ALASKA DEPARTMENT OF FISH AND GAME
JUNEAU, ALASKA

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Wallace H. Noerenberg, Commissioner

DIVISION OF GAME
James A. Harper, Director

GAME BIRD REPORT

by

Robert B. Weeden
David Roseneau

Volume XI
Annual Project Segment Report
Federal Aid in Wildlife Restoration
Projects W-17-1 & W-17-2, Work Plans B & R

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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-17-1 & W-17-2

WORK PLAN: B & R

JOB NO.: B-2
R-10.1

TITLE: Small Game, Waterfowl, & Furbearer Investigations

TITLE: Upland Game

TITLE: Population Characteristics of Ptarmigan

PERIOD COVERED: January 1, 1969 to December 31, 1969

ABSTRACT

The Eagle Creek study area had 113 territorial males in 1969, a slight decline from 1968. Spring hunting occurred in 1969 which may have lowered the count, however this depressing effect was not as great as that projected for 1968. An early spring snow melt got the breeding season underway at least one week earlier than most years, but an extremely cold, windy period in late May froze eggs in some nests. Consequently, renesting was rather common, and known hatching dates ranged from June 1 to July 1 (average June 17). Clutch size of 22 nests located on or near the study area averaged 6.4 eggs. Nest predation in 1969 was 29 percent, and hatchability of eggs in successful nests was 85 percent. An average of 5.3 chicks hatched from each successful nest, and by mid August chicks had sustained a 26 percent loss. Overall summer gain was 2.1, slightly lower than in 1968.

Adult to yearling ratios of trapped birds were 1.0:1.0 for females, and 1.6:1.0 for males. Over-winter mortality (fall of 1968 to spring 1969) was 55 and 39 percent for adult males and females, respectively. Estimated chick mortality (August 1968 - May 1969) was 57 percent for males and 66 percent for females. No checking station was operated in 1969, however 49 bands were returned voluntarily by hunters. These returns indicate 31 percent of the adult males, 8 percent of the adult females, and 22 percent of the summer's chicks were shot. This is a 26 percent harvest of the estimated fall population at Eagle Creek.

WORK PLAN SEGMENT REPORT

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TITLE: Small Game, Waterfowl, & Furbearer Investigations

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TITLE: Population Characteristics of Ptarmigan

PERIOD COVERED: January 1, 1969 to December 31, 1969

OBJECTIVES

To record numerical changes of ptarmigan on selected study areas.

To determine age - and sex - specific mortality rates and reproductive rates among ptarmigan.

To evaluate roles of behavior, movements, and birth and death rates in determination of spring population levels.

TECHNIQUES

A complete count of male rock and willow ptarmigan in May was undertaken at Eagle Creek and on two adjacent areas to determine how many breeding pairs were present. Number of females was estimated from direct counts in May and from subsequent intensive marking and observation work during nesting and brood-rearing periods.

Adults were trapped with long-handled nets, banded, and marked with colored dye on their wings. Trained dogs helped to find nests, broods, adults, and carcasses of dead ptarmigan. The age of trapped ptarmigan was estimated from a comparison of pigmentation on the ninth and tenth primaries, a technique described by Bergerud et al (1963) and found to be accurate for Alaskan rock ptarmigan (Weeden and Watson, 1967). The age of breeding ptarmigan was used to estimate the rates of mortality from August 1968 to May 1969.

ACKNOWLEDGEMENTS

Jerry McGowan conducted much of the field work on this study in 1969, assisted by John Trent, Walter Brunner, and Cliff Wright.

FINDINGS

Spring Densities

Males were counted at Eagle Creek on May 17, 18, 19, 20, and 22. Weather conditions were occasionally poor, but counting done in rain or snow was checked later when weather improved. A total of 113 cocks was tallied on the main study area, a slight decline from last year's total of 120 males.

The Steese Highway opened April 17 in 1969. Despite an immediate closure of the Eagle Summit area to ptarmigan hunting some birds were shot as late as June 1. There is some possibility that the total count for the study area was less than it would have been without this hunting, but the effect was not as great as projected for 1968.

Counts at Ptarmigan and Golddust Creeks are discussed in the report for Job 10.3R.

Spring Phenology

The spring of 1969 was an unusual one, beginning with very warm weather in early May which melted the light winter snowpack rather quickly. Alpine flowers that normally bloom in late May were exceptionally early (Table 1) and ptarmigan began ovulating at least one week ahead of normal years. On May 27 and 28, however, temperatures dropped to 17° F. This cold weather, accompanied by strong northerly winds, froze most of the newly developing vegetation and cracked eggs in nests of ptarmigan and passerines that were not yet incubating. Renesting occurred immediately, with the effect of dragging out the hatching period to an extent never observed since 1960.

Table 1. Comparison of flowering dates of early-blooming plants at Eagle Summit in 1969 with earlier records.

Species	Flowering Date, 1969	Previous Early Record	Previous Mean Anthesis
Syntheris borealis	May 13	May 22	May 29
Anemone multiceps	May 17	May 26	June 2
Ranunculus nivalis	May 17	May 29	June 3
Oxytropis nigrescens	May 18	May 22	May 31
Douglasia gormanii	May 15	May 19	May 23
Pedicularis lanata	May 18	May 21	May 29
Anemone narcissiflora	May 22	May 27	May 31
Anemone parviflora	May 22	May 21	May 30
Petasites frigidus	May 22	May 29	June 1
Androsace chamaejasme	May 22	June 10	June 15
Parrya nudicaulis	May 24	May 29	June 4
Cardamine purpurea	May 24	May 30	June 7
Rhododendron lapponicum	May 26	May 28	June 7

Age of Breeding Birds

Early in the summer (to June 20) we caught six hens that were two years old or older, and 19 yearling females, a ratio of 3.1 yearlings to 1.0 old birds. Later we caught more adults, and the final tally showed 30 yearlings to 29 older hens (ratio 1.0:1.0). This seasonal shift in ratio of captured hens has been noted previously and appears to stem from differential behavior of yearling hens when approached by humans.

We caught 31 yearling and 19 adult cocks (ratio 1.6:1.0) at Eagle Creek in 1969. This ratio is much less heavily weighted to first-year birds than in 1968 (6.3:1.0). Several factors probably are involved, including a) declining production and survival of yearlings in 1968-69, and b) smaller spring harvest of adult cocks on territories, resulting in less replacement by yearlings.

The age ratio among females probably is unaffected by local hunting. This ratio in 1969 therefore reflects a continuing decline in production and over-winter survival of first-year hens beginning in 1966.

Nesting

Nest hunting was done on the study area by Weeden, McGowan, Trent, Brunner, Write, and Theberge; nest hunting off the study area was done by Theberge, Trent, Brunner, and Write. Twenty-two nests (11 on and 11 off the study area) were located that yielded clutch size information (Table 2).

There was very little difference between average clutch size of nests found on and those found off the study area, however the pooled average (6.4) was significantly lower than in 1968 (7.4). In some years, as in 1963 and 1965, our sample suggested hens two years old and older had larger clutches than younger hens, however the reverse was found in other years. The biological significance of lower clutch size for old hens nesting off the study area in 1969 is not understood and possibly results from small sample size.

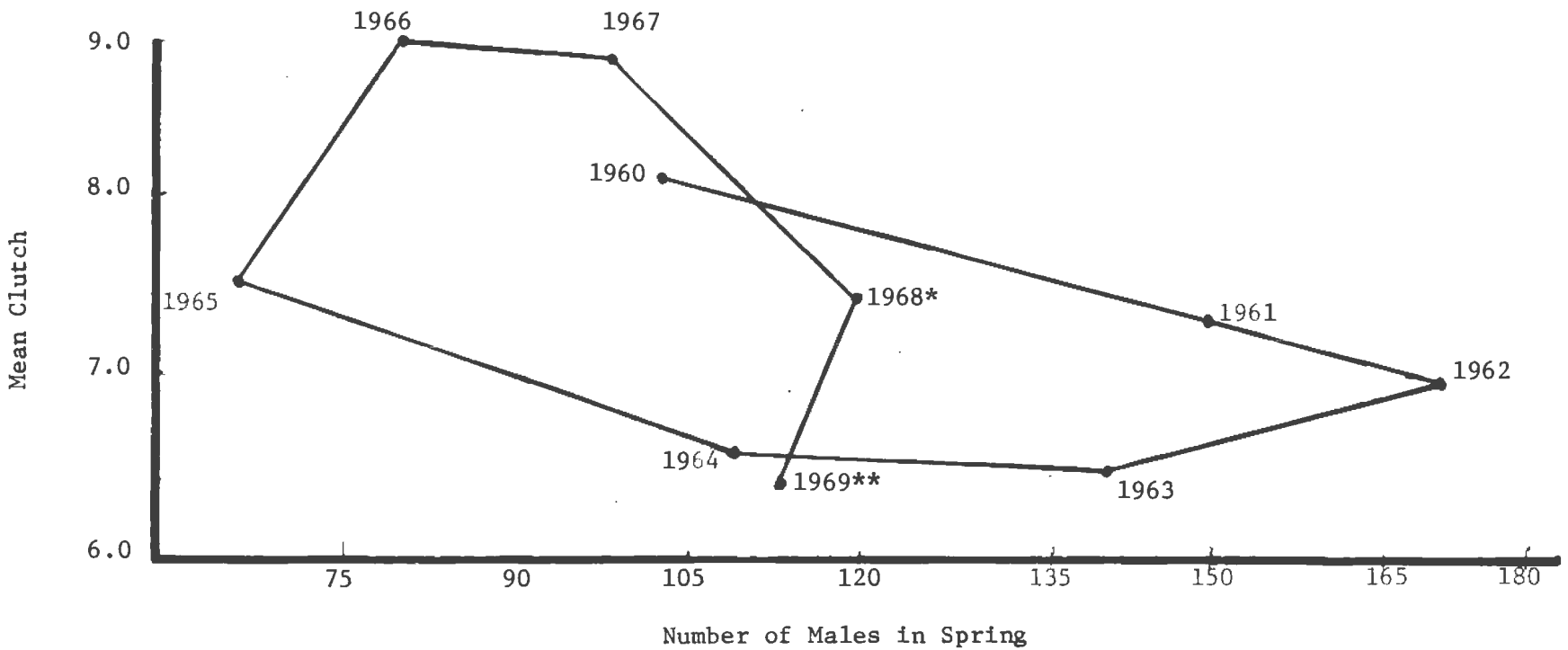
Clutches at Eagle Creek (Fig. 1) have been small during peak or declining periods, and have risen during years of low or rising spring densities. On this basis, one would expect breeding densities to decline further in 1970 and 1971.

Hatching dates were obtained from 21 nests in 1969, 11 of which hatched in the aviary at the University of Alaska after an artificial incubation period (Table 3). As in 1968, average hatching dates are generally the same for aviary and "wild" nests, however on the average, nests hatched earlier than in 1968. The peak of hatching occurred from June 19-21, somewhat later than most years. Eighty-two percent of the nests in 1968 hatched during the period three days before or after the average hatching date, however in 1969 only 57 percent of the nests hatched during this period. A very cold, snow and wind storm in late May could account for this. Judy Weeden noted that in some nests of tree sparrows (Spizella arborea) eggs were frozen and cracked as a result of the storm, however a ptarmigan was observed incubating while the storm was in progress. If female ptarmigan were already incubating at this time, the unusual weather probably had no effect

Table 2. Clutch size in nests found at or near Eagle Creek, 1969.

Age of Female	Nests on Area Av. Clutch (No. Nests)	Nests off Area Av. Clutch (No. Nests)	All Nests Av. Clutch (No. Nests)
Yearling	6.5 (4)	6.9 (7)	6.7 (11)
2+ years	6.5 (4)	5.5 (4)	6.0 (8)
Unknown	6.7 (3)	-	6.7 (3)
All females	6.5 (11)	6.4 (11)	6.4 (22)

Figure 1. Clutch size at Eagle Creek in relation to spring densities.



* Number of cocks expanded to compensate for spring hunting.

** No adjustment made for spring hunting.

Table 3. Hatching dates of ptarmigan nests, 1969.

	Nests Hatching in Wild			Nests Hatching in Aviary		
June	Yearling Hen	Adult Hen	Unknown	Yearling Hen	Adult Hen	Unknown
9	1					
10						
11	1					
12				1		
13					11	
14				1		
15	1			1		
16		1				
17*	1			11		
18**						
19	1					
20	1		1		1	1
21		1				
22	1					
23						
24						
25					1	
26						
27						
28						
29						
30						
July 1					1	

* Average hatching date for nests in the wild.
** Average hatching dates for nests in the aviary.

on the nest, but in cases where females were still laying, the eggs would have been frozen. In the latter case renesting would occur, giving a wide spread in hatching dates. Aside from documented hatching dates, the range in size of chicks from different broods reflected the long hatching period and suggested that renesting was rather common in 1969.

Of the 18 nests started, 12 were successful, four were destroyed by predators (probably weasel), one was abandoned for an undetermined reason, and one nesting hen died of shock during the banding process. The percentage of unsuccessful nests (29 percent) was lower than in 1968 (32 percent), but higher than in 1967 (20 percent). Seventy-three eggs were layed in the 12 successful nests and 62 hatched, for a hatchability of only 85 percent. Hatchability in 1968 was 86 percent; the only other year when it was below 90 percent was 1964. Of the unhatched eggs examined five showed no sign of development and two contained well-developed chicks.

Loss of Chicks

An average of 5.3 chicks hatched from successful nests at Eagle Creek in 1969. Thirty complete counts of broods in late July and early August averaged 3.9 chicks, for a 26 percent loss after hatching. This is the same summer loss of chicks as in 1968, and is close to the 10-year average loss since 1960.

Summer Population Gains

The number of ptarmigan alive in August per bird alive in May is estimated below:

1.	Adults alive in May	223
2.	Estimated loss of adults in summer (10 percent)	22
3.	Adults alive in August	201
4.	Nests started	105
5.	Nests hatching	67
6.	Chicks per brood in August	3.9
7.	Total chicks alive in August	261
8.	Adults plus chicks in August	462
9.	Summer Gain ($\frac{\#\ 8}{\#\ 1}$)	2.1

The low summer gain suggests that 1970 breeding stocks will be considerably lower than in 1969.

Mortality, August 1968 to May 1969

There were 19 cocks 2 or more years old out of 50 caught at Eagle Creek in 1969. The total population of 113 cocks must have contained 19 x 2.26

or 43 adult males. As there were estimated to be 95 adult males alive in August 1968, the mortality over the winter of 1968-69 was about 55 percent.

If half of the 326 chicks alive in August 1968 were cocks, the mortality of first-year males to May 1969 was 57 percent.

Half of the 1969 breeding population of females were two years old or older (55 birds). If 90 adult hens were alive in August 1968, the loss during the winter was 35 females or 39 percent. The loss of female chicks was from 163 alive in August 1968 to 55 living in May 1969, or 66 percent. The slightly better "survival" of male chicks in 1968-69 may be a reflection of replacement by yearlings of adult cocks shot by hunters.

There was a noticeable increase in the number of remains of dead ptarmigan, killed in fall, winter, or spring of 1968-69, found on the area in the summer of 1969. A total of 49 remains was found, in comparison with 22 found in 1968. Of the 49, 16 were killed by mammals (mostly foxes), and 30 were killed by avian predators.

Banding Results

We caught 64 adult females, 54 adult males, and 69 chicks on the Eagle Creek study area in 1969. University of British Columbia student John Therberge caught and banded 39 adult hens, 5 cocks, and 3 chicks off the study area (mainly near miles 109-111 Steese Highway and on Harrison Summit). Ron Modafferi, student at the University of Alaska, banded four cocks and two hens at Porcupine Creek, northwest of Eagle Summit.

Eighteen adults caught at Eagle creek had been banded previously (Table 4). Most of the banded cocks were two years old. These birds, hatched in 1967, may have benefited from the unusual number of vacancies created among territorial cocks in the spring of 1968, due to spring hunting. Thus more of this cohort bred at Eagle Creek in 1968 (and 1969) than would have been the case in a more natural situation. Most of the hens, however, were hatched in 1966 or 1965, suggesting good survival of these cohorts.

Body Weights

The weights of adults handled in 1969 are summarized in Table 5. Males were the same weight in 1969 as in 1968 from May 20 to June 19, but thereafter remained low through early July 1969 in comparison with increasing weights in that period in 1968. Hens were lighter in May and June 1969 than in 1968, but similar by late July both years. Both sexes showed little weight gain from late July to early September, but no data were available to show weight trends in August. Cocks were the same weights in early September in 1968 and 1969, but hens were slightly heavier in 1969. This may have been due to the earlier hatch and subsequent earlier return to good body condition in 1969.

Table 4. Rock ptarmigan recaptured in 1969 at Eagle Creek.

Year Hatched	Males	Females	Total
1965	2	1	3
1966 or before*	1	5	6
1967	6	2	8
1968	0	1	1
	9	9	18

* Two in this group were already two years old or older when first banded in 1968, so their year of hatching is unknown.

Table 5. Weight of adult rock ptarmigan at Eagle Creek and nearby areas, 1969.

	Males		Females	
Period	Mean Wt. (g.)	(No.)	Mean Wt. (g.)	(No.)
May 20-June 9	404	(29)	421	(23)
June 10-19	417	(6)	370	(12)
June 20-29	414	(8)	356	(19)
June 30-July 9	412	(5)	374	(18)
July 10-19	433	(10)	383	(17)
July 20-29	451	(1)	389	(2)
July 30-August 8	-		423	(4)
August 9-18	-		-	
August 19-28	-		-	
August 29-Sept. 7	-		-	
Sept. 8-17*	466	(32)	422	(47)

* Weights are from birds shot at Ptarmigan Creek on September 8, and are the total body weight less the mean weight of a sample of crops from adults of each sex. Mean crop weight of 10 males was 15 g. The mean weight of 10 crops from hens was 16 g.

Band Returns and Hunting Pressure

No checking station was operated on the Steese Highway in 1969, but 49 band returns were received voluntarily from hunters. All returns were from birds banded on or near the study area, and no unusually long movements were noted. A complete list of bands returned in 1969 is found in Appendix I.

Table 6 summarizes age-sex information of 1969 band returns, however of 12 cases where sex was not determined, all were juveniles. Bands from adult males made up 64 percent of all returns where age and sex could be determined, followed by adult females (28 percent). In 1968 age-sex percentages of 61 returns were as follows: adult males, 30; adult females, 39; juvenile males, 16; and juvenile females, 15. While 1968 returns suggested a harvest of 69 percent adults and 31 percent juveniles, bag checks showed an adult-juvenile ratio of 1:00 to 1.30. This year's juvenile segment of the kill was probably higher than the 8 percent suggested by Table 6.

Direct band returns indicated that resident adult males sustained a 31 percent harvest this fall, as 17 of 54 newly-banded cocks were reported killed. Last year resident adult males sustained a 27 percent loss, compared to 17 percent in 1967. Fewer females were harvested in 1969 than in 1968; 8 percent of those newly banded on the study area (5 of 64) were reported shot compared with 16 percent for 1968. Twenty-two percent of the 69 chicks banded in 1969 were reported shot; the highest rate of return for chicks to date. The highest return of chicks had previously been 11 percent in 1965. Ten of the 15 chick returns were taken before the second week in October; this was probably before longer fall movements were well underway, however local mixing of broods in various areas had occurred.

Hunters also returned 12 bands from ptarmigan (7 males and 5 females) banded in past years: 1 from 1965, 1 from 1966, 2 from 1967, and 8 from 1968. Nine of these were banded as adults, and 3 as chicks. The oldest birds (#'s 1259 and 1426) were four years old.

Band returns suggest about 8 percent (5 out of 64 newly-banded) of the adult female population, and about 31 percent (17 out of 54 newly-banded) of the adult male population were harvested in the fall of 1969. Of the estimated fall population of 462 birds on the study area, returns indicated a kill of 121 birds (26 percent). In 1968 the harvest was estimated at 13 percent, but many more ptarmigan were reported to have been shot. This was probably the case in 1969, but without a checking station exact harvest cannot be determined.

Table 6. Age-sex composition of banded birds shot and reported in 1969.

	Adult (%)	Juvenile (%)	Total (%)
Males	23 (64)	3 (8)	26 (72)
Females	10 (28)	0 (0)	10 (28)
Total	33 (92)	3 (8)	36 (100)

Appendix I. Bands returned by hunters, August 10, 1969 to October 26, 1969.

Band No.	Year Banded	Age When Banded	Sex	Age When Shot
2201	1969	Adult (1)	M	1
2281	1969	Adult (1)	M	1
2285	1969	Adult (1)	M	1
2290	1969	Adult (1)	F	1
2293	1969	Adult (1)	M	1
2296	1969	Adult (1)	M	1
2298	1969	Adult (1)	M	1
2300	1969	Adult (1)	M	1
2308	1969	Juvenile	?	Juvenile
2313	1969	Juvenile	?	Juvenile
2317	1969	Juvenile	?	Juvenile
2324	1969	Juvenile	?	Juvenile
2327	1969	Juvenile	?	Juvenile
2328	1969	Juvenile	?	Juvenile
2334	1969	Juvenile	M	Juvenile
2335	1969	Juvenile	?	Juvenile
2504	1969	Adult (1)	M	1
2515	1969	Adult (1)	M	1
2526	1969	Adult (1)	M	1
2528	1969	Adult (1)	M	1
2534	1969	Adult (2+)	F	2+
2539	1969	Adult (1)	M	1
2546	1969	Juvenile	?	Juvenile
2548	1969	Adult (1)	M	1
2550	1969	Juvenile	?	Juvenile

Appendix I. Con't. Bands returned by hunters, August 10, 1969 to October 26, 1969.

Band No.	Year Banded	Age When Banded	Sex	Age When Shot
2551	1969	Juvenile	?	Juvenile
2554	1969	Adult (1)	M	1
2555	1969	Adult (1)	F	1
2557	1969	Juvenile	M	Juvenile
2576	1969	Juvenile	?	Juvenile
2581	1969	Juvenile	?	Juvenile
2586	1969	Adult (1)	M	1
2589	1969	Adult (2+)	F	2+
2592	1969	Juvenile	M	Juvenile
3018	1969	Adult (2+)	M	2+
3038	1969	Adult (1)	F	1
3056	1969	Adult (1)	M	1
1790	1968	Adult (1)	F	2
1953	1968	Adult (1)	M	2
1960	1968	Adult (1)	F	2
1989	1968	Adult (1)	M	2
2000	1968	Adult (2+)	M	3+
2019	1968	Adult (1)	F	2
2238	1968	Adult (?)	M	?
2239	1968	Juvenile	M	1
1698	1967	Adult (1)	F	3
1801	1967	Juvenile	F	2
1426	1966	Adult (1)	M	4
1259	1965	Juvenile	M	4

Miscellaneous Studies

Weeden visited a golden eagle aerie at Mile 97 Steese Highway on August 14, 1969. This nest site was not active in 1969 but nearby roosting sites had been used frequently. Two subadult eagles were seen at the site, one of which was eating a freshly-killed rock ptarmigan chick.

Five bands or tags were found in regurgitated pellets at the aerie and roosts. One old pellet contained two tags (nos. 85 and 268) from birds banded in different years. Other pellets contained three leg bands (nos. 1678, 1757, 1805). Nearly all pellets contained claws, beaks, bones, or feathers of ptarmigan; many were comprised entirely of remains of this species.

A comprehensive publication on heart ratios (heart as a percent of body weight) was written in 1969, containing data from examinations of nearly 2000 grouse and ptarmigan collected since 1962. This publication (Interpreting relative heart size in Alaskan tetraonids) will be submitted to The Auk after review by several physiologists and ornithologists.

Another report was submitted to the Division of Game in May 1969 on the effects of hunting on ptarmigan populations. This draft was circulated for review and will be published in one or two sections when data from experimental hunting (see report for 10.3R) are incorporated.

LITERATURE CITED

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PREPARED AND SUBMITTED BY:

Robert B. Weeden
Study Leader

APPROVED BY:

James A. Harper
Director, Division of Game

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-17-1 & W-17-2

WORK PLAN: B & R

JOB NO.: B-8
R-10.3

TITLE: Small Game, Waterfowl, & Furbearer Investigations

TITLE: Upland Game

TITLE: Effects of Controlled Hunting on Rock Ptarmigan

PERIOD COVERED: January 1, 1969 to December 31, 1969

ABSTRACT

The spring count of 81 territorial males on the control (Golddust) area indicated a 15 percent decline from the spring of 1968. Counts on the removal (Ptarmigan Creek) area revealed 98 males; this is little change from 1968. For the third consecutive fall, 40 percent of the estimated fall population of rock ptarmigan was shot on the 5 square-mile Ptarmigan Creek area. Shooters shot every bird they could, regardless of age or sex, simulating the non-selective shooting by sportsmen. A total of 187 birds was shot; 32 were adult males, 47 were adult females, and 108 were chicks. At present it appears that 40 percent removal of fall population has no influence on subsequent spring breeding stocks. The counts planned for the spring of 1970 will complete this three-year study.

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-17-1 & W-17-2

WORK PLAN: B & R

JOB NO.: B-8
R-10.3

TITLE: Small Game, Waterfowl, & Furbearer Investigations

TITLE: Upland Game

TITLE: Effects of Controlled Hunting on Rock Ptarmigan

PERIOD COVERED: January 1, 1969 to December 31, 1969

OBJECTIVES

To determine the influence of known hunting pressures on local populations of rock ptarmigan, spruce grouse, and other small game.

To estimate safe levels of harvest under particular environmental and demographic situations.

TECHNIQUES

The study involves an assessment of what happens to spring breeding stocks of rock ptarmigan when about 40 percent of fall populations are removed. Spring counts were done in 1967, 1968, and 1969; a final census will be made in 1970. Birds were shot from the experimental area (Ptarmigan Creek) in early fall of 1967, 1968, and 1969.

The following demographic estimates of production at Ptarmigan Creek (based on summer studies at Eagle Creek, see Job 10.1R) were used to calculate numbers to be removed in 1969:

1. Number of hens nesting = 95
2. Number of hens hatching eggs = 61
3. Chicks per brood in August (from counts at Ptarmigan Creek) = 4.9
4. Total chicks on area in August = 298
5. Adults on area in August = 173

According to these data, we needed to remove 110 chicks, 35 adult males, and 34 adult females.

Shooting was done on one day, September 8, 1969. Shooters shot every bird they could, thus simulating the non-selective removal by sportsmen. In previous years birds were shot selectively so that the number of each sex and age actually shot would be as close as possible to what should have been taken.

Fifty chicks were frozen and sent to John Theberge, a cooperator from the University of British Columbia, for autopsy. Others were examined by Weeden and distributed through normal Department channels.

ACKNOWLEDGEMENTS

Jerry McGowan and Walter Brunner assisted in the spring counts at Ptarmigan and Golddust Creeks in 1969. Walter Brunner, John Burns, Peter Berrie, Robert Hinman, and Robert Rausch helped to conduct the controlled hunt on September 8, 1969.

RESULTS

Spring counts were done at Ptarmigan Creek on May 13 and 14, and at Golddust Creek on May 22-24, 1969. Eighty-one males were seen at Golddust and 98 at Ptarmigan Creek. The spring stocks thus declined 15 percent (from 95 cocks) from 1968 to 1969 on the unhunted area (Golddust), but stayed the same on the area subjected to removal of 40 percent of the estimated late-summer population. A small decline took place at Eagle Creek, where hunting occurs but is not controlled or closely monitored.

This work will be concluded in May 1970. Unless these counts change previous results, it appears that the experimental hunting will have no effect on spring breeding densities over the three-year period.

All of the birds were taken between 12:00 PM and 5:00 PM on September 8, at altitudes from 3500 to 4000 feet. The birds were in large flocks of up to 300; at least 700 different ptarmigan were observed on the area. This is roughly twice the number thought to belong on the area, suggesting that a) our density estimates were inaccurate, or b) birds had moved into the area early in the fall. I am confident of our spring census, and the proportion of adult hens to chicks in the shot sample suggested that our production estimates were close to real production. Therefore I think that temporary immigration is responsible for the high population.

The birds were all taken from the west end of the 5-square-mile experimental area. In 1967 most were shot from the east half of the area, and in 1968 birds were taken from all sections of the area. Because of the repeated movements of ptarmigan in August-September, spring distributions are not likely to be influenced by the spatial pattern of fall removals.

The random or non-selective shooting pattern of 1969 resulted in an excess of adult hens (47 instead of 34) being shot, possibly because the proportion of hens to chicks (1:2.3 in the sample collected) was greater than calculated from early August brood counts (1:3.4). This, in turn, could have been due to mortality among chicks between early August and early September, and from overestimation of summer adult mortality.

Other sex and age classes were represented as expected. Out of 187 birds shot and retrieved, 32 were adult males, 47 were adult females, and 108 were chicks. If an additional 10 percent were crippled but not recovered, the total killed may have been slightly over 200.

One banded bird was shot. It was a female (#2019) banded when one year old on July 12, 1968, very close to where it was shot.

PREPARED AND SUBMITTED BY:

Robert B. Weeden
Study Leader

APPROVED BY:

James A. Harper
Director, Division of Game

STUDY PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-17-1 & W-17-2

STUDY PLAN: B & R

JOB NO.: B-11
R-10.4

TITLE: Small Game, Waterfowl, & Furbearer Investigations

TITLE: Upland Game

TITLE: Density and Productivity of Gyrfalcons on the Seward Peninsula

PERIOD COVERED: January 1, 1969 to December 31, 1969

ABSTRACT

Aerial and ground surveys of approximately one-half of the 29,000 square miles of the Seward Peninsula suggested that 70 pairs of gyrfalcons nested on the Peninsula in 1969, and that this may be the relatively stable total population. Egg laying occurred between April 20 and May 15. Clutches in eight nests studied averaged 3.5 eggs. After an incubation period of about 28 days, these nests contained 21 young, for a hatching success of 75 per cent. There were about equal numbers of male and female young in nests examined in 1969. Almost all young lived to fledging (mortality 5-7%), except where young were removed by people. The nesting period was 42 to 48 days in duration. Mean estimated production for 44 nests was 2.45 fledged young per adult pair, indicating a productivity similar to gyrfalcon production recorded in the literature for other areas.

Data showed an almost exclusive diet of ptarmigan in the winter (determined from castings), a shift to ground squirrels and small birds in the spring and throughout the summer, with ptarmigan still a major food item, particularly in some areas. Ground squirrels appeared to be a major staple for the population during summer. All prey taken appeared to be utilized on the basis of availability, with individual pair preference playing a yet undetermined, though probably significant, role.

Other data on adult behavior nest site preference, growth of young in nests and color phases of adults are presented.

STUDY PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-17-1 & W-17-2

STUDY PLAN: B & R

JOB NO.: B-11
R-10.4

TITLE: Small Game, Waterfowl, & Furbearer Investigations

TITLE: Upland Game

TITLE: Numbers and Productivity of Gyrfalcons on the Seward Peninsula

PERIOD COVERED: January 1, 1969 to December 31, 1969

OBJECTIVES

To determine the approximate number of active gyrfalcon aeries on the Seward Peninsula, western Alaska.

To record productivity in a sample of aeries.

To determine the important summer foods of gyrfalcons on the Seward Peninsula.

METHODS

Transportation

Transportation requirements and methods were similar to those of 1968, with one major exception. Snow machines, used extensively during May and June 1968, could not be employed this field season due to early snow melt. Consequently more walking was required.

Aerial operations proved to be more successful. This was primarily due to the experience gained in 1968. The Cessna 180 was found to be effective for checking sites the observer had become familiar with in 1968. Ten aeries, or one per 0.9 hours, were found with the aid of this aircraft; an increase in effectiveness of approximately 500 per cent over 1968. The PA-18 Super Cub was more effective, however, when counting young. Almost all aeries located by Cessna 180 had to be rechecked with a PA-18 to obtain a satisfactory count. Twenty-four active aeries were located in 26.9 hours of PA-18 time or one per 1.1 hours; an increase in effectiveness of approximately 30 per cent. Of the 44 active nests, 34 were located from aircraft.

In 1968 it was apparent that successful counting of clutch size was possible from the PA-18. During 1969, in three instances where nests still contained eggs at the time of the survey, the clutches were accurately counted with ease. A verification attempt by 180 (rechecked by PA-18) was a failure.

Techniques used in locating aeries, weighing and handling chicks, and recording data were identical to those used in 1968. Climbing gear was also identical, but was used less since many nests were situated on easily accessible portions of the cliffs and outcrops.

Area Surveyed and Habitat Classes

The 1969 survey included virtually all the area searched in 1968, with the exception of a few areas previously found barren of gyrfalcon (Falco rusticolus) nesting sites.

In addition, an attempt was made to complete surveys of areas of the Peninsula lightly searched or omitted entirely from the 1968 survey. As a result, the entire Seward Peninsula was covered with the exception of:

The hills between the Kwik River and Koyuk River.

That portion of the Darby Mountains north of Omilak and the Bendeleben Mountains east of the Fish River, including the hills bordering Death Valley (this area was omitted because of local fires and extremely poor visibility).

The hills and rivers northeast of Council and White Mountain and bordered on the north by McCarthys Marsh.

The headwaters of the Inmachuk River and those hills and drainages southwest of the Inmachuk headwaters to Esperanza Creek.

A few of the important additions to the habitat search were:

The coastal cliffs and bluffs from Nome east to Cape Denbigh, by boat.

The north side of the York Mountains and the Cape Prince of Wales area.

The southern Kwiktalek Mountains and the southern Darby Mountains.

The region between Ear Mountain and Taylor.

The Continental Divide area east of Serpentine Hot Springs, west of the Goodhope River and north of Harris Dome.

The southwest portion of the Peninsula, the lower Kougarok River and the coast between Nome and Cape Denbigh. The Serpentine Hot Springs area and the Taylor area are those portions of the Peninsula ground-searched in addition to the study area.

Fig. 1 delineates the area covered by the search.

Figs. 2 and 3 show the general paths flown by the Cessna 180 and the Department PA-18 Super Cub. Approximately 3500 search-miles were flown with the two types of aircraft.

Fig. 4 is a map of the Seward Peninsula that has been divided into three classifications of gyrfalcon habitat. This map is based on 1968 data and is hereby updated using information gained during 1969.

The three classes of habitat are:

Class I - Good to excellent nesting habitat containing many available nesting sites. These sites are found both along and away from rivers and creeks. Breeding gyrfalcons are generally abundant, and sites tend to be evenly distributed within a given area.

Class II - Fair to poor nesting habitat. The terrain offers a limited number of nesting sites, usually sparsely distributed along rivers and creeks. Occasional sites occur in limited numbers and are widely scattered depending on the terrain.

Class III - This class represents areas where the terrain either does not offer physical nesting sites, or the area is too rugged and high, resulting in a barren, unproductive region that does not support adequate prey. The occurrence of nesting gyrfalcons in these areas is extremely unlikely (none found to date).

RESULTS

Population Estimates

Within the approximate 29,000 square miles of the Seward Peninsula, approximately 10,000 square miles are good to excellent habitat. Fourteen active gyrfalcon nests (plus one probable site) were located within the 2000 square mile study area during 1969, as opposed to 19 during 1968. On this basis, in 1969 one could estimate the population of the whole 10,000 square miles to be 70 breeding pairs (as opposed to 95 in 1968). Including all of the area given some coverage in 1969, about 15,000 square miles (as opposed to 5000 square miles in 1968), 44 active nests were located. This suggests the 1968 estimate of 68 active aeries in the 10,000 square miles of good habitat is high and a closer estimate for management purposes would be between 44 and 55 breeding pairs. Since some other birds nested in the "fair" habitat, the estimate of 70 breeding pairs appears to be very close to the actual average breeding population for the entire Seward Peninsula.

Figure 1. Approximate Area Covered in Search, 1969.

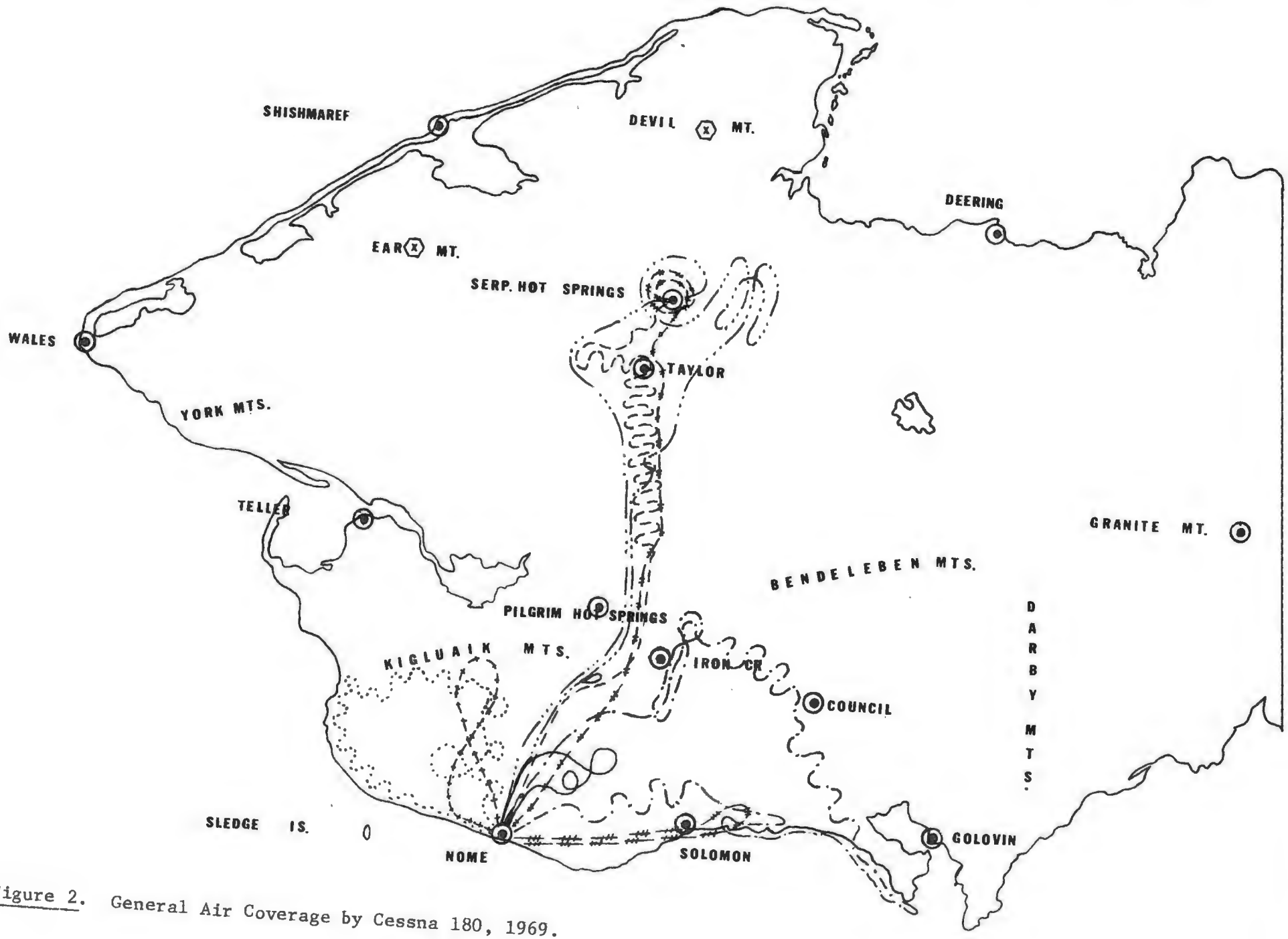

Figure 2. General Air Coverage by Cessna 180, 1969.

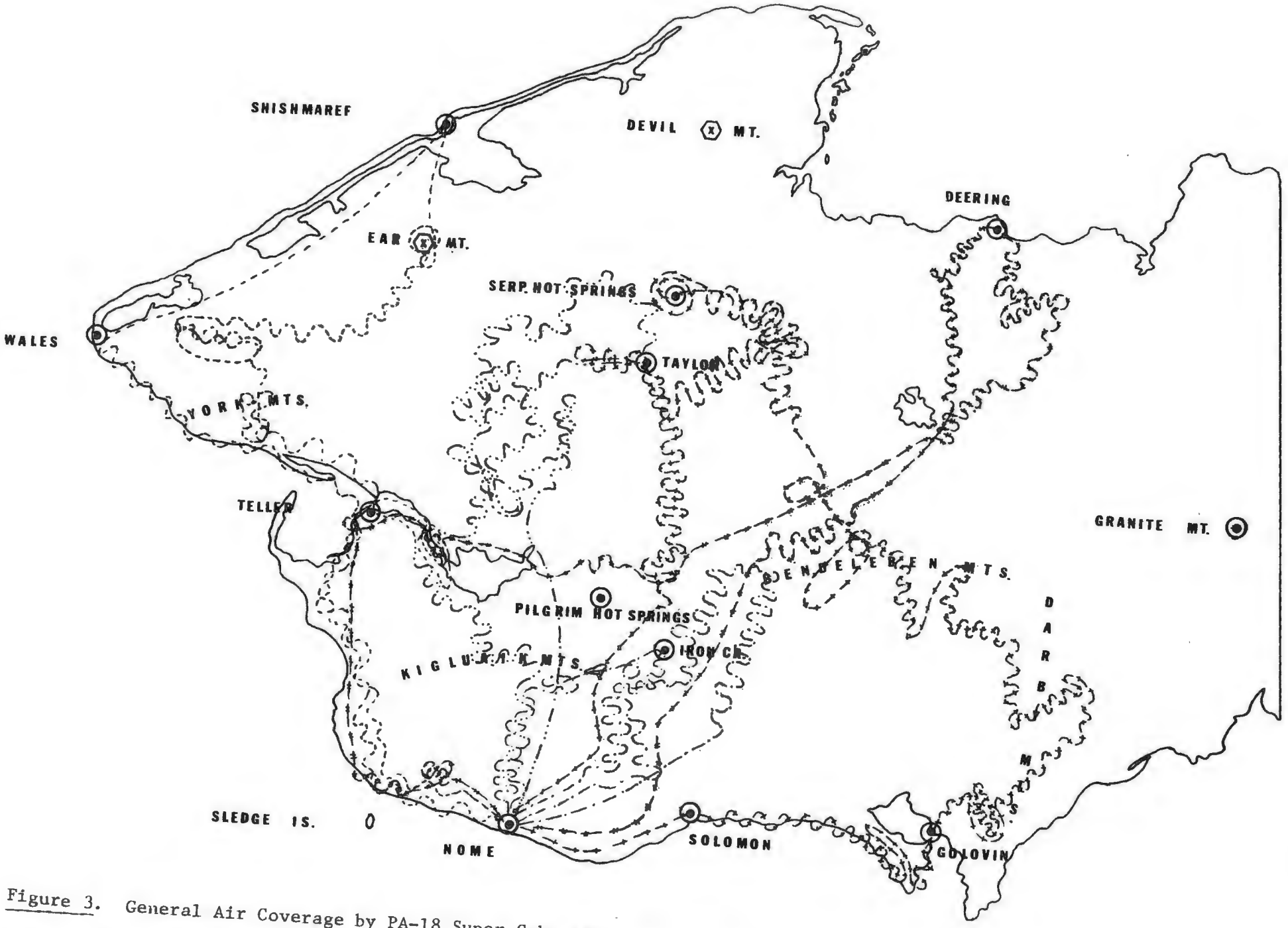

Figure 3. General Air Coverage by PA-18 Super Cub, 1969.

MAP SUPPLEMENT SHEET FOR AIRCRAFT COVERAGE

Cessna 180 Air Coverage

..... Represents flight of June 7 (2.3 hrs.)

- - - - - - Represents flight of June 11 (2.3 hrs.)

—‖ —‖ —‖ —‖ Represents flight of June 13 (2.3 hrs.)

_____ Represents flight of June 15 (.8 hr.)

__ . __ . _ Represents flight of June 22 (2.6 hrs.)

—+ —+ —+ Represents flight of July 8 (.7 hr.)

—‖ —‖ —‖ Represents flight of July 11 (.95 hr.)
and July 14 (.8 hr.)

___..___... Represents flight of Aug. 9 (2.0 hrs.)

Total Air Time 14.3 hrs.
Total Search Time 8.8 hrs.

PA-18 Super Cub Air Coverage

__ . __ . _ Represents flight of June 26 (4.5 hrs.)

—+ —+ —+ Represents flight of June 27 (6.1 hrs.)

—‖ —‖ —‖ Represents flight of June 28 (5.9 hrs.)

___..___... Represents flight of June 30 (5.1 hrs.)

- - - - - - Represents flight of July 1 (5.3 hrs.)

Total Air Time 26.9 hrs.
Total Search Time 26.9 hrs.

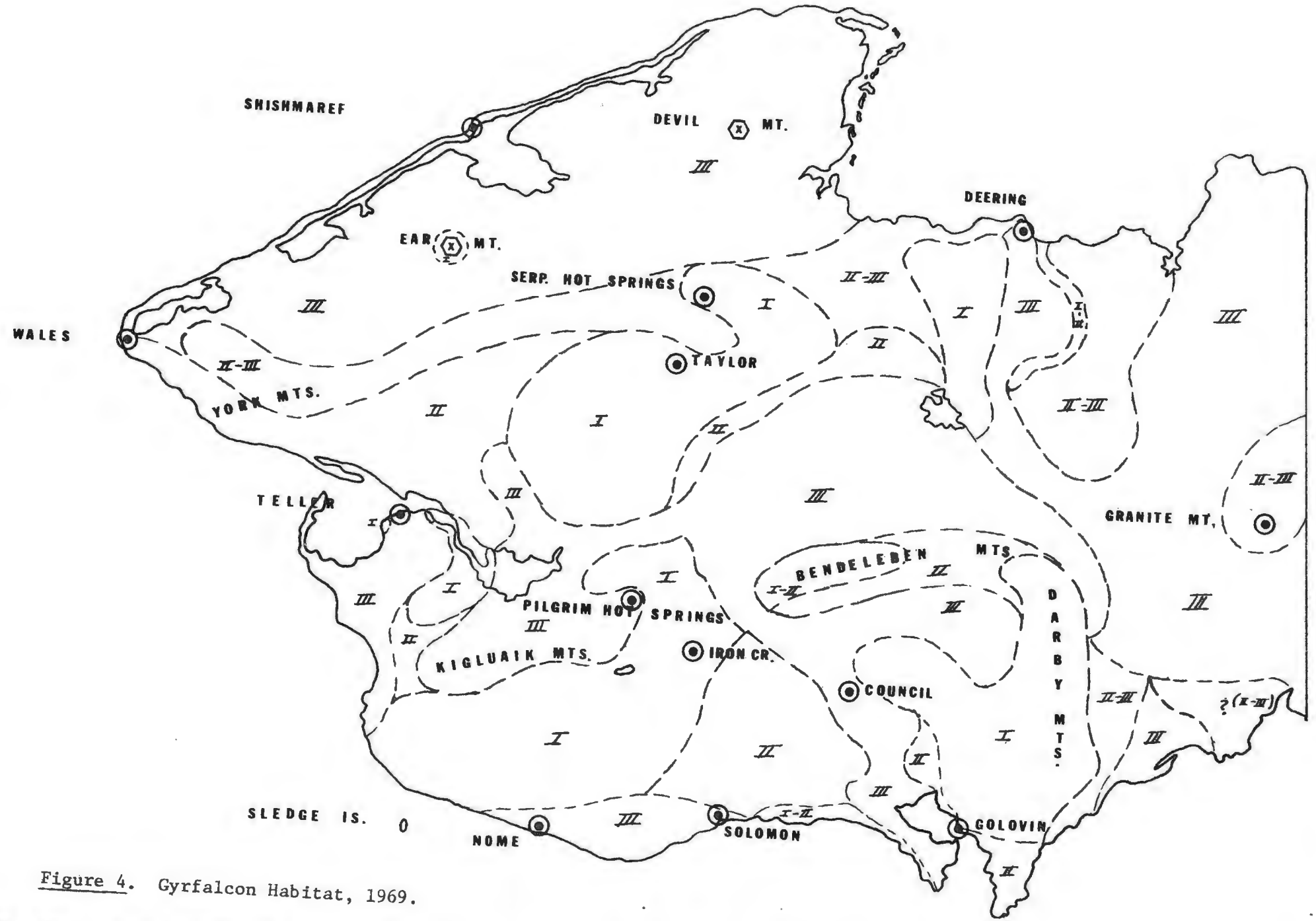

Figure 4. Gyrfalcon Habitat, 1969.

Gyrfalcons again appeared to tolerate close neighbors of the same species as well as rough-legged hawks (Buteo lagopus), ravens (Corvus corax), Canada geese (Branta canadensis), and cliff swallows (Petrochelidon pyrrhonota). One aerie site was located 150 yards from an active raven nest, and five pairs of Canada geese nested on and near the aerie cliff at distances of 50 feet to 300 yards from the gyrfalcon nest. A cluster of 22 active cliff swallow nests occupied a rock face approximately four feet away.

One area of excellent habitat of approximately 20 square miles contained the following: four pairs of gyrfalcons and a possible fifth, two pairs of ravens, and three pairs of rough-legged hawks (one pair of similar nesting species per three square miles).

The 2,000 square mile area covered thoroughly in 1969 (and 1968) contained 14 pairs of breeding gyrfalcons, seven known (and one probable) breeding pairs of rough-legged hawks and four known (and one probable) breeding pairs of golden eagles (Aquila chrysaetos). In addition, one active nest was located that contained either golden eagles or gyrfalcons (aerial survey), and at least 44 vacant nest sites in addition to five pairs of nesting ravens were found. This is a density of raptors of about one pair per 71 square miles.

During 1968 (see Game Bird Report, Vol. X) about one pair per 37 square miles was observed -- indicating a 50 per cent decrease in the species-wide raptor population within this particular portion of the Peninsula. This drop, most noticeable in the nesting pairs of rough-legged hawks, coincides with a major increase in nesting raptors (mainly rough-legged hawks) located in the northern half of the Peninsula. The difference in numbers of breeding pairs of gyrfalcon within this area between 1968 and 1969 does not appear significant.

This shift or displacement is almost certainly due, at least in part, to availability of prey (the scarcity of microtines on the Peninsula during 1969). It is not suggested, however, that this is the entire answer, since some rough-legged hawks took ptarmigan, and in one case, a snowshoe hare. Some of the rough-legged hawks did successfully adapt to the low density of prey that was available to them in 1969. It is possible that all pairs could not.

Nesting Habitat Preferences

Gyrfalcons again nested in variable situations with reference to terrain and the material on which the nest was built.

Of the breeding birds located during 1969, sea cliff nests were used by two pairs, hillside-overlook aeries were used by 21 pairs, river bluff sites were used by 17 pairs, and open tableland sites were used by 3 pairs. No dredge sites were occupied. The J-68-P-6 site near Taylor was reported last year as on a "tailing boom" separated from a dredge. This site was occupied by gyrfalcons again in 1969, however, the structure, upon ground investigation, proved to be a large steel elevated sluice box. The 1969 nest failed (cause unknown) and did not produce young. Tree nesting was not observed during 1969, and the one known tree nest utilized at one time had fallen down. The number of nests within the habitat choices was very similar to the 1968 findings, with the exception of a 10 per cent increase in river bluff site use.

Nests

Stick nests built by other species were again in common use. No sign of nest construction or rebuilding by gyrfalcons was observed. A second scrape was neatly constructed within six inches of the 1968 scrape at aerie J-68-4. This was apparently the same pair of birds that occupied this site in 1968, and they again used the same stick nest utilized in 1968. Two active "nests" were located in leached out depressions on top of granite spires. In one case a few scattered sticks were noted (from an old nest); in the second, the eggs had been laid directly on the rocky residue within the depression. It is not known if the adults in either case made scrapes.

The change in nest site status between 1968 and 1969 was impressive. Many nests, particularly those of ravens and rough-legged hawks, had fallen off the aerie cliffs. Some had slid off due to wind or snow and, in many cases the cliff itself had crumbled. Both cases were readily discernable from the air, and usually the broken nest could be seen lying at the foot of the cliff. Only six of the total active 1968 gyrfalcon, raven, and rough-legged hawk nests were found fallen from their cliffs, however many other perfectly usable unoccupied 1968 nests were missing. If such "erosion" takes place at a steady rate equaling that of 1968-1969, it will be an important factor in yearly distribution of gyrfalcons and may well be one of the raptor (and raven) population limiting factors. One raven nest fell off a cliff just before the young were fledged. Destruction was caused by the movements of the young themselves. However, all young scrambled to places on the cliff and successfully fledged. In some cases the nests accumulated various rocks in them over the winter (probably during breakup) and this may have been a factor in their unoccupancy.

Many gyrfalcon aeries located and observed during 1969 faced the south, as they did in 1968. Directional aspects of the 44 active sites were: N(2), NE(2), E(5), SE(11), S(11), SW(6), W(30), NW(4). During 1968 and 1969, approximately 62 per cent of the total aeries located faced one of the three main southerly compass points.

Nesting elevations ranged from approximately 75 feet to 1200 feet during 1969. The majority were between 200 feet and 800 feet above sea level.

Nest Re-use by Returning Pairs

Of the eight aeries regularly observed during 1968, only three were occupied by breeding gyrfalcons during 1969. The remaining aeries were unoccupied. These three active aeries were, however, apparently occupied by the same pairs that bred at these sites in 1968. At aeries J-68-5 (1969) and J-68-6 (1969) the pairs both chose alternate nests in better repair and under well-formed overhangs about 40 feet from their exposed 1968 nests. Pairs were identifiable by plumage and aggressive characteristics.

Of the 34 active breeding sites located in 1968, 19 were found inactive and unused by any species during 1969. Three were found to be occupied by ravens, two by rough-legged hawks and one was not checked. In addition I was unable to determine the species occupying one site (either golden eagle or gyrfalcon). The remaining eight were again active gyrfalcon aeries. During 1969, gyrfalcons were found nesting at two of the 1968 golden eagle sites and at three of the 1968 rough-legged hawk sites.

Behavior of Nesting Adults

Information on the behavior of adults applies strictly to situations in which the adults were disturbed by people or an airplane, with one exception; that being activities (primarily feeding) that occurred at an aerie watched closely for a 45-hour period beginning June 17 and ending June 19. The chicks in this nest were estimated to be 15-18 days old.

The aggressive responses to an intruder approaching from the ground during 1969 paralleled observations made during 1968. Generally, however, aggression by both sexes was less.

Gyrfalcons displayed some degree of aggression toward the aircraft at almost every aerie visited in this manner. It was noticeable to a much greater degree from the PA-18. In a few instances where the aircraft was flying low and directly toward an aerie site on the first approach, falcons flew out to meet the aircraft when it was still one-quarter of a mile away. Rarely, both male and female would attack together. Generally, it appeared that the females attacked, probably because they were in the vicinity of the nest and the males were not. In one instance, the female at J-69-62 attacked the aircraft during each of three passes by the nest; coming so close and fast from the side and above that the aircraft was forced to retreat (an accurate count of young was obtained on the third pass, however).

Incubation

As happened in 1968, the field work did not commence early enough in the season to obtain accurate data concerning incubation time. Using an arbitrary 28-day incubation period on two nests where hatching data was obtained, calculations indicate egg laying took place May 5-7 in one nest, and May 10-12 in the other. Data suggest that the majority of the Peninsular gyrfalcon population lays eggs between May 1 and May 15.

Eight aeries were visited 31 times and males were never seen on the nests. This supports the 1968 findings that the females do almost all, if not all, of the incubation and brooding.

Clutch Size

Eight nests were found early enough to provide data on clutch size. These nests contained 28 eggs (Table 1), an average of 3.50 eggs per nest. Counts of eggs and hatched young in 29 other nests indicated a mean minimum clutch size of 2.90, for a mean minimum clutch size of 3.03 for the 37 aeries from which data were obtained. A few young were probably missed during aerial counts.

Hatching and Fledging Dates

Actual hatching dates were known for J-68-5 (1969) (June 3, 12 noon); and J-68-4 (1969) (June 5-8). Data suggest that the majority of Peninsular gyrfalcons hatch between June 1 and June 15.

Table 1. Clutch and Hatching Data from Eight Gyrfalcon Nests Studied in 1969.

	Number of Eggs	Number Hatching	Addled	*Fledging (Undisturbed)	**Fledging (Actual)
J-68-2	3	0 (Assume 2)	1	2	0
J-68-4	3	3	0	2	0
J-68-5	3	2	1	2	2
J-68-6	4	4	0	3	2
J-69-38	4	4	0	4	1
J-69-40	4	3	1	3	3
J-69-43	4	0	4	0	0
RL-68-10 (Gyr 1969)	3	3	0	3	3
	28	21	7	19	11

* Number of young that probably would have left the nest if the nest had not been disturbed by falconers (and the collection of eggs for pesticide samples). Nesting mortality is included.

** This column breaks down as follows: J-68-2, all 3 eggs (2 viable) collected for pesticide samples; J-68-4, both surviving young taken illegally by persons unknown. J-68-6, 1 of 3 surviving young taken for falconry under permit. J-69-38, 3 of 4 young taken for falconry under permit; result, 11 fledged young.

At study aerie J-68-5 (1969) on June 3 (12 noon), one chick was found hatched but still wet, and a second egg pipped (1 cm. hole with the chick beginning to vigorously "chip" its way around the circumference of the egg). The third egg in this clutch was determined to be addled.

At aerie J-69-38, three chicks were observed hatched on June 8, and the fourth egg was pipping.

At J-68-4 (1969), the eggs were observed unpipped on June 4, and all three chicks were hatched and dry on June 9. Laying, hatching, and fledging data are found in Table 2.

Table 2. Laying, Hatching and Fledging Dates, 1969.

Aerie	Laid	Hatched	Fledged
J-68-4	(Est. May 10-12)	Hatched between June 5 & June 8	(Est. July 20-23)
J-68-5	(Est. May 5-7)	June 3, 12 noon	Male out of nest July 17. (Est. July 16-19)
J-68-6	(Est. May 3-6)	(Est. May 31-June 3)	All 3 out of nest July 16 (1 was caught) (Est. July 14-17)
J-69-37	(Est. April 23-26)	(Est. May 23-26)	3 of 4 in nest July 18, 1 out. (Est. July 8-10)
J-69-38	(Est. May 9-11)	3 prior to June 8; last (pipping on June 8)	(Est. July 21-24)
J-69-39	(Est. May 6-8)	(Est. June 3-5)	1 of 3 still in nest July 20; other 2 flying. (Est. July 18-21)

Hatching Success

As shown in Table 1, the eight aeries watched during 1969 produced 21 young at hatching (assuming two for J-68-2-1969), for a mean of 2.83 chicks per pair. Aerial observations of 29 other nests showed a total of 75 young or 2.58 young per aerie. The combined mean for 37 nests was 2.59 young hatched per nest. This figure is probably a close approximation of the true mean, although it is known that some young undoubtedly were not seen during aerial counts at the 29 nests not visited on foot. The true population mean may have been between 2.6 and 2.8 young hatched per nest; slightly lower than the 1968 mean. This can be attributed to the higher incidence of infertile eggs within clutches and three known complete clutch failures involving a combined total of 11 eggs.

Comparison of data from eight aeries in 1968, and the same number in 1969 shows that hatching success decreased from 87 per cent to 75 per cent. This was a downward trend, which probably occurred in the entire 1969 population.

Growth of Young

During 1969, one gyrfalcon aerie (J-68-5) was visited to measure weight gains of chicks and to attempt to correlate weight increase with feather growth. One male and one female were weighed. Crops were checked and weight of contents, if any, was estimated.

Data from this aerie are listed in Table 3 and plotted in Fig. 5. Generally it shows that sexual divergence in weight increases from about day 15 through day 25-30; at which point a marked slowing of the body weight increase occurs and a general leveling off in weight increase results. Primary flight feathers grow most rapidly between approximately day 35 and day 45, after a fairly constant growth rate from their emergence (about day 10) to day 35. This indicates the possibility of a period near fledging time when the young are subjected to a high physiological stress (i. e. demand placed on body resources) due to feather growth. Thus, there are probably two critical periods in the development of the young which may be reflected in mortality figures; the first during the first few days after hatching, and the second when the most rapid feather growth occurs.

Sex Ratio of Chicks

Eleven of 22 young in seven aeries visited were judged to be males by size of body and feet (Table 4). The ratio in this sample, therefore, is 1:1. This seems a significant shift from the 1968 ratio of 2:1 in favor of females.

Interval from Hatching to Fledging

The eggs in J-68-5 (1969) hatched at approximately 12 noon on June 3. When last visited July 17, the male was out of the nest and calling from nearby rocks. The female was in the nest, but would probably have jumped from it if excited by intruders. Both young were 44 days old (nearly to the hour). It was estimated

Table 3. Weights of Two Gyrfalcon Chicks of Known Age from Aerie J-68-5 (1969), Seward Peninsula, 1969.

Date	Age (Days)	Chick	Weight (Grams)	Crop (Included in Weight)
June 3	Date of Hatch	#1 ♀	?(Est. 50 gm.)*	None
	Date of Hatch	#2 ♂	?(Est. 50 gm.)	None
June 16	13	#1 ♀	645 g.	Est. 25 g.
	13	#2 ♂	582 g.	Est. 25 g.
June 23	20	#1 ♀	1084 g.	None
	20	#2 ♂	898g.	None
June 27	24	#1 ♀	1392 g.	None
	24	#2 ♂	1098 g.	None
July 11	38	#1 ♀	1425 g.	Slight?
	38	#2 ♂	1131 g.	Slight?
July 17	44	#1 ♀	1450 g.	None
	44	#2 ♂	(Fledged)	--

*Estimation of weight on date of hatch is based on known egg weights and measurements (average 62 g.).

Figure 5. Weights of Two Gyrfalcon Chicks from J-68-5, Seward Peninsula, 1969.

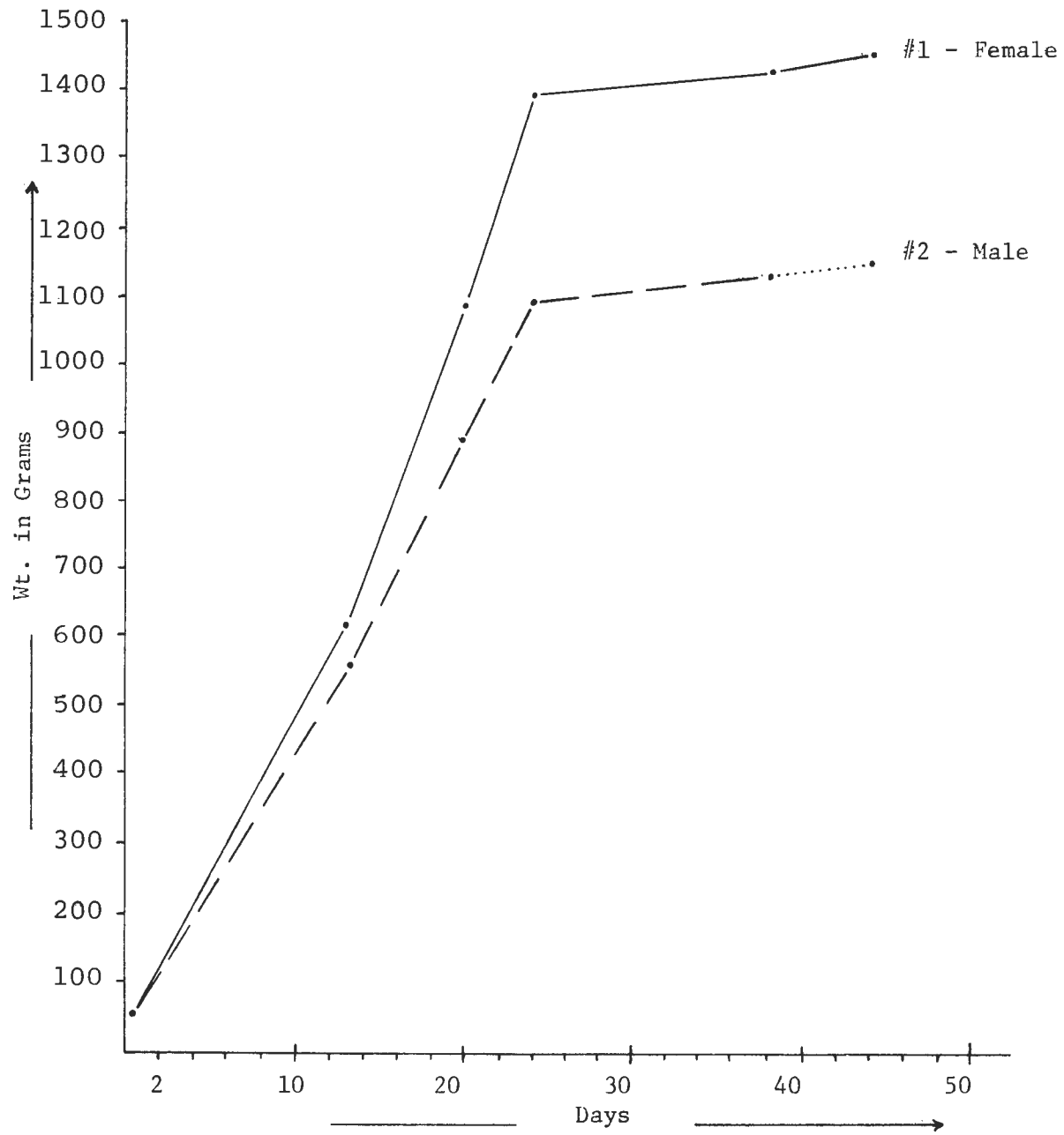

Table 4. Sex of Chicks from Seven Gyrfalcon Aeries on the Seward Peninsula, 1969.

Aerie	Males	Females
J-68-5	1	1
J-68-6	2	2
J-69-38	3	1
J-69-39	1	2
J-69-40	1	2
RL-68-10 (Gyr 1969)	2	1
GE-68-11 (Gyr 1969)	1	2
Totals	11	11

that the female would leave the nest by July 19. Thus, the male spent 42-44 days in the nest, and the female spent 44-46 days in it. A suggested interval of 42-48 days is reasonable for the average nest occupancy period.

Number of Young Fledged

Data on numbers of young leaving the eight study aeries are in Table 1. In an undisturbed situation, these aeries should have fledged 2.38 young per nest. It is not certain that all of the young taken by humans would have fledged if left alone, but since all but two were taken just prior or during fledging it is likely they would have. From this small sample it appears that, as in 1968, natural nesting mortality was quite low.

Summary of Productivity

Data obtained indicate that the 44 pairs of nesting gyrfalcons located in 1969 produced 144 eggs, hatched 116 young, and fledged 108 young (including 11 young taken by falconers). Mean estimated reproduction of fledged young per pair (2.45) compares closely with Cade's (1960) figure for production by Colville River populations. Egg production during 1969 was very similar to that found in 1968, and it is expected that this would be fairly constant from year to year. Hatching success was lower in 1969; there being an unexplained occurrence of clutch failures and an increase in addled eggs. Fledging success also was somewhat lower during 1969; there being a small but noticeable increase in chick mortality. No drastic changes occurred, however, and it appears the Seward Peninsula has a relatively stable breeding population and production.

Falcon productivity and breeding density showed signs of being related to food supply, since the decrease in productivity during 1969 coincided with a decrease in quantity of available food items. Microtines were very scarce during 1969, and consequently jaegers were fewer in numbers and many did not breed. Ground squirrels, though common, appeared more localized. Ptarmigan, though not scarce, were also more localized, particularly along some of the central and northern river drainages. There was a noticeable, though undetermined decrease in numbers of ptarmigan between 1968 and 1969. Rock ptarmigan were definitely less abundant. On May 22, John Burns, Department Biologist, stated that ptarmigan were scarcer, but that during the winter and early spring, there were large concentrations of ptarmigan along the Kuzitrin, Pilgrim and Bluestone Rivers. Burns saw up to eight gyrfalcons in one day in the Kuzitrin region during the winter months. This apparently resulted in a very interesting situation. Of the 13 cases of 4-egg clutches known to exist during 1969, 11 occurred in the Bluestone region (1) and north of the Pilgrim River and the Casadepaga River (10). Only two occurred south of this line. All aeries visited that had 4-egg clutches had liberal amounts of ptarmigan feathers scattered around the area. Possibly, due to the higher populations of ptarmigan in the regions and their availability to the gyrfalcons during early spring the clutch sizes were correspondently higher (maximum) due to better condition of the adults. In the remaining areas checked, gyrfalcons were depending primarily on squirrels and shore birds (which were possibly less available) and were having to work harder for them.

Only eight of 33 gyrfalcon sites active in 1968 were active in 1969, although 44 active sites were located. It appeared that there was a shift to other available sites, and a possible displacement of breeding pairs to areas of higher ground squirrel and ptarmigan populations. Four gyrfalcon sites were active this year in the Pilgrim River-Kuzitrin River-lower Kougarok region. In 1968, three of these sites were empty and the fourth was occupied by ravens.

General population data for gyrfalcons and other species on the Seward Peninsula are listed in Table 5.

OTHER BIOLOGICAL DATA

Interactions with Other Birds at Nests

Long-tailed jaegers (Stercorarius longicaudus) were observed at two aeries harrassing the male falcons. In both cases the jaeger appeared to have followed the gyr to the aeries. Both encounters were brief and as the jaegers dove at the flying falcons, the gyrs made faint noises of objection.

One aerie in particular had a very interesting ecological setting. Ravens nested on a nearby cliff in a freshly constructed and exposed nest about 150 yards from the falcon nest. Twenty-two occupied cliff swallow nests were situated on a rock face between two and six feet from the falcon nest. A good many of these nests were in view of the falcon when she sat on the front half of the nest. Five pairs of Canada geese nested within 15-300 yards of the nest. Of these, one was on the top edge of the cliff and one was directly below the falcon nest in some willows; both being about 15 yards from the nest. In addition, a total of 23 geese was observed in the immediate area -- many feeding on the river banks and talus slope directly below and in front of the aerie. One pair of Say's phoebes (Sayornis saya) nested on the aerie cliff and occasionally harlequin ducks (Histrionicus histrionicus) and red-breasted mergansers (Mergus serrator) were seen flying and feeding in front of the cliff. A 45-minute battle between the pair of gyrfalcons and the pair of ravens was observed in which a raven was driven from its nest and in which the gyrfalcons definitely held the upper hand. Occasionally a raven would fly at a falcon, but could not compete with the falcon's speed and aerobatics. The falcons paid little attention to other birds in the area, with only two goose-falcon encounters occurring. One, in which a goose attempted to fly up to perch above the falcon nest, resulted in the falcon leaving her nest and striking the goose in mid-flight. The goose "crash-landed" below the falcon nest and began feeding, while the gyrfalcon soared about and then returned to its nest. In the other case, a falcon chased a goose that flew by the nest, and the goose flew once at the falcon. One of the geese in the area had a broken wing and this may have been the result of an encounter with the falcons.

Canada geese were found nesting in the immediate vicinity of two other aeries. Two aerie sites, located on the same river, were found occupied by nesting Canada geese. The geese were utilizing the stick nests on the cliffs and one of these sites was 40 feet from, and in direct view of, a nest occupied by nesting rough-legged hawks.

Table 5. General Seward Peninsula Population Data, 1969.

Estimate of Total unoccupied available raptor sites checked, 1969	400, ± 50
Total 1968 Gyr sites checked in 1969	33 of 34
Total 1968 Gyr sites occupied by Gyrs, 1969	8
Total 1968 Gyr sites occupied by other species, 1969	5
Total of all active gyr sites located, 1969	44
Total active rough-legged hawk sites located, 1969	42
Total active golden eagle sites located, 1969	8
Total active raven sites located, 1969	21
Total unidentified raptor sites, 1969	1
Total probable golden eagle and rough-leg sites, 1969	5
Total sites checked (including estimate of unoccupied sites)	521, ± 50

In one situation gyrfalcons, ravens, and rough-legged hawks were found nesting along a 300-yard portion of a river bluff.

At aerie J-68-5 (1969), a group of ravens was often observed in the area. On one visit to the nest, a recently killed raven was found "stashed" beside the falcon nest; an obvious loser in some aerial battle.

The passerines commonly found nesting on the same cliffs as the falcons were cliff swallows, Say's phoebes and snow buntings (Plectrophenax nivalis). No conflict between the falcons and these species was observed.

Food Habits

Food remains were collected at 13 aeries and stored in labeled bags for study at a later date. General observations indicate a high usage of ptarmigan during the winter, and indicate (along with some observations by Bob Pegau, Department Biologist), that at least some of the falcons stay loosely paired and in the vicinity of the aerie during at least parts of the winter.

Food remains again varied significantly from aerie to aerie; some pairs took "potluck", while others appeared to concentrate on one (or a few) species. For the majority ground squirrels were a staple item. At aerie J-68-6 (1969) ptarmigan were taken almost exclusively. The male was observed to deliver to the female four cleanly plucked ptarmigan within a 30-hour period. The female did not hunt (at least for the young) during a 45-hour period. It appeared that not only was the male furnishing all the food, but was also "stockpiling" ptarmigan -- cleanly plucked -- in anticipation of the female's demand for them.

Common food items found at a number of the aeries were ptarmigan, ground squirrels, golden plovers (Pluvialis dominica), robins (Turdus migratorius), and gray-cheeked thrushes (Hylocichla minima). In addition, unidentified ducks, passerines, shorebirds, and a few sea birds were found. No kills were witnessed.

Mortality

Data for 1969 show that nesting mortality was low, though slightly higher than that of 1968 (except for losses to falconers). Dr. C. L. Sainsbury, USGS, reported to me July 14 that he had found an aerie north of Teller with four young in it. He stated the nest was easily accessible and located on the top of a cliff on a creek where "you could walk up on top and right into the nest." He further stated that two downy young were lying below the nest dead, and a third and much older young was lying dead in the nest (he thought there was blood on the lower abdomen and one leg). The fourth chick, nearly fledging age, was "small and very weak." He said, "It's crop was empty and I found no food remains in the nest or below it." He also stated that he was "in the area two days and I never saw or heard an adult." This appears to be a case of starvation, abandonment (including accidental death of both adults; however unlikely) or both.

Two chicks in the eight study aeries apparently died. At J-68-4 (1969), a young chick disappeared from the nest and probably was a victim of natural mortality, though the remains were not found. At J-68-6 (1969) a male chick disappeared between its 18th and 30th day. The remains were not found, but were believed to be in the back of the nest. It was noted between June 17 and 19 that one male chick did get crowded out at feeding time, but still appeared to get a reasonable share. This could have been a possible case of starvation.

One male from J-69-38 (clutch of four) was taken under a falconry permit and, upon examination, was found to be weak and possibly deformed. There appeared to be a bowing of the legs (similar to a case of rickets diagnosed in a male from the Seward Peninsula in 1961, though considerably less severe) and its back was swayed noticeably. Observations of this bird indicated that its survival after fledging would have been unlikely.

In addition to mortality occurring in 1969, two cases of mortality in previous years were observed, one of which was possibly due to predation. At J-68-6 (1969), the remains of one of the 1968 fledglings was discovered on a nearby slope. It appeared that the bird had been plucked in typical raptor fashion. Only the bones of one wing were found. If this were the result of predation by a raptor it could only have been a surprise attack by a snowy owl (Nyctea scandiaca).

Searching for food remains at RL-68-17 (Gyr 1969), the partial tail of an immature gyrfalcon was found between some rocks near a perching and feeding place above the cliff. These were old feathers and probably were from 1967 (this site was unoccupied by gyrs in 1968).

Falconers took 11 of 93 young from five of 37 nests at which data were gathered. Two of the nestings were taken illegally. In addition, two viable eggs from J-68-2 were collected for pesticide analysis.

Of 65 adults observed during 1969, none were identified as birds hatched during 1968.

Color Phases

The basic plumage colorations of 65 adult gyrfalcons were recorded in 1969 in the following subjective categories: grey (including light grey and dark gray), grey-brown, straw (cream tone on the light areas between grey bars) and white. Numbers seen in each class are as follows.

	Grey	Grey-Brown	Straw	White
Number Seen:	56	2	4	3
Percentage:	86%	3%	6%	5%

This is almost identical to the data obtained in 1968, with a slight decrease (4%) in white birds. During 1968, five white birds were located (two males and three females). During 1969 three white females were observed. This

indicates (on at least a two-year basis) that the coloration makeup of the breeding population is fairly stable.

Banding

Little effort was expended, during 1969, to band young gyrfalcons because of the work involved (reaching as many sites as possible within a short time just prior to fledging) and the chance that much of this effort would be negated, as in 1968, by falconers and collectors. The five young that were banded for study purposes are listed in Table 6.

LITERATURE CITED

Cade, T.J. 1960. Ecology of the peregrine and gyrfalcon populations in Alaska. U. of Cal. Publ. Zool. 63(3); 151-290.

Table 6. Young Gyrfalcons Banded on the Seward Peninsula, 1969.

Date	Aerie	Sex	Band No.	Color Band
June 23	J-68-5	F	877-02627	Yellow (R. leg)
		M	877-02628	Yellow (R. leg)
June 26	RL-68-10	M	877-02629	Red (Right leg)
		F	877-02630	Red (Right leg)
		M	877-02631	Red (Right leg)

Total - 5 chicks; 2 Females and 3 Males.

PREPARED AND SUBMITTED BY:

David Roseneau
Study Leader
or Project Leader

APPROVED BY:

James A. Harper
Director, Division of Game