ALASKA DEPARTMENT OF FISH AND GAME

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GAME BIRD REPORT

by

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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 & W-17-1 TITLE: Small Game, Waterfowl and Furbearer Investigations

WORK PLAN: B TITLE: Upland Game

JOB NO: 1 TITLE: Abundance and Distribution of Upland Game

PERIOD COVERED: January 1, 1968 to December 31, 1968

ABSTRACT

Answers to a mailed questionnaire on small game abundance indicated general increases in snowshoe hares and grouse (except blue grouse) over most of the State. Responses on ptarmigan showed regional populations different from each other in level and trend. Spring and fall counts on small areas showed increases (from 1967) among rock ptarmigan along the Steese Highway and among spruce grouse on the Taylor Highway and near Kenai. Counts of spruce grouse were lower than in 1967 along the upper Steese Highway.

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WORK PLAN: B TITLE: Upland Game

JOB NO: 1 TITLE: Abundance and Distribution of Upland Game

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

To determine current abundance of grouse, hares, and ptarmigan throughout Alaska and on selected study areas.

To collect distribution records of upland game in Alaska.

TECHNIQUES

The standard small game abundance questionnaire was mailed early in November to 510 people throughout the State. By early January 1969, 234 replies had been received. The replies were tabulated and analyzed as in previous years, and a summary of responses was mailed to cooperators early in February 1969.

Standard grouse counts were made in 1968 as follows:

1) Spring roadside counts of sharp-tailed grouse near Tok (by Larry Jennings and Keith Rulison);

2) Fall roadside counts of spruce grouse on the Steese Highway (Sandra Kogl), Taylor Highway (Larry Jennings), and Kenai area (Joseph Janutka).

The spring census of rock ptarmigan at Eagle Creek (see B-2) was done as usual, but no count of territorial willow ptarmigan was done at Chilkat Pass in 1968. No data on broods of ptarmigan near Nome were obtained in 1968 due to lack of available manpower.

FINDINGS

Game Questionnaire

Replies to the question about snowshoe hare populations (see summary below) indicate that more hares are present in the Interior than last year, although densities are still generally low.

According to the questionnaires and to verbal comments received by game biologists, snowshoe harea are abundant (perhaps approaching a peak) in the Fort Yukon-Circle-Central area of the upper Yukon River. In areas bordering the Gulf of Alaska, cooperators feel that snowshoe hares are rather scarce, but increasing.

Table 1. Summary of questionnaire replies, snowshoe hares, 1968.

	High	Mod.	Low	Index	More	Same	Fewer	Index
Interior (126)	8	23	94	2.25	54	55	13	6.34
Gulf (30)	2	6	22	2.33	10	14	3	6.00

Replies sent in regarding ptarmigan populations are listed in Table 2. Cooperators feel that ptarmigan populations are increasing in the Brooks Range, Interior, and Gulf coast areas, although none of these have more than "moderate" population levels. Other areas--western coastal regions, the Alaska Peninsula, and southeast Alaska--are thought to have fewer ptarmigan this year than last. However, the sample size in these areas, especially on the Seward Peninsula, is small.

Table 2. Summary of replies to questionnaire on ptarmigan population levels and trends, 1968.

	No. of Replies				No. of Replies			
	High	Mod.	Low	Index	More	Same	Fewer	Index
Brooks Range (9)	2	7	0	5.89	3	4	0	6.71
Westward (7)	0	6	1	4.43	2	2	4	4.00
Alaska Peninsula (17)	3	7	6	4.12	2	7	5	4.14
Kodiak (7)	0	3	4	2.71	2	3	2	5.00
Gulf (26)	2	17	8	4.04	8	14	3	6.00
Interior (123)	17	59	41	4.19	43	56	13	6.18
Southeastern (17)	0	10	6	3.50	1	9	5	3.93

Data on grouse are summarized in Table 3. In southeast Alaska, blue grouse seem to be at the same level of population density as in 1967. All grouse populations appear to be increasing in interior Alaska, and spruce grouse apparently are more abundant in southcentral Alaska.

Table 3. Summary of replies to questionnaire on grouse populations, 1968.

Species, Area	Present Abundance				Comparison with 1967			
	High	Mod.	Low	Index	More	Same	Fewer	Index
Grouse (General)								
Interior	6	4	4	5.57	6	7	0	6.85
Southcentral	1	8	9	3.22	8	8	0	7.00
Combined	7	12	13	4.25	14	15	0	6.93
Ruffed Grouse								
Interior	14	25	16	4.86	38	12	3	7.64
Southcentral	0	1	8	1.44	1	8	1	5.00
Combined	14	26	24	4.37	39	20	4	7.38
Spruce Grouse								
Interior	17	38	11	5.36	38	18	7	6.97
Southcentral	12	27	23	4.29	39	18	4	7.29
Combined	29	65	34	4.84	77	36	11	7.13
Sharp-tailed Grouse								
Interior	3	14	20	3.16	13	17	3	6.21
Southcentral	0	1	8	1.44	3	6	0	6.32
Combined	3	15	28	2.82	16	23	3	6.24
All Grouse								
Interior	22	39	22	5.00	47	26	6	7.07
Southcentral	13	32	35	3.90	41	31	4	6.95
Blue Grouse	3	14	7	4.60	6	11	3	5.66

Counts on Small Areas

Sharp-tailed Grouse

Only three daily counts were made in the spring of 1968 near Tok, instead of the usual six. These counts were made relatively late in May. Results are given below:

Table 4. Counts of sharp-tailed grouse near Tok in 1968.

	Sharp-tails Seen		
Route	May 20	May 27, 28	Highest Count, 1967
Taylor 56-46	5	4	1
Taylor 26-16	1	0	4
Slana-Tok	-	3	3
Tok south (Mile 1303-1313 Alaska Highway)	-	2	5

Ptarmigan

The annual census at Eagle Creek yielded a tally of 105 territorial cocks, a slight increase over 1967. Counts on adjacent areas showed 50-75 percent increases over 1967. However, other evidence suggested that hunting had reduced populations on the Eagle Creek study area. This is discussed in the report for Job B-2.

Spruce Grouse

Spruce grouse seen in 1968 during standard fall roadside counts are listed in Table 5. The results suggested significantly fewer grouse on the upper Steese route, but more grouse along the Taylor Highway and on the Kenai area route (Swanson River Road, near Sterling). The evidence for higher roadside populations near Kenai was supported by reports of hunters. Hunters contacted during October along the Swanson River Road were nearly unanimous in their avowal that more birds were available in 1968 than 1967.

Table 5. Spruce grouse seen on standard counts, 1968.

Location	Miles	Number of Counts	Range	Grouse per Mile Driven	Conf. Interval at 95%
Steese Highway	19	10	7-28	0.811	0.533-1.089
Taylor Highway	20	8	1-11	0.300	0.151-0.449
Kenai	12	15	4-29	1.416	1.319-1.513

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Robert B. Weeden
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APPROVED BY:

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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 & W-17-1 TITLE: Small Game, Waterfowl, & Furbearer Investigations

WORK PLAN: B TITLE: Upland Game

JOB NO: 2 TITLE: Population Characteristics of Ptarmigan

PERIOD COVERED: January 1, 1968 to December 31, 1968

ABSTRACT

The Eagle Creek study area as a whole contained seven percent more cocks in 1968 than 1967. Adjacent areas showed increases of 55 to 75 percent. The dampening of the population increase at Eagle Creek probably was due to hunting, especially in spring (April, May). There were about 1.35 yearling hens for every older female in the population, a slight decline in proportion of first-year birds from 1967. Of 51 males caught in 1968, only seven were two years old or older. This reflects the removal of old cocks by hunters in fall and spring, and their replacement by young birds.

Clutch sizes dropped sharply from 8.9 per nest in 1967 to 7.4 per nest in 1968. Nests hatched moderately late in 1968, the peak coming about June 23. Six of the 19 nests found on the study area were lost to predators, and hatchability in successful nests was relatively low (86 percent). The mean total loss of chicks was 26 percent from hatching to early August. August stocks were 2.5 times as high as breeding stocks. About 50 percent of the adult hens alive in August 1967 survived to June 1968, but only 15 percent of the adult cocks survived the same period.

Hunters shot about 27 percent of the resident adult cocks in 1968, 16 percent of the adult females, and seven percent of resident chicks.

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WORK PLAN: B TITLE: Upland Game

JOB NO: 2 TITLE: Population Characteristics of Ptarmigan

PERIOD COVERED: January 1, 1968 to December 31, 1968

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 rates of mortality from August 1967 to May 1968.

ACKNOWLEDGEMENTS

Dale Haggstrom and Jerry McGowan helped with studies at Eagle Creek, working without supervision in July and August. Sandra Kogl assisted during the spring census and again in late August; she also operated the checking station in September and October. John

Theberge and Jack Anvik, conducting a study of ptarmigan for the University of British Columbia, contributed nest and brood data and assisted in banding operations.

FINDINGS

Spring Densities

The 15 square miles of the Eagle Creek study area were censused in 6 days, May 16-21. Weather conditions were good for counts on the 16th, 18th, 19th, and 20th; only a few hours were spent in the field on the 17th and 21st due to wind, rain, and fog. South and west-facing slopes had very large snow-free areas (at times including half of the hillside) while north and east-facing slopes had shallow snow covering 80 to 90 percent of the ground. Ptarmigan displayed actively on May 18 but were very quiet on other days.

We counted 98 cocks on the area between May 16 and 21. Later work revealed seven other males. The total (105) for 1968 was essentially the same as 1967 when 98 males were found at Eagle Creek. Seventy-seven hens were seen in May and early June. Other hens, well hidden or on nests during the count, showed up during nesting and brood studies later. There probably were almost as many females as males in the breeding population. Five cocks were accompanied by two hens each - a somewhat smaller proportion of polygamous males than observed last year.

Although there were many snow-free patches in mid-may 1968 on the ridge on which the Steese Highway runs, and although no winter damage to vegetation could be seen in this area, the section had only half as many cocks (8) in 1968 as in 1967 (17). These facts led to the suspicion that hunting in spring had significantly reduced breeding densities along the highway.

Since this study began in 1960, the Steese Highway had never been cleared of snow by maintenance crews before May 15. Thus, although the legal open season on ptarmigan did not close until April 30, there was no hunting at Eagle Creek after the road snowed-in during October or November. In 1968, however, the Department of Highways opened the Steese Highway in March. Hunters quickly took advantage of the unusually early opening. On April 3 and 4 Jerry McGowan and Bob Weeden drove to Eagle Summit and found hunters who had shot rock ptarmigan on the study area. Some had shot banded, resident birds. To reduce the chance that this spring hunting would affect the ptarmigan study, the Department of Fish and Game closed the Eagle Summit area to the taking of ptarmigan on April 5. Protection Officers and Game Division personnel patrolled the area on weekends until April 30 to reduce illegal hunting. Nevertheless, some birds were shot during April (as reported to us by cafe owners along the Steese). Moreover, illegal hunting continued as late as

June 8; two pairs of rock ptarmigan, freshly shot, were found close to the highway on May 19 and June 8, and shots were heard on two other days.

Other evidence that hunting affected spring ptarmigan populations is presented in the following section on age ratios. The main conclusion relative to spring densities is that the number of ptarmigan counted at Eagle Creek in 1968 was less than it would have been if, as in all other years, there had been no spring hunting. The quantitative effect cannot be determined accurately. However, if one tallies the cocks seen on the study area apart from the strip within one-fourth mile of the road, one finds that populations were 19 percent higher in 1968 than 1967. Assuming that the habitat near the road would also have supported more birds in 1968 than in 1967, had it not been for an "artificial" reduction in breeding stock, the hypothetical total population on the study area in 1968 would have been at least 117 males.

This assumes that areas more than one-fourch mile from the highway were completely unaffected by hunting. It is more likely that hunting did, in fact, "drain" birds out of the surrounding areas as well as along the road. The actual depressant effect of hunting might well have been much greater than the above calculations suggest. As evidence of this, adjacent areas increased in population by 60 to 75 percent between 1967 and 1968 (see below). The habitat at Eagle Creek is similar to the other areas; one would expect that, undisturbed, the population at Eagle Creek would have increased a like amount.

McGowan, Haggstrom, and Kogl made a complete census of the upper Golddust Creek study area on May 25 and 26 this year. They recorded 95 males and 39 females on the four-square-mile area (28 pairs per square mile). Of the 95 cocks, 57 were on the same part of the area that was censused in 1967, when we located 36 males. This indicates an increase of 58 percent in the local population.

The same three people counted rock ptarmigan on upper Ptarmigan Creek (four square miles) on May 28, 1968. They found 99 males and 28 females on this area, an increase of 42 cocks (74 percent) over last year.

Age of Breeding Ptarmigan

Before June 21 we caught 16 female rock ptarmigan at Eagle Creek, of which 4 were two years old or more (3.0 yearlings to 1.0 adults). This was close to the ratio for the same period in 1967 (12 yearlings, 5 adults, or 2.4 to 1.0). In June and July 1968 there were more adults among hens with broods (22 yearlings, 24 adults; ratio 0.92:1.00) than among hens without broods (12 yearlings, 6 adults; ratio 2.00:1.00). Apparently yearlings are easier than adults to catch during the summer except when brood-defense behavior overcomes the adults' wariness.

The combined ratio for all females at Eagle Creek in 1968 was 46 yearlings to 34 adults or 1.35:1.00. Pooled ratios among females were 1.85:1.00 in 1966 and 1.59:1.00 in 1967. This suggests a slow decline in annual production or overwinter survival of females since 1966.

A number of hens were caught in areas within eight miles of Eagle Creek, but off the main study area, in 1968. The pooled ratio among these hens was 28 yearlings:16 adults, or 1.74:1.00. When divided into subsamples by area or class of hen (with brood, on nest, etc.) the samples are too small to be reliable. There was some evidence, however, that at Harrison Summit (8 miles east of Eagle Summit) there were proportionately more yearlings with broods than at Eagle Creek (10 hens out of 15 captured with chicks were yearlings).

There were 44 yearlings and 7 older cocks netted at Eagle Creek in 1968. This was the highest proportion of first-year birds ever recorded at Eagle Creek. My interpretation is that many adult cocks were removed by hunters in the fall of 1967 and spring of 1968, and that these were replaced by yearling males. Thus, spring hunting in 1968 may have had 2 effects: it caused a skewed age ratio among cocks, and reduced overall breeding populations by a minimum of 10-12 percent (hypothetical population of 117 males compared with actual population of 105). Whether hunting actually removed all wandering yearlings that were available to replace shot birds, or whether hunting persisted late enough in the breeding season so that the extra males had lost the urge to establish territories, is not known.

We caught or collected 12 yearling and 12 adult males off the study area, mostly in the Ptarmigan Creek area 3 to 4 miles from the Steese Highway. The age ratio in this small sample adds further circumstantial evidence that hunting actually did cause a skewing of age ratios close to the road.

Nesting

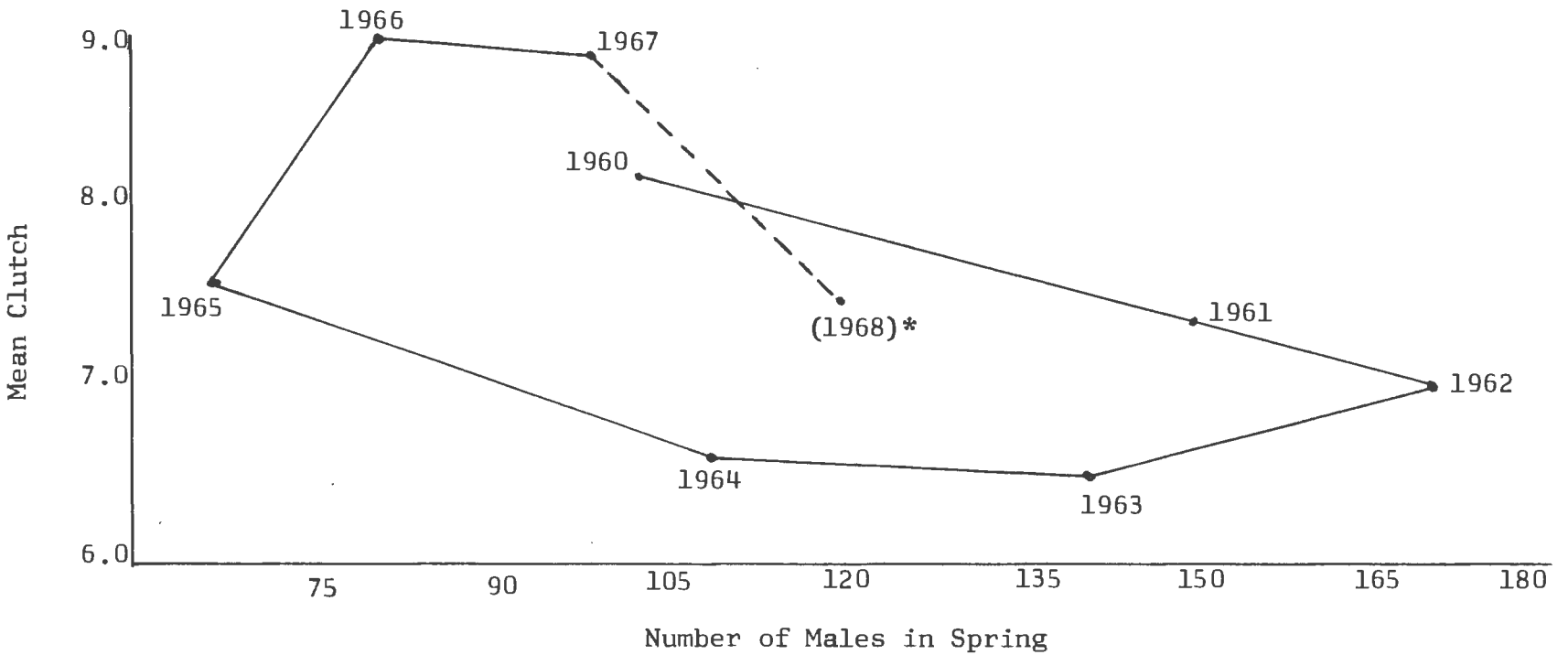
Nest-hunting was done at Eagle Creek by Weeden, McGowan, and Haggstrom and in surrounding areas by Theberge, Anvik, and Kogl. Of the nests located, 13 were found off and 19 on the study area. All but 2 provided data on clutch size (Table 1). The smaller average clutch among adults on the study area, in comparison to that of yearlings, is statistically not significant ($t=1.65$, $P>0.1$). The average clutches for yearlings on and off the area likewise are not significantly different. The pooled clutch size for 1968 (7.43 eggs) was statistically smaller than the average clutch in 1967 (8.52 eggs).

Clutches at Eagle Creek (Fig. 1) have been small during peak or declining periods and have risen during years of low and rising

Table 1. Clutch size in nests found at and near Eagle Creek, 1968.

	Nests On Area:	Nests Off Area:	All Nests:
Age of Female	Av. Clutch (No. Nests)	Av. Clutch (No. Nests)	Av. Clutch (No. Nests)
Yearling	8.1 (8)	6.9 (9)	7.4 (17)
2+ Years	6.7 (7)	8.3 (4)	7.3 (11)
Unknown	8.0 (2)	---	8.0 (2)
All Females	7.5 (17)	7.3 (13)	7.4 (30)

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



*Number of cocks expanded to compensate for spring hunting.

spring densities. On this basis, one would predict that breeding numbers will rise slightly in 1969 while clutch sizes will decline further; breeding densities should begin to decline following the winter of 1969-70.

Hatching dates were obtained from 22 nests in 1968, 11 of which hatched in the aviary at the University of Alaska after artificial incubation periods of from one to over two weeks. Actual hatching dates for nests are in Table 2. The 11 nests in the wild hatched at essentially the same time, on the average, as the 11 clutches in the avairy. The peak of hatch, June 23, is moderately late in comparison with most years, in which the peaks occurred June 19-21.

At Eagle Creek 13 of the 19 nests found were successful. The percentage of unsuccessful nests (32 percent) was higher than in 1967 (20 percent) due to increased predation and one instance of abandonment. One hundred eggs were laid in the successful nests, and 86 hatched. Six of the unhatched eggs had no visible development of the embryo, four eggs had some embryonic development, and four were not examined. This is the second year that hatchability has fallen below 90 percent during the nine-year study; the previous instance was in 1964.

Losses of Chicks

Losses of chicks were estimated from average brood counts throughout the summer. During the first three or four weeks after hatching (to July 19) 33 observations of complete broods averaged 6.4 chicks per brood. If our estimates of number of eggs hatching in successful nests is correct (6.5), then practically no chicks were lost during this early period. Later counts (53 observations from July 20 through mid-August) averaged 5.6 chicks; 19 of these counts were made in August and averaged 4.8 chicks per brood. The mean total loss from hatching to August (6.5 - 4.8 or 1.7 chicks) was 26.2 percent. The estimated loss in 1967 for the same period was 39 percent.

Summer Population Gains

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

1.	Adults alive in May	205
2.	Estimated loss of adults in summer (10 percent)	21
3.	Adults alive in August	184
4.	Nests started	100
5.	Nests hatching	68

Table 2. Hatching Dates of Ptarmigan Nests, 1968.

	Nests Hatching in the Wild			Nests in Aviary	
	Yearling Hens	Adult Hens	Unknown	Yearling Hens	Adult Hens
June 20	1	2	0	0	0
21	0	1	0	1	0
22	1	0	0	2	0
23*	2	0	0	1	0
24**	2	0	0	1	0
25	0	0	0	0	1
26	0	1	0	1	1
27	0	0	0	0	0
28	0	0	0	0	0
29	0	0	0	1	0
30	0	0	0	0	0
July 1	0	0	0	1	0
2	0	0	1	0	1

* Mean hatching data for 11 "wild" nests

** Mean hatching data for 11 "aviary" nests

6.	Chicks per brood in August	4.8
7.	Total chicks alive in August	326
8.	Adults plus chicks in August	510
9.	Summer gain ($\frac{\#8}{\#1}$)	2.5

In the past, when fall populations have been more than 2.5 times as high as in the previous spring, breeding densities have been greater the following year. When fall numbers were less than 2.5 times spring numbers, breeding stocks declined. Summer gains in 1968, therefore, were just at the balance point. Expanding my earlier prediction in this report, I expect breeding stocks in 1969 to be the same or slightly higher at Eagle Creek than in 1968. Clutch size probably will drop and nest predation will increase. Summer losses of chicks will be moderate to low, but productivity will, in sum, be low. Populations probably will decline in 1970.

Mortality, August 1967 to May 1968

The ratio among cocks trapped at Eagle Creek in 1968 suggests that there were only 14 males two years old or older on the area. Since there were 94 adults in August 1967, the survival of the age class is about 15 percent. Band returns in the fall of 1967 showed that about 17 percent of the resident adult cocks were shot by hunters in August, September, and early October. This leaves the death of 68 percent of the fall population of cocks to be accounted for. Spring hunting removed some males; the rest of the losses must be attributed to other types of mortality or dispersal in fall, winter, and early spring.

No calculation of losses of young males in the winter of 1967-68 can be made because the basic assumption underlying my annual mortality estimates - namely, that emigration and immigration are equal - was probably not valid for young cocks in 1968.

Of 90 adult females present in August 1967, approximately 43 survived until late May 1968, for an overwinter mortality rate of 52 percent. Fall hunting losses in 1967 (6 percent of resident adult females) and spring hunting losses in 1968 probably did not affect the validity of this estimate of hen mortality as much as in the case of males. If my suggestion is correct that the spring population would have been at least 117 pairs (instead of 105) had there been no spring hunting, the indicated loss of adult hens is 44 percent.

There were about 212 female chicks living at Eagle Creek in the fall of 1967. Fifty-seven yearling hens were on the area late in May 1968. The estimated mortality rate, therefore, was 73 percent. This was significantly above the loss of young females (59

percent) in 1966-67. Part of the increased mortality was due to spring hunting. Based on a hypothetical spring population of 117 cocks and about 112 females, the estimated overwinter loss would be 70 percent. The difference between the observed loss in 1966-67 and the hypothetical loss in 1967-68 (11 percent) indicates increased natural mortality this past year among first-year females.

As usual, little direct evidence of the magnitude of winter losses was obtained through intensive searches at Eagle Creek in 1968. Only 22 ptarmigan remains were found. Five were of birds killed in the fall of 1967, 10 were ptarmigan killed in winter, five were hens killed in spring by predators, 1 was a male struck by a car on April 3, and the last was a hen that died from digestive malfunction on June 27.

Banding Results

We caught 197 chicks, 51 males, and 75 females on the main study area in 1968. Field crews also banded 9 cocks, 48 hens, and 62 chicks outside the area but within eight miles of Eagle Summit.

Of the birds handled at Eagle Creek, 3 males and 12 females were carrying bands from past years. Two of the males were yearlings and one was five years old. Among hens, only one was a yearling. Three were two years old, four were three years of age, three were three years old or older, and one was four years old. In 1967 and 1968, females born in 1965 were recaptured more often than would have been expected. Survival of that cohort (hatched during the year of lowest spring densities) apparently has been good in all succeeding years.

The paucity of banded males among the recaptures is expected because of the high loss of resident cocks in fall and spring 1967-68. In many years 20 percent of the adult males we caught at Eagle Creek were already banded. In 1967 only 12 percent were banded, and in 1968 only 6 percent wore bands. The same trend occurred in adult females (29 percent previously banded in 1967, only 16 percent wearing old bands in 1968).

Body Weights

Males caught during banding work showed a continuous slow increase in body weights from a low mean of 407g early in June to 443g by July 10-19 (Table 3). Weights of cocks examined at a checking station indicate that males remained at approximately 435-440g through late August, rose slightly in early September and stabilized at 445-460g through early October. The weights of cocks throughout the summer and fall were similar to those of adult males examined in the previous two years.

Hens caught in 1968 were of the same weight as hens caught at the same time last year, from late May until late July. Recovery from the usual mid-summer low weight did not occur as rapidly among females in 1968 as it did in 1967, but by late September weights were similar in the two years.

Band Returns and Hunting Pressure

Hunters brought 66 banded rock ptarmigan to the checking station at mile 101 Steese Highway in 1968. Two of these had been banded and shot at Harrison Summit, eight miles east of Eagle Summit, and two had no data on where the birds were shot. All other birds were banded and shot on or close to the Eagle Creek study area. A complete list of bands returned in 1968 is in Appendix I.

Direct returns indicated that resident adult males sustained a 27 percent loss to hunters this fall, as 13 of 48 newly-banded cocks were reported killed. Last year only 17 percent of banded males were turned in by hunters in the fall. Females also were harvested more heavily in 1968 than in 1967; 16 percent of those newly banded on the study area (10 of 63) and 12 percent of those banded off the area (six of 48) were shot and reported, compared with 6 percent last year. Chicks, however, showed no increase in band returns. Only 14 of 197 (7.1 percent) banded at Eagle Creek and five of 62 (8.1 percent) banded off the study area were reported.

Hunters also returned bands from rock ptarmigan banded in past years: one from 1964, five from 1965, two from 1966, and eight from 1967. Seven of these had been banded as chicks, nine as adults. The oldest probably was a cock (#1260) at least two years old in 1965 and at least five years old when shot in 1968. This was one of only two males of the nine adults just mentioned. Again, this points up the consistently high loss of adult males due to hunting since 1966.

Twelve of 75 hens caught at Eagle Creek this year were carrying old bands, which indicates that about 16 of the total female population of 100 were carrying bands. Hunters shot seven, only one of which had been caught during the summer. This repeats the situation, reported last year, in which hunters killed a far higher proportion of previously banded hens allegedly living at Eagle Creek (in this case, 44 percent vs. 16 percent) than of newly-banded hens. Either the estimates of the number of banded hens living on the study area are in error, or hunters shot banded hens that did not nest on the area in 1968.

The rate of harvest of banded ptarmigan suggests that about 65 to 70 resident birds were shot out of an estimated 510 alive on the area in August, for an overall harvest of 13 percent. Far more ptarmigan were reported as harvested on the study area (278)

Table 3. Weight of Adult Rock Ptarmigan at Eagle Creek, 1968.

	Males		Females	
Period	Mean Wt.	(No.)	Mean Wt.	(No.)
May 20 - June 9	407 g.	(26)	457 g.	(17)
June 10 - 19	417 g.	(9)	407 g.	(18)
June 20 - 29	433 g.	(13)	377 g.	(23)
June 30 - July 9	441 g.	(22)	391 g.	(24)
July 10 - 19	443 g.	(3)	377 g.	(26)
July 20 - 29	420 g.	(1)	367 g.	(20)
July 30 - August 8	---	---	---	---
August 9 - 18*	434 g.	(26)	386 g.	(13)
August 19 - 28*	441 g.	(11)	392 g.	(6)
August 29 - September 7*	449 g.	(11)	394 g.	(12)
September 8 - 17*	458 g.	(17)	413 g.	(12)
September 18 - 27*	457 g.	(4)	418 g.	(11)
September 28 - October 7*	458 g.	(5)	422 g.	(9)
October 8 - 13*	464 g.	(4)	468 g.	(1)

* From August 9 to October 13 all weights refer to the weight of the whole bird less it's crop and crop contents. Before August 9 most birds were handled alive so that crop contents are included in the weights given. Crops contain about 5 grams of food, on the average, in June and July.

in 1968 which was probably due to the movement of ptarmigan onto and through the study area in September and October. Although hunters stay close to the highway, they are tapping ptarmigan production from a much bigger area. This may help explain why fall hunting has had little effect, so far, on the size of breeding populations recorded at Eagle Creek since 1960.

In last year's report I listed age ratios of rock ptarmigan shot on or near the Eagle Creek area. Data for 1968 are given below for comparison:

Period	Adults	Juveniles	Ratio
August 10-September 6	79	148	1.00 : 1.87
September 7 - 27	148	170	1.00 : 1.15
September 28-October 13	37	26	1.00 : 0.70
All	264	344	1.00 : 1.30

If our estimates of production were correct, the actual proportion of adults in the early August population was 1.00 to 1.66 young. If juveniles were more vulnerable than adults to hunting, as the 1968 harvest in August and early September suggests, the proportion of juveniles could have been reduced by mid-September. This, coupled with increased calling and displaying by adults in September, could have resulted in relatively more adults being taken in the period September 7-27 than earlier. I cannot explain why so few juveniles were shot late in the season. This change did not occur in 1967. Small sample sizes coupled with sorting of sexes and ages in the ptarmigan population could be partly responsible. One hunter, for example, shot 12 ptarmigan on October 13, all of which were males, but only two were juveniles. In the total known harvest for the latter period there were 24 adult males, 15 juvenile males, 13 adult females, and 11 juvenile females.

Over the season as a whole, hunters shot almost equal numbers of males (313 known) and females (301 known). Among adults, 55.4 percent were males; among juveniles, 46.1 percent were males.

Literature cited

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APPENDIX I

Bands Returned by Hunters, August 10 to November 10, 1968.

Band No.	Year Banded	Age When Banded	Sex	Age When Shot
1920	1968	Adult (1)	M	1
1924	1968	Adult (1)	M	1
1927	1968	Adult (1)	F	1
1928	1968	Adult (1)	M	1
1932	1968	Adult (1)	F	1
1935	1968	Adult (1)	M	1
1954	1968	Adult (1)	M	1
1955	1968	Adult (1)	M	1
1957 (willow ptarmigan)	1968	Adult (1)	M	1
1959	1968	Adult (1)	M	1
1963	1968	Adult (1)	F	1
1965	1968	Adult (1)	M	1
1966	1968	Adult (1)	F	1
1967	1968	Adult (2+)	F	2+
1974	1968	Adult (1)	M	1
1980	1968	Adult (1)	M	1
1981	1968	Adult (1)	M	1
1987	1968	Adult (1)	F	1
1990	1968	Adult (1)	M	1
1998	1968	Adult (1)	M	1
2015	1968	Adult (2+)	F	2+
2027	1968	Juvenile	M	Juvenile
2038	1968	Juvenile	?	Juvenile
2107	1968	Juvenile	F	Juvenile

Band No.	Year Banded	Age When Banded	Sex	Age When Banded
2109	1968	Juvenile	?	Juvenile
2110	1968	Juvenile	?	Juvenile
2128	1968	Juvenile	M	Juvenile
2137	1968	Juvenile	?	Juvenile
2139	1968	Juvenile	F	Juvenile
2157	1968	Juvenile	F	Juvenile
2174	1968	Adult (1)	F	1
2185	1968	Juvenile	F	Juvenile
2186	1968	Juvenile	F	Juvenile
2189	1968	Juvenile	F	Juvenile
2250	1968	Adult (2+)	F	2+
2252	1968	Juvenile	M	Juvenile
2254	1968	Juvenile	?	Juvenile
2266	1968	Juvenile	M	Juvenile
1748	1968	Adult (1)	F	1
1758	1968	Adult (1)	F	1
1766	1968	Adult (1)	F	1
1770	1968	Adult (2+)	F	2+
1783	1968	Adult (1)	F	1
1785	1968	Adult (2+)	F	2+
125 (wing tag)	1968	Juvenile	F	Juvenile
144 (wing tag)	1968	Juvenile	M	Juvenile
147 (wing tag)	1968	Juvenile	M	Juvenile
148 (wing tag)	1968	Juvenile	M	Juvenile
1547	1967	Adult (1)	F	2
1604	1967	Adult (1)	F	2
1627	1967	Adult (1)	F	2

Band No.	Year Banded	Age When Banded	Sex	Age When Shot
1631	1967	Adult (1)	F	2
1658	1967	Adult (1)	F	2
1659	1967	Juvenile	M	1
1888	1967	Adult (2+)	F	3+
38 (wing tag)	1967	Juvenile	M	1
1446	1966	Adult (1)	F	3
1483	1966	Juvenile	?	2
1260	1965	Adult (2+)	M	5+
1274	1965	Juvenile	?	3
1318	1965	Juvenile	M	3
1331	1965	Juvenile	F	3
1363	1965	Adult (1+)	M	4+
1117	1964	Juvenile	F	4
1749	1968	Adult (1)	M	1
1750	1968	Adult (1)	F	1
1784	1968	Adult (2+)	M	2+

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Joseph Gruska
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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3, W-17-1 TITLE: Small Game, Waterfowl, & Furbearer Investigations

WORK PLAN: B TITLE: Upland Game

JOB NO: 6 TITLE: Inventory of Accessible Small Game Hunting Sites

PERILD COVERED: January 1, 1968 to December 31, 1968

ABSTRACT

Forty-six small game hunting sites were visited during August and September 1968 on the Kenai Peninsula. There is considerable interest in grouse and ptarmigan hunting on the Kenai, and Department personnel often receive inquiries concerning good locations. Most spruce grouse hunting is presently done along the roads from mid-September through November; ptarmigan hunting occurs later when the birds are at lower elevations and snow machines can be used. A guide booklet with many hunting sites described is needed; if properly written, it could result in better utilization of the resource and help prevent overuse of certain areas. This report contains brief descriptions and plotted access routes for the sites visited.

WORK PLAN SEGMENT REPORT
FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 W-17-1 TITLE: Small Game, Waterfowl, & Furbearer Investigations

WORK PLAN: B TITLE: Upland Game

JOB NO: 6 TITLE: Inventory of Accessible Small Game Hunting Sites

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

To catalog known small game hunting sites in the Cook Inlet region and to locate new sites in this region that would be accessible to hunters.

To prepare a small game hunting guide for the Cook Inlet region.

TECHNIQUES

The location of hunting sites was accomplished during the hunting season in order to get a true ides of conditions as they exist at that time of year. Trails maintained by the U.S. Forest Service, U.S. Fish and Wildlife Service, and other types of public access leading to grouse and ptarmigan hunting areas were also listed. The following information was recorded for each site: lication, size and extent, terrain, vegetation, small game species available, season to hunt, road conditions during hunting season, parking facilities, trail length, best means of travel on trail, time required to walk in, suitability of area for camping, availability of cabins, distance to commercial accomodations, and miscellaneous recreational opportunities (photography, fishing, berry picking, etc.). Note was made only as to the presence of grouse and/or ptarmigan, and no effort was made to designate some areas as better hunting sites than others. Whenever possible, I visited with people encountered in the field to determine how, when, and where most small game hunting is done on the Peninsula.

FINDINGS

The Kenai Peninsula offers excellent hunting for spruce grouse and three species of ptarmigan, but a dense brush understory makes many places inaccessible if no trail is present. There seems to be considerable interest in small game hunting by local as well as Anchorage residents, and I received frequent inquiries as to good

hunting locations. Most of the spruce grouse hunting is done along the roads during mid-September through November, a time when birds come to the roads for grit. Very little ptarmigan hunting is done until later in the fall when the birds move down into areas closer to the roads and snow accumulation allows snow machine access into more remote locations.

Spruce grouse can be successfully hunted by walking through proper habitat, while early season ptarmigan hunting requires more effort. However, there are numerous areas containing ptarmigan less than two hours walk from a road. In most cases, trails leading into ptarmigan habitat pass through spruce forests at lower elevations, offering hunters both grouse and ptarmigan on a single outing.

Each year our offices get numerous calls from hunters requesting where and how to hunt. Many of these calls are from non-residents or short-term residents who are unfamiliar with the country and habits of small game species. Aside from just describing a place to hunt, here is our chance to point out the total-experience concept of small game hunting. The guide booklet should be oriented toward this concept and include locations of hunting areas, habitats and habits of small game species, use of dogs, and other recreational opportunities available.

The possibility of overadvertising certain areas must be considered. I do not feel that under the present conditions the game species would be depleted even if a considerable increase in hunting pressure occurred at specific locations. Large expanses of inaccessible, unhunted land seem ample to replenish nearby areas that receive heavy pressure. The danger of overadvertising lies in producing undesirable concentration of hunters which would decrease the quality of a hunt. By describing many locations and not designating some as better than others, I think the chance of overadvertising specific areas is greatly reduced.

To date 46 areas have been described which offer spruce grouse and/or ptarmigan hunting. This information will be made available to the public before the 1969 hunting season. After the survey of the Cook Inlet area has been completed, a higher quality booklet will be prepared for the entire region.

Much land along the roads near Soldotna, Kenai, and Homer is privately owned, and no sites were described in these locations. The guide booklet will treat these areas very generally and urge hunters interested in such locations to get permission from land owners prior to hunting.

The remainder of this report consists of brief descriptions of hunting sites with locations plotted on maps. Figure 1 serves as a key to locate areas covered by more detailed 0.25-inch-to-the-mile

maps (Figs. 2-5). Site numbers in the written descriptions correspond to numbered locations on Figs. 2-5, and the figure on which each site occurs is given in the description. The highway starting at Seward (Mile 0), passing through Soldotna (Mile 95), and ending at Homer (Mile 174) is referred to as the Sterling Highway. The highway between Anchorage (Mile 128) and the junction at Mile 38 on the Sterling Highway is referred to as the Anchorage Highway. The initials SG and P indicate the site is a spruce grouse or ptarmigan hunting area, respectively.

Site No.

1. South Fork Campbell Creek and Indian Creek Trail.

   Travel south out of Anchorage on Anchorage Highway to O'Malley Road, about 3.5 miles south of Highway junction with International Airport Road. Turn east onto O'Malley Road and go about 4.0 miles. Turn right onto Hillside Drive for 1 mile, and then left onto Upper Huffman Road. It is about 1 mile to South Fork Campbell Creek valley where a trail starts and continues 9.5 miles to intersect with the Indian Creek Road. Parking along roadside.

   P. Fig. 2.

2. Bird Creek Trail.

   Exact description not yet available.

   SG. Fig. 2.

3. Crow Creek Trail to Crow Pass.

   Turn to north off Anchorage Highway at Girdwood (Mile 91); follow this road for 2 miles; turn left and continue 7.5 miles to marked start of Crow Creek Trail. Parking space near start; marked trail for about 3 miles to Raven Glacier.

   P. Fig. 2.

4. Turnagain Pass.

   Area in vicinity of Mile 67.0 Anchorage Highway. Several pull-offs for parking.

   P. Fig. 3.

5. Bench Creek - Johnson Creek Trail.

   Trail starts as road south side of Anchorage Highway at Mile 63.8. Parking at gravel pit after turn-off, or

drive in, keeping right, and ford Six-mile Creek. Parking on south side Six-mile Creek. To avoid fording creek walk in over old road starting on south side Anchorage Highway at Mile 60.7 (see site 38). Parking in this area on north side of road. Marked trail leads 15 miles to railroad track 6 miles from Moose Pass.

SG, P. Fig. 3.

6. Lynx Creek Trail.

Takes off south side of Bench Creek Trail shortly after it passes the Watkins Cabin. For access from Anchorage Highway see old Silver-tip Road (site 7) or Bench Creek Trail (site 5) locations. Trail leads 1.5 miles up creek.

SG, P. Fig. 3.

7. Old Road - Near Silver Tip.

Starts on south side Anchorage Highway at Mile 60.7 and leads 3 miles to Lynx Creek and connects with Bench Creek Trail. Parking at gravel pit north side of Highway.

Rabbits, SG, possibly P. Fig. 3.

8. Trail to Wible Mine.

Trail starts as a road southwest of Anchorage Highway at Mile 56.9. Parking on north side of road at about Mile 57.3. Trail leads through spruce forest for 2.25 miles.

SG, P. Fig. 3.

9. Palmer Creek Road and Swetmann Mine.

Palmer Creek Road leads south from Hope Road 0.7 miles east of Hope. Swetmann Mine about Mile 12 on Palmer Creek Road.

SG, P. Fig. 3.

10. Porcupine Creek northwest of Hope.

About .75 miles northwest of Hope at Porcupine Creek campground. Trail starts at road on north side of Porcupine Creek in the campground and continues for 2 miles up the mountainside.

P. Fig. 2.

11.

West side Anchorage Highway at Mile 50.6. Parking east side of road Mile 50.6. This gives access to powerline cut less than 0.5 miles away and paralling the highway for several miles in both directions.

SG, P. Fig. 3.

12. Fresno Creek Trail.

Starts as road on west side of Anchorage Highway at Mile 47.4 and leads for 3 miles to Shell mine. Parking on east side of highway.

P. Fig. 3.

13. Colorado Creek Trail.

Starts on west side of Anchorage Highway at Mile 45.7 and leads for 2.5 miles to sub-alpine. Parking on pull-off north of creek on west side of road.

SG, P. Fig. 3.

14. Summit Creek Trail to Oracle Mine.

Road to west off Anchorage Highway at Mile 43.7. Could possibly drive the 1.3 miles to mine. From mine trail leads on 4.5 miles into alpine. Parking near turn-off or at mine.

SG, P. Fig. 3.

15. Daves Road.

This 2.5 mile extension of Daves Road is now impassible except on foot. Park at pull-off to south of Sterling Highway at Mile 39.5 or Tern Lake campground near junction of Sterling and Seward-Anchorage Highways.

SG, Rabbits. Fig. 3.

16. Crescent Creek Trail to Crescent Lake.

Turn south off Sterling Highway at Mile 45.8. Travel 0.6 miles past Crescent Creek campground. Park along road. Trail starts on east side of road and continues about 6.0 miles to Crescent Lake.

SG, P. Fig. 3.

17. Devils Creek Portion of Resurrection Trail System.

Start west of Anchorage Highway at Mile 39.5. Well marked and maintained with parking area at start. Start to Devils Pass 10 miles.

SG, P. Fig. 3.

18. Resurrection Trail from Devils Pass to Hope.

Trail starts near Hope and continues for 20 miles to Devils Pass. Signs at Hope to direct users. Parking along road at start.

SG, P. Fig. 2 and 3.

19. Devils Pass to Juneau Lake - Resurrection System.

Continuation of Devils Creek Trail; 6.6 miles to Forest Service cabin at Juneau Lake. Turn off to Swan Lake cabin 3.3 miles south of Devils Pass.

SG, P. Fig. 3.

20. Juneau Creek portion of Resurrection System.

Starts near Cooper Landing Mile 47.4 Sterling Highway and continues 8.7 miles to Juneau Lake. Signs direct users to start of trail where parking space is available.

SG. Fig. 3.

21. Stetson Creek and Cooper Creek Trails.

Trail starts in Cooper Creek campground south side of Sterling Highway at Mile 50.7. Stetson Creek Trail leads 5.5 miles up the creek; 3.5 miles in the Cooper Creek Trail branches off and continues 1.75 miles on to Cooper Lake. Parking in campground.

SG, P. Fig. 3 and 4.

22. Cooper Lake Trail - Cooper Lake to Upper Russian Lake.

This 8 mile trail starts south side Snug Harbor Road at Mile 11.25. Parking along road.

SG. Fig. 4.

23. Russian River Trail.

Road to south of Sterling Highway at Mile 52.5. Parking along this pull-off road. Start to Upper Russian Lake 13 miles.

SG. Fig. 3 and 4.

24. Fuller Lake Trail.

Mile 57.2 Sterling Highway. Park at gravel pit north of highway. Trail starts in back of gravel pit; 2.5 miles to upper lake.

SG, P. Fig. 5.

25. Pipe Line and Pipe Line Road.

Pipe line accessible by road intersecting north side Sterling Highway at Mile 63.6. Road can be driven for 7 miles to where a marsh prevents two-wheel drive vehicles from going farther. Easy 1.5 hour walk on to pipeline which continues northeast for about 25 miles to Chickaloon Flats.

SG. Fig. 2, 3 and 5.

26. Surprise Creek Trail.

Skilak Lake Road 0.3 miles from junction with Sterling Highway at Mile 58. Parking in Fish and Wildlife Service picnic area on left. Cross Kenai River to find start of trail. 4.5 miles to divide between Russian and Bear Mountains.

SG, P. Fig. 5.

27. Skilak Lake Trail.

South side Skilak Lake Road about 4.5 miles from its junction with Sterling Highway at Mile 58. Park at pull-off north side road. Trail marked. About 1 mile to lake.

SG. Fig 5.

28. Seven Lakes Trail.

Engineer Lake campground on Skilak Lake Road 9 miles from its junction with Sterling Highway at Mile 58. Parking in campground; 5 miles from Engineer Lake to Pederson Lake campground.

SG. Fig. 5.

29. Hidden Lake, Bear Mt., and Skilak Lake Lookout Trails.

Starting at about 5 to 5.7 miles on Skilak Lake Road - from east junction with Sterling Highway at Mile 58. These short trails start on road and are well marked.

SG. Fig. 5.

30. Funny River Horse Trail.

Funny River Road starts east side of Sterling Highway at Mile 96.2. This 9 mile trail starts at south side Mile 6.9 Funny River Road. Park in pull-off near start of trail.

SG. Fig. 5.

31. Carter and Crescent Lake Trail.

Starts as pull-off of Sterling Highway on south side at Mile 33. Park at pull-off and follow road (trail) to left for 3 miles to east end of Crescent Lake.

SG, P. Fig. 3.

32. Solar's Sawmill and Grant Lake Trail.

Park near railroad yard at Moose Pass, Mile 30 Sterling Highway. Trail leads south from railroad track at northeast end of bridge across Upper Trail Lake. Start to sawmill 2.5 miles, start to Case Mine 3 miles.

SG, P. Fig. 3.

33. Crown Point Mine Trail.

Turn east off Sterling Highway at Mile 25.2, cross railroad tracks and park in area by fork of road. Right fork leads 3 miles to Crown Point Mine.

SG, P. Fig. 4.

34. Falls Creek Trail.

Mile 24.2 Sterling Highway. Turn off highway to east and park after crossing railriad tracks; 3 miles to Falls Creek mine above timber line.

SG, P. Fig. 4.

35. Ptarmigan Lake Trail.

Trail starts along Ptarmigan Creek in the Ptarmigan Creek campground Mile 23.3 Sterling Highway; 6.5 miles to upper end Ptarmigan Lake.

SG. Fig. 4.

36. Victor Creek Trail.

Trail starts on north side of creek on east side of Sterling Highway at Mile 19.7. Trail leads about 1 mile up Victor Creek. Park on pull-off at south end of bridge.

SG, P. Fig. 4.

37. Grayling Lake Trail.

Trail starts at pull-off on west side of Sterling Highway at Mile 13.3 and continues 1.25 miles to lake. Parking in pull-off.

SG. Fig. 4.

38. Divide Ski Area.

West of road at Mile 11.5 Sterling Highway. Park on pull-off on east side of highway.

SG. Fig. 4.

39. Lost Lake Trail.

Mile 5.1 Sterling Highway. Parking at gravel pit west side of highway. Trail starts about 0.2 miles west of gravel pit; 6 miles start to Lost Lake.

SG, P. Fig. 4.

40. Marathon Mountain Trail.

Start is marked by a sign near Seward Hospital, also can start at small gravel pit 300 yards up Lowell Creek Canyon Road. About 1.5 miles to alpine valleys below peak of Marathon Mountain.

P. Fig. 4.

41. Rabbit Lake Trail.

Travel south on Anchorage Highway about 10 miles and turn left onto DeArmound Road. At intersection with Rabbit Creek Road go straight for about 5 miles. Last 4 miles is jeep road. Park along roadside and hunt the valley for 2 miles to Rabbit Lake.

P. Fig. 2.

42. Swanson River and Swan Lake Roads.

Swanson River Road north off Sterling Highway at Mile 84.6. Swan Lake Road to right off Swanson River Road at about Mile 17.

SG. Fig. 5.

43. Sunken Island Lake Road.

Swanson River Road leads north from Mile 84.6 Sterling Highway. Sunken Island Lake Road leads west off Swanson River Road at about Mile 4.25 and continues about 3 miles to Sunken Island Lake. Parking at end of road.

SG. Fig. 5.

44. Finger Lakes Road.

Leads west off Mile 9.5 on Swanson River Road, continues for about 2.5 miles. Parking at pull-off at start.

SG. Fig. 5.

45. Road East out Ninilchik.

Turn east at Ninilchik Highway Department Station, Mile 135 Sterling Highway. Travel 0.4 miles and turn left.

SG. Not shown in Figs.

46. Tustumena Lake Road.

This new road starts on southwest side of Sterling Highway about 2.0 miles south of Kasilof River bridge. About 6.0 miles to new campground at Tustumena Lake.

SG. Not shown in Figs.

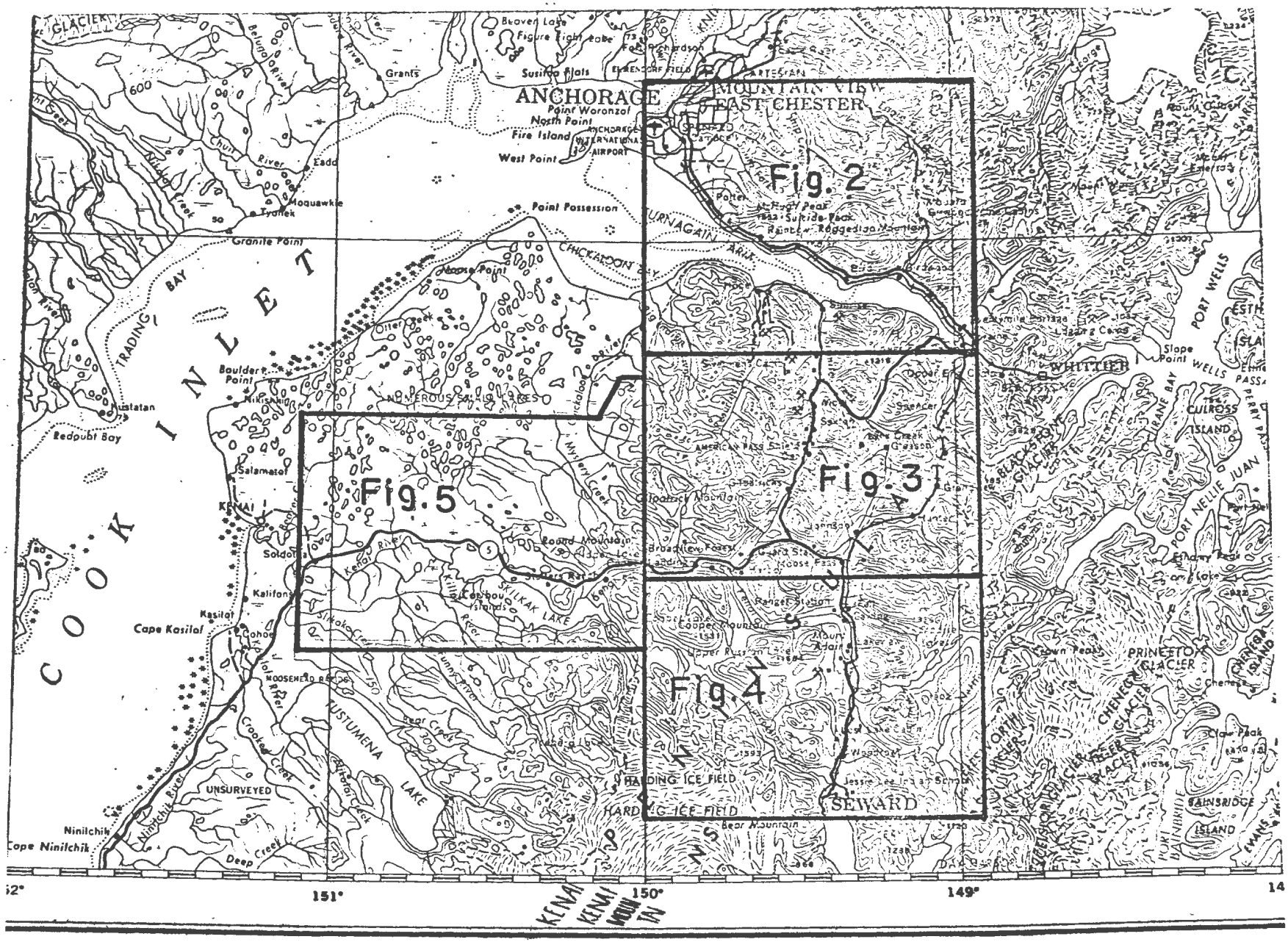


Figure 1. Index map showing areas covered by Figs. 2-5.

ANCHORAGE
SPENARD
Homesite Park
Ship Creek
SKI BOWL ROAD
RESERVATION
Temptation Peak
Wolverine Peak
Campbell Creek Canyon
Mount Williwaw
Flattop Mtn
Indian Creek Pass
Bird Creek Pass
Organ Mtn
Moraine Pass
Camp Robber Peak
Summit Mtn
Goat Mtn
Mount Yukla
Eagle River
Eagle Glacier
Eagle Lake
South Fork
North Fork
SEWARD MERIDIAN
Turnagain
Potter
McHugh Peak
Suicide Peaks
Indianhouse Mtn
Raggedtop Mountain
Bird Peak
Bird Glacier
Rainbow
Bird
Girdwood
INDEFINITE
TURNAGAIN ARM
GREATER ANCHORAGE AREA BOROUGH
KENAI PENINSULA BOROUGH
SEWARD HIGHWAY
THE ALASKA RAILROAD
CHICKALOON BAY
Gull Rock
Windy Pt
Hope
Sunrise
Snipers Point
APPROX BDY
Mud
CHUGACH

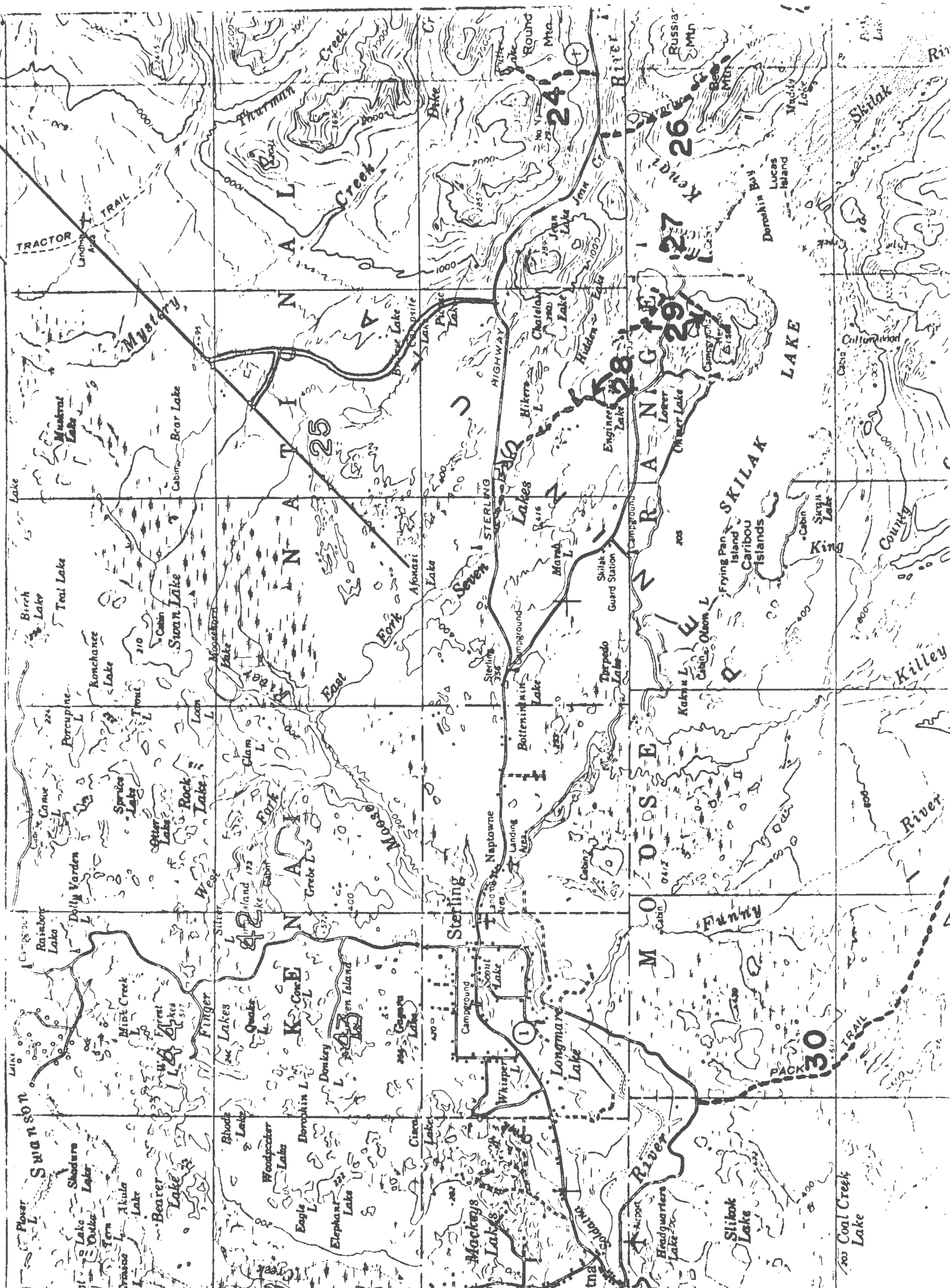
Figure 2.


Swetmann Camp
Silvertip
Granite Cr Guard Sta
Saxton
Glacier Ski Lodge
Gilpatrick Mtn
Snoring Inn
Grandview
Broadview Guard Sta
Round Mountain
Hentons Lodge
Kenai
Cooper Landing
Gwins Lodge
Moose Pass
Johnson Trail
Placer River
Spencer Glacier
Bartlett Glacier
Lake
K E N A I P E N

Figure 3.


KENAI
LAKE
SEWARD
Cooper Lake
Paradise Creek
Godwin Glacier
Sleeping Sister
Lowell Cr
Ellsworth
SEWARD ANCHORAGE HY
NATIONAL FOREST BOUNDARY (APPROXIMATE)
APPROXIMATE BOUNDARY
Snow
Primrose
Lakeview
Lawing
Marathon
Army Dock
Oil Tanks
City Dock

Figure 4.



SKILAK LAKE
Sterling
Soldotna
Longmare Lake
Swanson
Mystery Creek
Seven Lakes
Swan Lake
Killey River
Funny River
Kenai River
Tractor Trail
Pack Trail
Sterling Highway
Skilak Guard Station
Caribou Islands
Frying Pan Island
Mackeys Lakes
Headquarters Lake
Slikok Lake
Coal Creek Lake
Russian Mtn
Bear Mtn
Round Mtn
24
25
26
27
28
29
30

Figure 5

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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 & W-17-1 TITLE: Small Game, Waterfowl, & Furbearer Investigations

STUDY PLAN: B TITLE: Upland Game

JOB NO: 7 TITLE: Growth and Survival of Ptarmigan Chicks

PERIOD COVERED: January 1, 1968 to December 31, 1968

ABSTRACT

Hatchability of eggs was higher in the aviary (93 percent) than in the wild (86 percent) in 1968. Survival was also better in the aviary (84 percent to the end of August) than in the field (74 percent to early August). Chicks in the aviary appeared more aggressive this year than last. No strong differences in growth were noticed this season in comparison with 1967 either in the aviary or on the Eagle Summit study area.

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

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STUDY PLAN: B TITLE: Upland Game

JOB NO: 7 TITLE: Growth and Survival of Ptarmigan Chicks

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

To determine whether the vigor, growth rate, behavior, or survival rate of young ptarmigan differ in stable, rising, and declining populations.

To see if differences among chicks are related to their immediate environment or the condition or genotype of their parental stock.

TECHNIQUES

This is a cooperative study by the Alaska Department of Fish and Game, the University of British Columbia, and the University of Alaska. The University of British Columbia provides the principal researcher, a student who will use the data for a doctoral thesis. UBC also provides one field assistant and support funds. The University of Alaska (Laboratory of Zoophysiology) provides aviary space; some aviary equipment and care, and technical supervision. The Alaska Department of Fish and Game funds an aviary assistant and a field assistant, helps obtain eggs for the aviary, supplies background population and other field data, and provides technical advice.

Eggs were brought in from areas around the Eagle Creek study area in 1968 and incubated in an aviary at the University of Alaska. The chicks that hatched were kept in cages both indoors and outdoors; the indoor birds were in family (brood) units. Standard artificial foods were given. Frequent measurements were made of behavioral characteristics, weight, feather growth, and body size. Dead chicks were preserved for detailed autopsy, and survival curves were plotted.

Field studies consisted of trapping, marking, measuring, and counting chicks in the wild. Growth rates and survival rates were

determined. Early in the summer most of the effort went into finding nests to get eggs for the aviary. Some nests were found after hens were radioed. Telemetric studies were done on two broods in mid-summer to determine brooding behavior and movements. Specimens were obtained from a checking station in autumn to determine physical characteristics of juveniles just before movement to wintering areas.

RESULTS

Aviary

Ninety-three percent of the eggs in 13 clutches hatched after being brought into the aviary. Survival to the end of August was 84 percent. Both hatchability and chick survival were better in the aviary in 1968 than in 1967, and better indoors than in the wild in 1968. (Data at Eagle Creek showed a hatchability of 86 percent and survival of 74 percent to early August in 1968).

Aviary chicks seemed to be more aggressive this year than in 1967, although quantitative scores from standard tests are not yet compiled. Individual chicks showed great variation in growth rate; again, final data plots are not available as yet.

Field Studies

Telemetric studies of two broods showed that female rock ptarmigan do brood longer and more often in rainy or cold weather. Chicks were brooded so long in bad weather, in fact, that feeding time was seriously (?) restricted. The two radioed broods generally stayed within 100 yards of their nest until mid-July when many of the ptarmigan in the Eagle Summit area, including the telemetered broods, began to move about.

Behavioral studies, other than those mentioned above, were no more successful in the field this year than in 1967. UBC observers did note, however, that half as many of the chicks in a brood flew when disturbed in 1968 than the previous year. The meaning of this is unclear.

Field chicks were slightly larger (length of feet and wings) than in 1967, but the differences were not statistically significant. Body weights were the same in the two years for chicks of similar age.

Current plans are to conduct the study in the same fashion in 1969 for the third and final year.

PREPARED AND SUBMITTED BY:

Robert B. Weeden
Study Leader

APPROVED BY:

Director, Division of Game

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 & W-17-1 TITLE: Small Game, Waterfowl, & Furbearer Investigations

STUDY PLAN: B TITLE: Upland Game

JOB NO: 8 TITLE: Exploitability of Small Game Populations

PERIOD COVERED: January 1, 1968 to December 31, 1968

ABSTRACT

Between May 1967 and May 1968 spring breeding stocks rose 58 percent on the Golddust Creek unhunted area and 74 percent on the Ptarmigan Creek area, from which 136 ptarmigan had been removed in the fall of 1967. Two hundred ptarmigan, or about 40 percent of the calculated August population, were shot or trapped from the same experimental area in August and September 1968.

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

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STUDY PLAN: B TITLE: Upland Game

JOB NO: 8 TITLE: Exploitability of Small Game Populations

PERIOD COVERED: January 1, 1968 to December 31, 1968

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 current study under Job B-8 involves an assessment of what happens to spring breeding stocks of rock ptarmigan when about 40 percent of fall populations on the same area are removed. Spring counts have been or will be done in 1967, 1968, 1969 and 1970 on two areas, each four or five square miles in extent. Fall removals were done on one of these areas in 1967 and 1968 and will be done on the same area in 1969.

The spring counts on the removal area (Ptarmigan Creek) and the control area (Golddust Creek) were described in the report for Job B-2. Populations rose 58 percent on the control plot and 74 percent in the other area. The removal of 136 rock ptarmigan in August and early September 1967 from Ptarmigan Creek certainly did not depress ptarmigan numbers, although one could argue that the increase from 1967 to 1968 might have been even greater had these birds not been shot.

The following demographic estimates of production at Ptarmigan Creek (based on data from studies at Eagle Creek) were used to calculate numbers to be removed in 1968:

1. Number of hens nesting = 99

2. Number of hens hatching eggs = 62

3. Chicks per brood in August = 4.8

4. Total chicks on area in August = 298

5. Total adults on area in August = 178

According to these data, we needed to remove 129 chicks, 36 adult cocks, and 36 adult hens, for a total of 201 ptarmigan.

Birds were removed as follows:

1. Adult cocks shot in July = 14

2. Adult hens shot in July = 3

3. Adult hens trapped and shipped to San Francisco Zoo = 4

4. Harvest by Bureau of Land Management and other hunters = 37 (unknown sex and age)

5. Shot August 27 = 4 adult females, 7 adult males, 44 chicks (19 males, 25 females). One crippled.

6. Shot September 4, 5 = 22 adult females, 10 adult males, 51 chicks (24 males, 27 females). Three cripples.

The total number removed (200) was the number desired, but the actual composition of birds removed is unknown because the birds taken by BLM and other hunters were not examined.

Data from banded birds at Eagle Creek leave little doubt that many of the ptarmigan shot at Ptarmigan Creek early in the fall were not residents of that area during the previous summer. Thus, we are removing a number equivalent to 40 percent of the estimated resident population, but not 40 percent of the residents. At Eagle Creek hunters shot 19 banded and 42 unbanded adult rock ptarmigan between August 10 and September 7. Since only 68 percent of the resident adults were banded in 1968, 28 of the 61 birds shot probably were residents, or 46 percent of the total. Thus we can guess that at least half of the adults, and perhaps the same proportion of chicks, shot at Ptarmigan Creek were birds that had come onto the area from other breeding grounds.

The slight preponderance of females among juveniles collected August 27 and September 4, 5 echoes the larger percentage of females (54 percent) among juveniles shot by hunters along the upper Steese highway. This probably stems from a behavioral difference among chicks; the females tend to be last to fly or run away when approached.

PREPARED AND SUBMITTED BY:

Robert B. Weeden
Study Leader

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Director, Division of Game

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 & W-17-1 TITLE: Small Game, Waterfowl, & Furbearer Investigations

WORK PLAN: B TITLE: Upland Game

JOB NO: 10 TITLE: Biology of Ruffed Grouse In Interior Alaska

PERIOD COVERED: January 1, 1968 to December 31, 1968

ABSTRACT

Information on food and roosting habits of ruffed grouse was collected from December through April 1967-68. Grouse tend to use the insulative qualities of snow for roosting during the cold winter months when soft snow is available, but during warmer spring months, they roost on top of the snow, using conifers for cover. Dropping analysis showed aspen buds and twigs to be the most important winter food, with rose hips, Equisetum shoots, and persistent berries from the previous year becoming common in April. Evidence from Minto, Alaska, suggests that severe icing on vegetation and snow surface cause some starvation among ruffed grouse. Attempts to census grouse were largely unsuccessful during 1967-68.

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 & W-17-1 TITLE: Small Game, Waterfowl, & Furbearer Investigations

WORK PLAN: B TITLE: Upland Game

JOB NO: 10 TITLE: Biology of Ruffed Grouse In Interior Alaska

PERIOD COVERED: January 1, 1968 to December 31, 1968

OBJECTIVES

To develop techniques for observing, capturing, marking, and counting or censusing ruffed grouse.

To gather information on winter habits of ruffed grouse.

To discover seasonal changes in preferred habits of ruffed grouse.

To record breeding schedule, clutch size, mortality, and other aspects of the biology of ruffed grouse in summer.

TECHNIQUES

Data on winter roosting and food habits of ruffed grouse were collected by searching aspen and birch forests in the vicinity of Fairbanks as part of the reconnaissance work for studies of this species. From December through April, physical and biological information was recorded for 82 roosts, and a sample of five droppings from each was collected for food studies. Droppings collected at drumming logs supplies some food habit information for May. Large samples of crops would be difficult to obtain, and droppings show the general trends in diet suitable for this preliminary work. In the laboratory droppings were thawed, moistened under the tap, gently broken apart, and studies under a dissecting microscope to reveal the contents.

A census technique based on the number of grouse tracks encountered along and to 30 feet on either side of established lines was attempted. Lines were arranged in parallel pairs 0.5 miles apart so that the observer could count along one line, move over to the other, and count on the return.

Roadside drumming counts were tried during early May in the Fairbanks area using four-minute stops at mile and half-mile intervals.

FINDINGS

Habitat

Ruffed grouse in Interior Alaska occur in both aspen and birch stands, however, my observations suggest that the aspen type is preferred, at least in winter. No attempt has been made to determine habitat preferences during other seasons. Aspen woodlands in the Interior are restricted to the south and west aspects of well-drained slopes. Working in Interior Alaska, Gregory and Haack (1965) noted both birch and aspen as short-lived pioneer upland species that invade burned-over areas and quickly form even-aged stands. In the Fairbanks area most hills are less than 2,000 feet in elevation, and on the ridges the aspen forest type is abruptly replaced by a spruce-burch type. The latter type dominates the cooler, moist north and east-facing slopes. While ruffed grouse occur in this type, particularly in young, birch-dominated stands, fewer birds were found here than in aspen woodlands. Black spruce (Picea mariana) is most common on slopes or flats where permafrost or peaty soil produces extremely cool, moist soil conditions (Weeden, personal communication), and in areas where spruce is the dominant overstory species, ruffed grouse are not present. Consequently, ruffed grouse range is discontinuous, and a limited amount of sympatry exists with spruce and sharp-tailed grouse at the edges of different habitat types.

The aspen type consists of an overstory of quaking aspen (Populus tremuloides) 2-6 inches DBH (diameter at breast height); isolated groups of balsam poplar (Populus tacamahacca) occur in moist pockets. The woody understory consists of alder (Alnus crispa), birch (Betula papyrifera), willow (Salix sp.), high-bush cranberry (Viburnum edule), rose (Rosa acicularis), soapberry (Shepherdia canadensis), and white spruce. No work has been done when snow was absent, so the following list of ground cover species is from Lutz (1956) plus some personal observation. Species occurring most commonly are: bearberry (Arctostaphylos uva-ursi), low-bush cranberry (Vaccinium vitis - idaea), yarrow (Achillea borealis), fireweed (Epilobium angustifolium), horsetail (Equisetum scirpoides), twinflower (Linnaea borealis), and tall lungwort or mountain bluebell (Mertensia paniculata). Species occurring occasionally are: alpine bearberry (Arctostaphylos alpina), crowberry (Empetrum nigrum), Labrador tea (Ledum decumbens), raspberry (Rubus Strigosus), blueberry (Vaccinium uliginosum), arctic lupine (Lupinus arcticus), and wintergreen (Pyrola secunda).

Winter Mortality

In late December an area of undetermined extent, but including Fairbanks and Minto, 40 miles to the west, received rain resulting in an ice coating on all exposed vegetation. Late in January residents of Minto reported finding at least ten dead ruffed and sharp-tailed grouse along trails near the village. However, I found no evidence of such mortality in the Fairbanks area at that time. Local climatological data from the U.S. Weather Bureau suggested glaxing conditions were more severe in the Minto vicinity than at Fairbanks. Two ruffed grouse found dead at Minto were sent to the Department for examination; they showed no parasitic or pathological symptoms but were 38 percent lighter than six ruffed grouse of the same sex shot in December 1967 near Fairbanks.

It was concluded that the cause of death was starvation but that exposure, resulting from a thick crust preventing normal snow roosting, contributed significantly to the poor condition and eventual death. Apparently, conditions at Minto exceeded the limit of tolerability, whereas less severe conditions near Fairbanks produced little or no mortality. With this incident in mind, a closer record of food and roosting habits of ruffed grouse was kept throughout the winter. While samples are small at present, a summary of findings which show general trends and serve as a basis for future studies are presented in this report.

Roosting

Three types of roosts were used during the period when snow covered the ground. The "burrow" roost offers most protection from the elements in that the bird digs into the snow in such a way that only the head remains exposed. "Form" roosts result when the bird crouches in soft snow leaving the head, neck, and back exposed. Sometimes birds roosted on top of the snow, under a spruce tree, or occasionally on a branch a few inches above the snow surface.

Table I shows the preference for burrow and form roosts during the colder months; roosting above the snow became more common as spring approached. In April, daily temperature fluctuations result in surface crusting which probably accounts for the shift from sub-nivean roosting; during march and April spruce became more important as shelter. Only three of twenty-seven December roosts were within ten yards of a spruce. In March ten of thirteen roosts, and all the roosts located in April were less than ten yards from spruce cover. During the colder months "burrow", and to a lesser extent "form" roosts were most commonly found in open aspen woodlands with no overhead cover other than that of high overstory trees. However, as roosting on top of the snow became

more common, there was a tendency to seek some protection, usually low-hanging branches of spruce or a tangle of bent-over alder. This resembles roosting habits of ruffed grouse in certain southern portions of the range where snow is not an important ecological factor.

There was a tendency for several birds to roost in the same general area, and groups of two to five were commonly flushed from roosts within 30 yards of each other. At dusk, birds can be seen budding in aspens, often several birds in a single tree. The significance of these groups is not understood.

Food Habits

Table II shows the frequency by month of food remains in droppings. Despite small samples, and a considerable amount of partially digested, unidentifiable material in each dropping, this presentation shows general trends which I feel will hold true even when adequate samples are obtained. However, crop analysis are required if a precise food habits description is required. Aspen (Populus tremuloides) buds and twigs constitute the most common food from December through April, with rose hips (Rosa acicularis) second when items other than aspen occurred.

In May, aspen dropped considerably in the diet with rose hips, horsetail shoots (Equisetum sp.) and persistent fruits from other species appearing more frequently. Unfortunately, no data are available to show when the shift to winter diet occurred, but limited information from other tetraonids suggests winter diets are started rather early, often while highly-preferred fall foods are still available.

Census Information

In three locations census lines were established and described in the techniques section of this report, but no useful information was obtained for the winter of 1967-68 due to unusual crusting conditions. Attempts will be made to develop this technique during 1968-69.

Drumming was first heard on April 30 by Robert Weeden. Roadside drumming counts were conducted on May 6, but only one count was obtained from each route, and the data are presented here as a matter of record. Route 1, a ten-mile route with four-minute stops every mile, averaged one drumming per 2.5 stops. Route 2, an eight-mile route with four-minute stops every 0.5 miles, averaged one drumming every 4.0 stops. Drumming counts, if interpreted correctly, can show relative abundance over the years, and hopefully, time will permit several counts on each route in 1969.

Table I. Number of roosts of each type used throughout the winter.

Roost Type	Dec.-Jan.	Feb.-March	April
Burrow	33	12	0
Form	10	4	0
Above snow	0	10	13

Table II. Frequency of food items found in droppings.

	Dec.	Jan.	Feb.	March	April	May
Populus tremuloides buds and twigs	100	100	100	100	100	20
Rosa acicularis seeds	59	30	--	3	--	100
Viburnum edule seeds	9	--	--	--	--	80
Anemone sp. seeds	6	--	--	--	--	--
Arctostaphylos uva-ursi seeds	3	--	--	--	--	40
Empetrum nigrum seeds	3	--	--	--	--	--
Alnus crispa buds	3	--	--	--	--	--
Unidentified seeds	3	30	--	--	--	80
Shepherdia canadensis buds and twigs	--	17	--	--	--	--
Betula papyrifera bracts	--	17	--	--	--	--
Equisetum sp. shoots	--	--	--	--	--	60
Vaccinium vitis-idaea seeds	--	--	--	--	--	20
Unidentified leaves	--	--	--	--	--	20
Grit	3	17	--	3	--	--
Sample	34	6	14	30	10	5

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WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO.: W-13-R-3 and W-17-1 TITLE: Small Game, Waterfowl, and Furbearers Investigations

WORK PLAN: B TITLE: Upland Game

JOB NO.: 11 TITLE: Numbers and Productivity of Gyrfalcons on the Seward Peninsula

PERIOD COVERED: January 1, 1968 to December 31, 1968

ABSTRACT

Aerial and ground surveys of approximately one-sixth of the 29,000 square miles of the Seward Peninsula suggested that at least 70 pairs of gyrfalcons nested on the Peninsula in 1968. Egg-laying occurred May 1-25, and clutches in eight nests studied intensively averaged 3.75 eggs. After an incubation period of about 28 days, these nests contained 26 young, for a hatchability of 87 per cent. There were about twice as many young females as young males in nests examined in 1968. Except where nests were robbed by people, practically all young lived to fledging; the nestling period was 48-51 days. Mean estimated production for 34 nests was 2.91 fledged young per pair, indicating a higher productivity relative to gyrfalcon performance recorded in the literature for other areas.

Preliminary work showed a high percentage of ptarmigan in winter castings, a shift to voles, lemmings, and small birds in spring and early summer, and a slow change in late summer to larger prey items (ptarmigan, jaegers, ground squirrels).

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

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

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WORK PLAN: B TITLE: Upland Game

JOB NO.: 11 TITLE: Numbers and Productivity of Gyrfalcons on the Seward Peninsula

PERIOD COVERED: January 1, 1968 to December 31, 1968

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 gryfalcons on the Seward Peninsula.

INTRODUCTION

The gyrfalcon (Falco rusticolus), largest of the true falcons, is found around the world north of 60°N latitude. It is the arctic counterpart of the desert falcons, being closely associated with treeless terrain and adapted for catching birds and mammals on or near the ground. This species comes in many colors, ranging from almost black to almost immaculate white; this characteristic confuses taxonomists and indirectly causes management problems as well. It is the rarity or geographically restricted range of the white phase which, in addition to the imposing size and mien of all gyrfalcons, creates an exceptional demand for this glamorous bird. Inevitably, four-figure prices and bootlegging have resulted.

In Alaska the gyrfalcon lives throughout the Brooks Range, the Bering Sea coast and entire Seward Peninsula, the high uplands between the Yukon and Tanana Rivers, the Alaska Range, around Goodnews Bay at the mouth of the Kuskokwim River, and parts of the Alaska Peninsula and (perhaps) larger islands in the Aleutian chain. They also breed sparingly on Kodiak and Nunivak Islands (Cade, T.J. 1960. Ecology of the peregrine and gyrfalcon populations in Alaska. U. of Cal. Publ. Zool. 63(3):151-290.)

Most people seeking permits to collect gyrfalcons in Alaska want to go to the Seward Peninsula. There are extensive areas of good falcon habitat on the Peninsula, some of which are accessible by road. For this reason, and because biologists had reported exceptionally high fall populations of gyrfalcons near Nome in 1967, the

Seward Peninsula was selected as a location for the present study. The investigation took place May 24 to August 30, 1968 and was done by David Roseneau (field leader) and William Tilton. Game Biologists Robert Weeden and John Burns planned the study; Burns and Regional Game Supervisor Robert Hinman provided logistic and administrative support.

METHODS

Transportation

Exploratory work began on the outskirts of Nome and fanned out along the three major roads (to Teller, Taylor, and Council) as they opened to vehicular traffic. Most intensive work on study aeries was done on foot and with road vehicles all summer. Snow machines were invaluable through mid-June for going to places near Nome but well away from roads. A canoe was used for crossing rivers in June. We used a skiff and a 37-foot inboard patrol vessel (loaned by the Department of the Army) for coastal travel westward from Nome. Aircraft (Cessna 180, PA-18 Super Cub) were used extensively to find aeries.

Because of our previous knowledge of gyrfalcon nesting requirements, we were able to travel on the ground or in aircraft directly to all likely cliffs and outcrops found on topographic maps. The Cessna 180 was too fast for close observations of cliffs; this aircraft was used mostly to make preliminary searches for suitable aerie sites. Only three active aeries were found in 13 hours of flying in the Cessna 180, or one per 4.3 hours. The Super Cub, more maneuverable and slower, proved valuable for finding active aeries when piloted by a man familiar with aerial game surveys (William Griffin, Game Biologist, Alaska Department of Fish and Game). Nineteen active aeries were found in 33 hours with this plane, or one per 1.7 hours.

It was possible not only to recognize aeries but to flush adults (which often attacked the plane) and count nestlings. Eggs probably could be counted from this type of aircraft too, although the season was too far advanced for us to try this in 1968. In the case of nestlings, counts made from the air tend to be low because one young may hide another or because one or more nestlings may have crawled out of the nest, to be hidden under a rock or shrub. Except in very calm air, safety precautions preclude accurate counting. At the very least, however, one can see whether any young are in the nest. It usually took four to six passes in an airplane to find a nest, flush the adult, and count nestlings.

Recognizing Aeries

Certain lichens, highly nitrogen - or phosphate - specific, grow on rocks splashed with bird feces. These lichens (including Xanthoria elegans and Xanthoria fallax, according to identifications made by Dr. Thompson, University of Wisconsin, of specimens collected at nest site J-68-1) are common at raptor nest sites all over the North. They are so bright that they can be seen at great distances, providing a "flag" marking the location of nest sites or perches. The lichens, or course, do not tell what kind of bird is present, nor whether the site is currently in use. Furthermore, we found that the orange lichens were not as distinct on granitic intrusions with high orthoclase-feldspar content - as near Serpentine Hot Springs - possibly

because of the high rate of weathering of the rocks. The lichens were present but not easily seen on marine bird cliffs where they were hidden by sea birds and other species of lichens.

When many potential sites or old aeries were close to one another, the active nest could be found by the calling or flight of adults. Once the young had hatched, a gyrfalcon nest became the scene of much noise and activity. The investigator needed only to walk close to the cliff, and the adult falcons would fly out and begin some degree of defensive attack. A 15x60 variable-power spotting scope and 7x50 binoculars were standard equipment for observing birds and nests.

Climbing Gear

Climbing equipment used on hard-to-approach nests included 150 feet of 10mm Mammout nylon rope and 120 feet of 9/16 inch Gold Line nylon rope for rappelling; nylon seat and chest sling, combined with an aluminum snap-link with brake bar and heavy-duty locking snap-link for descents; rope-grippers for sheer ascents; and a single gripper as a safety measure while observations were made in the nest. Pitons were not necessary at sites visited in 1968.

Weighing and Handling Chicks

Chicks were weighed frequently at three study aeries, using a triple-beam balance. During the first three weeks after hatching, the chicks were put in a small, felt-lined aluminum pan to prevent injury during weighing. Later a frame-supported canvas case was used. Chicks were marked with blue or yellow acrylic paint on the feet for pre-banding identification, then were banded with aluminum bands from the U.S. Fish and Wildlife Service (folding-tab experimental closure type). Some red plastic expandable bands were used for color marking.

Four unhatched eggs were weighed, measured with calipers, blown, and preserved in 50ml of 10 per cent formalin for future chemical analysis.

The sex of chicks could only be determined by comparing foot and body size of the young in an aerie. Since adult male gyrfalcons are one-third to one-fourth smaller than females, one can assume that the young may show dimorphism too. Our studies show that siblings grow at different rates beginning approximately 15 days after hatching. By the end of the third week, some young are noticeably bigger than others. The big-footed, large-bodied ones are presumed to be females.

Recording Forms

Aerie visit forms and Alaska Nest Record Scheme Cards (Appendix I and II) were used in 1968 to record data at nest sites.

Area Surveyed and Habitat Classes

The portions of the Seward Peninsula searched for gyrfalcons during 1968 are outlined in Figure 1. Search was concentrated in the area (dotted line) bounded on the south by Norton Sound; on the west by the Bering Sea and Port Clarence; on the north by Grantley Harbor, Tuksuk Channel, Imuruk Basin and Pilgrim Springs; and on the east by a line drawn between Pilgrim Springs, Iron Creek and Solomon. Virtually all of the above area was searched thoroughly by aircraft and on the ground.

The Teller Road, Kougarok Road, Council Road and Glacier Road provided access to large portions of the Peninsula. The Teller and Glacier Roads are entirely within the area where effort was concentrated. The Kougarok Road, between Mile 35 (Salmon Lake) and Mile 85 was searched out to approximately three miles on either side. The Council Road, searched by vehicle and on foot, was also covered ten miles on either side by aircraft.

Major river and creek drainages searched in their entirety include the Nome River, Snake River, Penney River, Cripple Creek, Sinuk River (including most of the Stewart River), Feather River, Tisuk River, Canyon Creek, Grand Central River, and Flambeau River (Nome Quadrangle); the Bluestone River, Canyon Creek, Fairview Creek, and Cobblestone River, Washington Creek (Teller Quadrangle); the Eldorado River, Canyon Creek, Nome Creek, Iron Creek and Bonanza River (Solomon Quadrangle); the Kougarok River, Washington Creek, and Kugruk River, and Minnie Creek (Bendeleben Quadrangle); the Inmachuk River (Kotzebue Quadrangle) and the Buckland River (Selawik Quadrangle).

In addition, portions of the following drainages were surveyed: Agiapuk River, California River, Don River, Lost River, American River, Budd Creek, Igloo Creek, Kaviruk River, and the south fork of the Serpentine River (Teller Quadrangle); Solomon River, Casadepaga River, Niukluk River, and Fox River (Solomon Quadrangle); and the Kuzitrin River, Libby River, Boston Creek, Inmachuk River, Pennell River and Taylor Creek (Bendeleben Quadrangle).

The coastal bluffs and cliffs from Kotzebue, south and west to Shishmaref, and from York south and east to ten miles east of Bluff were searched carefully at least once by aircraft. The coastal region from Nome west to Sledge Island was surveyed by boat and aircraft.

The southwest portion of the Peninsula (outlined on all maps by a dotted line) and the Serpentine Hot Springs area are those portions of the Peninsula where ground search occurred. Ground search, in these areas, was intensive in proportion to the hours flown.

Figures 2 and 3 show the general paths flown by the Cessna 180 and the Department PA-18 Super Cub. Approximately 3900 miles were flown with the two types of aircraft.

Figure 4 is a map of the Seward Peninsula that has been divided into three classifications of gyrfalcon habitat. This map is based on knowledge of existing nest sites (both active and inactive during 1968), the conditions under which breeding gyrfalcons were found, observations of the terrain from aircraft, and topographic maps. It is by no means a completely accurate picture and will undoubtedly be altered with further data. I believe it to be a fairly good representation, however, and useful to Departmental investigators -- hopefully saving them time and effort.

The three classes of habitat are:

Class I - Good to excellent nesting habitat containing many available nesting sites. These sites were found both along and away from rivers and creeks. Breeding gyrfalcons are or should be abundant (as in the Nome-Teller region where 19 active aeries were located in a 2000 square mile area), 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 river and creek bluffs. Breeding gyrfalcons should occur in limited numbers (on the order of one pair per 200-250 square miles) and will be widely scattered depending on the terrain.

Class III - This class represents areas where the terrain either does not offer physical nesting sites (lowland flats, high barren plateaus, and marshes such as the Cape Espenberg-Shishmaref region), or, as in the case of the York and Kigluaik Mountains, snow cover remains late and the area is too rugged and high, resulting in a barren unproductive region that will not support adequate numbers of prey species. The occurrence of nesting gyrfalcons in these areas is extremely unlikely.

I suspect that further investigation will reveal "centers" in the Nome-Teller region, the Taylor-Kougarok Mountains vicinity, the Deering-Inmachuk River - Kugruk River area, and (likely) in the Darby Mountains region, where there are areas with many limestone outcroppings.

The Bendeleben Mountains were disappointing, though not covered thoroughly. They appear to be a relatively old range and do not offer many nesting sites, other than along the major creeks.

In the northeastern portion of the Peninsula, almost all the nesting sites are found along or in close proximity to river and creek beds. Nesting sites are more diversified throughout the remainder of the Peninsula.

RESULTS

Population Estimates

The Seward Peninsula - west of a line from the mouth of the Buckland River on the north and the Koyuk Inlet on the south - contains about 29,000 square miles. I estimate that 10,000 square miles is good to excellent habitat. We found 19 active gyrfalcon nests in 2000 square miles of this area, constituting the area most thoroughly surveyed. On this basis one could estimate the population of the whole 10,000 square miles to be 95 breeding pairs. Including all of the area given some coverage in 1968, about 5000 square miles, we found 34 active nests (Figure 5). This suggests a total of 68 active aeries in the 10,000 square miles of good habitat. Since some other birds nested in the "fair" habitat, the range 68-95 breeding pairs is probably a conservative estimate of numbers.

Gyrfalcons appear to tolerate close neighbors of the same species when nest sites are common and (possibly) when food is abundant. Cade (1960) mentions gyrfalcons nesting within 1/4 mile of each other. We found three pairs in a 10-mile stretch of the Nome River in 1968, and three breeding pairs in a 5-mile portion of the Iron Creek drainage. The latter area contains eight nest sites, of which three were used by rough-legged hawks (Buteo lagopus) in 1968.

The 2000-square-mile area covered thoroughly in 1968 contained 19 pairs of gyrfalcons with eggs or young, 28 known breeding pairs of rough-legged hawks, seven pairs of breeding golden eagles (Aquila chrysaetos), and at least 20 vacant nest sites. This is a relatively high density of raptors - about one pair per 37 square miles - to be sustained over an area of this size.

Breeding

Nesting Preferences: Gyrfalcons nested in six different situations with reference to terrain and the object on which the nest was built. These six types are 1) sea cliffs, 2) hillside overlook, 3) river bluff, 4) open tableland, 5) dredge, 6) tree.

1) Sea cliff nests are on bluffs whose base is washed by the Bering Sea. These cliffs often have sea-bird colonies on them. We saw two certain and one probably active nest in this situation, and Dr. David Hopkins, U.S. Geological Survey, reported one other (J-68-19, J-68-23, J-68-33, J-68-P-4).

2) Hillside overlook aeries are on outcrops or bluffs part-way up steep, vegetated slopes. Eighteen were found in 1968. Most (13) were on slopes above rivers or creeks, though a few (five) overlooked the sea.

3) River bluff sites were located on the exposed rock faces of bluffs found along the valley floors. These bluffs terminated in, or within a very few feet of, the present water course. Ten active aeries were found in this situation (J-68-6, J-68-14, J-68-15, J-68-16, J-68-20, J-68-21, J-68-22, J-68-27, J-68-28, and J-68-35). In addition a nonbreeding site (J-68-P-3), the raven nests at Birch Hill and the Pilgrim River, and the empty sites at Bunker Hill, Tuksuk Channel, the Kougarak River, the Flambeau River, the Salmon River, and the Pinnell River were in this situation. Almost all rivers on the Peninsula had at least one such site.

4) Open tableland sites are generally located on small rocks (10-20 feet high), usually standing alone on open expanses of gently rolling to flat land. Two aeries, J-68-29 and J-68-32, were in this situation. In addition, a possible aerie, J-68-P-2, near the headwaters of the American River, was of this type. Aerie J-68-25 near the Libby River was similar to this situation, but incorporated some aspects of the river-creek bluff type.

5) Dredge sites were stick nests located on abandoned gold dredges. The stick nests are almost always located on the bucket booms or on the superstructure supporting the booms. Occasionally they are found on the "tailing booms." Every dredge observed during the 1968 season had at least one such nest. Ravens were found to be nesting on two and possibly on a third. Rough-legged hawks were found nesting on one. Only one site observed may have been occupied by gryfalcons. This site was designated as J-68-P-6 and was located near Taylor. The site was observed from the aircraft and was located on a "tailing boom" that was separated from the dredge and partially buried by tailings. Although the adults were not observed, the nest, containing two young, was almost certainly a gyrfalcon site. In 1961 the Tweet family, mining at Taylor, informed me that a pair of gyrfalcons was nesting almost every year on their dredge and they had to remove the young before they could commence dredging operations. In 1961, this pair produced a clutch of four eggs, all of which hatched. I personally saw the young gyrfalcons after they had been removed from the nest.

Mr. Vern Seifert, a long-time falconer and resident of Alaska who has spent considerable time on the Seward Peninsula, reported that he has observed gyrfalcons nesting on dredges.

6) Tree nesting sites of the gyrfalcon are known, but relatively rare. Cade (1960) reports that there are no known tree nest sites of the gyrfalcon in Alaska.

Mr. Bahnke, a life-long Nome resident, told me of an observation of a tree nest. Mr. Bahnke has long been familiar with gyrfalcons and during the last four or five years has been authorized to collect gyrfalcons in fulfillment of requests for these birds directed to the State of Alaska by Saudi Arabians.

Mr. Bahnke related that he had a cabin on the Pilgrim River, and prior to 1967, ravens had built a stick nest in a balsam poplar (Populus balsamifera) tree nearby. In 1967 a pair of gyrfalcons raised two young in this tree nest. Mr. Bahnke removed the young from the nest and sent them to Saudi Arabia. The nest was empty this year.

Nests: Gyrfalcons occasionally use stick nests built by other birds, and also frequently scrape a saucer-shaped depression with their beak in the soil of a nesting ledge. Nearly all gyrfalcons on the Seward Peninsula used old stick nests, which were plentiful. I saw only three scraped nests (at J-68-3, J-68-4, and J-68-5), none of which were in use in 1968. Of 13 active nests investigated from the ground, seven had been built by eagles, two by rough-legged hawks, one by ravens, two by eagles or ravens, and one by rough-legged hawks or ravens. The successive use of one site by different species makes it hard to tell which had first built at the site.

Gyrfalcon aeries faced in almost any direction, but south exposures were used most often. Directional aspect of the 34 active sites were: N(3), NE(2), E(3), SE(8), S(8), SW(5), W(4), NW(1). The "preference" for southerly exposures may have been due to the early thaw of snow, to protection from winds or warmth from the sun.

The eight intensively-studied aeries (J-68-1, 68-3, 68-4, 68-5, 68-6, 68-7, 68-8, 68-9) were predominantly south-facing. The nests were at elevations of 250 to 850 feet above sea level (mean 550 feet) and ranged from 20 to 85 feet (mean 40 feet) above the base of the cliff or outcrop.

Good breeding habitat has to contain good nest sites and good food supplies. The York and Kigluaik Mountains of the Seward Peninsula have many potential nest sites but very low prey populations. The area north of a line from Ear Mountain to the mouth of Goodhope River, on the other hand, has abundant waterfowl, shorebird, and ptarmigan populations, but no nest sites.

Behavior of Nesting Adults: Our information on the behavior of adults applies strictly to situations in which the adults were disturbed by people or an airplane.

When we approached a nest on foot during the period of incubation, the following sequence of actions by the gyrfalcons usually took place:

1) The male (distinguished by its small size) would fly off silently while we were up to one-half mile away.

2) The incubating female would stay in the nest, crouching to remain hidden from below.

3) If the female felt it had been discovered it would fly off, "kekking", either flying to a perching place one-quarter to one-half mile away, or until she gained altitude and began circling overhead.

4) The male would appear as soon as the female flushed from the nest, and begin aggressive defense behavior including fast dives (stoops) and loud "kekking".

5) The male always displayed more vigorously than the female but would fly off after about 10 minutes if his actions did not give results.

The greater aggressiveness of males may be related to the fact that they choose the nesting area and are more highly territorial. Also, males usually are in better condition to fly than females during nesting.

When the eggs began hatching, and during the nestling period, some females became quite aggressive (as, for example, the female at J-68-5), more so than during incubation. After the young could fly the female gyrfalcon continued to "defend" the young by kekking, but her defense was relatively weak.

Gyrfalcons often attacked the aircraft as it passed close to the nest. The adults seemed completely capable of overtaking the aircraft at indicated speeds of 70 to 75 mph. Both the males and the females dove at the disturbing aircraft, with males seemingly most aggressive. Of 28 active aeries visited by us in aircraft, 14 were occupied by adults that attacked the plane at least once. In three cases both adults attacked together.

Incubation: The study was started too late to get data on incubation time. Cade (1960) believed that gyrfalcons incubated for 20 or 29 days. Using an arbitrary 28-day incubation period on two nests observed at hatching, I calculated egg-laying to have taken place May 6-9 in one nest and May 23-26 in the other.

We visited 10 aeries 29 times and saw males on the nests only twice, which indicates that the female does practically all incubating and brooding. This is further indicated by the fact that the breast feathers of females are stained from soil in the nests, whereas the plumage on the males is clean.

Clutch Size: Eight nests were found early enough to provide data on clutch size. These nests contained 30 eggs (Table 1), an average of 3.75 eggs per nest. Counts of young in 20 other nests totalled 51, or 2.55 young per aerie. This is a minimum figure, since some young were probably missed during aerial counts.

Cade (1960) believed that "the over-all clutch size of gyrfalcons seems to be close to four eggs," which suggests that the birds in the sample from the Seward Peninsula were producing at nearly the maximum for the species. Whether this is related to the abundance of microtines and ptarmigan on the Peninsula in 1968 is unknown.

Hatching and Fledging Dates: Actual hatching dates were known for J-68-4 (June 20 through 22) and J-68-5 (June 3 through 6), and approximate hatching and fledging dates could be estimated for 12 other nests (Table 2). These data are imprecise, but suggest that the Seward Peninsula gyrfalcon population layed eggs between May 1 and May 25, 1968, with a peak near the end of the first week.

At study aerie J-68-4 on June 19, two eggs were found at the same stage of pipping (3-4mm hole with fracture radiating from it up to 5mm long) and both chicks

were observed "worrying" the small exit hole with their egg teeth. Both chicks were emitting faint "peeps". This would imply that either the eggs were layed quite closely together or that one was brooded more than the other so that the hatching times coincided. By June 26 all four eggs in the nest had hatched.

At J-68-5, a visit on June (about noon) by Robert Pegau (Department biologist) revealed three hatched young and one unpipped egg. A visit by Mr. Tilton and myself on June 5 (3 p.m.) revealed the egg to be pipping. The chick was observed moving within the egg through the 3-4mm breach in the shell and could be heard peeping. I feel it safe to assume this egg hatched the following day, resulting in at least a two-day age gap between it and the next oldest chick. On June 5 the three hatched young did not apparently differ in size. On June 10 the fourth chick was noticably smaller.

Hatching Success: As shown in Table 1, the eight study aeries produced 26 young at hatching, for a mean of 3.25 chicks per pair. Aerial observations of 20 other nests showed a total of 50 young or 2.50 chicks per aerie. The combined mean for 28 nests was 2.71 young hatched. This figure is lower than the true population mean because a) there was a fairly high incidence of infertile eggs in the eight study aeries (13 per cent), and b) some young undoubtedly were not seen during aerial counts at the 20 nests not visited on foot. The true population mean may have been between 2.8 and 3.0 young hatched per nest, somewhat higher than Cade's (1960) average of 2.4 young per aerie at locations scattered throughout Alaska.

Growth of Young: During 1968, three gyrfalcon aeries (J-68-1, J-68-4, J-68-5) were visited to measure weight gains of chicks. Five males and four females were weighed. Each chick's crop was checked by sight and touch before body weight was recorded, and crop weight was estimated.

Data from the three aeries are in Tables 3, 4, and 5, and are plotted graphically in Figures 7, 8, and 9. Weights were not obtained on July 6 at aerie J-68-1 because of the high risk of injury of the very active young. Data on the female chick for July 23 were obtained after the bird had been in captivity two days, being fed a diet of ground squirrels during this time.

A few tentative conclusions can be drawn from the weight data concerning the sample of gyrfalcon chicks:

1) Males tend to weigh less than females, and this weight difference is most noticeable after the 15th day.

2) The weight difference (i.e. range of weights of males and females) is variable between individual aeries.

3) The weight ratio between males and females within aeries seems to be relatively constant (only two samples) -- the male at aerie J-68-4 weighed approximately 23 percent less than their sibling female. The weight range between males and females at these two aeries was, however, approximately 200 g.

Aerie J-68-4 produced the smallest birds weighed and the smallest observed. The largest birds observed were those of J-68-7. A female from

Table 1. Clutch and hatching data from eight gyrfalcon nests studied intensively in 1968.

Aerie No.	No. Eggs	No. Hatching	Addled	*Fledging (Undisturbed)	Fledging (Actual)
J-68-1	4	2	2	2	1
J-68-3	3	3	0	3	3
J-68-4	4	4	0	4	0
J-68-5	4	4	0	4	4
J-68-6	3	3	0	3	3
J-68-7	4	3	1	3	1
J-68-8	4	4	0	4	4
J-68-9	4	3	1	3	3
	30	26	4	26	19

* Number of young that probably would have left the nest if the nest had not been disturbed by falconers. Assume no nestling mortality, as was true in undisturbed nests.

Table 2. Laying, hatching, and fledging dates.

Aerie	Layed	Hatched	Fledged
J-68-1	May 5- 6 (est.)	June 3- 4 (est.)	July 21-25 (est.) One bird July 23 -Actual
J-68-3	May 3- 5 (est.)	June 1- 3 (est.) Observed to be hatched on June 17	July 18-20 (est.)
J-68-4	May 22-25 (est.)	June 20-22 (actual) First two chicks on June 20	August 10-15 (est.) Male would have been first
J-68-5	May 5- 8 (est.)	June 3- 6 (est.) Last chick June 6 -Actual	July 21-25 (est.)
J-68-6	May 4- 7 (est.)	June 2- 5 (est.)	July 20-22 (est.)
J-68-7	May 6- 8 (est.)	June 4- 6 (est.)	July 21-25 (est.) July 21 all three jumped & could fly 200-300 yards
J-68-8	May 1- 2 (est.)	May 30-31 (est.)	July 12-15 (est.)
J-68-9	May 6- 8 (est.)	June 4- 5 (est.)	July 21-25 (est.)
J-68-20	May 7- 8 (est.)	June 5- 6 (est.)	July 22-25 (est.) Observed flying poorly July 29
J-68-21	May 20-22 (est.)	June 18-20 (est.)	August 10 (est.)
J-68-22	May 7- 8 (est.)	June 5- 6 (est.)	July 22-25 (est.)
J-68-30	May 20-22 (est.)	June 18-20 (est.)	August 10 (est.)
J-68-31	May 20-22 (est.)	June 18-20 (est.)	August 8-10(est.)
J-68-34*	May 17-19 (est.)	June 15-16 (est.)	August 4 (est.) July 30 one flew 100 yds. Aug. 5 all fledged

* Fledging data furnished by Dr. David Hopkins, U.S.G.S.

(In addition, J-68-35 was located by Willy Foster and Dave Scott (BIA). Scott est. fledging at "about" August 17.)

the nest (in John Burns' possession at time of weighing) varied between 1800 and 1850 g on a natural diet of prey items.

4) The males' growth rate tends to fall faster than the females'.

5) Both males and females may complete as much as 85 to 95 per cent of their total weight growth by the 30th day after hatching (fledging - 48th to 52nd day).

Sex Ratio of Chicks: Twelve of 37 young in 12 aeries visited were judged to be males by size of body and feet (Table 8). The sex of two young could not be determined. The ratio in this sample, therefore, is approximately 2:1 in favor of females. My previous experience with peregrines (Falco peregrinus), pigeon hawks (Falco columbarius) and goshawks (Accipiter gentilus) also suggested a 2:1 preponderance of female nestlings.

Interval From Hatching to Fledging: We estimated the time from hatch to fledging from aeries J-68-1, J-68-4, J-68-5, and J-68-7. Eggs in J-68-1 hatched about June 3-5 and both young were flying by July 21-23; thus, these young spent up to 48 - 50 days in the nest (perhaps a few days less). The young gyrfalcons in J-68-4 spent 49 - 51 days in the nest between June 20-22 and August 10, the estimated fledging date. Observations at J-68-5 indicated that the young would fly about July 21-25, or 49 - 51 days after hatching. Chicks in J-68-7 probably hatched June 4-6. We disturbed them at the nest July 21, and they flew 200-400 yards. If they had not been disturbed they probably would have stayed in the nest another day or two. This indicated a nest occupancy period of 48 - 50 days for these three young.

Number of Young Fledged: Our data on number of young leaving the eight study aeries are in Table 1. We cannot be sure that all of the young taken by humans would have fledged if left alone, but since no young died in the other (undisturbed) nests, the chances are good that they would have fledged. From this small sample, it appears that natural nestling mortality was extremely low on the Seward Peninsula in 1968.

Summary of Productivity: Data given in foregoing sections indicate that the 34 pairs of nesting gyrfalcons visited in 1968 produced 113 eggs, hatched 101 young, and fledged 99 young (including young taken by falconers). Mean estimated production of fledged young per pair (2.91) is relatively high for the species. Without historical data from the Seward Peninsula we cannot confirm that this rate of production is high for that population, whether such rates are sustained over many years or only occasionally achieved, etc.

If falcon productivity and breeding density is related to food supply, the stage certainly was set in 1968 for successful breeding. John Burns, Department of Fish and Game biologist with six consecutive years of experience on the Seward Peninsula, indicated that microtines were exceptionally abundant both in 1967 and 1968 - and had, in fact, been high in 1966 as well. Ptarmigan (Lagopus mutus and L. lagopus) were also abundant in 1967-68. These two prey groups, together with ground squirrels (also noticeably abundant in this period), waterfowl, shorebirds, and songbirds, apparently provided an ample feed supply for weasels (mainly Mustela erminea), red fox (Vulpes fulva), jaegers (Stercorarius spp), short-eared owls (Asio flammeus), rough-legged hawks, golden eagles, and gyrfalcons.

Comparisons of 1968 data with information on gyrfalcons in a year of low prey den-

Table 3. Weights of two gyrfalcon chicks from aerie J-68-1, Seward Peninsula, 1968.

Date	Age (days)	Chick	Weight (grams)	Crop (included in weight)
June 14	est. 10	#1 (M)	127.8 g.	None
	est. 11	#2 (F)	267.0 g.	None
June 19	est. 15	#1 (M)	363 g.	2-3 g.
	est. 16	#2 (F)	569 g.	2-3 g.
June 23	est. 15	#1 (M)	540 g.	None
	est. 20	#2 (F)	766 g.	None
July 6	est. 36	#1 (M)	No. wt.	
	est. 37	#2 (F)	No. wt.	
July 23	est. 52	#1 (M)	No. wt.	
	est. 53	#2 (F)	1513 g.	None

Table 4. Weights of four gyrfalcon chicks from aerie J-68-4, Seward Peninsula, 1968.

Date	Age (days)	Chick	Weight (grams)	Crop (included in weight)
June 25	actual 5	#1 (F)	127.6 g.	None
	actual 5	#2 (F)	115.5 g.	None
	est. 4	#3 (F)	97.0 g.	None
	est. 3	#4 (M)	71.0 g.	None
July 5	actual 15	#1 (F)	missing from nest	----
	actual 15	#2 (F)	585 g.	3-4 g.
	est. 14	#3 (F)	483 g.	3-4 g.
	est. 13	#4 (M)	457 g.	3-4 g.
July 23	actual 33	#2 (F)	1341 g.	None
	est. 32	#3 (F)	1308 g.	None
	est. 31	#4 (M)	1059 g.	None
August 5*	actual 46	#2 (F)	1408 g.	None
	est. 45	#3 (F)	1399 g.	None
	est. 44	#4 (M)	1080 g.	None

* Weighed in possession of McCown -- I'm positive of the identification of #4, but it is possible that #2 and #3 are mixed up (bands were removed).

Table 5. Weights of four gyrfalcon chicks from aerie J-68-5, Seward Peninsula, 1968.

Date	Age (days)	Chick	Weight (grams)	Crop (included in weight)
June 10	actual 4	#1 (M)	126.0 g.	12-15 g.
	est. 6-7	#2 (M)	145.0 g.	None
	est. 7-8	#3 (M)	145.5 g.	None
	est. 8-9	#4 (F)	155.5 g.	None
June 16*	actual 10	#1 (M)	283.0 g.	None
	est. 12-13	#2 (M)	530.0 g.	None
	est. 13-14	#3 (M)	620.0 g.	None
	est. 14-15	#4 (F)	650.0 g.	None
July 6	actual 30	#1 (M)	1195.0 g.	None
	est. 32-33	#2 (M)	1208.0 g.	None
	est. 33-34	#3 (M)	1221.0 g.	None
	est. 34-35	#4 (F)	1589.0 g.	None

* Weights $\pm$5 g. due to constant movement of chicks.

Table 6. Estimated weights (in grams) of five young male gyrfalcons from study aerie, J-68-1, J-68-4, and J-68-5 at five-day intervals.

Age (days)	J-68-1	J-68-4	J-68-5	Means	Difference in Means
			150		
5	85	145	115	120	
			105		
					171
			283		
10	128	340	365	291	
			340		
					245
			520		
15	363	525	610	536	
			660		
					187
			740		
20	590	690	780	723	
			815		
					210
			960		
25		860	950	933	
			960		
					181
			1195		
30		1025	1120	1114	
			1115		
					75
			1230		
35		1065	1230	1189	
			1230		
40		1075			
45		1085			
					Mean of Differences
					178

Table 7. Estimated weights (in grams) of four young female gyrfalcons from study aeries J-68-1, J-68-4, and J-68-5 at five-day intervals.

Age (days)	J-68-1	J-68-4	J-68-5	Means	Difference in Means
5	147	115 135	100	124	
					179
10	250	350 328	283	303	
					270
15	515	585 525	665	573	
					235
20	766	800 755	910	808	
					195
25	880	1010 980	1140	1003	
					195
30	990	1220 1210	1370	1198	
					147
35	1100	1355 1328	1595	1345	
40	1220	1380 1363			
45	1330	1405 1399			
50	1445				
55	1520				

Mean of Differences
204

Table 8. Sex of chicks from twelve gyrfalcon aeries on the Seward Peninsula, 1968.

Aerie	Males	Females	Unknown
J-68-1	1	1	
J-68-3	1	2	
J-68-4	1	3	
J-68-5	3	1	
J-68-6	1	2	
J-68-7	1	2	
J-68-8	2	2	
J-68-9	0	3	
J-68-21	0	2	
J-68-30	1	2	1 (dead)
J-68-31	1	1	1
J-68-36	0	2	
	—	—	—
TOTALS	12	23	2

sity would be very instructive. These data would also provide rough parameters of productivity useful in setting limits to annual harvests of gyrfalcons for falconry.

Other Biological Data

Interactions at Nests With Other Birds: Some notes taken when we saw gyrfalcons interact near nest sites with jaegers, rough-legged hawks and other species may be of interest.

Encounters between rough-legged hawks and gyrfalcons were observed at J-68-3 and J-68-27. On May 31 we disturbed a male rough-leg at its nest 200 yards from J-68-3. The buteo sailed within 200 yards in front of the gyrfalcon aerie, and the male falcon (apparently not seeing us) stooped at the hawk. In the next five minutes the gyrfalcon dove at the rough-leg several times. Each time the buteo, watching the falcon, hovered beginning when the falcon was within about 100 feet. When the gyrfalcon got very close the rough-legged hawk sideslipped, easily evading the stoop.

A brief observation of another encounter between these two species was made at J-68-27 where, as at J-68-3, a pair of rough-legs nested 200 yards from the falcons. Our passing aircraft disturbed the hawk, which sailed in front of the falcon aerie, causing the falcon to stoop at it. The two birds locked feet, at which time we could no longer see them. On our next pass the hawk was on its nest and the falcon was gliding back to its aerie.

At aerie J-68-6 two pairs of Canada geese (Branta canadensis) nested within 15 and 30 feet of the gyrfalcon nest. On June 6 the falcons and one pair of geese circled above the cliff. The brooding goose flushed and the male gyrfalcon stooped at her, coming close enough to touch the larger bird. Then, turning on his back, the falcon grabbed the goose's feet with his, the goose calling loudly and taking evasive action. When the gyrfalcon clutched her feet she began squawking. The falcon hung on briefly, then both fell 25 feet. The falcon released its hold, climbed 100 feet above the goose, and stooped again, passing a yard from the goose. The gyrfalcon, spiraling upwards, chased the two circling geese. When one of them passed in front of the aerie and below it the gyrfalcon dove hard at it, driving the goose nearly into the river. This ended the encounter. The male falcon joined the female, still circling above the aerie; the two geese sat on a hillside one-quarter mile away.

On five occasions we watched long-tailed and parasitic jaegers dive at flying or incubating gyrfalcons, with the raptors apparently ignoring the ineffectual attacks. During a long sequence of encouters between a long-tailed jaeger and a pair of gyrfalcons July 5 at J-68-4, the jaeger dove a dozen times at the female raptor (which sideslipped each time), then apparently annoyed the falcon enough with several more dives that the falcon gave chase. The jaeger left hastily and the gyrfalcon broke off without coming very close.

We saw nests of snow buntings (Plectrophenax nivalis), Say's phoebes (Sayornis saya), and cliff swallows (Petrochelidon pyrrhonota) on the same cliffs as gyrfalcon aeries. There seemed to be no contact between the raptors and the passerines, except that a phoebe lined its nest (three feet from the active aerie at J-68-7) with falcon body feathers.

Food habits: Food remains were collected at ten aeries and stored in labeled plastic bags for study at a later date. The first collection at each aerie contains a considerable proportion of winter kills and possibly material from years before. Not all of this is necessarily from gyrfalcons. Each collection made thereafter contains the remains accumulated between our visits and is strictly from gyrfalcons.

General observations at aeries during May and June indicate a high usage of ptarmigan during the winter and early spring (ptarmigan remains in winter plumage). Thereafter, the falcons seemed to utilize lemmings and voles to a great extent, particularly during late incubation and the first three to four weeks after the chicks hatched. The microtines were supplemented with shorebirds, passerines, and ground squirrels, along with some ptarmigan. As the season progressed (perhaps because the female gyrfalcon is free to begin spending time hunting away from the rapidly growing young) the prey species became more varied and larger. More ptarmigan, jaegers, short-eared owls and more ground squirrels were found.

Food remains vary significantly from aerie to aerie. This in part depends on the abundance and availability of prey species found within the hunting terrirory. At J-68-4 small shorebirds and passerines (among which were found common snipe Capella gallinago and robin Turdus migratorius) and lemmings constituted the basic food remains. This aerie is in an area abounding in those prey. There were not many ptarmigan in this area. At Aerie J-68-3, which was in an area heavily populated with both willow and rock ptarmigan, the food remains consisted almost exclusively of ptarmigan.

At aerie J-68-6 ptarmigan, ground squirrels, and lemming remains were numerous when this aerie was first visited. At this time the female was brooding eggs. Later, after the young had hatched and were beginning to feather out, this aerie was visited for the purpose of banding the young. It was found that the adults had been feeding the young almost exclusively on long-tailed jaegers. At aerie J-68-5 lemmings, ground squirrels, and large shorebirds (especially whimbrels, Numenius phaeopus) constituted most of the remains recovered.

On a few occasions we have observed gyrfalcons with their prey:

Our first visit to J-68-4 (June 4) found the male apparently out hunting. Just before we left, he returned carrying a plover-sized bird in his feet. He flew to where the female was sitting; on a later visit, we could find no prey remains.

On June 14 John Burns, William Tilton and I visited J-68-1. The male was not present when we arrived. Shortly thereafter he appeared and upon seeing us dropped an object near the base of the cliff. Mr. Tilton recovered it and found it to be a male lemming (Dicrostonyx).

On July 9 Bill Griffin and I located from the air a gyrfalcon aerie on the sea cliffs near Teller. The female was sitting near the nest and flew out over the water when we were overhead. As we made another lower pass, the male was seen flying towards the cliff carrying what was either a puffin or a guillemot. The gyrfalcon landed on the cliff still clutching the dead bird and was not seen again.

On June 22 while checking Sledge Island for nesting gyrfalcons I found the remains of a small unidentified gull that had been killed this spring and very probably by a falcon (the sternum had the characteristic marks of a falcon beak). The remains of a

Black-legged kittiwake (wings joined by sternum) was found floating below the bird rookery. This was probably a falcon kill as again the sternum was characteristically marked. The unidentified gull remains were given to Dr. Brina Kessel, University of Alaska, for identification.

We have witnessed one kill. On our first visit to aerie J-68-1, May 30, the male stooped by the cliff, struck, and killed a bird believed to be either a water pipit (Anthus spinoletta) or a Lapland Longspur (Calcarius lapponicus), both very common near this aerie. The male carried the prey to a rock, where he remained until we left.

Mortality: Our data show that nestling mortality was very low in 1968 except for losses to falconers. We saw no evidence of starvation or cannibalism. One young (aerie J-68-30) died after a fall from its nest, and a dead chick was found below J-68-1 from the 1967 nesting. Falconers took eight of 41 healthy young in 14 nests for which we have data in 1968. Two of the nestlings were taken illegally.

Accidents could cause some loss of nestlings. For example, we found a basketball-sized rock in the center of nest J-68-4 on July 23, the rock having fallen from an overhanging ledge. The three nestlings were not hurt; they must have been on the rim of the nest or in a nearby crevice when the rock fell. Similarly, fist-sized rocks fell into J-68-5 some time in August 1968, but the young were not injured.

Circumstancial evidence suggests that mortality among young gyrfalcons is quite high once they leave the nest. Subjectively, it looked (in autumn 1967) as though production of falcons had been high on the Seward Peninsula that year according to John Burns. Of 57 adult gyrfalcons we saw in 1968, however, probably only one was hatched in 1967. Cade (1960) also saw very few first-year gyrfalcons on breeding grounds in summer. Either this age-group suffers high mortality or (less likely) they survive but spend summers in some different area or habitat. Chances are good that first-year gyrfalcons simply are not good enough hunters to cope with seasonal shortages in food, or to shift from one kind of food to another when they need to. At this point, however, we have no evidence to confirm this guess.

Color Phases: We recorded the color of adult gyrfalcons in 1968 in the following subjective categories: dark grey, grey, light grey, straw (cream tone to the light areas between grey bars) and white. Numbers seen in each class are in Table 9.

Table 9. Color tone of 55 adult gyrfalcons, Seward Peninsula, 1968.

	Color Category				
	Dark Grey	Grey	Light Grey	Straw	White
No. Seen	7	31	9	3	5
Per cent	12.7	56.4	16.4	5.4	9.1

According to Cade (1960) and my own knowledge, white birds are rare in Alaskan gyrfalcons as a whole, although they are apparently not uncommon on the Seward Peninsula. The five white adults observed in 1968 were as follows: a white "bar-tail" female mated with a grey male; a "plain-tail" white male mated with a dark grey female; a very white male mated to a "bar-tail" white female; a white adult, probably female, whose nest was not seen.

Detailed notes were made on plumage characteristics of several adults (particularly white ones) and a number of young. These will not be presented in this report as they are not pertinent to the main objectives of the study.

Banding

We did not band as many birds as we hoped in 1968, but did band 20 nestlings (Table 10). Six of these were later taken by falconers or collectors, so only 14 banded birds left their nests.

Our efforts to trap and band fledged juveniles and adults in August were unsuccessful. The young apparently were kept so well fed by the adults, and were so slow to hunt for themselves, that they ignored bait pigeons.

Table 10. Young gyrfalcons banded on the Seward Peninsula, 1968.

Date	Aerie	Sex	Band No.	Color Band
July 6	J-68-1	M	617-23411	None
		F	877-02611*	None
July 7	J-68-3	M	877-02616	None
		F	877-02617	None
		F	877-02618	None
July 23	J-68-4	M	877-02622*	None
		F	877-02623*	None
		F	877-02624*	None
July 6	J-68-5	M	877-02613	None
		M	877-02614	None
		M	877-02615	None
		F	877-02612	None
July 10	J-68-6	M	877--2620	None
		F	877-02619	None
		F	877-02621	None
July 12	J-68-7	M	877-02641	None
		F	877-02642*	None
		F	877-02643*	None
July 29	J-68-21	F	877-02625	Red (Right foot)
		F	877-02626	877-02626 Red (Right foot)

Totals: 7 aeries -- 8 Males; 12 Females (20 birds) -- 2 color banded

* Young later taken from nest by falconers.

Appendix II

SUMMARY OF 1968 AERIES AND PROBABLE AERIES

J-68-1: Discovered May 30 with four eggs. Nest visited June 7 and found to contain two newly hatched (2-3 day old) young. Visited again on June 9, June 10, and June 14. On June 14 two addled eggs were collected. Visited again on June 19, June 23, and July 6. On July 6 a male and a female were banded -- female #877-02611, male #617-23411. Next visited on July 23 and found the male flying (female was flying and run down and captured by Mr. Bahnke on July 21). Next visited on August 24 and August 25 in attempt to trap adults for banding. On August 24 the adult female and the immature male were seen briefly. Well used site. Loc. 16 mile Kougarok Road (east side of road, Nome Quad.).

J-68-2: (See end of section)

J-68-3: Discovered May 31 with three eggs. Observed from aircraft to have hatched young (number unknown) June 17. Observed from aircraft June 26 and counted two young. Visited on foot July 7 and found to contain three young. On July 7 one male #877-02616 and two females #877-02617 and #877-02618 were banded. Well used site - very old. This site probably has one of the longest, obvious histories of occupation judging from the old nests, scrapes, orange lichens, and littered food remains. Loc. on the NW side of the Sinuk River 1 1/2 miles downriver from the mouth of American Cr. (Nome D-2).

J-68-4: Discovered June 4 with four eggs. Next visited June 9 and June 14. Visited on June 19 and two eggs were found to be pipped. Visited June 25 and found all four young hatched. Visited July 5 and found the oldest chick missing (humans!). Visited July 23 and banded three chicks -- one male #877-02622 and two females #877-02623 and #877-02624. Next visited August 1 and found all young missing from nest -- adults gone. (Birds taken by McCown.) Well used site. Loc. 1/4 mile east of Kougarok Road Mile Post 25 (Nome C-1).

J-68-5: Discovered June 4 and contained three newly hatched young and one egg. Visited June 5 and found the egg pipped and could see and hear chick. Nest visited June 10 and June 16. Observed all four young from aircraft June 26. Next visited July 6 and banded four young -- one female #877-02612 and three males #877-02613-15. Next visited August 27-28 for trapping. All young present and both adults. Good site -- well used. Loc. lower portion of Wheel Cr. (a westerly tributary of Penny River (Nome Quad.).

J-68-6: First discovered June 6 and contained three eggs. Next visited by aircraft June 17 -- could see nest but not birds. Visited July 10 and one male #877-02620 and two females #877-02619 and #877-02621 were banded. Visited August 13 and 23 for trapping. Old, well-used and very good site. One of the more picturesque. Loc. 1/2 mile N. of the Teller Road on the W. side of the Blue Stone River (Teller Quad.).

J-68-7: Discovered June 13 with three hatched young and one addled egg (collected). Next visited by aircraft July 10 and observed all three young and both adults. Visited July 12 and one male #877-02641 and two females #877-02642 and #877-02643 banded. Loc. on Miocene Ditch, 3/4 mile N. of Willow Cr. cabins, opposite Mile 18 Kougrak Road (west of road - Nome Quad.).

J-68-8: Observed two adults in area from aircraft June 3. Discovered June 21 with four large downy young (feathering out). Visited June 26 by aircraft and observed all four young and adult female. August 15 visited vicinity by boat and saw one bird (adult/young?). Loc. lower portion of E. end of S. side of mountain between Rodney Cr. and Sonora Cr. (Triangulation Point Penney) on coast 14 miles W. of Nome (Nome Quad.).

J-68-9: Observed adult on nest June 3 from aircraft. Visited June 22 and found nest to contain three young and one addled egg (collected). Next observed from aircraft June 26 -- could not count young and saw adult female. Next visited August 16 and saw all three young (trapping). Loc. 5 miles W. of J-68-8 on cliff at top of mountain just W. of mouth of Quartz Cr. (Triangulation Point Hut), (Nome Quad.).

J-68-10: Adult observed on nest (brooding) June 17 from aircraft, appeared well used and very similar to J-68-6. Loc. 1/4 mile upstream from Tuksuk Channel on Canyon Cr. (Teller Quad.).

J-68-11: (See end of section)

J-68-12: Discovered by aircraft June 26. Observed two young in the nest and one adult by it. Very well used site - old. Loc. 4 1/2 miles SE of Singigyak and Cape Woolley on Coastal Mts. just south of Igloo Cr. (Nome Quad.).

J-68-13: Discovered by aircraft June 26. Observed at least three young (may have been four) in the nest and one adult by it (this adult was very aggressive against the plane). Very old site and well used. Loc. 1/4 mile W. of J-68-12 (Nome Quad.).

J-68-14: Discovered June 26 by aircraft. Flushed probable female adult from nest. Observed at least two young in the nest. Could have been three young. Well used site - good. Loc. in canyon (W. side) of American Cr. 6 miles WSW of the W. end of Glacier Lake, Kigluaik Mts. (Nome Quad.).

J-68-15: Discovered June 26 by aircraft. Observed two young in the nest and an adult near it. Well used site. Loc. east side of lower canyon of the Flambeau River (Nome Quad.).

J-68-16: Discovered June 26 by aircraft. Both adults came off cliff at plane. Number of young unknown as nest was not located and probably concealed by the numerous ledges and crevices. Action of adults, however, leaves no question of an active nest. Well used site - very good - old. Loc. lower portion of Star Cr., tributary on E. side of upper Bonanza River (Solomon Quad.).

J-68-17: Discovered July 8 by aircraft. Flushed both adults from rocks. One of them attacked the aircraft nine times. Number of young unknown as nest was not located and probably concealed by the numerous shadows, ledges, and crevices. Action of adults, however, leaves no question of an active nest. Extremely old and well used site. This site covers a large area -- many outcrops, spires, etc. Loc. between Hunter Cr. and Kaviruk River on hill-top (Teller Quad.).

J-68-18: Discovered July 9 by aircraft. Observed female (probably) to flush from nest and observed three young in the nest. Old, well used site. Loc. on Budd Cr. opposite Windy Cr. tributary (Teller Quad.).

J-68-19: Discovered July 9 by aircraft. The nest contained three young. Both adults were observed -- the female attacked the aircraft once. Old well-used site. Loc. Cape Riley (Teller Quad.).

J-68-20: Discovered by aircraft July 10. Counted at least three young. Observed one adult (sex?). This adult was aggressive toward the aircraft. Visited on foot July 29 and observed the three young flying about and doing quite well. On this date the adults were not observed. Old well-used site. Loc. on Canyon Cr. 1 mile above Dome Cr. (Iron Cr. vicinity) (Solomon Quad.).

J-68-21: Discovered July 10 by aircraft. Observed at least one young being fed by an adult female. Visited on foot July 29 and found the nest to contain two young. Two females were banded -- #877-02625 and #877-02626. Red plastic expandable bands were placed on their left feet. Observed the adult female. Well-used site. Loc. Iron Cr. 1 mile below Canyon and Dome Creeks (Solomon Quad.).

J-68-22: Discovered by aircraft July 10. Flushed an adult from the nest and counted at least one young in the nest. Observed through spotting scope July 28 and counted at least two fledged young. Visited July 30 and observed two young -- there may have been a third. Old well-used site. Loc. E. side of Iron Cr. where it leaves mountains (Solomon Quad.).

J-68-23: Discovered by aircraft July 10. Both adults were observed. The male was sitting in a rock on the top of the bluff and on our fourth pass the female flushed from the cliff below us. Due to the number of sea birds, we could not see the nest and had to leave the area as we were creating a rather dangerous situation. On August 4 Dave Hopkins, U.S.G.S., confirmed the nest but was unable to count the young. He had visited this area the last week in July. Old well-used site. Loc. VABM Bluff, 52 miles E. of Nome (Solomon Quad.).

J-68-24: Discovered July 11 by aircraft. Both adults were observed and both attacked the aircraft. Action of adults leaves no doubt as to an active nest. This is an old well-used site and covers quite a large area (many adjoining out-crops). Loc. along Eldorado Cr. between Pirate Cr. and Iron Cr. on W. side of Eldorado Cr. (Teller Quad.).

J-68-25: Discovered July 12 by aircraft. An adult (probably female) flushed from the nest and I counted two downy young. The adult attacked the aircraft. This site probably does not have much of a history of occupation. Loc. Libby River (Bendeleben Quad.).

J-68-26: Discovered July 12 by aircraft. Observed a male adult flying by us and then perching on the top of the cliff. An adult female flushed from the nest and attacked the aircraft. I counted at least three young in the nest. Old well-used site. Loc. head waters of Minnie Cr., Beldeleben Mts. (Bendeleben Quad.).

J-68-27: Discovered July 12 by aircraft. Observed one adult and counted at least two young in the nest. This is an extremely old and well-used site. Loc. upper Kugruk R. (opp. S. shore of Imuruk Lake) (Bendeleben Quad.).

J-68-28: Discovered July 12 by aircraft. Observed both adults. The male attacked the aircraft on each pass. The female flushed from the nest and joined in the attack. At least four young were counted in the nest. Well-used site. Loc. upper Pinnell River (tributary of the Inmachuk R.) (Bendeleben Quad.).

J-68-29: Discovered July 13 by aircraft. Observed both adults. The female flushed from the nest, and I could see an undetermined number of young in it. There was at least one. Old and well-used site. Loc. Triangulation Point Pinnacle, approximately 8 miles N. of Kougaruk Mountain (Teller Quad.).

J-68-30: Discovered July 19. The adults were mildly aggressive, and we could not climb into the nest or to the top of the outcrop. From a distance I observed two young and a possible third in the nest. A dead chick was found below the nest. On July 21 the site was visited again, and again both adults were present. From another outcrop, the spotting scope revealed three young in the nest. The status of this site's history was impossible to determine due to the decaying and continually changing rock surfaces. It probably, however, does not have a very long history. Loc. Hot Springs Cr. at Serpentine Hot Springs (Bendeleben Quad.).

J-68-31: Discovered July. The nest was impossible to get to. Three young were observed in the nest, however the back portion of the nest was hidded from view, and it is possible there could have been a fourth chick. Well-used site. Loc. 2 miles NE of Serpentine Hot Springs (Bendeleben Quad.).

J-68-32: Discovered during June (Dr. C.L. Sainsbury, U.S.G.S.). Dr. Sainsbury stated there were two young and one addled egg in the nest and that both adults were present diving and kekking at him. He further stated that he took one of the young (later released by him in mid-August). Status of site unknown. Loc. near head of Taylor Cr. between head of Taylor Cr. and Little Daisy Cr. (Bendeleben Quad.).

J-68-33: Discovered by Dr. David Hopkins (U.S.G.S.) during the latter part of July. Both adults were observed by him and they kekked and stooped at him when

he attempted to get near the nest to count young. He was unable to see into the nest. Well-used site. Loc. on coastal cliffs due W of Iknutak Mountain (Solomon Quad.).

J-68-34: Discovered by Dr. David Hopkins (U.S.G.S.) during the latter part of July. Both adults were aggressive toward him. He climbed into the nest and found it to contain four young, one of which jumped from the nest and flew about 100 yards. On August 5 he revisited the site and found all four young fledged and flying about near it. Well-used site. Loc. 3 miles N of Topkok Head betweed Rock Cr. (Topkok R.) and Allen Cr. (Solomon Quad.).

J-68-35: Discovered by Mr. David Scott (BIA) and Willy Foster (Foster Aviation) on August 10. One adult was present and was aggressive. The nest contained one young. Well-used site. Mr. Foster said "they are there almost every year." Loc. Inmachuk River between Milroy Cr. and Collins Cr. (Bendeleben Quad.).

J-68-36: Discovered by aircraft June 26. At this time the nest contained two young, but their species was uncertain. Visited on foot August 26. Two fledged young were found and the nest contained gyr feathers. The adults were not observed. Well-used site. Loc. on mountain above Oregon Cr. between Cripple Cr. and Penney R. (Nome Quad.).

The following are probably gyr nesting sites during 1968.

J-68-P-1: One adult observed by aircraft on July 11. There are numerous sites in the area. Active nest was not located nor did the bird observed show any aggressiveness toward the aircraft but instead flew over a hill and was lost from sight. This is, however, a very good area, and the bird probably was nesting within a few miles. Loc. upper Igloo Cr., vicinity of Kougarok Mountain (Teller Quad.).

J-68-P-2: One adult was observed from aircraft on July 11. Seven passes were made -- the gyr was observed on the first four. An empty stick nest was located and was the only nest noted. The bird was not aggressive toward the aircraft and stayed perched on a rock during the first four passes, then apparently flew off and was observed again. The site contained many grassy ledges and crevices, and the nest could have been missed. Loc. 2 miles SE of lake at head of American River 4 miles N of Boulder Cr. (Teller Quad.).

J-68-P-4: Observed July 10 by aircraft. Gyrs were not observed, however, due to the very numerous sea birds and the extent of the cliff, they could have easily been overlooked. I feel this site has a good probability -- Bahnke reported that gyrs nested here in 1967. Loc. Topkok Head (seacliff) (Solomon Quad.).

J-68-P-5: Observed by aircraft July 8. A site was located, and it appeared that a light colored bird was present in the area; the observation could not be substantiated. Fair probability of a pair in this general area. Loc. Rainbow Camp (Bendeleben Quad.).

J-68-P-6: Discovered July 8 by aircraft. The nest contained at least two large downy young. Adults were not observed. A second visit to this site later in the day did not produce adult observations -- again the count of young was at least two. There is a very high probability that this was a gyr nest, as the Rough-leg chicks would have been much smaller at this time. It definitely was not ravens, and I am almost positive Golden Eagles would not nest in this situation (on a dredge boom-separated from the dredge). The site is located in an area where gyrs have been known to nest on abandoned dredges. Loc. 2 miles up Washington Cr. from Taylor (Bendeleben Quad.).

J-68-P-7: Discovered July 19. White wash and orange lichen evident, and it appeared to have been active. Revisited July 21 and located two adults at the site. One flew off and disappeared. The other circled over us, out of what seemed curiosity and, without calling, flew off and began soaring over the valley. The action of the birds makes this a questionable site. Possibly non-breeders or they lost their clutch or young. Loc. Serpentine Hot Springs (Bendeleben Quad.).

J-68-P-11: Discovered by aircraft June 3. Two adult gyrs were observed on the cliff and orange lichen was evident. Revisited by aircraft on June 26 and no gyrs were noted. This site is located between two active gyr sites and may have been a perching place for the adults of one of them. Loc. E end of S side of mountain between Sonora Cr. and Quartz Cr. between J-68-8 and J-68-9.

The following are sites that were inhabited by gyrs, but they were non-breeders.

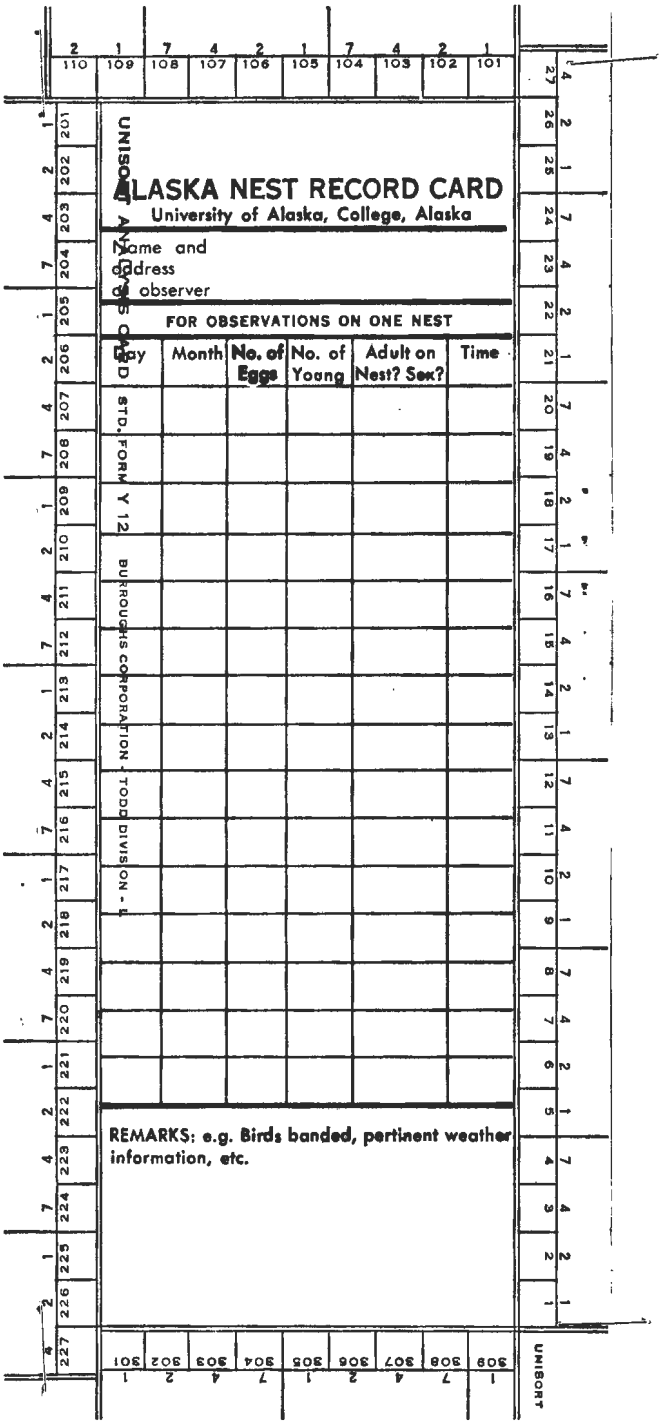
J-68-2: Discovered May 30. Both adults were present. The male flew off behind the mountain; the female gave a few keks and followed him. They seemed slightly attached to the cliff (which had a good stick nest and droppings indicated the birds had been perching in it). On June 7 the site was scoped and one bird was seen to fly off. On July 11 the site was visited and one bird was present, but flew off at our approach. There are no other sites on this string of hills, and from this evidence, the birds were considered non-breeders. Well-used site. Loc. Bluff at head of Slate Cr. (tributary of Banner Cr.) opposite Mile 14 Kougarok Road (W of road) (Nome Quad.).

J-68-3: Discovered July 2. One adult flew off and disappeared upstream. The site was scoped from across the river and there was uncertainty of young being in the visable nest. On July 8 an aircraft observation revealed the nest empty, and the bird was not observed. Bahnke told me in July that he had observed this bird a number of times and had visited the nest. It was a single bird and did not have a mate or brood. From by brief observation, there is a possibility that the bird was an immature from 1967. This is a well-used site. Loc. mouth of Windy Cr. 1/2 mile above Kougarok Bridge at Mile 85 Kougarok Road (Bendeleben Quad.).

The totals are as follows: 34 active breeding aeries, 7 "probable" aeries, and 2 non-breeding aeries.

Appendix I (A)

The Alaska Nest Record Card used during 1968 to record nesting information.



UNISORT ANY-SIZE CARD

ALASKA NEST RECORD CARD

University of Alaska, College, Alaska

Name and address of observer

FOR OBSERVATIONS ON ONE NEST

Day	Month	No. of Eggs	No. of Young	Adult on Nest? Sex?	Time

STD. FORM Y 12 BURROUGHS CORPORATION - TODD DIVISION - L

REMARKS: e.g. Birds banded, pertinent weather information, etc.

UNISORT

Name of Bird	Year

Locality of Nest

Latitude..... Longitude.....

Altitude..... Direction slope faces.....

Nest.....ft. above ground or base of cliff.

TYPE OF VEGETATION IN AREA (check one or more)

Forest ☐ Tall brush (4-10') ☐ Shrub (1-4') ☐

Moist Tundra ☐ Rocky Tundra ☐ Field ☐ Marsh ☐

Other .....

List abundant plants:

POSITION OF NEST

In tree, brush or shrub ☐

On ground, under tree, brush or shrub ☐

On ground, not under tree, brush or shrub ☐

On ground, in open on sand or rocks ☐

On cliff or bank ☐ On floating mat ☐

On building ☐

FATE OF NEST

No. of eggs hatched .....

No. of unhatched eggs.....

Cause of non-hatching of eggs.....

.....

No. of chicks that left nest.....

Cause of death of chicks not leaving nest.....

.....

Appendix I (B)

Alaska Nest Record Card # _____ Eyrie # _____

Eyrie Visit Form.

date found _____ stage first found (eggs, etc.) _____

dates visited _____

site:

height of cliff _____ _____

height of nest _____

type of rock _____

type of formation _____

direction facing _____

type site (rough-leg, raven, or scrape/pothole) _____

alternates _____

color of yg. _____

hatching dates _____ no. hatched _____

fledging dates _____ no. fledged _____

birds banded _____

reaction of yg. to humans _____

pellets collected: yes _____ no _____

dates and sample bag # _____

_____

color of adults _____

reaction of adults to humans _____

remarks (adl. eggs, mutes collected, parasites collected, etc.) _____

_____

_____

_____

name of observer _____

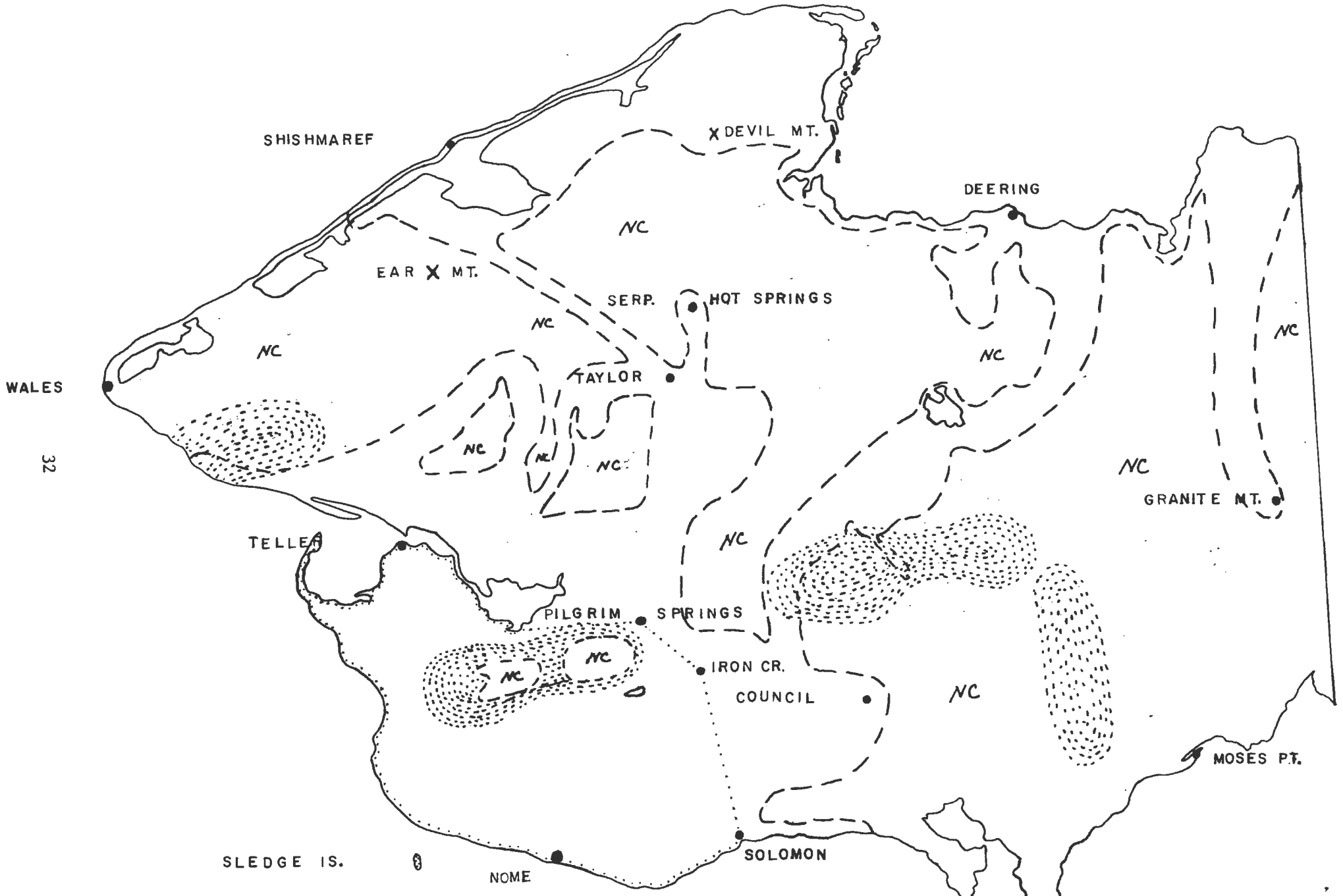
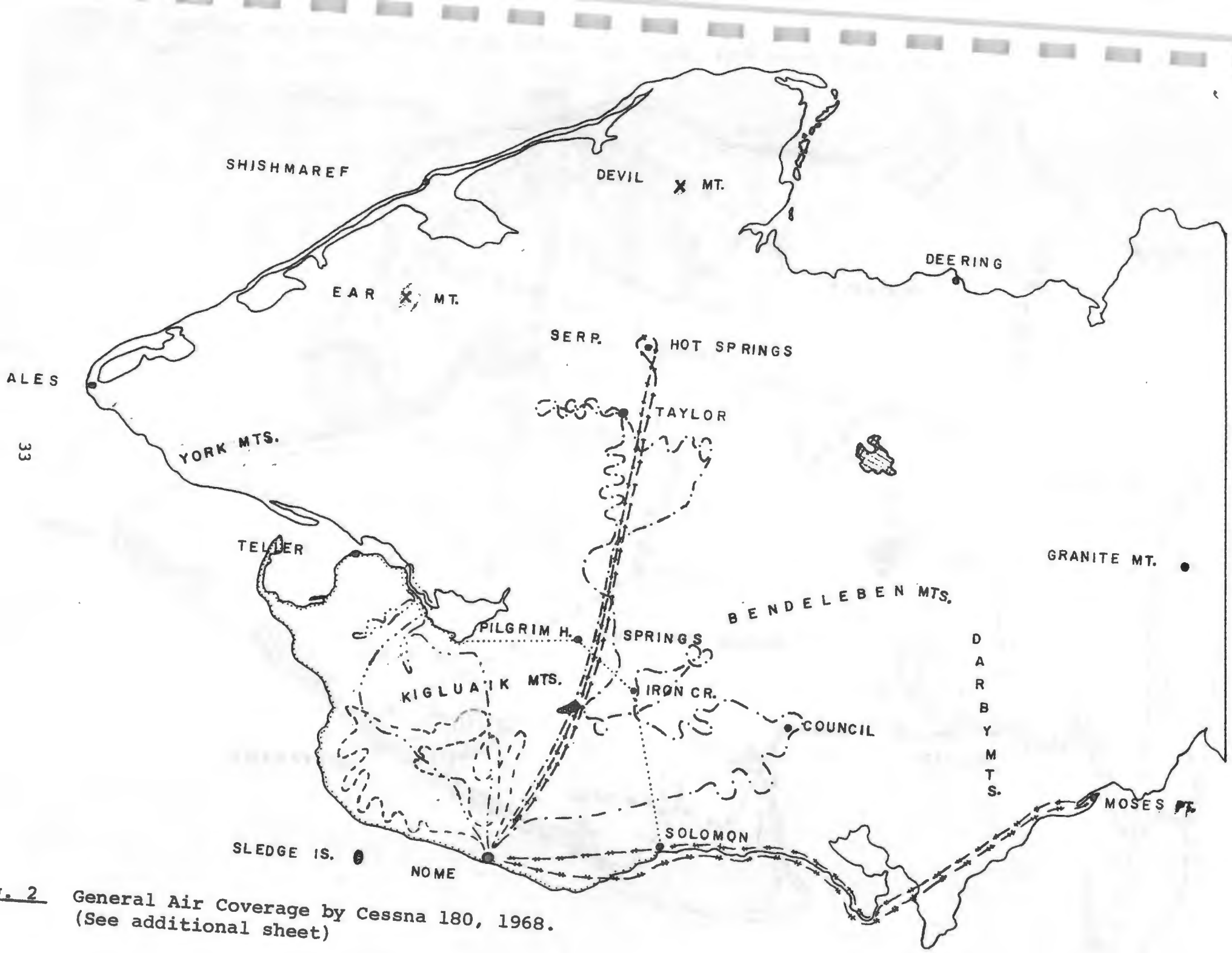


Fig. 1 Approximate Area Covered in Search. Shaded areas (NC) represent area not covered. The area most thoroughly covered is outlined by dots.



. 2 General Air Coverage by Cessna 180, 1968.
(See additional sheet)

Fig. 3 General Air Coverage by PA-18 Super Cub, 1968. (See additional sheet)

MAP SUPPLEMENT SHEET FOR AIRCRAFT COVERAGE

Cessna 180 Air Coverage

_ _ _ _ _ _ Represents flight of June 3 (1.9 hrs.)

—#—#—#— Represents flight of June 3 (Tilton-2.5 hrs.)

___ ... ___ Represents flight of June 17 (1.6 hrs.)

__ . __ . __ Represents flight of July 8 (3.4 hrs.)

—+—+—+— Represents flight of July 19 & 22 (3.7 hrs.)

Total 180 air time - 13.1 hrs.

PA-18 Super Cub Air Coverage

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

___ ___ ___ Represents flight of July 8 (4.8 hrs.)

__ . __ . __ Represents flight of July 9 (3.3 hrs.)

_____ Represents flight of July 10 (3.1 hrs.)

—+—+—+— Represents flight of July 11 (4.5 hrs.)

—#—#—#— Represents flights of July 12 & 13 (12 hrs.)

Total Super Cub air time - 32.2 hrs.

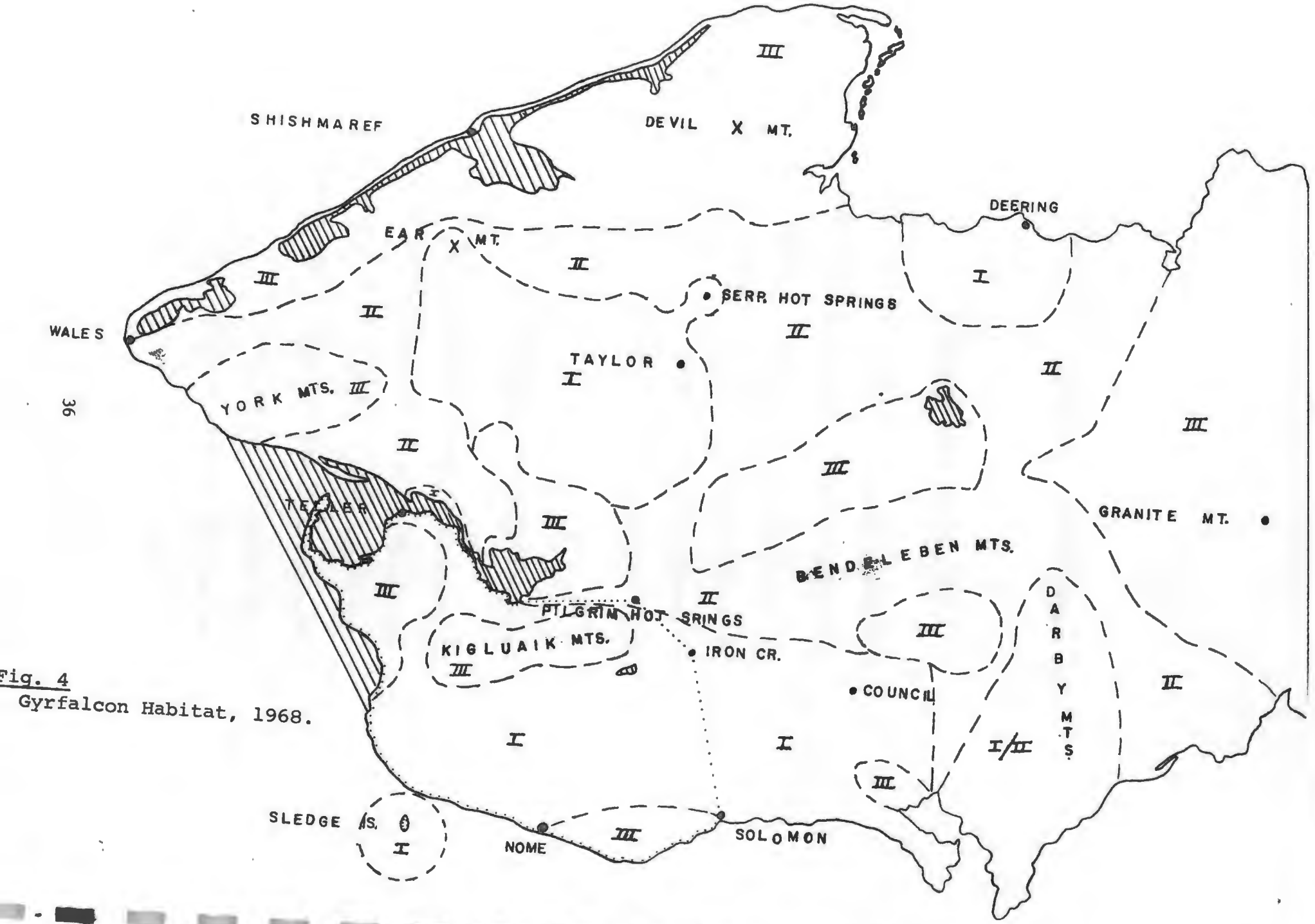


Fig. 4
Gyrfalcon Habitat, 1968.

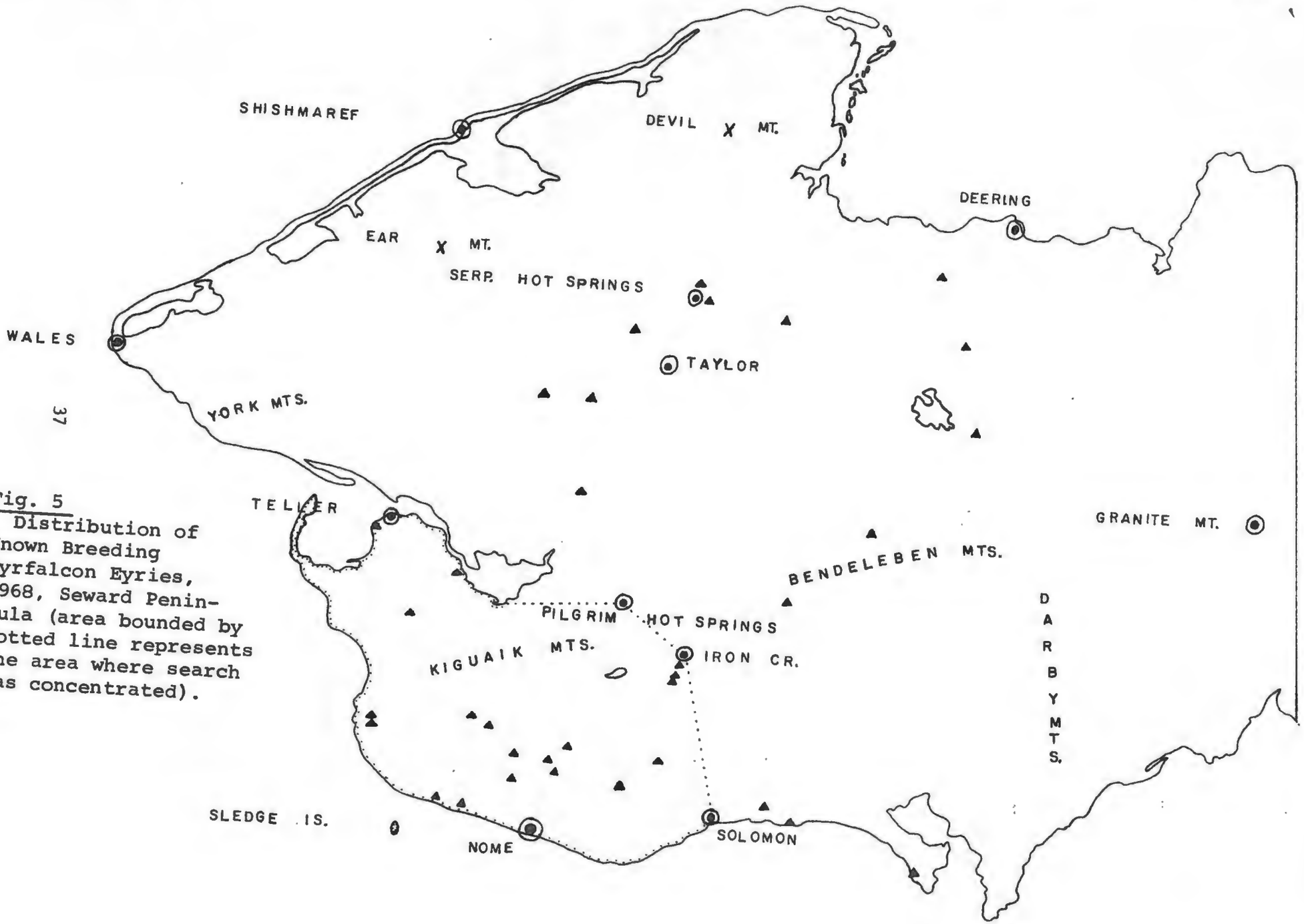
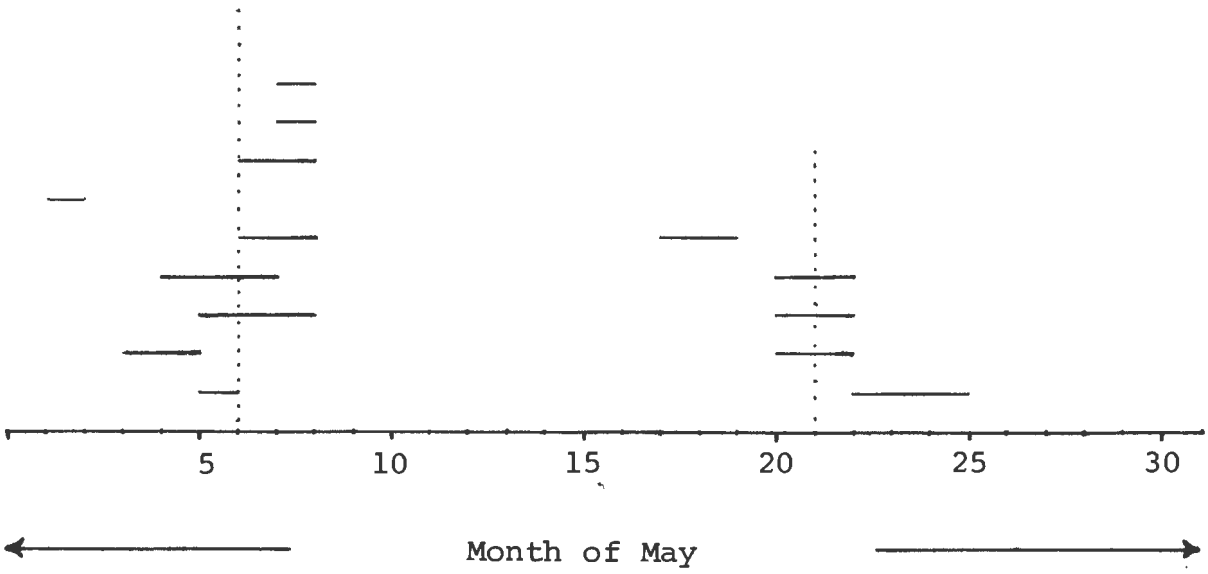


Fig. 5
Distribution of Known Breeding Gyrfalcon Eyries, 1968, Seward Peninsula (area bounded by dotted line represents the area where search was concentrated).

Fig. 6 Laying Incidence.



The lines indicate known and estimated dates of laying for each gyrfalcon eyrie. Incidence of laying forms a peak at approximately 6 May and again at 21 May.

These peaks will hold true for hatching and fledging as well.

Fig. 7 Plot of weights of 2 young gyrfalcons from Eyrie J-68-1, Seward Peninsula. Dotted lines indicate estimates.

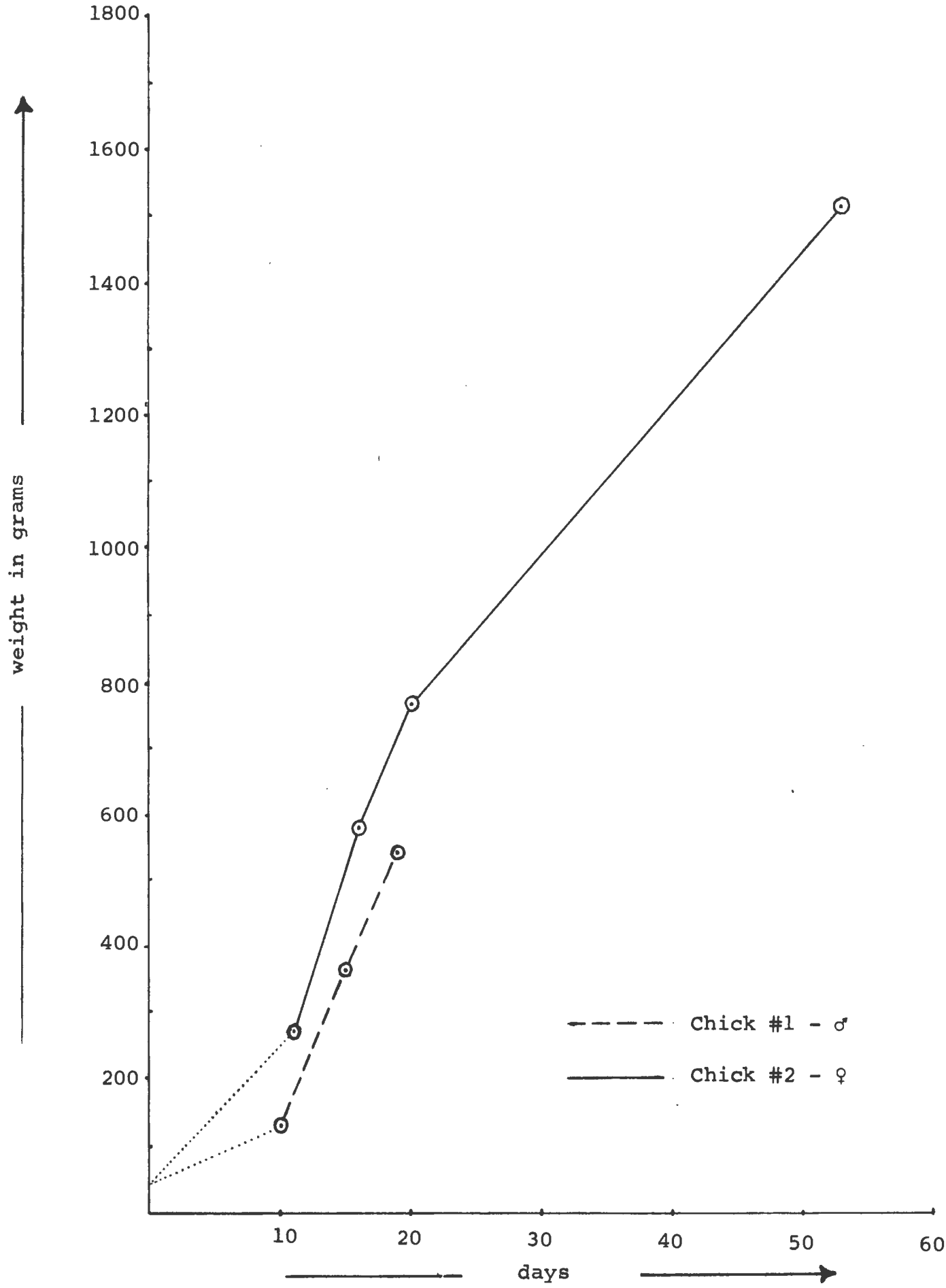


Fig. 8 Plot of weights of three young gyrfalcons (2 ♀'s & 1 ♂) from Eyrie J-68-4, Seward Peninsula.

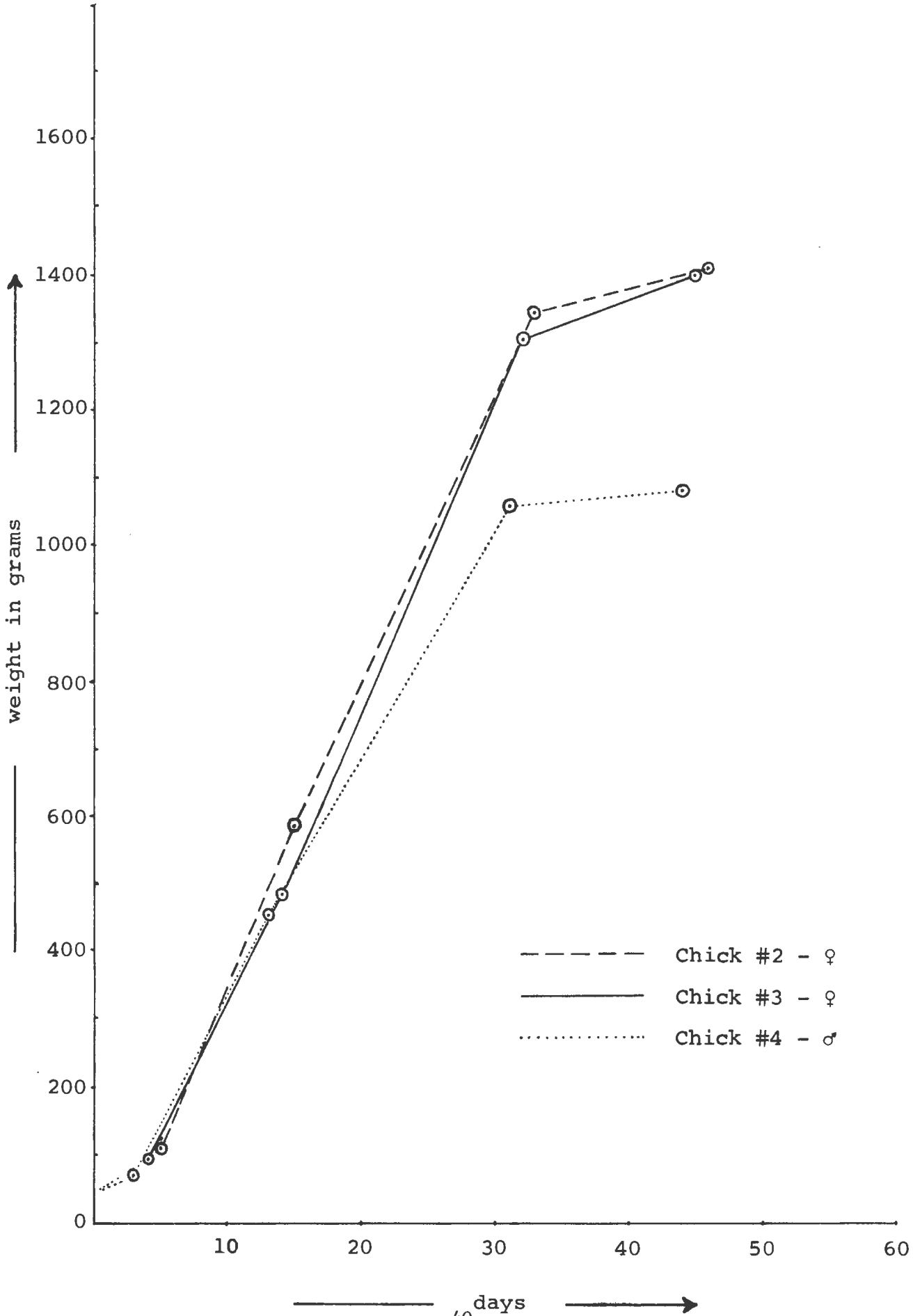


Fig. 9 Plot of weights of four young gyrfalcons (3 ♂'s & 1 ♀) from Eyrie J-68-5, Seward Peninsula.

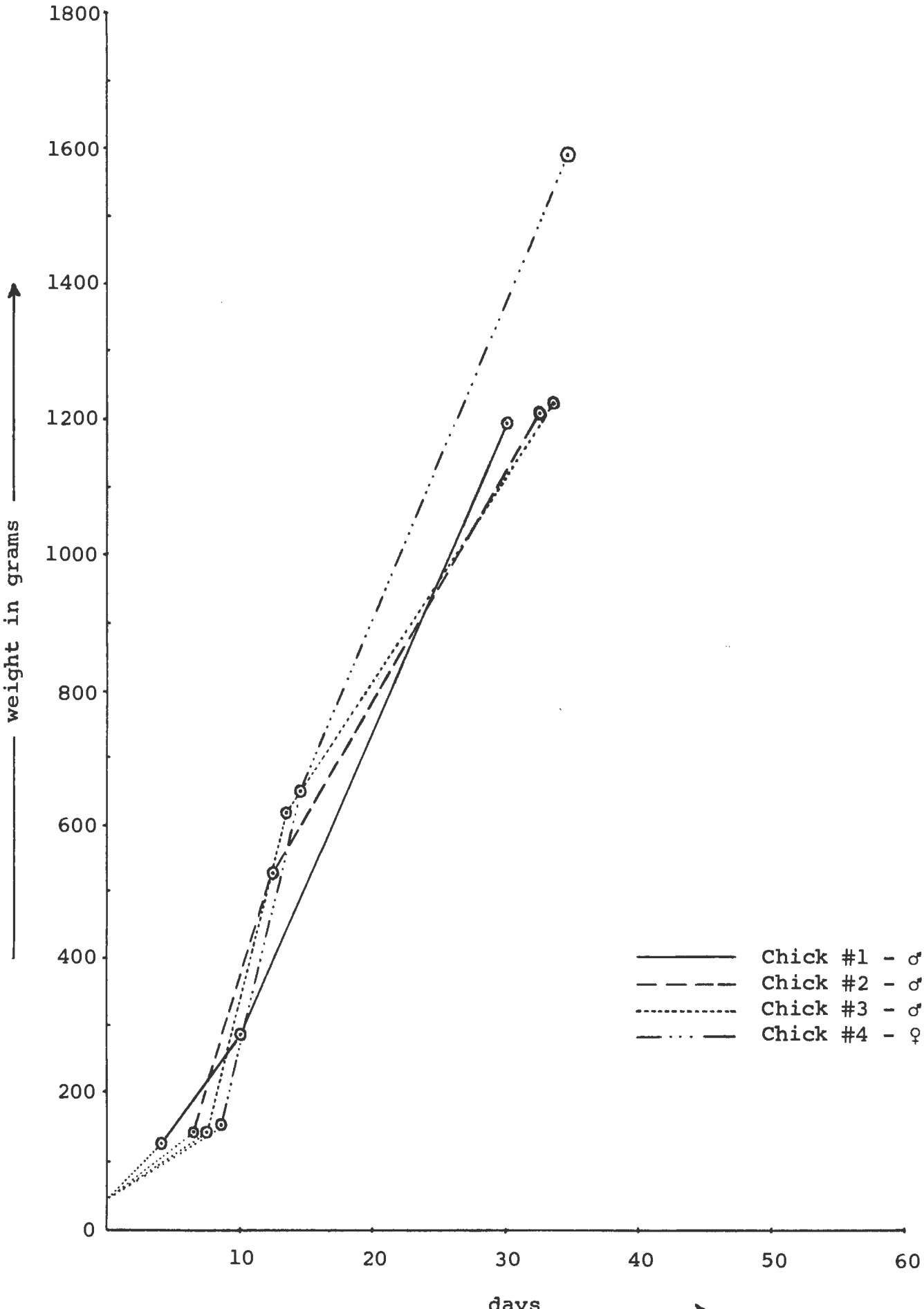


Fig. 10 Plot of mean weights of 5 male and 4 female gyrfalcons from Table X & Table XI for the first 35 days after hatching.

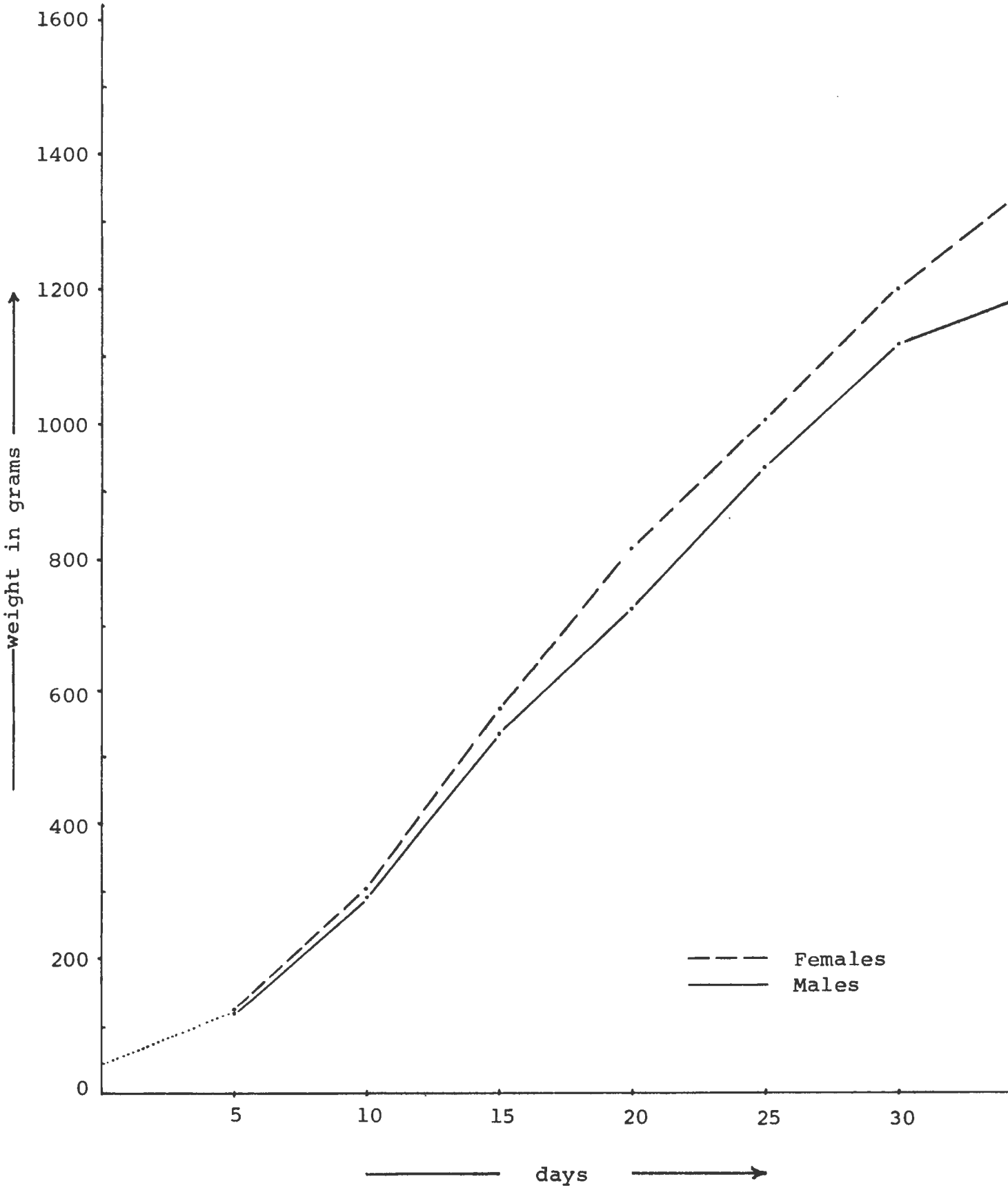
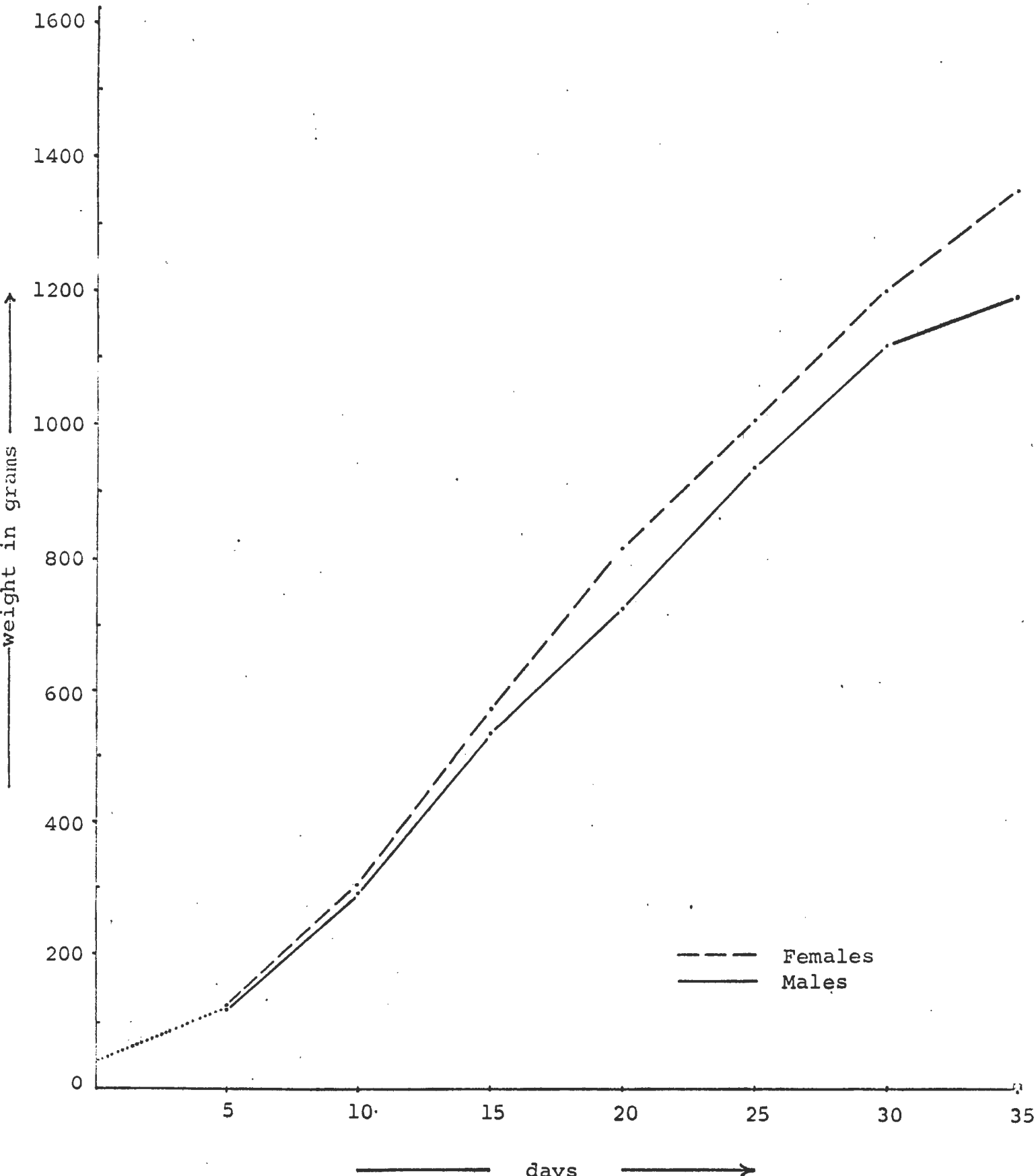


Fig. 10 Plot of mean weights of 5 male and 4 female gyrfalcons from Table X & Table XI for the first 35 days after hatching.



PREPARED BY:

David Roseneau
Game Biologist

APPROVED BY:

Director, Division of Game

SUBMITTED BY:

Robert B. Weeden
Study Leader

WORK PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska

PROJECT NO: W-13-R-3 TITLE: Small Game, Waterfowl, & Furbearer Investigations

STUDY PLAN: B TITLE: Upland Game

JOB NO.: 12 TITLE: Development of Methods for Numerical Surveys of Snowshoe Hares

PERIOD COVERED: July 1, 1968 to December 31, 1968

OBJECTIVES

To develop techniques for estimating relative numbers of snowshoe hares over large areas.

To develop methods of estimating densities or relative numbers of snowshoe hares on small areas.

FINDINGS

No work was done on this Job in the period July 1 to December 31, 1968 due to lack of personnel. The Job will be started in the first half of 1969 if position vacancies can be filled.

PREPARED AND SUBMITTED BY:

Robert B. Weeden
Acting Study Leader

APPROVED BY:

Director, Division of Game