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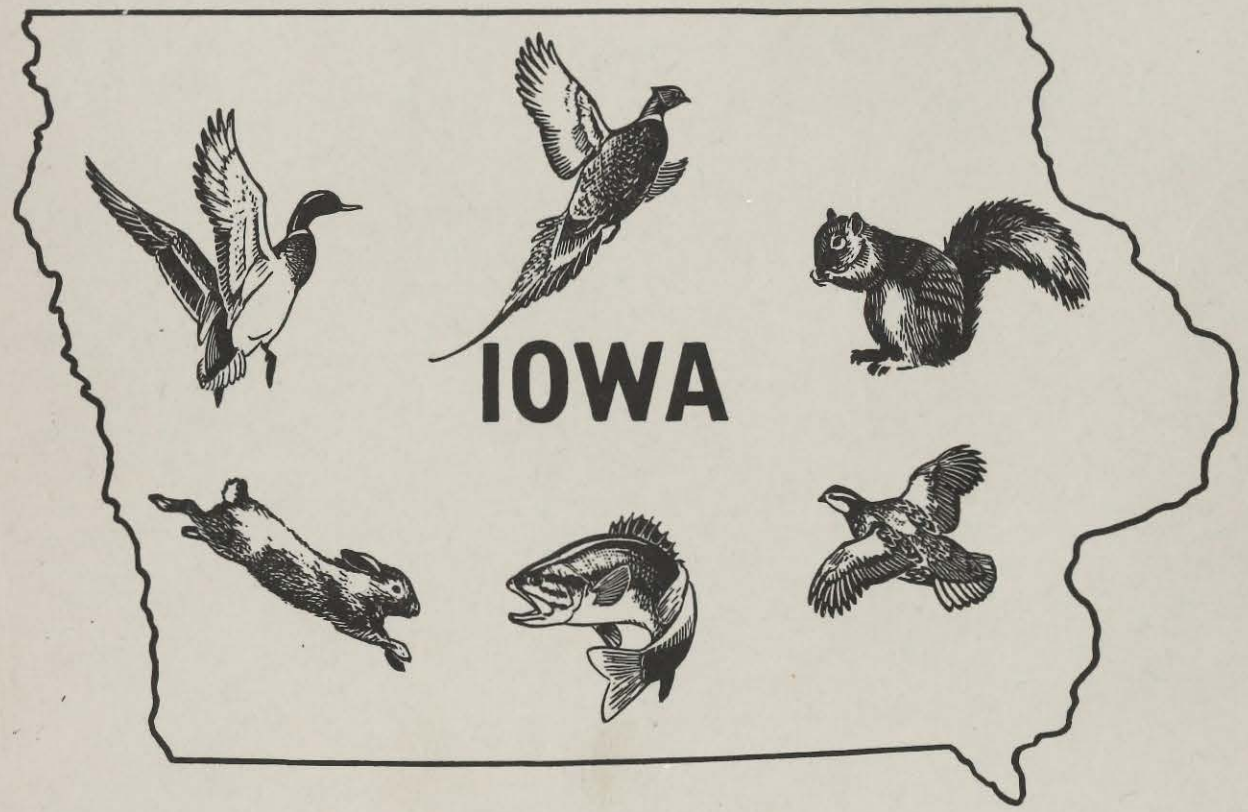

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Submitted by

Biology Section
Everett B. Speaker, Supt.

State Conservation Commission
Bruce F. Stiles, Director

Fish and Game Division
Ray W. Beckman, Chief

Des Moines, Iowa

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SUMMARY AND BRIEF ANALYSIS OF FISH TRAPPING AT THE HOTTES LAKE OUTLET, WINTER 1947-48, WITH ADDITIONAL NOTES ON MISCELLANEOUS WINTER TRAPPING OPERATIONS

Tom Moen
Fisheries Biologist

Introduction

As we endeavor to expand our knowledge of fisheries biology and thus of fisheries management, we find that the study and observation of fish during open water periods obviously does not supply all the answers. But due to the many well known handicaps, relatively little has been recorded about the biology of fish during that portion of the year when their habitat is covered by ice and snow. A few studies have been made on the winter food habits of a few species. Some work has been done on game fish and rough fish population ratios during winter seining operations. A number of papers have been concerned with the study of dissolved oxygen and the subsequent survival or winter-kill of the resident fish populations. But by and large our knowledge about what takes place under the ice covered water areas is quite meager.

The purpose of this report is not to add in any great measure to this small pool of facts but rather to present the results of several winter trapping operations in order to better evaluate possible future winter management practices. These

inlet of Spirit Lake. During periods of normal water levels these areas maintain sizeable resident populations of fish and act as important spawning areas, especially for northern pike.

One of the common practices in the management of these areas is to screen off the outlet during the open water periods to prevent the migration of undesirable fish into these spawning grounds. If a carp trap is operated in connection with the screens the undesirable fish are removed and the game species are put over the screen. In the case of northern pike the adults return in a short time and the process is reversed. The screens are removed in the fall to allow the young fish and adults freedom to return to the main lake. There is no evidence at present to indicate the extent of this fall migration but winter trapping indicates that fish migration may be fairly extensive, especially when dissolved oxygen readings are low. The migration can be detrimental as well as good; detrimental when rough fish are involved and supposedly good when game fish species are moving. It would seem that the addition or stocking of game species by this method should be geared to the needs of the lake as much as stocking from any other source.

HOTTES LAKE TRAPPING

about 10 feet. Six stop logs were removed from each side. On one side of the channel the bag portion and one throat of a large pond net (4 ft. hoops and 1½" mesh) was placed. A wooden frame with an opening two foot square was used to anchor the pond net in the stop log channels; a tail rope was used to keep the net tight. In order to sample small fish, a "box trap" was installed in the other half of the outlet channel. The box trap was 6 feet long and 2 feet square, covered with thin slats placed ¼" apart.

The daily catch of fish were counted and recorded as to species and as young or adult. Sample weights were taken from time to time. The traps were operated until March 15, 1948. Dissolved oxygen determinations were made at several stations once each week. Notes were made on air temperatures, especially when extreme changes occurred. For purposes of consolidation of the data the daily catch records of both traps were grouped into 15 day periods (Table 1 and Table 2).

These 15-day periods indicate two peaks in the catch, one during the Dec. 15-Jan. 1 period and the other during the Feb. 1-Feb. 15 period. Fairly good catches were also made both preceding and following the Dec. 15-Jan. 1 period with that 6-week period accounting for 65% of the 31,000 fish collected. Four

entirely different, at least from the construction standpoint. The most important difference lying in the fact that the box trap had a relatively dark interior thus exerting considerable influence on the species normally difficult to trap. As might be expected the bullheads were the only species that took both traps anywhere near equal numbers. There were approximately 2700 adult bullheads taken in each trap and the box trap accounted for an additional 10,823 young bullheads. Therefore another 10,000 bullheads could be counted for the large meshed trap.

Numerically the next species in importance was carp. Here we see the greatest differential in the two traps; the box trap collected less than 600 carp while the net trap caught over 6000. It is likely that relatively few young carp were lost through the net trap because young and adults were collected in about equal numbers in both traps.

Adult yellow perch and northern pike were both taken in larger numbers in the net trap with the combined totals for both traps amounting to 2480 perch and 1203 northerns. Over 3,000 young perch were taken in the box trap but no young northerns. All scale reading of northerns indicated that the smallest fish were two year olds.

Table 1. Number of fish taken with the net trap at the Hottes Lake outlet, winter of 1947-48

	Nov. 14 to Dec. 1	Dec. 1 to Dec. 15	Dec. 15 to Jan. 1	Jan. 1 to Jan. 15	Jan. 15 to Feb. 1	Feb. 1 to Feb. 15	Feb. 15 to Mar. 1	Mar. 1 to Mar. 15	Total by Species
Yg.									
Ad.	123	348	1553	381	1	301	1	2	2710
Yg.									
Ad.	275	477	896	63		6		7	1724
Yg.	5	53	110	51		2974	12	24	3229
Ad.	23	772	1362	596		410			3163
Yg.									
Ad.	26	136	396	227	1	111	1	1	899
Yg.			4					1	5
Ad.	1	30	67	18		84			200
Yg.									
Ad.						1			1
Yg.									
Ad.		1	95	18		10			124
Yg.									
Ad.	2		14	6		9			31
Yg.									
Ad.		4	5			3			12
Yg.									
Ad.		1	42	24		13			80
Yg.		1	18						19
Ad.		6				3			9
Yg.									
Ad.									
Yg.									
Ad.	1	3	3						7

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Table 1. Number of fish taken with the net trap at the Hottes Lake outlet, winter of 1947-48

Nov. 14 to Dec. 1	Dec. 1 to Dec. 15	Dec. 15 to Jan. 1	Jan. 1 to Jan. 15	Jan. 15 to Feb. 1	Feb. 1 to Feb. 15	Feb. 15 to Mar. 1	Mar. 1 to Mar. 15	Total by Species
					3			3
			2		1			3
2								2
1	1							2
7	54	132	51	0	2977	12	25	3258
452	1779	4433	1335	2	952	2	10	8965
459	1833	4565	1386	2	3929	14	35	12,223

Table 2. Number of fish taken in the box trap at the Hottes Lake outlet, winter of 1947-48.

	Nov. 26 to Dec. 1	Dec. 1 to Dec. 15	Dec. 15 to Jan. 1	Jan. 1 to Jan. 15	Jan. 15 to Feb. 1	Feb. 1 to Feb. 15	Feb. 15 to Mar. 1	Mar. 1 to Mar. 15	Total by Species
Yg.	43	1,289	6,825	1,715	3	849	56	43	10,823
Ad.		503	1,963	202	1	14			2,683
Yg.	39	52	2,231	781	11	142	2	21	3,279
Ad.		137	569	21		4		24	755
Yg.	1	3	9	6	1	241	1	3	265
Ad.		12	135	20		63			230
Yg.									
Ad.	4	82	107	71	4	36			304
Yg.		4	12	29	5	107			157
Ad.	3	3	9	2	1	8			26
Yg.									
Ad.		3	15	1	1	25	50		95
Yg.				7		12		1	20
Ad.		2	52	11		5			70
Yg.			9	11	3	47			70
Ad.			1	3		8			12
Yg.									
Ad.		3	38	12		5	4		62
Yg.		1	1	5	1	4			12
Ad.			2	9		9			20

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le 2. Number of fish taken in the box trap at the Hottes Lake outlet, winter of 1947-48.

ov. 26 to ec. 1	Dec. 1 to Dec. 15	Dec. 15 to Jan. 1	Jan. 1 to Jan. 15	Jan. 15 to Feb. 1	Feb. 1 to Feb. 15	Feb. 15 to Mar. 1	Mar. 1 to Mar. 15	Total by Species
	1							1
			1					1
	1							1
		1						1
	1	1	1		1			4
					1			1
					1			1
					2			2
83	1351	9087	2555	24	1402	59	68	14,629
7	746	2893	353	7	182	54	24	4266
90	2,097	11,980	2,908	31	1,584	113	92	18,895

were considered in computing total weights (Table 3). Eighty-three percent of the total catch of 20,695 pounds was taken in the pond net and 71% of the total catch was carp. Bullheads made up 15% of the total and northern pike and yellow perch 8% and 5% respectively. Thus these four species made up 97% of the total number and 99% of the total weight.

On Feb. 21, 1948 the fisheries management crew made a haul in the north central portion of Hottes Lake with 1000 feet of 1/2 inch mesh net. The results of this haul pointed out two important items relating to the trapping discussed above. First was the fact that the trap catches did not represent the proportion to be found in the lake. Crappies, especially young of the year, were the most numerous fish in the haul and there were as many adult large mouth bass taken as there were recorded for the traps. Secondly, a relatively small portion of the fish in Hottes Lake used the outlet that was available to them.

In the Hottes Lake trapping both the daily catches and the catches by 15-day periods varied a great deal. Just what factors or combination of factors influenced these movements remain for the most part unknown. At times there was a rather strong current into Hottes Lake and at other times the current was

Table No. 3. Pounds of each species of fish taken with the box and net traps at the Hottes Lake outlet, winter of 1947-48.

Species	Av. Wt. per 100 Fish in Pounds	No. of Fish in Sample	Pond Net: Total Fish Taken	Pond Net: Total Weight	Box Trap: Total Fish Taken	Box Trap: Total Weight
Black Bullheads (Yg.)	1.71	73			10,823	185.07
Black Bullheads (Ad. and Sub.ad.)	54.19	47	2,710	1,468.55	2,683	1,453.90
Yellow Perch (Yg.)	0.78	30			3,279	25.58
Yellow Perch (Ad.)	45.26	41	1,724	790.28	755	341.71
Northern Pike (Ad. and Sub.ad.)	145.12	9	899	1,304.63	304	441.16
Northern Pike (Yg.)	85.50	27	3,229	2,760.80	265	226.63
Carp (Ad. and Sub.ad.)	344.50	79	3,163	10,896.53	230	792.35
L. M. Bass Ad.	93.75	2	80	75.00	20	18.75
L. M. Bass (Yg.)	32.08	3	19	6.10	1	0.32
L. M. Buffalo (Sub.ad.)	197.54	6	9	17.78		
L. M. Buffalo (Yg.)	7.81	2	5	0.39	157	12.26
Crappies Ad.	34.31	4	200	68.62	26	8.92
Total Young			3,253	2,768.3	14,525	449.9
Total Adult			8,785	14,620.4	4,018	3,056.7
Total Weights			12,038	17,388.7	18,643	3,506.6
Grand Total Weight						20,895.3

cold periods but temperature and trap catches could not be correlated from the Hottes Lake data.

Dissolved oxygen determinations are the best evidence of correlation but with some reservations. The trap catches increased from mid-November to January 1. During this time the available oxygen in the central portion of the lake dropped from a reading of more than 8.0 ppm to 0.6 ppm. Both the catch and oxygen decreased from this time until about Feb. 9, at this time an increase in both oxygen and fish catch was noted. Although the oxygen increased to only 1.0 ppm the fish catch for the period of Feb. 1-15 nearly equaled the previous high for a 15-day period. As the dissolved oxygen continued to increase the fish catches dropped off sharply. Only 254 fish were taken in the next 30 days.

The pulsating currents mentioned above influenced the dissolved oxygen to a distance of at least 250 feet into Hottes Lake. This area of higher oxygen and current likely had a considerable influence on the catch of fish.

OXYGEN AND TRAP CATCHES IN OTHER AREAS

Dissolved oxygen apparently played an important role in the winter catches at other outlets. A control structure and new outlet had also been completed for Marble Lake in the summer of 1947. This channel was not opened until about one

than 1.0 ppm in Marble Lake.

Over 50% of the fish, mostly small bullheads, were found dead in the trap. The trap was removed on January 5 after about a week of work for no fish. The next spring a check of the fish killed by the low oxygen conditions revealed that the species composition was nearly like that of Hottes Lake. However, a complete kill had not taken place, although bullheads were about the only thing that survived.

During the winter of 1948-49 trapping was carried on by the fisheries management crews at Hottes and Little Spirit Lake outlets. The traps were 1½" mesh pond net bags similar to the one used in the Hottes Lake trapping in 1947-48. Only 5,295 fish were taken at the Hottes outlet in over two months of trapping. Bullheads comprised 90% of this number. The remainder of the catch was fairly well distributed among northern pike, crappies, perch and carp. The lowest oxygen reading for Hottes Lake that winter was 2.6 ppm. There was no reason to believe that the species composition or population ratios had changed much since the winter of 47-48.

The trapping at the little Spirit outlet was of shorter duration, about one month in all, mostly during the month of January. Some 26,000 fish were recorded. Stunted carp (about

immediate vicinity of the outlet.

Apparently low oxygen accounted for a catch of over 20,000 pounds of carp at the screens of the main inlet to Spirit Lake in February of 1951. Bullheads were quite abundant with small numbers of perch and northerns also present.

SUMMARY AND CONCLUSIONS

In reviewing and summarizing these trapping operations certain points seem to stand out.

1. The amount of dissolved oxygen apparently has a definite influence on the catch at these outlets. A few species tend to show some activity as the oxygen decreases but with oxygen lower than 1.0 ppm and in the absence of connecting bodies of water having higher oxygen their activity is near the zero point.

2. Carp, bullheads, perch and northern pike seem to be the species using these outlets in appreciable numbers; they are the species trapped most consistently, regardless of the oxygen readings.

3. The species and number of fish using these outlets from September to freeze-up is still unknown.

4. The number of fish caught in the traps is likely to account for only a very small portion of the fish in the lake they are moving out of.

5. Even though the catch is relatively small the value

FISHERIES INVESTIGATIONS
A Resume of a Paper Presented by E. T. Rose

Although the paper entitled "Fisheries Investigations" which was presented at the Seminar by Mr. E. T. Rose was designed largely for the administrators of the Iowa State Conservation Commission, it was felt that certain parts would be of sufficient interest to pass on to other fishery investigators and administrators. I have, therefore, with Mr. Rose's permission, made a summary to be included in this report.

E. B. Speaker
Supt. of Biology

LAKE SURVEYS

Mr. Rose pointed out that the lake inventories carried on in Iowa are comparable with those used by many of the neighboring states and provide us with information that is extremely valuable in determining the factors requisite for a good management program for the lakes. These surveys, begun in 1940, consist primarily of making sample seine hauls with 500 feet of 1/4 inch mesh nets and certain stationary gear in the major fishing lakes of the State. While the system used is considered standard, Mr. Rose pointed out that considerable more time should be spent

the larger lakes of the State.

It was Mr. Rose's recommendation that at least one additional survey crew be authorized in order that the artificial lakes in Southern Iowa receive their proper attention. At the present time most of the survey work carried on in the artificial lakes is conducted in the fall of the year and consequently an adequate sampling is not always obtained. Under the system followed for the past several years, it has been impossible to secure sufficient data on many of the lakes because of the crowded schedule. Plans have been made, however, with the fish management department to supplement efforts particularly in Southern Iowa and it is felt this will greatly increase the efficiency of the work.

Mr. Rose pointed out that more and more responsibility is being placed on the fishery investigators for information of corrective measures to improve angling and to obtain data on standing crops, populations and harvests. The influence of liberalized seasons and creel limits on these basic problems must be obtained qualitatively and quantitatively, largely by survey methods. These studies require a considerable part of the time of the present fishery biology staff.

Our anglers have increased five fold during the past fifteen

Rose stated that game fish populations are considerably increased following extensive rough fish removal. He strongly urged further studies concerning the population phenomenon of rough fishes in order that the department can continue to make recommendations on a more scientific basis to the management departments.

In summary Mr. Rose is of the opinion that we must have more accurate inventory of the fishes in the natural and artificial lakes to base recommendations of management and harvest upon.

STREAM CENSUS TECHNIQUES -- A CRITIQUE

R. E. Cleary
Fisheries Biologist

It is neither the purpose of this paper nor within the province of the author to list and analyse all the numerous publications and techniques of censusing fish populations in streams. Much has been written, but there has been little accomplished toward a practical yet reasonably accurate method of determining the fluctuations in stream fish populations. Most of the work has been confined to trout streams and small warm water streams. Rivers, however, present a far more complicated problem, and with the exception of the electric seine, which is still in the experimental stage, techniques of sampling river populations date back to the dawn of time.

Before discussing various techniques, an understanding of some of the important ecological features of river populations is in order. Unstability is a singularly important characteristic of unconfined river populations. Thompson (1933) found that buffalo, silver bass, black and white crappies, sheepshead, mud cat, bullhead and bluegills, were some of the most transient of Illinois River species. Harrison (M.S.) found that the channel catfish was a relatively stable species when tagged specimens were returned to familiar waters. The U. M. R. C. C. (1950)

in Michigan, using a 2-way fish trap, found that the common sucker, the smallmouth bass and the northern pike had two definite movement periods in April and May, and again in September and October. Bangham and Bennington (1938), working on a small stream in Ohio, found the same two movement periods in their smallmouth and common sucker populations. Tate (MS) and Cleary (MS) found that smallmouth populations in small streams move in on a rise and out on a continuous fall of the water stage. The U. M. R. C. C. (1950) states that high catches in both traps and hoop nets on the study area in the Mississippi coincide with spawning activities for the smallmouth bass, the flathead and channel cat, and the river carpsucker. This report also states that a 4-foot drop in a water stage coincides with a large influx of backwater species into the nets.

McLeod and Nemenyi (1940) found there were indications that fish are more likely to use a fishway in the Iowa River, Iowa, when the water temperature was above 65° F., and that heavy runs in the fishway coincided with rises in the water stage. Harrison and Speaker (1950), studying the use by fish of a fishway on the Des Moines River, Iowa, found that more fish entered the trap on both natural and artificial stage

Habitat preference is also a determining factor in the catchability of stream species. Thompson and Hunt (1930) and Gerking (1949) state that there is seemingly no correlation between bottom type and the standing crop of stream fishes. Gerking (op. cit.) further states that fish live in a volume of water and not in an area of water in streams, indicating that depth and current are more important than bottom type. Alan and Clark (1943) show that in a northeast Kentucky stream, most species of fish were found over a sand or gravel bottom, but hedge the data by stating that this may also be a current preference. Miller (1943), working in the Wheeler Reservoir in Alabama, ran hoop nets in four distinct localities of the impoundment. Nets set in the tail race of the upstream dam caught the most fish, but over 90% were black and white crappies. The middle reach of the impoundment, where current was still apparent but where the river overflowed its original banks to form large, shallow backwaters, had the second highest catch but had over 40% more species than found in the other three areas (the tail waters, the upper and the lower reach).

These data indicate that the best qualitative and yet adequate quantitative sample is to be found in the transitory reach of impounded streams. Eschmeyer (1943) notes that migra-

most part stream fish do not present a stable population and at some time or other they are in transit to other locales. Initiatory factors of this movement may be physiological such as spawning migration or tropic response to current, fluctuating water stages, temperature, chemicals, or light. It may also be the seeking out of more suitable habitat, movement in feeding, or just plain restlessness. Whatever the cause, this "here-today, gone-tomorrow" behavior makes it almost an impossible task for the stream biologist to get any more than haphazard trends on stream population employing any of several of the sampling techniques now in use.

Stream censusing techniques can be divided roughly into general classifications: Total standing crop surveys and random sampling. The former, because of the work involved, is limited to small streams and will be discussed in a later section of this paper. Random sampling or spot-checking various stations on rivers and streams can be broken down into two categories: Active and passive techniques of taking fish.

An active method of taking fish involves the investigator using any and all means to catch fish by his <u>own</u> efforts. This includes seining, angling, poisoning, etc. Embody (1939) advocated the use of cresol to chemically stun the fish of a

Embody (1939) diverted a trout stream and counted the fish trapped in the old channel, while Needham and Rayner (1939) pumped sections of a trout stream practically dry and poisoned out the remaining pools. The above mentioned techniques were all experimental in nature but the work and time involved prevented these methods from evolving from the purely experimental into the practical stage.

Hoover (1938), working on small trout streams, blocked off portions and with drag seines and a large crew attempted to complete removal inside the blocked-off area. His efforts varied with the type of bottom. The technique called for the most obvious obstructions to seining to be removed from the stream, and his efforts varied from 70% to 100% effective. He used the mark and recapture method plus dynamite to arrive at the efficiency figures. Gerking (1949), working on a small, warm water stream in Indiana, arrived at an 88% efficiency determination with a drag seine. Despite the high seining efficiencies in these operations, and the theory that the seine is relatively non-selective, the technique is of a very questionable worth when applied to large streams or rivers. Obstructions such as snags, boulders and the like, rock ledges, uneven bottoms, current, and the varied escape actions of the

year, crappies the next, and catfish the next. More often than not, due to the prefidious nature of fish, the net comes in empty or with just a tubful for a 500-foot piece of web. It is felt that this changing occupation dominance is due to one species occupying the concentration point in advance of another and remaining there for the winter, or that several species move in and out of the same concentration point at different times during the winter.

In overflow ponds this is apparent, but for another reason. An early high water period favors the occupation of certain ponds almost completely by buffalo, an early spawner. While in other years, when the high water comes late in the spring, these same ponds are occupied almost exclusively by carp, a late spring or early summer spawner.

The second group of techniques to spot check stream populations involves passive fishing in which the fish entraps itself. The investigator sets various types of throated nets, wire or wooden traps, gill nets or trammel nets, and the movement activities of the fish cause it to become ensnared or entrapped. With the exception of the gill net and trammel net, which may be floated with the current, all other gear are set in fixed positions.

nets, experimental or standard. When floating the trammel or gill nets, the same limitations and obstructions which hinder seining also limit these operations.

The common name for webbed traps vary from area to area, and rather than describe each piece of equipment, the names used in the following discussion are those standardized and described in the Proceedings of the second annual meeting of the U. M. R. CC., Jan. 28, 1946. Little has been accomplished in testing the efficiency of the various types of webbed traps. However, the U. M. R. CC. (1948), in a preliminary report on test netting in the northern section of the river, state that the trap net has proved to be an efficient and yet relatively non-selective type of gear. Being equipped with a shore lead, it is difficult to fish in swift water. For this type of environment they suggest the use of a buffalo net or plain hoop net. Scott (1949) found that in a small, clear stream hoop nets were more effective than were wire traps, and that the wing net's efficiency was greatly impaired by trash lodging against the wings. Miller (1943) found that hoop nets set in the tail race of a dam failed to catch proportionate shares of white bass, sauger, largemouth, and gar, which were known to occur in great numbers in the race at certain times of the year. Hansen (1944)

baskets were equally effective in some areas but varied in others, the location of the set being the determining factor. These types of gear were found to be most effective in quiet water. He found that hoop nets and wire baskets were ineffective to the taking of centrachids and gizzard shad. A permanent wier and trap took the blue cat quite effectively but failed to show the heavy populations of flathead and channel cat found in the immediate area of the trap in a subsequent poisoning operation. This indicates a lack of movement in the two species.

In our investigation of Eastern Iowa streams we have found the trap net, despite its limitations, to be the most effective method of taking a qualitative and yet quantitative sample of fish. The use of steel lead and net stakes permit its use over any bottom except bed rock, and moderately swift water can be fished by a diagonal set. The set is relatively ineffective during a flood or after the leaves begin to drop, as the nets are either torn out or plugged with trash. Hoop nets, without leads or frames and set in deep water are highly selective to the taking of catfish and suckers. Occasionally centrachids and carp are taken in these sets, but their numbers are far from indicative of the actual population. These nets can be fished either with bait or without. Baited nets are more effective

a reasonably accurate method of checking trends in stream fish populations. Harrison (1948) found that fish use the fishway roughly in proportion to species composition found in the area immediately below the dam, indicating that fishways are non-selective, at least to larger species of fish. McLeod and Nemenyi (1940) found that 50% of the fish using the fishway passed into the trap by June 1st and 80% by July 15. Although not stated, this movement corresponds with the spring stage rise and with the known spawning dates of the fish using the fishway. This feature would tend to rush the survey party during the months of heavy usage.

Restrictions to the general use of fishways as census techniques are numerous but not insurmountable since most streams in the state have a sufficient number of dams scattered throughout their various reaches. The use of identical gear, i. e. fishways and traps, in several areas of a river should provide for a comparison of relative abundance of individual species, even though data on the total abundance cannot be obtained. There would be a tremendous initial expense in setting up these fishways and even after the fishways were put in and made as attractive as possible, they would need constant remedial maintenance to keep them functioning properly

the return of tagged fish in a sample. Harrison (1951) tagged 4032 channel cat internally, and in three years' time he examined 35,000 specimens of which only 95, or 2.1%, were tagged. He states that marking fish offers little in a streamwise inventory of channel cat. Thompson (1933) recovered 124 tagged river species from a tagged sample of 6815 in a 5-year period. He was however working on migration and not popuation estimates. Of 3500 tagged channel cats in the Mississippi River (U. M. R. CC. - 1950) a total of 264 were returned in a 3-year period and most of the returns were, as in Thompson's study, made by commerical fishermen. Tate (MS) tagged 243 smallmouth bass in several small streams and retook 23 mostly through his own angling efforts. The indications therefore are that population estimations on tagged stream fish will be limited by the small number of returns and the difficulty encountered in getting the stream angler to return the tags and other data on his untagged catch. It has been found very difficult to make a mark and recapture estimation of stream populations here in Northeast Iowa, due to variations in populations entering or exiting the survey area. A 10% return in five days netting is considered very high, and estimations of populations are severely limited by daily net

To secure data on the standing crop of a stream, a complete or nearly complete fish removal program should be used. By covering an entire stream the errors of random sampling can be minimized. At present the most effective method is the use of electric fishing gear, however, the limitations of this method confine its use to small, relatively shallow, clear-water streams. For this reason most stream shocking surveys have been confined to trout streams. Most of the pioneer work in the United States was accomplished with an alternating current electric generator. At present many states are experimenting with direct current shockers and report they prefer this method to the alternating current shockers (Omand, 1950). Smith et al (1949), Haskell (1940), and others worked on complete standing crop estimation on trout streams using an alternating current shocker. They report that streams up to 50 feet wide with holes 8 feet in depth were successfully sampled. Rayner (1949), in pointing out some of the advantages of D. C. shocker over an A. C. machine, states that the effective range is slightly less in a D. C. machine but the narcotized fish being attracted to the positive pole or grid makes the manner of collecting stunned fish much more efficient. His experiments show that interrupted direct current (lifting one electrode out of the water or the

"seine" found turbidity to be the main limiting factor. He lists other general limitations as:

1. Equipment is cumbersome and costly.
2. The method is effective only in narrow, shallow, clear streams.
3. The effectiveness of the method varies with the chemical content of the water.
4. The method is potentially dangerous (to the survey party).

In experimenting with the electric seine, Funk (op. cit.) found that the method was more efficient on large fish and after blocking off three sections of a large stream, he found its effectiveness to vary from 42% to 16% depending on the turbidity, depth, type of bottom and velocity of current. Joeris (1949), working with a similar type of electric seine found it functioned best in clear water less than four feet deep, but without a blocking seine the fish moved ahead and out of the stunning range of the seine.

The possibility occurs that with the use of a direct current generator, a seine or series of grids would attract fish from their hiding place and hold them concentrated around the positive poles. This would not only facilitate collecting but tend

whereas one will tend to balance the limitations of another. However, unless a reasonably accurate understanding of the nature of the various populations under investigation is to be had, the most efficient methods of collecting will either fail to produce or their production will lead to entirely erroneous assumptions as to the density of certain populations.

If reasonably accurate quantitative yet qualitative information on trends in major river populations is desired, the fishway with appending trap, if properly installed, should give the best results. A combination of trap and hoop net sets will give indications as to quantitative and qualitative populations on a sample area during the time of the investigation only. The same applies to the electric seine and the standard webbed seine. This information is comparable on an annual basis only if all the physical and biological factors are constant or nearly so at each visitation. A great number of sampling stations on a restricted watershed would tend to minimize this error.

Where certain factors prohibit large or numerous survey parties and a multitude of gear, it would be more practical to work on only one or two species of fish, those receiving the heaviest angling pressure. Specialized gear to take these species can be used and this gear can be fished during the

becomes more of value with each year's experience, can play an important part in determining unverified changes in the rivers and streams he works on. It's an occupational disease for a technician to question his data. This hypercritical tendency causes him to rationalize the findings and in some cases completely ignore their apparent obviousness. It is a simple, safe and acceptable procedure to base conclusions on positive data. However, in lieu of positive data, casual observations, negative findings, and all sorts of tie-ins which come with experience, should be given some position of credibility and acceptability.

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CHANNEL CATFISH POPULATION STUDIES WITH NOTES ON VARIOUS COLLECTING DEVICES AND THEIR EFFECTIVENESS

Harry M. Harrison
Fisheries Biologist

For the past six years studies on the populations of channel catfish living in the Des Moines River watershed have been followed during the open water season of the year. In this work an effort has been made to get information concerning the size of the population and to follow its trends be it up, down or static. Concomitant with this work we have been seeking out ever-better techniques for sampling catfish populations.

Our successes to this time have not been striking, however, some of the results when treated in a certain manner seem to fit into a pattern which may be of satisfactory utility. Our failures, on the other hand, although much more pronounced and conclusive may also be considered as a positive gain to the investigation as we have learned to know what is possible in large stream and river work. By knowing this, we have been able to streamline our surveys to the point that much unnecessary work and techniques of questionable utility have been despenced with and more time has become available for studying special problems.

The purpose of this report is to bring our catfish survey

population work adequately to get figures that have the resemblance of being reliable. A search of the literature early in the investigation revealed that adequate sampling techniques had not yet been devised. Hence, in order to determine the best sampling methods for the particular problem at hand, sampling techniques were studied on a trial and error basis. These involved the use of drag seines of various dimensions, trap nets, box or basket traps and baited hoop nets. A brief discussion of the success encountered with each of these devices follows.

Because of a combination of swift current, irregular bottoms and the large volume of debris such as snags, piles of driftwood, wire and boulders in some areas littering the stream, drag seines were eliminated as collecting devices, soon after the study was initiated.

Trap nets exhibited little success, because of the difficulty of holding them in position in those areas where catfish normally move. On those sets made, floating debris soon filled the leads causing them to roll, and in such circumstance the trap net lost its effectiveness.

The box or basket traps were used for two summers with irregular results. Occasionally these devices took large numbers of fish, but then only as individual sets. The indications

catches could be guaranteed even if the right factors for catching catfish exhibited themselves. Partly because of this and because box traps are bulky to transport, their use has been done away with.

From the standpoint of effectiveness the baited hoop net took catfish in larger numbers and more consistently than any other gear. However, to be effectual, stream conditions had to be "just about so-so"for trapping fish and the netting sights had to be selected with much care. Much of our early work centered around perfecting the techniques for setting hoop nets and accounting for their everchanging efficiency. In view of this it is felt that much of our beginning data may be considerably warped through the inexperience of knowing the "wheres and whens" of setting hoop nets. This will be mentioned again later in the report where the catch records are discussed.

The technique for setting the hoop net was found to be largely a function of locating the net in stream with respect to an array of variable factors. In the early spring during low water temperatures and high river stages, sets along the bank took the perpounderance of fish while channel sets or those along middle of the river islands usually failed. Many of the best catches during this time of year were taken within 3 to 4

With the warming trend of spring and falling water stages, nets moved into the main channel or thread of the current started to catch more and more fish, and continued to do so until the on-set of June floods, at which time bank sets caught the more fish again. Because of the persistance of this situation year after year it is felt that during periods of extremely high water, i.e. spring thaws and June floods, the most lucrative sets are those made adjacent to the river banks while channel or thread of the current sets are better for times of lower water.

Traps set on a river raise always caught many more fish than those on falling waters. This had been demonstrated many times during the course of study. Catfish seem to be very sensitive to changing water levels. Nets catching few to no fish during receding waters would suddenly fill up with even a slight raise. Several times, a raise of an inch or two was sufficient to produce good catches.

With the leveling off of river stages after the June floods and during the low summer waters that follow, hoop nets rarely if ever take fish in substantial numbers. This is felt to be a condition of static river stages, warm and clearer waters. Of course, these are factors that cannot be manipulated, and it

young of the year and sub-adults, fish four to 13 or 14 inches in total length. At this time of year the correct location of the net in the river is a critical consideration. An area selected for fall netting is thoroughly sounded out to find its deepest pool. When this is located the net is carefully set so that it rests at the very bottom of that pool. If care is taken in setting the net and good sites are found, excellent catches can be assured year after year, if catfish are present.

By way of interest it is pointed out that in one of our fall sets we have taken as many as 3,600 fish in a single net in 24 hours time, and in the Humboldt pond, nets set in three pools caught on the average of four fish per net hour during our fall studies on that area in 1949 and 1950.

Hoop nets set in the fall continue to work well up until the formation of surface ice at which time there is an abrupt stoppage of catfish movement and any subsequent trapping meets with no success.

A part from the thermal, seasonal and varying water stages, there are a couple of other functions affecting hoop net catches. The most important of these is affiliated with the spawning season. This usually comes between June 20 and July 10. At this time and only then hoop nets are particularly effective

An additional consideration in hoop netting is that of locating the hoop net with respect to cover areas. By and large, it can be said that nets should never be set too close to cover, neither should they be too far away. Without postulating the reasons it has been generally the case that nets set in cover do not take the number of fish that those set a few feet away. In our work we like to place the nets with their openings or throats ten to twenty feet up-stream from cover areas and the nets are always set with their throats opening down stream.

The various baits used in this study consisted of cheese trimming, cut bait, corn and several varieties of commercial catfish baits. Considering the factors of effectiveness, ease of handling and expense, cheese trimmings out-ranked all others. The use of the cheese is simply a matter of packing one or two pounds of it into bags made of one-half inch mesh web and then to tie the bag in the rear portion of the net. This bait was usually sufficient to last from five to ten days.

In order to get information relative to the size or trends in the population, techniques involving tagging, finclipping and catch per unit of effort have been used throughout the course of the investigation. Of the three, the technique of catch

to the small returns of marked fish, there is some reason to believe that catfish, at least, become more secreative after marking. Extensive fin clipping work near Humboldt has without exception resulted in a larger retake of clipped fish a season later than during the time the clipping operation was in progress. This, even though the clipped fish were being returned to the water at the site in which they were netted.

Because of the changing success of hoop net catches from one set of conditions to another and from season to season, a study of catfish population will have to take this into consideration. Otherwise, such things as a fall or summer catch compared to a spring catch or vice versa may and very well could indicate trends of higher or lower populations in the reverse of that which actually exists. For example, a catch of one fish in ten net hour's time in August may come from a bigger population than a catch of one fish an hour in the spring or two fish an hour in the fall. Similarly a catch made on a rise in the spring cannot be compared to a drop in water levels during the same period.

For the reasons that our spring work has consistently been carried on over wider areas and because our catches are quite uniformly good at that time of year, only the results

in each county, are given. Keepers are considered catfish of sufficient size to be creeled, and depending upon their body condition include fish from ten to twelve inches in total length and up. Fiddlers are smaller fish. Our spring surveys are arbitrarily considered those beginning at the time the ice goes out and lasting until the fish stop using the nets in the early summer or at the time the water stages have leveled off after the June floods.

TABLE I. Channel Catfish Trapping Records For The Des Moines River Watershed, Spring 1951.

County	Fish Caught	Total Net Hours	Fish % Net Hour	Number of Keepers	Number of Fiddlers	No. of Coll. Made in Co.
Emmet	11	568	.01	11	--	1
Palo Alto	9	584	.01	9	--	1
Pocahontas	20	680	.02	18	2	1
Humboldt	2,658	6,178	.43	487	2,671	7
Webster	487	1,539	.31	277	210	1
Boone	322	604	.53	105	217	1
Polk	532	549	.99	112	420	2
Kossuth	6	576	.01	6	--	1
Total	4,045	11,278	.35	1,025	3,520	15

TABLE II. Channel Catfish Trapping Records For The Des Moines River Watershed, Spring, 1950.

County	Fish Caught	Total Net Hours	Fish % Net Hour	Number of Keepers	Number of Fiddlers	No. of Coll. Made in Co.
Emmet	45	1,310	.01	26	19	1
Palo Alto	13	584	.02	12	1	1
Pocahontas	316	570	.55	89	227	1
Humboldt	1,443	4,126	.34	116	1,327	5
Webster	--	--	--	--	--	-
Boone	530	1,516	.34	201	329	2

TABLE III. Channel Catfish Trapping Records For The Des Moines River Watershed, Spring, 1949.

County	Fish Caught	Total Net Hours	Fish % Net Hour	Number of Keepers	Number of Fiddlers	No. of Coll. Made in Co.
Emmet	--	--	--	--	--	-
Palo Alto	--	--	--	--	--	-
Pocahontas	125	590	.19	29	96	1
Humboldt	3,595	5,522	.65	175	3,420	6
Webster	68	827	.08	53	15	1
Boone	188	660	.28	33	155	1
Polk	16	566	.03	5	11	1
Kossuth	172	704	.24	71	101	1
Total	4,164	8,869	.47	366	3,488	11

TABLE IV. Channel Catfish Trapping Records For The Des Moines River Watershed, Spring 1948.

County	Fish Caught	Total Net Hours	Fish % Net Hour	Number of Keepers	Number of Fiddlers	No. of Coll. Made in Co.
Emmet	219	592	.37	77	142	1
Palo Alto	7	560	.01	3	4	1
Pocahontas	71	642	.11	35	46	1
Humboldt	2,730	7,006	.39	130	2,600	6
Webster	225	734	.30	54	171	1
Boone	136	780	.21	92	44	1
Polk	166	1,034	.16	31	135	2
Kossuth	--	--	--	--	--	-
Total	3,554	11,348	.31	422	3,142	13

TABLE V. Channel Catfish Trapping Records For The Des Moines River Watershed, Spring 1947.

County	Fish Caught	Total Net Hours	Fish % Net Hour	Number of Keepers	Number of Fiddlers	No. of Coll. Made in Co.
Emmet	21	670	.03	11	10	1
Palo Alto	--	--	--	--	--	-
Pocahontas	32	560	.06	22	10	1
Humboldt	1,035	2,874	.36	105	930	5
Webster	--	--	--	--	--	-
Boone	149	1,566	.09	31	118	3
Polk	91	966	.10	31	60	2
Kossuth	144	1,028	.14	45	99	2
Total	1,472	7,064	.21	245	1,227	14

TABLE VI. Channel Catfish Trapping Records For The Des Moines River Watershed, Spring, 1946.

County	Fish Caught	Total Net Hours	Fish % Net Hours	Number of Keepers	Number of Fiddlers	No. of Coll. Made In Co.
Emmet	16	586	.02	8	8	1
Palo Alto	85	574	.15	54	31	1
Pocahontas	18	534	.03	16	2	1
Humboldt	544	3,226	.17	59	485	6
Webster	75	604	.11	15	60	1
Boone	202	1,820	.11	69	153	3
Polk	85	990	.09	27	58	2
Kossuth	12	586	.01	3	9	1
Total	1,037	8,930	.11	251	806	16

Discussion of the Data

During our spring netting operations catfish were taken at a rate of from about one fish in ten hours up to a fish and a half an hour. The Tables show the lower figure, however, in case of the bigger catch, the grouping of the data by counties reduced the maximum catches by averaging them in with lesser ones.

Comes now the question if this difference is too great for any utility especially so when differences of this magnitude occurs within the same population. The situation has occurred many times when netting operations were meeting with no success, have suddenly "boomed" with increase in water stage. Although the Tables do not demonstrate that phenomena, they do show very irradic changes for the same areas from year to year. In the case of Emmet County, for example, we see the catch about one

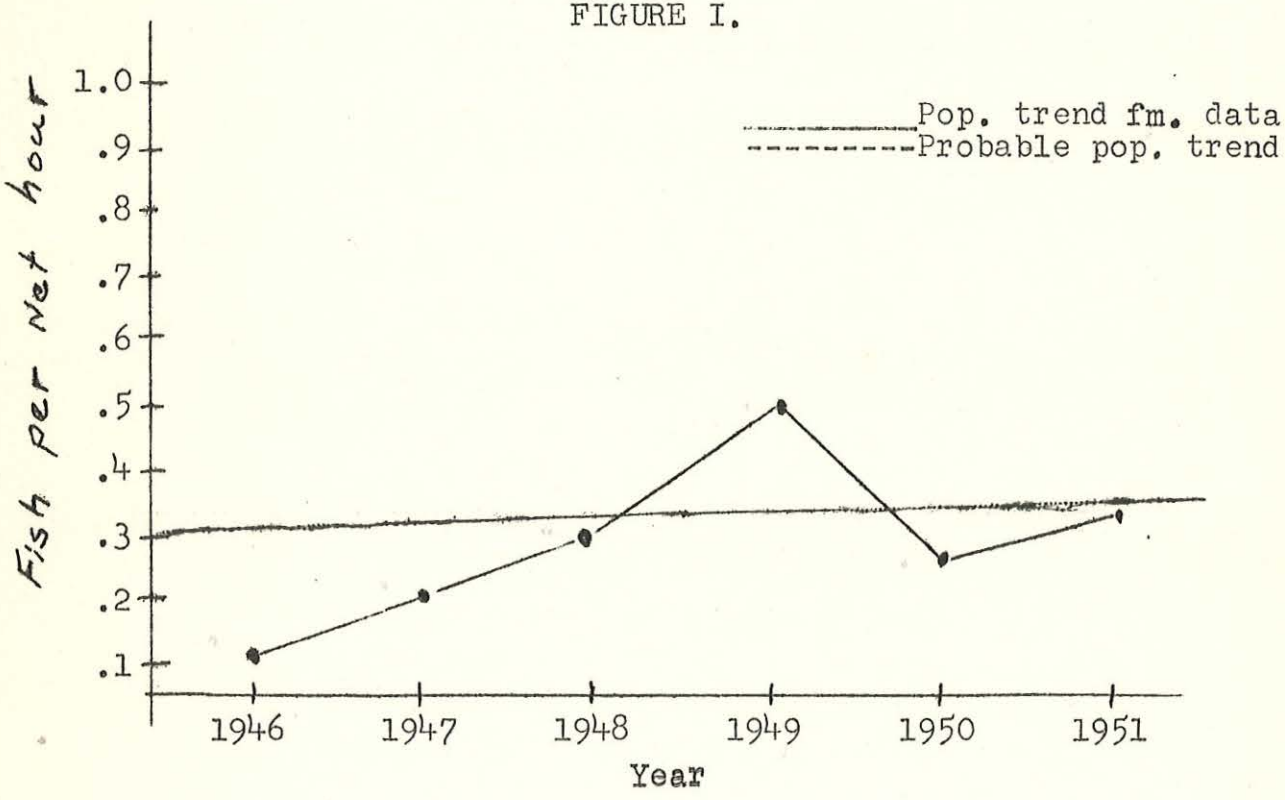
to changes in river conditions which make netting operations better or poorer. The only recourse to correcting those variences is that of longer netting periods. The logic of this argument is seen in the case of the Humboldt County data. Because there are two forks, the main stem and an impoundment in the Des Moines River in that county, we have more sampling stations and fish a greater part of the year there. This presents better chances of having the nets in during good fishing conditions and in turn has always enhanced the over-all catch. Now, there is no question but what Humboldt county has always had good catfish population, but excellent catches have been made upon occassion on other areas. This too leads to the belief that good catfish populations are not the exception in other areas of the Des Moines.

Because of the many exceptions that appear in hoop net catches and for the reasons that larger samples make for more creditable results, it is felt from the work at hand that the best analysis for the catfish populations in the Des Moines River is that of the total year's catch. These figures appear in the tables and from those tables the catch per net hour is pictured in graphic form in Figure I.

From a study of Figure I., catfish populations, at least

resulted in poor catches for those years. A dry spring in 1950 with fewer river rises explain the drop in the population for that year. Considering these factors, the dotted line probably more nearly indicates the population trends for the period of study 1946-51. This line indicates nearly static population figures. From pole and line fishing success and other empirical data there is nothing to indicate any other condition.

FIGURE I.



IOWA WATERFOWL SEASON AND REGULATIONS - 1951

James G. Sieh
Game Biologist

The 1951 waterfowl season opened throughout the state on October 12th and closed on November 25th. Shooting was allowed opening day from noon until one hour before sunset. Each day thereafter the season opened one-half hour before sunrise and closed one hour before sunset.*

The bag limit of ducks was four (4) per day; and the possession limit after the first day, eight (8), with only one (1) wood duck in possession at any time.

The bag and possession limit of geese was four (4). Not more than two (2) of the limit could have been Canada, Hutchins', Cackling, or White-fronted geese. Two (2) of any of the above may have been included in the limit. The entire bag could have been made up of either blue or snow geese or any combination of them.

The bag and possession limit of coot and mudhen was ten(10).

There was no open season on wilson or jack snipe, woodcock, grebe, rails (except coot) and gallinules, mourning dove, and swan.

The 1948, 1949, and 1950 waterfowl seasons and regulations were much the same except for minor changes in opening and

on October 21st and closed on November 29th. In 1950 the season opened on October 20th and closed November 23rd.

WATERFOWL BAG CHECKS

The Iowa Conservation Commission requested conservation officers to make waterfowl bag checks for the 1951 open season by completing tally cards. This was the fourth year this program was undertaken to determine the waterfowl kill situation in Iowa during the open season.

Conservation officers checked 9,955 hunters in the field and returned 1050 cards representing 77 counties in the state (Table I). This, by no means, indicated all the waterfowl killed in Iowa during the 1951 open season. It does, however, provide a measure of the kill in 1951, and data comparable with that of the 1948, 1949, and 1950 kill samples. Officers returned 541 cards representing 72 counties in 1948, 651 cards representing 72 counties in 1949, and 644 cards representing 71 counties in 1950.

THE 1951 WATERFOWL KILL SAMPLE IN IOWA

the State Conservation Commission has investigated the waterfowl kill in Iowa during each open season since 1948. The 1951 kill sample was larger than any previous sample taken, and from a hunter standpoint indicated the most successful waterfowl season since the study was initiated. This study has

In 1951 the total recorded kill sample of 13,870 birds included sixteen species of ducks and mergansers. This sample compared favorably with the kill sample of 4,666 birds in 1950, 5,906 birds in 1949, and 6,085 birds in 1948. This year (1951) only 469 geese of three species fell below the exceptional 1949 goose kill which was represented by 740 birds. In 1950 only 441 geese were recorded from the waterfowl bag check cards, and in 1948 only 206 were sampled.

Mallards totaled 53.0% of the aggregate kill sample and were represented by 7,354 birds in 1951. In 1950 mallards totaled 50.2% of the kill or 2,344 birds; in 1949 this species represented 46.3% of the kill or 2,735 birds; and in 1948 reached 54.7% of the kill sample totaling 3,327 birds. It is obvious that the mallard is by far the most important species of waterfowl to the Iowa hunter and has maintained first place of numerical importance in the kill sample.

In 1951 blue-winged teal were again second in numerical importance according to the officers' bag checks, and totaled 10.8% of the recorded kill or 1,502 birds. In 1950 this species represented 13.7% of the kill or 637 birds; in 1949 represented 11.7% of the kill or 691 birds. In 1948 the blue-winged teal represented only a small 2.9% of the sample or 174 birds. The

1951 when the waterfowl season opened respectively on October 21st, October 20th, and on October 12th. In 1948, when the waterfowl season opened nine days later on November 29th, the blue-winged teal harvest was approximately 9.0% less according to the officers' bag checks. This would indicate that the later opening date probably resulted in the reduced harvest of blue-wings in 1948.

Pintails reached third place in numerical importance in the kill sample for the first time in 1951. This season (1951) pintails accounted for 9.0% of the total kill sample or 1,252 birds. In 1950 this species represented 6.2% of the kill sample; in 1949 reached 10.9% or 643 birds; and in 1948 comprised 8.9% of the kill sample or 546 birds. From these data it can be concluded that this species can be expected to contribute about 9.0% of the kill sample in Iowa during a successful open season.

Green-winged teal dropped to fourth place in numerical importance representing 6.4% of the kill sample or 885 birds in 1951. During the 1950 open season this species represented 8.6% of the kill sample or 399 birds; 11.4% of the kill sample or 671 birds in 1949; and 12.6% or 766 birds in 1948. Green-winged teal have shown a continuous percentage decrease since

resented by 787 birds in 1951. In 1950 this species contributed 7.5% of the sample or 351 birds; 5.4% or 317 birds in 1949; and 7.2% or 439 birds during the 1948 bag check.

Wood ducks retained sixth place in numerical importance in the 1951 kill sample representing 3.3% of the kill sample or 464 birds. In 1950 this species represented 3.2% of the kill or 148 birds. In 1949 wood ducks totaled 2.3% of the kill sample or 133 birds, and 1.9% of the kill or 114 birds in 1948. Waterfowl bag checks have indicated an increased harvest of wood ducks for four (4) consecutive years. It is probable that this also indicates an increased population of wood ducks and/or greater abundance of the species in the state during the open season.

The remaining eleven species of ducks and mergansers represented in aggregate 12% of the total kill sample in 1951 and in 1949. In 1950 these same species in aggregate represented 10.6% of the kill sample, and 11.8% of the sample in 1948. None of these eleven species of ducks or mergansers exceeded 1.9% of the total kill sample in 1951, nor 2.1% of the sample in 1950. In 1949 none of these same species exceeded 3.2% of the recorded sample, nor 2.9% during the 1948 open season. It is apparent that there has been little change in the percentage

were represented by 27.2% of the kill sample in 1951. No white-fronted geese were reported in the 1951 or 1948 kill samples. Nine white-fronts were reported from the 1949 bag checks, and only 1 was reported in 1950.

The average hunter in Iowa bagged one duck in 1.87 hours of hunting in 1951. In 1950 the same average hunter required 4.1 hours of hunting to kill one duck, 3.2 hours were required in 1949, and 2.3 hours in 1948. The 1951 waterfowl season was by far the most successful duck harvest recorded since 1948 (figure 2). Goose hunting was slightly poorer in 1951 requiring the average hunter 52 hunting hours to kill a goose which in 1950 required 41.1 hours afield. In 1949 the same average hunter required only 25.4 hunting hours to kill a goose which in 1948 required 67.6 hours afield.

Hunters who had taken nothing averaged 2.1 hours in the field when checked by conservation officers in 1951, 3.3 hours in the field in 1950, 2.8 hours in 1949, and 2.2 hours in 1948. Throughout the state, conservation officers checked 9,944 hunters who had hunted 25,430 hours during the 1951 open season, and 5,170 hunters who had hunted 19,132 hours during the 1950 open season. Officers checked more hunters, 5,862 in 1949, who had hunted fewer hours, or 18,802 hours in 1949. In 1948

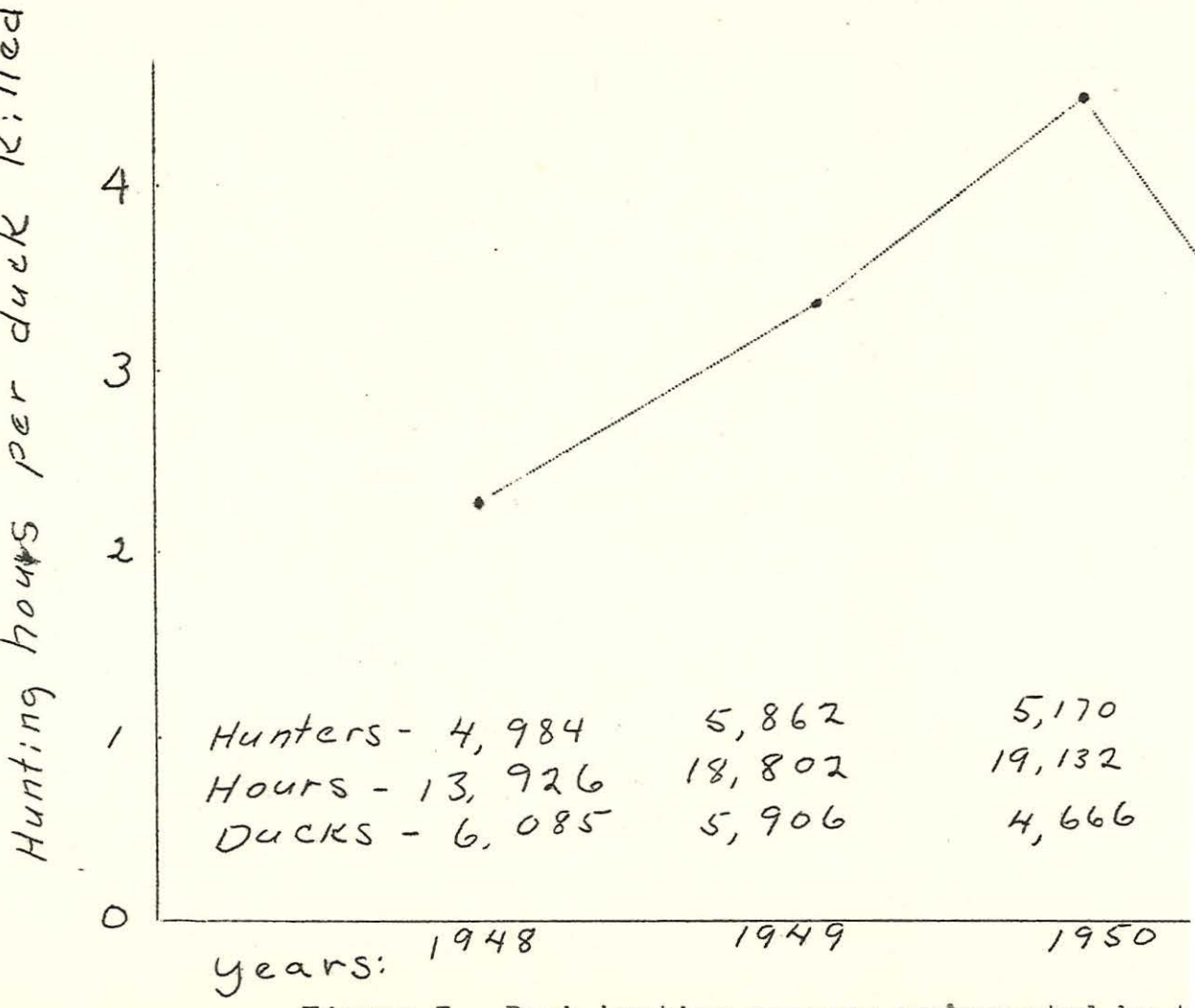


Figure I. Duck hunting success represented by t
hours required to kill one duck during the 1948,
and 1951 open seasons in Iowa.

Conservation officers checked 1,907 two-man hunting parties this season (1951), 979 two-man parties in 1950, 951 two-man parties in 1949, and 822 such parties in 1948. This year 1,198 persons were checked hunting alone compared with 572 one-man parties last year, and 523 one-man parties in 1949. In 1948 there were 700 one-man parties checked. In 1951 there were 800 three-man hunting parties compared with 434 last year, 494 in 1949, and 417 checked in 1948. Larger groups were still the exception, and very few parties numbering eight or more hunters were checked this season.

The data compiled during the last four waterfowl seasons have indicated that mallards provide approximately one-half of the total ducks harvested in Iowa. Blue-winged teal have maintained second place in numerical importance in the 1949, 1950 and 1951 kill samples. In 1948 this species represented only 2.9% of the kill sample indicating that blue-wings can be expected to represent about 12% of the aggregate kill sample when the waterfowl season opens on or before October 20th in Iowa. Green-winged teal have shown a continuous percentage decrease since 1948, while the sample kill of wood ducks has shown a continuous percentage increase. An increased harvest of any waterfowl species in Iowa indicates that more hunting

Conservation officers have contributed to the waterfowl program by completing and returning their waterfowl bag checks each year. If waterfowl shooting in the State of Iowa is to be improved, more complete waterfowl bag checks will help and are needed. All conservation officers are again urged to contribute to this study as generously as possible.

TABLE I
RECAPITULATION OF DUCK KILL BY COUNTY

	Adair	Allamakee	Appanoose	Benton	Black Hawk	Bremer	Buchanan	Buena Vista	Butler	Calhoun	Cedar
Total Number Hunters Checked:	8	279	185	32	29	75	162	292	53	377	7
Total Number of Hours Hunted	11	1088	526	49	88	295	192	607	107	484	10
None Taken:											
Number of Hunters		34	20	16	8	10	26	99	14	238	3
Hours Hunted		122	40	25	28	26	36	119	19	296	1
Mallard	5	121	197	8	13	74	40	275	9	139	2
Black Duck		31	13					1			1
Gadwall		1		1		3		1		6	3
Baldpate		17		1		2				1	
Pintail	2	57	8	3		6	2	55		36	
G.W. Teal		20	5	1	2	31	16	31		7	
B. W. Teal		42	31	7		6	9	70	16	16	2
Shoveller		5						21		2	
Wood Duck		46	14	5	6	28	6	5	1	5	
Redhead	3			1			1	9			
Ring-necked		2	17					1			
Canvas-back		4					2			14	
Blue-bill		3	9	2		3	54	15			
Golden-eye											
Bufflehead									1		
Ruddy Duck				1			4	1	3		
Merganser							2				
TOTAL DUCKS	10	349	294	30	21	153	136	485	30	226	8
Canada Geese		1	28				2	5			
Blue Geese			5					12			
Snow Geese								14			
W. F. Geese											
Other Geese											
TOTAL GEESE		1	33				2	31			

TABLE I CONT'D

RECAPITULATION OF DUCK KILL BY COUNTY

	Clinton	Crawford	Dallas	Davis	Decatur	Delaware	Des Moines	Dickinson	Dubuque	Emmet	Fayette
Total Number Hunters Checked:	25		35	23	11	36	188	279	186	367	12
Total Number of Hours Hunted	52		111	38	14	40	518	655	431	459	18
None Taken:											
Number of Hunters	6		18	2	2		27	29	103	81	6
Hours Hunted	5		47	1	2		78	34	214	96	8
Mallard	49		17	26	6	8	256	420	32	174	3
Black Duck								5	2		
Gadwall				3			9	1	1	3	
Baldpate							13			3	
Pintail							18	41	8	30	
G.W. Teal			6			5		24	2	59	1
B. W. Teal			4			2	4	70	5	96	3
Shoveller								9		6	
Wood Duck				4		5	2	5	10	11	1
Redhead				4			1	34	3	3	
Ring-necked							6	5		5	
Canvas-back	1					1	8	29	8	8	
Blue-bill	5				9	2	12	15	16	13	
Golden-eye								9	4	2	
Bufflehead	1								3		
Ruddy Duck								2	2	2	
Merganser								2	2		
TOTAL DUCKS	56		27	37	15	23	329	671	98	415	8
Canada Geese							4	4	1		
Blue Geese							1		3	1	
Snow Geese	1								1		
W. F. Geese											
Other Geese											
TOTAL GEESE	1						5	4	5	1	

TABLE I CONT'D
RECAPITULATION OF DUCK KILI BY COUNTY

	Grundy	Guthrie	Hamilton	Hancock	Harrison	Howard	Humboldt	Iowa	Jackson	Jasper	Jefferson
Total Number Hunters Checked:	35	151	269	154	77	30	10	21	253	100	48
Total Number of Hours Hunted	61	440	1229	378	497	41	15	43	857	144	28
None Taken:											
Number of Hunters	9	67	88	39	8	6		5	20	33	21
Hours Hunted	19	200	480	86	32	9		11	46	33	12
Mallard	14	70	142	79	101	25	16	18	331	44	8
Black Duck				2					14	3	2
Gadwall		6	4		5				12	4	
Baldpate		1	1		1		1		50		
Pintail	2	7	8	13	16	7	2	1	48	9	
G.W. Teal	2	6	30	16	20				4	8	
B.W. Teal	1	22	41	87	1	1		3	23	1	
Shoveller		3	14	8	2				6	1	
Wood Duck		6	10	8	5	3		2	46	2	
Redhead		2	4	6	13				1		1
Ring-necked		1	1		4				23		
Canvas-back		1		1	1					1	2
Blue-bill		5	10	3	5				33	14	24
Golden-eye									2		
Bufflehead									1		
Ruddy Duck			1	4	6				6		
Merganser			4					2			
TOTAL DUCKS	19	130	270	227	180	36	19	26	600	87	37
Canada Geese		2			11						
Blue Geese	7	3	2		1	2	2			2	
Snow Geese	4	4			1	1				1	
W. F. Geese											
Other Geese											
TOTAL GEESE	11	9	2		13	3	2			3	

TABLE I CONT'D
RECAPITULATION OF DUCK KILL BY COUNTY

	Lee	Linn	Louisa	Lucas	Lyon	Madison	Mahaska	Marion	Marshall	Mitchell	Monona
Total Number Hunters Checked:	208	41	432	98	23	13	56	83	145	202	191
Total Number of Hours Hunted	608	53	712	237	34	14	92	127	588	276	255
None Taken:											
Number of Hunters	30	5	29	2		3	2	31	60	44	27
Hours Hunted	60	4	49	4		1	9	39	220	58	27
Mallard	214	30	965	97	52	11	31	32	41	110	64
Black Duck			2	1						4	1
Gadwall	4		21		2		1			1	2
Baldpate	3	2	9							2	6
Pintail	36	5	35	7			1		18	34	34
G.W. Teal	53	23	1	23			3		7		28
B. W. Teal	60	5	11		2	2	4	5	8	1	55
Shoveller	2		4								5
Wood Duck	4	7	26	1			1	2	5	14	7
Redhead			13	17			6			17	9
Ring-necked			1	14			2				2
Canvas-back	35	2	9	12				1		1	
Blue-bill	10		43	32			3	5		17	21
Golden-eye			1	3				1			
Bufflehead											
Ruddy Duck							2	1			1
Merganser	2			1					2		
TOTAL DUCKS	423	74	1141	208	56	13	54	47	81	201	235
Canada Geese	7	8		2						7	3
Blue Geese	8	6		4			3	4	5	9	
Snow Geese	2	2		1					2	5	11
W. F. Geese											
Other Geese											
TOTAL GEESE	17	16		7			3	4	7	21	14

TABLE I CONT'D

RECAPITUATION OF DUCK KILL BY COUNTY

	Pocahontas	Polk	Potta-wattamie	Poweshiek	Sac	Scott	Sioux	Story	Tama	Wapello	Warren	Washington	Wayne	Winneshiek	Winnebago	Woodbury
Total Number Hunters Checked:	75	206	65	16	329	112	100	144	45	57	6	20	52	3	251	32
Total Number of Hours Hunted	68	271	89	9	417	271	151	223	80	114	8	14	211	11	925	70
None Taken:																
Number of Hunters	4	71		6	103	28	26	12	20	15	2	3	7		29	9
Hours Hunted	5	92		4	99	56	34	20	38	30	2	3	18		84	17
Mallard	41	91	40	18	153	56	50	67	7	31	3	10	37		241	15
Black Duck	1	2				3		1							29	
Gadwall	3	1			4	3	2			2						
Baldpate	7	2	4		7			1							37	
Pintail	15	29	2		23	27	6	25	3				2		37	17
G. W. Teal	16	4			24	15	24	5	1	2		1	5		8	6
B. W. Teal	2	16	14		65	18	4	76	10	16				3	109	5
Shoveller	4	5			6	2	2	2							3	1
Wood Duck	3	9	6		5	1		6	8	3		1	1	2	24	
Redhead			23		14		2	2		2			1			
Ring-necked			15		1		1	8								
Canvas-back		1	28		3	1		4					3			
Blue-bill	8	19	22	2	33	30	13	17		10	1	2	17		14	
Golden-eye					2	4										
Bufflehead																
Ruddy Duck								1		2					3	
Merganser									1	2						
TOTAL DUCKS	100	179	154	20	340	160	104	215	30	70	4	14	66	5	505	47
Canada Geese			1		3	7										2
Blue Geese		2	12		4		8	12	4	1						1
Snow Geese			8		3			17								2
W. F. Geese																
Other Geese																
TOTAL GEESE		2	21		10	7	8	29	4	1						7

COMBINED TOTALS AND PERCENTAGES
1948-1949-1950-1951
TABLE II

	Total Recorded Kill By Species 1948	Total Recorded Kill By Species 1949	Total Recorded Kill By Species 1950	Total Recorded Kill By Species 1951
Hunters Seen Bags Not Checked		3,413	2,807	6,800
Size of Hunting Party 1	700	523	572	1,198
(man) 2	822	951	979	1,907
" 3	417	494	434	800
" 4	215	274	192	362
five (5) or more than 5	91	134	91	207
Total Number of Hunters	4,984	5,862	5,170	9,955
Total Hours Hunted	13,926	18,802	19,132	25,419
None Taken:				
Number of Hunters	1,463	2,021	1,921	2,368
Hours Hunted	3,171	5,563	6,340	5,029
Mallard	3,327	2,735	2,344	7,354
Black Duck	38	26	71	168
Gadwall	120	185	98	207
Baldpate	58	34	50	231
Pintail	546	643	291	1,252
G.W. Teal	766	670	399	885
B.W. Teal	174	691	637	1,502
Shoveller	175	192	91	244
Wood Duck	114	133	148	464
Redhead	102	79	62	264
Ring-necked	48	52	26	138
Canvas-back	47	94	43	229
Blue-bill	439	317	351	787
Golden-eye	21	7	9	36
Bufflehead	30	11	9	10
Ruddy Duck	61	24	19	70
Merganser	19	13	18	29
TOTAL DUCKS	6,085	5,906	4,666	13,870
Canada Geese	39	159	73	127
Blue Geese	84	380	181	214
Snow Geese	70	189	180	128
W.F. Geese		9	7	

COMBINED TOTALS AND PERCENTAGES
1948-1949-1950-1951
TABLE II CONT'D

Species	Total Recorded Kill by Percent 1948	Total Recorded Kill by Percent 1949	Total Recorded Kill by Percent 1950	Total Recorded Kill by Percent 1951
Mallard	54.7%	46.3%	50.2%	53.0%
Black Duck	0.6	0.4	1.5	1.2
Gadwall	2.0	3.1	2.1	1.5
Baldpate	0.9	0.6	1.1	1.7
Pintail	8.9	10.9	6.2	9.0
G.W. Teal	12.6	11.4	8.6	6.4
B.W. Teal	2.9	11.7	13.7	10.8
Shoveller	2.9	3.2	1.9	1.8
Wood Duck	1.9	2.3	3.2	3.3
Redhead	1.7	1.3	1.3	1.9
Ring-necked	0.8	0.9	0.6	1.0
Canvas-back	0.8	1.6	0.9	1.6
Blue-bill	7.2	5.4	7.5	5.7
Golden-eye	0.3	0.1	0.2	0.3
Bufflehead	0.5	0.2	0.2	0.1
Ruddy Duck	1.0	0.4	0.4	0.5
Merganser	0.3	0.2	0.4	0.2
TOTAL DUCKS	100.0%	100.0%	100.0%	100.0%
Canada Geese	19.0%	21.5%	16.6%	27.2%
Blue Geese	41.5	51.3	41.7	45.6
Snow Geese	33.1	25.6	41.5	27.2
W.F. Geese		1.2	0.2	
Other Geese	6.4	0.4		
TOTAL GEESE	100.0%	100.0%	100.0%	100.0%

FORNEY LAKE GAME MANAGEMENT AREA

Lester F. Faber
Supt. of Federal Aid

Forney Lake in Fremont County was set up as a game management area during the 1951 waterfowl season. A controlled hunting system similar to that of 1950 was put into operation.

Twenty-five three men blinds were set up on the 400 acres open to public shooting. These blinds were allocated by mail reservations and all blinds not so reserved were filled on a first come first served basis at the area headquarters.

Letters seeking reservations were accepted and processed at the central office between September 1st and October 1st. After October 1st, all records were transferred to the area headquarters and all requests were processed there. As in 1950, an applicant was given not more than two dates, and party size limited to three men and not less than two if anyone was waiting to hunt.

Only two changes were made in the system followed in 1950. First, a charge of $.50 per man per day was made. Second, two men were employed to administer the project on the area instead of one.

It was felt that the controlled hunting system was a benefit to relatively few people from a small portion of the State, and that a fee should be charged to help pay the added costs

costs are broken into two phases. Administration costs include clerical help and supervisory personnel. Operational costs include installation and maintenance of blinds and other facilities. Costs listed below do not include postage, stationery, mimeographed material, etc.

Administrative Costs

Clerical help to process 523 pieces of mail for thirty days was 138 hours at $.75 per hour or $103.50.

Two lake patrolmen were assigned to process reservations, assign blinds, check licenses and hunter take, and general supervision. Two months salary and expenses for each man was charged against the project.

Clerical Help Costs.....	$ 103.50
Supervisory Costs.....	1,106.64
Total Administration.....	1,210.14

Operational Costs

Costs for installation and maintenance of blinds and for maintenance of a headquarters for 55 days are as follows:

Labor - Installation.....	$450.00	(45 days at $10.00)
Labor - Maintenance.....	357.00	(51 days at $7.00)
Materials.....	97.58	
Mileage.....	107.26	
Total Operational	$1,011.84	

$.50 per man the income was $914.50. This number of hunters represents only 54% of maximum use or 16% below the 70% utilization experienced in 1950. Even had the area been used 70% an income of $1,181.00 would still have been only about half enough to pay the bill.

Since weather, either good or bad, will always be a factor affecting the use of an area further consideration must be given to the amount of the fee charged for hunting if it is intended that the system pay for itself.

This year bad weather in the form of high winds and icing conditions seriously reduced the use of the area. The following table shows the extent of utilization during the 1951 season.

Table 1
Area Utilization

Percent Utilization	Number Days	Accumulative Days
0-20	7	7
21-40	12	19
41-60	10	29
61-80	10	39
81-100	6	45

Based on the number of reservations on hand by opening day, the area should be 80% utilized barring either too good or too bad weather.

as in 1950, everyone who came to the area to hunt was able to find blind space available. Average number of men per blind was 2.4, the same as last year.

In an effort to determine the residence of hunters using Forney Lake, all cards were checked for address of the individual representing the party. Of the 768 hunting parties who used the areas 735 are counted. The remaining 33 were listed without their address.

The 735 parties came from 49 Iowa towns and from Omaha. The 49 towns were in 26 different counties.

This picture gives only a general idea as to actual use by different people since it does not consider repeats. A further check will be made of this point because it is important to know the number of individuals this area is serving under the controlled hunting system. Of the 633 Iowa parties, 349 were from Pottawattamie County. These are not different people. Many are repeats since there was plenty of space this year for hunters without reservations.

Hunting Success

The 1,829 hunters bagged 2,099 ducks and coots and lost 460. They bagged 75 geese and lost 3. Each hunter was required to have his take checked and tally cards kept. Since all cards did not contain complete data, the following inform-

compares with 57% with ducks and 43% without ducks in 1950.

The 1,661 hunters brought in 1,841 ducks, 82 coots and 69 geese. Hereinafter, the total of ducks and coots will be used in discussing birds per hunters, hours per bird, etc.

The average hunter took home 1.15 ducks for his days effort. It required six hours to bag each duck and the average hunter hunted 6 hours and 38 minutes per trip. The figure 1.15 ducks per hunter per day represents a 30% increase in ducks per hunter per day over 1950, and the 6 hours per bird meant a 30% decrease in the amount of required time to bag each bird.

Hunters discussing their comparative success on Forney Lake could say that they enjoyed better than average hunting on 22 days, about average on 3 days and poorer than average on 18 days. They could also say that they enjoyed better than average hunting for two consecutive weeks between October 26th and November 11th.

In a later report more attention will be given weather, and ice conditions to obtain a more complete picture on hunter use and waterfowl migration.

Species Composition-1951

The following table shows species composition of ducks and coots during the season.

Species	Percentage in bag
Mallard	58.0
Lesser Scaup	10.0
Pintail	8.0
Red Head	4.0
Green Wing Teal	3.0
Gadwall	3.0
Blue Wing Teal	2.0
Shoveller	3.0
Ringneck	2.0
Baldpate	2.0
Ruddy Duck	1.0
Wood Duck	0.5
Canvas Back	0.5
White Winged Scoter	Present
Black Mallard	" - 0.5
Buffle Head	"
Merganser	0.5
Coots	4.0

The only significant change from the species composition reported in 1950 was a 5% increase in Lesser Scaup over 1950 and a 4% decrease in the number of blue wing teal taken.

Of the 69 geese taken 32 were snow geese, 23 blue geese, 7 white fronts, 5 Canadian geese and 2 Hutchins or Lesser Canada. Identification uncertain on the last two.

One gun accident occurred to mar the two season record. One man had an old gun from which the safety had been removed. While leaning on the gun with both hands over the muzzle, an accidental discharge badly maimed one of this mans hands while only scratching the other.

JULY AGE-RATIO AND ROADSIDE RABBIT COUNTS - 1951.

Glen C. Sanderson
Game Biologist

Although there are indications that Iowa's rabbit population has recovered somewhat from its very low levels of two years ago it is still of much interest and concern to Iowa sportsmen and professional wild-lifers. Sanderson (1951c) reports a statewide increase of approximately 16 per cent in the cottontail population from February 1950 to February 1951 based on counts made by Conservation Commission personnel during those months. The majority of the rabbit hunters reported last fall that they believed the rabbit population was higher than it was in the fall of 1949 (Sanderson, 1951d). Results of the May 1951 mail carrier rabbit surveys indicate a statewide increase of 133 per cent in the rabbit population over the previous year (Sanderson, 1951a) although it was pointed out that the late appearance of spring vegetation in 1951 might partially explain the increased number of rabbits seen. The July 1951 mail carrier reports indicate a population level slightly lower than the level indicated by reports made in July 1950 (Sanderson, 1951b).

In the above reports the possibility of a good spring population being followed by a low mid-summer population due

least a few more years until we can better evaluate the results and see which ones give the most consistent results. Of course, there is always the possibility, or probability, that the rabbit population level fluctuates drastically and that the population trends in different areas are moving in different directions at the same time. Thus the data may be more accurate than we realize, even though at times they appear to be inconsistent on the surface.

This report presents the results of the July roadside counts made July 15-28, 1951 and results of the age-ratio counts made during the period July 1-31, 1951, by conservation officers and members of the biology section. A total of 2,292.3 miles was driven in 61 counties during the roadside survey and 895 rabbits were seen. There were 5,025 rabbits from 85 counties reported as to age during the survey. The July roadside and age-ratio counts were begun in July 1951. For methods and details of the first counts refer to Sanderson (1950).

RESULTS

The results of the roadside drives are shown for each individual county in Table 1. The data are shown this way so that the actual figures will always be available, although county by county comparisons are not usually valid because of

each 10 miles of driving are shown by Table 2. The figures show a state-wide average density of 3.9 rabbits seen per 10 miles of driving - the range varying from 2.1 for region III (northeast) to 7.9 for region VIII (south central). A comparison of the population densities for 1950 and 1951, as shown by this table, indicates a state-wide average decrease of nine per cent in the population density from July 1950 to July 1951. This is very nearly the same as the state-wide average decrease of six per cent indicated by the July 1951 mail carrier reports over the previous year, although region by region comparisons do not agree (Sanderson, 1951b). The variations range from a 42 per cent increase in region IV (west central) to a 57 per cent decrease in region IX (southeast).

Table 3 presents the age-ratio information reported by the conservation officers and members of the biology section. The rabbits were classified as young or adult according to size with observers asked to list the doubtful ones as age unknown. Apparently in most cases there was not too much difficulty in identifying the two age groups. Only 438 (8.7 per cent) of 5,463 rabbits observed were listed as age unknown. This is similar to the seven per cent listed as age unknown during the July 1950 age-ratio counts (Sanderson, 1950). There were

TABLE 1.--Results of the summer roadside rabbit counts made by conservation officers and members of the biology section in July 1951.

County	Miles	No. R. Seen	R / 10 Mi.	County	Miles	No. R. Seen	R / 10 Mi.
Scott	40	12	3.0	Union	xx	xx	xxx
Dubuque	45	3	0.7	Mills	40	3	0.8
Hancock	62*	16	2.6	Winnebago	78*	33	4.1
Des Moines	35	4	1.1	Sioux	27	38	14.1
Guthrie	40.3	43	10.7	Muscatine	45	2	0.4
Buchanan	21	7	3.3	Mahaska	33*	15	4.7
Lee	30	10	3.3	Humboldt	37	6	1.6
Fayette	36	3	0.8	Tama	36	11	3.1
Appanoose	27	21	7.8	Wapello	29	12	4.1
Jefferson	33	5	1.5	Dickinson	41	9	2.2
Osceola	78*	53	6.8	Hardin	39	9	2.3
Monona	16	19	11.9	Decatur**	xx	xx	xxx
Howard	32	4	1.3	Iowa	24	26	10.8
Pottawattamie	20	15	7.5	Buena Vista	34	15	4.4
Calhoun	28.5	36	12.6	Cerro Gordo	40	9	2.3
Butler	24	6	2.5	Kossuth	47	9	1.9
Warren	32	24	7.5	Black Hawk	39	5	1.3
Marshall	22	13	5.9	Woodbury	40	17	4.3
Lucas	30	19	6.3	Cass	40	34	8.5
Poweshiek	34.5	3	0.9	Madison	20	22	11.0
Sac	40	17	4.3	Boone	31	10	3.2
Polk	35	14	4.0	Keokuk	39	3	0.8
Clay	64*	30	4.7	Davis	27	7	2.6
Clinton	42	7	1.7	Jones	59.3	28	4.7
Shelby	26	11	4.2	Delaware	34	21	6.2
Emmet	34	7	2.1	Palo Alto	7	11	15.7
Allamakee	38	9	2.3	Bremer	39	5	1.3
Linn	72.3*	41	5.7	Chickasaw	38	10	2.6
Page	25	20	8.0	Dallas	38	9	2.4
Cedar	40	13	3.3	Story	xx	xx	xxx
Mitchell	37.5	3	0.8	Benton	31	3	1.0
Greene	79*	4	0.5	O'Brien	32	21	6.6

* Two drives made.
** Observer reported that he failed to receive the instructions.

TABLE 2.--A comparison of the relative population densities by regions, as determined by the average number of rabbits seen per 10 miles in July 1950 and 1951.

AGRICULTURAL AREA	Miles Driven		R / 10 Miles		Total No. R. Seen		Percentage Increase or Decrease
	1950	1951	1950	1951	1950	1951	
I	292	317	4.2	5.8	123	184	38+
II	319.5	325.5	4.0	2.5	135	82	38-
III	351	322	1.8	2.1	63	67	17+
IV	304	269.8	3.8	5.4	116	147	42+
V	228.2	235.5	4.3	2.9	98	69	33-
VI	339.2	353.6	3.4	3.7	117	132	9+
VII	133	125	6.7	5.8	90	72	13-
VIII	198	109	7.7	7.9	152	86	3+
IX	227.4	225	5.8	2.5	131	56	57-
STATE TOTAL	2392.3	2282.4			1,025	895	
STATE AVERAGE			4.3	3.9			9-

then it seems that the July 1951 roadside counts should have shown an increase over the 1950 counts, since the number of young per adult was essentially the same for the two years. Since the data indicate a slight decline in rabbit numbers instead of an increase during this period, there must be an explanation for it. This explanation may be inadequate data, or there may have been a heavier adult mortality after February 1951 than there was in 1950.

It must be borne in mind that the July age-ratio counts take into account only the young from the first nesting peak. In a "normal" year this first peak is probably the important one in cottontail reproduction; however, in a year with a late

TABLE 3.--Results of the July 1951 rabbit age-ratio counts made by conservation officers and members of the biology section.

County	Rabbits Seen: Ads	Young	Age Unk	No. reported as to age	Young per adult
Adair	40	61	0	101	1.5
Adams	xx	xx	xx	xxx	xxx
Allamakee	38	18	0	56	0.5
Appanoose	59	168	9	227	2.8
Audubon	xx	xx	xx	xx	xxx
Benton	12	29	2	41	2.4
Black Hawk	30	42	0	72	1.4
Boone	15	15	6	30	1.0
Bremer	13	23	0	36	1.8
Buchanan	13	26	1	39	2.0
Buena Vista	46	97	18	143	2.1
Butler	18	41	10	59	2.3
Calhoun	13	34	18	47	2.5
Carroll	10	10	7	20	1.0
Cass	34	82	17	116	2.4
Cedar	8	38	3	46	4.8
Cerro Gordo	32	61	5	93	1.9
Cherokee	xx	xx	xx	xx	xxx
Chickasaw	3	18	4	21	6.0
Clarke	xx	xx	xx	xx	xxx
Clay	48	91	10	139	1.9
Clayton	34	22	0	56	0.6
Clinton	6	28	5	34	4.7
Crawford	7	18	5	25	2.6
Dallas	7	41	2	48	5.9
Davis	0	11	5	11	---
Decatur	xx	xx	xx	xx	xxx
Delaware	6	19	7	25	3.2
Des Moines	11	32	2	43	2.9
Dickinson	35	110	9	145	3.1
Dubuque	7	3	0	10	0.4
Emmet	18	43	0	61	2.4
Fayette	4	14	4	18	3.5
Floyd	6	8	1	14	1.3
Franklin	3	13	2	16	4.3
Fremont	22	44	0	66	2.0
Greene	8	6	3	14	0.8
Grundy	8	17	8	25	2.1
Guthrie	30	46	0	76	1.5
Hamilton	21	28	0	49	1.3
Hancock	22	34	2	56	1.5

Table 3 cont.

	Rabbits Seen				
	Ads.	Young	Age Unk	No. reported as to age	Young per adult
Johnson	7	7	0	14	1.0
Jones	17	48	5	65	2.8
Keokuk	6	12	9	18	2.0
Kossuth	32	63	0	95	2.0
Lee	35	78	1	113	2.2
Linn	23	121	10	144	5.3
Louisa	1	8	0	9	8.0
Lucas	28	48	10	76	1.7
Lyon	xx	xx	xx	xx	xxx
Madison	15	70	6	85	4.7
Mahaska	2	4	0	6	2.0
Marion	xx	xx	xx	xx	xxx
Marshall	29	78	24	107	2.7
Mills	47	70	0	117	1.5
Mitchell	15	9	6	24	0.6
Monona	20	40	9	60	2.0
Monroe	xx	xx	xx	xx	xxx
Montgomery	xx	xx	xx	xx	xxx
Muscatine	2	10	0	12	5.0
O'Brien	7	21	2	28	3.0
Osceola	116	198	41	314	1.7
Page	41	76	0	117	1.9
Palo Alto	25	34	3	59	1.4
Plymouth	xx	xx	xx	xx	xxx
Pocahontas	13	18	2	31	1.4
Polk	3	47	0	50	15.7
Pottawattamie	89	85	0	174	1.0
Poweshiek	4	21	2	25	5.3
Ringgold	xx	xx	xx	xx	xxx
Sac	31	60	0	91	1.9
Scott	18	23	2	41	1.3
Shelby	7	25	5	32	3.6
Sioux	55	39	17	94	0.7
Story	10	17	2	27	1.7
Tama	8	20	2	28	2.5
Taylor	xx	xx	xx	xx	xxx
Union	xx	xx	xx	xx	xxx
Van Buren	xx	xx	xx	xx	xxx
Wapello	15	92	11	117	6.1
Warren	24	71	9	95	3.0

month. However, the age ratios obtained from leg bones saved by cooperating hunters should help to shed some light on the relative importance of the two cottontail nesting periods.

It appears that there may be an inverse correlation between February population densities and July age-ratios, and a direct correlation between July population densities and age-ratios (Table 4). The data seem to indicate that counties with lower February population densities had a greater number of young per adult during July than did counties with higher February population densities. The reverse appears to be true for July population densities, because counties that had the lower July levels had a lower number of young per adult than counties that had the higher densities. This apparent correlation may be the result of inadequate information rather than a real correlation and should be used with caution until more data are available.

Age ratios for each agricultural area are shown in Table 5. These data do not indicate a correlation between February or July population densities and July age-ratios on an area basis. Perhaps this indicates that there is too much variation in the rabbit populations of the various counties within each of the agricultural areas to consider each of them as a unit.

The results of this survey indicate that on a state-wide

TABLE 4.--A comparison of February and July roadside densities and number of young per adult during July.

February 1951[1]		July 1951	
R. / 10 miles	No. young per adult* (during July)	R. / 10 miles	No. young per adult*
0.0-0.9	2.2	0.0-0.9	1.6
1.0-1.9	2.2	1.0-1.9	2.0
2.0-2.9	2.1	2.0-2.9	1.9
3.0-3.9	2.0	3.0-3.9	2.1
4.0-4.9	1.8	4.0-4.9	2.4
5.0 & over	1.6	5.0 & over	2.0

1 Feb. roadside densities based on information in Sanderson (1951).
* All counties falling within each density class are averaged together for age-ratio information.

TABLE 5.--Number of young per adult for each agricultural area based on July 1951 age-ratio reports.

AREA	Young per adult	Feb. 1951 density (R. seen / 10 mi.)	July 1951 den. (R. seen/10 mi.)
I	1.8	2.7	5.8
II	1.8	3.7	2.5
III	1.2	1.6	2.1
IV	1.6	3.0	5.4
V	2.2	2.4	2.9
VI	3.1	1.6	3.7
VII	1.5	3.9	5.8
VIII	2.5	3.2	7.9
IX	3.6	1.8	2.5
STATE AVERAGE	2.0	2.9	3.9

these verbal reports, it would seem to indicate that the second peak in production of young was unusually important to the 1951 rabbit crop.

SUMMARY

1. Results of the July 1951 roadside rabbit drives made by conservation officers and members of the biology section are presented.

2. Nearly 2,300 miles were driven in 61 counties during the survey and 895 rabbits were seen.

3. The figures reveal a state-wide average density of 3.9 rabbits seen per 10 miles of driving.

4. A state-wide average decrease of nine per cent in the rabbit population density from July 1950 to July 1951 is indicated by the results of this survey.

5. Results of the July 1951 age-ratio counts made by conservation officers and members of the biology section are presented.

6. More than 5,000 rabbits from 85 counties were reported as to age.

7. There were 2.0 young per adult reported form July 1951 as compared to 2.1 young per adult during the same period for the previous year.

8. It appears that there may be an inverse correlation between

the various counties within each area to consider each one as a unit.

REFERENCES

Sanderson, Glen C. 1950. The rabbit situation - 1950. Fourth Biology Seminar Reprts, Oct. 10, 1950, 10 pp. (mimeo).

---------- 1951a. Mail Carrier Rabbit Surveys: Results of the May 1951 survey. Report submitted to the Conservation Commission July 2, 1951, 7 pp. (typed).

---------- 1951b. Mail Carrier Rabbit Surveys: Results of the July 30-August 4, 1951 survey. Report submitted to the Conservation Commission Oct. 5, 1951, 7 pp. (typed).

---------- 1951c. Pre-breeding rabbit survey - 1951. Report submitted to the Conservation Commission May 17, 1951, 3 pp., 3 tables (typed).

---------- 1951d. Sex and age ratios of cottontails in the bag and hunter-success as reported by hunters, 1950-51. Report submitted to the Conservation Commission May 10, 1951, 7 pp. 8 tables (typed).

THE 1951 BOBWHITE HUNTING SEASON IN IOWA

Elden Stempel
Game Biologist

The 1951 quail hunting season was open from November 1, 1951 through November 15, 1951 in fifteen border counties, and November 1 through December 15 in thirty-six counties. Shooting hours were from 8:30 A.M. until 4:30 P.M. Bag limit and possession limit were six quail.

Data in this report was gathered by the assistance of conservation officers, other department personnel and interested sportsmen. Returns are incomplete. Additions will be made when all cards are received.

Weather Background 1951

Heavy snow occurred late in the winter. Spring was at least three weeks late in developing.

The Open Season

The following border counties had an open season of 15 days:

Adair	Clayton	Guthrie
Adams	Dallas	Marshall
Allamakee	Delaware	Page
Blackhawk	Dubuque	Polk
Buchanan	Fayette	Winneshiek

Counties in the long season zone include:

Appanoose	Iowa	Louisa	Scott

Quail Contact Cards

Quail contact cards were sent before the season to officers in the quail range. Hunters were contacted by officers and the following information was placed on the card. Date, county hunted, number of hunters, whether hunters were local or non-local, number of hours the party hunted, whether or not a dog was used, number of coveys flushed, number of quail killed, and whether hunting success was the same, better or poorer than in 1950.

Quail wings were also collected when hunter contacts were made. Date of collection was also kept on some wings in order to determine the approximate date that most quail were hatched in 1951. 318 cards have been returned to date.

Results of the Quail Seasons as Indicated Since 1945 by Quail hunter Reports as Recorded on Contact Cards

	No. Hunters	Hrs. Hunted	Bag	No. of Coveys	H.P.Q.
1946	703	2610	2514		
1947	1544	6032	4121	1262	1.0
1948	1887	6838	4075	1358	1.6
1949	1424	5041	2538	895	1.9
1950	1252	4088	2548	953	1.6
1951	725	2028.4	1025	378	1.9

Over the entire quail range, 16% more time was required for bagging one quail in 1951 than was required in 1950. The

1951 Quail Hunting

County	Parties	Hunters	Hunter Hrs.	Coveys	Quail
Southwest District					
Adair	10	25		10	42
Adams	10	22		19	49
Page					
Taylor					
Totals	20	47	173.6	29	91
South Central District					
Appanoose	52	140		100	336
Clarke	13	31		15	29
Decatur	23	65		23	58
Lucas	25	63		42	116
Madison	16	48		21	51
Marion	3	8		3	5
Monroe					
Ringgold					
Union					
Warren	13	36		23	66
Wayne	14	33		29	64
Totals	158	424	1285	254	720
Southeast District					
Davis	25	64		45	145
Des Moines	15	34		16	29
Henry	14	28		13	26
Jefferson	2	2		1	2
Keokuk	4	12		5	15
Lee	26	51		32	88
Louisa					
Mahaska	10	25		11	34
Van Buren	12	25		20	49
Wapello	6	14		5	13

1951 Quail Hunting Cont'd

County	Parties	Hunters	Hunter Hrs.	Covey	Quail
Northeast District					
Allamakee					
Blackhawk	6	15		3	10
Buchanan					
Clayton					
Delaware	3	5		1	3
Dubuque					
Fayette	2	6		2	3
Winneshiek	1	2		0	0
Totals	12	28	58.6	6	16
Central District					
Dallas	1	2		0	0
Jasper	5	8		5	15
Marshall					
Polk	10	22		9	26
Poweshiek	6	16		5	30
Tama					
Totals	22	48	123.9	19	71
East Central District					
Benton					
Cedar	1	2		0	0
Clinton	2	6		2	7
Iowa					
Jackson					
Johnson					
Jones	3	6		5	8
Linn					
Muscatine					
Scott	3	8		3	3

1951 Quail Hunting

Table of Hunting Success by Agricultural Districts
for the years 1949, 1950, 1951

District	Hours per Quail		
	1949	1950	1951
South Central	2.6	1.5	2.1
South East	1.4	1.5	2.4
East Central	2.5	1.2	2.1
Southwest	2.5	2.8	1.9
Central	4.4	2.2	1.7
Northeast		18.0	3.6

Hunting Success by Periods

November 1951, began with cover unusually heavy, and little corn was picked. Quail were hard to find. In 1950 the season was dry and birds were ranging limited areas near large creeks or other water sources.

A random selection of cards in 1950 showed little variation in success throughout the season. In 1951 success ran from 2.2 hunter hrs. per quail during the first two weeks of November, 3 hrs. per quail November 16 to 30, and 1.8 hrs. per bird December 1 to December 15.

Use of Dogs

In 1949, 75% of hunters interviewed used dogs. In 1950, 75% used dogs for hunting quail, and in 1951, 68% were reported using dogs in hunting quail.

Hunters using dogs averaged 1.8 party hrs. per cover and those

The Age Composition of Quail

From ages determined by a sample of quail wings, it was indicated that during the period November 1-16, 81% of birds killed were hatched in 1951. During the period November 16-30, 88% of quail killed were young birds. In December 83% of quail killed were hatched in 1951.

Seasonal Distribution of Interviews

60% of parties interviewed were contacted by officers during the first two weeks in November. 16% of the interviews were made November 16-30, and the balance of the interviews were made in December.

Wayne County Individual Quail Hunter Report

One quail hunter in Wayne County has voluntarily turned in a report of his party's hunting for 1950 and 1951.

Table Showing an Individuals Hunting Success, 1950-1951 Wayne County

	1950	1951
Average hunter per trip	2.1	2.4
Hunter hours	121.8	126.0
Party hours per covey	1.0	1.4
Hunter hours per quail	.80	.85

The hunter considered both 1950 and 1951 good hunting years.

1951 success is slightly less than 1950, but a young dog was being trained. All quail flushed were not shot at.

Summary

1. Southeast Iowa showed, in 1951, the greatest decrease in

to bag one quail.

4. It took less time to bag quail the last two weeks of the season.

5. Hunters using dogs were most successful locating coveys of quail, and in bagging quail.

THE 1951 PHEASANT SEASON

Richard C. Nomsen
Game Biologist

The 1951 pheasant season opened at noon, November 11 in 92 Iowa counties. The 65 counties in the Northern two-thirds of the State remained open for 25 days - the 27 counties in Southern Iowa were open to shooting for 12 days. Shooting hours each day were from noon to 4:30. The daily bag and possession limit was three cock birds.

Hunter success cards and instructions were mailed to conservation officers late in October - 35 cards per county in the long season zone and 15 cards for the short season counties. The information requested on these cards included county or state of residence, number of hunters in the party, hours hunted, number of birds in bag, number of birds shot down and lost, and number and types of dogs used, if any.

The following report includes the results of 2164 cards returned at the end of the season. Each card represents the hunting success for one party of pheasant hunters.

The 6880 hunters, which made up the 2164 parties, hunted 21,706 hours to bag 5974 pheasants - an average of three hours and thirty six minutes. This was 20% more time than was required to bag each bird in 1950. Average time for previous seasons were-

Hunters lost 17% of all birds shot down - a slightly higher percentage than in 1950 when 16% were lost.

During the past season, 46% of the parties interviewed had traveled from another county to hunt pheasants. North West and North Central Iowa experienced the greatest increase of non-local hunting over 1950. Table A-1 lists the percent of non-local hunters by districts for the past three seasons.

Table A-1
Per Cent of Non-Local Hunters by Districts

District	1949	1950	1951
1. North West	44%	32%	46%
2. North Central	60%	52%	62%
3. North East	38%	41%	45%
4. West Central	43%	37%	32%
5. Central	72%	61%	55%
6. East Central	43%	34%	41%
7. South West	36%	34%	22%
8. South Central	36%	34%	21%
9. South East	76%	62%	53%
State	50%	45%	46%

Table A-2 compares the use of dogs, hunting success, etc., of local and non-local hunters for the 1951 season.

Table A-2
Local and Non-Local Hunters

	% of Total	Average Party Size	% Parties Using Dogs	1 dog to ---hunters	Hours per Bird Bagged
Local	54%	3.1	28%	9.6	3.5
Non-Local	46%	3.3	25%	10.9	3.8

As during the previous seasons, local hunters used more dogs and required less time to bag each bird. Last Fall,

exception. Their average time per bird was 3.2 hours. Table A-3 lists information for non-resident hunters.

Table A-3
Non-Resident Hunters

	% of Total	Average Party Size	% Parties Using Dogs	1 Dog to -- Hunters	Hours per Bird Bagged
1949	4%	3.5	55%	4.4	2.5
1950	3%	3.2	44%	5.8	2.5
1951	3%	3.0	50%	5.7	3.2

Even though 50% of non-resident hunting parties used dogs, they still lost 16% of all birds shot down. In 1950 they lost 12% and in 1949 they lost only 4% of all birds shot down.

For each of the past three seasons, 27% of all parties contacted used dogs. Table A-4 lists the average conditions by districts.

Table A-4
Use of Dogs

	One Dog To --- Hunters			Percentage of Parties Using Dogs		
District	1949	1950	1951	1949	1950	1951
1. N.W.	11.8	10.3	11.8	22%	28%	22%
2. N.C.	8.3	10.5	10.7	32%	24%	30%
3. N.E.	7.6	9.4	7.5	31%	29%	37%
4. W.C.	10.9	8.1	9.0	29%	31%	28%
5. C.	13.3	12.4	11.6	23%	23%	24%
6. E.C.	7.2	7.1	11.0	31%	31%	24%
7. S.W.	15.3	8.2	10.6	15%	28%	24%
8. S.C.	15.3	8.2	6.3	15%	28%	37%
9. S.E.	17.0	10.6	16.1	19%	24%	17%
State	9.9	9.5	9.9	27%	27%	27%

The results of this survey show that hunters without dogs hunted more than an hour longer to bag each bird than

Table A-5
Hunting Success - With and Without Dogs

	With Dogs			Without Dogs		
	1949	1950	1951	1949	1950	1951
Average Party Size	3.2	3.1	3.3	3.1	3.1	3.1
Percent of Birds Shot Down and Lost	9%	9%	9%	21%	19%	20%
Birds in Bag for Each Bird Lost	11.4	10.2	10.1	4.1	4.3	3.9
Hours per Bird Bagged	2.7	2.4	2.9	3.9	3.3	4.0
Hours per Bird Shot Down	2.5	2.2	2.7	3.1	2.7	3.2

Each season, hunters with dogs lose about 9% of all birds shot down and hunters without the help of dogs lose about 20%. Averages for the past three seasons have shown that hunters using dogs can bag 40% more pheasants than hunters without dogs in an equal period of time.

Table A-6 lists types of dogs used most frequently and information regarding each type. If the party interviewed was using more than one type, the card was not used in this table. Table A-7 compares percent of birds lost for the past four seasons.

Table A-6
Types of Dogs Used - 1951 Pheasant Season

Dogs	No. of Parties	Hours Hunted	Birds Bagged	Birds shot down and lost	Percent of Birds lost	Birds in bag for each bird lost
Chesapeake	35	341.9	154	9	5.5%	17.1

Table A-7

Percent of Birds Shot Down and Not Found

	1948	1949	1950	1951	Four Year Average
Lab	8.6%	5.4%	4.8%	8.7%	6.9%
Chesapeake	6.9%	7.9%	8.5	5.5%	7.2%
Pointer	7.1%	9.4%	7.0%	8.6%	8.0%
Setter	13.8%	6.1%	7.9%	7.6%	8.8%
Springer	10.9%	7.3%	12.1%	9.9%	10.0%
Cocker	11.0%	14.2%	12.3%	13.3%	12.7%
Mongrel	23.0%	10.2%	16.0%	13.4%	15.6%
All Dogs	11.0%	9.0%	9.0%	9.0%	9.5%

Contact cards from districts one and two or North West and North Central Iowa were used to compare hunting success of parties using each type of dog. Table A-8 lists the types of dogs used, number of parties interviewed and the average time required to bag each bird.

Table A-8
Hours Per Bird Bagged Using Each Type Dog
Districts One and Two

	Number of Parties Interviewed			Hours Per Bird Bagged			
	1949	1950	1951	1949	1950	1951	3 year Aver.
Lab	49	48	47	1.9	1.6	2.0	1.83
Chesapeake	18	13	17	2.2	2.3	1.8	2.10
Pointer	15	14	16	3.2	1.8	2.1	2.37
Setter	12	11	20	2.5	1.5	3.1	2.37
Cocker	21	23	24	2.8	2.2	2.2	2.40
Springer	36	15	23	2.9	2.2	2.5	2.53
Mongrel	23	13	21	3.2	2.2	2.5	2.63

Hunting success for all districts and all hunters is shown

Table A-9
Hunting Success by Districts

District	Hours Per Bird Bagged 1948	1949	1950	1951
1. North West	2.5	3.2	2.0	2.5
2. North Central	2.5	3.1	2.5	3.0
3. North East	2.7	3.5	3.8	3.7
4. West Central	3.3	3.6	3.1	4.2
5. Central	4.5	4.3	3.8	6.3
6. East Central	4.6	4.1	3.8	4.6
7. South West	---	3.9	5.5	3.6
8. South Central	---	3.9	3.9	5.4
9. South East	5.9	3.2	4.0	6.3
State	3.3	3.5	3.0	3.6

Cover was heavy during the 1951 season. Only about 15% of the corn had been picked by opening day compared with 50% in 1950 and 90% in 1949. The soy bean harvest in North Central Iowa was delayed by wet weather. About 25% of the corn still was unpicked by the end of November.

Weather conditions during the first part of the season were mild with some precipitation reported. Snow fell over the Northern half of the State on November 25 and 26 with 3-6 inches reported on the ground. The last few days of the month were warm and heavy fog was reported. Table A-10 shows the hunting success for all hunters each week of the season.

Hours Per Bird Bagged

District	Period 1 Nov. 11-17	2 Nov. 18-24	3 Nov. 25-Dec. 1	4 Dec. 2-5
1. N.W.	2.1	2.6	2.6	3.7

The most snow was recorded during period three when success was nearly as good as the opening week. Fewer birds were lost during the third week - 13% compared with 18% opening week and 17% for the second and last periods.

Table A-11 lists data from individual counties.

Table A-11

District I County	Number Of Hunters	Number Of Parties	Pheasants In Bag	Pheasants shot down not found	Total Hours Hunted	H
Buena Vista	97	35	124	30	333	
Cherokee	96	35	113	19	308.7	
Clay	71	29	73	24	297	
Dickinson	116	35	242	49	380	
Emmet	88	34	58	23	280.5	
Lyon	124	31	212	36	349	
O'Brien	41	13	37	5	159.5	
Osceola	128	32	211	45	381.5	
Palo Alto	109	33	114	21	374	
Plymouth	90	31	70	15	255	
Pocahontas	93	35	143	35	336.5	
Sioux	131	38	170	28	446	
Ingham-High Unit	90	33	75	17	142.2	
Ruthven Unit	49	27	18	4	94	
District 1	1323	441	1660	351	4136.9	

Table A-11 Cont'd

District II County	Number Of Hunters	Number Of Parties	Pheasants in bag	Pheasants shot down not found	Total Hours Hunted	Hou
Butler	94	28	74	9	324	
Cerro Gordo	122	35	50	6	447.7	
Floyd	92	26	121	24	252.6	
Franklin	156	42	137	20	534.5	
Hancock	134	35	145	10	406	
Humboldt	92	34	148	27	331.7	
Kossuth	126	35	243	29	414.5	
Mitchell	108	31	149	35	328.4	
Winnebago	137	36	154	32	428	
Worth	106	31	43	25	308.9	
Wright	96	35	86	0	284	
Rice Lake Unit	47	21	19	1	85.5	
Totals & Averages	1310	389	1369	218	4145.8	

Table A-11 Cont'd

District III County	Number of Hunters	Number of Parties	Pheasants in bag	Pheasants shot down not found	Total Hours Hunted	H Ba
Allamakee	12	7	3	3	31.5	
Black Hawk	114	31	77	21	363	
Bremer	162	42	177	27	516.5	
Buchanan	65	19	48	14	247	
Chickasaw	89	23	89	16	268.1	
Clayton	78	27	28	20	193	
Delaware	48	16	38	9	155	
Dubuque	8	3	0	1	19.5	
Fayette	184	51	183	37	684.7	
Howard	147	36	156	41	399.5	
Winneshiek	31	13	13	6	114.6	
Totals & Averages	938	268	812	195	2992.4	

Table A-11 Cont'd

District IV County	Number of Hunters	Number of Parties	Pheasants in bag	Pheasants shot down not found	Total Hours Hunted	Ho B
Audubon	136	23	53	15	419.5	
Calhoun	86	36	95	5	280	
Carroll	92	33	56	13	320.5	
Crawford	83	29	55	25	256	
Greene	61	27	21	7	170.5	
Guthrie	96	35	79	4	294	
Harrison	6	2	5	0	27	
Ida	86	20	84	16	339.5	
Monona	115	35	57	15	356.5	
Sac	124	39	132	17	383.4	
Shelby	48	19	70	14	185.5	
Woodbury	117	35	115	14	439	
	1050	333	822	145	3471.4	

Table A-11 Cont'd

District V County	Number of Hunters	Number of Parties	Pheasants in Bag	Pheasants shot down not found	Total Hours Hunted	Ho B
Boone	132	35	38	15	416	
Dallas	32	15	11	0	67.4	
Grundy	73	25	45	9	265	
Hamilton	69	20	10	2	274	
Hardin	83	24	31	12	328	
Jasper	70	27	41	4	212.7	
Marshall	50	16	32	13	194.5	
Polk	38	15	0	0	97.5	
Poweshiek	130	42	117	15	431.2	
Story	127	35	56	15	456.5	
Tama	87	29	64	14	301.4	
Webster	96	35	85	21	309.5	
	987	318	530	120	3353.8	

Table A-11 Cont'd

District VI County	Number of Hunters	Number of Parties	Pheasants in bag	Pheasants shot down not found	Total Hours Hunted	Ho
Benton	72	19	73	12	196	
Cedar	120	46	78	13	349.2	
Clinton	60	22	26	7	137.5	
Iowa	20	9	10	2	53	
Jackson	23	6	3	2	43.5	
Johnson	48	23	31	11	126	
Jones	52	17	24	4	137	
Linn	46	17	36	10	119.5	
Muscatine	117	28	46	1	317	
Scott	90	33	54	3	273	
	648	220	381	65	1751.7	

Table A-11 Cont'd

District VII County	Number of Hunters	Number of Parties	Pheasants in Bag	Pheasants shot down not found	Total Hours Hunted	Ho Pa
Adair	44	16	61	1	149	
Adams	37	11	42	10	123	
Cass	55	16	43	8	144.5	
Mills	30	12	13	6	97	
Montgomery	23	7	7	4	60	
Page	6	3	1	-	10	
Pottawattamie	21	8	23	9	84	
Taylor	17	7	12	3	56.5	
	233	80	202	41	724	

Table A-11 Cont'd

District VIII County	Number of Hunters	Number of Parties	Pheasants in Bag	Pheasants shot down not found	Total Hours Hunted	H Ba
Appanoose	13	5	7	1	29.5	
Clarke	17	5	17	5	44	
Decatur	22	9	14	2	66	
Lucas	26	9	14	8	86	
Madison	38	10	16	2	98.5	
Ringgold	26	8	14	5	91	
Union	60	21	42	8	204.5	
Warren	10	4	2	0	22	
Wayne	38	15	19	17	124.5	
Marion	13	4	0	0	12	
	263	90	145	48	778	

Table A-11 Cont'd

District IX County	Number of Hunters	Number of Parties	Pheasants in Bag	Pheasants shot down not found	Total Hours Hunted
Keokuk	80	23	45	8	211.5
Mahaska	57	19	19	7	142
Washington	40	10	7	0	93
	177	52	71	15	446.5

Report of Pheasant Leg Check - 1951 Season

Right legs of pheasants shot during the open season are collected each year to help obtain information on reproduction. The spurs are measured to the nearest millimeter with calipers- all legs 20 mm. and under are classed as young of the year and all those 21 mm. and over are classed as adults. The age ratio is given as young per 100 adults.

A total of 4034 right legs were collected and measured at the close of the 1951 season. Of this total, 439 were adults, and 3595 were classed as young. The age ratio of all legs collected was 819 young per 100 adults. This figure is much higher than the age ratio obtained from any previous survey. Table B-1 compares the age ratios by districts for the last four years.

Table B-1
Age Ratios - Young per 100 Adults

District	1948	1949	1950	1951
1. North West	627	509	687	926
2. North Central	568	586	696	697
3. North East	629	656	593	1396
4. West Central	394	360	579	870
5. Central	545	475	486	710
6. East Central	495	376	564	1050
7. South West	---	666	357	370
8. South Central	---	---	367	725
9. South East	300	292	566	818
State	526	482	596	819

and wet spring - the percentages of legs in the 21 and 22 mm. groups were less than in 1950.

Table B-2
Percent of Legs in Each Size Group

Length in Millimeters	1948	1949	1950	1951
11	1.8%	0.8%	1.3%	2.3%
12	1.4	1.1	1.2	1.6
13	2.2	1.4	1.8	3.6
14	3.9	1.7	4.0	6.8
15	8.9	5.5	9.4	15.1
16	13.1	9.0	15.5	15.1
17	17.1	15.1	19.8	16.7
18	16.6	18.0	14.9	13.3
19	10.7	17.0	12.1	9.7
20	8.2	13.1	5.5	4.9
21	4.9	6.4	4.1	2.9
22	3.8	4.1	2.9	2.8
23	3.4	2.5	2.6	2.4
24	2.0	1.7	1.9	1.3
25	1.4	1.7	1.4	0.9
26	0.2	0.5	0.6	0.3
27	0.2	0.3	0.4	0.2
28	---	0.2	0.2	0.1

The average age ratio of 819 young per adult was an increase of 37% over the age ratio results of 1950. Reproduction counts last Summer decreased about 20%. Population studies also indicated poorer reproduction. Spring counts showed an increase of 10% in our brood stock and the sex ratio was the same as in 1950. The Conservation Officers Fall Roadside Count decreased 14% and the Rural Mail Carriers was down 8%. Therefore, results of the age ratio study were just the opposite of what could be expected from the surveys taken

tend to increase the age ratio figure obtained last Fall.

Brood counts were taken the first half of August - same period as in 1950. Some broods were observed in September that would have been too young for our reproduction check in August.

Table B-2 shows a decrease in the percentages of all adult size groups in the 1951 leg check. The 23-28 mm. groups included 5.2% of all legs in 1951 - compared to 7.1% in 1950. Age ratio studies at Rose Lake, Michigan, have indicated an early-season superiority of old cocks over young of the year in the ability to escape hunters. It is possible then, that while hunters were able to bag the less experienced young birds, they were not able to harvest as large a percentage of adult cocks as they did the previous year. Winter sex ratio studies should help with the explanation of this possibility.

Literature Cited

Allen, Durward L. 1947 Hunting as a Limitation to Michigan Pheasants Jour. Wildl. Mgt. 2 (3)p 237.

Table B-3
Distribution Table of Pheasant Leg Measurements - 1951

	I	II	III	IV	V	VI	VII	VIII	IX	County Unknown	State
11	22	25	9	15	11	3	4	1	-	3	93
12	24	18	5	2	4	6	1	-	3	3	66
13	33	50	12	12	16	9	2	3	2	5	144
14	83	64	22	36	32	10	2	5	5	14	273
15	169	164	58	76	63	23	8	8	16	24	609
16	170	121	61	90	89	23	16	7	14	17	608
17	155	132	67	106	104	40	21	6	20	23	674
18	119	91	46	98	72	51	13	17	15	15	537
19	65	76	40	64	67	35	14	8	13	11	393
20	49	47	15	32	32	10	4	3	2	4	198
21	24	32	7	13	24	6	6	1	2	2	117
22	34	26	5	17	14	4	6	2	-	5	113
23	20	23	6	9	16	4	8	3	3	5	97
24	9	16	4	12	6	4	1	-	1	1	54
25	7	11	1	8	5	1	-	-	1	1	35
26	2	2	-	1	2	1	1	2	2	-	13
27	-	2	1	1	2	-	1	-	1	-	8
28	-	1	-	-	-	-	-	-	1	-	2
Totals Right Legs	985	901	359	592	559	230	108	66	101	133	4034
Total Young	889	788	335	531	490	210	85	58	90	119	3595
Total Adult	96	113	24	61	69	20	23	8	11	14	439
Young per 100 adults	926	697	1396	870	710	1050	370	725	818	850	819