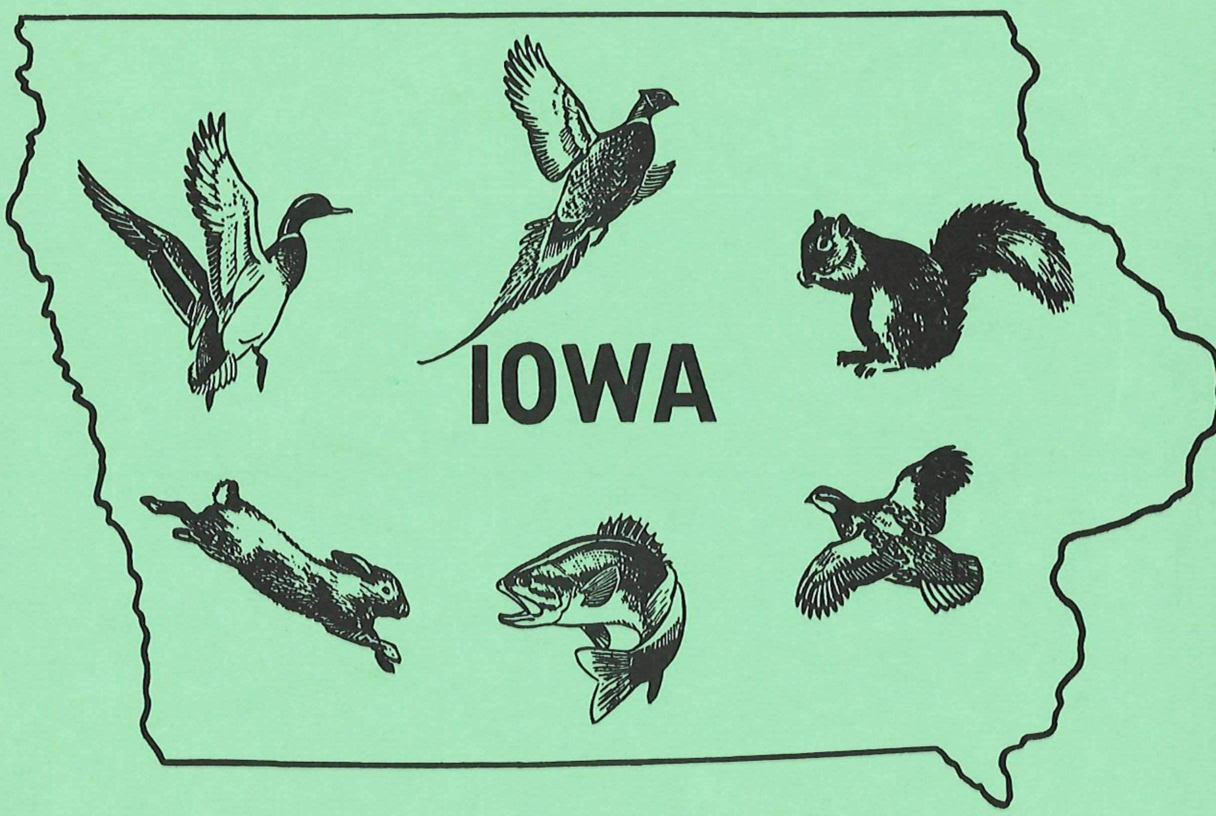
1964

QUARTERLY BIOLOGY REPORTS



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ABSTRACTS OF QUARTERLY BIOLOGY REPORTS

TRENDS OF MAJOR CROPS IN IOWA, 1950-1964

Richard C. Nomsen
Game Biologist

One of the most important factors thought to affect pheasant populations in Iowa involves agricultural activities and land-use practices. Pheasants are farm game birds and favor the most fertile regions of our state. Considerable changes have occurred in farming techniques and cropping practices in Iowa in recent years. The trend has been to more row crops (14.1 million acres); less small grain (2.3 million acres); less pasture (8.0 million acres); and hay about the same (3.3 million acres). The decrease in oats acreage as Iowa's primary production cover has been tempered by the addition of federal land retirement programs. The Conservation Reserve Program during 1959-1964 added up to 660,000 acres of excellent nesting cover. Most of these contracts expired in 1964. Annual land retirement programs have added another 1.0 - 3.5 million acres of potential nesting cover.

REEVES PHEASANT INTRODUCTION INTO IOWA

Eugene D. Klonglan
Ass't. Supt. of Biology

and

Gene Hlavka
Game Biologist

A prospective new game bird - the Reeves pheasant - has been introduced onto the Iowa scene by the State Conservation Commission. In its native habitat the Reeves is a woodland bird, and thus it is being stocked in timbered, southern Iowa. During 1963 and 1964, 634 birds have been stocked, most of them surplus cocks not needed for brood stock. All birds have been liberated adjacent to the Cedar Creek Unit of the Stephens State Forest in Lucas County. To date, no broods have been seen or reported to us, though the small number of hens released made the likelihood of seeing any rather slim. Sightings of the released birds have, however, been made regularly. Plans are to hold over 65 cocks and 270 hens as brood stock for 1965. From these it is hoped to be able to make a mass stocking of over 1,000 birds in the late fall of 1965. This experiment with the Reeves pheasant will continue on the present localized and limited scale until a definite idea as to the species' adaptability to Iowa conditions can be gained.

AGE OF QUAIL TAKEN BY IOWA QUAIL HUNTERS, 1964 SEASON

M. E. Stempel
Game Biologist

Wings from more than 1,200 quail shot by Iowa hunters were collected from 23 counties during the 1964-65 season. Eighty-six per cent were juveniles. The hatch as determined from wings and from coveys seen in the summer, began in May, peaked in July and remained high into August. Altogether, after an early start a high rate of hatch was soon reached and maintained over a long period, with a resulting high fall population.

COTTONTAIL STARVATION EXPERIMENTS, 1964

Paul D. Kline
Game Biologist

The welfare of rabbits is dependent on many factors, weather being one of the important ones. It is suspected that the severity of winter weather may affect cottontail production and subsequent populations. A study has been designed to establish whether or not stress in the form of starvation can reduce production. There is some evidence that rabbits in Iowa may suffer from starvation during extensive periods of deep snow and subnormal cold. The first phase of this study indicated mild starvation stress had no significant effect. In future experiments, the severity of stress will be increased and the results studied closely.

BIOLOGICAL DATA FROM THE 1964 SHOTGUN DEER SEASON

Keith D. Larson
Game Biologist

Age and sex ratio data were collected from 1,772 deer during the 1964 shotgun season. This represented approximately a 25 per cent sample of the estimated shotgun permit kill. The fawns:100 adults ratio of 83:100 indicates continued high reproduction in the deer herd. The percentage of fawns (45.2%) and 1 1/2-year olds (25.3%), totaling 70.5 per cent, indicates that the harvest was not taken at the expense of the needed breeding population. The sex ratio of the entire sample was 100:100; that of fawns, 117:100; 1 1/2-year olds, 100:100; and adult deer, 88:100.

WALLEYE POPULATION STUDIES ON SPIRIT LAKE 1961 THROUGH 1963

Tom Moen
Fisheries Biologist

A total of 5,913 walleyes from Spirit Lake was marked over the 3-year period of 1961-63. Marking was conducted by fin-clipping and tagging of fish taken by seine, shocer, and gill nets during the spawning run each spring. A quantitative type creel census was conducted each year from early May to February 15 to ascertain pertinent data concerning the number, size and ratio of marked and unmarked fish taken by fishermen. Population estimates of 27,645, 40,380, and 79,909 adult walleyes were obtained from 1961, 1962 and 1963, respectively. Adjusted exploitation rates of 50, 33, and 33 per cent were determined for the three years. Harvest, recruitment, vulnerability and mortality are discussed.

EFFECT OF STOCKING MARKED ADULT WALLEYES FROM DIAMOND LAKE INTO SPIRIT LAKE

Terry Jennings
Fisheries Biologist

The effect upon the walleye fishing in 5,660-acre Spirit Lake by the addition of 523 marked adult walleyes from a small 111-acre lake (Diamond Lake) is discussed. It was found that even this small number of fish, when stocked after the fishing season had begun, added to the walleye sportfishery of Spirit Lake, primarily during the first two months of the fishing season. It was also evident these fish biased the walleye population estimate of Spirit Lake. Therefore, they were disregarded when the population estimate was made.

NOTES ON THE GROWTH OF TAGGED WALLEYE

Jim Mayhew
Fisheries Biologist

Walleye were jaw tagged in 1960 and 1961 in Green Valley Lake to determine population magnitude and angler exploitation. As each fish was tagged it was also measured for total length. During the next 5 years, 59 fish were remeasured as they were recaptured. In comparison with untagged walleye, tagged walleye were approximately 35 per cent shorter at the same age. Mean growth increment for fish recaptured the second year after tagging was 1.6 inches. Cumulative growth increment of fish tagged in excess of 2 years was as follows: 3 years, 2.2 inches; 4 years, 3.3 inches; and 5 years, 4.7 inches. Growth retardation from the effects of tagging was constant throughout the life of the fish.

1964 ANNUAL SURVEY OF THE CORALVILLE RESERVOIR FISH POPULATION

Don Helms
Fisheries Biologist

The 1964 annual survey of the Coralville Reservoir fish population indicates little change from the previous year. Rough fish made up about 85 per cent of the total weight and 70 per cent of the total number. Carpsuckers and small carp dominated in the reservoir, while bigmouth buffalo dominated the tailwaters. Crappie and channel catfish were the most abundant game fish in both areas. Channel catfish were much larger in the pool than those found in either the headwaters or tailwaters. Crappie were also larger in the reservoir than in the tailwaters. Young of the year were abundant for carp, carpsuckers and channel catfish. No major changes in the population structure are anticipated for the coming year.

DESOTO BEND CREEL CENSUS, 1964

Bill Welker
Fisheries Biologist

A "visitor contact upon leaving" type of creel census was conducted on DeSoto Bend Lake between May 1 and September 15, 1964. Only two access roads lead to the lake. The 3,319 fishermen contacted fished a total of 9,055 hours and caught 3,948 fish for a catch per hour value of .43. Monthly catch per hour values decreased from a high of .76 in May to a low of .18 in September. Crappie (66.4 per cent), channel catfish (15.2 per cent) and carp (7.6 per cent) were the most abundant fish in the creel. More than 80 per cent of the fishermen contacted drove less than 35 miles to visit the lake.

COMPARATIVE AGE AND GROWTH OF CHANNEL CATFISH FROM SOME EASTERN IOWA RIVERS

Roger Schoumacher

and

Gary Ackerman
Fisheries Biologists

During 1963 and 1964, catfish populations were sampled in various rivers in eastern Iowa, and 1,391 spines were collected and analyzed for age. Growth rates varied considerably, with fish from the Wapsipinicon River at Anamosa being the slowest growing, followed by fish from the Wapsipinicon River at Independence, the Cedar River at Gilbertville and Cedar Rapids, and the Iowa River at Marshalltown. Faster growth was exhibited by fish from two renovated areas - the Iowa River in the Iowa Falls-Steamboat Rock area and Fontana Mill Lake -, from the lower eight miles of the Skunk River, and from various pools in the Mississippi River. It is suggested that the removals of a portion of the catfish population in selected areas, perhaps in conjunction with a rough fish removal program, would stimulate catfish growth.

TRENDS OF MAJOR CROPS IN IOWA, 1950-1964

Richard C. Nomsen
Game Biologist

One of the most important factors thought to affect pheasant populations in Iowa involves agricultural activities and land-use practices. Pheasants are farm game birds and favor the most fertile regions of our state. Considerable changes have occurred in farming techniques and cropping practices in the intensively farmed areas of Iowa in recent years.

The average size of farms increased during the period and fields were much larger, which reduced fence rows and edges. Cash grain farming replaced diversified farms in some areas which further reduced the permanent grassy type cover.

There were over 14 million acres planted to row crops during 1963 and 1964 compared to about 11.5 million acres in 1950 (Table 1). The total acreage of corn remained about the same due to land retirement programs during the past few years. However, total production of corn increased 60 per cent. An estimated 4.2 million acres of soybeans were harvested in 1964 compared to 1.9 million acres in 1950.

The total acreage of hay crops remained stable during the period. However, the trend has been to more alfalfa and less clover and timothy mixtures. Nesting studies in Iowa have shown that pheasant production is best in clover and timothy because of later harvest. Nest density in alfalfa is usually high but early cutting breaks up the nests before hatching. Pasture gradually decreased during the period from 9.7 million acres to 8.0 million acres. During that time, livestock on farms nearly doubled which lowered the quality of nesting cover in pastures.

Iowa's primary pheasant production cover decreased considerably during the past 15 years. The acreage of oats harvested for grain decreased from 6.4 million acres in 1950 to 2.3 million acres in 1964. The 1964 acreage was the smallest since 1881. Loss of this high quality nesting cover was greatest in the more intensively farmed areas of central and north central Iowa.

It was difficult to evaluate the effect of this loss because of various Federal Land Retirement Programs. Beginning in 1956, annual land retirement programs idled from 1.0 - 3.5 million acres of cropland (Table 2). Most fields were seeded to oats as a cover crop. However, thin stands, late seeding and mowing of diverted acres lowered chick production. Minnesota pheasant biologists reported their nesting studies showed that 'regular' oats fields produced about 4 times as many chicks as diverted acres even though oats was used as the cover crop.

In addition the Conservation Reserve during 1959-1964 added up to 660,000 acres of excellent nesting cover (Table 2). These contracts expired in 1964 and this phase of land retirement has been discontinued.

Iowa's statewide pheasant population has remained high during this period. Annual harvest has exceeded 1.5 million roosters in 1955, 1958, 1963 and 1964. Surveys indicated lower populations in some of the flat fertile regions where very intensive farming practices

TABLE I. Acreage summary, Iowa, of farm crops in thousands of acres, 1950-1964

Year	Corn	Soybeans	Total	Oats	Alfalfa	Clover & Timothy	Total	All Pasture	Cropland not Harvested or Pastured*
1950	9,752	1,892	11,644	6,430	1,138	2,371	3,509	9,730	306
1951	10,132	1,567	11,699	5,603	1,201	2,567	3,768	9,726	1,050
1952	10,665	1,500	12,165	6,007	967	2,614	3,581	9,693	419
1953	11,095	1,628	12,723	5,713	1,043	2,646	3,689	9,415	430
1954	10,409	2,091	12,500	5,971	1,265	2,432	3,697	9,428	365
1955	10,659	2,229	12,888	5,734	1,718	2,154	3,872	9,200	249
1956	10,015	2,481	12,496	4,915	2,359	950	3,309	9,238	1,574
1957	10,153	2,813	12,966	5,122	2,589	911	3,500	8,775	924
1958	9,979	3,089	13,068	4,740	2,516	1,274	3,790	8,570	1,243
1959	12,360	2,328	14,688	4,284	2,427	1,097	3,524	8,390	830
1960	12,485	2,564	15,049	4,045	2,256	1,195	3,451	8,160	1,071
1961	10,254	3,364	13,618	3,204	2,138	1,103	3,241	8,105	3,560
1962	10,068	3,365	13,433	2,923	2,224	1,217	3,441	8,143	3,787
1963	10,982	3,545	14,527	2,737	2,245	999	3,244	8,047	3,117
1964**	9,804	4,218	14,022	2,352	-----	----	3,309	8,000	3,500

* Includes acreage under Federal Land Retirement Programs

** Estimated acreage for 1964

have limited safe nesting cover. Regions of western and southwest Iowa have shown substantial gains in the pheasant population during recent years.

TABLE 2. Acreage summary of federal land retirement programs, Iowa, 1956-1964 (thousands of acres)

Year	Acreage Reserve	Conservation Reserve	Total
1956	1,277		1,277
1957	759		759
1958	1,010		1,010
1959		Est. 450	Est. 450
1960	Diverted Acres	663	663
1961	2,800	658	3,458
1962	3,100	586	3,686
1963	2,400	549	2,949
1964	3,500	202	3,702

REEVES PHEASANT INTRODUCTION INTO IOWA

Eugene D. Klonglan
Ass't. Supt. of Biology

and

Gene Hlavka
Game Biologist

A prospective new game bird - the Reeves pheasant - has been introduced onto the Iowa scene by the State Conservation Commission. The first release of Reeves was made in January of 1963, with subsequent releases in June and November of that year and in June and November of 1964. To date, 634 birds (453 cocks and 181 hens) have been stocked (Table I). All have been liberated adjacent to the Cedar Creek Unit of the Stephens State Forest in Lucas County northeast of Chariton (Section 6, Cedar Township).

Most of the early releases have been comprised of surplus cocks, since most of the hens have been held over for brood stock at the Wildlife Research Station near Boone. The January 1963 and June 1963 and 1964 releases, totaling 98 cocks and 76 hens, were all adults that had been used as brood stock for the preceding year. The November releases of both years, totaling 355 cocks and 105 hens were young birds raised that year. The original brood stock was received via a shipment of 210 eggs from Ohio in 1961. An additional 20 hens were obtained from Ohio in the spring of 1962. All of these were from pen-raised stock which Ohio had collected from pheasant raisers around the country in the early 1950's. Nothing then is known of the genealogy of these birds. Thus, it is certain this stock is inferior to wild-trapped birds. However, it was not possible to obtain the latter. It is hoped that enough broods can be reared in the wild from released birds to allow some to be trapped and then used for brood stock.

To date, no broods have been seen or reported to us. In view of the small number of hens released so far, this is not surprising. Only the 12 hens, or those of them that survived, would have been possible nesters in the summer of 1963. The 64 hens released in June that year had already nearly completed their laying season in the pens at the Research Station. With the added shock of being released to the wild, they would not be expected to do any late nesting in the wild. Only those of the above 76 hens that survived through the winter would have been available to nest in 1964. This is an unknown number, since it is known that mortality did occur. Also, these hens would then have been 2 or 3 years old. The 105 juvenile hens released this past November are the first young hens stocked. Survivors from these, plus what few older hens may still be present, will provide the only possible nesters next spring.

If we make a rough application of ringneck pheasant population dynamics to these birds (the best we have to go on since we have no specific data on Reeves), we can see that no great amount of brood production can be expected next summer either. In the wild, from 1/3 to 1/2 of ringneck hens are usually lost during the winter alone. The rate of mortality is almost sure to be higher with pen-raised birds. Thus, it is quite possible we will be lucky to have 50 Reeves hens still present next spring, likely fewer. Since these will be scattered over several sections and, referring to ringnecks again, less than half of these would be expected to hatch a brood, chances of seeing a brood in the heavy cover of the release

TABLE I. Numbers of Reeves pheasants stocked in south central Iowa in the Stephens State Forest area in 1963 and 1964

Date	Cocks	Hens	Total Birds
	1963		
January 8	10 (Adults)	12 (Adults)	22
June 11	46 (Adults)	64 (Adults)	110
November 21	89 (Juveniles)	-	89
TOTAL - 1963	145	76	221
	1964		
June 18	42 (Adults)	-	42
November 12-13	266 (Juveniles)	105 (Juveniles)	371
TOTAL - 1964	308	105	413
GRAND TOTAL 1963 and 1964	453	181	634

area will be rather slim. It is quite possible a brood or two, or more, were raised last summer but never seen or reported because of the unlikely chance of locating them in the heavy cover. Efforts will be made to check for bands whenever a bird is sighted or a dead one found, since all released birds have been banded. An unbanded one would indicate successful production.

Though no broods have been seen, sightings of the released birds have been made regularly - both by Commission personnel making a special point of looking for them and by local residents. Verified sightings have been made on 53 different days (Table 2). Numerous other unverified reports have been heard. A total of 529 "bird-days" has been recorded, most of course in 1964. Numbers sighted on any one day have varied from 1 to 75, with an average of 10. Most of the birds have been seen within 1 mile of the release site, many of these shortly after being stocked. Several were seen 1-5 miles away from the release site. Three birds were observed 5-10 miles distant, one about 15 miles away, and another about 17 miles "as the crow flies." These latter birds may well have just moved out practically on a "bee-line" from the site after liberation and covered a considerable distance in a short time. Such behavior is not unusual in stocking pen-reared birds to the wild. In effect, they are "lost" to the stocking experiment.

With the larger numbers of birds now present, a special effort will be made this winter to try to get a reasonably good estimate of the number of birds present within about 3 miles from the release site - or an area of about 10 square miles. This area should contain the nucleus of any brood stock likely to accomplish any significant reproduction next year. Snow conditions will, of course, affect the success of this endeavor considerably. There was practically no snow in the area last winter, making such a survey impossible. Lack of snow was no doubt advantageous to the survival of the birds, however.

Several local residents reported the birds as being unusually tame, something to be expected from pen-raised birds. It was stated that prior to the deer hunting season, some birds could almost be captured by hand, but that after the season the birds were much wilder. Poaching is known to have occurred on occasion, with at least three instances being reported.

Plans for the coming year at the Wildlife Research Station are to hold over 65 cocks and 270 hens as brood stock for 1965. From these it is hoped to be able to make a mass stocking of well over 1,000 birds in the late fall of 1965. The previous discussion of likely numbers of hens available from the stocked birds for nesting certainly illustrates the importance of the mass-stocking concept. Half of these hens are year-old juvenile birds; the other half will be 2 years old and constituted the brood stock used last year. A comparison will be made between the laying and hatchability rates of the two age groups. Young cocks will be used in all lay pens, at a ratio of 4 or 5 hens per cock.

A summary of the Reeves propagation results is given in Table 3, for the 4 years the project has been underway. One thing that has become evident is that the rate of fertility and hatch has been lower than anticipated, and noticeably lower than for the ringnecks being handled in similar fashion. Problems in maintaining proper temperatures in the egg room and incubator have been encountered, but it is anticipated these will be alleviated before next year. Better facilities for rearing the chicks should also increase the per cent of these raised from those hatched. As the men responsible for handling the birds gain more familiarity with the Reeves' "idiosyncrasies," the success in rearing them will no doubt improve.

TABLE 2. Summarization of Reeves pheasant sightings made in area where birds were released in 1963 and 1964 (See text)

Miles From Release Site When Seen	1963			1964			Both Years		
	No. Days Sightings Made	No. Birds Sighted	Avg. Per Sighting	No. Days Sightings Made	No. Birds Sighted	Avg. Per Sighting	No. Days Sightings Made	No. Birds Sighted	Avg. Per Sighting
0 - 1	9	61	6.8	24	432	18.0	33	493	15.0
1 - 5	5	11	2.2	10	20	2.0	15	31	2.0
5 -10	1	1	1.0	2	2	1.0	3	3	1.0
10 -15	1	1	1.0	0	-	-	1	1	1.0
15 -20	0	0	-	1	1	1.0	1	1	1.0
TOTALS	16	74	4.6	37	455	12.3	53	529	9.9

TABLE 3. Summary of Reeves pheasant propagation results at the Wildlife Research Station, 1961 through 1964

Year	No. of Breeding Hens	Cock:Hen Ratio in Pens	Total Eggs Laid	Avg. Eggs Laid/Hen	No. of Eggs Fertile	% of Eggs Fertile	No. of Chicks Hatched	No. of Chicks Raised to Adults	% of Chicks Raised
1961	-	-	210	-	110	52.4%	79	57	72.2%
1962	38	1:2	876	23.0	438	50.0	278	123	44.2
1963	75	1:2	1,621	21.6	962	59.3	601	415	69.1
1964	137	1:3	3,950	28.8	2,319	58.7	1,329	580	43.6
TOTALS	250	1:2.5	6,657	26.6	3,829	57.5	2,287	1,175	51.4

Why is the attempt being made to establish the Reeves pheasant in Iowa? The forested river valleys, timbered pasture lands and other woodland areas of southern Iowa have never been conducive to the establishment of ringneck pheasant populations. However, they do appear to have habitat resembling in several respects that in which the Reeves pheasant occurs in its native China. The Reeves in its native habitat is primarily a bird of the forest, though they reportedly will venture into brushy areas and clearings. Their diet in the wild apparently consists primarily of acorns and other mast, berries, seeds and insects. Thus, the typical oak-hickory forests of Iowa should be productive of the types of foods preferred by the Reeves in their native land.

The Reeves pheasant is a native of the wooded hills of central and northern China. It is found from about 30° north latitude to above 40°. Iowa thus lies at a comparable level to the northern part of the Reeves' native range. The climate of southern Iowa and the part of Asia where the Reeves is found is basically similar, with hot summers and cold winters. The biggest difference lies in winter precipitation - there is not as much snow in their homeland. During the last century many attempts have been made in Europe to establish the Reeves pheasant. As a result, the species has become established in a small number on a limited area in southern England, and in sizeable numbers in parts of France, Austria, Hungary, Czechoslavakia and Yugoslavia. Except for the well-known success of introductions of ringneck-type pheasants in many parts of the world, their success in establishing the Reeves in central Europe is to date about the only other noteworthy success in establishing a species of pheasant well outside its native range.

One factor that may increase the chances of the Reeves pheasant becoming established in Iowa is that in Iowa it is almost impossible to get more than a mile or two from the nearest field of corn, even in the more heavily timbered areas of the state. Since the stock of birds we have has a long pen-raised history, they are used to being fed typical pen diets centering around scratch grain, primarily corn. This means recognizable food will be available to them in the wild during the difficult period of adjustment to which all pen-reared birds are subjected upon release. In this regard, it is interesting to note that several of the sightings of released birds have been at cornfield-woodland edges, in bull-dozed brush piles where clearing of field edges is being done, or even as the birds were feeding in a cornfield close to timber. When flushed, the birds usually flew back into the trees.

Whether the Reeves will ever produce good hunting, or any hunting, in Iowa remains to be seen. As mentioned, it has been successfully established in parts of Europe, but in Ohio and some other areas in the United States releases have failed as yet to produce huntable populations. This experiment with the Reeves will continue on the present very localized and limited scale until a definite idea as to the species' adaptability to Iowa conditions can be gained. Over-optimism is certainly not in order at this time; neither is extreme pessimism. Remember, it was many years from the time the first ringneck pheasants were released in Iowa until the first hunting season on them was opened.

AGE OF QUAIL TAKEN BY IOWA QUAIL HUNTERS, 1964 SEASON

M. E. Stempel
Game Biologist

INTRODUCTION

The Iowa quail wing study began in 1964. It is based on data from wings of quail shot by hunters. Hatching dates of quail under 150 days old were determined through this work; further, it was a means of learning how various weather patterns affected hatching. From it we learned which age groups were most often taken, and eventually it should help show us whether long hunting seasons take excessive numbers of quail that would otherwise live until another production period. These data can be compared to summer whistling quail counts since both studies indicate progress of hatching. This report is based on results of the 1964 wing survey with supplemental data from roadside and field surveys. Comparisons are made with similar data for 1963.

METHOD

Before the 1964 quail season began, a number of cooperators were contacted. The first of these were 17 officers and other department personnel in the 22 counties in the main quail range of southern Iowa. While the entire state was open for quail shooting, the wing collection was made in southern Iowa where most quail are found, and where large numbers of wings could be easily gathered. The cooperators received letters of instruction with envelopes for mailing wings to the biologist. On these envelopes were spaces for recording date, place of kill, and sex of birds. It was requested that wings be mailed to the biologist as soon as they were picked up. I selected the second group of cooperators from among the many hunters in Appanoose, Davis, Des Moines, Henry, Jefferson, Lee, Monroe, Van Buren, and Wapello Counties. Biologist Gene Hlavka contacted hunters in Clark, Decatur, Jasper, Lucas, Marion, Ringgold, Union, Warren, and Wayne Counties. Those contacted agreed to save the least damaged wing from each quail shot during the season. The quail wings were collected from these men several times during the fall.

Methods used to determine age of the wings were outlined in the Quarterly Biology Reports for July 1959. Briefly, in the young the growth and replacement of primaries continues until the bird is 150 days old. Age is indicated by the growth stage of primaries. Thus, only those under 150 days old can be aged. The additional information needed on earlier production, (birds that are over 150 days old when shot) comes from data gathered by biologists during the summer when they record the age of quail broods seen on roadsides and in fields.

The moult stage of adult wings taken by hunters is also recorded. This is similar to the development in young. Adult moult begins after the brooding period. Thus the growth stage of primaries will indicate the moult period, which is also the post-brooding period. In simpler terms, an early moult reflects an early hatch.

RESULTS

A total of 1,639 wings was collected during the 1964 quail shooting season. These were from 23 counties. Eighty-five per cent were from young birds, compared to 89 per cent in 1963. There was a 100 cocks per 102 hens ratio in the sample. Other information is given in Tables 1 and 2.

It is assumed that the wing collections during different periods of the hunting season were in proportion to the amount of hunting. In this respect, 51 per cent of the wings were from quail that were shot between October 31 and November 15; 76 per cent were taken from October 31 to November 30 and only 24 per cent from December 1 to January 3, 1965.

While hunters took the most birds from the more numerous young segment, the true proportion in the field may not be represented. The quail wing sample which is obtained from hunters must be regarded as a sample of the most available birds which are large enough to be acceptable to the hunter since some hunters do not shoot the "squealers" or very young quail. Opportunity to kill quail is influenced by many factors; as an example, any quail adult or young, which have fully developed flight plumage, and are thus capable of strong flight, are less liable to be shot than mature-appearing quail with short or immature flight feathers. Hence, it is possible that the kill of the strong flying quail would be less than that of the weaker flyers, although the better developed birds (either old or young) might be more numerous than is shown in the kill.

Quail Hatched in 1964

Sixty-seven per cent of the wings of quail taken early in the season were from quail under 150 days old, and the approximate age of these could be determined by growth stage of primaries. For this segment the hatch began in June, peaked in July, remained high into August, then tapered off and ended in October, (Figure 1). The graph represents birds shot from October 31 to mid-November.

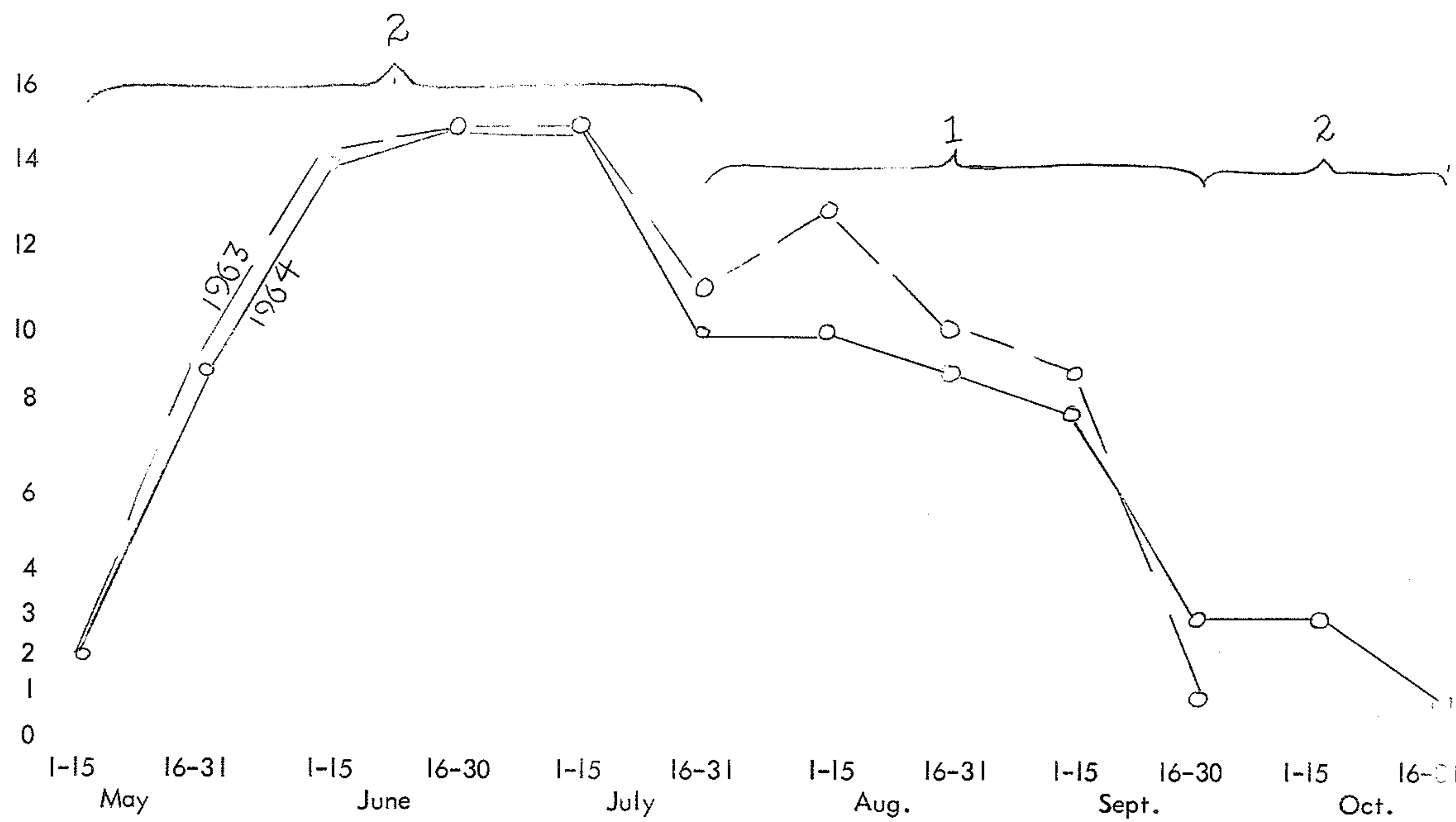
Adults

About 15 per cent of the total take was adult quail (over one year old). They moult all 10 of the wing primaries while the young usually shed only the inner 8 flight feathers. Eight per cent of all adults sampled during the season had moulted and regrown all of the primaries, or flight feathers. In the sample collected from December 1 to 15, 33 per cent of the adults bore mature flight feathers.

Supplementary Data from Broods Sighted During Summer

No exact hatching date can be assigned to young quail over 150 days old because flight feather growth is completed, and all primaries are full length. However, we have information on the age of 41 broods seen during summer. I observed some of these while others were reported to me by farmers, officers, biologists, and dog trainers. These began to hatch about May 15. Peak production was in July with hatching indicated into September and ending in October.

The larger share of birds under 150 days old were mature in size when shot. The



1. Data from ageable wings taken up to mid-November.
2. Based on wing samples, broods seen and aged, and summer calling quail counts. Few wings can be aged prior to July.

FIGURE 1. Comparison of 1964 and 1963 quail hatching date distributions

birds over 150 days old represent a good early hatch. Many adults still in moult when shot indicates a good late hatch. Data from observation of summer broods indicated good early summer production and the beginning of sustained high summer production. Altogether, after an early start, a high rate of hatch was soon reached and good success was maintained, with a resulting high fall population.

DISCUSSION

In 1964, good production was indicated by data from 1,639 wings. Twenty-three counties were represented. Forty-nine per cent were young (under 150 days old) that could be aged and their hatching dates established. Fifty-one per cent were young (over 150 days old) with fully matured flight feathers. Eight per cent of adults bore fully matured plumage. Additional information was gleaned from observations of 41 summer broods.

In 1963 there were 1,404 wings accompanied by data on place and date of kill. These were from 29 counties. Forty per cent were young with fully matured flight feathers, compared to 51 per cent this year. Fifty-three per cent of adults bore matured plumage, compared to only 8 per cent in 1964, indicating more extensive late hatching this year. Forty-four broods were observed and aged during the summer, about the same as the 41 in 1964. It is evident that production of young was good in both 1963 and 1964.

TABLE I. A tabular compilation of data from Iowa quail wings collected in 1964 and 1963

	1964	1963*
1. No. of wings	1,639	1,553
2. No. of wings accompanied by usable information	1,639	1,380
3. No. of counties represented	23	29
4. Per cent young in entire sample	85	89
5. Per cent of young that were mature or nearly so (90 days old or older)	87	81*

* This includes all wings accompanied by information on date of kill. Some of these were sent in late and were not included in the original report.

TABLE 2. The per cent young in quail bagged in Iowa, 1955-64

Year	% Young in Quail Bagged	*No. of Wings in Sample
1955	89	676
1956	87	352
1957	87	613
1958	80	1,253
1959	85	939
1960	90	656
1961	89	560
1962	88	576
1963	89	1,380
1964	85	1,639

* Some wings are not included as they were not accompanied by data on place and date of kill. Some wings decayed because they were packed in airtight containers.

COTTONTAIL STARVATION EXPERIMENTS, 1964

Paul D. Kline
Game Biologist

The welfare of cottontail rabbits is dependent on many factors. One of these may be the vagaries and general capriciousness of Iowa weather. Very little factual information is known regarding climatic influences. We suspect that the severity of winter weather may affect cottontail production and subsequent populations.

The study reported here is designed to establish whether or not stress in the form of starvation can reduce production. The writer has some evidence that rabbits suffer from starvation during extensive periods of deep snow and sub-normal cold (Kline, Paul D., 1962, Quar. Biol. Repts. 14(2): 36-43). This is a progress report of the starvation study. The study is to be continued.

In early February 1964, 10 females were removed from the 13-acre research enclosure at the Wildlife Research Station, weighed, and placed in individual pens. They were provided with ear corn, commercial rabbit pellets, red clover hay, and water. On February 7 all food was removed. After 115 hours of starvation, on February 12, the rabbits were removed from the individual pens, reweighed, and returned to the research enclosure. Average temperature during the period of starvation was 25.5 degrees F., or near normal for that time of year.

All adult-sized cottontails were removed from the research enclosure during hunts conducted March 27, May 1, and May 18, 1964. They were weighed, and all females were examined for state of pregnancy. Embryo numbers and sizes, and corpora lutea or ovule eruption sites, were noted. Each of the 10 previously starved females was recovered. In addition, 9 females resident to the pen but not starved were collected. They served as control.

The pertinent data obtained appears in Table 1. During 115 hours starvation the 10 females lost an average of 0.51 pounds, the range being 0.4 to 0.7 pounds lost. They recovered this lost weight during the 6 weeks prior to March 27 when most were shot. Mean weight at that time was 3.02 pounds. No weights for the control females were available prior to March 27. The nine control females averaged 2.9 pounds or somewhat less than those starved. This surely was due to chance.

First litter sizes for the starved group averaged 5.0 embryos each; in the control, 4.1 embryos. Second litter sizes were recorded for two females from each group. The two stressed averaged 6.0 embryos and the two control 6.5.

The study as conducted in 1964 indicates starvation stress has no effect on litter sizes. However, in a future study the severity of stress will be increased so that the starved females barely survive. Weights will serve as the criteria for this. The 1962 experiments revealed that death is apt to occur when adult-sized cottontails are reduced to weights of 2.1 to 2.3 pounds. The rabbits in the present study were not exposed to sufficient starvation stress to reach these weights.

TABLE I. Comparisons of starved with control female cottontail rabbits, 1964

	Starved Females	Control Females
Mean initial weights (pounds)	2.98 (10)*	------
Mean weights after starvation	2.47 (10)	------
Mean weights at death	3.02 (10)	2.90 (9)
Mean number embryos 1st litter	5.00 (10)	4.14 (7)
Mean number embryos 2nd litter	6.00 (2)	6.50 (2)

* Numbers in parentheses represent sample sizes.

BIOLOGICAL DATA FROM THE 1964 SHOTGUN DEER SEASON

Keith D. Larson
Game Biologist

The statewide deer season was held December 12, 13, 14, and 15 in 1964. The state was divided into two zones (Figure 1) based on relative populations of deer and hunters. In the north-central zone the season was of only 2 days duration with the balance of the state having a 4-day season. Zone boundaries were drawn to coincide with existing major highways. The short zone comprised approximately half the state.

Personnel from the Game Section and the Biology Section were assigned to collect data on the sex, age, and county of kill of a sample of the harvest. In previous years much additional data was collected relating to physical condition factors. Since many years data were available to use as a standard for an expanding population, it was deemed unnecessary to collect this information again until such time as circumstances warrant. The 1964 data was collected from nearly every county.

The sample size of 1,772 represents approximately 25% of the estimated shotgun permit kill. The distribution of the sample between zones was adequate, as 368 deer were checked in the short zone. There were no checking stations manned although there are some areas of the state where they would have provided more data at less expense.

RESULTS

Age was determined for 1,742 of the 1,772 deer checked. Thirty deer were listed either as age unknown or only as adults. The fawns:100 adults ratio of 83:100 and the fawns: 100 adult females ratio of 158:100 indicates extremely high reproduction in 1964 (Table 1).

The percentage of deer in each age class and the cumulative percentage of deer in the sample are given in Table 2 for the years 1961 to 1964. Fawns and 1 1/2-year olds made up 70.5% of the sample, with fawns comprising 45.2%. The distribution of the age classes has changed but little in this sample over recent years. The significance of the small increase in fawns is not known; however, it does indicate a continuing high reproductive rate.

The sex ratio of the complete sample was 100:100. There were 888 males to 884 females. This ratio in the short zone was 95:100 and in the long zone it was 102:100.

This is the lowest sex ratio since this data has been collected. If the hunters were less selective in what they would take, this would account for it. Perhaps the best explanation is the lack of snow cover. The antlered deer would have an added security needed to evade the hunters. With an increase of 33% in hunters, we no doubt have proportionally fewer "buck" hunters.

The sex ratio of the fawns in the sample was 117:100, and that of the adults 88:100. This ratio in 1 1/2-year old deer was exactly even 224:224. This suggests that this age group (1 1/2's) had an "in-between" vulnerability when no snow cover existed.

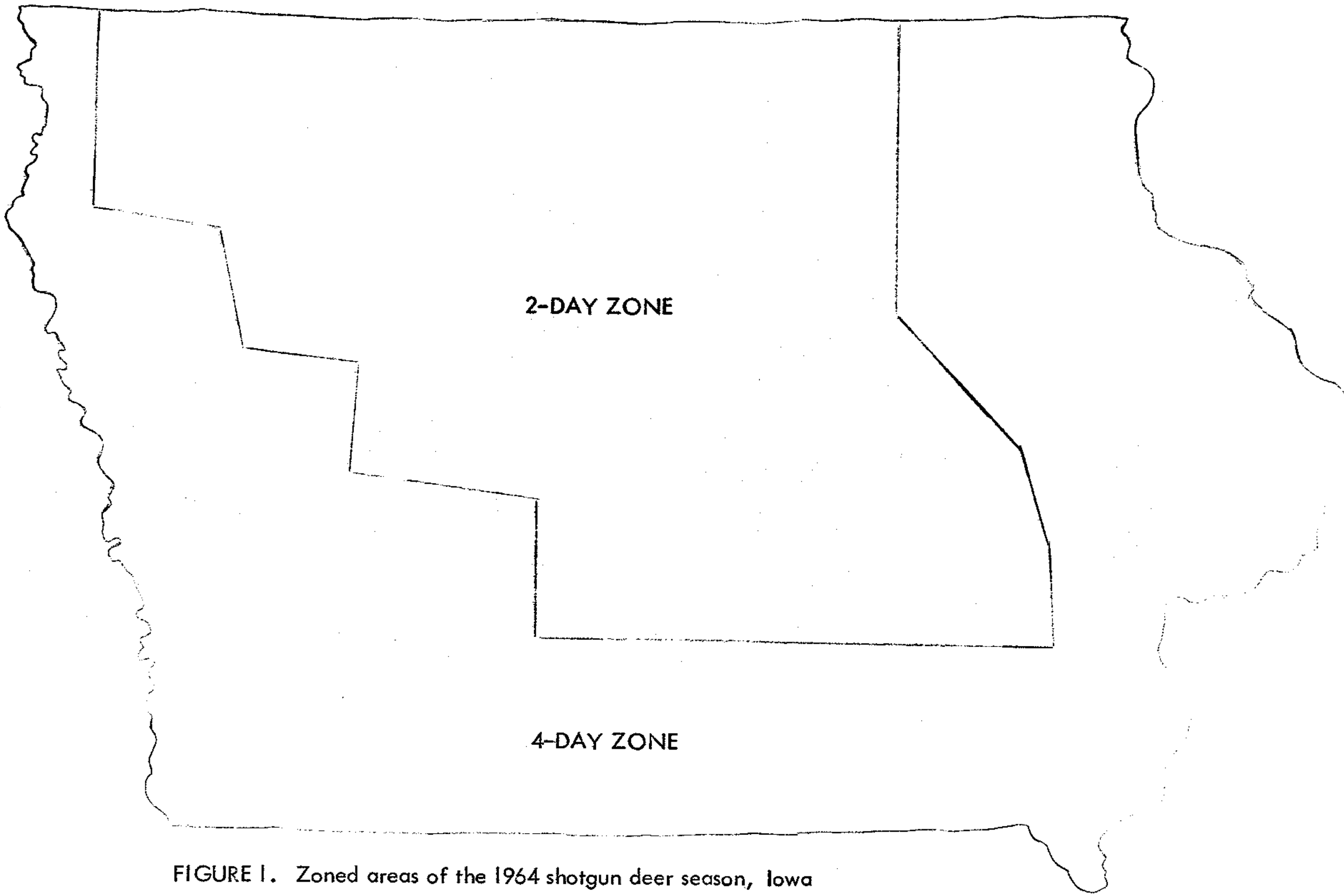


FIGURE 1. Zoned areas of the 1964 shotgun deer season, Iowa

TABLE I. Sex, age, and number of deer checked during shotgun season, Iowa, 1964

Age Class	Short Zone M	Short Zone F	Long Zone M	Long Zone F	State-wide M	State-wide F	Total	% of Total
Fawns	81	75	351	294	432	369	801	45.2%
Adult Age Unk.	3	2	8	6	11	8	19	1.0
1.5 yr.	44	51	180	173	224	224	448	25.3
2.5 yr.	37	43	93	155	130	198	328	18.5
3.5 yr.	9	13	39	38	48	51	99	5.6
3.5 Plus	2	0	2	0	4	0	4	0.2
4.5 yr.	3	1	22	18	25	19	44	2.5
5.5 yr.			8	3	8	3	11	0.6
6.5 yr.	0	0	2	4	2	4	6	0.3
6.5 Plus	0	0	0	1	0	1	1	0.1
Age Unk.	1	3	3	4	4	7	11	0.6
Total by Sex	180	188	708	696	888	884	1,772	99.9%
Sex Ratio	95:100		102:100		100:100			
Total by Zone	368		1,404		1,772			

CONCLUSIONS

The distribution of the age classes as presented indicates that fawns make up a large portion of the harvest. This % is maintained year after year and indicates that we have not been harvesting deer at the expense of the breeding population. It also indicates that the deer herd in Iowa is apparently reproducing at a maximum rate for the species.

SUMMARY

1. Age and sex ratio data were collected from 1,772 deer during the 1964 season. This represented approximately a 25% sample of the estimated shotgun permit kill.

2. The fawns:100 adults ratio of 83:100 indicates continued high reproduction in the deer herd.

3. The percentage of fawns (45.2%) and the percentage of 1 1/2-year olds (25.3%) indicates that the harvest was not at the expense of the breeding population.

4. The sex ratio of the sample was 100:100, that of fawns 117:100, 1 1/2's was 100:100, and adult deer was 88:100.

WALLEYE POPULATION STUDIES ON SPIRIT LAKE 1961 THROUGH 1963

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Fisheries Biologist

Early data and the data from the present 3-year study indicate that fluctuations in the abundance of adult walleyes in Spirit Lake may range from as few as 27,000 (about 5 per acre) to a high of 80,000. It is also evident that the success of the walleye fisherman in any one season is not necessarily dependent on the number of adult walleyes present. Quantitative creel census figures for the 1961 season indicate that an estimated 24,820 walleyes were taken. With nearly twice as many adults on hand at the start of the 1962 season, fishermen caught an estimated 22,142 walleyes. Fishing pressure, as measured by the number of fishermen, was about the same for both years. Fishing success was somewhat less and the total hours of fishing dropped about 10 per cent. Based on exploitation rates of 50 and 33 per cent for the 1961 and 1962 seasons, respectively, we find that about the same number of adults was removed from the population each of those years. At the start of the 1963 season, there were an estimated 80,000 adult walleyes on hand, largely due to the recruitment of the large year classes developed in 1959 and 1960. Thirty-three per cent of these (26,000) were taken by fishermen by the end of the fishing season, making up 65 per cent of the 40,000 walleyes caught. Fishing pressure increased about 40 per cent over the previous year.

There is little doubt that starting the season with a high population of adults (assuming that 40,000 and over is at least relatively high) contributes toward better walleye fishing and a greater total harvest, but equally good fishing often takes place with relatively low populations and a high exploitation rate. The combination of a low population and failure of the fish to bite would seriously curtail the walleye harvest. It is unlikely that a high population (near that number estimated as present at the start of the 1963 season) would result in poor fishing or low harvest rates. Although the data are not complete, the 1964 census for May and June indicates better walleye fishing than shown for the same 2 months of each of the previous 3 years. It is not unreasonable to assume that recruitment would at least balance the natural mortality of the adults during the 1963 season. Thus we can calculate that an exploitation rate of 33 per cent of 80,000 fish during the 1963 season would result in an adult population that was greater at the start of the 1964 season than at the start of the 1962 season and perhaps equal to the population at the start of the 1963 season. Thus, as most fisheries biologists realize, optimum fishing and harvest of walleyes over a series of years is contingent on consistent yearly recruitment to the adult or fishable population. Exploitation rates are important but secondary.

It is rather easy to visualize that the failure of two or more successive year classes would seriously affect adult populations. The effect on the sportfishery will depend on exploitation rates during the seasons just prior to the time these poor year classes enter the fishery. In the case of the walleyes, the annual stocking of fry may help fill the void created by a poor natural hatch of fry. Rose (1955) indicated that there was a correlation between fry stocking and future populations of yearling and adult walleyes in Spirit Lake. Carlander (1960) has also shown that walleye fry stocking contributed to an increased adult population in Clear Lake, Iowa. Except for the 1955 season when no walleye fry were stocked, Spirit Lake has received approximately 3,000 fry per acre each year since 1949. Although the two studies mentioned above have shown that fry stocking produces increased numbers of fingerling and adults in the succeeding years, there has been relatively little work conducted on the relation of fry stocking to the natural hatch. Data from the present study also indicates that a population study involving year class strength during the third year of growth would be of considerable value, particularly if it were coupled with investigations of the natural production of that year class prior to the stocking of walleye fry. It is highly probable that 3,000 fry per acre in years of high natural production contributes proportionately little to the adult population. Apparently the contribution of recruitment to the adult or fishable population has to be of considerable magnitude before it influences the sport fishery to a significant degree.

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EFFECT ON STOCKING MARKED ADULT WALLEYES FROM DIAMOND LAKE INTO SPIRIT LAKE

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Fisheries Biologist

INTRODUCTION

Diamond Lake is a small (111 acres), shallow (maximum depth 5 feet) lake of glacial origin in northwest Iowa. It is one of the many marginal lakes in this part of the state that is subject to frequent winter freeze-outs. Because of the freeze-out potential, this lake is unsuitable to manage for a successful sport fishery. Consequently, the lake is being used as a nursery lake for walleyes. Walleye fry are placed in this lake soon after hatching in the spring and allowed to grow throughout the summer. The fish are then removed by seining in the fall and stocked in more suitable habitat.

Because of various conditions that affected the efficiency of the seine and the absence of freeze-out conditions during the past several winters, a small population of walleyes, mostly the 1959 year class, developed in Diamond Lake. About one week after the 1963 fishing season opened, 523 of these fish, ranging in size from 12.6 inches to 23 inches in total length and averaging 19 inches long, were removed from the lake. Since a walleye tagging program was underway in Spirit Lake, this appeared to be an excellent opportunity to bolster the number of tagged fish used for the walleye population estimate and to check on the contribution of fish stocked from other waters to the fishery of Spirit Lake.

METHODS

The walleyes from Diamond Lake were hauled to the south shore of Spirit Lake and placed in a holding net. They were then marked, as were all Spirit Lake walleyes marked in 1963, with monel metal tags placed over the right maxillary and premaxillary and released at the tagging site. Scale samples were taken from every tenth fish.

A full-time creel census clerk is employed on Spirit Lake. As part of his routine duties in 1963, he was required to measure all walleyes observed by him and to record all tag numbers observed. Even though the sample collected by the census clerk was quite small, it was the most reliable data obtained. Therefore, the results in this report are based largely on the census clerk's observations.

RESULTS AND DISCUSSION

By mid-summer it was evident that these fish would have to be disregarded in any population estimate. Early in the fishing season these Diamond Lake walleyes were caught at a much faster rate than the native marked walleyes of Spirit Lake. During May and June 1963, census records indicated that 4.0 per cent (21) of the marked Diamond Lake walleyes were creeled as compared to 1.2 per cent (24) of the native marked walleyes of Spirit Lake. However, during the remainder of the fishing season this differential in catch rate was reversed, with only 0.4 per cent (2) of the marked Diamond Lake fish creeled as compared to 1.2 per cent (24) of the marked native walleyes of Spirit Lake.

It is quite possible that a higher percentage of these tags were recaptured during May and June than was realized. This could account for the low tag return for the remainder of the fishing season. It has been determined that during 1963 voluntary tag returns from native Spirit Lake walleyes could have been as much as 50 per cent below the actual number of tags taken by fishermen. During May and June, 144 Diamond Lake tags were voluntarily returned. The remainder of the fishing season produced 46 tags voluntarily returned. When a tag is voluntarily returned and there is no other data, such as date and place of capture, it is recorded as captured the day it was returned. It is quite possible that a large portion of the 46 tags returned after July 1 were caught prior to that date. If we assume that half of these 46 tags were caught prior to July 1 and that fishermen withheld Diamond Lake tags in the same proportion as apparent for the native fish, there could have been as few as 189 tags remaining in the lake on July 1, 1963. With relatively few tagged fish at liberty and better distribution (with time), markedly fewer tag recaptures would naturally be expected.

Mortality was not an important factor since only two dead Diamond Lake walleyes were noted throughout the summer.

These findings are similar to those reported by Lewis, Summerfelt, and Lopinot (1963) when they added marked fish to existing populations of warm-water fish. They found that the principal returns came the first season. However, they were using larger numbers of marked fish and a smaller lake which could account for the principal recoveries coming throughout the entire season instead of just the first two months. Also, Ricker (1958) stated that for the purpose of population estimates marked foreign fish must not be used in conjunction with marked or unmarked native fish.

This study indicated that the addition of catchable-size walleyes to an existing walleye population in Spirit Lake can produce added fishing, at least temporarily.

The aging of walleyes, especially the older fish, through examination of scales is at best difficult. The addition of these known aged fish from Diamond Lake, upon future recapture, should give us some clues as to the aging of these older fish.

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NOTES ON THE GROWTH OF TAGGED WALLEYE

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Fisheries Biologist

In the spring of 1960, 198 walleye were tagged in Green Valley Lake, Iowa. This project was a substantial segment of a comprehensive plan to evaluate the success of introducing walleye into a southern Iowa recreational impoundment. Initially the tagging was used to estimate the adult walleye population and determine rate of angler exploitation. Again in 1961, 98 additional adult walleye were tagged for further appraisal.

Fish were captured with electro-fishing gear and gill nets during inshore spawning movement. Each fish was measured for total length, affixed with a serially numbered No. 3 monel metal strap tag that enclosed the entire maxillary structure, and immediately returned to the lake.

Periodic resampling of the adult walleye population was made at least three times a year for the next succeeding 5 years. All recaptured fish were measured again and returned to the lake. Several measurements were also received from anglers that caught tagged walleye.

Previous fisheries studies by Rose (1958) and Pechacek (1956) indicated jaw tagging has a marked influence on fish growth. Both of these studies indicated interference of feeding was primarily responsible for growth retardation. The purpose of this study is to further examine the influence of tagging to walleye growth and determine the degree growth is retarded.

TAG RETURNS

Mathematical models of fish population structures and mortality rate usually portray a steady decrease in the occurrence of tagged or marked fish within a population following initial tagging (Carlander, 1956). Therefore, it is expected that the largest number of tagged fish would be recaptured the first year, with a diminishing number of returns during following years until natural or angler mortality eliminates all tagged fish within the population. Rose (1947 and 1954) found this evident in two separated tagging studies of walleye in Spirit Lake, Iowa.

The Green Valley Lake study is rather unique in that the largest number of fish were recaptured in the second year, then returning to the natural sequence of diminishing tag returns. This is probably due to a combination of two factors: (1) electro-fishing and gill net sampling was most successful during inshore spawning movement in the spring, and (2) the number of tagged fish caught by anglers was concentrated into a relatively short period in the spring when walleye activity is greatest in shallow water. In both cases, tagging had occurred the preceding spring with approximately a 1 year interlude.

During the first 4 years, 122 (or 41 per cent) of the original 298 tagged walleye were recaptured by anglers or resampling gear (Table 1). Approximately 50 per cent of the fish marked in 1960 were recaptured, whereas only 23 per cent of the walleye tagged in 1961 were recaptured. Several fish were recaptured in successive years with resampling gear. These fish were also remeasured and returned to the lake. The largest sample occurred in 1961 when 49 walleye were recaptured.

TABLE 1. Walleye recaptured from Green Valley Lake, 1960-1964

Year Tagged	Total No. Tagged	No. of Tags Returned	Number of walleye recaptured 1960	1961	1962	1963	1964
1960	198	99	12	48*	16*	22*	1*
1961	98	23		1	18	3	1

* Several walleye were recaptured on consecutive or successive years and were added to the actual total of tags returned.

GROWTH OF TAGGED WALLEYE

Age and growth studies were completed on the untagged walleye population in 1962 (Mayhew, 1963). Calculated mean total length from the first through seventh years of life was 5.7, 10.2, 12.6, 15.0, 17.6, and 20.8 inches. Annual growth increment for the corresponding years of life was 5.7, 5.5, 2.4, 2.4, 2.6, 1.9, and 1.3 inches, respectively.

Reliable measurements of total length were obtained from 59 of the 122 recaptured walleye. Most of these were caught during routine population resampling. Several accurate measurements were also received from walleye fishermen, but if there was any doubt of reliability of these measurements they were discarded.

During the first year of the study only one recaptured fish was measured. This walleye was caught by an angler 71 days after it was originally tagged and had increased 0.5 inches in total length (Table 2). The following year (1961) measurements were obtained from 17 recaptured walleye. Mean growth increment was 1.6 inches with a range of 0.5 to 3.0 inches. In 1962, after the fish had been released for 2 years, average growth increment increased to 2.2 inches and ranged from 1.0 to 3.0 inches. During the following 2 years, tag returns were rather small. Mean cumulative growth increment was 3.3 inches for those walleye that had been tagged 4 years previously, and 4.7 inches for those that had been tagged for 5 years.

In comparison to the 1960 project, tag returns from the 1961 project were rather inconclusive. Only one tagged walleye was recaptured the first year. The remainder of the recaptured fish were all taken the following year. This made comparison of long range tagging effects impossible. Mean annual growth increment after 1 year was 1.5 inches and ranged from 0.5 to 2.4 inches, which is quite similar to the 1960 project.

The exact degree of growth retardation as a result of jaw tagging can be analyzed in much more detail by close examination of the growth history of walleye No. 3774. The fish was first tagged and released on April 9, 1960. Total length was 14.0 inches and the fish was 4 years old. During the remainder of 1960 this fish remained at large in

TABLE 2. Growth of tagged walleye after being released 1, 2, 3, and 4 years in Green Valley Lake, Iowa

1960 Project			Length at Recapture							
Tag No.	Total Length at Tagging	Age at Tagging	1960 T.L.	1960 Inc.	1961 T.L.	1961 Inc.	1962 T.L.	1962 Inc.	1963 T.L.	1963 Inc.	Total Inc.
3638	17.5	5	18.0	0.5							0.5
3611	16.5	4			17.5	1.0					1.0
3623	16.2	4			18.0	2.8					2.8
3646	15.0	4			16.0	1.0					1.0
3658	15.5	4			15.7*	0.7					0.7
3690	15.0	4			16.7	1.7					1.7
3714	15.5	4			16.7	1.2					1.2
3715	16.5	4			17.7	1.2					1.2
3722	16.0	4			17.5	1.5					1.5
3724	15.0	4			17.0	2.0					2.0
3726	16.0	4			18.6	2.6					2.6
3730	14.0	4			15.5	1.5					1.5
3735	15.5	4			18.0	2.5					2.5
3736	14.0	4			17.0	3.0					3.0
3741	11.0	2			12.5	1.5					1.5
3753	14.5	4			15.5	1.0					1.0
3770	15.0	4			16.0	1.0					1.0
3772	15.0	4			17.2	2.2					2.2
		Mean Growth Increment 1.6 inches, range 0.7-3.0 inches									
3627	15.5	4					17.5	2.0			2.0
3630	20.0	6					21.0	1.0			1.0
3687	15.5	4					18.5	3.0			3.0
3688	15.0	4					17.2	2.2			2.2
3717	15.0	4			16.5	1.5	18.0	1.5			3.0
3752	15.5	4			17.0	1.5	18.0	1.0			2.5
3779	14.0	4					15.6	1.6			1.6
		Mean Growth Increment 2.2 inches, range 1.0-3.0 inches									
3608	15.2	4					17.6	2.4	18.0	1.0	3.4
3658	14.0	4							17.8	3.8	3.8
3705	15.0	4							18.0	3.0	3.0
3778	14.0	4							17.0	3.0	3.0
		Mean Growth Increment 3.3 inches, range 3.0-3.8 inches									
3774	14.0	4			15.5	1.5	16.6	1.1	17.2	1.1	
								(1964-	18.5	1.3)	
									18.7	0.2**	4.7
1961 Project											
2760	14.5	4			14.9***	0.4	15.8	0.9			1.3
2722	16.0	4					17.6	1.6			1.6
2735	15.0	4					16.5	1.5			1.5
2744	21.0	7					21.5	0.5			0.5
2754	13.2	3					15.6	2.4			2.4
2757	15.7	4					16.7	1.0			1.0
2771	13.2	3					15.6	2.4			2.4
2775	14.7	4					16.2	1.5			1.5
2783	12.0	3					13.7	1.7			1.7

TABLE 2. (Con't.)

2785	14.0	4	16.0	2.0	2.0
2788	13.2	3	15.2	2.0	2.0
2793	16.7	5	17.7	1.0	1.0
2797	14.5	4	15.5	1.0	1.0
		Mean Growth Increment 1.5 inches, range 0.5-2.4 inches			

* Walleye caught in Summit Lake by angler. Fish apparently swam over the spillway of Green Valley Lake.

** Tagged walleye recaptured in 1964 by electro-fishing then caught by angler later in year.

*** Growth increment represents 57 days of growth from original measurement.

Green Valley Lake. First recaptured occurred on April 13, 1961, or slightly more than one year after tagging. On this date the fish was 15.5 inches long, and had increased 1.1 inches in total length. The following year (1962) the walleye was again recaptured and measured. Total length was 16.6 inches with an increment of 1.1 inches. On March 30, 1963 the fish was again remeasured and had increased 0.6 inches to 17.2 inches. Early in 1964 this walleye was again recaptured and had increased 1.3 inches in total length to 18.5. Fifty-nine days later the fish was caught by an angler. Total length at this final recapture was 18.7 inches. Cumulative growth since the fish was tagged 5 seasons previously was 4.7 inches.

When data from the age and growth study (Mayhew, op. cit.) is applied to the growth history above, an estimate of the severity of growth retardation is evident. Walleye No. 3774 retained the tag for 4 full growing seasons. Also, the fish was not caught until a portion of the fifth growing season had passed. If the mean calculated annual growth increments are applied to the total length of the fish when it was originally tagged, the fish would have been 22.2 inches in length instead of 18.7 inches when caught by the fisherman. This is a deficit of 3.5 inches or approximately 25 per cent growth retardation directly attributed to tagging over a 4-year period.

Before the effects of jaw tagging on walleye growth can be fully evaluated, the differential rate of growth at different ages must also be considered. Growth patterns of fish usually portray a diminishing annual growth increment as the fish ages. In the previously listed age and growth study calculated growth increment was largest during the first year of life. As the fish became older, growth increment steadily declined. By comparison, tagged walleye growth pattern was essentially identical except growth rate was much less. As shown in Table 3, annual growth increment of tagged walleye was 1.5, 2.1, 1.6, 1.7, 1.0 and 1.5 inches for the second through seventh years of life. Untagged walleye had approximately 35 per cent faster growth. There was no evidence of increased growth retardation with an increase of time that the fish carried the tag. Rather the data indicates that growth retardation from effects of tagging is constant throughout the life of the fish. Mean deficit of annual growth increment directly attributed to tagging for each age group of fish was as follows: Age II, 4.0 inches; Age III, 0.3 inches; Age IV, 1.2 inches; Age V, 0.9 inches; Age VI, 0.9 inches; and Age VII, 0.2 inches.

TABLE 3. Growth of tagged walleye by age group and year of recapture

	Age Group						
	I	II	III	IV	V	VI	VII
Untagged							
Mean Increment	5.7	5.5	2.4	2.4	2.6	1.9	1.3
Tagged							
Mean Increment							
1 year	-	1.5	2.1	1.6	1.7	1.0	1.1
2 years	-	-	-	1.2	-	0.5	-
3 years	-	-	-	0.9	-	-	-
Mean Deficit	-	4.0*	0.3	1.2	0.9	0.9	0.2

* Only one fish in sample

DISCUSSION

Jaw tagging has been used by fisheries workers for several decades to determine population magnitude, angler exploitation, and fish movement. Information from such studies is considered by most workers valid only when a tagged fish reacts to an external stimuli identically with normal fish activity. Such studies are extremely important in understanding the life history of fish, and it would be impractical to approach the problem by any other method. However, side-effects resulting from the attachment of non-natural devices to fish must also be considered in evaluating the project.

Retardation of growth is one of the resulting side-effects of jaw tagging. This device undoubtedly interferes with the normal feeding of piscivorous fish such as walleye. Tagging studies in Green Valley resulted in about 35 per cent slower growth for tagged fish. There appears to be insignificant difference in the rate of growth of tagged fish with an increase in the length of time the fish carries the tag. Growth is rather constant after initial tagging, but at a slower rate than normal. Rose (op. cit.) found increased growth retardation with an increase in time. However, he used mean growth increments of fish recaptured after predetermined time interval, failing to evaluate the differential growth rate of fish at different ages. Rate of growth was reduced from approximately 10 per cent to 50 per cent in the Spirit Lake studies. Consequently, it is apparent a jaw tag does exert a retarding effect upon the growth of walleye. Obviously, tagged fish can not be used to substantiate or determine growth rate by scale or length-frequency methods.

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1964 ANNUAL SURVEY OF THE CORALVILLE RESERVOIR FISH POPULATION

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Following the initial and somewhat extensive survey of the Coralville Reservoir made in the fall of 1963 by Mayhew (1964), it was deemed necessary to make annual surveys of the fish populations of this reservoir. The purpose is to maintain a continuous inventory and anticipate changes in the fish population in order that management techniques can be recommended and evaluated. Presented here is a report of the 1964 annual survey.

METHODS

Methods employed in sampling fish included the electro-shocker, pound net, bait net, basket trap and drag seine. Pound nets and bait nets were not utilized in the tailwaters, as physical conditions of the area would not permit. Sampling continued over a period extending from May 15 through December 21, 1964. Much of the data was gathered incidental to various other projects presently in progress.

Total effort expended in sampling the pool and headwaters included 6 hours of electro-fishing, 10 net days of pound netting, 22 net days of bait netting, 37 net days of basket trapping and 8 hauls with 30 feet of 1/4-inch mesh drag seine. Sampling effort in the tailwaters of the outlet structure consisted of 4 1/2 hours of electro-fishing, 39 net days of basket trapping and 3 hauls with the above mentioned seine.

RESULTS AND DISCUSSION

Pound netting in the pool and headwaters yielded a high ratio of rough fish to game fish (Table 1). The rough fish consisted primarily of carpsuckers and small carp, and the most abundant game fish was crappie. Electro-fishing yielded an even higher percentage of carp and fewer crappie than did pound netting (Table 2). Seine hauls indicated that young-of-the-year of channel catfish, crappie, carp and carpsuckers were abundant, while largemouth bass, bluegill and bullheads were rare. No young-of-the-year walleye, northern pike or buffalo were observed.

Electro-fishing in the tailwaters also yielded a high ratio of rough fish to game fish (Table 3). Here, however, the dominant species was the bigmouth buffalo. Carpsuckers were also abundant, but carp were scarce. Although crappie was again the most abundant game fish, largemouth bass comprised a greater portion of the total weight of the sample. It is interesting to note that although bass represent a large segment of the game fish population in the tailwaters, they are seldom caught on hook and line in this area (Helms and Mayhew, 1964).

Young-of-the-year of largemouth bass, crappie, bluegill, green sunfish and carpsuckers were collected in the tailwaters following extended periods of low flow (500 c.f.s. or less). Seine hauls in the boat launching area (200 yards below the outlet structure) indicated an abundance of minnows.

TABLE I. Composition of fish caught in 10 net days of pound netting in the pool and headwaters of the Coralville Reservoir

Species	Number caught	Avg. Size (lb.)	Per cent of total number	Per cent of total weight
<u>Game Fish</u>				
Crappie	332	0.4	33.9	14.7
Bullhead	69	0.3	7.1	2.2
Bluegill	10	0.3	1.0	0.3
Walleye	4	4.0	0.4	1.9
Largemouth bass	4	1.5	0.4	0.7
Northern pike	3	4.0	0.3	1.4
Channel catfish	2	0.5	0.2	0.1
White bass	1	0.4	0.1	---
Sub total	425		43.4	21.3
<u>Rough Fish</u>				
Carpsucker	410	1.1	42.0	55.0
Carp	107	1.3	17.5	15.4
Bigmouth buffalo	19	3.1	1.9	6.9
Smallmouth buffalo	9	1.6	0.9	1.6
Redhorse sucker	5	1.4	0.5	0.6
Sub total	550		62.8	79.5

TABLE 2. Composition of fish caught in 6 hours of electro-fishing in the pool and headwaters of the Coralville Reservoir

Species	Number caught	Avg. Size (lb.)	Per cent of total number	Per cent of total weight
Game Fish				
Crappie	140	0.3	8.8	1.2
Bullhead	5	0.4	0.3	0.1
Bluegill	38	0.2	2.4	0.3
Walleye	1	3.0	0.1	0.1
Largemouth bass	11	0.5	0.7	0.2
Channel catfish	8	2.0	0.5	0.6
Sub total	203		12.8	2.5
Rough Fish				
Carpsucker	169	1.4	10.6	7.8
Carp	1,112	1.8	69.3	72.7
Bigmouth buffalo	113	4.1	7.1	16.9
Smallmouth buffalo	3	2.0	0.2	0.2
Sub total	1,397		87.2	97.6

TABLE 3. Composition of fish caught in 4 1/2 hours of electro-fishing in the tailwaters of the Coralville Reservoir

Species	Number caught	Avg. Size (lb.)	Per cent of total number	Per cent of total weight
<u>Game Fish</u>				
Crappie	90	0.2	4.7	0.1
Largemouth bass	70	2.5	3.7	4.3
Walleye	13	3.0	0.7	1.1
Bluegill	46	0.1	2.4	0.1
Miscellaneous*	6	---	0.1	0.2
Sub total	225		11.6	5.8
<u>Rough Fish</u>				
Bigmouth buffalo	1,355	2.5	70.8	81.5
Carpsucker	266	1.2	14.0	10.2
Carp	51	1.7	2.7	2.1
Smallmouth buffalo	7	1.9	0.4	0.3
Redhorse	2	1.8	0.1	0.1
Sub total	1,681		87.0	94.2

* Miscellaneous fish include: channel catfish, flathead catfish, yellow bass, white bass and bullhead.

In general, scale analysis indicated that fish collected in the extreme headwaters grow much slower than those in the lower end of the pool, and fish in the tailwaters grow at an intermediate rate. Possible exceptions are the bigmouth buffalo and the channel catfish. These two species both tended toward faster growth in the tailwaters.

Length-frequency data taken from 940 channel catfish collected in the headwaters and pool (Figure 1) demonstrate a preponderance of small fish in the headwaters and a virtual absence of similar sized fish in the pool. This phenomenon could be attributed to a number of causes, but the author prefers to think that the headwaters is serving as a nursery area for the smaller catfish and that there is a downstream migrational trend when the fish reach about 2 years of age. This theory is proposed because peaks in length-frequency of catfish from the two areas tend to coincide. And, when the data are combined (Figure 2), there is formed a uniform series of peaks which decrease in size with an increase in total length of the fish.

The length-frequency of 614 channel catfish taken in the tailwaters is similar to the sample taken in the headwaters except that the peaks occur higher on the scale. Thus, growth is slightly faster in the tailwaters.

Further information concerning growth of the channel catfish will be presented in a later study.

SUMMARY

The Coralville Reservoir fish population in 1964 appears to be very similar to what it was in 1963. Rough fish make up about 85 per cent of the total weight and 70 per cent of the total number. Carpsuckers and small carp dominate in the reservoir, while bigmouth buffalo dominate the tailwaters. Crappie and channel catfish are the most abundant game fish in both areas. Young-of-the-year channel catfish, crappie, carp, and carpsuckers are abundant in the reservoir.

No major changes in the population structure are anticipated for the coming year.

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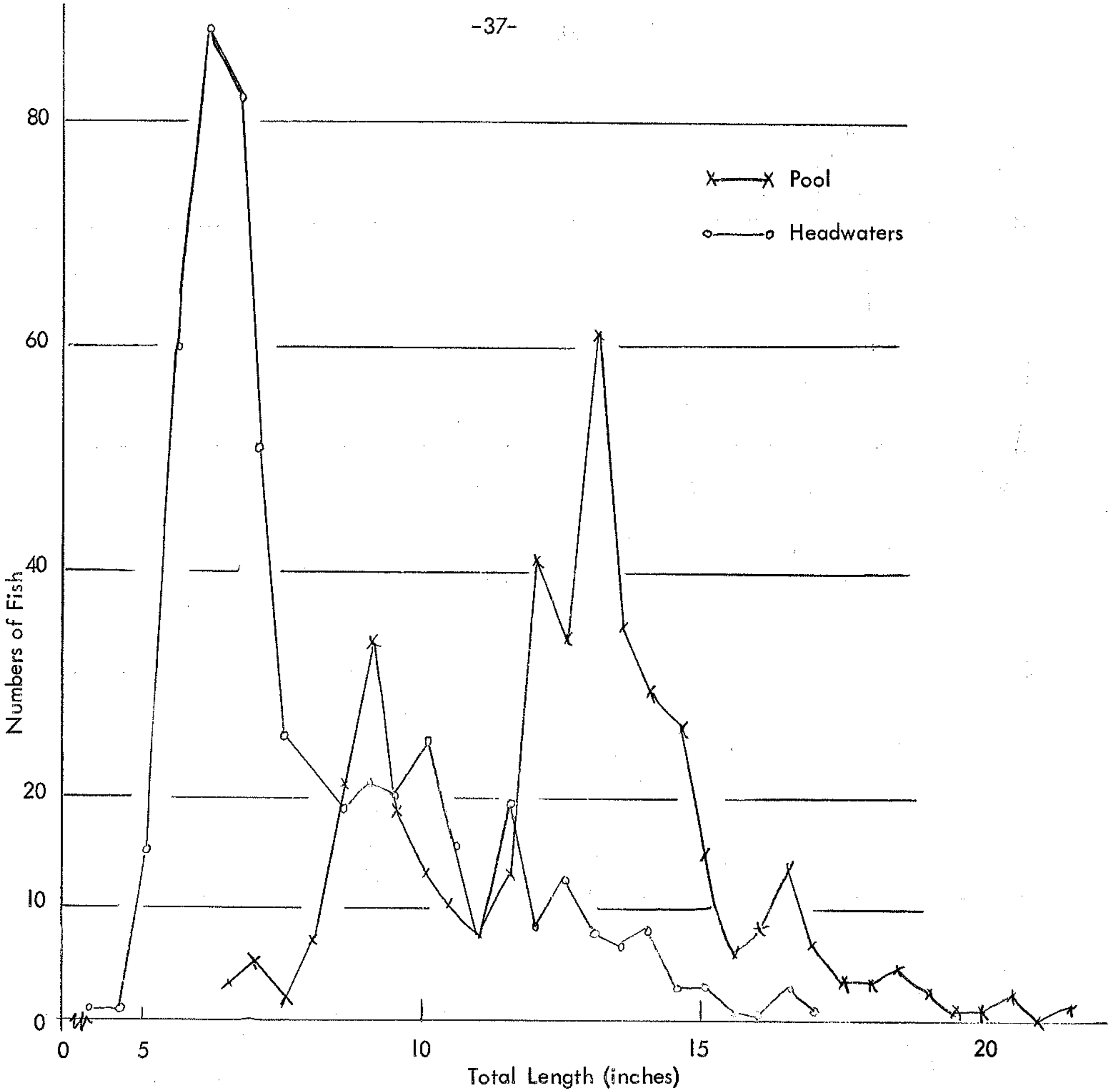

FIGURE I. Length-frequency distribution of channel catfish caught in the pool and headwaters of the Coralville Reservoir.

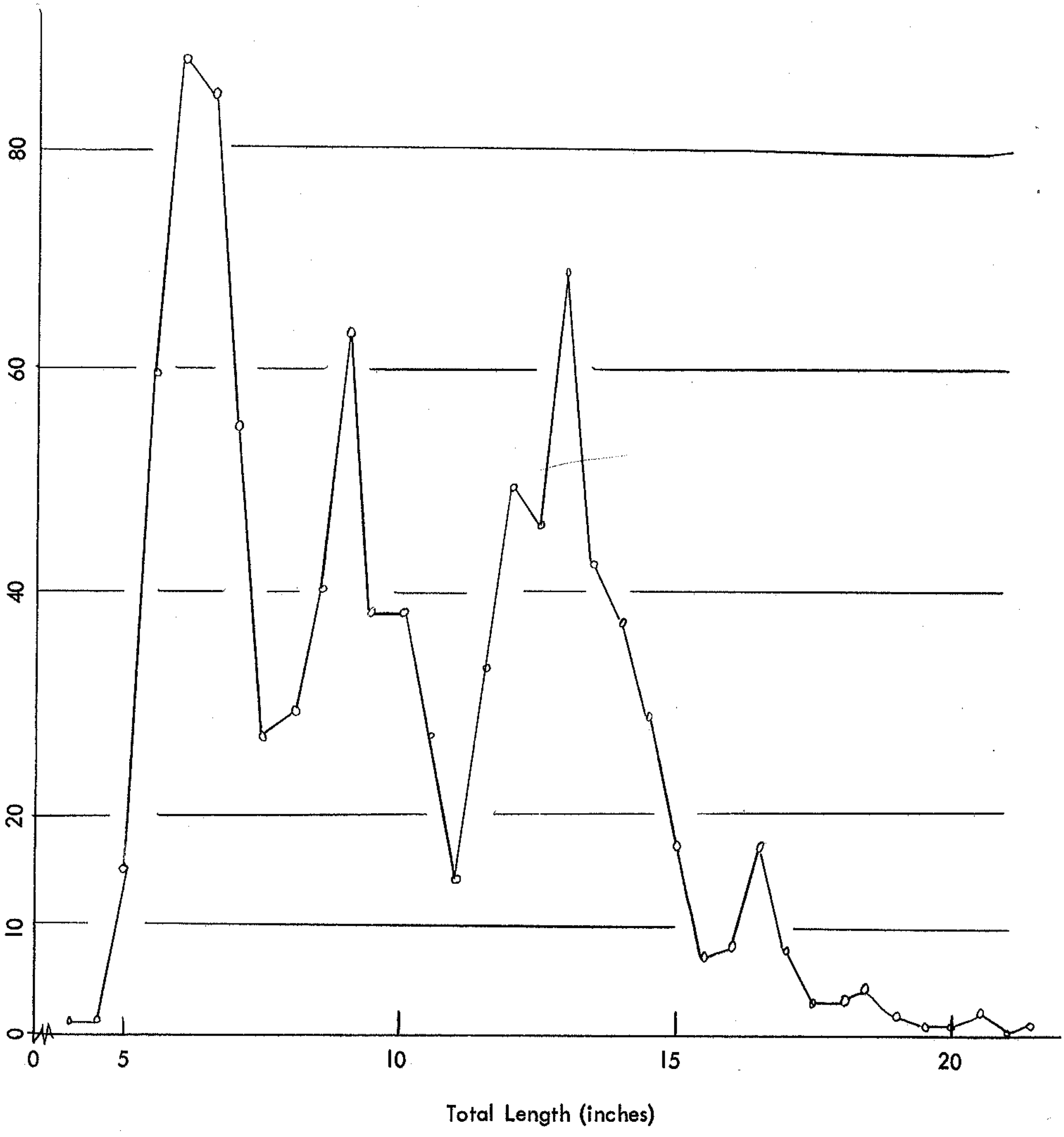

FIGURE 2. Combined length-frequency data for all channel catfish caught in the pool and headwaters of the Coralville Reservoir.

DESOTO BEND CREEL CENSUS, 1964

Bill Welker
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A creel census was conducted between May 1 and September 15, 1964 at DeSoto Bend Lake in western Iowa. This lake of approximately 800 surface acres is a Federal Wildlife Refuge. Fish management of the area is conducted jointly by Iowa, Nebraska and the U. S. Fish and Wildlife Service. The lake is situated about 20 miles north of Omaha and Council Bluffs. It was formed in 1960 from a 7 1/2-mile bend in the main channel of the Missouri River by construction of impervious levees across the upper and lower ends of the bend. It is a typical long, narrow, ox-bow lake with extensive shallow water areas. The public is only allowed use of the lake between May 1 and September 15, the period which does not interfer with waterfowl management.

The lake inherited a large rough fish population of gizzard shad, carp and carpsuckers from the Missouri River. Crappie are the most abundant game fish with channel catfish, largemouth bass, northern pike, sauger, walleye, yellow perch, bullhead and bluegill also present. Since formation of the lake, an extensive stocking program with walleye, channel catfish, and largemouth bass has been conducted.

METHODS

There are only two access roads into the refuge, each leading to opposite ends of the long, narrow lake. This limited access makes possible a complete check of anyone entering or leaving the area, which is very important to a creel census.

The census clerk worked one 8-hour period (6 a. m. to 2 p.m. or 2 p.m. to 10 p.m.) six days a week including Saturday and Sunday. The period worked each day and the access chosen for the interview station were randomly selected. The clerk stopped all cars leaving the area by his station and interviewed the occupants, except during periods of heavy traffic on weekends and holidays at which time he randomly chose cars to stop. It is estimated that by using this census method approximately 20 per cent of all cars leaving the area can be stopped and the occupants interviewed. A similar census was conducted at DeSoto Bend during 1963.

RESULTS AND DISCUSSION

Crappie were the most abundant fish in the creel (Table 1). They composed 66.4 per cent of the total catch during the census. This is a slight decrease from the 68.4 per cent recorded in 1963. Most of the crappie were between 6 and 8 inches total length and from 1962 and 1963 year classes. Approximately 50 per cent of the crappie were caught before June 1. The best crappie fishing in the Missouri River ox-bow lakes is during the spring and fall months.

Channel catfish were the second most important fish, composing 15.2 per cent of the catch. This is an increase from the 11.7 per cent recorded in 1963. All 2-inch size groups between 8 and 26 inches total length were represented in the catch. Since channel

TABLE 1. Total numbers and per cent of different fish caught during 1964 DeSoto Bend Creel Census

Species of Fish	Number caught	Per cent of total catch
Crappie	2,607	66.4
Channel catfish	600	15.2
Flathead catfish	7	*
Bullhead	44	1.1
Bluegill	189	4.8
Largemouth bass	16	*
Yellow perch	8	*
Sunfish	22	*
Sauger	12	*
Walleye	3	*
White bass	64	1.6
Carp	301	7.6
Buffalo	4	*
Carpsucker	1	*
Drum	43	1.1
TOTAL	3,921	

* Values less than 1 per cent

catfish are an important part of the DeSoto Bend Fishery, and since their natural reproduction usually decreases in an area that has been cut off from a river, extensive stockings of channel catfish have been made in the lake since 1960.

Flathead catfish, bullhead, bluegill, largemouth bass, yellow perch, green and orange spotted sunfish, sauger, walleye and white bass were the remaining game fish in the creel. They composed 9.3 per cent of the total catch.

Only four different kinds of rough fish were found in the creel; however, carp were the third most abundant in the overall total catch (7.6 per cent). Largemouth buffalo, carpsuckers and fresh-water drum were other rough fish caught by the fishermen (Table l).

There was a monthly decrease in the number of fish caught per hour between May and September (Table 2). Probably most responsible for this decrease was the increasing inability of fishermen to catch crappie as the season progressed. Crappie are most easily caught in Missouri River ox-bow lakes during spring and fall months. The catch per hour values were low, ranging from .76 in May to .18 in September.

Over 80 per cent of all the fishermen contacted drove less than 35 miles to visit DeSoto Bend Lake. The largest percentage came from the Omaha and Council Bluffs metropolitan areas which are 20 miles south of the lake. May was the month with the highest fishermen visitation (987).

SUMMARY

1. A "visitor contact upon leaving" type creel census was conducted on DeSoto Bend Lake between May 1 and September 15, 1964.

2. The 3,319 fishermen contacted fished a total of 9,055 hours and caught 3,948 fish for a catch per hour value of .43. Monthly catch per hour values decreased from a high of .76 in May to a low of .18 in September.

3. Crappie (66.4 per cent), channel catfish (15.2 per cent) and carp (7.6 per cent) were the most abundant fish in the creel.

4. More than 80 per cent of the fishermen contacted drove less than 35 miles to visit DeSoto Bend Lake.

TABLE 2. Total number of fishermen, fish caught, hours fished and fish caught per hour values computed from visitor contacts by census clerk at DeSoto Bend Lake during 1964, by month

	Fishermen	Fish caught	Hours fished	Fish caught/hr.
May[1]	987	1,881	2,468	.76
June	696	902	1,700	.51
July	683	552	1,930	.28
August	735	478	2,246	.21
September[2]	218	135	711	.18
TOTAL	3,319	3,948	9,055	.44

COMPARATIVE AGE AND GROWTH OF CHANNEL CATFISH FROM SOME EASTERN IOWA RIVERS

Roger Schoumacher

and

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INTRODUCTION

Since the channel catfish, Ictalurus punctatus (Rafinesque), has been established as the number one game species in most of our inland rivers and because of the commercial importance of this species in the Mississippi and Missouri Rivers, increased studies have been directed toward the many phases in its life history. It is hoped as answers to these inquiries are found, they can be incorporated into applicable management techniques in order to increase desirable catfish populations now and in the future.

The primary intent of this paper is to present a comparative study of age and growth of channel catfish in selected Iowa waters. Population samples have been acquired from a variety of streams and habitats. Representing typical inland rivers are the Cedar, Iowa and Wapsipinicon. Representing a commercially fished river is the Mississippi, and representing chemically renovated areas are Fontana Mill Lake and the Iowa Falls - Steamboat Rock section of the Iowa River.

METHODS

During 1963 and 1964 channel catfish populations were sampled in various areas and various times throughout the open water season. Emphasis was placed upon securing a cross section of sizes, but in all instances this was not accomplished due to uncontrollable factors. The date, place, weight and total length were recorded on a scale envelope in which was placed a pectoral spine of that particular fish. A total of 1,391 spines were sectioned and then read on a conventional binocular microscope. Growth was determined by a system of average length for a given age group rather than by a system of back calculation.

Specimens were secured from fish markets along the Mississippi River and by fishing baited slat nets, baited mesh nets, and trap nets.

RESULTS

Growth rates in inland rivers of this state varied considerably (Table I). Fish from the Cedar River at Gilbertville and Cedar Rapids and the Iowa River at Marshalltown had similar growth rates, at least for the first 4 years of life. The Wapsipinicon River at Independence, which has a reputation for good catfishing, has a slower growing population with good numbers of fish up to the IX and even X year classes present. These fish were taken in the impounded water above the dam, but they have free access to the river

TABLE I. Average observed total lengths of channel catfish at various ages from various rivers in eastern Iowa

Location	Date	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Cedar River Gilbertville	Aug., '63		7.1 (22)*	9.9 (4)	12.1 (11)	17.2 (3)	19.0 (1)	20.6 (1)	21.2 (1)				
Cedar River Cedar Rapids	July, '64			10.1 (2)	12.4 (20)	13.4 (16)	14.6 (3)	18.7 (1)					
Wapsipinicon River Independence	April, '64					13.3 (11)	14.6 (13)	16.2 (19)	17.5 (10)	19.7 (7)	21.8 (5)	24.1 (3)	27.9 (2)
Wapsipinicon River Anamosa	Aug., '63		6.7 (2)	8.0 (28)	11.0 (6)	10.1 (5)							
Iowa River Marshalltown	Sept., '64		7.8 (2)	9.3 (6)	11.2 (4)	15.5 (7)							
Iowa River Iowa Falls-Steamboat Rock	Sept., '64	6.7 (9)	8.2 (13)	12.9 (17)	13.2 (4)								
Fontana Mill Lake Hazelton	Aug., '64	7.6 (4)	9.2 (1)	13.0 (4)	14.3 (2)	17.0 (1)							
Skunk River Lower 8 miles	Aug., '64	5.9 (32)	8.5 (35)	12.6 (22)	16.8 (34)	19.0 (18)	22.0 (2)			30.6 (1)		24.8 (1)	

* Numbers in parenthesis indicate sample size.

above the dam.

Fish from the Wapsipinicon River at Anamosa were slower growing. This area has a reputation for producing a very small catfish to the angler, and a program has been in progress to reduce the population in hopes of increasing the growth rate. Bait net catches in the Anamosa area generally yield very large catches of small catfish, with 90 per cent or more of the fish under 10 inches in length.

Increased growth of fish from the Iowa Falls - Steamboat Rock area of the Iowa River and Fontana Mill Lake is due to chemical renovation of the areas. The Iowa River was treated in 1960 and channel catfish fingerlings have been stocked each year since then. Natural reproduction should alleviate this need in the future, and the growth rate will probably decline as the population increases.

Fontana Mill Lake was rotenoned in late 1963 and stocked with fingerling catfish from the Humboldt Hatchery as well as about 2,000 sub-adult and adult catfish from the Anamosa area on the Wapsipinicon River - the area of slow growing catfish. Netting in late summer of 1964 disclosed a good population of catfish up to 17 inches in length. Age and growth data indicated that these fish (the results from the Anamosa stocking) grew extremely fast when stocked in the "void" of the renovated impoundment. Age III catfish from Fontana Mill averaged 13 inches in length, whereas these same fish in 1963 at age II averaged less than 7 inches in length. Age IV fish from the impoundment averaged 14.3 inches in length, whereas as III year olds they averaged 8 inches. Tiemeier and Elder (1960) found that the growth rate of stunted catfish transferred to ponds without high concentrations of catfish increased very rapidly. They attributed the rapid growth to an abundance of food.

Fish from the Skunk River exhibited fast growth comparable to the growth of fish from the renovated waters. These fish were taken in the lower 8 miles of the Skunk River just before it enters the Mississippi River and their growth rate is similar to that in several places on the Mississippi River (Table 2).

Table 2 gives some growth information for fish from various pools of the Mississippi River. Most of these fish were taken by commercial fishermen. There is, then, an inherent error in the average size of some of the fish because of the 13 inch size limit. For instance, the size limit does not always allow the commercial fishermen to harvest the smaller age III catfish, so the average size of age III fish in the commercial catch is larger than in the river population. Fish from the Mississippi River grow faster than fish from any inland river. The species is fished commercially on both sides of the river and this harvest undoubtedly has an accellerating effect upon the growth rate.

Fish from the eastern Iowa Rivers generally grew faster than those from central and western Iowa; i.e. Storm Lake, Des Moines, Boone, Little Sioux and Missouri Rivers (Harrison, 1957) (Table 3).

Condition factors, "C", were calculated for fish from the Skunk River, the Wapsipinicon at Independence, and the Mississippi River in pool 19 (Table 4). The Mississippi River fish were the plumpest with a "C" of 3.73 in late May and early June, followed by Independence fish at 3.10 and Skunk River fish at 2.88. However, two factors have to be taken into account when comparing "C" values: (1) the time of the

TABLE 2. Average observed total lengths of channel catfish at various ages from the Mississippi River

Location	Date	I	II	III	IV	V	VI	VII	VIII	IX
Pool 9	June, '63			12.6* (5)**	15.4 (30)	16.8 (45)	18.1 (33)	20.4 (16)	21.3 (10)	20.7 (5)
Pool 11	May, '63		7.6 (40)	10.3 (8)						
Pool 13	Aug., '63	6.6 (17)	9.2 (24)							
Pool 14	July, '63			13.2* (92)	14.8 (52)	17.6 (5)				
Pool 14	July, '63		9.1 (10)	10.7 (57)						
Pool 16	July, '64				13.8* (26)	16.5 (7)	18.5 (1)			
Pool 17	July, '64			13.4* (6)	14.1 (67)	17.4 (4)				
Pool 18	June, '63			12.9* (16)	15.1 (132)					
Pool 19	May, '64			13.1* (18)	15.6 (51)	21.8 (4)	21.7 (3)			
Pool 19	June, '63			13.2* (9)	16.6 (120)	20.2 (17)				

* Average size exaggerated because of 13-inch size limit.

** Number in parenthesis indicates sample size.

TABLE 3. Average observed total lengths of channel catfish from various areas in Iowa (Harrison, 1957)

Location	Sample Size	I	II	III	IV	V	VI	VII	VIII	IX	X	XI
Des Moines River Bonaparte	26	3.0	5.6	8.2	9.8		17.0					
Des Moines River Humboldt area	655		5.5	7.0	8.6	9.4	11.9	12.1	13.6	14.3	14.5	17.6
Boone River Webster City	93		7.5	8.5	11.8	13.8	16.5	17.2				
Storm Lake Storm Lake	40		5.7	7.5			24.7	25.5				
Little Sioux River Linn Grove	31	2.8	7.1	8.5	10.3							
Missouri River Mondamin	16		7.1	8.9	10.0			18.4				

TABLE 4. Condition factors, "C", for some channel catfish

Location	Date	No. Fish	"C"
Skunk River Lower 8 miles	August, 1964	141	2.88
Mississippi River Pool 19	May-June, 1964	851	3.73
Wapsipinicon River Independence	April, 1964	320	3.10

year and (2) the size of the fish. Independence fish were taken in April and Mississippi River fish were taken in late May and early June, so many of the fish were heavy due to the proximinity of the spawning season. In both cases the fish were 12 inches or longer. The Skunk River fish were taken in August, after the spawning season. Also, there were a large portion of small fish from 3.5 to 12 inches in length which had a lower "C" factor. The "C" factor for fish under 12 inches was 2.59; for those over 12 inches it was 3.17.

A comparison can be made between the age composition of fish in the commercial catch from the Mississippi River where there is a 13-inch size limit and the age composition of fish taken at Independence, since the gear used at Independence tended to catch only fish 13 inches or larger. In the Mississippi River in 1963, 51 per cent of 9,415 commercially caught fish examined were age III and 40 per cent were age IV (Iowa Conservation Commission Quarterly Biology Reports, Vol. 16, No. 1). In 1964, 47 per cent of 4,861 fish examined were age III and 49 per cent age IV. Of 320 fish taken at Independence, however, five age classes contributed at least ten per cent of the catch: V (23%), VI (17%), VII (25%), VIII (15%), and IX (11%). Age X (6%) and XI (2%) fish were also present. This indicates that the bulk of the Mississippi River catfish are harvested before they reach age V.

Harrison (op. cit.) suggested that channel catfish growth in many Iowa rivers could be increased through management. It is the opinion of the authors that one of the primary reasons for the faster growth in the Mississippi River is the annual commercial harvest of a portion of the population. Increased growth in chemically renovated areas also suggest that intra- and/or inter-specific competition affect growth. Harrison (op. cit.) believes that high rough fish populations have a repressive effedt on growth. Tiemeier and Elder (op. cit.) found no apparent relation between growth rate of stocked catfish and the presence of populations of largemouth bass and bluegill. They did not, however, encounter high populations of rough fish.

The proper management technique for stimulating catfish growth, it seems, would be a reduction in the catfish and/or rough fish populations. In most Iowa rivers, removal of significant numbers of rough fish is impractical if not impossible without using chemicals which remove the catfish and other game fish as well. Unless long stretches of rivers are treated, or suitable barriers exist, re-invasion of undesirable fish occurs rapidly..

Catfish, however, may be taken readily with selective gear throughout much of the open water season, so it would be possible to harvest a portion of a catfish population in an attempt to stimulate growth of the remaining fish. There is an excellent market for this species and they could be taken by commercial fishermen under some type of agreement with the Commission. The possibility of rough fish removal using the same system, where suitable commercial markets exist, could also be tried, either separately or in conjunction with the catfish removal. Careful scientific evaluation of the effects of the programs would be a real contribution to catfish management.

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