

**Small game, waterfowl, & furbearer investigations.  
Upland game. Density and productivity of gyrfalcons  
on the Seward Peninsula**

STUDY PLAN SEGMENT REPORT

FEDERAL AID IN WILDLIFE RESTORATION

STATE: Alaska TITLE: Small Game, Waterfowl, & Furbearer Investigations  
PROJECT NO.: W-17-1 & W-17-2 TITLE: Upland Game  
STUDY PLAN: B & R TITLE: Density and Productivity of Gyrfalcons on the Seward Peninsula  
JOB NO.: B-11  
R-10.4  
PERIOD COVERED: January 1, 1969 to December 31, 1969

ABSTRACT

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

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

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

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OBJECTIVES

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

To record productivity in a sample of aeries.

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

METHODS

Transportation

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

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

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

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

#### Area Surveyed and Habitat Classes

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

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

The hills between the Kwik River and Koyuk River.

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

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

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

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

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

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

The southern Kwiktalek Mountains and the southern Darby Mountains.

The region between Ear Mountain and Taylor.

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

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

Fig. 1 delineates the area covered by the search.

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

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

The three classes of habitat are:

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

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

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

## RESULTS

### Population Estimates

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

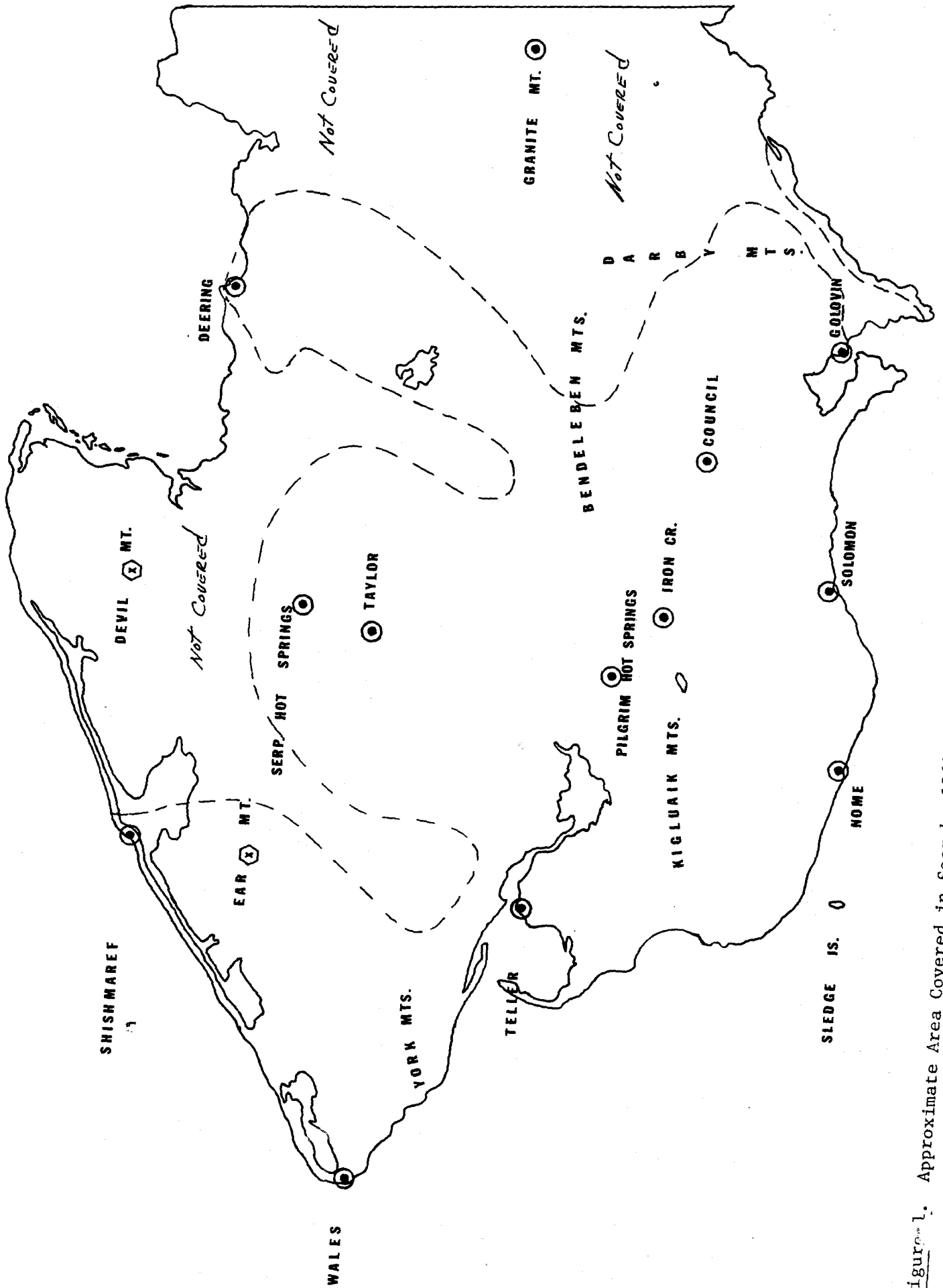


Figure 1. Approximate Area Covered in Search, 1969.

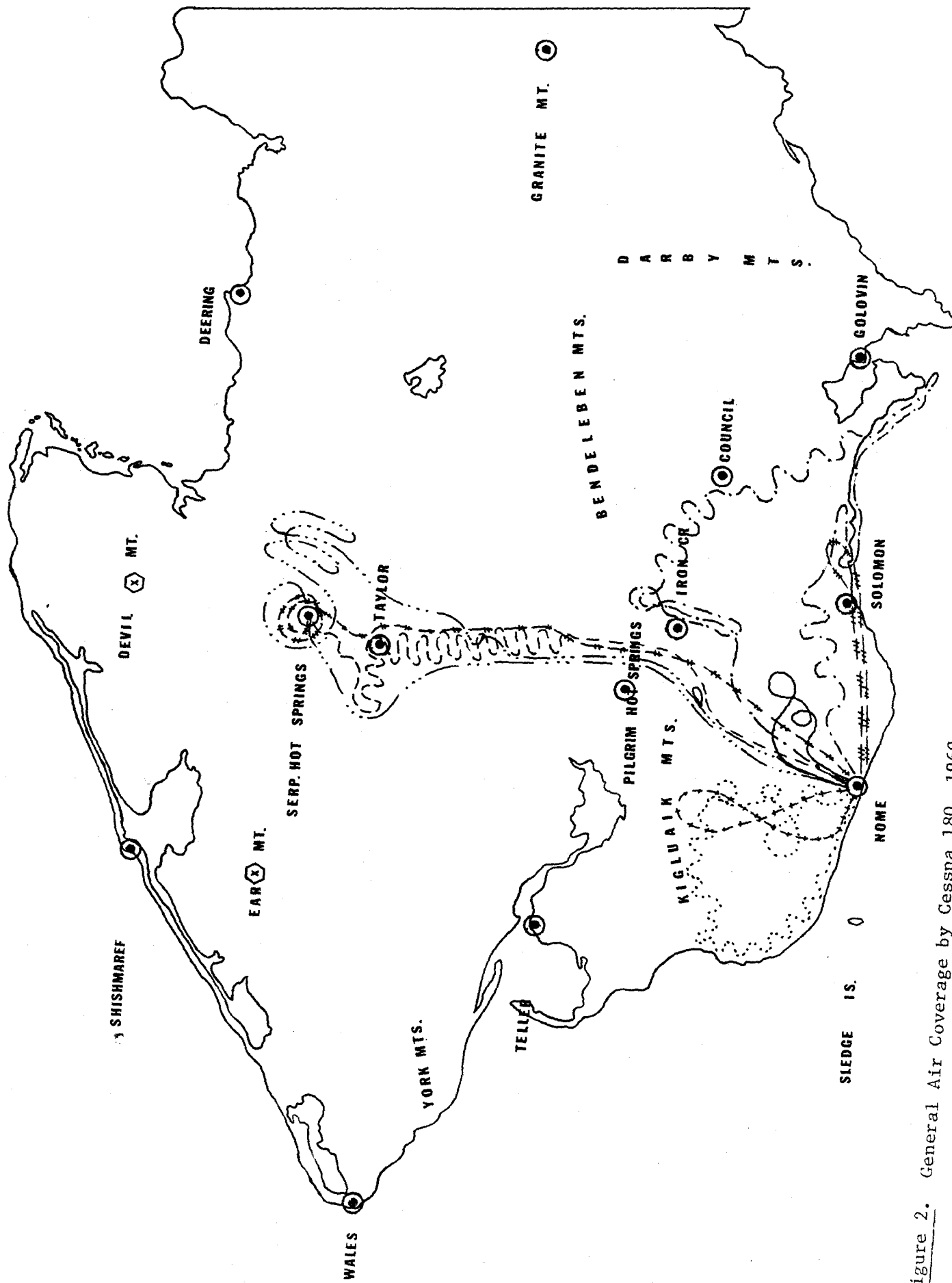


Figure 2. General Air Coverage by Cessna 180, 1969.

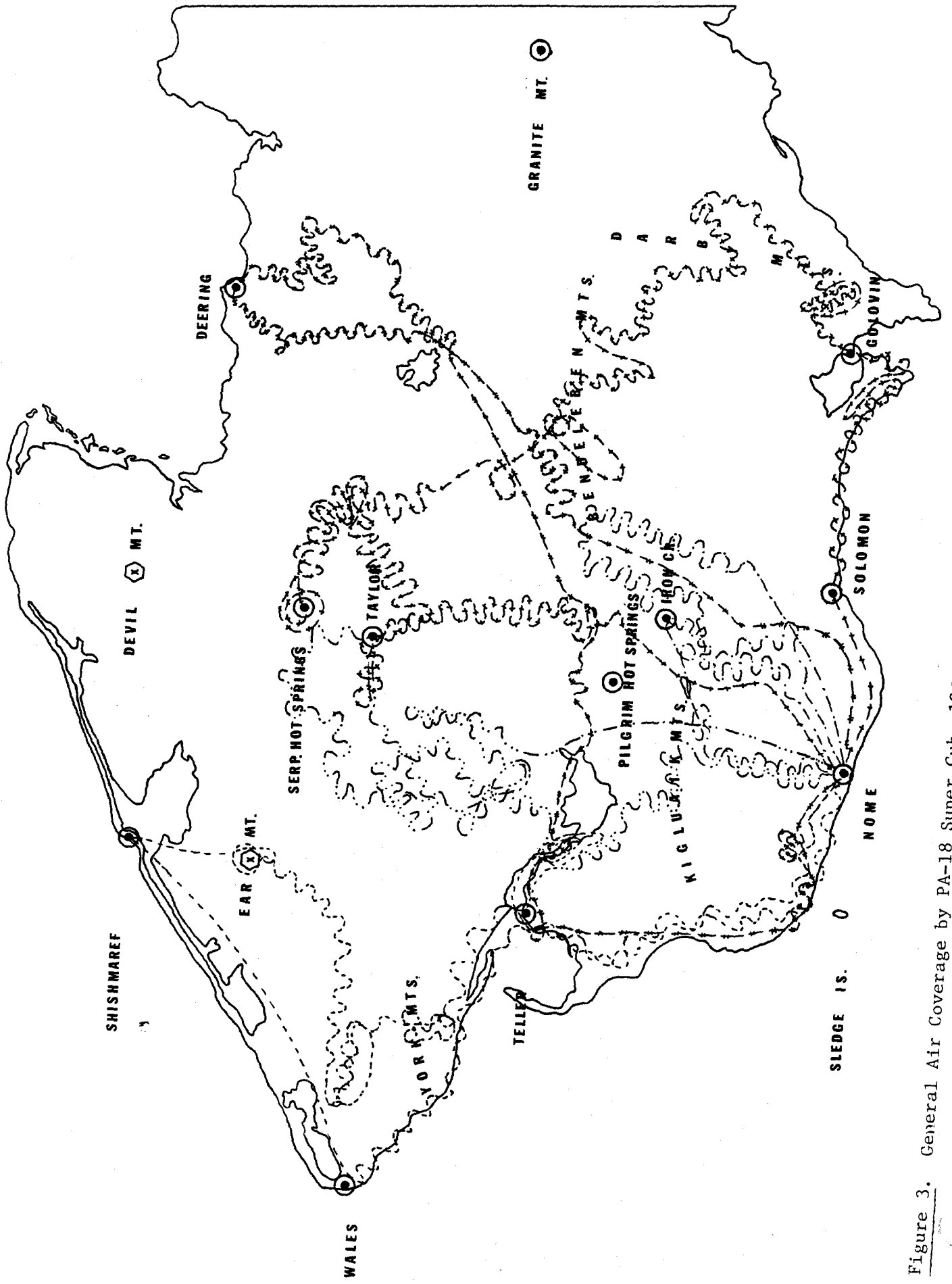


Figure 3. General Air Coverage by PA-18 Super Cub, 1969.



MAP SUPPLEMENT SHEET FOR AIRCRAFT COVERAGE

Cessna 180 Air Coverage

..... Represents flight of June 7 (2.3 hrs.)  
- - - - - Represents flight of June 11 (2.3 hrs.)  
-# -# -# -# Represents flight of June 13 (2.3 hrs.)  
\_\_\_\_\_ Represents flight of June 15 ( .8 hr.)  
\_\_ . \_\_ . \_\_ Represents flight of June 22 (2.6 hrs.)  
-+ -+ -+ Represents flight of July 8 ( .7 hr.)  
-# -# -# Represents flight of July 11 ( .95 hr.)  
and July 14 ( .8 hr.)  
\_\_\_...\_\_\_... Represents flight of Aug. 9 (2.0 hrs.)

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

PA-18 Super Cub Air Coverage

\_\_ . \_\_ . \_\_ Represents flight of June 26 (4.5 hrs.)  
-+ -+ -+ Represents flight of June 27 (6.1 hrs.)  
-# -# -# Represents flight of June 28 (5.9 hrs.)  
\_\_\_...\_\_\_... Represents flight of June 30 (5.1 hrs.)  
- - - - - Represents flight of July 1 (5.3 hrs.)

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

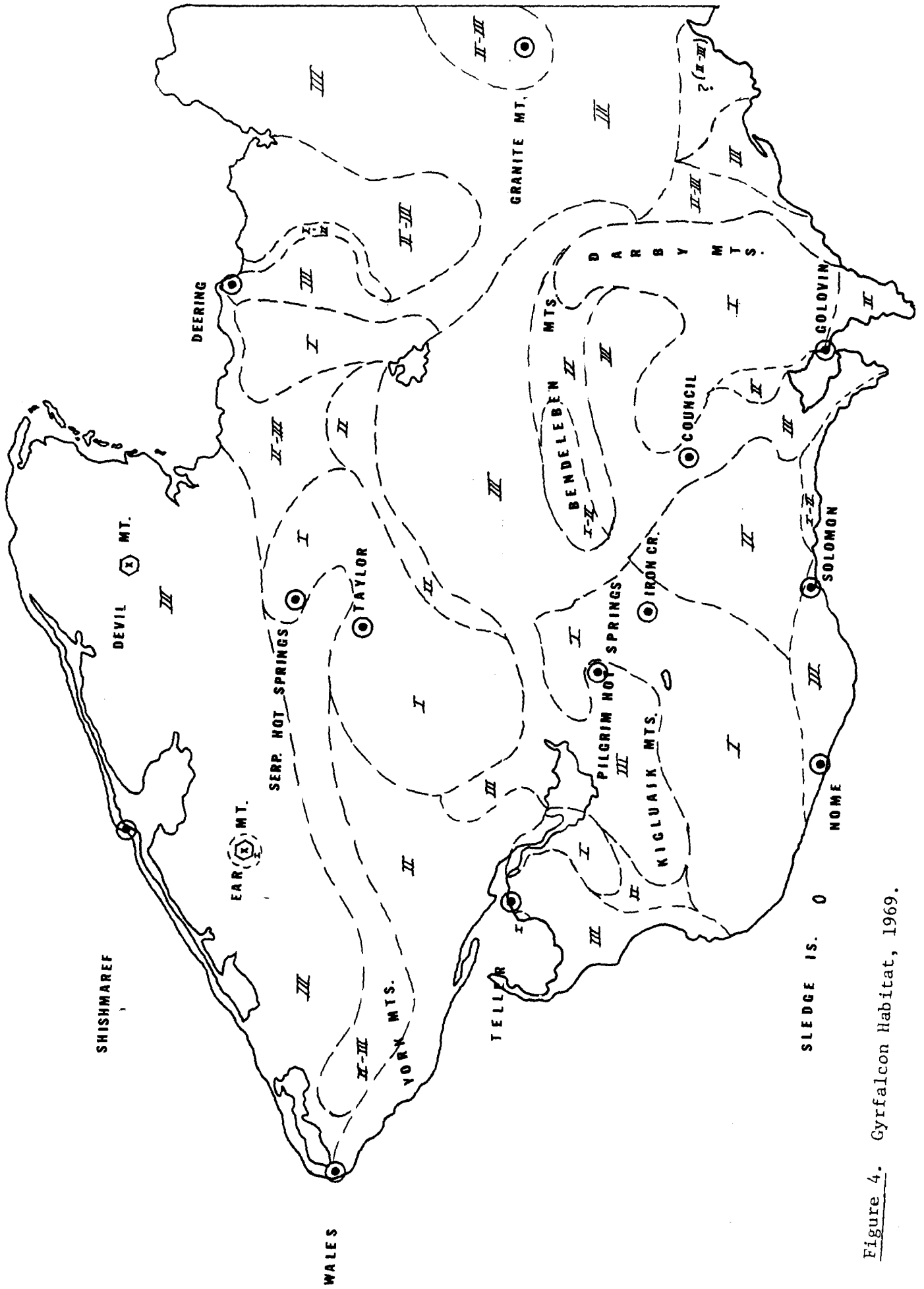


Figure 4. Gyr Falcon Habitat, 1969.

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

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

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

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

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

#### Nesting Habitat Preferences

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

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

## Nests

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

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

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

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

## Nest Re-use by Returning Pairs

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

Of the 24 active breeding sites located in 1968, 19 were found inactive and unused by any species during 1969. Three were found to be occupied by ravens, two by rough-legged hawks and one was not checked. In addition I was unable to determine the species occupying one site (either golden eagle or gyrfalcon). The remaining eight were again active gyrfalcon aeries. During 1969, gyrfalcons were found nesting at two of the 1968 golden eagle sites and at three of the 1968 rough-legged hawk sites.

### Behavior of Nesting Adults

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

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

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

### Incubation

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

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

### Clutch Size

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

### Hatching and Fledging Dates

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

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

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

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

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

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

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

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

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

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

### Hatching Success

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

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

### Growth of Young

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

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

### Sex Ratio of Chicks

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

### Interval from Hatching to Fledging

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



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

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

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

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

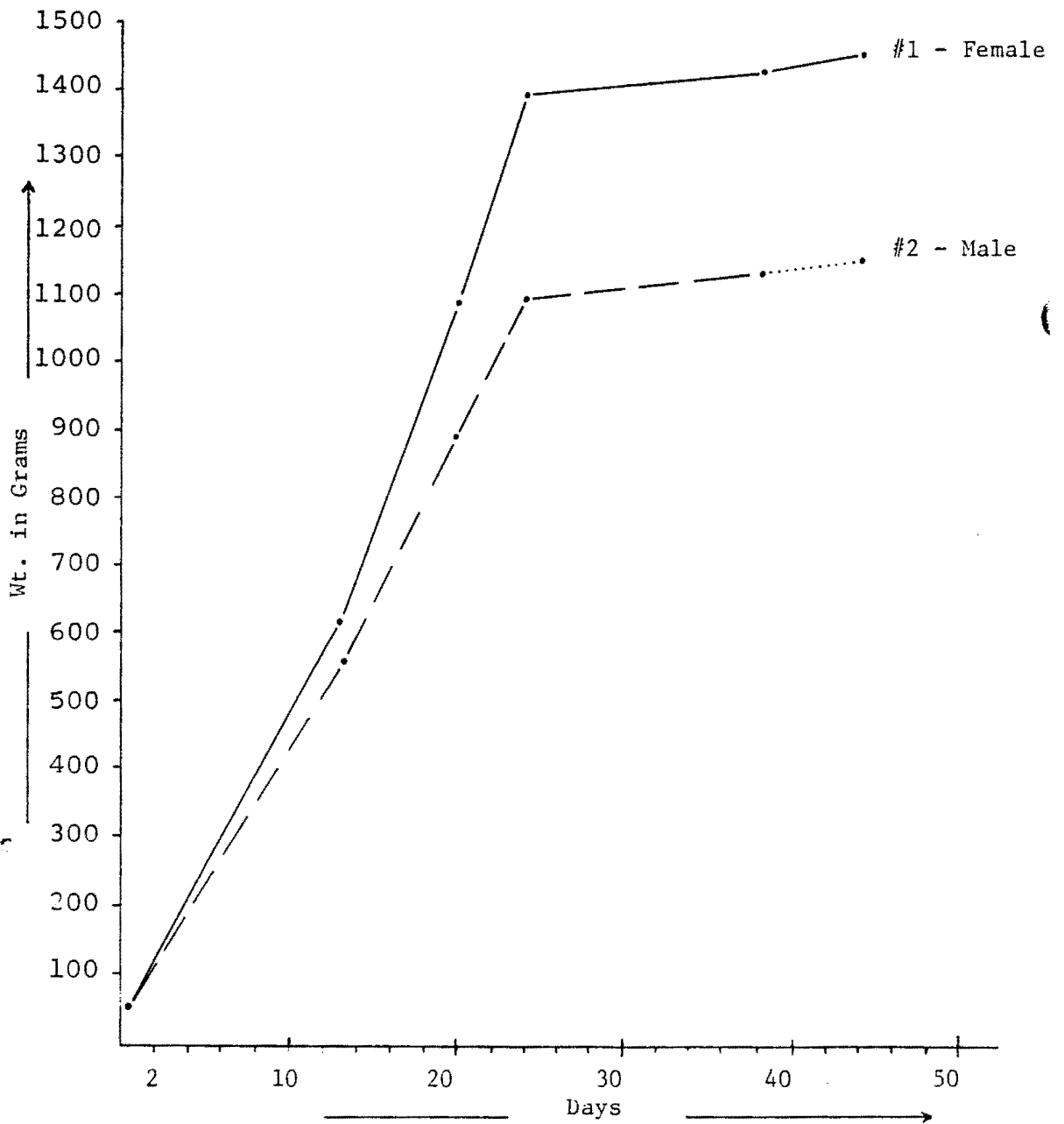


Table 4. Sex of Chicks from Seven Gyrfalcon Aeries on the Seward Peninsula, 1969.

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

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

#### Number of Young Fledged

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

#### Summary of Productivity

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

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

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

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

#### OTHER BIOLOGICAL DATA

##### Interactions with Other Birds at Nests

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

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

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

Table 5. General Seward Peninsula Population Data, 1969.

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

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

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

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

### Food Habits

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

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

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

### Mortality

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

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

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

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

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

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

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

#### Color Phases

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

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

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



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

#### Banding

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

#### LITERATURE CITED

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

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

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

Total - 5 chicks; 2 Females and 3 Males.

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