

THE MIGRATION OF LAPLAND LONGSPURS TO ALASKA

LAURENCE IRVING

EARLY in May Lapland Longspurs, *Calcarius lapponicus*, arrive at Anaktuvuk Pass in the center of the Brooks Range of arctic Alaska in large flocks that fly swiftly northward in compact formations or stop to feed among the hummocks of sedge that are exposed through the snow (Irving, 1960a). Judging from my observations, verbal reports, and compilations by Gabrielson and Lincoln (1959), these longspurs are generally the commonest nesting species of the Alaskan arctic tundra. They also nest in western Alaska over the grassy land beyond the forests as far south as the Alaska Peninsula, on St. Lawrence (Fay and Cade, 1959) and other islands in the Bering Sea (Preble and McAttee, 1923), and along the Aleutian Islands to Attu (Murie, 1959).

Published reports (Friedmann, 1935) show the occurrence of Lapland Longspurs on Kodiak. Unpublished reports (Fish and Wildlife Service) indicate that they are common summer residents in the Kodiak National Wildlife Refuge, which comprises a large part of Kodiak Island. The extent of their presence on Kenai Peninsula is not clearly shown in publications. Comments of residents on the northwestern shore indicate that longspurs pass that part of Kenai in migration. Nesting probably occurs on Kodiak and possibly on Kenai, but I have not been able to verify this.

On Middleton Island in the Gulf of Alaska (Rausch, 1958), the nesting of longspurs is detached from their arctic and western Alaskan nesting grounds. They have also been reported nesting in the interior of Alaska at Mt. McKinley National Park (Dixon, 1938); and, according to Gabrielson and Lincoln (1959), George Schaller found them nesting at Black Lake in the Talkeetna Mountains.

Except for the reported nesting of longspurs in these mountainous areas of the interior, the nesting population of the mainland of Alaska is settled in a peripheral band about its arctic and western perimeter (Figure 1). South of Barrow this heavily populated band extends from the coast about 320 kilometers (200 miles) inland to the forest. Elsewhere on the mainland the densely occupied nesting area is no wider, but it extends to the islands in the Bering Sea, southwestward along the Alaska Peninsula and for some 2,200 kilometers (1,400 miles) into the Pacific Ocean over the Aleutian Islands. Since longspurs are the commonest birds nesting over this great area, they are one of the most numerous avian populations in northwestern America.

The breeding Lapland Longspurs of Alaska are ascribed to the subspecies *C. l. alascensis* Ridgway (A.O.U. *Check-list*, 1957) and are said to winter in interior western states and as far north as southern British Columbia (Munro and Cowan, 1947). Taking latitude 50° and longitude 134° as reference points for the northwestern part of this wintering area, their migration would extend 20° of latitude northward and 14° of longitude westward to the eastern nesting limits of the race in

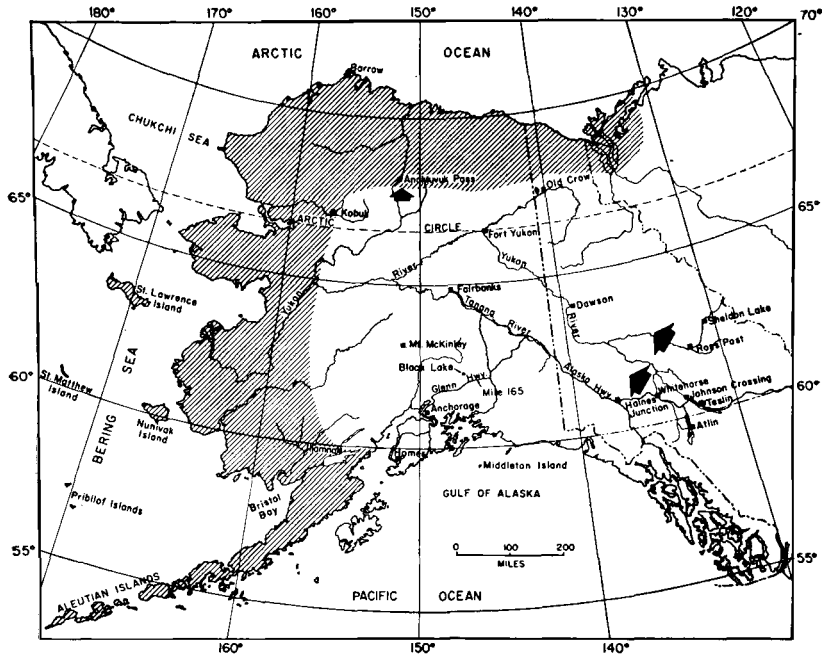


Figure 1. Northwestern range of *Calcarius lapponicus* (diagonal hatched) and location of well-recorded directional migration in spring (heavy arrows).

Mackenzie (A.O.U. *Check-list*, 1957). In the westernmost Aleutian Islands the migration would extend their summer range only 4° northward but 67° westward. During several years I have been gathering evidence for the course and program of this extended and large migration in Alaska.

MIGRATION THROUGH THE BROOKS RANGE

From 1948 to 1960 Simon Paneak, a resident of Anaktuvuk Pass (latitude 68° 19' N., longitude 151° 26' W. in the central part of the Brooks Range), recorded for me his observations of birds and those of his family and neighbors. In 1949 Thomas Brower kept records there during April, May, and June. These observations are supported by many specimens. I have been at Anaktuvuk during all or part of five spring migrations. In 10 years of suitable records the first Lapland Longspurs were recorded at Anaktuvuk on 1 May 1949, 29 April 1951, 9 May 1952, 4 May 1953, 13 May 1954, 5 May 1956, 8 May 1957, 3 May 1958, 11 May 1959, and 29 April 1960; the average date of these arrivals being 5 May.

The dates of first recorded arrivals of longspurs are more variable than for many arctic species. The daily records of migrations during eight years are complete enough to show that after their first arrival on the average date of 5 May only a few longspurs, usually identified as males, were seen before the average date of 17 May (11 to 20 May). On that average date flocks of 40 or "many" first appeared. Thereafter, for 10 days, numbers recorded by Tom Brower were as large as 2,000 a day in flocks that commonly included from 50 to 150 longspurs. Until about 20 May the flocks included mainly males, but thereafter the proportion of females increased. The less conspicuous appearance and behavior of female longspurs may have biased reports, but we have not noticed a late excess of females that would offset the obvious early preponderance of males.

Like pipits, *Anthus spinoletta* (Irving, 1960b), and several other species, the first male longspurs arrive at Anaktuvuk fat and with partially developed testes (Irving, 1960a, p. 123). After 15 May the testes had reached full breeding size, and flight songs began to be noticed among coherent flocks that were apparently still migrating northward. Pairing was recorded as early as 20 May, nest building a few days later, and first eggs just before 1 June in most years. In the confusion of so many migrating flocks I did not discern whether entire flocks separated and settled at Anaktuvuk or whether individuals dropped out as they paired and nested there while the remainder of the flocks continued northward.

The great northward migration of longspurs through Anaktuvuk continues for about 10 days after the average date of 17 May and intermittently for a few more days. The large numbers that remain to nest are an insignificant part of the many flocks that pass swiftly northward or occasionally alight to feed and drink busily as if in haste to continue. Occasionally a flock has been watched while grounded for several hours, but I have not searched to find if the migrants roost overnight in the valley. Sometimes a flock circles or makes a short flight, and on a few occasions flights have been seen to pass southward out of view. In most of the flocks the movement is well coordinated, closely organized, and pursues its course northward. I have gained the impression that the northward movement of longspurs at Anaktuvuk is as pronounced a directional migration as is the tremendous movement of eider ducks flying eastward in spring along the arctic coast past Barrow. The longspur is the most numerous migrant to pass Anaktuvuk in spring, and many thousands are transferred toward the arctic slope.

Although the Nunamiut Eskimos now are based at Anaktuvuk Pass,

their older people have lived in many valleys of the Brooks Range between longitude 150° and 158°, which their ancestors occupied as nomadic caribou hunters. These Eskimos named six other valleys through which longspurs migrate northward in numbers comparable with or exceeding the migration at Anaktuvuk and indicated that all valleys were utilized according to the extent of their grassy land. I have seen their migration through the Killik Valley and Howard Pass.

Records from Anaktuvuk show that the earliest reports of longspurs in spring differ from year to year more than is the case for other arctic migrants, each species of which commonly arrives within a few days of its regular date. Further, as a result of close observation by resident people, it is apparent that after the earliest longspur was noticed, on the average 12 days elapsed while only a few individuals, mostly males, were seen until numerically significant migration in flocks began suddenly and continued for 10 or 15 days. This rather unusual program of migration may be peculiar to the longspurs at Anaktuvuk; or it may be that the observation of migration by many Eskimos resident in open tundra, where visibility is especially good and migration is constricted in a narrow valley, detects the few early migrants that escape the view of single observers at less favorable positions.

MIGRATION ELSEWHERE IN THE WESTERN ARCTIC

Longspurs nest near Kittigazuit in the Mackenzie Delta (Porsild, 1943). Several reports of migration and nesting on the arctic coast of Yukon Territory have been compiled by Rand (1946), and Kessel and Schaller (1960) recently found a few nesting near the headwaters of the Sheenjek River in the northeastern Alaskan Brooks Range. We did not find them in the valley or on the tundra within 16 kilometers (10 miles) north of Old Crow, Yukon Territory (Irving, 1960a).

While watching the spring arrivals at Demarcation Point and Humphrey Point, respectively, in 1914, Brooks (1915) and Dixon (1943) reported that a few longspurs arrived there to nest. From their accounts and from the reports of Eskimos who have lived on the eastern arctic coast of Alaska, I have concluded that there is no evidence for a westward migration passing from Mackenzie Valley coastwise into Alaska (Irving, 1960a).

Alfred Bailey (1948) reported that longspurs seemed suddenly to arrive at Barrow and all along the western arctic coast in the third week of May. During the 1st International Polar Year John Murdoch (1885) reported their arrival at Barrow on 20 May 1880. Since migration coastwise along the northeastern Alaskan coast has not been re-

ported, I have taken for granted that migrants to the arctic slope and coast came with the many flights that have been seen passing through the valleys of the Brooks Range.

Max C. Thompson informed me that during the spring of 1960 he and several other ornithologists (Williamson, *et al.*, unpublished) who watched throughout the spring and summer at Cape Thompson (latitude 68° 15', longitude 166°) saw no group of longspurs near that northwestern Alaskan coast greater than 10 and that during migration they noticed only about as many individuals as they subsequently counted while nesting. Many longspurs nest there, but it seems that the area is a terminus and not a through route for their migration. Leonard Peyton and I found many longspurs already nesting about Cape Prince of Wales and Lopp Lagoon on 15 June 1960, and Alfred Bailey (1948) reported that they were common there on 29 May 1922. His Eskimo associate, Dwight Tevuk, who has made many important collections at the tip of Seward Peninsula, recently informed me that many longspurs migrate at Wales early in the first part of May and that some have appeared on the coast from over the sea.

Longspurs have been reported in the interior Kobuk Valley (Grinnell, 1900), where I have also found them nesting in summer visits in 1954 and 1957. Late in May 1951 I saw many longspurs migrating northward through Howard Pass, and just east of there in 1952 we found them the commonest birds nesting along the valley of the Ahlasuruk River (Irving and Paneak, 1954).

MIGRATION IN THE PORCUPINE VALLEY AND NORTHERN YUKON

At Old Crow, Yukon Territory, Leonard Peyton and I first saw a longspur on 4 May 1957, and occasionally saw a few males until 12 May (Irving, 1960a). After that some females were also seen until 24 May, and groups as large as a dozen were occasionally seen flying eastward up the Porcupine River as if coming from the Yukon Valley. We did not find them nesting in the Porcupine Valley, but Kessel and Schaller (1960) found a few longspurs nesting in the Sheenjek Valley 200 kilometers (125 miles) northwest of Old Crow. While watching for migration at Fort Yukon in 1958, Peyton and Francis S. L. Williamson saw a pair of longspurs on 4 May, a male on 5 May, and a few on the edge of the airstrip on 6 and 7 May. Judging from the small numbers seen at Fort Yukon and Old Crow, the Porcupine Valley is not an important migratory route for longspurs coming to Alaska, and the northeastern part of their nesting range does not extend very far south of the arctic coast.

OBSERVATIONS OF LONGSPURS MIGRATING WESTWARD TOWARD ALASKA

Since the early studies of Alaskan birds (E. W. Nelson, 1887 and 1913), it appears to have been commonly considered that the Lapland Longspurs nesting in Alaska winter in the interior western states. They are reported in winter as far north as southern British Columbia (Munro and Cowan, 1947) and migrate northward through the western Mackenzie Valley (Cooke, 1910 and Munro and Cowan, 1947).

In 1958, while Peyton and Williamson were proceeding to observe at Fort Yukon, I set out from Anchorage along the Glenn Highway to join the Alaska Highway and travel eastward through the Tanana Valley into southern Yukon Territory. I had compiled evidence (Irving, 1960a, p. 277) that observation along this course might be expected to find flights of a number of continental land birds migrating westward and northward into Alaska. I first identified longspurs on 24 April 1958, in a flock of 30 along the Glenn Highway, 265 kilometers (165 miles) northeast of Anchorage. The next flock of 50 was identified on 26 April, at mile 1,045 on the Alaska Highway at Boutilier Summit, Yukon Territory, between Kluane Lake and Haines Junction. On the fields of the Whitehorse Experimental Farm west of Haines Junction a compact flock of about 100 longspurs was milling about in rapid, swerving flight and occasionally alighting briefly on the stubble fields. Just beyond Whitehorse on 27 April a flock of 100 took off from the airfield and headed westward. In another flock of 100, which were drinking and feeding so busily that they appeared reluctant to fly, I examined 50 individuals with binoculars at close range and counted 48 males and two females. It had been my impression that in the six flocks noticed so far, most of the birds were males. The trend of their flights was westward.

Ninety-five kilometers (60 miles) east of Whitehorse at Johnson's Crossing over Teslin River many flocks of longspurs were flying swiftly down the river in the first days of May, occasionally swerving and sometimes circling before passing over the high bridge and embankment on the highway. Only one flock was observed to alight briefly on the flats along the river. In one period of five hours I noted that I saw flocks estimated at 2,500 birds flying northwest down Teslin River. I doubt if I noticed half of those passing within a half kilometer of my position, for I was walking about searching for other birds. The longspurs were not restricted to the flats of the Teslin River Valley, for I saw flocks moving westward over the high ground when I occasionally traveled on the highway.

As I was passing southward along the highway to Atlin, British

Columbia, on the east side of Lake Atlin on 2 May, I saw many flocks of longspurs in flight, a few alighted on the ground, and a few small groups perched in trees. I studied three of these flocks at close range as they fed on the ground and counted the proportion of females as one, two, or at most three among 10 birds. An automobile ahead of me had killed or wounded 15 longspurs from a flock on the Atlin Highway, and only three of them were females. At the village of Atlin there were several flocks of longspurs, one of which included about 200 birds, but they were apparently pausing in the village. During this day I estimated that I noticed about 40 flocks of from 20 to 150 longspurs, averaging about 50 birds or some 2,000 in all. The common direction of their flight was westward.

While with Charles Sheldon hunting for specimens of Dall's sheep on the Macmillan River, Osgood (1909) saw large flocks of longspurs early in September, and Rand (1946) saw them migrating in the same country in late summer. Many longspurs appear suddenly in spring at Dawson (Betts, 1940). The westward course of the spring migration of longspurs that I observed extended over the country between the Alaska Highway and Atlin for a width of 80 kilometers (50 miles) from north to south. Reports listed by Rand (1946) indicate that the migratory path in Yukon may extend 300 kilometers (200 miles) northward to the southern watershed of the Ogilvie Range. H. S. Swarth (1936) reported the first longspurs at Atlin, B.C., on 25 April 1930, 4 May 1931, 21 April 1934, and 11 April 1935; the average date for these four years being 22 April.

PROGRESS OF MIGRATION IN ALASKA

Taking 49 records of arrival in various years at 30 localities, the dates at 27 localities follow the average date of arrival in Atlin (Table 1). I have chosen Atlin as a reference point because a careful observer, H. S. Swarth (1936), observed there during the spring and summer of four years and because it is in the path of large migratory flights that I observed in progress westward. Migration to Mackenzie Delta is not likely to pass near Atlin, and arrival at Mountain Village four days after Atlin would require flight at the improbable speed of 413 kilometers per day. Omitting these records, the average advance of the front of migration from Atlin to 17 places in northern and northwestern Alaska was 83 kilometers per day, a distance that longspurs could travel in two hours.

Migrants may not be observed until some days after they arrive. Further, the arrival of longspurs has been variable from year to year

TABLE 1
DATA ON THE SPRING ARRIVAL OF *Calcarius lapponicus* IN LOCALITIES OF ATLIN, BRITISH COLUMBIA

Place (<i>Alaska unless noted</i>)	No. of years	Date of arrival	Latitude (degrees)	Longitude (degrees)	From Atlin days	From Atlin kilometers	Kilometers per day
Atlin, British Columbia (Swarth, 1936)	4	22 April	59 N.	134 W.	—	—	—
<i>Bering Sea and North of Atlin</i>							
1 Mackenzie Delta, N.W.T. (Porsild, 1943)		16 May	70 N.	134 W.	24	1,090	45
2 Old Crow, Y.T. (Irving, 1960a)		4 May	67 N.	140 W.	12	970	81
3 Demarcation Point (Brooks, 1915)		14 May	70 N.	141 W.	22	1,170	53
4 Humphrey Point (Dixon, 1943)		18 May	70 N.	142 W.	26	1,300	50
5 Fort Yukon (Irving, 1960a)		4 May	67 N.	145 W.	12	990	83
						Average	62
6 Fairbanks (Gabrielson & Lincoln, 1959)	2	3 May	65 N.	148 W.	11	970	88
7 Mount McKinley (Sheldon, 1930)		12 May	64 N.	149 W.	20	970	49
8 Anaktuyuk Pass (see page 2)	10	5 May	68 N.	152 W.	13	1,320	102
9 Barrow (Bailey, 1948)	3	20 May	71 N.	156 W.	28	1,680	60
						Average	75
10 Beaver Mountains (Gabrielson & Lincoln, 1959)		12 May	63 N.	157 W.	20	1,320	66
11 Kobuk (Grinnell, 1900)		20 May	67 N.	157 W.	28	1,500	54
12 Nulato (Dail, 1869)		12 May	65 N.	158 W.	20	1,400	70
13 St. Michael (Nelson, 1887)	2	1 May	63 N.	162 W.	9	1,580	176

14	Mountain Village (Gabrielson & Lincoln, 1959)	26 April	62 N.	164 W.	4	1,650	(413)
						Average	91
15	Hooper Bay (Brandt, 1943)	12 May	61 N.	166 W.	20	1,780	89
16	Cape Thompson (Williamson, <i>et al.</i> , unpub.)	2 May	68 N.	166 W.	10	1,830	183
17	Wales (Tevuk, 1960)	5 May	65 N.	167 W.	13	1,900	146
18	Pribilof Islands (Preble & McAtee, 1923)	9 May	57 N.	170 W.	17	2,190	129
19	St. Lawrence Island (Fay & Cade, 1959)	20 May	63 N.	171 W.	28	1,980	71
—	Total	35				Average	124
<i>Aleutian Islands and South Central Alaska</i>							
1	Dyea (Hartlaub, 1889)	21 April	59 N.	135 W.	—	—	—
2	Yakutat (Grinnell, 1910)	6 April	60 N.	140 W.	—	—	—
3	Tolsona Lake (interior) (see page 8)	25 April	62 N.	146 W.	3	740	245
4	Anchorage (Williamson & Peyton, unpub.)	24 April	61 N.	150 W.	2	910	460
5	Homer (Williamson & Peyton, unpub.)	19 April	60 N.	151 W.	-3	1,010	—
6	Cold Bay (Gabrielson & Lincoln, 1959)	5 May	55 N.	163 W.	13	1,800	140
7	Unimak Island (Murie, 1959)	23 April	55 N.	164 W.	1	1,930	1,930
8	Unalaska Island (Gabrielson & Lincoln, 1959)	8 May	54 N.	167 W.	16	2,130	133
9	Adak (Morse, 1946)	25 April	52 N.	177 W.	3	2,870	955
10	Anchitka Island (Krog, 1953)	25 April	51 N.	179 E.	3	3,180	1,060
11	Attu (Gabrielson & Lincoln, 1959)	2 May	53 N.	173 E.	10	3,580	358
—	Total	14					

in localities that have been under sustained observation. Erroneous reports or erratic migration could cause these records to be late and so lead to calculations of slower than actual progress. Since it is a likely possibility that the swift-flying longspurs can travel 150 kilometers per day, a delay of five or even 10 days in any of these annual local records would, if corrected, still lead to a plausible calculation of the progress of migration.

Reports show that migration to the western coasts of the Gulf of Alaska evidently pursues a different schedule. The recorded arrival of longspurs at Dyea, Yakutat, and Homer preceded the records for Atlin. Among the nine other records from the south-central and southwestern coast and Aleutian Islands, only two (Cold Bay and Unalaska) follow arrival in Atlin by an interval sufficient to make the calculated progress of the van of migration within the possible speed of flight. The other five records would require flight from Atlin at an impossible speed. In these cases erroneously late records would only increase the improbability that flights to southwestern Alaska and the Aleutian Islands proceed through the headwater valleys of the Yukon River.

MIGRATION FROM ASIA TO ALASKA

Dr. Frank Pitelka informed me that from his observations at Point Barrow the Lapland Longspurs might arrive in northern Alaska from wintering in Asia. According to his comment, thousands of longspurs have been seen at Barrow flying from the west late in May and in the first part of June. Further, of 1,400 bands applied to longspurs at Barrow, none were recovered either from well-populated western America or from the interior of Asia that we know so poorly. If direction of migration can be inferred from flights observed at one point, Dwight Tevuk's remarks that longspurs appeared over water near Wales might also suggest migration from Asia.

Stejneger (1885) reported that longspurs first reached the Commander Islands on 21 April 1883, but the specimens from there were later assigned to the darker race, *C. l. coloratus* Ridgway (1898), which occurs in Kamchatka and adjacent Siberia (Vaurie, 1959). Olaus Murie (1959) repeated Ridgway's (1901) opinion that over the Aleutian Islands the longspurs did not differ from *C. l. alasensis* of the mainland. These reports indicate opinions that eastern Siberian longspurs do not migrate to the Aleutians.

Vaurie (1959, p. 706) observed that "possibly all or the majority of visitors to China are *coloratus*." That distinction indicates the unlikelihood that many of the light-colored *C. l. alasensis* winter in China and

suggests that the nearest Asiatic range in which to suspect that some Alaskan nesting longspurs might winter unrecognized among Eurasian *C. l. lapponicus* would be in Manchuria. The distance and direction of such a migration does not appear impossible for the swift-flying and sturdy longspurs, because populations of four smaller and weaker-appearing species of land birds, *Oenanthe oenanthe*, *Luscinia svecica*, *Motacilla flava*, and *Phylloscopus borealis*, regularly migrate from wintering in warm areas in Asia to nest in Alaska (Irving, 1960a, p. 270).

Longspurs nest on the Chukchi Peninsula adjacent to Alaska, but their migratory schedules and taxonomic characters have not been reported in detail that provides evidence for the extent and direction of exchanges of longspurs between Alaska and Siberia.

MIGRATION IN SOUTHEASTERN ALASKA

Migrating longspurs have been frequently reported in southeastern Alaska (Gabrielson and Lincoln, 1959), but the reports do not show that the coastwise migration is a great contributor to their nesting in Alaska. Longspurs nest on Middleton Island 120 kilometers (70 miles) south of the mainland in the Gulf of Alaska (Rausch, 1958). Considering that longspurs reach west Greenland from America early in May (Salomonsen, 1951), it would be possible for them to make extensive flights over the Gulf of Alaska to reach south-central and southwestern Alaska at the early dates when they appear.

MIGRATION OF LONGSPURS THROUGH WESTERN CANADA

In British Columbia longspurs migrate northward in numbers that pass mainly east of the Rocky Mountains (Munro and Cowan, 1947). These authors designated the longspurs of British Columbia *C. l. alascensis*. At Fort Simpson Preble (1908) considered 24 out of 33 longspurs collected soon after 25 April 1904 to be *C. l. alascensis*. In assigning the longspurs of Banks Island to *C. l. lapponicus*, Manning, Höhn, and Macpherson (1956, p. 116) distinguished them from the longspurs migrating through western Canadian provinces and Alaska. They related the birds from the latter localities to *C. l. alascensis*. These recent opinions continue the older views that the longspurs that migrate northward in spring through the western Mackenzie Valley to Alaska resemble those from Alaska and can be differentiated from the longspurs that nest on Greenland, Canadian Arctic Islands, on the mainland east of Mackenzie Bay, and in northern Eurasia.

MIGRATION OF OTHER SPECIES IN YUKON TERRITORY

At Old Crow in the Porcupine Valley, migration carries several species that migrate along the Pacific Coast eastward, but no migration has been reported passing westward through the arctic part of Yukon Territory toward Alaska. I have reviewed evidence based upon dates of published reports from Alaska, Yukon, and British Columbia, which indicated that a number of American species of land birds migrate to Alaska through the watershed of the Yukon River in southwestern Yukon Territory (Irving, 1960a). While I was observing the migration of longspurs through southwestern Yukon during late April and early May in 1958, birds of the following species were also observed moving north-westward but not eastward: *Branta canadensis*, *Anser albifrons*, *Anas platyrhynchos*, *Anas acuta*, a few *Buteo lagopus*, a small number of *Circus cyaneus*, *Iridoprocne bicolor*, *Dendroica coronata*, *Euphagus carolinus*, and *Spizella arborea*. Only two species, *Bucephala islandica* and *Larus canus*, were observed flying southeastward along Teslin River, as if they had entered western Yukon Territory from eastern Alaska.

DISCUSSION

A course of migration can be inferred from observations showing a common direction of flight over a significant portion of a migratory path. Directional flights have been watched in southwestern Yukon as they passed many points along a course westward for 260 kilometers (160 miles) between Johnson's Crossing and Haines Junction. Great numbers of longspurs were observed proceeding uniformly westward over the 80 kilometers (50 miles) south of this line to Atlin, B.C.

Directional flights have also been observed during several years at Anaktuvuk. I have watched flights moving northward at points covering about 65 kilometers (40 miles) in the narrow upper valley of the Anaktuvuk River. Since 1947 resident Eskimos have annually reported northward flights of longspurs in spring over their camps and hunting parties that were distributed through 130 kilometers (80 miles) of the upper valleys of the John and Anaktuvuk rivers. This northward migrating stream is only a few miles in width, but it has been observed to transport many flocks of longspurs northward. The Nunamiut have seen flights of longspurs passing northward while they were earlier living as nomadic family groups encamped in spring in various valleys of the Brooks Range between Howard Pass (longitude 158° W.) and the Itkillik Valley (longitude 150° W.). The same northward migration of longspurs was described to the present Nunamiut by their parents. Over courses extending from 80 to 160 kilometers (50 to 100 miles) northward and across 290 kilometers (175 miles) from east to west, a great migration of longspurs passes through the valleys of the central Brooks Range.

Geographical succession of dates of first-arriving migrants is also an indication of the course and progress of the van of migration. In Alaska north of the Alaska Range reports from 19 localities follow the average date of arrival of longspurs at Atlin. At 18 localities their arrival occurred at dates consistent with reasonable rates of flight from Atlin. Records for the significant 18 localities have been averaged in four series according to intervals of longitude in Table 1. The calculated speed to points between longitudes 134° and 145° is 62 kilometers per day; between 148° and 156° , 73 kilometers per day; 157° and 164° , 91 kilometers per day; and 166° and 171° , 124 kilometers per day. The speed of the van of migration increases westward.

The advance of migration over south-central Alaska and the Aleutian Islands exceeded the possibility of flight from Atlin. When I informed Dr. Axel Hemmingsen of the earliness of arrival of longspurs in south-central and southwestern Alaska, he brought to my attention the fact that migration of some species eastward and westward through Asia and Europe proceeds more rapidly than northward. He had indicated (1951) that the advance of a number of migrations in Asia proceeded northward about as the movement in spring of fixed daily amounts of incident solar radiation. This relation would be fulfilled by the simultaneous arrival of the migratory front of a species all along a given high latitude.

Recorded arrivals of longspurs in south-central and western Alaska are not simultaneous, but they do not show progression eastward or westward. These records are not only fewer than those in the north, but I know that several of them were made by traveling naturalists as they arrived at localities and first saw longspurs. The records from north of the Alaska Range were made by observers resident in those localities during the spring migration, and usually in villages where resident people attentively watch and discuss migration. I suspect that careful observation will provide even earlier records of longspurs arriving on south-central and southwestern Alaskan coasts.

Records from the Aleutian Islands are too early to indicate that migration reaches there by skirting the coast of the Bering Sea after crossing Bering Strait or Sea from the Chukchi Peninsula. Only the existence of *C. l. coloratus* west of the Aleutians is evidence against migration from Siberia through the Aleutians. Although the progression of arrivals in northern and western Alaska is consistent with migration through the headwater valleys of the Yukon, it is possible that some longspurs migrate from Siberia to Alaska. Four passerine species regularly migrate in that direction, but a larger number of species mi-

grate over the interior of America to reach eastern Siberia. In recent years we have had no view of the exchange between Asia and America at the northern point where they are so close geographically.

No doubt there are other localities than in Yukon Territory and the Brooks Range where migrating flocks of longspurs can be watched along courses long enough to define the direction of their migratory flights. By strategic selection of a few localities, a prearranged tactical scheme of observation may define the physical progress of migration in one year. In addition, the flocks can be characterized by ratios of sexes, social behavior, plumage, fatness, and condition of gonads. These characteristics can be used to distinguish the flocks and to demonstrate social and physiological factors that are causally related to the organization and progress of migration.

SUMMARY

Lapland Longspurs, ascribed to *Calcarius lapponicus alascensis* Ridgway, nest in great numbers over the arctic tundra and grassy land west of the forests of Alaska and over the Aleutian Islands. During 10 years great numbers of longspurs have been observed in May migrating north through Anaktuvuk Pass. Similar migrations proceed through other interior valleys of the Brooks Range, taking vast numbers of longspurs toward the arctic tundra. There is no evidence that this migration proceeds westward to Alaska through arctic Yukon Territory or eastward from Siberia.

In the last week of April and first of May 1958, great numbers of longspurs, in flocks at first containing mostly males, were seen migrating westward over a distance of 260 kilometers (160 miles) through the headwater valleys of the Yukon River in southwestern Yukon Territory. Longspurs reach northern and western localities north of the Alaska Range after their appearance in southwestern Yukon Territory at dates indicating plausible rates of migration from Yukon Territory through Alaska.

South of the Alaska Range and on the Aleutian Islands, arrivals are so early that these regions cannot be settled by the migrants observed in Yukon Territory. Unobserved flights coastwise or overwater are suggested.

The northward advance of the front of longspurs migrating through Alaska is slow, but it increases as the northward component of migration diminishes and as the westward component increases.

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