BIRDS OF BULDIR ISLAND, ALASKA WITH NOTES ON ABUNDANCE AND NESTING CHRONOLOGY.

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August 1978

The avifauna of Buldir Island was studied May - September 1974 - 1976 and late-May - June 1977. The purpose of the study was to evaluate nesting chronologies, population sizes, and habitat utilization of birds, particularly Aleutian Canada Geese (Branta canadensis leucopareia) and breeding seabirds. Buldir Island was the site choosen because it has the only known remaining breeding population of Aleutian Canada Geese, and it provides habitat for the most diverse seabird colony in the Aleutians.

Background

The avifauna of the Aleutian Islands is rather poorly known because of the islands' isolation, the inclement weather, and the difficulty of travel in the region. Although ornithologists have been gathering data in the Aleutians since the 1800's, most of the studies conducted until recently have been fragmentary, often the by-product of other primary investigations.

W.H. Dall spent two seasons (1872 and 1873) in the Aleutians as a member of a geographical reconnaissance party for the U.S. Coast Survey. His bird notes formed the basis for two important papers (1873, 1874), the first extensive reports of the birds of the area. L.M. Turner, while in the U.S. Army Signal Corps, spent three years (1878-1881) in the Aleutians and published two works (1885, 1886) on his bird observations. His ornithological contribution is a truly remarkable achievement in view of the fact that the information was gathered

incidental to his primary duty as weather observer, and in addition to collecting plants, fish, mammals and ethnological material.

R.C. McGregor visited the Krenitzen Island group (Eastern Aleutians) in 1901 and published a short note (1906) on his bird observations. A.H. Clark (1910) and H.M. Laing (1925) made brief visits to several islands in the Chain, and their notes add considerable information to our knowledge of Aleutian birds. O.J. Murie spent two seasons (1936-1937) surveying the Aleutians for the then U.S. Bureau of Biological Survey (now U.S. Fish and Wildlife Service). Although he was primarily responsible for evaluating the suitability of the various islands for fur farming purposes, he also made many important bird observations. His monograph (1959) is still the major reference to the fauna of the region.

The advent of WWII in 1942 brought thousands of military troops to the Aleutians, including several ornithologists. Important papers were written on birds observed at Attu (Sutton and Wildon 1946, Wilson 1948), Adak (Taber 1946), and Unalaska (Cahn 1947).

Ornithological work generally waned for the next two decades. The next significant ornithological work appeared in 1961 with the publication of K.W. Kenyon's paper on the birds of Amchitka.

Ornithological research increased in the late 1960's. Extensive studies were conducted at Amchitka by researchers under contract to the U.S. Atomic Energy Commission in conjunction with underground nuclear tests (White in press). Byrd et al. (1974) provide an annotated list of the birds observed at Adak 1969-1973, and Jones and Gibson (1975) and Byrd et al. (in press) provide data on new records for the Aleutians.

This report present the first detailed account of the biology and distribution of birds in the Aleutian Islands west of Amchitka.

Study Area

Buldir Island is the westernmost of the Rat Island group of the Aleutian Islands (fig 1). The 2,000-ha island (52°21' N, 175°56' E) is located about 110 km from both Shemya to the west and Kiska to the east. Buldir is approximately 6.4 km long and 3.2 km wide. Figure 2 shows the place names used in the study.

Characteristic physiographic features of this volcanic island are boulder-strewn beaches, talus slides, and three volcanic peaks up to 655 m in height. There is a relatively flat valley on the island's northwest side, otherwise the island is composed primarily of steep slopes. Nearly vertical sea cliffs form

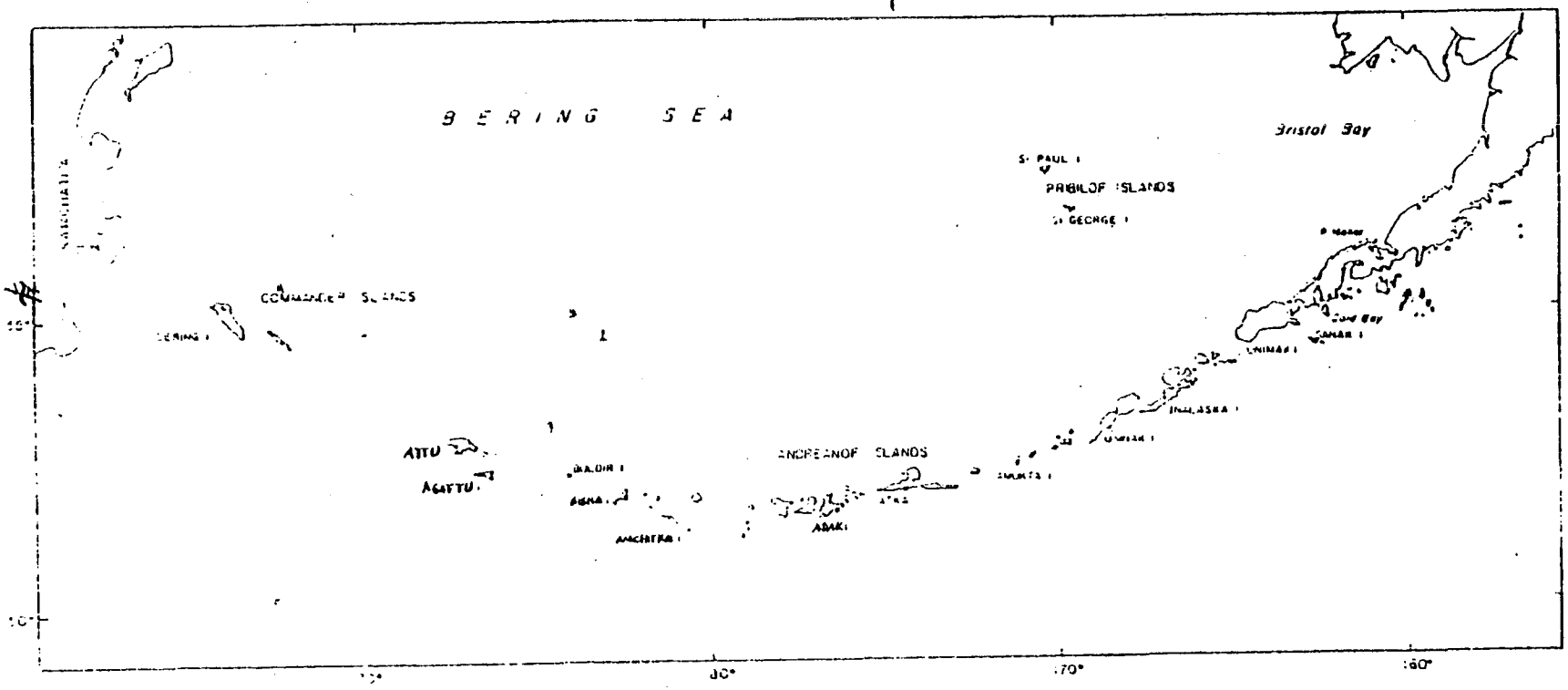

FIGURE 1

THE ALEUTIAN ISLANDS, ALASKA

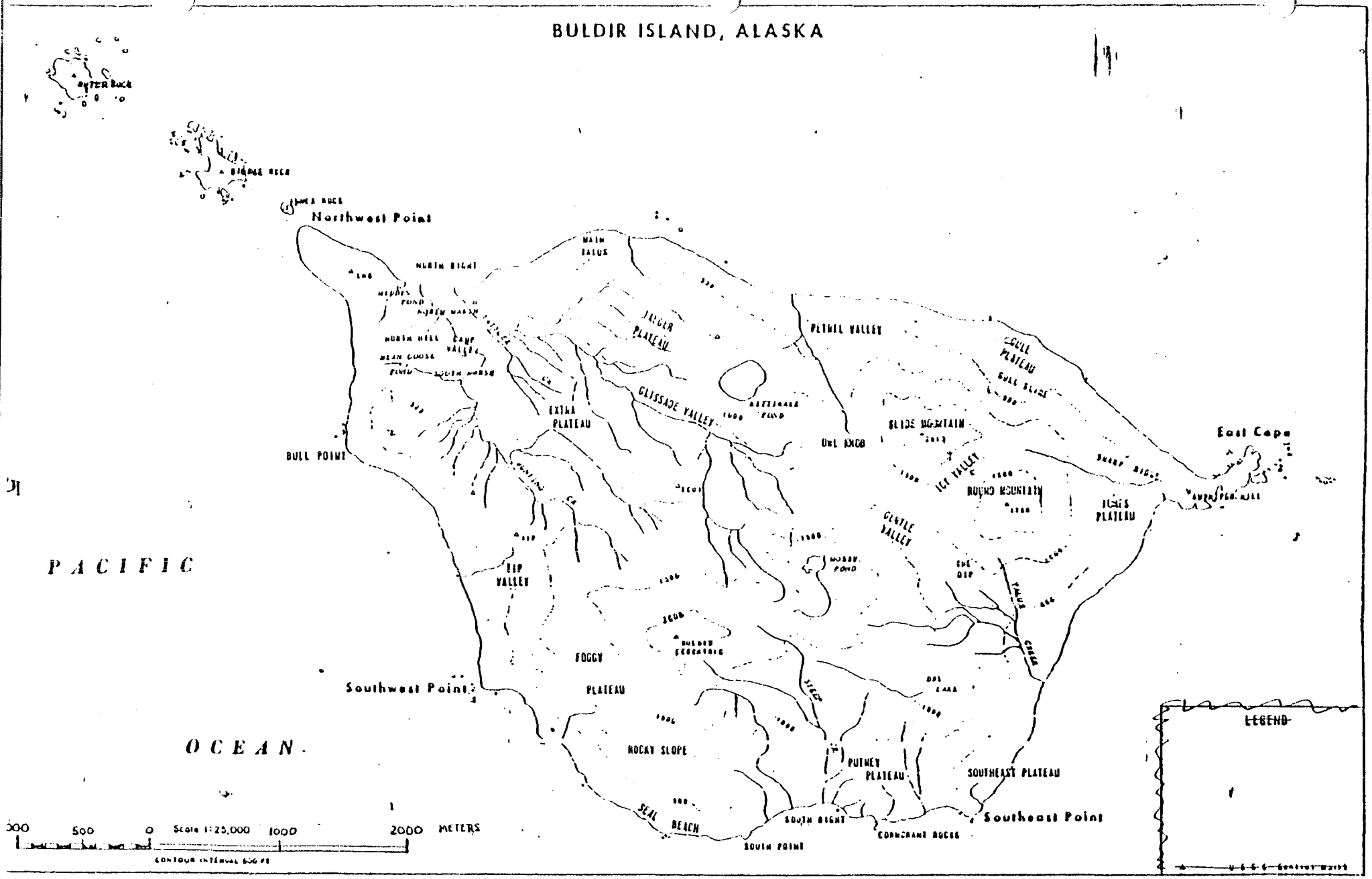

FIGURE 2

PLACE NAMES USED AT BULDIR

over half the island's 20 km-long coastline. Most of the remainder of the coast consists of talus slides (10%), earth slides, or steep vegetated slopes. The geology of the island is described by Coats(1951).

Buldir has a single freshwater lake, Kittiwake Pond (1.2 ha surface area), and five ponds of less than 15 m in diameter. Four small streams are known to flow all summer, but other streams flow only during spring thaw.

Summer weather at Buldir was cool, humid, cloudy, and windy (see Byrd and Woolington 1978 for weather records).

Flora

Two major vegetative/physiographic associations were defined at Buldir (fig 3). The Lowland Tall-plant association generally occurred below 300-350 m elevation. The most important plant communities were the Elymus-umbel and Elymus-umbel-fern including as key plants Elymus arenarius, Heracleum lanatum, Angelica lucida, and Athyrium felix-femina. The Upland Short-plant association, above 300-350 m, was dominated by Carex spp. Salix spp., mosses, and other dwarf plants. Large areas nearly devoid of vegetation were found in the upland.

Fauna

There are no native or introduced terrestrial mammals on Buldir,

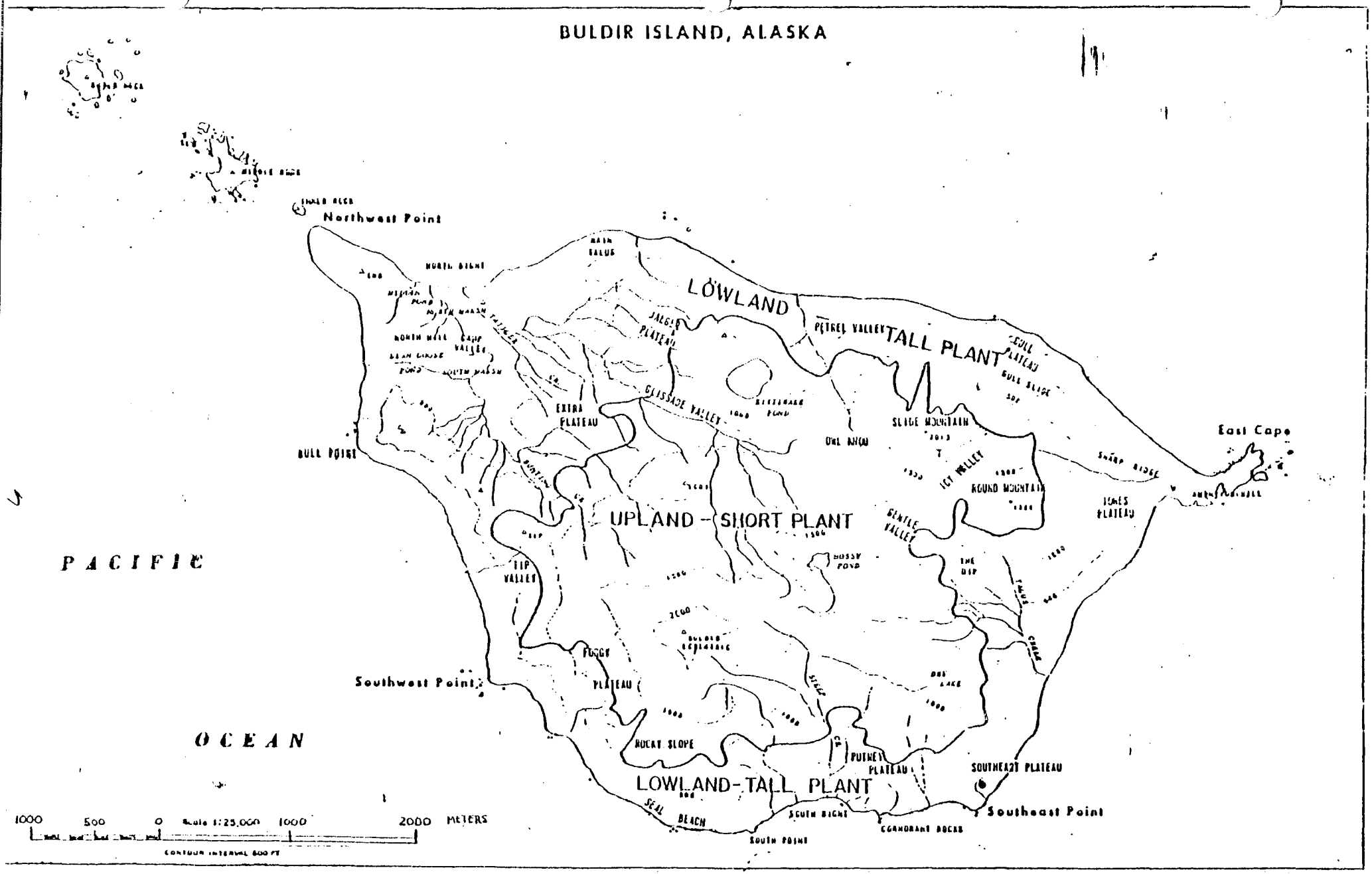

FIGURE 3

PHYSIOGRAPHIC AND FLORAL ASSOCIATIONS

but the marine mammals, Steller sea lions (Eumetopias jubata), sea otters (Enhydra lutra), and harbor seals (Phoca vitulina) occur.

As bird habitat, Buldir is similar to the other Aleutian volcanic islands, Gareloi, Kasatochi, Koniuji, and Chagulak. These islands are generally small (less than 7,000 ha) with a high percentage of coastline backed by steep cliffs, and all have talus habitat. They all differ from most of the larger Aleutian Islands by their lack of relatively extensive Empetrum/Cladonia tundra growing on gently sloping hills within island interiors which also include numerous small freshwater ponds. Of the "seabird-type" islands, Buldir is the only one with no introduced mammals on it. These "seabird-type" islands have diverse seabird colonies but limited habitat for waterfowl and some of the passerine birds.

Buldir provides habitat for one of the most diverse seabird colonies in the Northern Hemisphere. Its talus slopes, sea cliffs, and grassy hillsides teem with birds, including 19 nesting species of seabirds, 11 of them Alcidae.

Breeding raptors include Bald Eagles (Haliaeetus leucocephalus), Peregrine Falcons (Falco peregrinus), and Snowy Owls (Nyctea scandiaca). No shorebirds breed on the island, but 33 species were recorded as migrants. Buldir obviously provides a particularly attractive resting place for wind-blown stragglers.

Five species of passerine birds nest at Buldir, and 20 other species were recorded as migrants. A total of 122 species of birds was recorded on the island 1974-1977; however, only 31 bred.

Methods

Investigators were at Buldir 30 April-6 September 1974, 17 May-5 September 1975, 18 May-28 September, and 25 May-2 July 1977.

Our main purpose at Buldir was to study the endangered Aleutian Canada Goose, Branta canadensis leucopareia, so seabird studies were incidental except in 1975 when one investigator spent full time on feeding ecology of Horned and Tufted Puffins (Fratercula corniculata and Lunda cirrhata) Wehle 1976). Also during the period 1974-1976 storm-petrels (Oceanodroma) and auklets (Aethia) were given special attention.

Various methods were used to gather data on species. In general, transportation was afforded to off shore rocks or other colonies accessible only from the sea by Avon sportboats propelled by outboard engines. Colonies were located on 1:25,000 scale topographic maps provided by the U.S. Army Map Service, Fort Richardson, Anchorage, Alaska. Thomman pocket altimeters, and Silva hand-held compasses were used to determine colony locations accurately.

Measurements of birds and eggs were made with vernier calipers (accurate to 0.1 mm), and weights were taken with calibrated Pesola spring scales (accurate to within 0.5 to 2.0 g, depending on how large a scale was used).

Observations were made with the aid of optics varying from 7X binoculars to a Questar telescope with eye pieces providing magnification up to 130X.

More specific methods are provided in the discussion of the particular species for which they were used.

Bird names used follow the A.O.U. checklist (1957) and its supplements and Vaurie (1965) for those not on the A.O.U. list. Plant names follow Hulten (1968).

Results

Table 1 summarizes population estimates and nesting chronology for each breeding species. The following annotated list amplifies the data provided in the table and includes other information about each species recorded during the study.

Annotated List of Species

Gavia stellata. Red-throated Loon. Three individuals, all in flight, were recorded during the study; 20 May and 4 July 1974

and 7 August 1976. Each bird was heard calling. This species breeds on islands adjacent to Buldir, at Agattu (J.L. Trapp pers. comm.) and at Amchitka (White in press), but no breeding habitat is available at Buldir.

Podiceps grisegena. Red-necked Grebe. The remains of a high-plumaged bird were discovered on a boulder-strewn beach 25 June 1974. The species is known to breed at the western end of the Alaska Peninsula (Murie 1959) but has not previously been recorded west of Adak (Byrd et al. 1974) in summer. Red-necked Grebes winter regularly as far west as Adak (Byrd et al. 1974) but are rare westward.

Fulmarus glacialis. Northern Fulmars have been seen near nesting colonies in the Aleutians as early as 7 April (Chagulak I. 1974, Byrd and D.D. Gibson unpub. data). The earliest date investigators have been present on Buldir was 30 April (1974) on which date fulmars were seen flying over their nesting cliffs at East Cape.

The earliest date we visited the breeding colony was 26 May (1976) when birds were seen sitting on nest scrapes. Egg laying began as early as 7 June (1974) and most eggs were layed by early July. On 15 July (1976) eggs were found at most nests. An estimated 300 pairs (including non-breeding nest holders) were present in mid-July. On 31 July (1976) approximately 10%

Table 1 Status of breeding birds at Buldir Island 1974-1976

Species	Estimated Total Pairs	Arrival[1]	Laying (peak)	Hatching (peak)	Fledging/ Departure
Northern Fulmar	300	-1 May	16-24 June	31 Jul-11 Aug	after 24 Sept
Fork-Tail Storm Petrel	270,000	-15 May	25 May-10 June[2] 15 June-5 July[3]	15 Jul-7 Aug[2] 28 Jul-20 Aug[3]	10 Sept-10 Oct[2] 30 Sept-7 Nov[3]
Leach's Storm-Petrel	410,000	-15 May	5-15 July[2] 17-25 July[3]	10-23 Aug[3]	30 Sept-28 Oct[2] 1 Oct-9 Nov[3]
Pelagic Cormorant	80-95	-14 May	2-25 June	2-25 July	20 Aug-15 Sept
Red-faced Cormorant	150	-1 May	10-25 May	2-16 June	10-25 Aug
Aleutian Canada Goose	170	1-15 May	19 May-3 June	22 June-6 July	5-25 Aug/ 4-22 Sept
Green-winged Teal	5	-1 May	mid-June	mid-July	late July-mid-Aug

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Bald Eagles	1	resident		7-13 June	
Peregrine Falcon	4-5	resident			10-30 July
Parasitic Jaeger	50	1-7 May	early June	early July	5-17 August/
Glaucous-winged Gull	2,500	-1 May	17-30 May	11-24 June	24 July-10 Aug/ 10-25 Sept
Black-legged Kittiwake	10,300	-1 May	14-24 June	11-21 July	7-25 Aug/ 15-30 Aug
Red-legged Kittiwake	2,200	-1 May	20 Jun-2 Jul	21-30 July	20 Aug-10 Sept/ 10-25 Sept
Common and Thide-billed Murre	13,400	-1 May	6-20 June	15-30 July	19 Aug-5 Sept
Pigeon Guillemot	75-100	-1 May	early June	early July	3-20 Aug

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Ancient Murrelet	2,000-5,000	15-25 May	7-15 June	10-18 July	12-20 July
Cassin's Auklet	200+	-11 May			
Parakeet Auklet	2,000-5,000	-1 May	2-11 June	3-15 July	29 Jul-15 Aug
Crested Auklet	250,000	-1 May	28 May-5 June	5-12 July	29 Jul-15 Aug
Least Auklet	150.000	-1 May	28 May-8 June	30 Jun-9 July	29 Jul-12 Aug
Whiskered Auklet	1500	-1 May	28 May-4 June	26 Jun-6 July	5-15 Aug
Rhinocerous Auklet	10-20				
Horned Puffin	10,000	12-20 May	5-30 Jun	16 Jul-9 Aug	23 Aug-15 Sept

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Tufted Puffin	10,000	-1 May	5-19 June	19 Jul-2 Aug	2-15 Sept
Winter Wren		resident	mid-may-late June	late May-mid-July	23 Jun-18 Aug
Gray-crowned Rosy Finch	100	resident	mid-May-early June	5-25 June	22 Jun-mid-July
Song Sparrow	250	resident	1-21 May	28 May-11 Jun	15 Jun-early Jul
Lapland Longspur	300	1-15 May	14 Jun-1 Jul	5 Jul-	15-30 Jul
Snow Bunting	20	-1 May			23 Jul-20 Aug/ 15 Sept

- earlier than

1 Arrival on shore

2 1975

3 1976

of the eggs had hatched and by 11 August (1976) well over 50% of the eggs had hatched; some chicks weighed up to 100 g on the latter date. Birds were still present at the colony as late as 24 September 1976.

Northern Fulmars used two types of habitat for nesting at Buldir; soil covered ledges on a nearly vertical rocky cliff face and vegetated sea slopes with 45° to 60° slopes. In both areas nests consisted of depressions in the soil, averaging 3 cm - 5 cm in diameter, and they were about 1 cm deep.

All birds seen were of the dark-color phase, except two intermediate or light phase individuals (one 6 km from the colony, the other near the colony).

Sekora et al. (in press) identify known Aleutian nesting colonies of the species. Fulmars are encountered at sea near the Aleutians throughout the year. In winter large concentrations are found near Japanese and Russian commercial fishing vessels (Byrd and D.D. Gibson unpub. data).

Oceanodroma furcata. Fork-tailed Storm-Petrel, and Oceanodroma leucorhoa, Leach's Storm-Petrel. These two species were intensively studied 1974-1976 and details are reported separately (Byrd and Trapp in prep.)

Both species of storm-petrels were near Buldir as early as 30 April (1974) and fresh digging was noticed at burrows by 23 May.

Prior to egg laying, pairs were often found together in burrows presumably engaged in courtship.

The peak egg laying period for Fork-tailed Storm-Petrels in 1975 was 25 May-10 June much earlier than In 1976, when it was 15 June - 5 July (table 1).

Most Leach's laid 5-15 July 1975 and 17-25 July 1976 (table 1), nearly a month later than Fork-tails.

Both species laid mostly in earthen burrows, but a small percentage of Oceanodroma nested in rock crevices. Leach's were found nesting in burrows dug in dense Calamagrostis in a small area near Camp Valley.

The incubation period for Fork-tails was determined to be 53.4 days (Range=50-60 days, n=7) and Leach's incubated an average of 47.6 days (Range=46-52 days; n=6).

Of 366 Oceanodroma eggs we examined in various habitats 1974-1976, 45.4% were Fork-tailed and 54.6% were Leach's.

The peak of hatching for Fork-tails occurred 15 July-7 August 1975 and 28 July-20 August, 1976, while Leach's hatched 10-23 August 1976.

It is estimated that Fork-tails fledged 10 September - 10 October 1975 and 30 September-7 November 1976, while Leach's chicks departed 30 September-28 October 1976 and 1 October-9 November 1976.

Percent hatching success and assummed fledging success for the two species follows:

	1974	1975	1976
Fork-tailed (Hatching/fledging)	65/68	46/82	72/77
Leach's (Hatching/fledging*)	52/92	56/100	71/71

*The percent of chicks that hatched that were still alive when investigators departed early to late September.

Using a stratified random sampling technique it was estimated that approximately two million Oceanodroma burrow entrances existed on Buldir in 1976.

Phalacrocorax pelagicus. Pelagic Cormorant. Pelagic Cormorants nested mostly in small isolated colonies, 3-10 pairs, unlike its congener, P. urile, which tended to associate more closely with kittiwakes. Most of the following account was written by M.H. Dick based on his work at Buldir in 1974.

Pelagic cormorants were present when we landed at Buldir on 14 May, though were apparently outnumbered by Red-faced at

that time. They were first noted on nesting cliffs on 21 May, when there were three birds at display spots on the tip of Northwest Point and four on the landward side of Inner Rock. Pelagics were incubating by 25 May on the cliffs north of Slide Mountain.

Cormorants between Petrel Creek and the kittiwake colony north of Slide Mountain were censused several times during the summer. The cliffs along this stretch are relatively low, from 7 to 20 m high, and are basically cut banks, being composed of unrounded boulders set in a compact but crumbly sand and gravel matrix. Pelagic Cormorants were evenly scattered along the entire stretch from Petrel Creek eastward. Their density was constant along the stretches where they were the sole nesters, but decreased in the kittiwake colony. Red-faced cormorants nested only among the kittiwakes; their density was three times that of the Pelagics in isolated colonies and nearly four times that of Pelagics in the kittiwake colony (table 2).

Pelagic nests were built singly or in small clusters of four or less on small ledges and protruding boulders on the cut bank cliffs. Most were about 7 m from the beach and difficult to reach from below, though some could be easily climbed to and would have been the first to be predated had there been foxes on the island.

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The first 16 nests to the east of Petrel Creek were studied in detail, as these were the most accessible. These were checked eight times during the summer. Nests were constructed primarily of dried Elymus arenarius, though some contained copious clumps and fragments of moss. Leaves of Saxifraga punctata, S. bracteata, and Puccinellia sp., Festuca rubra, and bits of lichen were noted in the nests in June. Nest maintenance continued as long as the young were present, and on 17 August Carex macrochaeta, a fine grass, leaves of Chrysanthemum arcticum, Cerastium fischerianum, Achillea borealis, fresh Elymus arenarius, pieces of lichen, bits of fresh moss, and even an auklet wing were noted in nests. The plant species present indicate the cormorants gathered material on the sea slopes above the cliffs.

The first egg in the 16-nest study segment was laid on 2 June. By 25 June all but one of the nests had complete clutches. The latest egg was laid between 4 and 20 July and may have been a re-lay. The first young hatched on 2 or 3 July, giving an incubation period of 30-31 days for one nest. Clutch and egg data for 14 nests follows:

Nests with 2 eggs	1
Nests with 3 eggs	10
Nests with 4 eggs	3
Average clutch size (± S.D.)	3.1 ± 0.5

The average measurement of 15 eggs follow:

Egg length:	average (± S.D)	56.6 ± 2.1 mm
	range	51.8 - 59.4 mm
Egg width :	average (± S.D)	35.7 ± 0.9 mm
	range	34.1 - 37.1 mm

Nest period for the young was 6-7 weeks, and fledging from the nests studied began between 19 and 24 August. Birds probably fledged a little earlier than this from some of the nests farther east, and certainly some nests were later. On 19 August one nest contained young so small they could not be seen from the beach and could only be noticed when they defecated. There were young in nests at the tip of Northwest Point and on Inner Rock on 1 September. In 1976, chicks were still present in two nests near Northwest Point 9 September, but had fledged by 20 September.

Egg and nest success for the detailed study segment and nest success for the entire segment from Petrel Creek through the kittiwake colony are presented in table 3. Young present on 19 August are considered to have fledged.

Only fish were found in the nests or were regurgitated by the young. The only species identified was Ammodytes tobianus, which appreared frequently at nests in mid-August. Both adults

Table 3 Nesting, hatching, and fledging success of Pelagic Cormorants in the Petrel Creek study area 1974

	Study area	Overall area*
Total nest (5 June)	16	45
Total nests with clutches	14	
Total eggs	45-48	
Nests hatched (at least one egg)	13	
Nests with young (19 August)	11	32
Total young (19 August)	23	
Nest success to hatching	.81	
Nest success to fledging (young present 19 August assumed to have fledged)	.69	.71
Egg success to fledging	.48-.51	

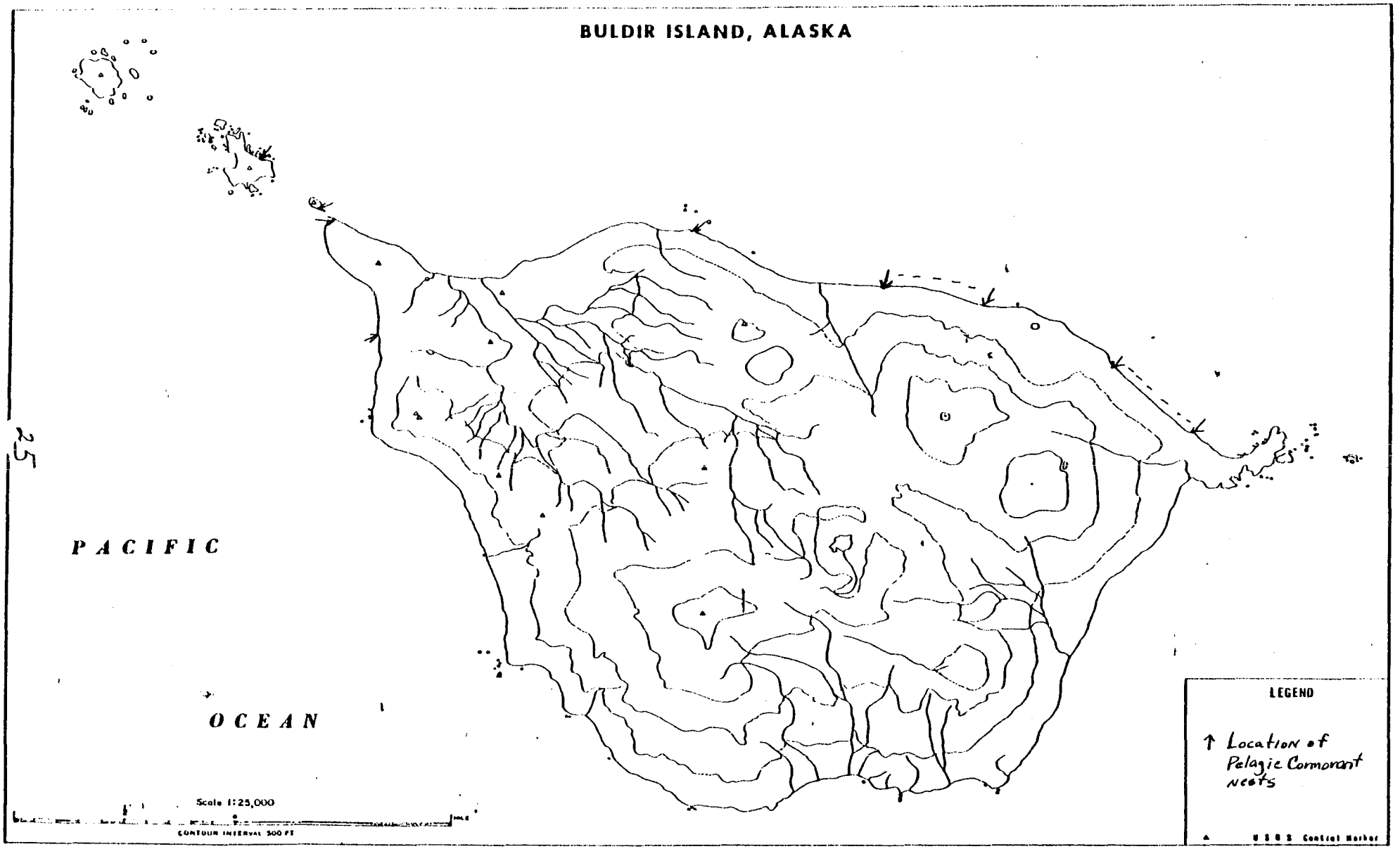
* Petrel Creek to Slide Mountain Kittiwake Colony

and sub-adults commonly fed in North Bight and around the three rocks off Northwest Point, along with numerous other seabirds.

Black-legged Kittiwakes were seen chasing Pelagic Cormorants on two occasions. The latter seemed to avoid competition with the former by not nesting near them as was indicated in table 2. There were few Pelagic Cormorant nests among the kittiwakes along the east side of the island or on East Cape. Red-faced Cormorants, however, were scattered throughout the kittiwake colonies. Pelagics nested at the tip of Northwest Point, on the cliffs near Bull Point, on Inner Rock, and along the north shore of Buldir from the point east of Main Talus to the west edge of Slide Mountain kittiwake colony; all areas lacking kittiwakes.

Once eggs were laid, nest mortality was apparently very low. Nest success to hatching was 81% in the study plot, but no eggs were laid in three of the completed nests. Based on nests with clutches laid, success to hatching was 93%. The low mortality is astonishing, for Glaucous-winged Gulls nested on the beach below the cormorant nests and on the slope above them. The cormorants were frightened from the nests by investigators at least 20 times during the season, occasionally for an hour at a time. The only nest lost after laying apparently fell from the cliff during a heavy rain.

Figure 4. Distribution of Pelagic Cormorants at Buldir



In addition to breeding and non-breeding adults, relatively gray-plumaged sub-adults were present at Buldir throughout the summer. These often were seen on intertidal boulders.

An estimated 90 pairs of Pelagic Cormorants nested at Buldir during the study. Figure 4 shows the nesting distribution.

Pelagic Cormorants nest throughout the Aleutians (Murie 1959), but the relative abundance of Pelagic and Red-faced Cormorants has not been determined over much of the range.

Phalacrocorax urile. Red-faced Cormorant. Red-faced Cormorants were observed on nesting cliffs at Buldir the earliest we made observations, 30 April (1974). Approximately 100 birds fed in a tide rip off East Cape 13 May 1974, and slightly fewer were seen in the same area the next day.

Red-faced Cormorants nested on ledges of nearly verticle cliffs always in association with kittiwakes and murres. Figure 5 shows nesting distribution of all cliff nesters, including this species.

Laying began as early as 10-15 May (1974); most birds were incubating eggs by 25 May (1974), on which date some were still displaying. Hatching took place mainly the first two weeks

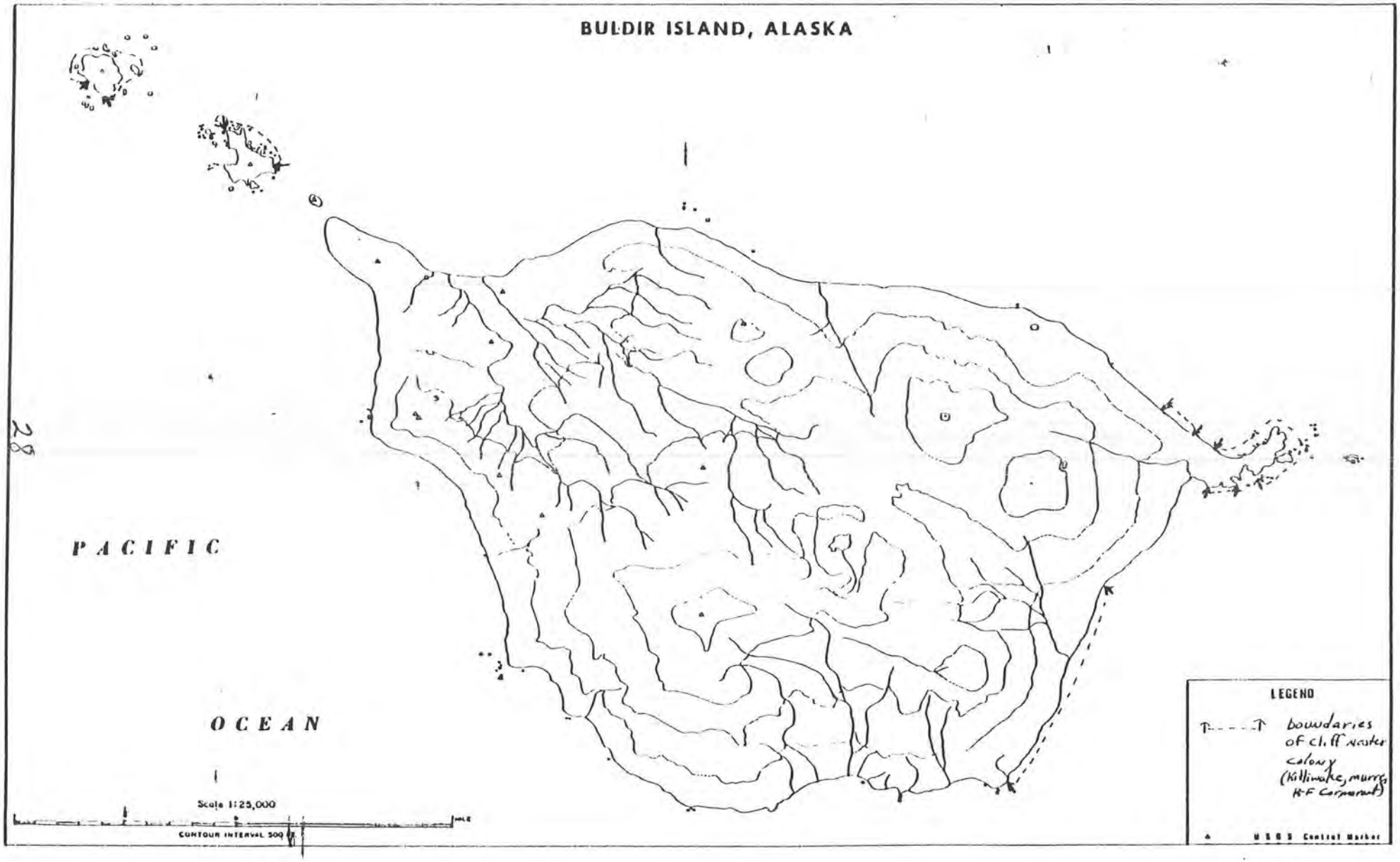
of June. On 25 June 1974 up to two-week-old young were seen on the cliffs in Slide Mountain kittiwake colony, and large nestlings were seen there 4 August (1976). At least 19 young had left their nests in this study area 19 August (1974); most were standing at tops of nesting cliffs, though several were seen flying. Most young had fledged by the end of August each year.

In 1976 remains of at least 8 to 10 Red-faced Cormorants were found scattered along the high tide line on North Bight Beach, upon our arrival 20 May. All were extremely decomposed, indicating they had not died recently, but probably in mid-winter

The unstable nature of the round boulder-strewn beach and its exposure to storm waves, makes it likely the birds found were only a remnant of a larger group that may have washed ashore.

Red-faced Cormorants nest throughout the Aleutians (Murie 1959), but seldom are seen near shore there in winter (Byrd et al. unpub. data).

Figure 5. Distribution of cliff-nesting seabirds



Branta canadensis leucopareia. Aleutian Canada Goose. This species was studied intensively 1974-1976, and details of the study are reported elsewhere (Byrd and Woolington 1978). The following summarizes their findings.

Aleutian Canada Geese began arriving at Buldir during the first week of May. The onset of egg laying peaked 25-30 May and most clutches (overall average 5.5) were complete by 7-10 June. Hatching peaked 27 June - 3 July, and most clutches had hatched each year by 7 July.

Nesting success was lowest in 1974 (81%) probably due to a small sample size (n=21) and investigator disturbance. In 1975 and 1976, hatching success was 89% and 93% respectively, among the highest recorded for Canada Geese. Hatching success of eggs in successful nests varied from a low of 63% in 1974 to a high of 86% in 1975. The overall average for 1975 and 1976 was 81%

Geese nested almost exclusively in the tall-plant lowland communities, favoring Elymus-umbel and Elymus-umbel-fern. Elymus aerenarius occurred by nearly all the nests. Other overstory plants commonly found near nests were Angelica lucida, Heracleum lanatum and Athyruim felix-femina Soon after hatching, goslings were usually moved from steep sea slopes to more inland areas at the edge of the tall-plant

association where their were raised.

Glaucous-winged Gulls took some eggs and possibly a few young goslings, but the impact of this predation on the goose population was apparently small due to the presence of abundant buffer prey species. Other mortality factors included predation by Bald Eagles, especially in mid to late September when most buffer prey species had departed; accidents; and perhaps disease.

Non-breeding adult geese were present on Buldir during the summer. They apparently did not regularly form large flocks during the flightless period, but most often were found in groups of two to four birds, occasionally with breeding pairs and their goslings. Non-breeders were usually flightless about 20 July - 10 August, and breeders molted later, being flightless the first half of August. Most goslings were flight capable each year by about 25 August.

Using a stratified random sampling technique in 1977, 167±10 breeding pairs of geese were estimated at Buldir.

Branta nigricans. Brant. On 6 July 1974 a lone subadult Brant swam 15 m off the beach near East Cape, Buldir. The species occurs only occasionally west of Amchitka during winter and previously was unknown from the central and western Aleutians in summer.

Philacte canagica. Emperor Goose. Each May 1974-1976 the remains of two to four birds were found in the North Bight area. A pair of birds was present at Buldir 4 June 1974, one remain through 20 June. Another pair was present 9-11 June 1975. Only in 1976 were investigators present late enough to see fall birds. The first pair of Emperors was seen feeding on Festuca rubra and Agrostos sp., near North Bight beach 16 September. Thereafter, until we left on 28 September, up to four were present there and a flock of eight was seen inland (17 September). It is likely that Emperors winter at Buldir, as they do throughout the Aleutians.

Anser fabalis. Bean Goose. Bean Geese were seen at Buldir two of the three springs of the study. In 1974 a single bird was seen near Bean Goose Lake 16, 20, and 22 May. In 1975 a single was seen in the same general area 1, 9, and 20 June. Byrd et al. (1974) review records of Bean Goose through 1973. Since then it has been recorded annually in the central and western Aleutians.

Anas platyrhynchos. Mallard. Little puddle duck nesting habitat is available at Buldir, so their scarcity except as migrants is not surprising. Each spring two to five mallards were seen 18 May (1974) - the end of June. Lone males were seen 24 July 1975 and 18 July 1976 in the South Marsh area. Kenyon (1963) reports an eclipse-plumaged male seen at Buldir 11 July 1963. The only fall record is a lone bird 25 September 1976.

Mallards are considered to be resident throughout the Aleutians (Murie 1959). The small movement at Buldir indicates some interchange between island populations.

Anas acuta. Pintail. Pintails are spring and fall migrants at Buldir arriving at least as early as 14 May (1974) and departing by early June, except in 1975 when two - four birds remained until at least 24 July. High count in 1974 was three pairs; in 1975 up to 10 birds were seen at a time; and in 1976 at least 31 were present on 20 May, but no more than three birds were seen 26 May-6 June. In 1977, the spring population peaked at 12 on 4 June (Woolington and Early 1977). In fall 1976 up to five birds were seen regularly 10-25 September.

Each year two to four dead, emaciated Pintails were found by investigators. Cause of death was not determined. Pintails breed on islands east and west of Buldir.

Anas crecca. Green-winged Teal. The Aleutian race A.c. nimia is the only dabbling duck that bred at Buldir during the study. Although nests were not found, "suspicious" females were encountered at the head of Camp Valley near Tattler Creek 21 June 1974, by a marshy area near Stint Creek 20 June 1976, and in South Marsh 26 June 1975. Females with class-I broods were found near North Marsh 14 July 1976 and 16 July 1975. Fledged ducklings were seen as early as 30 July 1974 in Bean Goose Lake and 11 August 1976 in South Marsh. Because of the limited habitat, it is doubtful that more than five pairs of teal bred at Buldir.

The highest number of teal was present during migration when up to 20 were seen 14 May-4 June 1974, a similar number were seen 21 May-13 June 1975, and 9 to 25 were regularly seen 19 May-8 June 1976 (except on 20 May when 58 were present in North and South Marshes and Bean Goose Lake). Woolington and Early (1977) report a high count of 23 on 25 May 1977. In fall there was no apparent buildup at least by the time we left (as late as 27 September). High fall counts were 10 birds on 19 August 1974, 6 on 4 September 1975, and 7 birds 14-17 September 1976.

A single male A.c. carolinensis was noted in North Marsh, 19, 28, and 29 May 1975. Another male was seen 26 May 1977; possibly the bird found dead at Tattler Creek 1 June. This race is rare west of Unalaska (Byrd et al. 1974).

Anas querquedula. Garganey. This Asiatic teal occurred at Buldir in 1974 and 1976. At least five different birds were seen 14 May-3 June 1974 in the two marshes. A single male remained in North Marsh through 16 June. In 1976 three to four birds were seen daily in North or South Marsh 20 May-11 June, thereafter a pair was seen through 11 July. A single female was seen 30 August-24 September in the North Marsh area. Byrd et al. (in press) summarize Garganey records for the Aleutians.

Anas spatula. Northern Shoveler. Two to six Northern Shovelers were present at Buldir 19 May-8 June 1976, and a female was found dead in South Marsh 3 June 1974 (Woolington and Early 1977). Although they are uncommon migrants east of Buldir (Byrd et al. 1974, White in press), shovelers have not previously been recorded west of Amchitka.

Anas penelope. European Wigeon. Spring migrants at Buldir, these birds were present as early as 19 May 1974, 18 May 1975, and 20 May 1976. Except for 1974 the dates are the first dates observations were made each year. Up to 11 individuals flew between North and South Marshes 19-20 May 1974 and two pairs were seen periodically through 3 June that year. In 1975 eight birds were present on 18 May, and by 21 May the flock numbered 19. By 26 May 1975, 40 birds were present. By 1 June the flock was down to 25 and it diminished to three birds by 15 June. On 20 May 1976 a total of 36 European Wigeons were present. The flock was down to 12 by 30 May and six to eight remained through 6 June. The last pair of the spring was seen 9 June. In 1977 the peak spring count was 12 on 26 May (Woolington and Early 1977).

Four birds seen on Bean Goose Lake 4 July 1975 is the only summer record. The only fall record is a female seen in North Marsh 14 September 1976. European Wigeons are known to be regular spring migrants in the central and western Aleutians (Byrd et al. 1974, D.D. Gibson unpub. data., J.L. Trapp unpub. data, White in press).

Anas americana. American Wigeon. A male was seen with European Wigeons in North Marsh 28 May 1975. He was joined by a pair 29-31 May 1975.

This species is a rare to occassional migrant in the central and western Aleutians (Byrd et al. 1974, D.D. Gibson unpub. data, Trapp unpub data, White in press)

Aythya ferina. Common Pochard. A male was seen with Greater Scaup, Aythya marila, in North Bight 7-8 June 1975. It was found emaciated and unable to fly in North Marsh 11 June. Common Pochard is a rare spring migrant and casual fall migrant in the central and western Aleutians (Kessel and Gibson in press).

Aythya marila. Greater Scaup. Each spring (19 May-27 June) two to nine Greater Scaup fed in North Bight. In 1974 a single female was seen 24-29 May and a lone male was present 4-27 June. A single male was seen 19 May 1975 and up to six birds were seen 29 May-19 June that year. In 1976 two to nine birds were seen daily 19 May-2 June in North Bight, and a single male was seen in North Marsh 18 June. In 1977 up to three birds were seen in N. Bight and Bean Goose Pone 26-30 May.

Greater Scaup winter throughout the Aleutians (Murie 1959), but their breeding distribution is uncertain. Apparently they breed in the eastern Aleutians (Murie 1959) and on

certain islands to the west; Amchitka (White in press) and Skagul (Day pers. comm). Perhaps introduced Arctic foxes, which have been removed from Amchitka, are responsible for the lack of breeding scaup on some of the other islands where they have historically bred (e.g. Adak, Kanaga, Agattu and others). There is little suitable breeding habitat for scaup on Buldir. It is doubtful that many winter at Buldir because of the lack of protected water; Buldir has no bays.

Aythya fuligula. Tufted Duck. Up to four Tufted Ducks were seen each spring at Buldir (11 May-18 June). Three males seen in North Bight 12 July 1976 was the only summer record. Each year two carcasses of Tufted Ducks were found. At least two of the six may have been killed by raptors, while the others seemed emaciated and had no signs of being hit by a raptor. The species is known to be a regular spring and fall migrant and summer and winter visitant in the Aleutians (Byrd et al. 1974, White in press).

Bucephala clangula. Common Goldeneye. Each spring 3 to 10 goldeneyes fed in North Bight. In 1974, up to three birds, two males and a female, remained in North Bight 18 May-2 June. Three females fed in the area 28 May-5 June, a single male remained 4-21 June, and one female was seen 29 June (all 1975) on Bean Goose Lake. In 1976 four to ten goldeneyes were

on North Bight 24 May-11 June.

The species winters throughout the Aleutians (Murie 1959).

Bucephala albeola. Bufflehead. A lone female recorded by Woolington and Early (1977) 25 May 1977 on Bean Goose Lake was the only record. The species winters regularly in the eastern and central Aleutians (Murie 1959).

Clangula hyemalis. Oldsquaw. Oldsquaws were seen each year in North Bight; two 9 May and one 19 May 1974, nine birds 21-30 May 1975, and a single male 2 July 1976. The species winters throughout the Aleutians, being most common from Adak, east (Byrd and D.D. Gibson unpub. data).

Histrionicus histrionicus. Harlequin. High counts of Harlequins in North Bight were obtained each year mid-may-early June; up to 41 birds 15-31 May 1974, up to 100 birds 16 May-2 June 1975, up to 45 19 May-8 June 1976, and a peak of 97 birds on 30 May 1977. Numbers decreased in June to 8 to 15 birds which remained all summer. In 1976 numbers increased to 25 birds on 20 September and by 27 September over 40 were present.

Harlequins are probably the most abundant winter duck in the

Aleutians (Byrd and D.D. Gibson unpub. data) and non-breeders are known to summer throughout the area; however, breeding has not been confirmed in the Aleutians (Murie 1959, Byrd et al. 1974).

Somateria molissima. Common Eider. King (Kenyon and King 1965) counted 120 eiders at Buldir 5 May 1975. Common Eiders bred at Buldir 1974-1976 in small numbers, as habitat was limited. They built nests by clumps of Elymus arenarieus, in areas where the vegetation was near sea level, once slightly above the high tide mark on a beach. An estimated 10 to 15 pairs nested at Buldir, primarily near Gull Slide, Seal Beach, and Crested Point. A total of six nests were checked; three nests had three eggs each, two nests contained four eggs each, and one had five eggs.

In 1975, one nest hatched about 7 July and the ducklings had been led to North Bight by 10 July. Eggs in a second nest hatched 16 July and the ducklings were led to the sea 18 July. In 1974, the first ducklings were seen 9 July.

In 1974, up to 36 male eiders in various stages of eclipse plumage were observed off the north side of Buldir 6 July-11 August. One eclipse male was noted as late as 3 September. In 1975 up to 24 males in various stages eclipse were seen 7-30 July. In 1976 approximately 20 eclipse males were seen 2 July-early August. A flock of 25 eiders in North Bight 27

September 1976 contained at least 3 males in high plumage.

In 1976, eiders begin to concentrate in North Bight in early September and by 25 September a flock of about 40 was present.

Common Eiders are resident throughout the Aleutians (Murie 1959), breeding in especially high densities at Agattu and Attu (J.L. Trapp and G.V. Byrd unpub. data).

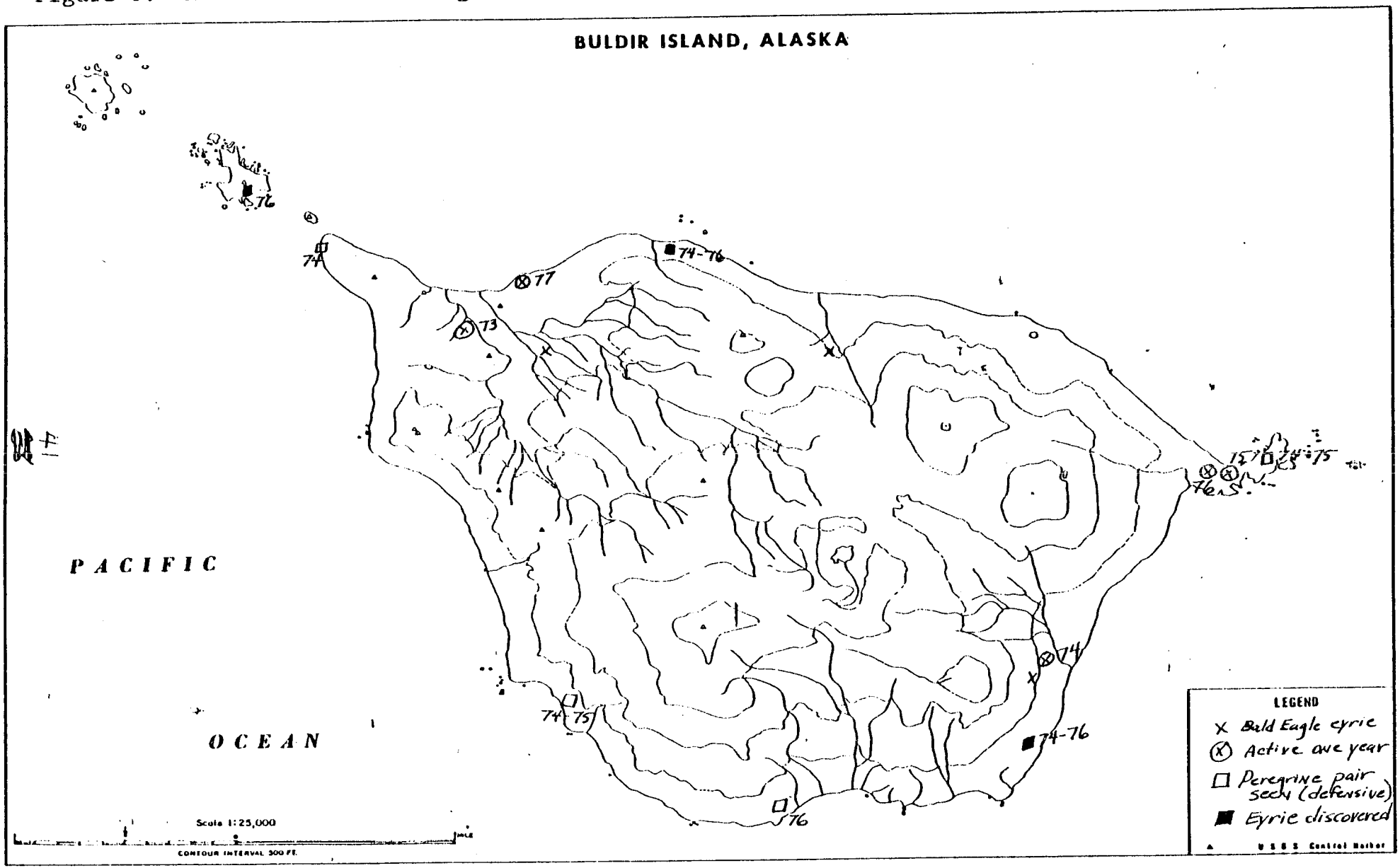
Melanitta deglandi. White-winged Scoter. In 1974 10 - 20 birds were seen regularly in North Bight 9-23 May; thereafter, eight were seen 30 May and four were present as late as 4 June. In 1975, a lone female was observed in North Bight 17 May and a male was seen there 5 June. Four to nine birds were present in 1976, 19 May - 1 June.

The only summer record was a male in North Bight 3-13 July 1975.

Investigators left Buldir in 1974 and 1975 before White-winged Scoters arrived, but in 1976 a single bird was recorded 21 September, and four were present 25 September.

The species is a common winter resident throughout the Aleutians (Murie 1959).

Figure 6. Locations of Bald Eagle and Peregrine Falcon eyries at Buldir 1973-1977



Melanitta perspicillata. Surf Scoter. The only record is a single female present in North Bight with White-winged and Black Scoters (Melanitta nigra) 22-30 May 1974.

The species is rare in the Aleutians west of Unalaska (Murie 1959).

Melanitta nigra. Black Scoter. The species was recorded each spring in North Bight; up to five 15-30 May 1974, a single female 5 June 1975, and one to nine birds 24 May-8 June 1976. The single fall record is of a male 20 September 1976.

Black Scoters are found in winter throughout the Aleutians (Murie 1959).

Mergus merganser. Common Merganser. One or two birds were recorded each year; a lone bird in North Bight 24-27 May 1974, single females 29 May and 28 July and a male on 19 June 1975, one female 24 May-7 June 1976, and a dead male 1 June 1977.

Byrd et al. (in press) discuss the status of M. m. merganser and M. m. americanus in the Aleutians.

Mergus serrator. Red-breasted Merganser. Up to two birds at a time were seen each spring; three different

individuals 14-30 May 1974, a pair plus a female 19 May-9 June 1975, and one male and two females during the period 23 May - 15 June 1976.

Red-breasted Mergansers nest where habitat safe from foxes is available on islands to the east and west of Buldir. The species winters throughout the Aleutians (Murie 1959).

Buteo lagopus. Rough-legged Hawk. In 1975 a single bird flew over North Marsh 19 May, and two birds flew over Main Camp 10 July following a strong wind from the northeast. In 1976, a single bird was seen over South Marsh 23-24 September.

The species breeds in the eastern Aleutian Islands (Murie 1959) but is considered a casual visitant in the central Aleutians (Byrd et al. 1974), and it has not been previously recorded west of Amchitka (White in press).

Haliaeetus leucocephalus. Bald Eagle. Each year 1974-1977 one eagle eyrie was active; however 1974-1976 two additional pairs of adults were observed all summer, often hunting over the Main Talus. The nesting pair used a different site each year. At least eight different eyries were located at Buldir during the study (fig. 6). In 1974, the two eggs of the active pair hatched between 7-13 June. When the nest was rechecked on 23 July only one young was found. In 1975,

the active eyrie had a single young on 23 July which was near fledging on 10 August. In 1976 the active eyrie was first visited on 15 June; it contained a single chick about one week old. When the eyrie was rechecked 17 June the chick was gone, and no adults were seen. In 1977 one egg was found in early June, but the nest was abandoned.

The carcass of one fledgling was found each spring, 1974-1976. Each was near a nest site; all had been dead for sometime when found, perhaps since the previous fall or early winter. We never saw a live fledged subadult eagle at Buldir, although Kenyon (1963) reports seeing a bird in subadult plumage there.

Kenyon (1963) reports finding three wings of adult Aleutian Canada Geese and remains of five other species of birds in an active eyrie in Camp Valley in 1963. As shown in table 4 at least 17 different species of birds were taken by Bald Eagles at Buldir. The list includes every breeding seabird except cormorants and Red-legged Kittiwakes. The location of the eyrie probably affected food items taken (e.g. significant differences in the number of Crested Auklets (Aethia cristatella) and Horned Puffins (Fratercula corniculata) taken at different locations.

Bald Eagle activities in relation to Aleutian Canada Geese were observed closely in September 1976. Up to five adult

Table #4 Prey remains found in Bald Eagle eyries 1974-1976

birds/% of total # of remains

Prey Item	1974	1975-76	Combined
Crested Auklet	2 (06)	22 (43)	24 (29)
Horned Puffin	12 (38)	1 (02)	13 (16)
Fork-tailed Storm-petrel	6 (19)	2 (04)	8 (10)
Least Auklet	3 (09)	5 (10)	8 (10)
Parakeet Auklet	3 (09)	2 (04)	5 (06)
Northern Fulmar		4 (08)	4 (05)
Black-legged Kittiwake	3 (09)	1 (02)	4 (05)
Tufted Puffin		4 (08)	4 (05)
Leach's Storm-petrel	1 (03)	2 (04)	3 (04)
Galucous-winged Gull		2 (04)	2 (02)
Unid. Murre	1 (03)	1 (02)	2 (02)
Canada Goose (gosling)		1 (02)	1 (01)
Parasitic Jaeger (chick)		1 (02)	1 (01)
Pigeon Guillemot		1 (02)	1 (01)
Ancient Murrelet		1 (02)	1 (01)
Cassin's Auklet	1 (03)		1 (01)
Whiskered Auklet		1 (02)	1 (01)
TOTAL	32	51	83

*1975 and 1976 are lumped because few remains were found in 1976 and the eyrie was in the same general location both years.

eagles were observed in pursuit of geese daily during the last half of September. The increased pressure by eagles coincided with the departure of a large proportion of other prey species. The fresh remains of five molting geese which were apparently taken by eagles were found during the study. Old remains of at least 10 geese, possibly killed by eagles were also found. At least 10 geese were seen either limping or dragging a tarsus in flight, and some of these may have been hit by eagles.

Bald Eagles are at the periphery of their breeding range at Buldir. For unknown reasons they occur in the Near Islands, (west of Buldir), only as casual visitants. On islands east of Buldir the species breeds commonly (Murie 1959).

Bald Eagles winter over most of their breeding range in the Aleutians, possibly subsisting mainly on Rock Ptarmigan (Lagopus mutus), waterfowl, and dead marine mammals washed up on the beaches.

Ptarmigan are absent from Buldir, and waterfowl may not be plentiful there in winter. Sea otters are present, and they may furnish some food, along with the dead sea lions left from the breeding season and an occasional that is washed ashore.

Whales and porpoises may occasionally wash ashore, but we found no remains of these animals on the beaches during the study.

It is possible that the adult eagles leave Buldir in winter, but if so they must regularly go east because of the scarity of records to the west. A large refuse dump at Shemya, the nearest island to the west, would almost certainly attract any birds on that island, and there are no records.

Falco rusticolus. Gyrfalcon. Single Gyrfalcons were seen 30-31 May and 19 June 1974. The latter bird was carrying an auklet. The decomposed carcass of a Gyrfalcon was found in South Marsh 20 May 1974.

Gyrfalcons are regular winter visitants in the Aleutians (Murie 1959, Byrd et al. 1974, White in press), but few summer records are available for the central and western Aleutians.

Falco peregrinus peali. Peregrine Falcon. During the study at least five different areas were used by nesting Peregrines (fig. 6). Only in 1974 were all five areas thought to be active. At least four of the areas were active in 1975 and 1976. At least two of the five sites were in use by Peregrines in 1963 (Kenyon 1963).

Only two of the nest ledges were visited by investigators, one each in 1974 and 1976. The nest ledge near Cormorant Rocks was placed in a large, horizontal cleft in a cliff face 30 m above the sea. It was known to be used all three years. The area east of the Main Talus had a pair present each year, but it is unknown whether the same ledge was used all three years. The cliff used at Northwest Point in 1974 slumped, probably as the result of an earthquake (Richter scale 7.6) during the winter of 1974-1975. A pair was seen in the area in 1975, but the eyrie was not located. In 1976, an eyrie was found near the tip of a south-facing cliff on Middle Rock, only 500 m from the original nest site on Northwest Point. This could have been the site used in 1975 also.

Locations of other sites are less exact, being located by defensive birds, not by finding the nest. The location on the north side of East Cape was used in 1974 only. Defensive birds were seen in the area near Bend in 1974 and 1975, and birds seen at the west side of Seal Beach in 1976 were in the same general area. A pair of calling birds were seen several times during 1976 west of Steep Creek, but no nest was located. This area was not visited in 1974 or 1975.

The only information gained on chicks was at the Cormorant Rocks eyrie which had four white, downy young just beginning to develop flight feathers on 6 June 1974, and near Gull Slide

where an eyrie not found earlier in the study had three young with flight feathers 1/2 - 2/3 their total length on 25 June 1977 (R.H. Day pers. comm.)

The earliest fledglings were seen 10 July 1974. That year, birds-of-the-year were apparent in the North Bight area by the last week in July. In 1976 the lone chick in the Middle Rock nest was fully feathered, having only a few downy plumes on 11 July. When the nest was rechecked on 15 July, the chick had apparently fledged.

Food items were collected at the Cormorant Rocks nest in 1974 and at Middle Rock in 1976. Table 5 summarizes the prey items.

Auklets seemed to be the primary prey when the young were still in the nest. Carcasses with necks turned inside out and partially eaten breasts were common on boulder beaches. On July 20, near Main Talus there were 12 dead Crested Auklets on a single boulder, nine Crested Auklets and five Ancient Murrelets scattered nearby. Least Auklets and less commonly Parakeet Auklets were found in the same area regularly.

Table 5. The number of birds taken as prey found at Peregrine Falcon eyries at Buldir Island.

Prey Item	1974[1]	1976[2]	Combined
Parakeet Auklet	2		2
Least Auklet	6	46	52
Leach's Storm Petrel	1	2	3
Crested Auklet	1	6	7
Horned Puffin	1		1
Whiskered Auklet		2	2
Cassin's Auklet		1	1
Ancient Murrelet		7	7

1. Fresh remains in the nest on the rock face above Cormorants Rocks 6 June.

2. Total analysed remains from eyrie on Middle Rock 15 July.

Adults remained more or less restricted to the sea slopes during the nesting season, but once the young were fledged, they again began appearing inland and over Camp Valley, where they had been often seen in May. After young fledged, they stooped on birds ranging in size from Canada Geese to Lapland Longspurs. Breeding success may have been very low. Winter food stress in peregrines have been discussed by White (1975). Mortality among birds-of-the-year must have been high. We found five dead sub-adult birds, all in early spring. Judging from the lack of fat on the three we were able to examine, starvation may have been a factor.

One dead adult was found at an eagle perch in Camp Valley, 17 May 1974. The cause of death is unknown but an eagle was involved before or after death.

Peregrines are resident throught the Aleutians (White 1975).

Grus canadensis. Sandhill Crane. A single bird was occasionally seen at Buldir 15 May-19 August 1974. On 25 May 1976, at least two individuals flew over Camp Valley just before dawn.

The species is a rare migrant and summer visitant to the central and western Aleutians. It breeds as far west as the west end of the Alaska Peninsula (Murie 1959).

Haematopus bachmani. Black Oystercatcher. Two individuals were seen at Buldir 7 July 1972 (Byrd et al. unpub. data). The species was not found at Buldir in 1974 or 1975. In 1976, a single bird was noted 12 June near Bend, a pair flew by Seal Beach 23 June, and a lone bird was seen periodically during July at the Main Talus.

Murie (1959) indicates the species probably nests as far west as Kiska (113 km east of Buldir) but does not extend further west. Recent intensive work in the Near Island (J. L. Trapp et al., unpub. data and D. D. Gibson et al. unpub. data) indicates the species apparently does not occur west of Buldir.

Charadrius semipalmatus. Semipalmated Plover. A single bird collected near the midden site 21 August 1974 is the westernmost record of this species in the Aleutians. Bill Rodstrom saw a single semiplated Plover, identified by the narrow breast band, 11 September 1976 in the upland. The species breeds on Unimak Island possibly as far west as Unalaska (Murie 1959). There is a single previous record west of Unalaska Island; a lone bird taken by Byrd at Amchitka Island 13 June 1973.

Charadrius dubis. Little Ringed Plover. A lone bird
llected 16 June 1974 near Midden Pond is the first record
r North America (Byrd et al in press).

Charadrius mongolius. Mongolian Plover. At least four
fferent birds were observed at the Midden Site and on
rth Bight Beach 16 May-6 June 1974. In 1975, single birds
re identified 19 May and 15-18 August as they fed in
itches of washed up kelp (mostly Alaria sp.). In 1976,
vo to six fed on North Bight Beach 20 May-1 June and two
ifferent birds were seen 27-30 July in the same area. A
one bird was present late May-4 June 1977 (Woolington and
arl, 1977)

lthough there were no records for the Aleutians prior to
974, a number have accumulated since then (Byrd et al. in
ress).

Pluvialis dominica. American Golden Plover. These
lovers were seen each spring feeding on insects in beds of
rotting kelp (primarily Alaria sp.) deposited on North Bight
each by storm-driven waves. Up to three birds were present
7 May-4 June 1974. A maximum of seven birds was observed
5 May-8 June 1975. The high count in 1976 was two plovers
-9 June.

In fall migrating birds were found mostly in the upland where they may have fed on Empetrum nigrum berries. A few were also seen in the same habitat as they used in spring. A lone bird was found 30 August 1974. Two birds were noted 19 August 1975. In 1976 when investigators were able to remain through September a better idea of plover movement was obtained. A single bird was seen 27-30 July after a storm. A single winter-plumaged bird was on North Bight Beach 25 August. On September 5, 20-30 birds were seen and thereafter through 24 September 2-13 birds were seen daily. Many more may have been present.

The species is an uncommon spring and uncommon to common fall migrant throughout the Aleutians.

Limosa limosa. Black-tailed Godwit. The species was recorded only in 1976; two different birds 21-23 May and up to two 3-9 June. Byrd et al. (in press) report a movement of the species in the central and western Aleutians in 1976, and they list one previous Aleutian record.

Limosa lapponica. Bar-tailed Godwit. One bird was seen in flight over Northwest Point 28 May 1974, a single fed on North Bight Beach 25-28 May 1975, and one was observed 21 May 1976 in South Marsh and on North Bight Beach.

Numenius tahitiensis. Bristle-thighed Curlew. A single bird was recorded daily as it foraged along the sandy banks at the head of North Bight Beach and near Midden Pond 19-28 May 1975. A second bird was present 25-26 May 1975.

There are two other records of this species in the Aleutians, Amchitka (White in press) and Shemya (D. D. Gibson unpub. data) both in spring.

Tringa erythropus. Spotted Redshank. Lone fall-plumaged birds were seen 30 August 1974 at Midden Site and 21 September 1976 in South Marsh. Byrd et al. (in press) list all Aleutian records of Spotted Redshank.

Tringa stagnatilis. Marsh Sandpiper. A bird reported by Byrd et al. (in press), fed in shallow water at the edge of the Midden Pond 2 September 1974, following a strong westernly wind.

Tringa nebularia. Greenshank. This Asiatic wader was found in North or South Marsh each spring; one bird 15 May 1974, the remains of an emaciated individual 5 June 1975, one or two Greenshanks almost daily 19 May-12 June 1976, and a lone bird was present 25 May-10 June 1977. In fall 1975, three birds fed in North Marsh 4 September, and a single remained in that area 14 July-6 August 1976. Byrd et al. (in press) lists all Aleutian records of Greenshank.

Tringa flavipes. Lesser Yellowlegs. On 31 August 1974 one bird fed on flies on a boulder beach near Northwest Point. On 4 June 1976, a single Lesser Yellowlegs was seen in South Marsh. The species is probably a casual to rare spring and fall migrant in the central and western Aleutians (Byrd et al. 1974, White in press, J. L. Trapp unpub. data, D. D. Gibson unpub. data).

Tringa glareola. Wood Sandpiper. From 17 May-5 June 1974 and 18 May-9 June 1975, up to 16 and 15 birds respectively were seen in a day. In spring 1976, there was a large movement of Wood Sandpipers in the central and western Aleutians (Gibson and Byrd 1976), including at least 77 birds at Buldir 20 May and 20-25 daily 21-27 May. Thereafter, two to ten birds were seen through 1 July. Although courtship flights and copulation were observed in late May, no evidence of breeding was found; in fact only a single bird was seen periodically 8-28 July. One bird was seen also in summer 1974; 17-19 July and 23 July. In 1977, only three were observed 26-30 May. One to three Wood Sandpipers were noted each fall; two at Kittiwake Pond 19 August and one in Camp Valley 3 September 1974, two or three 31 August-3 September 1975, and lone birds 20 August and 13 September 1976.

Wood Sandpipers occured most often in marshy habitats, but also fed on insects in kelp beds on North Bight Beach. Asiatic shorebird breeds in the Aleutians at least in years when numbers were present (White et al. 1974). It may breed at Buldir some years, while in others only a few occur in migration.

Xenus cinereus. Terek Sandpiper. One bird was seen on North Bight Beach 29-30 May 1974, and another was found near the frozen edge of Kittiwake Pond 31 May that year. There is a single fall record; one bird seen feeding on insects in a kelp patch on North Bight Beach 26 August-2 September 1975.

Byrd et al. (in press) summarize other Aleutian records of this Asiatic straggler.

Tringa hypoleucos. Common Sandpiper. The species was recorded in spring; two birds 29 May-16 June 1974, a single bird 29 May and 7 June 1975, and usually one to three birds 20 May-16 June 1976 (seven Common Sandpipers were present 7 June 1976). Single birds seen 31 August 1974 and 26-28 July 1976 were the only fall records. Common Sandpipers were found either near the mouths of Tattler or Stint Creeks or on the boulder beach, usually at the upper edges near drift logs. They were not associated with kelp beds as frequently as other shorebird species.

Common Sandpiper is a regular spring and occassional fall migrant in the central and western Aleutians.

Heteroscelus brevipes. Polynesian Tattler. Polynesian Tattlers were seen each spring and fall, usually on boulder beaches, occasionally by creeks. Tattlers often flushed far enough ahead of observers to make positive identification impossible, so numbers of Polynesian Tattlers reported here may be low. Up to four birds were present 27 May-5 June 1974, and one to four were present 20 May-9 June 1976. Two unidentified spring tattlers remained through 15 June 1976.

Fall Polynesian Tattlers occured 21 August-3 September 1974 (one to five birds), August-5 September 1975 (one 3 August, one 16 August-4 September, three 5 September) and 27 July-7 September 1976 (one to three 27 July-7 August, one to three 2-7 September).

Byrd et al. (in press) discuss the status of the species in the Aleutians.

Heteroscelus incanus. Wandering Tattler. Like its congener, Wandering Tattlers occured each spring and fall, mostly on boulder beaches. Spring migrants were recorded 21 May-15 June 1974 (up to five), 22 May-3 July 1975 (maximum count 10 on 31 May, usually one to five seen, 25 May-14 June

1976 (one to three birds), and up to 5, 25 May-15 June 1977 (up to five). In fall, birds seen: in 1974, 20 July (a single), 28 August (a pair) and 31 August (one bird); in 1975, 19 July-5 September (one to three seen periodically); and in 1976 30 July-7 August (one each date).

Wandering Tattlers are uncommon spring and fall migrants throughout the Aleutians (Murie 1959, Byrd et al. 1974, White in press, J. L. Trapp unpub. data, D. D. Gibson unpub. data).

Arenaria interpres. Ruddy Turnstone. Ruddy Turnstones occured at Buldir as spring and fall migrants.

In 1974 a maximum of three birds were present 20 May-6 June, up to ten birds were present at a time 17 May-11 June 1975, and three to six birds were seen daily 28 May-11 June 1976.

Each year one to seven Ruddy Turnstones appeared in mid July; as early as 17 July 1974, 12 July 1975, and 14 July 1976. After the arrival date of these early fall migrants one to seven birds were seen occasionally feeding on insects in kelp beds on North Bight Beach through the end of July 1974, 27 July 1975, and 23 July 1976. After these dates in 1975 and 1976 the number of birds increased significantly; up to 25 birds a day 28 July-5 September 1975 (the last day observers were present), and up to 23 a day 24 July-24 September 1976. No peak was observed in 1974; one to five birds were seen daily throughout August.

According to Thompson (1973) Ruddy Turnstones migrate across the Aleutians from the Pribilof Islands to the Hawaiian Islands, landing in the Aleutians only occasionally

Lobipes lobatus. Northern Phalarope. A mixed flock of phalaropes seen in North Bight 23 August 1974 contained five Northern Phalaropes. The only other record we obtained was a lone bird at Midden Pond 17-18 September 1976. Northern Phalaropes breed near small tundra ponds throughout the Aleutians where habitat is available (see Murie 1959 for a list of islands where he saw them). There is little potential breeding habitat available for Northern Phalaropes at Buldir.

Phalaropus fulicarius. Red Phalarope. On 23 August 1974 a flock of this species and Northern Phalaropes (Lobipes lobatus) was seen in North Bight. Of 23 birds, 18 were Red Phalaropes, in various stages of molt. In 1975 apparently pure flocks of Red Phalaropes were seen near Outer Rock; 13 birds on 11 July, 50 birds on 16 July, and 200 birds on 17 July. A single high-plumaged female fed near the Midden Site pond 8-13 June 1976. Red Phalaropes are common migrants at sea in the Aleutians, forming especially large flocks (up to 300 birds) in fall, sometimes mixed with Northern Phalaropes (R. D. Jones pers. comm., Byrd et al. 1974, White in press, G. A. Putney pers. comm.).

Capella gallinago gallinago. Common Snipe. Each spring and fall one to four Common Snipe were seen at Buldir. Spring records include two to four birds 14-30 May 1974, one bird 18-19 May and two birds 25 May 1975, one to three birds 21-27 May and a single 9 and 17 June 1976, and one bird 26-27 May and 25 June 1977. In fall one bird was flushed 25 August 1974, two birds were encountered 4 September 1975, and a single snipe was seen occasionally 28 August-17 September 1976 except 15 September 1976 when two were recorded.

A single summer record was obtained; a lone bird present 14 July 1976 after a severe storm.

Most observations were of birds flushed from marshy areas, but individuals were seen twice in the upland in fall.

Byrd et al. (in press) discuss this race and G. g. delicata in the Aleutians.

Calidris alba. Sanderling. Lone birds were present at the Midden Site 25-30 May 1977 and 22-30 August 1974. The species is a rare but regular wintering bird at Adak (Byrd et al. 1974) and has been recorded occassionally in fall and winter at Amchitka (White in press and G. E. Hall pers. comm.), but no previous data are available on the species west of that island.

Caldris ruficollis. Rufous-necked Sandpiper. The species was recorded in spring 1974 and 1976 and in fall 1975 and 1976, mostly in kelp patches on North Bight Beach or near the Midden Site. In 1974 two birds were present 30 May, one remained through 4 June. A lone bird was found 21 July 1975 and at least four different birds were seen 13-17 August that year. A pair fed by the Midden Site Pond 2 June 1976 and a single remained the following day. In fall 1976, single birds were seen 19 and 26 August and three were present 31 August. A high-plumage bird was flushed in the upland on 11 September 1976.

There have been annual records of migrant birds in the Aleutians since the species was first recorded at Adak in spring 1971 (Byrd et al. 1974)

Calidris temminckii. Temminck's Stint. Single Temminck's Stints were seen 26 May 1974; 31 May-3 June, 14-18 July, and 20-25 August 1976, and 26-27 May 1977. All were in freshwater marsh habitat; North Marsh, South Marsh, or Midden Pond.

Byrd et al. (in press) list all records of the shorebird from the Aleutians.

Calidris subminuta. Long-toed Stint. Three to four birds were seen each spring (19 May-4 June 1974; 21-30 May 1975; 25-30 May 1977) and one to three each fall (19 August-3 September 1974, 26-28 August 1975, 20 July-25 September 1976) except spring 1976 when a large movement occurred in the western Aleutians (Byrd et al. in press). During the period 19 May-28 May 1976, 7 to 20 Long-toed Stints were present daily in the area of Camp Valley and South Marsh. They fed at the edges of snow melt puddles. Thereafter two to five a day were seen through 9 June. Byrd et al. (in press) lists all records of this Asiatic stint in the Aleutians.

Calidris bairdii. Baird's Sandpiper. One bird was recorded each year of the study; 21 August 1974, 15-18 August 1975 and 3-5 September 1976. Each bird fed in a kelp patch on North Bight Beach with other shorebirds,

The species is a rare fall migrant elsewhere in the central and western Aleutians (Byrd et al. 1974, White in press, D. D. Gibson unpub. data, J. L. Trapp unpub. data).

Calidris melanotos. Pectoral Sandpiper. Up to two birds were seen in South Marsh 23-30 May 1974, a single was in the same area 22 May 1976, and up to three were seen the first week of June 1977. In fall 1975, one bird was observed near the Midden Site 26-28 August. In 1976, when investigators remained at Buldir through September, two or three Pectoral Sandpipers were seen daily 11-26 September except 23-24 September when seven were present. Most birds fed in a kelp patch on North Bight Beach.

Byrd et al. (1974) discuss records of Pectoral Sandpiper in the Aleutians through spring 1973. Few records were available prior to spring 1973, but since then the species has been recorded in numbers during fall 1973 and regularly each spring 1974 through 1976 in the central and western Aleutians.

Calidris acuminata. Sharp-tailed Sandpiper. One to four birds were observed on North Bight Beach and in the mossy-willow upland 17-22 September 1976. The species is a fairly common fall migrant at least some years, at the western end of the Alaska Peninsula (R. Gill pers. comm., Byrd unpub. data), but usually occurs in small numbers in the central Aleutians (Byrd et al. 1974, White in press). In some years, however, large members may be forced down in the Aleutians e.g. 1973 at Adak (Byrd and J. L. Trapp unpub. data) and Amchitka (White in press).

Calidris alpina. Dunlin. One to nine, usually two to five, Dunlins were observed on North Bight Beach or in one of the marshy areas each spring; 18 May-6 June 1974, 24-29 May 1975, and 20 May-3 June 1976. In fall 1976 one or two birds were seen 3-24 September.

The species is an uncommon spring and fall migrant and winter resident in the central Aleutians (Byrd et al. 1974, White in press) and probably in the eastern and western Aleutians as well, though little fall and winter data are available from these areas.

Eurynorhynchus pygmeus. Spoon-bill Sandpiper. A bird collected 2 June 1977 is the first Aleutian Islands record of the species (Day et al. in press)

Philomachus pugnax. Ruff. A white male was present 31 May 11 June 1977. Each fall a single fall-plumaged male was seen on North Bight Beach; 31 August-1 September 1974, 16 August-5 September 1975, and 30 August-5 September 1976.

Ruff has been recorded nearly annually in the Aleutians since 1973.

Stercorarius parasiticus. Parasitic Jaeger. About 50 pairs of jaegers nested in the upland areas, generally above 300 m elevation in the mossy-willow tundra vegetation type. Up to two light-phase birds were seen each year, all others were dark. At least one light-phase bird may have nested as it was observed feigning a broken wing on 29 July (1976).

Parasitic Jaegers probably arrived during the first week in May, as birds were present on 9 May (1974) the earliest date on which we were present.

Pairs were seen in courtship flight during the last week in May and first week in June (1975). Two nests with two eggs each were found 22 June (1974) and 23 June (1975) The former nest was revisited on 9 July and found empty. Two nests with two eggs each in 1977 had not hatched by 1 July.

Nestlings were found 18 July (1974), 23 July (1976), and 23 June (1975. Kenyon (1963 reports finding a nest with two nearly hatched young 11 July 1963. On 4 August (1975) a fully feathered bird-of-the-year that was nearly flight-capable was caught. The first fledgling was observed 5 August (1976). Most chicks fledged by 17 August (1976).

Jaegers departed Buldir during the second week of September. The last birds were seen on 13 September (1976)

Jaegers interacted with Peregrine Falcons which were often seen chasing and being chased by jaegers. Two jaegers were seen diving at three adult Canada Geese on one occasion and one of the geese was hit. The reason may have been to drive the geese away from jaeger young since the attacks stopped when the geese moved about 15 m away.

Jaegers chased kittiwakes and puffins often, apparently attempting to get fish being carried to young. Also increased activity of jaegers in South Marsh, coincided with the hatching of Glaucous-winged Gull chicks and the similtaneous carrying of fish to young by adults.

At least four dead jaeger chicks were found during the study, perhaps taken by Peregrines or Bald Eagles

Parasitic Jaegers probably nest locally throughout the Aleutians (Murie 1959), Murie indicated the species was particularly common on Buldir, seeing more there than on any other Aleutian Island he visited in 1936 and 1937.

Larus hyperboreus. Glaucous Gull. In 1974 one bird in second winter plumage was seen 14-18 May, and the remains of a bird in the same plumage was found 25 May, the latter bird had probably died in winter. In 1975 a second-year bird was observed occasionally near Kittwake Pond 1-23 June and a yearling was identified 20 June near Main Talus. In 1976, the carcass of a second-winter plumaged bird was found Near Midden Pond 19 May.

Glaucous Gulls, mostly subadults, are uncommon winter residents in the Aleutians, judging from data at Adak (Byrd et al. 1974) and Amchitka (White in press). It is likely that a few winter annually at Buldir.

Larus glaucescens. Glaucous-winged Gull. An estimated 2500 pairs of Glaucous-winged Gulls nested at Buldir during the study, remarkably similar to King's estimate of 5000+ gulls seen 5 May 1965 (Kenyon and King 1965). Twenty-five distinct colonies were located and two areas were frequented by sub-adults (fig. 7).

Gulls nested in areas generally with less than a 20° slope from just above the high tide line on the beach to the upper limits of (300-350 m elevation) tall plant vegetative communities which have offered nesting cover.

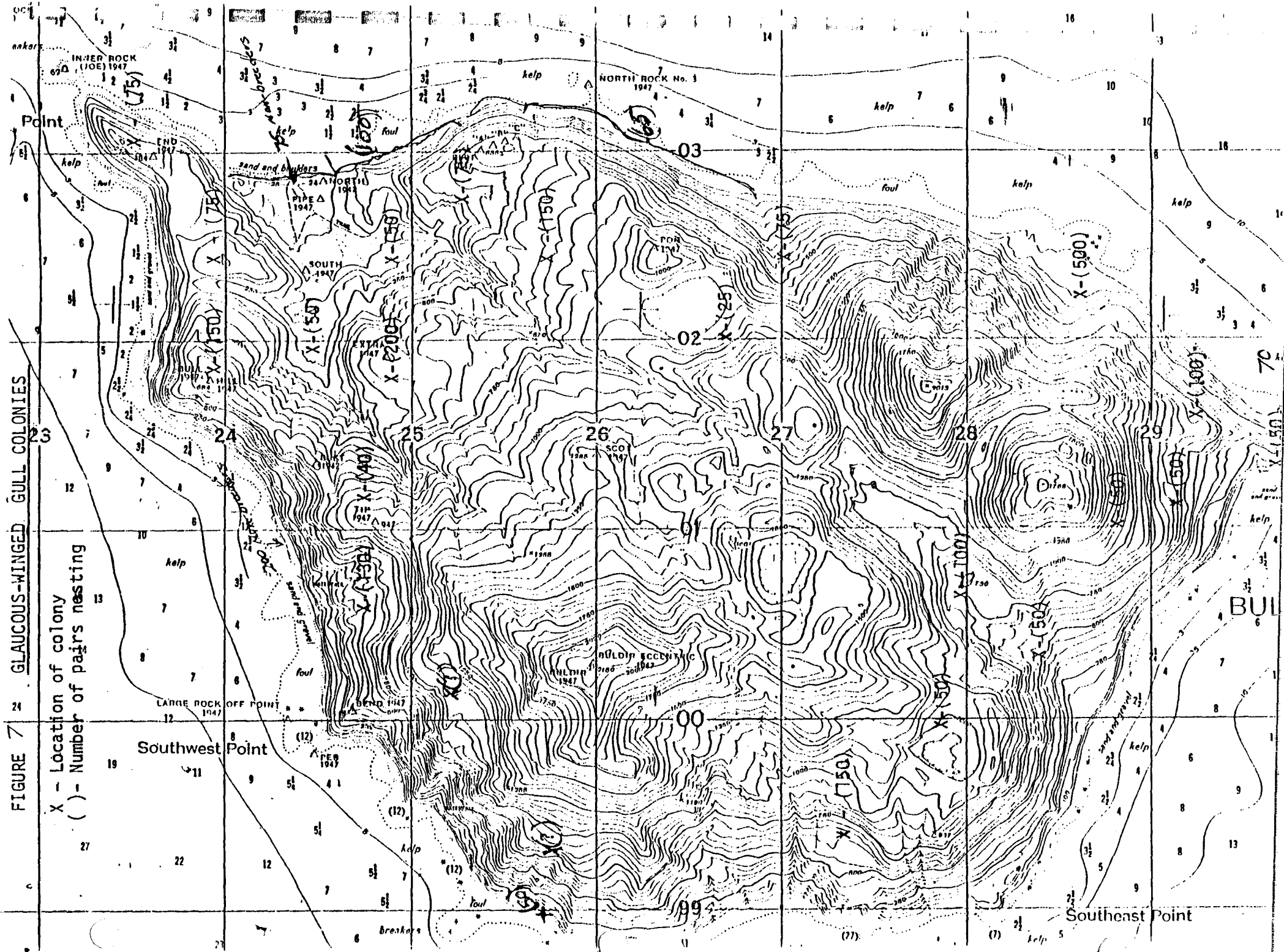


FIGURE 7 GLAUCOUS-WINGED GULL COLONIES

The first eggs were found May 18 (1974), May 17 (1975), and May 19 (1976). Laying was fairly synchronous and most first clutches were probably complete by the end of May each year. It appeared birds in colonies of higher elevations nested 5-10 days later than those at lea level.

Three-egg clutches were the most common in all years, comprising over 90% of all clutches checked (n=95). One, two, or four eggs made up the remainder of the clutches.

Nests were constructed of nearby plants, primarily Elymus arenarius and moss near sea level and Elymus, Festuca rubra, and moss in inland areas.

During the study the first eggs hatched 11 to 14 June except 1977 when first eggs hatched as early as 5 June. Forty percent (n=20) of nests checked 12 June (1976) contained at least one hatched chicked or pipped egg. On 24 June (1975), 98% of the 160 successful eggs under observation near sea level had hatched. The occassional late nest or renest was found, e.g. two eggs being incubated and a nest with a just hatched chick and one pipped egg on 24 July (1976), but most of the year's production hatched by the end of June each year.

An extremely early gull fledged by 6 July (1974) but most fledged between 24 July and 10 August.

There was a movement away from colonies as chicks fledged. Congregation points were Kittwake Pond, Bean Goose Pond, North Marsh, on beaches and on Empetrum covered hillsides.

By 9 September (1976), it was apparent that some gulls had departed Buldir. Over the following two weeks there seemed to be a constantly declining population. By 25 September (1976) it was estimated that fewer than 500 gulls remained on the island (less than 10% of the breeding population).

Food items of Gulls were recorded and have been reported elsewhere (Trapp in press).

Larus schistisagus. Slaty-backed Gull. Single adults were seen 27 May 1974 and 4 June 1975. The 1974 bird was seen flying over a nesting colony of Glaucous-winged Gulls near Kittiwake Pone. It was constantly harassed by the breeding adults.

There are three other recent Aleutian records: On 9 April 1976, R.P. and S. Schulmeister saw a flock of over 80 large, dark-backed gulls probably this speices at Amchitka, and in spring 1977, D.D. Gibson recorded this species at Shemya Island, and T.G. Tobish saw two adults at Attu in late May.

In his review of all previous records of this gull from the Aleutians, Murie (1959) shows that the species has not been encountered there often. He only saw it once, a single bird collected at Bogoslof 24 August 1937. About 24 May 1906 Clark (1910) saw "...a few of these gulls in Unalga Pass, near Unalaska...". Nelson (1887) mentions a specimen taken 1 October 1880 at Unalaska when the birds were apparently numerous. Frank Beals (unpublished field notes) collected a Slaty-backed Gull at Atka 14 February 1941, and the following winter he obtained the remains of a bird at Sanak on 15 March. Within the same week, 16 and 20 March 1942, Gabrielson (Gabrielson and Lincon 1959) saw a bird at Unimak and was told about one at Unalaska respectively.

Slaty-backed Gulls breed in the Commander Islands, on the Kamchatka Peninsula, in the Kuril Islands and further south (Demetev et al. 1951).

Larus argentatus. Herring Gull. In 1974, an adult was seen on North Bight Beach 17 May, and a second-winter plumaged bird was recorded in the same area 18 May. In 1975 an adult sat near a flock of Glaucous-winged Gulls at the mouth of Tattler Creek 30 May. A bird-of-the-year was seen on North Bight Beach 13 September 1976 and a second-year individual was identified 25 September 1976 in South Marsh.

A few Herring Gulls probably stray to the Aleutians during migrations. Two subspecies are possible; L. a. smithsonianus the mainland Alaska race from which Murie (1959) referred Aleutian sight records to and L. a. vega of northeastern Siberia (Vaurie 1965).

The species is a rare to uncommon winter resident in the Aleutians, perhaps more common at the eastern end of the chain (Murie 1959, Byrd et al. 1974, White in press, R. Tamburelli pers. comm.).

Larus canus. Mew Gull. A single fledgling Mew Gull was observed at Buldir 17-21 September 1976. Thereafter two

were present through at least 27 September. The birds remained somewhat separate from the Glaucous-winged Gulls nearby.

Byrd et al. (in press) discuss the status of Mew Gulls in the Aleutians.

Larus ridibundus. Black-headed Gull. In 1974 single adult Black-headed Gulls were observed 18 and 29 May in the North Bight Area, and a freshly dead immature bird was found near Kittiwake Pond 10 July. One adult and up to two immature birds were seen 19-31 May 1975. In 1976 at least four different birds, up to three at a time, were seen 18 May-18 June either in North Bight or North Marsh, and one immature spent the summer and fall (6 July-25 September) in the North Marsh area.

Byrd et al. (1974) review records of Black-headed Gull in the Aleutians to 1973. Kessel and Gibson (in press) provide a current summary of the species status in Alaska.

Rissa tridactyla and Rissa brevirostre. Black-legged Kittiwake and Red-legged Kittiwake. Kittiwakes were associated with the cliffs at Buldir on the earliest date the island was reached, 30 April. On 26 May (1976) Black-legged Kittiwakes were engaged in nest construction, but Red-legged Kittiwakes

had not yet commenced. Nest building included pulling blades of Elymus arenarius, Festuca rubra, moss, and other plants on the sea slopes and gathering kelp. Birds carried the plant material to nest ledges where the waiting mate took the material into its mouth and apparently masticated and regurgitated the wet pulp into layers of mud which formed nest cups. Nests were shaped by birds stamping their feet on the nest surface. This is an annual activity since it is doubtful nests survive winter storms.

On 30 May (1976) Black-legged, but not Red-legged Kittiwakes, were copulating. That day observations of inter- and intra-specific aggression in kittiwakes were recorded at the study area called Slide Mountain Kittiwake Colony. Birds were apparently fighting over establishment and location of territories and nest sites. As the birds flew to the cliffs, other birds seemingly on territory flew from nest ledges and approached the "intruders". Birds often clasped bills and tumbled nearly to the ground, calling loudly. In most of these interspecific encounters Black-legged Kittiwakes appeared to overpower Red-legged Kittiwakes, although occas ionally the same two birds had several encounters before the Black-legged Kittiwakes dominated. Smaller Red-legged Kittiwakes were considered subordinate based on the observed encounters between the congeners.

The earliest Black-legged Kittiwake egg was found 6 June (1974). On 15 June (1976) 54 (24%) of 225 nests of Black-legged Kittiwakes examined near East Cape had at least one egg. Of 46 clutches 34 (74%) had a single egg and 12 (26%) had two eggs. On the same day 34% (12 of 35) Black-legged Kittiwake nests had at least one egg (83% with one egg, 17% with two eggs) in a study area below the Dip. Fewer copulations were observed 15 June than had been seen 30 May.

On 14 June (1976), many Red-legged Kittiwakes were copulating on nesting ledges. No Red-legged Kittiwake eggs were found 14-15 June 1976 (n=24 nests). A comparison of observations of aggressive behavior 30 May and 14 June (1976) indicated a drastic reduction in the frequency of aggressive encounters. Most interactions on the latter date appeared to be territory defense and proclaiming.

On 24 June (1976), many Black-legged Kittiwakes had apparently completed laying. The mean size of 74 clutches was 1.61 eggs. No nest construction or copulation was observed. On this date some Red-legged Kittiwakes were still involved in nest construction although this activity had diminished greatly since 14 June. On 24 June only two Red-legged Kittiwake copulations were observed compared with at least 50 on 14 June.

The earliest Red-legged Kittiwake eggs were laid 14-24 June (1976); 4 of 10 nests which had not contained eggs on 14 June had eggs 24 June (two each with one and two eggs). Most eggs were very clean suggesting they were very recently laid. At least one Red-legged Kittiwake laid as late as 2-11 July in the study plot, but most laid by 2 July. Laying probably peaked 20-30 June (1976). The mean size of 21 clutches was 1.14 eggs.

Black-legged Kittiwake hatching occurred approximately 7-25 July. On 21 July 1976, 62 nests were examined; four nests had one egg, seven nests contained two eggs, five contained one chick and one egg, 24 nests had one chick, and in 22 nests two chicks were found. Assuming all nests with eggs hatched, 82% of the Black-legged Kittiwake nests had hatched by 21 July. Yearly variation in nesting chronology was apparently slight since on 23 July 1975 an estimated 85% of the Black-legged Kittiwake nests in the area below Jones Plateau had hatched.

The earliest known Red-legged Kittiwake egg hatched 12 July (1976), but most hatched 21-30 July. On 21 July 1975 none of the seven Red-legged Kittiwake nests in a plot below Jones Plateau had hatched.

The first Black-legged Kittiwake chicks fledged during the first week in August (1976). The majority departed the colony by

the end of August. Red-legged Kittiwakes fledged 7-14 days later than Black-legged Kittiwakes on the average, but it was not possible to determine enough actual fledging dates of either species for more accurate comparisons. Kenyon and Phillips (1965) found that Black-legged Kittiwakes were about one week earlier than Red-leggeds in the Pribilof Islands. On 30 August 1976 in a sample area that had contained about 250 Kittiwake nests (16% Red-legged Kittiwake), only five Black-legged Kittiwake nests still had chicks; all were nearly, if not flight capable. At least six Red-legged Kittiwake nests still had chicks, most with some feather development yet remaining before fledging.

Very few kittiwakes, mostly Red-legged Kittiwakes, were still associated with cliffs as late as 20 September 1976. All kittiwakes had departed the cliffs by 25 September. A flock of 200-400 adult Black-legged Kittiwakes fed in North Bight 26-28 September (1976), the first concentration of birds we had seen there. Perhaps they were fall migrants from other breeding areas

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Flocks of Rissa containing 75-800, average about 250-300, birds including both species, were seen bathing in Kittiwake Pond from the time there was open water (late May to early June depending on the year) until birds departed in fall.

There was a nearly constant stream of kittiwakes flying to and from the pond, usually up Petrel Valley, indicating high turnover of individuals.

Ratios of species were not obtained, but both were always present. Interestingly no inter- or intra-specific aggression was noted on the pond, although both species occured in a single, often dense, flock.

Kittiwake Pond was the only sizable freshwater area available for bathing, and it was the only freshwater area in which the activity was noted; however kittiwakes were observed apparently bathing in salt water, just off East Cape 30 April 1974 and several times in May each year (always before Kittiwake Pond had open water).

The distribution of nesting kittiwakes at Buldir is shown in fig. 5. Table 6 shows the relative abundance of each species. As shown Black-legged Kittiwakes outnumbered Red-legged Kittiwakes in every cliff segment.

Black-legged Kittiwakes nest locally throughout the Aleutians (Murie 1959). Red-legged Kittiwakes nest only at Bogoslof and Buldir (Byrd in press).

Table 6 Populations of cliff-nesting birds at Buldir 1976

Area	Total Kittiwake Nests (% Red-leg)	Total Murres (% Common)	Red-faced Corm. Nests
Outer Rock	2583 (12)	2540 (09)	25
Middle Rock	351 (03)	405 (07)	18
Slide Mt. Col.	896 (33)	135 (00)	33
East Cape[1]	2239 (15)	3983 (13)	17
South Side[2]	6973 (20)	5357 (?)	48
TOTALS	13,042 (16.6)	13,360 (7.3)	142

[1] North and east sides of East Cape

[2] South side of Buldir--Southeast Pt. to East Cape

Sterna hurundo longipennis. Common Tern. A single bird was noted in North Marsh 8-9 June 1976.

First recorded in the Aleutians in 1971 (Byrd et al. 1974), this Asiatic tern is now considered a rare spring migrant in southwestern Alaska (Kessel and Gibson in press).

Sterna paradisaea. Arctic Tern. One or two Arctic Terns were noted near Kittiwake Pond 6 July 1972 (C.M. White pers. comm.). One bird was seen at North Marsh 7 June 1974. Arctic Terns have a spotty breeding distribution in the Aleutians (Sekora et al. in press). The closest breeding colony to Buldir is at Shemya (R. D. Jones pers. comm.).

Uria lomvia and Uria aalge. Thick-billed Murre and Common Murre. Thick-billed Murres accounted for over 90% of the murres at Buldir (table 6). Both species were seen near the island on 30 April 1974. Most were sitting by cliffs 30 May 1974.

The earliest eggs were seen 6 June (1974). A pair was seen copulating on the cliff ledge 14 June (1976) at which time an estimated 35% of 140 birds viewed had eggs. The next day in a different area 9 of 23 (39%) murre scrapes had eggs. On 14 June 1974, 10 of 15 (67%) Thick-billed Murres had eggs in the same area checked above, suggesting nesting was slightly earlier that year.

On 5 July 1976, one of six Thick-billed Murres eggs checked was pipped, and no chicks were seen on the colony. On 21 July (1976) observations at East Cape revealed 20 unhatched eggs (at least 1 pipped), and 22 young chicks. On 23 July (1975) an estimated 50% of the Thick-billed Murre eggs below Jones Plateau were hatched.

Fledging began at least by 19 August (1974) and by 30 August (1976) no murres were seen in the study plot below The Dip where Thick-bills and Commons had been present earlier. However, a few birds with chicks were still on cliffs at Outer Rock as late as 4 September (1975).

Murres were present in nearly all Kittiwake colonies, but attained the highest densities on slightly less than sheer rock faces, like those found on East Cape and Outer Rock (table 6).

The breeding distribution of murres in the Aleutians is rather spotty, with colonies of over 5000 birds occurring only at Bogoslof, Kagamil, Chaguluk, Koniuji, Buldir, Agattu, and Atta Islands (Sekora et al. in press).

Cepphus columba. Pigeon Guillemot. An estimated 75-100 pairs of guillemots nested at Buldir, under large beach boulders. One main concentration was at the bottom of Main Talus where up to 15 pairs may have nested.

Guillemots were present at Buldir as early as 30 April (1974). On 24 May (1976) pairs were noted on boulders near Main Talus. Between 17:30 and 19:30 hours on 7 June 1976, 65 birds were counted in the area between Petrel Valley and the west side of Main Talus (fig. 2). On 7 July 1972, at least 50 birds were counted along Buldir's south coast, East Cape to Southwest Pt. The largest single concentration of Pigeon Guillemots was a feeding flock of 46 seen 3 June 1977 near East Cape.

Laying probably occurred in early June. The first chicks hatched in late June because adults were seen going into the boulders with fish (Ammodytes and Sculpius) in their bills as early as 4 July (1974, 1975). Two chicks (seights 228 g and 235 g) were found under a 2-m diameter boulder 6 July 1974.

The first fledglings were noticed 3 August (1974) and 4 August (1976). Most guillemots had fledged by about 20 August. Only six adults were seen between Petrel Valley and Main Talus on 30 August 1976, 17:00 to 19:00 hours (this is the same stretch of

beach where 65 birds were seen on 7 June 1976). By 5 September 1976, no adults were seen, but two birds-of-the-year were observed in North Bight. Between 6 and 27 September 1976 only three birds, all in winter plumage, were seen near Buldir.

A Peregrine Falcon stooped at a fledgling guillemot in North Bight 26 August 1976. Guillemots did not seem to be taken regularly by Glaucous-winged Gulls, perhaps because of their relative scarcity compared to auklets which gulls took regularly.

Pigeon Guillemots nest throughout the Aleutians (Murie 1959), and birds are found in protected bays in winter (e.g. Adak; Byrd et al. 1974).

Synthliboramphus antiquus. Ancient Murrelet. No accurate population estimate was possible for this species. The high count for a single flock was over 3000 on 9 May 1974 in North Bight. Flocks of about half that size were seen 25 May 1975 and 26 May 1976. Birds were found inland as early as 19 May (1974), for an individual flew into our tent that night.

Ancient Murrelets dug burrows on vegetated inland hillsides and sea slopes, often near storm-petrel and puffin nest sites. Murrelet burrow entrances apparently averaged slightly larger than storm-petrel entrances and smaller than Tufted Puffin entrances (4 murrelet burrow entrances measured 6.5 x 10.0 cm, 9.5 x 15.0 cm, 7.5 x 12.0 cm, and 8.0 x 10.0 cm; they ranged

from 36.5 cm to 50.0 cm deep).

The first eggs were laid by 30 May (1976). Of 10 burrows found with eggs on 6 June 1976, 8 contained a single egg and two had two eggs each. No birds were found in any of the burrows. Ancient Murrelets lay two eggs. The peak of laying of the first egg probably occurred during the first week of June (1976), and most second eggs were laid by mid-June(n=10), approximately 8 days after the first egg. Both eggs were then unattended for about four days before incubation began.

The incubation period in two cases was 35 and 37 days, similar to the average of 34.8 days Sealy (1972) found at Langara Island, British Columbia. It took about two days after the first sign of pipping for an egg to hatch, and chicks remained in burrows for two days after hatching before being led to sea.

The earliest chicks were seen 10 July 1974, 7 July 1975, and 8 July 1976. Peak movements occurred about 12-20 July. Nine downy Ancient Murrelets we weighed the day before they departed from their burrows averaged 30.6 g. The average weight of 128 downy young captured just before they entered the sea was 27.9 g (s=2.0). Most downies had departed by 27 July each year, but a single chick seen 9 August was an exception.

Table 7 Weight changes in incubating Ancient Murrelets.

Date	Wt (g)	Change	% Change	% Change/day
July 6	255			
July 8	238	17g	6.8	3.4
July 9	235			
July 11	214	21g	8.9	4.5
July 6	216			
July 7	209	7g	3.9	3.9
July 9	245			
July 11	230	15g	6.1	3.1

Glaucous-winged Gulls took numerous chicks judging from examination of gull regurgitations during the murrelet departure period.

Sealy (1972) found a similar relative timing of nesting events of Ancient Murrelets on Langara Island, but the chronology at Buldir was about three weeks later.

Incubation Ancient Murrelets lost 3.1 to 4.5% of their body weight per day (table 7), indicating over 10% body weight loss during an average 72-hour incubation shift.

Ptychoramphus aleuticus. Cassin's Auklet. Little data were gathered on Cassin's Auklet, but at least a few bred at Buldir. The species was first discovered at Buldir 05-06 July 1972 when single individuals (at least one with bare brood patches indicating it was nesting) came aboard the R/V Aleutian Tern while she lay at anchor in North Bight (Byrd 1972). On 11 May 1974 10 Cassin's Auklets were discovered aboard the R/V Aleutian Tern while she was anchored in the same area. The next night deck lights were left on for one hour after darkness to attract birds, and two Cassin's Auklets were captured; an adult male with enlarged testis and an adult female with ova to 4.2 mm. Both had nearly bare brood patches. In 1976 dead birds were found with bare brood patches; 25 July, and 15 July in the Peregrine eyrie on Middle Rock.

One or two Cassin's Auklets were seen during daylight on nearly evert trip to Middle and Outer Rocks in the Avon boat, but four specimens collected May-August 1974-1976 all were non-breeders, judging from eye color and brood patch condition.

One or two birds each year were captured when they flew into our tent after darkness. On 16 June 1976, a breeding bird (judging from its bare patch) was collected. On 5 July, 1976, two Cassin's Auklets were captured in mist nests near camp; one had bare brood patches, and the other had downy brood patches. Gray eye color indicated the bird with the downy brood patch was an immature while the bird with a bare brood patch had a white iris, indicating it was an adult (Mannual 1974).

In 1978, a nesting colony containing 50 pairs was found in earthen burrows just above the Crested Point talus (R.H. Day pers. comm.) Cassin's Auklets may have bred widely in the Aleutians prior to the introduction of foxes, but currently they are known to breed only on Buldir.

Cyclorrhynchus psittacula. Parakeet Auklet. A crude population estimate for Parakeet Auklets indicated between 2,000-5,000 nesting pairs at Buldir. Birds were usually seen near shore in feeding flocks of 10-20 birds, on the water near shore. As Bedard (1967) described, Parakeet Auklets tended to nest in burrows and rock creveices near the

peripheries of talus slopes, they also nested in rock crevices between beach boulders above the high tide line and in earthen burrows in some cases sharing a common entrance with Tufted Puffins (Lunda cirrhata).

Parakeet Auklets were present at Buldir as early as 30 April (1974). Distinctly paired birds were seen near Buldir 14 May 1972 (R.H. Day pers. comm.). Egg laying probably occured the first two weeks of June. The earliest egg was found 26 May 1977 a week earlier than the earliest egg found 1974-1976. The latest egg found was 11 June (1975). Hatching occured at least as early as 3 July (1976) and by mid-July most Parakeet Auklets arriving on the nesting colony had bulging necks from gular pouches containing food for chicks, indicating most chicks had hatched. Fledging began 29 July (1976) and most had fledged by 15 August. No parakeet Auklets were seen after 22 August (1974).

Parakeet Auklets were most active just after daylight and just before darkness, when they could be seen leaving land and returning respectively. This pattern was altered after chicks hatched. Movement of birds became more uniform over the day due to the requirement of feeding chicks, perhaps several times a day. Also, both adults were feeding young, whereas only one of a pair had earlier been away at a time. The peaks in activity remained early and late in the day even after chicks hatched.

Parakeet Auklets were taken occasionally by Bald Eagles and Peregrine Falcons, but they were apparently not taken regularly by Glaucous-winged Gulls, known predators on Aethia. Many times gulls were seen hunting over the Main Talus and Aethia almost always flew when gulls approached; however Parakeet Auklets largely ignore gulls, indicating they were not regularly taken. This is perhaps because of their slightly larger size. A few Parakeet Auklets nest west of Buldir. Spindler (pers. comm.) found about 5 pairs at West Cove, Agattu in 1976. The species nest locally east of Buldir (Murie 1959).

Aethia cristatella. Crested Auklet. Crested Auklets nested in rock crevices formed by angles of contact of boulders in the talus slopes. Bedard (1967) and Sealy and Bedard (in press) discuss segregation of Crested and Least Auklets nests based on boulder size. We noted the proclevity of Crested Auklets toward areas of talus composed largely of larger boulders while the smaller Least and Whiskered Auklets were more common in areas of talus composed of smaller boulders. Perhaps Crested Auklets generally use the sites they can fit into physically - the larger boulders providing larger crevices between them - while Whiskered Auklets use an intermediate size and Least Auklets use the smaller crevices, provided by smaller talus, or smaller crevices in the larger talus. Exceptions to this were noted.

Crested Auklets were present at Buldir as early as 30 April (1974), and courtship behavior was noted mid to late May.

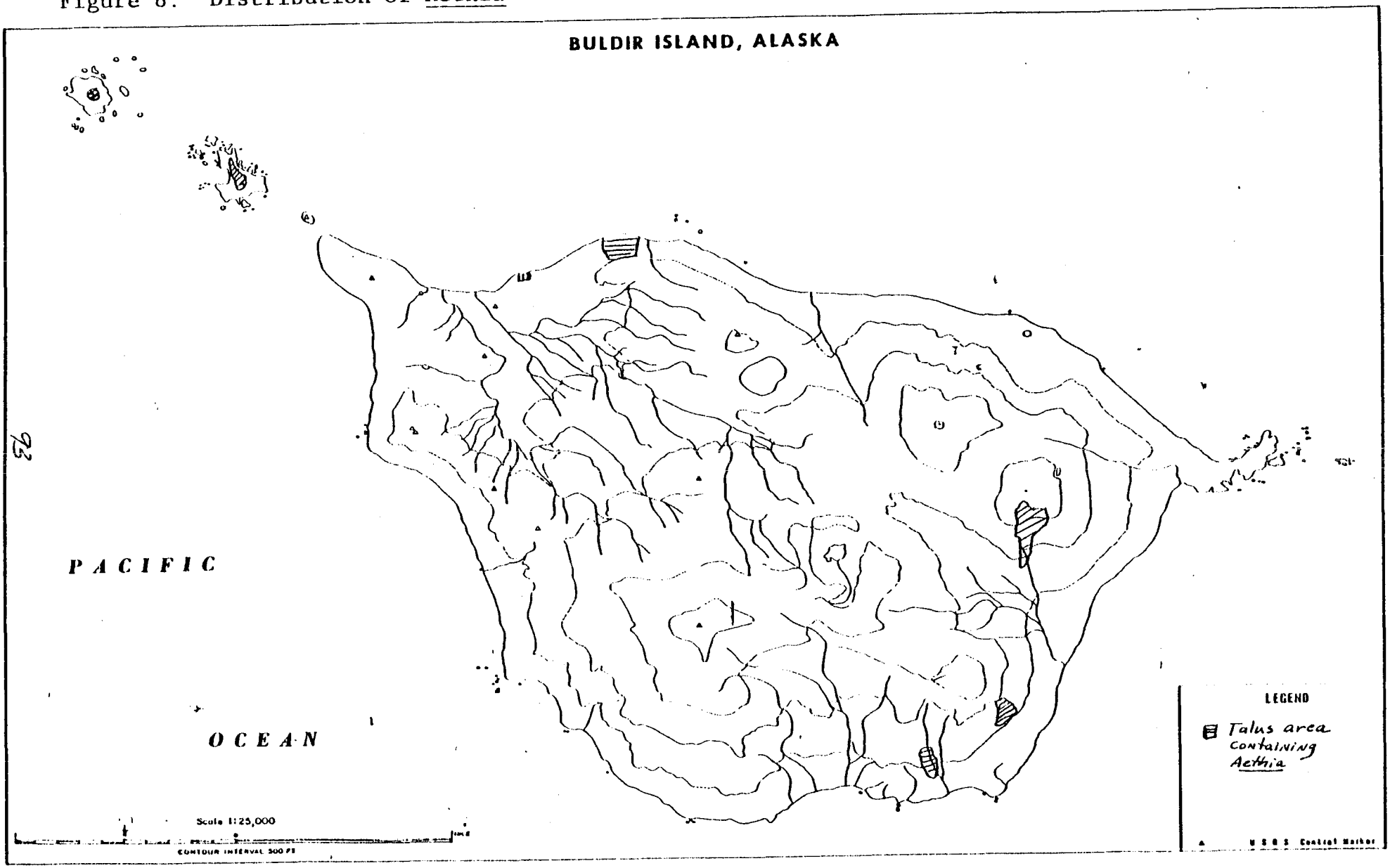
The following nesting chronology is from data collected in 1976. Egg laying occurred late May through 5 June. The incubation period varied from 35 to 41 days with an average of 38 days (n=). Hatching occured as early as July (1976), the peak occurred 5-12 July, and most eggs were hatched by 16 July. The first fledgling was found 29 July (1976) and most fledged by 15 August each year. By 22 August, Cresteds were gone from Buldir. Judging from scanty data nesting chronology was similar 1974-1976, but slightly earlier in 1977.

Crested Auklets were preyed upon by Bald Eagles, Peregrine Falcons, and Glaucous-winged Gulls.

The distribution of Aethia at Buldir is shown on Fig. 8.

Aethia pusilla. Least Auklets. Least Auklets tended to nest in the areas with smaller boulders than Crested Aulkets did. They were much more abundant than Crested Auklets in the talus below Dry Lake which was composed of small diameter boulders, and on Middle Rock where the talus was composed of flattened rocks slabs less than 1 meter deep.

Figure 8. Distribution of Aethia at Buldir



Aethia pusilla. Least Auklet. As discussed under Crested Auklet, Least Auklets tended to use the areas with smaller boulders. They were much more abundant than Crested in the talus below Dry Lake which was composed of small diameter boulders. Also on Middle Rock where the talus was composed of flattened rocks slabs less than 1 meter deep, Least were dominant.

Leasts were present as early as 30 April (1974). Courtship behavior was observerd 23 May (1976). Copulations were observed on the sea 24 May. Laying occurred late May (31 May was the earliest we found eggs, but we did not search earlier) to early June. Probably most eggs were laid by 8 June all years. Most eggs hatched between 27 June-8 July. The first fledgling was seen 29 July (1976) and most had fledged by 12 August (although a few remained as late as 22 August (1974).

Least Auklets apparently departed slightly earlier than Cresteds. They have a (4-5 days) shorter incubation period so assumming they lay at the same time and have a similar chick-raising period, they are able to conclude their nesting activity earlier.

Least Auklets were preyed on heavily by Glaucous-winged Gulls. Peregrine Falcons and Bald Eagles also took some birds.

Aethia pygmaea. Whiskered Auklet. No accurate estimate of numbers of Whiskered Auklets was possible, however they were far outnumbered by the other Aethia.

Whiskered nested in crevices in the Main Talus, and on Middle and Outer Rock, under boulders on the beach (perhaps more often than Least and certainly more than Crested), and in rocky earthen crevices on cliff faces.

The tide rip of Outer Rock was a major feeding area for Whiskered Auklets as they were seen throughout each summer (mostly in flocks of 8-10 birds). Only occasionally were Whiskereds seen in a mixed flock of Aethia, and when this occurred it was late in the day when Crested and Least Auklets were returning from feeding at sea.

The maximum number of Whiskereds observed in the tide rip was about 300 birds, seen several times in July each year. The largest single flock was 50 birds seen 26 May 1976 off Outer Rock.

Whiskered Auklets were present at Buldir as early as 30 April (1974). Courtship behavior was noted 27 May 1976 when most birds seen on the Main Talus were in pairs. On 30 May 1976, in the same area, mostly single birds were seen indicating

laying may have begun. The earliest eggs were actually found 2 June (1976) and others were discovered that week. The first marked egg hatched 28 June, but some hatched a few days earlier judging from the size of chicks discovered later. By 6 July, 9 of the 10 marked eggs had hatched.

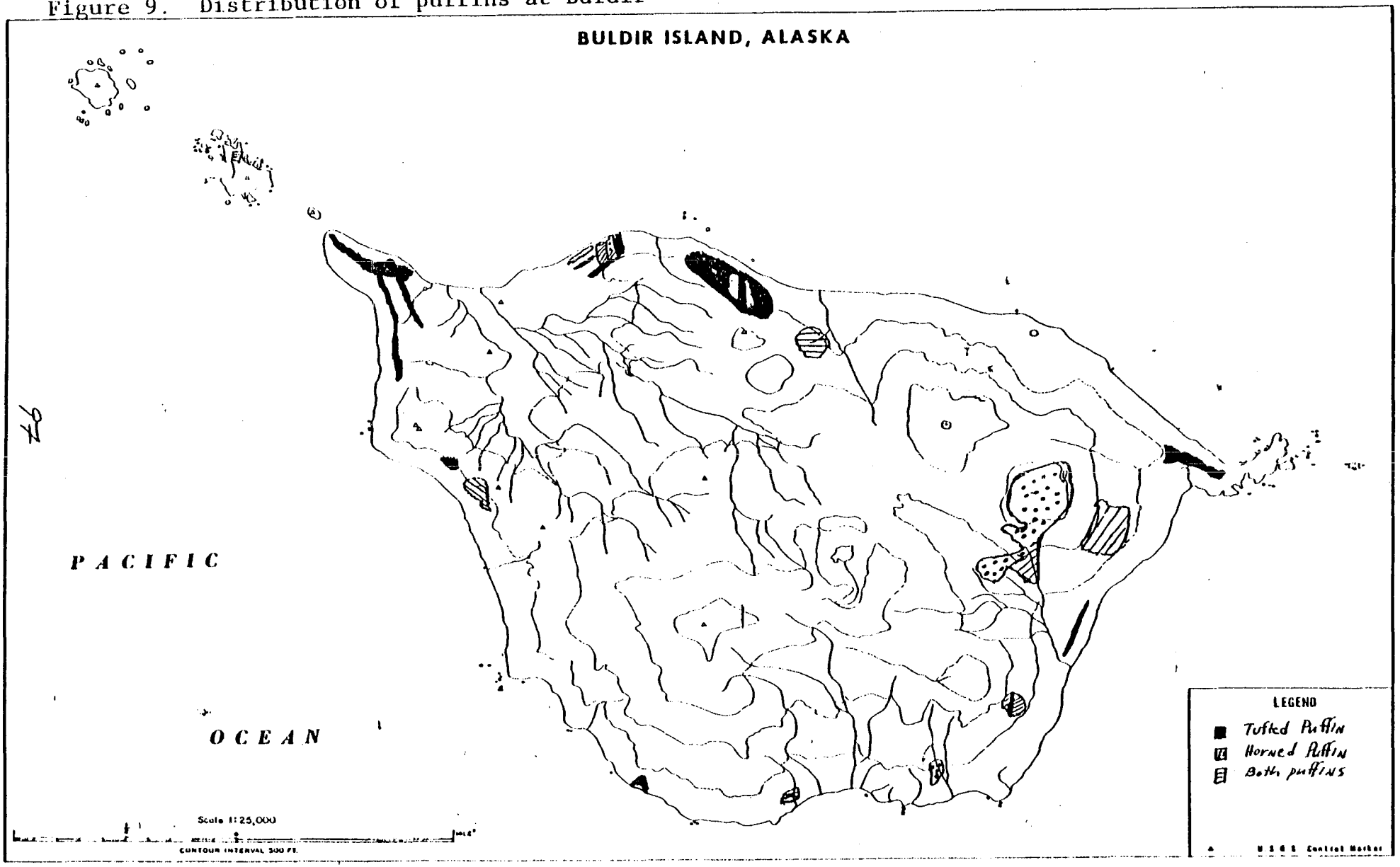
Most fledging occurred 5 August (1974)- 15 August (all years). Some Whiskereds were present as late as 22 August (1974).

Whiskered Auklets were taken by gulls, and Peregrines.

Cerorhinca monocerata. Rhinocerous Auklet. Single high-plumaged Rhinocerous Auklets were seen in flight at Buldir 7 and 18 July 1975 and a winter-plumaged bird (sub-adult?) was seen on the rocks of Main Talus 24 July 1975. In 1976 single high-plumaged birds were seen in North Bight 24 June, 2 and 15 July and 4 August.

It is possible that a few pairs of these auklets bred at Buldir, however, this was not confirmed.

Figure 9. Distribution of puffins at Buldir



Fratercula corniculata. Horned Puffin. Probably over 10,000 pairs were present each year. The main nesting concentrations were in the Main Talus and the Round Mountain Talus, with smaller concentrations in the Dry Lake Talus, Middle and Outer Rock, and in burrows in inland creek banks and hillsides. Up to 25 were seen on Kittiwake Pond each year.

Rock crevices were the typical nest sites used, but burrows were also used uspecially on Jones Plateau and to a lesser degree on the Northwest Point Peninsula. Horned Puffins nested less commonly in rock crevices on cliff faces and under beach boulders (Fig. 9 shows the distribution of puffins on Buldir).

Horned Puffins arrived at Buldir about 15-20 May, later than the other seabirds. Colony establishment occurred during the first week in June (data on nesting chronology are from Wehle 1976).

Laying took place 5-30 June (1975). Hatching generally occurred 16 July-9 August (1975), peaking the last week in July. By 23 August 1975 some chicks were fledging and most were gone by 15 September, with a few remaining until the end of September (1976)

Horned Puffins were regularly taken by Peregrine Falcons and Snowy Owls and by Bald Eagles occasionally. Glaucous-winged Gulls may have taken a bird occasionally, as a gull was observed catching a Horned Puffin in flight (the puffin escaped after a struggle). Horned Puffins are locally abundant throughout the Aleutians (Murie 1959).

Lunda cirrhata. Tufted Puffin. Probably over 10,000 pairs nested at Buldir.

Tufted Puffins commonly used earthen burrows for nesting, but some used rock crevices in the talus slopes. These puffins used nearly every sea slope up to 45° for nesting (Fig. 9). Some were observed well inland. Indeed, birds were seen on Kittiwake Pone each summer.

This species was present as early as 30 April (1974) and attempted copulation was observed on the sea in North Bight 10 May 1974. Colony establishment usually occurred during the last week in May. The following nesting chronology is from Wehele (1976).

Laying took place 5-19 June, and hatching occurred during the last week in July (19 July- 2 August).

The first fledglings were seen 27 August (1976), but peak fledgling probably occurred during the first week of September. By 12 September (1976) approximately 75% of the chicks had fledged, and by 22 September (1976) only a few scattered birds remained. They probably departed by the end of September.

Tufted Puffins were taken by Bald Eagles, and perhaps by Peregrines.

Jaegers, kittiwakes, and gulls chased Tufted Puffins for the fish (often Ammodytes) which they were carrying to their young.

Cuculus canorus canorus. Common Cuckoo. Single sick birds were collected 30 May 1974 near South Marsh and 19 June 1976 near Main Camp. The species recorded annually in the central or western Aleutians, usually in late spring or early summer, four of six years 1971-1976.

Nyctaea scandiaca. Snowy Owl. Up to five Snowy Owls were seen at a time in 1974 and 1976. Three was the high count in 1975. The owls remained in the upland, usually above 350 m elevation and at least one was seen on nearly every trip through the triangular-shaped area bounded by Owl Knob, Round Mountain and Slide Mountain. A bird which appeared to be a young-of-the-year was closely observed 30 July 1974, suggesting successful

nesting; however, no nests were found. Snowy Owls are known to breed at Attu Island (D. D. Gibson pers. comm., G. A. Putney pers. comm.)

This irruptive species winters in the Aleutians in varying numbers.

Asio flammeus. Short-eared Owl. A bird was seen flying over North Marsh 23 May and near Round Mountain 7 June 1975. The highly decomposed carcass of a bird was found near Main Camp 20 May 1976, and birds were seen in Camp Valley 11 June, 11 and 21 August, and 15 September.

Short-eared Owls breed as far west as Unalaska Island (Murie 1959), and are rare in winter at least as far west as Amchitka (White in press., J. T. Coffey pers. comm.). The species is a rare to uncommon spring and fall migrant in the central and western Aleutians judging from recent records at Adak (Byrd et al. 1974 and J. L. Trapp and A. W. White pers. comm.), Amchitka (White in press), Agattu (J. L. Trapp unpub. data) and Shemya (D. D. Gibson unpub. data).

Otus scops japonicus. Scops Owl. A wing of the this species, the first North American record, was found at Buldir 5 June 1977 (Day et al. in press).

Caprimulgus indicus. Jungle Nightjar. The first North American record of this species was a carcass found on North Bight Beach 31 May 1977 (Day et al. in Press).

Alauda arvensis. Skylark. Up to four were in Camp Valley almost daily 14-23 May 1974 and a single bird remained until 3 June that year.

Spring Skylarks have been recorded annually in the Near Islands 1973-1976 (Byrd et al. in press).

Iredoprocne bicolor. Tree Swallow. A lone bird collected 7 June 1977 is the only record for Buldir and one of the few records of the species in the Central Aleutians (Byrd et al. 1974).

Riparia riparia. Bank Swallow. A lone bird observed near the Main camp 24 June 1977 is one of two western Aleutian records of the species, the other involved a lone bird at Attu mid-May 1977 (T.G. Tobish pers. comm.).

Petrochelidon pyrrhonota. Cliff Swallow. A single bird perched on the antenna pole by Main Camp 4 June 1974. Another was found in the same area 28 June 1977. The only other record of Cliff Swallow in the Aleutians is a single bird at Amchitka (White in press).

Troglodytes troglodytes. Winter Wren. Winter Wrens are resident throughout the Aleutians, and separate subspecies have been described from different island groups (Gabrielson and Lincon 1959, Murie 1959).

Territorial singing male wrens were obvious when we arrived each year around mid-May. A bird was seen carrying nest material as early as 27 May (1976). Other individuals were seen carrying plants and feathers in late May and early June. There was apparently a wide range of nesting dates as just fledged (hardly able to fly) birds were seen 23 June (1976)-18 August (1976). Adults were seen carrying insects to crevices during most of July each year. Only one active nest was found during the study; it contained five nestlings and one addled egg on 1 July 1976. On 6 July, four wrens flew/ran from the nest when it was checked. Two days later the four flew from the nest again. When the nest was examined on 10 July it was empty, but at least three fledglings were seen within 10 m of the nest site. Three fledglings were still in the area as late as 17 August.

The nest was built into the side of a 0.5-m tall hummock of predominantly Elymus arenarius and Festuca rubra. Nest material was 50% Festuca, 20% Elymus, and 30% moss. The cup measured 60 mm diameter at the entrance and was 105 mm deep. It was lined with feathers, probably from an Ancient Murrelet.

Figure 10. Winter wren/Song sparrow transect

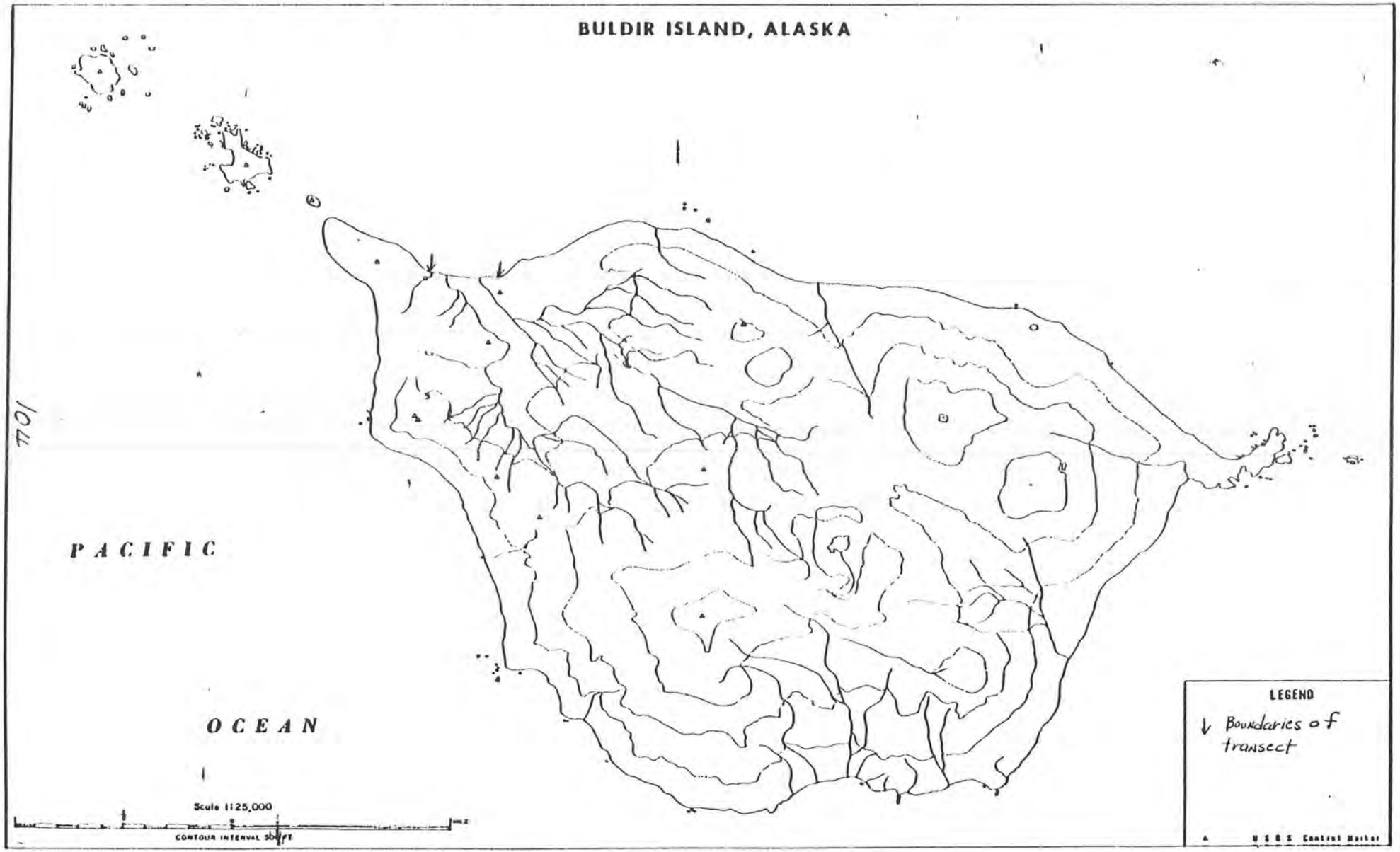


Table 8. Winter wren abundance in North Bight transect area 1974-1976, Buldir Island, Alaska

Period	1974	1975	1976
20 May-30 June			
n	3	9	4
$\bar{x}$	9.3	5.1	5.8
Range	7-13	2-9	4-9
1 July-1 Aug.			
n	0	6	0
$\bar{x}$	-	8.1	-
Range	-	5-10	-
2 Aug-17 Sept.			
n	1	2	1
$\bar{x}$	26	32.5	53
Range	-	29-36	-

Two other nests were discovered during the study, both had been dislodged from their original locations. One nest, still containing one egg, was near the edge of a bank overlooking North Bight Beach. It had apparently fallen out of a hummock which was damaged when the bank slumped. It was misshapen from the fall so was not measured. Nest material was 80% Festuca, 10% Elymus, 10% moss and the cup was lined with Glaucous-winged Gull feathers. The second nest was dislodged from a rock crevice in the Main Talus. The space the nest had filled measured 100 x 130 mm at the entrance and was 130 mm deep. The space was formed by the angle of contact of a 4-m diameter and a 3-m diameter boulder. The nest cup was 75 x 100 mm at the entrance; however, the depth could not be accurately measured. Nest material was 90% Festuca, or Puccinellia and 10% moss. It was lined with Least Auklet feathers.

Judging from the locations of singing birds, and birds carrying insects, Winter Wrens nested at Buldir primarily along the beach fringes in Elymus hummocks, among drift logs, in rock crevices on sea cliffs, and in rock crevices of the talus slopes.

A transect was established along North Bight Beach (Fig. 10) half way between the tide line and the bluff where wrens were particularly conspicuous. The 5 km transect line was censused by: one to three persons four times, 20 May to 28 August 1974;

one to three persons 17 times, 26 May-1 September 1975; and five times by one to three persons, 23 May to 17 September 1976. Only for the period 20 May to 30 June were data sufficient to afford comparisons. There were more wrens in 1974, the mildest spring, than in the other two years of the study (table 8). The 1975 data showed an increase in wrens along the transect during July; this probably reflects the presence of fledglings from pairs within the transect. During August and September territories apparently dissipated, and wrens moved from inland locations up to the beach where, insects were available in abundance. Subjectively, it was noticed that the beach population increasedas the season progressed. The 1976 count of 53 birds was made 17 September whereas the 1974 count was taken 2 August.

North Bight Beach was particularly attractive to wrens, probably because of its large rounded boulders which held washed-up kelp. The boulders provided numerous crevices where wrens could get protection from wind while feeding on insects living in the dead kelp. Also the beach was backed by the low bank of Camp Valley. The sand and large boulder beach from the west end of the transect to Northwest Point (.8 km) had no wrens on 19 September 1976, while the transect area, a shorter length, had 53 birds. On 31 August 1974 only one wren was seen on the sand and large boulder beach from the North side of Bull Point to Northwest Point (1.5 km) while 26 were present

in the transect area that day. On the boulder beach between Petrel Creek and the east side of Main Talus (1.5 km) 21 wrens were seen on 14 June 1974. That day the area between the west side of the talus and the east end of North Bight Beach (.8 km) contained 14 wrens. The transect area had probably the densest concentration of wrens on Buldir. The boulder beach backed by a valley instead of the typical cliff or steep sea slope apparently was attractive to them.

During winter, wrens must depend almost totally on insects found in beds of beached algae. They also probably forage under overhanging banks and perhaps even in seabird burrows. At Buldir there are no known predators on Winter Wrens, although it is possible Glaucous-winged Gulls take a few. Winter mortality may be fairly high especially during the prolonged storms with high-velocity winds, making feeding difficult. It is doubtful that a Winter Wren is capable of controlled flight in winds of 40 - 60 knots which occasionally blow steadily for 24 to 48 hours. Also heavy snow cover, which occurs some winters, may have adverse effects on wrens. During heavy snow conditions, the only areas available for feeding would be in the intertidal zone.

Turdus obscurus. Eye-browed Thrush. In 1976 at least five different birds, up to four in one day were seen at Buldir 24 May-12 June. The species is a casual migrant in the Aleutians (Byrd et al. in press).

Oenanthe oenanthe. Wheatear. Two different individuals, judging from plumage differences, were seen in the uplands 13 and 18 September 1976. There are only 3 other records of this species for the Aleutians, but few observations have been made in the upland habitat, so it could occur far more often than the records indicate.

Luscinia calliope. Siberian Rubythroat. In 1976 at least three different individuals, two males together and one female, were seen 7-17 June. Birds were seen in four widely separated locations along creeks and by melting snow banks, more birds were probably present than we could document.

Byrd et al. (in press) list all Aleutian records of this irregular Asiatic straggler.

Phylloscopus borealis. Arctic Warbler. One bird was seen among drift logs on North Bight Beach 6-12 June 1976. The species has been recorded at Nizki Island 4 June 1976 (Trapp pers. comm.); Amchitka Island , 11 May 1973 (White in press); 21 October 1965 Lensink (unpub. report), and mid-October 1957, (Kenyon 1961); and Attu, June 1977 (T.G. Tobish pers. comm.).

Muscicapa griseisticta. Gray-spotted Flycatcher. Different lone birds were seen 8 and 9 June 1976 near Midden Site and in South Marsh respectively. A bird was collected at North Marsh 1 June 1977. A muscicapa also thought to be this species was seen near Main camp 24 June 1977 (R.H. Day pers. comm.). Byrd et al. (in press) lists only one other Aleutian record; at Amchitka (Kenyon 1961).

Motacilla alba. White Wagtail. One or two gray-backed birds, M.a. ocularis, were seen daily near the Midden Site and on North Bight Beach 14-18 May 1974. Lone specimens of ocularis were closely observed 18 May, 31 May, and 1 June 1975, all on North Bight Beach. A dark-backed individual, M.a. lugens was seen near Midden Site 31 May 1976 and a bird in juvenile plumage was recorded on North Bight Beach 20 September and in South Marsh 22 September 1976.

Kessel and Gibson (in press) discuss the species and subspecies in the Aleutians.

Motacilla cinerea. Gray Wagtail. Different birds occurred on North Bight Beach 8 and 11 June 1976. Byrd et al. (in press) list two other Aleutian records of this species.

Motacilla flava. Yellow Wagtail. Two different individuals were seen 17 May, 24 May, 3 June, and 6 June 1974. In 1975 up to 12 were present 18 May-8 June, while three to nine were seen daily 19 May-8 June 1976 (except 20 May when at least 32 birds were present in both marshes and along North Bight Beach)

Fall records were; two birds 29 August 1974 and a single 9 September 1976. Yellow Wagtails concentrated near the mats of rotting kelp on North Bight Beach where they apparently fed on insects.

Yellow Wagtails have been recorded annually in the central and western Aleutians as migrants since 1974.

Anthus spinoletta. Water Pipit. Two Water Pipits were seen 30 May 1974 near Midden Site and one was noted occasionally in Camp Valley 20-30 May 1976. One bird was seen on North Bight Beach 29 August 1974. In fall 1976 a single bird was seen in the upland 15 September, and two fed near the Midden Site 23 September.

The species breeds as far west as Unalaska (Murie 1969) and is at least a rare migrant in the central and western Aleutians, but like migrating Wheatear, Water Pipits may go largely unnoticed.

Anthus hodgsoni. Indian Tree Pipit. A single bird fed near the creek by camp 31 May 1976. Byrd et al. (in press) lists one record at Attu in 1976.

Anthus cervinus. Red-throated Pipit. On 30 May 1974 at least three high-plumaged birds were seen on North Bight Beach and at South Marsh. Single birds were seen 20-26 May 1976 except 21 May, when four to six individuals were present near Main Camp.

Byrd et al. (in press) list other recent records of the species in the Near Islands.

Fringilla montifringilla. Brambling. In 1976 a pair fed near a melting snow bank at South Marsh 24 May and a female was seen in similar habitat in Petrel valley 28 May.

Kessel and Gibson (in press) summarize Aleutian records of this casual spring and fall migrant.

Erythrina erythrina. Common Rose Finch. One female fed by the melting pond in The Dip 2 June 1975, and two females

fed near a snow bank on Extra Plateau 21 June 1976. These are the first records of Common Rose Finch for the Aleutians (Kessel and Gibson in press).

Leucosticte tephrocotis. Gray-crowned Rosy Finch. My subjective impression was that approximately 100 pairs may have nested each year. Only four nests were discovered during the study. Two were in man-made objects, a crashed P-38 airplane and WWII bull-dozer in Camp Valley; and two were in depressions in the earth, one in the remains of a slumped puffin burrow and the other in a cavity under over-hanging vegetation on the side of a boulder. Judging from observations of adult birds, most rosy finches nested either in rock crevices on steep sea slopes and cliffs or among vegetated boulders in old-age talus slopes. The largest concentration of rosy finches were near The Dip (up to 15 pairs 31 May 1974) and at Main Talus (up to 10 pairs each summer). Pairs were on territory at least as early as 19 May (1974), but flocks were still seen as late as 26 May (1974) when a group of nine birds (seven males and two females) fed in a patch of washed up kelp together. The only nest for which a hatching date was recorded, hatched about 5 June (1974). Another nest still had four eggs 14 June (1974).

Fledglings were noticed as early as 22 June 1974, 1 July 1975, and 23 June 1976 although some probably fledged earlier than our first observation each year.

Family groups were conspicuous during July when they were seen feeding near drift logs on beaches, on vegetated boulders in talus, and atop stalks of Heracleum lanatum and Angelica lucida (apparently on seeds). One family was observed feeding on fruits of Draba borealis at the Main Talus 9 July 1976. Rosy finches were never seen above the upper reaches of the Elymus-umbel Community, and seldom on inland slopes except near talus slides.

A dispersal of rosy finches occurred by late August or early September. In 1976, no adult rosy finches were observed after 10 September. The only birds we encountered before we left 27 September were a pair and a flock of five birds-of-the-year. It is not known if birds return to winter At Buldir.

Rosy finches are thought to be resident in the Aleutian area (Bailey 1975, Trapp and Byrd unpub. banding data), but White (in press) provides evidience suggesting some inter-island movements.

Carduelis sinica. Oriental Greenfinch. A single bird was seen in Camp Valley 8 June 1976 and a flock of five fed near a melting snow bank at the top of Sharp Ridge 14 June 1976. On August 1976, a bird was observed closely near Midden Pond. Byrd et al. (in press) list a 1976 record for Attu. One greenfinch was seen on Round Mt. 3 June 1977 (R.H. Day pers. comm.).

Acanthis hornemanii. Hoary Redpoll. Three Hoary-type redpolls were closely observed near The Dip 31 May 1974. In 1975 a mixed flock of up to 30 Hoary and Common Redpolls, A. flammeus, was see regularly 23 June-12 August 1975.

Hoary Redpolls may be expected to occur in the Aleutians since they are "regular winter visitors" in the Commander Islands (Johansen 1961), however the 1974 Buldir record is the first. A number of observations were also made in the western Aleutians during the spring and summer of 1975 (Trapp pers. comm., Gibson pers. comm.), but none have been recorded since tho...

Acanthis flammeus. Common Redpoll. At least four Common Redpolls were identified in the mixed flock mentioned under Hoary Redpoll.

Common Redpolls were first recorded at Buldir 5-8 July 1972 (D.D. Gibson unpub data) when up to six were seen. They are known to nest as far west as Unalaska (Murie 1959), and Murie (1959) lists winter records for several islands in the central and western Aleutians. The summering flock at Buldir in 1975 coincides with records that summer from Alaid (Trapp pers. comm.).

Melospiza melodia. Song Sparrow. The race M. m. unalaskensis ~~is~~ considered a resident in the Aleutians (Murie 1959). The population at Buldir probably exchanges little with other song sparrow populations.

We found a complete clutch of four eggs 14 May 1974, the earliest date we searched. Laying occurred throughout the first three weeks of May and peaked about 15 May. A total of 36 nests were examined during the study. The average clutch size was 4.0 eggs, and ranged from 2 to 5. The mode was 4 eggs occurring in 75% of the nests. Nest material was examined at 10 nests; all were constructed of Elymus arenarius and lined with Festuca rubra. All nests observed occurred in a tuft of Elymus arenarius.

The earliest young were seen 28 May and hatching likely peaked after the first week of June. No eggs were found after 11 June (the latest were at 200 m elevation). An exceptionally early fledgling was recorded 7 June (1974), but most fledging occurred near the end of June.

Families of Song Sparrows were regularly seen near nests. The birds fed on insects and seeds of Heracleum lanatum and Angelica lucida. Heracleum was particularly attractive to Song Sparrows because the umbelliferous plant offers thick stalks and a flat topped inflorescence for perching. The sheaths at the branches hold water and Song Sparrows were often observed drinking from these "water troughs".

Although sparrows were often seen foraging on the boulder-strewn beaches, they seemed no more abundant here than at more inland locations, e.g. South Marsh.

Song Sparrows were most common at lower elevations although they were occasionally seen as high as 350 m (the upper edge of the Elymus-umbel plant community which they frequented).

A population index was recorded whereby population trends might be determined.

A transect about 175 m long was established along North Bight Beach (Fig. 10). Two to four investigators walked the transect 3 to 17 times each year. There was a slight increase in numbers in late June, probably dur to the presence of recent fledglings. However, a large increase was not observed until late August to early September when birds moved into the transect area presumably from further inland. The move coincided with the hatch of flies on the beach. Single counts each fall revealed 23 birds, 28 August 1974, 14 birds 1 September 1975, and 17 birds 8 September 1976.

Song Sparrow in transect area (spring and summer)

	1974	1975	1976
n	3	17	4
$\bar{x}$	8.7	4.1	4.8
R	7-11	1-10	3-5

The scanty data indicated some annual variation, 1974 being a year of high population which was also the mildest winter and spring of the three years.

Calarius lapponicus. Lapland Longspur. This species was present at Buldir when we first went ashore each year; as early as 9 May (1974).

Singing males were defending territories by 21 May each year, although some flocks (15-20 birds per flock) were still present in the uplands as late as 24 May (1976).

Tight sitting females were flushed as early as 6 June (1976), but the earliest nests were found 14 June (1974, and 1976). Ten nests with eggs were examined during the study. Egg dates ranged from 14 June to 1 July and clutches averaged 4.8 eggs (range 4 to 5). Every nest found was near a clump of Elymus arenarius. Elymus was also dominant in nest material along with Festuca rubra and moss. Most nest cups were lined with white feathers, perhaps from Glaucous-winged Gulls, since many molted contour feathers were present in gull colonies.

Judging from fledging dates, laying was probably asynchronous. The first fledglings were seen 10 July 1974, 7 July 1975, and 14 July 1976; however, just fledged birds were seen as late as 17 August 1976 and 26 August 1974. Peak fledging activity occurred about the third week in July each year.

In 1975, the only year in which a record was kept, the last male longspur was heard singing 29 July and males were molting by early August. During August, family groups (4 to 6 birds) of longspurs foraged in the Elymus - Umbel Community, feeding often on seeds of Heracleum lanatum and Angelica lucida.

As early as 17 August (1976) flocks of up to 20 birds were seen foraging in the upland. Most birds were in flocks by early September each year, and groups of up to 50 individuals moved through the upland 7-18 September 1976, after which period numbers diminished. A few birds were still present 27 September 1976, the last day of observation.

Nesting longspurs used the Elymus-Umbel Community, males singing from the talles Heracleum or Angelica stalks, females nesting in Elymus clumps. Lonspurs were seldom seen on the beaches, being more common inland. Parasitic Jaegers were often seen chasing longspurs and Peregrines were occasionally seen prusuing them.

Elsewhere in the Aleitians Lapland Longspurs are common breeders arriving early May. The last birds are seen mid-October (Byrd et al. unpub. data).

Plectrophenax nivalis. Snow Bunting. This species nests in rock crevices in the upland at Buldir. We never saw birds below 300 m elevation. Subjectively it was determined that about 20 pairs breed on the island. No nests were located, but fledglings were seen as early as 23 July (1975, 1976). Parasitic jaegers may take some buntings as they share the upland with the species, and a Peregrine Falcon was seen in pursuit on Snow Buntings occasionally.

Most Snow Buntings departed Buldir by mid-September 1976, except a single bird-of-the-year observed 22 and 24 September.

It is possible that a few migrating or wintering Snow Buntings occur at Buldir.

The species breeds and winters in the Aleutians. Perhaps separate populations are involved, or the breeding population may be augmented by birds that bred farther north. Bailey (1975) suggests migrating birds move through the Cold Bay area to and from the Aleutians. Local wintering population (e.g. Cold Bay and Adak) contain some of the same individuals throughout the year (Bailey 1975, Trapp and Byrd unpub banding data).

Emberiza rustica. Rustic Bunting. In 1976 at least four different individuals, two males and two females, were seen in widely scattered locations 26 May-17 June. Byrd et. al. (in press) discuss Aleutian records of the species, emphasizing a movement of the birds in the western Aleutians in 1976.

Emberiza schoeniclus. Reed Bunting. On 29 May 1975 an adult male was seen perched on a dried stalf of Heracleum lanatum near Bean Goose Pond and collected. It is the first Aleutian and North American record (Byrd et al. in press).

Acknowledgments

The report was assembled by Byrd. The background section was written by J.L Trapp who also helped plan the study and gather data in the field throughout the period. Mathew H. Dick wrote most of the section on Pelagic Cormorants and helped set up the study and collect data in 1974. Christian P. Dau helped write the sections on waterfowl and puffins and aided with study organization and data collection in 1974.

D.W. Woolington added waterfowl data and contributed particularly useful data on other species from 1975-1977.

D.H.S. Wehle was responsible for most of the information on puffins, and he provided data on other species in 1975. R.H. Day contributed data on many species in 1975 and 1977. Eric Knudtson collected the most significant auklet data and provided valuable assistance on other species 1976-1977. T.G. Tobish studied Kittiwakes and helped gather data on other species in 1976. W.E. Rodstrom, J.L. Trapp and M.H. Dick did most of the vegetation and habitat mapping. Rodstrom also assisted with data collection on all species in 1976. Tom Early was especially helpful by providing data from 1977 and making needed refuge files available. Glen Elison, Eric Hoberg, Mike Spindler, and Elaine Rhode also assisted at Buldir. Robert and Sue Schulmeisty and James C and Nancy Coffey kindly provided notes from Amchitka.

John L. Martin provided help with logistics.

Logistical support was provided by George Putney and Dave Clemens aboard the R/V Aleutian Tern, without which the project would not have been possible.

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