continued along the same lines in the fall of 1950; however, no new names of raccoon hunters were furnished by conservation officers. The 49 hunters who reported the first year plus the names of interested hunters furnished by them were used for the 1950 contacts. Thus, approximately 80 hunters were contacted by letter which explained the purpose of the project and again outlined the information the hunters were asked to collect. A form for recording the information was sent with the letter and in addition each hunter received a one-page mimeographed summary of the 1949-50 results. The hunters were asked to return their completed blanks soon after the close of the hunting season (Jan. 10, 1951).

In addition to the hunter-cooperators, the writer spent several days at the fur buying establishment of Mr. Louis Lamb of Bloomfield, Davis County, Iowa examining dead raccoons as they were being pelted. Age and sex ratio information, body weights, penis bones, and other information were collected from these carcasses. In addition several hundred cased raccoon pelts were examined for sex-ratio and breeding information at Iowa fur houses.

RESULTS-Table 1 shows that 22 of the 80 hunters contacted, or approximately 28 per cent returned the forms. The reporting hunters contributed 98 penis bones and other valuable information to the project. A comparison of the results shown by Table 1 and the 1949-50 results (Sanderson, op. cit.) reveals that the hunting success per hour, the number of times each reporting hunter hunted, and the distribution of the hunting pressure through the open season was about the same in the two years. In spite of complaints by hunters that the early freeze up in the fall of 1950 prevented them from hunting raccoons after the first few days of the season, they made 4.8 per cent of their catch during the last 10 days of the season compared to 4.4 per cent of their catch during the final 10 days of the 1949-50 season. Approximately 88 per cent of the catch was taken during the first half of the season during both years. This does not imply that raccoon

Table 1- Data from the 1950-51 raccoon hunter's reports.

Total no. hunters reporting	22	
No. hunters who took no raccoons	0	
No. hunters who saved penis bones	11	(saved 98 bones)
Av. no. in hunting party	2.5	(162 parties totaled 400 hunters).
Av. no hours hunted by each party	3.4	(162 parties hunted 543.5 hours)
Av. no. raccoons taken per hour per party	0.53	(289 raccoons taken in 543.5 hours)
Av. number raccoons taken per hunting trip	1.8	(289 raccoons taken by 162 hunting parties)
Per cent of catch that was females	51.5	(330 raccoons reported as to sex- 170 F. and 160 M.)
Per cent of juvs. in the harvest (penis bone criterion)	65.3	(98 bones- 66 juvs. 32 ads)
Per cent of hunters who reported more raccoons this year than last	61.9	(28.6% said fewer, 9.5% said same- 21 reported.)
Av. number times each hunter hunted	10.1	(19 hunters reported 191 trips)
Per cent hunting trips made during 1st 10 days of season (Nov. 10-Dec. 9)	47.6	(91 trips of 1951 total trips)
Per cent hunting trips made during 1st half of season (Nov. 10-Dec. 9)	86.4	(165 trips of 191 total trips)
Per cent of hunting trips made during last 10 days of season (Jan. 1-10)	4.7	(9 trips of 191 total trips)
Per cent of catch made during 1st 10 days of season (Nov 10-19)	63.3	(171 raccoons of 270 reported as to date.)
Per cent of catch made during 1st half of season (Nov. 10-Dec. 9)	88.5	(239 raccoons of 270 reported as to date)
Per cent of catch made during last 10 days of season (Jan. 1-10)	4.8	(13 raccoons of 270 reported as to date)
Total number of hunters contacted by letter	80	
Per cent of hunters contacted who returned the form	27.5	(22 hunters of 80 contacted)
Total number of raccoons reported by 22 hunters	329	
Average number of raccoons caught by each hunter reporting	15.0	(329 raccoons by 22 hunters)

(continued) Table 1-	
Av. No. raccoons taken per party per hour during 1st 10 days of season (Nov.-Dec.9) 0.55	(170 raccoons in 311 party-hours)
Av. no raccoons taken per party per hour during 1st half of season (Nov. 10-Dec. 9) 0.55	(263 raccoons in 474 party-hours)
Av. no raccoons taken per party per hour during last 10 days of season (Jan. 1-10) 0.59	(13 raccoons in 22 party-hours)

hunters do not have a legimate complaint concerning the weather and running their dogs, it merely shows that the effect of the weather was similar in the two years since the raccoon project was begun.

Age-Ratio-- The age-ratio of the male segment of the harvest, as determined by 98 penis bones sent in by hunters and 94 bones collected by the writer at Bloomfield, Iowa, is 1.87 young per adult (Table 2). To state it another way, juveniles comprised 65.1 per cent of the male harvest. This compares with 64.9 per cent juveniles in the male harvest for the 1949-50 season (Sanderson, op. cit.). The difference in the two years is so small that it is insignificant. Perhaps the more severe weather conditions in 1950-51 did have some small effect on the harvest for Sanderson (1949) reports that a greater percentage of young and female animals are taken earlier in the season in Missouri, and although the data are meager, Table 3 tends to confirm this for Iowa. Thus, if the severe weather curtailed the late season harvest somewhat this last year it would mean that a relatively smaller percentage of adult animals was harvested; perhaps accounting for the 1.2 per cent increase of juveniles in the 1950-51 harvest.

Sex-Ratio-- A total of 1,201 raccoons were sexed during the past fall and winter-733 were examined by the writer at fur houses, 330 were reported by hunters, and 138 were examined by the writer at a dressing station (Table 4). Of these 539 were males and 662 were females or 81.4 males per 100 females. To state it another way, females comprised 55.1 per cent of the harvest in 1950-51 in Iowa. This compares to 52.5 per cent females in the 1949-50 harvest; however, it must be kept in mind that the freeze-up came earlier in 1950-51 than it did in 1949-50 and thus a relatively smaller percentage of the males were subjected to hunting pressure, in 1950-51 than in 1949-50. This may explain the slightly higher percentage of females in the harvest last fall over the previous year.

Table 2.- Age ratios[1] of Iowa raccoons taken during the 1950-51 hunting season.

	From Hunters	From carcasses at Bloomfield, Iowa	Totals
Ads.	32	35	67
Juvs.	66	59	125
TOTALS	98	94	192

Juveniles per adult_____ 1.87

Per cent juveniles in harvest_____ 65.1

1 Age determined by the penis bone criterion.

Table 3- Age and sex of raccoons bought at various times during the hunting season at Bloomfield, Iowa

DATE	AGE COMPOSITION Ads.	Juvs.	SEX COMPOSITION Males	Females
Nov. 27, 1950	0	11	-	-
Nov. 28-Dec. 1, 1950	6	17	-	-
Dec. 4, 1950	19	21	53	50
Dec. 11, 1950	7	7	16	8
Jan. 8, 1951	3	3	6	4
TOTALS	35	59	75	62

Harvest and Population--Table 5 reveals a decline in the reported harvest from 58,527 pelts in 1949-50 to 56,075 in 1950-51, a decline of 4.2 per cent. This decline is slightly lower than had been anticipated in view of weather conditions and is much less than the pessimistic predictions of many fur buyers who estimated a 25 to 50 per cent (or even more) decline over 1949-50.

Twenty-one of the reporting hunters replied to the question, "Don't you think there are MORE or FEWER raccoons than there were last year?" Nearly 62 per cent reported more, while less than 29 per cent said fewer, and less than 10 per cent reported the same number. For the 1949-50 season the figures were 53, 39, and 8 per cents respectively (Sanderson, 1950b).

This is the third year in a row that the writer (Sanderson, 1949, 1950b, and this paper) has reported that the raccoon population appears to be at or near a peak in numbers. The evidence available still indicates that this statement is true. Figures presented above in Tables 2 and 5 show that the age and sex ratio of the population has remained essentially unchanged from 1949-50 to 1950-51. The minor changes reported in both cases favor a slightly higher population level in the latter year if any change is indicated in spite of the slight decline in the numbers harvested. As mentioned above, it is believed that the slight decline in the harvest can be entirely accounted for by the severe weather conditions early in the hunting season of 1950-51.

Breeding History--Information in Table 6 indicates that adult male raccoons start to become sexually active in southern Iowa during December but that they probably do not become fully sexually active until January or later. A few juvenile males show some sexualy development in December but they are somewhat behind the adults in the development of sexualy activity.

There were 103 placental scars representing 31 litters observed in the uteri of 29 females examined at Bloomfield, Iowa for an average of 3.1 placental scars per litter (Table 7). The number of scars for one litter ranged from one to seven, but two females showed evidence of having given birth to two litters. Whether these additional scars represent a litter from a previous year or whether they represent a second litter in the same year is not known; however, it is suspected that the latter is the case. It is known that raccoons <u>rear</u> only a single litter each year although the

Table 4.-Sex-ratio and breeding history information of the 1950-51 raccoon population obtained by the examination of cased pelts in fur houses, carcasses at one dressing station, and from reports submitted by hunters.

	From cased pelts	From hunters	From dressing station 1	Totals
Males	304	160	75	539
Females	(429) [2]	170	63	662
Parous	152			
Non-parous	277			
TOTALS	733	330	138	1,201

Computed from the above data:

No. of young of the year animals in the cased pelt sample[3] which gives 477

3.1 young raccoons per parous female in the harvest.

Sex-ratio: 81.4 males per 100 females in the harvest
or
55.1 per cent of the harvest was females.

1 Examined at Bloomfield, Iowa
2 Total of the parous and non-parous females.
3 Obtained by multiplying 733 by 65.1% (the per cent of young in the harvest).

Table 5--Raccoon harvest and average value received per pelt in Iowa in 1950-51 compared with the highest, lowest and average figures for the past 20 years-as reported by fur buyers.

SEASON	No. of pelts bought by dealers	Av. value per pelt	Total value
1932-33	10,468	$2.60	$ 27,216.80
1943-44	38,303	7.25	277,696.75
1949-50	58,527	1.95	114,127.65
20-YEAR TOTALS*	560,494		1,782,130.95
20-YEAR AVERAGE*	28,025	3.18	89,106.55
1950-51	56,075	2.95	165,421.25

* Does not included 1950-51.

Table 6.--Breeding status and body weights of male raccoons examined during the 1950- 51 hunting season at Bloomfield, Iowa

Date	Age	Wt. of animal (lbs)	Wt. of one testis (gm)	Size of testis (mm)	Sperm present in epididymis	Sperm motile	Preputial orifice
Dec. 4, 1950	Ad	23.0	10.1	37x23	High conc	no	open
		22.0	7.1	32x23	Med conc	few	open
		22.0	10.9	37x24	Med conc	no	open
		20.5	(this raccoon has been castrated)				open
		19.5	10.0	35x23	Med conc	some	open
		19.5	9.4	34x23	Med conc	no	open
		19.0	7.4	30x22	High conc	no	open
		18.5	9.9	38x24	High conc	no	open
		18.5	8.9	37x25	High conc	no	open
		18.0	10.7	36x25	Med conc	no	open
		17.5	9.0	36x23	High conc	some	open
		17.0	11.1	38x25	Med conc	few	open
		17.0	6.6	32x20	Med conc	no	open
		15.5	7.2	32x22	Med conc	no	open
		14.5	8.3	33x24	Med conc	yes	open
		14.5	6.6	32x20	Med conc	few	open
		14.0	1.6	22x13	no	-	open
		13.5	8.1	33x22	Med conc	no	open
	Juv.	17.0	1.5	22x13	no	-	closed
		15.0	0.8	18x10	no	-	closed
		14.0	0.7	17x11	no	-	closed
		14.0	0.6	16x10	no	-	closed
		13.5	3.6	27x17	no	-	open
		13.5	0.7	17x10	no	-	closed
		13.5	0.3	15x8	no	-	closed
		13.0	1.9	22x15	few	no	closed
		13.0	(didm't get testes)				closed
		12.5	3.1	26x18	no	-	open
		12.5	1.8	22x15	no	-	partly open
		12.0	0.6	14x9	no	-	closed
		12.0	0.7	18x10	no	-	closed
		12.0	0.3	15x8	no	-	closed
		11.5	0.6	17x11	low conc	no	closed
		11.0	0.5	16x8	no	-	closed
		10.3	0.4	15x11	no	-	closed
		10.0	0.6	15x9	no	-	closed
		9.5	0.1	15x10	no	-	closed
		9.5	0.4	16x9	no	-	closed
		9.5	0.2	14x7	no	-	closed
	Age Unk.	16.0*					
		15.5*					

Table 6.- continued from the preceeding page.

		15.0*					
		14.5*					
		14.0*					
		12.5*					
		12.5*					
		12.5*					
		11.0*					
		10.5*					
		10.0*					
		7.5*					
		7.5*					
Dec. 11, 1950	Ad	20.5	8.1	36x23	Med conc	no	open
		17.5	8.5	32x23	Med conc	slightly	open
		16.5	8.0	36x24	Med conc	no	open
		14.0	5.4	31x20	no	-	open
		14.0	5.2	33x20	Med conc	no	open
		12.5	5.7	33x19	no	-	open
	Juv						
		14.0	1.3	20x12	no		-partly open
		12.0	3.1	26x18	no	-	closed
		10.5	1.3	22x12	no		-partly open
		10.0	1.1	20x12	no	-	closed
		10.0	0.8	17x11	no		-partly open
		9.5	0.7	17x10	no		-partly open
		9.0	0.7	17x10	few	no	partly open
		8.5	0.9	19x12	no	-	closed
	Age unk						
		16.8*	(frozen)				
		17.0*	(frozen)				
Jan. 8, 1951							
	Ad.	14.0	7.2	33x20	yes (frozen)	no	open
		14.0	6.3	35x20	yes (frozen)	no	open
		13.5	7.0	32x21	yes (cold)	slightly	open
	Juv.						
		9.5	0.6	15x8	no		-partly open
		8.5	0.8	15x11	no		-partly open
		9.0	0.8	16x9	no		-closed

* Weight and external examination only.

Table 7.--Breeding history and body weights of female raccoons examined during the 1950-51 hunting season at Bloomfield, Iowa.

Date	Parous[1]	Wt. of animals (lbs)	No. placental scars in uterus	Teats	Uterus
Dec. 4, 1950	yes	19.0	3	large-black	-
	yes	17.5	3	large-white	-
	yes	17.0	4	med-white	-
	yes	16.8	3	large-slightly dark	
	yes	16.5	5	long-black	-
	yes	16.5	7[2]	long-black	-
	yes	15.5	3	med-white	-
	yes	15.5	4	long-black	-
	yes	15.5	3	black	-
	yes	15.3	3	black	-
	yes	15.0	4	med-slightly dark-	
	yes	15.0	3	large black	-
	yes	15.0	2	med-slightly dark-	
	yes	14.7	3	large slightly dark	
	yes	14.8	3	med-slightly dark-	
	yes	14.5	9[3]	long black	-
	yes	14.5	6	long-black	-
	yes	14.5	3	long-black	-
	yes	14.5	2	long-dark	-
	yes	14.0	2	long-black	-
	yes	13.8	1	med-white	stim., horns 5mm.
	yes	13.0	4	large-black	-
	yes	13.0	2	long-black	-
	yes*	13.0	-	med-slightly dark	not examined
	no	17.5	0	small-white	stim.
	no	14.5	0	small-white	-
	no	14.0	0	tiny-white	-
	no*	14.0	-	small-white	not examined
	no	13.5	0	tiny-white	-
	no	13.5	0	tiny-white	-
	no	13.5	0	tiny-white	-
	no	13.5	0	tiny-white	-
	no	13.5	0	tiny-white	-
	no	13.0	0	small-white	-
	no	13.0	0	small-white	-
	no	12.5	0	tiny-white	-
	no	12.0	0	tiny-white	-
	no	12.0	0	small-white	-
	no	12.0	0	tiny-white	-
	no	12.0	0	small-white	-
	no	12.0	0	small-white	-
	no	12.0	0	small-white	-

Table 7.- continued from preceeding page.

no	11.5	0	small-white	-
no	11.5	0	small-white	-
no	11.5	0	small-white	-
no	11.5	0	small-white	-
no*	10.5	-	small-white	not examined
no*	10.0	-	small-white	not examined
no*	9.5	-	small-white	not examined
no	9.0	0	white	-
??	16.0	?	white	not examined
Dec. 11, 1950				
yes	19.0	4	med-slightly dark-	
yes	19.0	1	large-slightly dark	
(hunter killed one small raccoon with the above female)				
yes	16.0	3	long-med dark	-
yes	14.2	3	med-white	-
yes	13.5	3	large-black	-
no	10.0	0	small-white	-
no	10.0	0	small-white	-
no	10.0	0	small-white	-
Jan. 8, 1951				
yes	14.0	7	long-black	-
no	8.5	0	tiny-white	-
no	7.5	0	small-white	-
no	6.0	0	quite black	small & white

* Weighed and external examination only.
1 Parous-has given birth to young.
2 Four light (one double), 3 dark scars (1 double).
3 Two doubles, 7 locations, 5 light scars, 4 noticeably darker than the light 5.

writer believes that second litters sometimes result in the same year when the first litter is lost soon after birth.

Table 4 reveals that there were 152 parous and 277 non-parous (did not give birth to young) females in the 733 cased pelts examined at fur houses during the past season. If 65.1 per cent of the pelts examined were young of the year (Table 2), then there were 477 young to 152 parous females or an average of 3.1 young (of both sexes) per parous female in the harvest, the same as the average number of placental scars observed per litter (see above). This compares to 5.0 young per parous female in the 1949-50 harvest (Sanderson, 1950b). Although this si a reduction in the reported litter size it should be realized that according to the figures in 1949-50 only 23.7 per cent of the females were parous whereas in 1950-51 35.4 per cent of the females were parous. Perhaps lack of experience resulted in the failure to recognize 100 per cent of the parous female pelts in 1949-50 and no placental scars were counted in that year.

Table 8 shows that there were 30 parous and 1 non-parous female among 62 adult females examined at Bloomfield. The one non-parous adult was identified on the basis of body weight; examination of her teats and uterus showed that she was non-parous. Sanderson (1949) reports that non-parous females in Missouri which weigh 11.5 pounds or more are usually adult; however, Table 7 indicates that this is not the case in Iowa. Figures in Table 7 indicate that the dividing line for Iowa would probably be nearer 15 pounds although enough body weights are not available at present to draw this line.

Body Weights-- Reported body weights of many wild animals are often grossly exaggerated and the raccoon is no exception. After carrying a dead 19-pound raccoon home through the brush late at night a hunter can hardly be blamed if his catch has grown to weigh 39 pounds in the short space of a few hours! Although raccoons weighing more than 30 pounds do occur, most of them that supposedly weigh this much were weighed by the imagination rather than on the scales. Tables 6 and 7 reveal the individual body weights of 75 male and 63 female raccoons Table 8 shows the average weights for these same animals. The adult males ranged from 23.0 pounds down to 12.5 pounds in body weight while the juvenile males ranged from 17.0 pounds down to 7.5 pounds. The juvenile males averaged 11.6 pounds, the adult males 17.1 pounds, and all males 13.9 pounds in body weight. As expected, the females weighed less on the average than did the males. Parous females ranged from 19.0 down to 13.0 pounds in body weight while one non-parous adult female weighed 17.5 pounds, and juvenile females ranged from 14.5 down to 6.0 pounds in body weight. Parous females averaged 15.3 pounds and juvenile females 11.2 pounds, and all

females 13.7 pounds in body weight.

Raccoon body weights are usually at a maximum during the fall and early winter and decline through the winter and until a new food supply is available in the spring. However, their body weight usually remains relatively low until late summer or early fall when they start a rapid gain in weight in preparation for the winter.

Table 8.--Average body weights of Iowa raccoons taken during the 1950-51 hunting season, grouped according to age, sex, and breeding history.[1]

MALES:[2]	
27 adults	17.1 lbs.
32 juveniles	11.6 lbs.
75 males (both ages)	13.9 lbs.
FEMALES:[3]	
30 parous adults	15.3 lbs.
1 non-parous adult	17.5 lbs.
31 juveniles	11.2 lbs.
63 females (all females)	13.7 lbs.

1 Raccoons weighed at Bloomfield, Iowa
2 Individual body weights shown in Table 6.
3 Individual body weights shown in Table 7.

Penis Bones--The bony distal tip of the raccoon penis bone identifies it as a bone from an adult animal while a cartilaginous tip (of square tip if the cartilage has been lost in the cleaning process) identified the bone as coming from an animal less than one year of age (Sanderson, 1950a). Length and weight of the penis bones will also place the bones in virtually the same two age classes, and although at present no further breakdown as to age is possible, if enough information is available it may be possible to place the adults in two or more age classes on the basis of length and/or weight of the penis bones. Although this information is not included in this report, the lengths and weights of the penis bones collected during the 1949-50 and 1950-51 hunting seasons in Iowa have been recorded for future reference.

SUMMARY

1. Results of the 1950-51 raccoon hunter reports reveal that the hunting success per hour, the distribution of the hunting pressure and harvest through the open season, and other factors regarding raccoon hunting were similar for the 1949-50 and 1950-51 seasons.

2. The age-ratio, as determined from 192 penis bones, is 1.87 young per adult compared to 1.77 young per adult for the previous season.

3. The sex ratio of 1,201 raccoons, as reported by hunters and from checks in fur houses, is 81.4 males per 100 females compared to 90.7 males per 100 females for the previous year.

4. Reports by fur buyers indicate a 4.2 per cent decline in the harvest from 1949-50 to 1950-51. This decline is not as great as was anticipated in view of the earlier freeze-up in the latter year.

5. Of the 21 hunters who replied to the question, 62 per cent believed that the population was higher in 1950-51 than it was in the previous year, 29 per cent believed that it was lower, while less than 10 per cent believed that it was the same in the two years.

6. It is believed that Iowa's raccoon population is still near a peak in numbers. The harvest showed a slight decline but the age and sex ratios remained virtually unchanged from 1949-50 to 1950-51; if anything they showed a favorable condition for an increased population in the latter year.

7. There were 103 placental scars representing 31 litters in the uteri of 29 females examined at Bloomfield, Iowa for an average of 3.1 scars per litter.

8. There were 477 young raccoons to 152 parous females or an average of 3.1 young per parous female in the harvest as determined by an examination of cased pelts. This is the same as the average number of placental scars observed per litter; perhaps indicating low juvenile mortality between birth and the hunting season.

9. Adult males show some signs of sexual development during December in southern Iowa but they probably are not fully sexually active until January or later. Juvenile males are slower to reach a peak in sexual development than are adults.

10. Juvenile males averaged 11.6 pounds, adult males 17.1 pounds, juvenile females 11.2 pounds, and parous females 15.3 pouns in body weight. A total of 138 raccoons of both sexes averaged 13.7 pounds in body weight.

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IOWA STATE CONSERVATION COMMISSION
DIVISION OF FISH AND GAME

Seventh Biology Seminar
July 1951

WATERFOWL BREEDING GROUND SURVEY IN IOWA- 1951

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Background and Progress

In 1944 the Iowa State Conservation Commission assigned a biologist to evaluate the waterfowl resource in Iowa and to gather data dealing with production, management, and harvest of this game crop. Iowa is the initial stage of statewide waterfowl production study and habitat improvement. Meager population trend data were gathered during the breeding season of 1949, 1950, and again in 1951. Production data have been gathered during on-the-spot check counts made on productive areas in northwestern Iowa. The three major waterfowl producing areas in northwestern Iowa have been named and encircled on the pictorial map to emphasize their geographical location. The other lakes and sloughs represented by dots on this map have been spot checked one or more times to determine their value to waterfowl. No serious attempt has yet been made to determine the extent of wood duck production along the many rivers in Iowa. It is the opinion of the writer for the second consecutive year that wood duck production in Iowa is increasing, and at present may equal or exceed the production of any other species in the state.

Most of the few remaining waterfowl producing areas in northwest Iowa are now state-owned and managed under the supervision of the Federal Aid Section (P-R). Resident area managers have been assigned to three game management units comprising roughly 15,000 acres of waterfowl habitat. In addition a fourth game management unit is in the construction phase of development and when completed will provide a marsh impoundment of approximately 1,000 acres. It is hoped that permanent transects can be established on each management unit to provide annual waterfowl trend data.

Spring Migration - 1951

Weather conditions contributed to the unusual migration of waterfowl through Iowa during the spring of 1951. Heavy late winter snows and freezing temperatures in northern Iowa and adjacent parts of southern Minnesota forced the early flight of mallards and pintails to avoid the ice covered lakes region of northwestern Iowa. Several concentrations of early migrants

(mallards) were reported from central Iowa somewhat eastward of the usual migratory concentration points. It was assumed that the heavy spring run-off provided flooded cornfields throughout central Iowa which were more attractive to waterfowl than the ice covered natural lakes and marshes. The 1951 spring flight through northwestern Iowa was smaller than the spring flights in 1949 or 1950; however, the aggregate statewide migration may have been as large as usual. The 1951 spring flight was more widespread over the state as a whole, than during either the spring of 1949 or 1950.

The concentration of blue and snow geese in the Missouri River Valley was again conspicuously large. The goose flight was delayed approximately ten days by freezing weather farther north. It was probable that this delay enroute increased the size of local concentrations, but like last spring there was no evidence to support an actual increase in total migratory numbers of geese. Competent observers estimated a quarter to a half million geese were present in Iowa during the peak of concentration. Aerial observers who had the best opportunity to witness the aggregate concentration had higher estimates than ground observers.

An unusually large number of lesser scaup (nyroca affinis) occupied the flooded cornfields, sloughs, potholes, and lakes of central and northwestern Iowa during the month of April. The 1951 spring flight of this species was much larger than the flights during 1949 or 1950, or at least the species was much more conspicuous. Redheads (N. americana) were mixed flocks. Ring-necked (N. collaris) and canvasback (N. valisneria) ducks were observed only occasionally in these mixed flocks.

The blue-winged teal flight passed into and through Iowa rapidly this spring compared to the last two years. It began in earnest about the first of May and reached a peak during the first week. By the 15th of May the blue-wing flight had dwindled to practically nothing and most of the teal present after this date were resident birds. The blue-winged teal flight appeared smaller this spring than during 1949 or 1950, and the same held true for the green-winged teal migration through northwest Iowa.

Migratory populations of coot observed in Iowa during the spring of 1951 were fewer than those observed during 1949 or 1950.

Water and Weather Conditions

The heavy spring run-off after the late winter snows in 1951 filled all the lakes, sloughs, and potholes to capacity and overflowing. Continued heavy rainfall throughout

the spring and early summer months has increased manyfold the number of available nesting areas, and improved the quanity and quality of available nesting habitat this year. There were more nesting waterfowl in Iowa during the spring and summer of 1951 than during the nesting season of 1949 or 1950. It was assumed that the increased nesting populations of waterfowl with in the state, coupled with good nesting and survival conditions, had increased the waterfowl production in Iowa could not be determined. A good breeding population of wood ducks within the state was present in 1951. Ample rainfall throughout the early summer has maintaned excellent food and cover conditions for all species.

Waterfowl Production

Waterfowl counts have been made on the same lakes and marshes in 1949, 1950, and 1951. These counts (see Table 1) represented breeding adults and are only partial indicators of comparative waterfowl abundance (trend) in Iowa. This was especially true in 1951 when maximum waterlevels caused an increase in the flooded emergent cover plants and made census counts more difficult and less accurate. This was the case on the larger areas where the shoreline was surrounded by emergent cover and then flooded by high water during the spring and summer of 1951. The majority of the on-the-spot check counts are apparently unbiased and do indicate relative abundance of each species from year to year.

Very few broods have been observed this year because of the excellent cover conditions, but those broods checked indicated better than average survival conditions and early hatching. Excellent survival of young birds is anticipated this summer. Practically all nesting began early with little or no delay on the nesting areas. Observations suggest that there has been a minimum of renesting this spring and subsequently better than average production. Only the lesser scaup are considered as non-breeders because in three years not one nest or brood of young has been observed by the writer during his studies. All observations indicate that waterfowl production in Iowa during 1951 should exceed production figures for all species, although this is not apparent when comparing the 1949, 1950, and 1951 data.

Summary

The 1951 spring flight through northwestern Iowa was smaller than the spring flight in 1949 or 1950; however, the aggregate statewide migration may have been as large as usual. The 1951 spring flight was more widespread over the state as a whole than during either the spring of 1949 or 1950.

The concentration of blue and snow geese in the Missouri

River Valley was estimated from a quarter to a half a million birds in 1951.

An unusually large number of lesser scaup were present in Iowa during the month of April. These mixed flocks of divers (scaup) included redheads which did not exceed 5% of the total, while ring-necked and canvas-back ducks were observed occasionally.

The 1951 flight of blue-winged teal passed rapidly into and through Iowa during the first two weeks in May. The 1951 flight of both blue-winged and green-winged teal appeared smaller than the observed flights during the spring of 1949 and 1950 in northwestern Iowa.

Migratory populations of coot observed in Iowa during the spring of 1951 were fewer than the migrant populations observed in 1949 and 1950.

The heavy spring run-off after the late winter snows in 1951 filled all the lakes, sloughs, and potholes to capacity and overflowing. There were more nesting waterfowl in Iowa during the spring and summer of 1951 than during the nesting season of 1949 or 1950.

High water during the early spring probably damaged wood duck nesting sites along many of the streams and rivers in the state, but a good breeding population of wood ducks was present in the state during 1951.

Iowa is cooperating with the Fish and Wildlife Service under the master permitee system and bird-banding supplies are on hand. Twenty-three adult mallards were banded and released this spring. A limited banding program is under consideration in conjunction with the Federal Aid Section on each of the established game management units.

Ample rainfall throughout the early summer has maintained excellent food and cover conditions for all species of waterfowl.

All observations indicate that waterfowl production in Iowa during 1951 should exceed past production figures for all species, although this is not apparent when comparing the 1949, 1950, and 1951 data.

Table 1. - Iowa Waterfowl Counts
Population (1949-1950-1951) Trend Data - (Continued)

AREA CENSUSED

	Cheever Lake (Esterville Area) Emmett County				Four Mile Lake (Esterville Area) Emmett County					
Acres	341				219					
	1950		1951		1949		1950		1951	
Species	M	F	M	F	M	F	M	F	M	F
Mallard	7	-	4	3	6	2	6	3	8	5
Black duck	-	-	-	-	-	-	-	-	-	-
Gadwall	-	-	-	-	-	-	-	-	-	-
Baldpate	-	-	-	-	-	-	-	-	-	-
Pintail	-	-	-	-	1	-	1	-	-	-
G-w. teal	1	1	-	-	-	-	-	-	-	-
B-w. teal	11	2	9	4	12	4	9	2	16	13
Shoveler	-	-	-	-	-	-	1	1	2	-
Wood duck	-	-	1	1	-	1	1	-	-	-
Redhead	-	-	-	-	-	-	4	5	1	1
Ringneck	-	-	-	-	-	-	-	-	1	1
Canvasback	-	-	-	-	-	-	-	-	-	-
Lesser scaup	2	3	-	-	6	2	-	-	-	-
Golden-eye	-	-	-	-	-	-	-	-	-	-
Bufflehead	-	-	-	-	-	-	-	-	-	-
Ruddy duck	-	-	-	-	-	-	-	-	4	2
Merganser	-	-	-	-	-	-	-	-	-	-
Total ducks	21	6	14	8	25	9	22	11	32	22
Coot	80		12		72		80		40	
Florida gallinule-	-		-		-		-		-	
Pied-billed grebe-	8		-		8		5			
B-c night heron	-		-		-		-		-	
Upland Plover	-		-		-		-		-	
Snow goose	-		-		-		-		-	

Table 1. - Iowa Waterfowl Counts
Population (1949-1950-1951) Trend Data - (Continued)

AREA CENSUSED

	Jammerson Slough (Spt.-Okoboji Lake Area) Dickinson County						Mud Lake Slough (Esterville Area) Emmett County					
Acres	160						25					
	1949		1950		1951		1949		1950		1951	
Species	M	F	M	F	M	F	M	F	M	F	M	F
Mallard	-	-	1	1	2	3	5	5	8	5	3	2
Black duck	-	-	-	-	-	-	-	-	-	-	-	-
Gadwall	-	-	-	-	-	-	-	-	-	-	-	-
Baldpate	-	-	-	-	-	-	-	-	-	-	-	-
Pintail	-	-	-	-	-	-	-	-	-	-	1	1
G-w. teal	-	-	-	-	-	-	-	-	-	-	-	-
B-w. teal	3	2	5	5	6	1	8	3	9	6	28	17
Shoveler	-	-	-	-	6	-	-	-	-	-	3	1
Woodduck	-	-	-	-	12		-	-	-	-	5	5
Redhead	-	-	-	-	-	-	3	1	4	2	5	3
Ringneck	-	-	-	-	-	-	-	-	-	-	-	-
Canvasback	-	-	-	-	-	-	-	-	-	-	-	-
Lesser scaup	-	-	-	-	5	1	4	2	-	-	-	-
Golden-eye	-	-	-	-	-	-	-	-	-	-	-	-
Bufflehead	-	-	-	-	-	-	-	-	-	-	-	-
Ruddy duck	-	-	-	-	-	-	2	1	-	-	5	2
Merganser	-	-	-	-	-	-	-	-	-	-	-	-
Total ducks	3	2	6	6	25	11	22	12	21	13	50	31
Coot	12		10				21		-		75	
Florida gallinule			--		-	-	-	-	-	-	3	
Pied-billed grebe			2	-	-	-	1	-	-	-	11	
B-c. night heron			-	-	-	-	-	-	-	-	5	
Upland Plover	-		-	-	-	-	-	-	-	-	-	
Snow goose	-	-	-	-	-	-	-	-	-	-	-	

Some Notes on Wood Duck Nesting Boxes in Iowa

Approximately thirty wood duck nesting boxes were distributed in the lake and marsh areas of northwest Iowa following the nesting season of 1949. During the winter of 1950 about eight additional houses were made ready for spring occupancy. After studing the nesting success in these boxes and the conditions which affect their success, some recommendations for improvement can be made. Following the second nesting season, a total of 47 nesting units had been checked at least once during the two-year period (1950-1951) and about ten of these boxes had been checked frequently during both the winter and summer.

The first improvement in the design of the box is to eliminate a completely removable cover. The boxes in use at the present time have covers which are held in place with two screen door hooks. Of the 47 boxes checked at least once, 12 of these had covers which were not in place and the boxes were not in habitable condition for nesting wood ducks. In several instances the covers have been replaced at least three different times on the same box. In other cases, the box was so warped out of shape that the cover could not be replaced or the cover was missing from the immediate vicinity entirely. A hinged top with one screen door hook opossite the hinge would be preferable to the present design using no hinge or other means of prohibiting complete loss of the nesting box cover.

The second improvement in the design of the box is to try to make it raccoon proof. Practically every box has been investigated by raccoons and many have been used regularly by these animals. If the entrance hole is of such size to permit easy access by raccoons, the box is of little use to a nesting duck. Of the 26 boxes checked during the second year, 11 of them showed signs of use by raccoons. Therefore, of the possible 47 nesting units which could have been used during the two-year period, probably less than 50% of them were desirable nesting sites.

Two practical methods could be used to eliminate the raccoon problem. The first would be to nail strips of sheet metal around the trees or posts to prevent the raccoons from climbing up to the nesting boxes. This would not always be practical or desirable. The second method would be to cut the entrance holes to such size and diameter to exclude raccoons and still permit free entrance to wood ducks. This may not be as simple as it sounds. The Illinois Natural History Survey has found an entrance hole approximately 3" on the vertical axis and 4" on the horizontal axis to be satisfactory. The wood duck boxes in Iowa which have not been

used by raccoons have had openings of approximately 3" in diameter. Further study should help determine the most satisfactory entrance design to eliminate the raccoons.

Only two nesting boxes were successfully occupied by nesting wood ducks during the check of 47 housing units. Thirteen eggs were hatched in a nesting box located at Praire Lake, Dickinson County in 1950; and at least nine eggs were hatched at Round Lake, Clay County during 1951. This is a very low percent of housing success. Considering the factors which tended to make the boxes undesirable or useless nesting sites, such a low percent of occupancy was explainable in part.

The two nesting boxes occupied were both located over water about 50 yards from shore. Both houses were approximately 6 feet above the surface of the water. Neither box was surrounded by emergent vegetation. Both houses had open water on one side and emergent vegetation close by. Two occupied nesting boxes do not provide enough evidence to base recommendations for selecting the most suitable nesting box sites, but the factors contributing to their success should be kept in mind.

Three maps have been prepared which locate the nesting boxes installed during the winter of 1950-1951. These maps will be filed in the Des Moines office. Similar maps have been filed showing the location of nesting boxes installed during the winter of 1949-1950.