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ALASKA DEPARTMENT OF FISH AND GAME
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EFFECTS OF CONTROLLED SPRING HUNTING ON ROCK PTARMIGAN

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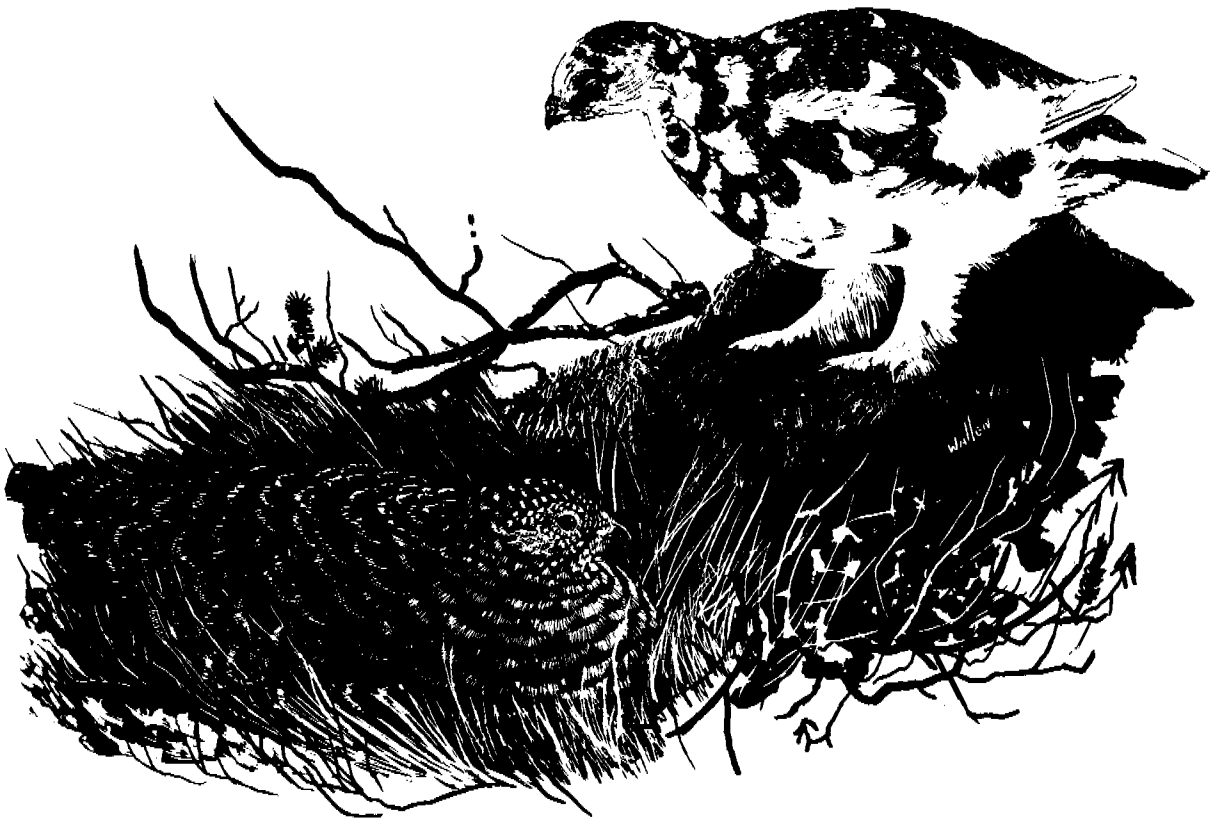

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FINAL REPORT (RESEARCH)

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Project Nos.: W-17-3, W-17-4 & W-17-5 Project Title: Small Game Investigations

Job No.: 10.5R Job Title: Effects of Controlled Spring Hunting on Rock Ptarmigan

Period Covered: July 1, 1970 - June 30, 1973

SUMMARY

An experiment designed to test the effects of spring hunting on rock ptarmigan was conducted in 1971 and 1972. Two study areas (experimental and control) representing typical interior Alaska rock ptarmigan breeding range, where no hunting occurs, were selected. In mid-May censuses were made on both areas, and approximately 40 percent of the breeding population removed from the experimental area. In late May counts were again made on both areas. Post-removal counts each year, plus territory locations, suggested that little or no replacement occurred during the remaining portion of the breeding season following removals. In 1971 and 1972, populations were low and decreasing; however, removals did not appear to influence the general population trend. Data from other years suggest that replacement did occur within two weeks following spring removals. Whether or not birds shot are replaced during the same spring probably depends on numerous factors, some of which are discussed. From this experiment it is concluded that spring removals at the 40 percent level have little noticable influence on birds available to hunters the subsequent fall, or abundance of breeding ptarmigan the following spring.

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BACKGROUND

Rock ptarmigan (*Lagopus mutus*) are heavily hunted in certain portions of interior Alaska during fall and spring. In past years, fall checking station operations at Eagle Creek (Mile 101 Steese Highway) have yielded useful information on hunting pressure, hunter success, number of birds taken, and age-sex composition of the harvest. Ptarmigan hunting at Eagle Creek currently results in annual harvests of 5 to 20 percent of the fall population (Weeden, 1972). In the same area, recently completed studies indicate that repeated shooting of 40 percent of the fall population of rock ptarmigan does not depress subsequent spring breeding stocks (McGowan, 1971).

Hunting has been suggested as a major factor controlling population levels of some game birds. This concept has been discussed in relation to ruffed grouse (*Bonasa umbellus*) by Bump et al. (1947), Ammann (1949), and Palmer (1956); pheasants (*Phasianus colchicus*) by Allen (1947) and Shick (1952); bobwhites (*Colinus virginianus*) by Baumgartner (1944) and Errington and Hammerstrom (1935); and Gambel's quail (*Lophortyx gambelii*) by Swank and Gallizioli (1954). These authors generally agree that populations fluctuate independent of fall hunting pressure.

Although annual fall harvests of ptarmigan throughout interior Alaska do not influence yearly population fluctuations, little is known concerning the impact of spring hunting on breeding stocks. A single experiment in 1966 suggested that territorial males shot in May were replaced by other males within 12 days after removal (Weeden, 1967, p.6). This experiment was conducted at a time when the population was increasing, and results may have been quite different had removals occurred during a population decline. Further work at Eagle Creek suggested that spring hunting along the Steese Highway may greatly reduce breeding densities (Weeden, 1972).

Territoriality of male rock ptarmigan normally starts in late March or early April, and by late April territories are well established. Currently, the hunting season in interior Alaska is open until April 30; hence, hunting actually occurs to some extent during the breeding season. Now that major highways are being opened early in the spring, certain

ptarmigan breeding grounds will receive a significant increase in spring hunting pressure.

This is a final report of 1971 and 1972 field studies designed to determine the effects of spring hunting on breeding densities of rock ptarmigan.

OBJECTIVES

To determine the effects of repeated shooting of 40 percent of the spring population of rock ptarmigan on subsequent fall and spring abundance.

PROCEDURES

Two study areas, an experimental removal area (Ptarmigan Creek) and a control area (Golddust Creek), were selected which represent typical interior Alaska rock ptarmigan breeding range. Both areas are about 100 miles northeast of Fairbanks in the Tanana Hills near Eagle Summit. These areas are essentially the same physically and vegetatively as the Eagle Creek area described by Weeden (1968). Both the Ptarmigan Creek area (approximately 2.9 mi^2, 7.3 km^2) and Golddust Creek area (approximately 2.3 mi^2, 5.1 km^2) are situated about six miles (9.6 km) from the Steese Highway and normally receive no ptarmigan hunting pressure from sportsmen.

In May of 1971 and 1972 direct counts of territorial males were conducted on both areas, and approximately 40 percent of the total population (males plus females) was removed at Ptarmigan Creek (Table 1). Territory locations of all males were plotted on maps and removal sites were marked in the field for future comparison. Although counting and shooting activities were completed during the same day in both years, removals were spaced uniformly over the entire study area. The number of ptarmigan to be removed was based on the estimated total population computed from direct count data for males plus an assumed, equal number of females. Removal activities were conducted in a manner which simulated hunting as it would occur by sportsmen. In most cases males were seen before females, and if the male was to be removed, it would be approached and shot using a .22 caliber rifle. If, in this process, females were observed, they were also taken. In this manner approximately 40 percent of the estimated population was removed; however, no specific attempt was made to take 40 percent of each sex. Blood smears for future parasite studies were made from all birds collected.

In order to determine the numerical effects of experimental hunting on the breeding population, post-removal counts were conducted (Table 1) and territories plotted at both areas. All counts were conducted as described by Weeden (1961, p.24) and are considered at least 95 percent accurate for determing the actual number of territorial males on a given area.

Table 1. Schedules of rock ptarmigan counts and removals at Ptarmigan and Golddust creeks, 1971 and 1972.

	Removal Area (Ptarmigan Creek)			Control Area (Golddust Creek)	
	Pre-removal Count	Removal	Post-removal Count	Pre-removal Count	Post-removal Count
1971	May 19	May 19	May 26	May 21	May 28
1972	May 4	May 4	May 21	May 5	May 23

FINDINGS

Comparison of Pre- and Post-Removal Counts

Results of territorial male counts conducted before and after removals are shown in Table 2. At Ptarmigan Creek in 1971, 13 of 28 males observed were shot, and a count seven days later revealed 16 males. In 1972, 9 of 23 males were removed, and 17 days later 16 males were present. Hence, following removal of 46 percent (1971) and 39 percent (1972) of the males, post-removal counts revealed decreases of 43 and 36 percent, respectively. Apparently, little or no replacement of vacated territories occured in either year. Comparisons of territory locations plotted during the counts further substantiate this point. The territorial urge among males is high during the first three weeks of May, and in both years the interval between counts should have been ample to allow new males to become established in vacated areas had "replacement" birds been present. By comparison, after removal of male ruffed grouse during the drumming season, replacement at drumming logs occurred within two weeks (Eng, 1959).

At Golddust Creek in 1971 the number of territorial males decreased between pre- and post-removal counts from 35 to 29, while in 1972 there was a slight increase (20 to 22) between counts (Table 2). The reason for the 17 percent decrease of males in 1971 cannot be definitely explained. However, the second count at Golddust Creek was started about 1.5 hours later than the first, and some males could have gone undetected because of decreased intensity of courtship displays later in the morning. It is not likely that this alone could account for the 17 percent decrease. No assessment of predation during the spring was made for either area, but gyrfalcons (*Falco rusticolus*) and golden eagles (*Aquila chrysaetos*) have commonly been observed at Golddust Creek from 1968 through 1971. These species have been observed only rarely at Ptarmigan Creek. Two golden eagle nesting sites are located in the general vicinity of the Golddust area, and it is suspected that at least one pair of gyrfalcons nests nearby. Three pairs of raptors efficient at taking ptarmigan could definitely account for a 17 percent reduction in breeding males on the small study area. No raptors were observed at either area in 1972, and the difference between 1972 pre- and post-removal counts at Golddust Creek are probably due to counting errors.

Spring Population Trends

During this study breeding densities of rock ptarmigan were low and declining at Ptarmigan, Golddust and Eagle creeks (Table 3). The number of breeding males has decreased at a rate of about 11 percent yearly at Eagle Creek since 1968; however, a greater rate of decline was suggested between 1971 and 1972 at Ptarmigan and Golddust creeks. While count data may not be comparable between the latter two areas and those from Eagle Creek, Ptarmigan and Golddust creeks data are considered directly comparable. Golddust Creek received no hunting, but underwent the greatest (43 percent) decline in breeding males. This suggests that, even in years of low abundance, populations can fluctuate annually in a magnitude great enough to overshadow the effects of moderately heavy spring harvests.

Table 2. Number of territorial male rock ptarmigan observed at Ptarmigan Creek (removal area) and Golddust Creek (control area), May, 1971 and 1972.

	Pre-removal Count		Post-removal Count		Percent Change Between Counts Per Year	
	1971	1972	1971	1972	1971	1972
Ptarmigan Creek	28	23	16	16	-43	-36
Golddust Creek	35	20	29	22	-17	- 9

Table 3. Population trends as shown by counts of territorial male rock ptarmigan on three study areas.

	1969	1970	1971	1972
Eagle Creek	113	102(-10)*	89(-13)	79(-11)
Ptarmigan Creek	-	-	28	23(-18)
Golddust Creek	-	-	35	20(-43)

*Percent change in parenthesis.

Age ratios of ptarmigan removed provided further evidence that populations were at a low during the study (Table 4). While removals may have influenced the age composition at Ptarmigan Creek, juvenile to adult ratios for both sexes combined of 0.6:1.0 (1971) and 0.4:1.0 (1972) were similar to those at Eagle Creek during the summer of 1965 when breeding numbers were the lowest recorded during the 14 years of study there (McGowan, 1972).

DISCUSSION

A full assessment of the effects of spring hunting on rock ptarmigan populations would be a complicated task requiring a much more intensive approach than undertaken in this study. It would be necessary to: monitor spring weather as it relates to progression of courtship and breeding activities, mark birds to allow visual identification of individuals, conduct counts before and after removals, plot territorial boundaries of males before and after removal activities, conduct autumn counts to assess the effect of removals on the subsequent fall abundance, and conduct spring counts the year following removals in order to determine effects on trends in breeding density. These activities must be conducted in years of increasing and decreasing spring densities. Furthermore, consideration must be given as to the pair status of birds shot. For example, the probability of replacement may vary depending on whether the male, female, or both are removed. The number of ptarmigan removed from various "pair categories" in 1971 and 1972 is presented in the Appendix for future reference.

Data collected in this study as well as other observations in the Eagle Summit vicinity provide some information concerning "surplus" or replacement males. During the two years of this study (1971 and 1972) little or no replacement occurred following removal of established males. The same was true in 1968 when early opening of the Steese Highway resulted in spring hunting (Weeden, 1972). This suggests that "surplus" males were not present in 1968, 1971, or 1972. However, in 1966, when 32 percent of the territorial males were shot, a count 12 days later revealed one more male than present prior to the removal. Apparently, "surplus" males were present and took up territories upon removal of the established birds. In two of the years when replacement did not occur during the same spring as removals, ptarmigan populations were declining and near their extreme low. The other year when replacement did not occur was the one of high spring density, and populations were increasing. The only year that replacement was noted was 1966, and at that time the spring population was extremely low, but increasing.

The reasons replacement occurred in 1966 but not in the other years cannot be definitely explained. Comparisons of summer gain figures, winter mortality rates, spring densities, and general population trends fail to offer a basis for explanation. In 1966 only males were removed, while in the other years both members of pairs were shot in most cases. Possibly females provide the stimulus for replacement males to take up territories.

Table 4. Age and sex of rock ptarmigan removed from Ptarmigan Creek area May, 1971 and 1972.*

	Adults		Yearlings		Total		Yearling to Adult Ratio	
	1971	1972	1971	1972	1971	1972	1971	1972
Males	10	6	3	3	13	9	0.3: 1.0	0.5: 1.0
Females	5	5	6	1	11	6	1.2: 1.0	0.2: 1.0
Total	15	11	9	4	24	15	0.6: 1.0	0.4: 1.0

*Age determined as described by Weeden, 1961. Sex determined by plumage characteristics.

The concept of "surplus" males within a population of red grouse (*Lagopus lagopus scoticus*) is discussed by Jenkins et al. (1967), but no mention is made concerning their role in replacing territorial males which die during the courtship period. Both during years of increasing and decreasing populations, blue grouse (*Dendragapus obscurus*) removed during the spring were replaced, largely by yearlings, the following spring (Zwickel, 1972 and Bendell et al., 1972). These findings suggest that "surplus" blue grouse of both sexes exist at all stages of the population "cycle". No mention was made concerning replacement during the same spring as removals, however. Watson (1967) reported that among red grouse, social interactions of males during autumn or winter adjusted subsequent spring densities, while Zwickel (1972) suggested that interactions of blue grouse females in spring numerically regulated breeding numbers. Population regulation in both cases involved exclusion of surplus birds from breeding areas, but the time that this occurs (if it does) among rock ptarmigan remains unknown. It must be concluded that among rock ptarmigan replacement males are present and will take up territories upon removal of established males in some years. Replacement can occur during the same spring as removal, or may be delayed until the following spring. The probability of this occurring the same spring is not simply a function of breeding density or population trend. Timing of removals with stage of the breeding season, whether one or both members of a pair are shot, and breeding densities all probably influence the likelihood and timing of replacement. A full understanding of "surplus" males and their role in rock ptarmigan population dynamics must await further investigation.

MANAGEMENT IMPLICATIONS

From a management standpoint two major points must be considered with respect to spring hunting: 1) the effects on subsequent fall abundance and 2) the effects on trends in breeding density the subsequent spring.

While no direct information to show the effect of spring hunting on subsequent fall abundance was collected in this study, past findings suggest that females, and to a lesser extent juvenile males, undergo considerable autumn movements. At Eagle Creek, where almost all hunting occurs within 0.5 miles (0.8 km) of the road, 77 percent of the ptarmigan harvested spend the summer more than three miles (4.8 km) from the road (Weeden, 1972). Hence, it may be surmised that moderate spring harvests will not noticeably decrease the number of birds available to fall hunters. As mentioned earlier, spring harvests of 40 percent of the breeding population do not seem to influence year-to-year trends in breeding density.

Nonconsumptive uses of ptarmigan must be considered in all management decisions. These are of special importance in areas where well-traveled roads pass through breeding habitat such as along the Steese, Taylor, and Denali highways. Spring harvests of up to 40 percent of the males prior to April 30 may be ideal in that they insure availability of some birds for observation and photography during spring and summer,

yet allow for spring hunting without significantly reducing the number of ptarmigan available to fall hunters. However, territorial male ptarmigan are highly vulnerable to hunters and a moderate increase in hunting pressure could easily result in harvests approaching 100 percent of the cocks in accessible areas. Should a marked increase in hunting pressure occur an earlier spring closure is recommended. In the Interior a March 1 closure would almost totally eliminate the possibility of taking territorial males, while a March 30 closure may be adequate in most cases. As long as spring harvests of territorial males are below the 40 percent level, and are restricted to small areas, a season extending to April 30 is justified.

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APPENDIX

Pair status of rock ptarmigan removed in 1971 and 1972.

	Pairs	Single Males*	Single Females**	Males with Two Females	Totals Birds Removed
1971	8	4	1	1	24
1972	6	3	0	0	15
Total	14	7	1	1	39

* No female observed in vicinity of male.
**No male observed in vicinity of female.