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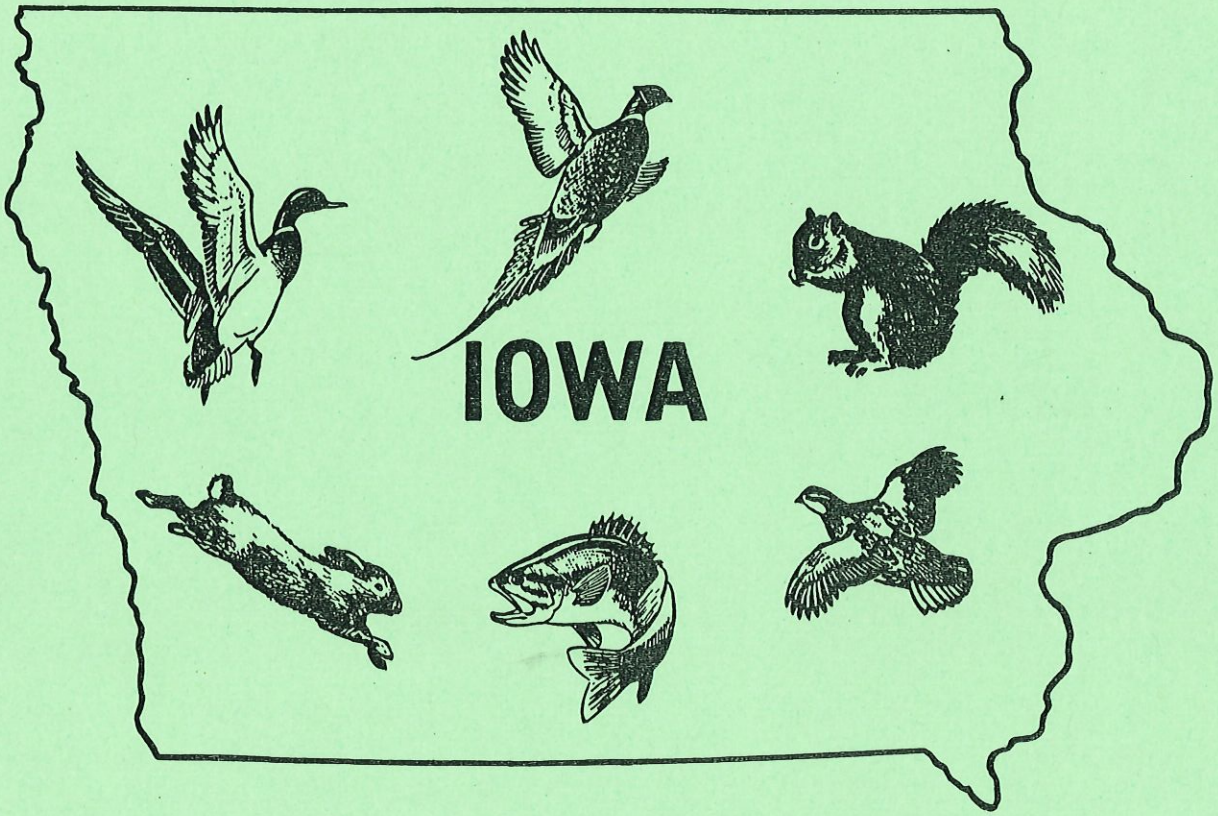
QUARTERLY BIOLOGY REPORTS



FISH AND GAME DIVISION — BIOLOGY SECTION

STATE CONSERVATION COMMISSION

QUARTERLY BIOLOGY REPORT

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TABLE OF CONTENTS

ABSTRACTS

PADDLEFISH HARVEST IN THE MISSISSIPPI RIVER BORDERING IOWA

Don R. Helms
Fisheries Biologist

A summary of Iowa's paddlefish fishery in the Mississippi River for the past 10 years is presented. Commercial harvest averaged 13,185 pounds annually and was valued at $1,461.18. A sport fishery, though presently nonexistant, is potentially available should snagging be legalized.

PROGRESS REPORT ON SPIRIT LAKE WALLEYE STUDIES 1969 POPULATION ESTIMATE

Terry Jennings
Fisheries Biologist

A mark and recapture study of the walleye population in Spirit Lake was completed in 1969. A total of 1,168 walleye ≥ inches in total length were marked with monel metal jaw tags. The population estimate was 35,177 and is considered the best estimate available of the population density. It is 29% higher than a similar estimate made in 1968. Anglers voluntarily returned 97 tags or a minimum exploitation rate by anglers of about 8%.

GROWTH AND LENGTH-WEIGHT RELATIONSHIP OF WALLEYE IN LAKE MACBRIDE

Larry Mitzner
Fisheries Biologist

Growth of male walleye in Lake MacBride was 7.5, 11.1, 13.9, 15.7, 17.1, 18.1, 19.3 and 20.3 inches for ages I through VIII. Corresponding growth for females was 7.9, 12.2, 15.2, 17.5, 19.2, 21.2, 22.9 and 23.6. There has been a general decline in growth rate since 1958. Length-weight relationship was established for walleye in 1966, 1968, and 1969.

EFFECTS OF EXPLOITATION AND ENVIRONMENTAL FACTORS ON CATCH SUCCESS OF CHANNEL CATFISH IN BAITED HOOP NETS

James Mayhew,
Assistant Superintendent of Biology
and Don Kline and Gaige Wunder, Fisheries Biologists

Experimental exploitation of channel catfish at the rate of 20% of the previous year's population estimate was conducted on the Des Moines River Study Area in 1967. During 10 bi-weekly periods 19,908 fish were removed from the area.

Environmental factors effecting catch success were monitored during the study, however, period and associated fish movement had the most significant influence on catch success over the entire netting.

AN ANNOTATED LIST OF FISHES ON THE MAPLE RIVER DRAINAGE

Don Kline
Fisheries Biologist

This study of the fish distribution in the Maple River continues previous inventories. Fishes were sampled using seine and pro-nox fish. River carpsucker, plains sucker-mouth minnow and channel catfish were added to the list of fishes of the Maple River. A description is given of each station and the fish are listed with notes on their distribution, numbers, length and previous records.

GAME

WOOD DUCK BAND RECOVERY DATA, 1963 - 68

Richard Bishop
Waterfowl Biologist

A total of 2,983 wood ducks was banded by state personnel from 1963 to 1968. Of the 2,983 wood ducks banded, 234 bands were reported during the same year of banding giving a 7.8% direct recovery rate. Adjusting for reporting rate and crippling loss, Iowa banded wood ducks averaged 35% total hunting mortality rate for the first year. Wood ducks were recovered in 15 states during this period, with Iowa reporting 58.3% of the kill. Minnesota, Texas, Arkansas, and Louisiana ranked next in line with 7.7, 7.3, 7.1, and 6.9% of the harvest respectively.

RESULTS OF THE 1969 DEER SEASON

Lee Gladfelter
Game Biologist

The 1969 shotgun season lasted three days in zones 1, 2, and 4 with two days being allowed in zones 3 and 5. A 62-day bow and arrow season was also permitted. There was a total of 18,000 paid shotgun, 23,476 landowner-tenant, and 5,465 bow and arrow licenses issued. All hunters were required to submit a biology report card following the season. About 97% of the shotgun hunters, 82% of the landowner-tenants, and 92% of the bow hunters returned the report cards. A total of 11,582 deer was harvested during the 1969 season. Of those individuals that hunted, 40.6% of the shotgun hunters, 21.2% of the landowner-tenants, and 16.5% of the bow hunters were successful in taking deer. The total kill and hunter success was lower than in 1968 with heavy snowfall during the season being one of the primary reasons. All deer hunters spent 676,815 hours in the field during the 1969 season. Paid shotgun hunters required 37.1 hours to bag a deer as compared to 42.1 hours for landowner-tenants and 305.1 hours for archers. A crippling loss of 2,250 deer was reported.

IOWA'S SPRING PHEASANT POPULATION - 1970

R. C. Nomsen
Game Biologist

Iowa's 1970 statewide spring pheasant population increased 20% according to the results of the spring survey. Highest pheasant densities were reported in southwest, central and east central regions. Although the winter was long and cold, it lacked the severe storms that normally occur. The birds wintered well and early spring weather conditions were favorable for the nesting season.

POSTAL CARD SURVEYS OF THE IOWA QUAIL HUNTERS FOR THE 1969-70 SEASON

M. E. Stempel
Game Biologist

During the 99 day 1969-70 quail season, all of the state was open for hunting. Of all licensed hunters, 25% or 81,105 hunters, took 1,144,709 quail at a rate of 1.5 hours per quail. Of that number of hunters, 5,196 were non-residents who took 97,165 quail at a rate of 1.1 hours per quail. The most of the quail and the best of the shooting are in southern Iowa.

POSTAL CARD SURVEYS OF RABBIT AND CROW HUNTERS FOR THE 1969-70 SEASON

Gene Hlavka
Game Biologist

The statewide 1969-70 season cottontail bag exceeded 1.7 million rabbits, which was 10% below the 6-year average. The jackrabbit harvest was just over 97,000 which exceeded the 6-year average by 15%. Nearly half of all licensed hunters pursue conttontails with only 8% hunting jackrabbits. Over a quarter million crows were bagged in the state with the 1969-70 crow hunting success showing a considerable increase ower recent years.

THE 1970 RUFFED GROUSE DRUMMING AND WOODCOCK SINGING - GROUND SURVEYS

Robert Sheets
Game Biologist

The 1970 ruffed grouse drumming survey resulted in 1.51 drums per stop compared to 1.37 a year ago. Marking was begun at each listening point to standardize the drumming routes. The 1970 woodcock singing ground survey concluded with 0.26 woodcock heard per stop compared to 0.15 heard last spring. Both surveys indicate a higher spring breeding population for grouse and woodcock this year.

RESULTS OF THE 1969-70 TRAPPER QUESTIONNAIRE AND FUR BUYERS REPORTS

Ron Andrews
Furbearer Biologist

For the fourth consecutive year, the Iowa Conservation Commission sent a trapper questionnaire to approximately 2,000 of Iowa's 8,525 licensed trappers. Trappers reported harvesting approximately 630,000 muskrats, 81,000 raccoon and 29,000 mink. The muskrat, mink, raccoon and coyote harvest showed gains while the beaver and fox take remained about the same. Fur buyer harvest data was significantly different from trapper questionnaire data. There are some reasonable suggestions for these differences, but it is believed that the trapper questionnaire is more valid than the fur buyer reports. These are the only two measures of fur harvest we have and we believe fairly reliable trend information is obtainable from either survey. It is interesting to note that Iowa has ranked among the top ten fur producing states for the past several years.

PADDLEFISH HARVEST IN THE MISSISSIPPI RIVER BORDERING IOWA

Don R. Helms
Fisheries Biologist

At the March 1970 meeting of the Fish Technical Section of the UMRCC, the Law Enforcement Section requested a review of laws governing paddlefish harvest in the Mississippi River. In response to this request, the following summary of the river's paddlefish fishery has been compiled.

Paddlefish, because of their dietary preference for plankton organisms, are not generally vulnerable to sport fishing methods except by snagging. Since snagging is currently illegal in Iowa, harvest is generally limited to commercial methods. Commercial fishing is permitted in the Iowa stretch of the Mississippi River for this species by Iowa and Illinois. Wisconsin protects paddlefish.

Paddlefish harvest data reported by commercial fishermen licensed in Iowa for the past 10 years are presented in Table 1. During this period, reports show large annual harvest fluctuations from pool to pool. Catch by pool indicates a systematic decrease in harvest from Pool 19 upstream to Pool 9. The 10-year mean for all pools combined is 13,185 pounds, while the maximum-minimum was 23,109 in 1966 and 3,407 in 1963. The low figures are most likely the result of non-reporting. This is evident by comparing per cent of fishermen reporting with the harvest (Table 2).

Price seemed to have little effect upon harvest. Value of the fish remained between 9¢ and 12¢ per pound, thus probably did not vary sufficiently to induce change in fishing pressure. The highest total value for any year since 1960 was $2,773.08 in 1966. The mean annual value was $1,461.18.

Catch by gear for all pools and all years combined were: seines, 51%; gill and trammel nets, 31%; hoop and trap nets, 18%. Harvest by setline was insignificant. Snag lines are often fished for paddlefish in other regions with considerable success, but are illegal in Iowa.

Sport fishing for paddlefish in Iowa is nonexistent except for some illegal snagging below dams where they tend to congregate at certain times of the year. Observations by the author indicate these fish often occur in densities sufficient to make snagging a successful and attractive fishing technique. It is the opinion of the author that through proper regulation of seasons, gear and bag limits, this otherwise relatively unused resource could be developed into a new sport fishery for Iowa's anglers.

Table 1. Commercial paddlefish harvest in the Mississippi River bordering Iowa

	POOLS											
Year	9	10	11	12	13	14	15	16	17	18	19	Summation
1969	317	2,672	57	2,066	545	1,812	218	1,238	7,432	344	2,667	19,368
1968	756	842	292	1,372	181	2,446	678	505	3,284	66	12,144	22,566
				(1,434)*	(1,881)	(2,446)	(1,178)	(505)	(5,088)	(66)	(13,381)	(27,869)
1967	20	1,165	183	726	1,253	1,680	149	586	3,064	40	717	9,583
				(726)	(33,611)	(1,812)	(399)	(814)	(9,143)	(5,743)	(22,794)	(76,410)
1966	436	306	20	-----	92	3,253	23	2,781	5,276	4,249	6,673	23,109
				(-----)	(706)	(3,513)	(573)	(2,831)	(11,612)	(5,399)	(18,468)	(43,864)
1965	627	100	78	-----	265	850	43	172	1,149	2,020	326	5,630
				(-----)	(1,161)	(1,208)	(143)	(492)	(3,349)	(4,984)	(23,237)	(35,379)
1964	225	750	109	36	417	117	-----	1,400	3,391	84	13,914	20,443
				(86)	(1,328)	(711)	(550)	(2,423)	(3,498)	(4,094)	(24,663)	(37,353)
1963	316	-----	65	9	-----	-----	-----	16	310	232	2,191	3,139
				(59)	(343)	(865)	(4,000)	(134)	(371)	(3,003)	(19,799)	(28,955)
1962	-----	-----	-----	-----	157	30	-----	177	240	5,000	3,111	8,715
				(-----)	(157)	(465)	(700)	(477)	(240)	(6,509)	(8,271)	(16,819)
1961	8	801	-----	2,257	578	804	-----	-----	2,675	1,125	50	8,298
				(2,257)	(1,343)	(1,372)	(700)	(50)	(3,465)	(2,250)	(12,380)	(24,626)
1960	105	55	-----	447	641	1,134	384	249	3,811	2,093	1,078	9,997
				(447)	(3,283)	(1,534)	(2,534)	(4,961)	(4,075)	(6,516)	(6,349)	(29,859)
10 Year Mean	281	669	80	691	413	1,213	150	712	3,063	1,525	4,287	13,185

* Figures in parentheses represent Iowa and Illinois harvest combined.

Table 2. Commercial value of paddlefish to Iowa fishermen

Year	Number of Licenses	% Reporting	Harvest in lbs.	Price per Pound	Total Commercial Value
1969	428	94	19,368	.11	2,130.48
1968	407	86	22,583	.11	2,484.18
1967	398	80	9,583	.11	1,054.13
1966	386	69	23,109	.12	2,773.08
1965	383	58	5,630	.11	619.30
1964	385	72	20,479	.09	1,843.11
1963	382	47	3,407	.10	340.70
1962	387	64	8,857	.12	1,062.84
1961	436	66	8,754	.11	962.94
1960	532	77	11,176	.12	1,341.12
10-year Average	412	71	13,295	.11	$1,461.19

PROGRESS REPORT ON SPIRIT LAKE WALLEYE STUDIES
1969 POPULATION ESTIMATE

Terry Jennings
Fisheries Biologist

During 1969, an estimate was made of the adult walleye population density in Spirit Lake. This estimate was the third in a series beginning in 1967. In addition to estimating the adult population and assessing exploitation by anglers, the study was designed to determine long term fluctuations in population density.

Previous studies of the walleye population density by the Iowa Conservation Commission have been reported in Quarterly Biology Reports and other publications (Jennings, 1965, 1968, 1969; Moen, 1962, 1963, 1964; Rose, 1949, 1955).

CAPTURE AND MARKING

Between 19 April and 24 April, 1969, 1,168 walleyes $\geq$ 12 inches total length were marked. Serially monel metal jaw tags were used. Each tag was clamped around the left maxillary and premaxillary bones. Number 3 sized tags were placed on all walleye $<$ 20 inches long. They accounted for 1,035 (89%) of the total fish tagged. Number 4 straps were used on fish $\geq$ 20 inches.

Electro-fishing, operated at night, provided 984 (84%) of the sample. Fish captured by this method were measured, tagged, and released near the place of capture. Ninety-seven percent of the fish taken by this method were males ranging in length from 12 to 16 inches (Figure 1).

Gill nets were used to capture 184 walleye, or 16% of the total fish marked. These fish were transported to the Spirit Lake Fish Hatchery and artificially spawned before being measured and tagged. They were then transported back to Spirit Lake and released. Males accounted for 77 (42%) of the gill netted fish and females 107 (58%). These males ranged in total length between 13 and 25 inches (Figure 2). A mode occurred at the 19.0 to 19.9 inch length group. Females ranged between 16 and 28 inches total length. Their length frequency distribution bi-modal. One mode occurred at the 19.0 to 19.9 inch length group and another at the 24.0 to 24.9 inch length group (Figure 2).

Mortality of marked walleye attributable to injury sustained during handling and tagging was not a serious problem. Only 14 tags were returned from dead fish. This is a minimum mortality of 1.2% . Considerable effort was expended to recover tags from dead fish. For this reason, the 14 tags recovered from them probably represents a majority of those floating ashore. None of the tags were taken from fish captured by electro-shocker. Two Number 3 tags were returned from gill-netted walleye. Both were males. Twelve Number 4 tags were recovered from gill-netted walleye. One was male and the remainder females.

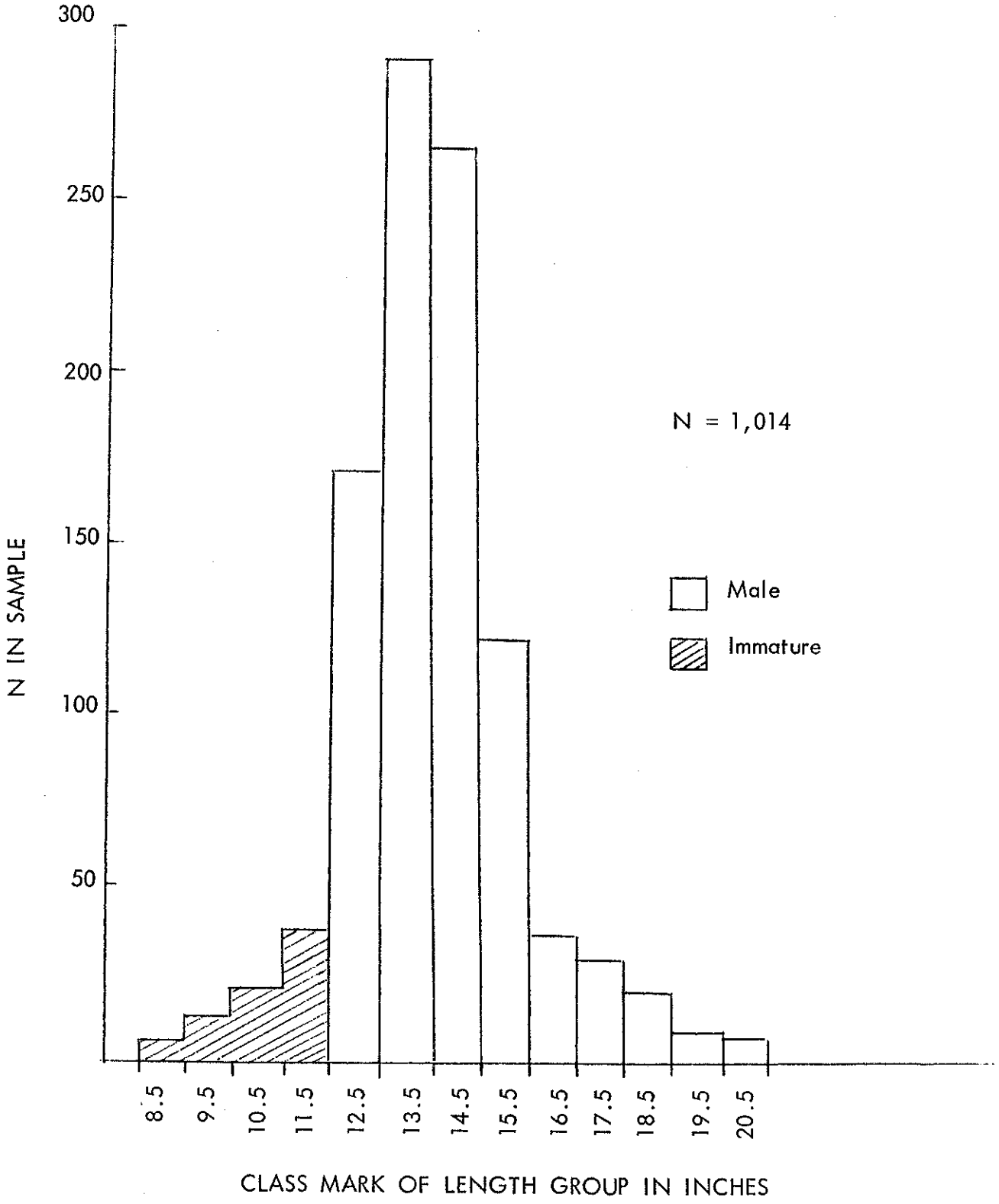

Figure 1. Length frequency distribution of immature and male walleye captured from Spirit Lake by electro-fishing during April, 1969.

POPULATION ESTIMATE

Recaptures, from which an estimate of the walleye population was made, were recovered through a creel census study. A census clerk measured and checked for tags nearly all walleye he observed. The only walleye he did not measure were those he observed after dark. During the first two or three days of each month and near the middle of each month, scale samples were taken from all fish observed by the clerk. Recruitment was eliminated by using the age distribution of scale samples and length-frequency.

During the period between 3 May, 1969 and 15 February, 1970, 774 walleye were observed (Table 1). Of this total, 97 (12.5%) were $<$ 12 inches at the time of capture and 165 (21.3%) had recruited into the population. After adjustment, 512 walleye that could have been tagged were observed. This sample contained 17 recaptures. Using the Petersen formula, a population estimate of 35,177 was obtained. This estimate is valid only for walleye $>$ 12 inches total length.

Confidence interval at the 95% probability level ranged between 18,401 walleye and 51,953 walleye. Population estimates were also made from data collected during May and from combined June through February samples. These estimates are within the confidence limits set around the estimate based on season totals.

VOLUNTARY TAG RETURNS AND EXPLOITATION RATE

During the 1969-70 fishing season, 97 tags were voluntarily returned by anglers. This represents a minimum exploitation rate of 8.3%.

After adjustment, creel census data showed 3.3% of the 3,756 marked walleye were caught in the sport fishery. Based on these data, 124 tagged fish were captured by fishermen. From this estimate fishermen exploited about 11% of the adult walleye population.

Anglers voluntarily returned 78% of the tags estimated to have been removed from population. This rate of return is higher than recorded for previous years. It is quite possible the harvest of walleye was under-estimated.

DISCUSSION

The most reliable estimate of the number of walleye $>$ 12 inches in Spirit Lake at the start of the 1969 fishing season was 34,177. Because of the relatively small number marked and the small number of recaptures, the 95% confidence limits of this estimate are wide (18,401 to 51,953). This estimate is larger than the 1968 estimate, (Jennings, 1969), but it is within the confidence limits of the 1968 estimate. Because of this the observed difference could have been caused by sampling error rather than in increased population.

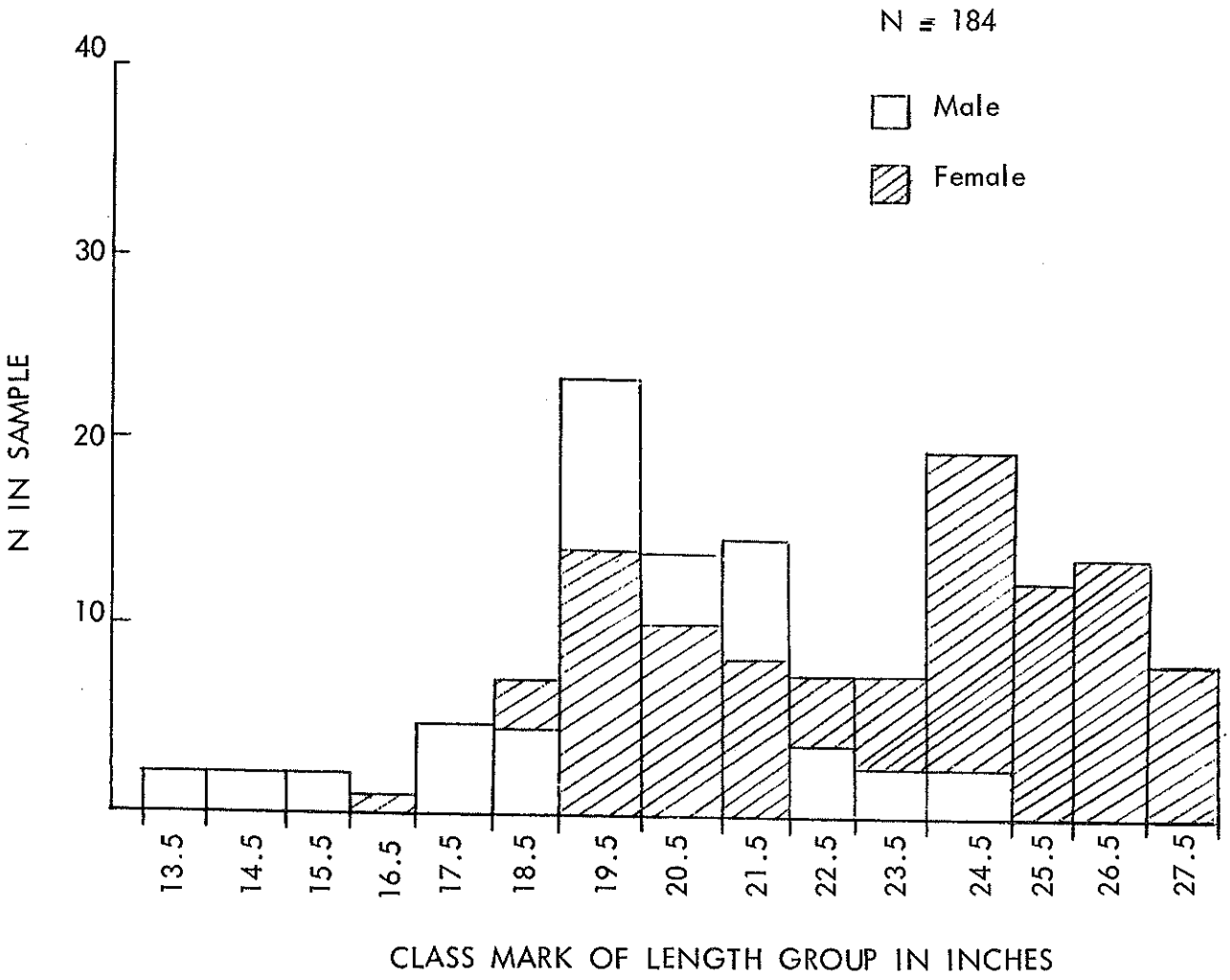

Figure 2. Length frequency distribution of male and female walleye captured from Spirit Lake by $2\frac{1}{2}$-inch bar measure gill nets, April 1969.

Table 1. Summary of Spirit Lake walleye data collected by creel census clerk and population estimates based on adjusted data.

Period	Total Observed	Under 12 inches No.	Under 12 inches %	Recruitment No.	Recruitment %	Adjusted Sample	Marked No.	%	Population Estimate
May	225	8	3.6	0	0	217	9	4.1	28,162
June through February	549	89	16.2	165	30.1	295	8	2.7	43,070
TOTAL	774	97	12.5	165	21.3	512	17	3.3	35,177

Ricker (1958; 86) lists six conditions that must be met or compensated for before population estimates are valid. These conditions are:

1. Marked and unmarked fish suffer the same rate of mortality.
2. Marked and unmarked fish are equally vulnerable to fishing being carried on.
3. Marked fish do not lose their marks.
4. Marked fish mix randomly with unmarked fish.
5. All marks are recognized and reported on recovery.
6. There is only a negligible amount of recruitment.

Except for condition Number 4, I believe these conditions have been met. There has been some discussion as to the difference in vulnerability of marked fish to hook and line as opposed to unmarked fish. Past data has indicated no statistical difference between estimates made from data taken by seine and those taken by hook and line. Because the last day of tagging and the opening day of walleye fishing season was only about one week apart, random mixing of the population had not been completed by season opening and probably was met mid-May. For this reason, I think the May estimate is low, and final estimate may also be low.

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GROWTH AND LENGTH-WEIGHT RELATIONSHIP OF WALLEYE IN LAKE MACBRIDE

Larry Mitzner
Fisheries Biologist

Investigations of the life history of walleye in Lake MacBride were initiated in 1965 and were designed to study growth, body condition, population magnitude and angler utilization. Progress on population magnitude (Mitzner, 1968) and angler utilization and survival (Mitzner, 1969) have been previously reported. This is a report of progress on walleye investigation and will deal with growth rate and body condition of this species in Lake MacBride.

A description of the lake and a brief history of walleye management is given in previous reports (Mitzner, 1968 and 1969).

METHODS

Scale samples were taken from individual fish along with measurements of total body length and weight. The samples were taken approximately 2-3 scale rows below the lateral line at the tip of the depressed pectoral fin. Body-scale relationship was determined from 496 measurements of body lengths and scale radius in 1968 and 1969. Growth determinations were based on 57 individual males and 51 females in 1964; 50 males, 6 females and 99 of unknown sex in 1968; and 153 male, 7 female and 60 of unknown sex in 1969. Length-weight regression was determined from 113 observations in 1966, 236 in 1968 and 278 in 1969.

The sample was obtained by pound netting and electro-fishing. Approximately 90% were taken in late March to mid-April during spawning activity.

GROWTH

Body-scale relationship was established to construct a nomograph for back calculating predicted lengths. Body lengths were measured to the nearest 0.2 inch interval and scales were magnified 32 times and radius measured from the focus to scale edge in the central, anterior field. Measurement was to the nearest 0.1 inch interval. Mean scale radius was determined for corresponding body lengths. Mean unweighted scale radius was combined for each one-inch interval of body length. This combined sample contained 13 pairs of body length (Y) and scale radius (X). These variables ranged from 5.8 to 18.3 for body length and 1.82 to 7.41 for scale radius.

A straight line regression equation was constructed by the least squares method. The constants for the equation were:

$$Y = 1.83 + 2.23 X$$

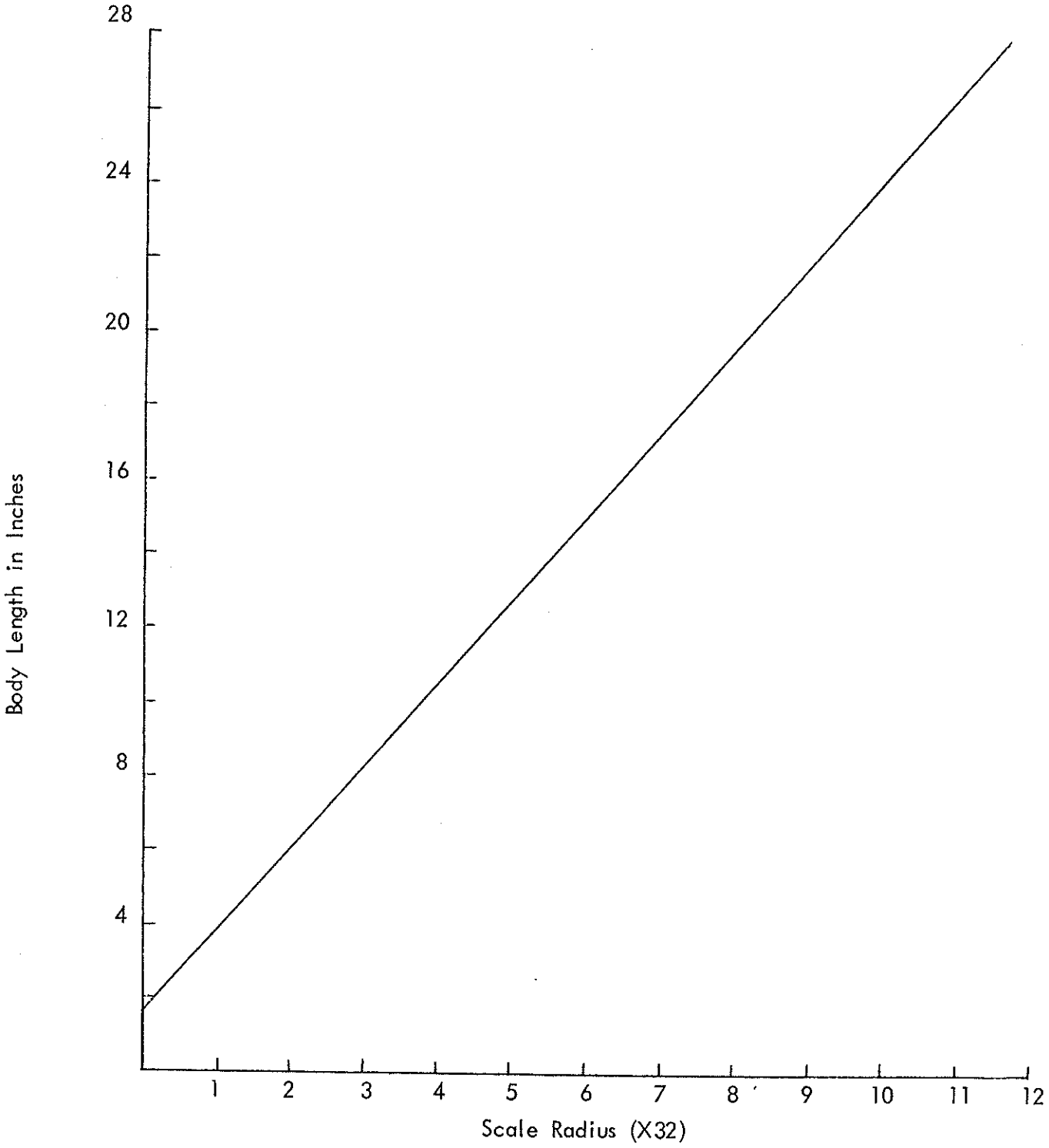

Figure 1. Body-scale relationship of walleye in Lake MacBride.

where Y = total body length in inches and X = scale radius, X 32, in inches (Figure 1). The correlation coefficient (r) was 0.999.

The predicted body length at time of scale formulation (X = 0) was 1.83 inches. A nomograph was constructed from this regression to aid in back calculating lengths of walleye at various annuli.

Back calculated lengths were determined independently for males, females and individuals of unknown sex. Year classes were combined by weighted means for each sex. Males were more difficult to age and consequently only 13 were aged beyond annulus VI.

Grand average calculated lengths were determined to be 7.5, 11.1, 13.9, 15.7, 17.1, 18.1, 19.3 and 20.3 inches for age groups I through VIII, respectively. The slowest mean growth in the first year was 7.0 inches for the 1956 year class; this year class was not endemic to MacBride at this time, but was stocked as age II in 1958. Greatest first year growth was in 1958, 1959 and 1960 when 8.0 inches was attained (Table 1).

Walleyes of unknown sex had similar growth characteristics to males. Grand average calculated lengths were 7.1, 10.2, 12.8, 15.1, 16.8, 18.1, 19.3, and 20.0 inches for age groups I through VII (Table 2). The close agreement to males indicated most of the sex unknown sample contained many males. Sex was undetermined because fish were taken in the pre- and post-spawning periods.

Table 1. Grand average calculated length of walleye males in Lake MacBride

Year		Year of Life							
Class	N	1	2	3	4	5	6	7	8
67	6	7.5	9.4						
66	125	7.2	9.9	11.7					
65	32	7.6	10.9	13.3	14.4				
64	19	7.2	10.8	13.3	15.2	15.8			
63	11	7.4	10.9	13.5	15.2	16.3	16.2		
62	9	7.4	11.2	14.0	15.7	17.0	17.8		
61	4	7.5	11.2	14.1	15.1	16.7	17.5	18.0	
60	4	8.0	12.1	14.4	15.3				
59	12	7.9	11.6	14.2	15.6	16.5			
58	29	7.9	12.4	15.3	16.9	18.0	18.7		
57	7	7.4	11.8	15.2	17.4	18.6	19.6	20.3	
56	2	7.0	10.5	13.4	15.8	17.6	18.1	19.6	20.3
Mean Length		7.5	11.1	13.9	15.7	17.1	18.1	19.3	20.3
Mean Weight		0.11	0.40	0.84	1.25	1.65	1.98	2.44	2.88

Female walleyes grew more rapidly during their first year of life than males and continued to grow at a more rapid rate in each year of life thereafter. Lengths were 7.9, 12.2, 15.2, 17.5, 19.2, 21.2, 22.9, and 23.6 inches for age groups I through VIII, respectively (Table 3). Female walleyes grew to the same size at age V as males were at age VII.

Table 2. Grand average calculated length of walleye of unknown sex from Lake MacBride.

Year		Year of Life						
Class	N	1	2	3	4	5	6	7
67	51	6.2	9.3					
66	64	6.9	8.8	11.1				
65	23	7.5	10.6	12.5	14.4			
64	4	7.6	11.1	13.3	14.5	15.8		
63	9	6.9	10.3	12.9	15.0	16.4	17.3	
62	7	7.3	11.2	13.8	15.9	17.4	18.3	20.5
61	1	7.0	10.0	13.0	15.6	17.4	18.7	19.4
Mean Length		7.1	10.2	12.8	15.1	16.8	18.1	20.0
Mean Weight		0.09	0.31	0.64	1.10	1.55	1.98	2.73

Comparison of growth in Lake MacBride to populations from Norris Reservoir (Stroud, 1949), Lake of the Woods (Carlander, 1945), Lake Erie (Deason, 1933), Saginaw Bay (Hile, 1954), Red Lakes (Smith, 1961), Spirit Lake (Rose, 1951), Clear Lake (Cleary, 1949) and Green Valley Lake (Mayhew, 1963) were made. The only body of water that growth was consistently greater was Norris Reservoir. MacBride ranked higher than Red Lakes, Saginaw Bay, Lake Erie and Lake of the Woods (Table 4). Walleye in MacBride grew faster than, or equal to those in Spirit Lake and Clear Lake for the first three years of life but more slowly thereafter. Growth in Green Valley Lake, Iowa was slower in earlier years of life, but faster in the later years.

Growth index was determined from the mean percent deviation from the mean annual increment. The index was based on growth from 1958 through 1968 (Figure 2).

Table 3. Grand average calculated length of female walleye in Lake MacBride.

Year		Year of Life							
Class	N	1	2	3	4	5	6	7	8
66	6	8.2	11.5	12.9					
65	2	8.3	12.5	14.9	16.5				
64	5	7.6	11.7	14.5	16.7	17.8			
63	1	7.4	12.3	15.1	16.4	17.0			
62	1	6.5	10.6	12.7	14.9	16.3	17.4		

Table 3 (continued)

Year Class	N	1	2	3	4	5	6	7	8
61	0								
60	2	7.1	11.1	14.9	17.9	20.3	21.5	22.2	22.7
59	4	8.5	12.7	15.8	17.4	18.7			
58	43	8.4	13.4	17.2	19.6	21.1	22.3		
57	3	8.3	12.8	16.1	18.8	21.0	22.5	23.3	
56	1	8.3	13.4	17.4	19.4	21.0	22.5	23.3	24.5
Mean Length		7.9	12.2	15.2	17.5	19.2	21.2	22.9	23.6
Mean Weight		0.13	0.55	1.12	1.78	2.39	3.30	4.25	4.68

Best growth was achieved for males in 1959 when they were +28.2% mean growth. Slowest growth occurred in 1968 with -52.2%. Females grew fastest in 1958 when they were 15.6 above mean growth. In 1969, they were -33.8%, the same year males grew slowest. A trend of slower growth rate existed from 1958-1968 with accelerated decrease from 1965-1966.

The general decline in growth may be attributed to natural biological succession in the lake as exhibited by many bodies of new water. The accelerated decline from 1965-1966 may have been caused by a decline in forage species as a result of the increase in the walleye population (Mitzner, 1968). The channel catfish and crappie populations have been increasing concurrently with the walleye.

Table 4 Comparison of growth of walleye in Lake MacBride with that in other bodies of water

Lake or Reservoir	Year of Life 1	2	3	4	5	6	7	8
MacBride - male	7.5	11.1	13.9	15.7	17.1	18.1	19.3	20.3
MacBride - female	7.9	12.2	15.2	17.5	19.2	21.2	22.9	23.6
Norris	10.3	16.4	18.7	19.9	20.8	21.0	22.1	24.9
Lake of the Woods	6.4	9.3	11.5	13.5	14.9	16.7	18.2	19.2
Saginaw Bay	6.8	10.8	13.6	15.7	17.2	18.5	19.3	20.0
Erie	6.0	9.7	12.1	15.1	18.0			
Red Lakes - male	5.5	8.4	10.5	12.2	13.5	14.3	15.1	15.6
Red Lakes - female	5.6	8.3	10.5	12.2	13.6	14.9	15.8	16.7
Spirit Lake	7.2	11.1	14.4	17.5	19.9	22.2	23.7	24.9
Clear Lake	5.9	10.9	14.5	17.2	19.3	21.4	23.6	26.3
Green Valley	5.7	10.3	13.8	16.5	18.7	20.8	21.7	

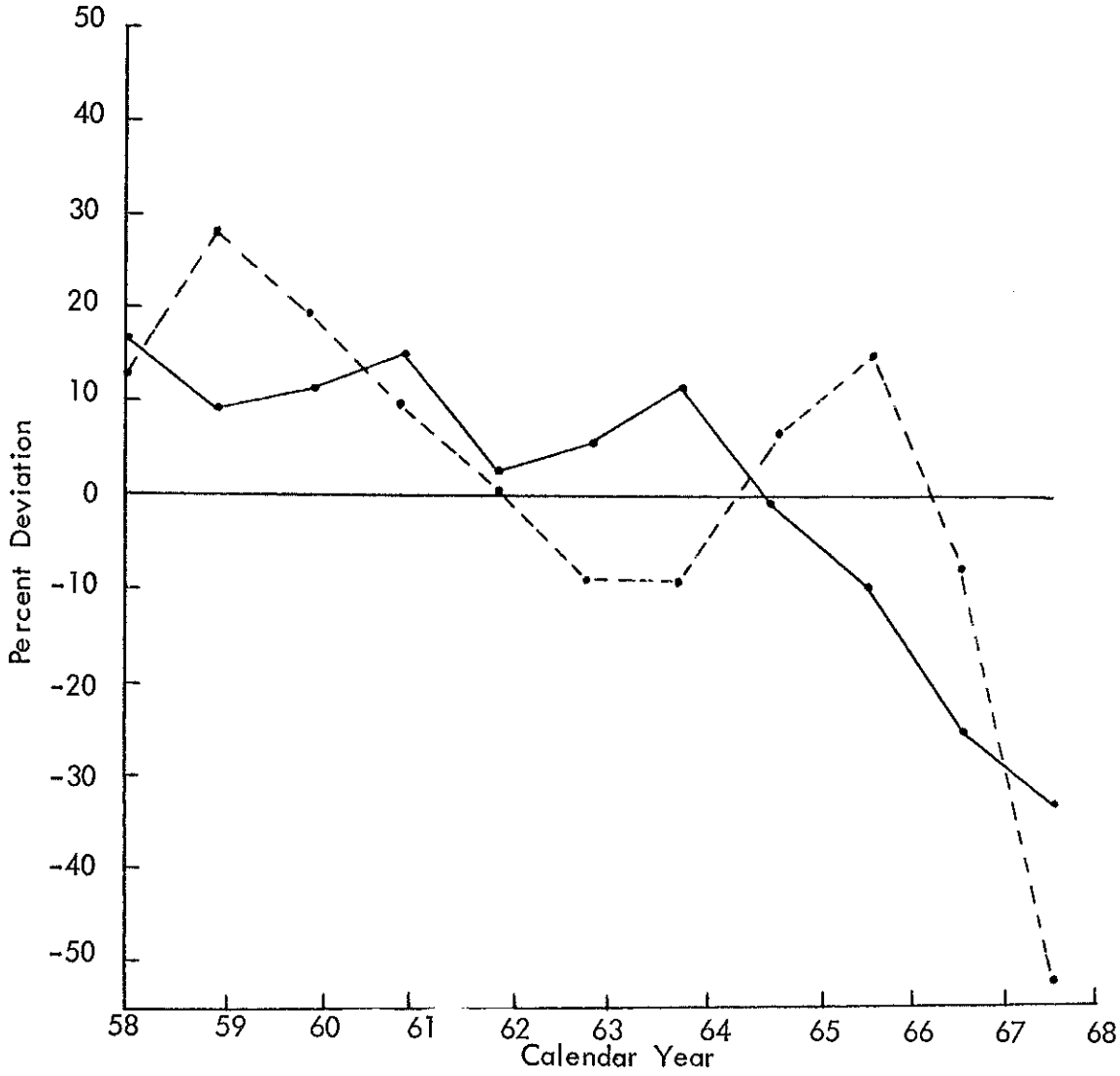

Figure 2. Percent deviation from mean annual increment of growth.

LENGTH-WEIGHT RELATIONSHIP

Length-weight regressions were determined for walleye with sexes combined in 1966, 1968 and 1969 by calculating constants a and b for the regression equation:

$$\text{Log}Y = a + b\text{Log}X$$

where Y = the weight in lbs and X = the total length in inches. The resulting equations in chronological order were:

1966 $\text{Log}Y = -3.7824 + 3.2431\ \text{Log}X$

1968 $\text{Log}Y = -3.5836 + 3.0698\ \text{Log}X$

1969 $\text{Log}Y = -3.8741 + 3.3232\ \text{Log}X$

The correlation coefficients for the regressions were 0.998, 0.997, and 0.998.

A Student's "t" distribution was used to detect possible differences between regression coefficients. There was a significant difference between 1968 and 1969 for both a and b coefficients. In 1968 fish above 12.9 inches were in poorer body condition than in 1969. Conversely, 1968 fish were significantly more plump than 1969 fish below 12.9 inches. The regression between 1966 and 1969 were the same as were those between 1966 and 1968.

Condition factors, C, were computed and are listed in Table 5. In all years there was an increase in body plumpness as fish became larger. The unweighted mean conditions in 1966, 1968, and 1969 were 34.0, 33.3 and 34.4, respectively.

Table 5. Condition factors C, for Lake MacBride walleye by grouped size intervals.

1966		1968		1969	
Observed length	C	Observed length	C	Observed length	C
10.8	33	5.8	36	8.8	26
11.5	31	6.8	29	9.8	28
12.5	31	8.2	29	10.8	29
13.3	30	9.4	30	11.8	30
14.0	32	11.0	31	12.8	31
14.8	32	12.0	32	13.8	31
15.5	31	13.0	29	14.8	29
16.3	32	13.8	30	15.8	32
17.0	32	14.8	29	15.8	31
17.5	31	15.8	29	17.8	32
18.5	35	17.0	30	18.5	33
19.3	32	18.2	29	19.9	34
20.0	36	19.2	32	20.9	44
20.8	33	20.1	31	21.9	33

Table 5. (continued)

1966		1968		1969	
Observed length	C	Observed length	C	Observed length	C
21.6	33	21.1	32	23.0	34
22.6	35	21.9	32	24.0	46
23.3	33	22.7	34	24.6	35
24.0	35	24.1	38	25.6	40
24.8	39	25.2	44	26.2	49
25.3	40	25.9	40	26.6	37
25.8	42	26.5	40	27.0	37
28.0	41	27.1	38	27.4	35
		28.0	42		

Length-weight regressions and condition factors agreed with the evidence of increasing population, decreasing growth rate (particularily for smaller fish) and decreasing body plumpness of smaller fish.

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EFFECTS OF EXPLOITATION AND ENVIRONMENTAL FACTORS ON CATCH SUCCESS OF CHANNEL CATFISH IN BAITED HOOP NETS

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In 1967 the channel catfish population within the boundaries of the Des Moines River Commercial Fisheries study area was experimentally exploited at approximately 20% of the previous year's estimate of 103,000 fish. Actual cumulative exploitation during 10 bi-weekly netting intervals was 19,908 channel catfish or 19.3% of this estimate. No restrictions were placed on size or number of fish exploited at each interval, with fish removed directly from the study area on a daily basis. Netting commenced on 18 May and continued only one period before flooding caused a delay until 7 July. After this date, exploitation was continuous until 4 November, except for a one period delay extending from 10-23 September because of low river flow and extensive equipment repair.

Many fisheries investigations involving dynamics of exploited populations of fish indicate downward trends in catch per unit effort are useful in determining declining stocks (Rounsefell and Everhart, 1953;64). In this study, catch success is defined as the ratio of the total number of channel catfish captured in all fishing gear in a 24-hour interval and the combined effort within the netting period. It is expressed in terms of fish per net day.

CATCH SUCCESS AND EXPLOITATION

A catch success curve of the mean number of channel catfish captured per net day within bi-weekly intervals (Figure 1) showed bimodal seasonal distribution. Catch success increased rapidly from 8.7 fish/net day in the first period to a maximum of 44.4 in the fourth period. A rapid decline in mean catch success occurred in the two subsequent periods, reaching a low of 4.4 fish/net day in the sixth period. Catch success increased gradually in the seventh and eighth periods until a secondary mode of 23.5 fish/net day was achieved in the ninth period. In the last period, catch success declined again to 10.4 fish/net day.

Exploitation rate within individual periods ranged from 0.64% of the population at P in the tenth interval to 4.66% in the fourth period. Since the number of fish caught in bi-weekly periods were used in the computation of both catch success and exploitation rate, higher values in catch success also accelerated exploitation. The rate of exploitation was based upon the original population estimate rather than progressively reducing the population density by the cumulative catch. Recruitment into the exploitable stock by growth and replacement by intra-stream movement would probably balance the constant loss of fish through natural mortality and the sport fishery.

Catch success should not normally be influenced by exploitation unless mortality from all sources exceeds replacement of fish into the available stock. When this level is reached, continued harvest at the identical rate should theoretically result in declining catch success proportional to the remaining stock. In the Des Moines River study area annual mortality rate was about 0.49 before experimental exploitation. Of this, <0.10 was attributable to the sport fishery. Total annual mortality from all sources, including 0.20 from exploitation by the experimental net fishery, would not exceed 0.69 before adjustment for recruitment and movement.

The nearly constant recruitment of fish into the exploitable stock as a result of growth would reduce the effects of this fishery. Channel catfish were not fully vulnerable to the mesh size used in the fishing gear until about 7.0 inches total body length. Annual estimated length increment of fish in this size range is approximately 3.7 inches. All fish between 3.3 and 6.9 inches in length would become vulnerable to the fishery during the netting season if growth remained constant. Length-frequency distribution of population samples in 1967 showed this size range contained 19.9% of the population. By exploiting 19.3% of the population in excess of 7.0 inches during this year, recruitment was about equal with exploitation rate. Assuming mortality from all sources was also constant, increasing exploitation 20% of the population density by the net fishery would actually not change the density of the exploitable population, although over a lengthy period some changes might be expected in the age structure of the population, particularly during initial exploitation when there is disproportionate loss of large and small fish from the population. The effects of exploitation on mortality rates and population density was further reduced because a portion of the mortality attributable to the net fishery would have occurred in the sport fishery and from natural causes regardless of net exploitation.

EXPLOITATION EFFECT

To test the effects of exploitation on channel catfish population density a multivariate analysis was made in which catch success (Y) was regressed on cumulative exploitation rate (X). The effects of exploitation on catch success is somewhat complicated by the fact certain environmental factors, such as river flow, temperature, and turbidity may also influence catch success (Table 1). Hoop nets rely on movement for self entrapment of fish and any factor which accelerates movement also increases catch success and would mask the true effects of exploitation. Effort is also an integral part in the computation of catch success, being the ratio of total catch and effort, and might effect catch success.

The influence of environmental factors and effort were minimized by holding the effects of these variables constant in the multivariate model:

$$Y_{ij} = \mu + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e_{ij}$$

where,

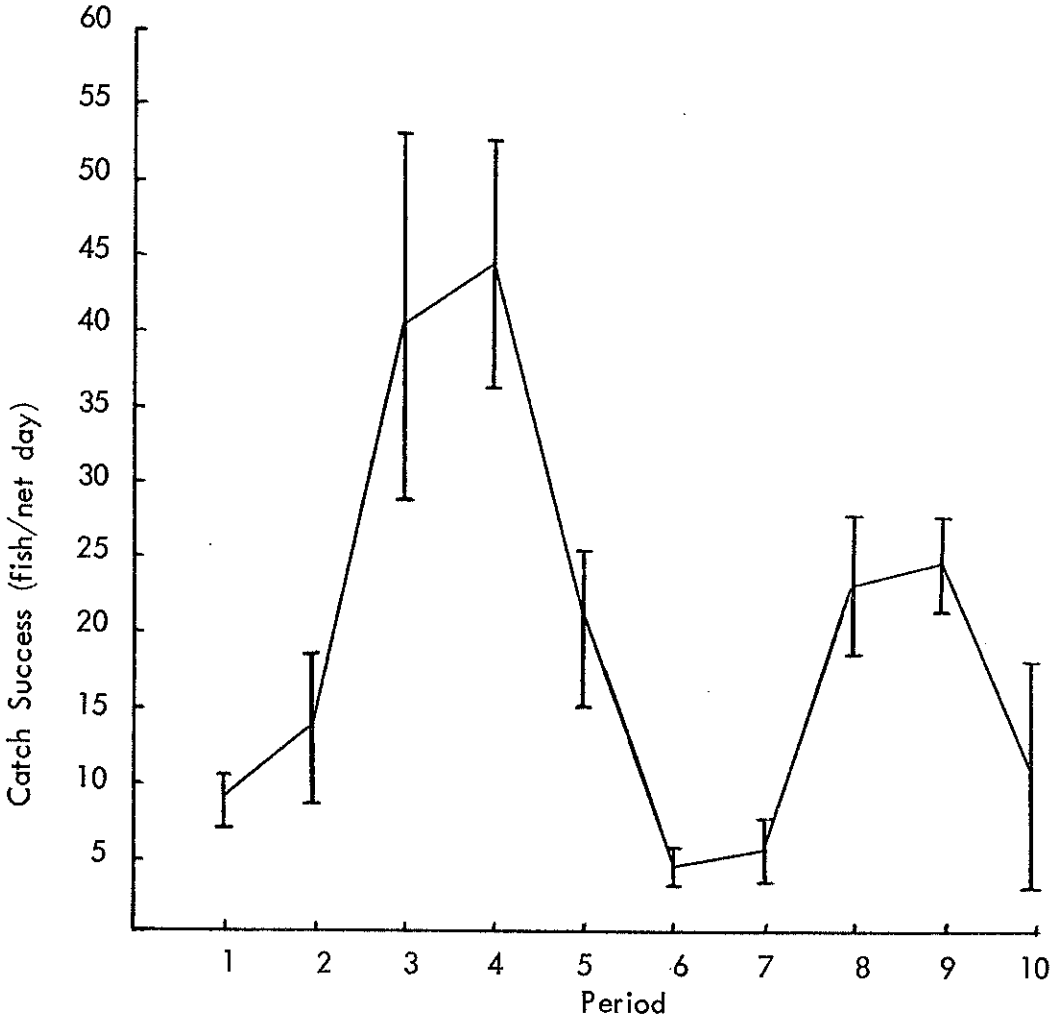


Figure 1. Catch success of channel catfish at bi-weekly intervals in 1967. Brackets represent standard deviation of the mean.

Y_{ij} = i^{th} catch success in the i^{th} net lift

X_1 = cumulative exploitation rate

X_2 = water temperature in °F

X_3 = river stage in ft

X_4 = light penetration in Secchi inches

X_5 = effort in net days

The b_1 value can be considered as the change in catch success with each unit change in exploitation rate, while the effect of temperature, river stage, turbidity and effort remain constant in the regression model. Partial regression coefficients to satisfy the normal equations and their standard deviations are listed in Table 2.

Table 1. Catch success and exploitation rate of channel catfish in the Des Moines River in 1967.

Period	Catch Success	Exploitation Rate (% at F)	Temp (°F)	River Stage (ft)	Turbidity (S inches)	Effort (net days)
1	8.7± 1.35	0.93	62.7	7.73	3.78	19.0
2	13.7± 5.00	1.61	63.2	14.17	4.58	23.6
3	43.5±12.30	3.70	74.7	11.27	5.43	15.5
4	44.4± 8.13	4.66	81.2	9.79	6.11	12.3
5	20.4± 4.87	2.48	80.6	8.77	6.25	12.4
6	4.8± 1.02	0.72	76.1	8.24	8.78	18.4
7	6.4± 2.01	0.71	72.7	8.14	12.04	18.8
8	22.8± 4.61	2.32	66.3	8.13	9.83	14.7
9	23.5± 3.18	1.69	52.7	7.64	10.50	11.7
10	10.4± 7.42	0.64	49.0	7.60	12.67	11.7

Results of this analysis revealed a slightly declining catch success occurred with cumulative exploitation, but the rather large standard deviation of the b_1 value indicated there could also be slightly increasing catch success within the sample. Analysis of variance (Table 3) testing the hypothesis, H_o: $b_1 = 0$, accepted the null statement of a nonlinear relationship between variables and the use of estimated regression coefficients would not improve accuracy in predicting Y values over use of mean X values. Extension of the analysis of variance in testing, H_o: $b_2 = b_3 = b_4 = b_5 = 0$, also showed acceptance of the null statement, meaning none of the variables strongly influenced catch success. Only about 3% of variation in the dependent variables could be attributed to variability in the independent variable. Therefore, it was concluded other variables were influencing catch success and were not being accounted for in the analysis.

Table 2. Partial regression coefficients with catch success as the dependent variable:

Variable	b value	S.D. of b
Exploitation rate	-0.12	$\pm$ 0.76
Temperature	+0.26	$\pm$ 0.24
River Stage	+0.83	$\pm$ 1.36
Turbidity	-0.62	$\pm$ 1.36
Effort	-0.56	$\pm$ 0.30

Table 3. Analysis of variance in the regression of catch success with environmental factors and fishing effort:

Source of variation	df	Sum of squares	Mean squares
Regression on X_1	1	10	10
Regression on X_2	1	495	495
Regression on X_3	1	150	150
Regression on X_4	1	150	150
Regression on X_5	1	82	82
Residuals	64	25,387	397
TOTAL	69	26,274	

Close inspection of these data indicated the extremely large variation in catch success between bi-weekly netting periods might have had significant influence upon this relationship. The high catch rates in periods 3 and 4 were attributed mainly to accelerated movement associated with spawning activity. The second mode in periods 8 and 9 was attributed to increased movement of small fish from riffle areas, where nets are not set, to deeper pool areas as water temperature declined rapidly in autumn. Channel catfish that were formerly not available to capture suddenly moved into close proximity with baited nets. Low catch success (periods 6 and 7) was attributed to sedentary effects of paternal nest care and guarding following deposition of eggs and care of young fish. Accurate measurement of these variables was not readily achieved, but by measuring the effects of period the influence of these factors was also measured. They must, however, be considered in combination because their individual influence cannot be separated.

The model becomes:

$$Y_{ij} = \mu + p_i + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e_{ij}$$

where,

Y_{ij} = i^{th} catch success in the i^{th} period

P_i = effect of the i^{th} period

and the other variables are the same as before.

The b_1 value in this model is also considered the change in catch success with each unit change of exploitation rate, holding the effects of period as well as other variables constant. Resulting partial regression coefficients (Table 4) revealed catch success increased about six units with each unit increase in exploitation. Thus, the effect of period has a rather marked influence upon changing values of catch success. Catch success becomes linearly related to exploitation, but slopes in the opposite direction for declining stock. This was expected because total catch is used in the computation of both catch success and exploitation rate. In this case, higher catch success would accelerate exploitation rate.

Table 4. Partial regression coefficients including the effects of netting period with catch success the dependent variable:

Variable	b value	S.D. of b
Exploitation rate	+ 5.93	$\pm$ 2.62
Temperature	- 0.22	$\pm$ 0.68
River stage	- 2.00	$\pm$ 1.91
Turbidity	+ 0.54	$\pm$ 1.40
Effort	- 0.19	$\pm$ 0.25

An analysis of variance (Table 5) was made as before. In this model the null hypothesis was rejected at the 0.05 level. Extension of the analysis of variance to include the other variables indicated their unique contribution after p_1 was added to the model was still not significant, and again added little to the accuracy of predicting catch success. About 52% of the variation in catch success was attributable to variability of the independent variables, of which 45% was due to variation in periods.

Table 5. Analysis of variance in catch success with environmental factors and fishing effort including the effects of netting period.

Source of variation	df	Sum of squares	Mean squares
Among periods	9	12,330	1,370*
Regression on X_1	1	1,212	1,212*
Regression on X_2	1	26	26
Regression on X_3	1	259	259
Regression on X_4	1	36	36
Regression on X_5	1	128	128
Residuals	55	13,057	237
TOTAL	69	27,048	

* Significant at 0.05 level

DISCUSSION

From the results of this analysis, it was concluded the 20% cumulative exploitation rate had no measurable effect upon catch success of channel catfish in baited hoop nets and, therefore, did not modify the density of the exploitable stock within the study area to any great degree. Accelerated movement, primarily the result of spawning activity, was the most important factor influencing catch success. There was no way the effects of period could be separated into unique categories in relation to fish movement patterns. In both models, temperature, river stage, turbidity and netting effort did not influence catch success over the entire netting period.

AN ANNOTATED LIST OF FISHES OF THE MAPLE RIVER DRAINAGE

Don Kline
Fisheries Biologist

The knowledge of present fish distribution in the Maple River coupled with a comparison of previous studies is necessary for the continued management of this fishery.

Harrison (1950) studied the fishes of the Maple River and compiled his field notes into an unpublished report (A Preliminary Survey of the Little Sioux River and its Main Tributaries). This information was later incorporated by Cleary (1956) in the chapter of fish distribution in Iowa Fish and Fishing (Harlan and Speaker, 1956).

The purpose of this study is to continue the inventory and examine the previous study for comparison. This paper contains notes on 4 families and 11 species of fishes. The present study has added 3 new species to the list of species found in the Maple River. Harrison collected 3 species that were not collected in the present study and 7 species of fish appeared on both lists.

I wish to thank Larry Gepner for his capable help in the field and laboratory. James Barry also assisted in the laboratory phase of the project.

DESCRIPTION OF STUDY AREA

The description of the study area given in this report is a summary from two previous reports (Harrison, 1950, and Iowa Natural Resources Council, 1959). Both stressed the importance of previous glacial and loessial action coupled with subsequent soil formation on the resources of this section of Iowa.

The topography of the area has been influenced by two glacial periods and loess deposits from the Missouri River.

The first significant glacial period was the Kansan, which completely covered the Nebraskan drift in western Iowa (Figure 1). A mature topography was developed on the Kansan drift by erosion before advancement of the Wisconsin glaciers. The Kansan drift that was not covered by substages of the Wisconsin glaciation was covered by loess deposits from the Missouri River during the Wisconsin time. This loess covered the landscape up to 50-ft thick near the bluffs in Woodbury and Monona Counties, but thins to about 4-ft in Buena Vista and Sac Counties were it covers the Wisconsin drifts.

The loess near the bluffs greatly influences topography and there is a lack of a well defined drainage system. The Maple River cut through the loess bluffs and formed a topography with high reliefs and steep side slopes so the tributary streams form deep gullies near the river.

To the east, the Kansan was not covered as thickly with loess and the former erosion developed topography was only slightly modified by the loess and later galcial drifts in Ida, Cherokee and Buena Vista Counties.

Cherokee, Buena Vista and Northern Ida Counties were covered by the Iowan and Tazewell substages of the Wisconsin glacial period, respectively (Figure 1) Iowan covered the Kansan in parts of Plymouth, Cherokee and Ida Counties but did not influence its drainage patterns. The topography of the Iowan area is gently rolling.

Tazewell drift covered only the Iowan on the eastern sides of Cherokee and Buena Vista Counties. The topography of the Tazewell is gently rolling to flat and only the larger streams have formed mature valleys.

Iowan and Tazewell drifts were covered by a relatively thin layer of loess from the Missouri River (up to 50-inches).

All the soils of the Maple River drainage are derived from loess material and formed under a grass cover. The soils belong to the Marshall soil association and may be separated into the Marcus-Primghar-Sac, Galva-Primghar-Sac and Monona-Ida-Hamburg associations.

The Marcus-Primghar-Sac and Galva-Primghar-Sac found in Cherokee, Buena Vista and northern Ida Counties are formed from fine to medium calcareous loess deposited on the Iowan and Tazewell drifts. Both have well developed drainage but slopes are gentle except near the Maple River.

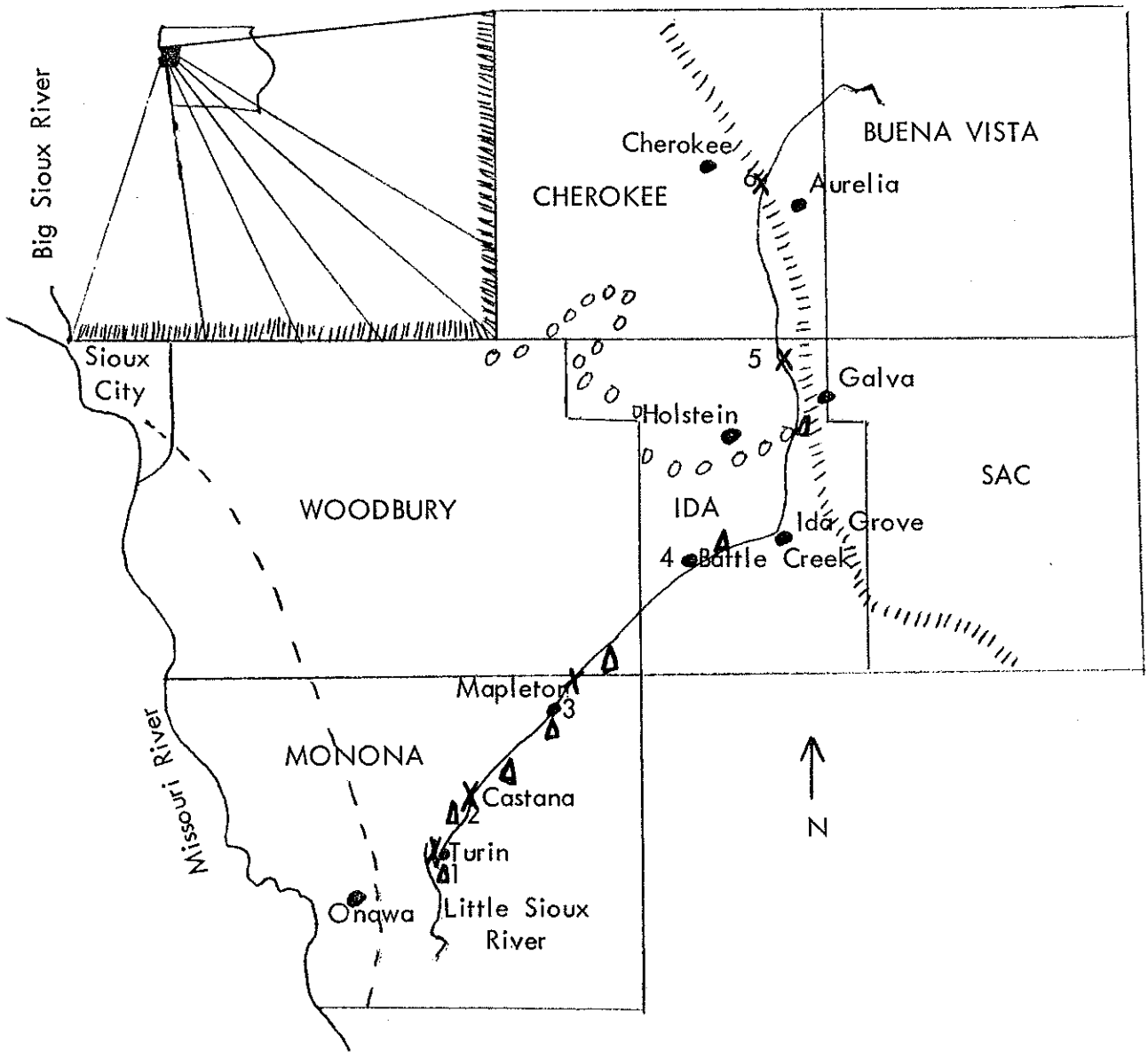
The MPS association is characterized by level uplands and $<$ 4-ft. of loess. The GPS association is characterized by rounded hills and $>$ 4-ft. of loess.

The MIH soils found in western Woodbury, southwestern Ida and central Monona Counties are formed from coarse-textured calcareous loess. These soils developed on the hilly and steep land along the Missouri River and are characterized by severe erosion and low productivity. The Hamburg soils are found on the steepest slopes and are non-tillable while the Monona and Ida soils are found in areas of less slope and are quite tillable.

The Maple River is a tributary stream of the Little Sioux River and has a drainage area of approximately 742 square miles (Larimer, 1957). It flows entirely in the state of Iowa and has the eighth largest drainage of the 19 rivers in Iowa associated with the Missouri River Basin.

The River rises in western Buena Vista County and flows through Eastern Cherokee and Ida Counties until near Ida Grove, Iowa, where it turns west and flows southwesterly through Ida, Woodbury and Monona Counties (Figure 1). It enters the Little Sioux River near Turin, Iowa, in the middle of Monona County just after it emerges from the Missouri River bluffs.

Figure 1. A sketch showing present sampling stations along the Maple River in relation to a previous study and approximate locations of glacerial drifts.



LEGEND:

X - Kline, numbered
Δ - Harrison
- - - - Kansan
ooo - Ida
///// - Tazewell

The communities of Aurelia, Galva, Holstein, Ida Grove, Battle Creek, Mapleton, Castana and Turin are in the Maple River Drainage.

Water flow records taken near Mapleton, Iowa, show a difference of 15,600 cfs for the past 28 years and a mean discharge of 226 cfs for 1969 (U.S. Department of the Interior, 1969). The Maple River maintains a flow during most of the year, but may be considered intermittent in Cherokee and Buena Vista Counties. Pool area would be present in this area during the drier season of the year.

The Maple River was rechanneled for approximately three miles near its mouth and ten miles around Mapleton, Iowa, before 1959 (Iowa Natural Resources Council, 1959). More recent straightening has been in the vicinity of Ida Grove, Iowa, during 1969, where approximately three miles have been straightened. Stations 1 and 3 are located in straightened parts of the river and Station 2 is at the end of the lower straightened section. The section of the river between Castana and below Mapleton and above Mapleton to below Ida Grove have been largely undisturbed. However, much of the surrounding vegetation has been removed and fields border the river. Many of the bends still hold their timber shelter composed of maple, elm, willow, and boxelder.

Above Ida Grove the Maple River is naturally straight and the banks slope gently to the surrounding terrain. Most of the trees and forbs have been removed by cropping and grazing practices.

PROCEDURES

Seine and Pro-Nox Fish (Rotenone) were used to capture fish in the Maple River.

Seine hauls were made at four stations on the Maple River using a 35-ft. x 6-ft 1/4-inch mesh seine. These seine hauls did not have preset length or width.

Pro-Nox Fish (Rotenone) was used at three stations on the Maple River. A 1/4-inch mesh block net was hung on reinforcing bars across the downstream end of the desired sample station. Pro-Nox Fish was mixed in a bucket with water and poured across the upstream end of the sample station. Additional dosages of mixed Pro-Nox Fish were put along the edges in the upper quarter of the station and allowed to slowly disperse. Pools and backwaters were similarly treated and all rotenone was put into the water as quickly as possible.

Because of the irregularity of the bottom and the presence of swift flowing water with backwater on one or both sides, a standard concentration in ppm was not an effective sampling technique. Downstream surveillance and the presence of fish in the block net indicated each station was sampled with very little undesired kill. The block net was left across the stream for one-half hour.

All fish collected were preserved in 10% formalin and returned to the laboratory for positive species identification and enumeration. Subsamples of ten preserved

fish were measured to the nearest millimeter and used to determine the average length and range. Representative samples of each species have been kept in a permanent collection.

After the collections were made, the stations were inspected for physical and ecological characteristics. Measurement of the cfs was made using a 50-foot cord, stop-watch and cork after the procedure described by Lagler, 1956. Field notes were taken on a standardized form with space available for additional notes on fish species on other fauna. Color slide pictures were taken for each station.

Fish species were classified as rare, common, or abundant using the following combined criteria:

	Specimens		Stations
Rare	1 or 2	at	1 or 2
Common	Several	at	2 or 3
Abundant	Many	at	3 or more well separated

STATION LOCATION AND DESCRIPTION

Fish samples were taken from six stations along the Maple River. Evenly distributed stations were selected that would be comparable with the previous study. The following is a list of stations describing their physical and ecological characteristics. Stations are listed from 1 through 6 starting at the station nearest the mouth. County, Township and Range numbers are given first, then the exact location by section. Seven additional characteristics are bottom type, flow in cfs, depth-deepest, gear, vegetation-presence and type, shore-bank type and principal cover and habitat.

Station 1. Monona (67), T-83N R-44W Sec. 10 middle
Bottom - saltating sand with silt deposits along the banks
Flow - swift to backwater
Depth - $\leq$ 3.0 ft.
Gear - 2 seine hauls, 24 September, 1969
Vegetation - None
Shore - levied 50-ft from bank and well protected with grasses and forbs
Habitat - stream meanders inside bank leaving alternating sand bars straightened with no trees on banks.

Station 2. Monona (67), T-84N, R-44W Section 24 middle
Bottom - saltating sand with some silt deposits along the banks
Flow - 93.0 cfs

Depth - < 1.5 ft.
Gear - 3 seine hauls, 24 September, 1969
Vegetation - none
Shore - levied 200 ft. from edge of bank and well protected with grasses
Habitat - stream meanders inside bank leaving alternating sand bars, straightened below bridge natural above.

Station 3. Monona (67), T-85N R-43W, Section 13 south
Bottom - hard sand
Flow - 127.1 cfs
Depth - < 3.0 ft
Gear - 2 seine hauls, 23 September, 1969
Vegetation - none
Shore - steep and well protected with grasses and trees
Habitat - pool area under bridge caused by dam built with large chunks of concrete, sand bar and shallows on east side, trees on west side and car bodies used to stabilize east bank downstream

Station 4. Ida (47), T-87N, R-41W, Section 35 north
Bottom - sand with few small boulders and gravel
Flow - 72.7 cfs
Depth - < 2.0 ft; pool area above > 4.0 ft.
Gear - 2 seine hauls and rotenone, 23 September, 1969
Vegetation - none
Shore - steep banks and cropped up to north bank
Habitat - pool area created by boulder dam, rapids area leads to shallows and bar on south side with swift water on north side.

Station 5. Ida (47), T-89N, R-39W, Section 16 northeast corner
Bottom - sand and coarse gravel, some hard mud on east side
Flow - 80.9 cfs
Depth - < 20.0 ft.
Gear - rotenone, 9 September, 1969
Vegetation - none
Shore - steep banks, cropped to bank upstream and pastured downstream
Habitat - river almost straight with very few trees in this area, pool under bridge and gravel bar upstream in middle of stream.

Station 6. Cherokee (18), T-92N, R-39W Section 33 middle
Bottom - medium sized gravel and silt
Flow - 17.1 cfs
Depth - < 1.0 ft
Gear - Rotenone, 9 September, 1969
Vegetation - a few stalks of grass
Shore - cropped upstream, pastured below and flat banks
Habitat - pool area with large brush pile at site of old bridge had filled knee deep with silt and rapids area below pool.

ANNOTATED LIST OF SPECIES

This list contains 11 species of fishes from four families. Harrison (1950) reported ten species in four families.

Notes contained in this list give the relative abundance, station(s), average length and range, records of previous work and a description of the habitat if the species was new to the list or more details were needed then given in the station description.

Catostomidae (Sucker Family):

Carpiodes carpio (Rafinesque). River carpsucker. Rare. Two specimens were collected with the seine, one each at Stations 1 and 4. The one at Station 4 was 233 mm (9.2 inches). This species has not been reported in the Maple River by previous workers.

Catostomus commersoni (Lacepede). White sucker. Rare. One specimen measuring 201 mm (7.9 inches) was collected at Station 4 using the seine. This species was reported by Cleary, but does not appear in Harrison's notes, near Station 3.

Cyprinidae (Minnow Family)

Phenacobius mirabilis (Girard). Plains suckermouth minnow. Common. This species was taken at Stations 5 and 6 using rotenone. A shallow rapids area approximately 100 ft. long at Station 6 yield 78 plains suckermouth minnows. Their average length was 57 mm (2.3 inches) and their range was 49 mm (1.9 inches) to 69 mm (2.7 inches). This species has not been found in the Maple River by previous workers.

Semotilus atromaculatus (Mitchill). Creek chub. Common. This species was taken at Stations 4, 5 and 6. A large number (135) were taken at Station 6. Their average length was 52 mm (2.1 inches) with a range of 42 mm (1.7 inches) to 102 mm (4.0 inches). Creek chubs were also listed as common in the same areas by Harrison.

Pimephales promelas (Rafinesque). Fathead minnow. Common. Fathead minnows were evenly distributed throughout the Maple River, but were noticeably more abundant at Stations 5 and 6. The average length of 145 taken at Station 6 was 47 mm (1.9 inches) and their range was 35 mm (1.4 inches) to 66 mm (2.6 inches). Harrison found this species in the same abundance and at nearly the same stations.

Notropis lutrensis (Baird and Girard). Red shiner. Common to abundant. This species was distributed throughout the river, but was most abundant at the first three stations (43, 25 and 10 respectively). Their average length was 61 mm (2.4 inches) with a range of 55 mm (2.2 inches) to 67 mm (2.6 inches). Harrison found red shiners rare to common and only in the middle portion of the Maple River in Woodbury and Ida Counties.

Notropis deliciosus (Cope). Sand shiner. Abundant. This species was the most widely distributed fish in the Maple River. Measurements were taken on 30 and shiners and their average length was 54 mm (2.1 inches) with a range of 31 mm (1.2 inches) to 68 mm (2.7 inches). The largest number taken was 366 at Station 3. Harrison found this species only in Woodbury and Ida Counties.

Notropis dorsalis (Agassiz). Bigmouth shiner. Abundant. Bigmouth shiners were found in all but one station and are the second most widely distributed species in the Maple River. One Station (6) yielded 452 bigmouth shiners and ten of these were measured. Their average length was 48 mm (1.9 inches) with a range of 31 mm (1.2 inches) to 65 mm (2.6 inches). The largest bigmouth shiner found measured 70 mm (2.8 inches). Harrison found this species abundant in Ida County.

Ictaluridae (Catfish Family)

Ictalurus punctatus (Rafinesque). Channel catfish. Rare. One channel catfish was taken with rotenone at Station 4. It measured 82 mm (3.2 inches). This species was collected in the swift water area. Harrison did not find channel catfish in the Maple River.

Ictalurus melas (Rafinesque). Black bullhead. Rare. Although not taken in the survey, a fisherman was observed 9 September, 1969, catching bullheads from a bridge located at T-91N, R-39W, Section 8, south in Cherokee County. He had five black bullheads. Harrison found this species common throughout the River.

Percidae (Perch Family)

Etheostoma nigrum (Rafinesque). Johnny Darter. Common. This species was found only in the upper portion of the River at Stations 5 and 6. The average length of seven Johnny Darters taken at Station 6 was 48 mm (1.9 inches) with a range of 44 mm (1.7 inches) to 55 mm (2.2 inches). Harrison found this species abundant near Station 5.

DISCUSSION

The Maple River was sampled using seine and Pro-Nox Fish in 1969 and seine in 1950.

The present study added river carpsucker, plains suckermouth minnow and channel catfish to the list of fishes of the Maple River. The river carpsucker was taken with a seine and the plains suckermouth minnow and channel catfish were taken with rotenone. The plains suckermouth minnows were taken at Stations 5 and 6 in the area of the Wisconsin glacial drifts. This area was not recorded by Harrison.

Stations 1, 2, 3 and 4 of the present study are comparable with stations of the previous study. Comparison of the species found at these stations reveals two char-

acteristics noted by Harrison: (1) The number of species decreases in the lower portion of the river; and (2) A smaller number of fish are found in the lower portion.

The most noticeable difference between the two studies is the lack of fathead chubs (Hybopsis gracilis) and the presence of sand and bigmouth shiners at all stations in the present study.

I consider rotenone an effective sampling technique, but because it must be applied to the whole stream section, sampling specific habitats was difficult. The seine was the best method for sampling individual habitats if the bottom was smooth.

Minnows were found at all stations, but are especially abundant in the upper portion of the Maple River where seining could yield large numbers for bait purposes. Habitat is available to substain a limited channel catfish population as far upstream as Cherokee County

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WOOD DUCK BAND RECOVERY DATA, 1963 - 1968

Richard Bishop
Waterfowl Biologist

A significant number of wood ducks has been banded yearly since 1963 to give a fairly reliable sample to determine distribution of kill and hunting mortality rates. From 1963 until 1968, a total of 2,983 wood ducks was banded in Iowa by state personnel (Table 1). The ducks were captured by three methods: drive trapping, bait trapping and night-lighting.

RESULTS AND DISCUSSION

Band Recovery Rates:

Direct band recovery rates ranged from 5.7 in 1968 to 9.9 in 1966 (Table 1). To determine the actual recovery rate you must adjust for non-reporting of bands. The band reporting rate is somewhere around 33%. Reporting rate varies with area and year, but available data indicate that it is in the neighborhood of 33%.

Crippling loss must be added to the actual recovery rate to give total hunting mortality rates. Information from the Bureau of Sport Fisheries and Wildlife indicates that crippling loss is about 35.6%. Total hunting mortality rates ranged from 26% in 1967 and 1968 up to 45% in 1966. The average total hunting mortality rate was 35% for the six years.

Table 1. Direct band recovery rates by year:

	1963	1964	1965	1966	1967	1968	TOTAL
No. Birds Banded	635	488	571	564	410	315	2,983
No. Returns	56	46	34	56	24	18	234
% Returns	8.8	9.4	6.0	9.9	5.8	5.7	7.8
% Hunting Mortality *	29	31	20	33	19	19	26
Total Hunting Mortality Rates **	39	42	27	45	26	26	35

* Adjusted for non-reporting rate (33%)
** Includes crippling loss (35.6%)

Recovery Distribution:

Direct band recoveries were reported from 15 states. Table 2 gives data on recovery location and percent of birds taken in each state. Iowa harvested on the

average 58.3% of the wood ducks during the six years. Minnesota, Texas, Arkansas, and Louisiana ranked next in number of recoveries indicating 7.7%, 7.3%, 7.1%, and 6.9% of the recoveries, respectively.

Table 2. Recoveries by state by year:

State of Recovery	1963	1964	1965	1966	1967	1968	Total No.	Total %
Iowa	33	25	19	37	19	3	136	58.3
Minnesota	2	6	3	2	2	3	18	7.7
Texas	2	3	4	6	0	2	17	7.3
Arkansas	2	5	2	3	2	1	15	7.1
Louisiana	7	4	0	3	1	1	16	6.9
Illinois	5	0	1	0	0	3	9	3.8
Missouri	1	0	1	2	0	3	7	3.0
Mississippi	1	2	1	1	0	1	6	2.6
Alabama	0	0	1	1	0	0	2	0.8
Tennessee	1	0	0	1	0	0	2	0.8
Wisconsin						1	1	0.4
Florida	1						1	0.4
Georgia	1						1	0.4
South Carolina			1				1	0.4
Kansas			1				1	0.4
TOTAL	56	45	34	56	24	18	233	100.3%

Regulations and Mortality Rates:

These data indicate that Iowa hunters kill a large percent of their own wood ducks and they are the most significant factor influencing mortality rates on Iowa banded wood ducks. Total first year mortality rates were the highest in 1963, 1964 and 1966 with 39%, 42%, and 45%, respectively. In 1965, 1967, and 1968, mortality rates were relatively the same at 26%. At the same time, the flyway kill of wood ducks during the period of 1963 to 1968 was 371,000, 313,000, 338,000, 484,000, 328,000 and 321,000 respectively. The high flyway kill of wood ducks partially explains the high mortality rate in 1966; however, more obvious in their effect are the dates of Iowa's hunting seasons. In 1963 and 1964, an early split season was held which hit the wood duck migration peak. The season dates were set late in October 1965, but then opened the middle of October in 1966. The season opened the third week in October in 1967 and the last week in October 1968. The three years with early opning coincide with the years of high wood duck kills in which Iowa is the major contributor. It is apparent that the harvest of Iowa wood ducks can, to a certain degree, be manipulated by season dates in Iowa.

Total hunting mortality makes up approximately 50% of total mortality (total hunting mortality plus natural mortality) according to Fish and Wildlife Service data. If we use the 50% figure, it indiciates that wood duck populations in Iowa are experiencing mortality rates of about 50% to 90%. The figure of 90% is much too high considering the healthy level of the population. One very important fact to note, however, is that the majority of these wood ducks were banded in the prairie marsh region of Iowa and probably do not reflect the overall situation in Iowa.

If mortality rates up to 90% are correct, we would have to experience a high rate of pioneering by this species and they are not noted for this. Mortality rates above 80% are probably too high to maintain good populations, but it is very likely that mortality rates would be much lower if the sample were better distributed across the wood duck habitat in Iowa. Nevertheless, it appears that the segment of wood ducks occupying the prairie pothole region is experiencing a fairly high mortality rate unless band reporting rates are much higher than expected.

RESULTS OF THE 1969 DEER SEASON

Lee Gladfelter
Game Biologist

The state was divided into five zones for the 1969 deer season (Figure 1) as compared to four Zones in 1968. The season was open December 6-8 in zones 1, 2, and 4 with zones 3 and 5 open on December 6-7. The bow season was open from September 27 to November 27. Hours of hunting were from 8:00 A.M. to 4:30 P.M. Heavy snowfall was recorded in some portions of the state, which may account for a reduction in hunter success because of reduced hunter mobility. An "antlered bucks only" season was held at the Red Rock Game Management Area during the regular deer season. Hunting pressure and kill was below normal in the area. No opposition to this regulation was expressed by hunters or landowners in the immediate area.

METHODS

All deer hunters were required to return a biology report card to the Conservation Commission following the hunting season. The information on the report card included hunting effort as well as hunting success. These cards were coded by Commission personnel and submitted to the Data Processing Division of the State Comptroller's office where they were key-punched for computer analysis. The data was separated into three categories: paid shotgun, landowner-tenant, and bow and arrow. The information submitted in this report is a result of computer analysis of the biology report cards.

RESULTS

Card Returns

There was a total of 18,000 paid shotgun, 23,476 landowner-tenant, and 5,465 bow and arrow licenses issued for the 1969 hunting season. Of these, 97% of the shotgun hunters, 82% of the landowner-tenants and 92% of the bow hunters returned the biology report cards (Table 1). Data in this report concerning number of hunters, number of deer killed, hunting success, and days and hours hunted has been corrected to account for those individuals who did not return their report card. This correction factor was computed from those cards returned too late to be sent to Data Processing and expanded to include all non-reporting hunters.

Hunting Success

A total of 11,582 deer was harvested during the 1969 season. This includes 6,952 (40.6% success) taken by paid shotgun hunters, 3,779 (21.2% success) by

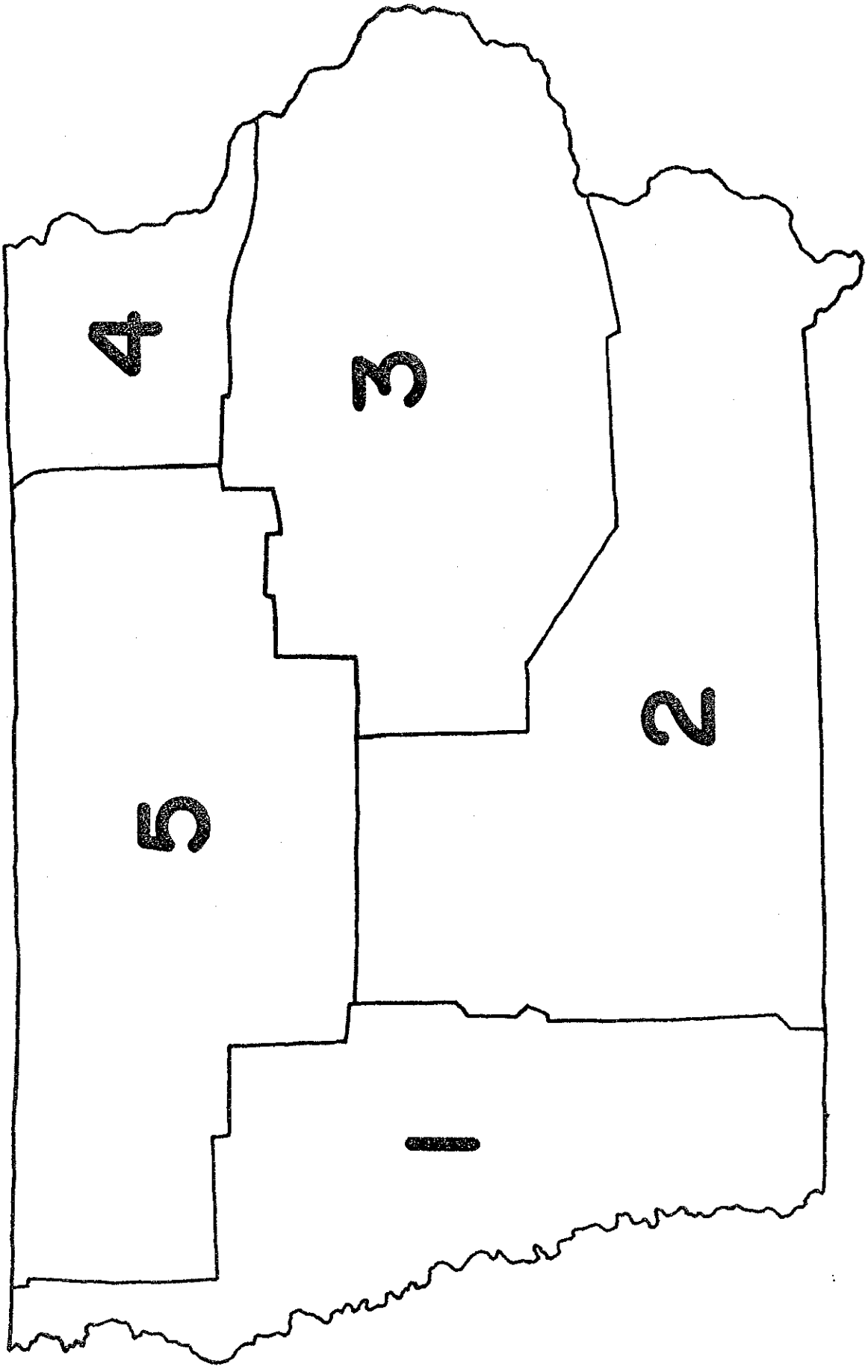


Figure 1. Hunting zones for the 1969 season.

landowner-tenants, and 851 (16.5% success) by bow hunters. Shotgun hunting success for 1969 (40.6%) was lower than 1968 (47.5%) and I believe that heavy snowfall during the short season is the primary reason. The number of deer killed by zone is presented in Table 2. A comparison is made with the 1968 season by expanding the data from the four 1968 zones. The 1969 hunters in zone 2 (46.5% success) and 5 (42.0% success had above average success, with those in zone 1 (38.8% success), 3 (30.0% success), and 4 (33.1% success) below average. The 1969 kill was 2,189 below the 1968 kill but there were 2500 fewer shotgun hunters and 1300 fewer landowner-tenants hunting. The 1969 deer season was a success from the standpoint that hunters obtained the second highest harvest on record.

Deer were bagged in every county except Grundy (Table 3), ranging from five in Pocahontas to 361 in Lucas. A compilation of past hunting seasons as compared to the 1969 season are presented in Tables 4 and 5.

Hunting Effort:

All deer hunters spent 676,815 hours during 143,836 days of hunting. Shotgun hunters averaged 15.1 hours in the field for the season as compared to 8.9 hours for landowner-tenants and 50.2 hours for bow hunters (Table 6). Paid shotgun hunters required an average of 37.1 hours to bag a deer as compared to 42.1 hours for landowner-tenants and 305.1 hours for archers.

Paid shotgun hunters hunted a larger percent of their time in counties other than their home county (Table 7). Landowner-tenants and bow hunters hunted a larger percent of their time in their home county.

Crippling Loss:

Paid shotgun hunters reported crippling 1,124 deer while landowner-tenants reported 546 and archers 580. This gives a total of 2,250 deer crippled during the 1969 season. A large percentage of these crippled animals is probably subsequently bagged by other hunters. Archers crippled almost twice as many deer per hunter as the shotgun hunters.

DISCUSSION

The expected fall population can be estimated by multiplying the winter population by a factor less than the potential reproductive rate of 1.7 (or 70% increase) which allows for mortality between spring and the fall hunting season. Kline (Biology Quarterly Reports, Vol. 21(2): 1-9p) stated that a multiplication factor of 1.4 was a good indicator of recruitment into the fall herd. If calculations are made for 1969, the estimated fall population was 32,658 (1.4 times winter estimate of 23,327). This is an increase of 9,331 deer from spring to fall. The 1969 kill was 11,582 which indicates that hunters harvested 2,251 deer more than the annual recruitment into the herd. However, it is feasible that a multiplication factor of 1.5

could be used. In this case, recruitment into the fall herd would be 11,663 which would be slightly more deer than were harvested. It is very difficult to evaluate annual mortality to the deer herd, other than legal hunting, but it seems that 20-30% is a good estimate. Therefore, I believe that a factor somewhere between 1.4 and 1.5 (40-50% increase) is acceptable. If these factors are used to evaluate the fall hunting results than a range in recruitment to the 1969 deer herd following the harvest is established at between a plus 52 deer (1.5 factor) to a minus 2,251 deer (1.4 factor). This indicates that a probable over-harvest of the herd occurred in 1969.

Table 1. Licenses issued and report cards returned:

	Paid Shotgun	Landowner-Tenant	Bow and Arrow
Number Licenses Issued	18,000	23,476	5,465
Number Actual Hunters *	17,103	17,844	5,168
Number Who Did Not Hunt*	897	5,632	297
Percent Licensees Who Hunted *	95.0	76.0	94.6
Number Reply Cards Returned	17,482	19,238	5,037
Percent Cards Returned	97.1	81.9	92.2

* These data have been corrected for non-reporting hunters.

Table 2. 1969 hunting success by zones:

Zone	*No. killed by shotgun hunters 1968	1969	% change in kill	Percent success (Shotgun 1969)	*No. killed by landowners (1969)
1	2537	1583	-37.6	38.8%	527
2	4374	3745	-14.4	46.5%	2143
3	771	571	-26.0	30.0%	461
4	701	637	- 9.1	33.1%	279
5	668	402	-40.0	42.0%	355
Unknown	---	14	-----	-----	14
Statewide	9051	6952	-23.2	40.6%	3779

* Corrected for non-reporting hunters.

Table 3. Comparison of hunting success by county, 1969

County	SHOTGUN			LANDOWNER-TENANT			BOW AND ARROW			Total Harvest
	No. of Hunters	Harvest	Percent Success	No. of Hunters	Harvest	Percent Success	No. of Hunters	Harvest	Percent Success	
1. Adair	211	90	43	136	31	23	27	3	11	124
2. Adams	228	126	55	149	39	26	28	5	18	170
3. Allamakee	684	212	31	468	110	23	106	14	13	336
4. Appanoose	269	115	43	261	67	26	46	5	11	187
5. Audubon	134	40	30	116	23	20	16	2	12	65
6. Benton	95	19	20	76	8	11	66	13	20	40
7. Black Hawk	58	10	17	55	3	5	187	17	9	30
8. Boone	302	103	34	200	46	23	157	20	13	169
9. Bremer	127	23	18	101	10	10	77	5	6	38
10. Buchanan	54	11	20	73	4	5	47	5	11	20
11. Buena Vista	48	28	58	41	9	22	57	5	9	42
12. Butler	79	25	32	134	26	19	65	6	9	57
13. Calhoun	22	3	14	7	2	29	28	5	18	10
14. Carroll	98	36	37	37	7	19	17	0	--	43
15. Cass	278	112	40	131	26	20	42	11	26	149
16. Cedar	58	17	29	69	7	10	33	3	9	27
17. Cerro Gordo	31	14	45	19	2	11	49	5	10	21
18. Cherokee	157	56	36	86	20	23	54	7	13	83
19. Chickasaw	77	15	19	94	17	18	38	0	--	32
20. Clarke	240	88	37	224	66	29	36	7	19	161
21. Clay	95	39	41	134	36	27	72	11	15	86
22. Clayton	530	164	31	431	73	17	130	19	15	256
23. Clinton	124	27	22	184	32	17	109	12	11	71
24. Crawford	310	77	25	92	21	23	25	2	8	100
25. Dallas	400	108	27	172	33	19	94	7	7	148
26. Davis	192	67	35	229	71	31	29	5	17	143
27. Decatur	472	225	48	383	121	32	51	6	12	352
28. Delaware	115	24	21	118	13	11	89	19	21	56
29. Des Moines	399	195	49	240	47	20	123	26	21	268

Table 3. Continued

County	SHOTGUN			LANDOWNER-TENANT			BOW AND ARROW			Total Harvest
	No. of Hunters	Harvest	Percent Success	No. of Hunters	Harvest	Percent Success	No. of Hunters	Harvest	Percent Success	
30. Dickinson	25	15	60	52	7	13	51	1	2	23
31. Dubuque	92	21	23	88	5	6	106	9	8	35
32. Emmet	42	24	57	97	21	22	50	9	18	54
33. Fayette	247	78	32	155	19	12	77	9	12	106
34. Floyd	66	23	35	102	11	11	87	9	10	43
35. Franklin	34	12	35	43	12	28	22	6	27	30
36. Fremont	164	77	47	212	57	27	36	14	39	148
37. Greene	146	45	31	98	21	21	59	6	10	72
38. Grundy	10	0	--	5	0	--	1	0	--	0
39. Guthrie	526	217	41	350	101	29	105	16	15	334
40. Hamilton	43	7	16	71	10	14	42	5	12	22
41. Hancock	30	13	43	40	4	10	34	4	12	21
42. Hardin	77	22	29	76	13	17	75	9	12	44
43. Harrison	536	194	36	272	57	21	65	12	18	263
44. Henry	218	83	38	243	52	21	23	3	13	138
45. Howard	89	27	30	61	9	15	41	7	17	43
46. Humboldt	25	5	20	43	9	21	28	3	11	17
47. Ida	52	19	37	17	1	6	13	3	23	23
48. Iowa	178	49	28	196	26	13	81	11	14	86
49. Jackson	266	71	27	237	32	14	111	21	19	124
50. Jasper	60	17	28	158	38	24	84	13	15	68
51. Jefferson	187	89	48	209	78	37	15	5	33	172
52. Johnson	127	28	22	171	26	15	136	9	7	63
53. Jones	151	43	28	217	38	18	67	9	13	90
54. Keokuk	166	67	40	215	47	22	27	3	11	117
55. Kossuth	51	20	39	126	21	17	61	9	15	50
56. Lee	394	139	35	477	122	26	89	21	24	282
57. Linn	195	42	22	150	11	7	210	17	8	70
58. Louisa	170	62	36	171	51	30	33	3	9	116

Table 3. Continuted

County	SHOTGUN No. of Hunters	SHOTGUN Harvest	SHOTGUN Percent Success	LANDOWNER-TENANT No. of Hunters	LANDOWNER-TENANT Harvest	LANDOWNER-TENANT Percent Success	BOW AND ARROW No. of Hunters	BOW AND ARROW Harvest	BOW AND ARROW Percent Success	Total Harvest
59. Lucas	601	249	41	428	104	24	64	8	12	361
60. Lyon	221	72	33	60	19	32	44	5	11	96
61. Madison	415	138	33	418	95	23	116	14	12	247
62. Mahaska	174	69	40	211	50	24	34	4	12	123
63. Marion	398	163	41	265	63	24	72	12	17	238
64. Marshall	43	18	42	53	9	17	67	9	13	36
65. Mills	184	75	41	140	42	30	55	15	27	132
66. Mitchell	57	17	30	65	7	11	38	7	18	31
67. Monona	435	113	26	198	54	27	42	4	10	171
68. Monroe	515	181	35	339	89	26	32	3	9	273
69. Montgomery	212	87	41	87	18	21	45	6	13	111
70. Muscatine	58	23	40	127	27	21	52	5	10	55
71. O'Brien	50	18	36	84	23	27	30	5	17	46
72. Osceola	19	11	58	27	6	22	14	1	7	18
73. Page	166	72	43	138	32	23	51	7	14	111
74. Palo Alto	48	22	46	112	23	21	21	4	19	49
75. Plymouth	198	47	24	55	12	22	37	7	19	66
76. Pocahontas	11	3	27	22	2	9	12	0	--	5
77. Polk	208	55	26	90	25	28	283	16	6	96
78. Pottawattamie	599	224	37	254	69	27	230	45	20	338
79. Poweshiek	46	13	28	78	16	21	29	5	17	34
80. Ringgold	230	124	54	246	93	38	14	1	7	218
81. Sac	33	9	27	55	15	27	42	6	14	30
82. Scott	86	13	15	54	3	6	115	9	8	25
83. Shelby	420	219	52	144	48	33	45	8	18	275
84. Sioux	249	57	23	94	20	21	42	12	29	89
85. Story	38	10	26	35	10	29	60	4	7	24
86. Tama	114	38	33	109	23	21	71	6	8	67
87. Taylor	123	65	53	154	46	30	14	1	7	112

Table 3, Continued

County	SHOTGUN No. of Hunters	SHOTGUN Harvest	SHOTGUN Percent Success	LANDOWNER-TENANT No. of Hunters	LANDOWNER-TENANT Harvest	LANDOWNER-TENANT Percent Success	BOW AND ARROW No. of Hunters	BOW AND ARROW Harvest	BOW AND ARROW Percent Success	Total Harvest
88. Union	284	134	47	159	48	30	35	2	6	184
89. Van Buren	406	190	47	409	114	28	19	4	21	308
90. Wapello	250	80	32	261	75	29	40	9	22	164
91. Warren	464	190	41	411	114	28	245	26	11	330
92. Washington	200	62	31	174	37	21	31	4	13	103
93. Wayne	205	78	38	180	44	24	10	0	--	122
94. Webster	80	17	21	133	25	19	94	11	12	53
95. Winnebago	46	9	20	62	10	16	73	12	16	31
96. Winneshiek	413	129	31	263	45	17	74	10	14	184
97. Woodbury	550	142	26	145	22	15	109	11	10	175
98. Worth	51	13	25	40	5	12	48	8	17	26
99. Wright	42	12	29	66	10	15	22	4	18	26
100. Unknown	16	16	--	28	28	--	4	4	--	48
TOTALS		6855			3489			825		11,169

Table 4. Comparison of statewide success with past gun seasons:

Year	Season Length in Days	Licenses Issued		No. Deer Killed		Total Gun Harvest	Percent Success	
		Shotgun	*Landowner	Shotgun	Landowner		Shotgun	*Landowner
1953	5	3,772	------	2,401	1,606	4,007	61.1	----
1954	3	3,788	------	2,414	568	2,982	63.7	----
1955	3	5,586	------	2,438	568	3,006	43.6	----
1956	2	5,440	------	2,000	561	2,561	39.2	----
1957	2	5,997	------	2 187	480	2,667	36.8	----
1958	2	6,000	------	2,141	588	2,729	38.4	----
1959	2	5,999	------	1,935	541	2,476	33.1	----
1960	3	7,000	------	3,188	804	3,992	45.9	----
1961	3	8,000	------	4,033	964	4,997	51.6	----
1962	3	10,001	------	4,281	1,018	5,299	43.5	----
1963	2,3	12,001	------	5,595	1,018	6,613	48.0	----
1964	2,4	15,993	------	7,274	1,750	9,024	47.1	----
1965	2,4	17,491	------	6,588	1,322	7,910	39.3	----
1966	2.4	20,811	------	9,070	1,672	10,742	45.2	----
1967	2,3	20,812	21,121	7,628	2,764	10,392	38.7	19.0
1968	2,3	20,485	24,796	9,051	3,890	12,941	47.5	21.4
1969	2,3	18,000	23,476	6,952	3,779	10,731	40.6	21.2

* These data collected since 1967 when landowner-tenants were required to obtain a free permit

Table 5. Comparison of statewide success with past bow and arrow seasons:

Year	Season Length in Days	Licenses Issued	Number of Deer Killed	Percent Success
1953	5	10	1	10.0
1954	12	92	10	10.9
1955	21	414	58	14.0
1956	31	1,284	117	9.9
1957	31	1,227	138	11.4
1958	30	1,380	162	12.4
1959	31	1,627	255	16.2
1960	44	1,772	277	16.0
1961	48	2,190	367	17.1
1962	51	2,404	404	16.9
1963	51	2,858	538	19.3
1964	51	3,687	670	18.8
1965	51	4 342	710	17.0
1966	51	4,576	579	13.3
1967	62	4,413	791	19.1
1968	62	5,136	830	17.0
1969	62	5,465	851	16.5

Table 6. Hunting effort during 1969 season.*

	Number Days Hunted	Number Hours Hunted	Hours per Hunter	Hours per Deer Killed
Paid Shotgun	38,926	258,072	15.1	37.1
Landowner-Tenant	33,592	159,119	8.9	42.1
Bow and Arrow	71,318	259,624	50.2	305.1
TOTALS	143,836	676,815	----	-----

* These data have been corrected for non-reporting hunters.

Table 7. Hunter distribution during the 1969 deer season:

	*No. of Hunters	Hunted Home County Only	Hunted Other Than Home County	Hunted Both Home and Other Counties
Paid Shotgun	19,212	9,491	9,705	1,736
Landowners	15,285	13,883	1,374	323
Bow and Arrow	6,302	4,002	2,296	1,122
TOTALS	40,799	27,376	13,375	3,181

* A tally was recorded for each county in which an individual indicated he hunted. This gives a greater number of hunters than there actually are since some hunters hunted in more than one county.

IOWA'S SPRING PHEASANT POPULATION - 1970

R. C. Nomsen
Game Biologist

The crowing cock count, which includes a 10-mile roadside survey, is the primary method for obtaining information on the spring pheasant population in Iowa. There were 181 routes checked this year by conservation officers, unit game managers and biologists.

The winter of 1969-70 began early in December when a general snowfall covered the entire state. Temperatures during January were extremely cold but snowfall was light. February was also dry but temperatures were near normal. March was cool with a few moderate to heavy snowstorms. Although the winter was long and cold, it lacked the severe blizzards and drift storms that normally occur. Winter mortality was apparently below normal to near normal in Iowa's pheasant range.

METHODS

The technique for conducting the spring crowing and roadside counts remained the same as in previous years. Results are given for the six major regions as well as state-wide.

The winter pheasant count was conducted from January 1 to March 15, 1970, to determine the sex ratio of Iowa's post-season pheasant population. These results are presented and are used to complete the crowing cock count interpretation.

RESULTS AND DISCUSSION

Sex Ratio Count:

Conservation officers, unit game managers and biologists reported a total of 22,705 pheasants during the winter survey (Table 1). Samples were adequate from all regions of the pheasant range and results varied from 2.6 hens per cock in northwest Iowa to over 4 hens per cock in the east and south regions.

The observed state-wide sex ratio of 3.5 hens per cock indicated that hunters harvested 66% of the cocks last fall. Observed sex ratios indicated the rate of harvest was 71% in the southeast half of the pheasant range but only 55% of the roosters were shot in northwest Iowa.

Table 1. Observed sex ratios, by regions, during the winter survey 1969-70:

Region	Number of Hens	Number of Cocks	Sex Ratio 1970	Sex Ratio 1969
Northwest	3,233	1,267	2.6	2.5
North Central	5,420	1,566	3.5	3.6
Southwest	2,400	708	3.4	4.8
Central	2,648	672	3.9	3.8
East	2,554	616	4.1	4.8
South	1,357	324	4.2	4.4
STATEWIDE	17,612	5,093	3.5	3.5

Crowing Cock Count

The 1970 crowing cock count indicated a 17% increase in crowing intensity when compared to results obtained in 1969 (Table 2). Increases were recorded in all regions.

Census conditions were generally favorable; however, wind was a problem in some localities (Table 3). The average completion date this year was May 7th which was about normal for this survey.

The state-wide hen index indicated that the 1970 population of hens was up 10% compared to the average of the previous five years and up 17% over the 1969 results. The hen index was determined by multiplying the average number of calls per stop by the observed sex ratio from winter observations.

Table 2. Results of the 1970 spring crowing cock counts made by conservation officers unit game managers, and biologists, and comparison with 1969 results:.

Region of State	1970 No. of Counts	1970 Mean Calls per Stop	1969 No. of Counts	1969 Mean Calls per Stop	Change from 1969
Northwest	29	12.3	28	9.5	+29%
North Central	27	12.5	27	11.1	+13%
Southwest	22	18.8	22	14.2	+32%
Central	30	14.1	28	12.4	+14%
East	36	10.2	30	8.7	+17%
South	37	9.4	37	8.8	+ 7%
STATEWIDE	181	12.4	172	10.6	+17%

Table 3. Comparison of dates on which spring pheasant counts were taken and mean wind velocity during counts 1970 vs. 1969:

Region of State	Mean Date of Counts 1970	Mean Date of Counts 1969	Mean Wind (mph) 1970	Mean Wind (mph) 1969
Northwest	May 7	May 18	3.3	3.1
North Central	May 9	May 20	4.5	2.2
Southwest	May 1	May 10	2.7	2.7
Central	May 12	May 12	2.8	2.1
East	May 5	May 13	4.1	1.9
South	May 8	May 12	3.5	3.0
STATEWIDE	May 7	May 14	3.5	2.5

Spring Roadside Count:

Results of the 1970 spring roadside count indicated a 22% increase in Iowa's brood stock of pheasants (Table 5). There were 2,936 pheasants sighted on the 181 routes censused this spring -- an average of 1.62 birds per mile. The average number of hens seen per mile increased 30% -- the average number of roosters increased 8%. The highest pheasant densities were recorded in the southwest, central and east central regions. The count in northwest Iowa improved this year but remains much below the state average.

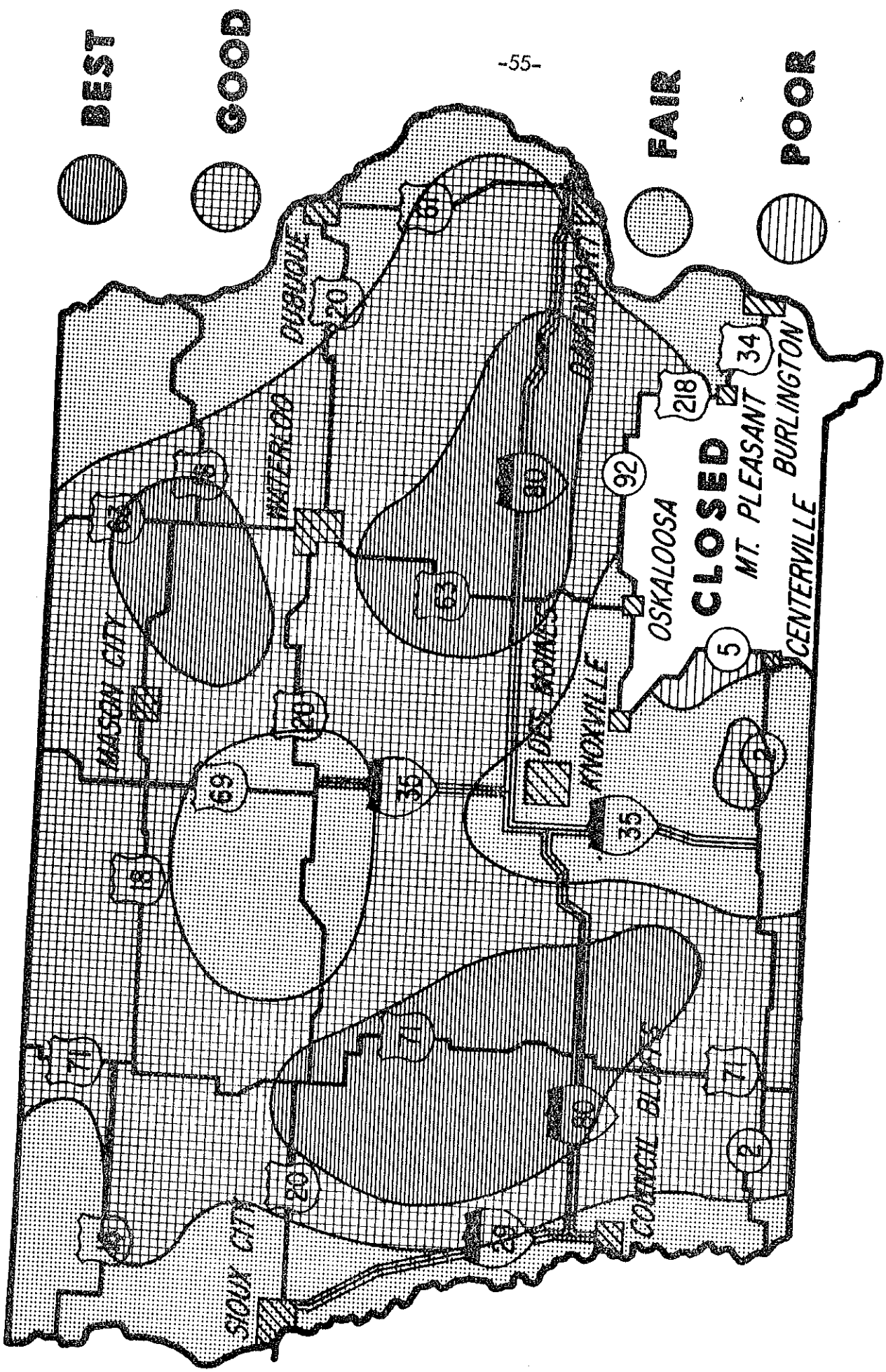
Thus, when all counts are considered, Iowa's 1970 statewide spring pheasant population was up about 20%. The greatest increase was recorded in the southern two-thirds of the pheasant range. The birds apparently wintered safely through the cold winter and mild spring temperatures indicated a normal nesting season.

Table 4. Results of spring population counts, 1965-1970:

Year	Calls Per Stop	Hen Index	Cocks Per Mile	Hens Per Mile	Birds Per Mile
1965	9.4	32.9	0.61	1.36	1.97
1966	13.1	41.9	0.80	1.77	2.57
1967	12.7	40.6	0.85	1.81	2.66
1968	11.8	48.1	0.81	1.92	2.73
1969	10.6	37.1	0.53	0.80	1.33
1970	12.4	43.4	0.57	1.05	1.62

Table 5. Results of the 1970 spring roadside counts:

Region of State	Number of Miles	Number of Cocks	Number of Hens	Total Birds	Cocks per Mile	Hens per Mile	Total Birds per Mile	Observed Sex Ratio
Northwest	290	110	132	242	0.38	0.46	0.84	1.2
North Central	270	157	214	371	0.58	0.79	1.37	1.4
Southwest	220	178	352	530	0.81	1.60	2.41	2.0
Central	300	174	501	675	0.58	1.67	2.25	2.9
East	360	220	394	614	0.61	1.09	1.70	1.8
South	370	192	312	504	0.52	0.84	1.36	1.6
STATEWIDE	1,810	1,031	1,905	2,936	0.57	1.05	1.62	1.8



1970 PHEASANT DISTRIBUTION MAP

POSTAL CARD SURVEYS OF THE IOWA QUAIL HUNTERS FOR THE 1969-70 SEASON

M. E. Stempel
Game Biologist

This report of quail hunting success for the past season is based on a hunter postcard survey. About 5% of all hunters were contacted and data are here expanded to represent the 1969-70 quail hunting success of all Iowa quail shooters.

Also included is information from a special research area and data from a survey of a group of experienced southern Iowa quail shooters. Since 1960, Iowa winters and most other seasons have favored survival and production of bobwhites. Hence Iowa could offer increasingly longer hunting seasons due to the comparatively high quail populations. The 1969-70 quail hunting season opened on October 25th. Further information on this and other recent seasons is in Table 3.

The methods of survey are outlined in the 1965 April-June Quarterly Biology Report, with about 5% of resident and 5% of non-resident hunters being contacted.

RESULTS

Resident Licensees, statewide:

From the entire state, residents returned 3,389 cards of which 840 contained information on quail shooting. Twenty-five percent had thus shot quail. Resident hunters bagged 1,047,544 quail (Table 1). The 75,909 hunters made 371,954 trips involving 1,632,044 hours.

The average Iowa resident hunter who shot quail made 4.9 quail hunting trips during the 1969-70 season. The average outing for the individual was 4.4 hours (21.5 hours for the season) with 2.8 quail per trip, and a success rate of 1.6 hours per quail bagged.

The material for the 1969-70 season is presented here on a statewide basis. In a similar 1966 report, success was discussed for various portions of Iowa. Since there were few significant regional weather variations the past several years, the trends in the different areas of the state were similar. For this reason, the various parts of Iowa will not be discussed here. A survey of comparative success in various parts of the state is also set forth in the 1965 April-June Quarterly Biology Reports.

Non-resident Hunters:

In addition to licensed resident quail shooters, 398 non-residents returned hunting reports and 119 of these (30%) shot quail. Non-residents bagged 97,165 quail last

year (table 1) with 5,196 such hunters making 21,304 quail hunting trips involving 111,194 hours. Non-resident quail shooters recorded an average (per-man) hunting trip of 5.2 hours with 4.5 birds per trip at a rate of 1.1 hours per quail (0.87 bird per hour).

Since there were so few of these cards, the figures may not represent very precisely the true results of hunting by the non-resident.

January Quail Hunting:

Because the month of January was added to the season in 1965-66, a special question was added regarding hunting during this month. Twenty-nine percent of the 1969-70 trips occurred during January; further information is in Table 2. The 5-year January averages include about one-third of the statewide bag and one-third of the statewide trips with 49% of all quail hunters participating. The above figure are both resident and non-resident shooters. Only a few non-residents reported, hence, their records are not entered separately.

DISCUSSION AND COMPARISON WITH RELATED SURVEYS

The 1969-70 postcard survey showed a statewide quail season which was better than that of the previous year and one of the best ever recorded. This was due to a succession of favorable production years. The quail-kill computations from the postcard survey are in Table 4. Experienced hunters thought the season was good both in coveys seen and in the birds bagged.

Since some corn is yet unharvested at the start of the season, this may reduce early success. Those shooters contacted through the postcard survey, took quail at a rate of 1.5 hours per bird. Experienced shooters took quail at a rate of 0.78 hour per bird.

This survey indicated that 25% of all licensed resident shooters do hunt some quail. Of these residing in the primary quail country, about 50% shoot quail. The latter figure was taken from an earlier survey.

Further information was obtained from interviews with farmers living on a 7,000 acre research area in quail range. This indicated that during the seven days the season was open in October, 16% of the season's quail hunting occurred. In November the figure was 38, in December 24, and January 22. These results differ somewhat from the postcard survey figures. However, the farmers do not know of all hunting that takes place on their farms, so their impressions have considerable room for error.

Table 1. Results of 1969-70 Iowa quail hunting season (from hunter postcard questionnaire)*

	Resident	Non-Resident	TOTAL
Statewide quail bag	1,047,544	97,165	1,144 709
Total hunting hours	1,632,044	111,194	1,743,238
Total hunting trips	371,954	21,304	393,258
Number hunting this species	75,909	5,196	81,105
Percent hunting this species	25	30	25
Average number of trips per hunter	4.9	4.1	4.8
Average number of gun hours per hunter	21.5	21.4	21.5
Average number of hours per trip	4.4	5.2	4.4
Average number bagged per hunter per season	13.8	18.7	14.4
Average number bagged per trip	2.8	4.5	3.0
Average number bagged per gun hour	0.64	0.87	0.67
Average number hours per bird bagged	1.6	1.1	1.5

* Based on 303,637 resident hunting and combination hunting and fishing licenses and 17,321 non-resident licenses.

Table 2. Iowa January quail hunting:

Year	Percent of State-wide bag	Percent of Total trips	Percent of all Quail Hunters Active
1966	29	34	42
1967	33	37	59
1968	33	27	53
1969	23	22	44
1970	26	29	47
5-year average	29	30	49

Table 3. Iowa quail hunting regulations, 1964 to 1970:

Season	Dates	Shooting Hours	Daily Bag Limit	Possession Limit
1964-65	Oct. 31-Jan. 3	8:30 A.M. to 5:00 P.M.	8	16
1965-66	Nov. 6-Jan. 31	8:30 A.M. to 4:00 P.M.	8	16
1966-67	Oct. 22-Jan. 31	8:00 A.M. to 4:30 P.M.	8	16
1967-68	Oct. 21-Jan. 28	8:00 A.M. to 4:30 P.M.	8	16
1968-69	Oct. 26-Jan. 31	8:00 A.M. to 4:30 P.M.	8	16
1969-70	Oct. 25-Jan. 31	8:00 A.M. to 4:30 P.M.	8	16

Table 4. Number of quail bagged annually, postcard survey 1963 to 1970:

Season	Number of Quail Bagged
1963-64	327,977
1964-65	291,030
1965-66	513,760
1966-67	1,051,630
1967-68	736,519
1968-69	777,687
1969-70	1,144,709

SUMMARY

1. A sample of 5% of resident hunters and 5% of non-resident Iowa hunters was contacted in early 1970 by mail.

2. Cards were filled out and returned by 3,389 resident licensees and 398 non-resident licensees.

3. Twenty-five percent of residents and 30% of non-residents hunted quail.

4. Residents took 1,047,544 quail at 1.6 hours per quail; the non-resident rate was 1.1 on a bag of 97,165 birds.

5. Twenty-six percent of the total quail bagged during the 1969-70 season was taken in January.

6. According to farmer interviews, about 16% of the total season hunting effort took place in October (first seven days of the season) while the remaining effort was for November, December and January as follows: 38, 24, and 22.

POSTAL CARD SURVEYS OF RABBIT AND CROW HUNTERS FOR THE 1969-70 SEASON

Gene Hlavka
Game Biologist

The results of the postal card surveys of rabbit and crow hunters for the 1969-70 season are presented in this paper. The 1969-70 figures are compared to the average of the preceding six years (1963-64 to 1968-69) for rabbits and to the average of the preceding four years (1965-66 to 1968-69) for crows. To compute the percent change from the average for the jackrabbit and crow statistics, only resident data were used.

RESULTS

Cottontails:

The 156-day season for cottontails and jackrabbits opened on Septebmer 13, 1969, and closed on February 15, 1970. Shooting hours were 6:00 A.M. to 6:00 P.M. The bag limit was ten with no possession limit. The entine state was open.

The state-wide cottontail bag exceeded 1.7 million (Table 1). This was 10% below the 6-year average. Since Iowa hunters wait and depend upon snow for most of their cottontail hunting, the number of rabbits bagged each year often fluctuates more in line with the amount and duration of snow cover than with the cottontail population level.

Forty-eight percent of all hunters hunted cottontails - a decrease of 8% from the 6-year average. Total days hunted was 25% below the 6-year average. Total hours hunted and the number hunting cottontails were both only slightly above this average. Poorer cottontail hunting was reflected by the 7% increase in average hours to bag one animal.

Jackrabbits:

The state-wide bag for resident hunters was 97,160 (Table 2). This was 15% above the 6-year average. Eight percent of resident hunters hunted jackrabbits -- the same as the 6-year average. Total hours hunted and total days hunted were below the 6-year average. Better jackrabbits hunting was reflected by the 27% decrease in average hours to bag one animal.

Crows:

Crows are unprotected birds with no bag or possession limits. The state-wide bag for resident hunters was 256,874 (Table 3). This was 28% above the 4-year average.

Nine percent of resident hunters hunted crows -- an increase of 13% above the 4-year average. Also above the 4-year average were total hours hunted, total days hunted and the number hunting crows Better crow shooting was reflected by the 7% decrease in average hours to bag one bird.

Table 1. Iowa cottontail hunting statistics from the 1969-70 season compared to the 6-year average (1963-64 to 1968-69):

Item	Resident	Non-Resident	Total 1969-70	Total 6-year Average	Total % Change
Statewide bag - cottontails	1,672,434	49,844	1,722,278	1,903,092	-10
Total hours hunted	2,678,992	64,018	2,743,010	2,711,819	+ 1
Total days hunted	727,819	14,550	742,369	985,908	-25
Number hunting cottontails	154,855	4,157	159,012	156,672	+ 1
Percent hunting cottontails	51%	24%	48%	52%	- 8
Average days/hunter/season	4.7	3.5	4.6	6.3	-27
Average hours/hunter/season	17.3	15.4	17.2	17.5	- 2
Average hours/hunter/day	3.7	4.4	3.7	3.0	+23
Average bagged/hunter/season	10.8	12.0	10.9	12.2	-11
Average bagged/hunter/day	2.3	3.4	2.3	2.1	+10
Average bagged/hunter/hour	0.63	0.78	0.63	0.70	-10
Average hours to bag one animal	1.6	1.3	1.6 *	1.5	+ 7

* Higher figure for current year reflects poorer hunting.

Table 2. Iowa jackrabbit hunting statistics from the 1969-70 season compared to the 6-year average (1963-64 to 1968-69):

	Resident	Non-Resident	Total 1969-70	Resident 6-year Average	Resident % Change
State-wide bag - Jackrabbits	97,160	1,768	98,928	85,926	+15
Total hours hunted	230,755	2,756	233,511	265,496	-12
Total days hunted	72,870	676	73,446	100,816	-27
Number hunting jackrabbits	24,290	520	24,810	24,915	---
Percent hunting jackrabbits	8%	3%	8%	8%	---
Average days/hunter/season	3.0	1.3	2.9	4.2	-29
Average hours/hunter/season	9.5	5.3	9.3	11.0	-14
Average hours/hunter/day	3.1	4.0	3.2	2.7	+15
Average bagged/hunter/season	4.0	3.4	4.0	3.5	+14
Average bagged/hunter/day	1.3	2.6	1.4	0.9	+44
Average bagged/hunter/hour	0.42	0.64	0.43	0.32	+31
Average hours to bag one animal	2.4*	1.6	2.3	3.3	-27

* Lower figure for current year reflects better hunting.

Table 3. Iowa crow hunting statistics from the 1969-70 season compared to the 4 year averase (1965-66 to 1968-69)

Item	Resident	Non-Resident	Total 1969-70	Resident 4-year Average	Resident % Change
Statewide Bag - Crows	256,874	5,917	262,791	205,369	+28
Total Hours Hunted	330,657	6,193	336,850	252,920	+33
Total Days Hunted	133,902	1,176	135,078	114,332	+18
No. Hunting Crows	27,327	346	27,673	23,467	+18
Percent Hunting Crows	9%	2%	8%	8%	+13
Avg. days/hunter/season	4.9	3.4	4.8	4.9	---
Avg. hrs/ hunter/season	12.1	17.9	12.3	14.0	-14
Avg. hrs/hunter/day	2.5	5.2	2.5	2.7	-7
Avg. bagged/hunter/season	9.4	17.1	9.6	9.8	-4
Avg. bagged/hunter/day	1.9	5.0	2.0	1.9	---
Avg. bagged/hunter/hour	0.78	0.96	0.78	0.73	+7
Avg. hrs. to bag one animal	1.3*	1.0	1.3	1.4	-7

*Lower figure for current year reflects better hunting.

THE 1970 RUFFED GROUSE DRUMMING AND WOODCOCK SINGING - GROUND SURVEYS

Robert Sheets
Game Biologist

Grouse:

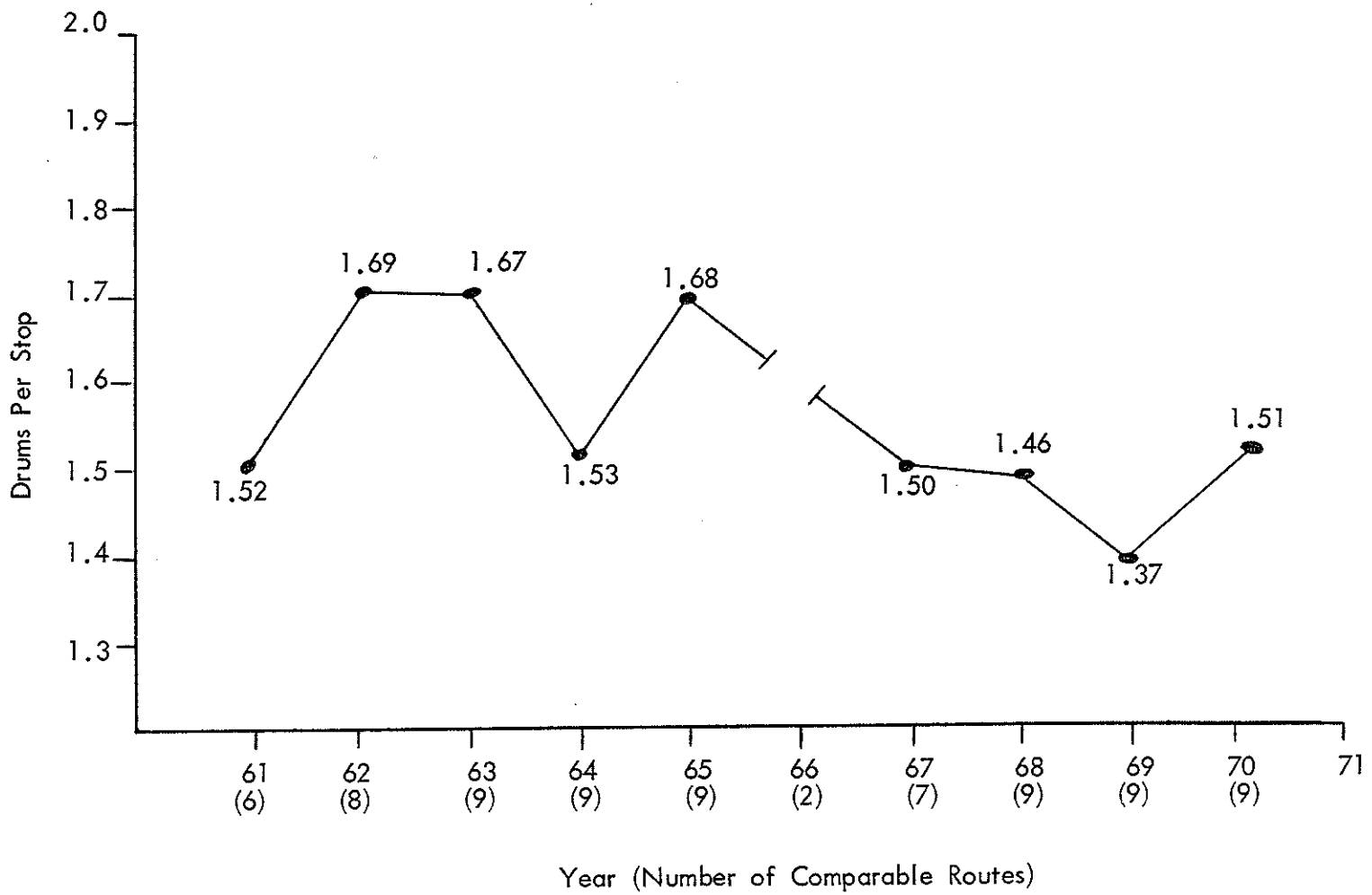
Ruffed Grouse drumming routes were run this spring from April 17 through May 8. Routes surveyed were the same as used in previous years. Two out of three survey personnel were involved the previous year, lending probability that listening points along the routes were the same or near locations used last year. However, to increase validity of trend data, identical stop locations from one year to the next are desired. Consequently, trees and stumps at each listening point are being spray painted with "Nelsons Yellow tree marking paint". This will be completed after leaf fall this year. Forest clearing is slowly altering or destroying grouse habitat and as a result, our drumming routes will be altered whenever sufficient habitat is destroyed within the audible radius of a listening stop.

Despite last fall's increased grouse harvest, 1.51 birds were heard per stop this spring during the drumming survey compared to 1.37 the previous spring. This adds credibility to belief that Iowa's grouse population dynamics so far are independent of the hunter. Table 1 depicts results of this year's survey. Figure 1 represents a 10-year spring breeding population trend based on drums per stop.

Table 1. Results of Spring 1970 ruffed grouse drumming counts in northeast Iowa:

Route	County	No. Stops	Drums Heard	Drums Per Stop
Yellow River State Forest	Allamakee (SE)	15	34	2.26
Village Creek	Allamakee (C)	15	28	1.87
Harpers Ferry-Wexford	Allamakee (E)	15	19	1.26
Upper Iowa River	Allamakee (N)	15	32	2.13
Highlandville-North Bear	Winneshiek (NE)	15	39	2.60
Sny Magill-Bierbaum	Clayton (NE)	15	11	.73
Bloody Run	Clayton (NE)	15	14	.93
Lower Yellow River	Allamakee (SE)	15	21	1.40
Frankville-Yellow River	Winneshiek (SE)	15	7	.47
		135	205	1.51

Figure 1. Ruffed Grouse Drumming Counts in Iowa



Woodcock:

The 1970 woodcock singing ground surveys began April 20. Routes in northeast Iowa were run concurrent with the grouse survey. Beginning efforts to standardize listening points by spray painting stops also began in this area. The survey dates are set to occur after migrant woodcock have passed through Iowa, resulting in an index primarily for the resident breeding population.

The nature of the survey can be described as a 10-stop route established on selected roads adjacent to prime woodcock habitat. Broadly speaking, such habitat is any area containing grassy openings, shrub or small tree thickets, and soil harboring a good supply of woodcock food. Research by Sperry (1940), Mendall (1943), and Miller (1957) all show a diet consisting of 50-70% earthworms. Most important to the survey, courtship and mating takes place in clearings that are void of mature woodstand but rather choked with low shrubby brush growth. One of the most probable locations in Iowa appears to be relatively dense willow thickets. Similar to the grouse habitat reduction, such areas are being cleared for increased pasture land. Re-adjustment of routes are being made to compensate for this. New exploratory routes are also being tested.

The call or "peent" of a male woodcock is audible for approximately .2 miles and stops along routes are selected with this also in mind. This year's survey resulted in .26 woodcock heard per stop (Table 2). Figure 2 displays trend information from the 10-year history of the survey beginning in 1961 and continuing through 1970.

Time limitations have posed somewhat of a problem during analysis each year. Fifteen minutes after sunset has been the recommended beginning time for routes run on cloudy evenings. Woodcock have been heard earlier than this on occasion and several routes have begun slightly earlier. This variable was also standardized this year by recalculating all survey forms since the start in 1961. All stops recorded less than 10 minutes after sunset and all stops beyond one hour after sunset were deleted.

Table 2. 1970 Woodcock singing - ground survey results in Iowa

Route	County	No. of Countable stops	No. Woodcock Heard	Woodcock Heard per Stop
Paint Creek	Allamakee	9	6	.66
Luster Heights	Allamakee	9	0	.00
Sny Magill	Clayton	9	4	.44
Buck Creek	Clayton	10	2	.20
Canoe Creek	Winneshiek	10	0	.00
Wapsie Bottoms	Bremer	8	2	.25
Otter Creek	Tama		High Water -- Being Revised	
Colyn Route	Lucas	10	1	.10
Klum Lake	Louisa	9	5	.55
City Lakes	Lucas	9	3	.33
Blakesburg	Wapello	7	0	.00
		90	23	.26

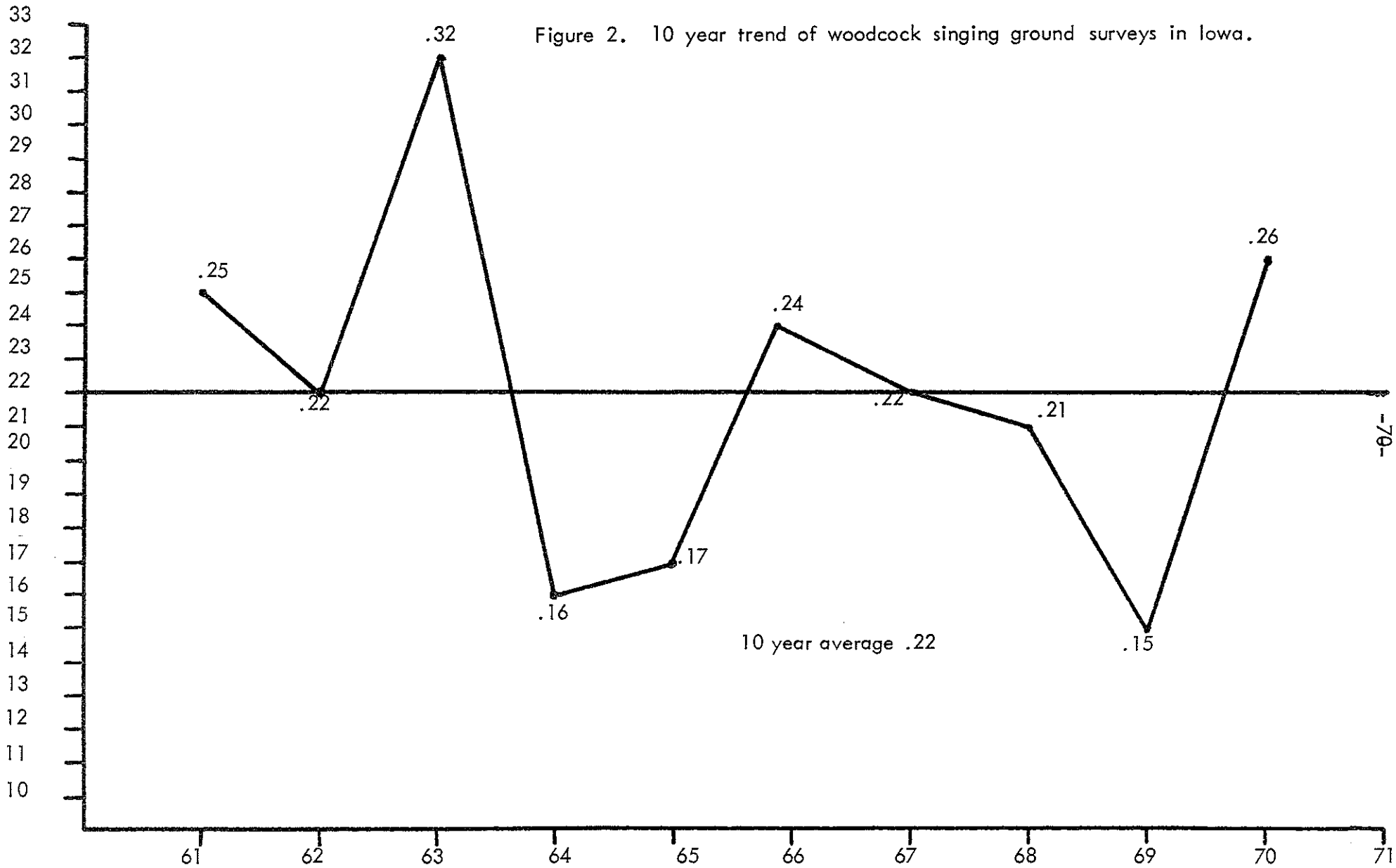


Figure 2. 10 year trend of woodcock singing ground surveys in Iowa.

RESULTS OF THE 1969-70 TRAPPER QUESTIONNAIRE AND FUR BUYERS REPORTS

Ron Andrews
Furbearer Biologist

Iowa is one of the leading states in fur production. Nearly a million dollars worth of fur is harvested in Iowa each year. To properly manage this fur resource, we must have information to assess the annual harvest.

Prior to 1966, fur buyer reports were the only measure of Iowa's fur harvest. In 1966-67, a trapper questionnaire was initiated to compare fur dealer harvest reports with trapper reports. Commission personnel generally feel that fur dealer report totals are not entirely satisfactory because of incomplete returns, inaccurate recording, and other inherent biases.

METHOD

Approximately 2,000 of 8,525 licensed Iowa trappers were contacted at the close of the 1969-70 trapping season. Sampling of licensees was stratified according to the number of licenses sold in each county. The total number of trapping licenses sold increased 2,000 over the previous year and was higher than it had been at anytime during the past five years.

Each cooperator is mailed an instruction letter and card at the close of the trapping season. Trappers are asked to record the number of each of the 12 listed fur bearers they trapped during the season, whether their furs were sold in or out-of-state, and the average price they received for their furs (see Figure 1).

Twelve percent of the total licensed trappers returned 1,032 cards for a response of slightly over 50% of those sampled. A 12% sample of Iowa trappers should produce reasonable harvest figures. If there is any bias in the data because of trappers who caught the most fur being more likely to send back the postcard this should be offset by the fact that non-licensed trappers (primarily farmers and farm boys) were not sampled. However, their catch is believed small in comparison to that of licensed trappers.

The low harvest figures as indicated by the fur dealers reports are likely a result of poor record keeping by the fur dealers reporting their fur purchases or simply inaccurate reporting. Also, 10 dealers did not report their purchases and this may alter the harvest figures slightly. However, these are probably dealers who purchase little or no fur, or at least not enough to significantly narrow the gap between the trapper questionnaire data and the fur dealer data.

According to the questionnaire, approximately 10% of Iowa harvested furs are sold

to out-of-state dealers. If we consider all these factors together, the gap between harvest figures is somewhat more explainable. The important thing is that trend information is readily obtainable from either survey, with the trapper questionnaire probably more reliable.

Total fur value during the 1969-70 season was down approximately 245,000 from the previous season. This is a reflection of the reduced overall take of most furbearers as well as reduced pelt prices of most species. Total fur value for 1969-70 was $1,090,000. The million dollar fur industry in Iowa ranks it high as a fur producing state. Fur quality is quite good here, exceeded only slightly by more northern areas. During the past 5 years Iowa has ranked among the top 10 states in fur production as far as the total number of animals taken is concerned. The fertile lands of Iowa, and the Midwest and Lakes States regions, support a high per unit area population of furbearers.

The trapper questionnaire indicated that 94 percent of the trappers caught muskrats, 78 percent trapped raccoon, and 67 percent trapped mink. The number of muskrat, raccoon and mink trappers increased slightly over the previous season. These figures do not necessarily reflect the true number of trappers pursuing a particular species as in some instances animals are caught incidental to trapping others, and in other cases individuals may have attempted to capture a particular species but were unsuccessful.

Furbearer harvest data are presented in Table 1 with comparative figures from the preceding season's harvest. Most species showed gains from the 1968-69 trapping season. Expanded data reveals approximately 33,000 more muskrats, 2,200 more mink, and 13,000 more raccoon were harvested in 1969-70 than in 1968-69. The beaver and fox take remained nearly the same as the previous year.

Table 2 shows furs purchased from Iowa trappers as reported by Iowa fur dealers during the 1968-69 season. Fur buyers totals showed increases in muskrat, raccoon, badger and weasel while all other furbearers showed decreases.

The muskrat was the only species showing significant gains in fur value over the previous season (see Table 4). The supply of fur harvested and the demand for fur in Europe as well as fashion trends generally determines the annual increase or decrease in fur value.

DISCUSSION

The most significant result of the survey is the discrepancy that exists between total harvest figures computed from the trapper questionnaire and those from the fur dealer reports (Table 3). This is particularly evident for some species, especially when taking into account that fur buyers purchase pelts of some species taken by hunters -- fox and raccoon primarily. The Iowa ranks high in the big "money makers" - muskrat, mink, beaver, raccoon, and during the past two years the red fox. A more extensive report on Iowa's importance as a fur-producing state will be written at a later date.

The increased trapping license sales from 6,447 in 1968-69 to 8,525 in 1969-70 is probably reflective of trappers speculating on good raccoon and fox pelt prices and the increased price of muskrat pelts. Trappers play an import role in wildlife conservation and, while their numbers have overall been decreasing since the 1940's and 50's, it is hoped that they will remain an important part in Iowa fur resource.

Figure 1. IOWA TRAPPING RECORD, 1969-70 SEASON

County(s) Trapped _____

Species	Total Number Trapped	Number Sold To Iowa Fur Buyer	Average Price Received	Number Sold to Out-of-State Buyers	Average Price Received
Muskrat					
Mink					
Raccoon					
Beaver					
Red Fox					
Gray Fox					
Coyote					
Opossum					
Civet					
Skunk					
Badger					
Weasel					

Table 1. Results of 1969-70 Iowa Trapper Questionnaire with a comparison of the 1968-69 results:

Species	Percent Reporting Trapping This Species		Number Reported Trapped *		Average Catch/ Trappers		Total Expanded Catch	
	1968-69	1969-70	1968-69	1969-70	1968-69	1969-70	1968-69	1969-70
Muskrat	99.9	93.7	72,694	77,510	88.6	80.2	604,449	631,014
Mink	62.9	67.0	4,120	3,503	6.5	5.1	26,458	28,693
Raccoon	71.1	78.1	10,680	9,954	14.8	12.4	68,154	81,349
Beaver	22.9	24.4	1,617	1,261	6.9	5.0	10,226	10,245
Red Fox	33.3	32.0	3,737	3,025	11.5	9.1	24,875	24,452
Gray Fox	10.6	8.0	116	185	.2	2.2	137	1,476
Coyote	4.4	6.4	184	220	4.4	3.3	1,254	1,772
Opossum	29.4	24.6	1,578	1,430	5.4	5.6	10,796	11,570
Civet	3.8	3.3	67	50	1.6	1.4	394	387
Skunk	41.6	12.1	456	610	3.7	4.9	9,930	4,978
Badger	4.4	6.3	88	66	1.8	1.7	513	899
Weasel	.9	.03	14	18	1.4	1.4	82	35
				TOTAL PELTS			757,268	796,874

* In 1968-69, 982 trappers responded while in 1969-70, 1,032 trappers reported their take.

Table 2. Furs purchased from Iowa trappers as reported by Iowa fur buyers during the 1969-70 season *

Species	Number Purchased	Percent Change from 1968-69	Average Price per Pelt	TOTAL VALUE
Muskrat	306,967	+33	$1.15	$353,012.05
Mink	12,616	- 2	7.06	89,068.96
Raccoon	137,453	+ 7	3.43	471,463.79
Beaver	4,905	- 6	9.18	45,027.90
Red Fox	17,993	-35	5.86	105,448.98
Gray Fox	702	- 4	2.72	1,916.44
Coyote	3,678	-25	5.17	19,014.26
Opossum	5,891	- 5	.51	3,004.41
Civet	197	-36	1.30	255.10
Skunk	1,146	-11	.81	928.26
Badger	507	+75	2.10	1,054.20
Weasel	48	+ 2	.38	18.24
Total Pelts	492,098			$1,090,212.59

* A total of 112 of the 120 licensed dealers reporting.

Table 3. A comparison of the total fur harvest for 12 major species for the 1969-70 season as indicated by fur buyer reports and the trapper questionnaire:

Species	No. pelts reported bought by Iowa fur buyers*	No. reported sold to Iowa fur buyers by trappers**	No. reported sold to out-of-state fur buyers by trappers**	Total catch reported by Iowa trappers**
Muskrats	306,967	566,020	64,994	631,014
Mink	12,616	24,992	3,701	28,693
Raccoon	137,453	78,583	2,766	81,349
Beaver	4,905	9,702	543	10,245
Red Fox	17,993	19,910	4,542	24,452
Gray Fox	702	1,253	223	1,476
Coyote	3,678	1,776	0	1,776
Opossum	5,891	11,362	208	11,570
Civet	197	387	0	387
Skunk	1,146	4,978	0	4,978
Badger	507	818	81	899
Weasel	48	15	0	35
TOTAL PELTS	492,098	719,816	77,058	796,874

* From fur buyers reports (includes pelts taken by hunting for some species)

** Computed from trapper questionnaire

Table 4. A four-year comparison of the average price paid per pelt, 1966-67, 1967-68, 1968-69, 1969-70:

Species	1966-67	1967-68	1968-69	1969-70
Raccoon	$2.47	$2.63	$4.62	$3.43
Opossum	.40	.36	.64	.51
Muskrat	1.32	.70	.92	1.51
Mink	7.83	8.08	11.44	7.06
Civet	2.56	1.37	1.06	1.30
Skunk	.91	.95	1.83	.81
Badger	1.90	1.90	2.25	2.10
Red Fox	5.80	4.12	10.39	5.86
Gray Fox	1.39	1.52	2.62	2.72
Weasel	.43	.25	.52	.38
Coyote	4.22	1.95	5.94	5.17
Beaver	8.07	10.80	14.41	9.18

* Average price paid/pelt was computed by averaging the prices paid by some of the larger fur dealers.