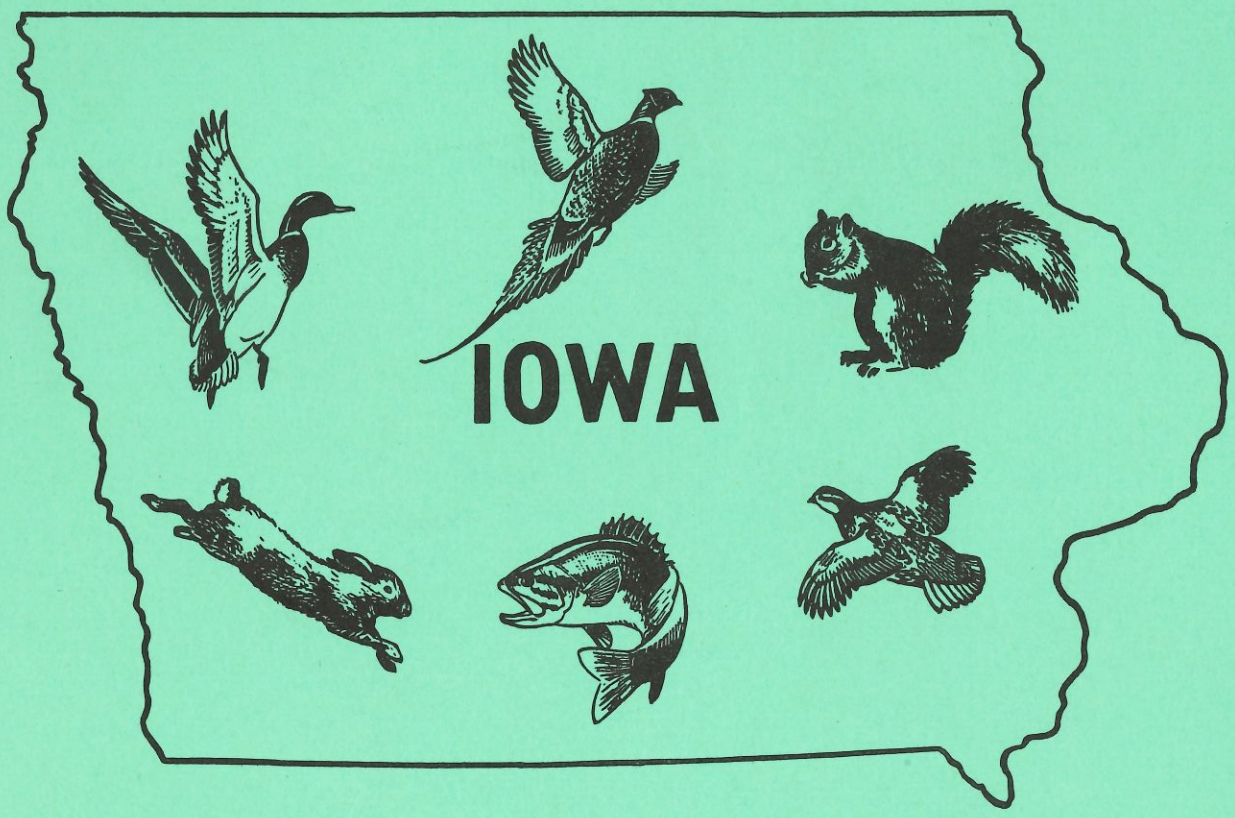
1965

QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

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ABSTRACTS OF QUARTERLY BIOLOGY REPORTS

RESULTS OF AN EXPERIMENTAL MUSKELLUNGE-SILVER NORTHERN PIKE CROSS

Terry Jennings
Fisheries Biologist
and
Fay Fronk
Fish Culturist

The results of a limited experiment in which a male muskellunge and female silver northern pike were cross-bred are presented and discussed. Essentially the results were as follows: 1. There was a good hatch of the cross-fertilized eggs when compared to that of purebred northern eggs hatched under similar conditions. 2. Pond reared individuals of this cross attained an average total length of 11.6 inches during their first 3 months. 3. The external coloration, markings, and distinguishing characteristics between northern pike and muskellunges varied widely among individuals of this cross.

PRE-IMPOUNDMENT STUDIES OF THE CHARITON RIVER IN THE VICINITY OF RATHBUN DAM AND RESERVOIR

Part II: Species Composition, Age Composition and Growth

Jim Mayhew
Fisheries Biologist

Rathbun Dam and Reservoir will impound 11,000 surface acres of water on the Chariton River. Pre-impoundment studies were conducted on several segments of the stream to obtain basic information on species composition, population structure, age structure, and growth of fish. Four study areas were selected on the North Chariton River and investigations were initiated in autumn 1965. Eighteen species of fish were found in the stream. Carp, channel catfish, carpsucker, white crappie, black bullhead, and gizzard shad were the most abundant species. Black bullhead dominated the river population by number, but carp was the most important species by weight. Mean calculated weight per mile of stream was slightly over 2,400 pounds, ranging from 858 to 3,481 pounds at individual sampling stations. The fish populations in the Chariton River appear to be stable, with minor variances in species composition and age composition annually.

SOME OBSERVATIONS ON TROUT POPULATIONS IN TWO IOWA STREAMS

Roger Schoumacher
Fisheries Biologist

Brown trout populations were sampled from 1962 to 1965 in two spring runs in which natural reproduction occurs. The populations were high in 1962 and 1963, but decreased drastically in 1964 and 1965. The percentage of fish under 6.5 inches in the populations decreased progressively each year, probably due to environmental conditions affecting egg or fry survival.

PROGRESS REPORT: CHANNEL CATFISH TAGGING STUDIES ON THE WAPSIPINICON RIVER - BUCHANAN COUNTY

Robert Schacht
Fisheries Biologist

During 1965, 2,937 channel catfish were tagged on the Wapsipinicon River in Buchanan County. Returns of 220 tags yielded information on movement within the 4-mile study area. Sixty nine per cent of the recaptured fish moved less than 1 mile. A homing tendency was indicated from fish transported from the capture site, and this will be studied further next year with the enlarement of the study area.

MOVEMENT OF TAGGED CHANNEL CATFISH BEFORE THE IMPOUNDMENT OF THE RED ROCK RESERVOIR

Gary L. Ackerman
Fisheries Biologist

During 1965, 4,972 channel catfish were tagged at Red Rock. Recaptures recovered from sport fishermen and from netting indicate that spawning catfish do move extensively within their environment. Ninety per cent of the recaptured tagged fish were spawners.

The data acquired demonstrates that channel catfish do move extensively within their environment on this section of the Des Moines River. Of 111 tags recovered, 27.9 per cent of the catfish moved upstream, 45.9 per cent moved downstream, and 26.2 per cent showed no movement tendencies.

CHANNEL CATFISH TAGGING ON THE CORALVILLE RESERVOIR AND ADJOINING WATERS - PROGRESS REPORT NO.1

Don Helms
Fisheries Biologist

During 1965, 3,874 channel catfish were tagged in the Coralville Reservoir and adjoining waters. Although tag returns were insufficient in number to present movement data, population estimates were possible on two important portions of the study area. These were Lake MacBride (8,362) and the pool of the Coralville Reservoir (34,572). It was also noted, as in previous studies, that the populations of the headwaters and tailwaters consist primarily of small fish while the pool and Lake MacBride are made up of larger fish.

RUFFED GROUSE TRAPPING RESULTS IN NORTH EAST IOWA
A Progress Report

Keith Larson
Game Biologist

From September 8, 1965 until January 7, 1966, 59 ruffed grouse were captured in clover traps. Of these 59, 36 were delivered to the Missouri Conservation Department, 18 died in the trap to predators and exposure, and five died in the holding room. A total of 2360 trap days were utilized for an average of 40 trap days per bird captured. Twenty traps were employed. Captured grouse were fed a variety of foods successfully until they were transported.

AGE OF QUAIL TAKEN BY IOWA QUAIL HUNTERS, 1965 SEASON

M. E. Stempel
Game Biologist

Wings from more than 1364 quail shot by Iowa hunters during the 1965-66 season were collected from 21 counties by November 18. Eighty-five per cent were juveniles. The hatch, as determined from wings and from coveys seen in the summer, began in May, peaked in June, and remained high into August. Altogether, after an early start a high rate of hatch was soon reached and, except for a low in August, it was maintained over a long period - with a resulting higher population than in 1964.

CLUB-REARED PHEASANTS VANISH AFTER STOCKING IN LEE COUNTY

Gene Hlavka
Game Biologist

One year after the stocking in October 1964 of 115 pheasants reared by the Prairie Hunters Club, Lee County farmers reported only two pheasant sightings, and none were reported during the 1965 fall crop harvest season. Farmer interviews and previous field checks had revealed the presence of very few birds. No cock calls were heard and no pheasants were seen during the spring crowing and roadside census on and around the release site. No pheasants were sighted during the two 30-mile pheasant summer roadside counts conducted in the immediate vicinity. Though the pheasants were raised from the same wild Union-Adair Counties stock as those the Commission is stocking in southeast Iowa, the results were markedly different. It is speculated that this may be a manifestation of the poorer job of rearing the birds - as typically done by such clubs - or a reflection of the value of mass stocking as compared to releases of small numbers of birds - also typical of sportsmen clubs - or a combination of these two things.

COMPARISON OF MAJOR CROP TRENDS IN NORTH CENTRAL AND WEST CENTRAL IOWA

Dick Nomen
Game Biologist

A comparison is made of major crop trends in north central and west central Iowa. A 4-county area was selected for comparison. Crop acreages and results of the August roadside count are listed for the years 1955, 1958, and 1964 - three "high" years for pheasants in Iowa. Briefly, the pheasant population declined in north central Iowa but still remained mush above the state average. The pheasant population increased in the west central area from 2.2 birds per mile in 1955 to 5.9 birds per mile in 1964. In 1964, row crops were planted on 57 per cent of the acres in north central Iowa compared to 43 per cent in the west central counties. Potential nesting cover crops such as oats, pasture and idle land totaled 39 per cent in the western area compared with 28 per cent in north central Iowa.

RESULTS OF 1965 IOWA WATERFOWL BANDING PROGRAM

Richard Bishop
Game Biologist

The banding of waterfowl was carried on in Iowa during 1965 much as it has been in preceding years. The banding of migratory birds supplies data on migrations, populations, distributions, and mortality. Such information is necessary for the better management of the species concerned. Iowa's banding program is based on drive-trapping and night-lighting young birds on the breeding grounds and bait=trapping flying birds prior to the hunting season. A total of 5,766 birds was banded and released in 1965 - 880 by drive-trapping, 1351 by night-lighting, and 3417 by bait-trapping. The birds banded consisted of 12 species of ducks and 8 species of other marsh birds. Blue-winged teal and wood ducks were the two most important and abundant species banded. Of the blue-winged teal banded, about 86 per cent were young birds.

RESULTS OF AN EXPERIMENTAL MUSKELLUNGE-SILVER NORTHERN PIKE CROSS

Terry Jennings
Fisheries Biologist

and
Fay Fronk
Fish Culturist

Introduction

West Okoboji is a highly eutrophic lake of glacial origin located in northwest Iowa. It is Iowa's third largest natural lake having a surface area of about 3,788 acres and a maximum depth of slightly over 130 feet. This lake has excellent habitat for northern pike and muskellunges consisting of ample aquatic vegetation in the shallow areas and several sloughs connecting with the lake which are used for spawning. There is abundant forage food available consisting mainly of young game fish (yellow perch and bluegills).

During the summer of 1960, 40 fingerling muskellunges were introduced into West Okoboji. This stocking marked the first known muskellunges in the lake. Subsequent stockings of fingerling muskies have been made during 1962 and 1965 with 41 and 200 fish being stocked each year respectively. The spring of 1965 was the first year that a sexually ripe muskellunge was captured. This male fish was taken from a fish-trap placed at the entrance of Garlock Slough into West Okoboji. Since a "ripe" female silver northern was available and no female musky was captured during the northern trapping operations or during the gill netting for spawning walleyes, this seemed to be an excellent opportunity to try a Muskellunge-Silver Northern Pike cross. Hybridization between northern pike and muskellunges was reported by Eddy (1940) as a possibility following a successful cross produced in a hatchery. Oehmcke (1951) reported that muskellunges and northern pike do hybridize naturally in Wisconsin rivers. However, neither of these reports mentioned hybridization between silver northerns and muskellunges. It was determined from observing the adult northerns brought in for hatchery purposes from West Okoboji Lake that silver northerns comprised about 5 per cent of the adult northern population in the lake during the spring of 1965. Because silver northerns are fairly common in West Okoboji, it is quite possible there could be natural hybrids produced between muskellunges and silver northerns. A limited experiment was set up to try and answer the following questions: Could muskellunges and silver northern pike bring off a successful hatch of healthy, rapidly growing hybrids when crossbred? What will the resulting fish look like and would they be recognizable should such a hybrid be produced naturally? Will the resulting hybrids be infertile?

Procedure and Results

During the spring of 1965, approximately 50,000 eggs were obtained from a 12 pound female silver northern pike. These eggs were fertilized by the sperm of a male muskellunge which weighed about 8 pounds. The eggs were washed and allowed to harden before being put into a hatching jar where they remained until hatched. Approximately 10,000 fry were obtained from the cross-fertilized eggs. As soon as the fry had swum out of the hatching jar, they were placed in rearing ponds where they remained most of the summer. After the distribution to the

rearing ponds was complete, there were 6 fish remaining in the tank at the hatchery. These fish remained in the hatchery until all were dead. It might be interesting to note that 2 of these fish died from predation, 1 was stolen, 1 jumped out of the tank and died, and 2 died in the tank from causes unknown. Approximately 3 months after the rearing ponds were stocked with hybrids the ponds were drawn down and the remaining fish were recovered. Most of these fish were stocked into various lakes in the vicinity with 6 fish being placed in a hatchery pond for future observation.

As the hybrids were recovered from the ponds, they were recorded as belonging to either of two groups depending on the external coloration and markings on the sides of the fish. One group was labled silver colored (no external marks on the sides of the fish, only a light silvery color characteristic of silver northern pike). The other group was labeled as musky marked (dark vertical bars on a light background thought of as fairly characteristic markings of muskellunges). From one pond in which 200 hybrids were stocked, 12 silver colored hybrids and 7 musky marked hybrids were recovered. Another pond produced 21 silver colored hybrids and 20 musky marked fish. These 60 fish ranged in total length between 10.5 inches and 12.1 inches and averaged 11.6 inches. Three of the 6 fish kept in the hatchery were silver colored and 3 were musky marked. The fish kept in the hatchery did not grow as rapidly as those reared in ponds. One hatchery reared fish lived until November, 1965 and had attained a total length of 10.6 inches. These fish seemed to be healthy and extremely quick in their movements.

Examination for most of the distinguishing characteristics between northern pike and muskellunges was carried out on the 60 pond reared fish. Most of the fish examined (48) had 5 madibular pores per side; 10 fish had 6 pores per side; 1 fish had 7 pores per side and 1 fish had 5 pores on one side and 6 pores on the other side. The lower half of the opercle in all the hybrids examined was scaleless, and the lower half of the cheek was partially scaled in all fish examined. The branchiostegal rays on two of the hybrids that had been preserved in a formaldehyde solution, following death, were counted. One hybrid had 16 branchiostegal rays per side and the other fish had 18 rays per side. This seems to indicate that branchiostegal ray counts also varied widely between individuals of this cross. There was no apparent correlation between external coloration or markings and any of the distinguishing characteristics of the northern or musky. None of the hybrids examined had all of the distinguishing characteristics of either the purebred muskellunge or the purebred silver northern pike.

Conclusions

1. Apparently a cross between a male muskellunge and a female silver northern pike could occur in the wild and produce a successful hatch of healthy, rapidly growing individuals. This seems to be a reasonable conclusion since the hatching percentage of the cross-fertilized eggs was not much different than was obtained from eggs of purebred northerns under similar hatching conditions and apparently there were no obvious inherent weaknesses bred into the fish which caused excessive mortality. This hybrid is also capable of rapid growth since the pond reared fish grew in total length an average of 11.6 inches in approximately three months.

2. It would take close examination of the fish in the wild to determine hybrids but they could be distinguished from purebreds in most instances since none of the hybrids examined had

all of the characteristics of either purebred silver northerns or purebred muskellunges.

3. The fertility of the hybrids will not be known for a number of years.

Literature Cited

Eddy, Samuel
1940. Do muskellunge and pickerel interbreed?
The Progressive Fish-Culturist, No. 48, January-February 1940, pp. 25-27.

Oehmcke, Arthur A.
1951. Muskellunge yearling culture and its application to lake management.
The Progressive Fish-Culturist, Vol. 13, No. 2, pp. 63-70.

PRE-IMPOUNDMENT STUDIES OF THE CHARITON RIVER IN THE VICINITY OF RATHBUN DAM AND RESERVOIR

Part II: Species Composition, Age Composition, and Growth.

Jim Mayhew
Fisheries Biologist

Permanent impoundment of approximately 11,000 surface acres of water by Rathbun Dam and Reservoir is scheduled for the autumn of 1968. This flood control complex will be of significant value to the State of Iowa as a recreational facility. A productive sport fishery is paramount to full development of the recreational potential.

Impoundment of the upper Chariton River will cause major changes in the aquatic environment. Basically the lotic habitat characteristic of natural conditions will change to lentic environment. Under natural conditions this will ultimately influence abundance and well-being of fish populations. Development of the sport fishery and resulting population manipulation will further influence population magnitude and composition. The purpose of this pre-impoundment study is to obtain basic information on the abundance of fish in the Chariton River, and determine age composition of these populations along with growth and general well-being of each species.

METHOD OF POPULATION STUDY

Four study areas in the North Chariton River and one station in the South Chariton River were selected for fish population studies. The investigations began in early August 1965 while flow was below 5.0 c.f.s. Flooding in mid-September delayed investigations in the South Chariton River until it was discontinued for 1965. Hence, studies were completed for only the North Chariton Stations.

Study areas were selected from typical segments of the Chariton River. Access on all-weather roads was also a factor in the choice of stations. The survey stations consisted of 300 feet of stream having typical environmental characteristics of adjacent areas. In regions where the original channel was straightened this type of stream was also included in the study. Hence, all types of habitat characteristics of the Chariton River was included.

Fish populations were isolated by blocking a section of stream at each end with wing nets (one-half inch mesh wings on 24 inch throated hoops). Seine hauls were made with a 50 foot one-quarter inch mesh drag seine within the trapped area. Captured specimens were marked by fin clipping and immediately released into the enclosure. The following day the area was treated with sufficient toxicant (water base Chem-Fish) to kill all fish. At two stations the downstream area was also treated with 2.0 p.p.m. potassium permanganate to detoxify the Chem-Fish, thereby preventing any drift of toxicant into pools where livestock frequently watered. In most of the study areas the amount of toxicant drifting downstream was negligible because of low stream flow (below 2.3 c.f.s.). Floating fish were picked up immediately after the toxicant was applied and during the following four days. Total population estimates

were made by applying mathematical expansion to the ratio of marked to unmarked fish recaptured. Scale samples, length, individual weight and aggragate weight was also obtained until flesh deterioration made handling dead fish inadvisable.

LOCATION AND DESCRIPTION OF STUDY AREAS

Station No. 1. Located at Highway 60 approximately 3.5 miles north of Centerville in Appanoose County. The station is located about 2.5 miles below the damsite. After impoundment this area will form the tailwaters of the dam and reservoir. The area is characterized by a series of short, deep, flowing pools and relatively swift short riffles. Maximum stream width is approximately 50 feet, with depth generally less than 6 feet. There has been some channel straightening in this area.

Station No. 2 Located at County Road C in Appanoose County about 4 miles south of Iconimum. The station is located approximately 2 miles below the confluence of the North and South Chariton Rivers. There are a series of short, relatively shallow pools alternating with long narrow riffles at the station. Maximum pool depth is 4.5 feet. This station is located in the approximate middle of the impounded conservation pool.

Station No. 3. The station is located adjacent to an unmarked Lucas county road approximately 0.7 miles downstream from Brown's Slough Game Management Area. Several short riffles and pools alternating with large, long, sluggish pools are typical of the station. Average stream width is 35 feet, with a maximum depth of 5 feet. This station is located in the headwaters of the reservoir at conservation pool elevation.

Station No. 4. Located at County Road J about 4.5 miles below Chariton in Lucas County. The stream bed in this area was rechanneled in 1938-39. The station consisted of a large, deep, sluggish pool isolated downstream by a very small riffle that was impassable to fish. Mean depth of the pool was approximately 6 feet, with stream width of 40 feet. The station will be in the headwaters of the reservoir at flood stage.

RESULTS OF THE SURVEYS

Eighteen species of fish were found at the 4 survey stations in the Chariton River. Channel catfish, carp, carpsucker, white crappie, black bullhead, and gizzard shad were the most abundant species of fish. Less numerous species included bigmouth buffalo, yellow bullhead, northern redhorse, bluegill, freshwater drum, orangespotted sunfish, green sunfish, flathead catfish, slender madtom, common sucker, stone cat, and largemouth bass. Numerous minnows were also observed, but were not included in the population studies.

Black Bullhead. In the combined study areas, bullhead comprised 27.5 per cent of the population density by number, but only 4.7 per cent of the population weight (Table I). Bullhead was far more numerous in the upper reaches of the river in areas with long, deep, sluggish pools. At Station No. 1 they were almost absent, but increased in number until they occupied more than 51 per cent of the population at Station No. 3.

Table 1. Species composition by number and weight of the fish populations in the Chariton River

Species	Station No. 1		Station No. 2		Station No. 3		Station No. 4		Combined	
	No.	Wgt.	No.	Wgt.	No.	Wgt.	No.	Wgt.	No.	Wgt.
Channel Catfish	82	20.5	88	37.3	15	4.3	6	5.2	191	67.3
	(52.3)	(41.8)	(28.9)	(22.1)	(3.9)	(1.7)	(1.4)	(2.6)	(15.1)	(10.1)
Carp	26	17.1	70	78.1	72	218.0	46	32.2	214	345.4
	(15.9)	(35.0)	(23.0)	(47.5)	(19.1)	(84.5)	(10.9)	(16.4)	(16.9)	(51.7)
Bigmouth Buffalo	1	1.5	5	1.6	9	4.5	11	16.5	26	22.5
	(0.6)	(3.1)	(1.6)	(t)	(2.4)	(1.7)	(2.6)	(8.4)	(2.1)	(3.4)
Carpsucker	5	1.9	62	39.3	14	7.5	5	2.8	86	51.5
	(3.2)	(3.9)	(20.3)	(23.9)	(3.7)	(3.0)	(1.2)	(1.4)	(6.9)	(7.7)
White Crappie	15	1.3	4	(t)	11	1.1	25	3.6	55	6.0
	(9.7)	(2.7)	(1.3)		(2.9)	(0.4)	(5.9)	(1.8)	(4.3)	(0.9)
Black Bullhead	2	t	48	3.9	196	17.1	102	10.1	348	31.1
	(1.3)		(15.8)	(2.4)	(51.3)	(6.6)	(24.1)	(5.1)	(27.5)	(4.7)
Yellow Bullhead			4	t	27	3.2	8	t	39	3.2
			(1.3)		(7.1)	(1.2)	(1.9)		(3.1)	(0.5)
Redhorse	2	1.1							2	1.1
	(1.3)	(2.6)							(0.2)	(0.2)
Bluegill	2	t	6	t	19	1.1	5	t	32	1.1
	(1.3)		(2.0)		(5.0)	(0.4)	(1.2)		(2.5)	(0.2)
Freshwater Drum	2	1.9					1	t	3	1.9
	(1.3)	(3.9)					(0.2)		(0.2)	(0.3)
Gizzard Shad	8	1.0					178	111.3	186	112.3
	(5.3)	(2.0)					(42.1)	(56.6)	(14.7)	(16.8)
Orangespotted Sunfish	7	t							7	t
	(4.5)								(0.6)	
Green Sunfish	1	t			9	t	9	t	19	t
	(0.6)				(2.4)		(2.1)		(1.5)	
Flathead Catfish	2	2.5	3	3.3					5	5.8
	(1.3)	(5.1)	(1.0)	(2.0)					(0.3)	(0.9)
Slender Madtom	2	t							2	t
	(1.3)								(0.1)	
Common Sucker			4	t	4	t	25	12.5	33	12.5
			(1.3)		(1.0)		(5.9)	(6.4)	(2.8)	(1.9)
Stone Cat			9	t	5	t			14	t
			(3.0)		(1.3)				(1.1)	
Largemouth Bass			2	2.4	1	1.2	2	2.6	5	6.2
			(0.7)	(1.5)	(0.3)	(0.5)	(0.5)	(1.3)	(0.3)	(0.9)
Station Totals	157	48.8	305	164.3	382	258.0	423	196.8	1,267	667.9

As in most Iowa streams growth was relatively slow. Mean total length was 1.0, 4.4, 5.7, 6.8 and 8.1 inches for the first 5 year classes respectively (Table 2). Age groups I and II dominated the bullhead population by making up 75 per cent of the sample. More than 15 per cent of the population was made up of young-of-the-year fish.

Carp. The combined weight of carp populations made up 51.7 per cent of the entire population weight. They also ranked second in abundance. Population density at individual sampling stations ranged from 10.9 per cent to 23.0 per cent. By weight they comprised as much as 84.9 per cent of populations at a single sampling station.

Age groups I through IV made up more than 97 per cent of the carp population. Fish in age group one were most numerous accounting for more than 37 per cent of the sample. Total length from the second through sixth years of life was 7.8, 11.8, 14.1, 17.2 and 19.2 inches respectively.

Channel Catfish. This important game-fish species comprised approximately 15 per cent of the population by number, and 10 per cent of the population by weight. Channel catfish were considerably more abundant in the lower sections of the stream. As an example, at Station No.1 catfish were the most numerous species of fish, making up 52.3 per cent of the magnitude. At Stations No. 3 and 4 they were relatively unimportant to the population structure.

Young-of-the-year and 3 year old channel catfish were the most prevailent age groups. Age composition and distribution of additional year classes through 7 years of life was similar to other stream populations. Mean total length for the 7 year classes was 2.1, 5.4, 7.6, 9.8, 12.1, 16.0 and 19.5 inches. These increments compare favorably with other interior Iowa streams.

Carpsucker. The Carpiodes population contained both C. cyprinus and C. carpio, but due to the number of fish handled in the surveys they were combined under a single identity. Carpsuckers were found in low density except at Station No. 2 where they represented over 20 per cent of the population and ranked as the second most numerous species. The abundance of this species at this station was indicative of the environment, a series of short, swift riffles and short shallow pools.

Most of the carpsucker population was made up of 3 and 4 year old fish. Fish from age group I not present in the samples. Average total length was 0.9, 7.1, 11.2, 13.5 and 14.7 inches for age groups 0, II, III, IV, and V respectively.

White Crappie. This species ranked sixth in abundance, but contributed less than one per cent to the population weight. Crappie were most numerous in the larger pools in the upper portion of the river.

Age composition of the white crappie population was as follows: Age 0, 31.9 per cent; Age I, 44.7 per cent; Age II, 14.9 per cent; Age III, 6.4 per cent; and Age V, 2.1 per cent. Growth was extremely slow with a mean total length at corresponding age groups 3.0, 5.2, 6.8, 8.8 and 9.8 inches respectively.

Gizzard Shad. Gizzard shad was found at only 2 of the sampling stations. At Station No.1

Table 2. Age composition of fish populations and growth of fish in the Chariton River

Species	No. in Sample	Age Group 0	I	II	III	IV	V	VI
Channel Catfish	161	63	17	50	17	10	1	3
Per cent in age group		39.6	10.4	31.2	10.4	6.2	0.3	1.9
Mean Total Length (in)		2.1	5.4	7.6	9.8	12.1	16.0	19.5
Mean Weight (oz.)		t	0.9	1.9	3.9	7.2	20.0	42.0
Carp	192	2	72	37	49	30	2	
Per cent in age group		1.1	37.6	19.3	25.5	15.5	1.1	
Mean Total Length (in.)			7.8	11.8	14.1	17.2	19.2	
Mean weight (oz.)			3.6	11.3	20.0	44.0	56.0	
Carpsucker	64	3		46	13	1	1	
Per cent in age group		4.7		71.9	20.3	1.5	1.5	
Mean total Length (in.)		0.9		7.1	11.2	13.5	14.7	
Mean Weight (oz.)		t		3.5	10.1	19.7	25.5	
Black Bullhead	233	35	74	101	19	4		
Per cent in age group		15.1	31.7	43.3	8.1	1.7		
Mean Total length (in.)		1.0	4.4	5.7	6.8	8.1		
Mean Weight (oz.)		t	1.0	1.5	2.7	4.3		
White Crappie	47	15	21	7	3		1	
Per cent in age group		31.9	44.7	14.9	6.4		2.1	
Mean Total Length (in.)		3.0	5.2	6.8	8.8		9.8	
Mean Weight (oz.)		0.2	1.0	2.5	4.5		9.5	
Gizzard Shad	49	5		24	20			
Per cent in age group		10.2		49.0	40.8			
Mean Total Length (in.)		0.9		10.2	12.5			
Mean Weight (oz.)		t		8.5	13.0			

they were found in small number, but at Station No. 4 they comprised over 42 per cent of the population by number and over 56 per cent of the population by weight.

The shad population was comprised of only 3 year classes. More than 89 per cent of these were from age groups II and III. Young-of-the-year shad made up the remainder of the age structure. Total length averaged 0.9, 10.2 and 12.5 inches for these respective age groups.

DISCUSSION

Species composition of the fish population in the Chariton River is apparently quite similar to that found in other Iowa streams (Harrison, 1956; and Cleary, 1957). Those species statutorally classified as rough fish dominate the entire population structure. In this study more than 43 per cent of the population density was made up of rough fish; however, by weight these species comprised in excess of 83 per cent of the population. Channel catfish, the most important game-fish in Iowa streams, was abundant in downstream stations but was unimportant in the upstreams samples. Carp was the most numerous species of fish, especially in upstream areas.

The population density of individual sampling station increased significantly as the surveys progressed upstream. Weight of the combined populations ranged from 48.8 pounds at Station No. 1 to 258 pounds at Station No. 3. There was an identical increase in the mean weight and number of fish. Calculated weight of the total fish population varied from 858.9 pounds per mile of stream in the lower reaches to 3,481.4 pounds per mile in upstream areas. The average was slightly over 2,400 pounds of fish per mile of stream.

Environmental characteristics of the Chariton River vary considerably from the headwaters downstream to where it leaves the state. There are many large, deep, sluggish pools and straightened channels in the upper reaches of the stream compared to the short, shallow pools and narrow, deep, swift riffles in the downstream segment. This variance of habitat is reflected in species composition of fish populations. The first type of habitat produced many more black bullhead, yellow bullhead, bigmouth buffalo, white crappie and gizzard shad than the down-stream survey areas. Just the opposite was found in the second type of habitat. Channel catfish, carpsuckers, and common suckers were more prevailent than in the lower reaches of the stream. Carp were abundant in all types of environment. Species such as green sunfish, bluegill, and largemouth bass were rare in the entire Chariton River.

There is some evidence of rather stable fish populations in the Chariton River. Variation or changes in species composition are probably minor and of short duration. Credence to this fact is evidence from the age composition of individual populations. There are very few dominate year classes within any fish population. Reproduction is apparently annually successful since there is little evidence of year class failure. Young-of-the-year were also rather common for white crappie, channel catfish, carp, carpsucker, and bullhead during the 1965 studies.

LITERATURE CITED

Harrison, Harry M., 1956. An experimental treatment of a segment of the Des Moines River in Iowa to increase desirable fish by suppressing undesirable fish. Quarterly Biology Report. Vol. VIII, No. 3.

Cleary, Robert E., 1957. Channel catfish surveys --Northeast Iowa Rivers. Quarterly Biology Report. Vol. IX, No. 1, 13-17.

SOME OBSERVATIONS ON TROUT POPULATIONS IN TWO IOWA STREAMS

Roger Schoumacher
Fisheries Biologist

In the course of trout stream survey work in 1962, two areas of significant brown trout reproduction were located. These have been re-visited in subsequent years, and some data have been collected on population size and composition. Both areas are spring runs near the heads of streams presently stocked with trout by the Iowa Conservation Commission. At the time of the initial survey neither run was included within the boundaries of posted trout water.

Kleinlein Creek is located in the southwestern corner of Clayton County just north of Strawberry Point. The stream is fed by three large springs and a number of smaller ones, and flows between steep wooded hillsides. The flood plain is pastured and the hilltops cultivated. Elk Creek is located in Delaware County near Greeley. It flows through a wooded valley, much of which is owned by the Delaware County Conservation Board, but drains a considerable amount of agricultural land.

The initial electro-fishing on Kleinlein Creek took place on November 9, 1962, and disclosed a high population of brown trout. In December the entire spring run, which is about 1/4 mile long, was electro-fished, and all the trout captured were measured and fin-clipped. Three hundred forty-two brown trout were taken (Table 1), and subsequent sampling gave a population estimate of 652. The fish ranged from 3.5 to 14.0 inches in length, with 88 per cent under 6.5 inches. Sampling in the main stream disclosed some of the naturally produced fish were scattered throughout, but at much lower population levels than in the spring. Numerous redds were visible in the spring run, with mature trout on some.

In February of 1963 a considerable number of trout fry about one inch long were observed in the lower end of the run.

The spring run was surveyed again in 1963, '64, and '65. Population estimates were not made, but since the spring run is very small and the same techniques were used each time the number of trout taken each year on the initial run through the area probably reflects quite closely the status of the populations. In 1963, 457 browns were taken, indicating an increase over 1962. In 1964 a decrease was noted, and the number was down to 167 The decrease took place primarily in the number of smaller fish. In 1965 the number decreased further to 40, with only two fish under 6.5 inches.

The initial effort on the spring run on Elk Creek in 1962 indicated a population of 372 brown trout, with 242 being captured, measured, fin-clipped, and released on the first run (Table 2). One hundred sixty-one (67%) were less than 6.5 inches. In 1963, only 1/3 of the spring run was sampled. One hundred one fish were taken, and because of distribution of the fish in the stream the population density probably would have been equal to slightly above

TABLE 1. Numbers and percentages of various size trout taken by electro-fishing gear in Kleinlein Creek from 1962 to 1965.

Year	Number and percentage of fish		
	Under 6.5 inches	6.5 inches & longer	Total
1962	306 (88)	36 (12)	342 (100)
1963	286 (63)	171 (37)	457 (100)
1964	65 (39)	102 (61)	167 (100)
1965	2 (5)	38 (95)	40 (100)

TABLE 2. Numbers and percentages of various size trout taken by electro-fishing gear in Kleinlein Creek from 1962 to 1965.

Year	Number and percentage of fish		
	Under 6.5 inches	6.5 inches & longer	Total
1962	161 (67)	81 (33)	242 (100)
1963*	59 (59)	42 (41)	101 (100)
1964	NO SAMPLING DONE		
1965	15 (20)	61 (80)	76 (100)

* Lower 1/3 of spring run only sampled

the 1962 level. The percentage of fish under 6.5 inches decreased to 59 per cent.

No sampling was done in 1964. In 1965, however, 76 fish were taken in the entire spring run. The mark-and-recapture population estimate was 99 fish, a 73 per cent decrease from the 1962 estimate. Fish under 6.5 inches accounted for only 20 per cent of the population.

Brown trout populations in the two areas have followed the same pattern during the last four years. Total population remained constant or increased slightly from 1962 to '63, and decreased drastically in '64 and '65. The percentage of fish under 6.5 inches dropped each year. It would appear that something has inhibited reproductive success or survival of young fish in 1963 and '64. Since there apparently was adequate brood stock, some environmental factor is probably responisble. The most likely explanation is that high water and/or siltation at a critical period in the development of the eggs or fry inhibited survival.

Forty-five trout from the two streams were aged by scale examination. In Kleinlein Creek in June, fish from age groups 0, I, and II were 4.6, 7.4, and 9.8 inches respectively. In Elk Creek in November fish were 5.2, 8.9, 10.2, and 17.8 inches at age groups 0, I, II, and IV respectively.

PROGRESS REPORT: CHANNEL CATFISH TAGGING STUDIES ON THE WAPSIPINICON RIVER - BUCHANAN COUNTY

Robert Schacht
Fisheries Biologist

A tagging study of the channel catfish was initiated on the Wapsipinicon River in June of 1965 to obtain information on growth and movement of this species. Fish were captured with 3/4 inch nylon mesh nets and wooden slat traps. The nets were baited with cheese trimmings and/or soybean cake, and during the spawning season the box traps were baited with mature female catfish. All fish were measured to the nearest 0.1 inch and a sample were weighed to the nearest 0.01 pound.

The tags were serially numbered aluminum strips 3/16 by 5/8 inch. A small slit was made immediately below the rib cage and the tag was inserted into the body cavity. The adipose fin was removed to allow immediate identification of tagged fish. Spines were taken from over 100 fish for age and growth studies.

The study area is Buchanan County above a lowhead dam at Independence. The dam creates an impoundment approximately 2.4 miles in length containing many sloughs and backwaters. The tagging area is 4.1 miles in length, beginning 0.7 miles above the dam.

Box traps were fished primarily in the mill pond and mesh nets in the upstream channel. Approximately five traps and four mesh nets were fished, although the numbers varied through out the netting period of June 11 to October 31. Aerial photographs of the study area were obtained and each netting station was plotted. Distances between nets were easily obtained from the maps and fish movement could be charted to the nearest 0.1 mile.

During 1965, 2,937 channel catfish were tagged. A total of 220 returns provide data on movement. Twenty-five tags were returned by fishermen and 178 were taken during netting operations. Seventeen fish were tagged twice, giving movement for two periods each. Of the recaptured fish, 64 had been tagged and released upstream from their point of capture, and they are considered separately from the others in Table 1.

Of the 156 catfish tagged at the point of capture, 49 per cent moved upstream, 27 per cent downstream and 24 per cent evidenced no movement. Sixty-seven per cent of the fish moved less than one mile (Table 2).

Of the 64 catfish transported upstream and tagged, 56 per cent moved back downstream, 16 per cent upstream, and 28 per cent remained at the tagging site. Approximately 75 per cent of all individuals moved less than one mile. On these transported fish only the point of release was recorded because fish from several stations were mixed together and tagged. Because it was later observed that a number of these fish returned downstream, special effort will be made to transport fish from only one station next year to see if these fish have a true homing tendency.

Of the 17 catfish tagged on two occasions, eight were transported at least once, and the remaining nine were released at the point of capture. A total of 34 periods of movement are recorded for these fish and are included in Tables 1 and 2. Five fish released at the point of capture showed movement both upstream and downstream with at least one trip being less than one mile. Two fish showed no movement at both recapture dates. One fish showed no movement after 7 days and less than one mile after 9 days. Another individual moved downstream over 2 miles after 47 days. When recaptured 15 days later it had moved further downstream less than one mile.

From the number of recaptures taken in the first year, it is evident that the catfish have a home territory from which they travel little. A homing tendency was suggested and will be investigated further next year. Also, the study area will be extended.

TABLE I. Miles traveled between time of tagging and recapture for transported channel catfish.

Month of Recapture	Miles Traveled				
	Less than 1	1.0-1.9	2.0-2.9	3.0-3.9	Total
			Downstream		
July	2	2	2	0	6
August	7	2	2	1	12
September	13	3	0	0	16
October	2	0	0	0	2
Total	24	7	4	1	36
			Upstream		
August	1	0	1	0	2
September	5	1	1	1	8
Total	6	1	2	1	10
			No Movement		
July	2	0	0	0	2
August	4	0	0	0	4
September	12	0	0	0	12
Total	18	0	0	0	18
Grand Total	48	8	6	2	64

TABLE 2. Miles traveled between time of tagging and recapture for non-transported channel catfish

Month of Recapture	Miles Traveled				
	Less than 1	1.0-1.9	2.0-2.9	3.0-3.9	Total
			Downstream		
July	1	0	2	4	7
August	15	2	1	1	19
September	10	4	0	0	14
October	2	0	0	0	2
Total	28	6	3	5	42
			Upstream		
July	1	0	0	0	1
August	17	1	1	0	19
September	19	11	17	3	50
October	2	0	4	0	6
Total	39	12	22	3	76
			No. Movement		
July	5	0	0	0	5
August	5	0	0	0	5
September	28	0	0	0	28
Total	38	0	0	0	38
Grand Total	105	18	25	8	156

MOVEMENT OF TAGGED CHANNEL CATFISH

BEFORE THE IMPOUNDMENT OF THE RED ROCK RESERVOIR

Gary L. Ackerman
Fisheries Biologist

INTRODUCTION:

Since channel catfish are the most important game species inhabiting Iowa streams, a project to study certain phases of its' life history was initiated in the spring of 1964. The area selected for study falls within a reach of stream to be impounded. The impoundment will be known as the Red Rock Reservoir, and lies in the Des Moines River a few miles below the city of Des Moines. One phase of this study concerns the movements of tagged catfish by utilizing a subcutaneous abdominal tagging method previously described by Harrison (1957). It is hoped as data are recorded and analyzed, some answers may be learned for the purpose of wise fisheries management of our future reservoir systems.

The pupose of this paper is to record data gathered on catfish movements prior to the impoundment of the Des Moines River at Red Rock.

DESCRIPTION OF STUDY AREA:

The area selected for study is an approximate 20 mile reach of the Des Moines River. It reaches from a point located approximately 9 miles downstream from the Highway #14 bridge to a point 11 miles upstream above that bridge. Presently this section of stream is characterized by a series of long sweeping bends, sharply cut banks alternating with extensive sand bars. Much of the bottom is fine sand with coarser gravel covering the swift areas. Sandstone outcroppings occur as bottom types, but they are of minimal importance. The presence of many under-cut mud and clay banks, numerous drift piles, and felled trees offer excellent catfish habitat.

Stream flow are dynamic and rapid fluctuations occur yearly. These fluctuations have ranged from a minimum of 40 to a maximum of 155,000 cfs. Depending upon stream stage, channel depths vary between 1 and 30 feet. During low flows long peel areas are divided by shallow sand bars. During flood stage the river becomes a torrent cutting away banks, shifting entire sand bars, and depositing sand and silt in backwaters.

By design eight stations were selected at an average 2.4 mile interval.

METHODS:

During the months May through June, one oak slat net and one 3/4-inch nylon hoop net equipped with oak hoops was fished in comparable habitats at eight locations. Each net was baited with a ripe female catfish from 14 to 18 inches in total length. All nets were located either along rocky shallows where the current was moderate to slow and at depths not exceeding 8 feet.

Beginning in July and extending through October these nets were fished at the same locations All nets were baited with cheese trimmings and soybean meal.

The tag used was fabricated from a poultry wing band by using only the portion bearing the serial number. This resulted in an aluminum bar 1/5 by 4/5-inch. This was incurted into the abdominal cavity by a performing a simple operation. A small incision was made through the body tissues anterior of the pelvic fin with a scalpel. The tag was then inserted through this opening with the aid of forceps. The adipose fin was clipped from all fish tagged so they could be recognized. Tagging and release was completed at the site of capture and records were made of the date, location, length TL, weight, sex, and tag number.

DISCUSSION:

During 1965, 10,226 channel catfish weighing 8,850 pounds were examined. During the study 4,972 catfish were tagged. Since little data exists on movement of spawning catfish, tagging was focused on this segment of the population. During the spawning season, 3,240 fish were tagged and 1,732 fish were tagged at other times of the year.

Recoveries of tagged fish were either from cooperating sport fishermen or from our nets. The rate of recovery was low, 3.1 per cent, and 158 recaptures were secured. On examination of visceral tissue for tags, only 70 per cent of the tags were located. Being quite small, they were not easily found in the fish. They were often embedded in viceral fat, or walled-off by a peritoneal like substance, and several were recovered within the ovary.

The data acquired demonstrates that channel catfish do move randomly within their environment. Of all tags recovered, 31 (27.9%) of the catfish moved upstream, 51 (45.9%) moved downstream and 29 (26.2%) showed no movement . Mean upstream movement was 7.8 milse and mean downstream movement was 6.4 miles. Other investigators indicate agreement; Welker (1964) reported that of tagged Little Sioux River catfish, 50.5 per cent moved downstream and 22 per cent moved upstream. Hubley (1963) found 45.8 per cent of the tagged Mississippi River catfish moving downstream and 18.8 per cent moving upstream.

A record for downstream movement was the recovery of a female catfish tagged during June and recovered about 70 stream miles downstream at Ottumwa. The fish was tagged 49 days. A record for upstream movement was the recovery of a male catfish caught near Bevington on the Middle River. The fish was tagged during June and it had moved about 40 stream miles upstream in 19 days. The quantity of fish which moved from the release sites seems directly proportional to distance (Fig.1).

Of the channel catfish showing movement tendencies, 74 (90%) were identified as spawners (Fig.2). The ratio of males to females when tagged was 56:44. They were recovered at a ratio of 68:32. This indicates that males move more than females, and suggests that a population "shuffle" probably occurs either during or after the spawning season.

In conclusion, I believe that channel catfish move extensively. This movement seems correlated to spawning activity, but other factors should be analyzed. For example, during

the spawn, the water flows are normally high. This offers the fish freedom of movement whereas during low flows they may be confined within pool areas. Thus the stream size, flow characteristics and physical features may be inhibiting factors. Physical obstacles such as low head dams may also inhibit movement.

LITERATURE CITED

Hubley, Raymond C. 1963. Movements of tagged channel catfish in the upper Mississippi River. Trans Am. Fish. Soc. 92(2).

Harrison, Harry M. 1953. Returns from tagged channel catfish in the Des Moines River, Iowa. Ia. Ac. Sci. Vol. 60 pp 636-644.

Welker, Bill D. 1964. Movements of tagged catfish in the Little Sioux River. Quarterly Biology Reports, Vol. XVI. No. 3. pp 4-6.

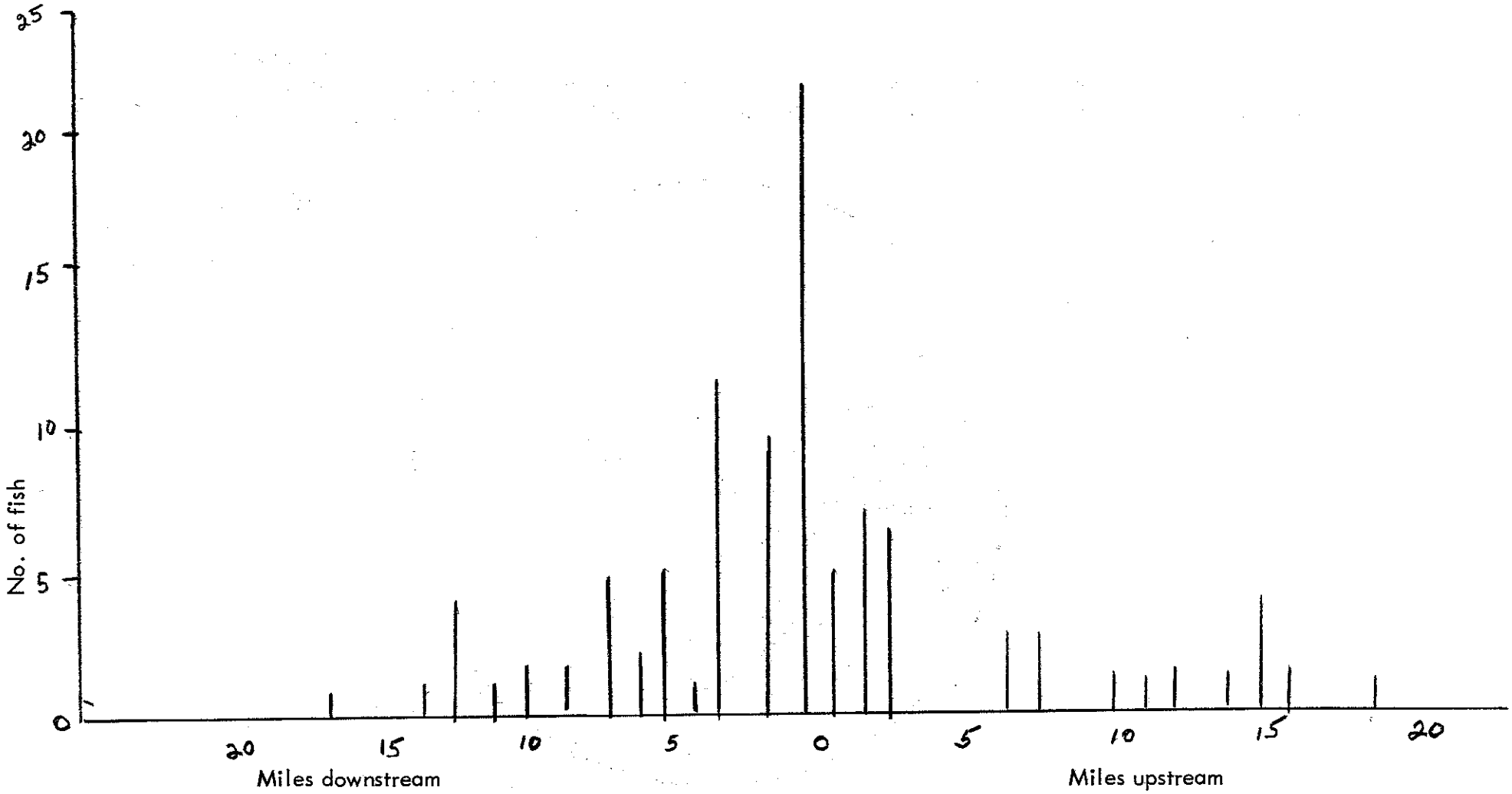


Figure 1. Intra stream movements of tag bearing channel catfish. No extreme records are indicated on this graph.

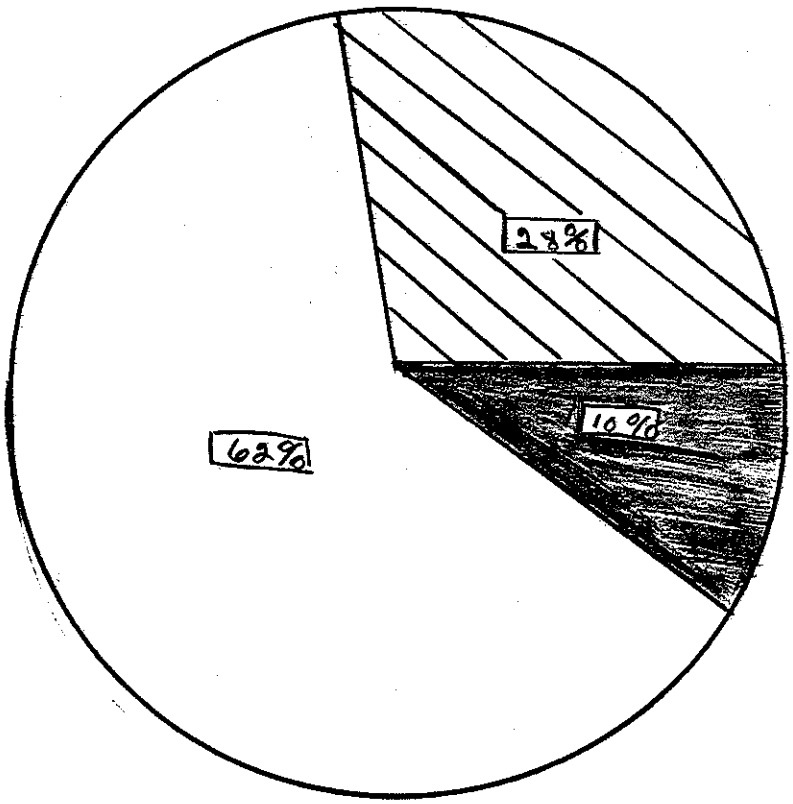


Figure 2. A sexual maturity comparison of tag bearing channel catfish. The shades indicates mature male spawners, the hashed indicates mature female spawners, and the shaded indicates both sexual immature fish and unknowns.

CHANNEL CATFISH TAGGING ON THE CORALVILLE RESERVOIR AND ADJOINING WATERS - PROGRESS REPORT NO. 1

Don Helms
Fisheries Biologist

The tagging of channel catfish in the Coralville Reservoir and adjoining waters was initiated in 1965 as part of a comprehensive state-wide channel catfish tagging program. The purpose for tagging on this particular area is to determine their movements as affected by a large flood control impoundment whose waters are subject to erratic water level fluctuations.

METHODS

Tagging is accomplished by inserting a numbered aluminum tag into the body cavity as described by Welker (1964). Tagged fish were marked externally for subsequent identification by removing the adipose fin.

Data recorded included total length, location captured, location released, date and comments on any visible deformities, injuries, etc.. Weights were taken periodically on a representative sample of fish caught for the first time and on all recaptures. In most cases, recaptures were tagged a second time and returned to the water. However, in cases where the adipose fin had healed and it was obvious that the fish had been tagged in another area, it was sacrificed.

Tagging effort was concentrated in 5 general areas. These were:

1. A 2 mile section of the Iowa River immediately below the Amana Dam which represented the extreme headwaters,

2. A 3 mile section adjoining the county road "0" bridge (22 river miles above the reservoir dam),

3. The lower 12 miles of permanent pool,

4. A 3 mile section of the river below the outlet structure (the tailwaters) and,

5. Lake MacBride, whose spillway discharges into the reservoir 8.5 miles above the reservoir dam.

Slat nets were the primary means of capturing fish in all areas; however, 3/4 inch mesh nets were employed to a limited extent in the area below the Amana Dam and in the tailwaters. All nets were baited with cheese and/or soybean cake.

RESULTS AND DISCUSSION

In this study, as has been noted in previous studies, the size of fish caught tends to increase as the sampling progresses downstream form headwaters to pool (Table I). Immediately below the Amana Dam, 64.7 per cent of the fish caught measured less than 10 inches; whereas, 15.8 and 1.8 per cent of the fish measured under 10 inches at County Road "O" and the pool of the reservoir respectively. Size of the fish caught in the tailwaters compared very closely to the size of those from the headwaters. Fish caught in Lake MacBride were similar to those caught in the pool.

Population estimates were possible in two areas. In Lake MacBride there existed a known number of marked fish. These consisted of 224 fish whose left spines had been removed during the fall of 1964 for age and growth work. Nine of the fish captured in Lake MacBride during tagging operations had a left spine missing. Thus, using the Petersen formula, we arrive at an estimate of 8,362 or 8.8 fish per acre.

The recapture rate of tagged fish in the pool of the reservoir was great enough to permit a population estimate by the Schnabel formula. This method resulted in an estimate of 34,572 fish which at an average weight of 1.2 pounds would constitute about 42,000 pounds of catfish.

The author feels that at the time this estimate was made, the range of that portion of the population sampled would include the entire conservation pool at elevation 680 feet (m.s.l.) or a surface area of 4,900 A. Thus, we could say that there were 7.1 fish per acre.

It is important to note that due to low catch rate, tagging could not be accomplished in the pool of the reservoir until late September. This area was kept under surveillance from mid May until September by fishing from 1 to 5 slat nets and checking them weekly. During this period, less than 50 channel catfish were caught.

The poor success was attributed to a severe late winter fish-kill followed by a 45 foot rise in water level, which in effect diluted the population to an estimated total of 60 pounds per surface acre for all species combined.

It was not until late September after a heavy rain that the nets started fishing well enough to begin tagging.

Seven recaptures were taken in this area whose adipose fins had completely healed and were obviously tagged elsewhere. These were sacrificed and it was found that 4 had been tagged in Lake MacBride and 1 below the Amana Dam. The remaining 2 had lost their tags.

This should indicate that the void created by the late winter fish-kill was being filled by a downstream movement from the headwaters and from Lake MacBride.

Tag returns from the other areas are rather limited and are meaningless at this time.

SUMMARY

During 1965, 3,874 channel catfish were tagged in the Coralville Reservoir and adjoining waters. Although tag returns were insufficient in number to present movement data, population estimates were possible on two important portions of the study area. These were Lake MacBride (8,362) and the pool of the Coralville Reservoir (34,572). It was also noted, as in previous studies, that the populations of the headwaters and tailwaters consist primarily of small fish while the pool and Lake MacBride are made up of larger fish.

LITERATURE CITED

Welker, Bill

1964. Movements of tagged channel catfish in the Little Sioux River. Quarterly Biology Reports. Vol. XVI, No. 3, pp. 4-7.

TABLE 1. Tagging effort and success on the Coralville Reservoir and adjoining waters in 1965.

Area	Dates (1965)	Net-days of effort	Number caught	Total weight (pounds)	Average weight (pounds)	Percent under 10 inches TL
Below Amana Dam	6/23 - 7/30	259	958	418	0.44	64.7
County Road "O"	8/25 - 8/31	48	95	53	0.55	15.8
Pool of Reservoir	9/24 - 11/10	470	2,276	2,742	1.20	1.8
Tailwaters	6/8 - 6/30	144	188	54	0.19	80.9
Lake MacBride	6/24 - 7/30	228	357	236	0.66	0.1

RUFFED GROUSE TRAPPING RESULTS IN NORTHEAST IOWA

Keith D. Larson
Game Biologist

INTRODUCTION

The Biology Section has been engaged in a ruffed grouse trapping program since June 1, 1965. The results of this effort to September 8 were given in the 1965 July-Sept. Quarterly Biology Reports. The earlier report describes the methods and materials used. This report concerns the results obtained from September 8 until January 7, 1966, when the trapping was terminated for the season.

During this period, Biologist Aid Robert DeCook was assigned to the field phases of the project and replaced a college student who had been employed for the summer.

OBJECTIVES

The initial objective of the trapping program was to obtain birds to transplant to Shimek forest in Lee County. Twelve birds were stocked there during the first phase of the program. Arrangements were subsequently made with the Missouri Department of Conservation to trade them 40 grouse for 10 wild-trapped turkeys. All birds caught were then transported to Missouri officials.

Secondary objectives of this program were to develop information on the home range of broods and individual birds, timing of the dispersal of broods, densities during the fall and winter, habitat preferences, food preferences, and further to develop a capability to hold captured birds until quantities were large enough to be economically feasible to transport across the state.

RESULTS

Trap Success. The total number of birds taken during the period from June 1 until January 7 was 78 birds. Nineteen birds were taken during the first reporting period and 59 during the current phase of the program. Table 1 indicates the number of birds seen, birds caught, and the ultimate disposition of these 59 birds.

Table 1 - Ruffed grouse trapping success, Sept. 8-Jan. 7, 1965

Trap Days	Birds Flushed	Birds Captured	Birds Died In Trap	Birds Died In Holding Pen	Transported to Missouri
2360	53	59	18	5	36

Expressed in trap days per bird captured, it required 40 trap days per bird. Twenty traps were utilized for this study most of the period so the results approximate one bird every two days.

Holding Captured Birds. Birds held during the period covered by this report were much

easier to care for than younger juvenile birds. September feedings began with dogwood branches laid on the floor of the holding room, from which the birds would help themselves directly to the dogwood berries. Later in September and subsequently, until about the last of October, the birds were fed a variety of items such as wild grapes, aspen leaves, hazel brush catkins, bittersweet seeds, apples, and grain sorghum.

About November 1 the birds were fed only shelled corn, continuing until the termination date. Of the five birds that died in the holding room, several were observed to be adult males. Deaths were attributed to self-imposed starvation.

Predation. Accurate determinations of losses within traps to specific predators were not recorded. The principal predators were known to be raptors and foxes. A red tailed hawk was observed perching on the pine boughs of a trap with a talon-killed grouse within. They could kill through the top but could not reach the birds to eat them. Fox would enter the trap either by digging or through the entrance throats and then would dig out. A large number of squirrels used the traps when they were baited, and many wandered in as well when they were not baited.

Mortality Factors. All but two of the 18 birds which died in traps were killed by predators. These two died of exposure due to cold temperatures following a heavy rain which occurred on a weekend when the traps were not being visited daily. Generally all traps were visited on Monday, Wednesday, and Friday. Some traps were visited daily when trap moving was necessary and personnel were working in the vicinity of existing trap sites. Of the 59 birds caught, 27 were taken on Monday. This does not seem to be consistent with the view of some other investigators that traps should be visited daily.

As this study progressed into the winter, it became apparent that birds were utilizing a much reduced home range. The location of trap sites became more critical as bad weather became more common. Traps needed to be located within approximately a 50-yard area in some instances in order to take birds using that area. Very little movement occurred by birds once the "fall shuffle" had been completed. Traps located a stones-throw from this small home range did not take birds. This was not apparent until the first snows gave an opportunity to determine ground movements. Traps that were successful were thought to be located in the best of the surrounding habitat; generally this would be an area with the thickest understory by comparison with adjacent edge. Trap sites well located would take several birds in just a few days and then no more. Observations made after a snowfall of areas around traps which had been successful indicated that there were no birds currently using these areas. The sites had presumably been trapped out.

All traps were set on the edge of the timber, and usually adjacent to a hay field. Of four grouse crops examined, all contained clover exclusively. These were collected primarily in November from predator kills.

Conclusions

1. The period from September 1 until heavy ground frost occurs seems to be the best trapping period for ruffed grouse.

2. In this study, trap site selection was made by flushing birds. Trap site selection should be made with the help of snow cover if possible. The best winter habitat, thus indicated, should be a prominent feature of annual home ranges and quite likely the best fall and early winter trap site locations as well.

3. Birds can be held indefinitely, if necessary, utilizing a holding room as in this study. Excluding the five birds that died, there were no apparent physical changes in birds due to holding. The wildness of the birds did not appear to diminish due to holding under these conditions.

4. The losses to predators seem to be unavoidable. The frequency of Monday morning successes after traps had not been visited over the weekend would indicate that daily visitations would not be necessary.

AGE OF QUAIL TAKEN BY IOWA QUAIL HUNTERS, 1965 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 would show 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 1965 wing survey with supplemental data from roadside and field surveys. Comparisons are made with similar data for 1964.

METHOD

Before the 1965 quail season began, a number of cooperators were contacted. The first group consisted of 29 officer, game and biology personnel from 31 counties in and adjoining good quail range. 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. The second group of cooperators was selected from among the many hunters who live in southern Iowa, and who are particularly interested in quail shooting. I chose men 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 in early November. These wings were picked up one or more times per week until November 18.

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 the 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 state of primaries will indicate the moult period, which is also the post-brooding period. In simpler terms, and early moult reflects an early hatch.

RESULTS

A total of 1,364 wings was collected by November 18. These were from 21 counties, and the number was more than enough to use in establishing production periods of the young (Haugen 1958). Eighty-five per cent were from young birds, and this was similar to 1964. There was a 100 cocks to 91 hens ratio in the sample. Other information is given in tables 1 and 2.

Through a coordinated effort, the 1965 wing collection was carried out between November 6 and 18, whereas the shooting dates were November 6, 1965 to January 31, 1966; in 1964, the collection had continued throughout the season which began October 31 and ended January 3, 1965. As a result, 1,364 wings were gathered in 1965 compared to 775 in about the same period (November 1 to 16) in 1964.

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 hunters since some 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 1965

Fifty-nine percent 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 November 6 to 18 in 1965, and October 31 to November 16, 1964.

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. Three percent of all adults sampled during the season, including some taken after December 18, had moulted and regrown all of the primaries or flight feathers. In a sample collected from December 1 to 15, 29 percent 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 55 broods seen during summer. I observed some of these, while others were reported by officers, biologists, farmers and dog trainers. These began to hatch in early May. Peak production was in June and July with hatching indicated into September and ending in October.

TABLE 1. A tabular compilation of data from Iowa quail wings collected in 1965 and 1964

	1965 *	1964
1. No. of wings	1,364	1,639
2. No. of wings accompanied by usable information	1,364	1,639
3. No. of counties represented	21	23
4. Per cent of young in the entire sample	85	86
5. Per cent of young that were mature or nearly so (90 days old or older)	81**	77*

* Each year a few wings were sent in plastic bags. These are usually in an advanced state of decay.

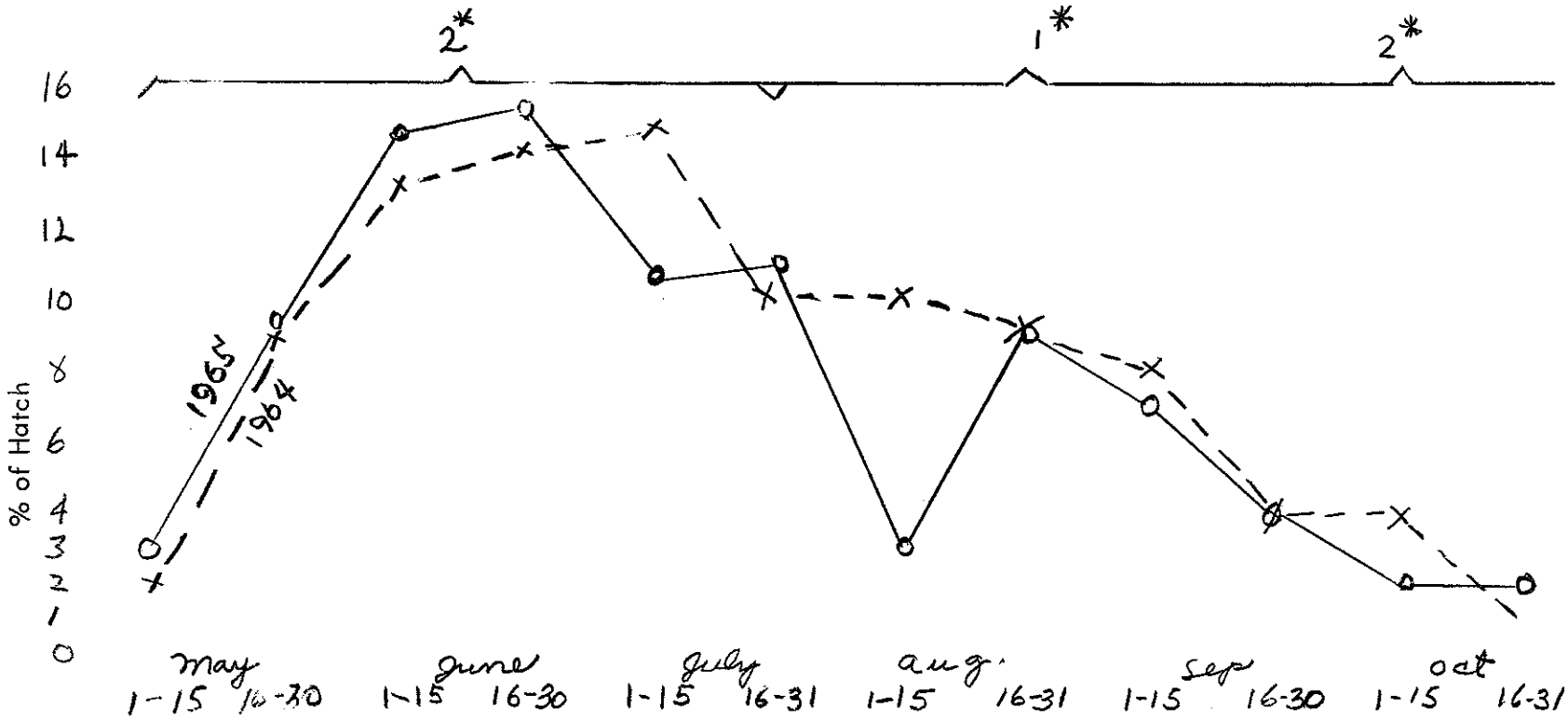
** These figures based on birds taken before November 18.

TABLE 2. The per cent young in quail bagged in Iowa. 1956-65

Year	% Young in Quail Bagged	* No. of wings in Sample
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	86	1,639
1965	85	1,364

* Some wings are not included as they were not accompanied by data on place and date of kill. Some wings decayed because they were sealed in plastic bags, or other air tight containers.

Figure 1. Comparison of 1965 quail hatching date distributions



*1. Data from ageable wings taken up to mid-November.

*2. Based on wing samples, broods seen and aged, research area call counts and other calling quail counts; few wings can be aged from birds hatched prior to July.

The larger share of birds under 150 days old were mature in size when shot. Other birds (over 150 days old) represent a good early hatch. Many adults were still in moult when shot, which 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. There was some low production in August.

DISCUSSION

In 1965, good production was indicated by data from 1,364 wings. Twenty-one counties were represented. Fifty-nine percent were young (under 150 days old) that could be aged and their hatching dates established. Forty-one per cent were young (over 150 days old) with fully matured flight feathers. Three percent of adults bore fully matured plumage. Additional information was gleaned from observations of 55 summer broods.

In 1964, good production was indicated by data from 1,639 wings. Twenty-three counties were represented. Forty-nine percent were young (under 150 days old)that could be aged and their hatching dates established. Fifty-one percent were young (over 150 days old) with fully matured flight feathers. Eight percent of adults bore fully matured plumage. Additional information came from 41 coveys seen in the summer. Only the wings collected early in the fall of 1964 were used in calculating the hatch. It is evident that production was good in both 1964 and 1965.

LITERATURE CITED

Haugen, Arnold O., and Daniel W. Speake, 1958. Progress report on Alabama bobwhite quail wing study. Proc. Twelfth Ann. Conf. S.W. Assoc. of Game and Fish Commissioners.

CLUB-REARED PHEASANTS VANISH AFTER STOCKING IN LEE COUNTY

Gene Hlavka
Game Biologist

INTRODUCTION

On July 7, 1964, 300 two-week old pheasant chicks were provided to the Prairie Hunters Club of Lee County under an arrangement whereby they would raise the birds and release them at a site designated by biologists. The local conservation officer volunteered that the Prairie Hunters Club wished to "help out" in our southeastern Iowa pheasant-stocking program. Also the wild hen brood stock from Union and Adair Counties at the Wildlife Research Station was still laying fairly well when the rearing facilities became full, so an extra hatch was available after capacity was reached. During transport to Lee County about 40 chicks were lost. Only 115 of the remaining 260 were raised to full size. It should be emphasized that these birds were exactly the same stock as that being raised successfully at the Wildlife Research Station.

RELEASE OF BIRDS

On October 16, 1964 the 115 juvenile pheasants (64 cocks, 51 hens) were caught, banded and stocked at a pre-selected site 2 miles southwest of Mt. Hamill by club members and Commission personnel. Commission personnel found the rearing facilities, which were in a section of a storage shed, to be cluttered. Outdoor pen space was inadequate. Plumages were ragged with bare skin commonly visible. The individual on whose shoulders the rearing responsibilities fell expressed no future pheasant-project enthusiasm, indicating he felt the rest of the club members "abandoned" him once he had to care for the birds.

Lee County Stocking

The release site (bridge on the Cedar-Harrison Twp. road between sections 34 and 3) provided adequate surface water (intermittent stream and nearby pond) and good winter cover. A large field of corn less than 1 mile distant was still standing in mid-March, 1965.

METHODS OF FOLLOW-UP

Since the October 1964 stocking, several trips were made to Lee County to follow up this club project. Farmers were asked to record pheasant sightings over the appropriate date on their calendars. Field checks were made on two occasions. The pheasant spring crowing and roadside census and the pheasant summer roadside count were also conducted.

RESULTS AFTER RELEASE

One of the club members reported a sighting of about 20 pheasants at the release site two days after the stocking. A local farmer picked up two dead birds, but misplaced the bands. Another resident reported that a rabbit hunter "accidentally" shot one pheasant. Other Lee County farmers in a total of 50 interviews in the release site vicinity reported only

two pheasant sightings during the spring and summer of 1965 - a cock in June and a hen with three chicks in August (Table 1). Both sightings were within two miles and southeasterly of the release site. No sightings at all were reported during the 1965 fall crop harvest season. Typically, the fox was blamed for the lack of pheasants in the area, though there were apparently no more foxes in this area than in many other areas of the state where pheasants are present.

On September 9, 1965 I conducted a standard pheasant summer roadside count. This new 30-mile route with a criss-cross pattern ran around and through the realease site. No pheasants were seen during this early morning count. Because Lee County had experienced recent severe weather, I had checked the route conditions on September 8th. During this road check from 4:20 to 5:55 P.M., I sighted two broods of quail but no pheasants. A fast-moving thunderstorm with strong winds and heavy rains delayed the road check. Likewise, no pheasants were seen by the local Conservation Officer on one of his regular 30-mile summer roadside count routes that, for the most part, passes through and around the release vicinity.

On May 6, 1965 Conservation Officer Entner and I conducted the pheasant spring crowing and roadside census. No cock calls were heard at any one of the 10 stops. No pheasants were sighted on the return roadside count.

Field checks were made on two occasions. On March 10, 1965 with good snow cover three biologists with a dog found two old sets of pheasant tracks, one set being in the previously mentioned field of standing corn (apparently a cock judging from the size of the tracks - perhaps the same one reported sighted in June not far distant). This field of corn was the only standing-corn field in the release site area. The other tracks (probably a hen judging from size) was found 1/2-mile north of the release site. On January 29, 1965 with about 3 inches of snow cover, I sighted no pheasants or tracks in this same general area covered on March 10th.

DISCUSSION

The Prairie Hunters Club had indicated they could handle 1,500 to 2,000 pheasant chicks. Yet this club raised only 115 of the 260 received (less than half), and did not have adequate facilities even for rearing these. The stocked pheasants were in poor to only fair condition. It was apparently the only too frequent story of enthusiasm far outrunning ability to perform.

In contrast to stocking of small numbers of pheasants by clubs, the Commission's "mass-release" program (4,843 pheasants in 4 years) in northeast Henry, northwest Des Moines and southwest Louisa Counties has been encouraging. Almost 30 calls per stop were heard on a 12-stop route in the Winfield-Olds vicinity - an area where 3 years ago very few were ever heard. Perhaps the failure of this Lee County effort is a reflection of the value of mass stocking as compared to the release of small numbers of birds. It also may be a manifestation of the poorer job of rearing the birds, as typically true of such clubs, or a combination of these two things.

SUMMARY

1. The Prairie Hunters Club of Lee County raised only 115 of 260 pheasant chicks from wild "Union Adair" stock to full size.

2. The pheasants were in poor to fair condition when stocked in Lee County.

3. The pre-selected stocking site contained adequate water, cover and food.

4. Interviews with farm families, field checks and roadside counts have indicated that these club-reared pheasants have almost, if not completely, vanished within a year after stocking.

5. The results of this study lend support to the principle of mass stocking and further point out the poor chances of obtaining worth-while results from sportsmen's club pheasant rearing and stocking projects.

TABLE 1. Scarceness of pheasant sightings by Lee County farm families in area where 115 birds were released in October 1964

Date of Interviews	No. of Farm Families Interviewed	Pheasant Sightings Reported	Remarks
Sept. 9, 1965	24	B. Cook in Sec. 11, T68N, R7W saw 1 cock in early June. No sightings reported during spring and summer by other farmers.	No broods reported.
Nov. 23, 1965	26	F. Hohl in Sec. 2, T68N, R7W saw 1 hen with 3 chicks in August. No sightings reported during fall harvest season by any of the farmers.	About 80-90% of corn picked and all beans harvested

COMPARISON OF MAJOR CROP TRENDS IN NORTH CENTRAL AND WEST CENTRAL IOWA

Richard C. Nomsen
Game Biologist

The ringneck pheasant in Iowa has demonstrated his ability to thrive with intensive agriculture. But the question soon arises - how intensive can farming be without having a detrimental effect on pheasant populations. Major changes in crops and farming practices have occurred in recent years. This report compares some of these changes with pheasant population trends in two areas of the state. Each area contains four counties or slightly over 1,400,00 acres. One is in north central Iowa (Cerro Gordo, Franklin, Hancock and Wright) and the other in west central Iowa (Carroll, Crawford, Ida, and Sac).

Pheasant populations are recorded from the August roadside count are shown for the years 1955, 1958 and 1964 -- three 'high' years for pheasants in Iowa. The pheasant population declined in north central Iowa over the 10-year period but still remained much above the state average. The pheasant population increased in the west central area from 2.2 birds per mile in 1955 to 5.9 birds per mile in 1964. This figure was just slightly higher than in the northern area where 5.5 birds per mile were reported in 1964.

Land-use changes have been more pronounced in the north central area (Table 2). In 1964, row crops were planted on 57 per cent of the acres in north central Iowa compared to 43 per cent in west central. Potential nesting cover crops such as oats, pasture and idle land totaled 39 per cent in the western area compared with 28 per cent in north central Iowa.

North central Iowa has consistently supported high pheasant populations. However, recent land-use practices appeared to reduce pheasant numbers in much of the flat rich farmland derived from drained marshland and lakes. Cash grain farming has replaced the general all purpose farm. It is not uncommon to see 80-acre corn fields or corn rows 1/2-mile long. The increase of row crops naturally resulted in a decrease of safe nesting cover. Oats acreage dropped from 19 per cent to only 6 per cent of the total acres farmed. In past years, oats harvested for grain was the primary production area for pheasant chicks. Pasture totaled only 9 per cent in 1964 and in most cases was very heavily grazed, which lowered the quality of nesting cover . Thirteen per cent of the acreage was idled in 1964 as a result of the Feed Grain Program. Although most of this was seeded to oats, it was less productive than the 'regular' oat fields. Late seeding, thin stands and clipping prevented many successful nesting attempts.

Land-use changes were less pronounced in western Iowa. In 1964, row crops were seeded on 43 per cent of the farmland - an increase of only 5 per cent in 10 years. The greatest change occurred in the small grain acreage. Oats for grain decreased to only 8 per cent of the total - a drop of 13 per cent. Idle cropland, which included diverted acres, totaled 13 per cent of the total. It was noted in both areas, decreases in the oat acreage equalled the increases of land idled under the feed grain program. Pasture decreased slightly but still included 18 per cent of the total farm acreage.

Although farm practices have changed considerably in most areas, the ringneck has been able to cope with these changes. Pheasant populations have decreased in areas supporting very intensive cash grain farming and probably will not recover to former high densities. However, it is believed that shootable populations can exist in areas with good quality winter cover and at least a limited amount of nesting cover. Extensive fall plowing could limit the food available during winter if present practices continue.

Prospects are much brighter for pheasants in the areas described as gently to sharply rolling plains. The topography has retarded the drastic land-use changes so noticeable on the level farms. General farming is more prevalent in this type of area, and much better qualified to meet the basic requirements of pheasants. Diversified crops provide for food, nesting, and more 'edge' for travel, escape and loafing sites. Winter cover is also more abundant. The hills, valleys and gulleys provide extra protection against strong winter winds and blowing snow.

Although many changes in land-use have occurred in recent years, its effect on pheasant populations have been apparently limited to the more intensively farmed areas. Here the trend to more row crops plus the absence of winter cover have had a depressing effect on the pheasant population. Most areas of Iowa's primary pheasant range still retain sufficient diversified cover to fulfill the ringnecks basic needs.

TABLE 1. Comparison of Pheasant Population Trends in North Central and West Central Iowa - Years, 1955; 1958; 1964.

	Birds per Mile	
Year	North Central	West Central
1955	6.4	2.2
1958	8.0	3.6
1964	5.5	5.9

TABLE 2. Comparison of Major Crop Trends in North Central and West Central Iowa - Years, 1955; 1958; 1964.

		Acreage and Per cent of Total			
Crop	Year	North Central		West Central	
Row crops	1955	693,000 A.	(48%)	543,000 A.	(38%)
corn and	1958	749,000	(52%)	551,000	(38%)
soy beans	1964	811,000	(57%)	620,000	(43%)
Oats	1955	278,000	(19%)	302,000	(21%)
	1958	226,000	(16%)	257,000	(18%)
	1964	92,000	(6%)	119,000	(8%)
All Hay	1955	144,000	(10%)	188,000	(13%)
	1958	144,000	(10%)	173,000	(12%)
	1964	108,000	(8%)	138,000	(10%)
Pasture	1955	222,000	(15%)	303,000	(21%)
	1958	177,000	(12%)	283,000	(20%)
	1964	135,000	(9%)	263,000	(18%)
Idle	1955	7,000	(0.5%)	7,000	(0.5%)
	1958	39,000	(3%)	46,000	(3%)
	1964	183,000	(13%)	188,000	(13%)
Land in lots	1955	91,000	(7%)	90,000	(7%)
Roads, waste,	1958	93,000	(7%)	89,000	(7%)
etc.	1964	95,000	(7%)	93,000	(7%)

RESULTS OF 1965 IOWA WATERFOWL BANDING PROGRAM

Richard Bishop
Game Biologist

The banding of migratory waterfowl was carried on during 1965 much as it has been for the last several years. Banding migratory birds supplies data on migrations, populations, distribution, and mortality which is necessary for the better management of the concerned species. Iowa's banding program is based on drive trapping and night-lighting young birds on the breeding grounds and bait trapping flying birds prior to the season. Operations totaled 5,766 wild birds banded and released.

As in years past, the Game Section has undertaken the banding of migratory waterfowl on Iowa marshes by three major methods. Drive trapping and night-lighting young birds on their natal marshes during July and bait trapping flying birds during August and September. A limited number of birds are banded during the winter on winter concentration areas. These ducks are predominantly mallards. A total of 5,766 wild birds were banded and released of which 4,485 were blue-winged teal and 571 were wood ducks. Blue-winged teal and wood ducks are the two major nesting species in Iowa. Our main efforts are thus directed toward the banding of these two species. In addition to blue-winged teal and wood ducks, ten other species of ducks occurred in the sample and eight species of marsh birds. Table I shows species and numbers of birds banded on the breeding grounds. Table II gives the species and numbers of birds banded by bait trapping.

Results and Discussion

Drive banding started on July 12, 1965, and two crews worked for two weeks banding birds on marshes in north-central and northwest Iowa. The banding crews successfully banded 880 birds of which 715 were blue-winged teal and 41 were wood ducks. Details of the methods can be found in the 1964 Banding Program Report of the Iowa State Conservation Commission.

Night-lighting by three select crews was in operation during the same period as the drive banding operations. The night-lighters banded 1,351 birds of which 817 were blue-winged teal. Night-lighting operations were conducted, for the most part, in the Ruthven and Ingham-High Game Units.

Pre-season bait trapping of flying birds was conducted on most game unit management areas during August and early September. In past years bait trapping continued through September; however, due to the early teal season in 1965, trapping operations were cut off prior to September 11. This resulted in a fewer number of birds being banded than the year before. Bait trapping accounted for 3,417 birds being banded of which 2,953 were blue-winged teal and 366 were wood ducks.

In comparison to last year's banding results, a fewer number of birds was banded primarily due to the shortened period that bait trapping was allowed. In 1964, 1,824 birds were banded on the breeding grounds as compared with 2,231 birds banded in 1965. Pre-season banding accounted for 5,544 in 1964 compared to 3,417 in 1965. Results show in 1964 about 75 per cent of the blue-winged teal banded were young birds and in 1965 approximately 86 per cent were young birds.

It appears that pre-season bait trapping and night-lighting are the two most effective ways of banding ducks when man power and operational expense are considered. Night-lighters banded considerably more birds than was banded by drive trapping crews with less effort and expense. However, one disadvantage is apparent. Marshes that are night-lighted must be open enough to allow a boat to pass and deep enough for a motor to run. Not all marshes qualify for this method and the only way birds can be banded is by drive trapping.

Possibly greater efforts to night-light and bait-trap birds could compensate for reduced drive-trapping operation. A few key marshes could be chosen and all efforts concentrated in order to determine a trend in production.

Summary

1. Banding operations consisted of three major operations:
   a. Drive trapping - 880 birds banded
   b. Night lighting - 1,351 birds banded
   c. Bait trapping - 3,417 birds banded

2. A total of 5,766 wild birds were banded and released.

3. Birds banded consisted of 11 species of ducks and 8 species of other marsh birds. Blue-winged teal and wood ducks were the two most important and abundant species.

4. Of the blue-winged teal banded, about 86 per cent were young birds.

TABLE I - Total Birds banded during breeding grounds waterfowl banding operations - 1965

COUNTY	NAME OF AREA	Mallard	G.W. Teal	B.W. Teal	Shoveler	Pintail	Wood Duck	Redhead	Gadwall	Ring-n. Duck	Ruddy	Coot	Gallinule	Eared Grebe	Sora Rail	Virginia Rail	Least Bittern	TOTALS
Cerro Gordo	Ventura Marsh	12		59			1	4								1		77
Clay	Dan Green Sl.	14		56				1				51						122
Clay	Barringer Sl.			24				3				17	3					47
Clay	Mud Lake	12		322	5			22			2	46						409
Clay	Rush Lake							1										1
Clinton	Goose Lake	1		75			44					1	6					127
Dickinson	Hottes Lake	5	1	113			1					4	1					125
Dickinson	Private Pond	4	6	77		4	18	1										110
Dickinson	Jemmerson Sl.			29			3					1					2	35
Dickinson	Christopherson			39			1											40
Dickinson	Grovers Lake	1	1	128				5				7						142
Dickinson	Marble Lake	1		80			25	6				1						113
Dickinson	Lily Lake	18		18			4											40
Dickinson	Center Lake			51			1											52
Dickinson	E. Okoboji Sl.			5														5
Emmet	West Swan Lake	5		7			18	1		1		43		26				101
Emmet	Ingham Lake		1	114			14		1			61						191
Emmet	High Lake	1		69			25											95
Emmet	Twelve Mile L.	9		63			1					15						88
Greene	Finn Pond	2		1			4											7
Greene	McCray's Slough			1														1
Greene	Goose Lake		2													2		4
Hancock	E. Twin Lake		1	4														6
Hancock	W. Twin Lake											1						1
Kossuth	Union Slough			19			30								1	3		53
Pocahontas	Little Clear Lake			4			1					12						17
Pocahontas	Lizard Lake	1		5								7						13
Palo Alto	Virgin Lake			9									1					10
Palo Alto	Silver Lake	1		67			13					2						83
Winnebago	Leland Pond			42			1											43
Winnebago	Harmon Lake			51								9			6	7		73
	TOTALS	87	12	1532	5	5	205	44	1	1	2	278	11	26	7	13	2	2231

TABLE 2 - Total birds banded during pre-season waterfowl banding operations - 1965

COUNTY	NAME OF AREA	Mallard*	G. W. Teal	B. W. Teal	Wood Duck	Coot	Gallinule	P. B. Grebe	Sora Rail	Green Heron	TOTALS
Bremer	Sweet Marsh				4						4
Clay	Dan Green Sl.	15		263	18	6					302
Clay	Trumbull Lake		1	490	3						494
Emmet	Ingham Lake	10	48	363	7	1	1				430
Emmet	High Lake			465							465
Greene	Goose Lake	6		223		5					234
Jackson	Green Island				29						29
Louisa	Cone Marsh				155						155
Louisa	Lake Odessa				12						12
Lucas	Colyn Area			2	84					1	87
Tama	Otter Creek				7	1					8
Winnebago	Rice Lake			1147	47	1		1	1		1197
	TOTALS	31	49	2953	366	14	1	1	1	1	3417

* In addition 118 mallards and 1 black duck were banded at Knox Basin on the Missouri River during the winter of 1965.

1965 REEVES PHEASANT PRODUCTION AT WILDLIFE RESEARCH STATION

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INTRODUCTION

The background and early steps in the experimental Reeves pheasant introduction program in Iowa were discussed in the October-December 1964 Quarterly Biology Reports (Vol. 16, No. 4, pp. 4-9). Information on subsequent releases and sightings of stocked birds was summarized by Game Biologist Gene Hlavka in the July-September 1965 Quarterly Biology Reports (Vol. 17, No. 3, pp. 3-7). This report will deal only with the production phase of the program as carried out at the Wildlife Research Station at Boone, or basically the success in the hatching and rearing of these Reeves pheasants. The following evaluations are based on the records kept by the Game Section personnel responsible for this phase of the program.

EGG LAYING RESULTS

In early spring at the beginning of the egg laying season there were 260 hens in the lay pens. These were penned in a 1 cock:5 hen ratio, meaning that 52 cocks were involved. Day-by-day records were kept of the total number of eggs gathered, how many of these were broken and could not be set, and any mortality of hens that may have occurred. Two age groups of hens were used - 131 juvenile (or 1 year-old) hens and 129 adult (or 2 year-old) hens. Records were kept separately in order to compare the results from the two ages, with the primary aim of determining whether or not it would be advantageous to hold the young hens over to possibly obtain better production their second year.

The first eggs from the 2-year-old hens were gathered on April 10 (a few that had been dropped earlier were not collected). The corresponding date for the 1-year-old hens was April 12. Thus there was no significant difference in the time of initial egg laying between the two groups. The last eggs needed for filling the rearing facilities were collected from both groups on June 4th. Both were still laying at peak rate at that time. One hen had been lost from the 2-year-old group during the laying period, while seven hens had been lost from the 1-year-old group.

During the 56 days on which egg laying records were kept for the 2-year-old hens, 3,223 eggs were laid. Using the weighted average of 128.2 hens per day (to allow for the one lost), and the mean of 57.6 eggs laid per day, this means the average rate of production of eggs was 44.9%. In other words, the number of eggs laid each day was, on the average, slightly less than half the number of hens present in this 2-year-old group. The corresponding figures for the 1-year-old hens were quite similar. During the 54-day period of record, 2,880 eggs were laid for an average of 53.3 per day. Using the weighted average of 125.3 hens (to account for the seven lost), this resulted in a 42.5% rate of production. Thus it was concluded that there was no important difference in the rate of egg laying between the 1-year-old hens and the 2-year-old hens. The actual difference observed indicated that the older hens laid eggs at about a 5% greater rate than did the younger hens.

Another way of interpreting this data is to compare the number of eggs laid per hen. The young hens averaged 23.0 each during their 54-day recording period; the old hens averaged 25.1 during their 56-day period. Adjusting the latter figure to 24.2 to account for the 2 day difference and then comparing the two groups again gives a difference of about 5% in the egg laying rate. It was concluded that this was not a great enough difference to justify the holding over of hens to their second year for brood stock. Consequently, all hens will be released to the wild as soon as sufficient eggs have been laid to fill the facilities at the Research Station, and brood stock for the next year will be selected from the young birds reared each year.

HATCHING RESULTS

Eggs were set weekly (on Friday), with a total of seven settings beginning on April 23 and ending on June 4. Of those eggs laid by the 2-year old Reeves hens, 2,914 were set, an average of 416 each setting (ranging from 371 to 440). Candling about 20 days after setting resulted in the discarding of 1,146 eggs (39.3%). Of the remaining eggs transferred from the incubating machine to the hatcher, 545 (18.7% of total) did not hatch. This meant only 1,223 of the original 2,914 eggs set actually hatched - or 42.0%.

The young Reeves hens (1 year old) showed a 45.6% rate of hatchability (based on 2,608 eggs set, 988 candled out, 432 failed to hatch, and 1,188 chicks hatched). As with egg laying, it was felt the difference between the two age groups in hatchability was not significant. In fact the situation was just the reverse of that for egg laying, with the younger hens making the better showing - thus the two phases were, in effect, self-canceling. Thus there was certainly no basis in the present evaluation to favor the holding over of 2-year-old Reeves hens for brood stock.

The rate of hatchability of Reeves pheasants was considerably lower than expected and significantly lower than the rate for ringneck eggs being handled simultaneously and in the same manner. Possible reasons for this seemed to hinge primarily on one point - the temperature at which the eggs were held prior to setting. Temperature records kept in the egg holding room from April 21 to May 25 showed that the average temperature in the forenoon was 79.7° F and in the afternoon was 81.5° F, with a range of 76°-86° and in overall average of 80.6°. This is far too warm to hold eggs prior to incubation if a good hatch is expected. The egg holding room is adjacent to the incubator room and heat from the latter apparently filtered into the former. Arrangements will be made before the next season to cool the egg room to a proper temperature. Further good evidence of this as a cause of poor hatching of Reeves was furnished by a comparison of the number of eggs candled out with the number of days eggs were held in the egg room. Eggs were set every Friday, meaning no eggs were more than 7 days old at time of setting. Those eggs held the full 7 days showed a much higher rate of candling out, with a subsequent steady decrease (see following table). There was no similar significant trend with ringneck eggs held under the same conditions (also see table).

Reeves Pheasant Eggs

Days Held in Egg Room -	7	6	5	4	3	2	1
No. Eggs Candled Out -	215	176	98	84	80	48	74

Ringneck Pheasant Eggs

Days Held in Egg Room -	7	6	5	4	3	2	1
No Eggs Candled Out -	35	33	26	26	17	29	21

Another possible deterrent effect to the hatchability of Reeves eggs could be exposure to sun and high temperatures in the laying pens. Thus eggs will be collected three times daily, instead of twice, during the coming season.

DISCUSSION

An evaluation of egg laying and hatching results will again be made in 1966 to determine if the various modifications in procedures followed can achieve the desired results. More complete records will be kept this year, and a more detailed report should then be possible.