# VOLUME II

*Birds of the Chukchi Peninsula and Wrangel Island* describes the avifauna of Far Northeast Asia based on the author's prolonged field studies and a comprehensive survey of the literature. The first volume covers the history of research and describes a few orders of birds: Gaviiformes, Procellariiformes, Anseriformes, Falconiformes, Galliformes, Gruiformes, and Charadriiformes. The second volume completes the species accounts of Charadriiformes, Alciformes, Cuculiformes, Strigiformes, Apodidae, and Passeriformes and draws zoogeographic conclusions. The distribution of birds in the area under study, their arrival and migration, nidification, molting and food are discussed in detail. The economic importance of commercial species of birds is assessed. Finally, the subspecific variations are analyzed on the basis of examination of museum collections.

This monograph fills a long-term void in our knowledge of the avifauna of the Far Northeast, taking us to a region in the vicinity of American fauna.

# BIRDS OF THE CHUKCHI PENINSULA AND WRANGEL ISLAND

Snowy owl *Nyctea scandiaca* (L.). Tundrovaya River (central part of the island), Wrangel Island. Photograph by A.V. Krechmar.

# BIRDS OF THE CHUKCHI PENINSULA AND WRANGEL ISLAND

VOLUME II

by

Leonid Aleksandrovich Portenko

DOUGLAS SIEGEL-CAUSEY
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# Foreword to the English-Language Edition

*The Smithsonian Institution Libraries, in cooperation with the National Science Foundation, has sponsored the translation into English of this and hundreds of other scientific and scholarly studies since 1960. The program, funded with Special Foreign Currency under the provisions of Public Law 480, represents an investment in the dissemination of knowledge to which the Smithsonian Institution is dedicated.*

This volume completes *Birds of the Chukchi Peninsula and Wrangel Island* by Leonid Aleksandrovich Portenko, first published in the USSR in 1973. The species accounts are completed here, and Portenko concludes with a biogeographic interpretation of the avifauna of this remote region. These volumes summarize the ornithological research done at that time in the extreme Northeast Siberian area, and allows access to a body of work inaccessible to those unfamiliar with the Russian language.

Probably the only accurate translation possible is that which might be undertaken by the original author. Barring this, we must rely upon the intuition and skill of one hopefully fluent in both languages and a savant in the topic. Deviations from these ideals create errors, some of which are inevitable. I was able to edit the translation of only volume two for accuracy and comprehension. As a result, there is a distinct difference in style between volumes. The errors that crept into the translation of volume one range from trivial grammatical solecisms to confusing misinterpretations. I have taken care to ensure that the translation of volume two accurately reflects the original, and I have retranslated the summary section on Zoogeographic Conclusions for greater accuracy. A quarter of a century has passed since Portenko completed this monograph, and much more is known about the breeding biology and biogeography of Arctic birds. I have kept the editorial annotations to a minimum, however, believing that this work should be read in the light of when it was written and not revised to conform to present-day conventions. Some annotations were required, especially when unfamiliar binomials were used in the original.

Investigations into the systematics and phylogeny of birds are part of a continuing effort throughout the world, and thus there have been several changes in scientific names since Portenko finished this monograph. Furthermore, common names of birds in English are not standardized. For the scientific and common names of birds discussed here, I have used the *A.O.U. Checklist of North American Birds,* 6th edition (American Ornithological Union, 1983) and *A Field Guide to Birds of the USSR,* V.E. Flint, R.L. Brehme, Y.V. Kostin, and A.A. Kuznetsov, eds., English-language edition (Princeton University Press, 1984). Corrections to the scientific and common names originally listed by Portenko are given below.

Douglas Siegel-Causey
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# Corrections to Species List

(Corrected scientific and common names are in boldface)

| | Species | Common Name |
|---|---|---|
| 2. | *Gavia arctic viridigularis* | East Siberian arctic loon<br>**Black-throated Loon** |
| 4. | *Gavia immer adamsii*<br>***Gavia adamsii*** | White-billed common loon<br>**Yellow-billed Loon** |
| | *Gavia i. immer* | Polar loon<br>**Common Loon** |
| 7. | *Puffinus tenuirostris* | Slender-billed shearwater<br>**Short-tailed Shearwater** |
| 8. | *Oceanodroma f. furcata* | Fork-tailed petrel<br>**Fork-tailed Storm Petrel** |
| 11. | *Chen c. caerulescens* | Lesser snow goose<br>**Snow Goose** |
| 12. | *Anser a. albifrons* | White-fronted goose<br>**Greater White-fronted Goose** |
| 14. | *Melanonyx fabalis*<br>***Anser fabalis*** | Bean goose |
| 15. | *Philacte canagica*<br>***Anser canagica***[1]<br>***Chen canagica***[2] | Emperor goose |
| 16. | *Branta bernicla nigracans* | Brent goose<br>**Brant** |
| | *Branta canadensis minima* | Cackling Canada goose<br>**Canada Goose** |
| 17. | *Anas p. platyrhynchos* | Mallard duck<br>**Mallard** |

[1] Preferred by *A Field Guide to Birds of the USSR.*

[2] Preferred by *A. O. U. Checklist of North American Birds,* 6th ed.

| Species | Common Name |
|---|---|
| 18. *Nettion c. crecca*<br>***Anas c. crecca*** | European common/green teal<br>**Green-winged Teal**[1] |
| *Nettion c. carolinensis*<br>***Anas c. carolinensis*** | American green-winged teal<br>**Common Teal**[2] |
| 19. *Nettion formosa*<br>***Anas formosa*** | Baikal teal |
| 20. *Dafila a. acuta* | Pintail<br>**Northern Pintail** |
| 21. *Mareca p. penelope*<br>***Anas p. penelope*** | Wigeon<br>**Eurasian Wigeon** |
| 22. *Spatula clypeata*<br>***Anas clypeata*** | Shoveler<br>**Northern Shoveler** |
| 23. *Aythya fuligata* | Tufted duck<br>**Tufted Pochard** |
| 25. *Clangula hyemalis* | Old squaw<br>**Long-tailed Duck** |
| *Melanitta fusca stejnegeri*<br>***Melanitta deglandi*** | Hook-nosed scoter<br>**White-winged Scoter**[1]<br>**Velvet Scoter**[2] |
| 28. *Polysticta stelleri*<br>***Somateria stelleri***[1] | Steller's eider |
| 29. *Arctonetta fischeri*<br>***Somateria fischeri***[1] | Spectacled eider |
| 35. *Thallassoaetus pelagicus*<br>***Haliaetus pelagicus*** | White-shouldered eagle<br>**Steller's Sea Eagle** |
| 36. *Hierofalco gyrfalco*<br>***Falco rusticollis*** | Gyrfalcon |
| 38. *Aesalon columbarius*<br>***Falco columbarius*** | Merlin |
| 39. *Cerchneis tinnunculus*<br>***Falco tinnunculus*** | Kestrel |
| 40. *L. l. lagopus* | Willow ptarmigan<br>**Willow Grouse** |

| *Species* | *Common Name* |
|---|---|
| 41. *L. mutus pleskei* | Rock ptarmigan<br>**Ptarmigan** |
| 43. *Antigone leucogeranus*<br>***Grus leucogeranus*** | Siberian crane<br>**Siberian White Crane** |
| 44. *Pluvialis squatarola* | Gray plover<br>**Black-bellied Plover** |
| 45. *P. dominica fulva* | Siberian plover<br>**Lesser Golden Plover** |
| 47. *Eudromias morinellus* | Dotterel<br>**Eurasian Dotterel** |
| 48. *Charadrius hiaticola* | Ringed plover<br>**Greater Ringed Plover** |
| 50. *Arenaria interpres* | Common turnstone<br>**Ruddy Turnstone** |
| 51. *Totanus erythropus*<br>***Tringa erythropus*** | Spotted Redshank |
| 52. *Glottis nebularia*<br>***Tringa nebularia*** | Greenshank<br>**Greater Greenshank** |
| 53. *Rhyacophilus glareola*<br>***Tringa glareola*** | Tiny Wood Sandpiper |
| 54. *Heteroscelus incanus brevipes*<br>***H. brevipes*** | Siberian tattler<br>**Gray-tailed Tattler** |
| 55. *Heteroscelus i. incanus* | American tattler<br>**Wandering Tattler** |
| 60. *Limnodromus griseus scolopaceus*<br>***Limnodromus scolopaceus*** | Dowitcher<br>**Long-billed Dowitcher** |
| 62. *Calidris canutis rogersi* | American Knot<br>**Red Knot** |
| 63. *Calidris tenuirostris* | Eastern knot<br>**Great Knot** |
| 64. *Erolia ferruginea*<br>***Calidris ferruginea*** | Curlew-Sandpiper |
| 66. *Pelidna a. pacifica*<br>***Calidris a. pacifica*** | Dunlin |

| | *Species* | *Common Name* |
|---|---|---|
| 68. | *Pelidna maritima ptilocnemis*<br>***Calidris maritima ptilocnemis***[1]<br>***Calidris ptilocnemis***[2] | Purple sandpiper<br>**Rock Sandpiper**[2] |
| 69. | *Pisobia r. ruficollis*<br>***Calidris r. ruficollis*** | Eastern little stint<br>**Rufous-necked Stint** |
| 70. | *Pisobia r. minuta*<br>***Calidris r. minuta*** | Little Stint |
| 71. | *Pisobia minutilla subminuta*<br>***Calidris m. subminuta*** | American stint<br>**Least Sandpiper** |
| 72. | *Pisobia mauri*<br>***Calidris mauri*** | Semipalmated sandpiper<br>**Western Sandpiper** |
| | *Pisobia pusilla*<br>***Calidris pusilla*** | North American sandpiper<br>**Semipalmated Sandpiper** |
| 74. | *Limonites temminckii*<br>***Calidris temminckii*** | Temminck's stint<br>**Temminck's Sandpiper** |
| 75. | *Actodromas bairdii*<br>***Calidris bairdii*** | Baird's Sandpiper |
| 76. | *Heteropygia melanotus*<br>***Calidris melanotus*** | Pectoral Sandpiper |
| 77. | *Heteropygia acuminata*<br>***Calidris acuminata*** | Sharp-tailed Sandpiper |
| 80. | *Phalaropus fulicaris* | Gray phalarope<br>**Red Phalarope** |
| 81. | *Phalaropus lobatus* | Northern phalarope<br>**Red-necked Phalarope** |
| 86. | *Larus argentatus schistisagus*<br>***Larus schistisagus*** | **Slaty-backed Gull** |
| 107. | *Lunda cirrhata*<br>***Fratercula cirrhata*** | Tufted Puffin |
| 111. | *Chionophilos alpestris*<br>***Eremophila alpestris*** | Horned Lark |
| 112. | *Iridoprocne bicolor*<br>***Tachycineta bicolor*** | Tree Swallow |
| 115. | *Pitrochelidon pyrrhonota*<br>***Hirundo pyrrhonota*** | Cliff Swallow |

| | *Species* | *Common Name* |
|---|---|---|
| 119. | *Cyanosylvia svecica svecica*<br>***Luscinia s. svecica*** | Bluethroat |
| 121. | *Acanthopneuste borealis*<br>***Phylloscopus borealis*** | **Eversmann's Warbler**[1]<br>**Arctic Warbler**[2] |
| 124. | *Budytes flavus*<br>***Motacilla flavus*** | Yellow Wagtail |
| 126. | *Anthus cervina*<br>***Anthus cervinus*** | Red-throated Pipit |
| 138. | *Chrysophrys pusilla*<br>***Emberiza pusilla*** | Little Bunting |
| 139. | *Junco hyemalis* | **Slate-colored Junco**[1]<br>**Northern Junco**[2] |
| | *Junco oreganus*<br>***J. hyemalis oreganus*** | **Dark-eyed Junco**[1]<br>**Oregon Junco**[2] |
| 140. | *Spizella arborea ochraeus* | **Winter Sparrow**[1]<br>**Eastern Tree Sparrow**[2] |
| | *Spizella passerina* | **Chipping Sparrow** |

# Contents

## Suborder LARI—GULLS

### 82. *Stercorarius pomarinus* (Temm.)—Pomarine Jaeger

*Local names*—Chukchian: Kanȯtl'khen, vuȧl'khukanȯl'khyn or uȧltl'gykaotl'-gyn, and the adopted name "albatross"; amnunkin nadl' ukanodlin in the records of the *Vega* expedition. In Eskimo: yunakhak (yugnȧhak) in Providence Bay; mŭ́-ghŭm yung-wắ-ghŭk on St. Lawrence Island.

*Distribution and status*—Nests on the Chukchi peninsula, but abundant nowhere. On Wrangel Island nests in large numbers and very common. Encountered often in adjacent sections of the sea when ice conditions are satisfactory. Leaves in winter.

The numbers of Pomarine Jaeger are subject to marked fluctuations, but the relation to fluctuations in the rodent population on the Chukchi peninsula and Wrangel Island has not been explained. Due to its great mobility, this bird is often seen and appears to be very common.

On August 6, 1932, I came across Pomarine Jaegers in the tundra around Notapenmen village on the southeast shore of Krest Bay. Mostly single birds were sighted, but a brood was seen on one occasion. Moreover, I spotted a pair remaining in one place, possibly a nesting area. In the summer of 1881 E.W. Nelson (1883) saw small numbers of these jaegers in Plover Bay. On August 12, 1914 E.E. Arngol'd caught a female in Providence Bay, but no one, including myself, has seen Pomarine Jaegers there since then.

E.W. Nelson (1887, p. 47) during a voyage on the *Corwin* observed these birds in large numbers around St. Lawrence Island. According to an eyewitness account by H. Friedmann (1932a), during his stay on the island with E.U. Harriman's expedition, a few Pomarine Jaegers flew over the tundra on July 13, 1899. H.B. Collins caught two females in Gambell on July 19 and August 6, 1930 and another specimen (undated); O.J. Murie (1936) collected five specimens in 1934 and 1935. F.H. Fay and T.J. Cade (1959) mention two specimens caught on July 17, 1932 in Savoonga, a male on June 4, 1953, and young ones collected in the fall of 1928 and 1929. According to these authors, Pomarine Jaegers were seen in small numbers every year on the banks in spring flight. At the end of May, 1956, reportedly 105 jaegers, mostly of this species, flew in from the sea through the valley of the Mogoveiik River for 8 hrs. It is quite likely that a pair seen daily near Sivokak Hill in July and August, 1953, and another pair west of Kavuk village in June, 1953 were nesting, but no nests were found. In the spring and summer of 1952 through 1957 nearly 300 Pomarine Jaegers were counted. Fall flight was seen in August, 1942, 1956, and 1957. Population fluctuations of voles were recorded from 1950 through 1957, but the number of Pomarine Jaegers evidently remained unchanged during the summer. However, there were obvious fluctuations in the number of jaegers in flight every spring. In 1960, E.G.F. Sauer and E.K. Urban (1964) encountered this species only once, on July 2, in the valley of the Mogoveiik River. H. Friedmann (1934a) found bones of this species in four archaeological excavations.

A specimen caught by I.N. Akif'ev on July 31, 1900 in Lawrence Bay is preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR. In my opinion, Pomarine (two or three birds) and not Parasitic Jaegers[1] were observed by the assistant of Captain Beechey's voyage (Vigors, 1839) in 1826 in Bering Strait. K.W. Kenyon (Kenyon and Brooks, 1960) saw flocks and a lone bird one mile east of Little Diomede Island during spring flight in 1958. F.L. Jaques (1930) observed Pomarine Jaegers over the sea north of Bering Strait and considered this bird not only common, but even highly numerous among other species of marine birds. It was not seen in the immediate proximity of Diomede Island however, although sighted not far from the mainland coast.

On July 12, 1921, A.M. Bailey (1925) saw a few jaegers and caught one in Uélen; Sheneberg caught one at the same site on July 6, 1927. In 1932 en route from Dezhnev village to Uélen and back, on August 13 and 15, I came across Pomarine Jaegers only occasionally. In the fall of 1933 I did not see a single one around Uélen, and observed only very small numbers in the spring flight of 1934.

E.W. Nelson (1883, p. 110) reports that in the summer of 1881, Pomarine Jaegers were found nesting along the north coast of the Chukchi peninsula and were particularly numerous on the shores of Cape Serdtse-Kamen' on June 29. In the register of the Zoological Museum of the Academy of Sciences for 1913, under No. 488 a male Pomarine Jaeger is listed from Cape Sardtse-Kumen', which was collected on September 8, 1912 by E.E. Arngol'd; unfortunately the bird has not been preserved.

Several finds were recorded in 1879 by members of the *Vega* expedition (Palmén, 1887) in Kolyuchin Bay. On June 24 a specimen was shot and another seen in Pitlekai. An adult male was collected on the following day and two specimens on July 5. One jaeger was shot on June 27 in Dzhénrétlen. During a trip to Tepkan, O. Nordquist and E. Almquist saw several Pomarine Jaegers on July 1, but A.A.L. Palander sighted only one during his journey deep into the country on July 10. O. Nordquist reports a sighting on July 17.

According to A.A. Kishchinskii, in 1970, Pomarine Jaegers were common in the nesting area on the north coast (Fig. 1). Up to 10 pairs nested in an area about 35 km$^2$ around Ukouge lagoon. Roughly the same number were counted along the Ékug-Véem River in the lowlands of the Amguéma and farther, up to Vankarém.

In the interior of the Chukchi peninsula on the Amguéma in 1956 I came across this species only in the spring flight and saw only two birds on different occasions.

E.W. Nelson thought Pomarine Jaegers were more common on the Chukchi

[1]In the work of N.A. Vigors this jaeger is identified as *Lestris parasiticus*, but such features as two long bars rounded at the end are also reported.

than the Alaskan coast. According to J. Koren (Thayer and Bangs, 1914), this bird was far more common south of Bering Strait on the southwest coasts of Alaska than on the north coast of the Chukchi peninsula, where it had been sighted only a few times. F.S. Hersey (1916), however, found the Pomarine Jaeger abundant north of Kotzebue Bay.

J. Koren caught a young bird on September 5, 1911 on Cape Schmidt. V.M. Artobolevskii (1927), who examined the diary and collections of A.A. Savich wrote that the Pomarine Jaeger nested on Cape Schmidt; in the spring of 1915 one specimen was caught there. V.Ya. Isaev gave me to understand that although the Pomarine Jaeger is common on Cape Schmidt, it is found in smaller numbers than the Long-tailed Jaeger. A.P. Andriyashev, a participant of the high-latitude expedition of 1946, sighted Pomarine Jaegers following the ship northward from Cape Shelagskii on August 28 and 31, at least 90 miles from the coast.

According to V.D. Lebedev and V.R. Filin, in 1958, Pomarine Jaegers were rare on the south coast of Aiok Island and observed only in the first half of June, i.e., evidently flying through. J. Koren noticed a pair of apparently nonnesting birds on July 12, 1912 about 30 miles east of Cape Baranov, while C. Amory (Riley, 1918) caught a male on August 1, 1915 on Bol'shoi Baranov Cape. According to S.A. Buturlin, this species of jaeger is comparatively rare in the lower reaches of the Kolyma.

E.W. Nelson sighted Pomarine Jaegers at some places close to the coast during the Arctic cruise of the *Corwin.* They were seen when the ship approached Herald and Wrangel Islands and were especially numerous near Herald Island on July 30, 1881, when the expedition landed on the coast. On September 15, 1911 E.E. Arngol'd caught a young female on the southwest extremity of Wrangel as the freighter *Vaigach* approached the island. According to G.A. Ushakov (Bannikov, 1941), this is a common nesting bird on Wrangel island. A.I. Mineev came to the same conclusion based on observations on the island over a period of five years; I, too, have drawn the same conclusion from my field work in 1938 and 1939. On July 24, 1938, when the icebreaker on which I originally intended to reach the island attempted to break through the ice in Long Strait, I saw two or three lone Pomarine Jaegers accompanied by kittiwakes. I noticed them on August 13 on my way to the vessel from Rodgers Bay to Bruch spit and on August 21 between the estuary of the Krasnyi Flag River and Bruch spit. While moored near the estuary of this river, a sizable number of Pomarine Jaegers gathered on a small lagoon on August 16 but flew over the tundra only occasionally; here I found broods. In 1939, Pomarine Jaegers were very common from the time of my arrival and were regularly sighted flying over the tundra throughout the summer right up to my departure. According to S.M. Uspenskii, R.L. Beme, and A.G. Velizhanin (1963), on Wrangel Island the Pomarine Jaeger was not numerous in 1960; however, it was often sighted during June-July in Rodgers Bay and in August in Somnitel'naya Bay.

Members of the *Maud* expedition (Schaanning, 1928), on August 18 and 19, 1923, collected two Pomarine Jaegers at 75°48′ N and 165°20′ E and sighted one on August 20 at 75°51′ N and 164°53′ E. A.P. Andriyashev also saw Pomarine Jaegers over the sea east of Wrangel Island. According to him, they followed the ship at 73°45′ N and 170°57′ W. On August 8, 1946, and later more westward on August 12, they were seen 20 miles north of Mushtakova spit and on August 19 at 73° 10′ N and 170° E.

Reliable information on the nesting of Pomarine Jaegers in this region is inadequate. The presence of nonnesting adults and two-year olds wandering in search of food invariably hampered the study of the distribution of nesting birds.

*Habitat*—The Pomarine Jaeger does not select a particularly distinguishable place for nesting. Unswamped tundra, with knolls rising up to about a meter, fully meets their requirements. According to the observations of A.I. Mineev, on Wrangel Island it lays eggs on a hard section of the tundra. When I and Tayan were crossing by tractor through the upland to the west of Cape Uéring, he mentioned that there were almost no birds in these hilly sections of tundra in the summer; only jaegers enlivened the desert.

Pomarine Jaegers were regularly seen flying over the tundra at different, but invariably low, heights scanning the area. In spring flight I noticed them often along the coastline and even more often over the sea when the ice came in. Unlike the other two species of jaegers, the Pomarine Jaeger is quite often sighted very far from the coast. It has a habit of following a ship together with kittiwakes, looking for food in the refuse in the race of the vessel.

*Arrival*—According to F.H. Fay and T.J. Cade, Pomarine Jaegers are seen every year at sea on St. Lawrence Island around mid-May, and by June 1 are observed on thawed parts of the tundra. In May and June, Pomarine Jaegers stay here for only a few days. In 1958 K.W. Kenyon tracked a small flight on Little Diomede Island: on May 20 a flock of eight Pomarine Jaegers flew northward, on May 29 five were sighted, and on June 10 one lone bird.

In the spring of 1934 in Uélen, I noticed the first pair on May 24. I next saw two pairs and a lone bird on May 29, a lone bird on June 1, and a pair on June 13. I noticed this species for the last time on June 17. In the spring of 1879 members of the *Vega* expedition sighted the first Pomarine Jaegers in Pitlekai only on June 24, and hence there was no spring flight there. In 1956 I saw lone birds flying on the Amguéma on June 10 and 11. One of the birds was light- and another dark-colored, and hence the two belonged to different species. They happened to be there in search of food and not in flight.

In 1970 A.A. Kishchinskii tracked their flight from May 31 through June 8. Flocks of five or six birds and lone ones in large numbers flew along the north coast in a northwestern direction. About 20 birds gathered on the dumps at Schmidt village. Pomarine Jaegers were far more numerous than other species. By June 15–16 nonnesting birds had migrated. V.D. Lebedev and V.R. Filin sighted Pomarine Jaegers on Aiok Island on June 3, 9, and 14 in 1958.

It is quite evident that this jaeger arrives to the Chukchi peninsula by the sea route.

A male Pomarine Jaeger was caught on June 7 on Wrangel Island in 1932. According to my observations, in the spring of 1939 the first incoming flock was sighted on June 1 near a hunter's cabin not far from the mouth of the Amerikanskaya River. The birds flew in formation along the coast initially eastward and later returned. On June 3 lone birds as well as groups flew past occasionally and from then on Pomarine Jaegers were sighted daily. On June 5 flocks flying past arrived mostly from the east and confined themselves to the coastline or flew parallel to it. This was the end of migration. In the spring of 1924 the *Maud* expedition sighted the first jaeger on May 16 on Vilkitskii Island.

*Nidification*—A specimen from Uélen dated June 1, 1934 was a very plump male with small testes: 14 mm × 10 mm and 10 mm × 8 mm. A Wrangel male on June 7, 1939 had filmy, subcutaneous adipose layers and very large testes: 23 mm × 10 mm and 18 mm × 8 mm. The testes of August males were normal, i.e., reduced in size:

Krest Bay, August 6, 1932—8 mm × 4 mm and 7 mm × 3 mm
Dezhnev village, August 13, 1932—7 mm × 4 mm and 6 mm × 3 mm
Krasnyi Flag River, August 15, 1938—13 mm × 3 mm and 9 mm × 3 mm

The ovary of a dark-colored female from Wrangel caught on June 8, 1939 was 19 mm long and the largest follicle 3 mm. A light-colored specimen caught on the Nasha River on June 10, 1939 had an ovary 20 mm long and the largest follicle measured 5 mm. A female shot on the Tumanskaya River in Anadyr basin on July 10, 1931 had an ovary with a granular surface. Of the 10 specimens described with subcutaneous adipose deposits, only one was very plump, one emaciated, and the others with insignificant filmy adipose deposits.

On June 7, 1939 in the tundra close to the lower reaches of the Mamontovaya River, I noticed Pomarine Jaegers in pairs at the time arriving flocks were still being recorded on June 5. On June 9, pairs could be seen sitting on hummocks and appeared to have selected nesting areas. Thereafter the number of Pomarine Jaegers observed each day decreased somewhat; they were evidently distributed over a large territory. At least up to mid-July, Pomarine Jaegers were seen flying over and scanning the tundra; later they were rare and had evidently moved away.

On June 23, 1932 A.I. Mineev found an unincubated egg on coastal tundra. It was 6.53 mm × 4.23 mm in size, greatly constricted toward the pointed end, and resembled the egg of a loon in color. The background color was dark olive with scattered brownish and brownish-violet spots and speckles clustering toward the broad end. A second egg was found in the oviduct of a female ready for laying, collected in the same place. The nest was occupied by both parents. According to Mineev, Pomarine Jaegers lay eggs without a lining and sometimes even without a depression. To protect the nest, these birds will attack both dog and man.

According to A.A. Kishchinskii, on June 6-8, 1970, Pomarine Jaegers occupied nesting areas and pairs were observed on June 10–12. Three nests with clutches of two eggs each were found on June 20, 24, and 27. Nests were built on dry knolls in a mossy-sedge tundra on a very thin bedding of dry grass. The jaegers aggressively chased any intruder: other birds of the same species, Snowy Owls, foxes, and man. They remained in the nesting area until mid-July.

On August 6, 1932 near Notapenmen, I came across a brood. An old female flew by very close with a young bird trailing her doggedly. On August 16, 1938 in the tundra not far from the mouth of the Krasnyi Flag River, I found two young ones with an old female hovering close-by.

*Departure*—I tracked the departure of Pomarine Jaegers on the north coast of Wrangel Island in the fall of 1938. On August 24 and 26 they were no longer rare on Bruch spit, but on August 27 I saw the last of lone birds in the pass west of Cape Uéring. In his records A.P. Andriyashev reports sighting adults and young birds on August 31, 1946 at sea north of Cape Shelagskii. According to an eyewitness account by F.H. Fay and T.J. Cade, on August 6, 1942 a large number of Pomarine Jaegers wandered around the eastern end of St. Lawrence Island singly and in flocks of five or six birds. In August, 1956 and 1957 uninterrupted flights of all species of jaegers were recorded over the tundra in the lagoon zone and on the Kuzata River. They flew for three weeks from northeast to southwest, and in the last week of August from northwest to southeast.

*Food*—The stomachs of specimens I collected contained the following: 1) Dezhnev village, August 13, 1932. Posterior half of body of lemming. 2) Uélen, June 1, 1934. Vertebrae of a small fish and three calcareous plates of cephalopods. 3) Wrangel Island, August 15, 1938. Down feathers and some bones of an unknown bird, and 0.5 g small stones. 4) Same place, June 7, 1939. Remains of a goby (*Myoxocephalus* sp.). 5) Same place, June 10, 1939. Arctic lemming (*Dicrostonyx torquatus*) swallowed whole.

In mid-August, 1938, on a lagoon near the Krasnyi Flag River estuary, I observed for several days an aggregation of gulls and terns attracted there by the abundance of small fish (*Boreogadus*). Pomarine Jaegers were also present. Among the gulls and terns they appeared less mobile and awkward, but no sooner did a gull or tern catch a fish in the water, than the jaeger appeared beside it. Its agility and ferocity of attack was remarkable. The gull troubled by its persecutor would drop the quarry and the jaeger would catch the falling fish before it reached the surface of the water. However, most of the terns successfully eluded their tormentors.

According to the observations of F.L. Jaques, in the Arctic Ocean north of Bering Strait toward the end of July, 1928, Pomarine Jaegers regularly harassed kittiwakes and even attacked *Lunda cirrhata* (Pall.), which tried to hide underwater. A.P. Andriyashev observed Pomarine Jaegers north of Wrangel Island and noticed that they not only snatched arctic cod caught by kittiwakes, but also caught it themselves. To do so, they landed on water and then rested on ice.

The Pomarine Jaeger is definitely a dangerous predator of clutches. On June 12, 1939 I observed a jaeger attacking a Snow Goose; the goose rose on its feet and stretched its neck to repel the attack. The shell of a broken Snow Goose egg found at the site was proof of the brigandage committed. On June 29 I visited a small colony of Brent Geese on the Nasha River. No sooner had the geese flown away from the nest than Pomarine Jaegers appeared. One Brent Goose successfully chased a jaeger away. Despite my presence, both Blue Geese and Brent Geese gave chase whenever possible, seeing in jaegers an imminent danger. I saw firsthand on Wrangel clutches of other birds, especially eiders, damaged by jaegers. A.I. Mineev told me that the

Pomarine Jaeger swallows lemmings whole, while the Long-tailed Jaeger first tears them to pieces because its throat is small. My observations disprove Mineev's assumption. As mentioned above, in the stomach of one Pomarine Jaeger I found only part of a lemming, and in the stomach of a Long-tailed Jaeger a whole lemming. On June 23, 1879 E. Almquist shot a Pomarine Jaeger which had swallowed three mice, of which one was mostly digested; only the head, legs, and shred of skin still remained. The other two mice were whole and lay with their head toward the stomach. One had already entered the stomach, while the second lay in the gullet with the rear and feet projecting from the mouth of the bird. On July 10 A.A.L. Palander watched a Pomarine Jaeger steal two mice from a fox burrow.

According to F.H. Fay and T.J. Cade, Pomarine Jaegers arriving on St. Lawrence Island initially fed together with Fulmars and Glaucous Gulls on debris washed up on ice. As the tundra thawed, they took to feeding on voles, which served as their main food for two weeks. The stomachs of four jaegers caught at the end of May, 1954, and of another shot on June 4, 1953, contained freshly caught voles. Of the six Pomarine Jaegers caught in August, 1956 and 1957, the stomach of one contained *Microtus,* of two fish, and of three walrus meat.

*Systematics*—The color variability of Pomarine Jaegers does not provide a basis for distinguishing geographic races among them.

On the Chukchi peninsula and Wrangel Island dark-colored individuals are encountered often, but always singly. F.H. Fay and T.J. Cade state that among nearly 300 birds observed on St. Lawrence Island in the spring and summer of 1952 through 1957, only five dark-colored individuals were seen. My specimens were two-year-olds. In light-colored individuals the distribution of brown on the lower body is very variable: in bands across the chest, posterior part of abdomen, and on the crissum.

*Specimens*—1) Lawrence Bay, July 31, 1900, ○, Akif'ev; 2) southwestern extremity of Wrangel Island near Cape Foma, September 15, 1911, ♀ 1°anno, Arngol'd; 3) Providence Bay, August 12, 1914, ♀, Arngol'd; 4) Uélen, July 6, 1927, ○, Sheneberg; 5) Wrangel Island, June 10, 1928, ○, G.A. Ushakov; 6) same place, June 19, 1929, ○, G.A. Ushakov; 7) East Siberian Sea, 75°52'N and 175°35' E, August 12, 1929, ○, P.V. Ushakov; 8) Rodgers Bay, June 7, 1932, ♂, Vlasova; 9) southern part of Wrangel Island, June 14, 1932, ♀, Vlasova; 10) southeastern part of Wrangel Island, June 23, 1932, ♂, Vlasova; 11 and 12) Krest Bay, August 6, 1932, ♂♀, Portenko; 13) Dezhnev village, August 13, 1923, ♂, Portenko; 14) Uélen, June 1, 1934, ♂, Portenko; 15) Krasnyi Flag River estuary, August 15, 1938, ♂, Portenko; 16) Wrangel Island, Akatylanva landmark, June 7, 1939, ○, Portenko; 17) same place, June 8, 1939, ♂, Portenko; 18) Nasha River, June 10, 1939, ♀, Portenko; 19) Rodgers Bay, July 1, 1939, ♂, Portenko; and 20) Nasha River, August 16, 1939, juv., Portenko.

*Biological material*—1) egg, Wrangel Island, June 23, 1932.

### 83. *Stercorarius parasiticus* (L.)—Parasitic Jaeger

*Local names*—Same as for Pomarine Jaeger.

*Distribution and status*—Small number nest on the Chukchi peninsula and

Wrangel Island. Far more rare than Pomarine Jaeger. Leaves in winter.

According to L.O. Belopol'skii (1934), the Parasitic Jaeger was sighted in Krest Bay throughout the summer of 1931, but no specimens collected. On August 6, 1932, I came across a few birds of this species around Notapenmen village from the southeastern side of the entrance to the bay. According to an eyewitness account by T.H. Bean (1883, p. 169), the Parasitic Jaeger used to be common in Providence Bay; on September 12, 1880 two birds were collected while in flight, including a female, near the base of Plover spit. On August 2, 1913 L.M. Starokadomskii obtained a female in Émma Bay. According to I.O. Olenev, the Parasitic Jaeger nested in the tundra adjoining Émma Bay. On August 25, 1932 I caught a lone female on the shore of Plover spit, and on July 12, 1938 another lone female north of Cape Stoletiya.

This species was sighted on St. Lawrence Island by A. Seale (1899) on July 1, 1896, and R.W. Hendee (Bailey, 1925) observed a small number of birds in the first week of July, 1921. O.J. Murie (1936) shot a young bird at Savoonga village on August 30, 1934. According to F.H. Fay and T.J. Cade (1959), from 1950 through 1957 the Parasitic Jaeger was the least numerous of the three species and constituted about 10% of the 196 accurately identified jaegers. In August, 1957 three specimens were caught on Kuzata lagoon. In 1960 E.G.F. Sauer and E.K. Urban (1964) sighted a few pairs around Boxer Bay and found a nest with two eggs. H.Friedmann (1934a) found a small number of bones of this species in the oldest excavations carried out by archaeologists on the island—three humerus, three tibiotarsi, one ulna, and a few other pieces.

E.W. Nelson (1883, p. 110) has written that on the Bering Sea coast the Parasitic Jaeger was almost as common as Pomarine Jaeger. On August 6 and 10, 1843 I.G. Voznesenskii collected specimens in Mechigmensk Gulf. A.P. Kuzyakin came across a pair on June 12, 1957 on a lake south of Lawrence Bay.

According to my observations, the Parasitic Jaeger is rare around Uélen. In the fall of 1933 I very rarely sighted lone birds before the start of migration, and in the spring of 1934 lone birds with arriving birds. On June 15, 1934, I saw a pair in flight. A.P. Kuzyakin on June 29 and July 1, 1957, sighted two pairs south of Uélen and found a nest with an egg. On August 10, 1934 I came across a young bird and two adults close to it in the lower reaches of the Kol'oam-Véem River. Members of the *Vega* expedition (Palmén, 1887) in 1879 did not collect even a single specimen on Kolyuchin Bay. Stukesberg thought that he saw this species on May 30, and F.R. Chel'man one on June 14. The eggs obtained in Pitlekai on July 8 were identified by V. Meves as those of the Parasitic Jaeger.

In the interior areas of the Chukchi peninsula at Amguéma I came across the Parasitic Jaeger only once, on June 22, 1956. The bird flew close to me.

E.W. Nelson (1883, p. 110) has written in very general terms that this species was sighted at all the points visited by the *Corwin* expedition. J. Koren (Thayer and Bangs, 1914) states that throughout his trek along the north coast of the Chukchi peninsula this species was notably less common than the Long-tailed Jaeger.

A.A. Kishchinskii states that in 1970 the number of Parasitic Jaegers was one-third to one-fourth the number of Pomarine Jaegers in the coastal tundra from Cape

Schmidt to Vankarém. In the same area of 35 $km^2$ not more than two or three pairs nested, and not a single nest could be found. According to V.D. Lebedev and V.R. Filin, the Parasitic Jaeger was rare on Aiok Island in 1958. A nest with an egg was found in the southeastern part of the island. On July 13, 1958 a pair was sighted over Malyi Chaunskii Strait.

In the lower reaches of the Kolyma, S.A. Buturlin (1906b) found fewer Parasitic than Long-tailed Jaegers. J. Koren (Schaanning, 1954) found a clutch in the Kolyma delta. C. Amory (Riley, 1918) caught two males in this area on July 2 and 15, 1915.

G.A. Ushakov (Bannikov, 1941, p. 199) collected a specimen (as *Stercorarius cepphus nigricapillus* Sten Berman) on Wrangel Island, but probably erred in listing this species as common in the nesting area. A.I. Mineev and V.F. Vlasova during five years of residence on the island never sighted the Parasitic Jaeger even once. In the fall of 1938 I came across this bird a few times on the north coast of Wrangel and A.N. Druzhinin caught a specimen on August 20, 1938. In the summer of 1939 I sighted Parasitic Jaegers only three times: a lone bird in spring flight, a pair evidently at a nesting site, and a lone specimen among other flying birds on July 11. In 1960 S.M. Uspenskii and his colleagues, R.L. Bëme and A.G. Velizhanin (1963) observed a pair with fledgelings in Akademi Tundra but sighted this species less often on the south coast. A.G. Velizhanin (1965) has listed this species as common and abundant and reports seeing it everywhere in summer. I suspect, however, that this species has not been correctly identified.

*Habitat*—If the Pomarine Jaeger generally can be considered a coastal bird, then the Parasitic Jaeger could be called a river bird. In 1938 in Providence Bay, north of Cape Stoletiya, I came across the Parasitic Jaeger during the nesting period in river valleys. On August 10, 1934 I found a brood in the estuary of the Kol'oam-Véem River. J. Koren found a nest on the Medvezhii River and in the Kolyma delta.

On the other hand, on Wrangel Island according to my observations, its nesting area was placed on dry elevated tundra at the foot of a conical hill. V.D. Lebedev and V.R. Filin found a nest in marshy tundra on Aiok Island, while A.P. Kuzyakin found a nesting section on wet grassy tundra south of the lagoon in Uélen.

Except during the nesting period, the Parasitic Jaeger may occur in tundra and along the sea coast depending on the availability of food. However, it is not a coastal bird to the degree that Pomarine Jaeger is. On August 6, 1932 I noticed a few along the coastal tundra near Notapenmen, and on August 25 I sighted a lone bird on a pebbled spit in Plover. In the fall of 1933 near Uélen Parasitic Jaegers flew mostly above the coastal waters or lagoons since they could find no food in the tundra.

According to E.W. Nelson, when the ship *Corwin* approached ice, Parasitic Jaegers became rare or were even absent. Not a single bird was sighted at sea in the proximity of Wrangel or Herald Islands.

*Arrival*—Incoming flights occur in the last days of May and early June. In 1931 the arrival in Krest Bay was observed by L.O. Belopol'skii on May 28. According to I.O. Olenev, in the spring of 1932 these jaegers were seen in Émma bay on June 25, when the ice in the bay had not yet opened up. This delay, however, was a purely local phenomenon caused by the closed bay conditions. In Gambell, on St. Lawrence Island, E.G.F. Sauer saw a pair on June 4, 1960. In the spring of 1934 I noticed the first lone parasitic jaegers on June 3 in Uélen. On the following day I sighted a lone bird near the tundra, and on June 15, a pair flying above the interior lagoons. In 1879 in Kolyuchin Bay, the arrival was dated May 30, but I can only assume that the species was correctly identified.

On June 2, 1971 V.V. Leonovich noticed a lone bird near Énurmino. A.A. Kishchinskii tracked the flight of this species from May 31 through June 8, 1970. Lone birds and flocks of up to three to five birds flew along the seashore in a northwestern direction. About 10 birds gathered around Schmidt village in the feeding grounds. Single birds wandered in by June 15 although vagrant jaegers were sighted even later. On Wrangel Island in the spring of 1939 I observed their arrival on June 9.

*Nidification*—On June 23, 1939 near Rodgers Bay I came across two Parasitic Jaegers on a nest plot (judging from the behavior of the female). The male was an invalid with a missing right leg. Subcutaneous adipose deposits were filmy. The size of his testes (12 mm × 6 mm and 9 mm × 5 mm) was somewhat smaller than that of males from Markovo I collected on June 4, 1932 (16 mm × 8 mm and 12 mm × 7 mm). The female I shot on Cape Stoletiya on July 12, 1938 was emaciated; her ovary was 15 mm long with a fine-grained structure. The female I caught in Plover Bay on August 25, 1932 was very plump; from the fine-grained ovarian structure, it had probably nested that year.

On June 27, 1960 E.G.F. Sauer (Sauer and Urban, 1964, p. 53, Fig. 6) found a nest near Boxer Bay in the form of a flat depression on a wet hummock surrounded by sedges and moss. The nest material consisted of lichen (*Thamnolia vermicularis*), a few grass leaves, and bits of dry brown willow leaves. Two olive-brown eggs 56 mm × 44 mm and 67 mm × 43 mm with brown and black spots were recovered. Jaegers withdrew from the nest as the men approached, feigning injury to wings on land and in flight, and crying for a long time. Their cry resembled the mewing of a kitten.

On June 29, 1957, A.P. Kuzyakin found a nest with a single egg near Uélen. V.D. Lebedev and V.R. Filin found a nest with a slightly incubated egg on Aiok Island on June 25, 1958. The nest was located on a marshy tundra. The male and female drove away both man and dog and aggressively chased other birds, especially Herring Gulls, from the nesting site. J. Koren found two clutches in 1912: one with two eggs in the Kolyma delta on June 26 and the other with one egg on the Medvezhii River on July 5. The first nest was built on a dry spot in a grassy marsh (see photograph by A.C. Bent, 1921, Pl. 3). On June 27, 1917 in the Kolyma delta he obtained a clutch with one egg incubated for 10 days lying in a pit in moss on a level tundra, and on July 2, 1917 a clutch containing two eggs with chicks about to emerge. The latter was found in a depression in moss covering a dry spot in the marsh on a flat island in the delta. On August 10, 1934 in the lower reaches of the Kol'oam River I came across a young bird. It was so cautious that I could not catch it.

*Departure*—In the fall of 1933 around Uélen I rarely saw lone jaegers of this species in the first half of September and sighted one for the last time on September

27. A.G. Velizhanin caught a young bird on September 24, 1960 on Cape Blossom on Wrangel Island. Birds shot by T.H. Bean in Providence Bay on September 12, 1880 were undoubtedly transients.

*Food*—The stomach of a specimen from Providence Bay caught on August 28, 1932 contained vertebrae and other bones of small fish, jaws and bits of cuticle from three unidentified arthropods, and three small stones. In a specimen from Wrangel Island shot on June 23, 1939 the stomach contained fish bones, two joints of a crab, and a small crustacean; another caught on August 16, 1939 revealed some bones and fur of an arctic lemming. According to F.H. Fay and T.J. Cade, unlike the other two jaeger species, three Parasitic Jaegers collected in August, 1957 on St. Lawrence Island had no voles in their stomachs. There were bits of marine invertebrates in the stomach of one and two seeds and berries in the stomach of the other.

A.A. Kishchinskii noticed that jaegers in search of lemmings on dry spits with hummocks flew low over grass only 5 or 6 cm high, hovered at times, and vigorously fluttered their wings. One jaeger (dark-colored) chased a Red Phalarope without success.

*Systematics*—G.P. Dement'ev (1940) described the subspecies *Stercorarius parasiticus parallelus,* which has a distinct dark coloration in the upper body and occurs from Wrangel Island to Kamchatka. I could establish no differences between the subspecies throughout the entire stretch of the Arctic coast in the material available in the Institute of Zoology, academy of Sciences of the USSR.

*Specimens*—1) Mechigmensk Gulf, August 6, 1843, ♂, Voznesenskii; 2) same place, August 10, 1843, ♂, Voznesenskii; 3) Émma Bay, August 2, 1913, ♀, Starokadomskii; 4) Wrangel Island, July 12, 1928, ○, G.A. Ushakov; 5) Providence Bay, August 25, 1932, ♀, Portenko; 6) same place, July 12, 1938, ♀, Portenko; 7) Wrangel Island, August 20, 1938, ○, Druzhinin; and 8) Rodgers Bay, June 23, 1939, ♂, Portenko.

### 84. *Stercorarius longicaudus pallescens* **Løppenthin—Long-tailed Jaeger**

*Local names*—Chukchian and Eskimo names collected by me are the same as for the Pomarine Jaeger. In Chukchian: ankaken-uadl′ukangodlin in the records of the *Vega* expedition. In Eskimo: yung-wắ-ghŭk on St. Lawrence Island.

*Distribution and status*—Nests and quite common on the Chukchi peninsula as well as Wrangel Island. Outnumbers the other two species of jaegers in population. Leaves in winter.

According to an eyewitness account by W.H. Dall (Dall and Bannister, 1869, p. 304), *Stercorarius buffoni* Baird was caught in the Anadyr basin. In the summer of 1931 the Long-tailed Jaeger was noticed by L.O. Belopol'skii (1934) in Krest Bay. On June 8, 1956 I saw three near Égvekinot. I.A. Palmén (1887, p. 383) wrote in his monograph that T.H. Bean listed this jaeger as common in Plover Bay. I did not, however, find this information in Bean's work (1883). On July 3, 1921, A.M. Bailey (1925) saw a lone Long-tailed Jaeger in Émma Bay and, not unexpectedly, this is the only reliable information for Providence Bay.

As pointed out by Friedmann (1932a), it was the Long-tailed and not the Parasitic Jaeger that was seen by E.W. Nelson (1887) in the summer of 1884 on St. Lawrence Island. O. Nordquist (Palmén, 1887) noticed a few Long-tailed Jaegers on St. Lawrence Island around August 1, 1879, and R.W. Hendee (Bailey, 1925) in the first week of July, 1921. In 1928 F.L. Jaques (1930) sailing northward on the Bering Sea, noticed the Long-tailed Jaeger for the first time near St. Lawrence Island. According to A. Brooks (1939, p. 328), a dark colored specimen, evidently two-years old, collected on St. Lawrence Island on July 26, 1929 is preserved in the Museum of Vertebrate Zoology. In the Museum of the University of Alaska the following specimens are additionally preserved: ♀♀, July 26, 1929; ♀, August 11, 1929; ♂, July 25, 1929; and ♂, July 8, 1930. O.J. Murie (1936) collected a male in Gambell village on July 23, 1933 and a female in Kukuliak village on July 28, 1935. O.W. Geist photographed a nest with a downy fledgeling and an egg and also an old bird in flight. T.J. Cade (Fay and Cade, 1959) encountered Long-tailed Jaegers on St. Lawrence Island daily although he could not locate a nest. On July 27, 1950 a specimen was collected in Boxer Bay. F.H. Fay in July, 1952 came across only three at Cape Sevu and on July 23, 1953 a pair east of Boxer Bay. In 1954 not a single Long-tailed Jaeger was seen. In July, 1955 some were sighted near Savoonga. In 1956 these jaegers appeared in large numbers, and in 1957 were twice as numerous as the other two species. During the summer of 1960 E.G.F. Sauer and E.K. Urban (1964) found a few pairs around Boxer Bay, and discovered a nest with two eggs. Among the bones excavated by archaeologists, H. Friedmann (1934a) found a large number of this species from the oldest to the most recent of this material in a total of 26 excavations. E.W. Nelson wrote (1887, p. 46) that this species was found on the east coast of Siberia. Such an extremely broad generalization was evidently based on the old date of Dall mentioned above. On August 19, 1932 I came across the Long-tailed Jaeger on the south coast of Lawrence Bay; on June 30, 1948 V.N. Lyubin caught a specimen there. In 1957 A.P. Kuzyakin encountered this bird all along the shore from Akkani village to Uelen, and on June 23 found two nests in the village between Lawrence Bay and Yandagai. It was not numerous, with less than one pair per km$^2$. V.V. Leonovich came across a pair here only occasionally in 1970 but nonetheless found a nest.

On August 13, 1932 I noticed Long-tailed Jaegers in large numbers around Dezhnev village. On August 24, 1914 E.E. Arngol'd caught a female near Uélen. In the immediate vicinity of the village, according to my observations, the Long-tailed Jaeger was not a rarity, but neither was it abundant in either summer or fall. I found no nests. More to the west, in the interior of the peninsula, it was evidently very rare. Only once, on August 12, 1934, did I happen to sight Long-tailed Jaegers in the upper reaches of the Kol'oam-Véem River. Throughout my trek along the Utte-Véem River I saw one, but around Mitkulen I found a good number, probably nonbreeding birds. There, in the first half of July, 1934, they gathered in large flocks, apparently due to the presence of some food along the seacoast.

In 1879 in Kolyuchin Bay the Long-tailed Jaeger was nowhere numerous (Palmén, 1887). From the time of the arrival to the departure of the *Vega* from its winter anchorage, the following finds were made by members of the expedition: June 13, A.A.L. Palander caught a female in Dzhénrétlen; June 14, a male was brought from Neshkan; June 16, E. Almquist shot three on a journey to Kolyuchin Bay and O. Nordquist sighted some in Pitlekai; June 25, a male was collected; June 27, Nordquist noticed a pair in Dzhénrétlen; July 4, two jaegers were downed in Pitlekai; July 5, another pair was collected. This species was sighted for the last time on July 17 near the winter anchorage of the *Vega*.

In mid-July, 1909 J. Koren (1910) encountered Long-tailed Jaegers from the western side of the entrance to Kolyuchin Bay. They flew in flocks but did not nest in that locality. Within the country, according to my observations, Long-tailed Jaegers were common and nested on the Amguéma in the summer of 1956. They were sighted very often and up to five birds were seen at one time.

A.A. Kishchinskii found this species to be common in the nesting zones in the tundra from Vankarém to Cape Schmidt, but rarer along the Ekug-Véem River. In a census area of 35 km$^2$ three or four pairs had nested. The total population was about one-half to one-third that of the Pomarine Jaeger.

The collections of A.A. Savich contained a lone specimen caught in the spring of 1915 in the tundra close to Cape Schmidt. The statement by V.M. Artobolevskii (1927) that it definitely raises young on Cape Severnyi was probably based on general conclusions. V.Ya. Isaev reported to me that Long-tailed Jaegers were numerous on Cape Schmidt. In August, 1966 F.B. Chernyavskii noticed fledgelings in the Kuekvun' River valley west of Cape Schmidt and concluded that this jaeger nested deep within the hilly country in the western part of the Chukchi peninsula. S.G. Pavlov collected a specimen in Chaun Bay on June 21, 1933. A.G. Ushakov, a hunter from Pevek living there for almost a decade (from 1954 through 1964), informed me that jaegers were numerous around the tundra. He had even collected a downy fledgeling. According to the observations of V.D. Lebedev and V.R. Filin (1959), the Long-tailed Jaeger was quite rare on Aiok Island in 1958. Lone birds were sighted in spring flight. On August 10 four jaegers were noticed on the Karchyk peninsula. According to S.A. Buturlin (1906b), this species was the most abundant among jaegers in the lower reaches of the Kolyma. J. Koren (Thayer and Bangs, 1914) tracked the arrival of these birds in the Lower Kolyma and collected a specimen on May 22, 1912, found a nest in Kalashkovo, and encountered a flock in the Kolyma delta on an island in June of the same year. This flock comprised about 100 nonnesting birds. On June 23, 1917 he caught a male beside its nest near the Lower Kolyma, and on June 25, found two clutches in the Kolyma delta (Schaanning, 1954).

According to E.W. Nelson, during the cruises of the *Corwin* near the pack ice north of Bering Strait, this jaeger was noticed only a few times. A. Crawford (Snyder, 1926) in 1922 caught two specimens on Wrangel Island. G.A. Ushakov (Bannikov, 1941) sighted far greater numbers of the Long-tailed Jaeger (as *Stercorarius parasiticus*) than of the other two species of jaegers on Wrangel Island. He collected a male on June 7, 1928 and collected two eggs on June 15, 1929. According to the five-year observations of A. I. Mineev and V.F. Vlasova on Wrangel Island, this bird nests in large numbers. On the basis of my own observations, I can only add that in the nesting period during the summer of 1939, on the southern side of the island, the numbers of Long-tailed Jaegers exceeded even Pomarine Jaegers. I encountered nesting pairs from Somnitel'naya Bay to the Nasha River estuary and in the valley of its midreaches. In the fall of 1938, on the northern side of the island, I rarely sighted it. I encountered separate pairs over the tundra from south of Bruch spit to the mouth of the Krasnyi Flag River. According to the observations of S.M. Uspenskii and his colleagues (1963), it was a common nesting species in 1960. Pairs with downy fledgelings were sighted everywhere, but more often in Akademii Tundra.

R.L. Newcomb (1888, p. 289), the naturalist of the *Jeannette* expedition, caught jaegers north of Wrangel Island in June and July, 1880 when the vessel was ice-bound. J.J. Collins caught a Long-tailed Jaeger (under the name "species *Buffonii*") at the end of July (Newcomb, 1888, p. 290). In 1928 F.L. Jaques (1930) sighted a few Long-tailed Jaegers in the Arctic Ocean north of Bering Strait up to Herald Island up to August 7.

*Habitat*—Nesting sites of the Long-tailed Jaeger, a typical inhabitant of the tundra, are not associated with areas close to the sea. I feel that it does not nest in Providence Bay because of the marine environment. During the nesting period I encountered not even one Long-tailed Jaeger at sea on Wrangel Island. I found nests on the southern conical foothills extending from Rodgers Bay to Atternon hill. G.A. Ushakov has stated that it nests in the tundra and only occasionally on the pebbled coast. A.I. Mineev regularly sighted this bird in the tundra during summer, but never saw it flying over the sea.

Nonnesting Long-tailed Jaegers are confined to places where food is available without their having to leave the seacoast. In the fall of 1933 I saw them a few times before flying off on Uélen spit, which separates the sea from the lagoon, and in the summer of 1934 came across a large congregation on the same spit near Mitkulen. On July 3 I set off in a whaleboat towed by Chukchians and along the pebbled coast of Mitkulen spit came across several resting Long-tailed Jaegers at various places. They permitted the men to approach very close, taking off at a distance of two paces. On July 20 I returned by the same spit from Mitkulen to Inchoun. Sandy sections overgrown with wild rye (*Elymus*) covered the pebbled expanse; in one of them I succeeded in catching a mouse and saw jaegers settled in such places looking for mice.

In the fall of 1938 on the north coast of Wrangel I noticed Long-tailed Jaegers on the tundra at the same time that Pomarine Jaegers were mostly confined to the lagoon and seacoast. Only once did I observe a Long-tailed Jaeger flying over the edge of the ice pushed up onto the pebbled Bruch spit. I have recorded these types of observations in my journals as exceptions. The occurrence of these jaegers on rocky fields was likewise exceptional. They not only flew over rocky fields, but lay on the rocks in ambush. I recorded such finds on August 16, 23, and 24 in the cinder cones of Rodgers Bay. On August 12, 1934 I came across a flock of Long-tailed Jaegers gathered in one of the small shallows in the midreaches of the Kol'oam-Véem River, and on the following day, I saw them perched on coastal hummocks. Besides this, in the nesting season I did not notice Long-tailed Jaegers being confined to rivers or rivulets.

*Arrival*—In Egvekinot on June 8, 1956 I saw three Long-tailed Jaegers flying southward over the cinder cones; they constituted a recently arrived flock. On the Amguéma, near Kilometer 91 on June 10, lone birds which had already mated flew past me quite frequently.

In the spring of 1934 I saw the first Long-tailed Jaegers arriving near Uélen on June 4. Three birds suddenly flew toward me in the tundra on June 7 and I often heard their call. By June 13 they were common in the grassy tundra near the lagoon and their calls constant. On the 15th I saw just one pair in flight and several on the 17th. No massive flight occurred but the numbers of local birds increased.

In the spring of 1879 the first specimens were shot on June 13 in Dzhénrétlen. Later finds, listed above, provide no information on their flight and evidently their arrival was poorly manifested. On June 6, 1970 A.A. Kishchinskii noticed his first Long-tailed Jaeger on a spit in Ukouge lagoon. By June 8 pairs were already common in the tundra. Nonnesting specimens were sighted until mid-June. On Aiok Island V.D. Lebedev and V.R. Filin in 1958 caught a male even on May 29. Stray birds were recorded on June 3, 5, and 6 on the west coast of the island.

In the spring of 1912, according to J. Koren, Long-tailed Jaegers were seen on May 22 around the Lower Kolyma long before the river opened up.

G.A. Ushakov recorded arrivals on Wrangel Island on May 29, 1927 and May 28, 1928. In the spring of 1939 I saw the first arrivals on June 2. Subsequently sightings of Long-tailed Jaegers increased but they were not as numerous as Pomarine Jaegers. I saw no flocks at all, encountered solitary birds often, and small groups rarely. From June 9 on, Long-tailed Jaegers were seen resting on knolls as if on nesting sites.

*Nidification*—The specimens caught on arrival were plump and well fed. The testes of males arriving from Markovo on June 1, 1932, from Uélen on June 13, 1934, and from Wrangel Island on June 5, 1939 were enlarged: 12 mm × 7 mm and 10 mm × 7 mm, 14 mm × 9 mm and 10 mm × 8 mm, and 12 mm × 8 mm and 10 mm × 6 mm. The Uélen male had well-developed testes similar to those of an adult bird and probably had mated already. In a male collected by its nest near Rodgers Bay on June 23, 1939, the testes were already enlarged (12 mm × 5 mm and 8 mm × 4 mm), but its subcutaneous adipose layers were reduced to a film. A male collected on July 22 had reduced testes of 7 mm × 2 mm and 3 mm × 2 mm, and its subcutaneous adipose layers continuously lined the body. In the male collected on Bruch spit on August 25, 1938 the gonads were definitely reduced and were only 4 mm × 2 mm and 3 mm × 1 mm. This was a very plump specimen in which the subcutaneous adipose layers were as much as 1.0 cm thick at places. During the nonbreeding phase the gonadal dimensions returned to normal early. In a male from Dezhnev village on August 13, 1932 the testes were 5 mm × 3 mm and 4 mm × 2 mm. It is interesting to note that the testes of a male from Tanyurer estuary, which was as emaciated as the Dezhnev specimen, were only slightly smaller in size on August 13, 1931 (4 mm × 2 mm and 3 mm × 2 mm).

Females arriving from Uélen and Wrangel had enlarged ovarian follicles reaching up to 6 mm; the gonads in the Wrangel specimen were 19 mm long. A female from Uélen on June 13, 1934, similar to the male of the same date described above, had well-developed ovaries; the diameter of the largest follicles in descending order were 25, 15, and 5 mm. The Wrangel specimens were characterized by much poorer adipose formations, which could well be explained by their much longer and more difficult flight course. The fall females from the Chukchi peninsula had a finegrained ovary structure and were devoid of subcutaneous adipose layers.

In the latter half of June, 1956 in the tundra on Amguéma, I heard the call of Long-tailed Jaegers quite often. On many occasions as they flew past me and screamed, but when I was not near a nest they moved on and continued scanning the tundra. On June 30 I watched an incubating bird and detected a lone egg lying in a depression in a dry peat zone (Fig. 2). The agitated pair flew toward me with a scream. One was particularly aggressive and swept past my head. On July 2 I found no birds in the nest. When seen later, they raised an alarm in response to which another pair arrived (Fig. 3). The owners of the nest drove them away and with due regards to the members of their clan, did so rather quickly (Fig. 4).

On June 23, 1939 I found two nests on Wrangel Island with two eggs in each. One nest was located on a large knoll in a swamp. On my approach both parents became restless even when I was still a quarter kilometer away from the nest on the slope of a nearby conical hill. From the behavior of the birds it was not possible to determine their location. I stumbled upon the nest by chance and the birds became greatly agitated. One flew toward me so fast that it almost grazed my head. The second nest was located in a mottled rocky tundra and likewise close to the conical hill. I located the nest by spotting one of the birds from a distance.

It should be pointed out that all three of the clutches I found had already been damaged. A predator of bird nests, the Long-tailed Jaeger itself falls victim to damage and destruction. On June 27 I happened to be close to two other nests but could not locate them. Jaegers flew toward me, landed, squeaked, and fluttered their wings. Later they rushed at me so frantically that I had to repel them with my entomological net. One of the birds I hit flew away a kilometer or two, while the second whirled around after the impact and fell somewhere in the hummocks.

F.B. Chernyavskii (1967) has had several opportunities to observe how Long-tailed Jaegers chase foxes so energetically that the intruder was forced to adopt a defensive posture and howl loudly.

The two eggs found by A.I. Mineev on June 28, 1932 near Rodgers Bay contained developed chicks. Of the three eggs collected on July 4, 1932 on Atternon hill, one contained a developed chick while the other contained a chick already covered with embryonic down. The eggs were 5.69 cm × 3.91 cm and 5.64 cm × 3.88 cm in the first clutch, and 5.42 cm × 4.05 cm and 5.30 cm × 3.75 cm in the second. Their main background color was a light greenish-olive. Violet-gray and sepia spots were quite dense toward the broader end of the egg and rather scattered toward the pointed end. Most of the egg was devoid of spots and the surface slightly lustrous. A.G.

Fig. 1. Nest with clutch of the Pomarine Jaegar *Stercorarius pomarinus* (Temm.).Ukouge lagoon. June 21, 1970. Photo by A.A. Kishchinskii.

Fig. 2. Nest with egg of the Long-tailed Jaeger *Stercorarius longicaudus* Vieill. Amguéma River, near Kilometer 91. June 30, 1956.

Fig. 3. Long-tailed Jaeger *Stercorarius longicaudus* Vieill. Amguéma River, near Kilometer 91. July 2, 1956.

Fig. 4. Long-tailed Jaeger *Stercorarius longicaudus* Vieill. by its nest. Amguéma River, near Kilometer 91. June 30, 1956.

Bannikov's note (1941, p. 200) that a single clutch contains four eggs is definitely erroneous.

On June 23, 1957 A.P. Kuzyakin found not far from Yandagai two nests with two unincubated eggs in each. The nests were located in sedge-cotton grass in the hilly tundra and were in the form of small flat pits on elevated moss-lichen sites. The diameter of the pits was 17 cm × 18 cm and their depth not more than 3.5 cm. The lining in one consisted of trampled and broken lichen. At the bottom of another lay some willow leaves, probably windblown. These eggs were 53.2 mm × 37.8 mm, 52.7 mm × 38.4 mm, 53.3 mm × 39.5 mm, and 55.6 mm × 39.4 mm. Those in one clutch weighed 38.0 g and 37.5 g, and in the other 43.2 g and 41.8 g. In Lawrence Bay, V.V. Leonovich found a nest on June 14, 1970 with two unincubated eggs. On June 21 in Énurmino evidently some pairs were already with fledgelings. A.A. Kishchinskii found a nest on June 22, 1970 near Ukouge with two fully incubated eggs; one of the eggs was pecked on June 29.

In the lower reaches of the Kolyma, J. Koren found on June 22, 1912, two almost unincubated eggs lying in a small depression on a mossy cover in a larch forest. On June 25, 1917 he found two clutches in the Kolyma delta with one egg each incubated for 10 and 15 days respectively. These eggs were 53.6 mm × 38.0 mm and 52.6 mm × 38.4 mm.

On July 16, 1956, I came across a nesting site on the Amguéma but could find neither eggs nor chicks. On the alarm raised by the pair three more birds flew toward them. The pair chased away the intruders with much less vigor than when they attacked me and ultimately withdrew from the chase.

On June 23, 1960 E.G.F. Sauer found a nest with two eggs in the Vanmaii River valley two miles north of Boxer Bay. This was a small depression in a mossy bed surrounded by moss, grass, and *Sedum.* Jaegers stood by the nest and chased and attacked any man who approached. Their cry resembled the bark of a fox terrier.

On August 2, 1932 A.I. Mineev caught a young male with down remnants on its head, neck, upper tail coverts, and underside of the body. In the fall of 1938 I encountered on the north side of Wrangel Island, pairs of Long-tailed Jaegers even in the middle decade of August.

*Residence of unpaired birds*—I often came across congregations of lone Long-tailed Jaegers. For instance, on August 13, 1932, in the tundra adjoining Dezhnev village I found this species gathered in large numbers at one place. On July 3, 1934, I came across a similar congregation on the spit east of Mitkulen, and on July 12 in the tundra some 10 km southward a large flock took flight at the sound of a gunshot. Finally, on August 12 I noticed an assemblage in the midreaches of the Kol'oam River. These groups could not be termed "flocks" since the birds did not settle densely; instead they spaced themselves out. On Wrangel Island I noticed a small aggregation near Somnitel'naya Bay on July 15, 1939, and very small flocks flying over the tundra near Rodgers Bay on July 22. In 1956 I saw a flock of eight screaming Long-tailed Jaegers fly over the tundra on the Amguéma on June 30. J. Koren reports seeing a flock in June, 1912 of about 100 nonnesting birds on one of the islands in the Kolyma delta.

A population increase is seen among sandpipers and gulls at the end of summer due to the addition of a new generation. I have never seen such a phenomenon among jaegers, not even among such a common species as the Long-tailed Jaeger. Young jaegers are rare in the fall. From this one may permissibly conclude that many nonnesting jaegers reside on the Chukchi peninsula during summer.

*Departure*—In the fall of 1933 I saw Long-tailed Jaegers several times at the end of August in Uélen and for the last time on September 18. On Wrangel Island in the fall of 1938 I spotted the last lone Long-tailed Jaeger on Bruch spit on August 25. In 1939 in the southern part of the island jaegers were rarer in the last days of July. At this time they no longer flew toward me and were more cautious. I saw lone birds only occasionally (August 7, 16, 23, and 24), sighting the same bird on the last two days (readily recognized since its central tail feather was missing). I left the island on August 28. According to A.G. Velizhanin, Long-tailed Jaegers remained on Wrangel Island in 1960 up to mid-September. Prior to migration they gathered into a flock, often mixing with Parasitic Jaegers.

*Food*—The dissected gullets and stomachs of specimens I collected revealed the following contents:

1. Dezhnev village, August 13, 1932. Gullet contained bits of a recently swallowed lemming; further down, beak, legs, stomach, and other remains of a young Red Phalarope. The stomach contained a pair of lower jaws of lemming and legs of a Red Phalarope. 2. Same place and date. Head with thorax and elytra of a Scarabidae, whole specimen of Staphylinidae, heads and elytra of 7 Carabidae, heads of 2 Hymenoptera, whole specimens, heads, and other remains of 10 Tipulidae, head of a fly, over 2,000 black eggs of Tipulidae, 2 bird feathers, and 2 seeds. 3. Same place and date. Heads and other remains of 7 Curculionidae, almost a whole specimen of Staphylinidae, heads and other remains of 62 Carabidae, heads and elytra of 4 unidentifiable beetles, whole specimens and heads of 9 beetle larvae, 2 caddisflies, of which one whole, almost whole specimens of stoneflies (?), whole specimens, heads, wings, and other remains of 23 Tipulidae, over 2,000 black eggs of Tipulidae, and a minute stone. 4. Same place and date. Whole specimens and heads of 10 Carabidae, heads of 4 hymenopterans, thorax with wings of butterfly, head of caterpillar, 6 dipterans of family Tipulidae, heads of flies, and several hundred black eggs of Tipulidae. 5. Uélen, June 4, 1934. Small bits of chitin of 16 carabids and thoracic segment of a hymenopteran.

It should be pointed out that of the four jaegers caught in a single tour near Dezhnev village, insects were found in the stomachs of three and numerous remains of vertebrates in the stomach of the fourth. Having been injured, this bird was regurgitating bits of a freshly swallowed lemming and phalarope. It is difficult to say whether this was a chance acquisition of such abundant quarry, or whether this bird, unlike other members of its insectivorous clan, specialized in hunting small animals and birds. On July 19, 1934, in Mitkulen I watched a Long-tailed Jaeger chase a young bunting for a long time and finally catch it in flight. The jaeger exhibited the same agility, untiring persistence, and tricks which I had occasion to observe once in the Ukraine in a Kestrel stalking a lark. On Wrangel Island I saw how even such comparatively large birds as Gray Plovers and Turnstones fly away on sighting a Long-tailed Jaeger. Yet, as often as not, the former pursued the jaeger. I also noticed jaegers on Wrangel Island resting among detritus, obviously awaiting the appearance of lemmings.

G.A. Ushakov states that in the first half of June, with the thawing of ice, fish become abundant on Wrangel Island. They are mainly consumed by jaegers, which search the ice by day but invariably spend the night in the tundra. In summer these birds feed on lemmings in the tundra. Based on his observations on Wrangel, A.I. Mineev told me that Long-tailed Jaegers feed on lemmings, small birds, and insects. The specimens caught by me on Wrangel revealed the following stomach contents: 1) June 3, 1939. Bits of meat, probably carrion. 2) June 5, 1939. Lower jaw, skull fragments, other bits, and fur of arctic lemming. 3) June 23, 1939. Ten *Chrysomela* beetles, five otoliths, and bones of *Boreogadus saida*. 4) July 22, 1939. Fur and vertebrae of arctic lemming.

Similar data was recorded by members of the *Vega* expedition. The stomach of a male brought from Neshkan on June 14, 1879 contained seeds of crowberries and probably cloudberries. The stomach of a bird caught in Kolyuchin Bay on June 16 contained bits of beetle wings, bits of moss, and bits of leaves of *Dryas octopetala*. A male obtained on June 25 contained a whole lemming swallowed head first. The stomach of birds caught on July 4 and 5 in Pitlekai revealed one-half of a digested vole in one male and the remains of beetles (*Harpalus* and *Carabus* ?) in the other two males.

According to my observations, on Amguéma Long-tailed Jaegers regularly fly over the tundra scanning it meter by meter like Harriers in the steppes or over rushes, and tyrannize the entire population of small birds which could serve as food. They often stop in flight and flutter their wings like a falcon for a minute or more. In two cases, jaegers in my presence ate offal thrown away by hunters. Once I chased a jaeger away from a rodent; the anterior part of its body was reduced to a thoroughly plucked skeleton, the head was absent, the skin turned back, the stomach hung sideways, but the legs and tail were intact. In another instance I found the remains of a female Pomarine Jaeger with the head intact, but the flesh on the trunk plucked clean in a characteristic manner.

According to F.H. Fay, the following contents were found in 10 stomachs of Long-tailed Jaegers caught on St. Lawrence Island in August, 1956 and 1957: predominantly voles in seven cases, exclusively insects in two, and fish in one. A small quantity of willow seeds and catkins were found in two along with the remains of a fowl.

*Economic importance*—Generally an energetic, dexterous, and insolent predator, it is a "pirate" in the literal sense of the word. It destroys lemmings, small birds, and clutches of large birds. Its destructive activity is an important factor in the life of tundra fowl. At places where jaegers are especially numerous they should be hunted and killed systematically, and particularly at places where wild waterfowl and partridge are endangered.

*Systematics*—I differentiate two subspecies of Long-tailed Jaeger in the Arctic zone.

1. ***Stercorarius longicaudus longicaudus*** Vieill. Dark brownish-gray color of abdomen extends onto chest. Ranges from Franz Josef Land to Novosibirsk Island inclusively.

2. ***Stercorarius longicaudus pallescens*** Løppenthin. Dark brownish-gray color on underside of body limited only to abdomen and subcaudal zones. Ranges in the east from Indigirka and arctic positions of North America to eastern Greenland inclusively.

All the specimens sighted by me in the Chukchi peninsula, Wrangel Island, and Anadyr were constant in coloration. A. Brooks mentions a dark-colored specimen in which dark brown spots were irregularly distributed on the white background of the underside of the body.

*Specimens*—1) Uélen, August 24, 1911, ♀, Arngol'd; 2) Wrangel Island, June 7, 1928, ♂, G.A. Ushakov; 3) Rodgers Bay, June 29, 1932, ♂, Vlasova; 4) same place, August 2, 1932, ♂, juv., Vlasova; 5) Wrangel Island, undated, O, Zvantsev; 6 to 9) Dezhnev village, August 13, 1932 ♂♂♀♀, Portenko; 10) Chaun Bay, June 21, 1939, O, Pavlov; 11) Uélen, September 17, 1933, ♀, Portenko; 12) same place, June 4, 1934, ♂, Portenko; 13 and 14) same place, June 13, 1934, ♂♀, Portenko; 15) Wrangel Island, Bruch spit, August 25, 1938, ♂, Portenko; 16) same place, Akatylanva landmark, June 3, 1939, ♀, Portenko; 17) same place, June 5, 1939, ♂, Portenko; 18) Rodgers Bay, June 23, 1939, ♂, Portenko; and 19) same place, July 22, 1939, ♂, Portenko.

*Biological collections*—1) Clutch of two eggs, Rodgers Bay, June 28, 1932, Vlasova; and 2) clutch of three eggs, coastal tundra around Atternon hill, July 4, 1932, Vlasova.

### 85. *Pagophila eburnea* (Phipps)—Ivory Gull

*Local names*—Chukchian: chynon-jajak in the records of the *Vega* expedition. In Eskimo: kurúgek and kuroúek in Providence Bay; kū-rū'-wĭĭk on St. Lawrence Island.

*Distribution and status*—This species flies over shores of the Chukchi peninsula and Wrangel Island, but not regularly and in varying numbers. It is very common on shores of Wrangel Island.

According to L.D. Belopol'skii (1934; wrongly labeled in his articles as "Sabine's gull"), the Ivory Gull was sighted once, on June 13, 1931, 15 to 20 km east of Meechkyn Island. This was undoubtedly a nonbreeding bird drifting with the ice. As reported to me by I.O. Olenev, the Ivory Gull appeared in the spring of 1932 in Providence Bay but remained there for a very short period; it was not sighted at all in the fall of 1931.

On St. Lawrence Island according to O.J. Murie (1936), two males were caught in flight on May 6, 1928 and May 6, 1930.

A.M. Bailey (1925 and 1956) has suggested that the Ivory Gull winters along the rim of pack ice in the exposed sections of the sea north of St. Lawrence Island. One specimen was caught on May 25, 1951. According to F.H. Fay and T.J. Cade

(1959), this bird was regularly encountered away from the shore in early spring and late fall, but was not common anywhere. E.G.F. Sauer and E.K. Urban (1964) sighted Ivory Gulls along the shore near Gambell on June 5, 1960. T. Pennant (1785, p. 530), guided by the information obtained from the expedition of J. Cook, wrote that the Ivory Gull was very common in the Arctic Sea between Asia and America.

J. Koren (Thayer and Bangs, 1914) on November 9, 1912 crossed the Bering Strait in a whaleboat and noticed a small number of Ivory Gulls between Cape Dezhnev and Diomede Islands. I never sighted this bird near Uélen nor the shores of Chukchi, but P.T. Butenko once saw four Ivory Gulls in Uélen in spring.

As soon as the *Vega* (Palmén, 1887) became icebound in Pitlekai, lone birds began to appear. On November 3, 1878 A.E. Nordenskjold saw a one-year-old bird (with black head) sitting on the refuse heap near the ship. I.A. Palmén, in my opinion, has erroneously related this sighting to a Sabine gull. Chukchians have told me that the Ivory Gull might nest on Idlidlya Island, but this is altogether unlikely. On September 26–27, 1878, when the *Vega* sailed past Kolyuchin Bay, Stukeberg saw Ivory Gulls in large numbers. This is a very early date for the fall flight and Stukeberg's report is dubious. On Wrangel Island, according to A.I. Mineev, Ivory Gulls are very rare. Only one or two have been seen in a year. Tayan lived on Wrangel for 12 years and told me that Ivory Gulls came to the island every year in fall, but in small numbers. In 1938 he saw a young specimen near Bruch spit in the first days of October and another near Predatel'skaya bay on November 21. The eskimo hunter asserted that he saw a few Ivory Gulls on October 13 along the shore on his way to Cape Hawaii. On November 4 I saw a massive flight in Rodgers Bay. The impression was that of a nesting colony on the wing. Several hundred birds flew past me. In the spring of 1939 I came across a single Ivory Gull on May 14 near Yulii cliff south of Cape Uéring.

The report of A.G. Bannikov (1941, according to G.A. Ushakov) that the Ivory Gull is common in the nesting area there totally contradicts all that has been narrated above about Wrangel Island. Bannikov even describes the conditions of nesting and uses as material evidence a clutch of three eggs found on June 20, 1927. Without doubt, some misunderstanding has occurred in his data, because the Ivory Gull does not lay three eggs.

Members of the *Maud* expedition (Schaanning, 1928) sighted this species during the flight period on ice northwest and west of Wrangel Island.

The naturalist on the vessel *Jeannette*, R.L. Newcomb (1888, pp. 279, 289, and 309), noticed Ivory Gulls in adult and juvenile plumage on Herald Island on September 4, 1879. Later, during June and July, 1880, he caught some when the vessel drifted far into the ice. E. de Long (1883, p. 129) wrote in his diary that Newcomb caught a few Ivory Gulls on September 17, 1879 a few miles off Herald Island, almost at 72° north. F.L. Jaques (1930) noticed three adult Ivory Gulls in August, 1928 near this island.

*Habitat*—The residence of Ivory Gulls during the flight period is confined to ice. To the south of Meechkyn, L.O. Belopol'skii noticed this bird among vast ice fields.

In Providence Bay, I.O. Olenev saw it on ice and along ice edge. In Uélen, P.T. Butenko encountered it in water pools among ice. From the icebound ship *Vega*, O. Nordquist saw Ivory Gulls fly over the ice. A.I. Mineev states that Ivory Gulls were sighted on Wrangel Island mostly over ice. Lone birds flew on two occasions into Rodgers Bay.

On November 4, 1938 during my observation of an intense flight on Rodgers Bay, Ivory Gulls initially flew over the bay and pebbled spit and later the coastal waters. In the second half of their flight, the gulls flew exclusively over the sea, not closer than a few tens of meters from the spit and at different heights, but mostly 10 to 20 m above the water. Some dived into the water for fish and others landed and rested for quite sometime on the water. They did not notice me but even then not one flew closer than 120 to 150 paces. It was an extremely beautiful sight since the gulls stood out sharply like white flakes against a dark strip of low clouds. The coastal water was free of ice for at least a kilometer or two from the shore and this open strip, except for occasional drifting floes, extended to the east and west as far as the eye could see.

In my journey to Cape Uéring I did not see any open ocean. Gulls flew over me, probably disturbed by my movements below a cliff when I was packing some guillemots and murres I had shot. In order to examine the unusual objects within the monotonous ice, Ivory Gulls flew toward the *Vega, Maud,* and other vessels.

*Seasonal phenomena*—Because of the proximity of the Chukchian coasts to the wintering sites, Ivory Gulls arrive at very different times. There is no mass spring flight here. In the spring of 1934 at Uélen, Ivory Gulls were noticed only once, on April 30. In 1879 during the wintering of the *Vega*, A.A.L. Palander shot two old birds on May 16 and another on May 31. O. Nordquist saw a lone bird on May 27. On June 16 a specimen was obtained from Pitlekai. On Wrangel Island, G.A. Ushakov observed the arrival of birds on April 24, 1927 and April 28, 1928, and caught a specimen on June 5, 1929.

In the spring of 1939 I noticed a lone Ivory Gull on Wrangel Island on May 17. The birds seen from the vessel *Jeannette* in mid-June and July, 1880 were probably unpaired. In 1923 the first specimens were noticed from the vessel *Maud* on May 6 at 74°42′ N 166°23′ E, and three Ivory Gulls shot on May 30 at 74°50′ N 165°45′ E. In 1924 the first specimens were recorded on May 27 at 75°54′ N 150°37′ E; one was caught on January 30 at 75°53′ N 150°35′ E and another (two years old) on June 19 at 76°28′ N 145°58′ E. Finally, in 1925 a lone specimen was noticed on May 22 on Chetyrekhstolb Island. Judging from the foregoing observations reported by members of the *Maud* expedition, Ivory Gulls were encountered in the spring in very small numbers and rarely. It may therefore be suggested that this species migrates to nesting sites separately and gradually over a two-month period, i.e., April and May, or even longer.

A young Ivory Gull was caught in spring flight by the *Maud* expedition on October 19, 1924, four miles north of Chetyrekhstolb Island.

In the fall of 1938 on Wrangel Island, according to the reports of hunters, lone birds were seen in the first half of October. On November 4 I witnessed a mass flight on Rodgers Bay. I noticed the first of small flocks at 11:30 local time. At the peak of movement, flocks comprised 5 to 15 birds of different ages. They followed one another at short intervals for 2.5 hours, and every flock flew along the coast in an easterly direction. At the conclusion of the mass flight, a lone Ivory Gull flew back west. On the following day, November 5, frostier and clearer weather set in and part of the lagoon, which until then had been open, lay under ice. Thus there is no doubt that the migration of Gulls preceded the change of weather, especially the onset of a cold snap. A lone bird was noted in Predatel'skaya Bay on November 21. Two young Ivory Gulls were taken by the *Vega* expedition from Irgunnuk on November 21 and 23, 1878. Ivory Gulls undertake fall flight in a relatively compact mass consisting of a large number of birds, while lone birds are more or less rare.

*Habits*—The Ivory Gull does not belong to the group of vociferous birds. When flock after flock of hundreds of these gulls flew past me, I heard their voice only at times. At Cape Yulin a lone bird flew over me with a scream, indicating not so much a frightened state as having sighted a quarry. In my opinion, their voice is similar to a tern's and recalls the scream of Sabine's gull. O. Nordquist transcribed it as guttural notes "hrrr, hrrr".

*Specimen*—1) Wrangel Island, June 5, 1929, ○, G.A. Ushakov.

### *Larus canus brachyrhynchus* Richards—Mew Gull

Reported for St. Lawrence Island. Not found for certain on the Chukchi peninsula and less so on Wrangel Island.

The Mew Gull was reported for St. Lawrence Island by W.W. Cooke (1915, p. 47) and later by A.C. Bent (1921, p. 145), but the basis for such findings is not precisely known. According to H. Friedmann (1934a), three humeri and a sternum about a thousand years old were found in three archaeological excavations on the northwestern extremity of the island. A.M. Bailey (1925, p. 107) has written that a number of Mew Gulls were seen in flight on June 3, 1922 over the Diomede Islands. Specimens were not collected and the observer could well have erred in identifying the birds by sight.

In my work *Fauna of Anadyr Region* (Portenko, 1939b, II, p. 12) I expressed an adverse opinion about the finding of the Mew Gull, i.e., its subspecies *L.c. kamtschatchensis* Bp., on the Anadyr seacoast. It seems even less probable for the Chukchi coast. Nevertheless, I do not exclude the possibility of an accidental flight of not only the Kamchatka and the American subspecies, but also the Siberian *L.c. maior* Midd. (the latter from the Kolyma side to the northwestern part of the peninsula).

### 86. *Larus argentatus vegae* Palmén

### *Larus argentatus birulae* Pleske—Herring Gull

*Local names*—Chukchian: ya-áyak; amnunkin-yayak, yayak in the records of the *Vega* expedition. In Eskimo: ugrak, ukhrak in Providence Bay; ū-răk′ on St. Lawrence Island.

*Distribution and status*—Nests on the Chukchi peninsula. More common on the south coast. Nests, but is not numerous on Wrangel Island. Leaves in winter.

E.M. Meller collected a flying specimen on May 26, 1939 near Pereval'naya station. On May 8, 1956 I saw Herring Gulls in the northern part of Krest Bay near Égvekinot. P.T. Butenko encountered gulls of this species on September 2, 1932 near Uel'kal' village and I found them common in nesting sites on August 6 of the same year near Notapenmen village. In the summer of 1931, L.O. Belopol'skii (1934) noticed Herring Gulls in the sea close to Krest Bay.

It is possible that the specimen collected by Captain Moore in the summer of 1849, and identified (Harting, 1871) as *Larus occidentalis* Audubon, originated from Providence Bay or from the most proximate section of the shore. W.H. Dall (Dall and Bannister, 1869, p. 305) used two names for the Herring gull—*Larus argentatus* (var.) Brün and *Larus borealis* Brandt—and considered it numerous in Plover Bay. E.W. Nelson (1883, p. 107) in a much earlier work referred to the Herring Gull on the Chukchi peninsula as *Larus affinis* Reinh. and pointed out that it was abundant in Plover Bay in nesting sites. About the much lighter-colored form, which he called *Larus cachinnans* Rall., Nelson wrote that it was not seen during the cruises of the *Corwin* in 1881, but it may have escaped observation. However, he used later only one name, *Larus cachinnans* (Nelson, 1887, p. 54), and thought that these gulls were common to some extent in Plover Bay. L.M. Starokadomskii brought to the Zoological Museum of the Academy of Sciences specimens of Herring Gulls he collected in Providence Bay and in Émma Bay in September, 1912 and July and August, 1914. C. Amory (Riley, 1918) caught a male and female in Émma Bay on August 4 and 5, 1914, and A.M. Bailey (1925) obtained a small number of them in early July, 1921. At the end of August, 1932, I came across in Providence Bay broods of undoubtedly local origin. In 1934 I saw only adult birds in Émma Bay on September 7 and 9. In July, 1938 I again visited the nesting sites of Herring Gulls in Providence Bay and had the impression that these birds somewhat surpassed the population of Glaucous Gulls. Finally, on September 14, 1939 I noticed broods floating in Émma Bay. A.P. Kuzyakin wrote to me that he encountered these gulls fairly evenly along the entire seacoast from Providence Bay to Uélen.

According to an eyewitness account by H. Friedmann (1932a), two specimens were collected in the summer of 1930 on St. Lawrence Island in Gambell village. Of the two gulls obtained by O.J. Murie (1936), one sported adult winter plumage. According to F.H. Fay and T.J. Cade (1959), at least 50 pairs nested in the islands of Kuzata lagoon. As reported to me by the local inhabitants, Herring Gulls also nested under similar conditions in other parts of St. Lawrence Island. An adult male was caught on July 23, 1953 in Murphy Bay and a specimen was obtained on July 10, 1950 from Boxer Bay. E.G.F. Sauer and E.K. Urban (1964) saw Herring Gulls while traveling by boat to Kangi village in 1960 only on June 14.

In the collection of the Institute of Zoology, Academy of Sciences of the USSR, a female is preserved which was caught by I.G. Voznesenskii on August 5, 1843 in Mechigmensk Gulf. I noticed Herring Gulls in small numbers in Lawrence Bay on August 19, 1932, August 13 and 14, 1933, and September 10, 1939. A.P. Kuzyakin found a nest there with a clutch on July 7, 1957. Five kilometers south of the bay, in the tundra, he also came across a pair and sighted mainly two- and three-year-olds along the seacoast. On May 20, 1970 V.V. Leonovich noticed a pair in a colony of cormorants.

As elucidated by H. Friedmann (see Bailey, 1943, p. 101), a specimen preserved in alcohol, collected by Captain K.L. Hooper on Bol'shoi Diomede Island in September, 1880 and transferred to the U.S. National Museum ought to be included in this species. As a result of incorrect identification, this specimen was long considered in ornithological literature as the basis for extending the range of *Larus schistisagus* north up to the Bering Strait. A.M. Bailey saw small numbers of Herring Gulls on June 3 and 25, 1922 around the Diomede Islands where they probably nested. On June 23, 1934 on Bol'shoi Diomede Island I noticed Herring Gulls, among which was a two-year-old. They flew by the shore but their nests could not be detected.

E.E. Arngol'd brought to the Zoological Museum of the Academy of Sciences a young specimen collected in September, 1912 near Cape Dezhnev. In the environs of Uélen I found Herring Gulls in small numbers. I tracked their 1933 fall flight as well as their arrival in the spring of 1934, but the flight was not well expressed. In summer, around the lagoons, I encountered individual pairs, in one case even two pairs, but I could not find the nests. On July 2, 1934 on Uélen spit I came across a flock of three-year-olds which had molted into the final adult plumage. Therefore, unpaired birds spent the summer here. In the environs of Uélen, Glaucous Gulls exceeded the population of Herring Gulls, which became more common only at some distance away from the seashore.

On July 5 and 12, 1934 in a kekur* in the southwestern corner of Inchoun lagoon, I found a few nesting pairs of Herring Gulls and one pair of Glaucous Gulls. During the transect along the Kol'oam-Véem River, I had the chance to study day after day how the population of Glaucous Gulls decreased while that of Herring Gulls increased as I moved farther inland from the sea. Possibly one pair of Glaucous Gulls nested in the estuary itself; upstream only individuals flying in search of food were encountered. In contrast, Herring Gulls nested along the entire stretch of the river, although only a few pairs were seen. I found an abandoned nest with fledgelings and older birds swooped down at me repeatedly. On Kool'ong Lake I noticed lone individuals flying. On the Utte-Véem River, Herring Gulls nested in separate pairs, while Glaucous Gulls sometimes flew over examining the water pools. In the lower reaches of the Utte-Véem River, Herring Gulls were numerous, but rarer along its middle reaches.

During my trip by dog sled in the spring of 1934, I occasionally came across Herring Gulls along the high rocky coast from Mitkulen to Cape Serdtse-Kamen'. On May 20 I noticed that Herring Gulls were sighted far more rarely than Glaucous Gulls west of Énmitagin village (near Mitkulen). Before this, on May 19, I did not see a single bird between Seitun and Seishan. On May 18 I had seen some occasionally at Cape Serdtse-Kamen'. E.W. Nelson (1883, p. 107; *Larus affinis* Reinh.) stated

*Bank of gravel pushed ashore by river ice—Ed.

that Herring Gulls were abundant at all points of the Chukchi coast where the *Corwin* happened to anchor. They were also sighted frequently a few miles from the coast along which the ship traveled. On June 29, 1881 they were found in large numbers, particularly at Cape Serdtse-Kamen' where they nested. On May 17, 1934 I encountered a pair between Neshkan and Énmelin villages. Between June 29 and July 2, V.V. Leonovich discovered colonies in the bird bazaars at Seishan, where they remained aloof from Glaucous Gulls. Four nests of Herring Gulls were found on an island in the lake at Énurmino.

Chukchians told members of the *Vega* expedition (Palmén, 1887) in 1879 that the gulls which they called "yayak" spent the entire winter in polynyas* in ice and nested on Cape Dzhénrétlen. This report on wintering was marked with a question mark by I.A. Palmén and also appears improbable to me. I might agree only that under conditions of abundance of water pools in the ice would some birds stay until mid-winter. In the spring of 1879 O. Nordquist sighted on May 12 near the vessel a bird the size of a Glaucous Gull which the Chukchians called "yayak". A very similar bird had been seen two days before. On June 1 a specimen was brought from Pidlin, on June 10 four from Neshkan, and on June 14 two from Padl'onna village (between Neshkan and Tepkan). On that same day five or six gulls remained near the vessel and one was shot. On June 17 a two-year-old was caught in Pitlekai. At that time Herring Gulls were quite common around the vessel, but by June 27, they were less common than Glaucous Gulls. On July 1 they were no longer seen around the vessel but were noticed between Pitlekai and Tepkan, and were sighted on July 1 and 2 on a strait on which the ice was opening up west of Neshkan. On July 11, O. Nordquist noticed one bird in Pitlekai. Besides individuals, the expedition obtained clutches of eggs from Pitlekai and Idlidlya Island. On the same island J. Koren (1910) obtained a clutch on June 29, 1909. On August 31, 1879 R.L. Newcomb (1888, p. 279), the naturalist of the expedition *Jeannette,* obtained a few Herring Gulls in Kolyuchin Bay. L.M. Starokadomskii obtained a specimen shot on Kolyuchin Bay (67°04′ N and 174°37′ W) on August 15, 1914. J. Koren found this species of gulls abundant on Kolyuchi Island in early July, 1909. According to my observations in 1938, Herring Gulls nested on this island together with Glaucous Gulls.

At Kilometer 91 on the Amguéma River in the interior of the Chukchi peninsula, I often saw Herring Gulls flying in single file over the river and tundra (once even high above the mountain valley) in the second and third decades of June, 1956.

According to the observations of A.A. Kishchinskii in 1970, the Herring Gull is a common nesting bird in the Vankarém lowland. It was encountered more often in the coastal tundra. One colony was found on an island in Nutauga lagoon. A colony of 80 to 85 pairs had settled on a sandy island in Amguéma lagoon on an area 80 m × 20 m (together with 5 or 6 pairs of Glaucous Gulls). Herring Gulls nested similarly on tiny islands in tundra lakes. Finally, they were encountered along the Ekug-Véem River up to 20 to 25 km inland from the sea.

E.W. Nelson (1883, p. 107) noticed Herring Gulls in the summer of 1881 in

* Open water between pack ice-floes — Ed.

Vankarém. On August 31, 1939 I sighted from the ship Herring Gulls feeding on the water at Two Pilots spit between the Amguéma estuary and Cape Schmidt. They were common on the north coast of the Chukchi peninsula. On Cape Schmidt this species was sighted by members of the *vega* expedition on September 12–18, 1878. The collections of A.A. Savich include a specimen caught in the spring of 1915 at Cape Schmidt, but extracts from the diary cited by V.M. Artobolevskii (1927), in my opinion pertain more to a Glaucous Gull judging from the early date of arrival and the name "white gull". V.Ya. Isaev told me that Herring Gulls were common on Cape Schmidt. In August, 1938 I saw them flying there along the shores.

A.I. Argentov in his articles mentions Cape Yakan as a habitat; unfortunately it is difficult to correlate his data with any definite species of gull. E.E. Arngol'd brought to the Zoological Museum of the Academy of Sciences a specimen collected on September 2, 1911 at Cape Shelagskii, and L.M. Starokadomskii brought in another specimen shot on August 23, 1913 over Chaun Bay (69° 37′ N 170° 30′ E). Around this bay, in the latter half of July, 1933, four birds were caught by S.G. Pavlov. A.P. Andriyashev saw many Herring Gulls in Pevek and its environs on September 3 and 6, 1946. V.D. Lebedev and V.R. Filin (1959) saw them at the same site in Pevek from May 22 through September 8, 1958. On the west shore of Chaun Bay, according to these observers, this species was particularly abundant. C. Amory caught a female on August 17, 1914 on Aiok Island.

According to the observations of J. Koren (Thayer and Bangs, 1914), Herring Gulls were abundant along the entire north coast of the Chukchi peninsula. On September 10, 1912 he saw broods and adult birds at Cape Kiber and on July 12, 1912 came across a nesting colony of both Herring and Glaucous Gulls 30 miles east of Baranov Bol'shoi. A.I. Argentov also recalls sighting some type of gull in that area. According to S.A. Buturlin (1906b), Herring Gulls were more abundant than Common and Glaucous gulls in the Kolyma delta.

A.I. Mineev and V.R. Vlasova state that the Herring Gull was not rare and regularly nested on Wrangel Island. This was confirmed by a collection of specimens of adult birds and fledgelings. However, in the fall of 1938 I failed to sight a single bird on this island and could literally count my encounters in 1939. On June 7 I saw a few among the other arrivals. On June 8 and 9 a pair swooped at me and undoubtedly had already occupied the nesting area. On August 28 Herring Gulls were sighted occasionally along the shore as my ship sailed around the island. S.M. Uspenskii, R.L. Beme, and A.G. Velizhanin (1963) detected no Herring Gulls in 1960.

*Habitat*—The nesting sites of Herring Gulls are extremely diverse. According to L.O. Belopol'skii, in Krest Bay they nest on spits or islands. In the rocky sections of the Chukchi peninsula I found that they often settled in colonies, at times together with Glaucous Gulls. I noticed nesting areas, for example, on the eastern side of the entrance to Providence Bay. They were recognizable from afar by grass thickets on the ledges and terraces, since the breeding activity of gulls promotes soil formation and fertilization. On Kolyuchi Island I found similar small mixed colonies, the Herring Gulls choosing the upper sections of the rocks. In Inchoun lagoon colonies were formed in a kekur by the shore. Although the kekur was not very high, the colony was actually inaccessible because the walls were quite steep. East of Predatel'skaya Bay, on Wrangel Island, pairs of Herring Gulls settled on the spit immediately at the time of arrival.

Tundra lakes constitute a special type of nesting site. On August 6, 1932, near Notapenmen I happened to enter a network of small lakes in the tundra not far from the low-land seacoast. I assumed that Herring Gulls nested there since several swooped toward me. Near the lower reaches of the Utte-Véem River I found a nest on a tiny island in a tundra lake. J. Koren encountered a nesting colony on a tundra lake east of Baranov Bol'shoi.

Herring Gulls are inhabitants of rivers. On the Kol'oam River I found a nest on a rock in a small but broad rift. I was also told that some type of gulls nested on the island in the Amguéma estuary. J. Koren collected an egg of a Herring Gull from an island in Kolyma delta. According to Buturlin, this species of gull is abundant in the tundra as well as in the forested section of the delta.

Outside of the nesting area or nesting period, the abode of Herring Gulls depends primarily on the availability of food. In search of it they fly hours along the seacoast, but do not move particularly away from it. In Krest Bay, during the walrus season, L.O. Belopol'skii happened to see gulls at a distance of about 20 km from the coast, resting on the ice on which walruses were being skinned. According to my observations, around Uélen, Herring Gulls remained in the lagoons for as long as the tundra provided them with food. In the late fall of 1933, when life in the tundra comes almost to a standstill, gulls were mostly sighted over coastal waters. In the spring of 1934 I noticed them in the lagoons as soon as polynyas appeared in the ice. I saw them often by the channels joining the lagoons with each other or with the sea. They landed on the ice in the sea and appeared tired from their long flight. Resting flocks gathered at times on Uélen spit. During a trip on the Utte-Véem and Kol'oam-Véem Rivers I noticed that Herring Gulls were often confined to the rifts where they could catch food. They landed to rest or to peck at prey on both sandy and pebbled spits.

*Arrival*—In 1931 L.O. Belopol'skii reported the appearance of Herring Gulls in Krest Bay on April 30. In the spring of 1934 I noticed the first pair on my way from Neshkan to Énmelin on May 17. The next day I came across them occasionally on Cape Serdtse-Kamen' and farther on, between Seitun and Mitkulen, on May 20. On May 21 I encountered flocks on Uélen spit. Journeying by dog sled along the shore ice between Uélen and Cape Dezhnev on May 25 I saw very few of these birds. On May 31 lone birds flew above the channels intersecting Uélen spit. On June 2 I saw this species on the ice opposite Uélen. Herring gulls were sighted in the tundra only on June 7 and were hostile. Thus for about a fortnight after their arrival they did not occupy the nesting sections. There is a significant gap in the observations of the *Vega* expedition on the arrival of this species. In the spring of 1879 O. Nordquist sighted on May 12 a somewhat large gull which reportedly had circled the *Vega* two days earlier, but a reliable specimen was only obtained on June 1. Other findings have already been listed by me while reviewing the range. It should be noted that a two-year-old, obviously nonbreeding bird was caught on June 17. On June 27 it was reported that Herring Gulls had become rarer, which I think is explained by the commencement of brooding.

In 1956 I arrived in Krest Bay only by June 8. Herring Gulls had already arrived there, although evidently quite earlier. A flock flew high overhead and its note could be heard from afar. On June 10 I heard call on the Amguéma at Kilometer 91. A pair had settled near the houses of the village where they and the migratory sandpipers were confined to thawed patches.

On Wrangel Island in the spring of 1939 I noticed the first Herring Gulls on June 8. I collected an unpaired female on the Mamontovaya River and saw a pair above the coastal waters. On June 8 and 9 the birds, probably the same pair, tried to attack me, indicating that they had occupied the nesting section.

The Hering Gull arrives later than the Glaucous Gull and, unlike the latter, follows not only sea but also land routes toward the Chukchi peninsula crossing, for example, the Anadyr basin.

*Nidification*—Based on measurements of gonads of more than 20 adult Herring Gulls in final plumage (Tables 1 and 2), I have reached the conclusion that on attaining maturity Herring Gulls do not nest every year. Table 1 and 2 present data on gonadal size for specimens of my Anadyr and Chukchi series sequentially by season.

I cannot resist drawing attention to the sharp difference in the state of gonads in some specimens caught almost simultaneously and to other inconsistencies as well. A male from the Tanyurer estuary on August 3, 1931 had the largest testes, while a male from the midreaches of the Kol'oam-Véem River on August 22, 1934 had the smallest. A female from the Tanyurer estuary on August 31, 1931 had an ovary in which the largest follicle was 5 mm, while a female from the lower reaches of Utte-Véem River on July 11, 1934 had an ovary with a uniform fine-grained structure, indicating she had not laid at all. It is quite obvious that some of the specimens listed in Tables 1 and 2 were nonnesting birds, viz., males of July 24 and August 22 and females of July 11 and 24 and August 4. It is not without interest that the female I caught on the Mamontovaya River, judging from the marbled pattern on the

**Table 1. Size of testes (mm) of nesting and unpaired Herring Gulls in final adult plumage**

| Date | Left | Right | Locality |
|---|---|---|---|
| July 10 | 10 × 7 | 10 × 7 | Tumanskaya in the Anadyr Basin |
| July 10 | 9 × 4 | 8 × 3 | |
| July 10 | 8 × 4 | 6 × 3 | Utte-Véem River |
| July 11 | 7 × 3 | 6 × 2 | -do- |
| July 13 | 10 × 4 | — | Cape Gek |
| July 24 | 6 × 4 | 4 × 3 | Novo-mariinsk |
| August 3 | 15 × 10 | 10 × 6 | Tanyurer |
| August 22 | 5 × 3 | 4 × 2 | Kol'oam-Véem River |
| August 31 | 10 × 4 | 8 × 3 | Tanyurer |
| September 9 | 10 × 4 | 8 × 3 | -do- |

Table 2. Condition of ovaries in Herring Gulls

| Date | Structure of ovary or diameter of largest follicle | Locality |
|---|---|---|
| May 21 | Largest follicle 10 mm | Uélen |
| May 29 | -do- 5 mm | -do- |
| June 7 | -do- 17 mm<br>Length of ovary 20 mm | Mamontovaya |
| June 10 | Largest follicle 5 mm | Tumanskaya |
| July 11 | Ovary fine-grained | Utte-Véem River |
| July 24 | -do- | Novo-Mariinsk |
| August 4 | -do- | Tanyurer |
| August 31 | Largest follicle 5 mm | -do- |

worn-out tail feathers, was a four-year-old (hatched in 1936). Although she remained single and did not breed, her ovary revealed a high degree of development.

I found no seasonal changes in the amount of subcutaneous adipose deposits in these particular specimens; this feature corresponds to sexual activity in many species. Evidently the gulls from Anadyr were emaciated mainly due to fluctuations in availability of food there. The birds from the Chukchi peninsula and Wrangel Island contained small deposits of subcutaneous fat.

Upon occupying the nesting area, Herring Gulls drive away intruders. They swoop down on humans from the side as well as from above, scream, and exhibit different degrees of aggression depending on the situation. In the spring of 1934 at Uélen I experienced my first attack by gulls on June 7, and in the spring of 1939 on Wrangel Island on June 8. Such attacks continue throughout the summer and even fall until the young birds become independent. In 1932 in Providence Bay gulls flew at me when I stood by their nest on August 26 and 28, and in 1934 on the Kol'oam River on August 22. E.W. Nelson (1883, p. 107) states that on June 26, 1881 Herring Gulls were just preparing to nest on Plover Bay, while on Cape Serdtse-Kamen' they had already nested by June 29. J. Koren found incubated eggs on Idlidlya Island on June 29, 1909. On July 1, 1879 the *Vega* expedition was given a clutch from Pitlekai, on July 2 three clutches from Idlidlya Island, and on July 9 two clutches from Pitlekai. The sizes of these eggs are given below (in the order in which the clutches were received):

| | I | | II (possibly a clutch) | | | | III | | |
|---|---|---|---|---|---|---|---|---|---|
| Length, mm | 71.5 | 67 | 80 | 74 | 73.5 | 72 | 75 | 72 | 71 |
| Width, mm | 50 | 52 | 47 | 50 | 48.5 | 45 | 49 | 47 | 49 |
| Weight, g | 6.25 | 5.93 | 5.93 | 5.69 | 5.70 | 5.20 | 6.37 | 6.44 | 5.85 |

| | IV | | V | | VI | |
|---|---|---|---|---|---|---|
| Length, mm | 73.5 | 74 | 77 | 75 | 69 | 69 |
| Width, mm | 50.5 | 48.8 | 48 | 48 | 49 | 49 |
| Weight, g | 6.57 | 6.64 | 6.30 | | 6.75 | 6.74 ? |

The color of the eggs varied widely, but their shell was less rough than that of Glaucous Gulls.

J. Koren found eggs on June 26, 1912 on an island in the Kolyma delta in a nest built of grass and placed on the roots of a large driftwood trunk. Other eggs, better incubated, were collected on July 12 of the same year from a tundra lake in Baranov Bol'shoi. On July 13, 1938 in Providence Bay I saw Herring Gulls resting in nests. On July 7, 1957, A.P. Kuzyakin found a nest on Lawrence Bay with three highly incubated eggs. The nest could be approached only by descending on a branch since it was placed on a small ledge of a high, rocky, and almost sheer drop 5 m from the top. The gulls remained silent and could not be heard even some distance away. On the ledge sat a cormorant, which the gulls did not attempt to chase away.

Most birds avoid close proximity with Herring Gulls, including their young, but I saw Glaucous Gulls and cormorants beside them time and again. According to A.A. Kishchinskii, nests of Common Eiders, King Eiders, Brent Geese, Black-throated Loons, and Glaucous Gulls were placed near those of Herring Gulls on a tiny island in a lagoon of the Amguéma. On July 3, 1970 incubated clutches (one or two eggs each) were found in 38 of the nests examined, while 6 contained chicks that had just hatched. On a tiny island in Nutauge lagoon on July 15 eggs were still present in three nests while a fourth contained one egg and two chicks (Figs. 5 and 6).

On July 5, 1970 at Énurmino, V.V. Leonovich found four clutches with three, three, two, and one eggs. These were related clutches and none were incubated. Nearby were nests of Common Eiders, also with eggs, but most of their contents had been taken, probably by gulls.

In Rodgers Bay on Wrangel Island a small downy chick was collected on July 8, 1932. On the Kol'oam-Véem River on August 21, 1934 I noticed two fledgelings, one of which attempted to flutter its wings while the other could already fly. On another day I saw a young gull flying over the river. In Providence Bay on August 26 and 28, 1923 I encountered young gulls still as a clutch. One of them went down to the spit while the others remained on the rocks. Although the young birds flew well, adults swooped at me as at the beginning of summer. In 1939 I noticed broods of Herring Gulls swimming in Émma Bay. On Cape Kiber J. Koren saw on September 10, 1911 young fledged birds which were nevertheless still being fed by adults. In 1946 near Pevek, A.P. Andriyashev saw young ones flying on September 3.

In 1934 at Uélen I caught the first of three-year-olds on June 15, somewhat later than the first arrival of adult birds. On July 2 I observed on Uélen spit a flock consisting exclusively of three-year-olds. Thus, it is clear that nonnesting three-year-olds usually live apart from adult nesting birds. In my diaries I find only one note about a two-year-old: "sighted over coastal waters, Uélen, July 28, 1934."

*Departure*—I observed the departure in Uélen, fall of 1933. At the end of August, Herring Gulls were already uncommon. During the first twenty days of September they could be seen at sea, their numbers decreasing with each successive day. I saw the last one on October 1. E.E. Arngol'd caught a young female at Cape Dezhnev on September 22, 1912. N.M. Vakulenko noticed a dark young individual in Rodgers Bay as late as October 9, 1934.

*Food*—The stomachs of the Herring Gulls I collected contained mostly amorphous remains of all types of discards or digested fish meat; very often the stomachs were empty. I observed these birds perched on a dog's corpse along with Glaucous Gulls, to which they conceded first place. On the Kol'oam-Véem River I once noticed a Glaucous Gull breaking open a loach; a Herring Gull waited patiently two paces away, evidently hoping for the leftovers.

In the stomachs of specimens caught by the *Vega* expedition were bits of bones, wool (probably seal), fragments of *Hyas arenaria,* and possibly dog excrement. The stomach of a young gull contained many feathers, seeds of *Empetrum,* and a kernel of *Rubus chamaemorus.* This bird was emaciated and probably gathered berries to offset acute starvation.

E.M. Meller found tiny bits of deer skin in the stomach of one Herring Gull. L.O. Belopol'skii observed these gulls many times on walrus carcasses either floating or cast ashore, some with their sides already ripped open. Lemming predominated in the specimens examined by A.A. Kishchinskii. Food remains also contained bullheads, bits of fish, and *Mesidothea.* Herring Gulls also ingest bits of carcasses of seals, walruses, whales, foxes, and other animals. In search of food they fly over the tundra and lakes, but not over the sea where Glaucous Gulls predominate. S.A. Buturlin (1960b, p. 9) wrote: "I saw a pair of Herring Gulls easily tear up a large, healthy, Black-throated Loon". I have never seen gulls attack loons and cannot imagine how a healthy loon could submit to such an attack and become prey. Finally, the stomach of a Herring Gull caught on Wrangel Island on June 8, 1939 contained the fur and bones of an arctic lemming.

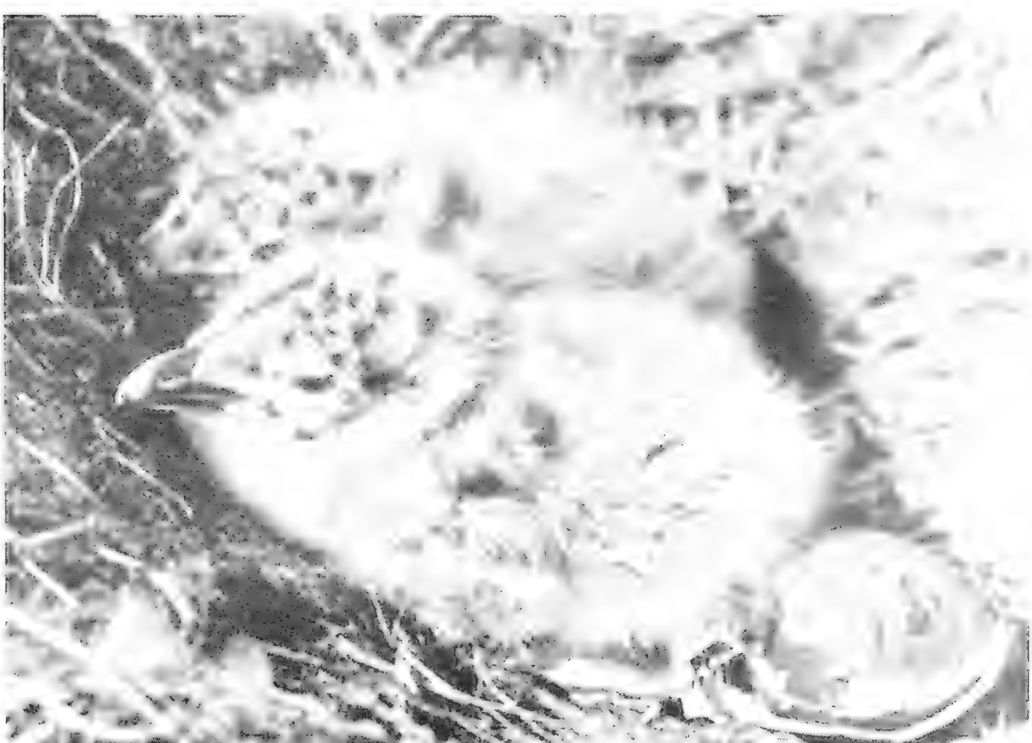
*Economic importance*—The role of Herring Gull in the overall economy of the tundra could well be twofold. On the one hand it removes carrion and all types of refuse and thus is useful. On the other hand, because it is a fairly large predator, it destroys various small animals ranging from marine invertebrates to fish, birds, and small mammals. As an object of economic utility, the Herring Gull under present-day conditions of the Chukchi peninsula and Wrangel Island plays an altogether insignificant role. Attempts have been made at different times to dress the skins of gulls but this industry has not caught on locally since to shoot them clearly, deliver, and neatly prepare skins is a laborious and unremunerative task.

Collecting the eggs of Herring Gull is not widely practiced due to the absence of large and readily accessible colonies. Collection on rocks is also unsafe. A.I. Argentov (1861a, p. 486) wrote concerning the collection of eggs of gulls regardless of the species): "It is no easy job to gather eggs of gulls by the sea. The hunter has to climb steep rocks and move along precipitous ledges overhanging the water. One might see on the ledge of a steep cliff fifty nests with large gull eggs inside them, but as the drop is great and the ledge high overhead, collection means risking life and limb. Anyone tempted to such folly ought to consider the possibility of the entire lot having already been incubated". V.D. Lebedev and V.R. Filin have reported that the eggs of Herring Gulls are even now collected by people around Chaun Bay for table use.

*Systematics*—Subsequent to a revision of the subspecies of Herring Gulls under-

Fig. 5. Herring Gull *Larus argentatus* Pontopp. on the nesting site. Amguéma lagoon. July 3, 1970. Photo by A.A. Kishc̆hinskii.

Fig. 6. Recently hatched chick of Herring Gull *Larus argentatus* Pontopp. Amguéma lagoon. August 3, 1970. Photo by A.A. Kishchinskii.



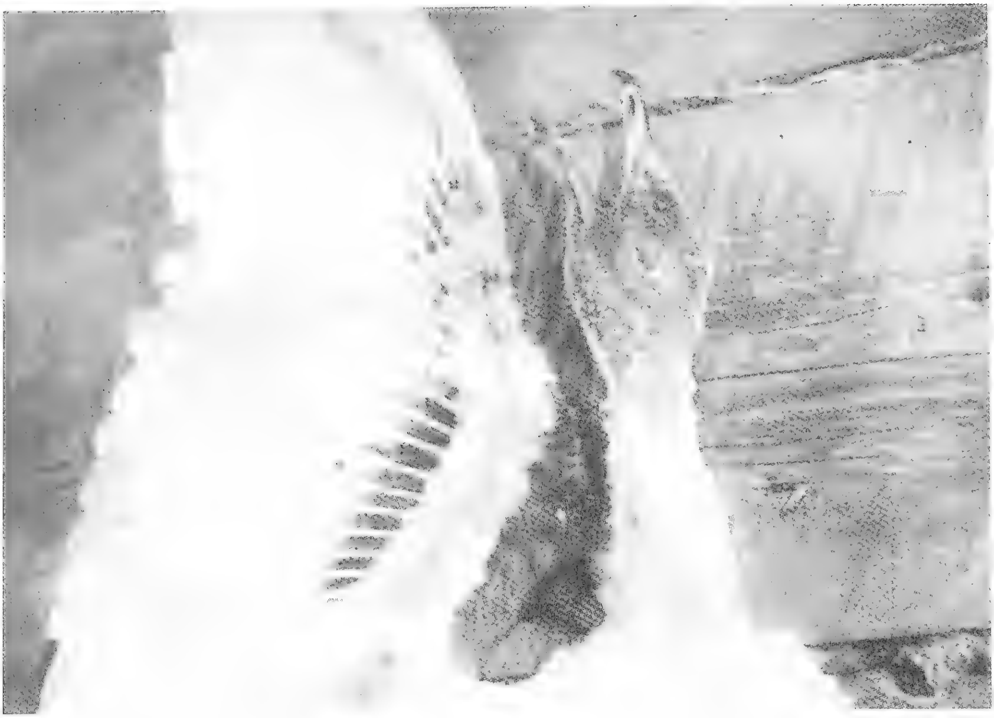


Fig. 7. Distribution of down on the head and neck of Glaucous Gull *Larus hyperboreus* Gunn. Wrangel Island. September 15, 1938.

Fig. 8. Female Crested Auklet *Aethia cristatella* (Pall.) which flew on the vessel near Two Pilots spit. September 2, 1939.

taken for my Anadyr work (Portenko, 1939b, pt. II, pp. 18–19), I returned repeatedly to the old material in connection with new findings and altered my conception a little of the subspecies of these birds. As in 1939, I would still assign the name *Larus argentatus* to the Herring Gull and not *Larus fuscus,* although I am not entirely certain of the independent status of Lesser Black-headed Gulls.

*Larus argentatus vegae* Palm. It possesses very stable distinctive features. The color of the plumage falls midway between the extremely dark and very light coloration of the various subspecies of Herring Gulls. That is, *L. a. vegae* occupies an intermediate position between *L. a. heuglini* Bree and *L. a. argentatus* Pentopp. The eye-ring is cinnabar-red; the legs are of different shades of body color and never as fully yellow as in the Lesser Black-headed Gull. The color of the legs depends on the blood supply, numbing of tarsi due to cold, blood decomposition in preserved specimens, etc. I have drawn sketches of a few legs of Herring Gulls and introduced yellowish, pinkish, and even violet tones in their coloration.

The description of body color is highly subjective and it is of interest to give some examples. O. Nordquist, in particular, provides the following. In an adult bird caught on June 1, 1879 the legs as well as the feet were white anteriorly and violet-pink laterally and posteriorly. In older birds obtained from Neshkan on June 10 and Padl'onna on June 14 the legs were light-yellow-violet. An adult specimen shot from the ship on June 14 had light violet legs; its metatarsals and webs were spotted in a yellowish pattern. A second specimen from Padl'onna collected on June 14 had light violet legs, somewhat lighter on the front surface of the metatarsus.

The legs of a three-year-old male collected in Rodgers Bay on July 18, 1931 were described by A.I. Mineev as pink, the digits and web as reddish-brown. E.M. Meller noted on the label that the digits of an adult gull were light gray and the webs dark pink. The legs of freshly killed birds which I observed varied in shade from flesh-colored like the human wrist, to more yellowish, at times pink, at times lilac, and even occasionally deep lilac. S.A. Buturlin (1934, I, p. 156) has described the leg color of *L. a. vegae* as "purplish-pink".

*L. a. vegae* alone crosses to Alaska, and thus the Bering Strait constitutes a good eastern limit of the range of this subspecies. Recently I succeeded in ascertaining its southern limit too. Along the seacoast, nesting sites of *L. a. vegae* reach Cape Navarin; in the interior parts of Koryatz Zemlya, it nests along the Achai-Vayam, Apuk, and Kultushnaya Rivers; specimens with characteristics transitional toward *L. a. schistisagus* Stejn. occur in the lower reaches of the Apuk and Kultushnaya.

*L. argentatus birulae* Pleske is characterized by an extremely pale plumage independent of wear or fading. On the label of a specimen caught in Chaun Bay on August 23, 1913, L.M. Starokadomskii noted the flesh-color of the legs.

This subspecies undoubtedly nests on Novosibirsk Island and in the Lena estuary. Very light-colored gulls are encountered west up to Taimyr and east up to the Chukchi peninsula. Evidently these are nonnesting individuals of *L. a. birulae.*

*Specimens of L. a. vegae*—1) Cape Shelagskii, September 2, 1911, ♂, Arngol'd; 2) Cape Dezhnev, September 22, 1912, ♀, 1° anno, Arngol'd; 3) Providence Bay, September 25, 1912, ♂ 1° anno, Starokadomskii, 4) Émma Bay, July 31, 1914, ♀, Starokadomskii; 5 and 6) Providence Bay, August 12, 1914, ♀♀, Arngol'd; 7) Rodgers Bay, July 8, 1931, ♂, Vlasova; 8) eastern part of Wrangel Island, September 9, 1931, ♂ 1° anno, Vlasova; 9) Rodgers Bay, July 8, 1932, Juv, Vlasova; 10) Chaun Bay, latter half of July, 1933, O, Pavlov; 11 to 13) same place, end of July, 1933 O O, Pavlov; 14) Cape Dezhnev, September 12, 1933, ♀, 1° anno, Portenko; 15) Uélen, May 21, 1935, ♀, Portenko; 16) same place, May 29, 1934, ♀, Portenko; 17) same place, June 15, 1934, ♀ 3° anno, Portenko; 18) midreaches of the Utte-Véem River, July 10, 1934, ♂, Portenko; 19 and 20) lower reaches of the Utte-Véem River, July 11, 1934, ♂♀, Portenko; 21) midreaches of the Kol'oam-Véem River, August 22, 1934, ♂, Portenko; 22) Uélen, August 28, 1934, O 1° anno, Portenko; 23) Pereval'naya Station, May 26, 1939, ♀, Meller; and 24) lower reaches of the Mamontovaya River, June 7, 1939, ♀ 4° anno, Portenko.

*Specimens of L. birulae*—1) Mechigmensk Gulf, August 5, 1843, ♀, Voznesenskii; 2) Chaun Bay, August 23, 1913, ♂, Starokadomskii; and 3) Kolyuchin Bay, August 15, 1914, ♂, Starokadomskii.

### *Larus argentatus schistisagus* Stejn.*

*Distribution and status*—A few unreliable references exist relating to the finding of this gull on the seacoast of the Chukchi peninsula up to Bering Strait and north of it.

L.O. Belopol'skii (1933, p. 427) wrote that in the Anadyr region, in which he included Krest Bay, this "species" was as abundant as the Herring Gull. Of the two specimens he collected one was an adult female shot on Meechken Island, June 21, 1931. Later (Belopol'skii, 1934), he altered the older text and deleted the reference to the Meechken specimen. There was no specimen of *Larus schistisagus* in his collection. Thus, his find for Krest Bay remains unconfirmed.

In the monograph by S.F. Baird and colleagues (Baird, Brewer, and Ridgway, 1884, p. 229) the finding of *L. schistisagus* in Plover Bay was questioned and a reference made to Nelson. E.W. Nelson (1887, pp. 53–54), however, does not mention this bay at all. He simply states the chance that the gulls caught in 1894 by Moore, Captain of the *Plover,* were *Larus affinis* although they might have been *Larus schistisagus.* The site of Moore's specimens has not been accurately established. J. Dixon (1918, pp. 388–391) suggests Providence Bay as their probable origin, or some other place on the Chukchi coast north up to Lawrence Bay. All subsequent references to the occurrence of *L. a. schistisagus* in the Plover Bay or Providence Bay originate from the vague guesses of Nelson and should be disregarded.

The next reference is that of W.F. Henninger (1910), who reported three clutches of *Larus schistisagus* collected on June 4, 1905 on the Siberian coast near the Bering Strait. According to this description, the eggs were intermediate in size between those of *Larus marinus* and *Larus cachinnans.* Of the six eggs collected, one was unusually large. It is difficult to verify the accuracy of identification of the species from these characteristics in the absence of the bird specimen. The above site of the

* Slaty-backed Gull. Now *Larus schistisagus* — Ed.

find, "near Bering Strait," is extremely vague. Had the eggs actually been those of *L. a. schistisagus*, then the three clutches could only have been gathered at a place where this gull is abundant. Hence there is some justification for relating this find to the Chukchi coast.

R. Ridgway (1882, p. 60) reported a gull collected by K.M. Hooper, Captain of the *Corwin,* on Herald Island and now preserved in alcohol in the U.S. National Museum. There is no doubt that E.W. Nelson had this same specimen in mind (Nelson, 1883, p. 107, under the name *Larus marinus;* 1887, p. 53), when he wrote that Hopper caught a specimen of *Larus schistisagus* in September, 1880 on Bol'shoi Diomede Island, which was later presented to the U.S. National Museum. J. Dwight (1925, p. 229) therefore gives two sites for the find of a single specimen. Ultimately, Friedmann (see Bailey, 1943, p. 101) cleared the misunderstanding by reidentifying the specimen preserved in alcohol as *L. argentatus vegae.*

Since these few vague references do not provide a positive resolution to the localities of *L. schistisagus*, the occurrence of this species on the Chukchi peninsula cannot be considered established. Nevertheless, chance flights are entirely possible and have already been established for Alaska.

I devoted a special article (Portenko, 1963) to the taxonomy of this gull and showed that it is only a subspecies of Herring Gull; hence it should be named *Larus argentatus schistisagus* Stejn.

### 87. *Larus (argentatus) glaucescens* Naum.—Glaucous-winged Gull

*Distribution and status*—Unpaired individuals are sometimes sighted on the south coast of the Chukchi peninsula, even though nesting on St. Lawrence Island has not been established with absolute certainty.

According to L.O. Belopol'skii (1933 and 1934), the Glaucous-winged Gull was very common in Krest Bay and encountered more often than in Anadyr lagoon. W.S. Brooks (1915) reportedly found this species in Providence Bay, but since he did not refer to the Glaucous Gull—a species very common there—his report arouses doubts. P.T. Butenko caught a young female on November 25, 1937 in Plover Bay. In Providence Bay on July 12, 1938 a large gull with gray, and not black, wing tips flew past me. It is not possible to guarantee the accuracy of identification of a bird in flight, but nevertheless I have assumed that it was a Glaucous-winged Gull.

On St. Lawrence Island, June 20, 1913, Brooks found an egg. O.J. Murie (1936) gathered a small series of mostly young gulls, of which six were identified by J. Grinell as *Larus glaucescens.* According to the observations of F.L. Jaques (1930), midsummer of 1928 in the zone between 58° and 63° N in the Bering Sea, a few large gulls were sighted, flying only north or south. This zone separated the range of *L. hyperboreus* to the north and *L. glaucescens* to the south. According to F.H. Fay and T.J. Cade (1959), the range of Glaucous-winged Gulls on St. Lawrence Island has not been clearly established. Adult specimens have not been identified even once, but a few yearlings were sighted and one caught in August, 1957 in Kuzata lagoon. In June, 1953 and 1954, a few pairs of large, light-colored gulls nested there together with *L. argentatus* and eiders. According to the eskimos, small numbers of such gulls also inhabited the rocks west of Boxer Bay. H. Friedmann (1934a) found among the bones of archaeological excavations some belonging to *L. hyperboreus* and *L. glaucescens,* with the latter predominating.

The collections brought by the *Vega* expedition contained a very sooty and soiled skin of a gull, which after cleaning was identified by I.A. Palmén (1887) as that of an adult *L. glaucescens.* Unfortunately, only the sex was marked on the label ("♀") with no reference to the locality. R.L. Newcomb (1888, p. 279), the naturalist of the *Jeannette* expedition, caught a few Glaucous-winged Gulls in Kolyuchin Bay, but he was not sufficiently competent to positively establish their identity.

Seasonal phenomena have not been studied. The ovary of a young female caught by P.T. Butenko was filmy, subcutaneous adipose deposits were absent, weight was 735 g, and wingspan was 41.2 cm.

*Systematics of subspecies*—The taxonomic status of the Glaucous-winged Gull has not been firmly established, the reason invariably being inadequacy of collection and field observations. To be on the safe side, the Glaucous-winged Gull is more often considered a separate species.

The following three synonyms are commonly used: 1) *Larus glaucescens,* 2) *L. hyperboreus glaucescens,* and 3) *L. argentatus glaucescens.* In my *Fauna of Anadyr Region* (Portenko, 1939b, II, p. 22), I subscribe to the second alternative.

A study of large Pacific Ocean gulls had led me recently to a different view. First of all, I succeeded in proving, with good justification, that *L. schistisagus* is only a subspecies of *L. argentatus.* The article by F.S.L. Williamson and L.J. Peyton (1963) on the existence of a series of transitional forms between *L. glaucescens* and *L. argentatus* brings to mind that *L. glaucescens* is also perhaps a subspecies of *L. argentatus.* These transitions were found in specimens of gulls from Cook Bay and its environs in southwest Alaska. Unfortunately, for lack of material on Glaucous-winged Gull from the western part of the range (for example, the east coast of Kamchatka), it is not possible to establish conclusively the true relationship between *L. glaucescens* and *L. argentatus schistisagus.*

*Specimens*—Plover Bay, November 25, 1937, ♀, 1° anno, Butenko.

### 88. *Larus hyperboreus pallidissimus* Port.—Glaucous Gull

*Local names*—Chukchian: ya-ayak; yttak and tchikerga in the records of the *Vega* expedition. In Eskimo: naguya in Providence Bay; nă-gho′-yă-pĭk on St. Lawrence Island.

*Distribution and status*—Nests on the south coast of the Chukchi peninsula, common but not abundant, and fewer in number than the Herring Gull; encountered from time to time in winter. Nests on the north coast, very common, abundant, and more numerous than the Herring Gull; leaves in winter. Does not nest in the interior of the peninsula. Nests on Wrangel Island, very common, but not all that abundant; flies away in winter.

In Krest Bay I noticed some stray specimens on September 2, 1932 near Uel'kal' village and on August 6 near Notapenmen village.

E.W. Nelson (1883, p. 106) wrote that the Glaucous Gull was one of the most widespread and common gulls in the Bering Sea and on the adjoining Arctic coast. In the summer of 1881 it was found at almost every point visited by the *Corwin.* In addition to *Larus barrovianus* Ridgw., Nelson differentiated another form—*Larus leucopterus* Faber— which is smaller in dimensions compared to *L. glaucus* Brünn. This small-sized Glaucous Gull, according to him, ranged throughout the Bering Sea coast, on the mainland as well as the islands, and occurred on both sides of the Arctic, but was less common north of the strait.

On June 26, 1881 these gulls were particularly numerous in Plover Bay. L.M. Starokadomskii and E.E. Arngol'd who brought specimens of Herring Gull in 1912 and 1914 from Providence Bay, for some reason did not bring a single Glaucous Gull. W.S. Brooks (1915), as noted above, reportedly found the nesting site of *L. glaucescens* in Providence Bay, but did not refer at all to *L. hyperboreus.* The Glaucous Gull was often sighted by A.M. Bailey (1925) in Émma Bay. Nesting birds were seen by him along rocks in Providence Bay in the summer of 1921. S.R. Buturlin (1934, vol. 1) collected adult birds on August 29, 1925 in the aforementioned region and also noticed some young ones around the 20th. According to I.O. Olenev, the Glaucous Gull was common in the nesting areas of Providence Bay. I, too, found this species common there: in 1932 at the end of August I found broods by their nests and caught some specimens. Birds were also flying over Émma Bay on September 7 and 9, 1934. In July, 1938 I had an opportunity to carry out a detailed examination of the coasts inhabited by them. Stray nesting pairs were visible on the rocks in Providence Bay along the seacoast east up to village Sireniki. At places the birds gathered in flocks. My impression was that Glaucous Gulls were only marginally fewer in number than Herring Gulls. P.T. Butenko caught a great number of specimens in the nesting area there and also during the flight period. He sighted Glaucous Gulls and caught a few in November, 1937, but did not see them in the Bay itself during winter.

H.C. Oberholser (1918, p. 471), who examined specimens from museums in North America, referred to specimens from Cape Chaplin (Indian Point) caught on August 9, 1910. I saw a small number at the Cape on August 24, 1932, among which were a few three-year-olds in white plumage, perhaps the basis for the erroneous description of distinct species, *L. hutchinsii* Richardson. P.T. Butenko during winter residence on Cape Chaplin from January 11 through February 18, 1938 saw Glaucous Gulls and caught ten specimens, among which were two three-year-olds.

According to an eyewitness account by E.W. Nelson (1887, p. 52, *Larus barrovianus*), this species nests on St. Lawrence Island. H. Friedmann (1932a) was informed that during the landing of the expedition led by E.G. Harriman on the island on July 13, 1899, Glaucous Gulls were sighted and one collected. O.J. Murie also collected a few young birds. In the opinion of F.H. Fay and T.J. Cade (1959) the population of Glaucous Gulls on St. Lawrence Island was second only to that kittiwakes, becoming the most common species from November through April. Twenty-five pairs nested in 1950 along a 3-mile stretch of the coast northwest of Boxer Bay. An adult male was caught there on August 1, 1950, and a young male shot in Gambell on May 12, 1953. According to E.G.F. Sauer and E.K. Urban (1964), in 1960, Glaucous Gulls nested in small groups on the tops of coastal rocks on both sides of Boxer Bay. H. Friedmann (1934a) found the bones of this species in archaeological excavations.

According to the observations of F.L. Jaques (1930), in midsummer of 1928 Glaucous Gulls were not encountered in the Bering Sea south of St. Lawrence Island.

J. Cassin (1863, p. 325) wrote that in August, 1855, the Glaucous Gull was abundant on the shores of Senyavin Strait and Arakamchechen Island. Specimens collected there by V. Stimpson were identified by E. Coues (1863, p. 294) as three-year-old *Larus hutchinsii.* H.C. Oberholser has also referred to some Senyavin specimens.

On August 13, and 14, 1932 I saw many Glaucous Gulls in Lawrence Bay and flocks on the sea ice on my way to Dezhnev village on August 18. According to A.P. Kuzyakin, in 1957, individual pairs of Glaucous Gulls were sighted from Providence Bay to Uélen. On June 25 an adult bird was caught near Akkani, and on July 7 a nest with an egg found at the end of Lawrence Bay, on Bennet Island. In the bird bazaar at Naukan these gulls were somewhat more numerous.

V.V. Leonovich on June 13, 1971 saw Glaucous Gulls over the sea at Lawrence Bay; on June 20 he noticed a pair in a colony of cormorants.

According to E.W. Nelson (1887, p. 52), Glaucous Gulls nested on the Diomede Islands. H.C. Oberholser mentions a specimen caught in July, 1881. J. Koren (Thayer and Bangs, 1914) caught a young Glaucous Gull on Diomede on December 7, 1912. According to K.W. Kenyon and J.W. Brooks (1960), this gull nests on Little Diomede Island and a large colony lives in Fairway, on a rock ledge jutting out over the water 8 miles southeast of the island. The abundance of these birds could also be inferred from the fact that eskimos brought them some two dozen eggs.

H.C. Oberholser mentioned a specimen caught on July 20, 1910 in Uélen. In the register of the Zoological Museum for 1912, under No. 448 a young Glaucous Gull is listed as caught by E.E. Arngol'd near Uélen on August 24, 1911. In 1921 A.M. Bailey (1925) often observed Glaucous Gulls when he was in Uélen. Sheneberg brought to M.A. Mezbier a specimen from Uélen shot on June 20, 1927. According to my observations, Glaucous Gulls nested in small numbers around Uélen, but were often sighted: nonnesting birds of different ages were frequently encountered. On August 16, 1932, during my two-day visit to Uélen, I noticed Glaucous Gulls flying over the ice occasionally. In the fall of 1933 I tracked their fall flight and departure. Glaucous Gulls sometimes disappeared and sometimes were seen again in small or large numbers depending on food conditions; during departure flights I saw large flocks. On October 1 I noticed many young birds which were absent there during August and September. Adults still predominated but two-year-olds were exceptionally rare, keeping generally more to the south. Towards the end of migration, Glaucous Gulls occurred in very large numbers. Depending on the formation of ice, gulls from Uélen moved toward Naukan and Dezhnev villages.

In 1934 I was able to observe Glaucous Gulls from their arrival until fall. On

May 25 in the section of rocky coast under my observation from Naukan to Uélen, these gulls clustered in groups but did not appear to form large colonies. In the cliffs closest to Uélen, I found three nesting pairs on June 17. On May 21, I traversed the entire Uélen spit by dog sled and saw flocks consisting of lone birds, or at least birds which had not yet started to nest. In June young birds of the previous year were seen, but only a small number. White three-year-olds were sighted less often and as single individuals. Outside the nesting sites on cliffs, Glaucous Gulls were observed flying in search of food; they were not rare nor were they abundant.

These gulls nested nowhere on the lagoons, but one pair evidently raised young in the Kol'oam-Véem River estuary. As purely marine birds, Glaucous Gulls do not go beyond the lower reaches of this river and I did not sight them even once in its middle and upper reaches. On August 22 in the lower reaches I saw a flock of eight gathered at a feeding site, and on the following day a lone three-year-old further down the river and a large flock in the estuary itself.

On the rocks of Cape Inchoun, according to my observations on July 2, 1934, Glaucous Gulls nested without forming colonies, although they might be seen as small groups of individuals. I later found a nesting pair on a kekur in the southwest corner of Inchoun lagoon. Glaucous Gulls did not nest on the stretch of the Utte-Véem River I travelled, but occasionally small numbers flew by in search of food. Farther to the west, along the rocky seacoast, I noticed Glaucous Gulls by nesting sites. On May 20, 1934 I encountered them in small groups at places all along the way from Seitun to Mitkulen. On May 19, near Seishan, pools of water had opened up in the ice by a rock and several Glaucous Gulls were perched there. P.T. Butenko came to see me on a dog sled and also observed en route on May 6 many gulls of this species, usually in groups of two or three, between Mitkulen and Seishan villages. In June, 1970 V.V. Leonovich noticed nesting Glaucous and Herring gulls in a large bird bazaar inhabited by murres, guillemots, cormorants, and kittiwakes.

E.W. Nelson (1883, p. 106) refers to Cape Serdtse-Kamen' as one of the sites of *Larus leucopterus*. H.C. Oberholser obtained a specimen from there on July 29, 1910. On the very high rocks of Cape Serdtse-Kamen' on May 18, 1934 I saw these gulls resting in small groups, and also some single ones flying in different directions. I had noted the latter on the previous day, also on my return from Neshkan. Between these villages and Énmelin, I sighted a flock devouring dog carcasses. At the end of June and early July, 1970 V.V. Leonovich saw two small colonies by the coastal rocks near Énurmino village and east of it (20 km) found a large colony of up to 100 pairs among Herring Gulls, guillemots, and cormorants.

At the wintering site of the *Vega* (Palmén, 1887), near Pitlekai, three gulls were sighted on October 13, 1878, and one on November 29; unfortunately their species was not reliably established. Later in the winter not a single bird was sighted. In the spring of 1879 large numbers of gulls were seen on May 11 on Idlidlya Island and it is possible that Glaucous Gulls were among them. On May 14 at Dzhénrétlen, E. Almquist shot an old female and on May 30 at Pitlekai a male evidently three years old. On May 31 quite a large congregation of gulls was seen in the spring floods among which Glaucous Gulls were spotted. On June 1 Chukchians brought two old birds from Pidlin (one male, one female), June 3 a male from Pitlekai, June 10 two Glaucous Gulls from Neshkan, and June 14 two from Padl'onna. On June 15, O. Nordquist noticed them at Dzhénrétlen. By June 27 Glaucous Gulls were more common there than any other species of gull. On a lagoon south of Pitlekai specimens were sighted on June 28 and 30, and large flocks seen between Pitlekai and Tepkan and on an ice-free bay west of Neshkan on July 1 and 2. In addition to skins and skeletons, members of the *Vega* expedition were given eggs of the Glaucous Gull from Pitlekai, Neshkan, and Idlidlya Island where nests were abundant. The eggs of this species were also found on Idlidlya Island by J. Koren (1910). H.C. Oberholser reports five chicks gathered on July 9, 1909 in Kolyuchin Bay and a few chicks from Kolyuchi Island collected on July 3 and 9, 1909. There is no doubt that Oberholser's material was collected by J. Koren, who wrote in one of his articles (Koren, 1910) that Glaucous Gulls were abundant on Kolyuchi Island in early July, 1909. On May 15, 1934 on the ice course from this island to Cape Dzhénrétlen, P.T. Butenko saw a lone Glaucous Gull while I saw three flocks flying high over Kolyuchi. In the latter half of July, 1938 Glaucous Gulls nested in different parts of Kolyuchi Island in small, scattered colonies and I collected some specimens. On May 11, 1934 P.T. Butenko sighted a lone bird near Il'khetan village. On May 13 I saw many gulls of this species resting on the rocks of Cape Onman. My Chukchian companion told me that they nested there every summer. Evidently Glaucous Gulls were found on Cape Onman by members of the *Vega* expedition on September 26, 1878.

In the interior of the country, at Kilometer 91 on the Amguéma River, I encountered a Glaucous Gull only once (June 10, 1956), on a polynya in the river. This was an adult bird that had accidentally strayed onto the river. It bathed in the water and cleansed itself and was probably sick or injured. According to the observations of A.A. Kishchinskii in 1970, in the coastal zone from Vankarém to Cape Schmidt, Glaucous Gulls were nesting but were encountered far more rarely than Herring Gulls. In a lagoon on the Amguéma, for example, only 5 or 6 pairs nested among 80 to 85 pairs of Herring Gulls. In the other lagoon Glaucous Gulls were somewhat more numerous. In the lagoons of the Amguéma, Ukouge, and Nutauge dozens of birds fed regularly. Among the birds feeding in the sea and lagoons at least 50% were immature and nonnesting gulls.

From September 12 through 18, 1878, members of the *Vega* expedition noticed the Glaucous Gull around Ryrkaipiya. Judging from the early dates, A.A. Savich's sightings (Artobolevskii, 1927) of large gulls near the anchorage of the vessel *Corwin* at Cape Schmidt applies to the Glaucous Gull. The gulls there in nesting sites were quite numerous. In early August, 1938, according to my observations, Glaucous Gulls often flew along the shores of Cape Schmidt. On August 31, 1939 I saw them feeding in the water by the ship during its anchorage at Two Pilots spit.

On September 9, 1878 a member of the *Vega* expedition collected a specimen somewhat east of Cape Yakan. E.E. Arngol'd collected a male on September 12, 1911 on Shalurova Island. Judging from the early period of arrival the date of A.I. Argentov (1861a, p. 495) for "very robust" gulls possibly applies to the Glaucous Gull. He referes to the following points of arrival: Yakan, Cape Shelagskii, and

Baranov Bol'shoi. J. Koren observed many young Glaucous Gulls on September 10, 1911 on Cape Kiber; on July 12, 1912 he encountered a dozen pairs nesting with several Herring Gulls 30 miles east of Cape Baranov Bol'shoi, and on July 6 caught a female on the Cape itself.

In 1905 S.A. Buturlin (1906b) considered the Glaucous Gull extremely common in the tundra of the Kolyma delta south to 69° N. He caught many specimens and initially identified them as *Larus glaucescens* Naum., but later corrected his error. J. Koren (Schaanning, 1954) collected an egg, downy young, and adult birds in the Kolyma delta.

Members of the *Maud* expedition (Schaanning, 1928) often sighted Glaucous Gulls in the East Siberian Sea. They were seen on May 25 and June 5, 1925 on Chetyrekhstolb Island and three eggs were gathered there on June 12. On June 24, 1923 several two-year-olds were noticed around 75°22′ N 165°30′ E and one gull sighted September 16, 1923 around 75°57′ N 163°17′ E. Glaucous Gulls were also noticed on August 24, 1924 around 71°15′ N 155°18′ E. On the morning of October 6, 1922 three Glaucous Gulls were sighted at 72°51′ N 181°18′ E, i.e., northwest of Wrangel Island. A.P. Andriyashev came across stray Glaucous Gulls around 73°10′ N 170° E on August 19, 1946 when the icebreaker *North Pole* was in the East Siberian Sea.

According to E.W. Nelson, in 1881, Glaucous Gulls were found nesting on Wrangel Island by members of the *Corwin* expedition. In August, 1911 this gull was caught there by Captain F.E. Kleinschmidt, and on September 17 a young specimen shot by E.E. Arngol'd in the southwestern part of the island (70°53′ N 179°15′ E). According to G.A. Ushakov (Bannikov, 1941) and A.I. Mineev (Portenko, 1937b), the Glaucous Gull was abundant in nesting sites on Wrangel Island. According to my observations in 1938 and 1939, the Glaucous Gull was undoubtedly a common species on Wrangel, but found in comparatively small numbers. I found its nesting sites only at a few places. They nested mostly on Cape Uéring, but pairs were scattered through different points of the murre bazaars over a distance of about 4.0 km. On May 14, 1939 I saw them in individual pairs and in groups. Judging from their behavior, they nested on Bol'shevik and Pillar Capes and near the Klér River estuary, but in far fewer numbers, i.e., one or two pairs at each point. Glaucous Gulls flew toward me during my tour of Ozero spit west of Rodgers Bay and on the spit west of Akatylanva, but I did not obtain definite proof of nesting. Outside of the nesting sites, these gulls were encountered in different parts of the island, mostly along the coasts, but only singly or in small numbers. On September 15, 1938 I steadily shot eight young ones from a good hideout over a two- or three-hour period. Only once, on August 4, 1939, did I come across a two-year-old; Tayan caught a sick three-year-old on August 13.

According to the observations of S.M. Uspenskii and colleagues (1963), in 1960 Glaucous Gulls supposedly nested in every colony of sea birds. On Cape Pillar a colony consisting of a few dozen pairs of exclusively Glaucous Gulls was seen from a plane, yet A.G. Velizhanin (1965) did not encounter them in large numbers anywhere.

On September 4, 1879 the naturalist of the *Jeannette* expedition, R.L. Newcomb (1888, p. 279), noticed a few Glaucous Gulls on Herald Island. According to E.W. Nelson, the Glaucous Gull *Larus glaucus* was found nesting on this island in 1881. In his 1883 work (p. 106) he refers to *Larus leucopterus* in the environs of Herald Island, which is erroneous. On July 30, 1928 F.L. Jaques sighted a solitary bird on a trip from Bering Strait to Herald Island and found it on August 4 nearby the island. This gull was very common in Bering Strait.

The habitats of the Glaucous Gull are restricted by its behavior as purely a bird of the sea. Unlike the Herring Gull, it does not nest along rivers in the interior of the Chukchi peninsula. I encountered a nesting pair only in the Kol'oam-Véem River estuary in the immediate vicinity of the lagoons. J. Koren found a nest on an island in the Kolyma dèlta and a nesting colony on a tiny island in a tundra lake east of Baranov Bol'shoi. In the lagoons of the ice coast Glaucous Gulls were regularly sighted and evidently nested on the spits.

In the coastal zone from Vankarém to the Amguéma, A.A. Kishchinskii found nesting sites of these gulls on the islands in the lagoons and on tundra lakes. In one lake, not far from the Amguéma, 15 km from the sea two pairs nested with two pairs of Herring Gulls. Farther away, deep inside the tundra, there were no Glaucous Gulls, only Herring Gulls. Over the coastal zone of the sea, over the polynyas, and on Cape Vandarém only Glaucous Gulls were encountered.

On two occasions on Wrangel Island I came across nesting sites on spits and though I could not find the nests, without doubt Glaucous Gulls nested there since they swooped at me aggressively. A.I. Mineev (1936, p. 181) has written that Glaucous Gulls select for nesting either the ends of sand spits or more often small sandy islets. G.A. Ushakov has likewise reported that Glaucous Gulls nest on sandy and pebbled coasts, although in smaller numbers than in cliffs.

Cliffs and rocks on the seacoast or in the immediate vicinity of the coast are undoubtedly the most common nesting sites of Glaucous Gulls. In the southwestern corner of Inchoun lagoon I found the nesting site of a pair on the crown of kekur also occupied by a colony of Herring Gulls. A peregrine nested on a rocky cape adjoining the coast where a lagoon covered an extensive area close to the sea. F.L. Jaques has written that on Diomede Island, Glaucous Gulls probably nest on flat-topped islets. I examined these islets on a peak of Bol'shoi Diomede Island and saw Glaucous Gulls resting there, but found no sign of nesting. The columnar islets, resembling classic ruins, are totally inaccessible and serve Glaucous Gulls as observation posts. On the seacoast of Providence Bay, on the rocks east of Uélen, on Inchoun and Onman Capes, and on the shore rocks of Kolyuchi and Wrangel Islands, I saw Glaucous Gulls nesting on cornices, terraces, and on the tops of cliffs. They selected commanding positions on the rocks or at least the upper portions of them, except on Cape Uéring where they occupied less elevated points. Nowhere were they satisfied with such narrow cornices as are occupied by murres or kittiwakes. Their nests were located in the open and not in a sheltered nook or crevice. G.A. Ushakov saw Glaucous Gulls nesting on Wrangel Island either away from the bird bazaars or on the periphery of murre colonies. In Providence Bay, I.O. Olenev found nests mostly above colonies of cormorants. As narrated by the Chukchians, who brought eggs of Glaucous Gulls from Idlidlya Island for members of the *Vega* expedition, nests of these gulls were abundant on a flat upper area of a columnar, isolated ledge.

Outside the nesting site, the Glaucous Gull may be encountered very far into the tundra or out to sea. Like ravens or jaegers it flies over an area scanning the coastline or simply crosses the tundra. In search of food it overflies rivers, but not far from their estuaries. At places of abundant food these gulls, even in the nesting period, gather in flocks or rest together in groups on the spits of rivers and lagoons, and on shoals. However, the coastline of the sea is the main residence of Glaucous Gulls, which always fly in search of food. During the nesting period they are not sighted far out to sea. When I went by ice toward Wrangel Island, I saw kittiwakes and Pomarine Jaegers in Long's Strait, but not so much as a single Glaucous Gull. On the way back via open sea from Naukan to Diomede Islands, I likewise encountered no Glaucous Gulls. Therefore, this gull is essentially a coastal bird.

Around Uélen in spring they were seen on melted water ponds on the ice and in fall their numbers fluctuated according to ice conditions. If the ice was compactly packed along the beach, they flew to polynyas in the lagoons. I repeatedly saw Glaucous Gulls resting on ice. On Wrangel Island I saw them flying over endless ice reefs, dropping on the snow. On August 18, 1932 I encountered these gulls on the ice on my way to the ship from Dezhnev village toward Lawrence Bay. Flocks of them fed on the remains of walrus frozen in the ice. The above-listed findings of the *Maud* expedition show clearly that the Glaucous Gull is encountered at sea far away from shore only during the flight period. Yet in the summer of 1923, on June 24, nonnesting two-year-olds were sighted. In the first half of October, 1937 P.T. Butenko, who travelled by ship along Kamchatka and the shores of Koryatz up to Krest Bay, observed Glaucous Gulls only when the coasts were in sight. A few Glaucous Gulls were seen on October 14 on approaching Krest Bay.

*Arrival*—According to the observations of P.T. Butenko, it was difficult to establish the time of arrival of Glaucous Gulls in the winter of 1938 on Cape Chaplin, since they appeared in midwinter and, depending on ice conditions, disappeared again. On January 11 a gull was sighted on the cape and three Glaucous Gulls sighted at sea. At that time they were a rare phenomenon. From January 14th through the 20th, Butenko made a tour of Arakamchechen Island and Senyavin strait but encountered not even a single gull. On returning to Cape Chaplin on January 30, he lamented the total absence of these birds. However, on January 31 an east wind set in, ice began moving northward, eiders began to appear, and a Glaucous Gull was sighted. A well-organized collection effort yielded results in 2.5 weeks so that by February 9 six specimens were in hand. From February 18 through March 15 Butenko traveled around Providence Bay where Glaucous Gulls were excluded because of local conditions. During his return to Cape Chaplin he sighted this bird on March 16, 21, and 23 and collected a two-year-old on March 27. The next day a snowstorm set in. Northeastern winds and approaching ice drove the seabirds southward for many days. A trip to Yanrakynnot village lasted from April

17 through 21, and upon returning Butenko spotted Glaucous Gulls on April 23. Thus, in spite of interruptions in observations, it was quite evident that Glaucous Gulls wandered in the second half of winter and hence it was difficult to establish the arrival of most of the local birds because of their mobility.

According to the observations of K.W. Kenyon, on Little Diomede Island in 1958, Glaucous Gulls were relatively rare until May 15. In the spring of 1934 at Uélen, P.T. Butenko noticed the first Glaucous Gulls on April 30. About 10 birds were seen at the ice edge that day and about 12 on May 2. On May 6, Butenko went by dog sled from Mitkulen to Seshan and saw many Glaucous Gulls, mostly in groups of two or three. On May 11 he recorded this species near Il'khetan.

On April 25, 1934 I made a round-trip from Vankarém to Cape Schmidt and saw not even one gull. On leaving Vankarém for the east on May 13 I saw my first—an entire colony of Glaucous Gulls on Cape Onman. Later I sighted three flying high above Kolyuchi Island. Spring flights of Glaucous Gulls at great heights closely resemble the aerial formations of ravens. Taking advantage of the air currents rising from the land warmed by the spring sun, Glaucous Gulls soar and only rarely flap their wings. Farther away, on my way toward Uélen, Glaucous Gulls were a common phenomenon all along the rocky coasts. On May 21, even on the outskirts of Uelén, I encountered what appeared to be the last of the flocks on the spit.

According to the observations of members of the *Vega* expedition, numerous gulls were seen in the spring of 1879 even by May 11 on Idlidlya Island. This date should be considered their time of arrival. At Cape Schmidt on May 5, 1915, A.A. Savich slighted the first five or six large gulls to arrive, evidently Glaucous Gulls, since May is too early for the arrival of Herring Gulls. The birds circled high in the air. By May 10 they were already numerous and their din could be heard everywhere. According to A.I. Argentov (1861b, p. 28), gulls appeared around Baranov Bol'shoi only in the first half of May and arrived near Cape Shelagskii in the first few days of May (old calendar). In another article Argentov (1861a, p. 485) states May 19 (7) as the date of arrival of gulls. In 1852 at Cape Yakan a pair of gulls was seen on April 29 or May 1. S.A. Buturlin (Buturlin and Dement'ev, 1934, I, p. 162) noticed the first appearance of Glaucous Gulls on Cape Stolbovoi on May 24, 1905. According to the records of members of the *Maud* expedition, the first Glaucous Gulls were seen in the spring of 1925 on Chetyrekhstolb Island on May 22.

On Wrangel Island, according to A.I. Mineev, Glaucous Gulls appeared in the first arrivals of birds even in the first days of May. In the spring of 1939, Tayan, on returning from a trip to the Klér River estuary, informed me that on May 9 he first saw two and later three Glaucous Gulls. On May 13 I myself saw a pair there flying high and shrieking. My shells hit one and injured the other. On May 13 to 15 I surveyed the rocky shore up to Cape Uéring where there were already many Glaucous Gulls occupying nest sites. After the fright caused by my hunting on Cape Bol'shevik, Glaucous Gulls flew over me shrieking but subsequently returned. Roughly the same thing happened on Cape Pillar. Two pairs lived there; one gull flew with a shriek so close that I shot it in flight. In Rodgers Bay, outside the nesting sites, I saw the first pair only on May 27; they were flying in a westerly direction. On

June 2, west of Somnitel'naya Bay, I noticed a few Glaucous Gulls soaring in a strong wind high over the tundra.

In summarizing the above data, it is clear that on the south coast of the Chukchi peninsula, winter wanderings of Glaucous Gulls obscure the picture of their arrival. This species arrives on the eastern exremity of the penninsula in the very last days of April or early in May. Farther west, in the area of Kolyuchin Bay-Cape Schmidt-Wrangel Island, gulls arrive in the first few days of May and not later than the first half of it. More westward, from Cape Shelagskii to Kolyma and Chetyrekhstolb Island, their arrival is delayed to the latter half of May. This sequence of dates provides a basis to judge the direction of spring flight—from the Bering Strait to the west along the coast.

*Nidification*—Measurements of gonads revealed a coordinated pattern of growth in males and females as is evident from Tables 3 and 4.

Outside the breeding period the testes are no more than 10 to 12 mm long. Maximum size is seen in the last 10 days of May and the first 10 days of June, when mating evidently takes place. In July the testes revert to normal size. In young birds up to three years of age, before they acquire adult plumage, gonadal length does not exceed 4.0 mm; nevertheless a few measurements showed an increase in spring.

The normal length of an ovary does not exceed 15 mm. In mid-May a sharp increase up to 35 mm was recorded and a large racemose ovary seen as late as on July 20. Between these dates enlarged follicles are seen. At other times the gland may have a fine-grained structure or appear filmy to the naked eye. Among young females, even at the end of the first fall, a filmy ovary attains normal length; a very dense and even fine-grained structure has been recorded in three-year-olds.

Subcutaneous adipose deposits do not decrease during the reproductive period.

**Table 3. Size of testes (mm) in male Glaucous Gulls of different ages**

| | Date | Left | Right | Locality |
|---|---|---|---|---|
| Adult males | February 9, 1938 | 10 × 3 | 8 × 2 | Cape Chaplin |
| | May 18, 1938 | 12 × 5 | 11 × 5 | Providence Bay |
| | May 18, 1938 | 17 × 7 | 15 × 6 | -do- |
| | May 18, 1938 | 16 × 6 | 14 × 5 | -do- |
| | May 20, 1934 | 20 × 15 | 18 × 4 | Naukan village |
| | June 6, 1938 | 18 × 7 | 16 × 4 | Providence Bay |
| | July 2, 1939 | 12 × 7 | 10 × 5 | Wrangel Island |
| Adult male | July 25, 1938 | 10 × 4 | 9 × 4 | Kolyuchi Island |
| ♂♂ 1° anno | September 15, 1938 | 4 × 2 | 4 × 2 | Wrangel Island |
| | October 4, 1933 | 4 × 2 | 3 × 2 | Uélen |
| ♂♂ 2° anno | March 27, 1938 | 12 × 3 | 10 × 2 | Cape Chaplin |
| | November 4, 1937 | 3 × 2 | 2 × 2 | Providence Bay |
| ♂ 3° anno | February 9, 1938 | 8 × 2 | 7 × 2 | Cape Chaplin |

**Table 4. Condition of ovaries in female Glaucous Gulls of different ages**

| | Date | Length of ovary, mm | Size of largest follicle, mm | Structure of ovary | Locality |
|---|---|---|---|---|---|
| Adult females | February 9, 1938 | 13 | — | Filmy | Cape Chaplin |
| | February 9, 1938 | 12 | — | — | -do- |
| | February 9, 1938 | 12 | — | — | -do- |
| | May 13, 1939 | 35 | 6 | — | Wrangel Island |
| | May 14, 1879 | — | 3 follicles — 5 mm long, 1 — 4.5 mm, 4 — 4 mm, and 60 small | — | Cape Dzhénrétlen |
| | May 24, 1938 | — | Egg in oviduct | — | Providence Bay |
| | June 4, 1934 | — | 8 | — | Uélen |
| | June 4, 1939 | 20 | 5 | — | Wrangel Island |
| | July 20, 1938 | "Large" | 3 | Racemose | Kolyuchi Island |
| | August 18, 1933 | — | — | Filmy | Uélen |
| | August 26, 1932 | — | — | Fine-grained | Providence Bay |
| | November 4, 1937 | 15 | — | — | -do- |
| | November 19, 1937 | — | — | Filmy | -do- |
| ♀♀ 1° anno | October 5, 1938 | — | — | -do- | Uélen |
| | October 15, 1938 | 12 | — | -do- | Wrangel Island |
| ♀♀ 3° anno | February 9, 1938 | 15 | — | -do- | Cape Chaplin |
| | June 18, 1934 | — | — | Dense, without grains | Uélen |
| | September 30, 1933 | — | — | Fine-grained | Uélen |
| | November 4, 1937 | 14 | — | — | Providence Bay |

Less than 50% of the females caught were emaciated; none of the males were emaciated. All the young gulls caught in mid-September were emaciated, but the October birds were already plump and some even very obese.

Right from the time of arrival Glaucous Gulls begin to fly in formations, soaring high in the air, and subsequently reoccupy old nesting sites. According to the observations of I.O. Olenev in Providence Bay, the breeding period of these gulls coincides with the breeding period of cormorants. He found two eggs in each nest. An egg was found in the oviduct of a female shot on Cape Stoletiya on May 24, 1938. Eggs gathered by W.S. Brooks on St. Lawrence Island on June 20, 1913 were highly incubated. On June 5, 1954, eggs with large embryos were also collected on St. Lawrence Island. On July 7, 1957, A.P. Kuzyakin examined a nest on Be net Island in Lawrence Bay. It was located on the grassy fringe of a coastal cliff. The lon gg was unincubated possibly from a second clutch. Eskimos on Little Diomede Island brought J.W. Brooks about two dozen eggs on June 7, 1953, some in the last stage of incubation. On June 10, 1958, eskimos gathered for K.W. Kenyon whole clutches laid just a few days before. The notable difference in laying periods can only be explained by frequent destruction of clutches.

On the north coast of the Chukchi peninsula, where Glaucous Gulls additionally nest on the north side of the ledges facing the sea, nesting periods are delayed compared with dates for the south coast. V.V. Leonovich saw incubating Glaucous Gulls on June 29, 1970 at Seishan. On June 28, 1879, members of the *Vega* expedition found an egg on the coast of a lagoon in Pitlekai. Chukchians brought eggs to the expedition which had been gathered on July 2 from Idlidlya Island. The nests were constructed of dry grass without feathers. Stray clutches were also collected on July 1 and 2 around Pitlekai and on July 1 in Neshkan village.

Egg sizes according to V. Meves

| | 1 | 2 | | 3 | | 4 | 5 | | 6 |
|---|---|---|---|---|---|---|---|---|---|
| Length, mm | 70 | 77.5 | 72.5 | 79 | 77 | 73.5 | 72 | 72 | 79 |
| Width, mm | 51.5 | 52 | 50 | 50 | 50 | 51.5 | 53.5 | 52.5 | 48 |
| Weight, g | 6.50 | 7.17 | 6.62 | 7.15 | 7.15 | 7.87 | 7.50 | 6.65 | 7.20 |

On July 3, 1970, according to A.A. Kishchinskii, three nests in a large colony of gulls on a sandy islet of the Amguéma lagoon contained three incubated eggs each and the fourth only a recently emerged chick; on July 6 on a lake 15 km from the sea, a downy chick fell into the water from its nest.

On July 29, 1909 on Idlidlya Island, J. Koren found eggs still unincubated, and on July 3 on Kolyuchi Island recently emerged chicks. According to the observations of A.A. Savich, on Cape Schmidt on May 20, 1915, large gulls (probably Glaucous) were already confined to nesting sites and on June 21 were incubating eggs. In a colony of gulls east of Cape Baranov Bol'shoi, J. Koren found rather highly incubated eggs on July 12, 1912, and collected three slightly incubated eggs on June 26 in the Kolyma delta. The nest in Kolyma was located on a mound overgrown with grass. On Chetyrekhstolb Island the *Maud* expedition procured a clutch of three eggs on June 12, 1925.

According to A.I. Mineev ( 1936, pp. 181–182), the nest of a Glaucous Gull on a spit was constructed of algae, moss, twigs, and other material. Outwardly it resembled a rubbish heap disturbed by the surf. In a clutch discovered on Rodgers Bay on June 20, 1932, two eggs were unincubated while the third contained an embryo in which the head had formed. The two preserved eggs were 78.3 mm × 52.6 mm and 77.6 mm × 54.3 mm. Their main background color was turbid olive-sand and the spotting varied in form, size, and color, ranging from dark sepia to pale grayish-violet, and covers the entire surface of the shell fairly evenly.

On occupying nesting sites, Glaucous Gulls are very hostile toward any visitor. In the spring of 1939 on Wrangel Island they swooped at me even in mid-May. These birds become particularly vicious when chicks emerge. On July 12, 1938, I went by motorboat along the shore of Providence Bay and adult gulls swooped at the boat from a great height and pursued it.

According to V.V. Leonovich, on June 28, 1970 near Énurmino village downy nestlings were found beside a nest. He also observed the destruction of seven nests by a brown bear.

J. Koren caught downy nestlings on July 7 and 9, 1917 in the Kolyma delta. T.J. Cade found a nest with four fledged but still nonflying, nestlings on August 1, 1950 on St. Lawrence Island. From July 19 through 26, 1938, I saw a few nests on Kolyuchi Island with two small nestlings each. On my approach the adults rose with a shriek and swooped energetically, but did not come particularly close. A.A. Savich has reported that on the ledger of Cape Schmidt on August 10, 1914 nestlings still remained in all of the gull nests.

I generally came across flying fledgelings only in the last 10 days of August. On Cape Schmidt I noticed the first young birds flying on August 8, 1938. In the small lakes of Plover Spit and on rocks adjacent to it, I came across broods on August 26 and 28, 1932. Two-year-olds and adult birds, strangers to the broods, helped the young gulls. In the fall of 1934 I noticed the first young Glaucous Gulls flying in the lower reaches of the Kol'oam-Véem River on August 22. In 1938 I saw the first young to fly on Bruch spit on the northeast shore of Wrangel on August 20. In the last 10 days of that month they lived together with their parents but occasionally assembled separately from them. On September 10, 1911 on Cape Kiber, J. Koren saw young ones flying which were still being fed by their parents.

I came across nonbreeding birds and two- and three-year-olds on the Chukchi peninsula as well as on Wrangel Island singly and occasionally also north of Bering Strait, and more often small groups on the south coast. Late in fall I saw none; evidently they had migrated early.

*Departure*—In the lower reaches of the Kolyma in Sukharnoe village, S.A. Buturlin sighted the Glaucous Gull for the last time on October 2, 1905. A.A. Savich has recorded in his diary that even on October 9, 1914, gulls enlivened the barren rocks of Cape Schmidt. According to A.I. Mineev (1936), on Wrangel Island Glaucous Gulls, old and young, were still flying in mid-September along the coast in search of food. They disappeared gradually, some only in October. In the fall of 1938 I noticed near Rodgers Bay adult birds for the last time on September 15. They flew away earlier than the young, which were sighted for a very long time thereafter. On September 29 I saw a flock of seven young Glaucous Gulls and a few more flying as a separate group behind them. Single birds were collected occasionally throughout October. Tayan saw Glaucous Gulls on Bruch spit early in October and in Somnitel'naya Bay on October 24. I noticed young Glaucous Gulls for the last time on November 4; they were flying east beyond Rodgers Bay together with ivory gulls. In 1960, according to A.G. Velizhanin, the departure of Glaucous Gulls from Wrangel Island continued from the end of August throughout September. At the end of September many young gulls still remained on Cape Blossom. According to observations made in the fall of 1878 by members of the *Vega* expedition, gulls (probably of this species) were found on Cape Onman on September 26. At the site of the *Vega* anchorage some species of gulls were sighted on October 13 and even November 29, but unfortunately the species not identified. Not a single bird was recorded there in winter.

According to my observations, in the fall of 1933 at Uélen Glaucous Gulls disappeared and reappeared in large or small numbers in the second half of August through the first half of September. On September 18 I encountered a very large flock over the shoals, a precursor of departure, and saw large flocks for the last time on October 3. The gulls were confined to the lagoons which on the following day gradually iced over. Eventually Glaucous Gulls were seen only in small numbers and at times only young ones spotted. On October 20 an east wind scattered the ice in the sea and Glaucous Gulls reappeared. A very large number of gulls was recorded on October 22 and 25, days with large waves. On October 27 a north wind blew and the ice again moved toward Uélen. On that day gulls disappeared entirely, but continued to be encountered around Naukan and near Dezhnev village, where they later withdrew also before the advancing ice. In the fall of the following year (1934) I saw a large flock of Glaucous Gulls on August 23. These gulls did not winter around Uélen; however, J. Koren caught a young gull on Diomede Island on December 7, 1912.

Glaucous Gulls stayed longer on the south coast of the Chukchi peninsula. In 1937 P.T. Butenko saw them in Krest Bay on the eve of his departure on October 21. In Providence Bay he saw them in his very first hunt on November 4 and collected a few. He noticed this gull for the last time that year on November 21, although Glaucous Gulls were sighted a few times in the latter half of winter.

*Food*—The stomachs of glaucous gulls I collected in Providence Bay on August 26, 1932 contained the following contents: one—a few white and dark-colored feathers and four minute stones, and another—vertebrae and other bones of tiny fish, about ten minute stones, and one feather. The other stomachs were either empty, contained a homogeneous mass that could not be identified, or digested remains of fish.

The following were found in the stomachs of birds caught on Wrangel Island: 1) September 15, 1938. About 7 g of meat and bits of bones, probably of carrion, 3 minute blades of grass adhering to the meat, 50 bits of tiny (3 to 15 mm) pebbles. 2) Same day. Highly digested mass of tiny crustaceans (*Cumacea*), 15 minute pebbles, and 70 to 80 average-sized and small stones. 3) Same day. Twenty-five shells and ground mass of crustaceans (*Cumacea*), 18 bits of pebbles 5 to 12 mm across, weighing 3 g. 4) June 4, 1939. Crab's claws. 5) August 13, 1939. Three crabs and pebbles 12 mm across.

The stomach of a female shot at Dzhénrétlen on May 14, 1879 contained only a few tiny feathers, while the stomach of a male caught in Pitlekai on June 3 showed the remains of a mollusk.

Birds are not rare prey to the Glaucous Gull. On June 17, 1934 near Uélen I watched a Glaucous Gull and a Long-tailed Jaeger chase a phalarope, which only saved itself by hiding under the ice. On May 14, 1939 at Cape Uéring Glaucous Gulls feasted right in front of my eyes on a murre before I could reach the downed bird. Only the skin and bones, without head, remained; all of the flesh had been picked clean by the gulls with their beaks. In a very similar manner these gulls tore an eider to pieces I had shot in Uélen. Along with other gulls, Glaucous Gulls quite often catch small marine organisms. On August 25, 1932 I noticed them in a large flock consisting of murres, kittiwakes, fulmars, and cormorants. This mass of birds covered an area of at least a few square kilometers, extending from Plover spit to the entrance of Émma Bay, and fed on plankton floating on the water surface in calm and warm weather.

On Wrangel Island I sometimes saw Glaucous Gulls flying along the shore together with kittiwakes. On August 15, 1938 near the Krasnyi Flag River estuary, on a closed lagoon, I saw kittiwakes and terns catching small fish which Jaeger snatched from them. Glaucous Gulls frequented this place. I did not actually see them catch small fish, but saw some tearing a bullhead apart on the Kol'oam-Véem River. Glaucous Gulls are habituated to feeding on the remains of fresh walrus. On Diomede Island I saw a huge lump of floating whale fat on which a few gulls sat while others surrounded it. In Diomede village in the fall of 1933 Glaucous Gulls collected in large numbers on the leftovers of the whale industry washed ashore. I saw these gulls time and again atop the carcasses of dead dogs, sometimes in large numbers and sometimes in the company of ravens.

According to F.H. Fay and T.J. Cade, on the sea near St. Lawrence Island Glaucous Gulls often gather on ice at places where walrus are skinned and feed on leftovers and remnants. In May they follow walrus south of the island at the time of parturition and feed on the placenta, etc., and also on their faces which often consist of bits of undigested marine invertebrates. In the bird bazaars Glaucous Gulls live almost exclusively on the eggs and young of guillemots, puffins, and especially murres.

Carrion is not at all a chance food for this carnivorous bird. I saw a peculiar distribution of feathers on the body of a Glaucous Gull, which was undoubtedly associated with its mode of feeding on carrion. In a plucked specimen I noticed that the head and part of the neck were not covered with down, which densely covered other body parts. Thus the distribution of downy cover in the Glaucous Gull is similar to that of vultures. Such similarity is hardly accidental! For comparison I plucked the feathers of a Sabine's Gull and found that its head was covered with down. Feathers of the downy cover of the Glaucous Gull stand out strikingly in photographs.

*Weight*—Weights taken by P.T. Butenko and myself provide a basis for drawing certain conclusions. Glaucous Gulls from Wrangel Island are indistinguishable in weight from specimens from Providence Bay. An adult female from Wrangel Island weighed 1,375 g, while similar females from Providence Bay weighed 1,880, 1,645, and 1,050 g. A two-year-old weighed 1,175 g and a three-year-old 1,165 g. Thus young birds are considerably lighter than adults. Males from Providence Bay weighed 2,105, 2,105, and 1,970 g and two-year-olds 1,640 g. A three-year-old of undetermined sex from Wrangel Island weighed 1,350 g. Thus males are considerably heavier than females.

*Economic importance*—All that has been said of the Herring Gull applies to the Glaucous Gull, except that the latter, being a far heavier and more abundant bird, plays a more significant role. However, its role is limited to the coastal zone because this species is almost totally absent in the interior of the Chukchi peninsula.

Kern has reported (Cassin, 1863, p. 325) that Chukchian boys caught Glaucous Gulls along the banks of Senyavin Strait with sling and that their skins were used in dressmaking along with those of other birds. No trace of this practice is evident today.

*Systematics*—In an extremely good collection consisting of about 80 specimens of Glaucous Gulls in adult plumage, about 50 in the first breeding plumage, and a few in transitional plumage, I could distinguish two good subspecies for the Arctic coast of Eurasia, one of which I described as a new subspecies (Portenko, 1939a).

At present, therefore, three subspecies of this gull have been established.

1. ***Larus hyperboreus hyperboreus*** Gunn. In adult birds, the color of the mantle is dark; in one-year-olds the pattern of brown coloration is also very dark along the sides of upper and lower body (Fig. 7). The measured wingspan of 34 adult specimens was 46.9 (43.0 to 50.9) cm.

*Range:* From Kola Peninsula in the east to Yenisey Strait inclusive.

2. ***Larus hyperboreus pallidissimus*** Port. The color of the mantle of adult birds is very pale and the white color is better developed. In the first breedinig plumage the brown pattern is paler and there is more white evident on the upper and lower sides. In well-prepared skins these differences are prominent not only in a series but also upon comparing any two specimens. The wingspan of 44 adult birds was 47.6 (43.7 to 51.2) cm.

*Range:* From the eastern parts of the Taimyr peninsula to the Chukchi peninsula; Wrangel Island and, judging from a lone specimen, Ellesmirova Land. According to I.N. Gabrielson and F.K. Lincoln, the east Siberian subspecies inhabits St. Mathew and St. Paul Islands.

3. ***Larus hyperboreus barrovianus*** Ridgway. The color of the mantle is darker than that of *L. h. pallidissimus.* The size is smaller; the beak is less massive.

*Range:* Arctic and western coast of Alaska, south to Bristol Bay.

The eyelids of a male from Naukan on May 29, 1934 (type description *pallidissimus*) were yellow and the legs were a pink-flesh color.

According to V.F. Vlassova, the eyelids of a female from Wrangel Island were reddish-brown, the legs whitish with pink webs, and the eyes bright yellow. In the records of O. Nordquist (Palmén, 1887) the edges of the eyelids among adult females were orange-yellow, the legs violet, and the irises light yellow. The legs of a male were flesh-colored. The beak of a two-year-old was light gray-violet with a black tip, the corners of the mouth and posterior part of the nostrils were light reddish-violet, and the legs white with a faint transition to a darker color.

*Specimens*—1) Shalaurova Island, 69°58′ N 173°8′ E, September 12, 1911, ♂, Arngol'd; 2) southwestern part of Wrangel, 70°53′ N 179°15′ E, September 17, 1911, ○ 1° anno, Arngol'd; 3 and 4) Uélen, May 20 and June 26, 1927, ○, Sheneberg; 5) Wrangel Island, June 2, 1928, ♂, G.A. Ushakov; 6) East Siberian Sea, 70°53′ N 175°34′ E August 14, 1929, ○ 3° anno, P.V. Ushakov; 7) southeastern part of Wrangel, June 16, 1931, ♀, Vlasova; 8) Meechken Island, June 21, 1931, ♀, Belopol'skii; 9 and 10) Providence Bay, August 26, 1932, ♀, ○ 1° anno, Portenko; 11)

Uélen, August 18, 1933, ♀, Portenko; 12) same place, September 30, 1933, ♀ 3° anno, Portenko 13) same place, October 4, 1933, ♂ 1° anno, Portenko; 14 and 15) same place, October 5, 1933, ♀, ○ 1° anno, Portenko; 16) Naukan village, May 29, 1934, ♀, Portenko; 17) Uélen, June 4, 1934, ♀, Portenko; 18) same place, June 18, 1934, ♀ 3° anno, Portenko; 19 to 21) Plover Bay, November 4, 1937, ♀, ♂ 2° anno, ♀ 3° anno, Butenko; 22) same place, November 19, 1937, ♀, Butenko; 23 to 28) Cape Chaplin, February 9, 1938, ♂ ♀ ♀ ♀, ♂ ♀ 3° anno, Butenko; 29) same place, March 27, 1938, ♂ 2° anno, Butenko; 30 to 32) Cape Stoletiya, May 18, 1938, ♂♂, Butenko; 33) same place, May 24, 1938, ♀, Butenko; 34) same place, June 4, 1938, ○ 3° anno, Butenko; 35) Plover Bay, June 6, 1938, ♂, Butenko; 36 and 37) Providence Bay, July 6 and 20, 1938, ♀ ○, Butenko; 38 and 39) Kolyuchi Island, July 20 and 25, 1938, ♂ ♀, Portenko; 40 to 47) Wrangel Island, Krasnaya Glina landmark, September 15, 1938, ♂ ♀ ○ ○ 1° anno, Protenko; 48) Rodgers Bay, September 17, 1938, ○ 1° anno, Portenko; 49 and 50) same place, October 15 and 28, 1938, ♀ ♀ 1° anno, Portenko; 51) Cape pillar, May 13, 1939, ♂, Portenko; 52) Klér river estuary, May 13, 1939, ♀, Portenko; 53) Wrangel Island, Akatylanva landmark, June 4, 1939, ♀, Portenko; 54) Wrangel Island, Ozero lagoon, July 2, 1939, ♂, Portenko; and 55) Rodgers Bay, August 13, 1939, ○ 3° anno, Portenko.

*Biological specimens*—1) Clutch of two eggs, Rodgers Bay, June 20, 1932, Vlasova.

### 89. *Rissa tridactyla pollicaris* Stejn.— Black-legged Kittiwake

*Local names*—Chukchian: kakytekh, kakytegk, more rarely kat'ek[2]; kakyttack in the records of the *Vega* expedition. In Eskimo: kakhsyunek in Providence Bay and kŏk-syngʻuk on St. Lawrence Island.

*Distribution and status*—Nests in colonies on the shores of the Chukchi peninsula as well as on Wrangel Island, but sporadically. Abundant. Leaves in winter.

According to the observations of L.O. Belopol'skii (1934) Black-legged, Kittiwakes nest in small numbers on the coastal rocks between Krest Bay and Anadyr lagoon . He noticed this kittiwake time and again but, compared with other larids, it was relatively rare. P.T. Butenko saw these larids on September 2, 1932 around Uél'kal' village on the western side of the entrance to Krest Bay, while I encountered solitary birds and flocks flying along the coast near Notapenmen village on the east side of the bay and also caught one specimen. Belopol'skii tracked the spring flight in 1931 around Cape Bering.

The Black-legged Kittiwake has been sighted in Providence Bay by many observers. W.H. Dall (Dall and Bannister, 1869, p. 305) wrote that these larids were abundant in Plover Bay. T.H. Bean (1883, p. 167) found them there in large numbers from August 11 through 14 and September 12 through 17, 1880. L.M. Starokadomskii and E.E. Arngol'd caught specimens in Émma Bay on July 20 and 22, 1913. In this same bay A.M. Bailey (1925) noticed flocks every day for one week, from

[2] The name "asek" given by A.G. Velizhanin (1965) relates to the Long-tailed Duck.

July 1 through 7, 1921, but could find no nesting sites there. From August 25 through 28, 1932, I saw kittiwakes on cliffs from the eastern side of the entrance to Providence Bay, where they undoubtedly nested, and also noticed them feeding inside the bay. Butenko encountered late arrivals on November 25, 1937 in Plover Bay, and in May, 1938 caught kittiwakes on Cape Stoletiya and near Sireniki village, and on July 20 caught breeding birds in Providence Bay. In July, 1938 I found small colonies at different places in Providence Bay; sometimes I encountered kittiwakes flying over the beach. Thus this larid was common there though not abundant.

In 1913, W.S. Brooks (1915) collected specimens on Cape Chaplin (Indian Point). On August 24, 1932 I noticed kittiwakes flying along the surf line, but they did not nest there because of the low coasts of this cape. P.T. Butenko observed their arrival.

E.W. Nelson (1883) encountered Black-legged Kittiwakes on the shores of St. Lawrence Island in the last days of June, 1881 and A. Seale (1899) saw very large numbers on July 1, 1896. On July 24 and 25, 1914, F.S. Hersey (1916) noticed them nesting with other seabirds on high cliffs in the northwestern part of the island. A.M. Bailey (1925) found them in abundance and on July 8, 1921 saw many nests on the rocks below Savunga village. F.L. Jaques (1930) in the summer of 1928 frequently came across kittiwakes over the sea around the island. According to H. Friedmann (1932a), seven specimens were caught in October, 1930 near Gambell village. O.J. Murie (1936) gathered four young specimens. According to F.H. Fay and T.J. Cade (1959), the Black-legged Kittiwake is the most common species of all larids. A few large colonies were seen on the rocky shores of the southwestern extremity of the island and in the middle of its north shore. Small groups, up to 12 or more birds, were sighted throughout summer on a lake near Gambell village, and large flocks on the beach between Gambell and Boxer Bay. In the opinion of E.G.F. Sauer (Sauer and Urban, 1964), the Black-legged Kittiwake is found in large numbers on the island. On a fresh-water lake near Boxer Bay hundreds, at times even thousands of these larids gathered to rest. Based on the finds of bones in archaeological excavations, H. Friedmann (1934a) concluded that the Black-legged Kittiwake was as numerous a thousand or more years ago as it is today.

A specimen is preserved in the Institute of Zoology, Academy of Sciences of the USSR, which was collected by I.G. Voznesenskii on August, 7, 1843 in Mechigmensk Gulf. P.V. Ushakov brought to the Institute a Black-legged Kittiwake shot in Lawrence Bay on July 31, 1929. I observed these gulls there on August 19, 1932 and on August 13 and 14, 1933, and also obtained a specimen. On August 14, 1932, I saw them around Dezhnev village. On September 6, 1933 P.T. Butenko sailed by whaleboat along the shore from Dezhnev to Uélen and came across numerous Black-legged Kittiwakes.

According to the 1957 observations of A.P. Kuzyakin, Black-legged Kittiwakes lived in flocks in various parts of the Chukchi coast from Providence Bay to Uélen. Nesting colonies of these birds were recorded (1) on the south bank of Lawrence Bay, 8 km west of the village; (2) near Poutyn village; (3) at Naukan, the largest colony consisting of a few hundred nests; and (4) around Uélen.

In August, 1855, V. Stimpson (Cassin, 1863, p. 325) caught a specimen in Bering

Strait. In June, 1922 A.M. Bailey found Black-legged Kittiwakes in large numbers on the Diomede Islands and also noticed pairs in nests. According to F.L. Jaques, these larids nest in abundance in Little Diomede Island. During my visit to Bol'shoi Diomede Island, I saw on June 13, 1934 many Black-legged Kittiwakes feeding by the surf in the southwestern part of the island. On my return journey through the strait there were almost no birds, near Cape Dezhnev Black-legged Kittiwakes, along with Fulmars and various guillemots, were quite abundant. In 1958 K.W. Kenyon (Kenyon and Brooks, 1960) tracked the arrival of Black-legged Kittiwakes on Malyi Diomede Island. The population of these birds fluctuated at different times, sometimes more, sometimes less, but many thousands rested on the rocks on May 20. They later disappeared, but returned to nest on the island in such numbers that they covered almost all the rocky ledges.

Only July 19, 1879, when the *Vega* left its winter anchorage and approached Cape Dezhnev, a few Black-legged Kittiwakes hovered around the vessel. E.E. Arngol'd brought to the Institute of Zoology, Academy of Sciences of the USSR, a young bird caught on September 22, 1912 on Cape Dezhnev. The following year, W.S. Brooks caught specimens there. In 1914 F.S. Hersey noticed nesting sites on Cape Dezhnev. According to A.M. Bailey, on July 12, 1921 Black-legged Kittiwakes were exceptionally abundant near Uélen village where they fed by the rim of the ice pack fringing the shore. At such small feeding sites I saw vast numbers of Black-legged Kittiwakes in Uélen village in the first few days of September in 1933, and in July and at the end of August in 1934. Collections were facilitated by surf conditions in Uélen village during a south wind and near Dezhnev village during a north wind. In the spring of 1934, I tracked the mass arrival of birds along the north coast in the course of a few days; significant numbers of Black-legged Kittiwakes remained to nest. On June 21 I sailed by canoe from Naukan village toward Cape Dezhnev and saw flocks gathered at places on the sea, and on the rocks a mixed colony of Black-legged Kittiwakes and murres with the gulls predominating. Five years later, on September 8, 1939 I again visited Uélen village and once again sighted Black-legged Kittiwakes. On July 2 and 3, 1934, I went by whaleboat from Uélen to Mitkulen. There flocks, at times very large, floated on the tranquil surface of the sea. Black-legged Kittiwakes nested on Inchoun rocks, but in small scattered colonies and only on very high cliffs. On July 4 and 13, I saw large numbers of these larids before reaching Mitkulen village along coastal waters.

According to V.V. Leonovich, in the large bird bazaar at Seishan mainly colonized by murres, Black-legged Kittiwakes nested only in individual groups of a few pairs.

On September 27, 1878, O. Nordquist saw a gull, possibly of this species, on Cape Dzhénrétlen, but during winter not a single bird was seen near the winter anchorage of the Vega (Palmén, 1887). In the spring of 1879, F.R. Chel'man first came across a gull of no particularly large size on June 15, which was probably a Black-legged Kittiwake. On July 1 Black-legged Kittiwakes were seen in large numbers around the vessel *Vega* together with other species of gulls. A.A.L. Palander shot an adult male and female. On that same day O. Nordquist and E.

Almquist sighted Black-legged Kittiwakes between Pitlekai and Tepkan. On July 2 and 3 three dead birds were found near the vessel and on July 4 a two-year-old was shot, also near the vessel. On July 10 and 17, Black-legged Kittiwakes were sighted on the water south of Pitlekai. Members of the *Vega* expedition found no nesting sites, but the Chukchians reported that Black-legged Kittiwakes nested on Cape Dzhénrétlen.

J. Koren (1910) found Black-legged Kittiwakes nesting in large numbers on Kolyuchi Island. In his opinion they were particularly numerous compared to other inhabitants of the bird bazaars. In some places the rocks appeared white from a distance due to innumerable resting and flying birds. I toured the coast of this island in the second half of July, 1938, and made a rough population count of its feathered inhabitants. Black-legged Kittiwakes took second place. I counted about 2,000 nests. These larids occupied different sections of the rocks, forming small independent colonies, and only occasionally did I come across a few nests of Black-legged Kittiwakes interspersed among murre colonies.

The register of the Zoological Museum of the Academy of Sciences records for 1913, under No. 521, an adult Black-legged Kittiwake and a young male caught in the Arctic Ocean by L.M. Starokadomskii around 67°49 N 174°61′ W. On September 12, 1878 members of the *Vega* expedition sighted innumerable individuals of this species on the rocks of Cape Schmidt. In early August, 1938 I found Black-legged Kittiwakes nesting on Kozhevnikov cliff and saw them flying quite often on Cape Schmidt.

On September 9, 1878, when the *Vega* sailed past Cape Yakan, many Black-legged Kittiwakes were sighted. Unfortunately, I could not establish whether or not they nested on Cape Shelagskii. A.P. Andriyashev noticed these larids following his ship north of Cape Shelagskii in the last few days of August, 1946; on August 28 the ship was 90 miles away from the coast. J. Koren (Thayer and Bangs, 1914) states that he shot specimens of subspecies *R. t. pollicaris* and *R. t. tridactyla* in Chaun Bay. He erred with regard to the latter. Farther west, Blacklegged Kittiwakes nested on Medvezhii Islands according to F.P. Wrangel (1841) and G.U. Sverdrup (Schaanning, 1928). The latter noticed Black-legged Kittiwakes daily from June 1 through 10, 1923, very far from the land, around 75°01′ N 165°05′ E.

On the coasts of Wrangel Island, according to the observations of E.W. Nelson (1883, p. 105), Black-legged Kittiwakes were common in 1881 although they were encountered in smaller numbers than on Herald Island. In 1911 E.E. Arngol'd caught two specimens on September 15 and 17 in the southwestern part of Wrangel Island at 70°53′ N 179°15′ E. G.A. Ushakov (Bannikov, 1941) caught a specimen on the island on June 12, 1929. He states that Black-legged Kittiwakes nested on the rocks all along the east coast, but in small numbers (some were erroneously mistaken for Ivory Gulls). However, according to A.I. Mineev (Portenko, 1937b), Black-legged Kittiwakes were abundant on Wrangel Island; their total strength was less than that of murres but exceeded that of guillemots. In Rodgers Bay they sometimes gathered in large flocks by the surf. Their nesting colonies were noticed in particular on the rocks of Cape Hawaii and at other places on the east coast. I visited the nesting colonies of Black-legged Kittiwakes on Cape Uéring. In the bird bazaars there they were second only to murres. Black-legged Kittiwake nests were scattered in groups in different sections of the bazaars. On July 27, 1939 I was on the peak of Cape Hawaii and heard the notes of Black-legged Kittiwakes, but none were visible in the mist. According to the eskimos accompanying me, kittiwakes did not nest there. In search of food, these birds fly far from their nesting site. On August 13, 1938 I saw them flying above the ice during my tour of the coasts from Rodgers Bay to Bruch spit. Near the Krasnyi Flag River estuary, Black-legged Kittiwakes flew over the tundra occasionally, but I found a large collection of them on a tiny lagoon with abundant small fish. They were numerous at places even in other sections of the Ice coast. During my stay on Bruch spit from August 21 through 27 they flew regularly along the ice rim; many confined themselves to the channel intersecting the spit. In the spring of 1939 I observed their arrival, but as I was in the middle of the south coast, roughly equidistant between the rocky east and west coasts, I could not witness the mass movement from their nesting colonies. After their arrival, Black-legged Kittiwakes were very rarely seen flying along the coast from Somnitel'naya Bay to Rodgers Bay; they flew mostly on cloudy days and for some reason almost invariably in an eastern direction. According to rough counts made by S.M. Uspenskii (1963) and his colleagues in 1960, no less than 10,000 pairs of Black-legged Kittiwakes nested on Cape Uéring in the company of murres and guillemots. Between Capes Pillar and Hawaii there were small nesting colonies with a total population of up to 100 pairs. More than 10,000 pairs of Black-legged Kittiwakes inhabited Cape Ptichii Bazaar, housing the largest colony of seabirds, and on Cape Zapadnyi (Gil'der) 1,000 pairs nested together with murres and guillemots.

On July 24, when our ship was somewhere in the middle of Long's Strait, Black-legged Kittiwakes and Pomarine Jaegers were the sole species among the deserted icy expanses. It was difficult to resolve from where they had arrived—Kolyuchi or Wrangel Islands. The distance to the nesting areas was about 100 to 200 km. R.L. Newcomb (1888), the naturalist of the *Jeannette* expedition, on September 4, 1879 noticed Black-legged Kittiwakes on Herald Island, and later saw and caught them in May through July of the following year (1880) during the drifting of the vessel toward Jeannette Island. Prof. J. Muir, the scientist of the *Corwin* expedition, in his description (Newcomb, 1888) of a visit to Herald Island on July 31, 1881, refers to innumerable gulls. These could only have been kittiwakes. E.W. Nelson (1883, p. 105) says they nested in large numbers on the rocks of the island.

F.L. Jaques noticed Black-legged Kittiwakes, at times in large numbers, on the Arctic Ocean north of Bering Strait up to 72°23′ N, and east to 166° W between July 30 and August 23, 1928, when he was quite close to Herald Island on August 4. In 1946 A.P. Andriyashev saw Black-legged Kittiwakes on August 8 persistently following the ship for food, when its course lay north of Wrangel Island around 73°45′ N 170°57′ E, and on August 12 around 72°08′ N 177°41′ E.

*Habitat*—The Black-legged Kittiwake is a seabird in the full sense of the word. Its colonies are always located on the ledges of precipitous or even overhanging rocks, and the bird is mostly confined to the edge of the shore in search of food. As mentioned before, the Black-legged Kittiwake flies far into open seas and not over ice-covered seas. It does not fly over rivers and I encountered it only three times over the tundra. On August 31, 1933, I saw a small flock over the tundra near Uélen, which was positively an exception, since most of the kittiwakes were confined to the sea on that particular day. On Wrangel Island I occasionally saw them over the tundra in the northern part of the island. On June 5, 1939 at Akatylanva landmark on the south bank, I saw the first flocks arriving from the sea turn with a shriek to the interior of the island.

According to E.G.F. Sauer, Black-legged Kittiwakes gathered for rest on a large lake near Boxer Bay. They performed daily flights from the rocks on which they nested to this lake. T.J. Cade noticed that these larids invariably flew through the coastal rocks and returned along the contours of the bay.

*Arrival*—Black-legged Kittiwake belongs to the class of late-arriving larids. Around Cape Bering in 1931 L.C. Belopol'skii encountered the first flock on May 21. In the spring of 1938 on Cape Chaplin, P.T. Butenko recorded arrival on May 6; Black-legged Kittiwakes appeared in large numbers together with murres, guillemots, and cormorants. According to the observations of F.H. Fay, on St. Lawrence Island near Gambell village the first Black-legged Kittiwakes were sighted on May 9, 1953 and May 11, 1954.

On Little Diomede Island in 1922 A.M. Bailey sighted numerous Black-legged Kittiwakes on June 3; however, even on June 16 he noticed a mass flight along the coast. In 1953 J.W. Brooks saw the first Black-legged Kittiwakes on May 15, but on May 21 saw them only on the rocks. In 1958 K.W. Kenyon studied in detail the arrival of this bird. On May 11 a few flocks of 20 to 100 each were observed from a plane on the shore ice between Nomo and Little Diomede Island. Four Black-legged kittiwakes were sighted on May 14 over the ice south of Little Diomede Island. As soon as pools of open water appeared in the ice on the island, they became abundant. Twenty were sighted on May 16, while huge flocks of many thousands arrived on May 18. At 8:00 a.m. on May 20 thousands rested on rock ledges, many right on the snow. At 7:00 p.m. thousands of new birds started arriving. Not a single Black-legged Kittiwake had been seen on the rocks before May 20. Unexpectedly, at 1:00 a.m. on May 21 they deserted the rocks and were not seen again until May 26; only a small number were sighted over open water. On May 26 several hundred rested on the ice as well as on the sea close to the coast, and only 100 to 200 sat on the rocks. The number of Black-legged kittiwakes on the rocks gradually increased and on May 29 each ledge and every old nest was occupied by these birds. Two-year-olds arrived later; the first ones were sighted only on June 5, but their number had increased significantly by June 14.

In the spring of 1934, I caught my first specimen between Dezhnev village and Naukan on May 28 and noticed the arrival in Uélen itself on May 31. Flocks of 10 to 30 birds passed throughout the day over the sea coast from west to east. Since the weather was cloudy they flew quite high. Flight continued on June 1 and 2 in the same eastern direction and at the same altitude. On July 2 the flight weakened somewhat. On July 3 only small groups were seen flying, and not right on the coast or the shore ice, but farther away over the sea and in different directions. Thus, the mass movement from the west had concluded. I could not fully comprehend the route of the flight. Possibly the Black-legged Kittiwakes passed over some northern polynyas in the eastern part of Bering Strait. The outlines of these polynyas produced a purely local wind direction near Uélen from west to east, which the bird followed for three days. Even on June 12, I saw many Black-legged Kittiwakes over the sea.

The *Vega* anchored on flat coasts and conditions were not favorable for studying the arrival of Black-legged Kittiwakes which usually is near rocky shores. A lone bird, apparently of this species, was sighted there only on June 15, 1879. Later, on July 1, Black-legged Kittiwakes were seen around the vessel in a fairly large number, but at that time they were wandering in search of food and had obviously arrived in the nesting sites quite early.

According to A.I. Mineev (1936), Black-legged Kittiwakes arrive somewhat abruptly on Wrangel Island by early May. In mid-May, 1939, on Cape Uéring, I found old empty nests but did not see a single kittiwake. Only on June 5 did I sight the first flock at the Akatylanva landmark, which is far away from their nesting site. On June 12 I saw a few Black-legged Kittiwakes flying from Predatel'skaya to Somnitel'naya Bay. Hunters at the Polar station caught specimens on these days in Rodgers Bay.

Members of the *Maud* expedition recorded their first Black-legged Kittiwake on June 10, 1923, at 75°01′ N 165°05′ E and on June 1, 1924 at 75°55′ N 150°35′ E. R.L. Newcomb's report (1888, p. 288) on sighting the first Black-legged Kittiwakes north of Wrangel on May 1, 1880 is, in my opinion, an exception.

*Nidification*—Measurements of gonads revealed that arriving Black-legged Kittiwakes have only slightly enlarged testes and ovarian follicles. By the time of laying the testes have increased notably in size and by early July decreased to normal size again (Tables 5 and 6).

**Table 5. Size of testes (mm) of Black-legged Kittiwakes**

| Date | Left | Right | Locality |
|---|---|---|---|
| May 18, 1938 | 8 × 3 | 7 × 3 | Providence Bay |
| June 1, 1934 | 8 × 5 | 6 × 4 | Uélen |
| June 18, 1934 | 12 × 6 | 9 × 5 | -do- |
| June 27, 1934 | 13 × 7 | 10 × 6 | -do- |
| July 6, 1938 | 4 × 2 | 3 × 2 | Providence Bay |
| July 13, 1939 | 9 × 4 | 7 × 3 | Rodgers Bay |
| August 19, 1932 | 6 × 4 | 5 × 3 | Lawrence Bay |

The granular structure was difficult to distinguish in the ovary of a two-year-old bird from Krest Bay on August 6, 1932. The length of the ovary of this specimen, and also of a few adult specimens, was 13 mm. The ovarian length of one female on August 25, 1938 was 15 mm. Subcutaneous adipose deposits could not be correlated with reproductive activity. Emaciated and plump specimens were caught simultaneously.

**Table 6. State of ovaries in Black-legged Kittiwakes**

| Date | Number of large follicles in ovary | Locality |
|---|---|---|
| May 18, 1938 | 5 | Providence Bay |
| May 28, 1934 | 4 | Dezhnev-Naukan |
| May 31, 1934 | 6 | Uélen |
| June 1, 1934 | 3 | -do- |
| August 25, 1938 | Relief—granular | Bruch spit |
| November 25, 1937 | Ovary with fine-grained structure | Providence Bay |

Kittiwakes nest late, not before the end of June. On St. Lawrence Island, T.J. Cade saw males gathering aquatic vegetation from the lake in June and July and carrying this nesting material to the rocks.

A.M. Bailey came upon nest on Little Diomede Island on June 25, 1922, but found them empty. In 1953 J.V. Brooks noticed that Black-legged Kittiwakes had not yet laid on June 25. Likewise, on June 21, 1934 I found only empty nests on the rocks north of Naukan. On Kolyuchi Island J. Koren obtained unincubated eggs on July 10, 1909; in 1938 I saw there on June 19 through 26 two eggs in each nest. On Chetyrekhstolb Island in 1925, Olonkin, a member of the *Maud* expedition, found the first single egg on June 21; by the 25th he and other members of the expedition had gathered 88 eggs at the same place. According to the observations of S.M. Uspenskii and his colleagues, on June 30, 1960, Black-legged Kittiwakes began to lay simultaneous with murres on Wrangel Island.

F.S. Hersey saw nestlings in nests on Cape Dezhnev on August 29, 1914, but at the same time also encountered flying birds.

F.L. Jaques noticed many young on Little Diomede Island from August 27 through September 6, 1928, and later encountered them more southward, in the Bering Sea, but came across none in the Arctic Ocean. Adult Black-legged Kittiwakes were still confined to the rocks. According to the observations of A.C. Velizhanin, on Wrangel Island many young Black-legged Kittiwakes still remained on Cape Blossom at the end of October, 1960, feeding presumably on walrus carcasses.

*Departure*—In 1911, in the southwestern part of Wrangel Island, E.E. Arngol'd caught Black-legged Kittiwakes on September 15 and 17. In 1938, in the southwestern part of the island, I saw them for the last time on September 15. According to A.I. Mineev, they all fly off simultaneously in the fall. In 1960, according to the observations of A.G. Velizhanin, the migration of Black-legged Kittiwakes extended up to early October.

On Cape Schmidt members of the *Vega* expedition saw innumerable Black-legged Kittiwakes on September 12, 1878. In 1912 J. Koren found Black-legged

Kittiwakes in their nesting sites on Kolyuchi Island and in large numbers even on September 22. In 1878 on Dzhénrétlen the last of the delayed larids, presumably of this species, was noticed by O. Nordquist on September 27. According to my observations in Uélen in 1933, Black-legged Kittiwakes disappeared at the end of the first or in the early second decade of September. Traversing the lagoon on October 3, I picked up a single young bird evidently left behind. E.E. Arngol'd caught a young Black-legged Kittiwake on Cape Dezhnev on September 22, 1912. In 1937 P.T. Butenko arrived late on Providence Bay, on October 29, and no longer found Black-legged Kittiwakes, but caught one exceptionally on November 25. This bird was extremely emaciated and evidently unwell. No more Black-legged Kittiwakes were sighted that winter. F.H. Fay saw a few young Black-legged Kittiwakes near Gambell village on November 10, 1957.

*Habits*—Most larids are flock-forming birds and kittiwakes surpass them all in this respect. It avidly selects the company of Sabine's Gulls on the sea and murres on rocks. Fights for the possession of narrow ledges often result in the loss of good neighborly relations with murres. I was a frequent witness to such fights during which piercing and characteristic screams could be heard. At places where kittiwakes are not frightened, they permit man to approach as close as murres do.

*Food*—The stomach of a Black-legged Kittiwake I collected on Lawrence Bay on August 19, 1932 revealed the vertebrae and other bones of small fish and six pebbles. Evidently they feed exclusively on marine organisms. At Uélen I often observed large collection of Sabine's Gulls and Black-legged Kittiwakes catching small fish right at the surf. The birds swam on the surface of a calm strip of water a few meters wide, formed by the north wind between the shoreline and large sea waves. For the sake of comparison, I would say that such relatively calm air prevails quite often in stormy weather in front of the sheer wall of a cliff. Both birds regularly swam to the surf, took off, and returned. Birds at the rear attempted to push forward into the front row. Visible animation suggested a successful catch. Such congregations regrouped into individual flocks and generally occupied a coastal zone two or more kilometers long. In Providence Bay I noticed Black-legged Kittiwakes among a very large flock of birds, mostly murres but also cormorants, Fulmars, and others. This flock, occupied an immense expanse from Plover Bay to the entrance to Émma Bay and the birds fed on small organisms swarming near the water surface.

On Wrangel Island I encountered a gathering of Black-legged Kittiwakes in a small lagoon near the Krasnyi Flag River estuary. The lagoon had a surfeit of small fish which served as food for the gulls. During my stay on Bruch spit I often walked with a gun along ice piled with pebbles. Sometimes Balck-legged Kittiwakes taking off from under the ice gave me a fright. The birds found food in such concealed places. The stomach of a specimen collected on August 25, 1938, revealed highly digested material reduced to the stage of a thin gruel, which proved to be the remains of crustacean *Astarte* (Amphipoda). The stomach of a male on July 13, 1939, contained a crab (*Chionocetes opilio* Fab.). In Long Strait an entire flock of Black-legged Kittiwakes followed our vessel looking for food in the wake formed by the propeller.

*Weight*—Weights recorded by P.T. Butenko revealed notable differences between emaciated and plump specimens. A plump male shot on Cape Stoletiya on May 18, 1938 weighed 505 g and a female 430 g; an emaciated female caught in Plover Bay on September 25, 1937 weighed only 320 g.

*Systematics*—Differences between subspecies of *Rissa tridactyla pollicaris* Stejn. stand out well in a series of direct comparison of skins of this subspecies with the nominal form. The beak and wing of *R. t. pollicaris* are particularly long. Ranges from eastern parts of Taimyr to the Bering and Okhotsk Seas.

*Specimens*—1) Mechigmensk Bay, August 7, 1943, ♂, Voznesenskii; 2 and 3) southwestern part of Wrangel Island, 70°53′ N 179°15′ E, September 15 and 17, 1911, ♀ 1° anno and ○, Arngol'd; 4) Cape Dezhnev, September 22, 1912, ♀ 1° anno, Arngol'd; 5) Providence Bay, July 20, 1913, ○, Arngol'd; 6) same site, undated, ♀ Arngol'd; 7) Émma Bay, July 22, 1913, ♂, Starokadomskii; 8) Wrangel Island, June 12, 1929, ○, G.A. Ushakov; 9) Lawrence Bay, July 31, 1929, ○, P.V. Ushakov; 10 and 11) Rodgers Bay, August 22 and 25, 1931, ♀♀, Vlasova; 12) near Rodgers Bay, undated, ○ 1° anno, Vakulenko; 13) Krest Bay, August 6, 1932, ♀, Portenko; 14) Lawrence Bay, August 19, 1932, ♂, Portenko; 15) between Dezhnev village and Naukan, May 28, 1934, ♀, Portenko; 16) Uélen, May 31, 1934, ○, Portenko; 17 and 18) same site, June 1, 1934, ♂♀, Portenko; 19) same site, June 18, 1934, ♂, Portenko; 20 and 21) Naukan Island, June 21, 1934, ○ ○, Portenko; 22) Uélen, June 27, 1934, ♂ Portenko; 23) Plover Bay, September 25, 1937, ♀, Butenko; 24 and 25) Cape Stoletiya, May 18, 1938, ♂♀, Butenko; 26 to 28) Providence Bay July 6 and 20, 1938, ♂ ○ ○. Butenko; 29 and 30) Wrangel Island, August 20, 1938, ♂♀, Druzhinin; 31) Bruch spit, August 25, 1938, ♀, Portenko; and 32) Rodgers Bay, July 13, 1939, ♂, Portenko.

### 90. *Rissa brevirostris* Bruch—Red-legged Kittiwake

Only a single case of flight over the northeastern extremity of the Chukchi peninsula has been established.

According to A.M. Bailey (1925), a splendid specimen of this gull was sighted on July 11, 1921 in Uélen only a few feet away from the vessel. A chukchian hunter also told me about an encounter with a Red-legged Kittiwake in Uélen.

A monograph by A.C. Bent (1921, p. 151) refers to an undated specimen from Wrangel Island. Quite possibly there is a tiny island bearing this name in the southern part of the state of Alaska.*

According to a report by F.H. Fay (Fay and Cade, 1959), on June 4, 1953 at Cape Tapguk on St. Lawrence Island this kittiwake flew past the head of an observer.

According to an eyewitness account by H. Friedmann (1934a), a pair of mandibles of this species, about a thousand years old, was found in the surface formations of kitchen middens on the northwestern extremity of St. Lawrence Island.

*It is located at 56°20′ N 132°10′ W, near Juneau, Alaska—Ed.

### 91. *Rhodostethia rosea* (McGill.)—Ross's Gull

*Local names*—Chukchian: erikadlin in the records of the *Vega* expedition. In Eskimo: kū-lū́-sē-mă, kă-wă-ghuk on St. Lawrence Island.

*Distribution and status*—According to unconfirmed second-hand information, it nests on Aiok Island and farther away on northwestern Chaun Bay. Wandering birds were sighted in small numbers northward on the sea, and on Wrangel Island in varying numbers, but not every year, and aslo near Herald Island. In the fall, it flies near Uélen in small numbers. It was very rare on the north coast.

N.P. Sokol'nikov learned from N. Bakeston, who gathered birds in Gizhiginsk Bay, that in Markovo village, spring of 1901, the captain of an American schooner saw cuneate-tailed gulls in Krest Bay. During his journey in 1902 along the south coast of the Chukchi peninsula, Sokol'nikov inquired about this bird but no one had heard of it. Apart from the foregoing third-hand reference, no one knew of Ross's Gull on the east coast either.

According to F.H. Fay and T.J. Cade (1959), eskimos on St. Lawrence Island did know of Ross's Gull, but it was not sighted there every year.

According to the information elicited on October, 1932 these birds were seen in flight along the coasts of Bering Strait near Dezhnev village and some Chukchians obtained specimens. According to V.M. Artobolevskii (1927), the collection of A.A. Savich contained a skin of an adult Ross's Gull, evidently, of a female in spring plumage, purportedly caught during the cruise of the *Kolyma* in June, 1915 (old calendar) through Bering Strait. A.M. Bailey (1925) reported that this gull was seen in flight in Bering Strait in comparatively small numbers and confined to open expanses of the Arctic Ocean.

In the fall of 1933, I observed a weakly formed flight near Uélen. On October, 1, three small flocks of not more than 12 birds flew rapidly past me eastward along the shore of a lagoon. Two of them appeared to be juveniles. At the time P.T. Butenko happened to observe an adult and two young Ross's Gulls flying right over Uélen. They bypassed the coastal rocks from the north at some distance. Around these rocks on October 3, Butenko saw up to 15 specimens flying over open water between ice floes from east to west. Other observers noticed three gulls on the same day flying along the coast of the lagoon in an eastern direction. Taking into consideration that the same number of birds were noticed on October 1 and 3 and that they flew in opposite directions, it could be suggested that up to 15 Ross's Gulls resided near Uélen for three days. Although I toured extensively at the end of the fall in 1933 and requested the local inhabitants to inform me of sightings of Ross's Gulls, none were recorded there.

On July 1, 1879, E. Almquist shot a two-year-old around the icebound *Vega* near Pitlekai (Palmén, 1887) but saw no others. On June 2, 1970 A.A. Kishchinskii saw an adult bird around Cape Schmidt.

On August 20, 1914, J. Koren (Riley, 1918) saw four young Ross's Gulls north of Aiok Island. In 1920 R. Amundsen (1929, p. 286) was informed on the ship *Maud* that Ross's Gull was common on Aiok Island and reportedly even nested there. In 1912 J. Koren (Thayer and Bangs, 1914) investigated the coast from Chaun Bay to Kolyma and not only found no nesting colonies, but not even a solitary specimen. According to the information collected by the *Maud* expedition from reliable local inhabitants, colonies of Ross's Gulls probably nested around the Bol'shaya Baranikha River, where a few specimens were seen throughout the summer. Moreover, young birds were noticed at the same place in early fall. R. Amundsen (1929, p. 284) has mentioned this reference, adding that the Chukchians were well acquainted with the nests of these birds.

Even A.I. Argentov (1861a, p. 496) wrote: "Ross's Gulls are seen in large numbers year-round in the Kolyma estuary." In 1850 they were seen in large numbers in the lower reaches of rivers. Nevertheless, Argentov placed these gulls among "random birds," i.e., not seen annually on the coasts of the Arctic Ocean. N.P. Sokol'nikov in a letter to M.A. Menzbier on December 8, 1906, wrote that he had been informed about the sightings of many Ross's Gulls there, i.e., in Markovo, by the local priest, now dead; the priest had arrived there in the 1860's from Kolyma. The birds were confined to the shore of the Arctic Ocean and eastern Kolyma, but were not sighted everywhere. On July 17, 1892, I.D. Cherskii collected two adult males between the Central and Lower Kolyma and on July 18, a female. In 1905 S.A. Buturlin (1905b, 1906c, 1907b, and 1912b; Buturlin and Dement'ev, 1934, I, p. 140) found nests and eggs of Ross's Gull in different parts of Kolyma delta up to Sukharnoe estuary collected a few dozen specimens, and considered it the most common of gulls. In the year preceding the arrival of J. Koren on Kolyma, in 1911, Ross's Gulls were numerous and nested in large numbers north of the Lower Kolyma from where two specimens were obtained. In 1911, a skin near the Central Kolyma was presented to the collection of the Institute of Zoology by N.V. Popov. However, in 1912, J. Koren caught in the Lower Kolyma only a single Ross's Gull in flight. In 1913, an adult bird was caught in August from the Kolyma estuary by Bagrov, and later some adult birds from Strelov, Lower Kolyma, shot in the summer of 1916, were given to the Institute of Zoology. According to Koren, N.P. Sokol'nikov (Menzbier, 1918, p. 205) reported that after heavy June rains in the pre-1917 years, Ross's Gull stopped nesting altogether in the locality where Buturlin had found them before and were not seen at all there in the spring of 1917. R. Amundsen (1929, pp. 282 and 284) acquired from Koren's widow 18 Ross's Gulls collected in the Lower Kolyma and Olonkin received 12 more specimens as gifts from various persons in the Lower Kolyma. All of these gifts were adult birds of excellent color. Amundsen was given to understand that Ross's Gull flew only over Kolyma. According to H.T.L. Schaanning (1954), specimens obtained by Amundsen lacked labels. On June 5, 1918 J. Koren collected a two-year-old male in the Lower Kolyma. From the records of the *Maud* expedition, Schaanning (1929) reported that, according to information from reliable residents of Kolyma, Ross's Gull was seen flying north every year in May. Among the specimens he listed, eight were caught in the Kolyma delta and one 30 miles north of it. In the 1930's some collectors brought a significant number of specimens from Kolyma. The geologist S.G. Pavlov brought five Ross's Gulls he collected around the Lower Kolyma in the last few days of May and on June 20, 1932. The expert hunter E.N. Dubrovskii shot a few specimens around the Central Kolyma, one of which was a male in excellent condition collected on Bodanovskaya Canal on May 28, 1938 that I received. Three skins were received by the Arctic Institute from A. Zubov who had collected them at the following points while journeying from the Central Kolyma: 1) Sangalakh, 20 km west, May 26, 1939, ○; 2) Alazeiskii Island, July 10, 1939, ♀; and 3) Ken'Kol', 250 km north, July 15, 1939, ♀.

Finally, in 1957, K.A. Vorob'ev (1963) investigated a colony with 11 nests on the Kon'kovaya River west of the Kolyma estuary.

Although Ross's Gull does not nest every year at the same place (which is also characteristic of some other species of gulls), the lake country adjoining the lower reaches of the Kolyma is evidently a center of the range of this species where it breeds prolifically. Commencing from Kolyma and possibly from Bol'shaya Baranikha or Aiok Island, the nesting range of Ross's Gull extends west at least up to the Yana delta and probably even farther up to the Omoloya estuary.

In 1905, K. Rozhnovskii (Buturlin, 1905b) found Ross's Gull to be "abundant" in the nesting area near Malaya village in the upper reaches of the Alazeya. According to the information collected, it nested in extremely small numbers near Russkoe Ust'e village in the Indigirka delta. According to N.M. Mikhel' (1935), the inhabitants of this village were well acquainted with Ross's Gull. Moreover, he was told that it was particularly abundant on Alazeya, that it nested in the lower reaches of the Khroma, and even in Yana estuary. Mikhel' found it near Yar village on the eastern side of the Indigirka estuary, but could not find nesting sites. In 1960, K.A. Vorob'ev found a small colony in the tundra between the Indigirka and the Khroma, and in 1940 L. Shastin collected a series of nesting birds in the western part of the Yana delta not far from Chukualakha: a female on June 12, a male on June 16, and some other specimens. Nesting birds were also caught in Omoloya estuary: a female on June 19, 1935 by A. Kedrinskii, and a male on June 25, 1936 by F. Balabin (they came from the Arctic Institute into the collection of the Institute of Zoology, Academy of Sciences of the USSR). B.A. Ritter brought two specimens of Ross's Gull: one was caught in Tiksi Bay in August, 1939 and the other in the channels of Lena delta in early summer, 1944. According to hunters, Ross's Gull definitely nested on these channels.

Not all of the summer finds could be considered proof of nesting by Ross's Gull. On July 8, 1883 A. Bunge (1884) caught a pair at Sagastyr in Lena delta, but the male was a two-year-old and the gonads of both birds totally undeveloped. A completely isolated nesting site was recorded for western Greenland in Disco Bay. Although two birds with brood patches were collected and eggs collected, this finding nevertheless still gives rise to doubts about its reliability, primarily because of their separation from the main range of the species. Similar instances of isolated occurrences of other arctic birds (for example, of the Curlew Sandpiper in Alaska) in nesting areas are required before the nesting of Ross's Gull in Greenland can be considered a fact.

In mid-October, 1879, when the *Jeannette* lay on Herald Island, R.L. Newcomb (Saunders, 1883, p. 349; Newcomb, 1888, pp. 282 and 289) shot five specimens of Ross's Gull in fall plumage. In June and July of the following year (1880) he caught Ross's gulls while drifting north and northwest from Wrangel Island. According to an eyewitness account by G.V. De Long (1883, pp. 151[3], 385, 387, and 390), Newcomb collected the first Ross's Gull on October 7, 1879 within the visible range of Wrangel Island, more precisely northeast of it, toward north–northwest of Herald Island. A third specimen was shot on June 22, 1880. These gulls cannot be considered rare there by any means. On June 23, a fourth specimen was caught and on the 25th another. By June 30 the expedition already had seven Ross's Gulls in its collection. On that day the *Jeannette* lay 72°19′14″ N 178°27′30″ E.

As the *Corwin* cruised around Wrangel Island in August, 1881, E.W. Nelson sighted a juvenile specimen, which initially was erroneously thought to be a young Sabine's Gull. F.L. Jaques (1930) caught two young specimens on August 16 and 19, 1928, and sighted six more on August 18 and 21 north of 70°, close to Herald and Wrangel Islands. They evidently flew northward. Adults were not sighted.

According to a report by G.A. Ushakov (Bannikov, 1941), Ross's Gull was seen in small numbers on Wrangel Island in summer, but it does not follow from this (as suggested by A.G. Bannikov) that it nested there in small numbers. A.I. Mineev (1936) saw none of these gulls. In his book he erroneously referred to Ross's Gull as Sabine's Gull, which has an intense pink bloom on the underside of the body. Late in the fall of 1934 N.M. Vakulenko caught nine specimens in the estuary of the Nasha River and in Rodgers Bay, including adult and young birds. In spite of several thorough searches, I came across Ross's Gull, a two-year-old female, on Wrangel Island only once—on August 26, 1938 on Bruch spit. According to Tayan, on October 24 of the same fall he saw four brightly colored Ross's Gulls flying west to east in Somnitel'naya Bay. Thus, this species not only does not nest on Wrangel Island, but also does not fly there every year.

On August 25, 1914 Ross's Gull was sighted by colleagues of E.E. Arngol'd as the freighter *Vaigach* cruised from Medvezhii Islands to Vil'kitskii Island. Members of the *Maud* expedition counted about 20 mostly young specimens north and east of Novosibirsk Islands, between 74°42′ to 76°35′ north and 136°24′ to 166°20′ east, between August 10 and October 4, 1923, and August 1 through 13, 1924. On June 27, 1947 E. Korotkevich caught a two-year-old on Novosibirsk Islands.

Nonbreeding two-year-olds and, toward the conclusion of the breeding season, adult and young Ross's Gulls wander in different places of the Arctic Ocean northwest, north, and northeast of their nesting colonies. In northwestern Alaska they used to be abundant in some years. According to the data of J. Murdoch (1899) in September and October, 1881 and 1882 at Cape Barrow, numerous Ross's Gulls were seen flying in a northeastern direction. In October, 1921 A.M. Bailey often encountered flocks of 12 to 30 birds there. According to a local senior inhabitant, C. D. Brauer, Ross's Gull was absent altogether in some years, and abundant in

[3]A picture labeled "Ross's Gull" on p. 152 is not a picture of that bird!

others. On September 26, 1928, as recorded by C.G. Abbot (1929), they were counted in the thousands. People fed on them and 25 skins were donated to the Society of Natural History, San Diego.

Regular mass wintering sites, if indeed they exist, are not known. Most likely they would be located in the northern part of the Pacific (possibly also the Atlantic) Ocean among large drifting icebergs not accessible to bird watchers. There are, therefore, far too few recorded winter findings. From among the unpublished finds, let me mention some known to me. N.P. Sokol'nikov in his manuscript referred to the following four specimens he obtained on Bering Island: 1 and 2) ♂ and ♀ yearling, Staraya Gavan', December 2, 1908; 3) ♂, Cape Vakselya, December 7, 1911; and 4) ♀, village Nikol'skoe, March 15, 1914. I was also informed that in May, 1935 two Ross's Gulls were sighted in the southern part of the Okhotsk sea at the entrance to Laperuza Strait. A few solitary birds have flown exceptionally up to the latitude of the Mediterranean sea and Japan.

*Habitat*—R. Amundsen was informed (1929, p. 286) that Ross's Gulls had built nests on a tiny shrub on Aiok Island. This report totally contradicts those of S.A. Buturlin and K.A. Vorob'ev.

During fall flight near Uėlen, I noticed Ross's Gulls flying over a lagoon by the shore. The water surface there was covered with a sludgelike mass of ice inaccessible to me and I did not even attempt to shoot the occasional bird since collection was impossible. However, in one case I ran across a small spit, causing the flying gull to turn toward the coast where my shot felled it. On Wrangel Island, I encountered Ross's Gull on the shore of a spit on which the ice was moving. It flew toward me so unexpectedly that I could not fire since my entire attention was directed to establishing its identity. For some reason it returned, only to be collected. E. Almquist evidently found a two-year-old wandering by his ship. This bird and Black-headed Kittiwakes swam in puddles in the ice formed around refuse heaps. Such were the conditions of the occurrences of Ross's Gull near the coasts. Except during the nesting period this species is not associated with such conditions at all, and is purely a bird of the sea especially in the presence of ice.

*Arrival*—No one has yet tracked the spring flight on the Chukchi peninsula. In my opinion this does not represent a gap in observations. As soon as I saw the spring flight in Markovo village, I concluded that Ross's Gull arrives at the nesting sites in Kolyma valley by journeying over land. Early in the morning of June 3, 1932, I saw a few pairs of bright pink birds against a clear blue sky moving slowly in a northwestern direction. In Markovo village they were not sighted before the last few days of May. On Kolyma, S.A. Buturlin tracked their arrival from May 30 through June 1, 1905, but J. Koren happened to catch a specimen very much earlier, on May 3, 1912.

*Summer observations*—The dates July 1, 1879 in Pitlekai and August 26, 1938, on Bruch spit pertain to nonbreeding two-year-olds. A specimen I caught was a fairly plump female with an ovary of unusual appearance. On the smooth surface of this small ovary were five whitish, round follicles about 0.2 mm in diameter.

Migration occurs in September and October. In 1923 the vessel *Maud* drifted between Novosibirsk and Wrangel Islands. On August 10 an apparently young

Ross's Gull was sighted at 75°40′ N 166°20′ E. It was probably this same specimen that was collected on August 12 at 75°50′ N 165°46′ E. From August 14 through 16, Ross's Gulls visited the area around the ship several times at 75°43′ N 165°04′ E. On September 1, two young and no less than four other specimens were sighted at 76°04′ N 164°03′ E. Finally, the last adult specimens were seen on October 4 at 74°42′ N 164°36′ E.

In the fall of 1934, N.M. Vakulenko caught nine specimens in Rodgers Bay on Wrangel Island between October 15 and 30. The back and head of the young birds shot on October 20 had molted into a pale blue-gray plumage. Those caught on October 30 were visibly younger since individual feathers of the summer juvenile plumage were present on their back and head.

These birds flew into Uélen in the fall of 1934 from October 1 through 3. A male caught by me had very small testes (3 mm × 2 mm and 2 mm × 2 mm), and subcutaneous adipose formations were absent. It had completely molted into winter plumage.

The mass flight in fall along the coasts of northwest Alaska was thoroughly detailed by J. Murdoch on Cape Barrow. A few flocks, flying in a northeastern direction, appeared on September 28, 1881. Ross's Gulls continued to fly in large numbers for almost a month thereafter. They were seen neither in the spring nor the summer of 1882 and 1883.

Early in September, 1882, several overflying gulls were sighted and on September 21 this species was abundant. The birds formed large but dispersed flocks moving northeast, and were innumerable until a northeastern wind set in. Not a single bird was sighted thereafter until October 6 when an intense flight began and continued for several days. On October 9 in particular there was an uninterrupted flow throughout the day. None of these gulls returned.

In the fall of 1921, A.M. Bailey noticed Ross's Gulls at Cape Barrow and Wainwright from October 12 through 27. Near St. Lawrence Island, according to the eskimos, Ross's Gulls were seen at the end of November and in December when large icebergs approached from the Chukchi Sea.

*Food*—According to the observations of S.A. Buturlin, in the breeding period this gull is a purely insectivorous bird. It is compelled to change its feeding habits in the marine environment. In the stomach of a specimen from Uélen were found a few vertebrae of small fish, about 50 crustaceans, and 11 calcareous plates of cephalopods. The stomach of my Wrangel specimen contained many crustaceans of the genus *Spirontocaris* (shrimps) and 4.0 g of gravel.

*Economic importance*—In the Soviet northeast during the prewar period an erroneous view prevailed that Ross's Gull was a very valuable bird. Consequently a senseless storage of skins resulted in their rapid deterioration. This idea arose due to inquiries and orders given by American tourists when they had extensive access to the coasts of Chukchi. In the above note of C.G. Abbott there is a statement that a specimen could be had for $200 some 15 years back (this note was printed in 1929); later the value dropped steeply to about $10. The same note contains an extract from a letter written by Ch. D. Brauer in which he says eskimos shot Ross's Gulls for the table, and that he himself had eaten some.

*Specimens*—1) Uélen, October 1, 1933, ♂, Portenko; 2) estuary of Nasha River, October 15, 1934, ○ 1° anno, Vakulenko; 3 to 7) Rodgers Bay, October 20, 1934, ♂ sen. and 4♂♂ 1° anno, Vakulenko; 8) same place, October 27, 1934, ♀, Vakulenko; 9 and 10) same place, October 30, 1934, ♂ and ♀ 1° anno, Vakulenko: and 11) Bruch spit, August 26, 1938, ♀ 2° anno, Portenko.

### 92. *Xema sabini tschuktschorum* Port.—Sabine's Gull

*Local names*—Chukchian: kapotal'gyn, apotal'khyn, kat'ek, and kakaterk; kakaha on Cape Shelagskii in the records of the *Maud* expedition In Eskimo: nasýakhtlyngen in Providence Bay; nakhasakhline in Krest Bay in Belopol'skii's records; nă-thlắ-thlĭng-uk on St. Lawrence Island.

*Distribution and status*—It nests on the coasts of the Chukchi peninsula and on Wrangel Island, but not regularly at the same site, and in general in relatively small numbers. It gathers in flocks for feeding during fall flight. It does not winter.

In the Zoological Museum in Berlin I examined three adult specimens, two males and a female, caught by Paul Niedeck on July 28, 1906 in Krest Bay. L.O. Belopol'skii (1934) found Sabine's Gull in a nesting site in the northern part of Anadyr Bay. On Meechken Island it was encountered in small numbers throughout the summer of 1931. One had only to walk along the island a short distance to see it every day. It was usually confined near the west cape. On August 6, 1932, P.T. Butenko noticed this species around Notapenmen village.

According to W.H. Dall (Dall and Bannister, 1869, p. 306), Sabine's Gull was not rare in Plover Bay in 1865 and 1866. E.W. Nelson (1883), giving no details, states that it was encountered on the Siberian side commencing from Providence Bay in the north to the exit of Bering Strait, that it was especially numerous in the breeding period, and even more abundant at the time of flight. Specimens were available to various collectors who landed there. W.S. Brooks (1915) collected a male in Plover Bay on June 18, 1913. I.O. Olenev, who wintered in Providence Bay, told me that Sabine's Gull did not nest there. Wandering, probably unpaired specimens were seen from July 8 through 10, 1932 remaining to the end of the month. Neither P.T. Butenko nor I saw this bird in Providence Bay, but I came across one adult and one young bird on Cape Chaplin on August 24, 1932.

According to E.W. Nelson, Sabine's Gull was encountered in small numbers on St. Lawrence Island. H. Friedmann (1932a) refers to four adults and one young bird caught in July and August, 1930. A.C. Bent (1921) included St. Lawrence Island in the nesting range of Sabine's Gull and F.H. Fay and T.J. Cade (1959) support its inclusion in the avifauna. According to eyewitness accounts of eskimos, no nests were discovered and for the island as a whole (rough estimate) under a hundred birds took up residence during the summer. Lone and small flocks were seen near Gambell village mostly in August. The majority of these gulls were confined to the south coast, particularly near Cape Siknik, where up to 20 specimens were seen daily in June, 1953 and 1954, and also in August, 1956. Only adults were seen in June while young were also sighted in the latter half of August.

R.L. Newcomb (1888), who visited Lawrence Bay on August 25, 1879, considered Sabine's Gull to be a rare species. I encountered these gulls on August 19, 1932 on the south coast of Lawrence Bay and noticed them in very large numbers on the sea coast in Dezhnev village on August 14 of the same year. On September 6, 1933, P.T. Butenko sighted them in small numbers west of this village. A.A. Savich's specimen was probably caught in June, 1915 (old calendar) on the Siberian coast of Bering Strait, as suggested by V.M. Artobolevskii (1927). F.L. Jaques (1930) noticed adult Sabine Gulls in Bering Strait and on the Arctic Ocean on six days in August and on September 2, 1928.

W.S. Brooks caught a young bird at Cape Dezhnev on August 29, 1914. In the immediate vicinity of Uélen, Sabine's Gulls, according to my observations, did not nest and were not encountered regularly. During my visit to Uélen on August 16, 1932 I saw them on the incoming ice. In September of the following year (1933) I sighted them in a storm gathering in the south together with Black-legged kittiwakes. Though numerous, they were noticeably fewer in number than the kittiwakes and gathered by the shoreline to feed. At the end of August, 1934, under similar conditions, I saw only a few. On August 9 and 10, 1934, I came into possession of a brood in the Kol'oam -Véem River estuary, but farther up this river, as on the Utte-Véem, no more Sabine's Gulls were seen. In the middle of September, 1933, I was given a specimen from Inchoun village.

On August 2, 1909, J. Koren (1910) caught a few adult specimens around Cape Serdtse-Kamen'. It is not without interest that he saw not one of these gulls during his journey along the north coast of the Chukchi peninsula in 1911 and 1912. F.S. Hersey (1916) also saw them on Cape Serdtse-Kamen', including young ones, on August 28, 1914.

The *Vega* expedition (Palmén, 1887) did not collect this bird from the wintering site near Kolyuchin Bay. A.E. Nordenskjöld (1880, I, p. 493) recalled that a gull similar to the Ivory Gull, but with a black head, was seated on a refuse mound by the vessel on November 3, 1878. In spite of the opinion of I.A. Palmén, I am inclined to think this bird was a young *Pagophila eburnea* and not *Xema sabini.*

In the fall of 1934 V.Ya. Isaev saw numerous Sabine's Gulls on Cape Schmidt feeding in the water along the shoreline. According to the records maintained by members of the *Maud* expedition (Schaanning, 1928), colonies of these gulls nested in the interior of Cape Shelagskii. G.U. Sverdrup and other members of this expedition found nesting sites in the southwestern part of Aiok Island and collected three clutches and eight birds. According to V.D. Lebedev and V.R. Filin (1959), Sabine's Gulls were rather scarce on the island in the summer of 1958. A small nesting colony of about eight pairs was found on its southeastern part. On the south coast six specimens were sighted on June 16 and a lone bird on June 20. On the west coast 10 to 12 gulls were seen on July 15. On the lakes 8 km south of the Rakvazan River, on the west coast of Chaun Bay, lived a colony of about 10 pairs.

According to A.S. Buturlin (Buturlin and Dement'ev, 1934, I, p. 145), Sabine's Gulls were seen in the fall on Cape Baranov Bol'shoi. In the lower reaches of the

Kolyma in 1905, Buturlin (1906b) saw only a single flock in spring flight. J. Koren (Thayer and Bangs, 1914) examined a skin acquired by the local residents of the Lower Kolyma. R. Amundsen (1929, p. 284) was told about gulls with black heads and white bodies, undoubtedly Sabine's Gulls, gathering en masse on the Kolyma. Sverdrup has recorded in his diary a pair sighted at sea west of the Kolyma estuary at 71° 15′ N 155° 18′ E.

E.W. Nelson did not find this species on Wrangel Island. The two young specimens referred to by him in his earlier monograph (Nelson, 1883, p. 109) were later (Nelson, 1887, p. 56) acknowledged as Sabine's Gulls. The collection of the Institute of Zoology, Academy of Sciences of the USSR, contains a specimen shot on August 22, 1929 in the East Siberian Sea southwest of Wrangel Island at 70° 51.5′ N 176° 09′ E. On Wrangel island a Sabine's Gull was first sighted by Captain F.E. Kleinschmidt on the south coast in August, 1911. A. Crawford (Snyder, 1926) caught three specimens in 1922. F.L. Jaques shot a young bird and noticed others on August 22, 1923, as well as on August 25, south of Wrangel Island. G.A. Ushakov (Bannikov, 1941) caught a Sabine's Gull on Wrangel Island itself on July 15, 1929. According to Ushakov, it irregularly nested in small numbers on the island. However, from the excellent description given me by E.P. Spangenberg, the clutch with three eggs of Sabine's Gull given by Ushakov to the Moscow Zoological Museum was erroneously identified, since the eggs were highly similar to those of a tern. According to A.I. Mineev (1936, p. 175), in some years Sabine's Gulls[4] flew over Wrangel Island in large numbers, but were seldom or very rarely sighted in other years. This irregularity, a characteristic feature of other gulls in the present case can evidently be explained by ice conditions. Mineev's data for different years are given below:

| | | |
|---|---|---|
| 1930 | Extremely abundant | Summer very favorable for ice and temperature conditions |
| 1931 | Few | Summer late; ice conditions so-so, moderate |
| 1932 | Not seen | Summer warm and ice conditions poor |

Mineev could not establish whether Sabine's Gulls nested on Wrangel Island or not. They were seen singly and in flocks over the island, and in flocks in flight along the seacoast. In 1938 and 1939, I was able to establish quite accurately the nesting sites of these birds in both northern and southern sections of the island. In mid-August, 1938, near Krasnyi Flag River estuary, Sabine's Gulls were abundant. On August 14, I encountered a few pairs in the tundra south of Bruch spit, and a week later broods on the spit itself; the young permitted me to come within four to five paces. On August 11, I found broods at the west end of Ozero lagoon on the south side of the island. In 1939, I saw their arrival and pairing all along the coast from 180° longitude to the mouth of the Amerikanskaya rivulet. On July 15, in Somnitel'naya Bay, I encountered two nesting pairs, one of which had chicks.

[4]Because the abdomen of the specimens he caught was pink in color, he called them "pink gulls".

According to the observations of S.M. Uspenskii, R.L. Bëme, and A.G. Velizhanin (1963), because the summer of 1960 was warm, Sabine's Gulls nested in large numbers. On July 23 they could be seen from the plane on Tundra Akademii on almost every lakelet. They also nested on the south coast. In 1964 F.B. Chernyavskii spotted colonies of nesting Sabine's Gulls on July 7 from a jeep and counted eight along the way between the Pestsovaya and Krasnyi Flag Rivers. There were three to eight pairs in each colony.

*Habitat*—According to my observations, Sabine's Gulls nest close to the banks of rivulets or lakelets. In the tundra south of Bruch spit I found nesting pairs in marshy valleys through which melted snow undoubtedly flowed in spring. I happened to be in the estuary of the Krasnyi Flag River when young ones wandered to the banks of the lagoon and adult birds often flew over the tundra. They were more numerous on lakelets. From their behaviour it was not difficult to establish where they nested. On the southern part of Wrangel Island I encountered broods on Ozero lagoon; the landscape here is a combination of lakes, rubble banks and tundra. In Somnitel'naya Bay, fledgelings I frightened swam across the lake from a grass-covered bank. It was quite apparent that a lake is mandatory for fledgelings seeking escape from terrestrial enemies. In mid-June, 1939, east of Predatel'skaya Bay, Sabine's Gulls which had just paired in coastal tundra and spits were invariably confined to the immediate vicinity of small lakes. On Wrangel Island, A.I. Mineev sighted these gulls over rivulets. S.M. Uspenskii and his colleagues found nests on Tundra Akademii on ponds with slimy banks, while F.B. Chernyavskii found nests in highly swamped tundra, invariably near ponds. According to A.G. Velizhanin (1965), Sabine's Gulls nested on the north coast of the island more often on sections of a spit separated by sea.

In the Chukchi peninsula, I encountered broods in the Kol'oam-Véem River delta where small lakes alternated with dry and wet tundra and a large shoal with ponds lay nearby. G.U. Sverdrup and his colleagues found nests on Aiok Island on a swampy expanse along a small rivulet winding through a broad, flat valley with numerous tiny bogs and small lakes. V.D. Lebedev and V.R. Filin found a nesting colony on islets in a small shallow lake on Aiok Island.

During the spring flight on Wrangel Island I found Sabine's Gulls on rubble spits with pools of melted ice. Similarly, before the fall migration they gathered on the rubble banks of lagoons. They collected in considerable numbers at special feeding sites. Thus on August 15, 1938 I saw many Sabine's Gulls along with Black-legged Kittiwakes on a small lagoon in the estuary of the Krasnyi Flag River. This lagoon contained many small fish which attracted a large flock of birds.

Like kittiwakes, Sabine's Gulls gathered quite often in large flocks at the end of summer and in the fall for feeding along the shoreline. I noticed such gatherings near Uélen and Dezhnev village and their ranks extended for a stretch of 2 to 3 km. The birds would quickly snatch some morsel from the water and several would repeat the same movement simultaneously. It was a singular yet characteristic spectacle. After swimming up to the surf, they appeared to continuously nod or bow their heads. At

Uélen such mass feedings were seen only under a south wind and in Dezhnev village under a north wind, i.e., under conditions of a small rebounding surf. A few tens of meters out a sea an intense wave formation prohibited quiet swimming. The gulls fed between it and the surf but nearer to the latter. On August 19, 1932 I saw many of these gulls on small lakes on the south coast at the entrance of Lawrence Bay. Thus, even outside the breeding period, Sabine's Gulls were confined to low coasts, lagoons, and lakes in the coastal tundra, and did not wander over the open sea as the cuneate-tailed gulls do.

*Arrival*—According to L.O. Belopol'skii, in 1931 on Meechken Island the first flock consisting of 30 to 40 birds was noticed on May 12. Neither I.O. Olenev nor P.T. Butenko observed their arrival in Providence Bay. Moreover, no one saw their first appearance along the entire length of the north coast of the Chukchi peninsula.

The flight patterns of this species run at least partially across the peninsula. According to information I collected, in the interior of the Anadyr region, Sabine's Gulls are actually seen in spring but in very small numbers; they were particularly numerous only in 1907. There is no doubt that they also fly through Bering Strait, but far from the coasts. In the Kolyma estuary, S.A. Buturlin noticed flocks on May 31, 1905. A.I. Mineev told me that Sabine's Gulls arrived on Wrangel Island in early May. He was undoubtedly mistaken since I spotted them in the spring of 1939 only in the first few days of June. The site of my observations was the coastal zone between Somnitel'naya and Predatel'skaya Bays. I saw the first flocks arriving there from the east on June 5. Having sighted suitable places with small lakes, the birds from one flock began landing. They dispersed in different directions, turning from side to side exactly like Lapwings. On June 8 and 9 single birds flew in different places. On June 11, I encountered them even overflying high montane watersheds.

*Breeding*—In a male from flocks arriving on June 5, 1939 the left testis was crushed by my shot while the right one was 8 mm × 5 mm; it was somewhat enlarged, especially in width, compared with the testes of males caught in August, September, and October 1 (total of 18 specimens). The average gonadal size in these birds was: left testis 5.6 mm × 3.0 mm and right testis 4.3 mm × 2.3 mm, with a range of 10.4 mm × 4.0 to 2.0 mm and 8.0 to 3.0 mm × 4.0 to 2.0 mm.

A female shot at the same time (June 5, 1939) had an ovary 16 mm long with the largest follicle measuring 6 mm. A fine-grained ovarian structure was seen in the 22 females caught in August. In one case the follicles were 1.0 mm (Lawrence Bay, August 19, 1932) and in another 3.0 mm (Cape Gek, Anadyr Bay, August 5, 1933); these were probably two-year-olds or in any case nonbreeding birds. In a female caught by V.D. Lebedev and V.R. Filin on June 18, 1958, two follicles in the ovary were about 7.0 mm long. Subcutaneous adipose deposits in the above males and females were negligible. The fall specimens were characterized by wide diversity of states. A pair caught with fledgelings on August 11, 1938 differed in fattiness; the male was emaciated while the female had adipose deposits under the pterylae. Wrangel specimens were generally plump and some even obese, while Chukchi specimens were mostly emaciated.

On June 12, 1939 I sighted Sabine's Gulls on the south coast of Wrangel Island only in pairs. They hid on the shores of small lakes to escape a very strong wind.

The three clutches found by members of the *Maud* expedition on Aiok Island on June 24 and 29 and July 1, 1920, were located in depressions among clumps of grass in a marsh. Only in one case had nest lining been provided, while in the other two the eggs had been laid directly on the ground. The nest lining was 13 cm across and 2.0 cm thick, and consisted exclusively of dry stalks, probably of year-old heather, a single straw, algae, and a pair of feathers. Each clutch contained three eggs. On June 24 all three eggs were fresh. The incubating gull swooped at the collector with such energy that he had to repel it with a stick. In the clutch found on June 29 one egg was fresh, another half-incubated, and the third with a chick about to peck out. The adult was frightened and could not be collected. The eggs in the clutch collected on July 1 were all highly incubated. In form and color they resembled the eggs of a Long-tailed Jaeger but differed in smaller size (in mm):

| | | |
|---|---|---|
| 46.5 × 32.2 | 46.5 × 34 | 40.5 × 31.5 |
| 47 × 33 | 47 × 33 | 41.5 × 33 |
| 47 × 33 | 47 × 33.5 | 43 × 32.5 |

The nests found by V.D. Lebedev and V.R. Filin were disposed among nests of terns and Long-tailed Ducks. One consisted of a depression lined with a small quantity of dry grass and contained three eggs. The gulls attacked viciously, dropping excreta on the man and striking him on the head with their beaks.

On July 10, 1960 A.G. Velizhanin found a nest on Chicherina spit on the south coast of Wrangel Island. It reclined in a small depression among gravel. The pit was 13.5 cm across and 3.0 cm deep and lined with grass stalks and a few feathers of Snow Goose. These eggs were 45.5 mm × 31.2 mm and 46.0 mm × 31.8 mm.

On July 7 and 8, 1964, F.B. Chernyavskii examined 15 nests on Tundra Akademii. Each contained two, more often three eggs, which were highly incubated with already formed embryos. The clutches lay on a thin lining of dry grass stalks. As the man approached the nest, the gulls swooped with a loud chirring scream to within half a meter of his head. They then soared upward, dove again, and exhibited agility as well as elegance of movement.

On July 15, 1939 in Somnitel'naya Bay, I came across a brood in which the chicks were still covered with down. On my approach they ran from the shore to the water, swam for a short distance, and when the danger seemed removed, soon returned. The adult birds protected their two chicks with great care. One, in flying past, almost brushed me with its wings and sprayed excreta. In another case, the chick was concealed by a tiny mound and I decided to photograph it with a reflex camera, but the adult bird took advantage of my unguarded position, and as I focused, it sprayed excreta with such force I was compelled to wipe my spectacles and face immediately.

Downy chicks found by S.M. Uspenskii and his colleagues on July 19, 1960, weighed 55 to 104.5 g and were 15.0 to 19.6 cm long. Upon their approach, they slipped into the water and attempted to escape by swimming, but soon returned to the shore. On July 27 A.G. Velizhanin came across young gulls which were already flying rather well but took off reluctantly on the approach of man.

On August 11, 1938, on Ozero lagoon, I encountered a brood in which the young birds and adults swooped at me. When the adults were collected, the young stopped flying but remained nearby. After a few days I noticed Sabine's Gulls in a tundra south of the Krasnyi Flag River estuary. Young birds wandered to the banks of the lagoon and only the adults remained in the tundra. In spite of the absence of young, the adults exhibited considerable alarm at my approach. They flew toward me, landed nearby, and slowly departed, sometimes dropping their wings as birds do when they leave the nest. The agitated parents sometimes stood opposite each other like fighting cocks: this is a mating display. Dropping of wings and other mating behavior were observed only at certain places by small lakes where evidently the birds had only recently nested and hence were still strongly attached to their nesting sites. On August 9 and 10, 1934, in the mouth of the Kol'oam-Véem River, I came across a brood with two young which were already flying. As my party approached an adult gull flew toward the first man with the young trailing behind it. There was great alarm in the adult's behavior.

V.D. Lebedev and V.R. Filin came across poorly flying nestlings taking to the water in the company of adult birds on the bank of Chaun Bay on July 22 and 25, 1958.

In the young specimens I collected, the gonadal growth was a stage above that usually seen among young birds of other species. Thus the testes of a one-year-old male caught in Lawrence Bay on August 19, 1932 were 3 mm × 2 mm and 2 mm × 2 mm. A similar male from Bruch spit shot on August 25, 1938 had a left testis 3 mm × 1 mm and a slightly smaller right one. A fine-grained ovarian structure was seen in young females; the ovary was tender and less sinuate than in older birds. Two young specimens from Lawrence Bay on August 19, 1932 were emaciated, while others had fairly significant layers of subcutaneous adipose deposits.

*Departure*—On the north coast of Wrangel Island, even by August 20 in the fall of 1938, I saw Sabine's Gull in large numbers. Later they became rare and I did not sight a single one after August 27. In 1928, migrating Sabine's Gulls were sighted by F.L. Jaques over the sea south of Wrangel Island on August 22 and 25. In the fall of 1933, according to my observations, a mass flight occurred around Uélen in the first few days of September. On September 9 I saw a lone specimen on a small lagoon in the tundra; a specimen was brought to me from Inchoun in mid-September. On October 1, I encountered separately an adult female and a young bird among phalaropes on Uélen lagoon. Finally, in October, in the same place I sighted the last solitary specimen. Immediately thereafter the lagoon froze over.

Evidently the course of migration of these gulls from the Chukchi peninsula lay toward the American coasts. As far as is known, Sabine's Gull winters on the Peruvian coasts.

*Habits*—The call of Sabine's Gull is a chirping, groaning, and rattling sound, which more closely resembles the scream of a tern than the call of a gull.

*Food*—An analysis of stomach contents revealed the following: 1) Cape Gek

(Anadyr range), August 5, 1933. Bit of the head of a hymenopteran, fiber of plant origin, bit of a shell, and pebbles. 2) Dezhnev village, August 14, 1932. Heads and thorax of 3 hymenopterans, moth, bits of legs of Tipulidae, 35 eggs of Tipulidae, bits of legs of several dozen small insects, and about 15 crustaceans. 3) Same date. About 5 crustaceans and 4 tiny pebbles. 4) Same date. About 10 crustaceans and amorphous animal residue. 5) Same date. Amorphous remains of crustaceans, 13 tiny pebbles and fine sand. 6) Same date. Vertebra of a small fish, abdomen and other remains of several dozen crustaceans, 1 seed, and 2 pebbles. 7) Lawrence Bay, August 19, 1932. Eightythree jawbones of *Lepidurus arcticus* (Pall.), identified by S.S. Smirnov. 8) Same date. Over a hundred small crustaceans, 3 *Lepidurus arctius,* 12 large saber-shaped jaws, several dozen insect larvae, some tiny pebbles. 9) Same date. Several dozen crustaceans in soft bivalve shell, 50 *Lepidurus arcticus,* and 5 large saber-shaped jaws. 10) Same date. Two Dytiscidae (one whole and one head), 4 female *Emycercus glacialis* Lillj. (identified by S.S. Smirnov), 6 insect lavae, about 250 small crustaceans, 9 *Lepidurus arcticus,* and 2 small saber-shaped jaws. 11) Same date. Thirty-three *Lepidurus arcticus.* 12) Same date. Three crustaceans in soft bivalve shells, 78 *Lepidurus arcticus,* and 2 large saber-shaped jaws. 13) Same date. Several hundred small insect larvae, 2 crustaceans in soft bivalve shells, a large saber-shaped jaw, and head of a water beetle. 14) Same date. Several hundred small larval insects, considerable sand, and tiny pebbles. 15) Same date. Amorphous animal remains, pair of jaws and individual chitinous parts of a *Lepidurus arcticus,* and tiny pebbles. 16) Same date. About 60 *Lepidurus arcticus,* 8 large saber-shaped jaws, and a few tiny pebbles. 17) Same date. Twenty-eight insect larvae and about a hundred crustaceans. 18) Uélen, October 1, 1933. Highly deformed remains of some 50 crustaceans. 19) Wrangel Island, August 11, 1938. Three *Gammarus wilkitskii,* bones of a *Boreogadus saida* (Lep.), and 11 tiny (3 to 48 mm) pebbles. 20) Same place, August 14, 1938. Four highly digested insect larvae and 10 small (3 to 6 mm) pebbles. 21) Same place, August 18, 1933. Gruellike mass of highly digested *Spirantocaris* sp. (Amphipoda). 22) Same place, August 25, 1938. Digested remains of 3 or 4 *Spirantocaris.* 23) Same place, August 25, 1938. Several small bones of *Boreogadus saida,* 5 bits of extremities of crab (*Chionocetes opilio* Fab.), and the bird's own feather. 24) Same place, June 5, 1939. About 2.0 g of remnants of *Trichoptera* larvae.

The stomachs of Sabine's Gulls caught on Wrangel Island by S.M. Uspenskii and his colleagues contained 50 to 60 adult Tipulidae each. Most of the stomachs were packed with these insects.

*Systematics*—The following subspecies are distinguished by me (Portenko, 1939a).

1. ***Xema sabini sabini*** (Sab.). Palest and smallest form. The head and upper portion of neck is very pale gray with bluish tinge. The back, shoulders, dorsal surface of the upper tail and wing coverts, i.e., the so-called mantle, are very bright bluish-gray. The white tips of black flight feathers are larger on the average than in other subspecies. The black fringe of the wing and the posterior of the carpal joint are very narrow. White color is more pronounced in the distal part of the sixth

primary flight feather. Wings are shorter than in other subspecies (Table 7). Young birds in the first plumage are paler than other forms.

*Range*—Greenland. Specimens from northeastern Greenland have been studied.

**Table 7. Wingspan (cm) of subspecies of *Xema sabini****

| Subspecies | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Mean | No. of samples | Max. | Min. | Mean | No: of samples |
| *X. s. sabini* (Sab.) | 27.4 | 26.6 | 27.0 | 5 | 26.1 | 24.2 | 25.2 | 2 |
| *X. s. palaearctica* Stegm. | 29.5 | 27.4 | 28.5 | 6 | 29.3 | 26.7 | 27.5 | 7 |
| *X. s. tschuktschorum* Port. | 29.2 | 26.5 | 27.8 | 22 | 29.5 | 25.8 | 27.0 | 28 |
| *X. s. woznesenskii* Port. | — | — | — | — | 26.8 | 26.7 | 26.7 | 2 |

*Measurements done with a metal scale. H.T.L. Schaanning recorded measurements similar to mine for eight specimens from Aiok Island: 27.0 to 29.0 (27.9) cm. Unfortunately, he did not classify the series into males and females.

2. ***Xema sabini palaearctica*** Stegm. Generally somewhat darker and larger. The head and upper part of neck are somewhat darker, but with the same intense bluish tinge. The mantle is darker and more steel-gray in color. White tips of the primary flight feathers are smaller. The black fringe of the wing is somewhat broader. The wing is longer; young birds are darker.

*Range*—From Taimyr peninsula to Lena delta and Novosibirsk Islands inclusive.

3. ***Xema sabini tschuktschorum*** Port. It is very similar to the preceding subspecies but even darker. The head and upper part of the neck are blackish with faint bluish tinge. The mantle is slightly darker and stands out noticeably only in a full series, and with an even deeper steel tone. The wingspan is on the average somewhat short. Young birds are dark, brownish-gray. This is one of the subspecies which can only be distinguished in a well-prepared series and any taxonomist lacking a satisfactory collection is likely to reject its subspecies status.

*Range*—Lower Kolyma, Chukchi peninsula, Wrangel Island, and coast of Anadyr Bay.

4. ***Xema sabini woznesenskii*** Port. It is the darkest-colored form compared to the rest. Head and upper part of neck is almost black. The mantle is darker, gray with very vivid steel tinge. White tips on the primary feathers are extremely small. The black fringe of the wing is broader. The black color is better developed on sixth primary flight feather. It surpasses only the nominal form in wingspan.

*Range*—Western Alaska.

Phylogenetically, the closest species to Sabine's Gull is *Creagrus furcatus* Néboux from Galapagos Islands. I examined a specimen of it, rare in bird collections, in the Berlin Zoological Museum. *C. furcatus* is a large gull, the size of a

Lesser Black-headed Gull, but very similar in color to *X. sabini.* The color of the desiccated beak is black with bright tip; legs, rings of eyelids, and angles of mouth are red or orange. The plumage on head is blackish-slate. Neck is smoky gray, without a black collar. The mantle is darker than in *X. sabini.* The apex of flight feathers is black with white tip. The underside of the body, broad cuneus on wings, and the tail are white. The depth of notch on tail is 8.0 cm.

The external resemblance of *C. furcatus* to *X. Sabini* is so great (see color photograph in the book *Eibl-Eibesfeldt,* 1966, pp. 144-145) that there is hardly any justification for isolating the Galapagos Gull into a separate genus. However, it biologically possesses several distinctive characteristics (see D.W. and B.K. Snow, 1967). *Creagrus furcatus* nests in colonies on rocks at all times of the year and the clutch contains only one egg. This is a typical Pelagic Gull acquiring food at night, as a result of which very large eyes have developed. It winters on the Peruvian coasts where Sabine's Gulls also winter (not reckoning their Atlantic wintering sites). Thus *Xema sabini* arrives in northeast Asia from the American side.

In comparing *Xema* and *Creagrus* another common characteristic becomes evident, namely, bipolar distribution of two proximate species as in the case of fulmars, goosanders, terns, and other birds.

*Specimens*—1) Wrangel Island, July 15, 1929, ○, G.A. Ushakov; 2) East Siberian Sea, 70°54.5′ N 176°09′ E, August 22, 1929, ○, P.V. Ushakov; 3) Rodgers Bay, June 25, 1931, ♀, Vlasova; 4) Wrangel Island, undated, ○, Zvantsev; 5) Dezhnev village, August 13, 1932, ♂, Portenko; 6 to 24) same place, August 14, 1932, 7♂♂, 11♀♀, and ○, Portenko; 25 to 36) Lawrence Bay, August 19, 1932, 4♂♂, 7♀♀, and ○ 1° anno, Portenko; 37) Uélen, September 9, 1933, ♂, Portenko; 38 and 39) same place, October 1, 1933, ♂ and ○ 1° anno, Portenko; 40 to 41) Ozero lagoon, south coast of Wrangel, August 11, 1938, ♂♀, Portenko; 42 to 44) Bruch spit, north coast Wrangel, August 14, 1938, ♂♀♀, Portenko; 45) Wrangel Island, August 15, 1938, ○, Druzhinin; 46 to 48) same place, Krasnyi Flag River, August 18, 1938, ♀♀○, Portenko; 49 to 58) Bruch spit, August 25, 1938, 4♂♂, ♀♀○, ♂♀♀ 1° anno, Portenko; and 59 to 60) Akatylanva landmark, Wrangel Island, June 5, 1939, ♂♀, Portenko.

## 93. *Sterna paradisaea* Pontopp.—Arctic Tern

*Local names*—Chukchian: kéruker, tykíchek, tekétschyak in the records of the *Vega* expedition. In Eskimo: tykiégak in Providence Bay and tŭ-qē-yā́-ghăk on St. Lawrence Island.

*Distribution and status*—It nests on the Chukchi peninsula and Wrangel Island, but only sporadically and in small numbers, although not a rarity. Flies away in winter.

In Krest Bay, L.O. Belopol'skii (1934) encountered nesting colonies around Notapenmen village and on the western extremity of Meechken Island. On September 2, 1932, I saw Arctic Terns in the environs of Uél'kal' village and on August 6 of the same year found them common around Notapenmen village. In Providence

Bay no one has seen terns and they are probably absent there due to prevailing local conditions.

On August 2, 1879, immediately after the departure of the *Vega* from St. Lawrence Island, a tern flying on board the vessel was caught by hand between 11.00 and 12.00 midnight. According to E.W. Nelson (1887), this species nested on St. Lawrence Island. In June, 1913 W.S. Brooks (1915) found a nesting colony of about 25 pairs on the southern side of the island. At the end of June and early in July, 1921, A.M. Bailey (1925) noticed a few terns every day. H.B. Collins (Friedmann, 1932a) caught a young female on August 21, 1930 in Gambell village, and O.J. Murie (1936) obtained a single specimen. In fact, O.W. Geist photographed a young tern and established that this species nested near Gambell and Kukuliak villages. According to F.H. Fay and T.J. Cade (1959), terns do not form large colonies on St. Lawrence Island and nest in a scattered manner. In spring and summer they are often confined near Gambell. E.G.F. Sauer and E.K. Urban (1964) saw some terns there on June 5, 1960. In Boxer Bay and en route from there to Kangi village, they noticed a few terns, in pairs and singly.

W. Stimpson (Cassin, 1863, p. 325) caught this tern in August, 1855 in Senyavin Strait. Specimens preserved in the Institute of Zoology, Academy of Sciences of the USSR include one collected there on July 24, 1900 by I.N. Akif'ev, and a male shot on August 7, 1843 by I.G. Voznesenskii in Mechigmensk Gulf. On August 19, 1932 I encountered Arctic Terns quite frequently on the south coast of Lawrence Bay. E.W. Nelson (1883, p. 109 and 1887, p. 59) wrote that this bird was common on both shores of the Bering Sea; he saw it at almost every site visited on the north coast of the Chukchi peninsula. F.L. Jaques (1929) noticed Arctic Terns in small numbers on August 26, 1928 in Bering Strait.

I sighted these terns in Uélen only in spring and fall flights, but farther west found a small nesting colony in the estuary of the Utte-Véem River. W. Brooks noticed a pair on July 17, 1913 on Cape Serdtse-Kamen' and V.V. Leonovich on July 5, 1970 in Énurmino. According to the information available, a large colony nested on Idlidlya Island.

Members of the *Vega* expedition (Palmén, 1887) collected arctic terns repeatedly in Kolyuchin Bay. Three were seen on June 22, 1879 and one shot on June 24. Later, they were sighted more often: on June 27 in Pitlekai, July 1 in Tepkan, and on July 2 and 5 by the vessel. On July 7 O. Nordquist noticed a tern between Cape Dzhénrétlen and the lagoon, on July 9 a few in the estuary of the Ryraitinop River, and on July 10 and 11 in the lagoons closest to Pitlekai. On July 12, a specimen was collected in Pitlekai and on July 16, an egg found at the wintering site. On July 17, Arctic Terns were encountered on the sea coast. Inside the country, according to my 1956 observations, terns flew in spring over the Amguéma River and frequently wandered in the summer around kilometer 91 village. Evidently they nested somewhere down the river; once they swooped at me with a scream only because I had disturbed some plovers during my search for nests.

A.A. Kishchinskii encountered terns on Vankarém spit along the banks of

Nutauge lagoon, in the tundra close to Ukouge, and in the Amguéma estuary. They were rare everywhere, not seen on every tour, and never more than two or three birds.

V.Ya. Isaev told me that this species occurred in small numbers on Cape Schmidt. In early August, 1938 I did not see them there even though I walked 10 km eastward along the coastal lowland. However, on August 30, 1939 I saw a flock flying close above the beach. The collections of A.A. Sevich contain the skin of an old tern from either Cape Schmidt or from the estuary of the Kolyma. On September 11, 1878 a few were sighted by members of the *Vega* expedition between Cape Schmidt and Cape Yakan. A.I. Argentov (1857a, p. 85) in *Opisanii Chaunskogo Prikhoda* (Account of the Arrival to Chaun) cites among other birds a "martyshka" i.e. a tern. S.G. Pavlov brought me a specimen from Chaun Bay. C. Amory (Riley, 1918) caught two males on August 17, 1914 on Aiok Island. According to V.D. Lebedev and V.R. Filin (1959), the Arctic Tern on Aiok Island was a fairly numerous nesting bird; in particular, nesting colonies were found in its southeastern corner. Quite often terns were also encountered on the west coast of Chaun Bay and sighted over the shallow Chaun Strait.

Based on the above data the conclusion could be drawn that the Arctic Tern is distributed unevenly on the north coast of the Chukchi peninsula, in spite of the view expressed by J.E. Thayer and O. Bangs (1914). According to S.A. Buturlin (Buturlin and Dement'ev, 1934, I. p. 180), this species is encountered in the Kolyma delta south up to 67.5° N.J. Koren (Thayer and Bangs, 1914) found the Arctic Tern at least up to the Lower Kolyma. C. Amory caught a female there on June 18, 1915. A pair of terns was noticed and one caught by members of the *Maud* expedition on August 29, 1924, 26 miles north of the Kolyma delta at 70°02′ N 163°59′ E. After midday on September 4, 1878 A.A.L. Palander (Palmén, 1887) saw terns southeast of Medvezhii Islands.

F.L. Jaques noticed Arctic terns from August 17 through 22, 1928 in the Arctic Ocean primarily near Herald Island and to the north of 70° N. A.P. Andriyashev on August 12, 1946 saw them only rarely in the sea around 72°08′ N 177°41′ W, i.e., north of Wrangel Island.

G.A. Ushakov (Bannikov, 1941) caught a specimen on July 10, 1929 on Wrangel. Members of the icebreaker *Litke* brought to the Institute of Zoology, Academy of Sciences of the USSR a specimen from Rodgers Bay shot on September 2, 1929. Ushakov believed that it was a common nesting species, but according to the five-year observations of A.I. Mineev (Portenko, 1937b) it was a common, but not numerous, species nesting on Wrangel Island. I totally subscribe to the latter conclusion on the basis of my observations in 1938 and 1939. On August 11, 1938, I encountered a few nesting pairs at the west end of Ozero lagoon. I found two or three nesting pair in the tundra south of Bruch spit. Near the estuary of Krasnyi Flag River, I came across terns from August 15 through 20 exclusively on the coast of the lagoon. They gathered in large numbers together with gulls on the closed lagoon and were absorbed in catching fish. From August 21 through 26 I came across many terns on Bruch spit. In June, 1939 I noticed their arrival on the south coast of

Wrangel Island. They settled in very small numbers in Somnitel'naya Bay, in the estuary of the Amerikanskaya rivulet, and in small number on Ozero lagoon, but flew over Rodgers Bay.

According to A.G. Velizhanin (1965), this tern was a common bird in 1960 and seen on all the spits along the coast.

*Habitat*—The Arctic Tern is an exclusive inhabitant of coasts, but only lowland coasts. Evidently it avoids even the vicinity of hills and thus is absent altogether in Providence Bay. It likewise does not penetrate deep inside the countryside. During my walking tours along the Kol'oam -Véem and Utte-Véem Rivers, I encountered a nesting colony only in the estuary of the latter river. This surprised me all the more since the Arctic Tern nests in Anadyr basin as a common bird, at least up to Markovo and probably even beyond. One can only assume that the Chukchian rivers are devoid of the principal food item of terns—small fish. On Wrangel Island, in the words of A.I. Mineev, "terns were not observed in the tundra, but on the seacoast and along the bays." In the tundra south of the Bruch spit I found nesting pairs which had selected a valley with a marsh for their residence. The valley lay near an extensive lagoon. Sand spits or islets represent the preferred nesting sites of Arctic Terns. For example L.O. Belopol'skii found a nesting colony on a spit around Notapenmen. On the evening of August 6, 1932 I saw a large flock settled there for a night's rest.

On St. Lawrence Island, W.S. Brooks encountered a large nesting colony on a sand spit in an extensive lagoon. O.W. Geist found nesting sites on a sand spit near Gambell village, on tundra coasts, and within sight of a fence in Kukuliak village. According to F.H. Fay and T.J. Cade, terns nested on St. Lawrence Island on pebbled spits and seacoasts. One nest was found on a sandy beach.

In Lawrence Bay I encountered terns on a spit with small lakes and found a nest in the estuary of the Utte-Véem River on an island in the delta. When the nests were destroyed, terns remained in the shallow lowlands of rivers and gathered in flocks on the sand shoals.

According to V.D. Lebedev and V.R. Filin, a colony of terns was located on Aiok Island in the coastal zone, on the islets along lakes.

During fall flight Artic Terns were seen flying over the sea.

*Arrival*—According to the 1931 observations of L.O. Belopol'skii, the first terns were seen in Krest Bay on June 1. On St. Lawrence Island, according to F.H. Fay and T.J. Cade, these birds began to appear in the last days of May. I noticed the first tern in Uélen in the spring of 1934 on May 31. A lone bird, it flew over the tiny channel intersecting the spit. The lagoon was still icebound but puddles had formed on the ice in the tiny strait. On June 22, 1879 on Kolyuchin Bay, O. Nordquist saw for the first time just three terns. A.A. Kishchinskii encountered lone ones in the tundra close to Ukouge lagoon on June 6 and 7, 1970. Finally, in the spring of 1939, on Wrangel Island I saw the first arrival of this species on June 12 and several the following day. On June 15, they were no longer rare in Somnitel'naya and the estuary of the Amerikanskaya rivulet.

*Breeding*—Male Arctic Terns arrive with enlarged testes (Table 8).

**Table 8. Size of testes (mm) of Arctic Terns**

| Date | Left | Right | Locality | |
|---|---|---|---|---|
| June 2, 1932 | 9 × 5 | 8 × 7 | Markovo | Anadyr region |
| June 4, 1932 | 10 × 8 | 9 × 7 | -do- | |
| July 11, 1931 | 5 × 3 | 5 × 3 | Tumanskaya | |
| July 13, 1931 | 4 × 3 | 3 × 2 | Cape Gek | |
| August 2, 1932 | 5 × 3 | 4 × 2 | Zhilova Koshka | |
| August 2, 1932 | 4 × 2 | 3 × 2 | -do- | |
| August 5, 1933 | 4 × 3 | 3 × 2 | Cape Gek | |
| August 11, 1938 | 4 × 3 | 3 × 2 | Ozero lagoon | Wrangel Island |
| August 16, 1938 | 5 × 3 | 4 × 2 | Krasnyi Flag River | |
| August 25, 1938 | 5 × 3 | 4 × 3 | Bruch spit | |
| August 25, 1938 | 5 × 3 | 3 × 2 | -do- | |

In females caught in Markovo in the Anadyr basin on June 1, 1932, the largest of follicle in the ovary was 4.0 mm, but in another collected on June 6 the ovary showed only a finegrained structure similar to that of another female from Cape Gek on July 13, 1931. Birds collected in flight had subcutaneous adipose layers as in most summer and fall birds. These deposits were absent only in a few terns shot in the Anadyr Bay (Cape Gek and Zhilova Koshka) in July and early August.

On June 25, 1931, in a colony on Meechken Island, L.O. Belopol'skii found a nest of terns with a single egg laid on the bare ground. On June 25, 1913, W.S. Brooks found some clutches on St. Lawrence Island; their incubation had just commenced. A nest with two eggs was found on June 22, 1953. In the estuary of the Utte-Véem River on July 5, 1934, I came across two nests, each of which contained two eggs with half-developed chicks. The adult birds screamed overhead but were cautious and kept away. The Chukchians accompanying me spread a rope noose over the nest and caught the tern resting beside it without difficulty. The color of the eggs in each clutch varied greatly and, moreover, the two clutches differed notably in form and size. The eggs in one were 4.37 cm × 2.90 cm and 4.27 cm × 2.98 cm, and in the other 3.89 cm × 2.99 cm and 3.83 cm × 2.92 cm. In the first clutch the main background of the eggs was a very cold greenish; one egg was pale sandy green and the other greenish-olive. In the second clutch the main background was a dark sandy ocher; one egg was very pale and the other very vivid. The spots were of two types: deep grayish-violet and moderately dark sepia. An egg obtained at the wintering station of the *Vega* expedition on July 16, 1879 was 40 mm × 29 mm and weighed 0.8 g. It was yellowish-gray with a grayish-black surface, with black and earth-brown sunken spots and dots.

I encountered terns on the Amguéma only on June 13 in 1956, when the river was not yet fully opened but leads in the ice were visible. These were recent arrivals searching for food in the exposed water and probably wandering from the lower reaches of the river. On July 13, 1970, on Nutauge spit, Kishchinskii found tiny chicks in down (Fig. 9) surrounded by its agitated parents. On Aiok Island in 1958,

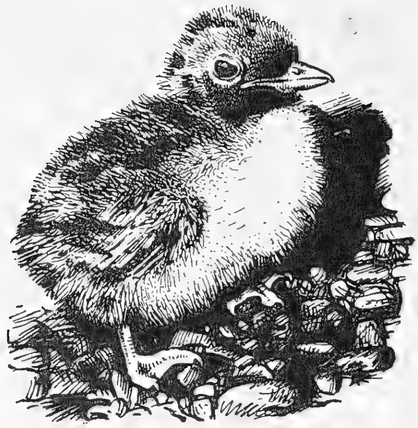


Fig. 9. Fledgeling of Arctic Tern *Sterna paradisaea* Pontopp Picture by V.S. Rozhdestvenskaya.

V.D. Lebedev and V.R. Filin had already detected nests with two and three eggs, i.e., with full clutches, on June 13. On June 28 they found nests with one, two and three eggs. Parents vigorously protected them from predatory Herring Gulls and jaegers.

On Wrangel Island, according to A.I. Mineev, Arctic Terns nested along the spits on sand. A pair of eggs had been simply laid in a small pit and the parents desperately protected them from predation.

According to O.W. Geist, on St. Lawrence Island, a pair of terns with two downy nestlings in a nest built within sight of human dwellings attacked any passerby, and even struck an observer on the head. Neighboring birds would also join in an attack. On August 11, 1938, I encountered some nesting pairs on Ozero lagoon. Terns swooped at me screaming. Semifledged chicks were scattered along the spit. I saw one swim from the spit into the sea; frightened, it attempted to remain concealed even in the open water.

From August 21 through 26, 1938, I saw many terns in pairs on Bruch spit. For some reason there were no young birds among them. Moreover, I noticed that in some pairs one bird fed the other. Gonads of specimens caught from the estuary of Krasnyi Flag River on August 16 and on Bruch spit on August 25 were somewhat larger than one would expect in birds which had just completed nesting. The female from Bruch spit on August 25, 1938, had a racemose ovary 1.0 cm long, while the ovary of the female from Cape Gek caught on July 13, 1931, was more compact with a fine-grained structure. Evidently, terns which had either lost clutches early or had not laid any gathered on Bruch spit. One cannot fail to see here an analogy with Sabine's Gulls, in which the ovaries in autumn still showed follicles up to 3.0 mm in diameter and exhibited a similar appearance.

On St. Lawrence Island flying young terns were sighted on August 4. On August 21, 1930 H.B. Collins collected a young female in the process of molting into adult plumage.

*Departure*—The migration of Arctic Terns commenced at the end of August. On

August 24, 1933, I saw some small flocks around Uélen, flying from the lagoon side from the south toward the seacoast northeast. The reason for migration was the onset of a cold snap. On August 30, 1939, I noticed flight on Cape Schmidt. A screaming flock flew eastward over the ship. In both cases, the flight direction agreed with the current view that Arctic Terns from northeast Siberia do not fly south through the Pacific Ocean, but follow the Atlantic Ocean along the arctic coast of America. Members of the *Vega* expedition saw migrating terns at a much later period, on September 4, 1878. A.A.L. Palander noticed small numbers southeast of Medvezhii Islands; later, on September 11, some flew on the coast between Capes Schmidt and Yakan. G.U. Sverdrup (Schaanning, 1928) noticed a pair on August 29, 1924 on the sea north off Kolyma delta.

On Wrangel Island in 1960, according to A.C. Velizhanin, migration occurred mid-August.

*Food*—Dissected stomachs contained remains of fish, mostly bones. According to observations made on St. Lawrence Island, terns fed on the nine-spined stickleback [*Pungiteus pungiteus* (L.)] on Lake Trautman.

*Systematics*—I do not differentiate subspecies among Arctic Terns and have discussed the matter in an earlier work (Portenko, 1939b, II. p. 9).

*Specimens*—1) Mechigmensk Gulf, August 7, 1843, ♂, Voznesenskii; 2) Senyavin Strait, July 24, 1900, ○, Akif'ev; 3) Wrangel Island, July 10, 1929, ○, G.A. Ushakov; 4) Rodgers Bay, September 2, 1929, ○, P.V. Ushakov; 5) Chaun Bay, June 21, 1933, ○, Pavlov; 6) southeastern part of Wrangel, July 14, 1933, ♂, Vlasova; 7) Ozero lagoon, August 11, 1938, ♂, Portenko; 8) Krasnyi Flag River, August 16, 1938, ♂, Portenko; and 9 to 12) Bruch spit, August 25, 1938, ♂♂♀○, Portenko.

*Biological specimens*—1) Two eggs, Utte-Véem River estuary, July 5, 1934; and 2) another two eggs recovered at the same time.

### 94. *Sterna camtschatica* Pall.—Kamchatka Tern*

*Distribution and status*—Only one occurrence was known until recently for the Chukchi peninsula. The naturalist of the *Jeannette* expedition, R.L. Newcomb (1888, p. 278: "Aleutian tern"; Nelson, 1883, p. 109; 1887, p. 59: "*Sterna aleutica* Baird."), was in Lawrence Bay on August 25, 1879 and observed the Kamchatka Tern as a rare species among many other birds. Since specimens were not captured, this observation should be considered doubtful until this site is proved to fall within the well-established range of occurrence of this very sporadically distributed bird.

The Kamchatka Tern nests on Sakhalin, Kamchatka, Koryatz Zemlya (found by me in 1959 and 1960), and Alaska, and there is no reason to doubt its occurrence in the lowlands of the Chukchi coast and adjoining Bering Strait.

*Systematics*—In the description of *Sterna camtschatica,* P.S. Pallas (II. 1811, p. 335) gives a contradictory characteristic—red color of mouth and legs: "*S.* (*sterna*) *rostro verticeque nigro, ore pedibusque rubris, fronte superciliisque albis.*" The reported white coloration of the forehead and supraocular zone, however, best characterizes our bird. Hence I assign priority to Pallas even though the description

* Synonym of *Sterna hirundo longipennis*—Ed.

by S.F. Baird (1869, p. 321, pl. XXI, Fig. 1) is more complete and, what is more, has a good color picture of the bird appended.

## Suborder ALCAE—GUILLEMOTS

### *Plautus alle alle* (L.)—Dovekie

In June, 1965, W.J. Breckenridge (1966) was given two Dovekies (Little Auks) by eskimos in Little Diomede Island. On the night of June 13/14, he sighted this species resting about 40 feet away from him; after a few minutes it hid under some huge boulders. On June 16 eskimos brought him a live Dovekie caught in a net and said it was not the first time such a bird had been trapped. One eskimo narrated that he had already collected three of them since 1949. Later that same day, Breckenridge was given a second specimen caught in a net. These two birds are preserved in museums. Based on these findings Breckenridge assumed that an extremely small population of Dovekies nested on Little Diomede Island for a few years consecutively.

Dovekies had been reported earlier in Bering Strait. According to I.N. Gabrielson and F.C. Lincoln (1959), one was collected on July 13, 1935 at Cape Barrow, and another sighted on August 10, 1914 near Wainwright.

### 95. *Uria lomvia arra* (Pall.)

### 96. *Uria lomvia heckeri* Port.—Thick-billed Murre

*Local names*—Chukchian: Keruker in the records of the *Vega* expedition; káru according to Mineev. In Eskimo: Al'pa in Providence Bay, kū-wŏk′ or ăthl-pă on St. Lawrence Island.

*Distribution and status*—It is an abundant nesting species in the Chukchi peninsula and on Wrangel Island; it is distributed in single, quite often very large colonies. It winters on the sea on the north coast of the Chukchi peninsula depending on ice conditions.

L.O. Belopol'skii (1934) found this murre in Krest Bay during spring flight. The specimen collected by him proved to be *Uria lomvia arra* (Pall.) although he called *Uria troile californica* (Bryant) in both his articles. Evidently Thick-billed Murres nested on the rocky shores around Cape Bering, but were sighted only occasionally in winter with the appearance of exposed water on the coasts; Belopol'skii encountered them twice in March, 1931. In August and early September, 1932, I sighted these birds from a ship along the shore southeast and southwest of Krest Bay, and later very often on my way to Cape Bering. On August 10, they were extremely numerous on Cape Bering and on the 21st, equally as abundant between Providence Bay and Preobrazheniya Gulf. Near the latter, I saw a bazaar of them, i.e., a nesting colony, on the rocks.

A.M. Bailey (1925) sighted Thick-billed Murres in small numbers daily from July

1 through 7, 1921 in Émma Bay. In Providence Bay and on the seacoast east up to Sireniki village, according to my observations in 1932 and 1938, Thick-billed Murres did not represent a rarity, but I came across nesting colonies, and very small ones at that, only on the seacoast. Murres flew into the bay to feed. I.O. Olenev had occasion to study the seacoasts on both sides of Providence Bay and found several hundred nesting colonies on the rocks containing up to a thousand birds. In his opinion, Thick-billed Murres wintered along the edge of the ice in the sea opposite Providence Bay and Cape Chaplin. According to the observations of P.T. Butenko, however, in the winter of 1937/1938, murres were seen there only in the first half of the season, after which they disappeared. Numerous specimens of Thick-billed Murres caught in the nesting season in Providence Bay belonged to the subspecies *U.l. arra* Pall.; the light-colored arctic form began to appear with the commencement of flight and was caught, for example, on September 19, 1929.

In mid-June, 1877, E.W. Nelson (1887) noticed Thick-billed Murres in large numbers on St. Lawrence Island. On July 31 and August 1, 1879, murres were sighted by members of the *Vega* expedition (Palmén, 1887) along the coasts. A large number of small flocks were seen on August 3 after the ship left the island. A. Seale (1889) wrote that Thick-billed Murres were far more numerous there than any other species of birds on July 1, 1896. W.S. Brooks (1915) collected specimens on St. Lawrence Island in 1913. F.S. Hersey (1916, p. 4) found nesting Thick-billed Murres on July 24 and 25, 1914, on high rocks behind Gambell village. R.W. Hendee (Bailey, 1925), who remained on the island from July 1 through 8, 1921, reported that Thick-billed Murres were extremely numerous. H.B. Collins (Friedmann 1932a) collected specimens on June 1, August 6 and 10, and even on September 4, 1930. Six specimens were collected by O.J. Murie (1936). According to the computations of F.H. Fay and T.J. Cade (1959), the population of Thick-billed Murres occupied third place in the total bird strength of the Island. In 6.5 hrs of daily flights, about 100,000 birds were seen. Murres of this species wintered along the coasts of the island. E.G.F. Sauer and E.K. Urban (1964) state that they were extremely numerous in Boxer Bay in 1960.

According to the studies of H. Friedmann (1934a), bones of Thick-billed Murre predominated over those of others in the kitchen middens discovered by archaeologists, and were found in 69 excavations covering the oldest civilization as well as the most recent.

Members of the *Vega* expedition sighted a few Thick-billed Murres in Bering Strait on July 27, 1879, as the ship sailed from Port Clarence toward Kon'yam Bay (in Senyavin Strait) and on July 30 right in the bay.

Thick-billed Murres undoubtedly nested at suitable sites on the east coast of the Chuckchi peninsula. In Lawrence Bay, where convenient high rocks are not available, I did not find these birds. However, a specimen was collected there by the expedition of the icebreaker *Litke* on July 31, 1929. A.P. Kuzyakin found a small colony around Poutyn. In the Bering Strait, feeding Thick-billed Murres were encountered throughout the summer and in larger numbers than near the coasts. A.P. Andriyashev passed through that area on July 31, 1946, and saw flocks of 20 to

30 birds each. A.P. Kuzyakin saw single birds, pairs, and small flocks of Thick-billed Murres more often than other species of guillemots on June 27 and July 3, 1957.

Even in 1881, E.W. Nelson (1887, p. 45) drew attention to the abundance of murres on Diomede Islands. In 1909, J. Koren (1910) observed them on the west coast of Bol'shoi Diomede Island. According to A.M. Bailey, they nested in countless numbers. Similarly F.L. Jaques (1929) recorded in 1928 that many murres nested on the Diomede Islands and sighted broods on August 27. On June 23, 1934, I saw murres on the coasts of Bol'shoi Diomede Island, but judging from the nature of the rocks I traversed in the southwestern part of the island, they hardly nested there in significant numbers.

J.W. Brooks (Kenyon and Brooks, 1960) watched the arrival of murres on Little Diomede Island in 1953, where several thousand gathered on the pools of exposed water in the ice. Although he had no opportunity to accurately determine the species of these birds, there is no doubt that they were Thick-billed Murres. In 1958, K.W. Kenyon saw large flocks during their flight from Nom toward Little Diomede Island. In May, many thousands sometimes appeared on the rocks, disappearing from time to time.

On the banks of Cape Dezhnev on July 20, 1879, lone Thick-billed Murres and pairs were sighted by O. Nordquist (Palmén, 1887). E.W. Nelson sighted them there in 1881, some specimens were caught by the expedition of Harvard University in 1913, and F.S. Hersey saw a large colony in 1914.

In 1957, A.P. Kuzyakin visited a colony occupying the ledges of very high rocks along the coast at Cape Dezhnev. A few thousand murres nested here. There were no particularly large colonies in the sections of the rocky coast from Naukan to Uélen that I inspected. On June 21, 1934, I visited a mixed bazaar slightly north of Naukan. Kittiwakes predominated. Several dozen groups of Thick-billed Murres were present, but their total did not exceed 300, or probably 400. Even smaller groups of murres were seen in the bazaars farther north of Uélen. On August 14, 1948 V.N. Lyubin caught three fledgelings near Naukan.

Both subspecies of Thick-billed Murres inhabit the vicinity of Cape Dezhnev. Judging from the specimens I caught the light-colored arctic form perhaps predominates. Whether the subspecies *U. l. arra* nests farther westward up to Cape Serdtse-Kamen' is still not known.

I encountered small colonies of murres on July 3, 1934, on Cape Inchoun. There they lived together with guillemots, Horned and Tufted Puffins, Crested Auklets, cormorants, and Black-legged Kittiwakes. Traveling the entire stretch of coastal ice by dog sled from Cape Serdtse-Kamen' to Mitkulen village, I found only a small colony on the rocks east of Seitun. E.W. Nelson encountered Thick-billed Murres in large numbers at Cape Serdtse-Kamen'.

According to V.V. Leonovich in 1970, there were four large bazaars along the entire stretch of the seacoast from Uélen to Énurmino, including the colony around Inchoun. In the bazaar at Cape Ikéchurun, dozens, if not hundreds of thousands nested. A detailed analysis of the bird population was possible in Seishan colony. Not more than 6,000 murres, several hundred guillemots, Horned and tufted Puffins, and cormorants, as well as Herring Gulls, Glaucous Gulls, a pair of ravens, and falcons nested there. A Rough-legged Buzzard reportedly nested a kilometer away. A small colony was detected 5 km east of Seishan.

On July 18, 1879, the *Vega* expedition (Palmén, 1887) sighted a lone Thick-billed Murre near Idlidlya Island, but only a single specimen in flight from the wintering site was secured. According to the Chukchians, this species lived there in large numbers.

In 1909 and 1912, J. Koren (Thayer and Bangs, 1914) found Thick-billed Murres numerous in the nesting site on Kolyuchi Island. In July, 1938, I studied the rocky coasts there in detail. According to my rough counts, at least 10,000 birds lived there and, as shown by the specimens I collected, were represented only by the light-colored arctic subspecies. Thick-billed Murres constituted the main bird population of the island. One could see how they swarmed from quite some distance away and, after gunshots, black and white variegated colors glistened against the sky.

J.Koren did not sight murres west of Kolyuchi Island. I noticed them from a ship on the Chukchi Sea almost right up to Cape Schmidt where they no longer nested.

No one has reported nesting of Thick-billed Murres on Cape Shelagskii. Farther west they have been noticed on Medvezhii Islands. E.E. Brusevits (Palmén, 1887) saw them there on September 3, 1878.

E.W. Nelson listed the Thick-billed Murre along with the Atlantic Murre on Wrangel Island, but committed several mistakes in identifying the birds of Wrangel since he did so only by sight without comparing specimens. Moreover, he (Nelson, 1887, p. 45) expressed the view that differentiating these two species of murres is possible only at close quarters.

In his 1883 study, Nelson reported finding thousands of nesting Thick-billed Murres on Wrangel Island, and stated in a later work (1887) that murres were the most numerous birds there.

As revealed by the specimens caught by me, only the light-colored subspecies of the Thick-billed Murre inhabits Wrangel Island.

Colonies of Thick-billed Murres were concentrated on the east and west coasts of Wrangel Island because a network of mountains intersects the island from west to east and terminates by the sea in high cliffs. Only feeding or wandering murres were seen on the lowland coasts of Tundra Akademii or along the southern side of the island. On the east coast, a very large bazaar was sighted on Cape Uéring. I surveyed it from a launch on August 13, 1938, and walked along the shore ice on May 14, 1939. The cliffs were colonized by murres for a stretch of about 4 km and I walked over 2.5 km of it. The birds were distributed unevenly; in some ledges, from 20 to 50 birds were settled, while in others, there were only isolated pairs. A.I. Mineev exaggerated (Portenko, 1937b, p. 117) in stating that over tens of thousands of Thick-billed Murres nested on Cape Uéring, but I agree that over 10,000 birds nested there. According to Mineev, Thick-billed Murres were also encountered south of Cape Uéring, but in very small numbers. Tayan told me that they nested on a particular black rock south of Uéring where sometimes only a few birds were seen. On July 27, 1939, I heard the voice of Thick-billed Murres on a cloudy night from the sea on Cape Hawaii. Whether or not they nested there or swam under the rocks could not be ascertained because of the mist. According to the eskimos, Thick-billed Murres were as numerous on the west coast of Wrangel Island as on the east coast. G.A. Ushakov (Bannikov, 1941) pointed out that they nested in general in very large colonies on the east coast on Cape Uéring, but were considerably fewer on other rocks. In 1960 S.M. Uspenskii and his colleagues, on the basis of data through observations from a plane, placed the total population of Thick-billed Murres in the Wrangel bazaars at 10,000 and up to 50,000: (1) Cape Uéring—20,000 to 30,000; (2) around West Cape (Gilder)—several thousands; and (3) Cape Ptichii bazaar, in the northern part of the cliffs on the west plateau—about 40,000 to 50,000.

Thick-billed Murres were encountered at sea far away from the coasts even in summer. R.L. Newcomb (1888, p. 289) collected them in June and July, 1880, as the *Jeannette* drifted north and northwest of Wrangel Island. On July 19, 1913, the expedition of Harvard University sighted Thick-billed Murres in small numbers about 80 miles south of Wrangel Island. On August 13, 1923, G.U. Sverdrup (Schaanning, 1928) saw a few Thick-billed Murres southeast of Wrangel Island at 71°43′ N 184°52′ E. They were found more often in flight at sea.

On Herald Island, Thick-billed Murres were seen by Captain R.N. Kellet (Hooper, 1884, p. 54), who discovered these islands in 1849 when he landed there on August 17. Specimens of murres were also brought from Herald Island to the museum of the Smithsonian Institution by the expedition of Captain J. Rodgers (Hartin, 1871, pp. 110–123). J.E. Harting incorrectly identified them as *Uria troile* L. This probably served as the basis for E.W. Nelson to include the Atlantic species among the murres he recorded. On September 4, 1879, R.L. Newcomb also saw Thick-billed Murres on Herald Island. In the account given by Prof. J. Muir (Newcomb, 1888, p. 47), Thick-billed Murres were the most numerous of the birds nesting on the steep rocks of Herald Island when the *Corwin* visited it on July 31, 1881. E.W. Nelson, who sailed with Muir, later wrote that more Thick-billed Murres were encountered on Herald than on Wrangel Island. On July 30, as the *Corwin* approached Herald Island, the birds became more numerous, circling or flying in very small flocks and singly. Nelson wrote (1883, p. 118) that as they came closer, myriad guillemots and these birds flew down the rocks with a large number of kittiwakes in such swarms that the air was filled with bodies in motion. In the same work, Nelson states that thousands of nesting Thick-billed Murres were found on Herald and Wrangel Islands, but in a later work (Nelson, 1887, p. 45) says simply that they were extremely numerous on the Siberian coast and constituted the most abundant birds on Herald and Wrangel Islands. Although no one had estimated the Thick-billed Murre population on Herald Island, Nelson enthusiastically refers to "myriad" and "thousands". This is quite understandable since a very large colony nested on the island. F.L. Jaques noticed a large number of Thick-billed Murres 6 to 8 miles away from the coast. V.V. Piotrovich (1936, pp. 125–126) observed bird bazaars located on the rocks on the southwest coast.

Although the Chuckchians also reported to members of the *Vega* expedition that Thick-billed Murres remained throughout winter by pools of open water on the ice along the north coast of the Chukchi peninsula, I assume that this report was based on the sighting of individual birds at different times in winter and hence is not proof of their regular wintering.

*Habitat*—Nesting colonies of Thick-billed Murres are invariably disposed on high coastal rocks, but height is not the first or only criterion. Rocks with innumerable ledges, broad crevices, caves, overhanging portions, etc., are considered suitable for nesting. Murres usually colonize those sections of rocks where the coastline is highly irregular, with numerous bends, especially in small bays; in other words, they colonize places protected from crosswinds. Rocky islets and grottoes are a preferred additional advantage to these birds. Quite often murres nest at such a height that they cannot be shot from a boat since they do not descend low enough. As far as I am aware there are no easily accessible bazaars either on the Chukchi peninsula or on Wrangel Island; on the contrary, most are inaccessible. I saw such bazaars at the entrance to Providence Bay, on Kolyuchi Island, and on Cape Uéring. In every colony, the nesting sites of Thick-billed Murres were to some extent intermixed with those of kittiwakes, cormorants, Horned and Tufted Puffins, guillemots, and individual nests of Glaucous Gulls or Herring Gulls. Sometimes small colonies of murres were interspersed among nesting colonies of other birds, for example, Black-legged kittiwakes (near Naukan).

In the feeding zones, Thick-billed Murres are encountered at sea under extremely diverse conditions: far from the coasts or close to them, near rocks and on pebbled spits, at shallow and deep points, in exposed water, and on ice, depending on availability of food. On September 21, 1928, F.L. Jaques encountered a half-grown chick with an adult bird in the Bering Sea, 97 nautical miles from the nearest land point and 125 miles from St. George Island where, most likely, the chick had hatched.

*Arrival*—Well before occupying nesting sites on rocks, Thick-billed Murres approach the adjoining sea sections. In the spring of 1938, P.T. Butenko noticed these birds at Cape Chaplin on the evening of May 6, but they were sighted on the rocks only subsequently.

According to F.H. Fay and T.J. Cade, on St. Lawrence Island, Thick-billed Murres occupy the rocks before Atlantic Murres and probably begin nesting earlier.

Their arrival on Little Diomede Island was studied in detail by K.W. Kenyon and J.W. Brooks. In 1953, large flocks of Thick-billed Murres, 50, to 200 each, flew past the island northward from April 27 through May 5. During this period, several thousand gathered in the proximate leads in ice. On May 3, Thick-billed Murres began occupying the rocks at the southern end of the island.

In 1958, large flocks were noticed on open water on May 11. Their number decreased sharply when the leads narrowed to 2 or 3 miles south of the island; up to May 16 not a single bird had been seen, but when the leads widened several hundreds appeared. On May 20, several thousands were sighted on the water. In the morning not a single bird was seen on the rocks, but by 7:00 p.m. (local time), several thousand had gathered on them with a significant percentage of them perched right on the snow and ice. A few birds fought for places and, in a skirmish two fell to their death on the coastal ice. By midnight most of the murres had left the rocks and by 3:00 a.m. not a single bird remained on them. Up to May 31, a few birds sat on ledges but by 1:00 p.m. that day none remained. From midday onward, the number of murres in the bazaar swelled by the hour.

In the spring of 1937 (April 30), P.T. Butenko noticed the first two flocks of Thick-billed Murres, consisting of 15 to 20 birds each by the open water pools in the ice around Uélen. The next flock was seen there on May 2 and throughout the month, Thick-billed Murres were occasionally sighted, only to disappear, depending on the availability of open water pools. Even in the first half of June, flocks flew over the sea; nesting had not yet begun and it was difficult to ascertain whether these were new arrivals or murres which had already arrived and were performing local migrations. Only at the end of May did murres occupy the rocks east of Uélen. On May 20, 1934, I noticed the first murres on the steep banks near Seitun, but I could not track them regularly during my trips.

In 1879, at the wintering site of the *Vega,* near Pitlekai, several Thick-billed Murres were seen in flight on April 30 and one was shot.

In the first half of May, 1880, R.L. Newcomb shot a few Thick-billed Murres north of Wrangel Island. In the East Siberian Sea the *Maud* expedition sighted the first Thick-billed Murres on May 5, 1923 by water pools around 74°42′ N 166°22′ E. A flock of five birds flew from the northeast, and two flocks of 10 to 12 and 50 birds flew from the north. On May 14, flocks were sighted at 74°41′ N 166°10′ E, and on May 19, two large flocks at 74°38′ N 166°10′ E. Thick-billed Murres were not seen thereafter and had evidently settled in their nesting sites.

On Wrangel Island, according to V.F. Vlasova, murres arrived a week and a half later than guillemots in the first half of May. In the spring of 1939, having arrived on Cape Uéring on May 14, I sighted Thick-billed Murres already on the rocks. There is no doubt that the first of them appeared in accordance with the formation of leads in the ice nearby. Similarly, daily migrations from feeding sites on the pools to resting points on the rocks depended on the distance between the bazaar and the nearest exposed water surface. Tayan writes that murres do not perform such regular daily migrations as guillemots in spring. Nevertheless, on May 14 I saw a local migration; on that day the water was exposed for a stretch of not more than 1 or 2 km. At the beginning of the day, Tayan, who had gone out first, saw only two murres. When I went after midday, they were sitting on the rocks in swarms of hundreds and thousands. Most were resting in bazaars.

*Nidification*—The mating season had already commenced by mid-May. In some pairs males chased the females. In other cases, their beaks interlocked and in the struggle to free themselves both birds slipped from the rocks. Usually they corrected their flight within a distance of a few meters, but once I saw two murres fall on the snow. As I advanced toward them, they recovered and took off some hundred paces away from me. Thick-billed Murres in flight give no distinct call such as is heard among guillemots, but some birds approach the rocks with a notable rustling of wings. Others, having settled, raise their wings upward like guillemots or sandpipers, a gesture I did not notice among murres at any other time of the year. The calls "arra" and "krrr" were always heard from every quarter of the bazaars.

Measurements of gonads revealed that the testes of arriving Thick-billed Murres were only slightly enlarged and some follicles beginning to enlarge in the ovary. The maximum size of testes was recorded in mid-May (Providence Bay) and early June (Uélen); in July they shrank to their size in spring and continued to diminish.

On June 18, 1934, a two-year-old female was collected on the shore near Uélen. The lower side of her neck was still white and only a few brown feathers visible. The form and size of the beak confirmed that the bird had not yet matured for breeding. Her ovary was a compact body without granular structure.

On June 21, 1934, in the bazaar near Naukan, Thick-billed Murres had not yet laid eggs but it was obvious that the laying period had commenced. The birds left the ledges very reluctantly, returned immediately, and permitted me very close approach. In the bazaars on St. Lawrence Island, courtship ceremonies were seen on June 11, 1953 and June 9, 1958. According to E.G.F. Sauer and E.K. Urban, eskimos on Boxer Bay gathered fresh murre eggs in the last ten days of June in 1960. In 1953, J.W. Brooks found the first eggs on June 19 on Little Diomede Island. On Kolyuchi Island, J. Koren found freshly laid eggs on July 10, 1909. In the bazaar at Énurmino, as reported by V.V. Leonovich, Thick-billed Murres began laying in early July, 1970, but unincubated eggs were found even in mid-July. Finally, according to S.M. Uspenskii, in 1960 on Wrangel Island, Thick-billed Murres began laying on June 30 and, according to A.G. Velizhanin (1965), clutches were completed by early July.

In 1950 the hatching of chicks, according to T.J. Cade, peaked roughly in the first week of August. On August 12, 1881, E.W. Nelson found a two- or three-day-old chick in down on Herald Island.

Between Krest bay and Anadyr, L.O. Belopol'skii frequently found on the pebbled coast from August 20 through 22, nonflying nestlings still with their mothers. V.P. Shuntov (1965) states that he came across Thick-billed Murres with chicks at a distance of 15 miles from the coast on August 19, 1960. V.F. Vlasova has reported that on Wrangel Island, chicks descended to the sea even when they were still halfcovered with down. On August 20, 1938, I met with a pair of Thick-billed Murres with a tiny chick midway between the Krasnyi Flag River estuary and Bruch spit. The nearest bazaar was at least several tens of kilometers away.

At that time, Thick-billed Murres were extremely numerous between ice floes, either singly, in pairs, or in flocks. Groups flying in single file were a regular sight. On August 21, ice pressed to the coasts and the leads reduced and joined. The movement of murres slowed down. Flocks and pairs remained landlocked on extremely small polynyas in ice since the runway was inadequate for takeoff. Chicks became extremely restless and their note "karr" was constantly heard. Under such conditions, Thick-billed Murres are squeezed by the floes, and die, perhaps even en masse.

On August 26, 1938, in a small channel intersecting Bruch spit, I collected a few molted females. Their flight feathers were totally molted and the birds were already changing to winter plumage from the underside, while the plumage on the upper side was a mixture of old and new feathers.

*Departure*—In the first few days of September, lone birds were sighted in Rodgers Bay that, until then, had been confined to the shore. The majority of them had migrated by mid-September. On the 15th, I saw a single bird and on the 29th, Tayan came across a thick-billed murre on a tiny polynya in a lagoon joined by Bruch spit. On October 15, I noticed the last murre on the shore of Rodgers Bay. That bird was in winter plumage and very wild; seeing me from at least 300 paces away, it became agitated and later dived. According to V.F. Vlasova, Thick-billed Murres migrate from Wrangel Island usually by the end of September. Vlasova saw murres gathering for departure on September 13, 1931. The sea on the southern side of the island was littered with birds over an area of a few kilometers. In 1960, A.G. Velizhanin reported sighting the last Thick-billed Murres on the shores of the island on October 5 and 6. On September 6, 1933, P.T. Butenko went around the Cape from Uélen to Dezhnev village and came across only a single murre; the majority had evidently already migrated. In 1928, F.L. Jaques noticed a few semiadult fledgelings on August 27 on the Diomede Islands. Each fledgeling was accompanied by an adult female bird. Ice blocked the island and the ship could not approach them. On September 3 and 4, Thick-billed Murres were no longer seen on the cliffs and a full-grown young or plumage was seen on the 4th.

In 1937, in Providence Bay, P.T. Butenko noticed lone murres in November and for the last time on December 22. At least in some cases, the delay was explained by the presence of young which had not yet developed flight feathers. The wingspan of a young female *U. l. arra* caught on November 15 measured 18.9 cm, that of another caught on December 11—19.6 cm, and that of a young, light-colored arctic female shot on December 11—20.8 cm. Since the wingspan of the latter was almost fully developed, it could migrate southward in good time.

*Habitat*—E.W. Nelson drew attention to the extent to which murres "trust man" during his visit to Herald Island in 1881. I have seen many of these birds, encountering them at different places, and have come to the conclusion that their trust depends on the degree of persecution and conditions associated with their broods. For example, Thick-billed Murres arriving on May 14, 1939 on Uéring rocks exhibited no trust at all. Contrarily, when they had chicks with them on August 13, 1938, they approached man. At times they hardly swam away from the boat, flapped their wings with great energy while still in the water, and later dove at some distance. When we alighted on the floes, Thick-billed Murres sat in rows along the rims of the nearest flat ice, very much like penguins. The widely prevalent view about the "stupidity" of murres arose mainly because their bazaars are easily accessible and generally visited by people during the nesting season.

Thick-billed Murres undertake local flights quite often and their flight pattern is very characteristic—chain or single file. I have seen as many as 20 birds in such chains but usually not more. Other species of birds, for example common and Siberian Eiders, Long-tailed Ducks, or cormorants, often formed individual links in the chain or, vice versa, Thick-billed Murres formed links in a chain, for example, of

Siberian Eiders. It is quite evident that birds find some advantage in flying in such formations.

F.H. Fay observed daily on St. Lawrence Island regular morning and evening flights possibly coinciding with the tides. On August 2, 1957, in the vicinity of Gambell village, the morning flight commenced at 3:00 a.m. and ended only at 9:30 a.m. (local time). About 500 birds passed in the course of the first hour with the number increasing rapidly thereafter. Between 8:00 and 8:30 a.m. roughly 2,600 to 3,000 birds flew past every 5 min. E. Sauer noticed that murres unable to land in Boxer Bay continued to fly around a rock 250 to 300 m in radius. The same number of birds flew past at equal intervals of time, as if clocked, appearing out of the mist for one moment and disappearing the next.

*Food*—The stomachs of seven Thick-billed Murres collected in Providence Bay on August 25, 1932, contained the following food remains: 1) Bones and meat of several small fish and some 20 calcareous plates of cephalopods. 2) Vertebrae of several fish and 10 calcareous plates of cephalopods. 3) Two small crustaceans, 5 calcareous plates of cephalopods, and 2 small stones. 4) Bones and meat of not less than 5 small fish and 5 calcareous plates of cephalopods. 5) Bones of one or more small fish and about 8 calcareous plates of cephalopods. 6) Bones, meat, and gills of up to 10 small fish, about 12 calcareous plates of cephalopods, and several small stones. 7) Bits of shell and small stones.

The stomach of a specimen collected on July 12, 1938 revealed fish bones—remains of two *Myoxocephalus* (Cottidae), 8 claws and 3 pairs of mandibles of crabs, and 10 *Mesidothea entomon.*

The stomachs of two specimens collected in Uélen on June 3-6, 1934 contained in one case small stones and about a hundred crustaceans, and the other small stones and over a hundred crustaceans.

The following contents were found in Wrangel specimens: 1) August 26, 1938. Three tiny *Myoxocephalus* sp. and their bones. 2) August 28, 1938. Twenty-six crayfish *Astarte* sp., a single *Atylus carinatus,* bones of *Boreogadus saida,* and *Myoxocephalus* sp. 3) Same date. Highly digested remains of *Boreogadus saida,* one *Stegocephalus inflatus,* and its own breast feather. 4) July 19, 1939. About 15 *Spirantocaris* sp.

The stomachs of a large number of dissected Thick-billed Murres were empty. On August 25, 1932, in the bay between Plover and the entrance to Providence Bay, I saw such a large number of feeding murres that they covered at least a few square kilometers of the calm shore. Whales dived here, the cormorants, Glaucous Gulls, Black-legged Kittiwakes, and Fulmars fed. All of these birds, however, were many times less numerous than murres.

Spring and summer specimens, with rare exceptions, were not as well-fed and frequently devoid of subcutaneous adipose layers. On the contrary, specimens shot at the end of August, including molted birds, contained significant adipose deposits.

*Weight*—The following data on the weight of Thick-billed Murres was obtained at my request by P.T. Butenko for the Chukchi peninsula and S.I. Korobko for Wrangel Island and is rather interesting (Table 9).

**Table 9. Weight (g) of two subspecies of Thick-billed Murres**

| Subspecies | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| *U. l. heckeri* Port. | 1,105 | 900 | 1,018 | 23 | 1,130 | 850 | 949 | 19 |
| *U. l. arra* (Pall.) | 1,075 | 895 | 989 | 9 | 1,050 | 845 | 905 | 14 |

Although the body weight of murres depends on their condition at a given time of the year, there is no doubt that weight differences do exist between subspecies, as seen from the average values given in the Table for *U. l. heckeri* and *U. l. arra*. Sex-related weight differences are quite significant, arising obviously from differences in size. Males are larger than females as is evident from measurements of wingspan. Even the heart of males is heavier (Table 10). P.T. Butenko removed and weighed the heart of murres in Providence Bay after dressing the skin. Vessels along the surface were cut away and the blood in the heart squeezed out with the fingers.

**Table 10. Weight (g) of heart of Thick-billed Murres**

| | Max. | Min. | Average | Number of samples |
|---|---|---|---|---|
| Male | 10.0 | 8.7 | 9.3 | 5 |
| Female | 8.9 | 7.2 | 8.1 | 9 |

*Economic importance*—Regular "murre shoots" are not organized on the Chukchi peninsula since other species of ducks, long-tailed or Eider, are invariably preferred. Due to the inaccessibility of the bazaars, egg collection is very organized.

According to I.O. Olenev, in Providence Bay eskimos used to gather up to 300 eggs per family. The inhabitants of Uélen usually did not collect murre eggs. On Kolyuchi Island, the Chukchians gathered eggs, but evidently not in large quantities. According to A.I. Mineev, traders of Wrangel Island living on Cape Blossom in his time collected several thousand eggs and preserved some for future trading by burying them in sand.

On Wrangel Island Thick-billed Murres along with guillemots are hunted in spring since other species of wild fowl appear there much later. In addition, shooting on shore ice beneath the cliffs is very convenient. On May 14, 1939, Tayan went hunting with me. He used a silent small-bore rifle and quickly bagged several dozen murres. The deafening shots of my rifle under the rocks produced a headache in no time. The meat of murres is acceptable, and rather tasty if prepared with proper spices, but nevertheless inferior to that of guillemots. A single murre replaces two guillemots in the daily ration of a dog.

The hunter accompanying J. Koren in 1909 used a throw net when hunting in

**Table 11. Beak length (cm) of subspecies *U. l. eleonorae* and *U. l. heckeri***

| Subspecies | Males | | | | | | | | Females | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | From nostrils | | | | From forehead | | | | From nostrils | | | | From forehead | | | |
| | Max. | Min. | Aver-age | No. of samples | Max. | Min. | Aver-age | No. of samples | Max. | Min. | Aver-age | No. of samples | Max. | Min. | Aver-age | No. of samples |
| *U. l. eleonorae* Port. | 2.73 | 2.58 | 2.66 | 3 | 3.51 | 3.43 | 3.47 | 3 | 2.58 | 2.47 | 2.53 | 3 | 3.35 | 3.22 | 3.29 | 3 |
| *U. l. heckeri* Port. | 3.17 | 2.77 | 2.98 | 22 | 4.00 | 3.48 | 3.79 | 22 | 3.24 | 2.67 | 2.87 | 19 | 4.15 | 3.39 | 3.64 | 19 |

bazaars. He killed the fallen and entangled birds by biting off their heads. This method, albeit barbaric, at present is the quickest and least agonizing for a bird.

During E.W. Nelson's time, i.e., in the early 1880's, the eskimos of Diomede Island commonly wore parkas made of murre skins.

*Enemies*—In addition to man, Thick-billed Murres have two enemies among predatory birds—peregrines and falcons. According to V.V. Leonovich, bazaars were visited by brown bears in 1970.

*Systematics*—I have revised the subspecies of Thick-billed Murres twice. In 1936, I studied the material in the collection of the Institute of Zoology, Academy of Sciences of the USSR, Arctic Institute, as well as in my personal collection, and recognized two new forms (Portenko, 1937, pp. 226–228). In 1940, I again reviewed this material in addition to a large series of specimens from Wrangel and Kolyuchi Islands. Based on this latter material, excellent in quality and quantity, I established one more subspecies (Portenko, 1944, pp. 237–240). In all, I recognize five subspecies in the Palearctic.

1. ***Uria lomvia lomvia*** (L.). The color of upper body is midway between the darkest- and lightest-colored forms. Wingspan is relatively short. White fringe on tips of secondary flight feathers is comparatively broad.

*Range*—Murmansk, Novaya Zemlya, and Spitsbergen. Probably this form is found extensively west of its range.

2. ***Uria lomvia arroides*** Port. Similar to the preceding subspecies in beak proportions and wingspan, but it differs in very dark, bluish-black color of upper body, resembling in this respect the Pacific *U. l. arra* (Pall.), which is why I named it *arroides.* White fringe on wing is narrower than in *U. l. lomvia.*

*Range*—Archipelago of Franz Josef Land.

**Table 12. Wingspan (cm) of subspecies of Thick-billed Murres (measured by tape measure)**

| Subspecies | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| *U. l. lomvia* (L.) | 22.1 | 20.2 | 21.3 | 19 | 22.4 | 20.7 | 21.2 | 12 |
| *U. l. arroides* Port. | 22.2 | 20.1 | 21.2 | 2 | 21.8 | 21.8 | 21.8 | 2 |
| *U. l. eleonorae* Port. | 22.3 | 21.5 | 21.9 | 4 | 21.7 | 21.5 | 21.6 | 3 |
| *U. l. heckeri* Port. | 23.4 | 21.3 | 22.2 | 27 | 24.0 | 20.4 | 22.1 | 19 |
| *U. l. arra* (Pall.) | 23.2 | 21.3 | 22.4 | 19 | 22.6 | 20.9 | 22.0 | 19 |

3. ***Uria lomvia eleonorae*** Port. Differs sharply from two preceding subspecies in pale coloration. The upper side is pale gray with slate or bluish tinge. This color is so light that it cannot be called blackish-gray, while the much darker sub-species of Thick-billed Murres is blackish. Coffee color of underside of neck is also lighter in color. Sides are variegated gray, very faint, and absent altogether in some specimens.

White fringe on wing is broader than in nominal form. Lower coverts are pure white, without brown marks (present in nominal form and *U. l. arroides*). Wingspan is relatively short, as in two preceding subspecies (Table 12), but the beak is even shorter, although slenderly proportioned (viewed from above, the beak appears narrow).

*Range*—From Preobrazheniya Island (eastern Taimyr) to Novosibirsk archipelago.

4. ***Uria lomvia heckeri*** Port. Color of upper body is pale as in *U. l. eleonorae* and similar to the color of the upper side of *U. algae inornata* Salom. This similarity should be kept in mind when all three forms are found together, for example in Providence Bay, outside the nesting season. This species differs from *U. l. eleonorae* in a clumsier and more prominent beak (Table 11), but approximates *U. l. arra* in wingspan.

*Range*—Wrangel Island and north coast of the Chukchi peninsula. Differences are more sharply manifest among Wrangel birds than among birds from Kolyuchi Island. The specimen from Norton Bay is close to *U. l. heckeri* and definitely not to *U. l. arra.*

5. ***Uria lomvia arra*** (Pall.). Color on upper side, compared with all other subspecies, is the darkest, blackish. Brownish coffee color of underside of neck is very dark. Variegated color on sides of body is denser than in other subspecies and blacker. White fringe on wing is narrow. Lower coverts with brownish marks and large marks are darker than in other subspecies. Beak and wingspan are relatively long.

*Range*—Bering Sea coast from Bering Strait south up to Kukil'skie range.

*Specimens of U. l. arra*—1) Providence Bay, July 10, 1900, ○, Akif'ev; 2 and 3) same place, July 18, 1912, ♀♀, Starokadomskii; 4 and 5) same place, July 19, 1912, ♂ ♀, , Arngol'd; 6 to 8) same place, July 20, 1912, ♂♂ ○; Starokadomskii; 9) Émma Bay, July 24, 1913, ♂, Starokadomskii; 10 and 11) Providence Bay, July 25, 1913, ♀ ○, Arngol'd; 12) same place, August 12, 1914, ♀, Arngol'd; 13) Lawrence Bay, July 31, 1929, ○, P.V. Ushakov; 14) Krest Bay, May 28, 1931, ♂, Belopol'skii, 15) Providence Bay, June 3, 1932, ♂, Olenev; 16 to 23) same place, August 25, 1932, ♂♂♂, ♀, and ○ (in alcohol), Portenko; 24) Naukan village, May 29, 1934, ♂, Portenko; 25) Uélen village, June 6, 1934, ♀, Portenko; 26 and 27) same place, June 12, 1934, ♀ ♀, Portenko; 28) Providence Bay, November 15, 1937, ♀ 1° anno, Butenko; 29) same place, December 11, 1937, ♀, Butenko; 30) same place, May 16, 1938, ♂, Butenko; 31 to 35) same place, May 17, 1938, 4 ♂, ○, and ♀ Butenko; 36 to 41) Cape Stoletiya, Providence Bay, May 18, 1938, 5 ♀ ♀, Butenko; 42) same place, May 30, 1938, ♂, Butenko; and 43) Providence Bay, July 12, 1938, ♂, Portenko.

*Specimens of U. l. heckeri*—1) Providence Bay, September 19, 1929, ○, P.V. Ushakov; 2 and 3) Cape Uéring, northeastern Wrangel coast, June 8, 1932, ♂ ♀, Vlasova; 4) Cape Dezhnev, August 14, 1932, ♂, Portenko; 5) Uélen, May 29, 1934, ♀, Portenko; 6 to 8) same place, June 3, 1934, ♂♂, Portenko; 9 to 11) same place, June 6, 12, and 18, 1934, ♀, ○, Portenko; 12) Providence Bay, December 11, 1937, ♂, Butenko; 13) same place, May 17, 1938, ♀, Butenko; 14 to 19) Kolyuchi Island, July 26, 1938, ♂ ♀ and 4 ○ ○, Portenko; 20 and 21) Bruch spit, north coast of Wrangel

Island, August 26, 1938, ♀, Portenko; 22 to 26) Rodgers Bay, August 28, 1938, ♂♂, Portenko; 27 to 61) Cape Uéring, May 14, 1939, 20♂♂, 14♀♀, and ○, Portenko; and 62) Rodgers Bay, July 19, 1939, ♀, Portenko.

The following are additional specimens of *U. lomvia* not identified at the subspecies level—1) Wrangel Island, June 14, 1929, ♂, G.A. Ushakov; 2) Providence Bay, August 25, 1932, ○, Portenko; 3) Uélen, June 3, 1934, ○, Portenko; 4 and 5) Naukan, June 21, 1934, ○ ○, Portenko, 6) Providence Bay, July 20, 1938, ○, Butenko; 7) Chechen village, July 25, 1938, ○ Butenko; and 8 and 9) Providence Bay, July, 1938, ○ ○, Druzhinin.

### 97. *Uria aalge inornata* Salom.—Common Murre

*Local names*—In Eskimo: ă-qă-vŏ-ghă-nuk or ăthl-pă on St. Lawrence Island.

*Distribution and status*—A very rare nesting species on the south and possibly east coasts of the Chukchi peninsula.

In the spring of 1938, P.T. Butenko succeeded in collecting three specimens of the Common Murre in Providence Bay: May 17—female at Plover Bay, and May 18—male and female at Cape Stoletiya. These represent the first reliable finds of this species on the Chukchi peninsula and suggest that this bird nests on the seacoast near Providence Bay, probably in small numbers, since it has not been sighted to date by other collectors.

The Common Murre nests on St. Lawrence Island. O.J. Murie (1936) collected a specimen on August 26, 1931. According to F.H. Fay and T.J. Cade (1959), murres of both species are encountered in the coastal waters there even in winter, although in far fewer numbers than in summer. Population ratios of the two species in winter were not accurately determined by them, but the ratio proved extremely variable in summer in different years. In 1950, in the colonies between Cape Tatik and Boxer Bay, the ratio between Common and Thick-billed murres was 1:100 or 2:100, while in 1954 it was 1:2. A small series caught in 1954 near Boxer Bay contained 6 *Uria aalge* and 8 *U. lomvia*. In 1956 and 1957, in these same bazaars, the population ratio was 1:4 and 1:3. A small series collected near Gambell village in May and early June, 1958, contained 103 *U. lomvia* and only 4 *U. aalge*.

It is possible that such a fluctuation is caused by food conditions. It was noted that the excrement of murres, normally white in color (from digested fish), was reddish or brownish in 1957 (due to amphipods). According to the observations of E.G.F. Sauer and E.K. Urban (1964), Common Murres were very rare in the colonies west of Boxer Bay in 1960.

H. Friedmann (1934a) identified two excavated humeri as belonging to *Uria aalge californica*, but offered no definitive conclusion since the dimensions of the humerus in the two species overlap.

A.M. Bailey (1925) collected specimens on Cape Prince Uélskii among flocks of Thick-billed Murres, but found none on the Diomede Islands. F.L. Jaques (1929) found a skin of a Common Murre among 25 murre skins collected on the Diomede

Islands in 1928. It may therefore be assumed that the Common Murre colonizes the east coast of the Chukchi peninsula also, although in small numbers.

Even J.E. Harting (1871) made a reference to *Uria troile* Linn. based on a specimen from Herald Island received by the Smithsonian Institution from the expedition of Captain J. Rodgers. This species was later mentioned in two works by E.W. Nelson. In the first work (Nelson, 1883, p. 117) he wrote that *Lomvia troile californica* (Bryant) was not noticed by him during the journey of the *Corwin* in the Arctic; in the second work (Nelson, 1887, p. 45) without collecting further details about this species, he reported finding *Lomvia troile californica* on Herald and Wrangel Islands. The foregoing references, in my opinion, pertain to the Thick-billed Murre since finds of *L. t. californica* have not been confirmed subsequently. E.W. Nelson either did not collect specimens, or was somewhat confused by Harting's reference, or having collected some specimens, automatically assumed them to be *Lomvia troile californica* from their light coloration.

*Seasonal phenomena*—Common Murres, according to the observations of P.T. Butenko in 1938, arrived in Providence Bay in mid-May. The testes of a male shot on May 18 were enlarged: the left one was 18 mm × 10 mm and the right 17 mm × 10 mm. In a female caught almost at the same time, follicles were growing in the ovaries. In one female, the length of the ovary with a coarse-grained structure was 27 mm and in the other, 15 mm, but the diameter of individual follicles was 4 mm. All three specimens differed in degree of plumpness. The subcutaneous fat in the male was patchy, insignificant in one female, and altogether absent in the third specimen.

According to the observations of F.H. Fay, near Gambell village, murres were rare until mid-April, 1953, and appeared later in flocks of 10 birds or more. Roughly a fifth of the birds, including Common Murres, were still in winter plumage.

*Weight*—Male 970 g and females 910 and 765 g.

*Systematics*—I have 20 specimens from the Far East and only two from California, but even on the basis of this material one can confirm the suggestion of F. Salomonsen (1932) that Pacific Ocean Common Murres comprise two subspecies.

1. ***Uria aalge inornata*** Salom. The color of the upper side approaches the light-colored forms *U. lomvia eleonorae* and *U. l. heckeri,* but differs in distinctive features: different form and length of beak, without light-colored thickenings at the base of the culmen, and distinct variegations on the sides.

*Range*: Bering Sea coast along American side up to the state of Washington and along the Asian coast up to Japan, Vladivostok, and northeastern China.

2. ***Uria aalge californica*** Bryant. The upper side is somewhat lighter in color. Some specimens of *U. a. inornata* are barely distinguishable. The much darker shade seen on underside of neck in one specimen was absent in another. This feature, as pointed out by Salomonsen, perhaps depends on the duration of storage in a museum. Mainly differs from *U. a. inornata* in small wingspan (Table 13).

*Range:* California.

This form rarely falls into the hands of ornithologists collecting in the Bering Sea; Thus skins of Common Murres from the Far East are urgently required. It is

Table 13. Wingspan (cm) of subspecies of Common Murre (measured by tape measure)

| Subspecies | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| *U. a. inornata* Salom. | 22.1 | 20.6 | 21.4 | 6 | 22.8 | 20.9 | 21.6 | 5 |
| *U. a. californica* Bryant | — | — | 20.8 | 1 | — | — | 20.8 | 1 |

quite possible that with a larger collection the subspecies *U. a. inornata* could be further subdivided.

*Specimens*—1) Providence Bay, Plover, May 17, 1938, ♀ Butenko; and 2 and 3) Providence Bay, Cape Stoletiya, May 18, 1938, ♂ ♀ Butenko.

## 98. *Cepphus grylle mandti* (Mandt)

## 99. *Cepphus grylle tajani* Port.—Black (Polar) Guillemot

*Local names*—Chukchian: chep'átl'gyn and tsóadlin in the records of the *Vega* expedition; sev'al'gyn according to Velizhanin. In Eskimo: samsykhagak in Providence Bay.

*Distribution and status*—It is a common nesting species on the north coast of the Chukchi peninsula and on Wrangel Island. It is encountered in winter near polynyas on the Chukchi Sea, but it migrates en masse. Winters regularly near polynyas on the south coast of the Chukchi peninsula.

The nesting zone of this guillemot in the east justifies its name; it does not extend beyond the limits of the Arctic Ocean. I possess not even one single reliable nesting specimen from around Cape Dezhnev. Presumably this species begins to nest in colonies only on Kolyuchi Island and farther west since the majority of guillemots in Bering Strait are represented by the species *Cepphus columba.* I have not been able to trace myself the distribution of the two species of guillemots from Kolyuchin Bay to Uélen.

On May 19, 1879, a female Black Guillemot was presented to the *Vega* expedition (Palmén, 1887) by the Chukchians of Kolyuchi Island. According to the observations of J. Koren (1910), Black Guillemots were quite common on this island in early July, 1909. In July, 1938, I found them in nesting areas in large numbers, but no densely inhabited colonies. Instead the guillemots were distributed along the rocky coasts in pairs or in small groups.

The Black Guillemot might occur farther west but only on rocky capes. The collections of A.A. Savich (Artobolevskii, 1927) included two specimens without labels, but since they were Black Guillemots one may assume that they were caught on Cape Schmidt and not farther east. I found guillemots with a white fringe on the wing, i.e., undoubtedly Black Guillemots in nesting sites on Kozhevnikov cliff (Cape

Schmidt). I have stuffed specimens of birds caught there by hunters. J. Koren (Thayer and Bangs, 1914) noticed some by nests and collected specimens there on September 6, 1911. Thus, with the accuracy possible on the basis of these documents, nesting of this guillemot on Cape Schmidt could be established. Nesting sites extending westward were reported by Koren for Cape Kiber (opposite Shalaurova Island). Finally, C. Amory (Riley, 1918) caught a male on August 9, 1915 on Cape Baranov Bol'shoi.

On Wrangel Island the Black Guillemot is confined only to the rocky west and east coasts and lives in large colonies. According to G.A. Ushakov (Bannikov, 1941), nesting sites are located on the rocky coast along the western side of the island from Cape Foma up to Zanes cliff, and on the eastern side from Capes Hawaii to Uéring. The birds are found in large numbers and their favorite sites are: Cape Hawaii, Cape Foma, and the region of Gilder cliff. According to A.I. Mineev (Portenko, 1937b) Black Guillemot colonies commence in the west from Cape Foma and extend north as far as the rocky coast permits. According to the eskimos, Black Guillemots are more numerous there than on the east coast, probably because they are less persecuted. I examined the east coast of the island from the Klér River estuary to Uéring. In spite of the availability of suitable sites, Black Guillemots do not nest everywhere. I found large colonies along both sides of the Klér River estuary but the largest colony was on Cape Pillar. Hundreds of birds nested there. Farther away, on Yulin Mountain, I found only a small colony of up to 30 birds, and on Cape Uéring, though numerous, Black Guillemots were less noticeable among the mass of murrelets. Thus, a few thousand birds nested on the east coast, but my visits to the colonies did not give me the impression of the abundance ("myriad") as described by Mineev. A.G. Velizhanin (1965) considered the density of Black Guillemot colonies, compared with that of murrelets, rather negligible. He reiterated that Black Guillemots were more numerous on the west coast than on the east. Their colonies were disposed on both coasts over a stretch of about 20 km. He detected a small colony additionally even north of Cape Uéring.

On Herald Island, Black Guillemots have been known from the time this island was discovered by Captain R.N. Kellet in 1849. E. Seemann (1858) in describing the crew's landing on the island on August 17 casually mentions innumerable black and white guillemots ("schwarze and weisse Eistaucher"), which had found there a safe haven for laying eggs and raising chicks. In August, 1855, a specimen of Black Guillemot was gathered on Herald Island by the expedition of Captain J. Rodgers (Baird, 1860, p. 912). R.L. Newcomb (1888) noticed guillemots on Herald Island on September 4, 1879. E.W. Nelson (1883) found them there in abundance. On July 20, 1881, flock after flock flew toward the *Corwin* as it broke through the ice.

Among the Black Guillemots I sighted on Wrangel Island, not a single *C. columba* was present. I collected over 200 specimens, some shot by me and some by local hunters, and all of them belonged to the same species, namely *C. grylle*. Thus, E.W. Nelson (1883, p. 117) committed another error in stating that *C. columba* was the most numerous of small guillemots in the North from the Aleutian to Wrangel and Herald Islands. L. Stejneger (1884b, pp. 210–229, in particular, p. 223 and footnote on p. 225) drew attention to this error even in 1884 and noted that Nelson did not bring a single specimen from these Arctic sites. E.W. Nelson later spoke of the numerical predominance on Herald Island of guillemots over murrelets, which is also erroneous.

Black Guillemots were caught by members of the *Jeannette* expedition when it drifted north-northwest, away from Wrangel Island. According to G.V. de Long (1883, p. 340), on May 5, 1880 three specimens were shot at 73°11′24″ N 179°37′30″ E. The day before, the water pools were fully surrounded by birds and I would assume Black Guillemots predominated. Members of the expedition caught two birds on May 12 and another two on May 13. According to an eyewitness account by R.L. Newcomb, he together with others downed Black Guillemots in large numbers in June and July, 1880. Finally, on May 18, 1881 a Black Guillemot taking off on a polynya was caught (de Long, 1883, p. 547) at 76°44′50″ N 161°30′45″ E, within sight of Jeannette Island. In 1938 L.I. Leonov brought a series of skins from Henrietta Island.

The expedition of Harvard University sighted a lone male, which was caught by J. Dixon on July 19, 1913 at sea around 80 miles south of Wrangel Island. In 1928 F.L. Jaques (1929) noticed the first Black Guillemots on the Arctic Ocean on August 2 and the last on August 23 at almost the same site, north of 69°. These birds were common even farther north, especially near Herald Island, which was then icebound. They were most numerous along the ice rim. G.U. Sverdrup (Schaanning, 1929) noticed Black Guillemots during the nesting season in the East Siberian Sea far from the coasts. On June 9, 1923 a Black Guillemot was caught by a pool of open water in the ice at 74°57′ N 165°05′ E, another on June 10 at 75°01′ N 165°05′ E and another on July 18 at 75°30′ N 166°54′ E. On August 20, a lone bird was sighted at 75°51′ N 164°53′ E. Reference has been made to specimens caught in June, 1923, at 75°22′ N 165°30′ E and in August at 75°50′ N 164°55′E. These findings show that nonnesting birds have been encountered in summer far away from their nesting territories and even of their wintering sites. The summer birds known to me from Providence Bay were in a state of incomplete molt since molting was delayed in two-year-olds. These include specimens caught by I.O. Olenev in early May, those shot by P.T. Butenko at the end of May and E.E. Arngol'd in mid-July, and finally the specimen belonging to N.P. Sokol'nikov caught from Chaplin on April 24, 1901.

I observed the distinct migration of Black Guillemots on October 31, 1938, on Wrangel Island. In the East Siberian and Chukchi Seas some stray, mostly single, birds were encountered in winter by leads in the ice.

Chukchians from Dzhénrétlen reported to members of the *Vega* expedition that the Black Guillemot remained throughout winter by pools in the ice along the coast, but this information still does not confirm their genuine wintering. On February 10, 1934, a Black Guillemot in winter plumage was caught in the ice southeast of Uélen. Unfortunately, I have not seen this specimen.

On the south coast of the Chukchi peninsula, however, Black Guillemots winter fairly regularly even though, depending on ice conditions, they disappear at times. I.O. Olenev established their wintering in 1931/1932 near Providence Bay through personal observations. In November and December, 1937, P.T. Butenko encountered and collected Black Guillemots in Providence Bay. In January, February, and March, 1938, he noticed them near Cape Chaplin. According to an eyewitness account by H. Friedmann (1932a), H.B. Collins caught a young male in Gambell village on St. Lawrence Island on November 23, 1930.

*Habitat*—Nesting sites of Black Guillemots are invariably associated with rocks on the seacoast. They do not colonize rocks located far from the coastline, which is evidently associated with their ability to find food by the shoreline. In calm weather the first guillemots to be sighted on the water under rocks are Black Guillemots. They prefer large rock boulders projecting from the water, kekurs, and so forth, on which they sit for long periods in groups or even flocks; in the absence of such rocks they gather on the ice. That is why, in going past rocks, I came across Black Guillemots more often at places where there were rows of rocks or kekurs in the water or shallow ice. Ledges, fissures, crevices, caves, and grottoes provide convenient sites for nests, but the height of the rocks is not significant. According to G.A. Ushakov, Black Guillemots nest at a height of 15 to 20 m; according to my observations, they may nest on rock cliffs only a few meters high and colonize above and below very high cliffs, even though preferring the upper portions. Large colonies are located on the east coast of Wrangel Island in coastal areas noted for their heights.

Prolonged presence of shore ice and the collection of park ice by rocks evidently do not compel Black Guillemots to abandon their homes because of the distance to exposed water. In 1909, according to J. Koren, Black Guillemots on Kolyuchi Island had to negotiate a strip of coastal ice some 7 miles wide. On Wrangel Island, according to my observations, conditions at different sites were even more unfavorable for these birds since exposed water was still farther away from the rocks on which they colonized.

In the nesting season, Black Guillemots are usually confined to the coast and coastal waters singly, in pairs, or in flocks; if ice appears they are attracted to it. In October and November, 1938, in Rodgers Bay I noticed Black Guillemots feeding near the rim of ice on the seaside of pebbled spit. Water pools and ice represent sites of winter residence of Black Guillemots.

*Arrival*—The Black Guillemot arrives on Wrangel Island not earlier than April. According to R.L. Newcomb, in the spring of 1881, the first Black Guillemot on the ice southeast of Jeannette Island was seen on April 6; later, they were observed in larger numbers than in April of the preceding year, when the *Jeannette* came closer to Wrangel Island. G.U. Sverdrup, who wintered on the vessel *Maud* northwest of Wrangel Island, sighted the first four Black Guillemots on April 22, 1923, at 74°26′ N 167°52′ E. Later, a few were noticed on May 5 at 74°42′ N 166°22′ E. On Wrangel Island, according to A.I. Mineev, Black Guillemots arrive in the last days of April. According to the information collected on Wrangel Island in the spring of 1939, the first seven Black Guillemots were sighted by a lead in the ice south of Cape Hawaii on April 22. According to F.B. Chernyavskii, in 1964 guillemots appeared on the rocks of Cape Hawaii in early May.

There is no doubt that G.A. Ushakov erred in his dates on migrations; "June 15, 1927 (possibly somewhat earlier) and May 28, 1928." According to him Black Guillemots arrived at night in flocks of several tens and hundreds of birds. Mineev's observation that Black Guillemots arrived singly is also obviously erroneous.

A female Black Guillemot was caught on March 19, 1879 at the wintering site of the *Vega* near Kolyuchin Bay.

Periods of arrival probably depend on ice conditions, i.e., presence of a sufficient number of leads in the ice. On Wrangel Island, however, Black Guillemots appear on the Cliff when it is still too early for leads to form. Evidently they are content at that time with extremely small water bodies.

Having arrived, Black Guillemots later perform regular daily movements from coastal cliffs to the sea and back. Based on a few years of observations, Tayan noted that the arrival of Black Guillemots from the sea commences at 7: 00 p.m. and slows down by 1:00 a.m.; the reverse movement to the sea commences in the early morning hours. Therefore, passing beneath the cliffs during the day, I found no birds whatsover, while many enlivened the scene in the evening. The regular periodicity of daily migrations is later disturbed probably with the advance of ice toward the coast. In summer, however, I did not observe this phenomenon although I was aware that by evening Black Guillemots became active and flew more often. In this respect Black Guillemots, unlike murres and Horned and Tufted puffins, may be classed to some extent with Crested Auklets as twilight birds.

Foraging conditions are often unfavorable to just-arriving guillemots. I found in the empty stomach of a specimen collected on Wrangel Island on April 28, 1939, a small triangular stone with sides 8 to 9 mm long. A small stone 6 to 7 mm in diameter was similarly found in the stomach of a Kolyuchin specimen caught on March 19, 1879; fragments of crustaceans were identified in the intestinal wash. My entire catch of Black Guillemots in mid-May, 1939, had emaciated subcutaneous adipose deposits in the form of films.

Two-year-old Black Guillemots do not nest and their flight north from wintering sites occurs after the flight of nesting birds. In the first few days of May, 1932, I.O. Olenev caught Black Guillemots in Providence Bay still in variegated plumage and without the full winter plumage. Young birds were immediately recognizable by the mosaic of black on the white background plumage.

*Breeding*—In spite of the fact that Black Guillemots arrive at nesting sites long before laying, mating activity commences immediately. It is manifested by characteristic calls, which I became acquainted with for the first time on Wrangel Island. On my journey from the Klér River estuary to Uéring and back (May 12 through 16, 1939), I noticed Black Guillemots flocking as I neared their colonies in the evening. Words fail me in describing the phenomenon. They flew to the rocks in pairs and flocks, landing sometimes but overshooting, returning often to make an approach. Some sat for a long time, while others immediately or almost so split up. Pairs settled in the nesting sections, while flocks arranged themselves in rows on the ledges or, as also seen on the rocks south of the Klér River, sat directly on the snow front clinging to the rocks. Their call was heard regularly—a sharp, delicate, not particularly powerful whistle, accompanied by the rustle of wings. In flight, Black Guillemots resemble pigeons, but at times perform aerial maneuvers like calling sandpipers. In such instances, the Black Guillemot flaps its wings vigorously, then produces a noise reminiscent of a Common Snipe falling from a height, and at the moment of greatest vocal intensity lifts its wings upward like a bow and drops its tail. Eventually it will sit on a rock or be swept away in a counterflight. This swarming of Black Guillemots against a backdrop of blackish rocks and white snow presented a rare spectacle that stands out vividly among all my sightings of arctic birds.

In the 18 males caught Mid-May, 1939, testes ranged in size from 10 to 18 mm × 5 to 9 mm for the left and 8 to 11 mm × 4 to 7 mm for the right. The ovary in 12 females ranged from 13 to 28 mm in length and the diameter of the largest follicle from 1 to 5 mm. According to I.A. Palmén, the ovary of a female caught in Kolyuchin Bay on May 19, 1879, contained 40 to 50 follicles, of which the largest were 2.0 to 2.5 mm in diameter. For comparison, note that the testes of specimens caught on Kolyuchin Bay on July 26, 1938, were 5 mm × 15 mm and 4 mm × 10 mm, while the follicles in a racemose ovary did not exceed 3 mm.

Even after continuous shooting, these birds often returned to their sites, indicating that they greatly value the territories which they occupy. Probably their relatively early arrival is explained by their desire to occupy as quickly as possible suitable shelters for nesting.

In 1960, according to A.G. Velizhanin (Uspenskii et al., 1963), mass laying of eggs occurred in early July on Wrangel Island. On August 30 and 31, 1912, according to the observations of J. Koren, young Black Guillemots on Cape Kiber were still in their nests, while on September 10 of the preceding year neither adult nor young birds were seen there. On September 6, 1912, a few Black Guillemots were feeding their young on Cape Schmidt. On July 30, 1881 E.W. Nelson saw adult birds on Herald Island carrying small fish (up to 4″ long) for their nestlings.

A.I. Mineev encountered chicks still in down at sea. In spite of the fact that the nearest point of the nesting area on Cape Hawaii to Rodgers Bay was only 25 km away, I saw no Black Guillemots during the nesting season on the shore in front of the polar station, except for an occasional stray. On the north coast of Wrangel Island, in the estuary of a small bay washing Bruch spit, I sighted Black Guillemots for the first time on August 25 in the fall of 1938. These were two independent young birds, unaccompanied by adults, and it was obvious that their wings were not yet fully developed. At 75°57′ N 163°17′ E in the East Siberian Sea, a young Black Guillemot was sighted on September 16, 1923.

*Departure*—On October 31, 1938 I noticed mass movements among Black Guillemots. A few flocks in white winter plumage flew past me above the shore of Rodgers Bay for two hours, all on a western course. They then scattered in every direction. I correctly forecasted that this unusual phenomenon was related to an imminent change in weather and, true enough, the following day a blizzard began to blow. This worsening of weather set in from the east but did not drive all the Black Guillemots away. On November 4, in calm weather, I again saw pairs, broods, and small flocks on the beach. Those that took off turned eastward. Their "cheep" could be heard occasionally. Adult birds were readily differentiated by their whiter coloration. In 1923, in the East Siberian Sea at 75° N 163°22′, E.G.U. Sverdrup saw the last Black Guillemots on October 17. In 1960 on Wrangel Island, A.G. Velizhanin noticed their departure flight in mid-September, but in my opinion this cannot but be considered an extreme case.

*Food*—I.O. Olenev found in the stomach of birds collected on May 3, 1932, the remains of small marine organisms, including bits of mussel. According to the observations of A.G. Velizhanin in 1960, Black Guillemots nesting on the west coast of Wrangel Island flew from August 7 to the middle of the month for feeding on Somnitel'naya Bay where capelins were available. For this purpose they had to travel some 250 to 300 km.

*Economic importance*—Under the conditions prevailing on Wrangel Island, early arriving, fairly large-sized, and tolerably tasty birds such as the Black Guillemot are a long-awaited spring prey. Hunters pursue it with relish and at times obtain several dozens. On the tables of winter residents of the Polar Station, grilled Black Guillemot constitutes a delicacy. When these birds are abundant on the island, there is no reason to ban spring hunting by individuals, especially since the catching of Black Guillemots involves long journeys and can hardly lead to their mass destruction.

The most rewarding are evening hunts in early May, using small bullets but not a shotgun. The latter badly frightens the birds by its deafening sound and its loud echo from the rocks. I could bag 16 to 20 birds with a shotgun, in one evening, while Tayan collected twice as many with a Monte Cristo.*

Sled dogs were fed with freshly killed guillemots, two per dog. According to A.I. Mineev, in the western part of the island eskimos collected eggs and preserved them for future use by burying them in sand.

*Systematics*—The new revision undertaken by me (Portenko, 1944, pp. 239–240) of the taxonomy of subspecies of Black Guillemots convinced me of the existence of three within the Soviet Arctic.

1. ***Cepphus grylle grylle*** (L.). Nominal form is well distinguished by presence of a blackish band on white background across wing. This subspecies does not differ from the next form in color and length of wing. In some specimens the beak is thicker at the base, and the greenish shade is weaker.

The subspecies *C. g. grylle* (L.) inhabits the northern part of the Atlantic Ocean from Ireland, Newfoundland and Labrador up to southern Greenland and Murmansk coast, partly penetrating northern sections of the Baltic Sea. In Greenland transitional forms to the next subspecies are known.

2. ***Cepphus grylle mandti*** (Licht.). Differs from the preceding subspecies in absence of bands on white surface. There are no differences in the beak and green shade of the black plumage in these two subspecies.

*Range*: The coast of the polar basin from Greenland, Spitsbergen, Yan-Maien and farther eastward through Novaya Zemlya, Taimyr, Novosibirsk Islands, and coasts on the north western part of the Chukchi peninsula up to arctic Canada inclusive.

* A small-bore rifle—Ed.

3. ***Cepphus grylle tajani*** Port. The series I collected on Wrangel Island differs in dense black coloration and vivid greenish shade and long wingspan compared with other Black Guillemots (Tables 14 and 15). If dimensions overlap somewhat, a Wrangel specimen can be distinguished by coloration. I was certain of the freshness of my collection and the state of freshly molted feathers, and concluded that differences in Wrangel specimens cannot be ignored. Specimens from the Chukchi coast are more brownish, while those from Henrietta, though similar in color, possess short wings.

The subspecies I described is evidently distributed only on Wrangel Island and presumably on Herald Island also.

Sex-related differences in wingspan are negligible and may be ignored. I also found small differences in weight. Weights taken by S.I. Korobko before dressing killed birds are presented in Table 14.

**Table 14. Wingspan (cm) (measured by tape measure) and weight (g) of male and female *C. g. tajani***

| | Wingspan, cm | | | | Weight on chemical balance, g | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| Male | 17.8 | 16.9 | 17.2 | 23 | 450 | 363 | 394.3 | 23 |
| Female | 18.1 | 16.6 | 17.2 | 18 | 427 | 345 | 383.7 | 17 |

**Table 15. Wingspan (cm) of subspecies of *C. grylle***

| Subspecies | Max. | Min. | Average | No. of samples |
|---|---|---|---|---|
| *C. g. grylle* (L.) | 17.7 | 15.2 | 16.7 | 25 |
| *C. g. mandti* (Licht.) | 17.4 | 15.0 | 16.6 | 40 |
| *C. g. tajani* (Port.) | 18.1 | 16.6 | 17.2 | 41 |

*Specimens*—1) Cape Chaplin, April 24, 1901, ♂, Sokol'nikov; 2) Providence Bay, July 17, 1912, ♂, Arngol'd; 3) Wrangel Island, April 14, 1929, ○, G.A. Ushakov; 4) Providence Bay, May 2, 1932, ♀, Olenev; 5) same place, May 3, 1932, ♂, ○, Olenev; 6) Cape Hawaii, May 9, 1932, ♂, Vlasova; 7) same place, May 25, 1932, ○, Vlasova; 8) Wrangel Island, undated, ○, Zvantsev; 9) Providence Bay, November 15, 1937, ♀, Butenko; 10) same place, November 19, 1937, ♂, Butenko; 11) same place, December 22, 1937, ♀, Butenko; 12) Cape Chaplin, February 20, 1938, ♀, Butenko; 13 and 14) Providence Bay, May 24, 1938, ♂, Butenko; 15) Cape Stoletiya, May 30, 1938, ♂, Butenko; 16 and 17) Kolyuchi Island, July 26, 1938, ♂♀, Portenko; 18 and 19) Bruch spit, August 26, 1938, ○ ○ 1° anno, Portenko; 20) Cape Hawaii, April 28, 1939, ♀, Portenko; 21 to 34) Klér River estuary, May 12, 1938, 8♂♂ and 6♀♀, Portenko; 35 to

51) Cape Pillar, May 13, 1939, 10♂♂ and 7♀♀, Portenko; and 52 to 60) Cape Uéring, May 14, 1939, 5♂♂ and 4♀♀, Portenko.

### 100. *Cepphus columba columba* Pall.—Pigeon Guillemot

*Local names*—Chukchian: chep'átl'gyn. In Eskimo: sam-sykhá-gak in Providence Bay and sĭm-sŭ'-khă-ghăk on St. Lawrence Island.

*Distribution and status*—It is a common nesting species on the south and east coasts of the Chukchi peninsula; to the northwest it hardly reaches Kolyuchi Island. It regularly winters on leads in the ice and in exposed sea on the south coast.

L.O. Belopol'skii (1934) encountered this bird a few times in Krest Bay commencing June 1, 1931. According to the eskimos, it nested on Érulen Bay, and in the interior of Krest Bay. I noticed guillemots on August 21, 1932, on the shore before the entrance to Preobrazheniya Bay. In Providence Bay, it was an abundant nesting species, as recorded by myself and other ornithologists. In 1914 C. Amory (Riley, 1918) reported Pigeon Guillemots in Émma Bay and said they were a very common bird; in July and August he collected six specimens. A.M. Bailey (1925) also found it to be common in 1921. I.O. Olenev, who spent a year in Providence Bay, considered this bird abundant in nesting and wintering sites. Among other alcids, it is numerically inferior only to murrelets. At places, it colonized rocks in independent colonies of up to 150 to 200 birds. According to P.T. Butenko, Pigeon Guillemots were also numerous there and he came across a number of colonies on the east coast of the upper section of Providence Bay and on Cape Stoletiya. I encountered this species regularly in my excursions on Providence and Émma Bays in the summer and early fall of 1932, 1934, 1938, and 1939. Travelling on a motored whaleboat along the west coast up to Cape Stoletiya and from the east up to Cape Ivga, I saw so many Pigeon Guillemots that the impression arose it is possibly the most abundant species of all the *Alcae*. Quite often colonies of several dozen birds were encountered. V.N. Lyubin caught specimens on July 15 and 18, 1948. On July 23, 1932, I saw Pigeon Guillemots at Cape Chaplin.

According to A.M. Bailey, Pigeon Guillemots were abundant in 1921 on St. Lawrence Island and nested close to Savoonga and Gambell. As reported by H. Friedmann (1932a), H.B. Collins collected adult males in Gambell on July 14 and August 16 and also a young bird on October 11, 1930. O.J. Murie (1936) collected six specimens, including two males, on the cliffs at Savoonga on August 13, 1934, a female on August 6, 1935, and a young bird and others later. According to F.H. Fay and T.J. Cade (1959), colonies of Pigeon Guillemots were located on Cape Chibukak, near Gambell, and along the rocky coast on the southwestern extremity of the island. They were likewise seen near Savunga on the northern side. A small number of Pigeon Guillemots were sighted on exposed water in winter, but not regularly. In an article by E.G.F. Sauer and E.K. Urban (1964), encounters near Gambell are mentioned and from there along the coast to Boxer Bay small colonies are recorded as well on the way to Kangi. In the opinion of H. Friedmann (1934a), who found bones of Pigeon Guillemot in 16 archaeological excavations, the population of this bird has evidently undergone no change in the last 2,500 years.

In the latter half of August and in the first half of September, 1855, W. Stimpson (Heine, 1859, p. 168) and E.M. Kern (Cassin, 1863, p. 323) found Pigeon Guillemots in abundance on Arakamchechen Island and along the rocky coasts of Senyavin Strait. I noticed a nesting specimen collected from Lawrence Bay in the collection of M.A. Menzbier. On July 22, 1879 E.K. Brusevits, a member of the *Vega* expedition (Palmén, 1887), saw Pigeon Guillemots in Nunyamo. In 1957, A.P. Kuzyakin noticed individual pairs in a colony of cormorants near Yandagai, later in Lawrence Bay (8 km west of the village), on the rocky coasts of Balk and Bennet Islets, and finally around Poutyn. Only a few Pigeon Guillemots were seen on the boat from Akkani to Uélen.

On August 13 and 14, 1932, I noticed Pigeon Guillemots beneath the cliffs east of Dezhnev village and later on in the ice approaching them. Nesting of Pigeon Guillemots at Cape Dezhnev (East Cape) was reported even by E.W. Nelson (1883, p. 117). Specimens were caught from this cape by W.S. Brooks (1915) in 1913. F.S. Hersey (1916), in his visit to the cape in 1914, counted some 150 guillemots flying with flocks of murrelets and puffins. V.N. Lyubin obtained a specimen in Naukan on August 14, 1948.

On September 6, 1933, P.T. Butenko sailed around the rocky coasts on a whaleboat from Dezhnev village to Uélen and saw Pigeon Guillemots in small numbers. On June 21, 1934, I inspected the cliffs north of Naukan and found small colonies or individual pairs of resting guillemots including *Cepphus columba*; the day before I had seen them in very large numbers on the way from Uélen to Naukan. These guillemots did not rest right at Uélen but, at times, with the approach of ice, appeared there in significant numbers. In the fall of 1933, when there was no ice, not a single Pigeon Guillemot was entered in my diary. On August 16 of the preceding year they were present and in June, 1934, numerous at times on the ice; in any case they were regularly sighted. A.M. Bailey saw a few Pigeon Guillemots near Uélen on July 11, 1921.

On the Diomede Islands the Pigeon Guillemot has been sighted by various observers, but was first reported by E.W. Nelson (1883, p. 117). His later work (Nelson, 1887, p. 45) mentions that Pigeon Guillemots were particularly numerous there. J. Koren (1910) encountered Pigeon Guillemots on June 24, 1909 on the islands and caught a male on June 4, 1913. The Zoological Museum of the Academy of Sciences received on August 6, 1914 an egg collected on Bol'shoi Diomede Island by the Hydrographic Expedition to the Arctic Ocean. A.M. Bailey noticed Pigeon Guillemots along the islands from June 3, 1922 onwards. They were very abundant during the nesting season. Contrarily, according to F.L. Jaques (1929) who passed through the islands in 1928, this guillemot was the least numerous of all the *Alcae*. During my sojourn on Bol'shoi Diomede Island from June 21 through 26, 1934, I encountered Pigeon Guillemots in very large numbers close to Cape Dezhnev and in small numbers in the strait and on the island per se. Here they nested on comparatively low coastal cliffs in the southern part.

On Little Diomede Island, K.W. Kenyon (Kenyon and Brooks, 1960) counted in mid-June, up to 100 pairs of birds which had already settled.

On July 3, 1934, I found small colonies of Pigeon Guillemots on the cliffs of Cape Inchoun. Though numerous, they often sat in very small groups on huge rocks projecting out of the water. On May 19, 1934, I saw a pair on a lead opening up in the ice near Seishan. E.W. Nelson found guillemots (probably of this species) nesting close to Cape Serdtse-Kamen'. In a large bird bazaar in Énurmino, according to V.V. Leonovich, some hundred guillemots nested among several thousand murres. One trustworthy Chukchian reported to members of the *Vega* expedition that guillemots nested on Cape Dzhénrétlen, and a member of the crew saw some sort of guillemot on July 11, 1879 by a pool of water in the ice at the winter anchorage of the vessel. Unfortunately, in all these foregoing cases no specimens were obtained for proper identification of the species.

On July 26, 1938, I went around Kolyuchi Island by canoe and thoroughly examined the various species of guillemots encountered, trying to catch as many specimens as possible. I sighted and collected only a lone specimen of Pigeon Guillemot which, on Kolyuchi, was undoubtedly present in very insignificant numbers among massed black guillemots. If one recalls that J. Koren likewise states that he saw no *Cepphus columba* west of Kolyuchin Bay, the limits of the range of this species along the northern coast of the Chukchi peninsula in the west become very clear.

E.W. Nelson speaks of the spread of *C. columba* north up to Wrangel and Herald Islands; furthermore, this species reportedly nested in abundance, surpassing the number of murres, especially on Herald Island. In my opinion this reference pertains undoubtedly to the Black Guillemot.

The wintering sites of Pigeon Guillemots evidently begin from the south coast of the Chukchi peninsula. Unfortunately, I only have specimens collected not later than November on Cape Chaplin. In winter, early in 1938, P.T. Butenko was not able to collect a series of guillemots in order to ascertain their species composition. Hunting under conditions of moving ice in erratic weather was not only beyond him but even highly dangerous. The data gathered during his winter stay and during the winter stay of I.O. Olenev in 1931 to 1932 in Providence Bay established that guillemots occur throughout winter on exposed sections of the sea. Both species were positively encountered but the more northern *C. grylle mandti* were predominant. These facts explain the observations given below.

*Habitat*—Since there is no inadequacy of rocky coasts on the Chukchi peninsula, Pigeon Guillemots select for nesting the most suitable sites, as already described by me for *C. g. mandti.* On the rocks west of Cape Ivga, I noticed stray nests of these birds at notably different heights. Pigeon Guillemots were confined to the coast or shore near nesting sections; however, there were more birds closer to the coast. Pairs formed far away in the sea. Reference was made earlier to the affinity of these birds for ice. According to P.T. Butenko, Pigeon Guillemots do not return to the rocks to winter, but are confined to the sea and overfly leads freshly opening up in the ice.

*Arrival*—In Providence Bay, according to P.T. Butenko, in 1938, Pigeon Guillemots arrived on the rocks around May 10. Along the coast from Vankarém to

Uélen from May 13 through 21, 1934 I saw them only once, on May 19. A pair of some species of guillemots appeared by leads in the ice opening up near Seishan. Around Uélen they were common only after June 1.

On Little Diomede Island, J.W. Brooks noticed small numbers of Pigeon Guillemots even on April 25, 1953, while K.W. Kenyon noticed two of them only on May 14, 1958 on a narrow lead south of the island. During a single day on May 20, up to 20 specimens were counted at sea, some in pairs. On May 26 six pairs were confined to the coast, on May 31 a few pairs to the rocks, and on June 2 a few pairs lay in rock crevices on the southern extremity of the island. On June 13 the island was surrounded by open water and the number of Pigeon Guillemots rose to a hundred or more pairs.

*Breeding*—The length of the ovary of a recently arrived female was normal, but the largest follicle already 4.0 mm. As can be seen from the measurements of gonads (Tables 16 and 17), not all the birds caught near nesting sites bred.

**Table 16. Size of testes (mm) of Pigeon Guillemots**

| Date | Left | Right | Locality |
|---|---|---|---|
| July 6, 1938 | 15 × 7 | 13 × 6 | Providence Bay |
| July 13, 1938 | 23 × 7 | 20 × 8 | –do– |
| July 26, 1938 | 14 × 5 | 10 × 4 | Kolyuchi Island |
| August 25, 1932 | 12 × 5 | 8 × 4 | Providence Bay |

**Table 17. State of ovaries (mm) of Pigeon Guillemots**

| Date | Length of ovary | Largest follicle | Locality |
|---|---|---|---|
| May 18, 1938 | 14 | 4 | Cape Stoletiya |
| June 12, 1934 | — | Fine-grained structure | Uélen |
| June 16, 1934 | — | 5 | -do- |
| August 27, 1932 | — | Fine-grained structure | Providence Bay |
| November 18, 1937 | 15 | — | -do- |

A male with large testes caught on July 13, 1938 had brood patches. It is remarkable that this bird still showed thin layers of subcutaneous fat. Other July, as well as June and August specimens, contained no adipose deposits or only insignificant films. Subcutaneous fat was present at places in a female shot on May 18, while a November female was fatty throughout.

According to J.W. Brooks, in 1953 on Little Diomede Island, Pigeon Guillemots had not yet laid eggs by June 25. The oviduct of a female caught by me in Naukan on June 20, 1934 contained an egg ready for laying. At that time Pigeon Guillemots could be seen in isolated colonies sitting in pairs for quite sometime on their favorite rocks. Their notes were often heard. It was evident from various indications that the birds had not yet begun to incubate. I.O. Olenev found eggs of Pigeon Guillemots in Providence Bay in early July. It should be pointed out that these birds lay their clutches in the open on ledges. In Émma Bay early July, 1921, A.M. Bailey found a nest with two eggs in a depression filled with snow. The nesting section seemed more a refrigerator than a place for rearing chicks! E.W. Nelson gathered unincubated eggs on the Diomede Islands in mid-July, 1881. An egg brought by the Hydrographic Expedition from Bol'shoi Diomede Island was collected on August 6, 1914, i.e., very late in the year. In the absence of additional information on incubation, this find loses importance (perhaps the egg was sterile). It was 6.18 cm × 4.1 cm, dirty milk-white, with pale gray, violet-gray, brown, and blackish-brown spots.

O.J. Murie emphasized the fact that the males collected by him had brood patches.

On July 13, 1938 and August 25 and 26, 1932, passing beneath the cliffs from the eastern side of the entrance to Providence Bay, I often saw Pigeon Guillemots flying to crevices with fish in their beak. A whistling sound could be heard before the bird disappeared into the nest. On August 13, 1934, a young Pigeon Guillemot was caught with an underdeveloped wing, only 14.9 cm long. On August 26, 1932, I sighted fully grown young birds in white plumage. A specimen caught by me was emaciated and had a filmy ovary. The birds swam by the shoreline and on September 9, 1934, I saw similar fledged young swimming in Émma Bay. F.L. Jaques reported sighting of these guillemots on Diomede Island on August 27, 1928.

*Molting*—O.J. Murie noticed white feathers on the abdomen of a female caught on August 6, 1935, but the males shot on August 13, 1934 were still in full summer plumage. Change of feathers during molt occurs throughout the body fairly uniformly. By the end of November all adult Pigeon Guillemots wear full winter plumage.

*Departure*—According to the observations of P.T. Butenko, in the winter of 1937/1938, Pigeon Guillemots flew away in the latter half of November; the last were seen on November 25. They reappeared later, on December 22, when leads in the ice opened up for a few hours in Providence Bay. On January 11, Butenko arrived on Cape Chaplin and the very next day sighted Pigeon Guillemots. However, throughout the latter half of winter Pigeon Guillemots were seen there only twice—January 31 and March 16—as a result of changes in ice conditions. These birds were not seen regularly in the arrival of other waterfowl. In other words, eiders, Long-tailed ducks, and other birds appeared together in each arrival but Pigeon Guillemots were usually not among them.

*Food*—The stomachs of a few specimens caught in Providence Bay on August 25 and 26, 1932 revealed the following contents: 1) vertebrae and other bones of small fish and shrimps; 2) ten mollusks, including whole specimens and crabs; and 3) about a hundred small crustaceans and two very small stones.

The stomach of another specimen caught in Providence Bay on July 13, 1938 contained 17 *Astarte* sp. (Amphipoda) and bits of the shell of an unidentifiable mollusk.

The stomach of a Pigeon Guillemot shot around Uélen on June 12, 1934 revealed the bones and meat of two small fish, about five large crustaceans, extremely fine rays of unknown invertebrates, two calcareous plates of cephalopods, and three small stones.

*Weight*—Two females caught on May 18, 1938 from Providence Bay weighed 435 g each, and another caught on November 18, 1937—515 g.

*Economic importance*—Special hunts are not organized for Pigeon Guillemots on the Chukchi peninsula and they fall prey to hunters only by chance. The sea opens up along the coasts considerably earlier than near Wrangel Island and Pigeon Guillemots do not form very large colonies. Therefore, special hunting expeditions are not organized because the favorable conditions prevailing on Wrangel Island for hunting on land are not available here. Moreover, the hunter almost invariably prefers a much larger fowl such as the eider or even murre.

Because of the difficulties of collection, eggs are gathered only occasionally and on a negligible scale.

When the expedition of Captain J. Rodgers stopped on the banks of Senyavin Strait, its members shot Pigeon Guillemots in large numbers in August and September of 1855, using the skins of killed birds as baits while they themselves hid behind the rocks. Nevertheless, the Pigeon Guillemots soon abandoned any place that became the scene of shooting several times.

*Systematics*—I distinguish the following two subspecies among Pacific guillemots.

1. ***Cepphus columba columba*** Pall. It differs sharply from the Black Guillemot in that the white surface is intersected by a wedge-shaped spot of slate-black color. The black plumage is without greenish tinge but with slate-blue bloom. Beak perceptibly more clumsy.

It inhabits the mainland coasts of the Bering Sea: east coast of Kamchatka, south and east coasts of the Chukchi peninsula northwest up to Kolyuchin Bay, and west and south coasts of Alaska west up to Unalaska inclusive.

2. ***Cepphus columba kajurka*** Port. This subspecies, described by me (Portenko, 1937, p. 228), differs distinctly in smaller dimensions, readily visible to the naked eye. That the beak is smaller is evident in a direct comparison of specimens. The wings are so short that their size does not even fall within the range of the preceding subspecies (Table 18). References to the small wing size appear in literature time and again: I.A. Palmén (1887, p. 392), male from Bering Island, 16.4 cm; E. Hartert (1938, p. 505) and B.M. Zhitkov and S.G. Shtekher (1915, p. 297), wingspan of one female 170 mm and two females 169 mm each; and H. Johansen (1934, p. 253), who states that the wings more often measured 168 to 170 mm.

This subspecies inhabits the Komandor and Aleutian Islands in the east up to Unalaska.

Table 18. Wingspan (cm) (measured by tape measure) of the subspecies of *C. columba*

| Subspecies | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| *C. c. columba* Pall. | 18.9 | 18.1 | 18.5 | 10 | 19.5 | 18.05 | 18.4 | 12 |
| *C. c. kajurka* Port. | 17.6 | 17.1 | 17.2 | 6 | 17.2 | 16.8 | 17.0 | 3 |

*Specimens*—1) Lawrence Bay, July 25, 1903, ♀, Sokol'nikov; 2 to 5) Providence bay, July 18, 1912, ♂ ♂ ♀ ♀, Starokadomskii; 6) same place, July 20, 1912, O, Arngol'd; 7 and 8) Émma Bay, July 20, 1913, ♀ ♀, Starokadomskii; 9) same place, July 31, 1914, ♀, Arngol'd; 10) same place, August 1, 1914, ♂, Arngol'd; 11) same place, August 2, 1914, ♀, Arngol'd; 12) same place, August 11, 1914, ♀, Arngol'd; 13) Uélen, June 20, 1927, O, Sheneberg; 14) Providence Bay, undated, O, Pavlov; 15 and 16) same place, August 25, 1932, ♂ ♀, Portenko; 17) same place, August 26, 1932, ♀ subad., Portenko; 18) same place, August 28, 1932, O, Portenko; 19) Uélen village, June 12, 1934, ♀, Portenko; 20) same place, June 16, 1934, ♀, Portenko; 21) Naukan village, June 20, 1934, ♀, Portenko; 22) Providence Bay, August 13, 1934, ♂ juv., Chechulin; 23) same place, November 18, 1937, ♀, Butenko; 24) Cape Stoletiya (Providence Bay), May 18, 1938, ♀, Butenko; 25) Providence Bay, July 6, 1938, ♂, Butenko; 26) same place, July 13, 1938, ♂, Portenko; 27 and 28) same place, July 20, 1938, O O, Butenko; 29 to 31) same place, July 21, 1938, O, Butenko; 32 Chechen village, July 24, 1938, O, Butenko; and 33) Kolyuchi Island, July 26, 1938, ♂, Portenko.

*Biological specimens*—One egg, Bol'shoi Diomede Island, August 6, 1914.

## 101. *Brachyramphus brevirostris* (Vigors)—Kittlitz's Murrelet

*Local names*—In Eskimo: tagitugek in Providence Bay; tă-ḡā'tū-wā-yuk on St. Lawrence Island.

*Distribution and status*—It is a very rare nesting species on the coasts of the Chukchi peninsula and Wrangel Island.

I obtained a specimen only in 1940. It had been collected by L.O. Belopol'skii (1933 and 1934) on May 28, 1931 in Krest Bay. In his two articles this bird is referred to as *Synthliboramphus antiquus* (Gm.). Belopol'skii wrote (1934, p. 38) that this bird was found along with guillemots, but only rarely, in pairs in Krest Bay and in exposed sea on ice, and also on water free of ice throughout the summer of 1931. Evidently it nested on an island in Érulen Bay together with guillemots. This extremely rare bird could hardly be found here in large numbers. No doubt it was confused with *Aethia cristatella* (Pall.). In any case, Belopol'skii's specimen can reliably be assumed to have come from the coast of Krest bay where the murrelet nested.

For Providence Bay there is an old reference by E.W. Nelson (1883) which requires considerable correction. First of all, he incorrectly identified the bird as *Brachyramphus marmoratus* (Gm.); secondly, he undoubtedly confused it with another small guillemot species, since his statements regarding population and range are more appropriate to *Aethia cristatella.* He wrote (Nelson, 1883, p. 116) that the range of this murrelet extended north along the west coast of the Bering Sea up to Bering Strait. It was extremely abundant during his visits to Plover Bay and from there along the coast to the strait, but not sighted north of this last point.

Without doubt, this murrelet does inhabit Providence Bay, but rarely. Local eskimos have their own name for it. P.T. Butenko throughout his residence in the bay in 1937 and 1938 caught just one female, on August 6, 1938. V.M. Gudkov (1959) also sighted this bird there in the summer of 1955. I shot a lone Kittlitz's Murrelet on Cape Chaplin on August 23, 1932. Finally, the Institute of Zoology, Academy of Sciences of the USSR, has a specimen from the collection of J.E. Thayer caught by J. Koren on August 2, 1910 at Indian Point, i.e., also on Cape Chaplin. Strangely enough not a word about this bird appears in the work of J.E. Thayer and O. Bangs (1914). A.C. Bent (1919, p. 148), however, mentions that a few specimens had been caught in this bay.

On the west coast of St. Lawrence Island, Kittlitz's Murrelet has been sighted in the nonnesting period and evidently is not very rare. F.H. Fay (Fay and Cade, 1959) saw small flocks totaling some 50 birds from August 10 through 15, 1950 flying past Cape Chibukak. T.J. Cade sighted at sea in Gambell village at total of eight, singly and in pairs, all of which were still in their winter plumage, from April 22 through 26, 1956. Two Kittlitz's Murrelets were sighted in the vicinity of Povuiliyak on August 10, 1957. According to the eskimos, this bird nested in the hilly parts of the island, in the Kinipagul'gat and Kukulgit mountains. A colony was reportedly found on the south coast of Atuk hill and a nesting site at the source of one of the tributaries of the Boxer River.

As confirmed by H. Friedmann (1934a), a humerus of this bird was found in the main excavation of an ancient colony in the northwestern extremity on St. Lawrence Island in kitchen middens 1,000 years old.

Kittlitz's Murrelet undoubtedly nests on the east coast of the Chukchi peninsula also. V.N. Lyubin caught specimens on July 30, 1948 in Lawrence Bay. I.A. Palmén (1887) indicated that the specimens presented to F.G. Kittlitz by the expedition of F.P. Litke were caught around Bering Strait. These specimens are presently preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR, and the label on at least one reads "Kamchatka"; the handwriting is that of I.F. Brandt.

A.M. Bailey (1925) noticed two Kittlitz's Murrelets just taking off on June 3, 1922, near Cape Dezhnev when the vessel drifted into pack ice. On June 22, 1879, a lone male was caught on the leads in ice near the winter anchorage of the *Vega* in Pitlekai. J. Koren occasionally encountered this species singly and in pairs along the entire Arctic coast of the Chukchi peninsula west to Cape Yakan, where a lone bird was sighted on September 8, 1912.

I succeeded in finding a Kittlitz's Murrelet on Wrangel Island myself. Through inquiries among eskimos I came to know that this bird, though rare, had been seen on the coasts. On August 4, 1939, I saw my first specimen on the shore between Rodgers Bay and Somnitel'naya Bay and on August 5 a pair at the same place. Only on August 15 did Tayan succeed in collecting a specimen there. Since on the coasts of Wrangel Island I sighted no other small alcids, I feel that the sightings of E.W. Nelson and A.I. Mineev (Portenko, 1937b) reported as *Aethia cristatella* should also be considered *Brachyramphus brevirostris.* Nelson wrote (1883, p. 116) that some of these birds were sighted around Herald Island during his visit, but they were apparently quite rare compared to guillemots and murres. Another observation occurred on Wrangel Island on August 11 and 12, but only two or three specimens sighted. Thus, in both instances, the birds were few. The discovery of solitary Kittlitz's Murrelets is extremely typical. A.I. Mineev, in the course of five years, happened on some small-sized groups at 10 to 15 km from the coast only a few times. This is quite in conformity with my experience on Wrangel coasts. A.G. Velizhanin (1965) in 1960 encountered Kittlitz's Murrelets in Somnitel'naya Bay. They were noticed for the first time on August 9. In the evening two birds flew into the village from the west; while hunting for them six more were detected. The birds remained not far from the coast until the end of the month. On August 31, one of the first two was caught. First-year-birds were seen among adult birds. In an article by A.M. Sudilovskaya (1964), reference is made to a male specimen collected on August 19, 1960, in Somnitel'naya Bay by S.M. Uspenskii, who presented it to the Moscow Zoological Museum.

*Habitat*—The nesting sites on the Chukchi peninsula and Wrangel Island still remain unknown, but every occurrence occurred on the shore within sight of the mountains. It has now been clarified that this murrelet nests in the hills, at times fairly far from the sea, with which it is nevertheless associated throughout its life. On St. Lawrence Island, eskimos called Kittlitz's Murrelet "bird of mist" since it nests on elevations covered in mist for most of the time. It was found nesting on the dry banks of streams or on low rocks.

At Cape Chaplin I caught Kittlitz's Murrelets on exposed water and saw them on Wrangel Island on the ice.

*Seasonal phenomena*—A single Kittlitz's Murrelet was caught on May 28, 1931 in Krest Bay. This bird had not yet completed molting from winter plumage into summer. Kittlitz's Murrelets can hardly find a suitable site for residence on Wrangel Island at this time due to prevailing ice conditions on the sea and year-round winter environment.

The length of the ovary of a female from Wrangel Island caught on August 15, 1939, was 17 mm and the diameter of the largest follicle was 7 mm. The testes of a male from Cape Chaplin on August 23, 1932 were 4 mm × 2 mm (left) and 3 mm × 2 mm (right). The male was characterized by significant adipose deposits, while the female had only films of fat.

Since most of the observations occurred in the month of August, one may assume that Kittlitz's Murrelets are preoccupied with gathering food at that time for the young. It is quite possible that the lone bird noticed on Yakan on September 8, 1912 had wandered away from Wrangel Island.

*Habits*—Kittlitz's Murrelets are quite trusting and allow a motor boat to approach quite close. In flight they resemble Crested Auklets although the latter can be distinguished by color and larger size.

In July, 1939, eskimos reported to me that they had heard the call of Kittlitz's Murrelets on the ice. It was loud and discordant, but perhaps a loud scream is necessary for communicating in an icy environment where birds are not visible to each other. A.M. Bailey has written that sexually aroused Kittlitz's Murrelets produce a scream similar to that of a chicken.

E.K. Brusevits mentions the fact that felled birds have a strong smell of garlic.

*Food*—The stomach of a male caught on Cape Chaplin contained the remains of 10 to 20 crustaceans. The stomach of a Wrangel female contained 24 *Spirantocaris* sp. This female weighed 250 g.

*Specimens*—1) Cape Chaplin, August 2, 1910, ♂, Koren; 2) Krest Bay, May 28, 1931, ○, Belopol'skii; 3) Cape Chaplin, August 23, 1932, ♂, Portenko; 4) Providence Bay, August 6, 1938, ♀, Butenko; and 5) Wrangel Island, shore between Rodgers and Somnitel'naya Bays, August 15, 1939, ♀, Portenko.

### ?102. *Brachyramphus marmoratus* (Gm.)—<br>Marbled Murrelet

The single discovery of a single pair was reported for the north coast of the Chukchi peninsula.

On June 29, 1909 J. Koren (1910) noticed a pair of Marbled Murrelets feeding by puddles near Idlidlya Island and succeeded in catching the male. I have had no occasion to check the identification of this specimen but hold grave doubts concerning its authenticity.

The northern boundary of the range of *B. marmoratus* passes far more southward, along southern Alaska. It would be more natural therefore to expect a find of Kittlitz's Murrelet on Idlidlya Island. A.C. Bent (1919, p. 146) accepted Koren's specimen as a Marbled Murrelet but considered it to be a chance occurrence. Thus, he treats his identification as "tentative". Insofar as the information reported by E.W. Nelson (1883) about Marbled Murrelet on the Asian side of Bering Strait is concerned, it is much more likely that this pertains to Kittlitz's Murrelet.

### 103. *Cyclorrhynchus psittacula* (Pall.)—<br>Parakeet Auklet

*Local names*—In Eskimo: seiruyúk on Bol'shoi Diomede Island and sū-klū'-ruk on St. Lawrence Island.

*Distribution and status*—It nests on suitable sections on the south and east coasts of the Chukchi peninsula, in the north not more west than Cape Serdtse-Kamen', and also on Diomede Islands. It is common, but not abundant; everywhere it is far smaller in population than the Crested Auklet. Flies away in winter.

The zone of habitation of the Parakeet Auklet on the south coast of the Chukchi peninsula probably commences from the outcropping of hills and cliffs toward the sea, i.e., at places where the coast in high and rocky. According to E.W. Nelson (1883, p. 115), this auklet was found by the *Corwin* expedition in Providence Bay in great abundance. During a trip to the upper part of the bay on August 26, 1881, a large number were caught. Not only were they extremely abundant in the bay itself, but also in the adjoining portions of the seacoast. In his later work, Nelson (1887, p. 41) details the presence of numerous Parakeet Auklets along the length of Providence Bay, covering a stretch of almost 18 miles. W.S. Brooks (1915) has given no details about the range of Parakeet Auklets in Providence Bay; he simply mentions that this species was observed everywhere together with Crested Auklets. On August 26 and 28, 1932, I saw Parakeet Auklets arriving at their nests on the seacoast between the entrance to Providence Bay and Cape Ivga. Unlike the Crested Auklet, they flew single file and hence had to nest there in very small numbers. Nests of Parakeet Auklets were somewhat interspersed with those of the Crested Auklet in nesting colonies and, as far as I could discern in the section of the coast under study, were concentrated in three places. On August 28, P.T. Butenko collected a specimen on the cliffs close to Plover spit where a single family of Parakeet Auklets lived in isolation. In the spring of 1938, Butenko tracked their arrival on Cape Stoletiya. He and I collected a great number of specimens, which is sufficient justification for considering this bird a common though not abundant species in Providence Bay and its environs.

J. Koren (Schaanning, 1954) collected a male on Cape Chaplin (Indian Point) on August 8, 1914. E.W. Nelson saw Parakeet Auklets on the eastern end of St. Lawrence Island on June 17, 1877, and together with Crested Auklets, numbered them in the thousands. Although Nelson used the word "myriad" in his description, this was figurative and in no way an accurate arithmetical assessment; he merely wished to convey his impression of an abundance of birds. In 1914 P.S. Hersey (1916) detected nesting Parakeet Auklets on the rocks behind Gambell village. Yet among the considerable number of Crested Auklets caught by the eskimos, he found only one specimen of a Parakeet Auklet. This numerical ratio is closer to that I estimated for Providence Bay than to the quantitative data given by E.W. Nelson, who tended to exaggerate somewhat. In 1912, R.W. Hendee visited this same colony and A.M. Bailey (1925) another colony near Savunga. H.B. Collins (Friedmann, 1932a) collected a female in Gambell on July 1, 1930, and O.J. Murie (1936) a female also on July 22, 1933. According to F.H. Fay and T.J. Cade (1959), Parakeet Auklets were far from abundant on St. Lawrence Island and sporadic in distribution. A few nesting birds were detected on Cape Chibukak but not a single one on Cape Kagupalik; they were scarce in Savunga and relatively denser near Cape Singikpo and on the southwest coast between Cape Tatik and Boxer Bay. They nested everywhere together with Crested Auklets except at Boxer and Murphy Bays where Crested Auklets were absent. According to E.G.F. Sauer and E.K. Urban (1964), in 1960, Parakeet Auklets nested in small numbers on the rocks in Boxer Bay and were encountered at sea on the way to Kangi on June 14. According to H. Friedmann (1934a), this species was abundantly represented among the bones excavated on the island by archaeologists.

In 1849 or 1850 three specimens were collected by Captain Moore (Harting, 1871), somewhere in Bering Strait, perhaps along our coast. There is no doubt that Parakeet Auklets, like Crested Auklets, nested at different places on the east coast of the Chukchi peninsula, although I could only obtain factual data for Cape Dezhnev. In 1913, specimens were collected here by the expedition of Harvard University (Brooks, 1915). In the collection of the Institute of Zoology, Academy of Sciences of the USSR, a female specimen is preserved, which was caught by E.E. Arngol'd on August 24, 1911 near Uélen (66°13′ N and 169°38′ W). In the spring of 1934, I observed Parakeet Auklets here from the time of their arrival. They nested on the rocky coast in very small numbers from Uélen to Dezhnev villages, but sporadically, and unlike Crested Auklets. On June 26, while returning from a trip to Diomede, I encountered lone Parakeet Auklets at the entrance to the rocky coast between Naukan and Uélen, and on September 3 sighted them on the coast while sailing past the knolls of Dezhnev and somewhat more to the south. A.P. Kuzyakin came across a few Parakeet Auklets at Cape Dezhnev on June 27 and July 3, 1957.

Early July, 1881, E.W. Nelson found Parakeet Auklets nesting on Diomede Islands and gathered some eggs. According to his description (Nelson, 1883, p. 115) they swarmed there in thousands. Unfortunately, the information provided by J. Koren, W.G. Brooks, and F.S. Hersey intermixes all the species of Pacific auklets and provides no data for individual species. The same is true of the observations of F.L. Jaques (1929). It is pertinent to point out that he, like W.S. Brooks, considered the Parakeet Auklet numerically the least abundant. According to A.M. Bailey, these birds nest in very large numbers on the Diomede Islands as also on the nearby Féruéi rock. Specimens were caught on the latter. I distinctly saw Parakeet Auklets even while entering Bol'shoi Diomede Island on June 22, 1934. Later, I came across the birds repeatedly for five days running on the island itself. They were so few in numbers compared to Crested Auklets that the ratio could be expressed only as a single-digit percentage. Nevertheless, they should be considered common and abundant. According to K.W. Kenyon and J.W. Brooks (1960), Parakeet Auklets on Little Diomede Island were the least abundant of all three species of small alcids, yet they gathered in thousands on the exposed coastal waters on May 23, 1953.

E.W Nelson (1883, p. 115) observed that Parakeet Auklets were a rarity outside the limits of Bering Strait. However, on June 29, 1881, they were sighted on Cape Serdtse-Kamen'. No one saw more of them on the north coast of the Chukchi peninsula.

*Habitat*—The nature of the seacoast inhabited by Crested and Parakeet auklets for nesting can be judged from the photograph in my *Zametke o tikhookeanskikh lyurikakh* (Notes on Least Auk) (Portenko, 1934b, p. 6). Parakeet Auklets nest alternately with Crested Auklets, alongside them, or quite independently. In building a nest, this bird utilizes gaps or passages under large rock boulders or between them and thus heaps of large talus slopes suit it well for settlement. I did not find large colonies of Parakeet Auklets. As far as I could ascertain they nest above Crested Auklets. Near Cape Ivga, before my very eyes, these birds arrived at nests located in rock fissures over debris in which crested auklets lived. It is interesting to note that they rested regularly on the same favorite large stone. On Plover spit, Parakeet Auklets also nested on cliffs but not on debris. On Bol'shoi Diomede Island, I saw them on huge boulders on the coastal slopes. While Whiskered Auklets did not avoid small talus slopes, they nevertheless also colonized places far above those of Parakeet Auklets. According to A.M. Bailey, on St. Lawrence Island near Gambell, R.W. Hendee found nesting sites among gigantic boulders. Bailey himself found one near Savunga in the upper parts of precipitous cliffs rising 75 to 100 ft above the deep water shore. Cormorants, murrelets, kittiwakes, and puffins nested at places where extensive snow banks alternated with sections of exposed rock surfaces, while Parakeet Auklets lay in burrows at the top of cliffs in very quiet places. Fay and Cade observed Parakeet Auklets at the apices of rocks, more often together with puffins than with other species of alcids.

I quite often sighted single birds at the feeding sites where Crested Auklets usually gathered, often in flocks.

*Arrival*—In 1938, P.T. Butenko sighted and collected the first Parakeet Auklets on Cape Stoletiya on May 18.

According to F.H. Fay and T.J. Cade, Parakeet Auklets arrived on St. Lawrence Island earlier than Crested Auklets. Their first appearance was sighted on May 17, 1952, May 15, 1953, May 11, 1954, and May 12, 1956. J.W. Brooks noticed the first Parakeet Auklets on Little Diomede Island on May 29, 1953, while K.W. Kenyon noticed the first flocks of 5 to 10 birds each at sea among ice on May 20, 1958. By 7:00 p.m. up to 500 to 600 were sighted on the coast. By May 25 thousands of them had gathered on the exposed water. On May 26 they flew high over the island and some sat on the peaks of rock projections. On May 31, at 4:30 p.m., a large number began to occupy the upper portions of rocky slopes. The number of Parakeet Auklets increased rapidly until June 4. At the end of May, a large number were airborne from late evening to early morning even though the sun shone round the clock. They commenced flight later on foggy days than on sunny days.

In the spring of 1934 I saw them around Uélen for the first time only on June 12. Very small numbers remained singly on the sea.

*Nidification*—Males caught on May 18, 1938, had testes of normal size: 10 mm × 4 mm and 9 mm × 3 mm, and 6 mm × 3 mm and 5 mm × 3 mm. They were already enlarged in a male from Bol'shoi Diomede Island on June 24, 1934—19 mm × 9 mm and 14 mm × 9 mm. The testes of a male from Providence Bay on August 28, 1932, were almost the same size as those of spring birds—7 mm × 4 mm and 6 mm × 3 mm. The ovaries of females caught in Providence Bay at the end of August revealed a fine-grained structure. In one female the ovary was 12 mm long. May and June birds contained very thin subcutaneous adipose deposits, while August birds were entirely devoid of fat.

On June 24, 1909, J. Koren discovered a nest on the west coast of Bol'shoi Diomede Island but not so much as a single egg. The eggs collected by E.W. Nelson in July, 1881 from islands in Bering Strait were still unincubated.

On August 26 and 28, 1932, I saw Parakeet Auklets flying from the sea to nesting sites. In the specimens he collected, the cervical sacs were full and hence these birds were feeding chicks. On September 3, 1934, on coming out of Uélen, I still saw Parakeet Auklets on the coast. Unfortunately, the observations of F.L. Jaques relate to all three species of Pacific auklets; nevertheless, it is obvious that in 1928, a few flocks of this species were seen on August 14 north of Bering Strait at 59°40′ N. I assume that such northward migrations were necessitated by the icy environment and the foraging conditions associated with it. On August 27, when the expedition returned to the Diomede Islands, birds were as numerous as before and performed daily flights morning and evening. By September 3 and 4, they had become far less numerous and their flights no longer observable. Still many birds were sighted on the water, but by September 7 their number too had dwindled.

*Cervical sac*—In my *Notes on the Least Auk* (1934) I described the cervical sac of the Parakeet Auklet, which until then was not known to science. The sac is in the form of a very large cavity commencing under the tongue and extending for at least half the length of the neck. On the underside it is restricted by a connective tissue membrane with muscular fibers which separate it from the air sac. The inner surface of the skin of the neck is provided with muscular fibers, which also cover the outer surface of the constricted proximal portion of the cervical sac. The sac contents are emptied by the contraction of muscular fibers. Inflated air sacs, one imagines, promote the emptying of the cervical sac.

*Food*—A study of the contents of sacs, crops, and stomachs revealed tiny planktonic crustaceans. In the stomach of a specimen caught in Providence Bay at the end of August, 1932, I found the remains of Calanidae (*Calanus cristatus* Kr.). In the mouth of another I discovered *Parathemisto libellula* Mont., an amphipod. The stomach of a third specimen contained the mandibles of a polychaete. Since a study of the food of *Aethia cristatella* (Pall.) revealed a very uniform composition consisting of tiny copepods, there is reason to believe that the Parakeet Auklet feeds on very large planktonic organisms, leading to a very unique mode of life. A more detailed study would no doubt reveal that it occupies an ecological niche similar to that of Crested Auklets.

*Weight*—Two males examined by P.T. Butenko on May 18, 1932, weighed 275 g and 240 g respectively.

*Economic importance*—Because of its relatively low population, the Parakeet Auklet is of no practical significance on the Chukchi peninsula.

According to E.W. Nelson, in July, 1881, eskimos from the islands in Bering Strait brought on board the *Corwin* a large number of Parakeet Auklets for the table. They were consumed in the absence of fresh meat, but their fishy aftertaste rendered them only tolerable. F.S. Hersey wrote that eskimos on St. Lawrence Island caught them as well as Crested Auklets in large numbers with nets. In his visit to the island in 1914 almost every eskimo family had a dozen or more dressed Crested Auklets, but Parakeet Auklets were kept by just one family.

*Specimens*—1) Sea near Uélen, August 24, 1911, ♀ Arngol'd; 2) Providence Bay, August 26, 1932, ♀, Portenko; 3 to 8) same place, August 28, 1932, ♂♂. ♀♀♀, ○, Portenko; 9) Uélen, June 12, 1934, ♂, Portenko; 10) Bol'shoi Diomede Island, June 24, 1934, ♂, Portenko; 11 and 12) Providence Bay, Cape Stoletiya, May 18, 1938, ♂♂, Butenko; and 13 to 17) Providence Bay, July 21, 1938, ○ ○, Butenko.

### 104. *Aethia cristatella* (Pall.)—Crested Auklet

*Local names*—Chukchian: em'atlegátl'khyn or emkhatygátl'khe, and éru among children. In Eskimo: sukhlyaugrak in Providence Bay; teïek on Bol'shoi Diomede Island; and sū-kĭs'-pŭk on St. Lawrence Island.

*Distribution and status*—It nests in large numbers in colonies on suitable sites on the south and east coasts of the Chukchi peninsula, penetrating the north coast not farther than Cape Inchoun, and in very small numbers on the Diomede Islands. Random finds have been reported north almost up to Cape Schmidt and Wrangel Island. Flies away in winter.

As reported by L.O. Belopol'ski (1933), pairs of this species were sighted a few times in May and June, 1931 in Krest Bay. According to eskimos, a nesting colony existed close to Cape Bering. On August 10, 1932, I saw flocks flying as the ship sailed around Cape Bering. On August 21, I noticed similar flocks in Preobrazheniya Bay.

In Providence Bay the Crested Auklet is the most common species and nests mostly near seacoasts. According to an eyewitness account by W.H. Dall (Dall and Bannister, 1869, p. 309, Table 31, Fig. 2), a few specimens were caught in Providence Bay in 1866. Judging from the illustration and the fact that they were labeled *Phaleris tetracula*, these were young late-fall specimens. The Zoological Museum of the Academy of Sciences of the USSR received from members of the Hydrographic Expedition a series of Crested Auklets caught in Providence Bay by E.E. Arngol'd and L.M. Starokadomskii in July, 1912, 1913, and 1914. According to the observations of W.S. Brooks (1915), this bird was common around Providence Bay in June, 1913.

C. Amory (Riley, 1918) caught a male in Émma Bay on July 29, 1914. As reported to me by I.O. Olenev, Crested Auklets were encountered singly in the summer of 1932 within Providence and Émma Bays, while small flocks of 6 to 8 birds were seen only in the fall. On August 26 and 28, I studied a nesting colony located between the entrance to Providence Bay and Cape Ivga. Farther east, another colony no doubt existed since I saw flocks flying beyond Cape Ivga. In the section I surveyed hundreds of Crested Auklets nested. On August 12, 1933, while sailing from Providence Bay to Cape Chaplin, roughly five miles away from the coast I noticed an exceptionally large number of flocks of Crested Auklets. On September 10, 1934, while departing from Providence Bay, I saw single birds rafting along coast. Very late (October 29) in 1937, P.T. Butenko arrived in Providence Bay, yet he still saw Crested Auklets throughout November. In 1938, he observed their arrival and later collected summer specimens, especially on Cape Stoletiya. In July 1938, I came across lone birds repeatedly along the coast of Plover spit. Just before sunset, at least 10 or 15 flocks swarmed like puffs of smoke high into the sky above the entrance to Providence Bay. V.N. Lyubin brought to the Moscow Zoological Museum a specimen caught in this bay on July 14, 1948.

I found a very generalized reference in the manuscript of N.P. Sokol'nikov to the fact that young alcids were numerous on the rocky seacoasts of the Chukchi peninsula. This reference should be taken as pertaining mainly to the south coast. It is difficult to establish in terms of observations, or more correctly the lack of them, the basis on which E.W. Nelson (1887, p. 42) concluded that the Crested Auklet was far less numerous than the Parakeet Auklet on the Chukchi coast.

On St. Lawrence Island, the Crested Auklet was common in nesting sites. This species was apparently found there even by the expedition of Captain Beechey (Vigors, 1839) in 1826. E.W. Nelson sighted Crested Auklets on June 17, 1877 at sea in the ice east of St. Lawrence Island; they were very numerous, at least as numerous as Parakeet Auklets. During the residence of the *Vega* expedition on St. Lawrence Island, the Crested Auklet was sighted in large numbers on the north-western extremity. Five males were shot on July 31, 1879, and two salted skins were brought back from the Island. W.S. Brooks found this species to be common on Cape Chibukak on June 3, 1913, and collected some specimens. According to F.H. Fay (Hersey, 1916), who visited St. Lawrence Island on July 24 and 25, 1914, Crested Auklets nested on the rocks behind Gambell village. A.M. Bailey (1925) in his 1921 journey also saw this colony and another one close to Savoonga village. H.B. Collins (Friedmann, 1932a) collected these birds in Gambell at the end of June, in July, and in August, 1930. In 1933, O.J. Murie collected a series of 15 birds, including a male, at Kukuliak village on July 18, a male in Gambell village on July 22, and five adults and four young on September 2. According to F.H. Fay and T.J. Cade (1959), the number of auklets of both species in a colony near Cape Singikpo exceeded a million. Their flocks leaving Kongkok Bay in the morning literally obscured the sky. The population ratio of the two species was not always identical. On Cape Chibukak the ratio of Crested Auklet to Least Auklet was 1:1 or 1:2, but in Savoonga 1:20. Mention is made of specimens caught in Gambell village on July 9, 1927 and August 2, 1953. E.G.F. Sauer (Sauer and Urban, 1964) noticed Crested Auklets at sea on the way to Kangi on June 14, 1960. H. Friedmann (1934a) found the bones of the species in 16 archaeological excavations on the northwestern extremity of the island, but not a single bone in the opposite end (corresponding to the present location of Crested and Parakeet auklets). This is the only report indicating that the two species are mutually exclusive, at least to some extent. E.N. Kurochkin (1963) encountered in the fall of 1961, a huge flock extending for a stretch of some 200 miles in the open sea southeast of St. Lawrence Island. The density of Crested Auklets there reached 24 birds per km$^2$.

On July 4, 1779 the expedition of J. Cook (King, 1785, III, p. 243) happened to be north of St. Lawrence Island after Cook's death. On that day "several small Crested Auklets" were seen. In 1849/1850, three birds were collected by Captain Moore (Harting, 1871) somewhere in Bering Strait, possibly on the Chukchi coast.

E.W. Schmidt informed me that Crest Auklets were numerous in Lawrence Bay.

I did not, however, find these birds there, although I only visited the strait in passing. Moreover, Schmidt found Crested Auklets on his way to Uélen from Lawrence Bay. In 1957, A.P. Kuzyakin noticed several hundred pairs rafting along the coasts between Akkani and Yandagai on June 24 and 25. A thorough scrutiny of the rocky section of the coast on July 9 revealed no Crested Auklets either on land or on water—which is not surprising. One can walk entire days along piles and rocks colonized by these birds and yet see none. In the evenings, massive swarms may appear in the same places. On June 21, 1970, V.V. Leonovich sighted a single Crested Auklet on Lawrence Bay.

On July 20, 1879, when the *Vega* bypassed Cape Dezhnev and entered Bering Strait, a lone Crested Auklet was sighted. The collection of the Institute of Zoology of the Academy of Sciences of the USSR contains a specimen caught by J. Koren on July 21, 1910, on Cape Dezhnev. According to W.S. Brooks, this species was common in Bering Strait in June, 1913, and specimens were collected on Cape Dezhnev. The next year (1914), F.S. Hersey encountered "many Pacific auklets" on Cape Dezhnev; such a general report could well refer simultaneously to all three species. On September 6, 1933, P.T. Butenko noticed Crested Auklets in large numbers near Naukan village but only rarely were the flocks in flight. In the first half of June, 1834, on the coast before Uélen these birds were constantly found in large numbers, but the flocks dispersed. On June 20, while going by whaleboat, from Uélen to Naukan, I saw them in large numbers, although they were fewer than, for example, guillemots. On June 26 they were still abundant on my return from Diomede Islands, proceeding toward Cape Dezhnev. A.P. Kuzyakin also saw a large congregation of Crested Auklets on July 3, 1957, as he approached Cape Dezhnev. On September 10, 1880, eskimos on Bol'shoi Diomede Island brought a large number of skinned Crested Auklets to T.H. Bean (1883, p. 171); Bean himself caught six young birds. According to E.W. Nelson, the Diomede Islands represented the center of abundance of this species together with the Parakeet Auklets. In 1881, he collected a large number of specimens without difficulty. On June 24, 1909 J. Koren (1910) found Crested Auklets on the west coast of Bol'shoi Diomede Island in large numbers in spite of storm and rain. The Institute of Zoology received by way of exchange a specimen caught there by Koren on June 6, 1913. The next year (1914), F.S. Hersey found both Crested and Parakeet auklets abundant near Cape Dezhnev (East Cape) and the Diomede Islands, but sighted none north of Bering Strait. A.M. Bailey simply mentions that Crested Auklets were obtained on the Diomede Islands, by the eskimos for their table. The observations of F.L. Jaques in 1928 (1929) pertain to little Diomede Island and all three species of Pacific auklets as a group. According to him, the most abundant species was the Crested Auklet. On July 27, 28, and 29, these birds were so numerous on the Diomede Islands as to defy description. In the darkness, which in that time of year came late, the air on the islands throbbed with the humming of Crested Auklets and several thousand could be seen as far as the eye could see. In the morning the noise of their wings and the din of their activity resembled the sound of a tidal wave. The birds soared so high that they were barely discernible specks in the sky. Their numbers would gradually decrease and then suddenly, around noon, they would disappear completely. After midday, they could be seen flying low over the water around the islands. Even within a mile of the island, their number was not as great as that of birds sighted on the island; farther away at sea they were sighted only rarely. F.L. Jaques put a question mark under "place" from which large numbers of birds collected in the twilight. I can answer his query with full confidence—from hideouts under stones. Both Crested and Parakeet auklets take advantage of all suitable sites on the island for nesting. On June 22, 1934, it was 2:00 a.m. at night when I approached Bol'shoi Diomede Island. Even at the entrance I saw Crested Auklets along with other auklets, puffins, and cormorants. Nesting Crested Auklets were abundant on the island, but their population less than that of Least Auklets.

In 1958, K.W. Kenyon (Kenyon and Brooks, 1960) noticed the mass arrival of Crested Auklets on Little Diomede Island. On May 25, many thousands gathered on the exposed water south of the island. Crested Auklets were so numerous that they gave off a distinctive citrus odor from the sea as well as from their nesting sites. On May 29, the smell from tens of thousands of flocks hidden by mist was so strong that the wind carried the odor for half a mile away from the birds.

E.W. Nelson (1883, p. 116) wrote that Crested Auklets on the coast of Chukchi peninsula north of Bering Strait were extremely abundant. F.S. Hersey saw none north of the strait. These two extreme views are based on inadequate observations and erroneous. I established, as accurately as possible, that Crested Auklets did not nest on the rocks closest to Uélen. On August 10, 1948, V.N. Lyubin caught two old birds near Uélen, which were evidently wandering in search of food. On July 2, 1934, I came across flocks of Crested Auklets which had not yet reached Cape Inchoun, but saw some pairs the following day directly on its rocky coasts. Since the pairs allowed the whaleboat to approach closely, I got the impression that these were local nesting birds. On July 4, I saw lone birds east of Mitkulen. J. Koren (Thayer and Bangs, 1914) observed a small flock from September 26 through 28, 1912 on Cape Insurin (evidently Ikechurun). West of the cape he sighted none.

On June 28, 1970, V.V. Leonovich saw several dozen Crested Auklets in Énurmino, on June 29, a pair in Seishan, and on July 5 a few west of Énurmino. On July 9, he saw a few 20 km eastward in a small bird bazaar. Members of the *Vega* expedition encountered no Crested Auklets at the wintering site of the ship near Kolyuchin Bay.

Quite unexpectedly, I came across two specimens in September, 1939 at Two Pilots spit near the Amguéma River estuary. On September 1, when the ship remained on the coast during a storm, I was given a female caught in the bow. On the morning of September 2, I saw another bird on the waves near the ship. After a while I was told that a Crested Auklet had landed on the bow. I found it on the forecastle among pipes but could not catch it, since the bird managed to slip through the barrier and fly out to sea. It returned to the ship, however, and landed on board, but then the children frightened it off. This time the auklet circled the vessel and returned to land on the forecastle, where I caught it with my bare hands. The prevailing circumstances and the stormy weather fully explain its random flight so far west.

E.W. Nelson (1883, p. 116) wrote that a few birds of this species were seen in 1881 around Herald Island, but were very rare compared with guillemots and murres. Crested Auklets were also sighted on August 11 and 12 on Wrangel Island, but only two or three. One cannot help but think that some misunderstanding occurred in this last reference by Nelson, all the more so since he makes no mention whatsoever of these sightings in his 1887 monograph.

F.L. Jaques sighted a few flocks of Pacific auklets, probably all three species, on August 14, 1928, in the Arctic Ocean at 69°40′ N. They flew in the same direction, which could not be established because of the distance. At almost the same latitude a few lone birds were sighted on August 23 and 24. A.G. Bannikov (1941) refers to a male bird caught at sea on his way to Wrangel Island on August 13, 1938. Judging from the year, this bird was later acquired by A.N. Druzhinin who on that same day (August 13) journeyed with me by launch from Rodgers Bay to Bruch spit. Neither of us saw Crested Auklets. In any case Bannikov had no basis for concluding that this species possibly nested on the island. A.I. Mineev told me that he happened to sight Crested Auklets only a few times in the course of five years, and that only at sea and not closer than 10 to 15 km from the coast. According to the eskimos, who were well acquainted with this bird on the Chukchi peninsula, it was absent on Wrangel Island. In my opinion the references to Wrangel and Herald Islands are not reliable. They may refer to flying birds, which I also encountered at Two Pilots spit, or to murrelets. I am fully convinced that the Crested Auklet does not nest on these islands.

According to A.M. Bailey, Crested Auklets, after the nesting season, appear in small numbers at sea north of Cape Barrow, where a few specimens have been collected in recent years.

*Habitat*—The Crested Auklet I noticed at the entrance to Preobrazheniya Bay evidently nested in the section of the coast which lay in the form of a hill slope covered with large boulders and smaller debris. Nesting colonies I found between the entrance to Providence Bay and Cape Ivga were located at two or three sites along the coast, which was in the form of a nearly continuous wall of precipitous cliffs. A narrow surfline of talus extended below the rocks. Crested Auklets, Tufted Puffins, as well as cormorants, and at places guillemots, nested in abundance on the rocks. A nesting colony of Crested Auklets was situated on a cape formed by large boulders interspersed with talus. In my *Notes on the Least Auk*, the general landscape of this locality is depicted in Fig. 1. The photograph was taken directly from the rocks beneath which Crested Auklets nested at a height of 10 to 15 m above sea level. On following the coast past the debris-laden cape, my attention was riveted by a sharp smell of decomposing crustaceans. It emanated from under the rocks inhabited by Crested Auklets and evidently issued from spoiled food and bird excreta. Even dead birds smelled of crustaceans. This smell was so specific and intense that I could find a nesting site inhabited by Crested Auklets on any section of the coast by literally following my nose!

On Bol'shoi Dimede Island, I found nesting sites of Crested Auklets among large stone boulders piled mostly mid-way up the slopes of banks. Beneath these boulders the shoreline was in the form of precipitous cliffs inhabited by other guillemots, cormorants, and kittiwakes; above, the talus was very small in size and occupied mainly by Least Auklets. According to F.L. Jaques, Little Diomede Island was entirely occupied by three species of Pacific auklets except for the sheer cliffs at the base of the slopes where murrelets and kittiwakes nested. On St. Lawrence Island, according to the records of members of the *Vega* expedition, Crested Auklets were seen in large numbers in rock piles on the steep coastal slopes on the northwestern extremity of the island, where they nested together with Least Auklets but usually at a somewhat higher level than the latter. In Gambell village, R.W. Hendee found nesting sites among gigantic boulders and A.M. Bailey visited a nesting colony near Savunga located above steep cliffs colonized by cormorants, murrelets, kittiwakes, and puffins. Together with the Least Auklet, the crested Auklet inhabited the upper portions of cliffs covered with rounded stones.

The reference by F.H. Fay and T.J. Cade to the colonies of Crested Auklet on the middle and lower slopes on St. Lawrence Island, while the Least Auklet occupied almost exclusively the upper level, is somewhat at variance with this information. This was the case in at least the first few weeks of arrival. At the commencement of nesting, this type of vertical distribution became less noticeable, although maintained by and large.

At rest and in search of food, Crested Auklets either cling to the coastline or, far more often, stay far away from it. They have no affinity whatsoever for ice and cannot be called arctic birds in this respect. The abundance or paucity of flocks was undoubtedly related directly to the distribution of crustaceans on which they fed. Between Mitkulen and Uélen, in large coastal sections free of ice I came across large flocks scattered over a considerable area in the summer of 1937. At the end of August, 1932, on the calm shore 1 or 2 miles from the coast of Cape Ivga, an extremely compact flock of Crested Auklets rafted. The birds were so closely packed that at a distance the flock looked like a floating circular patch with an uneven surface. When I first saw such a patch on water, I could not determine by binoculars what it was for quite sometime. I became convinced that the patch consisted of a flock of birds only after seeing some swimming away from the group. In Providence Bay, I encountered Crested Auklets in flocks of six to eight birds. I never saw so much as their feathers in the lagoons near Uélen. Therefore, the Crested Auklet is a true sea bird.

Instances of Crested Auklets landing on a ship and persistently returning to it, are explained by their mistaking it for a rock or boulder.

*Arrival*—Crested Auklets arrive no earlier than the latter half of May. In May, 1931, L.O. Belopol'skii noticed them in Krest Bay. In the spring of 1938, P.T. Butenko noted their arrival in Providence Bay on May 19, a day later than Parakeet Auklets. Possibly since Crested Auklets were rare to start with, entries of their arrival in my diary were intermittent, i.e., May 27, 30, etc. A.M. Bailey wrote that Crested Auklets arrived in Bering Strait somewhat later than Parakeet Auklets. In

1922, the first bird was sighted on May 23, but subsequently Crested Auklets were quite few until June. Only by June 25, were they as numerous as Parakeet Auklets. In the spring of 1934, in Uélen the first flocks were sighted on June 3, but they did not constitute the first arrivals. Because of ice conditions, I could not track their arrival on Cape Dezhnev; around Uélen they appeared in the feeding grounds far away from their nesting sites in large numbers of flocks at sea as soon as large expanses of water were freed of ice. On June 6 and 12, I recorded in my diary that Crested Auklets were initially found in large numbers at sea and distributed over an extremely large area. On June 20, however, while journeying from Uélen to Naukan they were few in numbers and, too, only close to such sites as could have been nesting areas.

On Little Diomede Island, according to the observations of K.W. Kenyon, the first three Crested Auklets were sighted on May 20, 1958, flying over exposed water three miles east of the island. From midday May 25, flocks swarmed high above the rocks on which some rested. Thousands of flocks rested on the water, then took off in small groups of four or five to fly around the island; the maximum number of birds were airborne around 2:00 a.m.

According to F.H. Fay and T.J. Cade, both species of auklets arrived every year around May 20 on St. Lawrence Island at Cape Chibukak.

*Breeding*—Males arrive in spring with slightly enlarged testes. Gonadal growth commences only at the end of June. In mid-July a reduction to a size smaller than on arrival is seen, and by August the testes have diminished even more (Table 19).

Measurements in specimens 20 to 25 are those of young male yearlings in which the testes grow almost to the same size by winter as those of adults.

The ovaries of arriving females had a uniform fine-grained structure. This was the condition in specimens from Uélen caught on June 7, 12, and 16. In one female caught on June 7 follicles up to 4.0 mm in diameter were seen. Enlarged follicles were usually seen around the 20th of June (Table 20). The granular structure of the ovary was already uniform in some females shot at the end of August, 1932.

Female yearlings caught mid- and end of November, 1937 possessed ovaries with a smooth surface. The ovary in one was 12 mm long.

From the time of arrival Crested Auklets revealed thin subcutaneous adipose deposits in continuous or patchy films. From the middle of July, i.e., from the time of commencement of feeding their chicks, subcutaneous adipose deposits were absent in every specimen caught.

On June 24, 1909, on Bol'shoi Diomede Island, J. Koren (1910) found no eggs of the Crested Auklet in spite of a thorough search. During my visit to the island from June 22 through 26, 1934, eskimos told me that nests of Crested Auklets did not yet contain eggs, but autopsied specimens revealed that at least some of them had already laid. By that time, mating was at its peak. Although Crested Auklets were seen resting on rocks in flocks with Least Auklets, they were invariably found in pairs and I never saw more than four of them on the same rock. They also arrived from the sea mostly in pairs and more rarely in small groups. Males could be distinguished by their very long crests and their dandyish external appearance. In the

Fig. 10. Least Auklets *Aethia pusilla* (Pall.). Bol'shoi Diomede Island. June 26, 1934.

Fig. 11. Crested and Least Auklets *Aethia cristatella* (Pall.) and *Aethia pusilla* (Pall.). Bol'shoi Diomede Island. June 25, 1934.

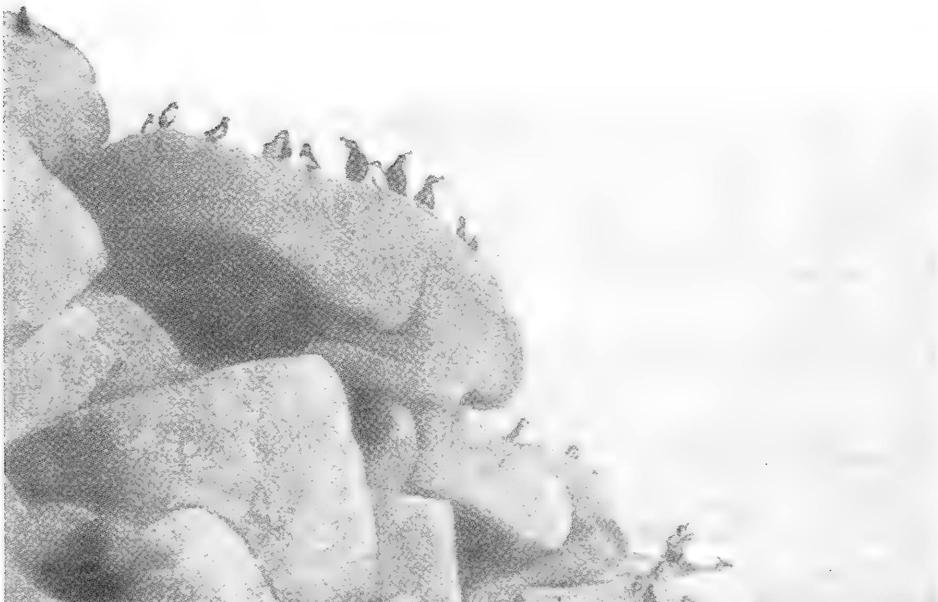


Fig. 12. Least Auklet *Aethia pusilla* (Pall.). Bol'shoi Diomede Island.
June 26, 1934.

Fig. 14. Location of a nesting plot of a Snowy Owl *Nyctea scandiaca* (L.). Mamontovaya River.
June 9, 1939.

**Table 19. Size of testes (mm) among Crested Auklets**

| Specimen | Date | Left | Right | Locality |
|---|---|---|---|---|
| 1 | June 3, 1934 | 11 × 8 | 8 × 6 | Uélen |
| 2 | June 7, 1934 | 15 × 8 | 12 × 6 | -do- |
| 3 | June 12, 1934 | 10 × 5 | 8 × 4 | -do- |
| 4 | June 12, 1934 | 12 × 7 | 10 × 6 | -do- |
| 5 | June 16, 1934 | 8 × 3 | 6 × 2 | -do- |
| 6 | June 16, 1934 | 10 × 5 | 8 × 4 | -do- |
| 7 | June 16, 1934 | 11 × 4 | 8 × 3 | -do- |
| 8 | June 23, 1934 | 19 × 3 | 15 × 2 | Bol'shoi Diomede |
| 9 | June 24, 1934 | 14 × 8 | 10 × 7 | -do- |
| 10 | June 28, 1934 | 15 × 10 | 12 × 8 | Naukan |
| 11 | June 28, 1934 | 18 × 9 | 13 × 7 | -do- |
| 12 | July 6, 1938 | 7 × 3 | 6 × 3 | Providence Bay |
| 13 | July 13, 1938 | 8 × 4 | 9 × 4 | -do- |
| 14 | August 8, 1938 | 4 × 2 | 3 × 2 | -do- |
| 15 | August 18, 1938 | 4 × 2 | 3 × 2 | Cape Chaplin |
| 16 | August 26, 1932 | 6 × 4 | 6 × 4 | Providence Bay |
| 17 | August 26, 1932 | 8 × 3 | 7 × 3 | -do- |
| 18 | August 28, 1932 | 8 × 4 | 7 × 3 | -do- |
| 19 | September 6, 1933 | 8 × 3 | 6 × 2 | Naukan |
| 20 | November 17, 1937 | 5 × 2 | 4 × 2 | Providence Bay |
| 21 | November 17, 1937 | 5 × 2 | 4 × 2 | -do- |
| 22 | November 17, 1937 | 6 × 3 | 5 × 2 | -do- |
| 23 | November 17, 1937 | 6 × 3 | 5 × 3 | -do- |
| 24 | November 18, 1937 | 8 × 2 | 7 × 2 | -do- |
| 25 | November 19, 1937 | 7 × 2 | 6 × 2 | -do- |

evenings they preferred to warm themselves in the sun. Some pairs exhibited characteristic courtship behavior. The male and female would stand face to face, not opposite each other, but as on adjoining squares of the same color on the chessboard. In this position they tenderly caressed each other with their beaks in the manner of pigeons. Their note then sounded different from that heard at the end of summer when Crested Auklets were feeding chicks. From afar it resembled the note of a jackdaw, but when I went by rocks under which Crested Auklets were resting, their note resembled the barking of a dog. The most striking courtship ceremony was observed in the mating flights of flocks of various sizes, for which I cannot find a more apt word than "swarming". On Wrangel Island, I tracked such swarming among other guillemots—murrelets and Black Guillemots. On the Diomede Islands

**Table 20. State of ovaries among Crested Auklets**

| Date | Largest follicle, mm | State of ovary and oviduct, other findings | Locality |
|---|---|---|---|
| June 7, 1934 | < 1 | Ovary with uniform grainy structure | Uélen |
| June 12, 1934 | < 1 | -do- | -do- |
| June 16, 1934 | < 1 | -do- | -do- |
| June 7. 1934 | 4 | — | -do- |
| June 23, 1934 | 7 | Signs of diminishing activity. Oviduct active | Bol'shoi Diomede |
| June 23, 1934 | 12 | Oviduct enlarged. Evidently egg laid quite recently | -do- |
| June 24, 1934 | 26 | Follicle at stage close to release in oviduct | -do- |
| June 24, 1934 | 6 | — | -do- |
| June 28, 1934 | 8 | — | Naukan |
| June 25, 1957 | Enlarged | According to the records of A.P. Kuzyakin | Yandagai |
| September 1, 1939 | 2 | Length of ovary 12 mm. Individual follicles up to 2 mm on granular surface. Ovary active. | Two Pilots spit |
| September 2, 1939 | 2 | Length of ovary 20 mm. Follicles up to 2 mm lodged on surfae | -do- |

I noticed that this ceremony was more intense among Least Auklets but only apparent among Crested Auklets. Swarming occurred periodically, twice in the course of a day, at the beginnng and end of night. With the onset of cold in the evening, the birds left their ground sites and selected convenient rock surfaces. On a surface of 1 to 2 $m^2$, I saw simultaneously up to four Crested Auklets, over ten Least Auklets, and one or two Parakeet Auklets. Crested Auklets, in spite of their outward impudence, behaved quite peaceably toward their neighbors. A.M. Bailey states that on St. Lawrence Island they were very quarrelsome and invariably rolled down the stones in fights.

After a while the birds would fly away, not all at once, but singly, or in small flocks, and Crested Auklets more often in pairs. They would later return, land, or fly past, and finally fly far away to sea. On June 23 in the evening, due to inclement stormy weather, Crested Auklets on arrival from the sea immediately hid themselves under stones.

The foregoing observations were also noted by F.L. Jaques on Little Diomede Island from July 27 through 29, 1928. On his return on August 27, migrations occurred as before in the mornings and evenings, but ceased by September 3 and 4.

On July 13, 1938, I noticed the swarming of Crested Auklets above the entrance to Providence Bay. When the sun began to set, a large number of flocks swarmed high in the sky. I saw a similar swarming from a ship on the evening of August 21, 1932, at the entrance to Preobrazheniya Bay. West of it, one cape stood out prominently against the background of the sky; illuminated by the rays of a low sun a beautiful bluish silhouette resulted. The weather was excellent and calm, a rarity in these places. Crested Auklets circled in large numbers for a long time above the cape, flew toward the shore and returned again. At a distance the flocks resembled small puffs of smoke.

On August 26, I found myself directly over the nesting site of Crested Auklets west of Cape Ivga. In the evening, as darkness set in, flocks flew in from the sea onto the scree, but did not settle immediately on the rocks. Usually they first flew low above the water, soared to a cliff, flew above the scree, and eventually a few would land. The flock would again fly toward the sea, at times quite far, again return, and so on, until gradually all the birds had settled into small groups on the rocks. Some birds, having landed and stayed put for sometime, again flew away and shifted to much smaller neighboring boulders, hiding themselves in crevices and passages between or under the rocks. Upon the onset of total darkness, however, arriving flocks landed immediately. The rock talus came alive with the chirp-chirp of the young and the rumbling bass growls of the adults. On August 28, probably because the day was overcast, single birds as well as small groups flew onto the talus during the day. Flapping their wings rapidly, Crested Auklets generally landed with ease on the rock. At times, however, the sound of a small body skidding over a rock was distinctly heard. Some birds, under their own impetus, ran two or three paces on landing, while others stumbled and fell on their abdomen. Having inspected and sensed no danger, the birds, using their wings, hopped and landed on rocks lying below and hastened to disappear underground. Surprised to find me, there they stretched their neck, looked sideways, flew away, but soon returned. Eventually my presence was noticed by most of the Crested Auklets which, though they arrived in flocks several times, decided against landing. Toward evening two large flocks flying toward the talus attempted to land but I opened fire. Far to the east, beyond the cape, I could see small swirling, circling flocks.

There is no doubt that swarming is a manifestation of spring calling. Since Crested Auklets do not lay any longer after arrival, swarming continues. Later it takes the form of daily migrations from the nesting sites to the feeding areas and back. Swarming toward the end of summer is not as animated as at the beginning.

On St. Lawrence Island, F.H. Fay noticed intense flighting even on September 1, 1957. Flocks consisting almost exclusively of Crested Auklets commenced flight around 4:00 p.m. Between 5:30 and 5:35 p.m., a matter of five minutes, about 15,000 birds were counted; between 7:00 and 7:05 p.m. 7,500 birds; and from 7:30 to 7:35 p.m. less than a thousand. Movement ceased around 8.00 p.m.

On the evening of July 13, 1938, when I went past nesting sites known to be located between Providence Bay and Cape Ivga, I encountered no Crested Auklets. Evidently these birds had already laid and daily movements associated with bringing food to chicks had not yet commenced. It is possible that they were satisfied more than in other seasons with the food available in nearby sites. On July 3, 1934, I noticed pairs on Inchoun rocks. Crested Auklets nested on them and, as often happens with nesting birds, permitted the whaleboat close approach. Outside the nesting season these birds are cautious. On August 10, 1932 I journeyed in stormy weather from Cape Bering to Preobrazheniya Bay. No doubt the weather prevented Crested Auklets from feeding on planktonic crustaceans. Waves were such that the ship could not move close to the coast. Flocks of Crested Auklets were restless and remained low over the sea roughly a mile from the coast. On August 12, 1933, while sailing along the south coast from Providence Bay to Cape Chaplin in good calm weather (a rarity in that part of the country), I noticed an exceptionally large number of flocks about five miles away from the coast. They swam in every direction and flew mostly in single file. Such is the behavior of Crested Auklets at sea during the period when they must fill their cervical sacs with crustaceans to feed their nestlings. Observing the thick swollen necks of Crested Auklets arriving at the nesting sites, I knew their catch had been successful. They probably suffered from hunger in cloudy weather.

According to E.W. Nelson, in 1881, on the Diomede Islands, the young were fully feathered around August 10 to 15. However, O.J. Murie noticed down in the plumage of fledgelings caught on St. Lawrence Island even on September 2, 1933.

Females I caught on September 1 and 2, 1939 (Fig. 8) were in a state of molt, particularly noticeable on the forehead and beak. The ricti at the corners of the mouth were not covered by horn. A.P. Andriyashev traveled through Bering Strait toward Providence Bay on September 21, 1946 and saw many small guillemots which, judging from his statement, would be more correctly considered Crested Auklets. They remained on water and evidently were undergoing molt since they did not fly away as the ship approached, but ran flapping their wings on the water and later dove.

*Departure*—Crested Auklets from around Cape Dezhnev and the Diomede Islands migrate in the first half of September. According to the observations of F.L. Jaques, on Little Diomede Island in 1928, Crested Auklets were far less numerous on September 3 and 4, although many were still seen on the water. On September 7 their number decreased notably. Near Naukan, P.T. Butenko saw them in large numbers on September 6. In Providence Bay in the fall of 1937, he encountered Crested Auklets on the sea on almost every trip throughout November. This bird was recorded for the last time on November 30 and not even once thereafter in winter.

The dates given by V.P. Shuntov (1965) do not agree with the September dates of migration. According to him, Crested Auklets nesting in large numbers in the northern Bering Sea began migration southward early. He saw several flocks flying along the Chukchi coast in the second half of August, 1960.

*Habits*—Sitting on the stones beneath which lay the nests of Crested Auklets, I heard adult birds arriving from the sea feeding their nestlings. These sounds reminded me of scenes of feeding pigeons. Not only the chirping of the young but also, and quite often, the note of the adult birds could be heard. The latter was like a gruff mooing or a loud bass groan. I attempted to transcribe these sounds in my diary with the syllables "kyp" and "kanyg," and in my opinion the name "konyuga" in the Russian language is an onomatopoeic imitation of the voice of these birds. In the rocky environment of the seacoast in the twilight hours, the characteristic silhouette of a Crested Auklet blended harmoniously with its unusual voice.

Once I happened to shoot a Crested Auklet floating on Plover Bay. Both wings were damaged by the small shot and the wounded bird could not dive. It floated on the surface and plunged its head helplessly in the water. This proved that Crested Auklets dive exclusively with the help of their wings, which is quite understandable since their tarsi are extremely small.

*Cervical sac*—In my *Notes on the Least Auk* (Portenko, 1934b) I described the cervical sac of the auklets I caught. It is best developed in the Crested Auklet and is in the form of an ampullar extension of the oral cavity measuring 5.5 cm when fully developed, with a capacity of 16 $cm^3$. The degree of distension of its walls is roughly the same as that of the walls of the crop. From the right and partly dorsal side, the sac is interconnected with the surface of the crop by a loose connective tissue; from the left it is fused with the fascia of the muscular base of the neck. The proventriculus is thus located asymmetrically and shifted toward the right side. The width of the entrance to the cervical sac is almost the same as the entrance to the proventriculus. This organ is developed in both sexes during the period of nidification, but later its walls fuse through a loose connective tissue. It is altogether absent in young birds; a frenulum occurs under the tongue instead of a depression. It was detected and described for specimens feeding chicks. Imagine my surprise when I found not even a trace of this sac under the tongue of birds shot in Uélen in early June, 1934. The first signs of a depression under the tongue were seen only among birds caught on the Diomede Island on June 23 and 24. For example, in a male caught on June 23, I found a small sac with a distinct entrance to it. I likewise found a very short sac among females on June 24. On May 19, 1938, P.T. Butenko caught a specimen with an extremely tiny cervical sac that had just begun to develop. Further study led me to the conclusion that when there is no need to carry food for chicks over a long distance, the Crested Auklet loses the cervical sac right up to the time of breeding the following year. The sac does not completely shrink but its walls fuse. In June specimens I was able to separate the walls for over a centimeter by exerting force with pincers.

*Food*—The sac contents of captured Crested Auklets consisted of a soft mass of reddish, or salmon-colored copepods, with a small admixture of schizopods. The sacs in most specimens overflowed with food matter and crustaceans were visible even in the oral cavity.

In the crop of three Crested Auklets collected in Providence Bay on August 26, 1932, the following contents were found: 1) about 300 crustaceans of three or four species; 2) about 800 small crustaceans; and 3) about 900 similar crustaceans. The stomachs were empty. The stomachs of specimens collected on August 28 revealed: 1) amorphous jellylike animal remains; 2) very little of these remains; and 3) bits of large saber-shaped maxillae and a large stone over 1.0 cm long. Some 250 crustaceans of three species were found in the crop of a fourth specimen.

The stomachs of Crested Auklets caught in Uélen on June 3 through 15, 1934, were nearly empty. Only highly deformed remains of 20 crustaceans were distinguishable, with three small stones present in one specimen.

The stomach of a Crested Auklet shot in Providence Bay on June 13, 1938, contained three *Spirantocaria*, one unidentified crustacean, and three small mollusks. The stomach of a specimen collected on Two Pilots spit on September 2, 1939 was filled with semidigested crustaceans.

According to F.H. Fay, the food of Crested Auklets on St. Lawrence Island consisted almost exclusively of amphipods.

*Weight*—P.T. Butenko weighed yearlings caught in November, 1937 in Providence Bay: ♂♂ 275, 270, 265, 265, 255, and 230; ♀♀ 245, 200, and 190 g; and ○ ○ (judging from the heavy weight of males) 290 and 260 g.

*Economic importance*—On the coast of the Chukchi peninsula, where much larger wild fowl such as geese and ducks are available, the Crested Auklet is not hunted for meat. On Bol'shoi Diomede Island, however, it is caught by the local eskimos for the table along with Least Auklets but in considerably smaller numbers. T.H. Bean wrote that on September 10, 1880, eskimos on Bol'shoi Diomede Island brought him a large number of Crested Auklets. More recently, in 1922, A.M. Bailey has reported that when his ship moored off the Diomede Islands, local inhabitants brought any number of these birds on board to sell. According to the information collected by the *Vega* expedition in 1879, both species of auklets constituted the main food item for the population of St. Lawrence Island. Tiny tassels and the horny ricti from corners of the mouth were strung on intestines in several rows over the hearth as a decoration. This was confirmed by E.W. Nelson who visited the island in 1881. He was also aware of the use of Crested Auklet for fishing, but how this was done is not comprehensible from his description. In 1914, according to F.S. Hersey, almost every eskimo family had a dozen or several dressed Crested Auklets. Not only were they eaten, but served as dress material. An upper shirt of bird skins required 85 skins.

In Uélen, Chukchians detailed to me how the horny ricti of Crested Auklets were fashioned into a special type of fishing rod used in winter and called "akan". When ricti were insufficient, adjacent sections of the horny beak were used. Since these are orange-colored and do not change color with immersion in sea water, they serve the purpose of imitating crustaceans of similar color (in Chukchian: "konéerétl'gyn"). Ricti or parts of a beak split into fine bits are lowered on a thread made from whale whiskers. The "akan" device is sketched in Fig. 13. The "akan" is dropped into a narrow ice hole or a natural crevice between ice chunks and rhythmically, without hurry, raised and lowered until a semidormant fish is caught sideways in the very sharp ends of the tiny hooks. I saw such an angler, an aged Chukchian, setting out on a frosty day with a stool and a strainer. The legs of the stool were made of walrus tusks and the strainer of whale periosteum. Placing a stool by the ice hole is wholly understandable when one realizes that this type of angling requires prolonged

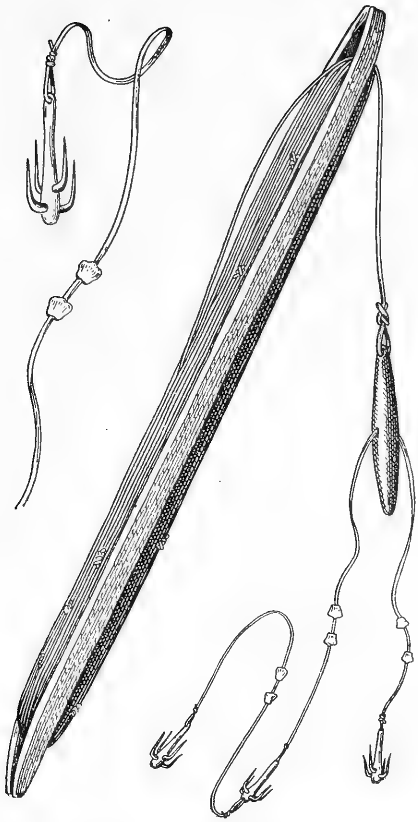


Fig. 13. "Akan" fishing rod for catching fish in winter with mounted baits made from rosettes of Crested Auklets.

monotonous movements. A strainer is used to clean the ice hole of snow and ice grease. When horny ricti are inadequate, they can be replaced even with beads. I paid 30 rubles for an "akan" made to order at Uélen in January, 1934.

This same device is used for catching fish in Alaska, and has been described in detail by L.M. Turner (1886, p. 91). He caught *Eleginus gracilis* (Til.) with it, a fish which the Russian villagers call "vapnei".

*Systematics*—I have found no differences among Crested Auklets caught in various parts of their range.

*Specimens*—1) Cape Dezhnev, July 21, 1910, ♀, Koren; 2 to 4) Providence Bay, July 19, 1912, ♂♂♀, Arngol'd; 5 to 7) same site, July 20, 1912, ♂♂, Starokadomskii; 8) Diomede Islands, June 6, 1913, ♂, Koren; 9 to 12) Providence Bay, July 20, 1913, ♂♂♀♀, , Starokadomskii; 13 and 14) same site, July 30, 1914, ♂♀, Arngol'd; 15) same site, July, 1932, ♂, Portenko; 16 to 18) same site, August 26, 1932, ♂♂♀, Portenko; 19 to 23) same site, August 28, 1932, ♂♀♀♀O, Portenko; 24) Naukan village, September 6, 1933, ♂, Portenko; 25) Uélen, June 3, 1934, ♂, Portenko; 26 to 28) same site, June 7, 1934, ♂♀♀, Portenko; 29 to 33) same site, June 12, 1934, ♂♂♀○○, Portenko; 34 to 37) same site, June 16, 1934, ♂♂♂♀, Portenko; 38 to 40) Bol'shoi Diomede Island, June 23, 1934, ♂♀♀, Portenko; 41 to 44) same site, June 24, 1934, ♂♂♀♀, Portenko; 45 to 47) Naukan, June 28, 1934, ♂♂♀, Portenko; 48 and 49) Providence Bay, Plover, November 15, 1937, ♀ and ○ 1°, anno, Butenko; 50 to 53) same site, November 17, 1937, ♂♂, Butenko; 54 to 56) same site, November 18, 1937, ♂○○ 1° anno, Butenko; 57 and 58) same site, November 19, 1937, ♂♀ 1° anno, Butenko; 59) same site, November 30, 1937, ♀ 1° anno, Butenko; 60 and 61) same site, May 30, 1938, ○○, Butenko; 62) same site, July 6, 1938, ♂, Butenko; 63) same site, July 13, 1938, ♂, Portenko; 64) same site, July 14, 1938, ○, Druzhinin; 65) Chechen village, July 24, 1938, ○, Butenko; 66) Providence Bay, August 6, 1938, ○, Butenko; 67) same site, Cape Stoletiya, August 8, 1938, ♂, Butenko; 68) Cape Chaplin, August 18, 1938, ♂ Butenko; 69) Two Pilots spit, September 1, 1939, ♀, Portenko; and 70) same site, September 2, 1939, ♀, Portenko.

### 105. *Aethia pusilla* (Pall.)—Least Auklet

Local names—In Eskimo: apalík or apalék on Bol'shoi Diomede Island; ăkh-mă′-lā-ghŭk on St. Lawrence Island.

*Distribution and status*—It nests in two large colonies on the Diomede and St. Lawrence Islands; it probably nests in very small numbers around Cape Dezhnev and on Arakamchechen Island, but is noticed only in the flight period in other sections of the Chukchi coast, but not west of Kolyuchin and Providence Bays. Leaves in winter.

In 1849 or 1850, three specimens were caught by Captain Moore somewhere in Bering Strait, possibly on the Asian coast and not excluding Providence Bay. J.E. Harting (1871) processed these birds himself and observed that the species "*Phaleris cicroceras* Brandt" was evidently common on the coast of northeast Asia. W.H. Dall (Dall and Bannister, 1869, p. 309) collected in Plover Bay an adult and young birds which, judging from his reference to two "species," *Phaleris microceros* and *P. pusilla,* were erroneously identified at that time from age characteristics. In September, 1912, A.M. Starokadomskii caught a series in Émma Bay which later went into the collection of Zoological Museum of the Academy of Sciences. W.S. Brooks (1915) wrote that the Least Auklet was found in 1913 in large numbers by the expedition of Harvard University in Providence Bay and also at other sites. The extremely general nature of these references, without supplementary explanations or details, renders them worthless, especially since no specimens were collected. In 1931, according to I.O. Olenev, Least Auklets were seen in Providence and Émma Bays in the fall flight literally en masse. Lone birds were even sighted in summer from July 8 through 12 and later very large flocks arrived in fall. According to his description, these were small birds the size of a sparrow, with an extremely small beak, wings, and tail, dark gray on top, white underneath, and without a crest. This reference thus raises no doubts even though specimens were not collected. On September 10, 1934, I sighted Least Auklets singly at sea from the ship south of Providence Bay, but saw none in the bay itself during my several visits. Neither did P.T. Butenko find them there. C. Amory (Riley, 1918) caught a male at Cape Chaplin on August 8, 1914.

The above finds provide no justification for considering the Least Auklet a nesting bird on the south coast of the Chukchi peninsula; however, a large nesting colony has been found on St. Lawrence Island. Specimens of this species (*Cerorhinca occidentalis* ?) were brought from the island by Beechey's expedition (Vigors, 1839) in 1826. Auklets killed by eskimos were brought aboard the ship in abundance. I.G. Voznesenskii caught a specimen on July 2, 1843. The *Vega* expedition obtained a specimen on July 31, 1879. Local inhabitants brought Least Auklets in large numbers and reported that these birds nested in the northwestern section of the island. The expedition brought back four males and two females, in addition to two salted specimens. E.W. Nelson (1887) wrote that this species inhabited the island in large numbers in summer. According to W.S. Brooks, they were found there in large numbers and a large series of specimens caught. In the Institute of Zoology of the Academy of Sciences of the USSR are preserved two specimens received in exchange from J.E. Thayer, which were caught on June 2, 1913. On a visit to the island the following year (1914) F.S. Hersey (1916) selected from among Least Auklets collected by the eskimos a good series for the Institute's collection. A.M. Bailey (1925) saw thousands of them in 1921, in the nesting colony in Savunga on the north coast of the island. According to him, they more resembled swarms of bees than birds and when they landed a dozen or more gathered on the rocks. H. B. Collins (Friedmann, 1932a) collected a male and female in Gambell village in July, 1930, and O.J. Murie (1936) gathered a series, including four adult birds, on St. Lawrence Island in July, 1933, nine young birds on September 2, 1933, and one adult on August 16, 1934. According to the data of T.J. Cade (Fay and Cade, 1959), the Least Auklet was the most abundant bird on the island in 1950. Up to 100,000 inhabited Cape Chibukak and 1,000,000 lived between Cape Tatik and Boxer Bay. E.G.F. Sauer and E.K. Urban (1964) came across hundreds of thousands of Least Auklets on their way from Gambell to Boxer Bay on June 6, 1960. Between 3:30 and 5:30 p.m. the birds flew from their nests to the sea. Thousands were seen on June 14 near Southwest Cape. H. Friedmann (1934a) found only four humeri and one breast bone of this species in archaeological excavations. One cannot conclude, in my opinion, that this bird was scarce in the past since such small-sized bones do not preserve as well as those of larger species.

According to E.M. Kern (Cassin, 1863, p. 324) and W. Stimpson and Brook (Heine, 1859, III, pp. 169 and 202), the Least Auklet was extremely abundant in the first half of September, 1855, in Senyavin Strait and along the shores of Arakamchechen Island, but remained there for only a short period. Some specimens were kept in ornithological collections, but most were used for the table. On July 27, 1879, as the *Vega* moved from Port Clarence into Kon'yam Bay in Senyavin Strait, E.K. Brusevits noticed Least Auklets rafting on the water. Judging from the time of year, these may have been local birds, but I.A. Palmén (1887) did not indicate precisely at which point these birds were sighted and moreover the accuracy of identification is hardly reliable.

In the collection of N.P. Sokol'nikov, there were two specimens, one male and one female, collected on September 20, 1903, in Lawrence Bay. A.P. Kuzyakin encountered a large number of pairs on the coast at the entrance to the bay along both sides of Yandagai village between June 25 and 27, 1957, but a thorough search of the rocky coast on July 9 revealed not even a single auklet. Although E.W. Nelson states that Least Auklets were common along the Chukchi coast, south of Bering Strait, the observations listed do not confirm nesting on the east coast. On Diomede Islands, E.W. Nelson found Least Auklets abundant in the summer of 1881. According to his description (Nelson, 1887, p. 43), looking toward the coast the air appeared saturated with black dots that flowed in an endless stream. The sound of the surf was obliterated by the humming of "myriad" birds. Landing on the coast, he found such an unbelievable number of flying birds that he likened them to swarms of bees. This was in mid-July and although the auklets had laid, millions flew around, almost all of them in pairs close to each other, and rarely joined with other guillemots. The eskimos caught them by the thousands. F.S. Hersey also states that the Diomede Islands were saturated with these birds in 1914.

According to a description by A.M. Bailey, early in the morning of June 3, 1922 on Little Diomede Island, an endless number of Least Auklets continually took flight. During the day literally thousands of flocks could be seen, often on leads in the ice. The data of F.L. Jaques (1929) unfortunately pertains inseparably to all three species of Pacific auklets of which, on Little Diomede Island, the Least Auklet occupied second place after the Crested Auklet. All three species nested at suitable sites on the island. From July 27 through 29, 1928, the number of these birds on Diomede surpassed description. I have given more detailed data under the section pertaining to the Crested Auklet. Jaques was under the impression that these birds were colossal in number and little can be added to this observation. According to K.W. Kenyon (Kenyon and Brooks, 1960), on June 10, 1958, Least Auklets were the most abundant of all the birds on Little Diomede Island.

On June 24, 1909, J.Koren (1910) visited the west coast of Bol'shoi Diomede Island and, in spite of stormy and rainy weather noticed, Least Auklets in large numbers, like midges, on a warm summer day. According to W.S. Brooks, on June 15, 1913, Bol'shoi Diomede Island was literally swarming with them, the air filled, and the rocks overflowing. Judging from their shrieks, each hole and fissure in the rocks hosted one or more birds. A large series of Least Auklets was collected.

Throughout the four days of my stay on Bol'shoi Diomede Island, I noticed Least Auklets flying in a nearly continuous stream. They could not be seen at all in the brightest and warmest period of the day. In the mornings and evenings, they swarmed in such numbers as to indicate one of the largest bird bazaars known. In this respect the Diomede Islands represent one of the remarkable places in the North. Though one cannot deny in the preceding descriptions a touch of hyperbole, especially in the description given by E.W. Nelson, nevertheless auklets did inhabit these islands in large numbers and could be reckoned in tens of thousands. Eskimos caught them in nets like butterflies and I saw dogs loitering around the talus three times catch birds with their teeth emerging from fissures. Such could only be possible with a notable abundance of birds. The swarming of auklets produced a din that it obliterated all other sounds. Conversation under such circumstances was possible only by shouting and listening intently. Their shrieks and noisome activity literally drowned the roar of the sea. In intensity of sound emitted, Least Auklets surpassed our starlings, which also gather in large flocks.

E.W. Nelson expressed a doubt that the Least Auklet could nest anywhere north except perhaps in some sections of the Chukchi coast. On July 19, 1879, the *Vega* expedition, prior to reaching Cape Dezhnev, noticed flocks of rafting birds, tiny and dark, in which Least Auklets presumably were present. Among the sites where this bird was found in large numbers by the expedition of Harvard University in 1913, W.S. Brooks included Cape Dezhnev also. He did not list the specimens caught there, but two bagged on June 7 and 14, 1913, were later sent to the collection of the Institute of Zoology on exchange.

According to F.S. Hersey, there were many auklets there the following year (1914), but none were sighted north of Bering Strait. One night in June, 1922, when the vessel in which A.M. Bailey was traveling moved near Cape Dezhnev, thousands of Least Auklets flew before the bow but disappeared within a short distance. On August 15, 1933, I traveled on Bering Strait a few miles from Cape Dezhnev in somewhat cloudy and still atmospheric conditions. Least Auklets rafted on the slightly undulating surface of the sea in flocks of various sizes, sometimes allowing very close approach of the ship. On September 6 of the same year, P.T. Butenko going round Cape Dezhnev in a whaleboat sighted just one bird of this species but many Crested Auklets. On June 12, 1934, Least Auklets were seen on the coast before Uélen in large numbers but scattered in every direction. They were in somewhat lesser numbers than Crested Auklets and on subsequest days even fewer. On June 20, I traveled by whaleboat from Uélen to Naukan and saw numerous guillemots but far smaller numbers of Least Auklets. They were wandering singly and in pairs on the gentle undulations. On June 26, I returned from the Diomede Islands and along the way came across almost no birds, but on entering Cape Dezhnev various alcids abounded.

The observations cited above do not prove the nesting of Least Auklets on the stretch of rocky coast from Uélen to Dezhnev. Chukchians could not give me reliable information about their nesting and a single journey on the coasts even during the nesting season yielded no worthwhile information since Least Auklets migrate far to feed, and feeding conditions often change depending on ice conditions. I admit the possibility, however, of small nesting colonies around Dezhnev. On June 27, 1957, A.P. Kuzyakin saw a large number of pairs on Cape Dezhnev, but nonetheless concluded that this species did not nest there.

J. Koren (Thayer and Bangs, 1914) came across a lone Least Auklet on September 26, 1912, at Cape Iksurin (Ikechurun) but encountered none more westward on his way to Kolyma and back. E.W. Nelson (1883, p. 116) has written that a small number of Least Auklets was recorded on June 29, 1881 on Cape Serdtse-Kamen'. A lone bird flew onto the ship *Vega* on November 3, 1878, in stormy weather and was shot. On August 14, 1928, F.L. Jaques noticed at sea at 69°40′ N some flocks of all three species of Pacific auklets flying in the same direction, but the exact direction of the flight could not be established because of the great distance. Almost around the same latitude a few single birds were seen on August 23 and 24. No one has reported this bird for Wrangel and Herald Islands.

*Habitat*—In the northwestern part of St. Lawrence Island, as reported by members of the *Vega* expedition, the Least Auklet nested on steep rock piles, preferably close to the coast. In Savoonga village, according to the observations of A.M. Bailey, Least Auklets nested among rocks and around boulders. This was an amazing colony! An endless snow bank along the walls of the coast, inaccessible cliffs, and dark-colored rocks among which green moss and bright-beaked auklets and puffins could be seen, with the clouds illuminated by the sun on the horizon, presented a breath-taking spectacle. According to F.L. Jaques, Little Diomede Island was "littered" with nesting Least Auklets except in steep cliffs and bases of slopes where murrelets and kittiwakes resided. W.S. Brooks states that on Bol'shoi Diomede Island the nesting sites of Least Auklets penetrated farther into the island than Crested and Parakeet auklets, with which I can agree in general based on my own observations. They had to make do with very small rock piles and for this reason searched for higher levels, which brought them closer to the center of the island. Least Auklets in such conditions cannot be considered shore birds, but rather hill birds. Thus, their nesting sites in terms of habitat can be compared with those of Kittlitz's Murrelets, with the difference that the latter species nested at an even higher level, farther away from the sea, and not in colonies.

Like Crested Auklets, Least Auklets while at sea exhibit no affinity for ice and apparently avoid it. In search of large expanses of open water they have been known to fly vast distances at times. All of the specimens caught in the fall along the north coasts of Alaska were flying in an environment of sparse ice.

*Arrival*—On June 3, 1922, on Little Diomede Island, A.M. Bailey observed numerous flocks of Least Auklets. They fed, stayed in pairs, and took to the air with a strange scream and considerable noise. The birds went out to feed and returned to the nesting sites regularly morning and late evening. Solid masses of auklets could be seen floating on the water pools in ice. K.W. Kenyon noticed Least Auklets for the first time in 1958 on Little Diomede Island on May 23 and May 26, a few of which flew around the upper slopes of the island. At 3:00 a.m. on May 27 thousands swarmed over the village and landed on the rocks. Midday on June 10, not one flying bird was seen; at 2:00 p.m. a few fliers were sighted and by evening their number had risen rapidly; flight peaked between 9:00 p.m. and midnight.

According to my diary, around Uélen in the spring of 1934, Least Auklets were first sighted only on June 12. The distance to their nesting colonies was 12 and more kilometers and hence their appearance around Uélen could be considered "arrival". They remained scattered at sea. On June 17 only a lone bird was seen.

*Breeding*—According to the observations of K.W. Kenyon, on Little Diomede Island, Least Auklets had already occupied most of their nesting sites by June 8,

1958. Flocks of 500 to 600 birds, interspersed with a small number of Crested and Parakeet auklets, rested on the snow bank that covered part of the rocks, in anticipation of access to their nesting grounds.

The testes of a male caught by me on June 12, 1934 were smaller (10 mm × 3 mm and 7 mm × 5 mm) than those of most of the birds autopsied later in the mating season. In birds caught on Bol'shoi Diomede Island on June 22, 1934 the testes were quite large (Table 21).

In the ovaries of a fairly obese female caught in Uélen on June 12 the follicles had begun to enlarge, with the largest measuring 5 mm. Yet a female shot on June 17 was emaciated and the ovary with a uniform fine-grained structure. In females from Bol'shoi Diomede Island on June 22, the follicles were 5.0, 4.4, and 3.0 mm, while those caught on June 24 in one case were 8.0 mm, in four 5.0 mm, in eleven 4.0 mm, and in another 3.0 mm. Moreover, in one female in which the largest follicle in the ovary measured 5.0 mm, the oviduct was inflamed and had distended blood vessels, indicating to me that an egg had passed through it. The oviduct of another female contained an egg 42 mm long, obviously ready for laying.

Subcutaneous adipose formations were developed in a female and male caught on June 12 near Uélen. In most of the birds shot on Bol'shoi Diomede Island on June 22 and 24 adipose deposits were in the form of thin films; only a few birds could be labeled obese and these were mostly females. Of some 50 specimens only 3 were actually emaciated.

In spite of a thorough search on June 24, 1909, J. Koren found no eggs of Least Auklets, and according to E.W. Nelson on Bol'shoi Diomede Least Auklets had already laid by mid-July, 1881. During my residence on the island from June 22 through 26, 1934, eskimos told me that Least Auklets had not yet laid and did so in July. This is probably correct in general, but among 25 autopsied females I found two exceptions as mentioned before: one had apparently already laid and the other was close to doing so. In most cases, reaching the nests located under heavy boulders

**Table 21. Size of testes (mm) of Least Auklets on Bol'shoi Diomede Island**

| Date | Left | Right | Date | Left | Right |
|---|---|---|---|---|---|
| June 22, 1934 | 15 × 10 | 12 × 8 | June 24, 1934 | 19 × 11 | 14 × 7 |
| | 14 × 10 | 14 × 7 | | 18 × 9 | 13× 6 |
| | 13 × 9 | 10 × 6 | | 16 × 9 | 12 × 11 |
| | 13 × 8 | 8 × 7 | | 15 × 8 | 13 × 6 |
| | 13 × 8 | 8 × 6 | | 15 × 7 | 10 × 6 |
| | 10 × 7 | 8 × 4 | | 15 × 5 | 10 × 4 |
| | 9 × 6 | 6 × 4 | | 13 × 6 | 12 × 5 |
| | | | | 13 × 6 | 11 × 5 |
| | | | | 12 × 8 | 9 × 6 |
| | | | | 12 × 7 | 8 × 4 |
| | | | | 12 × 5 | 10 × 4 |
| | | | | 11 × 7 | 8 × 6 |
| | | | | 11 × 5 | 8 × 5 |

proved an impossible task for me and in the burrows which I could reach and inspect there were no eggs.

I observed the same periodic swarming, twice a day, among Least Auklets as recorded for Crested Auklets on Bol'shoi Diomede Island (Figs. 10 and 12). The difference was purely quantitative since Least Auklets were fewer and produced their own characteristic notes. At midday, with negligible exceptions, these birds were absent altogether on the talus. Before twilight, indicated more by the cold than by failing light, Least Auklets deserted their ground refuges and crept onto rocks. Having rested for a while, they flew hither and thither, but returned immediately. Activity steadily increased until the air was filled with thousands of flying Least Auklets, which emitted sounds resembling the screams of starlings in flocks, especially of European Bee-eaters. Least Auklets twittered, chirred, and chirped. At times their notes resembled the chirping of innumerable Great Reed-warblers, which I have often heard on ponds in the Ukraine. In good weather swarming over the island continued longer and a larger number of birds participated. At 2:00 a.m, i.e., beginning of June 22, the wind was calm but the weather cold; the sling thermometer registered–0.5° C. The wet grass and meadow surface were somewhat iced. Least Auklets swarmed in abundance. On the evening of June 23, because of inclement weather, Least Auklets arriving from the sea immediately hid under rocks. At the peak of swarming the spectacle on the rocky island defied description. This island is situated in the center of Bering Strait within sight of both the Asian and American continents and at the confluence of the Arctic and Pacific Oceans. In this deserted environment there lived just three Eskimo families. Swarming was so unique and magnificent that the sight is indelibly printed on my mind. The swarming of Crested and Parakeet auklets had already been described (Figure 11).

T.J. Cade saw nestlings of Least Auklets on St. Lawrence Island still occupying their hideouts by mid-August.

On August 27, 1928, on his return to Little Diomede Island, F.L. Jaques found even more Least Auklets, which continued to perform daily flights morning and evening. On September 3 and 4, flying birds were far less numerous, flights were not observed, but hundreds of Least Auklets still were seen on the water. By September 7 their number had greatly diminished.

*Departure*—In 1855, Least Auklets appeared in large numbers in flight in Senyavin Strait where they remained for a brief interval up to September 12.

In the fall of 1934, leaving Providence Bay on September 10, I saw in the sea toward the south, Lone Least Auklets, which were evidently migrating to their wintering sites. In 1912, L.M. Starokadomskii collected specimens in Émma Bay on September 24. On St. Lawrence Island, on September 2, 1833, O.J. Murie collected young birds which were already feathered but still with remnants of down. Late broods were encountered much later. As soon as the *Vega* became icebound in Pitlekai, on November 3, 1878, a lone bird flew aboard in a gusty northeastern blizzard at a temperature of 10 to 12° C. No bird had previously been sighted on open water for three weeks. Evidently, this bird flew in from a site not far away since it was in a state of molt. Dressed in winter plumage, the first flight feather projected out of the covert 3.0 or 4.0 mm, the second and third 17 mm, and the fourth 33 mm; the fifth was the largest of all and the distance from the carpal flexure of the wing to its apex 89 mm.

*Habits*—I have already described the call of this bird. E.M. Kern identified in it short chirping sounds. W.S. Brooks drew attention to a great variety in its notes, the common one being a sound similar to the call of *Agelaius phoeniceus* (L.) of the family Icteridae. It was produced by Least Auklets flying over nesting sites.

In the opinion of various observers, this is a very trusting bird. According to Kern, it could be killed with an oar from a canoe. On the Diomede Islands, I could approach without difficulty to within 5 to 10 paces of Least Auklets sitting in the open on rocks; taking advantage of stones, one could crawl to within 2 or 3 paces of them. Some, however, were extremely timid.

*Cervical sac*—In my *Notes on the Little Auk* (Portenko, 1934b, p. 12) I described the cervical sac of Least Auklets. Compared to the corresponding organ in Crested Auklet, this sac is very narrow and elongated, up to 3.2 cm long. The bottom of the sac has very thick walls since it is supported by musculature, but elsewhere the walls are thin. On the inner surface muscular fibers extend across the sac, while on the outer surface they extend lengthwise. The trachea lies between the sac and cervical muscles. The proventriculus enlarges to a roomy crop as in Crested Auklet and is likewise shifted to the upper right side of the neck. The entrance to the cervical sac is relatively narrow.

In Least Auklets, as in the Crested Auklets, the cervical sac undergoes seasonal variations. In birds caught around Uélen on June 12, 1934 I found no depression under the tongue; it had begun to develop in birds caught on June 22 and 24.

*Food*—I could not study in detail the food of the Least Auklet since the stomachs of over 50 specimens I caught on the Diomede Islands were empty. In two Least Auklets shot in Uélen on June 12, 1934, the stomachs contained amorphous remains of a small number of crustaceans and one had, in addition, small stones. Judging from my observations of Least Auklets rafting near the island upon entering the Diomede islands, they also found food nearby, although they mainly obtained it by flying very long distances. V.P. Shuntov (1965), who observed guillemots in the Bering Sea several times, noticed that Least Auklets, like Crested Auklets, were encountered quite often in the open sea. In the words of E.M. Kern, the Least Auklet constantly dived while gathering food in the sea but remained underwater for a very brief interval; it also gathered food on the water surface.

*Economic importance*—According to E.W. Nelson, on the Diomede Islands, eskimos caught Least Auklets by the thousands. This type of hunt was in vogue until just recently and was a colorful ethnic feature of the island people. The catch was made with a net shaped like a sparse thin sac and was more successful in foggy weather. I saw a young eskimo, walking by the talus slope where Least Auklets nested, ensnare them with his net in the same manner as an entomologist captures a fast-flying insect in summer. Such catches could by no means be dubbed "mass hunting," and in my opinion no administrative control is necessary under the prevailing conditions. My colleagues from Uélen did not bother to bring this wild fowl to Diomede since in Uélen there were many eiders, which are tastier and larger. Dogs on the Diomede Islands hunted for food themselves. On three occasions, I saw a dog stand on its rear legs and skilfully catch a flying auklet, which it later swallowed feathers and all. I could not definitely establish whether the dog tore the bird open first or swallowed it whole after smothering it with its jaws. In the dress of local eskimos I saw neither decorations nor parts made from bird skins.

According to E.M. Kern, in September, 1855, a large number of Least Auklets together with other birds were caught in Senyavin Strait; they provided the expedition a supplement to scanty reserves of fresh provisions.

In 1914, F.S. Hersey examined a large number of Pacific auklets caught by net on St. Lawrence Island. Least Auklets were caught there with a net for table use as well as dressmaking. A.M. Bailey encountered several eskimos in 1921 wearing upper shirts made of bird skins. The articles of H. Friedmann (1932a, p. 6) and O.J. Murie (1936, pp. 362, 372, and 373) include some interesting photographs depicting catching Least Auklets using a hand net.

Murie has also described a method of baiting these birds by suspending live ones on a strap. Flapping their wings, the later attract flocks in flight which land in the vicinity. The strap, made of walrus or seal skin, is stretched between two pyramids formed of stones. To it are tied walrus whiskers with sharp ends which are run through the bird's nostril. Eskimos catch the hopping birds with a hand net tied to a long pole. A newly caught bird was substituted for the tormented bird which had long dangled from the strap.

Thus, the hunting of Least Auklets is a purely local affair of little significance.

*Systematics*—The Least Auklet comprises no subspecies.

Among males and females two types of coloration can be distinguished—dark and light without distinct pattern—but the darker color predominates. All possible gradations exist between these two extremes. It is possible that darkening sets in with age but the two types of coloration were also present among two-year-olds. Among the darkest birds, the back and shoulders are uniformly black with a metallic greenish-blue iridescence; the white patch on the throat is extremely small and the boundary between it and the slateblack breast sharp; the general coloration of the underside is slate with a translucent white field, and even the midportion of the abdomen is not pure white. In light-colored specimens, whitish feathers occur on the underside of the shoulders and form a transverse band of whitish spots across the back. The white color of the throat fuses with the white color of the breast and abdomen, with slate-colored smears and stripes seen only on the breast and sides. These differences between the dark- and light-colored specimens are distinctly seen in populations and flocks resting on rocks and invariably reflect a heterogeneous coloration.

O.W. Geist sighted an albino chick on St. Lawrence Island.

*Specimens*—1) St. Lawrence Island, July 2, 1843, ♀, Voznesenskii; 2 and 3) Lawrence Bay; September 20, 1903, ♂ ♀, Sokol'nikov; 4 to 10) Émma Bay, Sep-

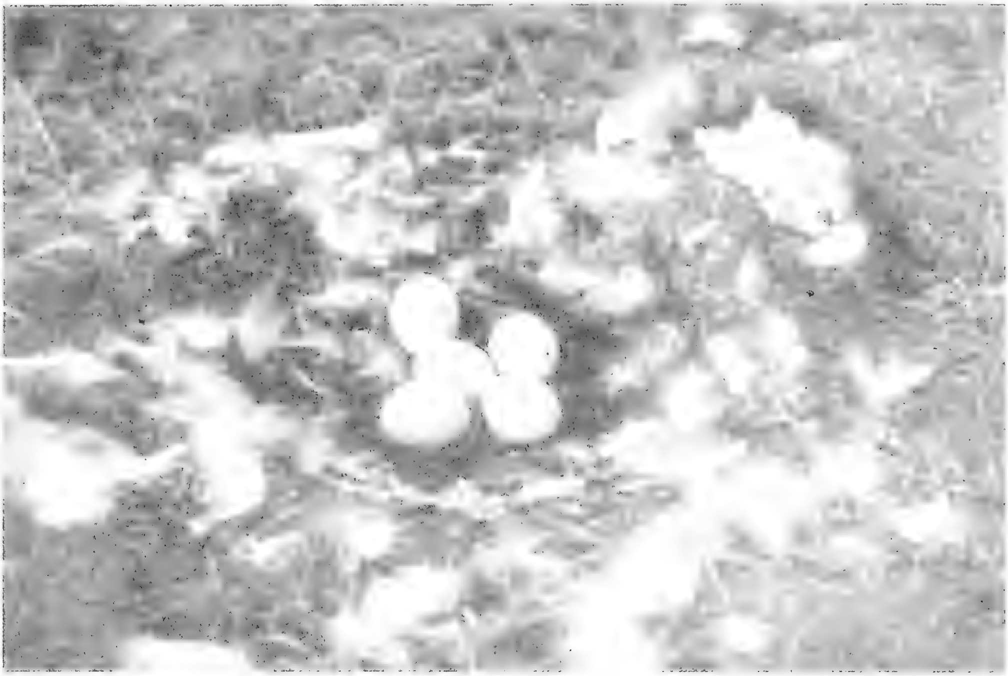


Fig. 15. Nest with a clutch of Snowy Owl *Nyctea scandiaca* (L.). Mamontovaya River. June 9, 1939.

Fig. 16. Nest of the Snowy Owl *Nyctea scandiaca* (L.) with eggs and one chick. Atternon mountain, Wrangel Island. July 6, 1939.

Fig. 17. Incubating Snowy Owl *Nyctea scandiaca* (L.). Wrangel Island. June, 1970. Photo by A.V. Krechmar.

Fig. 18. Nestling of the Snowy Owl *Nyctea scandiaca* (L.). Nutauge lagoon. July 15, 1970. Photo by A.A. Kishchinskii.

tember 24, 1912, ♂♂ ♂♀♀♀ ○, Starokadomskii; 11 and 12) St. Lawrence Island, June 2, 1913, ♂♀, Thayer; 13) Cape Dezhnev, June 7, 1913, ♂, Brooks; 14) same site, June 14, 1913, ♀, Brooks; 15 to 17) Uélen, June 12, 1934, ♂♀ ○, Portenko; 18) same site, June 17, 1934, ♀, Portenko; 19 to 29) Bol'shoi Diomede Island, June 22, 1934, 7 ♂♂ and 4 ♀♀, Portenko; and 30 to 68) same site, June 24, 1934, 14♂♂, 21 ♀♀, and 4 ○ ○, Portenko.

### *Aethia pygmaea* (Gm.)—Whiskered Auklet

It is not found on the Chukchi peninsula; stray birds were caught on St. Lawrence Island.

L. Choris (1822, Isles Aleoutiennes, pl. XII, pp. 17–20, Kamtchatka, p. 5), in a lively description of the travels of O.E. Kotsebue, includes a color sketch of the Whiskered Auklet, and states in the explanatory text that the specimen was obtained from residents of St. Lawrence Island. The expedition received from the islands freshly killed waterfowl on July 28, 1816, and July 10, 1817. Unfortunately, this find cannot be considered reliable since the names "*Alca cristatella* Pall." and "*Mormon cristatellus* Cuv." were used in the description and text. In the text, which was not written by Choris, the disparity from the description given by Pallas is obvious. If one reckons that the Whiskered Auklet may be encountered on St. Lawrence Island only as a very great rarity, there is every justification to regard the find of Choris with skepticism.

Almost a century ago, at least before July 9, 1931, a specimen of Whiskered Auklet was caught in Gambell village according to H. Friedmann (1932b, p. 297). The label on the specimen states that the bird was an uncommon species which, until then, had never been sighted.

### 106. ***Fratercula corniculata*** (Naum.)—Horned Puffin

*Local names*—Chukchian: pannát'yak in Uélen, pannáchek in Lawrence Bay, and pannáek on the south coast. In Eskimo: pagrúgak in Providence Bay and kŭ-prŭ́-wuk on St. Lawrence Island.

*Distribution and status*—It nests on the coasts of Chukchi peninsula west up to Kolyuchi Island; it is common, but is nowhere particularly abundant. It nests in very small numbers on Wrangel Island. Migrates in winter.

In 1849–1850, Captain Moore caught a puffin somewhere in Bering Strait or Providence Bay. The specimen was erroneously identified by J.E. Harting (1871) as "*Mormon glacialis* Leach." This find is of importance as a minor historical reference. W.H. Dall (Dall and Bannister, 1869) noticed this species in 1865 and 1866 in Plover Bay. I found a reference in the manuscript of N.P. Sokol'nikov that very large numbers of puffins inhabited the rocky coasts of the Chukchi peninsula. It is more probable that the information gathered by him pertains to the south coast. E.E. Arngol'd caught a female on August 18, 1911, at sea one mile from Providence Bay (more accurately at 64°22′ N and 173°45′ W), and on August 12, 1914, a male in the bay itself. C. Amory (Riley, 1918) shot a male in Emma Bay on July 28, 1914. According to A.M. Bailey (1925), puffins were quite common along the rocks in Providence Bay in 1921. From August 25 through 28, 1932, I saw puffins in large numbers in nesting colonies located on the rocks along the seacoast from Plover spit to Cape Ivga. Individual pairs sat here and there at a good distance from each other. On Plover Bay and at the entrance to Providence Bay single birds rafted and gathered food. I inspected this section of the coast again in July, 1938, and extended survey eastward up to Sireniki village. I was convinced that puffins nested in comparatively small numbers. Judging from the fact that P.T. Butenko collected some spring and summer specimens on Cape Stoletiya, they were common also to the west of the entrance to Providence Bay. In the bay itself, neither I nor Butenko sighted this bird in the nesting areas.

The Horned Puffin is extremly common on St. Lawrence Island. I.G. Voznesenskii caught a female there on July 4, 1843. L.M. Turner (1886, p. 119) included St. Lawrence Island among the numerous nesting sites of this bird. At the end of June, 1921, A.M. Bailey found puffins to be extremely numerous on the northern side of the island, particularly near Gambell village. H.B. Collins (Friedmann, 1932a) caught six specimens there in August and September, 1930. O.J. Murie obtained a male in Savoonga village in 1934 and puffings were numerous in the bird bazaars. T.J. Cade (Fay and Cade, 1959) found three nests on Cape Chibukak, while F.H. Fay found a nest in Boxer Bay. On Cape Chibukak, puffins were less common than Parakeet Auklets, but far more common than guillemots. In Boxer Bay, all these species nested in equal numbers. The largest collection of birds was seen in 1957 on the western side of Murphy Bay where one or two thousand resided. According to E.G.F. Sauer (Sauer and Urban, 1964), Horned Puffins inhabited the western side of Boxer Bay but were fewer in number than Tufted Puffins; there were ten Tufted Puffins to one Horned Puffin.

Horned Puffins for some unknown reason were poorly represented in the kitchen middens excavated by archaeologists. According to H. Friedmann (1934a), some bones were found in only eight excavations.

In 1911, V.K. Arsen'ev presented to the Zoological Museum a specimen from the Chukchi headland but, unfortunately, without accurate data. A puffin was caught by U.L. Stimpson (Cassin, 1863, p. 324) in August, 1855 in Senyavin Strait. From this very place, I.N. Akif'ev brought (1904) a specimen caught by him on July 23, 1900.

P.V. Ushakov brought a Horned Puffin from Lawrence Bay which he had shot on July 31, 1929. In 1957, A.P. Kuzyakin inspected a large colony on Balk Islet at the western extremity of the bay, where some 200 to 300 pairs nested. He came across individual nesting pairs on Bennet Island, near Yandagai, and noticed Horned Puffins on the shore along the rocky sections of the coast between Akkani and Uélen.

According to V.M. Artobolevskii (1927), the collections of A.A. Savich contained the skin of an adult bird caught in June (old calendar) 1915, as the ship *Kolyma* passed through Bering Strait. A.P. Andriyashev journeyed through the strait on July 31, 1946 and noticed lone puffins. As the ship *Vega* sailed past Cape

Dezhnev (Palmén, 1887) on July 20, 1879, several floating birds resembling puffins were sighted. In the first few days of July, 1881, a small number were seen on this cape by E.W. Nelson (1887). On September, 9, 1912, an adult male was caught by E.E. Arngol'd. Specimens were obtained there by the expedition of Harvard University in 1913 (Brooks, 1915). Late fall of 1914, F.S. Hersey (1916) found young birds on Cape Dezhnev. On September 6, 1933, P.T. Butenko traveled by whaleboat along the entire rocky coast from Dezhnev to Uélen and saw Horned Puffins in large numbers. At the end of summer of the same year I found them common in the nesting sites on the rocks east of Uélen. In 1934, I saw a weak spring flight on the coast before Uélen, and during the journey from Uélen to Naukan on June 20 and return to Cape Dezhnev on June 26, I saw Horned Puffins quite often, but nowhere in large numbers. On July 3, 1957, A.P. Kuzyakin encountered fairly large numbers of Horned Puffins around the rocky coasts of Naukan.

In 1928 F.L. Jaques (1929) found Horned Puffins numerous on Little Diomede Island, in fact more numerous than Tufted Puffins. However, he states that his impression of the number of nesting Horned Puffins could be erroneous since Tufted Puffins flew out farther into the sea and were less noticeable on the rocks. According to K.W. Kenyon and J.W. Brooks (1960), Horned Puffins also predominated over Tufted Puffins to a noticeable degree.

On June 24, 1909, J. Koren (1910) saw Horned Puffins on the west coast of Bol'shoi Diomede Island, while E.E. Arngol'd caught a male and female there on August 17 and 18, 1914. On June 22, 1934, while approaching Bol'shoi Diomede Island, I sighted Horned Puffins on the shore.

V.M. Gudkov (1959), who sailed in the Bering Sea on the ship *Nerpa* in the summer of 1955, came to the conclusion that Horned Puffins have a distinct affinity for coasts; they were dispersed sporadically but nonetheless were more mumerous on the Chukchi peninsula than at any other place.

On July 3, 1934, I traveled beneath the cliffs of Cape Inchoun and saw Horned Puffins nesting there. On July 13, I noticed them on the shore before Mitkulen village. On June 29 and July 2, 1970, V.V. Leonovich counted several dozen pairs in Seishan and found a few pairs on July 9 in a small colony 20 km east of Énurmino. The birds had settled near fissures. On July 19, V.V. Leonovich saw them in a large colony of murres in Énurmino. On July 19, 1879 A. Palander noticed Horned Puffins as soon as the *Vega* (Palmén, 1887) left its winter anchorage at Kolyuchin Bay and sailed in the direction of Cape Dezhnev. On June 29, 1881, this species was seen in small numbers by E.W. Nelson on Cape Serdtse-Kamen'. At the wintering site of the *Vega* Horned Puffins were not sighted at all. J. Koren (Thayer and Bangs, 1914) found a large nesting colony on Kolyuchi Island in 1909 and on September 22, 1912, reportedly saw them there in large numbers. In winter, when I sailed past this island on May 15, 1934, I learned from local residents that "panas'yak" (local name for Horned Puffins) nested there. In July, 1938, I thoroughly scrutinized the coast of the island by going around it on a motorboat. Not more than 100 to 150 Horned Puffins inhabited Kolyuchi in my reckoning. Most nested in the northeastern section of the coast.

Farther west, during a journey to the Kolyma River and back, J. Koren saw no Horned Puffins. I did not see them on Cape Schmidt and E.W. Schmidt reported to me that they were absent on Cape Shelagskii.

In 1881, E.W. Nelson saw a lone Horned Puffin on Herald Island. In 1928, on August 4, F.L. Jaques saw several specimens there and concluded that a sizeable colony probably inhabited the island. I find no basis for his conclusion.

G.A. Ushakov (Bannikov, 1941) failed to find Horned Puffins on Wrangel Island in the nesting areas, and his statement that they were encountered in small numbers there is based on no factual data. A.I. Mineev was given to understand that this bird was sighted at sea on Wrangel Island but could not obtain more reliable information. In 1938, I lucked upon Horned Puffins nesting on Cape Uéring. On August 13, I saw a few lone birds in the northern part of the bazaars. Evidently they nested there in extremely small numbers. On August 21, 1939 a pair of Horned Puffins was caught on Cape Pillar.

*Habitat*—I came across no independent colonies of Horned Puffins. Their colonies, consisting of several or just one pair, were interspersed in large mixed colonies of cormorants, murrelets, guillemots, and Tufted Puffins. Horned Puffins invariably nested on cliffs in the rocky sections of the seacoast. Between Providence Bay and Sireniki village, according to my observations, they did not descend below 20 m above sea level and only exceptionally to 15 m; they were generally encountered in the uppermost sections of the rocks. The same could be said of their find on Kolyuchi Island and Cape Uéring. According to E.G.F. Sauer, in Boxer Bay they occupied ledges and fissures closer to the top of the cliffs.

Horned Puffins build nests in the clefts of exposed cliffs, but probably even prefer to nest on cliffs farther away from the coastline. East of Uélen, I found their nests on the side walls of deep ravines and often reached them from above, i.e., from the side of the source of erosion gulleys. On the precipitous cliffs on Kolyuchi Island, Horned Puffins nested in small but deep niches. Under those conditions of rocky soil, they cannot dig holes for themselves and select already formed crevices. This would evidently explain the scattered nests of individual pairs and eliminate the possibility of the colony being dense. E.W. Nelson (1883, p. 115) wrote that almost every rocky cape in the Bering Sea was abundantly inhabited by this bird, while F.L. Jaques noticed that the puffin in its habit of nesting deep in the bays is similar only to guillemots among all the Alcidae found in the northern part of Bering Strait. According to F.H. Fay and T.J. Cade, the Horned Puffin is similar to Parakeet Auklet in selection of nesting sites on St. Lawrence Island: where one species is present, the other is invariably found.

A.P. Kuzyakin surveyed Balk Islet. No more than 200 to 300 m across, it is a low, single-peaked, stone-covered cone. Mounds and stone masses cover much of its surface from the peak to the coastal cliffs. On July 7, a thick snow front still lay on the north side of the islet. Between the mounds were scattered small meadows with holes dug by squirrels. Horned Puffins did not occupy these holes, but nested in the rock piles.

Since they nest in clefts and not in the open, Horned Puffins, for understandable reasons, are not always seen on rocks like murrelets, but nevertheless quite often sit on ledges, especially in good weather or before sunset. They are often seen flying along cliffs and more often from a cliff to the sea and back; even among an abundance of frightened murrelets, puffins can be spotted at once by their sparkling red claws and yellowish-orange beak. Horned Puffins often gather food in the most proximate sections of the shore, but invariably singly and not in flocks. In the spring of 1934, they were noticed in flight in small numbers on the shore before Uélen. E.W. Nelson (1887, p. 39) states that Horned Puffins were as numerous on the shallow waters of the Alaskan coast as on the deep cold waters of the Siberian coast.

*Arrival*—In 1938 P.T. Butenko caught the first arriving pair on Cape Stoletiya in Providence Bay on May 30.

Near Gambell, on St. Lawrence Island, according to F.H. Fay and T.J. Cade, the first Horned Puffins were seen between May 15 and 20, mostly together with Parakeet Auklets.

On Little Diomede Island, according to an eyewitness account by K.W. Kenyon, Horned Puffins arrived late. In 1953, the first birds arrived only on June 2, and in 1958 a puffin flying over the sea was likewise sighted on June 2. Two birds sat on the rocks on the south end of the island on June 3 and two others flew along them. A few pairs were also seen on June 6 and by June 10 rock cornices were already occupied by several hundred.

In the spring of 1934 in Uélen, P.T. Butenko saw three Horned Puffins on April 30 on water pools opening up in the ice. They were evidently stray visitors arriving because of favorable ice conditions in Bering Strait, since spring movements of small groups of three or four birds were observed one month later, on June 3. They were seen in small numbers on the sea before Uélen on June 12. Possibly this was the flight of puffins nesting more westward. On June 17, I established quite positively that horned puffins had not yet occupied the nesting sites on the rocks east of Uélen.

*Breeding*—The gonads in recently arrived birds exhibited no changes. Outside the period of breeding testes varied in size rather notably (Table 22).

**Table 22. Size of testes (mm) among Horned Puffins**

| Date | Left | Right | Locality |
|---|---|---|---|
| May 30, 1938 | 13 × 6 | 11 × 5 | Cape Stoletiya |
| July 6, 1938 | 13 × 5 | 11 × 4 | Providence Bay |
| July 6, 1938 | 12 × 5 | 10 × 4 | –do– |
| July 6, 1938 | 9 × 4 | 8 × 3 | –do– |
| August 1, 1932 | 13 × 7 | 10 × 6 | Alyumka Island |
| August 5, 1938 | 6 × 3 | 5 × 3 | Cape Stoletiya |
| August 21, 1939 | 13 × 10 | 9 × 8 | Wrangel Island |
| August 26, 1932 | 10 × 6 | 8 × 4 | Providence Bay |
| August 27, 1932 | 7 × 4 | 5 × 3 | –do– |
| September 11, 1933 | 7 × 3 | 6 × 3 | Cape Dezhnev |
| September 14, 1933 | 12 × 6 | 10 × 4 | –do– |
| September 14, 1933 | 10 × 5 | 9 × 5 | –do– |
| September 14, 1933 | 10 × 5 | 8 × 5 | –do– |
| September 14, 1933 | 7 × 4 | 6 × 3 | –do– |

**Table 23. Structure of ovary and size of largest follicles in Horned Puffins**

| Date | Ovary length, mm | Structure | Largest follicle, mm | Locality |
|---|---|---|---|---|
| May 30, 1938 | — | Fine-grained | — | Cape Stoletiya |
| June 30, 1938 | — | — | Egg ready in oviduct | Providence Bay |
| July 6, 1938 | 15 | Fine-grained | — | -do- |
| July 6, 1938 | 14 | Coarse-grained | — | -do- |
| July 13, 1938 | 20 | — | 4 | -do- |
| July 26, 1938 | — | Racemose | 3, 2, . . . | Kolyuchi Island |
| August 1, 1932 | — | — | 3 | Anadyr estuary, Alyumka Island |
| August 1, 1932 | — | Fine-grained | — | - do - |
| August 1, 1932 | — | -do- | — | -do- |
| August 5, 1938 | 10 | -do- | — | Cape Stoletiya |
| August 8, 1938 | 12 | -do- | 6 | -do- |
| August 21, 1939 | 22 | — | 6 | Wrangel Island |
| September 11, 1933 | — | Relief-granular | — | Cape Dezhnev |
| September 14, 1933 | — | — | 7 | -do- |
| September 14, 1933 | — | — | 5 | -do- |

Autopsies of females caught by P.T. Butenko in Providence Bay revealed that soon after arrival the ovaries still were fine-grained in structure (for example, among females of May 30). On June 30 an egg was found in the oviduct. In July the glands had reverted to different degrees of quiescence. There is reason to assume that the mating season does not commence simultaneously among all pairs. Notes on the length of the ovary, nature of its surface structure, and size of the largest follicle preserved in the gland reveal a high degree of variability (Table 23).

High varibility was also recorded in the size of testes. Males and females caught on Wrangel island on August 21, 1939 had such well-developed glands that one got the impression that sexual activity had commenced very recently among them, say in July. A female caught near Cape Dezhnev on September 14 was also remarkable; some follicles in her ovary measured 7 and 5 mm. In a young female shot near Cape Stoletiya on August 5, 1938 the ovary was 8 mm long and without a distinct structure.

Subcutaneous adipose layers evidently are not subject to seasonal variation. The male of a pair caught on May 30, 1938, at Cape Stoletiya was obese, while the female was emaciated. Of the 30 birds in which adipose deposits were studied, seven were emaciated, four had fat in a uniform layer throughout the body, and the rest had fat in the form of separate thin layers. Even the young bird caught on August 9 was obese.

In 1909, on Kolyuchi Island, J. Koren found the first eggs of Horned Puffins on July 14. At that time he had to fly over an extensive zone of broken ice to reach exposed water at a distance of nine miles from the island. T.J. Cade discovered three clutches with two eggs each on Cape Chibukak on St. Lawrence Island between June 23 and July 7, 1950. A nest with a single egg was found in Boxer Bay on July 13,

1952. All these nests were found in crevices near the top of the cliffs.

Nests surveyed by A.P. Kuzyakin on Balk Islet were situated 2 or 3 m apart. They were placed between as well as beneath rocks and the entrances to the crevices varied in width and shape. Some nests were half open or even fully open on top, while others were located deeper in passages resembling burrows, with an enlarged section at the end 30 to 70 cm from the entrance. Kuzyakin's hand could just reach the eggs in some, while in others the eggs could only be removed using the barrel of his gun. In one case, the passage between the stones led initially downward and later up above the rocks. Part of the nest was disposed quite close to the snow front. Nine of the nests investigated had a bedding of large feathers from gulls, cormorants, and Horned Puffins. In some there were only a few feathers, while in others several dozen. In addition, short twigs, tiny sticks, and clumps of grass were seen, but in one nest only dry grass. The base of the nest consisted of soil piled under a stone pebbles, and moss.

On July 3, 1957, this colony suffered damage from residents of Lavrentia village who gathered about 40 eggs. On July 7, Kuzyakin's colleagues discovered 50 more nests containing only one egg each. Most of the Horned Puffins were frightened off by people, but some lone birds remained and sat in the nests very faithfully. Three were caught by hand and bit the fingers and tore the clothes of the catcher. The eggs collected were unincubated. The size of nine were as follows: 64.0 to 68.6 mm × 41.8 to 47.4 mm (average 67.0 × 45.1) and weight 62.0 to 81.7 (74) g. They were milk-white with spots except for one, which was almost devoid of spots. In some the spots were few, barely perceptible, and dull lead-gray in color; in others the spots almost covered the entire surface of the egg and had distinct outlines; and finally some had a few brownish spots and tiny markings.

The periodic phenomena in the life of Horned Puffins are extremely variable. I have described the characteristics of late sexual activity among Wrangel birds. F.S. Hersey found young ones in nests in a colony on Cape Dezhnev (East Cape) even on August 29, 1914. On Little Diomede Island on September 4, 1928, F.L. Jaques saw numerous adult birds but not a single young one as they had evidently not yet left the nests. In Providence Bay, P.V. Ushakov caught a fully-feathered young bird on September 19, 1929, with only half-grown flight feathers. P.T. Butenko shot a full-grown specimen there on August 5, 1938, with a wingspan of 17.8 cm.

Departure occurs in the latter half of September. On September 22, 1912, J. Koren noticed Horned Puffins still in their nesting sites on Kolyuchi Island. E.E. Arngol'd caught a male on Cape Dezhnev also on September 22, 1912. According to my observations, in the fall of 1933, on the rocky banks east of Uélen, even on September 14 Horned Puffins arrived in groups on cliffs and flew along them; they were sighted for the last time on September 16.

*Habits*—W. Stimpson mentions that several other Horned Puffins flew over to one which had fallen in the water. They pecked it with such vigor that even shots fired at a distance of three paces did not frighten them off.

*Food*—The stomachs of three Horned Puffins caught in Providence Bay on August 26 and 27, 1932, showed the remains of tiny crustaceans varying from a few individuals to several dozens and even up to a hundred. The stomach of a specimen caught on July 13, 1938 contained 10 *Astarte* sp. (Amphipoda).

*Weight*—Horned Puffins caught on Wrangel Island weighed 550 g (male) and 520 g (female); those caught on Cape Stoletiya on May 30, 1938—655 g (male) and 505 g (female). A female with an egg in the oviduct was shot on Providence Bay on June 30, 1938 weighed 605 g.

*Economic importance*—Horned Puffins are not usually hunted, but eggs are collected in some places, for example, on Balk Islet. Arriving hunters were invariably fascinated by the characteristic appearance of the puffin. Some asked P.T. Butenko to make stuffed birds for them.

*Systematics*—Having studied collections of Horned Puffins from the Okhotsk coast, Kamchatka, Kuril'skiye Islands, Komandor and Pribylov Islands, Anadyr estuary on Alyumka Island, Chukchi coast, Kolyuchi and Wrangel Islands, and finally Alaska, I am convinced that this species cannot be classified into geographic races.

*Specimens*—1) St. Lawrence Island, July 4, 1843, ♀, Voznesenskii; 2) Senyavin Strait, July 23, 1900, ○, Akif'ev; 3) Bering Sea, mile away from Providence Bay, August 18, 1911, ○, Arngol'd; 4) Cape Dezhnev, September 22, 1912, ♂, Arngol'd; 5) Providence Bay, August 12, 1914, ♂, Arngol'd; 6) Bol'shoi Diomede Island, August 17, 1914, ♀, Arngol'd; 7) same site, August 18, 1914, ♂, Arngol'd; 8 and 9) Chukchi headland, without date, ○ ○, Arsen'ev; 10) Lawrence Bay, July 31, 1929, ○ P.V. Ushakov; 11) Providence Bay, September 19, 1929, ○ 1° anno, Ushakov; 12 to 14) same site, August 26, 1932, ♂♂○, Portenko; 15) same site, August 27, 1932, ♂, Portenko; 16 and 17) Cape Dezhnev, September 11, 1933, ♂♀, Portenko; 18) same site, September 12, 1933, ○, Portenko; 19 to 24) same site, September 14, 1933, 4 ♂♂ and ♀♀, Portenko; 25 and 26) Cape Stoletiya, May 30, 1938, ♂♀, Butenko; 27) Providence Bay, June 30, 1938, ♀, Butenko; 28 to 32) same site, July 6, 1938, ♂♂♂♀♀, Butenko; 33) same site, July 13, 1938, ♀, Portenko; 34 and 35) same site, July 21, 1938, ○○, Butenko; 36) Kolyuchi Island, July 26, 1938, ♀, Portenko; 37 to 39) Cape Stoletiya, August 5, 1938, ♂♀ and ♀ 1° anno, Butenko; and 40 and 41) Wrangel Island, Cape Pillar, August 21, 1939, ♂♀, Portenko.

## 107. *Lunda cirrhata* (Pall.)—Tufted Puffin

*Local names*—Chukchian: pannát'yak in Uélen; pannáchek in Lawrence Bay; pannáek on the south coast of the Chukchi peninsula (Chukchians do not have different names for Horned and Tufted puffins). In Eskimo: koprókhak in Providence Bay; p̆ŭ-ghă-rū′-wuk on St. Lawrence Island.

*Distribution and status*—Nests on south and east coasts of the Chukchi peninsula, reaching up to Énurmino and Kolyuchi Island in the north. In the Chukchi Sea, it is encountered on Cape Serdtse-Kamen' and up to 70° N, to north of Bering Strait. Common, but not numerous; almost everywhere it is rarer than the Horned Puffin. Not found on Wrangel Island. Migrates in winter.

According to L.O. Belopol'skii (1933), Tufted Puffins were noticed by him in small numbers throughout the coast of Anadyr Bay. In the manuscript of N.P. Sokol'nikov, there is a mention that Tufted and Horned puffins were very numerous on the rocky coasts of the Chukchi peninsula. This extremely vague reference unfortunately pertains mostly to the south coast. On August 10, 1932, when I sailed past Cape Bering, Tufted Puffins were encountered occasionally and on August 21, again in a similar environment, in Preobrazheniya Bay. On July 30, 1914, two males were caught by E.E. Arngol'd in Providence Bay. In the fall of 1931 and the summer of 1932, I.O. Olenev also sighted Tufted Puffins there. From August 25 through 28, 1932, I found nesting sites on the seacoast between Plover spit and Cape Ivga and sometimes saw them in pairs sitting not far from Horned Puffins which were quite numerous. I visited these same sites in July, 1938, but it seemed to me this time that Tufted Puffins were slightly more common than horned. In the summer of 1938, P.T. Butenko collected ten specimens in Providence Bay. A specimen with an extremely vague notation, "on Chukchi headland," was received in 1911 from V.K. Arsen'ev and added to the collection of the Zoological Museum of the Academy of Sciences.

According to L.M. Turner (1886, p. 117), Tufted Puffins inhabited St. Lawrence Island in significant numbers. A.M. Bailey (1925) found them quite common in 1921, although fewer compared with Horned Puffins. H.B. Collins (Friedmann, 1932a) collected four adult specimens in Gambell village at the end of June and in August, 1930. O.J. Murie (1936) collected nine adult specimens and two chicks in down in 1934. Two specimens were obtained from Savoonga village and others from Punuk Islets. F.H. Fay and T.J. Cade (1959) referred to some colonies on the north coast, in particular east of Savunga. Around Cape Singikpo at the end of June, 1952, F.H. Fay noticed hundreds of Tufted Puffins. On the south coast they were common at places from Cape Tatik to Povuiliyak. I was given to understand that a large colony inhabited the central islet of Punuk Islets. According to E.G.F. Sauer (Sauer and Urban, 1964), Tufted Puffins in Boxer Bay occupied the very same cliffs as Horned Puffins. According to H. Friedmann (1934a), bones of Tufted Puffins were found in larger numbers than Horned Puffins in all the excavations, ranging from the oldest to the most recent horizons in kitchen middens discovered by archaeologists.

In the collection of the Institute of Zoology, Academy of Sciences of the USSR, is preserved a young specimen collected by I.G. Voznesenskii on September 8, 1843, in the Bering Sea, evidently on his return journey from the Chukchi peninsula to Alaska. In 1849 or 1850, two specimens were caught by Captain Moore (Harting, 1871) somewhere in Bering Strait, probably also on our coast. On July 31, 1946, A.P. Andriyashev saw a few lone Tufted Puffins while passing through the strait.

According to F.L. Jaques (1929), in the summer of 1928, many Tufted Puffins nested on Little Diomede Island, but they were somewhat fewer than Horned Puffins. K.W. Kenyon (Kenyon and Brooks, 1960) saw only scattered pairs on rock ledges in June, 1958.

On June 24, 1909, J. Koren (1910) encountered "puffins" on the west coast of Bol'shoi Diomede Island, but could not ascertain their exact species. On August 18, 1914, E.E. Arngol'd caught a male there. In 1922, A.M. Bailey found this species nesting abundantly on the Diomede Islands and Farway cliff. On June 22, 1934, while approaching Bol'shoi Diomede Island, I saw Tufted Puffins but could not accurately determine the number of birds nesting on the island.

V.M. Gudkov (1959), while sailing in the Bering Sea in the summer of 1955, termed the Tufted Puffin a "background species" (highly abundant) in the summer marine avifauna along with murrelets and Least Auklets, but encountered them only singly on the Chukchi coast.

In the first few days of July, 1881, E.W. Nelson (1883, p. 115) noticed Tufted Puffins on Cape Dezhnev. In 1913 W.S. Brooks (1915) caught specimens there and F.S. Hersey (1916) observed this species in limited numbers in 1914. On August 13, 1932, I came across Tufted Puffins in Dezhnev village. On September 6, 1933, P.T. Butenko went by whaleboat around all the capes from Dezhnev village to Uélen, and saw Tufted Puffins only in small numbers. In that same fall, I found stray nesting pairs on the rocks east of Uélen. Only stray birds in spring flight were sighted near Uélen in my 1934 visit. On June 20, traveling from Uélen to Naukan, I also saw Tufted Puffins but in small numbers, and later encountered them on June 26 while returning from Bol'shoi Diomede Island and approaching Cape Dezhnev. V.N. Lyubin collected a specimen near Uélen on August 10, 1948.

On July 3, 1934, I boated beneath the cliffs of Cape Inchoun and examined the nesting sites of seabirds. Among them were Tufted Puffins, but in small numbers. On July 13, I saw them on the shore opposite Mitkulen village.

At the end of June, 1881, E.W. Nelson noticed Tufted Puffins at sea on Cape Serdtse-Kamen'. In 1970, V.V. Leonovich observed pairs flying on June 29 and July 2 in Seishan. He saw a few pairs 20 km east of Énurmino in a small colony with gulls. The birds sat beside crevices and evidently were not incubating. The *Vega* expedition (Palmén, 1887), almost a century earlier, had no glimpse of this species in the region of Kolyuchin Bay. According to J. Koren, however, Tufted Puffins were fairly common in 1909 on Kolyuchi Island. More accurate information (Thayer and Bangs, 1914) indicates that Koren found only a few pairs in the nesting area in 1911 and 1912 and encountered none more to the west. I thoroughly inspected the coast of this island in the second half of July, 1938. Far fewer Tufted Puffins were present than Horned Puffins, definitely not more than 10 to 20 birds. The two species were grouped mostly on the northeastern section of the coast.

F.L. Jaques sighted a solitary Tufted Puffin in the Chukchi Sea north of Bering Strait (around 70° N), but this bird has not been reported to date on Wrangel Island.

*Habitat*—According to my observations, in Providence Bay, near Uélen and on Kolyuchi Island, Tufted Puffins nested on the same cliffs as Horned Puffins. In the section of the seacoast from Plover spit to Cape Ivga, they lived high in the cliffs, not descending below 20 m above sea level, and were scattered in isolated pairs. Every nearby rock was inhabited either by cormorants, guillemots, or other sea birds. I also saw isolated pairs interspersed in the colonies of cormorants and other birds on the rocks east of Uélen. According to F.L. Jaques, Tufted Puffins also nested high on the rocks on the Diomede Islands.

In the feeding grounds, I came across Tufted Puffins close to the coast and at the same time sighted some, although only a few, far away from the coastline. Near Dezhnev and Mitkulen villages I saw them on the ice but they showed no sign of affinity for it. In this respect Tufted Puffins differ from guillemots, which are basically birds of the North, i.e., prefer the icy environment and are drawn toward it.

Passing along the east coast of Kamchatka in early summer (undoubtedly the nesting season), I sighted Tufted Puffins a few times when the ship lay on course toward Komandor Islands. In other words, these birds did not deviate from their course of feeding more than a few tens of kilometers from the coast.

Flocks of Tufted Puffins were not seen by me either on the rocks or at sea.

*Arrival*—In the spring of 1934 in Uélen I saw Tufted Puffins for the first time on June 3. Lone birds flew over the sea. Birds were seen in small numbers and some caught in the first ten days of the month. On June 17, I saw a lone bird flying in front of the rocks east of Uélen. It did not land and I was a bit surprised to realize that neither Tufted nor Horned Puffins had yet occupied their nesting sites.

According to F.H. Fay and T.J. Cade, Tufted Puffins arrive on St. Lawrence Island three to four weeks later than their horned cousins.

*Breeding*—The testes of a male caught in Uélen on June 6, 1934 were not particularly enlarged and measured 10 mm × 8 mm and 9 mm × 7 mm. On Alyumka Island in Anadyr estuary I still found eggs in the nests of these puffins on August 1, 1932. In three males shot there the testes were 14 mm × 8 mm and 9 mm × 5 mm, 12 mm × 6 mm and 10 mm × 5 mm, and 5 mm × 3 mm and 4 mm × 3 mm. In 1933, three females were caught in Providence Bay on June 30, July 13, and August 8. In the first the ovary was 21 mm long and had a coarse-grained structure; in the second the ovary exhibited traces of activity as the largest follicle was 6 mm; while the ovary of the third was only 10 mm long with a coarse-grained structure. The females were emaciated, while the males had adipose deposits.

According to F.H. Fay and T.J. Cade, on St. Lawrence Island Tufted Puffins usually nested in burrows dug in turf, more rarely under rocks or in crevices. Chicks in down were noticed on Punuk Islets at the end of August, 1953.

*Departure*—According to my observations, in the fall of 1933, in Uélen Tufted Puffins were quite common on the cliffs even in the first half of September. On the 25th I met several there, but on September 27 and October 3 spotted only a single bird, probably the same one held up by a delayed brood of chicks. On Little Diomede Island, on September 4, 1928, F.L. Jaques found Tufted Puffins still sitting on the rocks. According to I.O. Olnev, in Providence Bay in the fall of 1931, Tufted Puffins flew away late and remained until the freezing of the bay. On September 10, 1934, while leaving Providence Bay, from the ship I noticed a solitary Tufted Puffin rafting on shore. The time was still early for departure. In 1937, P.T. Butenko arrived in Providence Bay on October 29 but sighted no Tufted Puffins. On the way he saw them in large numbers on October 11 and 12 on the coasts of Cape Novarin.

*Habits*—Tufted Puffins avidly stay in the company of their horned cousins, as is the case with Crested and Parakeet auklets, which are also frequently encountered together.

*Food*—The stomach of a female caught in Providence Bay on August 28, 1932, revealed a large saber-shaped maxilla of a marine invertebrate, while the stomach of a male caught in Uélen on June 6, 1934 contained highly digested remains of some ten crustaceans.

*Weight*—A female shot by P.T. Butenko on June 30, 1938 in Providence Bay weighed 655 g.

*Economic importance*—What has been said above for Horned Puffins applies to the Tufted Puffin as well, but its eggs are reportedly not gathered.

*Systematics*—I compared the specimens caught by me with skins from Alaska and the Okhotsk coast and could establish no differences whatsoever.

*Specimens*—1) Bering Sea, September 8, 1843, ♂ 1° anno, Voznesenskii; 2) Chukchi headland, undated, Arsen'ev; 3 and 4) Providence Bay, July 30, 1914, ♂♂, Arngol'd; 5) Bol'shoi Diomede Island, August 18, 1914, ♂, Arngol'd; 6) Providence Bay, August 26, 1932, ♀, Portenko; 7) Uélen, June 6, 1934, ♂, Portenko; 8) same site, June 12, 1934, ♂, Portenko; 9) Providence Bay, June 30, 1938, ♂, Butenko; 10) same site, July 13, 1938, ♀, Portenko; 11 and 12) same site, Cape Stoletiya, July 21, 1938, ○ ○, Butenko; 13 to 15) same site, August 5, 1938, ♂♀♀, Butenko; 16 and 17) same site, August 8, 1938, ♀♀, Butenko; and 18) same site, August 9, 1938, ♀, Butenko.

## Order CUCULIFORMES—CUCKOOS

### *Cuculus saturatus horsfieldi* Moore—Himalayan or Oriental Cuckoo

This species is not found on the Chukchi peninsula though its accidental sighting is quite likely. Two finds are known for St. Lawrence Island.

According to H. Friedmann (Friedmann and Riley, 1931, and Friedmann, 1932a), an adult female was collected by H.B. Collins on July 1, 1930 near Gambell village, and according to an eyewitness account by O.J. Murie (1936 and 1952), another adult specimen shot there on July 14 or 15, 1935.

In both cases the cuckoos were initially identified as *Cuculus canorus bakeri* Hart, and the error later rectified by H.G. Deignan (1951).

## Order IX. STRIGIFORMES—OWLS

### 108. *Nyctea scandiaca* (L.)—Snowy Owl

*Local names*—Chukchian: teekatl'; takkadlj in the records of the *Vega* expedition. In Eskimo: anípa in Providence Bay and ā-nē -pŭh on St. Lawrence Island.

*Distribution and status*—This species nests for certain in small numbers on the Chukchi peninsula only in the northern part but, not every year. Nonnesting birds and pairs are not particularly rare in the summer throughout the peninsula except for the hilly and rocky sections of the south coast. They are encountered in flight nearly everywhere, but not in the same numbers. They are often sighted in winter. On Wrangel Island it is very common and nests regularly except during particularly unfavorable years. Some individuals overwinter from time to time.

*Distribution in nesting sites*—In 1884, E.W. Nelson (1887) and I.C. Rosse (1883) encountered the Snowy Owl on Wrangel Island. According to G.A. Ushakov (Bannikov, 1941), it is common there in the nesting area. A.I. Mineev (1936) noticed several owls on Wrangel Island and reported that pairs nested at a distance of 2 or 3 km from each other. However, in the inclement spring of 1931 these owls (like Snow Geese) almost did not breed.

According to my observations, the Snowy Owl inhabits Wrangel Island in far larger numbers than on the Chukchi peninsula and its distribution there exhibits certain characteristic features. In Tundra Akademii I did not see a single bird during the middle and end of August, 1938, while in the southern half of the island Snowy Owls were very common. I found their nests in the Nasha River valley, around Atternon mountain, and in the Mamontovaya River valley. Along Nasha River, I found nests at a distance of 8 to 10 km from each other. With the hatching of young, the number of Snowy Owls on Wrangel Island became so numerous that I sighted an owl on almost every knoll around Rodgers Bay at the end of summer in 1938 and 1939.

According to S.M. Uspenskii (1963) and his colleagues, Snowy Owls nested on Wrangel Island in 1959 in large numbers but did not breed at all in 1960. On July 18 and 19, 1960, in the central part of the island, 8 to 10 owls were encountered over a stretch of 60 to 70 km; lemmings were quite scarce that year. Nevertheless, A.G. Velizhanin counted 38 owls on Cape Blossom on September 27.

If the data for 1960 is compared with my data for 1938 and 1939, it becomes obvious that while Snowy Owls did not nest in the northern half of the island, they were not rare after chicks had hatched on the south coast. Thus, there is no categorical basis for supporting the total cessation of breeding among owls in 1960.

The boundary of the nesting range on the Chukchi peninsula cannot be delineated precisely because of the biological characteristics of the Snowy Owl (which does not nest every year at the same place) and because of inadequate observations of nests with eggs or nestlings. A.I. Argentov (1857a, p. 85) reported "harriers" (the name of Snowy Owl widely prevalent in the North) among birds of Chaun parish, i.e., in the vicinity of Chaun Bay south up to Anyuev. He even mentions the period of commencement of laying and later lists it among the regular inhabitants of Aiok Island (Argentov, 1857b, p. 39).

In the summer of 1970, A.A. Kishchinskii and his assistants found only three owl nests in the tundra from Cape Schmidt to Vankarém over an area of about 100 km$^2$ even though many nonnesting birds were sighted.

The *Vega* expedition (Palmén, 1887) collected nesting specimens in Pitlekai. On

June 1, 1879[5], Chukchians brought in a female with an egg in its body cavity, and on July 3, a second specimen. On July 8, two nests with clutches were found. Thus the Snowy Owl is not a rarity in the nesting sections there.

On July 7, 1879, a tiny pure white owl was seen between Dzhénrétlen and Pitlekai on top of a snow block; later two similar ones were sighted down the slope. There is some misunderstanding with regard to this reference.

As recorded by G. Maydell (1893, p. 256), a nesting Snowy Owl was encountered along the course of his travels on the southern slopes of Anadyr range. W. Taczanowskii (1882, p. 118) referred to an egg of a Snowy Owl, brought undoubtedly by Maydell, as originating from "Cape Chukchi" ("z Czukotskiego przylądku na pólnoci Kamczatki"). This find in no way pertains to the Chukchi peninsula within the boundaries under consideration.

There are no reliable references to the find of eggs or chicks of the Snowy Owl for the Diomede Islands, but nidification has been positively established for St. Lawrence Island. According to a report of F.H. Fay and T.J. Cade (1959), four nests with clutches and one with nestlings were found in 1954. Two under-one-year-olds were seen with an adult bird on the Kuzata River in the central part of the island in 1956 and two adult birds with under-one-year-olds were daily sighted near Kavuk in 1957 from August 25 through 30. E.G.F. Sauer (Sauer and Urban, 1964) reported sighting a pair of Snowy Owls with four under-one-year-olds on August 19, 1960, 15 miles north of Boxer Bay.

*Distribution of nonnesting birds in summer*—J. Koren (Thayer and Bangs, 1914) encountered the Snowy Owl in the summer of 1911 and 1912 on the north coast of the Chukchi peninsula. In 1958 V.D. Lebedev and V.R. Filin (1959) sighted Snowy Owls on June 17 and 29 and also on July 29 on the south coast of Aiok Island and on July 17 and 29 on the west coast of Chaun Bay; that year was characterized by a near total absence of rodents. A.A. Savich (Artobolevskii, 1927) termed this owl "a rather frequently settled bird" around Cape Schmidt, but "settled" did not mean then what it signifies today. On June 9, 1915, he collected a specimen near the tundra. V.Ya. Isaev found this species in the summer of 1934 on Cape Schmidt up to the nearest hills but sighted it only twice in the hills. In the first half of June, 1970, A.A. Kishchinskii met with Snowy Owls in large numbers on the coastal zone of the tundra from Cape Schmidt to Vankarém. From June 6 through 12 an area of some 35 km$^2$ contained 20 to 30 owls. Such a large number was explained by the abundance of lemmings. In this same area from June 17 through 20 and until mid-July there were only 10 to 12 owls since wandering lemmings had diminished. A roughly similar density of owl population was recorded in the lower reaches of the Amguéma and around Nutauge lagoon; according to the notes of Kishchinskii an average of 2 to 6 owls were sighted per 10 km$^2$ but no more than 15% nested. Purely white birds predominated, i.e., adult males; yearlings constituted no more than 10%.

[5]An obvious error occurred in the work of I.A. Palmén, in which July is mistakenly printed for June.

On June 27 and July 5, 1971, V.V. Leonovich saw a lone owl near Énurmino. In 1956, I did not encounter the Snowy Owl on the Amguéma. I came across the bird on Kolyuchi Island on July 25, 1938. On July 17, 1913, W.S. Brooks (1915) noticed Snowy Owls on Cape Serdtse-Kamen'. On July 3, 1934, I frightened a lone bird near Mitkulen and met with another on July 8 on the Utte-Véem River, but saw one along the Kol'oam-Véem River.

On June 10, 1934, I sighted a pair on the Dezhnev knolls and succeeded on June 26 in catching a female. She was an old bird with an extremely worn-out plumage and thick subcutaneous adipose deposits. Her ovary had a fine-grained structure and it was obvious she had not laid that year. Thus the well-known phenomenon that Snowy Owls do not nest every year was confirmed in this particular case. At the end of June, 1957, A.P. Kuzyakin found in the tundra south of Uélen the remains of an owl which had been shot. A local hunter had tried for a year to obtain a Snowy Owl to prepare as a stuffed specimen, but had no success even with the help of other hunters.

From June 20 through 25, 1934, I regularly came across the Snowy Owl on Bol'shoi Diomede Island. W.S. Brooks also saw it there on June 25, 1913.

On St. Lawrence Island, according to O.J. Murie (1936), the Snowy Owl was encountred at any time of the year and was not rare there. He recalled two males caught on August 2, 1935, near Savunga and Kukuliak villages. F.H. Fay and T.J. Cade listed a few summer finds, probably pertaining to nonbreeding birds. Only one owl was seen in the summer of 1950. In 1956 an adult bird was sighted in Kukulgit knolls and on August 21 and 23, 1957 on Putgut plateau.

In the kitchen middens from archaeological excavations, H. Friedmann (1934a) found fragments of bones and a pair of metacarpals. Quite possibly the snowy Owl came upon the eskimo table ony by chance.

On the south coast of Chukchi peninsula the Snowy Owl was extremely rare. I did not encounter it even once in Providence Bay even though I traveled there in the summer of 1938 and the fall of 1932, 1934, and 1939. P.T. Butenko, who wintered in Plover in 1937/1938, and I.O. Olenev, who wintered in Émma Bay in 1931/1932, also failed to see the Snowy Owl. None of the American ornithologists who repeatedly visited Providence Bay sighted this species. Similarly, I did not find this bird in Krest Bay; according to the local residents, it was encountered rarely in summer in that neighborhood. On August 6, 1932, I was told that it had been seen quite recently in Notapenmen.

*Distribution and status in the flight period*—According to A.G. Velizhanin (1965), by the evening of September 27, 1960 on Cape Blossom on the southwestern extremity of Wrangel Island, 38 snowy owls had gathered; yet not a single one had been seen that morning. The owls remained for quite some time because they were attracted by carrion (walrus meat). May more gathered there in 1959 and it was impossible to count them from a single point. Whatever the degree of exaggeration of these statements, in my opinion, large collection of Snowy Owls are not improbable, considering my own observations made in the fall of 1938 (although I saw far fewer owls at that time). These birds do not gather into flocks, but remain alone, and many can be seen simultaneously from a given place.

In early spring they fly over hummocks from the mainland to Wrangel Island and vice versa in the fall. On May 13, 1810, M.M. Gedenstrom saw a "white horned owl" (Argentov, 1857a) at sea north of Bol'shoi Baranov Kamen' 245 versts* from the nearest coast. A.P. Andriyashev, aboard ship near Kolyuchi Island on October 7, 1946 saw two flying owls. Around Uélen, according to my observations, this bird was not a rarity during mass movements in spring and fall. According to the information collected by K.W. Kenyon (Kenyon and Brooks, 1960), the Snowy Owl is more numerous on Malyi Diomede Island in fall than in spring.

W. Heine (1859, p. 196) mentions that the Snowy Owl was hunted on the rocks in Senyavin Strait on September 10, 1855. On St. Lawrence Island, H.W. Collins (Friedmann, 1932a) caught two males in Gambell on September 18 and October 2, 1930.

*Winter range*—G.A. Ushakov thinks that the Snowy Owl probably deserted Wrangel Island or the population diminished significantly only in certain winters. A.I. Mineev relates a contrary picture. For the five years of his residence on the island, owls overwintered in fairly large numbers only in 1931/1932. This he explained by the abundance of lemmings. According to my observations, Snowy Owls do not winter on Wrangel Island.

On the Chukchi peninsula, the Snowy Owl is encountered more rarely in winter than in summer. A.A. Savich termed it a "settled" bird for Cape Schmidt evidently on the basis of winter finds. At the winter anchorage of the *Vega* in Pitlekai, Snowy Owls, according to reports of local residents, were encountered throughout the winter of 1878/1879. P.T. Butenko during his January travels on the Utte-Véem River in 1934 met this owl only once, on January 17, in the valley of the tributary Yararmumny. On November 19, 1912, J. Koren collected a specimen on Bol'shoi Diomede Island. On January 14, 1938, Butenko noticed an owl flying near Cape Chaplin.

According to F.H. Fay and T.J. Cade, on St. Lawrence Island in the period from October through May inclusive, Snowy Owls became rare on the island per se and along the north coast; they remained quite common along the west and south coasts. In February, 1953, one owl was sighted on the ice near Gambell, another on Boxer Bay, and a third 50 miles more southwest. In April two owls were sighted on the ice 3 and 10 miles west of Gambell.

*Habitat*—On Wrangel Island, the Snowy Owl nested on sites with an uneven terrain (Fig. 14). I found its nest on the gentle northern slopes of knolls extending along the south coast. In the northern part of the island it avoided hill tops and plain of lowland tundra. In summer on the Utte-Véem River coast and on Bol'shoi Diomede I came across Snowy Owls in an environment of hilly terrain, but on Gek (on

*verst = a measure of distance of Imperial Russia equivalent to 3500 feet or 1.067 km —Ed.

the coast of Anadyr Bay) and in the fall flight in Uélen I saw it on sandy as well as rubble marine spits. J. Koren correctly pointed out that the Snowy Owl avoided lowlands and wet tundras on the north coast of the Chukchi peninsula. L.M. Turner (1886, p. 163) noticed one Snowy Owl at sea between St. Mathew and St. Lawrence Islands. It was sitting on a high ice floe and disturbed by shots settled on the floe again. According to F.H. Fay and T.J. Cade, south of St. Lawrence Island Snowy Owls were encountered in winter in ice with pools of open water.

*Periods of spring flight*—According to F.H. Fay and T.J. Cade, on St. Lawrence Island Snowy Owls return to nest at the end of May. On Little Diomede Island, J.W. Brooks saw an owl on May 23, 1903, while K.W. Kenyon saw one on May 26, 1958.

I was informed that around Uélen the first Snowy Owl was sighted on April 16, 1934 near Vtoraya brook. On May 17 this species was sighted in Dezhnev knolls.

In the spring of 1934, owls deserted the north coast of the Chukchi peninsula in mid-April. V.S. Stakhanov traveling by dog sled from Vankarém to Uélen noticed lone owls on the following dates: June 8th in Vankarém, 11th in Pitlekai, and 12th one in Énmitagin and another near Neshkan, opposite Idlidlya Island. On April 26, I saw an owl on Cape Vankarém, but later saw none at all when I traveled by dog sled most of the coastal section from Cape Schmidt to Uélen in the first half of May.

In 1879, in Pitlekai the first owl after the winter break was sighted on March 11. Mass flight occurred later. On April 23, one owl was shot and on May 21 three seen, two of them together and evidently a pair.

According to the observations of G.U. Sverdrup (Schaanning, 1928), a few Snowy Owls were noticed on Chetyrekhstolb Island on May 16 and later on May 25, 1925.

According to A.I. Mineev, the Snowy Owl arrives on Wrangel Island in early May. In 1931, it appeared in Rodgers Bay on May 1. In the spring of 1939, Tayan sighted the first owl in the upper reaches of the Nasha River on April 18; on the 20th perhaps the same bird was seen in the northern foothills south of Bruch spit. From its dark coloration, this bird was probably a female. On May 3 Tayan caught a male on the Klér River. Owls were still very rare at that time. On May 12 I saw a lone female while approaching the Klér River. Hence they did not arrive en masse but appeared gradually and singly. In 1964 F.B. Chernyavskii came across owls several times even in April. There is no doubt that M.M. Gedenstrom sighted a transitory bird over the sea on May 13, 1810, 245 km north of Cape Bol'shoi Baranov.

*Breeding*—I measured the gonads of a small number of birds (Tables 24 and 25).

**Table 24. Size of testes (mm) of the Snowy Owl**

| Date | Left | Right | Locality |
|---|---|---|---|
| March 17, 1932 | 9 × 5 | 9 × 5 | Vaegi village on the Maine, tributary of the Anadyr River |
| May 9, 1939 | 16 × 5 | 15 × 8 | Nasha River, Wrangel Island |

**Table 25. State of ovaries among Snowy Owls**

| Date | Ovary length, mm | Diameter of largest follicle or ovary structure | Locality |
|---|---|---|---|
| June 10, 1939 | 15 | 7 | Nasha River |
| June 26, 1934 | — | Fine-grained | Uélen |
| June 29, 1939 | 19 | 6 | Nasha River |
| October 3, 1933 | — | Fine-grained | Uélen |
| October 24, 1933 | — | Filmy | Uélen |

In Table 25 the first and third females had nested, while the second had not. The fourth and fifth were first-year-birds. Arriving males (Table 24) had enlarged testes.

All the specimens I gathered from Wrangel had only traces of sparse adipose layers except for the single chick collected on August 17, 1939, which contained a compact layer of fat. The spring male from Vaegi was obese. October females from Uélen differed sharply in accumulation of subcutaneous fat; one caught early was obese while one caught late had only traces of adipose layers.

Snowy Owls usually build nests at places from which they can survey their surroundings.

At Akatylanva, and in one of the passes to the Mamontovaya River, I saw nests located high on the slopes of knolls, in one case on the projecting section of a rock and in another on a mound of large stones. In the Mamontovaya River valley, a nest was located on an elevation jutting over the river bank, and two other nests in the Nasha River valley. A nest on a hill slope in the eastern foothills of Atternon mountain was quite inconspicuous; situated among innumerable terraces, its location was not distinctive and I found it only with difficulty on subsequent visits.

A.I. Mineev (1936, p. 180) has also pointed out that this owl usually builds its nest on the peaks of small hillocks or on the projection of a terrace, but always in such a manner that the incubating female can survey her surroundings.

Nests examined were in the form of a large, circular, platelike, shallow depression devoid of special bedding. Feathers, rootlets, and particles of peat happened to be in them purely by chance. In appearance they looked neglected or shabby. It was very easy to spot them at a distance because of the white plumage of the birds. Heaps of lemmings, untouched for many days and infested with maggots of the sheep fly, were found near each nest.

In the immediate vicinity of one owl's nest on the Mamontovaya River, several pairs of Snow Buntings and Wheatears were nesting, and on the Nasha River a small colony of Black Brant Geese. In such surroundings the owl derived the unique advantage of being forewarned of any approaching danger by the geese.

According to A.I. Argentov, in the environs of Chaun Bay a Snowy Owl began laying from May 5. In Pitlekai on June 1, 1879, a female was caught with one developed egg inside her body, and on June 8 two nests found with four eggs each.

On Wrangel Island, owls laid at the end of May and in early June. On June 12, 1932, V.F. Vlasova found a clutch of eight eggs; in two blood vessels were discernible and in the rest embryos with a formed head. In another clutch, also of eight eggs, taken on June 14, 1932, embryos in different stages of development were seen.

On Wrangel Island I had occasion to inspect three nests closely. One was located on the slope of the Mamontovaya River valley (Fig. 15) and was discovered on June 7, 1939. When I approached it, the cautious female flew far away and landed behind a cover. The male was much more restless; it flew about, flapped its wings frantically, and emitted an uneasy "kuk". His anxiety was expressed intermittently. As I settled by the nest with my sketchbook and photographic equipment, both owls calmed down and sat about 0.5 km away, but when my sled dog set off toward them flew at least a kilometer away. I gathered the entire clutch of five eggs and the three arctic lemmings lying beside the nest. On June 9, the female still remained by the site of her nest even though it was empty. The male brought no fresh lemmings and stayed aloof.

On June 23, 1939, I noticed near Atternon mountain an incubating female (in a nearly recumbent position) on a small mound on a terrace. She flew away but remained closer than the male. Both birds were restless and cried but nonetheless remained extremely cautious. This nest contained seven eggs but an eighth had tumbled out. On June 27 another had likewise fallen out. I took away the two eggs that had fallen out and the three lemmings lying beside the nest. The female resettled on the nest almost the moment I moved away. On July 6, there were four eggs and two chicks inside the nest (Fig. 16). One had just hatched and its down was still wet. There were no fresh lemmings by the nest. The female flew far away when I approached the nest, but seeing me near the nestlings moved closer and exhibited extreme anxiety by squeaking and flapping her wings. She resettled on the nest when I was no more than 150 paces away. On July 24, I saw gray figures of loafing chicks. At my approach they flattened to the ground; one even stretched its legs backward. They remained motionless, initially stared at me, and then blinked their eyes. There were only two to be seen; next to these loafing chicks was the rear half of a third. The nest was full of mud and crawling with maggots of the sheep fly. A large arctic lemming lay beside it. The female flew closer this time than previously, but still outside the range of a rifle. On landing, she began to squeak. Meanwhile the male sat far away on a mound and screamed a repulsing note similar to the bark of a fox. On July 29, both owls remained by the nest, which I discovered was empty. In the vicinity lay scattered feathers of undergrown chicks, none of which could be seen, and despite my search not even one chick was found. Nevertheless the female swooped at me when I came to within 150 paces of the nest. On August 7, both owls were still in the neighborhood of the nest. Once again the female allowed me to approach to within 150 paces of it. Possibly she had hidden the remaining live chicks nearby.

On the Nasha River at the beginning of summer, hunters destroyed an owl's nest. On June 26, I passed this spot and the male flew around me; on landing he remained restless and screamed for quite some time.

I found the third nest somewhat higher on the bank of this river on June 29. Four nestlings of different size and dressed in white down were snuggled inside next to two eggs, one of which had been pecked. The parent owls stayed away from each other. The female was extremely restless, flapped her wings, and squeaked. When I went to examine the nests of Brant Geese in the neighborhood, she flew in and settled to warm the nestlings. A piercing cold wind blew. Every time I chased her off, she returned. Finally she remained 150 paces away, unwilling to risk an approach to the nest since I stood only 100 paces away from it. I succeeded in shooting her but the male had absented himself. I returned to the nest a few hours later. One nestling was frozen and another barely showed signs of life. Obviously the male had not warmed them. A.I. Mineev also reported that the male does not participate in care of the nest in the absence of the female. In general I found the female much more restless in the presence of man than the male; contrarily in Taimyr in 1949 the males seemed far more restless. A.I. Mineev described the behavior of owls by the nest in quite the same manner as described by most bird watchers. According to him, with man's approach the male exhibits greater restlessness than the female. When she is incubating, he keeps guard over several hundred meters of area; on sighting man, he descends and swoops at him from a considerable height. Even the female flies near man and both birds land by his side. The male proceeds to fluff his plumage, click his beak loudly, scrape his wings on the ground, squeak, widen his eyes, and tumbling over fly or hop toward the intruder. If the man continues to approach, the male takes off and flies over him, clicking its beak, screaming, and as an extreme measure even drops a stone on him from overhead. A.I. Mineev injured one such male but the bleeding bird recouped sufficient strength after some time to renew its attack.

I did not find more than eight eggs in the nests of snowy owl; according to Mineev up to ten eggs have been laid.

On June 22, 1970, A.A. Kishchinskii detected an abandoned nest with a broken egg. The nest was disposed on a high mound. Another nest was seen on June 30 and contained three nestlings; a third was detected July 15 and contained seven nestlings of different ages (Fig. 18). The youngest was still in the first down and the others prefledged. The oldest was already running from the nest and hid between the mounds. Both adult birds remained by them. The second and third nests were located on the slope of a knoll.

According to F.H. Fay and T.J. Cade, on June 5, 1954, two nests were found with eight and nine eggs respectively on St. Lawrence Island. On July 5, two nests with nine eggs each and chicks beginning to hatch from some were found at another site. Another nest with ten recently hatched chicks was discovered on July 7. As narrated by the local residents, these clutches were exceptionally large; usually only four to six eggs were found in a single nest.

The size of the eggs taken from the nest in the upper reaches of the Mamontovaya River on June 12, 1932 varied according to my measurements, but insignificantly: 60.7 mm × 44.0 mm, 56.9 mm × 45.5 mm, 56.4 mm × 43.7 mm, 55.2 mm × 44.5 mm, 54.8 mm × 44.1 mm, 54.7 mm × 45.2 mm, and 54.6 mm × 44.2 mm. The size of the eggs gathered on Atternon mountain on June 14, 1932 was: 56.7 mm × 44.3 mm, 56.1 mm × 44.6 mm, and 54.7 mm × 45.1 mm. The eggs collected by the *Vega* expedition had the following measurements:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Length, mm | 56 | 55 | 57.8 | 60 | 60 | 59.5 | 58 | 54.9 |
| Width, mm | 43 | 43.8 | 44 | 45.3 | 45 | 46 | 45.5 | 45 |
| Weight, g | 5.62 | 5.62 | 6.6 | 4.95 | 5.52 | 5.17 | 4.90 | — |

The wingspan in a chick with half-grown flight feathers I collected on August 17, 1939, was 26 cm. It had not yet learned to fly and its body and head were mostly covered with gray down.

*Fall flights and migration*—In mid-August, 1939, owls appeared in large numbers along the south slopes of knolls in Rodgers Bay. They had evidently abandoned their nesting sites by that time. The periods of fall flights and migration can be judged from the following data. In the fall of 1933, around Uélen I initially came across only single birds on August 22 and September 9 and 11; later I saw groups of them—two owls on October 1 on a rubble spit and eight on October 3. I paid special attention to a very dark-colored specimen that hung around the neighborhood for several days. The owls were obviously not in flight and simply wandering. As shown by my observations, they became extremely rare with the formation of banks of thin ice crust, which coincided with the migrations of phalaropes, their favorite food item. My diary contains entries of only solitary birds: on October 21 and 24 and November 12 and 16. Owls were not sighted around Uélen throughout the winter but on January 17, 1934 one was encountered by P.T. Butenko in the valley of the Utte-Véem River tributary. It remained because partridges and hares were available in shrub growths.

On Wrangel Island in 1932, one specimen was caught on October 29; the last owl in 1934 was sighted on October 8. In 1938, according to my observations, owls disappeared before a sharp worsening of weather on September 4 when snow occurred. On Kolyuchi Island in 1946, A. P. Andriyashev saw two owls in flight on October 7. One appeared gray to him and the other white; thus an adult and young bird or a male and female flew over the sea together.

*Behavior*—Snowy Owls in captivity, according to A.I. Mineev, are extremely fond of bathing in water and perform their ablutions with great animation and considerable chirping. They domesticate rapidly and respond to pet names.

I heard the voice of the owl only from restless birds. On excitation they issue a monosyllabic "kuk"; with the appearance of man some distance away they sometimes yelp "kiv, kiv, kiv" and sometimes emit sounds resembling those of a fox.

On October 3, 1933, on a rubble spit near Uélen I saw an owl time and again only 20 paces away from me. The bird lay on its abdomen under a tiny sand mound and, taken unawares, stiffened on seeing me. Since I was concealed in a sitting posture close to a flock of buntings, I could level the gun directly at it and shot the bird with half a charge.

E.W. Nelson (1883, p. 76) was surprised on landing on Wrangel Island to encounter a very cautious owl that took off some 200 paces away. He did not reckon with the fact that although the island was then totally uninhabited, an owl had flown in from a country inhabited by man.

*Food*—Lemmings no doubt represent the main food of the Snowy Owl. In refuse heaps I invariably found their bones and fur. The following contents were found in the stomachs of birds I collected on Wrangel Island: 1) May 9, 1939. Six complete skulls, 2 mandibles, 13 forepaws, 7 rear paws, and bits of skin on a pair of rear paws of an arctic lemming. 2) June 10, 1939. Fur and some bits of bones of *Dicrostonyx.* 3) June 29, 1939. Two specimens of arctic lemmings, 3 flies of *Borellus atriceps* Zeet. (Calliphoridae), some 30 shoots and leaves of grass *Dupontia fisheri* R. Br., 5 tiny bits of moss *Polytrichum Juniperinum* Will., and 3 owl feathers. 4) August 17, 1939. An arctic lemming swallowed whole.

On Wrangel Island in 1938 and 1939, as far as could be judged from the specimens of lemmings lying by owl nests, *Dicrostonyx* predominated over *Lemmus.* At Akatylanva I noted the fact that owls kept watch for lemmings on the scree where they were particularly common (seen running). Field observations on the Chukchi peninsula revealed that owls watched at the burrows of squirrels, frightened hares in the scree, and disturbed partridges near shrubs. In October, 1933, owls were numerous on the rubble spit near Uélen, evidently attracted there by masses of phalaropes feeding by the surf. On April 26, 1934 at Cape Vankarém I saw an owl flying around the south coast where there were partridges. Subsequently the partridges disappeared and no more owls were seen. On June 22, 1934, while on a trip on the upper plateau of Bol'shoi Diomede Island, I noticed that hares were hurrying to settle in the rocks and did not run far away. This was explained by the presence of Snowy Owl. Down of birds, tiny seeds, and small stones were found in the stomach of an owl killed around Uélen on Octoner 3, 1933. I assume that the seeds were ingested by the bunting consumed by the owl. E. Almquist found the bones of mice, two claws of white partridge, and the hair apparently of a dog in the refuse heaps of owls near Dzhénrétlen.

A.I. Mineev wrote that lemmings constituted the main food of snowy owl and were swallowed whole commencing from the head. Nowhere did he observe owls attacking other birds. Once a snowy owl flew toward an injured jaeger, but immediately withdrew when the latter moved slightly. Owls have been observed devouring killed gulls.

A.G. Velizhanin (1965) was told that in 1959 on Cape Blossom, on the southwest extremity of Wrangel Island, owls fed on the carcasses of walruses and caught small fowl. According to the observations of A.A. Kishchinskii, in 1970 on the north coast of Chukchi peninsula, Snowy Owls sat for hours on high dry mounds in the tundra or on the mounds of driftwood. Mounds overgrown with grass dried up early in spring and in June, lemmings dug passages in them. Owls patiently stood watch for them. Initially, until June 10, their food consisted mainly of *Dicrostonyx;* from June

10 through 23 both species of lemmings were consumed almost in equal proportions; and from June 28 through July 29 *Lemmus* predominated. Birds were eaten at random.

In the absence of lemmings and terrestrial wild fowl, the Snowy Owl is compelled to look for other sources of food and becomes a predator of water birds—ducks, guillemots, and others. In winter on the west and south coasts of St. Lawrence Island, Snowy Owls exclusively hunted wintering ducks, especially Long-tailed Ducks and King Eiders.

Young owls taken captive fed only on fresh meat, refusing dried meat. Males and females caught as adults lived quietly in large cages. The male invariably passed the food to the female and waited until she had had her fill before eating the leftovers.

*Economic importance*—Since the owl feeds on lemmings, it is no doubt a competitor of the fox and in this respect should be considered harmful for commercial fur farming. Given the relative rarity of owls, however, measures for exterminating them are hardly justified. Industrialists on the Chukchi peninsula never lamented to me that the owl was a harmful bird. On the contrary, this bird was of considerable interest to them; they correctly linked the appearance of a large number of owls with an increase in population of mouse-like rodents and the early migration of owls with the absence of lemmings. In the fall of 1938, I forecast to residents of Wrangel a lean fox season based primarily on the early migration of owls.

Under conditions of Wrangel Island the Snowy Owl should be assiduously protected in those cases where the presence of its nests is not harmful to colonies of Snow Geese.

*Systematics*—It has long been thought that the Snowy Owl forms no subspecies even though attempts have been made to isolate a North American race. To test the geographic variability of this bird, I carefully studied the age and sex differences in a series of 130 birds.

In various phases of plumage the male differs from the female in a much shorter wingspan, not exceeding 43 cm. Very short-winged females are easily recognized by the large number of cross stripes on the tail. In young birds the wing is generally longer, but very insignificantly so (Table 26).

The wingspan reveals no geographic variability (Table 27) although my collection from North America is rather minimal.

Color also provides no basis for isolating local forms. I would like to expand on one particularly striking feature.

It is generally known that as the plumage wears out, the color of the bird usually becomes darker or denser. I found a totally reverse picture in the case of Snowy Owl. Worn-out plumage loses the dark-colored spots and stripes and becomes whiter. This discoloration is explained by a special distribution of dark pigment, which colors only the surface and does not penetrate deep into the feather. Under low microscopic magnification one can see that only the tips of barbules (radius), the so-called pennulum, or the barbules themselves are pigmented. More rarely, the color penetrates the barbs (rami). Pennula form the nap which under external influences gradually breaks off and with it the dark pattern of the feather disappears.

**Table 26. Wingspan (cm) of adult and young Snowy Owls**

| | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of specimens | Max. | Min. | Average | No. of specimens |
| Young | 43.0 | 39.5 | 41.4 | 37 | 47.1 | 43.2 | 44.9 | 29 |
| Adult | 42.9 | 39.5 | 41.2 | 31 | 47.0 | 43.0 | 44.5 | 32 |

**Table 27. Wingspan (cm) of Snowy Owl in different parts of its range**

| Locality | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of specimens | Max. | Min. | Average | No. of specimens |
| Murmansk, Novaya Zemlya, Vaigach, Yugorskii Shar | 42.9 | 40.5 | 41.6 | 11 | 45.8 | 43.8 | 45.1 | 4 |
| Outside the Arctic limits of Europe | 43.0 | 39.5 | 41.5 | 17 | 46.0 | 43.0 | 44.4 | 15 |
| Arctic Siberia from yamal to Indigirka | 41.7 | 39.5 | 41.0 | 6 | 45.9 | 44.1 | 44.9 | 6 |
| Outside Arctic Siberia | 43.0 | 40.1 | 41.5 | 26 | 47.1 | 43.0 | 44.8 | 25 |
| Wrangel Island, Chukchi peninsula, Bering Island | 40.7 | 39.6 | 40.3 | 3 | 45.5 | 43.5 | 44.3 | 8 |
| Anadyr range, Kamchatka, Sakhalin, and Japan | 41.0 | 39.7 | 40.4 | 2 | 46.2 | 44.1 | 44.9 | 4 |
| Alaska, Newfoundland, Greenland | 41.5 | 40.5 | 40.9 | 3 | 45.5 | 45.5 | 45.5 | 1 |

Highly worn-out feathers are devoid of nap and appear totally white. After molt they are replaced by new, fully striped feathers.

*Specimens*—1) Wrangel Island, June 2, 1928, ♂, G.A. Ushakov; 2) Rodgers Bay, September 26, 1932, ♀, Vlasova; 3) same site, October 29, 1932, ♀, Vlasova; 4 and 5) southeastern part of Wrangel Island, July 8, 1933, ♂♂, Vlasova; 6) Uélen, October 3, 1933, ♀, Portenko; 7) same site, October 24, 1933, ♀, Portenko; 8) same site, June 26, 1934, ♀, Portenko; 9)Nasha River, May 9, 1939, ♂, Portenko; 10) same site, June 10, 1939, ♀, Portenko; 11) same site, June 29, 1939, ♀, Portenko; and 12) Khrustal'nyi brooklet, Mamontovaya River tributary, August 17, 1939, ♂ juv., Portenko.

*Biological specimens*—1) clutch of eight eggs, upper reaches of the Mamontovaya River, June 12, 1932, Vlasova; 2) clutch of five eggs, Mamontovaya River, June 7, 1939, Portenko: 3) clutch of eight eggs, near Atternon mountain, June 14, 1932, Vlasova; and 4) one egg, Nasha River, June 29, 1939, Portenko.

### 109. *Surnia ulula caparoch* (Müll.)—Northern Hawk Owl

*Local name*—Chukchian: kapljeko in the records of the *Vega* expedition.

*Distribution and status*—One finding is known of a transitory specimen on Kolyuchin Bay.

On May 22, 1879, E.K. Brusevits (Palmén, 1887) shot a Northern Hawk Owl which landed on the ship *Vega* during its winter anchorage in Pitlekai. On autopsy its stomach was empty and the intestine contained dark green and brown mucus.

While apparently a resident bird, the Northern Hawk Owl in fall flights at times ventures very far and hence repeated finds could be expected on the Chukchi peninsula. It is interesting that the Palearctic form, *S. u. ulula* (L.) twice flew into Alaska in winter (Gabrielson and Lincoln, 1959).

*Systematics*— In determining the subspecies, I.A. Palmén was guided by the fact that the transverse stripes on the breast of the specimen caught are broader than in the European form. There is nothing improbable in assuming that the American subspecies *S. u. caparoch* (= *hudsonica* Gm. of Palmén) had flown in since instances of its sightings have been established even for the British Isles. Differences from our Hawk Owls are quite sharp and pertain to the notably deeper black and broader stripes, but nevertheless a comparison of more specimens of the two subspecies is essential.

### 110. *Asio flammeus flammeus* (Pontopp.) — Short-eared Owl

*Distribution and status*—Wandering specimens are encountered in different parts of the Chukchi peninsula. It possibly nests in the tundra adjoining Krest Bay from the west. One case of flight into Wrangel Island has been confirmed.

I found in the manuscript of N.P. Sokol'nikov a note based on information he collected stating that the Short-eared Owl is encountered along the coast of the Bering Sea north of Anadyr, but is absent on the coasts of the Arctic Ocean. O.J. Murie (1936) reported three finds on St. Lawrence Island in 1934. A male was caught west of Savoonga village on September 2, another near Kukuliak village on September 7, and a third specimen in Gambell village on November 3. F.H. Fay and T.J. Cade (1959) in the course of field observations in six summers sighted the Short-eared Owl 13 times: twice near Gambell on May 24 1954; nine times along the Mogoveiik River on May 24, through 28, 1956; and twice near Kaval'gak on May 29, 1956. According to reindeer shepherds, this bird does not nest there. E.G.F. Sauer (Sauer and Urban, 1964) saw a flying owl along the shore near the Mogoveiik River estuary on June 6, 1960.

On June 13, 1970, V.V. Leonovich saw a Short-eared Owl on Lawrence Bay being chased by Long-tailed Jaegers. On July 5, he scared a lone owl near Énurmino. J.W. Brooks (Kenyon and Brooks, 1960) noticed Short-eared Owls flying west of Little Diomede Island on May 20 and 22, 1953. In June, 1970, A.A. Kishchinskii came across these owls around Ukouge lagoon and Cape Schmidt, where a dead specimen was found. Nesting has not been established.

On Wrangel Island, near my anchorage in the lower courses of the Mamontovaya River, a lone Short-eared Owl flew on June 5, 1939, roughly within 150 paces of me. It was beyond rifle range and I decided to wait for it to come closer. The owl turned from the Mamontovaya River to the sea and a curtain of mist later hid it from view.

*Habitat*—The owl I saw flew above the hummocky tundra at a man's height. Its return to the sea did not surprise me. This bird often visits the open sea to hunt for waterfowl. Thus, on the morning of October 12, 1932, before the ship entered Perouse Strait, I watched a Short-eared Owl flying near the ship throughout the morning. On October 1, 1934 in Petropavlov-na-Kamchatka, I was shown a Short-eared Owl caught on the ship when it passed Perouse Strait. Finally, on October 2, 1939, I noticed a Short-eared Owl flying over the sea of Okhotsk. All these observations suggest that Short-eared Owls, like Peregrines, do not venture into the sea without reason.

Unlike many other owls, the Short-eared and Snowy owls are no strangers to the sea. This affinity would explain the flights of the nominal form on Wrangel Island south up to Borneo, Antilles, and Bermuda Islands. Over a long historic period, because of its ability to fly far into the sea, the Short-eared Owl colonized Hawaiian, Marian, and Caroline Islands, where the endemic subspecific forms *A. flammeus ponapensis* Mayr., *A. f. sandwichensis* (Bloxh.), and others have evolved.

### *Aegolius funereus richardsoni* (Bp.)—Tengmalm's Owl

F.H. Fay and T.J. Cade (1959) listed three instances of the flight of this owl into St. Lawrence Island. Early March, 1951, a female was caught in Gambell. On March 1, 1953, a male was caught in Savoonga, and on November 10, 1955 a female caught live by children near Gambell.

Quite likely, the tiny "snowy" owls sighted on July 7, 1879 between Dzhenretlen and Pitlekai (see p. 349) were *Aegolius funereus magna* (But.). In the blinding polar light, the Kamchatka owl could well appear white but this is only a conjecture.

# Order X. APODIFORMES—SWIFTS

## Suborder TROCHILI—HUMMINGBIRDS

In 1932 I asked an eskimo in Providence Bay about local birds, but language barrier hindered communication. Nevertheless he narrated, among others, an encounter with an extremely small bird green in color. Although he emphasized its small size, I was rather certain he was referring to Eversmann's Warbler, a highly probable find it seemed to me.

Very recently two eskimos on St. Lawrence Island also told F.H. Fay (Fay and Cade, 1959) about a tiny green bird flying over flowers with such rapid wing movements that the latter could hardly be distinguished.

Comparing now the information given to F.H. Fay and myself, I consider the stray intrusions of hummingbirds along the Chukchi coast wholly possible.

# Order XI. PASSERIFORMES—SPARROWS

### 111. *Chionophilos alpestris flava* (Gm.)—Horned Lark

*Distribution and species*—This species was found nesting on the Chukchi peninsula in the hills along the midreaches of the Amguéma River. One instance of spring flight has been established for Wrangel Island.

At last, in 1956, I found the Horned Lark in a nesting area. Three, possibly four, pairs nested on the knolls along the midreaches of the Amguéma River by the 87th km. On May 9, 1939, I had caught a lone male in Rodgers Bay on Wrangel Island.

This lark does not nest in the Anadyr and according to the data of K.A. Vorob'ev (1963) is absent altogether in Kolyma tundra and the tundra between the Khroma and Indigirka Rivers. According to I.E. Vorob'ev, however, it probably nests on Chetyrekhstolb Island.

The nesting area I found no doubt represents the extreme northeastern limit of the range of this bird in Asia. This species does not reach the coast of the Bering Strait.

*Habitat*—Horned Larks nested on foothills by the Amguéma River at a height of about 300 to 400 m on terraces. The soil consisted of fine gravel with small groves of extremely poor hill vegetation characteristic of mottled tundra.

In Rodgers Bay I noticed a lark in the eastern part of the spit. At one place on the pebbled bed grass grew thickly and attracted a flock of arriving Snow Buntings. A Horned Lark also flew to this spot.

*Arrival*—A lone male flew onto Wrangel Island on May 9, 1939. J. Koren (Thayer and Bangs, 1914) caught six males on May 14 and 15, 1912 in the Lower Kolyma. C. Amory caught as many males at the same place on May 14, 15, and 16 (Riley, 1918).

*Nidification*—A male caught on May 9, 1939, already had enlarged testes: 5.0 mm × 4.0 mm (left) and 7.0 mm × 5.5 mm (right). Subcutaneous fat was deposited here and there. On June 20, 1956, a cloudy and cold day (+10° C), I passed along a terrace close to the summit on a hill within sight of the Amguéma River and frightened a female from her nest just five paces away. She first flew nearby and later ran off. While I inspected the nest she remained aloof. Later she reappeared but did not permit close approach. I noticed the male after a while. His song, resembling that of a lark, was characterized by clear, liquid, and very loud notes. Both Horned Larks rose in the air, flew a short distance, and issued an anxious call ("vit'") in much lower notes than the squeak of a water pipit. The larks were easily distinguished from pipits by their compact round body, larger size, and black tail feathers.

The nest was located on a tiny flat mound (Fig. 19) and quite exposed; nevertheless it did not catch the eye. Unlike in Taimyr where I frequently found nests very deep in the ground, this one was situated in a shallow depression and was about 12 cm in diameter. Its outer wall was woven with old stalks and leaves of grass (*Calamogrostis holmii* Lange) and sedge (*Carex* sp. sp.), gray in color, with an admixture of straw. At the bottom of the tiny trough lay a thick layer of old reeds with seeds of Compositae (*Erigeron* sp.) forming a soft and fluffy camel-colored bedding. The entire surface of the eggs was covered with diffuse brownish-gray specks, the color turning lighter at the poles. Thus the color of the nest and eggs was closer to that of a desert than of the tundra.

There were only two eggs in the nest on June 20 but the female had laid a third by the next day. On June 24 the incubating female flew down when I appeared and remained 15 to 40 paces away from me. She shifted restlessly from place to place with a loud "uip" and did not settle in the nest for the length of time I kept her in sight. On June 28 she flew out almost on her legs (Fig. 20), limping and dropping to the ground, and later settled nearby. Evidently she had become somewhat habituated to my visits. The male stayed below, along the slope, but also came close.

Chicks were found in the nest on July 2. Assuming that the third egg was laid on June 21, incubation continued for 11 days. The chicks were covered with long dense down of ocherous-clay (camel) color. Looking at the nest from above, I saw only a lump of down with the chicks completely hidden under the mother. The color of the down, trough of the nest, and the eggs blended harmoniously more with a desert than a tundra background. While I mounted the telephoto lens the female sat on the nest firmly, but as soon as the camera clicked she flew down and remained 10 to 15 paces away. The male, however, flew off when I approached the nesting site. I found the nest empty on July 16 and saw no larks in the vicinity.

On June 20 on the same knoll, but slightly below and in a gap, the male of another pair flew to within a few paces of me. On the apex of an adjacent knoll, also on mottled tundra, I encountered a female which behaved exactly as the one whose nest I had discovered, but she did not betray the location of her nest.

On June 24 I was convinced of the presence of a nesting section at the place where I had encountered the male on the 20th. On July 2 I found an extremely cautious pair in an altogether different place on one of the surrounding knolls. Thus three or four pairs nested in the group of three knolls inspected by me, i.e., somewhat like a tiny dispersed colony.

*Food*—In the stomach of the specimen I collected 2 g of wheat grains and 1 g of fine sand were found.

*Systematics*—In 1951, I carried out a thorough revision of the subspecies of Horned Larks based on the collection of the Institute of Zoology, Academy of Sciences of the USSR. The following subspecies are found within the Arctic.

1. ***Chionophilos alpestris alpestris*** (L.). Differs from Horned Larks of the northern zones of Europe and Asia by a more massive and longer beak, noticeable in a direct comparison of specimens. The brown centers of the feathers on the upper body are broader and darker. March specimens from Canada are similar to Palearctic Horned Larks caught in December.

The wing is fairly long: in two males it was 11.22 and 11.11 cm and in two females 10.18 and 9.91 cm.

*Range:* Labrador. See map in article by G.K. Oberholser (1902, Pl. XLVII).

2. ***Chionophilos alpestris hoyti*** Bishop. Very similar to the East Siberian Horned Lark, but upper side of body more brown in color. Wingspan: male 11.20 and female 10.21 cm.

*Range:* Canada from Hudson Bay to the Mackenzie.

3. ***Chionophilos alpestris flava*** (Gm.). In a large series of Horned Larks caught from Lapland to the Chukchi peninsula I could decipher no differences in color associated positively with a given territory. At first sight it seemed to me that Maydell specimens from the southern slopes of the Anadyr range, Kolyma Horned Larks, and my Wrangel specimen differed in the very pale color of the lemon-yellow spot on the throat. This feature, among others, was pointed out in the description of *Otocoris alpestris euroa* Thayer and Bangs based on six Lower Kolyma specimens collected by J. Koren. However, Horned Larks with such a pale-colored throat are also encountered in the western parts of the Palearctic. The lemon-yellow color fades readily by summer and, moreover, is not the same in different specimens. My Wrangel specimen is very similar in color to *C. a. arcticola,* but variegations in the rear part of the back of the latter are blacker and the white feathers whiter. A faint yellow bloom on the throat is nevertheless distinguishable in the Wrangel male.

The variability of wingspan is of some interest. Wing measurements of transitory and winter specimens had to be rejected since the tail feathers of first-year birds are evidently shorter than those of adult birds. Commencing from eastern Taimyr and farther east, the majority of Horned Larks have much longer wings (Table 28).

The boundary between populations with long and short wings coincides precisely with the boundary between western and eastern subspecies of *Anthus cervina* (Pall.), *Motacilla alba* L., and other birds. If these differences are confirmed in more exhaustive material, there is no need for a new name for the above subspecies of Horned Larks in the Arctic. The *terra typica* for Gmelin's *flava* was shown so broadly (Sibirica) that this name could be assigned to western as well as eastern

**Table 28. Wingspan (cm) of arctic Horned Larks**

| Locality | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of specimens | Max. | Min. | Average | No. of specimens |
| Lapland and Murmansk | 11.22 | 10.58 | 10.87 | 10 | 9.99 | 9.80 | 9.90 | 4 |
| Dvina-Pechora | 11.61 | 10.53 | 10.93 | 10 | — | — | — | — |
| Novaya Zemlya and Vaigach | 11.12 | 10.21 | 10.84 | 5 | 10.48 | 10.15 | 10.31 | 2 |
| Yamal and Nizhnayaya Ob' | 11.14 | 10.56 | 10.86 | 8 | 10.46 | 10.12 | 10.25 | 3 |
| Gydanskaya tundra | 11.32 | 10.46 | 10.95 | 10 | — | — | 10.23 | 1 |
| Taimyr peninsula | 11.49 | 10.60 | 10.95 | 10 | 10.48 | 10.21 | 10.37 | 4 |
| Khatanga-Lena | 11.47 | 10.96 | 11.18 | 8 | 10.57 | 10.11 | 10.37 | 4 |
| Yakutsk and northern Yakutia | 11.57 | 11.07 | 11.32 | 12 | 10.70 | 9.90 | 10.29 | 7 |
| Indigirka-Anadyr* | 11.71 | 11.09 | 11.42 | 7 | 10.66 | 10.49 | 10.23 | 3 |
| Lapland-Taimyr | 11.61 | 10.21 | 10.91 | 53 | 10.48 | 9.80 | 10.19 | 14 |
| Khatanga-Anadyr | 11.71 | 10.96 | 11.30 | 28 | 10.70 | 9.90 | 10.39 | 15 |

populations. The name *Alauda nivalis* Pallas (1811, I, pp. 519–523) could be used for the western population. In the description of P.S. Pallas the wingspan is given as 4.2 inches (= 10.67 cm), which totally corresponds to the much shorter wing of western Horned Larks. The range was indicated as follows: very rare in temperate Europe, but very common in the eastern parts of Russia, along the Volga, and in Siberia up to the Lena. The name *Otocoris alpestris euroa* Thayer and Bangs could be used to denote the eastern population.

A total of 337 specimens, including over a hundred nesting birds, were studied.

4. ***Chionophilos alpestris arcticola*** Oberh. The single male that came into my hands (♂, British Columbia, April 20, 1888) is paler and grayer than *C. a. hoyti.* The lemon-yellow color on its throat is totally absent and replaced by pure white. Wing: male 11.4 and female 10.19 cm.

*Range:* Alaska, except for the Bering Sea coast.

Specimen—1) Rodgers Bay, May 9, 1939, ♀, Portenko.

*Biological specimens*—1) Nest, midreaches of the Amguéma River (87th km), July 16, 1956, Portenko.

### 112. *Iridoprocne bicolor* (Vieill.)— Tree Swallow[6]

*Distribution*—A random flying species on the Chukchi peninsula and Wrangel Island. This is the first find in the Soviet Union.

A specimen of a Tree Swallow was brought to me by a hunter, who had collected one from a pair on a rubble spit near his cottage on the south coast of Wrangel Island, slightly west of 180° E between June 6 and 9, 1939. I had already observed this species of swallow in the midreaches of the Utte-Véem River on July 9, 1934. A single bird flew over the river, totally justifying its name*, and remained aloof. On June 13, 1934, in Uélen some type of flying swallow was sighted, but the viewers could not describe its features sufficiently well to determine its species.

Some cases of flight into St. Lawrence Island are known. A male of this swallow was brought by F.H. Fay (Fay and Cade, 1959). On the evening of May 27, 1952, during a severe storm with an east wind, a bird flew into a dwelling through an open window. On May 25, 1956, two Tree Swallows were noticed in the estuary of the Mogoveiik River. According to E.G.F. Sauer (Sauer and Urban, 1964), three specimens were spotted on June 5, 1960 in Gambell and one above the village in Boxer Bay on August 5.

*Food*—The stomach of the specimen collected contained the remains of a beetle and up to 30 flies.

*Systematics*—Since the flight of swallows into the region under description is no

[6]According to W.H. Dall (Dall and Bannister, 1869), Russian villagers in Alaska called this sparrow "rechnaya".

*The Russian common name means River Swallow —Ed.

longer rare, it would be appropriate to give a description of this species previously unknown to Russian ornithology.

Among our swallows, the Tree Swallow is more similar to the House Martin in body form, with a comparatively small tail notch, no elongated extreme tail feathers, and pure white throughout the entire underside of the body except for the wing margin. The upper tail coverts are the same color as the other parts of the upper body. This color is not bluish-black as in the house martin, but greenish-bluish-black with a metallic luster. It turns bluer on the upper wing coverts. The feather bases are not white as in the house martin, but gray or grayish. Body dimensions are slightly larger. The wingspan of one male was 11.98 cm and of six other males measured by me ranged from 11.20 to 12.24 cm; the average of these seven specimens was 11.78 cm. The wingspan of four females was 10.60 to 11.37 cm, and average 11.08 cm. In females the upper body is more brownish. The tarsi in this species are not feathered. The Tree Swallow is distributed throughout most of North America and does not constitute a subspecies.

*Specimen*—1) South coast of Wrangel Island west of 180° E, June 6-9, 1939, ♂, Portenko.

### 113. *Riparia riparia kolymensis* But.—Sand Martin

*Distribution and status*—This species nests sporadically in the northwestern part of the Chukchi peninsula.

A.I. Argentov (1857a, p. 85 and 1861a, p. 493) mentioned "swallows" among the birds encountered in Chaun parish, by which he meant two species of "white-bellied" swallows, i.e., evidently the Sand and House martins. Apart from Chaun Bay, the territory of Chaun parish also included the Anyui tributary. In June, 1966, F.B. Chernyavskii encountered a small colony on the rocky coast of the Énmen-Véem River on the southwest slope of the North Anyui range.

E.V. Schmidt reported to me that on one occasion in winter he detected the burrows of a large nesting colony in the midreaches of the Kuvét River on a high rocky coast. A dead nestling was found in one of the burrows. The holes had been dug in a rocky soil and some were partly finished.

According to an eyewitness account by T.J. Cade (Fay and Cade, 1959), an eskimo boy caught a Sand Martin on Lake Trautman near Gambell village on August 11, 1950.

*Systematics*—I have twice undertaken a revision of the subspecies of the Sand Martin based on material in the Institute of Zoology, Academy of Sciences of the USSR. Results of my first study were published in *Fauna of Anadyr Range* (Portenko, 1939b, I) and of the second in *Birds of the USSR* (Portenko, 1954, III).

### 114. *Delichon urbica lagopoda* (Pall.)—House Martin

*Distribution and status*—This species flies randomly into the Chukchi peninsula.

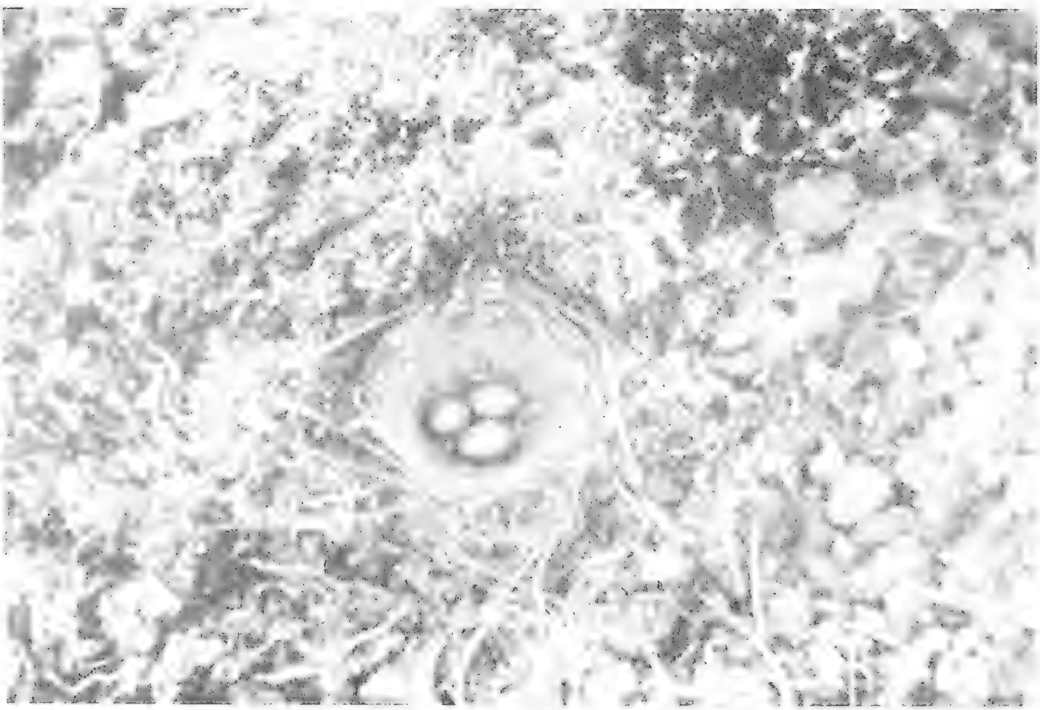
L.O. Belopol'skii caught a House Martin on June 14, 1931 on Meechken Island

Plate I

Snowy Owl *Nyctea scandiaca* (L.). Original drawing by V.S. Rozhdestvenskii.

Fig. 19. Female Horned Lark *Chionophilos alpestris* (L.) in her nest. Amguéma River by Kilometer 91. July 2, 1956.

Fig. 20. Nest with clutch of Horned Lark *Chionophilos alpestris* (L.). Knoll near the Amguéma by Kilometer 91. June 28, 1956.



by Krest Bay. According to him, local residents were seeing this bird for the first time. A.I. Argentov (1861a, p. 493) listed "two species of white-bellied martins (swifts)" and one "red-bellied swallow". Thus his term "swifts" could signify Sand and House martins. Argentov (1857a, p. 85) also listed "swifts" among the birds of Chaun parish and hence the appearance of the House Martin could be expected around Chaun Bay. Since this bird was found in the Anadyr region even in the nesting section, it could well be encountered in other parts of the Chukchi peninsula.

*Systematics*—In my *Fauna of Anadyr Region* I do not mention the two specimens of House Martin brought in by the Maydell expedition, because they were brought to my attention after publication. Judging from the details given on the labels, these birds were caught one after the other and evidently represent a pair; unfortunately the locality of the find has not been mentioned. In addition to these two skins and the six specimens from Anadyr region described in the foregoing work, another has come into my hands from Meechken Island. All represent, beyond doubt, the East Siberian subspecies since the upper tail coverts, like all of the tail coverts, are white. As an individual variation let me mention that the male from Meechken Island and the female from the Algan River have dark spots in the white background of the longest of the upper tail coverts. The wingspan ranges from 10.65 to 11.09 cm.

Apart from the white tail coverts and the small notch at their end, the lower wing coverts in the subspecies *D. u. lagopoda* are considerably darker than in the nominal *D. u. urbica* (L.), and a gray bloom can be seen along the sides of the breast not only in females but also in many males. The wing is somewhat shorter than in *D. u. urbica:* males 10.49 to 11.51, average 10.88 cm; females 10.13 to 11.02, average 10.62 cm. Measurements were taken of 24 males and 13 females.

*Range:* From lower Yenisey in the area 63° N of Turukhansk, from the upper reaches of the Angara and northwestern Mongolia (Ulyasutai) in the west to the midreaches of the Anadyr, and up to Amur at the point of its intersection with the Malyi Khingan range.

*Specimen*—1) Meechken Island, June 14, 1931, ♂, Belopol'skii.

### ***Hirundo rustica*** **L.—Barn Swallow**

Random intrusions are possible on the Chukchi peninsula.

On June 11, 1931, on Meechken Island in Krest Bay, L.O. Belopol'skii saw a swallow fly into a skin tent and disappear quickly. He identified it as a Barn Swallow, which does not seem improbable, but I am not recording this species under a separate number for want of more reliable finds.

According to a report of O.J. Murie (1936), a Barn Swallow was collected on St. Lawrence Island in the spring of 1934, and according to H. Friedmann (1939), another in the spring or summer of 1938 in Gambell village. F.H. Fay and T.J. Cade (1959) came across this swallow in Gambell village several times on the evening of June 12, 1953 and once on June 1, 1954. A dead specimen was found there on August 14, 1950.

A.I. Argentov (1861a, p. 493) mentions a "red-bellied swallow" and had in mind mostly the region of the Lower Kolyma in which this swallow actually nests. Argentov noted its arrival on May 20 (old calendar) and migration in early August. From there the Barn Swallow could fly into the environs of Chaun Bay.

*Systematics*—Flights onto the Chukchi peninsula are possible by the American subspecies *H. r. erythrogastra* Bodd., as well as the East Siberian subspecies: *H. r. tytleri* Jerd. or *H. r. gutturalis* Scop. O.J. Murie identified his find as *H. r. erythrogastra* and H. Friedmann as *H.r. gutturalis* although one could expect the flight of *H. r. tytleri,* a form typical of northeastern Siberia.

### 115. *Petrochelidon pyrrhonota hypopolis* Oberh.—Cliff Swallow

*Distribution and status*—This species intrudes randomly onto Wrangel Island. This is the first find in the Soviet Union.

One specimen was collected in the summer of 1939 on the Gusina River in the western part of Wrangel Island. On the morning of May 26, 1939, according to the observations of a meteorologist on duty, a pair of swallows landed on one of the houses in Rodgers Bay. The observer could describe no features worthwhile in identifying the species. According to persons wintering on Wrangel Island before me, a pair of swallows had flown into the station in the summer of 1937 and 1938. They remained there for some time and were very trusting, for example, flying into the dining room, disappearing, and reappearing. One person could recall that the swallows had a reddish neck. It is quite possible that this was the same pair of Cliff Swallows which had flown into the island for three consecutive years. However, only the specimen collected can be considered a reliable find.

*Systematics*—This swallow is similar to the Barn Swallow in color of throat and lower part of the neck, but differs notably in other respects. First of all, the tail of the Cliff Swallow is very faintly notched, the extreme tail feathers do not form thin elongations, and preapical spots are absent. As a result a transverse stripe is visible on a Barn Swallow in flight. Judging from the description, the Cliff Swallow is easily recognized in a flock of other birds from its red-colored upper tail coverts.

In general, coloration is quite variegated. A dirty white forehead is bound on sides and front by a black lore. The forehead, back of the head, and back are bluish-black with metallic luster. The basal part of each feather on the back is light gray. The upper part of neck is light brown. Upper surface of wings are dark brown and the flight feathers are almost blackish-brown. The upper tail coverts are red or brown and the tail feathers are blackish-brown. The underside of head, including cheeks, are chestnut-brown and darker than in the Barn Swallow. The ocherous-brown posterior part of the crop gradually turns red and merges into reddish-brown color of throat. Tiny blackish-blue spots along underside of neck form a longitudinal band (in the Barn Swallow band transverse). The abdomen is dirty white. The sides are ocherous-brown and the subcaudal part is reddish. The bottom tail coverts are brown with broad whitish borders. The axilla and wings are brown underneath. The female similar to the male.

The wingspan of my specimen is 10.85 cm. Of the specimens from America I measured, the wingspan in two males is 10.92 and 10.75 cm and in four females 11.02, 10.67, 10.50, and 10.47 cm.

The taxonomy of the subspecies is not clear to me due to inadequate comparative material. In recent reports (Committee of the American Ornithologists' Union, 1957, pp. 353–354; Mayr and Greenway, 1960, pp. 120–121) only one subspecies is mentioned, i.e., *Petrochelidon pyrrhonota pyrrhonota* (Vieill.), for the northern zone of North America. I.N. Gabrielson (gabrielson and Lincoln, 1959, p. 604), however, recognizes and includes two subspecies for this zone: *P. p. pyrrhonota* and *P. p. hypopolis* Oberh. Alaskan Cliff Swallows, according to his description, differ not so much in the pure white color of the forehead and the more ocherous and less grayish breast, as in the short wing—its most distinctive feature. If Gabrielson is correct, my specimen evidently should be called *P. p. hypopolis.* I earlier (Portenko, 1954, pp. 50–51) identified this swallow as *Petrochelidon albifrons albifrons* (Rafinesque).

*Specimen*—1) Wrangel island, Gusinaya River, June/July, 1939, ○, Portenko.

### 116. *Corvus corax kamtschaticus* Dyb.—Raven

*Local names*—Chukchian: uétl'khly, vél'fe, and ual'khvynngyn; uedlje in the records of the *Vega* expedition. In Eskimo: mytýkhluk in Providence Bay; mtŭkh'-luk on St. Lawrence Island.

*Distribution and status*—This species is a common nesting and resident species on the Chukchi peninsula and Wrangel Island. On the south and east coasts it is abundant at places; contrarily, it is extremely few in number on Wrangel Island.

According to L.O. Belopol'skii (1934), Ravens nested in the environs of Krest Bay. On March 16, 1931, he obtained a male on Cape Bering. It is possible that the specimen caught by Captain Moore (Harting, 1871) in the summer of 1849 originated from Plover Bay or some other point on the south or east coast of the Chukchi peninsula. T.H. Bean (1883) saw Ravens in abundance in Plover Bay on September 14, 1880. E.W. Nelson (1883, p. 73) has stated in very general terms that Ravens were equally common on the Chukchi and Alaskan coasts in summer as well as in winter.

L.M. Starokadomskii collected an adult male on September 24, 1912, in Providence Bay. According to I.O. Olenev, who wintered in 1931/1932, at least 12 pairs inhabited Providence Bay. In the winter they gathered in Urelik village where they were easily counted. On August 26 and 28, 1932, I met broods inhabiting Plover spit next to a flock of five birds, I saw a Raven in Émma Bay on September 7, 1934, in Providence Bay on July 12, 1938, and encountered a brood in Émma Bay on September 12, 1939. P.T. Butenko arrived in Providence Bay on October 29, 1937, and noticed Ravens throughout November in nearly all his tours. This species is recorded in his diary on 4, 6, 11, 12, 15, 17, and 25 November, but only once in December; he collected a specimen on December 27. In June, 1957, A.P. Kuzyakin saw a pair in one of the ravines between the knolls west of Providence Bay.

E.W. Nelson and G. V. Elliot (Nelson, 1887, p. 165) saw Ravens on St. Lawrence Island. According to A.M. Bailey (1926), R.W. Hendee during his short stay on this island in June, 1921, daily saw a small number of Ravens chasing birds in the bazaars. H. Friedmann (1932a) wrote that H.B. Collins considered this bird an extremely common nesting species and collected a female in Gambell village on August 16, 1930. O.J. Murie (1936) collected a male in Kukuliak village on August 29, 1933, and another on the cliffs near Savunga village on October 23, 1934. According to F.H. Fay and T.J. Cade (1959), Ravens are regular inhabitants of St. Lawrence Island but their population varies (and not in direct proportion to the number of voles available on the island). It nests in the hills near Gambell and Tapguk villages and also on the rocks near Boxer Bay. On July 7, 1950, a nest was seen from the sea on a high cliff at Cape Kaval'gak. In Boxer Bay, Ravens are encountered every year from June through August and, according to E.G.F. Sauer (Sauer and Urban, 1964), nest west of the bay.

According to P.T. Butenko, Ravens were regular inhabitants of Cape Chaplin. On April 18, 1938 on his way from Seklyuk village to Yanrakynnot village, he saw Ravens passing from time to time and also encountered them on April 21 on his way from Seklyuk to Cape Chaplin. In the catalog of J. Cassin (1863, p. 313), there is a reference to a specimen from Arakamchechen Island. Its dimensions were given by E.W. Nelson (1887, p. 167). W. Stimpson (Heine, 1859, p. 169) sighted a few Ravens in the coastal precipices of Senyavin Strait in mid-August, 1855.

As reported to me by E.V. Schmidt, many Ravens were evident close to Mechigmensk Gulf and in Lawrence Bay. In 1957, A.P. Kuzyakin found a nest between Akkani and Yandagai villages, and on July 12, a pair flew toward him 10 km west of the village in Lawrence Bay. V.V. Leonovich sighted solitary birds there on June 15 and 16, 1970.

I saw a Raven on June 25, 1934, on the peak of Bol'shoi Diomede Island. J.W. Brooks (Kenyon and Brooks, 1960) saw three Ravens flying from Bol'shoi Diomede into Little Diomede Island on April 25, 1953, and K.W. Kenyon saw a single bird there on June 1, 1958. Earlier, on May 14, 1958, a Raven was sighted over a water pool that had opened up south of Little Diomede Island. According to the eskimos, two or three Ravens regularly wintered on Diomede Islands and, at times, even nested on the highest peaks of Little Diomede Island.

Around Uélen village, according to my observations in 1933 and 1934, Ravens were abundant because food conditions were extremely favorable there. In the fall of 1933, I saw resting flocks of 10 to 15 birds. They gathered quite often in even larger numbers in the feeding ground and for a night's rest. Once, from a hideout under the rocks where ravens came to spend the night, I felled three in one shot in the evening twilight. These birds were invariably extremely cautious, but under conditions in Uélen where the Chukchians considered them sacred, remarkably trusting. This greatly facilitated my collection of birds and during the first half of winter I gathered a large series, which did not perceptibly deplete the population of Ravens! Sixteen Ravens were counted around a carcass on March 19, 1934, and five or six some distance away. On June 2, I saw a flock of 23 rise from the peak of a knoll nearby. Abundant food conditions tempted Ravens into Uélen village and they invariably flew into the neighborhood only singly or, at the most, in pairs. A.P. Kuzyakin visited Uélen village on June 29, 1957, and saw only a single Raven. His observations inclined him to regard this bird as a very rare species on the coast from Providence Bay to Uélen village. This is an incorrect assumption since the Raven is seen quite frequently in summer.

When I visited the interior of the Chukchi peninsula, Ravens were extremely rare and occurrences were associated with reindeer camps. During a trip along the Kol'oam-Véem River, from August 9 through 24, 1934, i.e., even in the postnesting season, I encountered them several times but probably these were birds of a single brood. On August 13, in the midreaches of the river, I saw a pair and then a lone Raven, and correctly predicted that a Chukchian nomadic camp lay in the vicinity. On the 14th, a lone bird passed by, and on my return journey, not far from the vicinity, I sighted a pair on August 20. On the 23rd, far below along the course of the river, a brood flew very close to me. Possibly this was the same brood I had seen in other sections of the river and also in the section of the Peregrine nesting area destroyed earlier. On the following day I noticed a pair in transit in the lower reaches of the river. I toured July 6 through 11, 1934, along the Utte-Véem River and saw a lone Raven only on July 9 at the farthest point of my journey along this river. In January, 1934, P.T. Butenko noticed Ravens in Inchoun village. Just short of Inchoun cliffs on July 2 of the same year, I saw a Raven in flight and therefore have no doubts that this bird nested there on the cliffs. On May 21, I traveled by dog sled from Mitkulen to Inchoun village and found a dying Raven on the hummocks after seeing a live one in Énmitagin village the day before. I came across Ravens from time to time on my way from Seitun to Mitkulen. On May 19, I traveled the rocky coast from Seishan to Seitun and encountered lone birds only at one or two places.

In 1914, F.S. Hersey (1916) noticed two or three Ravens on Cape Serdtse-Kamen'. V.V. Leonovich encountered Ravens in Énurmino and detected a nest on June 28. Five pairs were recorded on July 2 over a 30 km stretch of the seacoast. A Raven was sighted year-round at the winter anchorage of the *Vega* (Palmén, 1887) near Pitlekai. O. Nordquist noticed this bird at Cape Dzhénrétlen on September 27, 1878. In October A.A.L. Palander and F.R. Chel'man noticed and heard a pair in Pitlekai. Ravens were confined to the neighborhood throughout November (one was shot on the 23rd) and December, 1878, as well as January and February, 1879 (shot on February 5, 14, and 18). During a trip to Stolovaya mountain southwest of Pitlekai and Kolyuchin bay, a few Ravens were sighted on March 17 and 18. Mating was observed on April 20 through 26, later nests seen on one of the cliffs of Cape Dzhénrétlen, and eventually some eggs gathered.

On May 16, 1934, while approaching Cape Dzhénrétlen from the side of Kolyuchi Island, I saw two Ravens chasing Rough-legged Buzzards. On June 29, 1909, J. Koren (1910) found broods of Ravens on Idlidlya Island and noticed a pair inhabiting Kolyuchi Island in the first few days of July. In 1938, I once again thoroughly inspected the fauna of Kolyuchi Island but encountered only a pair by the settlement on July 26. On the morning of May 14, 1934, I had seen a Raven flying over Pnoupyl'gyn village west of Kolyuchin Bay and the day before heard its scream on Cape Onman. E. Almquist (Palmén, 1887) had recorded this species on Cape

Onman on September 26, 1878. According to a Chukchian named Yarak, who had earlier served in the expedition of R. Amundsen, Ravens nested on Cape Onman and only flew into Vankarém. Persons traveling from Uélen to Vankarém told me that Ravens were encountered everywhere near the villages in winter. During my journey by dog sled I stopped twice in Vankarém and spent in all 12 days in this village: April 24 through 28 and May 7 through 13, 1934. Only once, on May 11, did I hear the call of this Raven and later came across its tracks on the ice. In the interior of the country, around the midreaches of the Amguéma, in the summer of 1956 I encountered a Raven only once, on June 19. It appeared over the tundra before the onset of a cold snap with rain. I had been informed that it appeared there in winter prior to a snowstorm.

Even members of the *Vega* expedition during their residence on Cape Schmidt saw Ravens from September 12 through 18, 1878. According to A.A. Savich (Artobolevskii, 1927), a small population of resident birds lived on the coast. A pair was confined to Cape Schmidt from September 18, 1914 through June 30, 1915. A third specimen was sighted which disappeared later from fall to the end of September. V.Ya. Isaev informed me that he had encountered Ravens near Cape Schmidt, usually on the coast but at times in the hills where, however, they did not nest. The Chukchian named Yarak, referred to above, told me that this Raven nested on the rocks of Cape Schmidt; wintering personnel of the Polar Station could only state that ravens had been sighted. Early August, 1938, I saw them on Cape Kozhevnikov. O. Nordquist sighted a Raven on September 9, 1878, southeast of Cape Yakan. It is not without interest that this was the first Raven seen during the course of the *Vega* along the Arctic coast of Siberia. According to E.V. Schmidt, ravens were rare on Cape Schmidt and not seen in Pevek even once, nor in Chaun Bay and Baranikha. Yet they were common on the Kolyma, albeit not as numerous as around Uélen or on the east coast of the Chukchi peninsula. A.I. Argentov (1857a, p. 85) listed the Raven among the birds of Chaun parish and in particular (Argentov, 1857b, p. 39) among the regular inhabitants of Aiok Island. V.D. Lebedev and V.R. Filin (1959) sighted not one Raven on this island, however, in the summer of 1958.

A general reference to the north coast of the Chukchi peninsula is evident in reports. J. Koren (Thayer and Bangs, 1914) considered Ravens numerous along the entire Arctic coast covered by him, and states that a pair or more wintered in each village. C. Amory (Riley, 1918) also reported Ravens along the Chukchi coast. J. Billings (Sarychev, 1811, p. 58) wrote that during the winter when residents migrated Ravens flew with them everywhere; a few pages later (p. 61) he states that only Ravens were seen in winter. The hunter K.N. Yakovlev informed me that he had seen Ravens in March, 1939 in the upper reaches of the Yatachan River, a tributary of the Bol'shoi Anyui. F.B. Chernyavskii came across Ravens repeatedly in the summer of 1965 and 1966 in the hills in the northwestern part of the Chukchi peninsula.

J. Koren (Schaanning, 1954) collected a Raven in the Lower Kolyma on October 19, 1916, but this species was absent in Kolyma tundra. K.A. Vorob'ev (1963) saw it neither there nor in the tundra between the rivers Khroma and Indigirka. Thus, the northwestern boundary of the range of the subspecies *Corvus corax kamtschaticus* Dyb. runs somewhere east of Kolyma.

E.E. Arngol'd was the first to collect a Raven on Wrangel Island and did so on September 17, 1911 in the southwestern part at 70°53′ N 179°15′ E. In the diary of L. Night (Snyder, 1926, p. 19) a note was found about the sighting of a Raven on December 1, 1921. G.A. Ushakov (Bannikov, 1941) considered this bird a unique species that wintered regularly. A.I. Mineev (1936, p. 172) had written earlier that birds were almost absent in winter on the island and only the Raven was a regular inhabitant, though few in number. N.M. Vakulenko in his records left a note that on October 8, 1934, Ravens were rather frequently sighted in Rodgers Bay. According to my observations in 1938 and 1939, the Raven was a normal nesting and resident bird on Wrangel Island, but comparatively few in number and sporadic in range. In Tundra Akademii I did not encounter this bird even once. In the vicinity of Rodgers Bay Ravens appeared in the fall of 1938. During my fall and winter trips, I invariably encountered one to four Ravens. I saw a flying pair on May 7, 1939, but could establish no signs of nesting in the environs of Rodgers Bay. I heard their call in the estuary of the Klér River on May 13. Solitary birds and once a pair I saw above the coast on the way to Cape Pillar, where one pair probably nested farther away, toward Cape Uéring. I saw Ravens for the last time in different cliff sections and therefore presumed that a few pairs nested there. In the summer around Rodgers Bay I heard its scream only once, on June 5, far off in the hills. On July 14, I found a dead bird on the roof of a hunter's cabin near the estuary of the Amerikanskaya River. Judging from the degree of decomposition it had been shot down long before then. S.M. Uspenskii and his colleagues (1963) sighted no Ravens in the summer of 1960, but from the information given them five or six pairs nested on Wrangel Island. A.G. Velizhanin (1965) encountered this bird on the south coast on September 21, 1960. F.B. Chernyavskii wrote to me in 1964 that the only bird he saw in March on Wrangel Island was a Raven.

R.L. Newcomb, naturalist of the *Jeannette* expedition (1880, p. 280), noticed Ravens early in September, 1879, near Herald Island. One member of this expedition (De Long, 1883, p. 187) caught a Raven on November 30, 1879, at 72°36′ N 178°08′ W. According to the entries in the diary of E.De Long (1883, pp. 314 and 328), members unexpectedly came face to face with a Raven on April 9, 1880, near the ship; the bird later flew away and hid among large ice floes. On April 21, a Raven landed once again but dogs chased it. Because the bird turned toward northwest De Long held the faint hope that land lay toward the north. These observations took place relatively close to Wrangel Island.

*Habitat*—While in the Anadyr basin, nesting sites of Ravens are inseparably associated with wooded vegetation, even with large trees standing alone; in such a forestless country as the Chukchi peninsula or Wrangel Island they are confined to rocky coastal cliffs. I presume that the Raven is abundant on the hills and rocky sections of the south and east coasts of the Chukchi peninsula where it finds favorable places for nesting. In Providence Bay Ravens nest on very high rocks. In 1934, I attempted to establish whether Ravens nested on Dezhnev knolls and found that they did not, at least not on the knolls closest to Uélen with large boulders on the peaks; but there was no doubt that they raised broods on the cliffs facing the sea. Nevertheless, Ravens are genuinely fond of the tops of knolls since elevated points are convenient for surveying the locality over a long distance. It is no accident that on Bol'shoi Diomede Island I encountered Ravens in the upper sections. The nesting area visited by O. Nordquist on Cape Dzhénrétlen was located on a columnar steep cliff at a height of 10′ above the sea. On the low coasts west of Kolyuchin Bay Ravens did not nest at all, but colonized every fairly prominent cliff on the cape. According to G.A. Ushakov, on Wrangel Island this bird nested in the hills and rarely on the coastal cliffs. A.I. Mineev likewise told me that Ravens nested in the hills in the interior of the island and not on the coastal cliffs. My observations led me to conclude exactly the opposite. On the cliffs of Cape Uéring, Ravens were confined to the peaks and beyond rifle range. According to F.H. Fay and T.J. Cade, these birds nested on St. Lawrence island in the hills and on coastal rocks. The nest detected by A.P. Kuzyakin was located on the ledge of a steep, smooth stone wall and was totally inaccessible.

Ravens fly considerable distances from nesting sites, often very far out to sea in search of food (as shown by observations of members of the *Jeannette* expedition). I saw them flying along the coastline above plain tundra and above hummocks and apparently avoiding open sea. As fledgelings take to flight, Ravens gradually leave the cliffs and begin to wander as food conditions change, but nevertheless prefer to confine themselves to a hilly landscape, especially knolls with a rock scree.

According to A.A. Savich, in the winter of 1914/1915, Ravens were seen often on the hummocks close to Cape Schmidt. In the fall of 1933, I often saw Ravens in Uélen village returning from the sea where, no doubt, they found the remains of another bird's meal on the hummocks or along the edges of exposed water pools. On June 3, 1934, I noticed a lone bird confidently turning into the sea and suspected it had a definite site in mind.

*Seasonal phenomena*—Although Ravens in search of food perform distant flights, this species is, nevertheless, by and large a resident bird of the Chukchi peninsula. The suggestion of V.M. Artobolevskii that only strong adult birds remain on Cape Schmidt to winter, while young birds migrate for the cold season, is not confirmed by actual observations.

In the life of Raven it is difficult to track the sharp commencement of annual periodic phenomena. Courtship, according to my observations in Uélen, depended on weather conditions and was more intense in the fall of 1933 than in the spring of 1934. On August 30, I heard the characteristic scream with which Ravens perform aerobatics, but it was listless. Later, on days of good weather, such displays became livlier. On October 19, I had no difficulty in tracking the courtship of a Raven which flew above the knoll near Uélen village at a height of 500 to 600 m; broken monosyllabic sounds could be heard from time to time. It intermittently pressed one wing to its body with the other spread out and glided in a vertical plane to land sideways. The silhouette of this falling bird resembled a comet. It seemed to me that the drop was a few tens of meters. In other cases a Raven falling on its side later turned rapidly on its back, but did not perform a full dead loop such as I had seen, for example, among Booted Eagles in Podolin; instead it turned on the same side and finally assumed a normal position. Later in winter, these aerobatics were not in evidence. A.A.L. Palander and F.R. Chel'man heard the call of a pair of Ravens in Pitlekai in October, 1878. For quite a prolonged period, with short breaks, the birds emitted the sound "klong' with a sharp metallic timbre. In the diary of A.A. Savich, it has been recorded that the call of Ravens on Cape Schmidt on March 3, 1915, was something unique—an announcement of spring. On May 13, 1939, on the rocks of Cape Uéring the spring notes of Ravens could sometimes be heard which I transcribed with the syllables "kau-kau" in my diary.

Members of the *Vega* expedition observed mating from April 20 through 26, 1879. O. Nordquist visited the nesting site on Cape Dzhénrétlen on May 27, but found no eggs. Nests were built of twigs with grass laid inside and a few feathers on top. Chukchians brought the first egg from Dzhénrétlen on May 31 and the second on June 6. These eggs were 48 mm × 34 mm and 47.5 mm × 34.5 mm and weighed 1.95 g and 2.15 g.

I could not obtain April and May specimens; among the males I caught outside the period of mating, testes varied in size significantly (Table 29), which is evidently associated with the age of the bird.

**Table 29. Size of testes (mm) of Ravens**

| Date | Left | Right | Locality |
|---|---|---|---|
| June 24, 1934 | 8 × 5 | 6 × 4 | Uélen |
| August 25, 1931 | 6 × 4 | 6 × 4 | Lake Krasnoe (Anadyr) |
| September 18, 1933 | 5 × 3 | 4 × 2 | Uélen |
| September 27, 1933 | 8 × 3 | 7 × 3 | -do- |
| November 10, 1933 | 5 × 3 | 4 × 2 | -do- |
| November 16, 1933 | 4 × 2 | 3 × 2 | -do- |
| November 20, 1931 | 3 × 3 | 2 × 2 | Markovo (Anadyr) |
| November 28, 1933 | 6 × 3 | 5 ×3 | Uélen |
| December 13, 1933 | 4 × 2 | 3 × 2 | -do- |

Of the 11 females caught in the fall, a fine-grained structure of ovary was seen in adult specimens but not in young birds. The length of the ovary in a female caught by P.T. Butenko on April 26, 1938, on Cape Chaplin was 14 mm. For some unknown reason the ovary of a female caught in Plover on November 11, 1937, contained the largest follicles, upto 17 mm in diameter.

On June 24, V.V. Leonovich noticed on the rocks of the seacoast in Énurmino a pair of Ravens together with Glaucous Gulls. On June 28, a nest was detected on a butte with grown-up chicks. A brood of two young birds and an adult was encountered on July 12. On June 29, 1909, J. Koren found chicks on Idlidlya Island which were still half plumed. A photograph of a nest with chicks was taken by H.B. Collins (Friedmann, 1932a, Pl. 4) near Gambell village. On June 24, 1957, A.P. Kuzyakin found tiny feathered Ravens in a nest on the coastal cliffs between Akkani and Yandagai villages.

On August 26 and 28, 1932, on Plover Bay, I noticed broods remaining by a flock of five birds. The young had still not learned to fear man and landed close to me on a coastal spit, then on the snow face, and more often in fact on the rocks of a cliff; they followed my actions with marked curiosity. At the outset of my hunt for birds inhabiting the cliffs, young Ravens accompanied me, and were only later frightened off by rifle shots. A.P. Kuzyakin related to me an incident (July 12, 1957) in which a pair of adult Ravens came quite close to him, evidently attracted by some type of meat prepared from cranes.

I came across complete broods in the last ten days of August. In September, I no longer encountered young birds of a particularly trusting nature. I noticed flocks until late fall which, probably, had formed partly from the earlier broods.

At the end of August, I caught Ravens on the Chukchi peninsula. These birds were in the process of molting from juvenile to adult plumage. On Wrangel Island I shot a young bird on September 13, 1938, which had not yet completely molted.

*Food*—Under the conditions of the country under description, there is no doubt that Raven is a predator to some extent. E.W. Schmidt told me that Ravens attack helpless young deer left behind by their mothers, but do not attack when the mothers are present. According to O.W. Geist (Murie, 1936), mice and lemmings are the favorite food of Ravens on St. Lawrence Island. He saw Ravens with a field vole in their beak and on one occasion shot the bird and took both it and its victim for his collection. At the end of September, 1938, I saw Ravens attack young cormorants resting on ledges in the rocks near Uélen. They tried to tumble them down the cliff. In the stomach of one Raven I found the fur of a small mammal and in another the white feathers and gray down of some birds. The stomach of a young female caught on Wrangel Island on September 13, 1938, contained four strips of parchment up to 7.0 cm long, remains of odd waste matter, shreds of meat, four feathers (probably its own), and a mushroom.

The appearance of a Raven in the tundra at the nesting sites of small birds invariably induces alarm calls. A.I. Mineev noticed that jaegers and sandpipers invariably exhibited restlessness at the sight of a Raven. In Uélen, these birds were permanent inhabitants and hunters left some quarry behind for them. They scrutinized the places where we camped and once, on October 1, 1933, a Raven took a Dunlin shot down right before my eyes. This was a tiny sandpiper which had fallen on extremely thin ice that I dared not traverse and the feathered predator took full advantage of my predicament! In my Anadyr work (Portenko, 1939b, I, p. 32) I have narrated an instance in which Ravens led me to wildfowl they detected. A similar instance occurred on October 19, 1933, when I went to the top of the knoll closest to Uélen together with P.T. Butenko. A couple of Ravens drew our attention to something moving not far away, sometimes by flying toward us and sometimes by with-drawing to piles of large rocks. They seemed to be beckoning us to the rocks and going there, we found a hare in hiding. The Chukchians told N.P. Sokol'nikov that when a Polar bear moved onto land and rested during the day somewhere on an elevated place, Ravens pointed out its location to the people by cawing and flying over the bear. Evidently this bird points out to man the location of other wildfowl, secure in the knowledge that it will ultimately share in the booty.

Ravens live on prey falling in traps as well as bait used for trapping and thereby at times get trapped themselves. I once found the track of a Raven near the scattered bait of a trap I had set. The trap was entirely covered with snow but nevertheless from the bird track it was obvious that the Raven had scented the meat but was afraid to touch it. Ravens accompany the hunt not only of man and bear, but also of feathered predators. A falcon stayed near Uélen toward the end of September, 1933, and on each of my trips I saw Ravens accompanying it. Ultimately the falcon had to abandon Uélen because of too many spectators!

The above notwithstanding, the main food of Ravens is carrion and garbage. In the fall of 1933 in Uélen dogs died en masse and Ravens had a field day. Colonies of them sat on the carcasses and their remains in company with Glaucous Gulls. I invariably noticed an association between these two species of birds which, from its outward manifestation, could be termed "mutual respect based on contempt". If two dogs lay in a row, Ravens perched on one and the gulls on the other. If a gull flew to carrion, the Raven withdrew, and at times vice versa. These birds did not form close associations nor mix to form a united flock.

According to A.I. Mineev, toward the end of September, Ravens appeared on the lowland coasts of Wrangel Island where they could find discarded carcasses of seals on the spits. After gathering around a meat prize, a flock often indulged in din and quarrel. In spite of the fact that the frozen seal at –40° C became as hard as glass, the Ravens pecked at it, without success. According to J. Koren, a pair or more lived in each village on the Arctic coast of the Chukchi peninsula throughout winter and fed on the refuse of seals and walruses.

The ancient custom of the Chukchians to leave the dead in the open without a coffin provided Ravens with another source of food, whereby they were considered sacred. When some Chukchians from Uélen saw me with Ravens I had shot, they expressed mournful displeasure. To avoid further offense to my friends, I was compelled to hunt for Ravens on the sly. Once I witnessed the disposal of the corpse of a Chukchian girl. On top of the knoll the procession was welcomed by the cawing of a pair of Ravens which quite upset the mourners. In truth it was a chilling reception.

T.H. Bean (1883, p. 159) has described how once he pretended to be dead on the cape of a spit and watched Ravens approach him. They came to his head with obvious pleasure, cawing hoarsely at times when new birds arrived. For some reason they performed a strange ceremony; hopping one over the other they picked up a bit of moss with a rock, again hopped, and picked up a stone of ordinary size. It looked as though they were trying to point out that some sort of food lay hidden underneath. Sometimes one would put on a show of having found a morsel, and when another would try to snatch it the first stood firm and teased the other.

In October, 1933, on one of the unfrozen tiny springs on Vtoraya brook near Uélen, I conjectured from snow tracks that Ravens came there to drink.

The large number of specimens I caught displayed various degrees of obesity. Some were totally devoid of subcutaneous adipose deposits, some extremely obese, and some with intermediate gradations. Eleven were emaciated and 13 fairly obese with adipose formations. From the nature of their food habits one could naturally expect that on occasion they find enough to satiate, while at other times, especially in winter, they go hungry.

*Weight*—A female caught in Plover on November 11, 1937 weighed 1,500 g.

*Economic importance*—The damage caused by the activity of Ravens is assessed primarily in terms of loss of game. According to A.I. Mineev, the hunter S.A. Skurikhin deliberately destroyed a Raven's nest in the western part of Wrangel Island since the bird inflicted injuries on foxes held in traps. In the opinion of Chukchians, the damage caused by the Raven is insignificant and tolerable. Chukchians primarily value the Raven for its sanitary role and consider it to be sacred. According to Kiber (1824b, p. 119), to dream of a Raven was considered a good omen by these people.

From the viewpoint of organized game hunting, the Raven on the Chukchi peninsula and especially on Wrangel Island is not a desirable element of the local fauna.

*Systematics*—I discussed the northern subspecies in detail in my *Fauna of Anadyr Region* (Portenko, 1939b, part I, pp. 33–34). I placed Chukchian and Wrangel Ravens in the subspecies *C. c. kamtschaticus* Dyb., which extensively ranges in East Siberia. After the publication of my revision, I obtained five more specimens, all females: 1) Plover, November 11, 1937, wingspan 440.2 mm; 2) Plover, December 27, 1937, wingspan 455 mm; 3) Cape Chaplin, April 26, 1938, wingspan 442 mm; 4) Rodgers Bay, September 13, 1938, wingspan 430 mm; and 5) Rodgers Bay, September 29, 1938, wingspan 439 mm. These wingspans do not exceed the range of values given in the Table on p. 33 of the work mentioned above.

*Specimens*—1) Southwestern part of Wrangel Island, September 17, 1911, ♂, Arngol'd; 2) Providence Bay, September 14, 1912, ♂, Starokadomskii; 3) Cape Bering, March 16, 1931, ♂, Belopol'skii; 4) Rodgers Bay, February 1, 1932, O, Vlasova; 5) Providence Bay, August 28, 1932, O 1° anno, Portenko; 6) Rodgers Bay, September 24, 1932, ♀, Vlasova; 7) Uélen, August 20, 1933, ♀, Portenko; 8) same site, September 12, 1933, ♀, Portenko; 9) same site, September 18, 1933, ♂, Portenko; 10) same site, September 23, 1933, ♀, Portenko; 11 and 12) same site, September 27, 1933, ♂♀, Portenko; 13 and 14) same site, September 30, 1933, ♀♀, Portenko; 15) same site, October 1, 1933, ♀, Portenko; 16) same site, November 10, 1933, ♂, Portenko; 17 and 18) same site, November 16, 1933, ♂♀, Portenko; 19 to 21) same site, November 28, 1933, ♂♀♀, Portenko; 22) same site, December 13, 1933, ♂, Portenko; 23) same site, June 24, 1934, ♂, Portenko; 24) Providence Bay, Plover, November 11, 1937, ♀, Butenko; 25) same site, December 27, 1937, ♀, Butenko; 26) Cape Chaplin, April 26, 1938, ♀, Portenko; 27) Rodgers Bay, September 13, 1938, ♀ 1° anno, Portenko; and 28) same site, September 29, 1938, O 1° anno, Portenko.

### 117. *Corvus corone orientalis* Eversm.—Carrion Crow

Very rare and random flights into the north coast of the Chukchi peninsula from the Kolyma side have been recorded.

A.I. Argentov (1857a, p. 85) mentioned the Carrion Crow along with Ravens. Within the boundaries of Chaun parish he included the Anyui tributaries, and it is quite probable that the Carrion Crow penetrated there from Kolyma. In another article (Argentov, 1861a, p. 485), it is stated that the Carrion Crow arrived in the middle of April (old calendar), but the place is not indicated. According to a report of J. Koren (Thayer and Bangs, 1914), a bird, probably a stray, was sighted in Chaun Bay on August 6, 1912. E.W. Schmidt told me that he had never encountered the Carrion Crow there during his visits to the different coastal sections of the bay. It is evident that the Carrion Crow was sighted by members of the *Vega* expedition (Palmén, 1887) at the winter anchorage near Pitlekai. On May 31, 1879, the industrialist P. Johansen returning from an exposed water pool to the ship, found a bird which he took for a Carrion Crow. T.A. Bostrem, hunting at the same time, also indicated that he had sighted this crow. The foregoing reports exhaust my information on the flight of Carrion Crow.

### 118. *Oenanthe oenanthe oenanthoides* (Vigors)—Northern Wheatear

*Local names*—Chukchian: utteradlin, also applicable to other small fowl; in the records of the *Vega,* makatodljongadlin.

*Population and status*—This species nests everywhere on the Chukchi peninsula, in small numbers, yet is commonly sighted. It nests on Wrangel Island but is rare.

In June, 1961, V.E. Yakobi noticed Northern Wheatears evidently nesting in Uél'kal' and its vicinity. He caught two males on June 11 and 30. L.O. Belopol'skii (1934) found broods in mid-July of 1931 around Krest Bay and observed their arrival on Meechken Island.

W.S. Brooks (1915) caught a Northern Wheatear in the upper part of Providence Bay in the first half of June, 1913. This species was rare there. I caught nesting Northern Wheatears in Émma Bay on August 11, 1932 and in Providence Bay on July 12, 1938. P.T. Butenko had a much larger collection than mine, including four summer specimens. A.P. Kuzyakin encountered two nesting pairs on June 10, 1957 in Providence Bay.

The Northern Wheatear nests on St. Lawrence Island, but in small numbers, and is more often seen in the flight period. According to O.J. Murie (1936), a male was caught on August 22, 1930 and another on August 18, 1931. H. friedmann (1937, p. 91) reported that a Northern Wheatear was collected near Gambell village in August, 1936, F.H. Fay (Fay and Cade, 1959) daily noticed these tiny birds in the second and third week of August, 1953, and later in July and September, 1956 on Lake Trautman near Gambell village in numbers of one to three birds. Young females and males were caught on August 13 and 15, 1953. Moreover, a young specimen was shot on Kuzata lagoon on August 19, 1957. E.G.F. Sauer and E.K. Urban (1964) noticed a pair on July 12 and 23, 1960, north of Boxer Bay and later, on July 11, by one of the lakes in the neighborhood. Broods were often encountered from the end of July and in August.

On the east coast of the Chukchi peninsula, the Northern Wheatear has been collected several times and is not a rarity. In the collection of the Institute of Zoology, Academy of Sciences of the USSR is preserved a specimen brought in by I.G. Voznesenskii from Mechigmensk Gulf. This is a young bird that was caught on July 10, 1843. The *Vega* expedition (Palmén, 1887) sighted the Northern Wheatear on July 21, 1879, in Nunyamo village at the entrance to Lawrence Bay. I came across a brood of them on August 19, 1932 and shot one near the cultural reserve on the south coast. V.N. Lyubin likewise caught there a male on July 30, 1948. In July, 1957, A.P. Kuzyakin encountered Northern Wheatears between Akkani and Yandagai villages, also around the village in the strait, and found a nest with chicks by the lake south of the strait. This bird was reported by A.P. Kuzyakin as very rare. Finally, V.V. Leonovich found it in Lawrence Bay in 1970. F. Dyufresi (Gabrielson and Lincoln, 1959, p. 668) caught a Northern Wheatear on August 29, 1929 on Malyi Diomede Island. K.W. Kenyon (Kenyon and Brooks, 1960) saw a pair on June 2, 1958 and caught a female. In 1778, J. Cook's expedition (Streseman, 1949, p. 251) found a Northern Wheatear in the ice fields between Asia and America.

W.S. Brooks obtained this bird in the first half of June, 1913 near Cape Dezhnev and considered it rare. Around Uélen, I saw Northern Wheatears mostly during flights, which were weakly manifested in the fall of 1933 and well defined in the spring of 1934. They evidently did not nest in the immediate vicinity of the village. V.N. Lyubin caught a female in flight in Uélen on August 21, 1948. In 1957, A.P. Kuzyakin sighted this species in the vicinity.

During my journey along the Kol'oam-Véem River to Lake Kool'ong and environs from August 9 through 24, 1934, I saw wheatears, mostly young birds and quite often with broods, almost every day. There they were common but not abundant. On July 12, 1934, I saw a Northern Wheatear on the west coast of Inchoun lagoon. From July 6 through 10, 1934, I came across many more Wheatears at favorable sites along the banks of the Utte-Véem River than at any other place in the Chukchi peninsula.

J. Koren (1910) noticed Northern Wheatears near the Shelton River estuary on the north coast (south of the Polar Circle) on June 27, 1909. In July, 1970, V.V. Leonovich found wheatears in nesting sections in Énurmino. In the spring of 1879 these birds were sighted by members of the *Vega* expedition (Palmén, 1887) in flight near Kolyuchin Bay in fairly large numbers. A female was shot at Cape Dzhénrétlen on May 31 and a few birds caught in Pitlekai, Tapkan, and Dzhénrétlen on June 1, 2, 8, and 9. On June 13, five specimens were brought from Padl'onna and on June 15, wheatears were sighted at Dzhénrétlen; by June 27 they had disappeared from these sites altogether. I.A. Palmén expressed the view that Northern Wheatears regrouped in the hills deep inside the country. I would add that their disappearance no doubt affected their flocking.

In June, 1909, J. Koren found the Northern Wheatear in small numbers on

Kolyuchi Island. In his subsequent tours he came to the conclusion that although the Northern Wheatear was widely distributed throughout the Arctic coast of the Chukchi peninsula, it could not be considered common anywhere.

The collection of the Institute of Zoology, Academy of Sciences of the USSR contains two young birds which flew onto the freighter *Vaigach* on August 27, 1911, during its anchorage 1 to 2 miles from Cape Vankarém. A.A. Kishchinskii came across nesting Northern Wheatears at places in the marine tundra from Vankarém to the Amguéma. On the Amguéma lagoon, from July 4 through 6, 1970, pairs (see Figure 23) were encountered 100 to 200 m from each other. A young specimen was collected by J. Koren (Thayer and Bangs, 1914) on August 27, 1911, in the Amguéma estuary. I found Northern Wheatears not very rare on the nesting areas near midreaches of this river. At least two pairs nested in the immediate vicinity of the Kilometer 91 village. In the surrounding knolls these birds were common. E.M. Meller brought me two specimens from Pereval'naya—a male caught in spring flight and a young bird caught during the nesting season.

C. Amory (Riley, 1918) collected a young male on August 17, 1914, on Aiok Island (wrongly printed in this article as "Ayan"). According to V.D. Lebedev and V.R. Filin (1959) Northern Wheatears were encountered there not so rarely. In 1958, pairs were sighted 3 and 7 km south of the village. On the south coast of the island on June 16 a pair, evidently nesting, was seen. On July 3, a female was collected, probably near her nest since she called an anxious note, and another one was sighted on July 29. F.B. Chernyavskii found Northern Wheatears on the North Anyui range: in 1965 in the upper reaches of the Yarak-Véem River, and in 1966 in the upper reaches of the Enmen-Véem River.

On July 6, 1912, J. Koren found a nest with chicks on Cape Bol'shoi Baranov (Kamen'). C. Amory likewise caught there a male on August 11, 1915. The collection of J. Koren (Schaanning, 1954) contained three nesting specimens from the Kolyma delta (male and female, July 9, 1917; male, July 10, 1917) and also a young bird from the Lower Kolyma (August 17, 1917).

E.W. Nelson (1887) expressed surprise at not finding the Northern Wheatear on the Chukchi coast and on St. Lawrence and Wrangel islands, but found it in Alaska. Since the Northern Wheatear flies through the Chukchi peninsula and is common in flight in Uélen, one hopes it was only bad luck that Nelson did not sight this bird.

One must mention the peculiarity of distribution of the Northern Wheatear on the Chukchi peninsula. I did not find it on Bol'shoi Diomede Island nor on Kolyuchi Island, yet it occurred everywhere along the coastal zone in small numbers and in far larger numbers inside the country. Being an insectivore, naturally it is numerous at places where insects abound. The island and coast swept by winds from the sea represent less favorable conditions for insects. That is one reason why reindeer turn to the shore to escape from insect pests.

On Wrangel Island I first noticed Northern Wheatears in the fall of 1938. Returning from Tundra Akademii on August 28, I met with two Wheatears at the foothills of knolls near Rodgers Bay. One was a young bird. On September 5, I came across a similar young bird in the valley of a brook slightly westward. B.N. Gorodkov returning from a trip to Berry peak reported that he had seen Northern Wheatears in the hills. In 1939, I caught a calling male on May 28 in Rodgers Bay and sighted another in the valley of the lower reaches of the Mamontovaya River on June 7. I sighted a female on the southern slope of Atternon mountain on June 27, and in August again sighted wandering Northern Wheatears before migration: one on the 16th on the same brook west of the station and two on the southern slope of Atternon mountain, one on the 22nd in the environs of Rodgers Bay, and two on the 24th near the Polar Station. Thus, I was able to establish beyond doubt that the Northern Wheatear nests on Wrangel Island and resides there in very small numbers.

Two Northern Wheatears flew onto the *Maud* (Schaanning, 1928) when it lay in the Arctic Ocean at 75° N 165° E. They were caught on June 1 and 2, 1923, and proved to be a male and female, i.e., evidently a pair. This find conclusively showed that Wheatears move in pairs in their spring flight.

*Habitat*—The Northern Wheatear at times inhabits extremely inhospitable sites with nothing but insects. It is primarily an inhabitant of rock scree on knolls irrespective of their height. I encountered the Northern Wheatear many times on knolls by the Amguéma and on Wrangel Island, more often on slopes with a southern exposure. It is confined to fine rubble sections, very dry places on the peaks of knolls, and rocky beds of spring streams which dry up in summer. K.W. Kenyon encountered a pair among large stone boulders at the edge of a flat apex on Little Diomede Island.

On the coasts of the Utte-Véem River, I came across large numbers of Northern Wheatears on sand dunes of different heights. These dunes were totally exposed or overgrown with tundra vegetation. Due to their sand base, the hillocks were well heated by the sun and served as a refuge for several insects. On the seacoast Northern Wheatears nested along the precipices. In July, 1970, A.A. Kishchinskii found nesting sites in the peat-covered cliff tops along the coast of the Amguéma lagoon and in the estuary of this river. V.V. Leonovich encountered Northern Wheatears along the dry rocky sections of tundra on Lawrence Bay and along the precipices of the rocky coast at Énurmino and even right in the village itself. J. Koren found a nest in a small settlement on a steep rock on the bank of Bol'shoi baranov (Kamen' ). On Aiok Island, according to V.D. Lebedev and V.R. Filin (1959), Northern Wheatears nested along the precipices among driftwood and dune exposures. In Uél'kal', V.E. Yakobi noticed Northern Wheatears close to the shore itself where they evidently nested in the old burrows of squirrels. They were more often encountered in flight on pebbled spits with extremely poor coastal vegetation.

L.O. Belopol'skii noticed the first arriving Northern Wheatears on Meechken Island on puddles in ice. On June 15, 1879, at the end of flight near Dzhénrétlen, wheatears remained among large flocks of tiny birds which found abundant food in the form of insects on puddles along the coastal hillocks. On June 12, 1956, by Kilometer 91, I saw from the window a Northern Wheatear fly to a rubbish heap on the snow in inclement weather and an end-of-winter atmosphere. Snow Buntings and White Wagtails accompanied it. On July 9, at the same site Northern Wheatears were found on a new building together with wagtails of both species, redpolls, and

Fig. 21. Bluethroat *Cyanosylvia svecica* (L.) on its nest. Amguéma by Kilometer 91. July 10, 1956.

Fig. 22. Nest of Bluethroat *Cyanosylvia svecica* (L.) with chicks. Amguéma by Kilometer 91. July 10, 1956.

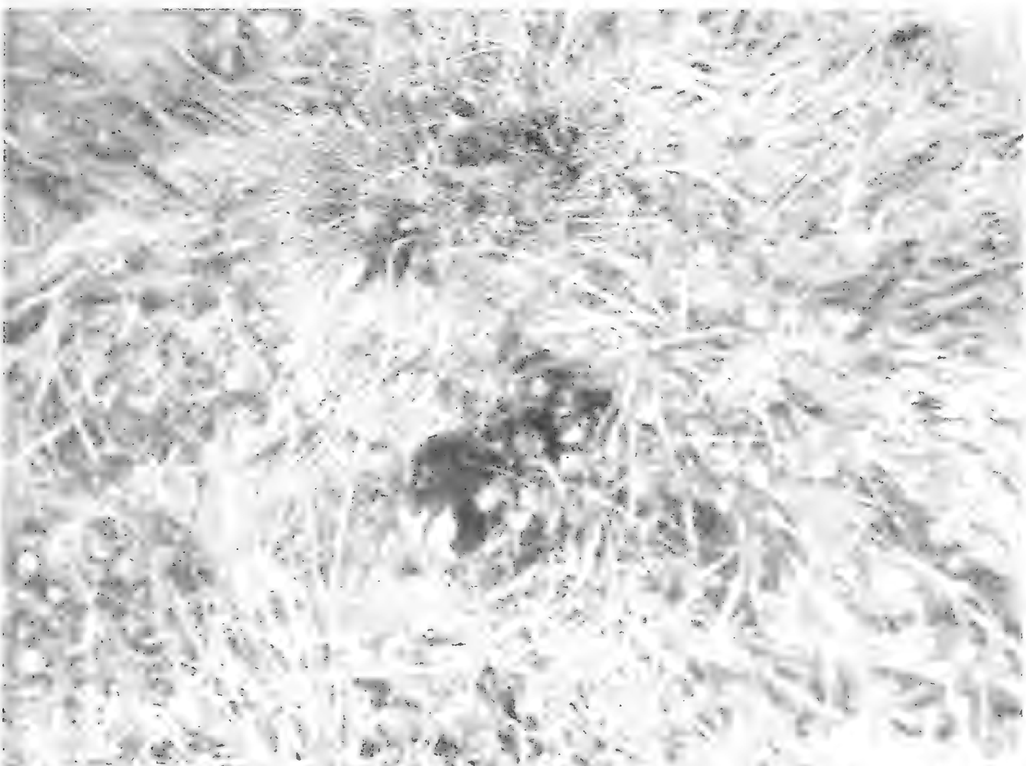


Fig. 23. Male Northern Wheatear *Oenanthe oenanthe* (L.). Amguéma estuary. July 7, 1970. Photo by A.A. Kishchinskii.

Fig. 24. Yellow Wagtail *Budytes flavus* (L.). Amguéma River, by Kilometer 91. July 14, 1956.

Lapland Longspurs. They sought food in debris and other waste matter and found refuge from the wind and cold in uncompleted cabins. It was strange to find Northern Wheatears and Yellow Wagtails sitting on wires. On Wrangel Island a calling male sat on a wire attached to a pole inclined at an angle of 60° to the ground. Such a posture appeared extremely uncomfortable but I often saw this bird sitting on that wire.

Northern Wheatears do not colonize marshes and wet tundra, but nest on dry and in particular elevated tundra with some rubble piles, precipices, etc.

Not only are they unafraid of the closeness of human residences (although they are extremely cautious birds), they often even remain in the immediate vicinity of houses or yarangas*. During the fall flight, on September 1, 1933, I encountered a few Northern Wheatears on fallen fruit near Uélen. They had been attracted to Uélen by a proliferation of insect larvae on the carcasses of dead dogs. Wheatears often visit garbage dumps in villages.

*Arrival*—Northern Wheatears arrive in the last few days of May. On Meechken Island the first specimen was recorded by L.O. Belopol'skii on May 25, 1931, and E.M. Meller caught an arriving male on May 26, 1939 in Pereval'naya. In the spring of 1934, according to my observations in Uélen, the first lone Northern Wheatear appeared at the top of a knoll on May 25. On the way from Dezhnev village to Uélen on May 27, I came across Northern Wheatears singly and in small groups. On May 31, I encountered small pairs at different places around Uélen but at the same place at the end of the evening tour as at the beginning of the day. The birds did not settle, however, and were seen in the days to follow at other places. This observation confirms that pair formation, as mentioned earlier, takes place at least in some birds during the flight period. I noticed the last wheatears in flight around Uélen on June 3. According to the records of the *Vega* expedition, in the spring of 1879 the first Northern Wheatear, a female, was sighted on Cape Dzhénrétlen on May 31. On Wrangel Island I noticed the first Wheatear in Rodgers Bay on May 28, 1939.

The dates listed above pertain to the first appearances of these birds. Flight evidently extends almost up to the middle of June. In 1913 in Providence Bay, W.S. Brooks noticed very cautious Northern Wheatears in the first half of June, which appeared to be on migration. On St. Lawrence Island, E.G.F. Sauer saw the first pair on June 12, 1960 and noticed them again on June 23. K.W. Kenyon noticed a pair on Little Diomede Island on June 2, 1958. These birds were extremely cautious. At the winter anchorage of the *Vega* and nearby Northern Wheatears were caught in the spring of 1879 right up to June 15 inclusive. On the Amguéma I noticed the first Northern Wheatear on June 12, 1956, but it arrived at Kilometer 91 only on June 9, on which date the first appearance of this species could be entered.

*Breeding*—Northern Wheatears begin to call almost immediately after arrival. On Wrangel Island on May 28, 1939, a male called so animatedly that he literally soared in the air with a song. On June 7, I heard another Northern Wheatear calling

*yavanga = a skin tent used by Chukchian hunters—Ed.

near the nest of a Snowy Owl in the Mamontovaya River valley. Following inclement weather, June 13 on the Amguéma was a calm sunny day; a male took off here with a scream of "chekkhvyit, chekkhvyit". Northern Wheatears commenced singing around knolls on June 20. The short and fairly simple song consists of gurgles and is rendered differently by individual males. When they hop on the ground with females in search of insects, one knows their singing has terminated. Yet A.P. Kuzyakin heard a male calling in Providence Bay on June 10, 1957, after the female had already begun building the nest. V.D. Lebedev and V.R. Filin heard calls on Aiok Island on May 30, 1958.

The testes of the males were very well developed from the moment of arrival (Table 30).

**Table 30. Size of testes (mm) of Northern Wheatears**

| Date | Left | Right | Locality |
|---|---|---|---|
| May 22, 1932 | 7 × 4 | 6 × 4 | Main River, Anadyr tributary |
| May 26, 1939 | "with a pea" | | Pereval'naya |
| May 27, 1934 | 10 × 7 | 9 × 6 | Uélen |
| May 27, 1934 | 9 × 7 | 8 × 5 | -do- |
| May 28, 1939 | 7 × 5 | 5 × 4 | Rodgers Bay |
| May 31, 1934 | 8 × 5 | 7 × 4 | Uélen |
| May 31, 1934 | 7 × 5 | 6 × 4 | -do- |
| July 6, 1934 | 7 × 4 | 5 × 3 | Utte-Véem River |
| July 12, 1938 | 3 × 2 | 3 × 2 | Providence Bay |
| July 18, 1933 | 2 × 1 | 1 × 1 | Gek (Anadyr region) |
| August 19, 1932 | 1 × 4 | 1 × 4 (juv.) | Lawrence Bay |

Two females shot in Uélen on May 31, 1934 had ovaries with a fine-grained structure, while a female caught on June 2 had a follicle about 4.0 mm in diameter. The ovary of a female from Providence Bay on July 6, 1938, was 7.0 mm long with a fine-grained structure. This bird had a large brood patch. A filmy ovary was seen in young August females. The ovary of a female caught by the *Vega* expedition on June 2, 1879 contained tiny follicles.

Almost all the Northern Wheatears brought by me from the Chukchi peninsula and from Anadyr region had subcutaneous adipose deposits which, at times, were considerable, although the summer birds were emaciated—a male from the Utte-Véem River on July 6, 1934, and a female from Providence Bay on July 6, 1938. A female I collected six days later, however, had remnants of isolated subcutaneous fat. Fall specimens, adult and young birds alike, were obese. Northern Wheatears in spring were slightly inferior in this respect, with the sole exception of a male caught on the bank of the Main River on May 22, 1932, under conditions of winter snow. This bird was totally devoid of subcutaneous adipose deposits.

I found a nest of Northern Wheatears near Km. 91 on the Amguéma on June 22, 1956. It was built in a depression under a rail projecting from the edge of an incomplete causeway and was a cumbersome, but loose and soft, saucer-shaped structure 12 to 14 cm across, consisting of extremely thin dry stalks. The trough, 3 to 4 cm deep, was spread with a thick layer of fur, mostly deer, interwoven with three tiny white feathers of partridge, dark-colored feathers, a shred of furry skin from a field vole, a lump of white dog's underfur, etc. In the nest were five eggs of a grayish-white color with a bluish tinge that intensified on dusting them. I noticed three reddish-brown spots on one and a single spot on another. A whitish air bubble and yolk were visible through the shell. The eggs were 21.8 mm × 14.5 mm, 21.6 mm × 15.5 mm, 21.4 mm × 15.8 mm, 21.2 mm × 15.5 mm, and 20.9 mm × 14.9 mm. The clutch had not been incubated. When I took away the nest the female sat nearby on a telegraph wire. I saw her on the same wire two days later and then she disappeared.

On June 23, 1966, F.B. Chernyavskii detected a nest in the upper reaches of the Énmen-Véem River located under a stone slab. It contained just two eggs.

I encountered a male and female energetically catching insects for their chicks on the Amguéma on July 4, 1956. On July 16, on the knolls a male flew very close to me and a brood was probably nearby. On July 8, 1970, V.V. Leonovich found a nest disposed under a roof in Énurmino. The day before, July 7, flying fledgelings had been sighted. On July 3, 1970 A.A. Kishchinskii detected a nest with four nestlings in pin feathers. This nest was built in a small cave under collapsed turf in a high coastal precipice on Amguéma lagoon. From July 14 to 16, a pair with flying fledgelings was sighted on the precipices of Nutauge spit, and on July 20 broods on the dry grassy Vankarém spit. The nest found by J. Koren on Cape Bol'shoi Baranov on July 6, 1912, contained nestlings roughly one week old. South of Lawrence Bay, on July 12, 1957, A.P. Kuzyakin found five feathred chicks and a degenerate runt egg in a wheatear nest.

The remains of nest plumage were almost totally replaced by postnesting plumage in a young male from Mechigmensk Gulf on July 10, 1843. Yet the plumage of a young bird from Pereval'naya on July 31, 1939, consisted of an almost equal mixture of nest and postnesting plumage. One chick collected in Sireniki village on August 4, 1938, had not so much as a single feather of postnesting plumage. In an adult male from Lawrence Bay on July 30, 1948, the tail and most of the flight feathers were in a state of intense growth.

*Departure*—In 1934, I noticed wandering young birds for the first time on the Kol'oam-Véem River on August 11, and in 1939 on Wrangel Island on August 16.

Northern Wheatears migrate at the end of August and early September. In 1933 in Uélen I saw the last of them on August 28 and September 1; in 1938 on Wrangel Island, on August 28 and September 5, days of sharp cooling and snowfall. In 1939, even on August 24 I saw two Northern Wheatears. The weather was calm and warm, the sun shone almost throughout the day, flies buzzed on the knoll and mosquitoes at its foothills. In the evening the wind turned bitterly cold and by the 25th there was so much snow that it partly covered the soil. Unfortunately, I had stopped recording observations by August 28.

On St. Lawrence Island, E.G.F. Sauer noticed the appearance of broods in early August, 1960. From that time they gradually advanced toward the coast where they were still seen from August 14 through 20.

*Food*—The following contents were found in the stomachs of specimens caught: 1) Émma Bay, August 11, 1932. Bit of head of a large curculionid, heads of 2 small beetles, 2 beetle larvae, heads of 10 small hymenopterans, heads of 4 dipterans, and mandibles of 12 caterpillars. 2) Lawrence Bay, August 19, 1932. Bit of elytron of a beetle, heads and wings of 12 hymenopterans (one Ichneumonidae), head of a dipteran, head, mandibles, and pieces of skin of 11 caterpillars, cocoon of an insect, and some large sand grains. 3) Uélen, May 27, 1934. Heads and other remains of 16 carabids, mandibles of 8 caterpillars, and 2 tiny spiders. 4) Uélen, May 27, 1934. Heads of 16 carabids, head of a curculionid, larva of a beetle, mandibles of 7 caterpillars, larva of a dipteran, and a single spider. 5) Uélen, May 31, 1934. Bits of the heads of 3 curculionids, heads, elytra, and other remains of 4 chrysomelids, 37 beetle larvae (Chrysomelidae), 2 small moths, 2 larvae of dipterans, a hymenopteran, 3 larvae of unknown insects, 9 spiders, and a mite. 6) Uélen, May 31, 1934. Bits of heads of 2 carabids, heads, elytra, and other parts of 4 chrysomelids, bits of 13 caterpillars, bits of the larva of a dipteran, 5 tiny spiders, and some sand grains. 7) Uélen, May 31, 1934. Whole specimen and heads of 13 carabids, heads, elytra, and thoracic rings of 4 chrysomelids, 9 larvae of beetles, 9 hymenopterans, 2 larvae of dipterans, and 3 larvae of of unknown insects. 8) Uélen, May 31, 1934. Heads of 5 curculionids, heads of 2 unknown beetles, and larvae of 8 unknown beetles. 9) Uélen, June 2, 1934. Bits of heads of 7 carabids, a single hymenopteran, mandibles of some tens of insect larvae, and chelicerae of about 50 tiny spiders. 10) Utte-Véem River, July 6, 1934. Bits of heads of 12 carabids, 5 curculionids, head of an unknown beetle, heads and thoracic rings of 3 hymenopterans, head of a butterfly, bits of caterpillars, and chelicerae of spiders. 11) Providence Bay, July 12, 1938. Remnants of some 40 carabids, *Platynus* sp., *Nelbria* sp., and subfamily Harpalinae. 12) Wrangel Island, May 28, 1939. Seven large caterpillars, 3 larvae of other insects, and 5 beetles.

The stomach of a female caught in Pitlekai on June 9, 1879, contained fragments of the larvae of beetles and tarsi of flies. E.M. Meller saw berries and sand grains in the stomach of a male shot on Pereval'naya on May 26, 1939, and beetles in the stomach of a young bird caught on July 31.

*Systematics*—I have published in my works (Portenko, 1938b, 1939b, I, and 1954) the classification of subspecies based on the study of an extensive collection.

A significant part of the Arctic region is inhabited by two subspecies: *O. o. oenanthoides* (Vig.) and *O. o. leucorhoa* (Gm.). The former was noted for the first time by me, but a strange name found for it among synonyms. This form is well distinguished by its dark color and distributed in the tundra and forest tundra from the Kola peninsula in the east to Alaska inclusive, migrating for the winter from Alaska, Chukchi peninsula, and Wrangel Island, initially almost straight westward, then turning southwest and south.

The wingspan of additional specimens caught in 1938 and 1939, does not exceed the range given by me in Table 13, p. 125 of *Fauna of Anadyr Region.* In the two males the span was 9.77 cm and 9.40 cm and in the female 9.44 cm.

The subspecies *O. o. leucorhoa* is well distinguished by its large wingspan. Found in Labrador and western Greenland, it migrates through the British Isles and France into West Africa. Thus two subspecies of wheatears arrive in North America from two opposite directions: *O. o. oenathoides* from the southwest (Chukchi peninsula) into Alaska, and *O. o. leucorhoa* from the southeast (British Isles) into Labrador.

The affinity of these two subspecies for Arctic landscape is proof that the Northern Wheatear did not penetrate the Arctic by chance; rather it is a long-time resident of this area and has evolved a purely Arctic race.

*Specimens*—1) Mechigmensk Gulf, July 10, 1843, ♂ 1° anno, Voznesenskii; 2 and 3) Cape Vankarém, August 27, 1911, ○ ○ 1° anno, Arngol'd; 4) Emma Bay, August 11, 1932, ♀ 1° anno, Portenko; 5) Lawrence Bay, August 19, 1932, ♂ 1° anno, Portenko; 6) Uélen, August 29, 1933, ♀ 1° anno, Portenko; 7 and 8) Uélen, Téeyu-Véem River, May 27, 1934, ♂ ♂, Portenko; 9 to 12) Uélen, May 31, 1934 ♂ ♂ ♀, Portenko; 13) same site, June 2, 1934, ♀, Portenko; 14) midcourse of the Utte-Véem River, July 6, 1934, ♂, Portenko; 15) midcourse of the Kol'oam-Véem River, August 11, 1934, ○ 1° anno, Portenko; 16) Providence Bay, July 6, 1938, ♀, Butenko; 17) same site, July 12, 1938, ♂, Portenko; 18 to 20) Sireniki village August 4, 1938, ♀ and ○ ○ 1° anno, Butenko; 21) Pereval'naya Station, Tadleo River, May 26, 1939, ♂, Meller; 22) Rodgers Bay, May 28, 1939, ♂, Portenko; 23) Pereval'naya, July 31, 1939, ♀ 1° anno, Meller; and 24) Rodgers Bay, August 22, 1939, ○ 1° anno, Portenko.

*Biological Specimens*—1) Nest with clutch of five eggs, midreaches of the Amguéma River by the 91st km, June 22, 1956, Portenko.

### 119. *Cyanosylvia svecica svecica* (L.)—Bluethroat

*Distribution and status*—This species nests in the interior of the Chukchi peninsula, and in certain areas it is not as rare. Solitary specimens are found during flights on the north coast, but their encounter in the south should be expected since one was collected on Lawrence Island.

I collected a male on July 10, 1934, in the valley of the midreaches of the Utte-Véem River. This was the first observation of the Bluethroat in the nesting area on the Chukchi peninsula. In 1956, I came across Bluethroats on the Amguéma by the 91st km. They were quite common and abundant here. Passing by the coastline, I came across males drinking water at intervals of 150 to 250 m.

Observations of birds in flight are known. On June 7, 1879, E. Almquist collected a specimen by the winter anchorage of the *Vega* (Palmén, 1887). In the collection of the Institute of Zoology, Academy of Sciences of the USSR, is preserved a young Bluethroat which flew onto the freighter *Vaigach* on the night of August 27, 1911, while the vessel was anchored two miles off Vankarém at 67°50′ N 175°05′ W. According to a report of H. Friedmann (1937), a Bluethroat was caught on St. Lawrence Island in August, 1936, near Gambell village.

The expedition of J. Cook (Stresemann, 1949, p. 251) caught a Bluethroat on ice in the fall of 1778, but the location of the find is not known; it may have been north of Bering Strait.

Bluethroats are absent on Wrangel Island. In the lowlands of the Kolyma it is abundant, and in 1916 and 1917, J. Koren (Schaanning, 1954) collected five clutches. The Bluethroat nests in northwest Alaska from St. Michael in Norton Bay up to the Meade River, and south of Cape Barrow.

The foregoing list literally exhausts the finds of this species (Gabrielson and Lincoln, 1959).

*Habitat*—The nesting area of Bluethroat on the coast of the Utte-Véem River is characterized by groves of comparatively low purple osier* in which Redpolls, Eversmann's Warbler, Petchora Pipit, and Yellow Wagtail also reside. Gray-cheeked Thrushes nest in much higher shrubs, while Bluethroats nest close to the lake.

On the Amguéma, the Bluethroat was confined to the banks of rivers and brooks, more often to places where a hummocky tundra with thin shrubs adjoined the river. Males were seen at different elevations, on mounds and on tops of bushes.

In flights over Pitlekai it was sighted on the exposed seacoast and flew even onto a ship at Vankarém.

*Arrival*—June 7 should be considered the date of arrival in Kolyuchin Bay. On my arrival in the Amguéma on June 10, 1956, the lively song of the male could already be heard. Nevertheless the arrival of these birds had not yet concluded since their number perceptibly increased gradually the following day. It should be pointed out that males caught one's attention readily because of their considerable activity.

*Nidification*—The song of the Bluethroat is extremely individual; each male sings his own tune. Some, for example, repeat the syllables "chui-chui" for quite sometime, which I did not hear from others. The song represents a set of different strophes interspersed with both the melodic and rattling sounds characteristic of warblers. Sitting on top of a bush a singing Bluethroat sometimes wags its tail sideways. This process reveals the vivid reddish color on the tail feathers and makes the blue neack less prominent.

In calm weather on April 13, 1956, males called animatedly. Usually singing the same phrase, the male soars obliquely high into the air, at times quite steeply. I saw Bluethroats calling above buntings, but in terms of height they were always inferior to pipits. The calling male flaps his wings rapidly, but more to maintain his position at a given point than to exhibit passion, i.e., not as rapidly as pipits, but at a faster rate than sandpipers. Having gained altitude, the Bluethroat relaxes its wings and tail and maneuvering more on its longitudinal axis than from side to side, descends to bush or mound. Yet I saw one male descend, flapping his outspread wings and tail, on top of a shrub in pursuit of a female. He gave up the chase somewhat later. During the mating period, Bluethroats are extremely energetic and impetuous; they permit man's approach to within 40 paces although by and large they are classed as cautious birds.

Animated calling occurred mid-June. By June 22 it had become intermittent, by

* *Salix purpurea*—Ed.

June 24 was simply an attempt, and by June 26 had stopped altogether.

The females had evidently laid during the last ten days of June. During this period both sexes were very active. They constantly flew from bush to bush singly and in pairs. Even on June 26, I saw males sitting on tops of bushes or some sort of elevation.

In the first few days of July no sound could be heard from these birds. On July 10 I saw for the first time a male with an insect in its beak, i.e., chicks had hatched. He was very restless, flew from place to place, periodically calling out "chek-chek" or "chak-chak". The female appeared soon with insects. After sometime the uneasy birds left me to search for insects again. No sooner had I begun searching the precipitous shrub-lined coast, the male swooped at me within 8 to 10 paces. He could not endure my presence and sat right on the nest (Fig. 21), in which I could see the long extended necks of chicks. Every time I clicked the camera they opened their yellow mouths cordially, making no sound whatsoever. There were six chicks and all were in the same stage of development. Unlike the well-plumed chicks of Lapland Longspurs and Redpolls, the chicks of Bluethroats have scanty down on the head and neck.

The nest was located on the side of a mound (Fig. 22) as done by other birds: buntings, pipits, or Yellow Wagtails. It was a saucer-shaped structure 13.0 cm × 10.5 cm × 5.0 cm, with a trough up to 3.0 cm in depth lined with old leaves and stalks of different types of sedge, which were very coarse below and on the outside. Among these were some small plants of *Carex lugens* Holm., leaves of *Salix cuneata,* and branches and leaves of *Betula exilis.*

The trough was filled with thin, yellowing (not grayish) straw, and devoid of hairs and feathers.

The male collected on July 10, 1934 on the Utte-Véem River had testes 3.0 mm × 2.0 mm and 2.0 mm × 1.0 mm. Some stray adipose deposits were found under the skin. I collected a female, a breeding bird with chicks recently fledged, on July 26, 1933 near Anadyr village. Her ovary had already reduced and had a faint granular structure; she was emaciated. The young male caught on August 10, 1931, in the estuary of the Tanyurer River had very small, but distinctly developed testes. Post-nesting plumage was evident on the back and partly in the center of the forehead; only a few feathers had grown on the chest. Subcutaneous adipose layers had not yet formed.

*Departure*—As can be judged from the Vankarém find, departure flights occurred at night (probably arrival as well) at the end of August.

*Food*—The stomach of a Bluethroat I collected on the Utte-Véem River contained the heads of five carabids, head of a hymenopteran, and legs and wings of a *Tipula.*

*Systematics*—The results of my revision of the subspecies of Northern Bluethroats were published in my *Fauna of Anadyr Region* (Portenko, 1939b, pt. I, pp. 130-131). I was convinced that the Northern Palearctic, from Scandinavia to the Chukchi peninsula, was inhabited by a single subspecies, i.e., the type subspecies *C. s. svecica* (L.), and that subspecies *C. s. grotei* (Dem.) and *C. s. robusta* (But.) do not exist.

*Specimens*—1) Cape Vankarém, August 27, 1911, ○ 1°anno, Arngol'd; and 2) Utte-Véem River, July 10, 1934, ♂, Portenko.

*Biological specimens*—1) Nest from the midreaches of the Amguéma River, by the 91st km, July 16, 1956, Portenko.

### 120. *Catharus minimus minimus* (Lafresn.)—Gray-cheeked Thrush

*Local names*—Chukchian: oyngoptschekadlin and also utteradlin (tiny bird) in the records of the *Vega* expedition.

*Distribution and status*—This species is common in the nesting sections within the eastern part of the Chukchi peninsula. It flies along the north coast, but in small numbers. It is not found on Wrangel Island.

Evidently it is not entirely by chance that the Gray-cheeked Thrush is not found on the south coast of the Chukchi peninsula, where a large number of ornithologists have made collections. Only one find is known for St. Lawrence Island. O.J. Murie (1938) reported a female caught in Gambell village on May 26, 1937. There is also no information for the east coast, where almost no one has engaged in systematic bird collection. Around Uélen, thoroughly inspected by me, I only came across a flying thrush once—September 14, 1933, on the first terrace of the knoll closest to the village. During my trip along the Kol'oam River from August 9 through 24, 1934, I did not sight a single Gray-cheeked Thrush, but in the course of July 6 through 10 of the same year saw it rather frequently along the banks of the Utte-Véem River, commencing from the lowlands upward to the pool where I stopped. Thrushes began to appear along with Eversmann's warblers and were common. In spite of their concealed living style, I saw Gray-cheeked Thrushes many times. Since they were singing at that time and called to each other agitatedly on my approach, their number could be determined without difficulty. At least in the bushes they were quite numerous. Near Kolyuchin Bay members of the *Vega* expedition (Palmén, 1887) collected a few specimens in spring flight in 1879. On June 1 two were shot in Pitlekai, one near the vessel on June 8, and one more specimen obtained on June 10.

In the summer of 1956, I did not encounter this bird even once on the Amguéma. In 1938, I obtained a stuffed Gray-cheeked Thrush from workers at the Polar Station on Cape Schmidt; the bird reportedly flew there in the spring of 1937, and caught the attention of the wintering personnel as an unusual bird. E.W. Nelson (1883, p. 57; 1887, p. 216) only presumed that the Gray-cheeked Thrush had been sighted on the Chukchi peninsula and referred to its find on Kamchatka. L. Stejneger (1884a, p. 166) explained that the report of this thrush in Kamchatka involved some misunderstanding. According to J.E. Thayer and O. Bangs (1914), J. Koren regularly encountered this species at favorable sites along the Arctic coasts of East Siberia and in the west up to Kolyma, and heard its song at some sites. In the Lower Kolyma, Koren found a nest on June 15, 1912, and collected a female on June 8, 1915. Later, according to an eyewitness account by G.T.L. Schaanning (1954), he obtained a male on June 5, 1917, and found two nests in the same year. Strangely, in the lower reaches of the Kolyma, the Gray-cheeked Thrush was not encountered by such experienced ornithologists as S.A. Buturlin in 1905 and E.P. Spangenberg in 1959.

*Habitat*—On the Utte-Véem River these thrushes nested in tall willows, which at some places exceeded a man's height. The higher the bushes and the greater the density of thickets, the greater the number of thrushes. Frightened by my shots, the birds flew into the open and sat in the lower part of the trunks and on the lower branches. After much hesitation, they then flew into the low shrubs and hid there. Once I met a thrush on mounds among cotton grass on a high bank devoid of shrubs. Alarmed there, it flew far away. Thus the presence of shrubs is a necessary condition for the habitation of the Gray-cheeked Thrush during the nesting period.

During the fall flight I encountered a single bird near Uélen outside shrubs. It lay on the first terrace of a knoll, in a trough with a tiny stream, the bank of which was densely overgrown with green grass. On being chased the thrush attempted to hide between stones in a pile.

*Arrival*—The spring flight of Gray-cheeked Thrushes was observed on Kolyuchin Bay from June 1 through 10, 1879. Judging from the specimens caught, the birds flew singly and in pairs.

*Breeding*—The gonads are well developed (Table 31) in males evidently right from their arrival.

The ovary structure was fine-grained in females caught in the nesting period: June 29 and 30, 1932 on the Markovka River, and July 9, 1934 on the Utte-Véem River. The ovary was in the form of a structureless film in fall females on September 14, 1933.

I heard true songs on the Utte-Véem River on July 7 and 9, 1934. On my appearance the thrushes stopped singing and erupted in screams of anxiety. Initially anxiety was expressed with sounds like "dzhi" and later "ts'ok," which highly resembled the scream of a domestic chick that has lagged behind its mother.

**Table 31. Size of testes (mm) of Gray-cheeked Thrush**

| Date | Left | Right | Locality |
|---|---|---|---|
| June 12, 1932 | 10 × 7 | 9 × 6 | Markovo |
| June 13, 1932 | 12 × 8 | 10 × 7 | -do- |
| June 13, 1932 | 10 × 7 | 9 × 8 | -do- |
| June 29, 1932 | 9 × 6 | 6 × 4 | Markovoka River |
| June 29, 1932 | 8 × 4 | 7 × 3 | -do- |
| June 30, 1932 | 9 × 7 | 7 × 4 | -do- |
| July 8, 1934 | 8 × 6 | 6 × 5 | Utte-Véem River |
| July 14, 1932 | 12 × 8 | 10 × 8 | Lukovaya stream (Anadyr) |
| August 23, 1931 | 1 × 1 | 1 × 1 | Tanyurer |
| September 4, 1931 | 2 × 2 | 2 × 2 | -do- |

On the Kolyma, J. Koren found a nest right on the ground among the branches of an alder grove. Two other nests were situated at a height of 7 ft from the ground on willow and alder on the bank of a river. On June 25, 1916 there were four eggs in them; in one clutch they were fresh and in the other had been incubated for four days. On the approach of man the birds fell silent and disappeared into the shrub.

*Departure*—During the fall flight a lone female was caught on September 14, 1933 near Uélen. Specimens caught on August 23 and in September had fully molted into fresh plumage; the male from Lukovaya stream (Anadyr) on July 14, 1932 had not yet commenced molt, which means this process begins at the end of July or in early August.

*Food*—The stomach of a male caught on the Utte-Véem River on July 8, 1934 contained the heads and other remains of four carabids and mandibles of a caterpillar. A female shot the following day contained the heads of five carabids, head of a curculionid, larva of a beetle, 8 hymenopterans, 11 moths, a caterpillar, and 8 mollusks. The stomach of a specimen caught on June 8, 1879 near the anchorage site of the *Vega* contained sand and its intestine a digested black mass.

Molted fall specimens possessed subcutaeneous adipose formations, while all the summer specimens were devoid of them.

*Systematics*—The series of my fresh specimens from Anadyr and the Chukchi peninsula differs marginally from the specimens of considerable antiquity in the Alaskan museum. Among fresh fall specimens I noticed differences in the gray-olive shades of the plumage on the upper side of the body. But even these differences are so negligible that I consider our birds and the Alaskan birds identical. Thus both belong to the nominal form, *Catharus minimus minimus* (Lafresn.).

*Specimens*—1) Uélen, September 14, 1933, ♀, Portenko; 2) midreaches of the Utte-Véem River, July 8, 1934, ♂, Portenko; 3) same site, July 9, 1934, ♀, Portenko; and 4) Cape Schmidt, 1937, spring, ○, Portenko.

### *Turdus migratorius* L.—American Robin

Since its range is quite extensive in North America, E.W. Nelson (1883, p. 58) assumed that the American robin, *T. migratorius* L. should indubitably fly into Northeast Asia. According to an eyewitness account by H. Seebohm (1881, p. 221), a specimen of this species from Bering Strait was brought in by Captain Kellet and Lieutenant Wood and is preserved in the British Museum. Its exact place of capture is not known. It is not improbable that the American Robin should at times fly into our territory, but there is no record of it to date.

### 121. *Acanthopneuste borealis hylebata* (Sw.)—Eversmann's Warbler

*Local name*—In Eskimo: kuvykhsipak in Providence Bay.

*Distribution and status*—This species nests in eastern and inner parts of the Chukchi peninsula where it is common or even abundant at favorable sites. It is found on the coast only during flights, more rarely in the south and more often in the north where mass flight has been observed. It flies to Kolyuchi and Wrangel Islands.

Eversmann's Warbler is well known to the eskimos in Providence bay in whose language it has a special name (which is rare for a small bird of no game value), yet observations on the south coast of the Chukchi peninsula are few indeed. In 1932, I.O. Olenev noticed this warbler in Providence Bay not more than two or three times. In mid-June, 1957 A.P. Kuzyakin encountered two Eversmann's Warblers on one of the knolls at a place totally unsuitable for its nesting. P.T. Butenko caught a male on Cape Chaplin on August 17, 1938, evidently in fall flight.

In one of his articles, O.J. Murie (1936) mentions the flight of an Eversmann's Warbler onto St. Lawrence Island. There is no doubt that it was carried by a northwestern storm, since it was totally exhausted when collected on the coast of Savoonga village and died in the man's hands. H. Friedmann (1937, p. 91) reported two specimens caught near Gambell village in July and August, 1936. A July find could be placed among nesting specimens, but a chance flight cannot be ruled out. F.H. Fay (Fay and Cade, 1959) noticed this warbler three times from July 1 through August 17, 1953, in Gambell village. One bird hid in the rocks and apparently nested there. A male was caught on August 8. Nevertheless, not a single reliable instance of nesting on St. Lawrence Island has been established to date. On June 13 and 14, 1970, V.V. Leonovich encountered this warbler a few times in the tundra of Lawrence Bay. The birds remained there until June 20.

In the collection of the Institute of Zoology, Academy of Sciences of the USSR is preserved a male specimen caught on the Bering Sea by I.G. Voznesenskii in July, 1847. Accurate information about it is not available.

On June 12, 1958 K.W. Kenyon (Kenyon and Brooks, 1960) caught a transitory female on Little Diomede Island.

Around Uélen in the fall of 1933 I met with only one lone warbler. There is no doubt that it was moving into the estuary of the Vtoraya River, i.e., Téeyu-Véem River. In the 1934 spring flight these birds were more common. In the course of a single day, on June 10, I came across five specimens at different times; I encountered one bird only on the 13th, 15th, and 17th.

During my journey along the Kol'oam-Véem River from August 9 through 24, 1934, I sighted these warblers often. On August 12 I met a pair evidently nesting roughly 10 km from the seacoast; on August 15, I encountered a single bird still higher along the river; and on the 19th another on the west bank of Lake Kool'ong. On August 21, I came across a few in the upper reaches of the river. There were intense fall flights that day, but I saw only one flight, on the 22nd.

On the Utte-Véem River, Eversmann's Warblers were very common and even numerous. From July 6, 1934, they began to appear simultaneous with Gray-cheeked Thrushes from the lower reaches of the river and above the banks we were traversing. On July 10, their songs were heard, and as we approached their nesting sections calls of anxiety. In the Utte-Véem River valley this species was one of the most characteristic inhabitants together with the Gray-cheeked Thrush, Petchora Pipit, Yellow Wagtail, and Redpoll.

On June 25, 1970, V.V. Leonovich heard the songs of some warblers in Énurmino, which were more animated after midnight. He heard their songs at this same place, on the west slope, on July 2. Evidently the birds had nested there.

E. Almquist (Palmén, 1887) during his journey from June 13 through 17, 1879, within the country toward Kolyuchin Bay noticed Eversmann's Warblers, possibly resident birds. According to the information collected, these birds nested in the vicinity. All other information and the specimens gathered by the *Vega* expedition pertain to birds in flight. A large number of Eversmann's Warblers appeared on June 13 at the winter anchorage of the *Vega* in Pitlekai. Some 20 landed on the ship itself in the evening and specimens were collected that same day from Cape Dzhénrétlen, Pitlekai, and Irgunnuk. The Chukchians felled warblers with a bow and arrow. On the following day only two birds remained aboard ship, but more were obtained from nearby villages, especially Chutpa (at 66°40′ N, i.e., closer to Serdtse-Kamen'). A.A.L. Palander and F.R. Chel'man also noticed warblers in considerable numbers on Cape Dzhénrétlen. On June 15, a large number of specimens was collected and the birds sighted among other small birds. Only a few specimens were received on the 16th, among which were some from Pitlekai. On June 18, the Chukchians caught many warblers at Cape Dzhénrétlen, but subsequently none were seen in this locality. A pair was sighted, however, near Dzhénretlen on June 27. Thanks to mass flighting many specimens of Eversmann's warblers were collected; the *Vega* expedition brought back 2 skins, 11 birds preserved in spirit, 30 salted, and 2 skeletons—a total of 45.

On July 19, 1938, I came across a lone Eversmann's Warbler in the northwestern part of Kolyuchi Island. It was hiding but betrayed no restlessness, which would have been normal had it been nesting.

On June 10, 1956, I came across warblers en route from Égvekinot to Kilometer 91. The flight was weak on the Amguéma, but warblers nested in small numbers. Early July in the willows, their song prevailed over the voices of other birds.

In the Lower Kolyma, J. Koren (Schaanning, 1954), I gathered a clutch on June 26, 1916.

An Eversmann's Warbler was found on Wrangel Island only as a transitory bird in the fall. On August 22, 1932, Tayan found a dead specimen in the tundra on Cape Litke in the northern part of the island. I noticed a warbler in the territory of the Polar Station in Rodgers Bay on September 6 and 7, 1938. The wintering personnel caught it by hand and presented it for my collection.

*Habitat*—On the coasts of the Utte-Véem River where warblers were most numerous, their nesting sites were willow thickets, generally tall, in some cases surpassing a man's height. There they nested together with Gray-cheeked Thrushes. On the banks of the Kol'oam river such tall shrubs were not available and the warblers had to make do with low shrubs of an average height of 30 cm. On the banks of the Amguéma they inhabited lowland thickets of willow and alder, which became inundated in high water. During flight these birds remained on even recumbent surubs and if absent, they hid in dense grass or behind peat mounds or simply in rock piles. On July 19, 1938, I saw a warbler in the upper zone of a coastal rock on Kolyuchi Island in a small depression with grass. It later flew down onto a ledge in a clearance overgrown with vegetation. Such an environment was totally unusual for the residence of warblers in July. I often came across warblers in rock piles below Uélen. In Lawrence bay, V.V. Leonovich found warblers in a totally "bare" tundra.

In Énurmino they remained in small osier beds along brooks. In the spring of 1879, near Kolyuchin Bay, they were sighted in puddles on shore mounds.

Under certain conditions these birds are no strangers to the proximity of man. On June 13, 1879, they appeared in large numbers on the ship *Vega* and sat under landing nets, ropes, boats, etc. On Wrangel Island on September 7, 1938, as the weather worsened sharply toward winter a lone warbler left behind clung to the walls of wooden houses and pecked at closed windows.

On June 12, 1958, on Little Diomede Island a warbler in flight was sighted near a school. It avidly sought food in the lichens and year-old grass mounds among rock boulders.

*Arrival*—Warblers arrive quite late, by June 10. In the spring of 1934 in Uélen, I observed uncoordinated mass arrivals on June 10. On that same day I encountered five lone warblers. Some hopped onto the peaks of stone piles with an anxious "trr-trr" or "tstrr'," and I shot one in a mound of grassy tundra. Subsequently I scrutinized the knoll, but warblers had not remained there to nest. Later I sighted lone birds on June 13, 15, and 17; this completed the flight.

In the spring of 1879 at the winter anchorage of the *Vega,* Eversmann's Warblers were seen in large numbers all at once on the evening of June 13, and some 20 descended to the ship. They flew in a circle or sat and chirped, often several together. Some had even paired. On the 14th only two remained aboard ship but in nearby villages large numbers were caught. Many were brought in on June 15, only a few on June 16, and several on June 18. This species then disappeared altogether.

On June 10, 1956, I traveled the Amguéma and saw that the flight of warblers had already commenced. In the floodlands a lone bird fluttered from branch to branch and pecked at something. The weather worsened, a snowstorm set in, but this bird simply fluffed its plumage and behaved very cheerfully. The icebreaker stayed in the Amguéma on June 14, a sunny day with a temperature of +13°C. Because of a fresh southeastern wind, warblers hid among the lower branches of bushes. By 7:00 p.m. it had turned cold and the birds became animated. They began advancing along the shrubs on the coastline up the course of the river. I noticed lone birds and two pairs. Small insects appeared and warblers pecked at them from branches and osier shoots. There was no singing, but on being alarmed the birds emitted the call "tstrr'". Subsequently the Amguéma flooded and the lowland shrubs became temporarily inaccessible.

*Breeding*—By June 22, 1956, the water level in the river had dropped by nearly a meter. With the end of high tide, warblers began to occupy the nesting sections in shrubs which had been waterlogged earlier. The bushes now had an untidy appearance, being covered with silt and various drift material. Only on June 26 did I hear the song of these warblers for the first time.

The singing male climbs to the end of a high projecting branch and sings for quite sometime. The song commences with fruity notes resembling those of finches, but the similarity is lost even by the middle of the strophe, since the warbler does not increase the tempo of his song and renders the entire strope "chiv-siv-siv-siv-si-si-si-..." at a uniform pace. I could trace some remote similarity to the song of Yellow-browed Warbler (*Phylloscopus sibilatrix*). In some warblers the clicking merges almost into a trill; the syllables "chiv-chiv-chiv" are heard as "chriv-chriv-chriv" and from a distance as "chiri-chiri-chiri". The singing male never flies off with a note as do Northern Bluethroats, pipit, bunting, or other birds of the open terrain. It behaves like a forest bird. One could come to within 25 to 40 paces of this warbler before it took fright, descended, and moved into the base of bushes to hide.

The loud singing of warblers was heard everywhere on July 7 on the Amguéma, but after the 10th I heard nary a note.

On the Utte-Véem River in 1934, warblers continued to sing even on July 7, but singing lessened by the 9th (perhaps because of inclement weather). When we toured along the border of shrubbery thickets, warblers became restless, called "trzhd' " or "tstrr'," flew slowly from branch to branch, and came close to the edge. Seeing us gradually and leisurely moving away, they fell silent again.

Observers of the *Vega* expedition mentioned that warblers landing on the ship on June 13, 1879 chirped. The scream of a male flying and hopping in a circle was transcribed as a loud "t'yut'-yu-t'yu-t'yu-t'yu" without modulation. The scream of the female was weaker and consisted of two notes, the first higher than the second.

I studied seasonal changes in the size of gonads throughout the period from arrival to migration (Table 32).

**Table 32. Size of testes (mm) of Eversmann's Warblers**

| Date | Left | Right | Locality |
|---|---|---|---|
| June 13, 1932 | 6 × 5 | 5 × 4 | Markovo |
| June 13, 1934 | 6 × 3 | 5 × 2 | Uélen |
| July 10, 1934 | 5 × 4 | 5 × 4 | Utte-Véem River |
| July 10, 1934 | Attains 5 mm | | -do- |
| July 22, 1934 | 4 × 2 | 3 × 2 | Ugol'naya Station on the Anadyr |
| August 12, 1934 | 2 × 1 | Slightly smaller | Kol'oam-Véem River |
| August 17, 1938 | 1 × 1 | 1 × 1 | Cape Chaplin |
| August 21, 1934 | 1 × 1 | 1 × 1 | Kol'oam-Véem River |
| August 27, 1931 | Less than 1 mm | | Lake Krasnoe |
| September 16, 1931 | -do- | | Tanyurer River |

The female from the vicinity of Anadyr village collected on July 30, 1933, had an ovary with a fine-grained structure. No granular structure was evident in the ovary of an adult, unmolted female from the Kol'oam-Véem River caught on August 21, 1934.

Right from arrival the obesity of warblers varied considerably. In particular, the male from Uélen caught on June 13, 1934, had significant subcutaneous adipose deposits, while a male from Markovo on June 9, 1932, was totally devoid of fat. Another male from Markovo on June 13, 1932, had very insignificant adipose deposits. It is known that birds which have not yet completed flight preserve their adipose accumulations and, therefore, in my opinion, the obese warblers near Uélen had still to fly to Alaska. At the end of the nesting period I encountered no more obese specimens. Instead a male from Ugol'naya on July 22, 1932, was emaciated and one from the Utte-Véem River on July 10, 1934, had very small adipose layers. The same was the case with a female from near Anadyr village on July 30, 1933. Most of the specimens caught in August and September were characterized by a very significant development of subcutaneous fat.

J. Koren found an unincubated clutch of five eggs on June 26, 1916, near the Lower Kolyma. The nest was located on a heather mound in a mixed plantation of willow and alder by the river.

*Departure*—On the Kol'oam-Veem River I encountered a pair even on August 12, 1934, but later came across only lone birds. I sighted a few during the day on August 21. Evidently mass migration had taken place.

Eversmann's Warblers migrate at the end of August. In the fall of 1933 I saw the last of them on August 28 around Uélen. Having taken off from the grass, one bird stared at me for sometime, then displayed great caution and began to fly long distances, hiding between peat mounds. In 1934 I noticed a warbler for the last time in the lower reaches of the Kol'oam-Véem River on August 22; however, my field observations terminated just a few days later. On Wrangel Island a dead specimen was found on August 22, 1932. In 1938 I saw this bird there on September 7.

*Food*—The following contents were found in the stomachs examined: 1) Uélen, June 10, 1934. Heads and other remnants of 9 carabids, heads, elytra, and other remnants of 7 very small curculionids, and heads and other remnants of 4 staphylinids. 2) Uélen, June 10, 1934. Heads and other remnants of 9 carabids. 3) Uélen, June 13, 1934. Head of carabid, head and elytron of very small beetle, heads of 6 hymenopterans, and mandible of a caterpillar. 4) Utte-Véem River. July 9, 1934. Heads of 13 hymenopterans, heads of 2 dipterans, and 4 larvae of insects. 5) Utte-Véem River, July 10, 1934. Thoracic ring and elytron of a curculionid, head of a hymenopteran, a plant louse, and heads and remnants of bodies of 10 caterpillars. 6) Utte-Véem River, July 10, 1934. Larva of chrysomelid, heads of 7 hymenopterans, 2 midges, heads of 8 caterpillars, and a mollusk.

The stomachs of warblers caught in Kolyuchin Bay in June, 1879 contained fragments of Harpalinae and other beetles as well as larvae.

*Systematics*—I have revised the subspecies of Eversmann's Warblers three times: 1938 (Portenko, 1938a, and 1939b, I), 1953 (Portenko, 1954), and 1965 (for the present book), i.e., at intervals of 15 and 12 years. Each time there was more material to incorporate and additional reports by American ornithologists (Parkes and Amadon, 1948; Vaurie, 1954) on the subspecies *Acanthopneuste borealis kennicotti* (Baird). This subspecies is of great interest for the present work, but satisfactory comparative material unfortunately could not be collected. Vaurie had 30 specimens from Alaska, but lacked a sufficiently large series of nesting birds from the Palearctic. I have a good collection from the Palearctic but only 14 specimens from Alaska. The latter includes nine skins kindly sent me by George Watson, the curator of the ornithological division of the U.S. National Museum in Washington. Unfortunately this collection contained only one young bird in fresh fall plumage. K.M. White sent me four specimens from the Zoological Museum of the University of Utah. For my latest revision therefore I had 342 specimens which could be spread out and examined simultaneously. Generally speaking, I have reached the same conclusions in this third revision, which I reached in 1938 and 1953.

Except for the long-winged subspecies *A. b. xanthodryas*, coloration served as the main criterion for identification of the remainder. For *A. b. kennicotti* there is one more feature—the size and shape of the beak. There is no need to repeat that for the identification of subspecies of warblers based on color, one needs fresh, well-dressed skins in the fall plumage, even though the series be small. Of my 342 specimens, I selected for this purpose only 42, or 6 to 8 for each subspecies. Any disagreement with my classification into subspecies is possible only on the basis of similar material, which needs to be as good or better than mine in quality and quantity. A comparison of individual specimens in determining subspecies is unproductive to my way of thinking. It should also be remembered that females appear paler and more grayish compared to males. The fall molt of different birds extends from the end of July to the end of August, and specimens of warblers which have not fully molted appear grayer.

Insofar as dimensions are concerned, as also pointed out by Vaurie, first-year-birds are distinguished by a very short wing, which is generally smaller than that of adult birds. The wing is longer even in adult birds with worn-out tips of primary flight feathers. Thus the wingspan of fall yearlings of the subspecies *A. b. talovka* (7 males) was 6.18 to 6.45 cm and (3 females) 5.95 to 5.99; that of adult birds (20 males) 6.50 to 7.12 cm and (7 females) 6.10 to 6.42 cm. I refrained from taking beak measurements because they are useless in relation to an entire series.

In the material studied I lacked the desired number of warblers from Alaska, and the nesting areas of Primor'e territory and Japan. My latest revision of the subspecies is given below.

1. ***Acanthopneuste borealis talovka*** (Port.). In fresh plumage the color on the upper body (forehead, shoulders, back, and upper tail covering) is greenish-brown-olive. Since *A. b. talovka* occupies much of the territory of our country, I shall take it as a basis for future discussions. The underside of body of *A. b. talovka* has a sulfur-yellow bloom. The eyebrow region is yellowish. The chest has faint, smudged brownish-gray variegations. A bloom of the same color is seen on the sides. The upper side of the body, in worn-out plumage, gradually becomes grayer, and the underside whitish. The wingspan as shown in Table 34.

*Range*—The range is from Norway to eastern and southern parts of Yakutia, up to Baikal and Sayan. I identified specimens from the lower Lena (Bulun) as *A. b. talovka* but do not have well-prepared skins of birds from farther eastward.

Over 140 specimens were examined.

2. ***Acanthopneuste borealis transbaicalica*** (Port.). The upper side of the body in a series of freshly molted warblers is perceptibly paler and the underside is white. In some specimens the sulfur-yellow bloom, like the brown variegations on the chest, was not perceptible. The sides are slightly darkened. In worn-out plumage, warblers of this subspecies are almost light gray on top and white underneath. Dimensions similar to those of the preceding subspecies, or slightly less.

*Range*—Trans-Baikal and Mongolian People's Republic; probably Tuvin also.

Total of 42 specimens examined.

3. ***Acanthopneuste borealis borealis*** (Blas.) The upper side of body is considerably darker and green; the underside is darker. Variegations on the chest are sharper and form a spotted collar. The eyebrows are light yellow. The sides are brownish. In the dark color above and below, this subspecies is closer to the one that follows than to the preceding subspecies. On the average, the wing is only slightly shorter than in *A. b. talovka* and *A. b. transbaicalica.*

*Range*—Okhotsk coast and Koryatsk range.

The series is well represented by impeccable stuffed skins gathered by S.I. Snigirevskii near Ayan. Over 40 specimens examined.

4. ***Acanthopneuste borealis hylebata*** (Swinh.). This is the darkest-colored of all the subspecies. The upper side of body is brownish-olive. The eyebrows are light yellow. The yellow bloom on the underside is not sulfur-colored, but is a warmer shade, denser under the cheeks and on the chest. Variegations on the chest darken into a distinct spotted collar. The sides are covered with an intense sulfur-brown bloom, covering a wider zone than in *A. b. talovka* and *A. b. transbaicalica.* This subspecies is closest to *A. b. borealis* in color and size.

*Range*—Anadyr range and Chukchi peninsula. The exact boundary of the range in the west is not clear. The poorly prepared specimens from the Lower Kolyma could perhaps be placed in this species.

Total of 80 specimens examined.

In my former revisions I identified the olive-colored warbler from Ussuri region as *A. b. hylebata.* L. M. Shul'pin collected a large series at the end of May, i.e., in the flight period. I had thought it probable that their nesting zone was located somewhere on the Okhotsk coast. S.I. Snigirevskii subsequently brought local warblers from around Ayan which are green in color. I now transfer the Ussuri migratory warblers to the Anadyr-Chukchi subspecies.

*Phylloscopus hylebata* Swinhoe was described from Amoi (in flight) as similar to *P. borealis,* but the eyebrows and underside of the body are yellow, and the wingspan 6.6 cm. The description best approaches that of olive-colored warblers.

5. ***Acanthopneuste borealis xanthodryas*** (Swinh.). The upper side of body is not darker than in *A. b. talovka*, or even lighter, but with a more vivid greenish tinge. The underside is a dirty white with a vivid sulfur-yellow bloom. The eyebrows are the same color. Variegations on the chest are absent, or almost so, and with a slight grayish bloom on the sides. In worn-out plumage, the greenish shade is retained on upper side and a sulfur-yellow color on the underside.

**Table 33. Body weight (g) of subspecies of Eversmann's Warblers**

| Subspecies | Male | Female |
|---|---|---|
| *A. b. talovka* (Port.) | 9.5, 9.3 | 11.5, 11.0, 10.5, 10.0 |
| *A. b. borealis* (Blas) | 11.5, 10.9, 10.85, 10.66, 9.3 | 10.4, 9.8, 9.2 |
| *A. b. xanthodryas* (Swinh.) | 17.7, 11.6 | 10.8 |
| *A. b. kennicotti* (Baird) | 11.7, 10.1, 9.6, 9.5, 9.4, 9.1 | 9.9, 9.3 |

This light-colored form is best characterized by its larger dimensions, long wing, and large, broad beak which is well differentiated in a direct comparison of specimens. One would expect the weight to be characteristically high, but it is not entirely comparable since specimens differ in obesity. I found 27 labels with notes on weight, including 10 written by me or my assistants. They are of some interest (Table 33).

*Range*—Kamchatka, Komandor, and Kurel'skiye Islands, and hills in Japan.

Total of 26 specimens examined.

6. ***Acanthopneuste borealis kennicotti*** (Baird). Among the 14 specimens from Alaska, 10 were males and 4 females; most were in summer worn-out plumage and had been caught between June 12 and July 18. Only one specimen, a female yearling, was in fresh plumage. Another specimen, a male caught on August 10, 1964, was in a state of molt. In both the fresh plumage was lighter and more greenish than in Chukchi warblers. These specimens, like the summer ones in worn-out plumage, lack the characteristic olive shade on the upper side of the body and even more so on the underside. At the same time, Alaskan warblers differ in their short, thin beak. Although a similar beak is encountered among some Palearctic specimens, large beaks are not seen among Alaskan warblers.

Vaurie came to the conclusion that the Alaskan warbler is similar in wingspan to the Siberian (he had eight specimens from northeastern Siberia, from Anadyr to Lena), but distinguished by: (1) olive shade versus more gray Siberian warbler, and (2) short, thin beak. The remarks of Vaurie concerning color possibly relate to specimens of different subspecies. In my material Alaskan warblers are not at all distinguishable by their olive shade. Insofar as the beak is concerned, this feature is wholly reliable and must be reckoned with.

The tiny beak of *A. b. kennicotti* was noted even by J.L. Peters (Ticehurst, 1938, p. 132), but he had just five specimens from Alaska. Because of its very nature, this feature is not amenable to precise measurements with calipers. The difference is well discernible in a direct comparison of specimens. In *A. b. kennicotti* the beak suddenly thins midlength and the tip is very sharp. In *A. b. hylebata* and other subspecies the side of the beak is less concave, the base broader, and the tip more obtuse.

Among the specimens I collected on Wrangel Island, Chukchi peninsula, in Anadyr region, and in Koryatsk Zemlya, there is not a single specimen with an

**Table 34. Wingspan (cm) of subspecies of Eversmann's Warblers**

| Subspecies | Male | | | | Female | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | Number of specimens | Max. | Min. | Average | Number of specimens |
| *A. b. talovka* (Port.) | 7.12 | 6.50 | 6.72 | 77 | 6.51 | 6.05 | 6.31 | 34 |
| *A. b. transbaicalica* (Port.) | 6.92 | 6.47 | 6.70 | 17 | 6.42 | 6.00 | 6.26 | 24 |
| *A. b. borealis* (Blas) | 7.11 | 6.25 | 6.65 | 24 | 6.49 | 6.07 | 6.21 | 14 |
| *A. b. hylebata* (Swinh.) | 6.82 | 6.47 | 6.62 | 23 | 6.35 | 6.05 | 6.19 | 6 |
| *A. b. kennicotti* (Baird) | 6.73 | 6.53 | 6.66 | 10 | 6.17 | 6.02 | 6.11 | 4 |
| *A. b. xanthodryas* (Swinh.) | 7.47 | 6.88 | 7.08 | 18 | 6.86 | 6.72 | 6.79 | 4 |

extremely small beak and light green coloration, i.e., features whereby I could place them beyond doubt among the subspecies *A. b. kennicotti* (Table 34).

*Specimens*—1) Cape Litke, Wrangel Island, August 22, 1932, ○, Vlasova; 2 and 3) Uélen, June 10, 1934, ♂♂, Portenko; 4) same site, June 13, 1934, ○, Portenko; 5 and 6) midcourse of the Utte-Véem River, July 9, 1934, ♂♂, Portenko; 7 and 8) same site, July 10, 1934, ♂♂, Portenko; 9) midcourse of the Kol'oam-Véem River, August 12, 1934, ♂, Portenko; 10) upper courses of the Kol'oam-Véem River, August 15, 1934, ○, Portenko; 11 and 12) same site, August 21, 1934, ♂ ♀, Portenko; 13) Cape Chaplin, August 17, 1938, ♂, Butenko; and 14) Rodgers Bay, September 7, 1938, ○, Portenko.

### 122. *Prunella montanella badia* Port.—Siberian Accentor

*Distribution and status*—A single instance of flight of two Siberian Accentors has been established for Wrangel Island. This species is found on the Chukchi peninsula.

I noticed a Siberian Accentor on September 26, 1938, flying over the rivulets in the immediate proximity of the Polar Station in Rodgers Bay. I ran for my gun and succeeded in bringing it down. This bird was a female. Roughly around the same place on September 30 I saw a second Siberian Accentor, perhaps a male. While I was crawling along, it hid under the snowbank overhanging the coast of the bay which was inaccessible. Southern winds prevailed in the second half of September and warmed the weather, making possible the flight of Wrangel Island of some Siberian and Alaskan birds which, until then, had not been sighted by anyone on the island.

On the Chukchi peninsula, in spite of thorough inspections, I found no Siberian Accentors even though the species had already nested in Anadyr region. According to O.J. Murie (1938) a male in transit was caught on October 13, 1937, on the north coast of St. Lawrence Island (in Kol'e village on Cape Kendzhi).

The ovary of the female I shot was devoid of structure. Subcutaneous fat was deposited on the inner surface of the skin below the pterylae.

*Food*—The stomach contained seeds of crowberry.

*Systematics*—The specimen caught belonged to the subspecies *Prunella montanella badia* described in my earlier works (Portenko, 1929; 1939b, pt. I, p. 133; 1960a, p. 143). Compared with the nominal form it is well distinguished by denser coloration of plumage.

*Specimen*—1) Rodgers Bay, September 26, 1938 ♀, Portenko.

### 123. *Motacilla alba ocularis* Swinh.—White Wagtail

*Distribution and status*—This species is common on the Chukchi peninsula in the nesting areas; it is not rare, but it is not abundant either. It is encountered more often on the south coast. Flies away in winter. It flies into Wrangel Island from time to time.

E.M. Meller collected a female on June 7, and another on June 30, 1939, near

Pereval'naya. I encountered it rather often on June 8, 1956, on my way along the north coast of Krest Bay to Égvekinot. L.O. Belopol'skii (1934) encountered the White Wagtail along the banks of Krest Bay in the nesting period in numbers far greater than Yellow Wagtail. In Providence Bay this species has been found by several collectors, but the first was W.H. Dall. L.M. Turner (1886, p. 179) recalls this bird. T.H. Bean (1883, p. 147) during his three-day residence in Providence Bay noticed a female in Plover Bay and caught her on August 14, 1880. Later that same year he saw a wagtail flying toward the cape of the spit on September 13. Judging from the lateness of this sighting, no doubt the bird was a White Wagtail also. On June 26, 1881, E.W. Nelson (1883) caught a male on the spit from the eastern side of the entrance to the bay; a drawing of this specimen was appended to his work. W.S. Brooks (1915) noticed some White Wagtails in Providence Bay on June 5, 1913, and caught two males. This species was also sighted by A.M. Bailey (1926) in Émma Bay and in Providence Bay in 1921. He subsequently found a nest with a clutch and caught a few specimens. According to I.O. Olenev, the White Wagtail was common in the nesting area in Émma Bay where two nests were discovered in 1932. In the same year (1932) I encountered this bird in Émma Bay on August 11 and sighted a pair on August 26 and 28 on the coast south of Plover Bay. On September 7, 1934, I again met with White Wagtails, two birds separately, in the tundra section at the northern tip of Émma Bay. In the summer of 1938, P.T. Butenko caught a few specimens in June and July, i.e., from fresh arrivals, in the nesting area in Plover Bay. On July 18, 1948 V.N. Lyubin shot an adult and a young bird in Providence Bay. In 1957 A.P. Kuzyakin found White Wagtails to be quite rare in the settlement in the bay and found a nest around Urelik village.

The White Wagtail has been found only recently on St. Lawrence Island. According to F.H. Fay and T.J. Cade (1959), a nesting pair was found in Gambell village on July 10, 1953. A few adult and young wagtails were noticed in the environs of Boxer Bay from August 5 through 8, 1957. Males and young birds were caught there itself in 1960. E.G.F. Sauer and E.K. Urban (1964) saw White Wagtails daily. One bird persistently chased a Long-tailed Jaeger from its section. A brood landed on the roof of their tent on July 28.

A few observations are known from the east coast of the Chukchi peninsula. E.A. Almquist (Palmén, 1887) noticed the White Wagtail on Kon'yam Bay in Senyavin Strait on July 30, 1879. E.W. Schmidt reported to me that he had sighted wagtails in Mechigmensk Gulf. According to F.S. Hersey (1916), this species was not a rarity in the summer of 1914 in Lawrence Bay. On August 19, 1932 I saw a young bird there. V.V. Leonovich and E.W. Schmidt sighted it there also. In 1957 A.P. Kuzyakin encountered a White Wagtail in almost every village on the coast from Providence Bay to Uélen, in particular villages Akkani, Chulkhyn, and Kytrytkan, and also among buildings west of the village in Lawrence Bay. In the latter place no less than four or five pairs nested. In Poutyn he saw a nest with chicks. At least one pair nested in Dezhnev village.

K.W. Kenyon (Kenyon and Brooks, 1960) encountered lone White Wagtails on Little Diomede Island on June 4, 10, and 13, 1958, which had evidently strayed since this bird flies into Alaska quite by chance. I have not seen the White Wagtail on Bol'shoi Diomede Island and, according to my observations, it is very rare around Uélen. Throughout the period of my stay in this village I saw lone young birds only in the fall of 1933 on August 22 and 28, i.e., during the fall flight. On July 3, 1934 I came across a white wagtail in Inchoun village. During my journey along the Kol'oam-Véem River from August 9 through 24, 1934, I noticed this species only a few times at different sites on the river; it was recorded in my diary on August 13, 20, and 21. White Wagtails were as few along the Utte-Véem River where I noticed them only on August 7 and 8. I later came across a brood near Mitkulen, on July 20, 1934.

J. Koren came across this species near the estuary of the Shelton River (on the north coast slightly south of the Polar Circle) on June 27, 1909, (Koren, 1910) and on Cape Serdtse-Kamen' on August 23, 1911, (Thayer and Bangs, 1914). In the summer of 1914, F.S. Hersey found it there not so infrequently. In 1970 V.V. Leonovich found a clutch as well as nestlings in Énurmino. A White Wagtail was encountered only three times on Kolyuchin Bay by the members of the *Vega* expedition (Palmén, 1887). F.R. Chel'man saw one on June 12, 1879, at the winter anchorage, while E.A. Almquist shot a male on Cape Dzhénrétlen, and a bird was sighted by O. Nordquist on June 27. On July 3, 1909, J. Koren sighted White Wagtails in small numbers on Kolyuchi Island, but I did not encounter them there.

In the western part of the Chukchi peninsula, according to my observations, this bird was not particularly abundant but still regularly seen in my tours. On July 18 I sighted it repeatedly along the road from Égvekinot to the Amguéma. A few pairs nested in the village by Kilometer 91 and I found a nest there.

In 1970, A.A. Kishchinskii encountered this species on Vankarém spit, Ukouge lagoon, and in the village on Cape Schmidt.

J. Koren saw a wagtail on Cape Schmidt on September 4, 1911. V.Ya. Isaev also found it there from time to time. A.I. Argentov (1857a, p. 85) mentions a "black breast" (local name of White Wagtail among Markovo and Kolyma residents) for Chaun parish. J. Koren noticed it on Cape Shelagskii on August 27, 1912. According to a report by E.W. Schmidt, this bird was encountered by him in Pevek and was a regular inhabitant of Aiok Island. In the opinion of V.D. Lebedev and V.R. Filin (1959), it was not abundant on the island in 1958. A pair was seen on May 27, 1958, some 25 km north of Pevek in village Anapel'khin; a female was caught on June 3 on the west coast of Aiok Island in the estuary of the Utatgyr River, and three young birds sighted on the west coast of the Karchyk peninsula near Urtykuul'. F.B. Chernyavskii came across this species nearly everywhere in the northwestern part of the Chukchi peninsula during his visits in 1965 and 1966.

J. Koren (Schaanning, 1954) found a clutch in the Lower Kolyma.

No one before or after me has reported White Wagtails on Wrangel Island. Nevertheless, I did encounter it a few times in the spring and fall of 1939. On May 28 I saw a female in the territory of the Polar Station in Rodgers Bay. In the course of a few days—July 4, 5, and 9—I noticed a male near my camp south of the lower reaches of the Mamontovaya River, at 180° longitude. Finally, on August 16 I encountered a young bird on one of the knolls near Rodgers bay.

*Habitat*—The nesting sites of White Wagtails are associated with the coast or human residences, especially in the neighborhood of water. A.M. Bailey found a nest in the stone piles facing Providence Bay. I found a nesting pair near the cliffs south of Plover Bay. In both cases the nesting sites were far away from human residences. In the nesting season, I noticed White Wagtails on sandy coasts on the Utte-Véem River, but they probably arrived there only to feed since insects were bountiful in the well-warmed sandy soil. They were common on the Amguéma although I found no nesting sites directly on the banks. On June 13, 1956, I saw wagtails sitting on ice floes floating in a pool which had opened up. Phalaropes were feeding in the rapids there. Wagtails could not obtain food from the water, but the animated feeding ground of sandpipers attracted them. On June 24 and 30 I saw a wagtail on the rubble coast of a lake littered with barrels of rotting fish; the abundant flies had attracted the bird. During the breeding period I did not find this species even once on grassy tundra or on knolls.

V.D. Lebedev and V.R. Filin encountered the White Wagtail on Aiok Island along the precipitous coasts and at points where driftwood had collected. On St. Lawrence Island, according to the observations of E.G.F. Sauer, a pair of these birds had settled by a lake near Boxer Bay, close to a river flowing from it; the birds flew from the lake to the rocks in the bay.

Nevertheless, the White Wagtail colonizes more often near human residences, abandoned structures, and roadways. In Émma Bay I came across a wagtail near a village. In Mitkulen I met a brood at a site where a Chukchian yaranga had stood sometime ago. By Kilometer 91 on the Amguéma, these birds inhabited a new colony and nested inside houses devoid even of windows and doors. They entered the houses to feed on rubbish heaps when the tundra was still under snow. One pair nested on a heap of peat not far from the roadway and I saw another sitting on a public road.

I.O. Olenev found a nest in the broken window of a factory in Émma Bay and another under the roof of a shed. E.W. Nelson and T.H. Bean encountered this species near a yaranga in Plover Bay. According to F.H. Fay and T.J. Cade, a nest found in Gambell village was located in a smoke chimney projecting horizontally from the wall of a nonresidential building. J. Koren found a nest in the Lower Kolyma on the peat roof of a log cabin. A.P. Kuzyakin regarded the White Wagtail as an "exceptionally synanthropic species" for the conditions of the Chukchi coast. One of the nests he examined was located on top of the framework of a large unfinished house, another nest on a pile of bricks, and a third on the wall of a low nonresidential stone structure. According to the observations of A.A. Kishchinskii, White Wagtails colonized destroyed Chukchian mud huts along Ukouge lagoon, were sighted on rocks, and from July 22 through 25, 1970, a brood seen on a dry grassy spit of Vankarém. Usually this bird exhibits an affinity for villages.

In flight, White Wagtails remain more often by water. On Wrangel Island I encountered them in spring along the banks of a lagoon. On June 8, 1956, on the north bank of Krest Bay I came across these birds on a rocky tundra by streams flowing downhill. According to K.W. Kenyon, wagtails in transit moved along the coast on Little Diomede Island.

In fall flights along the Kol'oam-Véem river broods were confined to the rubble and rock debris coasts. Near Uélen I noticed migratory wagtails under coastal cliffs and on the lagoon. In the environs of Cape Schmidt V.Ya. Isaev also encountered them along the banks of the lagoon.

*Arrival*—A.I. Argentov (1861a, p. 485) wrote that White Wagtails ("black breasts") arrived in the Trans-Lena region on May 1 (old calendar). For the Chukchi peninsula this date appears extremely early, although I.O. Olenev told me that White Wagtails arrived in Providence Bay in the spring of 1932 simultaneous with snow buntings in early April. Members of the *Vega* expedition in the spring of 1879 in Kolyuchin Bay sighted the first wagtails only on June 12. F.R. Chel'man also saw a bird on June 11 which he took to be a wagtail. In my opinion the date June 12 is extremely late. Members of the *Vega* expedition reported this species only three times, which is obviously inadequate to establish the period of arrival. In the spring of 1939 I sighted the first arrivals on May 28 in Rodgers Bay.

*Nidification*—On June 8, 1956 on the north coast of Krest Bay recently arrived male White Wagtails were calling to each other and singing. Clear spring weather with blinding sunlight in the general background of thawing snow prevailed. Overcast days set in later and I no longer heard such animated singing. Unlike other local birds, singing White Wagtails do not take off with a call.

I studied the growth of testes in only four males (Table 35).

**Table 35. Size of testes (mm) of White Wagtails**

| Date | Left | Right | Locality |
|---|---|---|---|
| May 27, 1932 | 10 × 7 | 9 × 6 | Fort on Anadyr |
| June 9, 1939 | 10 × 7 | 8 × 6 | Akatylanva landmark on Wrangel Island |
| July 13, 1931 | 11 × 8 | 9 × 8 | Gek, Anadyr Bay |
| September 7, 1934 | 3 × 2 | 2 × 2 | Émma Bay |

On June 26, 1956, in one of the small cottages in a new settlement near kilometer 91, I collected a nest with unincubated eggs. It had been left behind by birds disturbed by construction activity. The nest was 18.0 cm × 11.5 cm and the trough 7.5 cm × 6.5 cm across and 4.5 cm deep. The nest was mainly woven with fiber, while the base and partly the sides contained an admixture of thin twigs, dry stalks of sedge, and thin shavings. The trough was overlaid with fine reindeer hair and fur, probably that of dogs. The eggs were 20.1 mm × 14.9 mm, 20.0 mm × 14.9 mm, 19.8 mm × 15.3 mm, and 19.2 mm × 14.7 mm. Their color was that usual for White Wagtail eggs—white with uneven minute gray spots. On July 15, I found a second nest in another house under construction across the street. It, too, was made of fibers and lined with a mixture of stalks; it contained four nestlings aged not more than two or three days. The construction material of this nest was so similar to the one I found on June 26 that it could have been constructed by the same pair of birds.

On July 9, at another site, I noticed a male and a female which were alarmed by my presence. I transcribed their call as "chtri-chvchiv". Thus wagtails had already had chicks by that date. On July 15, discounting the chicks in the aforementioned nest, I encountered young birds flying in which the tails were already three-fourths the normal length. In 1934 I found the first flying brood in Mitkulen on July 20.

On June 20, 1916, J. Koren collected a full clutch of five still unincubated eggs in the Lower Kolyma. On June 28, 1970 V.V. Leonovich found a nest in Énurmino with chicks attempting to fly, and another nest with six slightly incubated eggs. On July 2, flying fledgelings were sighted, and on July 7 young wagtails with fully grown tail feathers. On July 5, 1921, A.M. Bailey found a nest with five slightly incubated eggs in Providence Bay. It was located in a very small gap in stone heaps at a height of about 20 ft above the ground and was constructed of grass plastered with mud. The bedding consisted of a few feathers. The structure was firmly embedded in the gap. When he approached the nest, the incubating bird descended and during the entire time of the nest's removal two wagtails flew over his head. I.O. Olenev reported to me that he found a complete clutch in Émma Bay in 1932 in the first few days of July.

According to the observations of A.P. Kuzyakin, in 1957, a nest found by him in Providence Bay on June 10 was fully constructed but contained no eggs. On June 26 he found a nest in Poutyn with five tiny nestlings that were still bare. In a village in Lawrence Bay nestlings still remained in the nest by mid-July; adults brought food for them often.

On July 18, 1948, V.N. Lyubin caught a young wagtail in Providence bay with undergrown flight and tail of feathers. According to F.H. Fay, in a nest found in Gambell village on July 10, 1953 there were two bare nestlings with their eyes still unopened; scattered behind the nest were three dead chicks aged one or two days. E.G.F. Sauer has described how two adult birds and two flying fledgelings landed on top of his large tent; the fledgelings loudly demanded food and the parents hastened to feed them.

*Departure*—Departure occurs in the second half of August on the north coast and early September on the south coast of the Chukchi peninsula. In 1939, I encountered a lone wagtail on August 16 on Wrangel Island. It remained close to flocks of buntings on the slope of a knoll, but with my appearance began flying around with a chirp and was extremely cautious. To my mind this bird had strayed.

In the fall of 1933 in Uélen I could detect no distinct departure flights. I came across a young bird on August 22 and saw a White Wagtail for the last time on August 28. In 1934 I noticed this species in Émma Bay even on September 7. According to observations on the Kol'oam-Véem River in August, 1934, migration of white wagtails along the northern boundary of their range was better defined than in the more southern sites and included family groups as well as single birds.

*Food*—E.M. Meller found insects in the stomach of a specimen caught by him.

All of the White Wagtails collected by me had large or small subcutaneous adipose deposits regardless of the time of year.

*Systematics*—Subspecies *M. a. ocularis* Swinh. is such a well-defined form that nothing new need be added.

*Specimens*—1) Émma Bay, September 7, 1934, ♂, Portenko; 2) Plover Bay, June 6, 1938, ♂, Butenko; 3) Providence Bay, July 6, 1938, ♀, Butenko; 4) source of the Amguéma River, June 7, 1939, ♀, Meller; and 5) Akatylanva landmark, Wrangel Island, June 9, 1939, ♂, Portenko.

*Biological specimens*—1) Nest with clutch of four eggs, midreaches of the Amguéma River (91st km), June 26, 1956, Portenko.

### 124. *Budytes flavus tschutschensis* (Gm.)—Yellow Wagtail

*Distribution and status*—This species nests on the Chukchi peninsula; it is not rare on the south coast, is common inside the country and at places is abundant, but it is encountered far more rarely on the north coast. Flies away in winter. A solitary instance of flight into Wrangel Island established.

E.M. Meller collected a male on June 8, 1939, in Pereval'naya Station. On June 8, 1956 I encountered Yellow Wagtails on the north coast of Krest Bay on my way to Égvekinot. L.O. Belopol'skii (1933, 1934) saw yellow wagtails a few times in June and July, 1931, on Meechken Island where it evidently nested.

This species has been found in Providence Bay by almost every naturalist who has visited the area. A specimen was quite likely caught by Captain Moore in the summer of 1849 (Harting, 1871) either in Providence or Lawrence Bay. In 1880 T.H. Bean (1883, p. 147) found Yellow Wagtails in small numbers on the spit south of Plover Bay. He caught a specimen on August 13 and another (male ) on August 14. In the following year (1881) in Plover Bay itself E.W. Nelson (1883) found Yellow Wagtails in moderate numbers. L.M. Starokadomskii acquired a female in Providence Bay on July 20, 1912; this specimen is preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR. On June 14 and 19, 1913, W.S. Brooks (1915) shot three males and two females in Providence Bay. According to I.O. Olenev, in 1932 Yellow Wagtails nested there in small numbers. On August 11, 1932, I sighted this bird in Émma Bay and on August 30 heard its call; on August 25 and 26, I encountered a few birds, a brood or a flock, on a spit south of Plover Bay. In 1938, P.T. Butenko caught specimens on June 9 and 14 in Plover Bay, and on July 6 in Providence Bay. A.P. Kuzyakin encountered this bird in 1957 throughout the coast of Providence bay Between villages and on one of the neighboring knolls.

On August 18, 1884, Yellow Wagtails were sighted by E.W. Nelson (1887, p. 207) on St. Lawrence Island. According to F.H. Fay and T.J. Cade (1959), a female was caught on August 26, 1956 near Siknik and a male on June 3, 1957 in Gambell village. These two specimens still represent the solitary finds for the island. The Yellow Wagtail is little known to local residents but is observed from time to time during the flight period. At the same time it is not rare in the nesting area in the western part of Alaska, east up to the delta of Kolvill River and the Nushagak River (Gabrielson and Lincoln, 1959).

A few finds are known for the east coast of the Chukchi peninsula. O. Nordquist (Palmén, 1887) encountered a specimen on July 28, 1879, on Kon'yam Bay in Senyavin Strait. The collection of the Institute of Zoology, Academy of Sciences of the USSR, includes a young bird caught by I.G. Voznesenskii on August 7, 1843 in Mechigmensk Gulf. On July 21, 1879 A.A.L. Palander (Palmén, 1887) caught a female near Nunyamo village on the northern side of Lawrence Bay. On August 19, 1932, I encountered a few Yellow Wagtails east of the cultural base on the south coast of the same bay. In 1970 V.V. Leonovich found a nest with eggs and chicks in this bay.

According to the observations of A.P. Kuzyakin, in 1957, this bird was quite common all along the seacoast from Akkani through Yandagai, Chulkhyan, and up to Lawrence Bay inclusive. He found it in Poutyn village, but very rarely toward Cape Dezhnev.

Judging from the description of T. Pennant (1785, p. 397), a young Yellow Wagtail ("Wagtail Tschutschi") was caught in Bering Strait of the Chukchi coast at 66° N. Based on a sketch made by V.V. Ellis, E. Stresemann (1949, p. 251) established that it was a young female. The bird flew onto the ship of the J. Cook expedition in all probability on September 3, 1778.

E.W. Nelson (1887) recorded Cape Dezhnev (East Cape) among the localities well known for observations of Yellow Wagtail on the Siberian coast. K.W. Kenyon (Kenyon and Brooks, 1960) obtained a female on Little Diomede Island on June 13, 1958, and later sighted another wagtail. I encountered Yellow Wagtails on the very first day of my trip into Uélen from Dezhnev village on August 16, 1932. I then came across a brood, judging from the time of flight, on one of the streams flowing from the Dezhnev knolls. However, in the fall of 1933, I did not find even one bird in Uélen. Evidently this species is seen least in fall flight. In the spring of 1934, I observed a fairly intense flight but the birds did not set about building nests there. During my journey along the Kol'oam-Véem River to Lake Kool'ong from August 9 through 24, 1934, I found the Yellow Wagtails nested on both banks of the river and also around the lake. I came across them almost every day but in very small numbers. Contrarily, during my journey along the Utte-Véem River from July 4 through 10, I encountered Yellow Wagtails in large numbers wherever even lone shrubs occurred. It was one of the most abundant birds. On July 3 of the same year, I had seen Yellow Wagtails in Mitkulen, a few kilometers away from the seacoast; on July 12, still further inside the country and about 15 km southeast of Mitkulen, I found this species nesting in abundance.

J. Koren (1910) came across a Yellow Wagtail on June 27, 1909 near the estuary of the Shelton River (along the Chukchi coast south of the Polar Circle). V.V. Leonovich considered the Yellow Wagtail common around Énurmino at places with shrub growth.

At the winter anchorage of the *Vega* (Palmén, 1887), near Kolyuchin Bay, Yellow Wagtails were rare. On June 22 and 25, 1879 E. Almquist shot two on Cape Dzhénrétlen. O. Nordquist sighted another pair on June 27. C. Amory (Riley, 1918) collected a young specimen on August 10, 1914 in Kolyuchin Bay. During my residence on Kolyuchi Island in 1938 I sighted a Yellow Wagtail twice. On July 25 the bird flew high above the island and on the 26th past West Cape. Under such conditions it was impossible to resolve whether the bird nested there or not, or having flown in by chance simply remained there; neither could I say whether the same bird was sighted twice or two individuals separately.

On the Amguéma in 1956, I found yellow Wagtails (Figure 24) in the nesting area around kilometer 91. It was common, but nests were not dispersed. J. Koren (Thayer and Bangs, 1914) noticed Yellow Wagtails on the Tenkergyn River east of Cape Schmidt on August 29, 1911, and right on the Cape on September 5 of the same year. I came across a female east of Cape Schmidt on August 2, 1938. A.I. Argentov (1861a, p. 493) in listing the Passeriformes of the Trans-Lena region, recalled a "yellow-bellied bird," i.e., probably a Yellow Wagtail, with no remarks concerning its range. According to F.B. Chernyavskii, both species of wagtails were encountered by him nearly everywhere in the northwestern part of the Chukchi peninsula in 1965 and 1966.

In 1916 and 1917, J. Koren (Schaanning, 1954) collected five clutches in the Lower Kolyma. The male he shot on June 1, 1917 lacked the white eyebrow region and hence belonged to the subspecies *B. f. plexus.*

The lone observation for Wrangel Island is a male I collected in Rodgers Bay on May 31, 1939. This instance of flight constitutes nothing unusual. What is exceptional is the observation of a Yellow Wagtail by the naturalist of the *Jeannette* expedition (Newcomb, 1888, p. 288) north of Wrangel Island in April, 1880. A second such find has been reported by A.P. Andriyashev, who obtained a female caught on the deck of the icebreaker *North Pole* on August 12, 1946, when the ship lay at 72°08′ N 177°41′ W.

*Habitat*—Among the more characteristic habitats of Yellow Wagtail is grassy tundra with or without shrubs on the plains as well as in the hills. An excessively wet tundra inundated with water and tall dense grass is not suitable for this species. This species selects tundra with knolls, peat mounds, more often with shrubs, and in the neighborhood of a water body. During my trips along the course of the Kol'oam-Véem and Utte-Véem Rivers, Yellow Wagtails began to appear as soon as I approached willow thickets along the banks. Low shrubs grew on the Kol'oam-Véem River, mostly not taller than half a meter, and a few Yellow Wagtails were sighted among them. High up along the course, totally devoid of shrubs, these birds were sometimes satisfied with just grass banks. On the west bank of Lake Kool'ong, in the lower part of the slope, willow grew to a meter or more in height and was colonized by Yellow Wagtails. I met an adult male in the upper part of a nearby knoll, which had probably strayed there only to feed.

On the Utte-Véem River, I found these birds mostly at places where shrubs grew tall and covered much of the area. I detected numerous nesting wagtails at the foot of a small knoll between the southwestern extremity of Inchoun lagoon and Mitkulen village. There, along the banks of a small ravine with tiny lakes and choked rivulets willows grew to a man's height, but along the edges such thickets were low. This area, extremely favorable for colonization by wagtails, was also inhabited by Red-throated and Petchora Pipits, as well as Redpolls. For some reason, Eversmann's Warblers were not in evidence.

On the extensive expanses of grassy tundra adjoining the midreaches of the Amguéma, Yellow Wagtails nested but, according to my observations, not everywhere. They avoided tall willows near rivers inundated by high water and waterlogged marshes, selecting the central zone of knolls because of their height. At such places they remained by the brooks closed in partly by meadows and partly by shrubs.

I encountered these birds from time to time even higher, on a plateau with meadow vegetation and water bodies, although the latter were few.

The Yellow Wagtail is not afraid of man and colonizes close to villages but not in them. Nearby Kilometer 91 on the Amguéma a nest was found on a tiny swamp between the village and a new colony. The swamp was so wet that negotiating it in galoshes was difficult; local people crossed it wearing high boots. A Yellow Wagtail nested 20 paces from the road in this inconvenient site, a White Wagtail nested in the new colony, and Redpolls and Northem Wheatears foraged in the latter. These birds were attracted to this area by insects.

While going around the east coast of the Chukchi peninsula, A.P. Kuzyakin encountered Yellow Wagtails almost everywhere in the immediate vicinity of villages. From time to time individual pairs were encountered on knolls. One pair nested on a recently thawed grass meadow on top of a high knoll in Providence Bay, and was sighted on June 13, 1957, when the meadow was still surrounded by snow masses. V.V. Leonovich encountered Yellow Wagtails in Lawrence Bay in places where shrubs were altogether absent. Around Énurmino they were common on the slopes of brooklets and wet sections of the tundra.

According to I.O. Olenev, in Providence Bay Yellow Wagtails selected thickets of tall grass for nesting, at places where yarangas had stood before. T.H. Bean also encountered them in grass and in inhabited yarangas, but only occasionally.

Under similar conditions, I found Yellow Wagtails in Providence Bay on the spit south of Plover during the fall flight in 1932. They remained in tall and dense luxuriant grass in soil sections fertilized by the fat discarded while dressing sea animals.

In the spring of 1934 around Uélen I encountered Yellow Wagtails in transit on a grassy tundra, initially on a lowland and later when puddles appeared on the benches on knolls, and in hilly tundra right up to the boundary of the largest piles at the top of knolls, but invariably on meadows with grass. On June 8, 1956, on the north coast of Krest Bay I came across recently arrived Yellow Wagtails on a thawed, marshy, grassy tundra.

*Arrival*—In 1932, according to I.O. Olenev, Yellow Wagtails arrived in Providence Bay in the second half of May, two weeks later than Lapland Longspurs. In 1938 P.T. Butenko caught the first specimens in Plover Bay only on June 9. In the spring of 1934 I had occasion to track their flight in the environs of Uélen. I encountered the first few pairs and flocks on May 31. The birds took off with a chirp and flew a very long distance. On June 2 I caught a single wagtail and sighted two more. On June 4 I came across a few pairs and heard their chirp, on June 7 frightened some, and on June 10 caught a lone bird near the top of the highest Dezhnev knoll. This specimen constituted the second find from Uélen. All of the Yellow Wagtails observed were extremely cautious and did not remain to nest. There was no doubt that flight had taken place but they did not appear in the nesting sites. On June 8, 1956, on the north coast of Krest Bay I came across a lone bird, then a pair, and finally three birds together. Since they remained on the open tundra without shrubs I assumed that they had recently arrived and not yet selected their areas. In the spring of 1879 this species was noticed very late near the winter anchorage of the *Vega*, from June 22 through 27, and hence these birds were not arrivals. Even on Wrangel Island a Yellow Wagtail in transit had been sighted almost a month before, on May 31, 1939.

A female in transit was collected by W. Kenyon on Little Diomede Island midday of June 13, 1958 and behaved in an unusual manner. She repeatedly took off to a height of about 50 ft above a point selected by her, then descended, fluttering her wings, and emitted a trill in high notes. Since a second wagtail appeared after midday, the calling female was evidently trying to make her presence known. This incident explains the significance of male calling since it is primarily they who wish to make their availability known.

*Nidification*—Seasonal changes in testes are given in Table 36.

The ovaries of females caught in July had a fine-grained structure. It was not possible to establish seasonal variations in subcutaneous adipose deposits. Many of the Yellow Wagtails I collected in spring and summer in Anadyr and on the Chukchi peninsula had no deposits whatsoever. A male in transit from Uélen was collected on June 2, 1934 and registered as an obese specimen. Subcutaneous fat was noticed at places in a transitory male on Wrangel Island shot on May 31, 1939. Small subcutaneous deposits were also noticed in some nesting specimens, although most specimens were devoid of them at this time, e.g., males from the Utte-Véem River on July 8 and 10 and females from Mitkulen on July 12, 1934. A young bird from Providence Bay caught on August 26, 1932 was obese.

**Table 36. Size of testes (mm) of Yellow Wagtails**

| Date | Left | Right | Locality |
|---|---|---|---|
| May 31, 1939 | 7 × 5 | 6 × 5 | Wrangel Island |
| June 5, 1932 | 10 × 8 | 9 × 6 | Markovo |
| July 14, 1938 | 8 × 4 | 7 × 3 | Providence Bay |
| July 8, 1934 | 5 × 3 | 4 × 2 | Utte-Véem River |
| July 9, 1934 | 5 × 3 | 4 × 2 | -do- |
| July 10, 1932 | 6 × 4 | 5 × 3 | Gorelovy hills, Anadyr |
| July 10, 1934 | 3 × 3 | 3 × 3 | Utte-Véem River |
| July 11, 1932 | 4 × 3 | 3 × 2 | Gorelovy Hills |
| July 11, 1932 | 3 × 2 | 2 × 2 | -do- |
| August 26, 1932 | 1.5 × 1 | 1.5 × 1 (juv.) | Providence Bay |

In 1956 I began my observations on the Amguéma on May 10. Here Yellow Wagtails remained in a lowland shrub until they were later displaced by flood. On June 13 I came across them on tundra patches free of snow cover. On June 15 males began pursuing females. At times the tiny birds grappled, took off together, or fell to the ground entangled. They formed pairs gradually. On June 18 skirmishes continued to occur as before, but quiet pairs were also seen, and I no longer heard the singing or calling of males. On June 20 males were still chasing females, but some began to call. They would soar high into the air with a chirp and advance as though propelled.

From June 22 Yellow Wagtails exhibited alarm at my appearance, and on June 24 flew far away with a chirp toward me. Such behavior makes it extremely difficult to search out nests. It is not without reason that ornithologists consider the Yellow Wagtail one of the most difficult species in this respect. Not only does it confuse the searcher of nests, but raises a general alarm among the other birds in the neighborhood. In the last ten days of June males as well as females exhibited restlessness by the nest. The call of the male could be transcribed as "tsvit' " and of the female as "drzhzhi" or "dzhrrt'."

I saw a male on July 4 soar into the air with a song that immediately changed to the standard repetitive call "tsvit'."

Finally, on July 7, I found a nest on a tiny marsh between Kilometer 91 village and the new settlement. It was located in a niche on the side of a mound with its coarsely plaited edge projecting out. This was a stable structure of stalks, with a bedding of hair, and very similar in general appearance to the nest of a pipit rather than the nest of a bunting. The absence of feathers in the bedding was explained by the location of the nest in a crowded place. The nest contained two tiny nestlings and two eggs, of which the shell of one had been pressed in and the dead chick visible inside, while the other was addled. The eggs were 18.9 mm × 15.3 mm and 18.5 mm × 14.9 mm. Their color, as usual, was finely speckled and smudged: a pale, slightly yellowish background covered by diffuse brown speckles more or less concentrated at the obtuse end of the egg. As I gathered the nest both wagtails displayed extreme restlessness and came to within 10 paces of me, the female venturing closer than the male.

On July 14 and 16 I encountered Yellow Wagtails with insects in their beak. All of them exhibited extreme restlessness, such as they usually do when beside their chicks.

On July 16 I heard the song of a male; it probably reflected an attempt to set out for laying a second clutch.

According to my observations on the Utte-Véem River in 1934, Yellow Wagtail chicks hatched in the first ten days of July. When I appeared near their nesting sites they became airborne with a characteristic chirp, but were extremely cautious and stayed beyond the reach of a rifle shot. Only a few flew closeby. At times Petchora Pipits joined the Yellow Wagtails in their anxious flights. On July 9 I noticed a somewhat different behavior. Male and female Yellow Wagtails, having flown a considerable distance around me, settled some distance away on top of bushes and emitted the characteristic notes "tsvit', tsvit'" while swaying their tails. Others after fright flew immediately far away. I noticed insects in the beaks of many birds intended for feeding their chicks. On the following day I saw young birds already sitting on the bushes. Some had fairly long tails and joined the general alarm. The tail feathers of a specimen caught had grown to only slightly more than half the normal length. This specimen skillfully hid in the bushes and I chased it for quite sometime, mistaking it for a bird not known to me. Other birds were also in hiding, including adult males. In mid-August of the same year (1934) on the Kol'oam-Véem River I came across young birds almost exclusively.

On June 21, 1970, V.V. Leonovich found a nest on Lawrence Bay with six slightly incubated eggs, and on June 22 with six nestlings. On June 25 Yellow Wagtails flew around and over Énurmino with a scream; on July 5 they were still feeding nestlings in the nest.

According to A.P. Kuzyakin, in Providence Bay on June 11 and 12, 1957, a pair of Yellow Wagtails had just built a nest. On June 23, between the village in Lawrence Bay and Akkani he found a nest with six highly incubated eggs.

*Migration*—By August 20, 1934 there were very few Yellow Wagtails on the Kol'oam-Véem River, but even on August 21 I saw a few. In 1932 I heard the note of a Wagtail in Émma Bay for the last time on August 30. In 1911 J. Koren noticed a Yellow Wagtail on Cape Schmidt on September 5. Thus the migration of this species occurred in the last few days of August and in early September.

*Habits*—My attention was caught by the fact that, compared to their European counterparts, Chukchi Yellow Wagtails are far more cautious and possess an exceptional ability to hide, resembling Gray Wagtails in this respect. The timidity of these birds has been noted by other observers also.

*Food*—The stomachs of the specimens caught by me contained the following: 1) Uélen, June 2, 1934. Bit of elytron of a chrysomelid. 2) Utte-Véem River, July 6, 1934. Head of a curculionid and heads and thoracic rings of 13 hymenopterans. 3) Utte-Véem River, July 8, 1934. Heads and thoracic rings of 31 hymenopterans, head and legs of a *Tipula,* about 150 eggs of *Tipula,* and head of an unknown dipteran. 4) Utte-Véem River, July 10, 1934. Heads of 2 carabids and heads and thoracic rings of 20 hymenopterans. 5) Utte-Véem River, July 10, 1934. Heads and other remnants of 3 carabids and bits of the body of a caterpillar. 6) Utte-Véem River, July 10, 1934. Heads of 2 curculionids, head of a hymenopteran, and small grains of sand. 7) Mitkulen, July 12, 1934. Elytra of a curculionid, elytra and abdomen of a staphylinid, an unknown beetle, heads and thoracic rings of 4 hymenopterans, and bits of bodies of 15 to 20 insect larvae.

E.M. Meller found beetles and other insects in the stomach of a Yellow Wagtail.

*Weight*—A male caught in Plover Bay on June 14, 1938 weighed 18.7 g.

*Systematics*—The problem of establishing subspecies of Yellow Wagtails inhabiting the Chukchi penisula and adjacent countries has engaged the attention of many ornithologists, especially I.A. Palmén (1887, p. 271), A.H. Clark (*Proceedings of the U.S. National Museum,* vol. 38, 1910, p. 71), J.E. Thayer and O. Bangs (1914, pp. 23–41), J.H. Riley (1918, pp. 621-622), and others. The present views on the systematics of the subspecies have undergone such change that it is rather senseless to undertake a critical examination of outdated revisions here.

I collected a good series of Yellow Wagtails in the Anadyr, the Chukchi peninsula, and on Wrangel Island and revised the subspecies after also examining the excellent material available in the collections of the Institute of Zoology, Academy of Sciences of the USSR, P.P. Sushkin, and others. The results of my revision have been published twice (Portenko, 1939b, I, pp. 87–88[6]; 1960a, pp. 156–158).

The need for renaming the subspecies *B. f. alascensis* was explained recently. Even T. Pennant (1785, II, p. 397) described a bird which he called "Wagtail Tschutschi". This name and description were repeated by J. Latham (*A General Synopsis of Birds,* II, 2, p. 403). In both cases the Latin binary name of the bird was not given, as done in 1788 by J.F. Gmelin (Caroli and Linné, *Systema Naturae.*Lipsiae, vol. I, pt. II, p. 962). Under the name *Motacilla tschutschensis,* Gmelin gave a description in Latin from the diagnosis made by T. Pennant: "*M. (otacilla)* ex olivaceo fusca, subtus alba, ferrugineo maculata, macula inter rostrum et oculos, tectricum alarum fasciis duabus, rectricibusque extimis pluriman partem albis.... Habitat ad littora Tschutschi. Tectrices alarum remigesque primores fuscae; crissum flavescens; cauda praelonga, atra: pedes nigri." Since Gmelin made a reference to T. Pennant, the description evidently pertains to the bird mentioned above by me which was collected in Bering Strait at 66° N. The description very closely fits a young female Yellow Wagtail. I place the Chukchi Yellow Wagtails in the subspecies *Budytes flanus tschutschensis* (Gm.), and very close to *B. f. plexus* Thayer and Bangs, but differing mainly in the more grayish-brown color of the upper side of the body and the presence of a white eyebrow. Its nesting zone extends from western Alaska through the Chukchi peninsula and the Anadyr Basin to Kolyma, but a transitional zone extends from Gorelovy hills to Kolyma; in this zone *B. f. tschutschensis* is found together with *B. f. plexus.*

*Specimens*—1) Mechigmensk Gulf, August 7, 1843, ○ 1° anno, Voznesenskii; 2) Providence bay, July 20, 1912, ♀, Starokadomskii; 3) same place, August 26, 1932, ♂ 1° anno, Portenko; 4) Uélen, June 2, 1934, ♂, Portenko; 5 and 6) lower course of the Utte-Véem River, July 6, 1934, ♂♀, Portenko; 7) midcourse of the Utte-Véem River, July 8, 1934, ♂, Portenko; 8) same site, July 9, 1934, ○, Portenko; 9 and 10) same site, July 10, 1934, ♂ and ○ 1° anno, Portenko; 11) environs of Mitkulen, July 12, 1934, ♀, Portenko: 12 and 13) Plover Bay, June 9, 1938, ♂♀, Butenko; 14) same site, June 14, 1938, ♂, Butenko; 15) Providence Bay, July 6, 1938, ♀, Butenko; 16) Rodgers bay, May 31, 1939, ♂, Portenko; 17) Pereval'naya Station, June 8, 1939, ♂, Meller; and 18) Chukchi Sea, 72°08′ N 177°41′ W, August 12, 1946, ♀, Andriyashev.

*Biological specimens*—1) Two eggs in a clutch, middle reaches of Amguéma River Kilometer 91, July 9, 1956, Portenko.

[6]There were some printing errors in my sketch on p. 88. Line 21 should read "up to the limits" and not "from the limits"; line 25 should read "incorrect" and not "correct".

## 125. *Anthus spinoletta härmsi* Sar.—Water Pipit

*Distribution and status*—This species nests in the Chukchi peninsula, but is extremely rare. It is found in the nesting area only in the hills of Providence Bay and inside the western part of the peninsula, on the Amguéma. It flies onto north coast. It is absent on Wrangel Island.

E.W. Nelson (1883, p. 62) wrote that "*Anthus ludovicianus* (Gm.) Licht." was encountered in the Chukchi peninsula. This reference, however, was not supported by observations and was probably conjectured from purely theoretical premises. On July 6, 1938 P.T. Butenko caught a female with a brood patch, i.e., undoubtedly a bird that had nested in the environs of Providence Bay.

According to H. Friedmann (1937, p. 91), a specimen was caught in June, 1936, near Gambell village on St. Lawrence Island. F.H. Fay (Fay and Cade, 1959) have reported that on August 3, 1956, a young pipit was caught in Boxer Bay. E.G.F. Sauer and E.K. Urban (1964) noticed one on June 8, 1960 on the western slope of the mountain range, and heard a calling male 3 miles from the bay on June 17. A female reportedly stayed in an area of west tundra. On June 19 a few pipits flew past near the coast of Lake Boxer.

After midday on June 10, 1879, a Chestnut-sided Warbler ["*Anthus* [Dendroica] *pensilvanicus* (Lath.)"] flew onto the ship *Vega* (Palmén, 1887) anchored for winter in Kolyuchin Bay and was caught by hand. It was frozen or sick and died the same evening.

At the end of June and early in July, 1956, I found Water Pipits in small numbers on the hills near Kilometer 91 extending parallel to the midcourse of the Amguéma. Males called and behaved as if they were by a nest. I did not come across these pipits in the hills around Lake Kool'ong nor near Uélen.

*Habitat*—Near the Amguéma Water Pipits colonized in the alpine zone next to the nesting area of shore larks and dotterels.

*Arrival*—Judging from the date of the find given as June 10, 1879, in Kolyuchin Bay, the Water Pipit arrives in the Chukchi peninsula early June. In the Anadyr I caught an arriving bird in 1932 even on May 27 (Portenko, 1939b, I, p. 81; 22nd line should read "July 10 and 12" and not "May 10 and 12").

The ovary length of a female caught on July 6, 1938, was only 5 mm and had a fine-grained structure; adipose deposits were absent under the skin and a brood patch present on the abdomen.

On June 20, 1956, I noticed a calling male on a knoll by the Amguéma. Probably because of my presence calling was incomplete. The pipit soared in the air with the scream "vyut'-vyut'-vyut' " and advanced in spurts. On June 24, on another rock pile at midheight of the knoll, I met yet another male. He at once appeared to me larger than a Red-throated Pipit and his voice was noticeably more sonorous. The bird flew at me and began calling. On July 2, a pair of pipits, alarmed by my presence, flew from place to place and followed my movements on the rocks. Later the male soared very high into the air, but without a song. All the pipits encountered were very cautious and did not permit close approach.

*Systematics* (Figure 25)—My revision of Water Pipits was published in *Fauna of Anadyr Region* (Portenko, 1939b, I, pp. 81–83, Table 9) and later with some change of taxonomy and nomenclature in my *Birds of the USSR* (Portenko, 1960a, p. 178). In 1963 I again reviewed the skins of Water Pipits in the collection of the Institute of Zoology, Academy of Sciences of the USSR and those collected by me in northeastern Asia from the Chukchi peninsula to Kuril, and was convinced once again of the actual existence of the subspecies *A. s. japonicus* and *A. s. härmsi*. Chukchi and Anadyr specimens undoubtedly represent *A. s. härmsi* in color and size. The zone of distribution of the large, dark, and spoted *A. s. japonicus* commences from southern Kamchatka and encompasses at least the northern Kurile Islands.

*Specimen*—1) Providence Bay, July 6, 1938, ♀, Butenko.

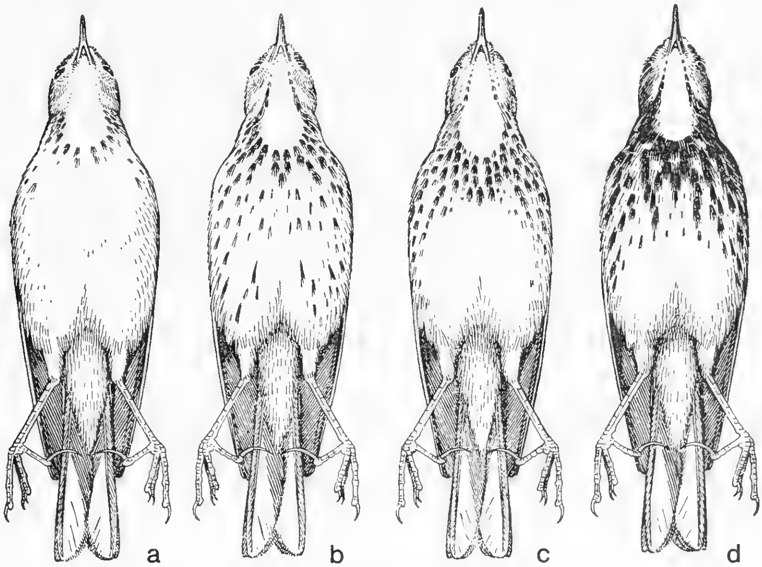



Fig. 25. Subspecies of Water Pipit *Anthus spinoletia* (L.).

Adult males: a—*A. s. härmsi* Sar.; b—*A. s. japonicus* Temm. and Schleg.

Male yearlings: c—*A. s. härmsi;* d—*A. s. japonicus.*

### 126. *Anthus cervina cervina* (Pall.)— Red-throated Pipit

*Distribution and status*—This species nests on the Chukchi peninsula, but their distribution is erratic. It is not rare on the south coast, at places even abundant in the interior of the country, but rare on the north coast. It flies away in winter. It was noticed once in spring on Wrangel Island.

L.A. Belopol'skii (1933, 1934) noticed the Red-throated Pipit in Krest Bay. W.S. Brooks (1915) encountered this species on June 20 and 21, 1913, in small numbers and obtained specimens from Providence Bay. C. Amory (Riley, 1918) collected some young pipits on August 5, 1914, in Émma Bay. On September 7, 1934, I very distinctly heard the chirp of a Red-throated Pipit in the upper part of Émma Bay, and on July 12, 1938, found nesting pairs near Cape Stoletiya. On the following day, July 13, I caught a fledgeling on the spit south of Plover Bay. In 1938, P.T. Butenko shot three specimens: on June 30 and July 6 in Providence Bay and on July 22 near Kivak village. V.N. Lyubin obtained an adult bird on July 15, 1948 in Plover Bay. A.P. Kuzyakin found a nest in Providence Bay. There, as in other places he visited in 1957 on the east coast of the peninsula, the Red-throated Pipit appeared to be not numerous. W.S. Brooks noticed this species in small numbers on June 4 and 7, 1913 on Cape Chaplin (Indian Point).

According to H. Friedmann (1937, p. 91), in July, 1936, a young bird was caught on St. Lawrence Island in the environs of Gambell village.

On August 19, 1932, I encountered a few Red-throated Pipits in the immediate vicinity of the cultural center on Lawrence Bay. V.V. Leonovich found these pipits in the nesting area in Lawrence Bay in the second half of June, 1970.

K.W. Kenyon (Kenyon and Brooks, 1960) recalled seeing two males in nuptial plumage on June 13 and 14 on Little Diomede Island. On June 12 and 13, 1958, a few pipits were noticed above the slopes of the island, but their species could not be determined. In Uélen I failed to see pipits even once, but P.T. Butenko noticed one on September 14, 1933. During my journey along the Kol'oam-Véem River I encountered Red-throated Pipits in the nesting area on August 11, 1934. I came across one or two broods on August 18 and 19 on the west coast of Lake Kool'ong. Later, even in the fall flights, I found lone birds in the upper as well as lower reaches of the Kol'oam River. On the Utte-Véem River, I collected some specimens during the breeding season, but this species was numerically less than the Petchora Pipit and was less noticeable. Not far from the river lowlands, between the southwestern bay of Inchoun lagoon and Mitkulen village, roughly 18 km southeast of the latter, I found countless Red-throated Pipits on July 12, 1934, but saw fewer Petchora Pipits, both nesting there. Farther west along the coast, J. Koren (1910) noticed Red-throated Pipits on June 27, 1909 in the vicinity of the Shelton River estuary, slightly south of the Polar Circle. According to V.V. Leonovich these pipits were common in the tundra around Énurmino.

On June 14, 1879, one specimen was brought to the *Vega* expedition (Palmén, 1887) in Chutpa village, west of Cape Serdtse-Kamen', but this species was not seen at the site of winter anchorage near Kolyuchin Bay. J. Koren saw the Red-throated Pipit in small numbers on July 3, 1909, on Kolyuchi Island. On subsequent visits to the north coast of the Chukchi peninsula he came to the conclusion that evidently this bird was rare as there were fewer than half-a-dozen seen.

According to my observations, in the tundra around the midreaches of the Amguéma, by Kilometer 91, the Red-throated Pipit nested in large numbers, although its distribution was erratic. In Vankarém, A.A. Kishchinskii noticed many broods with flying fledgelings. Farther west in the marine tundra, Red-throated Pipits rarely were seen, but they appeared to be quite common in the nesting area in the Amguéma delta.

V.D. Lebedev and V.R. Filin (1959) saw the Red-throated Pipit only rarely in the southeastern part of Aiok Island at places. The male of a pair was collected by its nest.

On July 6, 1912, J. Koren (Thayer and Bangs, 1914) collected a specimen on Cape Bol'shoi Baranov Kamen'; judging from the date, it was undoubtedly a nesting bird.

One June 5, 1939, I noticed the Red-throated Pipit on Wrangel Island near our post south of the lower reaches of the Mamontovaya River. Unfortunately the bird was extremely cautious and I could not get it.

A.M. Bailey (1932, p. 47) reported the nesting of a Red-throated Pipit on Cape Prince of Wales. On June 29, 1931, a nest with four slightly incubated eggs was found and the female was collected by it. At that time only three occurrences of the Red-throated Pipit were known in North America.

*Habitat*—The nesting sites of Red-throated Pipit are associated with shrubs, but it does not nest in the thickets, being confined mostly to their edges or only near them. In very tall shrubs on the Utte-Véem River this species was replaced by Petchora Pipit. Many Red-throated Pipits nested southeast of Mitkulen only because shrubs were of varied heights. On the Kol'oam River, I saw them at places where willows grew to half a meter or more. On the coast of Lake Kool'ong, I encountered broods in willows up to a height of a meter or more. Around Cape Stoletiya the Red-throated Pipit nested in a stream valley and in the lower zone of a hill where there were very few shrubs; recumbent willow no higher than 30 to 40 cm predominated here. On the cape south of Plover Bay I found a fledgeling which had just begun flying among tall weeds. In June, 1957, A.P. Kuzyakin encountered individual pairs on Providence Bay in tiny meadows on hills just below the ridges.

On the Amguéma, Red-throated Pipits nested from the edge of its banks to the lower slopes of the nearest hills, but did not breed densely in this tundra area. Although they were numerous even on the flat lands, their residence for the most part was associated with the uneven terrain. I encountered them on the banks of brooks or streams, on hills, or simply on peat mounds, but always where small bushes were present. They were seen rarely on the level expanses of the grassy tundra. In the marshy hill valleys Red-throated Pipits nested halfway up the hills and were seen in genuine hilly environments. For example, one could see them sitting on a rock among piles of large stones. They reached the point where the habitat of Water Pipits began. On hilly slopes, the Red-throated Pipit nested where there were clumps of two or three alder bushes.

According to A.A. Kishchinskii, on the islands in the Amguéma delta, Red-throated Pipits nested at places where recumbent willow grew to a height of 20 cm. More east, in the marine moss-sedge tundra, they were seen only in a few places—on dry slopes with hills, on small beds of willow, or in a section of mixed grass tundra. On Nugauge spit and Vankarém, pipits were confined to dry grassy soil. According to V.V. Leonovich, they were common in Énurmino in hilly tundra with shrubs.

According to V.D. Lebedev and V. R. Filin, these pipits nested on Aiok Island on ledges among shrub thickets.

In the fall of 1934, Red-throated Pipits of the Kol'oam-Véem River valley hid in extremely low shrubs on hills when I chased them. On September 14, 1933, P.T. Butenko saw a lone bird near Uélen in the ledges of coastal cliffs. On Wrangel Island, a pipit I gave chase to flew from place to place on the hilly tundra.

*Arrival*—In the territory of the Anadyr River, Red-throated Pipits arrived in the very last days of May and in early June. J. Koren (Schaanning, 1954) collected a female in the Lower Kolyma on May 30, 1917. They arrive later in the Chukchi peninsula and continue to arrive almost up to mid-June. According to my observations on the Amguéma in 1956, these pipits arrived on June 13 in large numbers. The day before not a single bird had been sighted and the day after I saw even calling males. Their characteristic delicate chirp, something like "vit' " or "ffit'," could be heard often. The day was sunny and calm and the atmospheric temperature at 10:00 a.m. +8° C, rising after midday to +10.5° C. The sun was so intense my face burned. Near Ukouge lagoon, A.A. Kishchinskii noticed the first male on June 6, 1970, but pipits appeared there in significant numbers only on June 16.

On June 14, 1879, a Red-throated Pipit was collected near Cape Serdtse-Kamen'. On June 13 and 14, 1958, two males were shot on little Diomede Island. On June 4 and 7, 1913, pipits in flight were sighted on Cape Chaplin. Finally, on June 5, 1939, I saw a pipit flying on Wrangel Island.

*Nidification*—Along the Amguéma River, calling male Red-throated Pipits rose higher in the air than any other calling bird in the tundra by at least several tens of meters. While soaring, the calling pipit flaps its wings rapidly, then moves in an arc of considerable diameter, and finally descends, pressing the tips of the wings to its body. The descent of a pipit is not exactly the same as that of a bunting, which glides with its wings spread and the tail in a characteristic "bow". Just before landing the pipit swings sideways sharply to land at the very point from which it took off. During the calling flight the rhythmic repetition of the main syllable of the call is modulated or diversified throughout the song to roughly: "vit'-vit'-vit' . . . vet'-vet'-vet' . . . vyut'-vyut'-vyut' . . ." The song commences on a very high note with chirping, modulating gradually into richer lower tones, and terminating finally in a roulade. Such a complete song is evidently not characteristic of all males, however.

From the time of arrival, Red-throated Pipits called endlessly with no audible evidence of fatigue; calling weakened only after a week had expired. On June 18 males chasing females were sighted. From June 20 through 22 the weather was inclement, calling was only occasional, and laying had commenced. Until June 28, some individual males did call at times, or rose in the air without concluding the entire procedure of calling and without song. One male was heard calling on July 4, possibly before laying a second clutch. From July 14 if pipits soared high it was because of fright.

Males caught in Providence Bay on June 30 and one on July 12 had enlarged testes (Table 37) and fairly significant subcutaneous adipose layers. In my opinion these were nonbreeding birds. Among the other July males the testes were several times smaller and subcutaneous adipose layers absent or only faintly perceptible. A young male I shot in the Tanyurer River on September 12, 1931, was obese with tiny testes of less than 1.0 mm in diameter. In all the July females the ovary had a

**Table 37. Size of testes (mm) of Red-throated Pipits**

| Date | Left | Right | Locality |
|---|---|---|---|
| June 30, 1938 | 8 × 3 | 7 × 3 | Providence Bay |
| July 6, 1938 | 4 × 2 | 3 × 2 | -do- |
| July 10, 1934 | 5 × 3 | 4 × 2 | Utte-Véem River |
| July 12, 1938 | 8 × 4 | 6 × 4 | Providence Bay |
| July 12, 1938 | 4 × 3 | — | -do- |
| July 12, 1934 | 4 × 2 | 3 × 2 | Mitkulen |
| July 12, 1934 | 4 × 2 | 3 × 2 | -do- |

fine-grained structure and the birds were emaciated.

On June 20, 1956, while walking along the hilly tundra surrounding the banks of the Amguéma, I frightened a Red-throated Pipit from its nest about five paces away. The bird fluttered about, then ignored me. The nest was located under a small bush on a mound and was woven with dry grass. The inside was closely woven with fine but resilient straw-yellow stalks with no admixture of fur or feathers. In this respect the pipit's nest differs in structure from the nests of buntings in which I always found feathers. Moreover, the former was slightly larger in dimensions. This nest contained three eggs.

On June 24 there were already five eggs in the nest. The bird was absent when I approached even though evening had set in but it appeared as I moved a little away. The beautifully colored eggs were characterized by marbling: against a lilac-brown background there were blackish-brown curves and variegated brown smudges.

On July 2 I again visited the nesting area. In one egg I detected a tiny opening from which a blood-colored fluid was oozing. The sides of another were compressed. The entire clutch was extremely warm to the touch and hatching appeared imminent. The next time I visited the nest was July 16. It was empty but the pair of adult pipits which had hidden during my former visits now exhibited considerable alarm as I approached. Both were equally distressed, a fact I had occasion to notice in other cases too. Evidently the chicks had abandoned the nest and gone into hiding.

I detected a second nest containing five eggs on June 28 at the center of a fairly steep slope of a bank under a tiny bush. A large alder bush slightly below was already covered in foliage. The female flew out from under my legs and moved out of sight. When I visited it again on July 16, it held six eggs (Figure26), but it appeared to be abandoned. It was semicircular since the rear of the nest was inclined toward the trunk of the bush and was woven on the outside with coarse material: bits of tiny dry branches, stalks, lichen, and partly moss. The inside of it was laid with a layer of extremely thin and resilient straw-colored stalks as in the first nest. The eggs were 19.6 mm × 14.3 mm, 19.5 mm × 14.0 mm, 19.4 mm × 14.0 mm, 19.1 mm × 14.2 mm, and 18.9 mm × 14.4 mm. Their color was quite uniform: grayish-white background very densely covered with generally tiny brown spots varying in size and shape. One egg was perceptibly lighter in color than the rest. Strangely, the eggs had been incubated to different degrees. A very large nestling had hatched from one, small nestlings from three, while two had hardly been incubated.

On June 14, 1957, A.P. Kuzyakin found a nest with a clutch of six half-incubated eggs in a low swampy tundra in Providence Bay. It was built on the side of a grassy-moss mound with a small bush of recumbent willow and was well covered from the sides by the walls of the mound and on top by leaves of dry grass. The entrance to the nest was from the south. The nest was 9.0 cm × 9.0 cm across and 4.2 cm deep; the bed was 7.5 cm × 6.5 cm across.

According to A.A. Kishchinskii, calling flights and singing of Red-throated Pipits occurred regularly from June 17, 1970. On July 7 a nest with five eggs was found; on July 16, flying young were sighted for the first time and from July 20 through 26 in large numbers.

According to V.V. Leonovich, on June 13, 1970, males were still singing in Lawrence Bay. On June 18, pipits flew restlessly and hopped away on the appearance of man in the nesting sites. On June 23 a nest was found with five- or six-day-old chicks. Pipits flew by screaming over a man in Énurmino on June 25.

On June 14, 1917, J. Koren (Schaanning, 1954) found a nest with four fresh eggs near the Lower Kolyma. The nest was located in a pit on the side of a grassy mound. Another nest was detected on July 5 in the Kolyma delta on a low island and contained five eggs incubated for two days.

On the Amguéma River, I noticed for the first time a male with some insects in his beak, evidently intended for chicks, on June 30, 1956. The bird was extremely agitated and flew from place to place. Only on July 7 did I see a second male with insects in his beak. From July 10 females carrying food were seen time and again. As long as the nestlings were small the females evidently continued to warm them while the males brought food. Later, the nestlings were fed by both parents with more or less equal vigor. The male and female are equally restless with the approach of man, but only the male soars high in the air on being alarmed. At this time the call "vit' " could be heard in the tundra very often and Red-throated Pipits seemed to be rather abundant. They raised an alarm with greater fervor than other birds. One pipit in a closed hill valley became so startled on my appearance that its chirp frightened Rufous-necked Stints and Northern Wheatears. Pipits generally remain very cautious, never flying close like Yellow Wagtails do, even though the latter are alarmed to the same extent.

On July 12, 1938, I happened to be in the nesting area of Red-throated Pipits north of Cape Stoletiya. On my approach they frequently chirped and exhibited much disquiet. The following day on a spit on the eastern side of the entrance to Providence Bay I tracked a chick by its chirp and gathered it in my hands.

*Migration*—In the fall of 1934, on the Kol'oam-Véem River even on August 18 Red-throated Pipits remained with their broods. Walking on the tow path, I chased broods flying along the edge of the bank ahead of me quite sometime. On August 21 under very similar conditions I came across only lone birds and encountered only one bird throughout the day on August 22.

P.T. Butenko encountered Red-throated Pipits in Uélen on September 14, 1933 and in Émma Bay on September 7, 1934.

*Food*—The stomachs of collected specimens contained the following: 1) Utte-Véem River, July 9, 1934. Heads of 2 carabids, heads of 14 hymenopterans, 31 caterpillars, spiders, and some grains of sand. 2) Utte-Véem River, July 9, 1934. Legs of a beetle, heads and thoracic rings of 13 hymenopterans, head and wings of a bug, and heads of 8 larvae of insects and spiders. 3) Utte-Véem River, July 10, 1934. Elytra of a small beetle, and heads and thoracic rings of 13 hymenopterans. 4) Utte-Véem River, July 10, 1934. Heads and bits of 10 insect larvae and some small stones. 5) Mitkulen, July 12, 1934. Head of a tiny beetle, heads and thoracic rings of 7 hymenopterans, a dipteran, 12 larvae of chrysomelids, a caterpillar, and 3 spiders. 6) Providence Bay, July 12, 1938. Highly digested remnants of insects. 7) Providence Bay, July 12, 1938. One specimen of an ichneumonid, remnants of beetles of *Poecilus* (tribe Platysmatini), an *Amara,* caterpillars, and particles of sand.

*Systematics*—In my *Fauna of Anadyr Region* (Portenko, 1939b, pt. I, pp. 85–86) I divided the formerly monotypic species of *Anthus cervina* (Pall.) into two subspecies, without giving a name to the newly designated subspecies, selecting instead a suitable name from among the synonyms. Chukchian specimens belong to the nominal form, *A. c. cervina.* The subspecies *A. c. rufogularis* brehm lives west of Taimyr. The main difference between the two lies in coloration; however, a large series reveals differences in wingspan also.

*Specimens*—1 and 2) midcourse of Utte-Véem River, July 9, 1934, ♀♀, Portenko; 3) same place, July 10, 1934, ♂, Portenko; 4 and 5) Mitkulen, July 12, 1934, ♂♂, Portenko; 6) Providence Bay, June 30, 1938, ♂, Butenko; 7) same place, July 6, 1938, ♂, Butenko; 8 and 9) same place, July 12, 1938, ♂♂, Portenko; and 10) Kivak village, July 22, 1938, ○, Butenko.

*Biological specimens*—1) Nest with clutch of six eggs, midreaches of Amguéma River (87th km), July 16, 1956, Portenko.

### 127. *Anthus gustavi gustavi* Swinh.—Petchora Pipit

*Distribution and status*—This species nests in the interior of the Chukchi peninsula, but is distributed erratically. At places it is common and abundant. It is found in nesting areas around Énurmino. Flies away in winter. It is not found on Wrangel Island.

I succeeded in finding Petchora Pipits nesting in large numbers along the banks of the Utte-Véem River and southwest of its estuary, roughly 18 km southeast of Mitkulen village. Together with Yellow Wagtails and partly Redpolls, they represented the main bird population of shrub groves on the Utte-Véem River where shrubs reach a man's waist or higher. Petchora Pipits predominated here over Red-throated Pipits, but were fewer in numbers southeast of Mitkulen. V.V. Leonovich found Petchora Pipits common in Énurmino. V.N. Lyubin caught a single bird on August 11, 1948 in Uélen, but I did not encounter this species in 1956 on the Amguéma. According to H. Friedmann (1938), a specimen was collected near Gambell village on St. Lawrence Island in 1937. The Petchora Pipit lives in small numbers throughout the Anadyr region (Portenko, 1939b, I, p. 79). J. Koren (Schaanning, 1954) collected five specimens and found two nests with clutches around the Lower Kolyma and in the Kolyma delta.

*Habitat*—On July 6, 1934, while going up the Utte-Véem River, I encountered Petchora Pipits as soon as a tall shrub came into view along the coast. On July 7 they also occurred in extremely low bushes, but along high banks. Under these, right by the water, I subsequently saw pipits many times searching for insects and shot them right from the boat. In general these birds were encountered more often near water—by ponds, marshes, etc. Almost the entire region of shrubs by the banks of the river was inhabited by Petchora Pipits and it appeared that a large colony of them lived there. Southeast of Mitkulen a few pairs inhabited an isolated island of shrubs. In Énurmino, V.V. Leonovich sighted Petchora Pipits on slopes near brooks where willows rose to a height of a meter and also in grassy sections. I also found a small nesting colony in the upper reaches of the Kozachka River near Anadyr village.

*Periodic phenomena*—On July 6, 1934, finding myself among the above-mentioned willow groves in the midreaches of the Utte-Véem river, I first turned my attention to the song of a bird with which I was not acquainted; it somewhat resembled the song of a warbler. Thoroughly examining the shrubs, I could not find the singer, but eventually sighted a Petchora Pipit on top of a bush. Itwas exceptionally cautious, initially flying away long distances and later disappearing altogether. In the next few days I encountered many pipits which behaved quite differently. Some flew restlessly, expressing anxiety, at times swooping at me, and at times swinging sideways. They often flew together with yellow wagtails and resemble them in manner of flight. Pipits initially take off straight upward and later advance in spurts as though propelled. Finally they slow down the rhythm of the wing beats and gradually descend, moving farther away all the time. On their first encounter with me the pipits came close enough for a rifle shot, but later became more cautious. Some persistently hid in the shrubs from where it was difficult to flush them out even when the shrubs were low. Others on seeing me, landed on the top of bushes, but mostly in such a way that the willow leaves hid them. Some no doubt crept down into the foliage and thicket again and probably sat on their nests, since on my approach they took off within a few paces and immediately flew far away. Some, however, took off from the top of shrubs and appeared the most cautious even while flying away.

The testes of specimens caught in the first ten days of July were enlarged (Table 38).

The ovaries of July females were fine-grained in structure. Understandably, by the time chicks hatched July specimens were emaciated or had only traces of subcutaneous adipose deposits. Nevertheless, two females from a series of nine had deposits in the form of thick layers.

According to the observations of V.V. Leonovich, in Énurmino on June 25 and 28 pipits sang from 2:00 to 4:00 a.m. On July 1 he saw chicks being fed in the nest.

**Table 38. Size of testes (mm) of Petchora Pipits**

| Date | Left | Right | Locality |
|---|---|---|---|
| July 7, 1934 | 6 × 3 | 5 × 2 | Utte-Véem River |
| July 7, 1934 | 3 × 2 | — | -do- |
| July 9, 1934 | 6 × 4 | 5 × 4 | -do- |
| July 25, 1932 | 3 × 2 | 2 × 2 | Kozachka River |

According to the observations of J. Koren, Petchora Pipits nested in the swampy soil of the Lower Kolyma by the river. The nest was in the form of a very loose structure and devoid of bedding. It was usually placed on the side of a mound. On June 24, 1916, clutches of three and four eggs were found, which had been incubated for about two days.

*Food*—The stomachs of specimens collected contained the following: 1) Utte-Véem River, July 7, 1934. Heads of 11 hymenopterans, head, legs and wings of a *Tipula,* heads of 2 tiny dipterans, and head of a caterpillar. 2) Utte-Véem River, July 7, 1934. Heads and thoracic rings of 5 hymenopterans. 3) Utte-Véem River, July 7, 1934. Bits of chitin of a beetle, heads of 13 hymenopterans, heads of 4 insect larvae, and 2 cocoons of insects. 4) Utte-Véem River, July 9, 1934. Heads of 4 carabids and heads of 5 hymenopterans. 5) Mitkulen, July 12, 1934. Heads and thoracic rings of 10 hymenopterans and a mollusk.

*Systematics*—My revision of the subspecies of Petchora Pipits has been published in my *Fauna of Anadyr Region and* in my *Birds of the USSR* (Portenko, 1939b, I; 1960a, p. 176).

*Specimens*—1 to 4) midreaches of the Utte-Véem River, July 7, 1934, 3♂♂ and ♀, Portenko; 5) same place, July 9, 1934, ♂, Portenko; and 6) Mitkulen village, July 12, 1934, ♀, Portenko.

## 128. *Lanius excubitor* subsp.—Great Gray Shrike

*Distribution and status*—A single instance of stopover is known from near the eastern extremity of the Chukchi peninsula.

There is an old reference of T. Pennant (1785, II, p. 238) pertaining to the ornithology of the eighteenth century. According to him, a Great Gray Shrike was collected by English seafarers in Bering Strait at 66° N on the Asian side of the Arctic Ocean. Judging from the description and the synonymy given, it was in fact *Lanius excubitor.* Since that time no one has mentioned the Great Gray Shrike for the Chukchi peninsula, although its flight into it would be quite natural, especially into the interior of the country where tall shrubs occur, or in the northwestern part much closer to the forest zone.

### 129. *Lanius cristatus cristatus* L.—Brown Shrike

*Distribution and status*—Instances of flight onto Wrangel Island have been established.

On August 12, 1884, before the departure of the *Corwin* from Wrangel Island, a sailor gave E.W. Nelson (1883, p. 65) a dead, desiccated specimen of a shrike which had evidently flown onto the island and died of emaciation. According to the sailor, he picked up the bird on the slope of a bank. Nelson gave a full description of this specimen and included a colored sketch drawn by R. Ridgway. At that time the accuracy of the identification was doubtful (see, for example, Schalow, 1884a, pp. 291–292; 1884b, p. 247). J.H. Riley (1918) later confirmed that Nelson's identification was correct.

Early in the summer of 1939, one of the wintering personnel in Rodgers Bay caught a red-tailed female shrike. I saw this specimen but it is not in my collection because the finder subsequently lost it.

All in all, the flight of this species onto the Chukchi peninsula could well be anticipated.

### 130. *Dendroica coronata* (L.)—Yellow-rumped Warbler

*Distribution and status*—A solitary instance of a spring stopover onto the north coast of the Chukchi peninsula is known.

On May 25, 1879, a male in spring plumage was shot by T.A. Bostrem (Palmén, 1887) near Cape Dzhénrétlen. This was one of the more interesting finds made by the *Vega* expedition.

Recently, references have been made in American literature in different contexts to the nesting of two species of the family Parulidae on the Chukchi peninsula or even in the Anadyr range. This confusion is explained primarily by the fact that finds of *Dendroica coronata* (L.) and *Seiurus noveboracensis* (Gm.) flying into Pitlekai were published for the first time in Swedish and later appeared rather often in Russian. As a matter of fact, neither of these species was ever noticed in the nesting sites of northeast Asia.

*Systematics*—I give below a translation of the description given by O. Nordquist for a freshly killed specimen.

Body length 132 mm, wing 72 mm, tail 58 mm, and metatarsus 20 mm; second, third, and fourth primary flight feathers nearly identical in length, 2 to 3 mm longer than the first, and 5 to 6 mm longer than the fifth.

Upper part of head bluish-gray with black spots; forehead lemon-yellow; anterior of eye, over it, and posterior to it, with white stripe; sides of head gray and chin white. Occiput bluish-gray, almost without spots. Gray color on middle of back merges somewhat into brown, with longitudinal black spots. Abdomen white; lemon-yellow spots on both sides of breast; upper tail coverts same color. Wings brownish-gray on top with two narrow grayish-white stripes running aslant. Underside of wing light gray, darkening toward outer rim. Tail brownish-black, with white spot near apex. Beak and claws black.

I.A. Palmén identified the specimen preserved in alcohol (Saunders, 1883, p. 350) as a young male. Dr. B. Kullenberg wrote me that a specimen of the bird was available in the National Museum of Natural History in Upsala.

The Yellow-rumped Warbler resembles somewhat the Mountain Accentor in size and general appearance, but its color is bluish and not reddish. Males and females can be differentiated at all ages from the yellow upper tail coverts.

The subspecies *D. c. hooveri* McGregor is a very large and pale bird. It is encountered in the western part of the range, especially in Alaska.

### 131. *Seiurus noveboracensis* subsp. *notabilis* Ridgw.?—Northern Water Thrush

*Distribution and status*—A single occurrence of a stopover in early summer onto the north coast of the Chukchi peninsula has been established.

A male of this species was brought on June 14, 1879, by the *Vega* expedition (Palmén, 1887) from Chutpa village, located between Cape Serdtse-Kamen' and the winter anchorage of the vessel.

*Systematics*—According to a description of O. Nordquist of a freshly killed specimen, the upper part of the body is dark gray with a slightly olive-green shade and without spots. Yellowish-white stripe runs through eyes. Underside of body white, with greenish-yellow hue that is more vivid on the chest and abdomen. Throat, crop, anterior of chest and sides peppered with black wedge-shaped spots, very long on the sides, but narrow on the chest. Wings and tail grayish-brown, while white lower tail coverts with slight yellowish tinge and gray at base. Appearance of bird something of a cross between a Gray-cheeked Thrush and Petchora Pipit, both in color and size.

Three subspecies are differentiated: 1) S. n. noveboracensis (Gm.) from the eastern part of North America; 2) *S. n. notabilis* Ridgw., larger and darker, ranging from Alaska to southwest Labrador; and 3) *S. n. limnaeus* McCabe and Miller from British Columbia.

### *Wilsonia pusilla pileolata* (Pall.)—Wilson's Warbler

According to O.J. Murie (1936), this species of the American family Parulidae was caught on Lawrence Island in Kukuliak village on September 6, 1935. Moreover, O.W. Geist (in the same article by Murie) reported that the bird caught was the fourth one sighted in a week. This species was reported on St. Lawrence Island almost every year. Its flight into the Chukchi peninsula is not ruled out.

### 132. *Euphagus carolinus* (Müller)—Rusty Blackbird

*Distribution and status*—A single instance of a spring stopover onto the south-eastern extremity of the Chukchi peninsula known.

J. Dixon (Brooks, 1915) collected a female in transit on Cape Chaplin on June 7,

1913. O.J. Murie (1938) reported a male collected in Gambell village on St. Lawrence Island.

*Systematics*—This American bird resembles our starling in size and color. The summer plumage of the male is entirely black with a metallic bluish-green shade. In the freshly molted dress this lustrous color appears somewhat tinged with red because the fringes of the feathers are red. The female is slate-gray with a greenish hue. Like young starlings, the young of this species are grayish-brown with red fringes. The iris is a light yellow.

Colonizes the northern and eastern parts of North America, including Alaska.

### 133. *Leucosticte arctoa curilica* (Pall.)—Arctic Rosy Finch

*Distribution and status*—Only four observations are known to date in the Chukchi peninsula, on the basis of which this mountain bird could be considered nesting here, but the size of its population is not known for certain.

On September 25, 1933, I saw an Arctic Rosy Finch on the slope of a bank near Uélen and I encountered a pair on June 8, 1956, on the north coast of Krest Bay on my way to Égvekinot. A.P. Vas'kovskii brought me a specimen collected in the hills south of Pevek on June 22, 1945. Finally, F.B. Chernyavskii saw a female feeding two flying fledgelings on August 7, 1965, in the upper reaches of the Yarak-Véem River in the eastern part of the northern Anyui range.

*Habitat*—In both instances I saw Arctic Rosy Finches at the bottom of banks. Near Uélen the bird lay in a ledge of coastal cliffs amid a flock of Snow Buntings and was pecking at something in the grassy terrace. It was extremely cautious, flew up along a crevice, and hid.

The pair encountered on Krest Bay was not as cautious and permitted a truckload of people to come quite close. The birds lay on an elevated tundra with stones projecting from the ground and were pecking at seeds. They were separated by a distance of several tens of meters from each other; sometimes the male flew slightly ahead and sometimes the female. Eventually both birds turned toward the foot of a knoll.

V.B. Chernyavskii met a brood on a hilly slope with rocky outcrops in the upper reaches of the river.

*Systematics*—In 1955 I revised the genus *Leucosticte* based on material from the Institute of Zoology, Academy of Sciences of the USSR. Now with a specimen from the hills near Pevek available to me, I can evaluate the subspecies of Arctic Rosy Finch inhabiting the Chukchi peninsula.

This subspecies should be called by the name given by Pallas—*L. a. curilica* (Pall.). The distribution zone of *L. a. giglioli* adjoins the range of *L. a. curilica* from the southwest. The chukchi subspecies differs from *L. a. giglioli* primarily in the pattern of variegation on the back. This pattern terminates in an acute angle in *L. a. curilica* and forms an arc in *L. a. giglioli.* Hence in the fresh plumage of *L. a. giglioli* an ocherous scaly pattern forms on the back and an arrow-shaped one in *L. a. curilica.* In the worn-out plumage of males of *L. a. giglioli* a blood-red color stands out on the head and back, which is totally absent in *L. a. curilica.* A light pink pattern occurs on the wings of *L. a. curilica,* which is absent in *L. a. giglioli.*

Judging from breeding specimens, *L. a. curilica* nests in the hills from the Lower Lena to the Chukchi peninsula. The extreme southern points of its nesting are the upper reaches of the Zeya River, Dzhugdzhur near Ayana and Urup Island in the Kuril'skiye system.

*Specimens*—Hills south of Pevek, June 22, 1945, ♂, Vas'kovskii.

### 134. *Acanthis flammea flammea* (L.) — Redpoll

*Distribution and status*—The nominal form of the Redpoll is seen in the Chukchi peninsula only as a rare transient.

P.T. Butenko collected a male on Cape Stoletiya in Providence Bay on May 27, 1938, during spring flight. This was the only specimen of the species *Acanthis flammea* (L.) he sighted throughout his residence in the bay in 1937 and 1938.

W.S. Brooks collected a nesting female on June 27, 1913 on St. Lawrence Island and identified it as "*Acanthis holboelli* (Brehm)". H. Friedmann (1932a), under the same name— "*Acanthis linaria holboelli* (Brehm)"—referred to the discovery of a Redpoll on October 16, 1930 in Gambell village. According to T.J. Cade (Fay and Cade, 1959), a lone female, not apparently breeding, was sighted on July 17, 1950 in Boxer Bay. Finally, E.G.F. Sauer and E.K. Urban (1964) accurately identified this Redpoll subspecies on June 28, 1960, in her nesting area Vanmaii River valley entering into Boxer Bay.

E.W. Nelson (1883, p. 67; 1887) recognized two subspecies of Redpolls and wrote that he had encountered both near Cape Dezhnev and on the adjoining shores of Siberia, but the White Redpoll predominated (as on the coast of Alaska). W.S. Brooks caught specimens on Cape Dezhnev and Bol'shoi Diomede Island on June 14 and 15, 1913. He identified them as "*Acanthis holboelli*". At the request of A.M. Bailey (1943, p. 110), the specimen caught on Bol'shoi Diomede Island on June 14, 1913 was studied by J.L. Peters and identified as "linaria".

Even if some of the foregoing ornithologists erred in the identification of the subspecies, there is no doubt that *A. flammea flammea* (L.) flies from time to time onto the Chukchi peninsula but does not nest there.

It was pointed out in *Check-List of North American* Birds (Committee etc., 1931, p. 325) that "*Acanthis linaria holboelli* (Brehm)" nests on Herschel Island in Siberia. This is a strange misunderstanding. On the one hand Herschel Island falls close to the MacKenzie River estuary, and on the other if the reference is actually to "Herald" Island, no one has ever seen Redpolls there.

A male shot in Providence Bay on May 27, 1938 weighed 13.6 g. The testes were 7.0 mm × 6.0 mm and 6.0 mm × 5.0 mm. In a male I caught on the Main River in the Anadyr region on May 22, 1932 the right testis was 12 mm × 9 mm. This, however, constitutes an exception; the left testis in this specimen was 10 mm × 8 mm.

*Specimen*—1) Providence Bay, Cape Stoletiya, May 27, 1938, ♂, Butenko.

### 135. *Acanthis flammea exilipes* (Coues)—White Redpoll

*Local names*—Chukchian: kedliptschekadlin in the records of the *Vega* expedition. In Eskimo: qū-wū-slē′-puk on St. Lawrence Island.

*Distribution and status*—This subspecies nests on the Chukchi peninsula but it flies away in winter. Its distribution is uneven; it is rare everywhere on the coasts, is common inside the country, and at some places abundant. It comes to Wrangel Island, but not every year. Instances of nesting have been established.

E.M. Meller collected a male in Pereval'naya Station on August 2, 1939, i.e., in the nesting season. V.E. Yakobi shot a White Redpoll near Uél'kal' on June 28, 1961; moreover, he noticed pairs as well as flocks on June 23 and 25.

A pair of White Redpolls collected by I.N. Akif'ev in Providence Bay on July 9, 1900, is preserved in the Institute of Zoology, Academy of Sciences of the USSR. Three specimens collected there also by L.M. Starokadomskii on July 20, 1912 are likewise preserved in alcohol in the Institute. A.M. Bailey (1926) obtained a specimen on June 30, 1921, in Émma Bay. However, I.O. Olenev who wintered there in 1931/1932 did not sight a single White Redpoll. I too failed to see this bird even though I visited Providence Bay on more than one occasion. P.T. Butenko wintered there and caught a single Redpoll in spring flight, which proved to be the nominal form [*A. f. flammea* (L.)]. A.P. Kuzyakin sighted one White Redpoll in Providence Bay in mid-June, 1957.

On St. Lawrence Island the White Redpoll is not a common species. O.J. Murie (1936) discovered one on September 25, 1934 in Kukuliak village. F.H. Fay (Fay and Cade, 1959) sighted pairs and flocks every day near Gambell village from May 24 through June 2, 1957, and collected two specimens. According to the eskimos, White Redpolls at times nested in the village in structures and under boats. In 1960 E.G.F. Sauer and E.K. Urban (1964) noticed three pairs in Boxer Bay on June 9; they sighted White Redpolls even later, until August 18, and saw one in Kangi village on June 14.

On June 20 and July 12, 1957, A.P. Kuzyakin saw solitary White Redpolls in Lawrence Bay west of the village. On June 15 and 16, 1970, V.V. Leonovich also saw lone birds at the same place in Lawrence Bay. According to E.W. Nelson (1883, p. 67), on the Asian coasts adjoining Bering Strait, the White Redpoll was perhaps the most numerous of land birds. He encountered it on Cape Dezhnev (East Cape) and at almost every landing place on the coast.

On Little Diomede Island, K.W. Kenyon (Kenyon and Brooks, 1960) noticed a solitary White Redpoll on May 18 and another on June 13, 1958. The birds could not be collected as Snow Buntings were chasing them.

On June 10 and 15, 1934 I saw a single White Redpoll around Uélen. Although I studied the local bird fauna for over a year, I did not see any others.

On the Kol'oam-Véem River, according to my observations, they nested in small numbers: I encountered a brood on August 11 and another on August 13, 1934 in the midreaches of the river. Moreover, I came across a brood on August 18 on the west bank of Lake Kool'ong. Later, I found numerous White Redpolls in the nesting

Fig. 26. Nest with clutch of Red-throated Pipit *Anthus cervina* (Pall.). Amguèma, by Kilometer 87. July 16, 1956.

Fig. 27. Nest of the White Redpoll *Acanthis flammea* (L.) with clutch. Amguéma, by Kilometer 91. June 22, 1956.

Fig. 28. *Emberiza hyperborea.* Unpublished sketch prepared for *Zoographia Rosso-Asiatica* by N.S. Pallas.

Fig. 29. Recently hatched nestling of Lapland Longspur *Calcarius lapponicus* (L.). Amguéma, by Kilometer 87. Early July, 1956.

areas from July 6 through 10, 1934 along the banks of the Utte-Véem River. The more extensive and taller the willow groves, the greater were their numbers. On July 12 I found several nesting White Redpolls in the shrubs between the southwestern bay of Inchoun lagoon and Mitkulen village, roughly 18 km southeast of the lagoon.

V.V. Leonovich on June 25 and later, on July 1 and 2, encountered a few pairs in 1970 among willows rising to a height of up to a meter along brooks near Énurmino. The birds were flying and singing animatedly. Old nests were discovered.

E. Almquist (Palmén, 1887) during his trip into the interior to the southern extremity of Kolyuchin Bay, saw two White Redpolls on June 16, 1879, of which he caught the male. In Dzhénrétlen he succeeded in shooting both a male and female on June 22. This was all the material the *Vega* expedition managed to gather. Expectedly, judging from the description, the specimens caught were genuine *A. f. exilipes.*

In July, 1909 J. Koren (1910) found White Redpolls in small numbers on Kolyuchi Island. I sighted a bird on July 25, 1938, flying over the island. Judging from the time of year it was perhaps a breeding bird but, on the other hand, this could have been a bird that had strayed. Even in the nesting period, White Redpolls perform significant daily flights, in any case several tens of kilometers per day.

According to my observations in 1956, White Redpolls inhabited the banks in large numbers along the midcourse of the Amguéma river. They were encountered on each trip and sighted several times even on days when I did not go round the knolls. I studied 12 nests with eggs and chicks (Fig. 27) as well as a large number of old nests of previous years. In reviewing my trip to the North I cannot name a single locality where white Redpolls were as numerous as along the Amguéma.

According to V.Ya. Isaev, White Redpolls nested on the northern foothills of the mountains closest to Cape Schmidt. A.I. Argentov (1857a, p. 85) referred to White Redpolls among the birds wintering in Chaun parish. L.M. Starokadomskii collected chicks on Cape Val'kumei in Chaun Bay on July 27, 1913. V.D. Lebedev and V.R. Filin (1959) found old nests of White redpolls on the south coast of Aiok Island, and on June 22, 1958 shot the female of a pair. On June 13, 15, and 27 they sighted flocks on Aiok Island; on August 10 even larger flocks in the Tikhaya River valley in the western part of the Karchyk peninsula; and on September 9 a flock in Pavek. J.E. Thayer and O. Bangs (1914), based on a report by J. Koren, wrote that the White Redpoll was common at all the points on the Arctic coast of the Chukchi peninsula visited by them. Such a generalization is extremely superficial and not confirmed by observations. In 1965 and 1966 F.B. Chernyavskii found it to be common in the northwestern part of the Chukchi peninsula. On the Lower Kolyma, J. Koren (Schaanning, 1954) obtained 16 skins and 4 clutches of this bird. E.W. Nelson did not find White Redpolls either on Wrangel or Herald Island. According to the observations of V.F. Vlasova over a five-year period, White Redpolls were not seen every year on Wrangel Island. Some birds were usually encountered in the tundra near Rodgers Bay. In 1931 a pair of White Redpolls even made a nest in the territory of the Polar Station. In the fall of 1938, I did not encounter a single White Redpoll on Wrangel Island, but in the spring of 1939, found a pair between Predatel'skaya and Somnitel'naya bays, which perhaps had come there to nest. I managed to catch the female of this pair. According to a report of S.M. Uspenskii and colleagues (1963), a solitary White Redpoll and a pair were sighted on July 18, 1960, in the Mamontovaya River valley.

*Habitat*— The White Redpoll nests only in such areas of the Chukchi peninsula where shrubs are available. When I was trekking the lowlands of the Utte-Véem River on July 6, 1934, White Redpolls flew infrequently to very low, but not recumbent, shrubs along the coast. However, as soon as high bushes rising to a man's height occurred on the right bank of the river, White Redpolls and Yellow Wagtails were immediately sighted in large numbers. Likewise, in the high willows in southeast Mitkulen numerous White Redpolls were sighted together with Yellow Wagtails, Red-throated Pipits often with Petchora Pipits, and even with Lapland Longspurs. On the Kol'oam River they were compelled to satisfy themselves with low shrubs, and nested there in far smaller numbers.

Lowland willow groves served as the habitat of White Redpolls on the Amguéma River. Around Kilometer 91, shrubs rarely exceeded my height and often reached only up to my waist. Although the White Redpoll builds its nest in the upper portion of a bush, floods flush many pairs out of the willow groves. Unlike Eversmann's Warblers, White Redpolls do not avoid thickets growing on very wet soil or in shallow water, and sometimes make their nests in extremely small groves consisting of only a few bushes. They also nest far away from the lowland along brooks and marshes, colonizing in bushes rising to a height of several tens of centimeters, and do not build nests right on the ground in open tundra or in recumbent willows. I did find a nest on the ground but it was located among tall bushes.

Unlike Eversmann's Warblers and other shrub birds, White Redpolls stray from their nesting sites long and even very great distances. I found them on hills in the sun-warmed tundra sections where insects were abundant. In search of food or nest material, white redpolls land straight on the grass and wander among stalks or on the ground under bushes in search of food. White Redpolls have also been seen on the snow gathering willow and alder seeds cast on the ice by wind. Even on their arrival they have been sighted on puddles where no bushes were growing.

White Redpolls are no strangers to human habitations. Nonetheless they had not nested in the new settlement by Kilometer 91 village, even though seen there as often as wagtails, wheatears, and Lapland Longspurs.

According to V.Ya. Isaev, White Redpolls nested in low shrubs on the northern foothills of the mountains near Cape Schmidt. Such localities are also available to them on Wrangel Island, but for some reason they selected a bear cave to nest in. According to V.P. Vlasova, they wove their nests in the depression of beam on which a metallic grid was attached. On June 4, 1939, at the mooring site on the Mamontovaya River, I noticed a pair of White Redpolls hiding between the pillars of a dilapidated house. On the next day one appeared there in the morning, and later I collected the female which had continued to hide behind the pillars. I had the impression that the birds had gathered there to nest. The tendency of birds in general to gather in the proximity of human dwellings is explained by the availability of abundant insects on the refuse dumps during the warm months of the year. According to S.M. Uspenskii, a pair of White Redpolls was sighted on July 18, 1960, in one of the gulleys on Wrangel Island where willow thickets occur. V.D. Lebedev and V.R. Filin found nests on Aiok Island among willow thickets. F.B. Chernyavskii considered White Redpolls to be a common inhabitant of willow groves on river banks at all the sites he visited in the northwestern part of the Chukchi peninsula.

During spring flight, I came across White Redpolls around Uélen on the stone piles of one of the higher knolls. On Little Diomede Island, K.W. Kenyon also saw them flying between rocks along the steep slopes.

*Arrival*—The White Redpoll arrives on the south coast of the Chukchi peninsula at the end of May and on the north coast in early June. In the spring of 1934, I noticed around Uélen the first White Redpolls only on June 10. I succeeded in attracting it by whistling and shot it down. On June 15 I heard a vigorous call, probably the male partner of the female shot by me. He responded to my whistling but then disappeared. In the spring of 1939 I sighted White Redpolls on Wrangel Island for the first time on June 4.

In 1956, I arrived on the Amguéma River by Kilometer 91 village on June 9 and found myself in an end-of-winter environment. White Redpolls had recently arrived and were sitting by puddles calling to each other—“chiv-chiv”. They were few in numbers and became fairly common only on June 14.

In 1958 K.W. Kenyon noticed them on Little Diomede Island on May 18 and June 13.

*Nidification*—I studied the growth and decline in size of testes by autopsying the males of my Anadyr and Chukchi series (Table 39).

**Table 39. Seasonal changes in dimensions (mm) of testes of the White Redpoll**

| Date | Left | Right | Locality |
|---|---|---|---|
| October 15, 1931 | 1.5 × 1 | 1 × 1 | Markovo |
| January 31, 1932 | 1 × 1 | 1 × 1 | -do- |
| March 23, 1932 | 3 × 2 | 3 × 2 | -do- |
| May 11, 1932 | 8 × 5 | 7 × 4 | -do- |
| July 6, 1934 | 5 × 3 | 4 × 2 | Utte-Véem |
| July 8, 1934 | 6 × 6 | 6 × 5 | -do- |
| July 9, 1934 | 6 × 4 | 5 × 3 | -do- |
| July 9, 1934 | Up to 6 mm | | -do- |
| July 10, 1934 | 7 × 5 | 8 × 5 | -do- |
| July 22, 1932 | 3 × 2 | 2 × 2 | Ugol’naya |
| July 25, 1932 | 4 × 2 | 3 × 2 | Kozachka River |
| July 30, 1933 | 6 × 5 | 4 × 4 | Anadyr village |
| August 5, 1931 | 8 × 5 | 8 × 4 | Tanyurer |
| August 5, 1931 | Up to 5 mm | | -do- |
| August 7, 1931 | 7 × 5 | 7 × 5 | -do- |
| September 1, 1931 | 2 × 2 | 2 × 2 | -do- |

The testes of adult males decrease sharply in size in September and then maintain a constant size throughout fall and winter. At this time both gonads are about 1.0 mm across. At the end of March the testes again begin to grow and from May through August inclusively evidently do not change significantly in size. In young males, commencing from September and through March inclusively, the testes do not exceed 1.0 mm. The size of the testes in two-year-olds in the nesting period is the same as in very old birds.

From fall, young females have ovaries in the form of faintly distinguishable films. I found such ovaries among White Redpolls I collected in Markovo on January 31, 1932, but even by December 23 the ovaries had acquired the form of tiny dense glands. One follicle in the ovary of an adult female on May 11, 1932 was 2.0 mm long. This ovary had just begun to grow. In a specimen collected on June 13, however, only a fine-grained ovarian structure was seen. This corresponded to the completion of clutching. It is interesting that a female killed on the Tanyurer on August 5, 1931, had an ovary in an active state and a dilated oviduct. Since a male with enlarged testes was caught on the same day, it is quite obvious that the White Redpoll is capable of laying a second time right up to early August.

Subcutaneous adipose deposits undergo seasonal variations. All of the White Redpolls obtained from October through June possessed abundant fat bodies. Not a single emaciated bird was noticed; in fact birds collected in July, August, and at least in the first half of September were characterized by the absence of adipose deposits with very few exceptions. Thus males from the Utte-Véem River on July 10, 1934, possessed traces of subcutaneous adipose deposits while chicks appeared obese. Adipose deposits in a male from Anadyr village on July 30, 1933, were in individual lumps. In the crop of this specimen, as in others, around 500 to 600 tiny seeds were found, while the stomach of emaciated Chukchian White Redpolls contained mostly insects. A chick from Gek on July 17 had similar adipose deposits. Such exceptions were few among the 40 specimens autopsied.

According to my observations, on the Amguéma River in 1956, White Redpolls were seen in pairs right from arrival. On June 10 they called to each other and often landed on bushes on which leaves had not yet emerged. I heard the first call on June 13. A male soared into the air, gradually gathered height, and advanced in starts. Some males rose into the air even above pipits. They often flew very far while calling, but returned to the original place. They repeated the bisyllabic call "chi-chi" or "chi-chyuv" continually. On landing on a bush the male would often give out a prolonged call—"chyuippii . . ."—resembling a linnet. A very fine thrill—"tr'r'r', . . ."—could be heard from low-flying lesser redpolls.

By June 14 some pairs had selected the bushes in which they wished to nest. They often flew to the same site, descended from the bushes onto the ground, and wandered among dry grass. On Jung 16 their trills were even more frequent.

On June 18 I tracked a female that had begun to build a nest, a third of which was already completed. The bird often visited it without, however, bringing additional build-in material. The male sat aside on a branch indifferently but followed the female when she set out to fly very far. On June 22 I found the nest completed and with four eggs inside. The birds were in evidence by their clutch.

I gathered some old nests and found that they were constructed in the following manner. At the base of a fork in a bush, the White Redpoll first places rough and thick tiny branches, crossing them in every direction, then places very thin branches on top of them. Before raising the walls the bird constructs the base in the form of a tiny saucer made of soft material: extremely thin stalks, plant fluff, wool, feathers, etc. Although the nest rests on an empty base, the entire structure is extremely stable. It cannot be easily dislodged by hand and an old nest remains quite often in the bush for more than a year, withstanding winter storms and the weight of snow piled on top. Nests are placed at different heights, from the ground to the apex of the bush, but mostly at a height of 70 to 150 cm. They are situated at the edge of a bed or inside a thicket, but not far away from its edge. One nest had been built on a rubble spit 50 m away from the river and was located between the trunks of willows.

The nests of White Redpolls are extremely uniform in design. On the outside they are lined with material of a light gray color and attached most often to branches of a gray color also. The inside of the nest is invariably white, consisting of white plant fluff interwoven with feathers that are mostly white in color. The walls of the trough, usually in the form of a regular hemisphere, project slightly above the edges of the gray walls of the nest. Hence the gray-white bird sitting on its nest is totally indistinguishable from the gray-white environment.

In a nest I found on July 4, nestlings hatched after 11 days of incubation by the female. Their down is a light gray while that of nestlings of Lapland Longspurs is grayish-ocer. The female sat in the nest very firmly; the male was nowhere to be seen. After a week the nestlings had grown so much they could hardly be accommodated in the nest. Pin feathers had begun to appear on the wings. The chicks were apparently totally silent. On July 14 they looked at me without fear when I approached the nest, but the moment I began removing branches in order to photograph them, they fluttered to the grass and hid. I took one chick away in a carton and it sat absolutely quiet, only chirping and struggling the following day. When I opened the carton it flew 2 or 3 m upward. An autopsy revealed extremely tiny testes.

I found a second nest with four eggs on June 22. The female was incubating it.

There was only one egg in the third nest found on June 24. By June 28 a second egg was seen. The female had sat very firmly until my interruption and returned to the nest the moment I left. The male was not in evidence.

In the fourth nest, found on June 25, I watched the male feed an incubating female. She sat very firmly. When I cleared the branches for photographs, I could hear the voice of the male. The female responded with a hurried chirp—"chiv, chiv, chiv"—and a fluttering of wings. On arriving at the nest the male immediately commenced feeding her by emptying the upper part of his gullet. Feeding continued for half a minute.

Realizing that the female in the fifth nest was also being fed, I resolved to wait for the male's next visit. I sat quietly by the nest for 20 minutes without results. Thus the male takes a long time in gathering food.

The female in the fourth nest incubated with surprising tenacity. She did not descend even when I broke tiny branches near the nest and held my telephoto lens within 1.0 m of her. On July 7 there were three chicks and one egg in the nest. Incubation had evidently commenced from the time of laying the last egg and continued for 11 or 12 days. The shell of the unhatched egg was broken and a dead chick lay inside. Its size was 16.9 mm × 12.5 mm.

The eighth nest was a truly graceful structure and I took it for my collection. It was located in the narrow junction of three branches and hence about 10 cm high; exteriorly it was 7. 7 cm across and the trough 4.6 cm across. The walls were covered with very thin grass stalks with a small admixture of tiny thin branches and leaves of sedge. The inner soft base of the nest consisted of plant fluff and the trough was lined with tiny white feathers and partly white deer hair. In the nest were five eggs measuring 18.2 mm × 13.2 mm, 17.9 mm × 12.6 mm, 17.8 mm × 12.8 mm, 17.7 mm × 12.8 mm, and 16.7 mm × 13.0 mm. They were pale greenish-blue (aquamarine) with numerous brownish-red specks and spots on some and almost none on others. There were more specks at the obtuse end of the eggs. One June 26, semigrown chicks were visible inside all the eggs and appeared identical in size.

The ninth nest, found on July 4, contained three chicks and two eggs. The female flew onto the nest, was very trusting, and did not descend all the time I was around. The male flew close within a minute of my arrival.

I took the tenth nest for my collection also. It was 11 cm across, 5.0 cm inside, and the trough about 2.5 cm deep. It differed from the eighth nest in the use of very coarse material. There were fewer gray-colored stalks in the walls, which contained instead some moss and ears of mixed grass. The soft base of the nest was made of plant fluff. Among the white feathers I identified two summer feathers of a partridge. The four eggs were 16.7 mm × 12.8 mm, 16.6 mm × 13.1 mm, 15.9 mm × 12.9 mm, and 15.8 mm × 13.2 mm. They were pale blue with reddish-brown specks and spots of different intensities toward the obtuse end. On July 10 extremely small embryos were visible inside the eggs, in which the eyeballs had not yet fully formed.

The eleventh nest differed in that it was situated in the fork of very thick (over 5.0 cm) branches of a willow at a height of 1.0 m from the ground. The female (evidently young, with a yellow spot on the forehead) descended only when I began to separate the branches. On July 5 I found three fairly large chicks in the nest with stubs of feathers jutting out on the pterylae.

The twelfth nest was located in quite a low bush and on July 5 contained five chicks of different ages. The youngest had probably hatched only the day before.

My observations of nests were disturbed by damage to half of them caused by dogs wandering in the surrounding tundra in search of poultry. Finding the nests was not difficult since the willow bushes leafed very late. Only on June 26 did leaves begin emerging from buds and the thickets could still be seen through. On the ground and on low bushes nests were visible and birds could be seen descending from them.

Only the female incubates and generally sits very tenaciously. Birds descended from the nest only when I clapped my hands with 1.0 or 2.0 m of it, stretched my hands out toward them, stirred or broke branches to take photographs, and once when I sneezed. The female descended unwillingly, as though driven out. One became thoroughly habituated to my visits, but there were some which flew away when I was still 20 to 30 paces distant. Frightened females dove into the nearest bush, landed on the ground, and searched for seeds; some drank water or climbed to the top of the bush and remained for several minutes. Their mobility depended on the degree of their alarm.

Males which had not flown far away for food, remained close to the nest and when alarmed gathered very quickly. Sometimes they rushed to a female abandoning her nest, chased her, or even mated with her. They usually sat on top of the bushes, flew from one bush to another, and uttered sounds.

In general, my observations revealed that a clutch consists of four or five eggs. The first eggs were seen on June 18 through 26 and full clutches from June 22. The female lays one egg per day and commences incubation after the last is laid. The female of the twelfth nest constituted an exception. Chicks began to emerge in the first few days of July and in some cases probably even on the last few days of June, but I saw no broods outside the nests until mid-July.

On June 30 I noticed groups of three to five White Redpolls comprising, probably, partly nonbreeding birds, later undoubtedly those which had lost their clutches, and still later birds with moderately grown chicks. V.E. Yakobi noticed flocks in Uélkal' even from June 23 through 25. In the first ten days of July, White Redpolls exhibited restlessness on the Amguéma River when I approached the willow thickets; evidently they had hidden chicks there.

In 1934 on the Utte-Véem River at the end of the first ten days of July White Redpolls could be seen moving around animatedly in every direction. They flew from place to place with a chirp, landed on the bushes, descended immediately, or sat quite some while in pairs or singly on projecting branchlets. Even on July 7 I heard males singing and trilling.

White Redpolls were the most trusting of all the birds I observed and permitted the closest approach to bushes. I saw the first young birds attempting to fly on July 10.

A nest found in the factory in Rodgers Bay on July 15, 1931 was built of thin shavings, fiber, dry threads, scraps of wool, and pappus of Compositae. A few feathers were seen in the trough. The four eggs in it differed in a comparatively brighter color. Already developed blood vessels were visible inside the eggs. In 1913 L.M. Starokadomskii found feathered chicks in a nest in Chaun Bay on July 27. In mid-August, 1934 I came across broods on the Kol'oam-Véem River and again on August 18 on the bank of Lake Kool'ong. Adult White Redpolls began to scream unceasingly and sat atop small bushes.

*Departure*—Migration of the White Redpoll in the Chukchi peninsula occurs in gradual movements. The extreme dates of observations were recorded near Pevek (September 9, 1958) and on St. Lawrence Island (September 25, 1934, and October 16, 1930).

*Food*—The following food remnants were found in the stomachs examined: 1) Uélen, June 10, 1934. Spider, pulverized remnants of some seeds, and much sand. 2)

Utte-Véem River, July 6, 1934. Bits of 4 caterpillars, heads of some 10 tiny midges, 10 plant lice, and sand. 3) Utte-Véem River, July 8, 1934. Pulverized remnants of some seeds and sand. 4) Utte-Véem River, July 9, 1934. Very tiny bits of some caterpillars, bits of shell of 3 to 5 seeds, and much sand. 5) Utte-Véem River, July 9, 1934. Bits of bodies and heads of some 10 caterpillars and grains of sand. 6) Utte-Véem River, July 9, 1934. Tiny bits of some 5 caterpillars and sand. 7) Utte-Véem River, July 10, 1934. Nearly whole and bits of 50 to 70 plant lice and much sand.

E.M. Meller found plant seeds in the stomach of a specimen caught in Pereval'naya Station on August 2, 1939.

*Systematics*—I analyzed our White Redpolls in my *Fauna of Anadyr Region* (Portenko, 1939b, pt. I, pp. 52–55; unfortunately due to an oversight on p. 55 letters under the diagrams of beaks have been mixed up) and in a more abridged manner in my *Birds of the USSR* (Portenko, 1960a, pt. IV, p. 275). The shrub tundra of the Chukchi peninsula is inhabited by the White Redpoll, *Acanthis flammea exilipes* (Coues.).

*Specimens*—1 and 2) Providence Bay, July 9, 1900, ♂♀, Akif'ev; 3 to 5) same site, July 20, 1912, ○, Starokadomskii; 6 and 7) Cape Val'kumei, Chaun Bay, July 27, 1913, juv., Starokadomskii; 8) Rodgers Bay, July 15, 1931, ♀, Vlasova; 9) Uélen, June 10, 1934, ♂, Portenko; 10 and 11) midreaches of the Utte-Véem River, July 6, 1934, ♂♂, Portenko; 12) same site, July 8, 1934, ♂, Portenko; 13 to 15) same site, July 9, 1934, ♂♂ ○, Portenko; 16 and 17) same site, July 10, 1934, ♂, juv., Portenko; 18 and 19) Lake Kool'ong, August 19, 1934, ♀ ○, Portenko; 20) Wrangel Island between Predatel'skaya and Somnitel'naya Bays, June 5, 1939, ♀, Portenko; 21) Pereval'naya Station, August 2, 1939, ♂, Meller; and 22) Amguéma River, 91st km, July 14, 1956, juv., Portenko.

*Biological specimens*—1) Nest with clutch of four eggs, Rodgers Bay, July 15, 1931, Vlasova; 2) nest with clutch of five eggs, midreaches of the Amguéma River, June 26, 1956, Portenko; 3) nest with clutch of four eggs, same site, July 10, 1956, Portenko; and 4) one egg, same site, July 10, 1956, Portenko.

## *Loxia* sp.—Crossbill

According to F.H. Fay and T.J. Cade (1959), an eskimo from Gambell village, evidently in 1943, killed some sort of a crossbill using a sling. His description is not disputable, but the species could not be established.

## *Pyrrhula pyrrhula cassini* Baird—Northern Bullfinch

According to H. Friedman (1937, p. 91), an adult male Northern Bullfinch was caught in May, 1936 on St. Lawrence Island near Gambell village. In Alaska this bird was caught on January 10, 1867 in Nulato, and three specimens from October 12 through 16, 1927 on Nunivak Island.

### 136. *Passerella iliaca unalaschcensis* (Gm.)—Fox Sparrow

*Distribution and status*—Two occurrences of the stopover of this bird is known for the Chukchi peninsula. It ranges in North America from Alaska to California and east up to Newfoundland.

On June 28, 1961 V.E. Yakobi (1962) caught a male in transit in Uel'kal'. The discovery occurred in a plain grassy tundra not far from a brook and 700 m away from the bank of Krest Bay. The bird weighed 44.1 g and had well-developed testes: 11.2 mm × 8.3 mm. V.E. Yakobi therefore assumed it to nest; I cannot agree with this because I consider this instance an accidental occurrence.

In the western part of North America, this species is divided into a large number of subspecies and a good series is necessary for their accurate identification. I have only 43 skins with me and am therefore obliged to use the thorough yet outdated revision of H.S. Swarth (1920). In my opinion the specimen collected by Yakobi belongs to *Passerella iliaca unalaschcensis* (Gm.) and this identification was confirmed by C. Vaurie when I sent the skin for scrutiny to the American Museum of Natural History in New York.

Yakobi's find of *P. iliaca* (Merr.) in the Soviet Union is evidently not the first. I shall discuss the reference of P.S. Pallas (1811, II, p. 35) to "*Emberiza hyperborea*" and the find of I.G. Voznesenskii on Mednyi Island.

It is well known that *Zoographia Rosso-Asiatica* remained unillustrated but some charts were printed and some prepared for the press. I found among those housed in the Archives of the Academy of Sciences of the USSR (collection 129, schedule I, no. 136) two sketches of "*Emberiza hyperborea*", prepared for reproduction, one in the same frame with "*Passer pusillus*" (Red-fronted Finch) (Fig. 28), and one of "*Emberiza hyperborea*" alone. It is possible that the second constituted a drawing by Merck, about which Pallas had written that he had appended a sketch from those of Merck ("inter cujus icones figura superest quam hic adjeci"). Both sketches are highly imperfect from the viewpoint of present-day standards. Having photographed them, I compared both with specimens in the collection of the Institute of Zoology, Academy of Sciences of the USSR. All of the species, and most of the subspecies of North American sparrows, are represented in the Institute's collection. In my opinion the sketches better resemble the species *Pipilo fuscus* Swains, which I mentioned in one of my articles (Portenko, 1951).

Prof. E. Stresemann (1951) in reading my article disputed my identification and placed the bird depicted by Merck in the species *Melospiza melodia* (Wilson). In the collection of the Institute of Zoology, Academy of Sciences of the USSR, 82 specimens of this species are preserved, including almost all of its subspecies. With respect to beak, legs, general appearance, and more so color, not one of them comes close to resembling the bird depicted in the drawing.

Ten years later, having obtained the specimen caught by V.E. Yakobi, I again undertook a detailed analysis of American sparrows. Furthermore, I took into consideration the fact that old museum specimens of *Passerella iliaca* (Merr.), in particular those collected in Alaska by I.G. Voznesenskii, were labeled "*Emberiza* *hyperborea*". Identifications had been done by, among others, academician F.F. Brandt. In the 1840's *Zoographia Rosso-Asiatica* was not yet outdated, and the name "*Emberiza hyperborea*" still in use; it went out of circulation soon thereafter.

I also paid attention to the fact that in the sketch done by Merck the birds are depicted with long, thin, sharp claws on a large foot, a feature extremely characteristic of *Passerella iliaca;* the claws are shorter, blunter, and more hooked in *Pipilo fuscus.* Since "*Emberiza hyperborea*" is shown in profile in the sketches, the spots on the underside of the body are hidden. This feature escaped me in 1951 when I identified "*E. hyperborea*" as "*P. iliaca*".

Since the type description has not been preserved, the diagnosis is very brief ("brown sparrow, white underneath, with brown spots on breast"), and the sketches not entirely reliable, the question of "*Emberiza hyperborea*" remains unresolved. I am now inclined to draw the following conclusions, however: 1) under the name "*Emberiza hyperborea*" Pallas evidently described not *Pipilo fuscus,* but *Passerella iliaca;* and 2) Merck sketched a bird actually caught in the Chukchi peninsula as stated by P.S. Pallas. Since a reliable specimen of *P. iliaca* is now available from Uél'kal', it is best to avoid reference to the dubious "Brown Towhee" mentioned to date in just two monographs on bird fauna of the Soviet Union.

In a series collected by I.G. Voznesenskii, there is a specimen of *P. iliaca* bearing a label: "*Emberiza hyperborea,* ♂, Mednyi Island". Flight into Mednyi Island from the Aleutian Islands is entirely probable.

*Systematics*—A Russian name has to be assigned to *Passerella iliaca,* which is being introduced into the bird fauna of the Soviet Union. I have called it "pevchaya ovsyanka" [song sparrow] because it sings well and the Latin name "*iliacus*" means "singing, celebrating".

This species is remarkable for its exceptionally wide geographic variability. H.S. Swarth placed the subspecies *P. i. unalaschcensis* among the group of subspecies characterized by extremely wide variation in color, with a predominance of reddish-brown and not gray shades. The size of the beak is moderate and the tail shorter than the wing. Among the six subspecies included in this group, *P. i. unalaschcensis* stands out in its slightly larger dimensions, including those of the beak, and the fainter development of reddish-brown coloration. The nesting range covers the Alaskan peninsula and Shumagin and Unalaska Islands.

It is not easy to find a counterpart for the Fox Sparrow among our birds. It is somewhat smaller than the Corn Bunting, but is solidly built. The beak is massive but sharp at the end. The short wings cover less than one-third of the long tail. The color on the upper side of the body is an olive-brown, but more reddish at the fringes of the secondary flight and tail feathers, especially on the upper tail coverts. The underside of the body is white, with large brown spots on the breast and sides and small ones on the throat.

*Specimen*—1) Uel'kal' village, June 28, 1961, ♂, Yakobi.

### 137. *Passerculus sandwichensis anthinus* Bp.—Savannah Sparrow

*Distribution and status* Stopovers onto the Chukchi peninsula and Wrangel

Island have been established. This is the first occurrence in the Soviet Union.

On June 2, 1934 in Uélen I caught a male and a female, probably of the same pair, on different occasions. On the bright night of this same day, I was on Bol'shoi Diomede Island, and saw a small sparrow in the grass near my bungalow. By the time I had fetched my gun the bird had disappeared and I could not accurately determine its species. It appeared to be a Savannah Sparrow.

A.G. Velizhanin (Uspenskii et al., 1963; Sudilovskaya, 1964) collected a solitary bird on Wrangel Island on Cape Blossom on September 27, 1960.

*Habitat*—Some of the Savannah Sparrows caught by me were found in pits in which walrus meat was preserved, between the last building in the village and the ridge of a knoll. One specimen was found a few hours later on the same ridge on a grassy tundra.

*Seasonal phenomena*—The ovary of the female caught was fine-grained in structure.

*Food*—In the stomach of one specimen were bits of heads of 3 carabids, an insect cocoon, and ground remains of 30 to 40 tiny seeds. Another contained the heads and elytra of 7 staphylinids, rear ends of 5 insect cocoons, bits of the body and heads of about 50 tiny dipteran (?) larvae, and large grains of sand.

Some subcutaneous adipose layers were present in the male specimen, while the female was emaciated.

*Systematics*—The Savannah Sparrow is very similar to our Little Bunting in size and color, but it lacks the brownish-red color on the head. Instead, a light lemon-yellow stripe runs over the brow and broadens above the fillet (it is white in the subspecies of groups *princeps* and *rostratus*). Finally, the Savannah Sparrow does not have such long white spots on the longest tail feathers, which are so characteristic of most Palearctic sparrows. The general shade on the upper side is olive, while in little buntings it is red.

The color on the upper side is variegated. Against a background of grayish-brown, longitudinal brownish-black variegations stand out sharply. These are broader along the sides of the forehead where they form two distinct bands with pale gray or ocherous-gray partings in the center. On the back they are even broader, but narrow and short on the nape, and diffused in the anterior part of the back. Dorsally, the wings are brownish-horn and the feathers edged in grayish-ocher. The upper tail coverts, like those on the back, also exhibit variegated colors. The tail is the same rolor as the wings, with very narrow light-colored fringes. The underside of the body is white, with blackish-brown variegations surrounding the throat. Much broader virgate longitudinal spots occur on the sides. The color of the two sexes is almost identical. The beak is a dark horn color, but lighter on the sides and underneath. The legs and claws are also horn-colored.

The outline of the horny palate* in the Savannah Sparrow is very similar to that of Little Buntings and a detailed anatomical study might possibly reveal such a close phylogenetic similarity between the two that they could be combined under a common generic name.

At present, up to 15 or more subspecies of Savannah Sparrow are differentiated.

* The premaxillary palate—Ed.

In the 1930's this species underwent three basic revisions: H.C. Oberholser (1930), H.S. Swarth (1934), and J.L. Peters and L. Griscom (1938). Based on these revisions and the collection of the Institute of Zoology, Academy of Sciences of the USSR, I was able to accurately determine the subspecies of the specimens caught by me. I have 55 skins of Savannah Sparrows and a study of them yielded the following results:

1. ***Passerculus sandwichensis*** (Gm.). Three specimens from Unalaska differ in their massive beak as shown in Fig. "C" in the work of Swarth (p. 49). The wingspan of the male is 7.73 cm and of the two specimens of undetermined sex 7.73 and 7.55 cm. Moreover, one specimen from Stephens Island in Norton Bay possesses a similarly massive beak and a long wing measuring 7.71 cm. This bird had a freshly molted plumage even though the label states "summer of 1843". If the label is not erroneous, the specimen should most probably be recognized as having flown in from the Aleutian Islands.

2. ***Passerculus sandwichensis crassus*** Pet. and Grisc. Described from Sitka and according to Peters and Griscom, range covers the islands of southern Alaska, from Chichagov to Prince of Wales, and adjacent parts of the mainland coast. Characterized by a massive beak but not to the same degree as in the type form (see Fig. "B" of Swarth); the wing is short. Of the three specimens from Sitka, only one has a massive beak. The other two were evidently birds of passage and caught on May 18 and 23. Their beak is small as in the north Alaskan birds.

3. ***Passerculus sandwichensis anthinus*** Bp. Described from Kodiak from where I obtained May specimens. Their beak is small and thin as shown in Fig. "A" of Swarth. Hence the name "*anthinus*" should be applied to the north Alaskan form as done by Peters and Griscom. To this subspecies belong the 16 specimens from Alaska, from Norton Bay to Kenai, including the two birds of passage from Sitka, and both of my Chukchi specimens. The wingspan ranges from 6.49 to 7.21 cm.

I have some reservations about the male from Kenai caught on September 24, 1842. Its wingspan is 7.15 cm, but the beak is massive as in the nominal form.

*Specimens*—1 and 2) Uélen, June 2, 1934, ♂♀, Portenko.

### 138. *Chrysophrys pusilla* (Pall.)—Little Bunting

A solitary instance of stopover onto Wrangel Island.

A.I. Mineev found a dead specimen on September 8, 1933 in the tundra near Rodgers Bay. The bird was probably a victim of inclement weather.

*Specimen*—1) Rodgers Bay, September 8, 1933, ○, Mineev.

### 139. *Junco hyemalis hyemalis* (L.)—Slate-colored Junco

*Local names*—Chukchian: ramau in the records of the *Vega* expedition. Although the Chukchians who brought the specimen called it by this name, it is quite clear that they have no established name for this rare migratory species.

*Distribution and status*—It flies onto the Chukchi peninsula and Wrangel Island by chance.

The *Vega* expedition was given a female of this species on June 4, 1879, which had been collected in Tepkan village east of Kolyuchin Bay opposite Idlidlya Island.

I noticed a male Slate-colored Junco on October 6, 1938 flying over the Polar Station in Rodgers Bay and obtained it. Later, I shot a female not far from the same place. Tayan examined these specimens and told me that in all probability he had seen a Slate-colored Junco on October 17 of the same year in the Khishchnikov River estuary.

According to K.W. Kenyon (Kenyon and Brooks, 1960), a male *J. h. hyemalis* was caught in nesting plumage on June 5, 1958 on Little Diomede Island. Eskimos said they had never seen such a bird before.

Discoveries were also made on St. Lawrence Island. O.J. Murie (1938) reported two males caught in spring flight on May 21, 1937 in Gambell village, while R.L. Rausch (Fay and Cade, 1959) noticed a Slate-colored Junco on November 28, 1954 in Savunga village. Instances of junco flight in the northeastern extremity of Asia probably occur more often than flights of other species of American birds.

*Habitat*—I found a male in a small cattle shed with hay where it had taken refuge during stormy weather. The female flew around the structure. Tayan saw a Slate-colored Junco by the hunter's cabin. In all instances the birds were thus confined to inhabited structures where they were evidently habituated to finding food. Finds on St. Lawrence Island were also made in the village and a specimen caught on Little Diomede Island on a rocky slope behind the village.

*Seasonal phenomena*—The male I collected had testes slightly less than 1.0 mm in diameter, while the ovary in the female had a compact structure. Judging from the intense brown bloom, both were yearlings. Subcutaneous adipose deposits were present only below the pterylae. The birds did not give the impression of emaciation due to a prolonged flight.

*Systematics*—I give below a description of the specimens I collected. Beak of male before desiccation lilac-flesh-colored, with a dark brown tip and ridge. Iris dark nut-colored, metatarsi dark brown, and digits and claws darker. Entire upper side of body, throat, breast, and sides bluish or slate-gray, blackish on forehead and fillet. Feathers on top in very fresh state with nut-brown fringes, not sharp but broad. Neck and breast with extremely narrow, whitish borders. Wing coverts slate-black with light-colored fringes. Flight as well as central tail feathers blackish-horn with bluish-gray fringes. Extreme secondary flight feathers with broad nut-brown margins. Two extreme tail feathers white, and third with broad white longitudinal stripe. Lower part of breast and abdomen white. Subcaudal part generally white, but wing flaps dark slate-gray. Length of beak from frontal plumage 0.94 cm, wingspan 7.65 cm, tail 6.50 cm, and metatarsi 2.16 cm.

The female differs noticeably in its more brownish color tone, due in particular to the intense development of nut-brown edges on feather tips which have not yet worn out. Upper part generally an uneven nut-brown color, with a vivid translucent bluish-gray at the feather base. Margins yellowish-brown. Neck and breast grayish-slate with ocherous-brown feather tips. Rest of underside white with an ocherous bloom on the subcaudal portion and brownish-ocherous on the sides. Wing flaps dark, grayish. Beak much lighter flesh color than that of male. Beak length 0.97 cm, wingspan 7.52 cm, tail 6.53 cm, and metatarsi 2.12 cm.

The description of a freshly killed bird (later preserved in alcohol; see Saunders, 1883, p. 350) given by O. Nordquist (Palmén, 1887) mostly approaches my female specimen; latter only slightly larger with a different wing measurement and differs partly in color since it was caught in fresh fall plumage.

My specimens quite clearly belong to the nominal form *Junco hyemalis hyemalis* (L.). Their back is roughly of the same color as the sinciput, neck, and breast. This subspecies ranges from Alaska to Pennsylvania.

Juncos are an American group of sparrows inhabiting North and partly Central America in large numbers. These have been differentiated into much smaller groups, usually regarded as species but considered subspecies by some authors.

*Specimens*—1 and 2) Rodgers Bay, October 6, 1938, ♂♀ 1° anno, Portenko.

### *Junco oreganus* (Townsend)*

According to F.H. Fay and T.J. Cade (1959), an adult female of this form of junco was caught on January 31, 1957 in Gambell village.

This species of junco differs in the brownish color on its back.

### 140. *Spizella arborea ochracea* Brewster—Winter Sparrow

*Distribution and status*—A single stopover onto the northeastern extremity of the Chukchi peninsula has been established. This is the first occurrence in the Soviet Union.

E.W. Nelson [1883, p. 71, "*Spizella montana* (Forst.) Ridgw."] lacked information as to where and when this bird was sighted, but expressed the view that it undoubtedly occurred on the Chukchi peninsula. His assumption has proven true only now. On June 2, 1934, I found a solitary Winter Sparrow in Uélen. On that day there was a strong southerly wind and two specimens of *Passerculus sandwichensis* were obtained. The wind thus carried to us American birds which are not typical of Russian fauna.

*Habitat*—I found the Winter Sparrow on a rubble zone between the last house and the knoll. The bird was searching for seeds in sparse vegetation and remained close to a Lapland Longspur.

*Food*—The stomach of this specimen contained 75 tiny seeds and large sand grains. It was devoid of subcutaneous adipose deposits, yet did not appear particularly emaciated as is usually the case for birds in transit.

*Systematics*—The Winter Sparrow together with some other closely related American species constitutes the genus *Spizella* Bp. From among the Palearctic sparrows, in my view *Emberiza jankowskii* Tacz. is closest to them. The species *Spizella arborea* (Wils.), characteristic of the northern parts of North America, is divided into two subspecies: the eastern *S. a. arborea* (Wils.) and the western *S. a. ochracea* Brewster. The latter represents a common bird in Alaska and hence

* Oregon Junco. Now considered a subspecies of *Junco hyemalis*—Ed.

repeated flights into Soviet territory can be anticipated.

The cap of the male in fresh plumage is rusty-reddish, with a longitudinal mid-stripe formed by the ocherous feather tips. Stripe running through the eyes and feathers on the sides of the breast covering the carpal fold of the wing same color. Rest of head and neck dirty bluish-gray, lighter on the broad zone above the brows. Back ocherous-gray, with reddish and dark brown longitudinal variegations as in reed bunting. Upper tail coverts light olive-gray. Upper wing coverts darker gray. Central and large coverts with white tips forming two fairly broad bands across the wings. Large coverts with reddish margins on top, while extreme secondary tail feathers with ocherous margins. Rest of tail feathers horn-colored with tiny rusty-reddish pipings. Tail feathers lighter than flight feathers; extreme ones with whitish margins. Underside of wings whitish-gray. Small brownish spot visible through gray breast feathers. Underside, abdomen, and upper tail coverts ocherous-white. Sides of body olive-gray. Culmen and tip of gonys dark horn-colored; legs lighter, but digits blacker.

Females of this sparrow are very similar to males, but smaller in size and slightly more lustrous. The wingspan of the male caught was 7.58 cm.

*Specimen*—1) Uélen village, June 2, 1934, ♂, Portenko.

### *Spizella passerina* (Bechstein)*

F.H. Fay and T.J. Cade (1959) mention an encounter with this North American sparrow on St. Lawrence Island. It was sighted for only a few minutes on May 31. 1957 in the immediate vicinity of Gambell village.

### 141. *Zonotrichia atricapilla* (Gm.)— Golden-crowned Sparrow

*Distribution and status*—Accidental flights into the Chukchi peninsula and Wrangel Island known. This is the first occurrence in the Soviet Union.

P.T. Butenko collected this bird on May 6, 1938, in Providence Bay near Plover village. The credit for its detection on Wrangel Island belongs to me. On September 26, 1938, I saw a lone Golden-crowned Sparrow, unknown to me until then, flying above Rodgers Bay from southeast to northwest. It later landed on the bank but could not be caught because extremely cautious. On October 6 I came across a Golden-crowned Sparrow a second time, no doubt the self-same bird, in the territory of the Polar Station and captured it.

*Habitat*—My Golden-crowned Sparrow landed on the rubble section below the precipitous coast of the bay in Wrangel Island. On October 6 the bird penetrated the wire net around the building where cattle meat was kept. P.T. Butenko caught his Golden-crowned Sparrow on a rubble spit near the village. In both cases the sites of capture were totally similar, which is no mere accident.

*Seasonal phenomena*—The male caught by Butenko on May 6, 1938 had large testes, 8.0 mm × 4.0 mm and 7.0 mm × 4.0 mm, a size expected in birds before the mating season has commenced.

*Chipping Sparrow—Ed.

*Food*—The stomach of my specimen was empty except for a few tiny pebbles. The nature of the subcutaneous adipose formations, i.e., films covering the pterylae, were patchy, revealed that the bird was emaciated due to starvation. This explains why on landing on the rubble coast it immediately began searching for food in the drift material on the surfline, and on October 6 attempted to feed even on frozen meat. The specimen caught by P.T. Butenko was likewise totally devoid of subcutaneous adipose deposits.

*Systematics*—The Golden-crowned Sparrow is a purely American bird and I was the first to sight it in the Soviet Union. It belongs to the genus *Zonotrichia* and differs in many respects from Russian sparrows. It is a large sparrow, equal in size to a Corn Bunting. The length of the tail is approximately equal to the length of the wing. Characteristic features of color are: black longitudinal stripes on the sinciput among males or top of head totally black, "sparrow-type" coloration of the back and wings, and absence of large white fields on the extreme tail feathers. The species of interest to us—*Zonotrichia atricapilla* (Gm.)[7]—inhabits the western parts of Alaska, north up to Kotzebue Bay, and much of British Columbia; it migrates in winter from Oregon to the California peninsula. The Golden-crowned Sparrow differs from related species in its relatively large metatarsi and color of the sinciput.

A description of the collected specimens follows: Males in spring plumage. Three longitudinal stripes on the upper side of the head: two lateral lustrous black and broad central greenish-yellow in forepart and ash-gray in rear. Neck, cheeks, and throat fairly pure gray. Main background of back nut-brown, with variegations of brown, blackish-brown, and ocher. Wing brown, with two white transverse stripes. Flight and large coverts with nut-brown-yellow fringes. Shoulder and extreme secondary flight feathers with broad reddish-brown margins turning white toward peak of feather. Upper tail coverts nut-brown and tail feathers olive-brown. Wing lining yellowish-brown. Breast somewhat more gray than sides. Abdomen dirty white; whitish and yellow-brown spots seen under tail. Large feet flesh-horn-colored; culmen dark horn-colored and gonys dirty orange. Iris nut-brown. Length of beak from frontal plumage 1.08 cm, wingspan 8.29 cm, tail 7.90 cm, and metatarsi 2.58 cm. Body weight 34.1 g; for the sake of comparison it suffices to say that the average weight of a house sparrow is 30 g.

The bird I collected in the fall, judging from its fairly large dimensions, was a young male. The lateral stripes on its head were cinnamon-brown and the one on its forehead yellowish-olive. The rear part of the head was nut-brown with brownish and blackish-brown variegations. The throat was white with brown stripes on the sides, and the cheeks brownish. The rest of its coloration resembled that of an old male. Its beak length was 1.07 cm, wingspan 8.39 cm, tail 8.15 cm, and metatarsi 2.65 cm.

*Specimens*—1) Providence Bay, Plover spit, May 6, 1938, ♂, Butenko; and 2) Rodgers Bay, October 6, 1938, ♂ 1° anno, Portenko.

[7]Synonym—*Zonotrichia coronata* (Pall.)

Fig. 30. Male Lapland Longspur *Calcarius lapponicus* (L.). Amguéma, by Kilometer 91. July 5, 1956.

Fig. 31 Male Lapland Longspur *Calcarius lapponicus* (L.) by the nest.
Amguéma, by Kilometer 91. July 15, 1956.

Fig. 32. Female Lapland Longspur *Calcarius lapponicus* (L.) by her nest.
Amguéma, by Kilometer 91. June 15, 1956.

Fig. 33. Nest with clutch of Lapland Longspur *Calcarius lapponicus* (L.).
Amguéma, by Kilometer 91. June 30, 1956.

### *Zonotrichia leucophrys gambelli* (Nuttall)*

This species of the genus *Zonotrichia* was reported by K.W. Kenyon (Kenyon and Brooks, 1960) for Little Diomede Island. On June 5, 1938, a singing male sat on a slope back of the village for 12 hours before it was caught. According to the eskimos, these birds were sighted by them in spring singly or in twos, but they never found their nests.

### 142. *Calcarius lapponicus lapponicus* (L.)

### 143. *Calcarius lapponicus alascensis* Ridgw.

### 144. *Calcarius lapponicus kamtschaticus* Port. — Lapland Longspur

*Local names*—Chukchian: tómkopchekal'gyn; tumkup in the records of the *Vega* expedition. In Eskimo: nazotleýak (nazoleyak) on Bol'shoi Diomede Island; qung-uthl-qō′-yuk on St. Lawrence Island.

*Distribution and status*—This is most common and abundant nesting species on the Chukchi peninsula and Wrangel Island. Flies away in winter.

According to V.E. Yakobi, this was the most common bird in 1961 around Uél'kal'. He also found a nest. On August 6, 1932, I came across broods around Notapenmen village on the east bank of Krest Bay. L.O. Belopol'skii (1934) collected a specimen on Meechken Island and often noticed Lapland Longspurs in the nesting period along the banks of Krest Bay.

In Providence Bay the Lapland Longspur has been sighted by all visiting ornithologists. It used to be numerous there in the grassy tundra, but is rare in the hilly rocky tundra. A specimen was found in the collection of Captain Moore (Harting, 1871), who obtained it in the summer of 1849 apparently in Plover Bay (Dixon, 1918, pp. 338–391). E.W. Nelson (1887) found this species rare in Providence Bay in spite of the apparent availability of suitable habitats. Specimens are preserved in the collection of the Institute of Zoology, Academy of Sciences of the USSR, which were caught in Providence Bay on July 11, 1900 by I.N. Akif'ev and July 20, 1912, by L.M. Starokadomskii. In June, 1913 this species was a very common one there according to W.S. Brooks (1915). On July 22 and 28 and August 8, 1914, C. Amory (Riley, 1918) collected six specimens in Émma Bay and considered the Lapland Longspur to be the most common bird nesting there. In the summer of 1921 A.M. Bailey (1926) found Lapland Longspur abundant. According to I.O. Olenev, these longspurs were common and abundant in Providence Bay in 1932. Nevertheless, in 1938, P.T. Butenko obtained very few specimens. I found these birds at different places: in Émma Bay and north of Cape Stoletiya where they were not rare in the nesting sites. During incubation of eggs, because of their reticence, buntings are rarely sighted even at places where they are common.

* White-crowned sparrow—Ed.

In 1961 A.P. Kuzyakin discovered 10 nests near Providence Bay. According to his general impression while visiting the coasts of the Chukchi peninsula, commencing from Providence Bay to Uélen, Lapland Longspurs constitute the most abundant species of land birds, surpassing in numbers by ten times, perhaps, the other common forms among them.

Every observer visiting St. Lawrence Island has likewise mentioned that Lapland Longspurs were common or even abundant on the island. The *Vega* expedition (Palmén, 1887) found it common on August 1, 1879; E.W. Nelson in the summer of 1881; Harriman's expedition (Friedmann, 1932a) in 1889 (five adults and a young bird were caught on July 13); W.S. Brooks in June, 1913; A.M. Bailey in the summer of 1921; and O.W. Geist (Murie, 1936) in the fall of 1935 (males were collected in Kukuliak; according to him, these buntings were common everywhere in the fall).

F.H. Fay and T.J. Cade (1959) sighted this bird every year. It was more widely distributed on the island than any other species, and especially common in Gambell village and Boxer Bay. These observers found more than five nests. They mention specimens collected from Gambell village: ♂ and ♀, June 25, 1950: four pull., June 27, 1950; ♂, May 22, 1953; and ♀, August 8, 1953. In 1960 E.G.F. Sauer and E.K. Urban sighted Lapland Longspurs quite often in Boxer Bay, Kangi, and the tundra between this bay and Gambell village; five nests were found.

O. Nordquist (Palmén, 1887) sighted a female by Kon'yam Bay in Senyavin Strait on July 28, 1879. I saw many young Lapland Longspurs in Lawrence Bay on August 19, 1932. V.N. Lyubin collected specimens there in 1948: two males, July 30 and two young, July 26 and 30. A.P. Kuzyakin in the last decade of June and the first half of July, 1957, found nests with nestlings and incubated clutches by the lake west of Lawrence village, and around Uélen from June 27 through July 2. V.V. Leonovich found a nest with clutch and nestlings on Lawrence Bay.

In 1953, according to a report by J.W. Brooks (Kenyon and Brooks, 1960) a lone pair was sighted on Little Diomede Island, but in 1958 K.W. Kenyon reportedly saw a few singing males in May, encountered about 10 pairs on the flat top of the island on June 2, and found a nest with clutch 300 yards from a school building on June 9. In my visit to Bol'shoi Diomede Island at the end of June, 1934, the Lapland Longspur was not a rarity and one specimen was caught.

According to W.S. Brooks, Lapland Longspurs were very common in June, 1913 on Cape Dezhnev (East Cape). Around Uélen, according to my observations from 1932 through 1934, they represented the most numerous species of all the land birds.

I later found numerous Lapland Longspurs in the tundra along the Kol'oam and Utte-Véem Rivers several tens of kilometers deep inside the country, west up to Mitkulen village. Lapland Longspurs were sighted by J. Koren (1910) near the Shelton River estuary (south of the Polar Circle) on June 27, 1909. W.S. Brooks encountered them in small numbers on Cape Serdtse-Kamen' even on July 17 and 18, 1913. Their small population in the rocky section of the north coast is readily explained by the terrain. V.V. Leonovich, in the summer of 1970, found Lapland Longspurs common in the nesting area in Énurmino. The *Vega* expedition (Palmén,

1887) caught specimens, including breeders, on the coast from Tepkan to Dzhénrét-len. Innumerable Lapland Longspurs had been sighted there on June 16, 1879. E. Almquist considered these longspurs the most common species of birds in the interior of the country between Pitlekai and Kolyuchin Bay. K. Amory obtained a young bird on August 10, 1914 in Kolyuchin Bay Inlet. On Kolyuchi Island, J. Koren found Lapland Longspurs in small numbers on July 3, 1909. I collected a young specimen there on July 25, 1938, but sighted no others. E.W. Nelson (1883, p. 69) pointed out that this bird was found in moderate numbers on the Chukchi coast. His reference probably pertains not only to Providence Bay, but also to Vankarém region where the *Corwin* was moored. In a later work Nelson (1887, p. 183) gives only a general comment—that the Lapland Longspur including young birds, had been sighted on the north coast of Siberia.

Judging from the fact that the small collection of birds made by E.M. Meller in Pereval'naya Station contained two specimens of Lapland Longspurs, this species was no doubt common in the interior hilly sections of the Chukchi peninsula. In 1956 I found Lapland Longspurs to be numerous in the Amguéma basin. Commencing journey from the north coast of Krest Bay, I found many in the tundra on my way to Égvekinot. Arriving near Kilometer 91 on the Amguéma River, I found them literally as abundant as larks everywhere in the southern steppes. Lapland Longspurs colonized the area unevenly. Often it was the only species of bird inhabiting the dry elevated sections of the tundra, but even there one could go a quarter to half a kilometer without encountering a single one. At places favorable for these birds, however, pairs nested 100 to 150 m apart. Going along the wet grassy tundra in the breeding season, I heard the call of agitated Lapland Longspurs on all sides. When I sat to rest on a mound, I saw within 30 to 40 paces of me two or three males simultaneously within a short time. I uncovered 11 nests.

According to A.A. Kishchinskii, in June and July, 1970 Lapland Longspurs were the most abundant bird in the tundra from Vankarém to the Amguéma River estuary. Reckoning the number of singing males, Kishchinskii calculated that nearly 23 pairs lived per km$^2$, but by then incubation had ceased and females, which until then had not been sighted, were encountered everywhere. Thus it appeared to Kishchinskii that a pair resided in every hectare of land. Along the Ekug-Véem River, 20 km from the sea, Lapland Longspurs were even more abundant. On June 27 and 28, they were encountered once every 50 m (about 400 pairs per km$^2$).

In early August of 1938 I noticed large numbers of broods on Cape Schmidt. According to V.Ya. Isaev, who wintered there, Lapland Longspurs were common nearly everywhere up to the foothills, and penetrated the hills at least up to the midreaches of mountain rivers.

According to V.D. Lebedev and V.R. Filin (1959), this was the most common bird in Pevek and on Aiok Island. In 1912 J. Koren (Thayer and Bangs, 1914) found Lapland Longspurs common along the north coast of the Chukchi peninsula and saw them in particular on Cape Bol'shoi Baranov. According to F.B. Chernyavskii, in the summer of 1965 and 1966 this species was encountered in large numbers everywhere in the broad river valleys he visited on the northwestern part of the peninsula.

E.W. Nelson did not encounter Lapland Longspurs either on Herald or Wrangel Islands. A. Crawford (Snyder, 1926) caught two specimens on Wrangel Island, however. According to A.I. Mineev (1936) it was a rather common nesting bird on this island, although its population was significantly less than that of snow buntings. In Tundra Akademii over a three-day period, from August 16 through 19, 1938, I noticed a lone brood in the Krasnyi Flag River estuary and concluded that the Lapland Longspur was rare in the northern part of the island. On the southern side, on the contrary, it was a very abundant species and I came across significant numbers from the Mamontovaya River in the west to the Nasha River estuary in the east. In 1960 S.M. Uspenskii, R.L. Bëme, and A.G. Velizhanin (1963) met with broods on the coasts as well as in the interior of the island. In their opinion, too, it was a common nesting species. On July 18 while traveling by jeep from the Mamontovaya River valley into the Tundrovaya River valley (in Tundra Akademii), they came across only a single brood in a 5-km stretch over rubble and mottled hilly tundra. On July 19, between 6:00 and 7:00 a.m. local time over a 1.5-km stretch in Tundra Akademii three broods were sighted, and at another place at the same latitude in a test zone of 50 m six broods recorded between 11:00 a.m. and 12:00 noon.

I noticed more males than females on Wrangel Island. Hence some males remained unpaired. Contrarily, in the nesting period I sighted females being chased by more than one male. The comment by E.W. Nelson, who visited the coasts of both Alaska and Chukchi peninsula, that Lapland Longspurs were more numerous on the American side of the Arctic Ocean than on the Asiatic is worthy of note.

*Habitat*—The Lapland Longspur is essentially an inhabitant of plain grassy tundra, especially in hilly and grassy tundras. It nests in mounds and it is not without reason that Chukchians call it "tómkopchẹkal'gyn," which means "bird of the hills". In the flatland tundra terrain it is a typical bird and quite ornamental, especially at the time of calling. The Lapland Longspur avoids very wet and flat expanses where there is nothing to hinder vision. It usually resides at places where the monotonously flat landscape is interrupted, as in brooks, ponds, streams, swamps, meadows, peat mounds, willow thickets, and so on. In very wet tundra, the Lapland Longspur selects very dry areas, but generally it nests rarely in dry tundra. It does not avoid hilly areas and when grassy tundra is available occupies even the top of knolls. For example, I found it nesting on the slopes of Bol'shoi Diomede Island and on knolls adjoining Uélen, even in the hilly regions, and also in the lower sections of knolls in Providence Bay. It is no stranger to rocky areas with only sections of grassy tundra alongside. It may be found along with Snow Buntings although both birds are usually mutually exclusive. Snow Buntings need rocky ground while the Lapland Longspur requires grass.

The banks along the midreaches of the Amguéma that I examined had individual pairs of Lapland Longspurs 250 m above the bottom, i.e., slightly more than half way up but only along marshy or river valleys where fairly extensive tundra meadows prevailed. According to A.P. Kuzyakin, the Lapland Longspur was so rare in the hilly rocky tundra in Providence Bay that hardly a pair lived in a $km^2$. In the hilly regions of Little Diomede Island, K.W. Kenyon noticed calling males on a grass strip among rocks around the village and also on a flat peak of the island.

On the seacoast near Uél'kal', according to V.E. Yakobi, Lapland Longspurs inhabited sections of rubble spit overgrown with scanty tundra vegetation, but also hilly tundra covered with mixed grasses.

In the opinion of F.H. Fay and T.J. Cade, the habitat of Lapland Longspur on St. Lawrence Island is more cosmopolitan than that of any other species of bird, despite the fact that it prefers wet tundra and sites in the proximity of human habitation. A.P. Kuzyakin noticed that Lapland Longspurs nested in tiny meadows in the villages, for example in Uélen and Lawrence Bay, where they were common. He found nests in Providence Bay on the glades between structures. A particularly large number of Lapland Longspurs gathered in the vicinity of the village.

In Chukchi peninsula, to the extent that I could trace them, Lapland Longspurs land on bushes but do not colonize them. On the Utte-Véem River, Lapland Longspurs that I frightened, especially males, regularly landed on willow bushes regardless of their height. On the other hand, on Bol'shoi Diomede Island they landed on large boulders even though they did not nest beneath them like the Snow Bunting. In the tundra near the Amguéma I observed Lapland Longspurs often and for quite a while in 1956. They rarely landed on bushes there, but males in exceptional circumstances sat on wires, once even beside a Yellow Wagtail. This was totally absurd for the Chukchian landscape. I also saw Lapland Longspurs fly several times through the broad Amguéma expanse for no discernible reason whatsoever.

According to A.A. Kishchinskii, in the dry lichen-crowberry tundra with dryad, *Betula exilis,* and mixed grass, Lapland Longspurs were especially numerous on the Ékug-Véem River. In the marine coastal and sandy lowland tundra they were totally absent.

During migrations and flights this bird can be found on hilly, grassy, or dry cloudberry tundra, as well as on reedy mounds, rubble spits, and in villages, but invariably at places where grass bushes are available, however so scanty. On September 6, 1938, I saw a late bird in the Polar Station in Rodgers Bay; it lay in a haystack.

*Arrival*—Mass flight in the Chukchi peninsula and Wrangel Island occurs in the last 10 days of May. On St. Lawrence Island, according to F.H. Fay and T.J. Cade, this species was seen annually around the 20th of May. P.T. Butenko noticed it for the first time in 1938 in Sireniki village on May 27.

On Little Diomede Island, K.W. Kenyon saw a lone male on May 27, 1958; a few males had already begun calling by the 29th.

In the spring of 1934, I noticed arriving Lapland Longspurs around Uélen on May 24. Three days later, on May 27, I encountered a few pairs throughout the day on my way through the tundra from Dezhnev to Uélen village. On May 31 pairs and solitary birds were apparent. According to A.A. Kishchinskii, in the marine coastal tundra east of Cape Schmidt the first males were seen on June 1 and pairs sighted on June 2.

In 1879 near the winter anchorage of the *Vega,* in Tepkan, the first Lapland Longspurs were collected on May 23. Arrival continued as follows: On May 23 a male was obtained from Tepkan which still had remnants of the ocherous fringe on the feathers around the head and neck. On June 1 another male was collected in Padl'onna village and a female in Chutpa village. On the 15th a male was collected on Cape Dzhénrétlen and another in Pitlekai. By June 16 E. Almquist found this bird to be common along the road to the southern part of Kolyuchin Bay. On June 22,Lapland Longspurs were abundant at the winter post of the expedition.

According to A.I. Mineev, this species arrives on Wrangel Island during the first half of May; but in the spring of 1939, according to my observations, Lapland Longspurs arrived as late as May 28. I noticed them for the first time on that evening when a few males arrived in the company of a flock of Snow Buntings. Later I went westward to Akatylanva landmark where I sighted males on June 2 which, apparently had also just arrived. Females appeared the next day and pairing commenced.

Males invariably appear before females, more often in small flocks.

*Nidification*—Pairing occurs after arrival. Lone males are often seen in the spring. On June 11, 1956 I met solitary females in the tundra by the Amguéma which were still unencumbered.

According to my observations in 1934, in Uélen some males flew from place to place with a song on May 31. Apparently, they were selecting nesting sections. On June 2 individual males were singing in earnest and by June 4 calling had peaked and continued until mid-June. By June 17 calling was still audible but weaker and stopped altogether not long thereafter.

According to my observations in 1939, on Wrangel Island one of the first arriving males called on May 28 and sang. On June 4 most of the Lapland Longspurs were singing and calling animatedly. Calling continued until June 15 inclusive.

On the north coast of Krest Bay, I encountered in 1956 pairs already distributed in their nesting sections on June 8. The environment was still quite wintry on the Amguéma River near kilometer 91, and the tundra was almost entirely covered with snow. Lapland Longspurs arrived to feed on domestic refuse, were very cautious, and did not permit close approach. Some males attempted to call, but weakly. They had to take shelter in the hideouts to protect themselves from strong winds. Because of these winds, Lapland Longspurs still called weakly even on June 15. As I moved along the tundra they took off from the grass with extreme reluctance—females only at a distance of 5 to 10 paces from me and males 15 to 30 paces. Many males were calling on June 16 but without special fervor; they soared in the air for not more than 10 m. On June 18 they called with full vigor at any time of day, but by June 20 mating calls had weakened. By June 24 calling was even fainter. On June 25 only a few lone males called. On June 28 individual males rose in the air, but without singing. By the end of June all manner of calls had ceased.

On Little Diomede Island, K.W. Kenyon noticed a few calling males on May 29 in 1958, one day after the appearance of the first arrivals. In 1970, according to the observations of A.A. Kischinskii, on Cape Schmidt males were already singing by June 2 and occupied nesting sections around June 3 to 5. Animated singing continued until June 10, later weakened, and ceased altogether after June 20.

In general, the male Lapland Longspur commences calling immediately or almost immediately after arrival, initially very weakly and gradually gaining strength. The intensity of calling depends solely on the weather. On good sunny days, the singing of Lapland Longspurs, as with many other birds, literally continues nonstop; in cloudly weather singing is suppressed. On days of inclement weather in spring singing is shortened to such an extent as to be almost inaudible, but let the sun appear for even a couple of minutes and the outburst is amazing. There is no doubt that in the reproductive process singing is as important a link as other associated processes. There is no mating season without singing, but it does not follow that the male has to sing a definite number of times or some minimum amount of time for uninterrupted breeding. Nevertheless, a particularly unfavorable Spring can render singing irrelevant as an essential link, its physiological role being replaced, evidently, by some other event.

Calling represents one of the characteristic phenomena in the life of the tundra in spring and is very similar to the singing of a lark above a field or the calling of other birds on an open plain terrain. The male initially rises up along the slope 10 to 20 m above the tundra, fluttering its wings rapidly, and emits broken and quickened notes of a song. The height of his rise depends evidently, apart from weather, on the individual characteristics of the bird and on the extent of its excitation. Some males take off almost vertically, while others gradually gain altitude but are never concealed from the eye like skylarks. Having gained a certain height, the Lapland Longspur sways from side to side and gradually turns three-fourths of a circle. The duration of this act of calling varies, but some males sing fairly long. For the most part, having attained the "upper limit," the Lapland Longspur then slowly descends, straightening its wings and tail and slightly raising them in such a way that he resembles a paper pigeon or a bow. He next lengthens his song in fused notes. Now he more often resembles a calling pipit than a lark. The bird descends by gliding and turning in a spiral of large or small radius, depending on the rate of descent. In accordance with weather conditions the flight and tail feathers open up, sometimes more, sometimes less, and the descent may be steep (like a falling leaf) or follow a gentle slope. The calling male lands quite far from the point flight commenced and, having touched the ground, usually flies low over it sideways as though keeping the place of his landing a secret. Some males on descending fly above the ground without landing and soar into the air once again.

The song of the Lapland Longspur is difficult to transcribe; it is quite mellifluous though somewhat monotonous. It consists of a repetition of phrases that vary slightly from bird to bird. The initial notes resemble the commencement of the song of a Redpoll and thereafter more the modulations of the song of a lark. Some males vocalize their song twice during the calling ascent.

The song of a Lapland Longspur surprisingly comprises sad, melancholic notes that differ on different occasions. The first time I heard it on the Amguéma River I wrote down the bisyllabic call as "klyu" or "tklyu," followed by the syllable "chyu" in a very low register. I likewise transcribed the sounds as "klyu" or "kyuu" and "chtri" or "chrti". In July, when the chicks had hatched, the call appeared to be "tprrti" or "tprrui". In Uélen I transcribed it as "chi-ke-lei" or "té-ke-rei". The similarity of these sounds to the word "chetyre"* was commented on by the local inhabitants. Having passed through endless grassy expanses of the tundra, I often heard the cautious voice of the Lapland Longspur as "chi-khu". It triggered an inexplicable despondency, like the mournful silences of plovers. Males as well as females utter "chi-khu" by the nest. By fall these birds become quite silent.

The testes of males caught at the time of arrival (Fig. 30) were already enlarged. For example, the testes of two males caught on May 27, 1938 in Providence Bay were 7.0 mm × 6.0 mm and 5.0 mm × 4.0 mm, and 6.0 mm × 4.0 mm and 5.0 mm × 3.0 mm. The testes of June specimens were somewhat more varied: left 6.0 to 10.0 mm × 4.0 to 9.0 mm and right 7.0 to 10.0 mm × 5.0 to 8.0 mm. In June they decreased rapidly to normal size as evident from measurements of Wrangel males: 1) July 11—4.0 mm × 3.0 mm and 3.0 mm × 2.0 mm; 2) July 24—3.0 mm × 2.0 mm and 2.0 mm × 1.0 mm; and 3) July 29—less than 1.0 mm.

The Lapland Longspur usually builds its nest in a depression or niche on the side of a mound at its base. These depressions are mostly spherical and it occurred to me that similar tiny caves are dug by lemmings in winter during their residence under the snow cover. Of the 11 nests found by me on the Amguéma, 10 were built in such tiny niches. On June 22, 1956 I found one built not in a niche, but under a tiny bush.

In the 1930's, especially on Wrangel Island, I found nests, for example, at the base of a large overhanging grass bush. Such a curtain protected the nest from rain and the entrance to it opened sideways. Locating such a nest is no easy task! I found such mostly when the incubated female flew out just a few paces away from me.

O. Nordquist noticed that the entrance in the nests he discovered near Dzhénrétlen faced southeast. In the nest described above for Wrangel Island the entrance also faced southeast. The first nest discovered by me on the Amguéma was located on the western side of the mound and the second on the southwest. The entrance to other nests faced diverse directions, including north.

A.P. Kuzyakin found more than 10 nests on the coasts of Providence Bay between June 9 and 19, 1957. All of them were located on the sides of mounds and well-covered on the sides and top with dry grass. More north he found a nest also in a pit among grass. In most of these nests the entrance faced south, but in others east, west, and even north.

The nest of a Lapland Longspur often represents an accurately formed saucer in shape, but is quite often loose in structure, depending on the nature of the depression selected as well as the "construction expertise" of the bird. I saw a female with nesting material in her beak at a time that males were calling incessantly. Evidently the female builds the nest.

In 1956 I came upon nest building by the Amguéma River (see Fig. 33) at the

*Meaning "four" in Russian —Ed.

commencement of the middle decade of June. On June 14 Lapland Longspurs took off before me with reluctance: males within 15 to 30 paces and females 5 to 10 paces. On June 15 I law a female carrying a feather which she later dropped. The agitated males issued a melancholic "tklyu," frequently followed by the sound "chyu". The call of the female was identical but not as loud. Some females took off within three paces of me. On June 16 males exhibited alarm at my approach by calling and females appeared from somewhere in the grass, within 15 to 20 paces of me.

In 1934 I observed intense nesting activity among this species in Uélen in the first decade of June.

Nest dimensions depend on how spacious the selected depression or niche is. Those I extracted were 13 cm × 11 cm, 9.0 cm × 9.0 cm, 9.0 cm × 8.0 cm, 9.0 cm × 7.0 cm, and 8.0 cm × 7.0 cm across, and 3.0 cm to 5.0 cm deep. The base of each consisted of stalks and leaves of mixed grass and sedge. The weight of the structure varied as the walls were formed from diverse material. According to Prof. V.N. Vasil'ev, nest No. 7 contained bits of green moss (*Hylocomium* and *Dicranum*), lichens (*Centraria* aff. *islandica* and *Dufourca arctica*), *Betula exilis,* leaves of *Vaccinium vitis-idaea* f. *microphylla* Herder and *Salix cuneata,* and an ear of *Eriophorum vaginatum* L. and *Ledum decumbens* Ait. The interior of the compact structure was lined with white partridge feathers. Some tiny dark-colored feathers were woven into the outer walls.

Nest No. 8 was a very compact structure but tiny, conforming to the size of the small depression in which it was located. The walls consisted of the same lichens and *Ledum decumbens* but the inside of the nest was lined with *Empetrum subholarcticum* V. Vassil. The bed contained white partridge feathers together with some dark-colored ones.

Nest No. 9 was an extremely small, loose structure consisting of very poor material. The trough was constructed of thin stalks only, i.e., contained no feathers. The walls had been built of lichens *Dufourca arctica, Cladonia rangiferina, C. alpestris,* and *Cetraria cucullata,* mosses *Hyolocmium splendens* and others, syncarps and stalks of *Ledum decumbens,* and leaves of *Betula perfilievii* V. Vassil. and *Vaccinium vittis-idaea* f. *microphylla* Herder.

Nest No. 10 was taken from a tiny hollow. The walls consisted of lichens *Usnea, Dufourca arctica,* and *Cetraris,* mosses including *Polytrichum* and some *Sphagnum,* and leaves of *Betula.* Different parts of the nest also include dark-colored partridge feathers.

Nest No. 11 was the largest in dimensions. The outer walls comprised tiny branches of *Vaccinium* devoid of leaves, tiny branches of leaf-stalk mosses, and an admixture of leaves of *Betula exilis* or *B. perfilievii, Ledum decumbens,* and *Festuca brevifolia.* The tiny trough was laid with white feathers with an admixture of striped feathers from a female partridge.

Almost all the nests found by A.P. Kuzyakin contained white feathers of domestic chickens, partridges, gulls, Snow Buntings, Snowy Owls, and other birds. Troughs not overlaid with white feathers constituted an exception. Hence these nests when not covered by the incubating female stood out sharply aganist the surrounding dark background even when cover was available. E.G.F. Sauer and E.K. Urban also found nests of Lapland Longspurs on St. Lawrence Island which were overlaid with white feathers.

The nests examined by A.A. Kishchinskii in the coastal tundra between the Amguéma and Vankarém were extremely monotypical. They were woven of dry stalks of mixed grasses and sedge, more rarely with pannicles of mixed grasses, and overlaid with feathers, mostly of Eiders and Long-tailed Ducks. A shred of lemming fur was found in one. The nests were situated under a mound of sedge and turned southwest, south, or south-east.

On June 18, 1956, I observed a mating pair on a rubbble spit by the water. In approaching the female, the male often assumes the posture of a sluggishly cooing pigeon. In the present instance, however, the male behaved very energetically. He scraped his wings on the ground, slid along it, and invited the female to do likewise, which she did. The birds later separated, having expended so much energy during courtship that they had none left for further activities.

Clutches were found on different dates on June, depending on the latitude of the site and climatic and meteorological conditions. In a clutch taken by V.F. Vlasova on June 23, 1932, on Wrangel Island, embryos were visible in which the head and extremities had formed. In a nest of a Lapland Longspur near Rodgers Bay I detected two chicks and four eggs on June 23, 1939. According to A.G. Velizhanin (1965), Lapland Longspurs on Wrangel Island began laying only at the end of June in 1960; there were still no eggs in a nest discovered in the vicinity of Rodgers Bay on June 21.

On the southwestern coat of Aiok Island, V.D. Lebedev and V.R. Fiin found a nest with five eggs on June 13, 1960. Accoridng to my observations on the Amguéma River in 1956, Lapland Longspurs began laying as soon as the snow thawed on the tundra.

I found the first nest on June 16. It contained four eggs and hence the clutch had not commenced before June 13. On June 17 there were five eggs in the nest and six on June 18. In a second nest I found two eggs on June 18, three on June 19, and four on June 22. In a third two eggs were detected on June 20. The fourth contained four eggs on June 22 and six eggs on June 24. Three eggs were detected in a fifth nest on June 22 and the last or fourth the very next day. On June 24 the sixth nest held a full clutch of five slightly incubated eggs. Five slightly incubated eggs were seen on June 25 in the seventh nest also. The eighth nest contained five eggs on June 28 together with nestlings covered with down; the ninth had six eggs in addition to nestlings. I found two more nests on June 30, each with five eggs and nestlings.

In the coastal tundra between the Amguéma River and Nutauge, A.A. Kishchinskii found his first clutch of five eggs on June 6, 1970. The oviduct of a female caught on June 7 contained an egg with shell. Between June 8 and 10 six nests were found with clutches. On June 17 nestlings hatched in two of the nests (which contained two eggs and four chicks; three eggs and three chicks). Mass feeding of nestlings commenced on June 19 and 20. By June 27 chicks began to sport feathers; on July 6 the first young Lapland buntings attempted maiden flights.

Some nests were collected by the *Vega* expedition in 1879. Chelman discovered the first on June 25. O. Nordquist later collected a nest with five eggs and another with four on June 27 near Cape Dzhénrétlen. A nest with five eggs was found on June 30 in Pitlekai. Early July a clutch of three eggs was found constituting evidently a second one from the same female.

In 1934 near Uélen I found a full, not incubated, clutch on June 10, and another on June 15 in which tiny embryos were visible inside the eggs (Table 40). In 1957 A.P. Kuzyakin found at the same site highly incubated clutches or chicks between June 27 and July 2. On Little Diomede Island, K.W. Kenyon found a nest with five incubated eggs on June 9, 1958. On June 13 this nest contained six eggs. On that same day Kenyon discovered yet another nest with seven partly incubated eggs.

In the vicinity of Lawrence Bay from June 20 through 23, 1957, A.P. Kuzyakin came across highly incubated clutches or even chicks. On July 12, by the lake west of the village, a nest contained seven nestlings. In 1970 V.V. Leonovich found nests on June 13 and 14 containing five eggs each, another on June 18 with four feathered nestlings and an addle, and a second with five highly incubated eggs, and on June 21 a nest with four feathered nestlings. Feeding of chicks was observed in Énurmino on June 24 and 25, and the first young birds attempting flight seen on July 2.

On St. Lawrence Island, A.M. Bailey gathered a nest with four unincubated eggs in the summer of 1921. According to F.H. Fay and T.J. Cade, on June 24, 1950 four nests with four and five eggs each were discovered there. On June 11, 1960 E.G.F. Sauer and E.K. Urban found a clutch of five eggs and on July 14 another of six eggs.

The nests found by A.P. Kuzyakin between June 10 and 19, 1957, along the banks of Providence Bay contained mostly incomplete clutches. Only after June 15 were full clutches found, all of which were still unincubated or only slightly incubated. Most of these nests contained six eggs each, and only the smallest five. In a nest found on June 18 there were four chicks which had just commenced feather growth. This tiny brood was exceptionally early.

Finally, V.E. Yakobi found a nest with three eggs near Uél'kal' on June 7, 1961.

The number of eggs in a clutch thus varies from three to seven. In the 26 clutches listed above 10 contained five eggs each, 6—six eggs each, 6—four eggs each, 2—three eggs each, and 2—seven eggs each. A.P. Kuzyakin maintains, however, that six eggs are more standard than five. The 10 clutches found by A.A. Kishchinskii contained either 5 or 6 eggs each for an average of 5.7.

Considerable variability was evident in egg coloration—from chocolate tones to brownish-gray to pale green or greenish-gray. Patterning was more often diffused or smudged, sometimes marbled, and in some eggs consisted of well-defined dots and curls. The round dots measured up to a millimeter or more, while the spots were irregular with broken margins. The background of the eggs was mostly pale gray with greenish or chocolate shading. Much lighter-colored or violet spots, or dark or sepia-colored, almost black in some cases, were scattered on this background either uniformly or only concentrated on the obtuse end of the egg. Of the seven clutches collected by me, the main background color of the eggs in five was greenish, but differentiating the greenish tones was much too taxing. In another clutch, the main

**Table 40. Size (mm) of eggs of Lapland Longspurs**

| | Length | | | | | Width | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *Vega* expedition | 23.0 | 22.8 | 22.2 | 22.0 | 22.0 | 15.0 | 15.0 | 15.0 | 15.0 | 15.0 |
| | 19.5 | 20.5 | 22.3 | | | 15.0 | 14.8 | 15.0 | | |
| L.A. Portenko | 22.3 | 21.9 | 21.8 | 21.8 | 21.5 | 15.7 | 15.5 | 15.6 | 15.4 | 15.0 |
| | 22.2 | 22.2 | 22.2 | 21.9 | 21.7 | 15.2 | 14.6 | 14.4 | 15.3 | 14.9 |
| | 21.8 | 21.6 | 21.4 | 21.3 | | 14.6 | 14.5 | 14.6 | 14.5 | |
| | 20.9 | 20.6 | 20.3 | 20.2 | 19.6 | 14.8 | 15.6 | 15.4 | 15.5 | 15.7 |
| | 20.4 | 20.1 | 19.9 | 19.6 | 19.2 | 14.1 | 14.8 | 14.1 | 14.5 | 14.1 |
| | 20.4 | | | | | 14.5 | | | | |
| | 20.0 | 19.9 | 19.8 | | | 15.0 | 15.3 | 14.9 | | |
| | 20.9 (22.3 –19.2) | | | | | 14.9 (15.7 – 14.1) | | | | |

background color was gray overlaid with blue, much like the color of starling eggs. This was a late clutch and its lighter coloration perhaps explained by the exhaustion of the pigment-producing resources of the oviduct. No doubt this is the reason why one or two eggs with pale coloration are not uncommon in clutches. In nest No. 1 with a full clutch of six eggs, three were chocolate-gray and three greenish-gray. In the second clutch of three eggs the last one laid was light green and without spots, while the general color of the clutch was a light brownish-gray. Nest No. 7 contained four chocolate-brown eggs and one pale gray. In nest No. 9 four of the eggs were brown and two gray. In nest No. 10 one of the five eggs stood out from the nest by its light-colored background with well-defined but scattered dark spots.

In the tundra by the Amguéma females laid daily. From a comparison of the dates of laying and hatching of nestlings I came to the conclusion that incubation commenced not with the first egg, but somewhat later, at different times in different cases, and continued for 11 to 13 days. Only the females incubate. V.D. Lebedev and F.R. Filin mention a case of incubation by a male, but I am fully convinced that this observation is erroneous. Some females, in particular very old ones in worn-out plumage, are extremely similar to males in external appearance.

In warm weather, females leave the nest from time to time during the day as well as at night (bright in those latitudes). In cold weather, especially with strong winds, they sit very firmly. If one did not search for nests in the period of incubation, the entire day could be spent traversing the tundra without sighting a single female. In the initial days of incubation females, on man's approach to the nest, descend to a distance of a few meters, are not alarmed, and together with the male remain in the vicinity; the male usually stands slightly farther away. In this respect the Lapland Longspur differs from Yellow Wagtails; the male wagtail remains closer than the female. Once I laid a large lump of peat beside a nest as a marker for later detection. This black mass was visible from afar but did not frighten the bird. On June 22, 1956, males followed the females frightened by me, but did not chase them as usually happens in other species of birds. On June 28 some females descended from the nest readily and well in time. Having flown out they stopped, cleaned themselves, pecked at something, and some drank water. Others, however, fluttered and threw themselves to one side, initially in large hops, later running, and finally flew off in the manner of sick or wounded birds. The males, on my appearance, gathered in twos and threes, at times permitting me within 10 to 15 paces, which was not the case earlier. Some birds soared in the air, but without song. Usually they sat on mounds and emitted their melancholic call "klyu, chtri". Some did not fly out of the nest; instead, like the females, they hopped away.

In the eggs gathered near the Amguéma River in 1956, I found fully formed nestlings around the end of June (see Fig. 29). I removed nestlings from the shells on June 28; they were covered with down and capable of movement. On July 2 in nest No. 4 there were two hatched nestlings and four eggs; on July 12 three nestlings overflowed the nest; the fourth probably lay under them, because I found it dead on July 14 when the live ones vacated the nest. On July 2 I found three nestlings and an unfertilized egg in nest No. 5 and two nestlings and three eggs in nest No. 6.

On Wrangel Island on June 23, 1939, I found in the nest of a Lapland Longspur near Rodgers Bay four eggs and two evidently recently hatched nestlings. All of the chicks had hatched within a three-day period thereafter. On July 6 I visited the nest again and saw a feathered but dead chick inside. Since the male standing nearby was very agitated, I assumed that the remaining live ones hid somewhere close-by. Even on July 24 a pair of alarmed adult birds were encountered at this site.

On St. Lawrence Island, T.J. Cade found a nest with recently hatched nestlings on June 27, 1950. E.G.F. Sauer and E.K. Urban found a nest with six 2- to 3-day-old nestlings on June 30, 1960. On the south coast of Aiok Island, V.D. Lebedev and V.R. Filin found a nest with blind, almost bare nestlings very early, i.e., on June 19, 1960.

The hatching of eggs in a single nest at different times I established and suggests that the female begins to incubate her eggs even before laying the last of them.

Day-old nestlings were already well-covered in down, which protects them from loss of heat. On my approach they opened their mouths wide, but produced no audible sound.

On July 2 and 4, I came across many females in the tundra hurriedly searching for food. Evidently the eggs were hatching individually and incubation had ceased but for the rare exception. I later observed both adult birds gathering food right until late in the evening. On being alarmed, the male usually remained "on watch" while the female hopped into the grass and attempted to hide from vision. However, the behavior of these birds varies widely.

On July 2 on my appearance by nest No. 6 the male and female initially crept along the ground, and later screamed only "klyu," the male being more alarmed than the female. On July 5 he exhibited even greater alarm and came to within 7 or 8 m, although the nestlings had grown perceptibly. The pterylae had stubs. On July 7 the male approached very close as before. At nests Nos. 4 and 5 the adult birds were very frightened, remained aloof, and behaved passively.

From everywhere in the tundra could be heard the call "klyu, chrti", with a new variant—"tprrti". Adult birds were very animated. Some males flew close to me above the dwarf birch under which I stood and behaved as though intoxicated or beserk, spreading their wings and scraping them along the mounds, in a word "drawing attention". The eyes of the nestlings were half open. Examining some in the nest, I noticed that they quite often differed in size in one and the same brood, i.e., evidently they had not hatched simultaneously.

Already by July 10, as a result of rapid growth, nestlings hardly remained in the nest. When I chased them they ran off, while those still in the nest stood stiff on my approach. On the ventral side of the body many had two stripes of white feathers with an intense lemon-yellow shade. The large wing feathers projected from the coverts by more than 1.0 cm, although even on July 7 the coverts had not emerged from the skin.

Thus nestlings (Fig. 34) even a week after hatching were capable of leaving the nest, taking advantage of the fact that it is located on the ground. Adult birds continued to exhibit alarm for the safety of their growing chicks, however. On July

11, I startled a Temminck's Stint which fluttered rather helplessly by the nest. His alarm was transmitted to the paternal Lapland Longspur, which had just begun to fly over a tiny sandpiper and came to within 2 m of me. By July 14 the fledgelings had abandoned the nests, probably in every brood.

On July 9, 1934 I saw the first fledgelings on the coast of the Utte-Véem River; on July 19, I photographed a nonflying chick in Mitkulen. At the end of the middle decade of July young Lapland Longspurs were seen everywhere in large numbers.

On July 11, 1939 I picked up a nestling that had remained in the nest in Rodgers Bay. Judging from the alarmed behavior of the adult birds, there were many nonflying nestlings in the tundra. On July 14 and 15 during a trip up to Somnitel'naya Bay, innumerable young Lapland Longspurs took off right in front of the car (i.e., were still flying poorly), while others saved themselves by hopping aside.

In 1956 by Amguéma River I did not see even a single young Lapland Longspur in outside nests in the tundra on July 14. But on July 16, they were abundant. For the most part these were fledgelings with short tails, but even they on occasion flew over small lakes of over 100 m in width. In the suddenness of takeoff and rapid fluttering of wings they resembled small quails. Adult males flew behind them and later sat side by side with them, apparently excited about the first flight of their offspring.

L.M. Starokadomskii found a nest with nestlings on August 9, 1913 on Cape Val'kumei in Chaun Bay. Three of them flew off in different directions and hid.

In 1958 V.D. Lebedev and V.R. Filin noticed the first flying young on June 30 on the south coast of Aiok Island. In 1957 A.P. Kuzyakin saw a flying fledgeling with a short tail on July 5 in Providence Bay, and noticed many such fledgelings on July 9. Moreover, young birds with grown tails were also encountered. According to the observations of V.E. Yakobi made in 1961 chicks left their nest near Uél'kal' by July 2.

According to S.M. Uspenskii and his colleagues, on Wrangel Island broods of Lapland Longspurs with flying young were encountered everywhere from July 17 through 22, 1960. J.Koren saw a flying young bird on Cape Bol'shoi Baranov on July 12. Finally, according to T.J. Cade on St. Lawrence Island flying young were encountered in 1950 from the middle of July.

Following the flight of the young, intense molting commences among adult males. The exhausted birds, devoid of tails, continued to raise an alarm for sometime but gradually began to leave their broods. Females molt later and remain longer with their broods. I encountered males in a state of intense molt by their broods at the end of July and early August, for example, August 6, 1932 in Krest Bay, and July 24 through 29, 1939 on Wrangel Island.

According to A.A. Kishchinskii, in 1970 in the coastal tundra between Amgúema River and Vankarém, broods accompanied by adults were encountered often from July 11. Females were seen only at the end of incubation or away from the nest with fledgelings. From July 21 through 25 broods began to break up. Many adult and young Lapland Longspurs remained single.

At places where there were few Lapland Longspurs, broods did not break up until migration. I found such an isolated brood, for example, in the Krasnyi Flag

River estuary on the north coast of Wrangel Island between August 16 and 19, 1938. On the contrary, where buntings were many they formed flocks and wandered at the end of summer. On August 6, 1932, I noticed small flocks of young in the vicinity of Notapenmen. In the fall of 1934 the first wandering flocks of Lapland Longspurs appeared on August 11, two large flocks on the 16th, and the last sighted on the 20th. In 1938 I met with flocks, mainly wandering broods, on cape Schmidt from August 3 through 6. In the fall of 1939, during systematic observations on Wrangel Island, I noticed wandering broods and flocks only on August 16; one of the flocks was large. On August 24 I saw a flock flying eastward.

*Departure*—Departure flights commence as soon as flocks have formed. At the end of August delayed broods remain which, though scattered in the lifeless tundra, are nonetheless recognizable as broods because, when alarmed, the birds fly off together in a small flock. Those that remain are mostly single birds.

In 1932, during my second visit to Providence Bay from August 25 through 31 I did not come across even a single Lapland Longspur. In the fall of 1933 I encountered young ones around Uélen on August 27 only from time to time; on the 31st Lapland Longspurs were seen in very small numbers, one caught on September 9, and another sighted for the last time on the same day. Lapland Longspurs were rarer in the second half of August. I saw some on the 23rd but terminated my trips a day later. According to A.G. Velizhanin (1965), migration on Wrangel Island extended until the end of August in 1960.

*Food*—The stomachs of the specimens caught contained the following contents: 1) Lawrence Bay, August 19, 1932. Ten seeds of mixed grasses, 111 tiny seeds of four species of plants, very small bits of chitin of insects, and some coarse sand. 2) Gek (Anadyr region), July 17, 1933. Elytra of one curculionid, head of a hymenopteran, wings, heads, and other remnants of 2 dipterans, a caterpillar, a spider and its cocoon with eggs, 47 seeds, and tiny stones. 3) Uélen, June 27, 1934. Chelicerae and legs of 5 to 10 tiny spiders, 32 tiny seeds, a few shoots of moss, and many tiny stones. 4) Uélen, May 27, 1934. Small bits of chitin of a beetle, about 20 seeds, and many tiny stones. 5) Uélen, May 27, 1934. Three larvae of dipterans, mandibles of 2 insect larvae, chelicerae and legs of 2 spiders, bits of shell of 2 to 5 seeds, and many tiny stones. 6) Uélen, June 2, 1934. Bits of heads of 2 carabids, mandible of a caterpillar, larva of a dipteran, 2 spiders, about 80 tiny leaves, and some small stones. 7) Uélen, June 2, 1934. Mandible of a caterpillar, mandibles of the larvae of an unknown insect, about 120 tiny seeds, and small stones. 8) Uélen, June 3, 1934. Mandibles of 3 carabids, elytra of a tiny beetle, ground remnants of several tens of seeds, and small stones. 9) Uélen, June 7, 1934. Small bits of chitin of some carabids, 6 larvae of dipterans, and small stones. 10) Uélen, June 7, 1934. Small bits of chitin of a carabid, bits of a caterpillar, 11 larvae of dipterans, and small pebbles. 11) Uélen, June 7, 1934. Head and thorax of a hymenopteran, legs and chelicerae of 10 small spiders, some small pebbles. 12) Uélen, June 7, 1934. Bits of head and elytra of 3 carabids, 9 larvae of dipterans, and small pebbles. 13) Uélen, June 7, 1934. Small bits of 7 carabids, body (without head) of a large caterpillar, 3 larvae of flies, and small pebbles. 14) Wrangel Island, June 4, 1939. Seeds, paste of plant remnants, and 0.12 g

Fig. 34. Fledgeling of Lapland Longspur *Calcarius lapponicus* (L.).
Mitkulen village. July 19, 1934.

Fig. 35. Fledgeling of the Snow Bunting *Plectrophenax nivalis* (L.) in nesting area.
Mitkulen village. July 6, 1934.

of fine sand. 15) Wrangel Island, June 8, 1939. Beetle of type *Poecilus* (tribe Platysmatini), larva of a carabid and abdomen of beetle, larva of a staphylinid (?), head of a caterpillar, seeds of crowberry (?), and 0.12 g sand. 16) Wrangel Island, June 14, 1939. Remnants of 6 caterpillars and 2 beetles. 17) Pereval'naya Station, June 17, 1939. Small pebbles. 18) Wrangel Island, June 26, 1939. Five caterpillars and 0.12 g sand. 19) Wrangel Island, June 26, 1939. Intensely ground remnants of tiny insects and 0.12 g sand. 20) Wrangel Island, July 2, 1939. Mass of remnants of tiny beetles, remnants of 4 flies, and 3 mosquitoes. 21) Wrangel Island, July 24, 1939. Remnants of beetles, a caterpillar, and not more than 0.05 g of fine sand. 22) Wrangel Island, July 24, 1939. Three larvae of insects, a small spider, seeds of crowberry (?), and 0.25 g of sand. 23) Pereval'naya Station, July 27, 1939. Insects. 24) Wrangel Island, July 29, 1939. Remnants of a small beetle, seeds, and 0.5 g of sand.

The stomach of a male shot in Pitlekai on June 1, 1879, evidently while in flight, contained mostly sand. A greenish-black digested mass was found in the intestine. The specimen was fairly obese.

I came across Lapland Longspurs in the new settlement near kilometer 91 of the Amguéma River during the period of chick feeding. The birds searched for food in refuse dumps together with Redpoll, Northern Wheatears, and two species of wagtail.

Of the 12 males I collected on Wrangel Island, with the exception of the July specimen, subcutaneous adipose deposits were in the form of large or small individual films. Contrarily, males caught near Uélen and in Providence Bay were characterized by the absence of such deposits. Yet A.P. Kuzyakin caught Lapland Longspurs in 1957 in Providence Bay which were mostly well fed or even overly obese.

*Weight*—The weight of two males caught on May 27, 1938 in Providence Bay was 33.7 and 25.7 g; the first had fatty accumulations, while the other had none. A male shot on May 23, 1879 in Tepkan weighed only 20.3 g. Five males collected by Kishchinskii weighed 24.0 to 27.5 g, with an average weight of 25.8 g.

*Enemies*—The most dangerous enemy of Lapland Longspur is the Long-tailed Jaeger. Frequently on Wrangel Island I saw *Stercorarius longicaudus* chase just-arrived and extremely tired Lapland Longspurs. Right before my eyes (in Mitkulen) a Long-tailed Jaeger pursued a young bird for quite sometime and eventually caught it in flight in the same manner as a falcon catches a lark in the steppes.

*Economic importance*—Only indirect. Without doubt incubating and young birds, as well as clutches, often fall prey to fox.

*Systematics*—I have undertaken a revision of the subspecies of Lapland Longspurs several times commencing from the 1930's (Portenko, 1937d; 1939b, I, pp. 75–78), using the material of the Institute of Zoology, Academy of Sciences of the USSR. In 1938 I collected additional material on Wrangel Island, in 1949 in northern Taimyr, and from 1957 through 1960 on Koryatsk Zemlya. A series of birds very carefully prepared, mostly by myself, made possible an analysis of seasonal changes in color, assigning them due importance as taxonomic characters. I studied the specimens by placing them together on a table for purposes of comparison. Let me emphasize that in this method of comparative analysis, differences among subspecies of Lapland Longspurs become strikingly apparent.

It should be noted that a small sample of material could lead to contradictory conclusions. A total of 411 skins passed through my hands: 252 males, 120 females, and 39 nestlings found directly in nests. For purposes of identification of the subspecies, birds of all ages and seasons of both sexes were used. Only molting specimens posed difficulties since the feathers just emerging from the stubs differ greatly in their dark coloration. Soon, perhaps within a few days, the feathers become light-colored, and changes due to fading and wear of barbules far less evident. Seasonal changes in color are quite significant. Hence the following have to be compared in isolated groups: 1) specimens from nests from the end of May through August; 2) specimens in fresh fall plumage; 3) winter-spring specimens caught in spring flight; and 4) males, females, and chicks respectively. Such complex conditions of study notwithstanding, it is possible to thoroughly analyze differences in characteristics and limits of ranges of the subspecies *C. l. calcaratus, C.l. kamtschaticus,* and *C.l. coloratus.* It became necessary to place Lapland Longspurs from the Chukchi peninsula and Wrangel Island among the Alaskan subspecies, even though this appears to be a heterogeneous population. More about this later. The small amount of material available to me prevented a decisive resolution of this problem. Finally, I realized that only the Scandinavian and Kola, Lapland Longspurs could be placed among the nominal form, but here, too, the material proved inadequate. I therefore distinguish the following subspecies.

1. ***Calcarius lapponicus lapponicus*** (L.). Scandinavian Lapland Longspurs compared with other north European and Siberian birds differ in much darker coloration of the upper side of the body in both males and females. According to F. Salomonsen (1950–1951, III), Russian and Siberian Lapland Longspurs in the material of the British Museum contrarily appear slightly darker than Scandinavian birds. My collection from Scandinavia and the Kola peninsula was meager and constituted only one-tenth of the number of skins from the rest of Europe and Siberia. It is therefore desirable to collect more material in the near future.

In beak length this subspecies is similar to the next, but the wing is longer on the average, albeit insignificantly so (Table 41.)

*Range*—The nominal subspecies inhabits the east coast of Greenland (according to Salomonsen), the tundras of Scandinavia, and the Kola peninsula. A light-colored male was also caught on Iokanga.

*Material*—Total of 23 specimens (13 males and 10 females).

2. ***Calcarius lapponicus calcaratus*** Pall. No one has differentiated this subspecies before. In the series studied by me it emerged as entirely distinct. The color on the upper side of the body and plumage is lighter or paler. The beak is usually rather massive. The main difference, however, lies in coloration.

*Range*—Tundras from the White Sea to the western parts of the Chukchi peninsula.

*Material*—Total of 230 specimens (135 males, 79 females, and 16 chicks).

3. ***Calcarius lapponicus alascensis*** Ridgw. Upper side of body paler and wings and beak perceptibly longer. In a series the pale coloration stands out fairly well. If

**Table 41. Beak length* and wingspan (mm) of subspecies of *Calcarius lapponicus* (L.)**

| Subspecies | Beak length | | | | | | | | Wingspan | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | | | Female | | | | Male | | | | Female | | | |
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| *C. l. lapponicus* (L.) | 8.5 | 7.1 | 8.0 | 12 | 8.4 | 6.8 | 7.4 | 10 | 94.9 | 86.4 | 91.7 | 13 | 89.0 | 84.0 | 86.2 | 10 |
| *C. l. calcaratus* Pall. | 9.2 | 6.9 | 7.9 | 133 | 8.6 | 6.8 | 7.7 | 80 | 95.8 | 87.0 | 91.4 | 134 | 89.5 | 79.8 | 85.6 | 79 |
| *C. l. alascensis* Ridgw. | 9.7 | 7.3 | 8.7 | 40 | 9.6 | 7.1 | 8.2 | 13 | 98.2 | 89.1 | 93.3 | 39 | 91.5 | 84.0 | 87.3 | 13 |
| *C. l. subcalcaratus* (Brehm) | 9.4 | 8.6 | 9.0 | 4 | 9.3 | 8.1 | 8.8 | 3 | 93.9 | 91.5 | 92.3 | 4 | 89.4 | 82.8 | 87.1 | 3 |
| *C. l. kamtschaticus* Port | 9.8 | 7.6 | 8.5 | 40 | 9.1 | 7.9 | 8.4 | 9 | 95.9 | 86.5 | 91.4 | 43 | 88.7 | 83.0 | 85.6 | 10 |
| *C. l. coloratus* Ridgw. | 10.3 | 8.5 | 9.1 | 17 | 9.2 | 8.0 | 8.6 | 7 | 99.7 | 93.4 | 97.4 | 16 | 93.7 | 88.2 | 90.2 | 9 |

*Measured from outer edge of nostril.

in comparing individual specimens, it is difficult to ascertain for certain the identical extent of wear of the feathers, attention should be given to the color of the fringes of the greater wing coverts. In this subspecies these are grayish-yellow and in the preceding subspecies reddish-yellow. On the second (from the edge of the tail) tail feather the white wedge is smaller than among *C. l. calcaratus*. In the specimens from Alaska the quills of the feathers on the back are broader than in my specimens from Bol'shoi Diomede Island, Chukchi peninsula, and Wrangel Island. Lapland Longspurs from the Aleutian and Pribylov Islands have very massive beaks. As mentioned by R. Ridgway (1907, I, p. 159), the features of the subspecies *C. l. alascensis* described by him are more sharply manifest among specimens from the Aleutian Islands. Thus the populations of *C. l. alascensis* is distinctly not homogeneous. Because of the inadequacy of the collection from Alaska, one could not go beyond the differences already noted.

*Range*—Alaska, Aleutian Island, Pribylov Islands, Diomede Islands, eastern part of the Chukchi peninsula, and Wrangel Island.

*Material*—Total of 62 specimens (40 males, 13 females, and 9 chicks).

4. ***Calcarius lapponicus subcalcaratus*** (Brehm.) Similar to the preceding subspecies in broad quills of the feathers of the back, and in the comparatively large beak. Main difference lies in the dark coloration of the upper side of the body. Differs from the nominal form mainly in its long beak.

*Range*—Arctic Canada and west coast of Greenland.

*Material*—Total of 7 specimens (4 males, 3 females).

5. ***Calcaricus lapponicus kamtschaticus*** Port. Together with the next subspecies from the Komandorski Islands, it differs sharply from the others in very dense coloration, in which the yellow shades predominate over the reddish-brown.

Differs from *C. l. coloratus* in the small dimensions, especially the weak and short beak, break between the black spot on the breast and the black stripe on the side of the body (separated by a white bridge), and the slightly lighter margin on wing edges. Differs from *C. l. calcaratus,* in addition to coloration, in a very long beak, but is identical in wingspan.

*Range*: Tundras in the Kamchatka peninsula, south at least up to Ust'-Kamchatka, Koryatsk Zemlya, Primorye belt of Anadyr estuary, and environs of Krest Bay, apart from the coast of Shelikhov Bay in the northern part of the Sea of Okhotsk.

This subspecies was described by me in 1937 based on a small series from Kamchatka. The large series collected by me on Koryatsk Zemlya first of all confirmed magnificently the actual existence of the form described, and second established fairly accurately the boundaries of its range.

*Material*—Total of 64 specimens (43 males, 11 females, and 10 chicks).

6. ***Calcarius lapponicus coloratus*** Ridgw. Noticeably larger in all dimensions. Black spots on the neck and breast fuse with the broad black stripe along the sides of the body. Color on the upper side darker, even the black color being more vivid. Black upper wings coverts with grayish fringes. White wedge on the second tail feather small.

Nests only on the Komandorski Islands.

*Material*—Total of 25 specimens (17 males, 4 females, and 4 chicks in nest plumage).

Individual variability in the dimensions of Lapland Longspurs is so great that beak length and wingspan cannot be used for purposes of identification in every case. Seasonal variability of dimensions on the other hand is insignificant. I verified it in a large series of *C. l. calcaratus* in which birds arriving from the European part of the USSR and Siberia gave rise to no doubts about the correct identification of the subspecies (Table 42).

Thus *C. l. alascensis* Ridgw. inhabits the eastern part of the Chukchi peninsula, east at least from Kolyuchin Bay and Krest Bay, and also Bol'shoi Diomede Island and Wrangel Island. The specimen I collected on Kolyuchi Island, a male in nesting plumage, was indistinguishable from similar fledgelings of the Siberian subspecies *C. l. calcaratus* Pall. The dark-colored subspecies *C. l. kamtschaticus* Port. intrudes into Krest Bay from the side of Anadyr Bay.

Although I succeeded in considerably elucidating the range of subspecies of Lapland Longspurs in the Bering Sea zone, the solution to two aspects remains incomplete. I am not convinced that the Aleutian Longspurs and those originating from Pribiylov Islands are identical to those from the Alaskan mainland or the Chukchi peninsula and Wrangel Island. Secondly, I am not certain about the accuracy of the boundaries of the ranges of the subspecies *C. l. alascensis* and *C. l. kamtschaticus* in the territory of the Chukchi peninsula.

*Specimens of C. l. alascensis* Ridgw.—1) Providence Bay, Plover Bay, July 11, 1900, ♀, Akif'ev; 2) Providence Bay, July 20, 1912, ♂, Starokadomskii; 3) Lawrence Bay, August 31, 1929, juv., P.V. Ushakov; 4) southeastern part of Wrangel, June 23, 1932, ♀, Vlasova; 5 to 7) Émma Bay, July, 1932, ♂♂♀, Olenev; 8) Lawrence Bay, August 19, 1932, ♂, Portenko; 9) Uélen, September 9, 1933, ♀ 1° anno, Portenko; 10 to 12) same site, May 27, 1934, ♂♂♀, Portenko; 13) same site, May 31, 1934, ♂, Portenko; 14 and 15) same site, June 2, 1934, ♂♂, Portenko; 16) same site, June 3, 1934, ♂, Portenko; 17 to 21) same site, June 7, 1934, ♂♂♂♀♀, Portenko; 22) Bol'shoi Diomede Island, June 22, 1934, O, Portenko; 23 and 24) Providence Bay, Cape Stoletiya, May 27, 1938, ♂♂, Butenko; 25) Providence Bay, Plover Bay, June 14 1938, ♂, Butenko; 26) Kivak village, July 22, 1934, O, Butenko; 27) Wrangel Island, Akatylanva landmark, June 2, 1939, ♂, Portenko; 28) same site, June 4, 1939, ♂, Portenko; 29) same site, June 8, 1939, ♂, Portenko; 30) same site, June 12, 1939, ♂, Portenko; 31 to 33) Somnitel'naya Bay, June 14, 1939, ♂♂♂, Portenko; 34 and 35) Nasha River, June 26, 1939, ♂♂, Portenko; 36) near Atternon mountain, July 2, 1939, ♂, Portenko; 37) same site, July 6, 1939, pull., Portenko; 38) Rodgers Bay, July 11, 1939, ♂, Portenko; 39 and 40) near Atternon mountain, July 24, 1939, ♂♂, Portenko; and 41) same site, July 29, 1939, ♂, Portenko.

*Specimen of C. l. calcaratus* Pall.—42) Kolyuchi Island, July 25, 1938, ♂ juv., Portenko.

*Specimens of C. l. kamtschaticus* Port.—43) Pereval'naya Station, June 17, 1939, ♂, Meller; and 44) same site, July 27, 1939, ♂ juv., Meller.

*Biological material*—1) Nest with a clutch of 5 eggs, southeastern part of Wran-

**Table 42. Beak length and wingspan (mm) of *C. l. calcaratus***

| | Beak length | | | | | | | | Wingspan | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Male | | | | Female | | | | Male | | | | Female | | | |
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| Nesting period | 8.9 | 7.4 | 8.1 | 68 | 8.6 | 6.9 | 7.8 | 55 | 95.6 | 87.1 | 91.2 | 69 | 89.5 | 79.8 | 85.4 | 56 |
| Winter and spring | 9.2 | 7.3 | 8.0 | 23 | — | — | — | — | 94.9 | 87.0 | 91.4 | 24 | — | — | — | — |
| Fall | 8.5 | 6.9 | 7.5 | 42 | 8.5 | 6.8 | 7.4 | 25 | 95.8 | 88.0 | 91.7 | 41 | 88.3 | 83.0 | 86.1 | 23 |
| For the series as a whole | 9.2 | 6.9 | 7.9 | 133 | 8.6 | 6.8 | 7.7 | 80 | 95.8 | 87.0 | 91.4 | 134 | 89.5 | 79.8 | 85.6 | 79 |

gel Island, June 25, 1931, Vlasova; 2) nest with a clutch of 5 eggs, same site, June 26, 1931, Vlasova; 3) nest with a clutch of 5 eggs, Rodgers Bay, June 23, 1932, Vlasova; 4) nest with clutch of 5 eggs, Uélen, June 10, 1934, Portenko; 5) nest with a clutch of 6 eggs, Uélen, June 15, 1934, Portenko; 6) nest with a clutch of 5 eggs, midreaches of the Amguéma River (Km. 91), June 25, 1956, Portenko; 7) nest with a clutch of 5 eggs, same site, June 28, 1956, Portenko; 8) nest with clutch of 6 eggs, same site, June 29, 1956, Portenko; 9 and 10) nest with a clutch of 5 eggs, same site, June 30, 1956, Portenko; 11) egg, same site, July 4, 1956, Portenko; and 12) 3 eggs, same site, July 5, 1956, Portenko.

### 145. *Plectrophenax nivalis pallidior* Salom.

### 146. *Plectrophenax nivalis vlasowae* Port.—Snow Bunting

*Local names*—Chukchian: týmkopchekal'gyn; ptschekadlin in the records of the *vega* expedition (but the word "pohekal'gyn" generally denotes "small bird," i.e., a tiny passerine bird). In Eskimo: katyříégak or katekh-ékhak in Providence Bay; kavunúvak on Bol'shoi Diomede Island; tŭgh-ă-nŭgh'-ă-rūk-wŏk on St. Lawrence Island.

*Distribution and status*—This species is common in the nesting sites on the Chukchi peninsula, and is abundant in flights. It nests in large numbers on Wrangel Island. Flies away in winter.

According to V.E. Yakobi, Snow Buntings nested in Uél'kal' village in 1961. There two nests were detected and fledgelings caught at different times. L.O. Belopol'skii (1934) observed this species in the nesting section in Krest Bay. In Providence Bay, Snow Buntings have been collected by all the ornithologists who visited there, probably beginning with Captain Moore (Harting, 1871), who brought two specimens without proper dates, most likely from Plover Bay in the summer of 1849. T.H. Bean (1883) collected five specimens on August 13 and 14 and September 12, 1880, and encountered these tiny birds in large numbers. E.W. Nelson (1883, 1887) found them common in the nesting section at the end of July, 1881. The Institute of Zoology, Academy of Sciences of the USSR has specimens obtained in Providence Bay by I.N. Akif'ev in 1900, by E.E. Arngol'd in 1911, and L.M. Starokadomskii in 1912. W.S. Brooks (1915) considered Snow Buntings very common there in June, 1913. C. Amory (Riley, 1918) collected specimens in Émma Bay on July 22 and August 5, 1914. A.M. Bailey (1926) found this species to be common in the summer of 1921 in Émma Bay where, in his opinion, several pairs were the only feature of wildlife among deserted hills. I.O. Olenev wintered in Providence Bay in 1931/1932 and encountered Snow Buntings only in the nesting site and not a single one in winter; P.T. Butenko had the same experience in 1937/1938. I found Snow Buntings to be common in the nesting section at different places in Providence Bay, Émma Bay, around Plover, and Cape Stoletiya where it could not be called numerous. In Émma Bay I also saw flocks in fall migrations. V.N. Lyubin caught young ones in Plover Bay on July 15, 16, and 17, 1948. During his journey in 1957 A.P. Kuzyakin encountered Snow Buntings throughout the coast from Providence Bay up to Uélen. On the west coast of the bay they nested in the village and were numerous. Two nests were found.

The Institute of Zoology, Academy of Sciences of the USSR has a male specimen collected by I.G. Voznesenskii on July 2, 1843 on St. Lawrence Island. From July 31 through August 2, 1879, Snow Buntings were seen on this island by members of the *Vega* expedition (Palmén, 1887) and a feathered chick collected. On June 24, 1881, E.W. Nelson found Snow Buntings nesting on the southwestern cape of St. Lawrence Island, found a nest, and collected a female. According to W.S. Brooks in June, 1913, it was a common bird on the island, and according to A.M. Bailey, even very common from July 1 through 8, 1921. H.B. Collins (Friedmann, 1932a) obtained a young specimen in the summer of 1930 in Gambell village. According to O.J. Murie (1936), Snow Buntings nested in large numbers on St. Lawrence Island, but only a few birds remained for winter. Two males were collected on August 28 and September 2, 1935 in Kukuliak village. According to F.H. Fay and T.J. Cade (1959), although Snow Buntings even wintered in small numbers on St. Lawrence Island, arrivals were nevertheless numerous in spring in Gambell village. Specimens were obtained on June 25, 1950 and May 1 and 23, and July 13, 1953. Snow Buntings were common on Cape Chibukak and on the cliffs in Boxer Bay.

Three nests were detected on the slopes of Sivokak mountain. According to the observations of E.G.F. Sauer and E.K. Urban (1964) in 1960, Snow Buntings were common in Boxer Bay, nested in the dried-up bed of Boxer River, and on the rocks behind the bay.

P.T. Butenko tracked their arrival in April, 1938 on Cape Chaplin.

In the Institute of Zoology, Academy of Sciences of the USSR, there is a young specimen obtained by P.V. Ushakov on July 31, 1929 in Lawrence Bay. I shot Snow Buntings there on August 19, 1932 in small numbers. In 1957 A.P. Kuzyakin found Snow Buntings to be common along the coasts from Akkani village to Uélen. In the village in Lawrence Bay, he found a nest but for some reason never sighted this bird in Poutyn village and its vicinity where Snow Buntings should have been in evidence among the rock piles. In 1970 V.V. Leonovich found a few nests with chicks in Lawrence Bay.

According to the observations of K.W. Kenyon and J.W. Brooks (1960), Snow Buntings were numerous in the lower sections of slopes on Little Diomede Island; nests were found.

On Bol'shoi Diomede Island on June 24, 1909 J. Koren (1910) noticed Snow Buntings. According to W.S. Brooks on June 15, 1913, two nests with clutches were found. According to my 1934 observations, Snow Buntings nested there in large numbers.

These birds were even noticed by E.W. Nelson on Cape Dezhnev. In June, 1913 Brooks found them very common there in the nesting section. In 1957 in Dezhnev village, A.P. Kuzyakin met a pair inhabiting a man-made structure. In 1948 V.N. Lyubin caught specimens on August 14 in Naukan and on July 9 and August 8 in Uélen. A.M. Bailey saw Snow Buntings in small numbers on July 11, 1921 in Uélen.

I found Snow Buntings common in the nesting area right in Uélen and in its vicinity east up to Cape Dezhnev; in fall migrations they were encountered in large flocks.

In the interior of the country, Snow Buntings colonize only at places where rock exposures are available. Thus I found them in the nesting area in the lower reaches of the Kol'oam-Véem River and on the knolls west of Lake Kool'ong, but found none whatsoever in the Utte-Véem River valley. In nesting sections, I found Snow Buntings in various places on the north coast farther westward—near Inchoun, Mitkulen, and later along the coast up to Cape Serdtse-Kamen'. On June 27, 1909 J. Koren noticed these birds in the vicinity of the Shelton River (south of the Polar Circle). On July 17 and 18, 1913 they were sighted in small numbers by W.S. Brooks on Cape Serdtse-Kamen' where flying young birds were caught. F.S. Hersey (1916) wrote that he had the impression that Snow Buntings were more numerous on the Chukchi coast than on the coasts of Alaska, but it should be kept in mind that in the summer of 1914 he visited only Cape Dezhnev and Cape Serdtse-Kamen', i.e., a locality exceptionally favorable for the habitation of Snow Buntings. In 1970 V.V. Leonovich studied a few nests with nestlings and eggs in Énurmino where there were many Snow Buntings.

Members of the *Vega* expedition brought a few specimens including chicks, from Tepkan, Pitlekai, and Dzhénrétlen. On June 15, 1879, countless Snow Buntings were sighted in Pitlekai. E. Almquist encountered this bird on June 16 during his trip to Kolyuchin Bay. Traveling by dog sled in May, 1934 I noticed that Snow Buntings inhabited the lowland sections of the coast from Cape Serdtse-Kamen' to Dzhénrétlen in smaller numbers than on the rocky coasts in the east. On July 3, 1909 J. Koren noticed young birds on Kolyuchi Island. In July, 1938, I found Snow Buntings to be common in the nesting section there.

On June 8, 1956 in Égvekinot, and on June 10 on the way to the 91st km on the Amguéma, I came across Snow Buntings everywhere—by houses, on the rock scree, and near knolls. In the vicinity of the Amguéma River in the nesting season this was one of the most common mountain birds. At places the distance between the nests of individual pairs was less than 100 m, as a result of which skirmishes and quarrels often arose among them.

On my way back to Égvekinot on July 18, Snow Buntings were repeatedly encountered when I traveled through the mountains.

The coastal strip from Vankarém to Cape Schmidt was surveyed by A.A. Kishchinskii in 1970 and Snow Buntings proved abundant in the nesting area. In the village and on Cape Vankarém, as well as around the tundra, many broods were sighted. On the rubble spits of Nutauge and Ukouge lagoons pairs nested 100 to 400 m apart, on dry ridges at distances of 40 to 50 m, at times even 20 m, and on the coastal precipices 100 to 500 m apart. They were numerous in the village by Cape Schmidt and inhabited the proximate Raneikal' mountain.

In 1915 A.A. Savich (Artobolevskii, 1927) tracked the arrival of Snow Buntings on Cape Schmidt. There were days when they appeared in considerable numbers on the hummocks alongside the ship anchored for winter. A nest with eggs was found later.

In the spring of 1934 on my way by dog sled along the north coast from Cape Schmidt to Uélen I noticed flocks of wandering birds along the coastline, moving mostly northwest.

In early August, 1938 I encountered innumerable broods literally everywhere in the vicinity of Cape Schmidt. At the end of April, 1935 V.Ya. Isaev had sighted Snow Buntings rather frequently in the surrounding hills.

According to E.W. Schmidt, in the hilly sections of the Chukchi peninsula Snow Buntings lived nearly everywhere. I therefore can concede now that the specimen of Snow Bunting caught by G. Maydell's expedition on the southern slopes of the Anadyr mountain range (judging from the numeration of the label, somewhere east of the upper reaches of Tanyurer en route to the Tadleo River) was a nesting bird. In my *Fauna of Anadyr Region* (Portenko, 1939b, pt. I, p. 72) I decided against including this discovery because its reported location was not then entirely reliable; information about the nesting of Snow Buntings in the hills in the interior of the Chukchi peninsula was not available in the 1930's. In the description of the travels of J. Billings (Sarychev, 1811, p. 61) along the northern slopes of.the Anadyr mountain range, it is stated that only Ravens, partridges, and Snow Buntings were seen in winter. On February 14, 1792 Billings' expedition approached the first larch forest on the Gek River (see Billings' map). There the expedition saw "partridges and Snow Buntings" (ibid., p. 54). According to the information I collected on Cape Schmidt, in the interior hilly sections of the country Snow Buntings not only nested, but were encountered even in winter at places in the lowland tundra where the wind carries snow. Nevertheless they were encountered in small numbers and hence the possibility of regular, permanent wintering sites is not ruled out. In my opinion, under favorable feeding conditions Snow Buntings remain quite sometime after fall. On the other hand they sometimes arrive early and do not spend the whole of winter at one site.

A.I. Argentov (1857a, p. 85) referred to "bullfinches" in his *Description of Chaun Parish*. In 1958 V.D. Lebedev and V.R. Filin (1959) saw Snow Buntings in the vicinity of Pevek in spring and fall. On Aiok Island this species was sighted only rarely, but judging from all available data it nested on the west and south coasts, and a nest was discovered in the southeast. In 1912 J. Koren (Thayer and Bangs, 1914) found a nest on Cape Bol'shoi Baranov. In 1965 and 1966 this bird was sighted time and again by F.B. Chernyavskii on the North Anyui mountain range, and on other mountains in the northwestern part of the Chukchi peninsula.

During flight to Wrangel Island and back, Snow Buntings were seen on hills, above the coastal ice, and on the sea in Long's Strait. When the ship *Sovyet* idled in the floes not far from Wrangel Island in August, 1932, Snow Buntings arrived and landed on deck in large numbers.

On August 12, 1881, E.W. Nelson landed for the first time on the coast of Wrangel Island and found there a pair of Snow Buntings with young ones already fairly grown. In the early 1920's one specimen was caught on Wrangel Island by A. Crawford (Snyder, 1926). G.A. Ushakov (Bannikov, 1941) considered this bird one of the most common species. According to V.F. Vlasova, Snow Buntings nested in the interior of the island, were more common on the coastal cliffs, and very common in spring flight, at least in Rodgers Bay. According to my observations, on Wrangel Island Snow Buntings nested in large numbers, a fact attested to by the number of specimens I caught. They were encountered at nearly every place I visited except the Tundra Akademii lowland, where they were not seen simply because of the absence of suitable habitats. Like Vlasova, I saw many Snow Buntings in spring flight and quite a few before fall migration. Nonetheless their number was lower than anticipated. According to the observations of S.M. Uspenskii, R.L. Bëme, and A.G. Velizhanin (1963), the Snow Bunting in 1960 was one of the most common birds on the island. A.I. Mineev during a trip extending 7 km into the Mamontovaya River valley met with 12 pairs, while on a 5-km trip from the Mamontovaya River valley to the Tundra Akademii came across only one pair. On two trips into the Tundra Akademii, Snow Buntings were not sighted. A.G. Velizhanin (1965) was hardly precise when he wrote that this bird was "omnipresent" and inhabited all of the islands from the sea to the hill tops.

On July 30, 1881, E.W. Nelson found Snow Buntings nesting on Herald Island. K.L. Hooper, Captain of the *Corwin,* noticed a few birds at the top of the island. They flew animatedly from rock to rock. According to an eyewitness account by G.V. de Long (1883, p. 329) a flying Snow Bunting was sighted on April 23, 1880 north of Wrangel Island at about 72° 52′ N.

At the winter anchorage of the *Maud* (Schaanning, 1928) in the East Siberia Sea, a Snow Bunting in transit was sighted on May 7, 1923 at 74° 43′ N 166° 23′ E, in 1925 Snow Buntings were sighted in spring flight on May 17 and 22 as well as June 12 on Chetyrekhstolb Island.

*Habitat*—A common and typical arctic bird, the Snow Bunting nevertheless selects specific areas for habitation in the nesting season. One could pass the summer in sites unsuitable for this species and not see a single bird. Basically, its habitats are associated with stones; in other words, it prefers a rugged terrain. E.W. Schmidt told me that in the interior of the Chukchi peninsula, Snow Buntings evidently did not nest on top of high mountains, but colonized the mid-sections of slopes. On the Chukchi peninsula and Wrangel Island I happened to study the hills only up to 1,000 m above sea level and at this low height came across nesting sites of Snow Buntings from top to bottom. The same was true of Bol'shoi Diomede Island. They often nested among large boulders on tops of hills in Dezhnev, on Bol'shoi Diomede Island, on hills west of Lake Kool'ong and, on Wrangel Island, on hills around Atternon and the Mamontovaya River. Lower down they selected large stone piles and were confined to the vicinity of hill brooks or springs. Since Snow Buntings occupy nesting sites very early, their selection depends additionally on the condition of the snow cover at the commencement of spring. That is why, after thaws, it is difficult to understand why Snow Buntings have overlooked the most suitable sites. On Wrangel Island they selected, for example, small terraces on slopes of hills with stone slopes, covered by mossy and lichen beddings on which the snow disappeared early. In Émma Bay Snow Buntings were characteristic inhabitants of rock slopes together with pikas [*Ochotona alpina hyperborea* (Pall.)], at least in the lower levels of hills. Snow Buntings also love coastal ledges by the sea and rivers independent of the height of cliffs, as on Cape Dezhnev, along the banks southeast of Cape Serdtse-Kamen', and on the east coast of Wrangel Island, or a shore only a few meters high, with uniform soil, and consisting of slatelike shale or rock slopes large and small. Snow Buntings are common on such capes as Onman, Vankarém, Kozhevnikov, and so on up to Cape Bol'shoi Baranov inclusive (according to J. Koren). At the same time, I came across Snow Buntings along the Kol'oam-Véem River every time I approached ledges or rocky outcrops and also in canyon-type lowlands of streams on the south coast of Wrangel that intersect the plateau between the hills and the sea. According to V.F. Vlasova, Snow Buntings were more common in the nesting sites on the shale coasts of Wrangel Island than on the rock fields inland.

On the north coast east of Cape Schmidt, according to A.A. Kishchinskii, the main habitats of Snow Buntings were confined to the high coasts of the sea and lagoons, at times not more than 1.5 m high. Man not only did not frighten this bird, but even attracted it. Pairs were regularly seen in partly damaged Chukchian mud huts along the coast and around aerodromes. Driftwood dumps on the spits constituted favorite nesting sites where the density of Snow Buntings reached 30 pairs per $km^2$. They also nested in rock slopes along the tops of hills, but were totally absent in plain and hilly watershed tundra.

On Aiok Island, according to V.D. Lebedev and V.R. Filin, Snow Buntings nested even among driftwood. An interesting case was described by E.G.F. Sauer; a Snow Bunting built its nest among stones in the dried stream bed of Boxer River and successfully raised its chicks, which had already left the nest by the time the bed was inundated by a strong water current.

Outside hills and coasts, Snow Buntings tend to nest in human settlements where they find favorable feeding conditions. Nests are constructed under house roofs and in every type of crevice, especially in uninhabited storehouses, rock fences or simply rock or brick stacks, even in dustbins, and in the walls of pits in which Chukchians preserve walrus meat ("kopal'gyn"). These structures are extremely typical and require no special explanation. Their upper portion is constructed of stones and the birds build nests in the gaps. Abundant summer insects, attracted by animal refuse, provide an excellent source for fattening chicks. In Uélen village, in the Polar Station on Cape Schmidt, on Wrangel Island and, undoubtedly, in many other villages, the Snow Bunting is almost as habituated to man as the common house sparrow in temperate latitudes.

In the nesting period, Snow Buntings quite often leave their sections for the village or the rubble spit. I noticed this time and again in Uélen near Kilometer 91 and on Wrangel Island. During wanderings and flights, the localities of Snow Buntings are determined by the presence of food; only in a storm or blizzard do they leave the open expanses to seek hideouts. A.I. Mineev (1936) has described how, in the snowy spring of 1931, literally a thousand Snow Buntings found shelter in the Polar Station in Rodgers Bay in attics and storerooms which they entered through slits in the structures. Tayan told me that Snow Buntings invariably flew into the station during the blizzard.

In the spring of 1934, on the north coast of the Chukchi peninsula, I encountered migratory Snow Buntings mostly on rubble spits with islands of grass, on puddles at places where the wind had carried snow, and also near human residences. In the spring of 1939 I came across the first Snow Buntings on Wrangel Island at those places where I had found them in the preceding fall—sections of the grassy-hummocky tundra where the snow was light and in windblown sections along the slopes of knolls. Nevertheless they happily rested on snow. On my way to the Amguéma River I saw them perched on snow mounds alongside puddles.

In the fall of 1933, I often encountered Snow Buntings on rubble spits with scanty grass near Uélen, and wherever there was diverse and mature mixed grass vegetation, for example, at the foot hills in Émma Bay, or on flat sections on the south coast of Wrangel Island.

*Arrival*—Snow Buntings arrive early but never altogether. Hence, first arrivals are seen at very different periods, rarely in March and mostly in early April. According to L.O. Belopol'skii, in the spring of 1931 in Krest Bay, the first Snow Buntings were sighted on March 8. In Providence Bay, according to I.O. Olenev, in the spring of 1932 Snow Buntings appeared in early April, which correlates the date given by P.T. Butenko for 1938, namely, April 10. In 1934 the first bird around Uélen was seen on April 7 and in 1878 in Pitlekai on April 24. According to a report of A.A. Savich, in 1915 a lone Snow Bunting appeared on April 17 by Cape Schmidt; in the spring of 1934 an advance party of birds was sighted there on April 4. In his *Description of Chaun Parish* A.I. Argentov (1857a, p. 85) pointed out that the eagle and bullfinch were the earliest to arrive, in March (according to the old calendar); in a later article (*Birds of the Trans-Lena Region*, 1861a) he was more precise, giving the date as March 25, i.e., early April by the new calendar. According to Mineev, they were the first of the birds to arrive on Wrangel Island, appearing in mid-April; in the late spring of 1934 they were sighted in the last 10 days of April. In 1939 I noticed the first bird only on April 22, although some tiny passerines had been seen close to the Polar Station in Rodgers Bay on April 13. According to G.A. Ushakov, they arrived by April 10 to 15. On Malyi Diomede Island, according to J.V. Brooks, Snow Buntings arrived in the first half of April in 1953.

The course of flight can be traced according to the following dates in different years. In 1938, the first two Snow Buntings were noticed on April 10 on Cape Chaplin, but only a few sighted there as of April 23. In 1879, at the winter anchorage of the *Vega* near Kolyuchin Bay, the first snow buntings were seen on April 24. Chukchians reported sighting this bird on the following day as well, but the first specimens were brought from Pitlekai only on April 26. This bird was simultaneously recorded in Neshkan, but seen in large numbers only in the first half of May. On Cape Dzhénrétlen, one specimen was collected on May 18 and two males on May 25; they were numerous on the 27th. Two males were subsequently obtained on June 2, specimens on June 10 and 12, and females on June 13. The next day a male was caught in Pitlekai and innumerable Snow Buntings sighted on June 15 among a flock of tiny birds that had alighted by recently formed puddles on the sand banks. Finally, on June 27 one was sighted around Dzhénrétlen and on July 1 near Tepkan.

In 1951, A.A. Savich noticed the first lone Snow Bunting on Cape Schmidt on April 17. On the 21st a pair lazed around the ship on ice bergs and a flock of six or seven birds was sighted on the hills on April 26; they were seen the next day in significant numbers; their chirping was heard on May 10 and singing on May 17 and 20.

I was given to understand that in the spring of 1934 the first specimens on Cape Schmidt were sighted on April 4. Due to my departure from the north coast of the Chukchi peninsula at that time I could not track their arrival at any one place. I saw one on my way between Naukan and Dezhnev on April 13. It was the first to be sighted there that spring (1934). On April 14 I saw two near Énurmino, but only on April 18 did I finally catch a lone male in the Polar Station in Uélen, and later hear the call of another bird. On my arrival by plane at Vankarém on April 24 I was told that a Snow Bunting had been sighted the previous day. On the 26th I saw a lone male there which called and flew high and encountered six birds on the 27th; on April 29, the second day of my journey by dog sled toward Cape Schmidt, I saw three flying northwest; on May 1 I saw them flying in the vicinity of the Polar Station on Cape Schmidt. In the first few days of the month they were few everywhere. On May 4 I saw some from time to time on my return to Vankarém. P.T. Butenko also saw some on May 4 to 6 on his way from Inchoun to Seishan. From the Polar Station into Uélen I was told that five or six Snow Buntings had been seen in a day. Only on May 8 did Butenko encounter a large flock of 30 to 40 birds west of Énurmino. On May 10 I encountered a flock of 11 males near the factory in Vankarém, but up to that date not so much as a single female. In spite of the obvious commencement of the mating season, I saw two flocks of Snow Buntings even on May 27 on my way from Dezhnev to Uélen, and on the 31st the last flock west of Uélen.

In Gambell village on the northwestern extremity of St. Lawrence Island, according to F.H. Fay and T.J. Cade, Snow Buntings were seen in large numbers only around May 1st; a small number had been regularly sighted throughout winter.

On Wrangel Island, according to A.I. Mineev, Snow Buntings arrived late in the spring of 1934—during the last 10 days of April. In 1939 I sighted the first bird on April 22. Although males arrive earlier and independent of females, for some reason this bird was a female. On that same day a lone male was sighted later. Because a snowstorm set in I could not go out again until April 27, on which date I came across only one male. On the 28th I heard birds calling to each other, but Tayan actually saw a snow bunting on Cape Hawaii. On May 2 it snowed lightly and two flocks appeared in the Polar Station. On the 3rd the weather was warm and good (soil +1.5°C and atmosphere –8°C) and I could not sight even a single Snow Bunting in the station. On May 4 I saw a flock of buntings in the tundra and on the 5th caught more than 20 specimens, but found nary a female among them. Excluding the female sighted on April 22, I saw only lone males right up to May 7, the date females began to arrive in flocks. On May 12 a flock gathered by our tent in the Klér River estuary. Even up to May 28 I came across flocks in transit, consisting mostly of males.

In the spring of 1880, when the *Jeannette* lay in ice north of Wrangel Island at

72° 52′ N, a Snow Bunting in transit was sighted on April 23. Having arrived from the east, it turned southwest. I could not establish the distinct flight direction on Wrangel Island. Based on the observations of eskimos, who stated that Snow Buntings were initially seen in the western part of the island, A.I. Mineev thought that they flew west to east.

*Breeding*—Unlike many arctic birds, Snow Buntings arrive long before the onset of the breeding season. Mating behavior therefore develops gradually. In the spring of 1934 I noticed even on May 9 near Vankarém a male exhibiting signs of attachment to a nesting section. On my approach it hopped a few paces away from me, then flew up and circled, and again landed within a few paces. Generally Snow Buntings remain extremely cautious right from the moment of arrival. Two or three other males showed an attachment for the rocky precipices and flew from ledge to ledge with a song. These may have been false ploys induced by the excellent sunny though somewhat windy weather; on cloudy days I found no Snow Buntings there. On May 14 I observed males singing animatedly on Cape Onman, on the 15th on Kolyuchi Island, and on the 19th near Seishan. Some pairs roamed along the crevices in the rocks in search of a convenient place for nesting. Their singing was heard right up to June 15 even though it had slowed down perceptibly by June 1. On June 10 at the top of one of the knolls near Uélen I saw a female carrying nest material in her beak.

On Wrangel Island in the spring of 1939 I heard the first full song of a male on May 7. At that time, males began occupying the nesting sections. On May 9 I noticed that flocks were sometimes divided into pairs. In search of food, males constantly hopped behind females somewhat to the rear and sideways. In the northeastern part of the island, for example on Cape Uéring, I noticed some males even on May 12. They sang from time to time or flew from place to place in their nesting sections in anticipation of females. In Rodgers Bay males exhibited great attachment to their nesting sections on May 23. On my appearance they swooped, hopped quickly across the moss, but did not fly off for quite sometime and appeared to be searching for food. Birds usually behave in this manner near a nest, but these males were still unpaired.

According to the observations of K.W. Kenyon, in 1958 Snow Buntings were already numerous on Little Diomede Island on May 11. On May 14 "courting" was observed. On May 18 a large number of males sang in the nesting sections occupied by them. Between 11:00 a.m. and 2:00 p.m. singing ceased, to be renewed around 3:00 p.m. and continue for the rest of the day. On April 23 four females and one male were seen arriving on the island from the south. On May 24 females were sighted for the first time gathering material for nest building.

There is a preponderance of males over females among Snow Buntings. For example, on Wrangel Island in the nesting sections occupied by males, one saw every type of trick practiced by them to attract females. They sang almost incessantly and were in constant motion. Fluttering from place to place these desert birds enlivened the inanimate monotonous stone piles. As a result of the shortage of females, I quite often encountered on Wrangel Island and along the rocky sections of the Chukchi coast, two males sharing one female. This phenomenon has been observed time and again among different types of birds even outside the Arctic. On May 27, 1934, on Tret'ya brook between Uélen and Dezhnev, I saw a male Snow Bunting with a female Lapland Longspur. I could not prolong my observations, but for the length of time I watched the two birds remained together.

The male Snow Bunting is a magnificent singer in spring. Although singing varies in individual birds, at times even significantly, the phrase generally consists of lilting notes similar to the song of a Crested Lark [*Galerida cristata* (L.)]. In my diary in Uélen I noted some similarity even with the strophe of a Scarlet Rosefinch [*Rubicilla erythrina* (Pall.)].* On clear sunny days these phrases were repeated *ad nauseam* with such energy one got the impression that the birds were fighting. Their song recalled to mind that of a Great Tit (*Parus major* L.) uttering "tsi tsi-kerr" in the spring. E.G.F. Sauer found a resemblance to the song of a common Whitethroat (*Sylvia communis* Lath.). If we compare the song of a Snow Bunting with that of a Lapland Longspur the former would appear more sonorous, protracted, and convoluted.

Right from arrival buntings often call with monosyllabic sounds—"tsiv" or "t'yu". Later, the trill "tyu-tyu-tyu" is heard. The first songs of the males are jerky and short, attaining perfection later. In the summer on sunny days males love to sing not so much on rocks as while sitting there alongside snow. The females respond with the sound "chirr" as they approach the males. The trill "trrri" could be heard from both sexes when alarmed, such as is heard when a man approaches their brood.

According to a description of E.W. Nelson, the long, pure, and fairly powerful song of the Snow Bunting consists of four or five sibilant notes, which are much shorter than those of a Lapland Longspur. The male sings on any rocky cape or on top of a projection. In 1881 this melodious song was heard in Providence Bay even on June 26.

I heard the singing of males near Égvekinot on June 8, 1956, and later on the Amguéma River right up to June 20. Not one rose with a song in the air like calling Lapland Buntings. I observed fighting males chasing one another far more often among Snow Buntings than among other birds living in the neighborhood. The males remained by the females and pairs flew incessantly along the rock piles.

Early in June, 1939, south of the Mamontovaya River, I saw pairs arrive on the rubble spit to feed on insects. Males sang animatedly in the nesting sites among stone piles, but became silent in mist and cold. A few pairs nested near an owl's nest, evidently finding safety there. On June 11 pairs became restless on my approach and swooped nearby. On June 13 I tracked one pair for quite sometime. The male stood afar and sang while the female incessantly hopped out of stones to twirl around within four or five paces of me. A second male flew by several times.

Snow Buntings had probably laid only the first eggs by mid-June. Measurements of testes of 74 males caught in Rodgers Bay from April 30 through May 11, 1939 revealed that their size had not undergone change, ranging from 1.5 to 7.0 mm × 4.0 to 5.0 mm for the left and 1.5 to 6.0 mm × 1.0 to 5.0 mm for the right. The testes of four males caught in Providence Bay between April 10 and June 9, 1938 were only

* Now *Carpodactus erythrinus*—Ed.

slightly larger: 6.0 to 8.0 mm × 2.0 to 5.0 mm for the left and 5.0 to 7.0 mm × 2.0 to 4.0 mm for the right. An insignificant increase was observed on May 18 in one male: 8.0 mm × 5.0 mm for the left and 7.0 mm × 4.0 mm for the right.

At the end of May and in June testes reached the following limits as exhibited in a specimen from Uélen on May 27, 1934—10.0 mm × 7.0 mm and 9.0 mm × 6.0 mm, and in a specimen from Diomede on June 22, 1934—10.0 mm × 7.0 mm and 8.0 mm × 7.0 mm. The testes of seven males caught on Kolyuchi Island between June 18 and 26 yielded entirely different measurements: 3.0 × 2.0 mm for the left and 2.0 to 3.0 mm × 2.0 mm for the right. Similar small testes were noticed by me among molted fall males. Among arriving Wrangel females the ovary length varied in the range of 6.0 to 8.0 mm while the follicles did not exceed 1.0 mm.

On June 24, 1884, E.W. Nelson examined a nest located on St. Lawrence Island 100 paces from an eskimo skin tent on the slope of a mound under cover of a small grass bush. It was built of thin stalks of grass interwoven with feathers and plant fluff inside and out. The nest was 2.25 inches high and 4 to 5 inches across, while the trough was 1.25 inches deep and 2.5 inches across. A single unincubated egg was found inside it. The female emitted anxious, sharp, chirping sounds. As soon as she was caught and the nest gathered, the male flew around with the call "p-chir" drawn out at the end and exhibited extreme restlessness. He led the party for more than 100 paces and remained very close without caution. The egg was cold, grayish-white with a bluish tinge, and mottled with innumerable reddish-brown dots and irregular spots that became larger toward the obtuse end and formed a halo.

In Providence Bay, W.S. Brooks collected a clutch of six eggs in a very early stage of incubation on June 19, 1913. The nest was situated under a heap of stones, each the size of a man's head. To get at it one would have had to remove perhaps some 200 pounds of stones. On June 15 of the same year two nests were gathered on Bol'shoi diomede Island. In one were five and in another six eggs. The first nest was located under a large circular stone and the second in a deep crevice between boulders. Both nests were built of grass and lined with feathers.

On June 22, 1934 on Bol'shoi Diomede Island, I found a nest with six eggs and took away the fully developed embryos. It was located in a pile under a large stone and consisted of dry stalks with a bedding of feathers. On June 22, 1879 near Pitlekai, E. Almquist detected a finished nest under a stone. On June 21, 1915 A.A. Savich found a nest with six eggs on Cape Schmidt. On Cape Bol'shoi Baranov Kamen', J. Koren found a nest on July 6, 1912 in the crevice of a precipitous cliff above the sea. It contained chicks aged nearly three days old. G.A. Ushakov brought from Wrangel Island a nest which contained seven eggs on July 5, 1927. The structure was 8.0 cm × 6.0 cm and 7.0 cm high, with a wall thickness ranging from 3.0 to 4.5 cm.

According to A.I. Mineev, Snow Buntings built nests on Wrangel Island in rock scree, crevices of coastal precipices, and in the village in brick stacks, empty storehouses, under the roofs of houses, and similar other sites. The nest collected was built of straw, stalks, partly even of fiber, and bits of rope woven into the structure. The trough was lined with scraps of wool and feathers, in particular those of Raven.

The structure was larger than the nest of a Lapland Longspur. On June 27, 1932, there were six eggs in another nest, of which one was totally unincubated and rudimentary blood vessels visible in the rest.

On June 17, 1939, I found a nest under the roof of a storehouse in Rodgers Bay. It was built of dry stalks and lined with feathers, fur of dogs and reindeer, and was a fairly massive body. Of the seven eggs, only some were slightly incubated.

A.F. Kuzyakin found a few nests in 1957. One had been built on a stone wall at the boundary of the village in Providence Bay and on June 11 contained a lone egg. On June 15, in another case, a female was seen descending into a stone pit of large stones. She could not be chased out by tapping the stones with a stick. On June 17 A.P. Kuzyakin saw the same Snow Bunting fly again into the pit and once again tapping did not dislodge her. The heavy stones had to be removed. Under one a large-sized nest was found. The female continued to sit in it, merely looking at the intruder, and jumped down only when his extended hand almost touched her. Even then she did not fly away but attempted to hide under the stones where she was caught by hand. The nest was 9 × 17 cm across, inner side 7.0 cm × 7.5 cm, and depth of trough 4.0 cm. It contained six highly incubated eggs. On June 21 A.P. Kuzyakin found a nest at the boundary of the village in Lawrence Bay on a grass meadow by a brook. It was hidden under a piece of a broken, rusted iron pot and contained five recently hatched eggs. The shell of a sixth hung on the side of the nest. Finally, on June 23 a nest was found with two eggs in a pit under a stone on a tractor trail between Lawrence Bay and Akkani village.

In 1970 A.A. Kishchinskii found males singing animatedly on May 31 on Cape Schmidt. From June 10 singing began to lessen and after June 13 ceased. Snow Buntings carried material for nest building in their beaks during the first 10 days of June. Their nests were located in deep niches, in ground fissures, under crumbling turf beds, under trunks of driftwood, under logs or wood planks, in dustbins, in discarded fuel oil barrels, etc. On June 4 finished nests were found but they were still empty. Full clutches of four, five, six, and six eggs were found on June 4, 12, 13, and 21 respectively. Repeat clutches were discovered on July 13 and 15 with four eggs each. In five cases females were on the nests while in one a male was incubating. V.V. Leonovich found a nest with four fresh eggs under a stone in the tundra in Énurmino on June 29, 1970.

On June 25, 1950 three nests were brought to T.J. Cade on St. Lawrence Island; one contained three eggs and two four eggs each. The nests were discovered under stones. On June 27, 1960 E.G.F. Sauer found a nest with six eggs under stones in the dried bed of Boxer River. Both birds were silent and left the place together. On June 29 a male was seen feeding the female at a distance of 1.0 m from the nest; the female ran behind him and begged like a nestling. On Little Diomede Island a nest with an incubating female was found by K.W. Kenyon on June 10, 1958.

At the end of June, 1939, I noticed males and females gathering food for chicks on Wrangel Island. On my approach they hopped around on the ground. In 1956 on the knolls near the Amguéma, Snow Buntings had hatched chicks even on July 2, but did not leave the nests until July 16. V.D. Lebedev and V.R. Filin found a nest with four blind chicks on the southeast coast of Aiok Island on June 24, 1960.

The flight of fledgelings (Fig. 35) commenced from the end of June through mid-July.

In 1934 on Bol'shoi Diomede Island, even on June 24 I saw a chick with a short tail being fed by its mother. On the Chukchi coast near Inchoun I came across the first fledgelings only on July 2 and noticed a male gathering insects in his beak for the brood on July 3. Even on July 16 I came across fledgelings in Mitkulen with tails not fully grown. Even those with tail feathers fully grown were fed by adults, both male and female.

On July 16, 1970 A.A. Kishchinskii found a nest near Nutauge with five nestlings aged six or seven days. Their feathers were in the form of tiny tassels. After July 20 only flying broods were encountered. V.V. Leonovich found a nest in Énurmino on June 25, 1970 located in a fire bucket; it contained five growing nestlings. On June 28 he found another nest under a roof, which contained five nestlings and an addle. On July 2 flying nestlings were sighted in two places. In Lawrence Bay feeding of fledgelings was noticed in four nests from June 14 to 18. Five fledgelings and two eggs were found on June 18 in one of the nests. On June 23 a nest was found with five nestlings aged five to seven days, and another with nestlings aged 11 days together with three addles. These two nests were discovered in dustbins at the aerodrome. Growing nestlings with still underdeveloped tails were found at the same time.

W.S. Brooks encountered flying young on July 17 and 18, 1913 on Cape Serdtse-Kamen'. On Kolyuchi Island, J. Koren saw fully feathered young on July 3, 1909, and I came across fledgelings of different ages from July 19 through 26, 1938. Males remained by the broods, chirped anxiously, and some even flew away feigning a wounded bird. Those which I caught were emaciated and had extremely worn-out plumage. Only very few had begun to molt. On July 12, 1938 I arrived in Providence Bay to find growing fledgelings. Adult birds remained with them and on my appearance flew toward me and chirped anxiously. On July 18 on Cape Schmidt I met with nestlings with tails not yet fully grown. Early August broods were flying from place to place everywhere.

On Wrangel Island in 1939 I noticed nestlings with half-grown tails only on July 11. From July 22 onward flying broods became common. At the end of July and early in August local movements of broods began. Adult birds gradually desisted from gathering insects to feed the young although they remained with them constantly.

According to the information collected by S.M. Uspenskii and colleagues in 1960 (Uspenskii and others, 1963), the flight of nestlings from the nests began on Wrangel Island on July 17 or 18 (on Cape Schmidt 10 days earlier). However, A.G. Velizhanin (1965) states that growing nestlings (those planning to fly out) appeared in Ushakovskii village from July 10 through 14.

E.G.F. Sauer noticed nestlings leaving the nests on St. Lawrence Island on July 13, 1960. Toward the end of July, Snow Buntings began to advance to the coastal tundra.

According to the observations of V.E. Yakobi, in Uél'kal' in 1961 a fledgeling with a wingspan of 6.2 cm and tail of 3.1 cm was found on June 25; it weighed 21.2 g. On June 30 the wingspan of another fledgeling flying quite well was 8.1 cm and tail 5.2 cm; it weighed 28.1 g. On July 5 more fledgelings were seen, but they could fly no farther than 10 m.

In 1938 a half-molted young bird was caught by me on Wrangel Island on August 20; in 1939 I noticed molting young Snow Buntings in the first fall plumage on August 16. The tail had not yet fully grown in a highly molted adult male caught August 20, 1938.

*Departure*—Local wanderings and flock formations precede fall flights. In the fall of 1938 on Wrangel Island, even on August 28 I sighted Snow Buntings in the Klér River valley along precipices in the estuaries of brooklets and along fences; in other words, near sites where they had hatched. On September 5, following a cold snap with snow, the picture underwent a sharp change. On September 12 flocks fed in the grassy sections of the hilly tundra in a winter setting. When the birds dispersed it could be seen that the adults tended to remain in pairs. On the following day I noticed several Snow Buntings on knolls with puddles. Their mutual calling was often heard and sometimes they swooped at me with curiosity. I saw them for the last time on September 14.

In 1939 I noticed wandering flocks on August 16. They were calling to each other and some flew close by me while others were extremely cautious. On August 22 flocks of Snow Buntings were innumerable. According to A.I. Mineev individual birds remained singly on Wrangel Island until the end of September, but Snow Buntings never wintered there. According to the observations of A.G. Velizhanin, in 1960 the departure of Snow Buntings on Wrangel Island commenced in the middle of August and continued to the last 10 days of September. On Cape Blossom the last Snow Buntings were seen on September 25.

Around Uélen in 1933, even on August 28 I caught a young Snow Bunting among adult birds on the precipitous bank of the Vtoraya brook (Téeyu-Véem). It could be that Snow Buntings remained in their nesting sections or near it. Even on September 9 I saw a pair of buntings there. From September 11 through 25 I came across pairs and flocks wandering along rock slopes and ledges of cliffs above the sea. By September 27 all of them still remained in flocks on the rocks, but by October 1 very few were left. I saw Snow Buntings for the last time on October 3 on a rubble spit with grass where, from the tracks on the snow, it was obvious the birds had stayed quite sometime.

In the fall of 1934 I noticed the first of the flocks on August 18. They remained on the rocky beds of spring streams, on the hills west of Lake Kool'ong. On September 9 I saw buntings overflying the stone scree in Émma Bay. Almost invariably they remained not far from their nesting sites.

In the first half of September, Snow Buntings on the Chukchi peninsula were no longer a rarity. On September 14, 1912 L.M. Starokadomskii caught a specimen in Providence Bay. In 1958 V.D. Lebedev and V.R. Filin sighted Snow Buntings until August 31 on Aiok Island and until September 9 in Pevek. According to V.E.

Yakobi, Snow Buntings still remained around Uel'kal' on September 5, 1961. I was convinced that Snow Buntings did not winter on the Chukchi peninsula even though, as pointed out, they did winter in small numbers on St. Lawrence Island.

*Food*—The food of Snow Buntings sometimes consists mainly of plant material and sometimes mainly of insects, depending on the time of year. The stomach of a male arriving on Wrangel Island on May 2, 1939 contained fully digested remains of shoots and 1.0 g fine sand. Autopsied specimens caught by members of the *Vega* expedition at the end of flight, between May 18 and June 2, 1879, contained seeds, bits of grass, and some sand; some specimens also contained bits of flies. In the stomach of a male caught in Uélen on May 27, 1934 were 28 tiny seeds, 2 larvae of dipterans, bits of 2 or 3 larvae of other insects, the egg of a *Tipula,* and many tiny pebbles. I invariably found sand in the stomachs of migratory snow buntings in Uélen.

The food of summer birds was mixed. Thus the stomachs of males from Kolyuchi Island on July 25 and 26, 1938 contained highly ground plant remnants and tiny insects; one additionally contained seeds. A male shot in Émma Bay on August 11, 1932 revealed the following stomach contents: bits of the skin of a caterpillar, legs and chelicerae of a spider, 6 seeds of mixed grasses and bits of scales of not less than 100 very similar seeds, 2 more seeds of some other variety, and some coarse sand. The stomach of a young Snow Bunting caught on the Klér River estuary on August 20, 1938 contained remains of average-sized caterpillars of butterflies, remains of tiny insects and plant seeds, and also 0.25 g of sand. An analysis of the stomach contents of Snow Buntings caught in Rodgers Bay in the fall of 1938 yielded very interesting results: 1) September 12. Seeds of crowberry and other plants and fine sand. 2) September 12. Five caterpillars, 2 caddis worms, and plant seeds. 3) September 12. Seeds of 3 species of plants and remnants of crowberry seeds. 4) September 12. Remnants of a caterpillar, plant seeds, and fine sand. 5) September 13. Seven caterpillars of a single species and 10 of another, crowberry seeds, and 0.25 g fine sand. 6) September 13. Three caterpillars, digested remains of 5 more, about 70 crowberry seeds, and 0.25 g of sand.

Thus I found mostly caterpillars in the stomachs, gullets, and beaks of Snow Buntings shot on September 12. This was all the more unexpected since frosts had dipped to −10°C and the soil was covered with snow over much of the expanse.

The stomach of a male from Cape Dezhnev on September 27, 1933 contained about 250 tiny seeds and many small stones. In the Snow Buntings caught on October 3, 1933 in Uélen the following food remains were found: 1) about 100 seeds, much sand, and tiny stones. 2) About 100 seeds partly ground, much sand, and tiny stones. 3) About 300 tiny seeds, much sand, and tiny stones. In the crop of the same specimen were 1,200 seeds of three or four species of plants and a few small stones. 4) About 1,000 seeds of four or five plant species and tiny stones.

On Wrangel Island the wintering personnel fed Snow Buntings finely ground buckwheat and barley. Birds flew to these offerings in large flocks even in a snowstorm. Running in strong wind on the snow they resembled stints from afar, more so Purple Sandpipers. According to O.J. Murie, on St. Lawrence Island Snow Buntings flocked together with Lapland Longspurs in the fall and fed on seeds of plants similar to thistle.

For much of the year, the specimens caught were characterized by significant subcutaneous adipose deposits. In the spring of 1934 around Uélen at the commencement of flight I caught very obese specimens. Of the 80 specimens caught in flight on Wrangel Island in 1939, adipose deposits were present only in patches and just a few birds had a continuous layer. Among the fall Snow Buntings on Wrangel Island as well as on the Chukchi peninsula, I regularly found a thick layer of subcutaneous fat. However, the breeding specimens caught on Diomede Island near Uélen and on Kolyuchi Island were totally or nearly devoid of adipose layers.

My collection includes a young specimen raised on Wrangel Island in captivity, which died in October. It had been fed exclusively on bird seeds and given thawed water to drink. An autopsy revealed extremely brittle bones, deformity of feather structure, and faulty coloration. Molt was intense; tail and flight feathers had not emerged completely and exhibited albinism. The small feathers resembled those of fledgeling plumage in the first autumn.

*Economic importance*—Snow Buntings on occasion fall prey to fox, ermine, weasel, and other ranch animals. In the Polar Station on Wrangel Island they were a favorite caged bird and were caught in cages using groats as bait.

*Systematics*—I have partly discussed the results of my revision of the subspecies of buntings in my *Fauna of Anadyr Region* (Portenko, 1939b, I, p. 73), and in an article on the birds of Wrangel Island (Portenko, 1937b). In 1940 I reexamined the entire material in the collection of the Institute of Zoology, Academy of Sciences of the USSR, to better understand the taxonomic status of long-winged Snow Buntings encountered in northeast Siberia. I brought from Wrangel Island a series of more than 90 specimens personally gathered by me. In all, I studied about 550 skins (350 males and 200 females). Through the courtesy of R. Horring, who sent me a series of Iceland Snow Buntings from the Zoological Museum in Copenhagen, I became acquainted with the subspecies *P. n. insulae* Salom. Later, I collected a series of Snow Buntings in northern Taimyr. Because F. Salomonsen introduced significant changes in the concepts of the subspecies of this bird in the northern Atlantic, I had to undertake a third revision in 1956. I now have with me over 700 specimens. Nevertheless this large collection is still deficient as it contains no specimens from Scandinavia. A full review of the subspecies of Snow Buntings is given below based on the material collected and partly on literature.

1. ***Plectrophenax nivalis insulae*** Salom. Iceland Snow Buntings differ very distinctly from mainland ones in their generally dark coloration. The ocherous-brown ends of feathers in freshly molted, undamaged plumage are exceptionally dark. The black color in the summer plumage of the male is more widely distributed than in our Snow Buntings. According to F. Salomonsen (1951a, p. 536), the black color of the upper tail coverts extends from the back to the tail feathers without interruption or almost so; black tiny spots are seen on the occiput. Specimens of such coloration are encountered as an exception in Scandinavia and southern Greenland. In the collection of the Institute of Zoology studied by me there was only one male with

black upper tail coverts; it was caught on Cape Zhelaniya on the northern extremity of Novaya Zemlya on June 1, 1935. This eastern find cannot be accidental, and is explainable as migration or a continuation of genetic characteristics in the offspring of birds which had migrated there in the past.

*P. n. insulae* is a resident bird in Iceland.

2. ***Plectrophenax nivalis nivalis*** (L.). In his 1940 publication F. Salomonsen came to the conclusion (1947, pp. 136–140) that Scandinavian Snow Buntings are darker than ours. I have no specimens from Scandinavia, but had noticed long ago the presence of dark-colored specimens among Snow Buntings wintering in Poland and in the extreme west of the European part of the USSR. They are so dark that initially I was inclined to identify them as *P. n. insulae*. The nominal form, according to Salomonsen, differs from the preceding in white upper tail coverts, large white fileds on the wings and tail, and absence of minute black spots on the nape of the neck; moreover, in fall plumage the ocherous coloration is slightly lighter.

As a result of significant sex-related and seasonal differences in color, only specimens in identical dress and state of plumage should be compared during the determination of subspecies of Snow Buntings. Compared with the next subspecies, the nominal form differs only in a much darker ocherous-brown color in the fall plumage.

This subspecies nests in Greenland, North America, Faeroe Islands, Scotland, Scandinavia, Spitsbergen, Franz Josef Land, and Murmansk. I had with me winter specimens from Scotland, Poland, environs of Leningrad and Moscow, and Karelia. From the birds caught within the nesting range of the species, one could conclude that the nominal form nests in Murmansk (together with the next subspecies) and possibly on Franz Josef Land, but no farther east. Specimens from Greenland and North America were also studied.

In 1926 Skeler established a new subspecies from northeast Greenland and selected the name *subnivalis* (Brehm) from among old synonyms. In 1931 Salomonsen (1931, pp. 59–64) gave a detailed description of this subspecies, but in 1951 (Salomonsen, 1951a, p. 539) relegated it to a synonym of the nominal form. Due to inadequacy of material, it is difficult to say when Salomonsen erred—on the first or second occasion—but considering the simple geographic variability of the Snow Bunting, regardless of the characteristics of the subspecies, it is interesting to note that long-winged specimens with a large spread of white coloration (at the expense of black) on the upper tail coverts and tail, and a much lighter ocherous coloration in fresh plumage predominate in northeast Greenland.

3. ***Plectrophenax nivalis pallidior*** Salom. Like Salomonsen, I place all Snow Buntings ranging east of Murmansk up to Alaska, with the exception of Wrangel and Komandorski Islands, among the subspecies *P. n. pallidior* described by him. This subspecies is paler than the nominal form in fresh fall plumage, and the color difference in a series does not constitute a contradiction (ocherous-brown coloration highly variable).

Salomonsen affirmed that two types of coloration exist among male Snow Buntings: normal and “feminine”. In the normal type the white coloration is more widespread on the wings, and the bases of the coverts a pure white or with black tips. In "feminine" males these bases are dark-colored. In my opinion, the second type is exclusively characteristic of young birds; I found not even a single specimen among them with pure white covert bases, although in some the black areas on the feather tips were small. Evidently the juvenile features in coloration of young males are expressed to different degrees, a usual phenomenon among young birds.

Insofar as wingspan is concerned, it is less in yearlings than in older birds (Table 43). I place in the latter class specimens with pure white covert bases or those with only traces of tiny spots on their tips.

Moreover, the wingspan changes noticeably as the tips of the flight feathers wear out (Tables 44 and 45).

**Table 43. Wingspan (cm) of adult and young males of subspecies of Snow Buntings**

| Subspecies | Young male | | | | Old male | | | |
|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Average | No. of samples | Max. | Min. | Average | No. of samples |
| *p. n. pallidior* Salom. | 11.45 | 10.24 | 10.84 | 126 | 11.97 | 10.37 | 11.00 | 180 |
| *p. n. vlasowae* Port. | 11.49 | 10.52 | 10.99 | 33 | 11.84 | 10.87 | 11.28 | 55 |

**Table 44. Wingspan (cm) of the nominal form and of *p. n. pallidior* in different seasons**

| Season | Max. | Min. | Amplitude of variation | Average | No. of samples |
|---|---|---|---|---|---|
| Males | | | | | |
| Fall (Sept.–Nov.) | 11.51 | 10.62 | 0.89 | 11.08 | 27 |
| Winter (Dec.–March) | 11.97 | 10.50 | 1.47 | 10.97 | 65 |
| Spring (April) | 11.86 | 10.37 | 1.49 | 10.99 | 77 |
| Summer (May-July) | 11.42 | 10.16 | 1.26 | 10.83 | 60 |
| Females | | | | | |
| Fall | 10.74 | 10.02 | 0.72 | 10.35 | 19 |
| Winter and spring | 10.89 | 9.71 | 1.18 | 10.33 | 94 |
| Summer | 10.62 | 9.71 | 0.91 | 10.13 | 30 |

The measurements presented in the Tables reveal that for an accurate comparison of wingspan of different subspecies, early fall-spring and summer specimens should be analyzed separately. Specimens differ in the nesting season because the tips of their flight feathers are highly damaged; moreover, there are not many of them in collections. Specimens in transit should also be included in measurements. Without doubt, the long-winged Wrangel birds are such specimens. The transit passages of Wrangel buntings are not known, but it is possible that they travel

**Table 45. Wingspan (cm) of *P. n. townsendi* in different seasons**

| Season | Max. | Min. | Amplitude of variation | Average | No. of samples |
|---|---|---|---|---|---|
| | | | Males | | |
| Fall | 12.22 | 11.14 | 1.08 | 11.72 | 8 |
| Winter | 11.62 | 11.29 | 0.33 | 11.42 | 7 |
| Summer | 11.79 | 10.87 | 0.92 | 11.39 | 20 |
| | | | Females | | |
| Winter and spring | 11.00 | 10.66 | 0.44 | 10.80 | 5 |
| Summer | 11.14 | 10.60 | 0.54 | 10.80 | 6 |

westward at least in part. Insofar as one can judge from the data on ringing published by V.A. Arsen'ev (1947, pp. 95–96), Snow Buntings from Yenisey lowlands fly toward the lowlands of Ob', and there is nothing improbable in their flying even farther westward. Hence the three fall males with very long wings—11.51 cm, 11.39 cm, and 11.20 cm—caught on Kola peninsula may not, as a matter of fact, be local birds. In the series of summer nesting Snow Buntings, long-winged birds are encountered more often in northeast Siberia; this increase in frequency is generally not significant, however (Table 46).

The subspecies *P. n. pallidior* is very widely distributed in the Arctic, from the Bering Sea to Novaya Zemlya and along northern Asia up to the western parts of Alaska. On the coast of the Bering Sea it is encountered in the south up to Kamchatka. It is substituted by the next subspecies on Wrangel Island and on the islands in the southern parts of the Bering Sea.

**Table 46. Wingspan (cm) of *P. pallidior* in western and eastern parts of the range**

| Locality | Max. | Min. | Average | No. of samples |
|---|---|---|---|---|
| Males | | | | |
| From Spitsbergen to Novosibirsk | 11.20 | 10.60 | 10.82 | 39 |
| From Indigirka to Canada | 11.31 | 10.24 | 10.84 | 21 |
| Females | | | | |
| From Spitsbergen to Novosibirsk | 10.62 | 9.71 | 10.11 | 25 |
| From Anadyr to Alaska | 10.50 | 9.21 | 10.25 | 5 |

4. ***Plectrophenax nivalis vlasowae*** Port. Even P.S. Pallas (1811, II, pp. 33–34) pointed out that much larger specimens were known in East Siberia. It is difficult, however, to establish whether he had in mind long-winged Snow Buntings from

extreme northeastern Siberia or the large *P. n. townsendi.* E. Hartert (1933, p. 100) later posed the question of the origin of the innumerable very large birds encountered in East Siberia in fall and winter, whether they nested partly in North Siberia, and whether another subspecies, probably somewhat smaller than *townsendi,* nested there.

I noticed long ago that Snow Buntings from Wrangel Island differed in a larger wingspan (Table 47). In 1937 I described a new subspecies from a small number of specimens (Portenko, 1937b, p. 124); now I can confirm the real existence of this form based on more complete material. However, this new subspecies is not so sharply differentiated as I had originally assumed.

I could find no differences whatsoever in the color of Wrangel Snow Buntings compared with *P. n. pallidior.* Fall specimens had not yet attained fully grown flight feathers; thus they migrated with feathers incompletely grown. Collection in the fall was therefore stopped.

Age-related differences in size and color were discernible in the series collected. Along with adult males in nuptial plumage, almost without remnants of ocherous fringes, with black beak, and with a wingspan usually exceeding 11 cm, were undoubtedly much younger birds in which much of the ocherous color still remained on the back and head. The gold-colored caps brightly illuminated on the snow greatly enhanced the appearance of these tiny birds. Their beak was yellow or yellowish, i.e., still in winter color, while the wingspan did not reach 11 cm. The testes in such specimens were one-half the normal size. These birds were not exactly identical, which is understandable in the case of broods delayed to some extent or the other.

If one includes birds of passage and winter specimens, thereby considerably increasing the number of measurements, the values obtained differ somewhat but by and large are still similar (Table 48).

The dimensions shown in Table 48 have the advantage that they cover a much larger number of birds, three times those covered in Table 47 (619 versus 202), but the series of nonbreeding *P. n. pallidior* undoubtedly contained some *P. n. vlasowae* even though in negligible numbers. Nonetheless this circumstance has increased the average value for *P. n. pallidior.* Regardless, it is quite evident that Wrangel Snow Buntings possess, on the average, much longer wings than their mainland counterparts. Moreover, since they are well isolated geographically, my collection of *P. n. vlasowae* gives rise to no factual doubts.

The body weight of freshly killed male Wrangel Snow Buntings ranged from 34.0 to 52.9 g, with an average of 44.5 for 77 birds. The weight of two females was 41.2 and 43.9 g, with an average of 42.5 g. I can compare these figures with only a few weights of specimens of *P. n. pallidior* from Providence Bay supplied by P.T. Butenko at my request: males 36.4, 34.9, and 33.9 g, and females 35.8 and 30.5 g. Thus in body weight, too, Wrangel Snow Buntings surpass their mainland counterparts, albeit the weights overlap to the same degree as wing dimensions.

5. ***Plectrophenax nivalis townsendi*** Ridgw. This bird strikes the eye as a significantly larger subspecies than the others. The beak is longer, a fact distinctly seen on a

**Table 47. Wingspan (cm) of subspecies of Snow Buntings in the breeding season**

| Subspecies | Male | | | | | Female | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Amplitude of variation | Average | No. of samples | Max. | Min. | Amplitude of variation | Average | No. of samples |
| *P. n. pallidior* Salom. | 11.42 | 10.16 | 1.26 | 10.83 | 60 | 10.62 | 9.71 | 0.91 | 10.13 | 30 |
| *P. n. vlasowae* Port. | 11.84 | 10.50 | 1.34 | 11.18 | 84 | 10.70 | 10.28 | 0.42 | 10.49 | 2 |
| *P. n. townsendi* Ridgw. | 11.79 | 10.87 | 0.92 | 11.39 | 20 | 11.14 | 10.60 | 0.54 | 10.80 | 6 |

**Table 48. Wingspan (cm) of subspecies of Snow Buntings during the flight period and in wintering sites**

| Subspecies | Male | | | | | Female | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Max. | Min. | Amplitude of variation | Average | No. of samples | Max. | Min. | Amplitude of variation | Average | No. of samples |
| *P. n. pallidior* Salom. | 11.97 | 10.24 | 1.73 | 10.94 | 306 | 10.89 | 9.68 | 1.21 | 10.28 | 174 |
| *P. n. vlasowae* Port. | 11.84 | 10.52 | 1.32 | 11.17 | 88 | 10.70 | 10.12 | 0.58 | 10.35 | 5 |
| *P. n. townsendi* Ridgw. | 12.12 | 10.87 | 1.25 | 11.43 | 32 | 11.14 | 10.58 | 0.56 | 10.76 | 14 |

simple comparison of specimens. The wing is also longer, as shown in Tables 47 and 48. The ocherous coloration in fresh plumage is noticeably lighter.

Nests in the Komandorski, Aleutian, and Pribilof Islands.

6. ***Plectrophenax nivalis hyperborea*** Ridgw. R. Ridgway (1884, pp. 68–70) described *P. hyperboreus* on the basis of seven specimens from Alaska caught in winter and early spring. He thought that his subspecies inhabited some still unknown corner in the northern part of the Arctic mainland.

The color differs in albinism. In the lone nonbreeding specimen from Nom I examined, the color on the inner secondary flight feathers is asymmetric. H.S. Swarth (1934) insisted on an independent species status for this form. Closely acquainted with the color variability of Snow Buntings, I am inclined to treat this form as a subspecies, especially because I am aware of a transitional specimen. A male caught by I.G. Voznesenskii on July 10, 1843 on St. Paul Island has very highly developed white fields.

The range is extremely limited: St. Matthew and Hall Islands.

*Specimens of P. n. pallidior* Salom—1) St. Lawrence Island, July 2, 1843, ♂, voznesenskii; 2) Providence Bay, July 9, 1900, ♂, Akif'ev; 3) Émma Bay, August 19, 1911, ♂ 1° anno, Arngol'd; 4 to 6) Providence Bay, July 20, 1912, ♂♂, Starokadomskii; 7) Lawrence Bay, July 31, 1929, juv., P.V. Ushakov; 8) Émma Bay, August 11, 1932, ♂, Portenko; 9) Cape Dezhnev, September 27, 1934, ♂, Portenko; 10 to 12) Uélen, October 3, 1933, ♂♂, Portenko; 13 and 14) same site, May 24, 1934, ♂♂, Portenko; 15) Téeyu-véem River, near Uélen, May 27, 1934, ♂, Portenko; 16) Bol'shoi Diomede Island, June 22, 1934, ♂, Portenko; 17 and 18) Mitkulen village, July 14, 1934, ○ juv., ♀ juv., Portenko; 19) Cape Chaplin, April 10, 1938, ♂, Butenko; 20 to 22) Providence Bay, Cape Stoletiya, May 18, 1938, ♂♂♀, Butenko; 23) Providence Bay, Plover spit, May 30, 1938, ♀, Butenko; 24) same site, June 9, 1938, ♂, Butenko; 25) Cape Schmidt, July 18, 1938, ♂, Portenko; 26 to 28) Kolyuchi Island, July 20, 25, and 26, 1938, ♂♂♂, Portenko; 29) Kivak village, July 22, 1938, ○, Butenko; and 30 and 31) Cape Schmidt, August 8, 1938, ○ ○, Druzhinin.

*Specimens of P. n. vlasowae* Port.—1) Wrangel Island, July 5, 1927, ♀, G.A. Ushakov; 2) Rodgers Bay, July 30, 1931, ♂ juv., Vlasova; 3 and 4) same site, May 16, 1932, ♂♀, Vlasova; 5 and 6) same site, May 19, 1932, ♂♂, Vlasova; 7) Wrangel Island, undated specimen in summer plumage, Vlasova; 8) Uélen, April 18, 1934, ♂, Portenko (wingspan 11.42 cm); 9) upper reaches of Klér River, August 20, 1938, ♀ 1° anno, Portenko; 10 to 12) Rodgers Bay, September 12, 1938, ♂♀, Portenko; 13 to 15) same site, September 13, 1938, ♂♂, Portenko; 16) same site, captive bird, October 29, 1938, juv., Portenko; 17) same site, April 30, 1939, ♂, Portenko; 18 to 22) same site, May 2, 1939, ♂♂, Portenko; 23) same site, May 4, 1939, ♂, Portenko; 24 to 49) same site, May 5, 1939, ♂♂, Portenko; 50) same site, May 6, 1939, ♂, Portenko; 51 to 68) same site, May 7, 1939, 17 ♂♂ and ♀, Portenko; 69) Nasha River, May 7, 1939, ♂, Portenko; 70 to 85) Rodgers Bay, May 9, 1939, 16 ♂♂ and ♀, Portenko; 86 to 90) same site, May 10, 1939, 4♂♂ and ♀, Portenko; 91 to 99) same site, May 11, 1939, ♂♂, Portenko; 100 and 101) same site, May, 1939, ♂♂, Portenko; and 102) same site, August 16, 1939, ♂ 1° anno, Portenko.

*Biological specimens*—1) Nest with clutch of six eggs, Rodgers Bay, June 27, 1932, Vlasova; 2) nest with clutch of six eggs, Bol'shoi Diomede Island, June 22, 1934, Portenko; and 3) nest with clutch of seven eggs, Rodgers Bay, June 17, 1939, Portenko.

# Inferences and Conclusions

Zoogeographic problems in the study of the avifauna of Northeast Asia. Comparison of the avifauna of different parts of the world: South America—North America—Asia—Europe—Greenland. Brief comments on the bipolar distribution of birds. Notable differences in the Neotropical region. Subordinate status of the Nearctic as a zoogeographic subregion. Arctic zoogeographic subregion of the Holarctic and its subdivision on the basis of distribution of nesting birds. Role of random arrivals. Main directions of flight routes. Changes in the composition of avifauna recorded over the historic period. Similarity and features common to the avifauna of Eurasia and North America in the northern and middle latitudes. Routes of dispersal of birds to adjacent parts of these continents. Hypotheses of Bering Bridge (Beringia) and the Archipelago.

## ZOOGEOGRAPHIC PROBLEMS IN THE STUDY OF THE AVIFAUNA OF NORTHEAST ASIA

My studies of the avifauna of the extreme far northeastern region of Asia were undertaken primarily with a zoogeographic goal. In the early 1930's, when I was first attracted to the "Chukchi-Anadyr region," information was extremely scanty on its faunal composition as a whole, the topographic distribution of this fauna, and still scarce on the terrain itself of the northeastern extremity of Asia. Some sketchy information was available for the Anadyr region, but the information available then on the nature of the Chukchi peninsula was negligible. Wrangel Island was totally *terra incognita.* Even access to these regions was extremely difficult 30 to 40 years ago.

Nonetheless, from a zoogeographic point of view, the extreme far northeastern region of Asia is of particular interest. First of all, the degree of similarity and dissimilarity of the fauna at the point where the American and European mainlands are closest was not clearly understood. A.Ya. Tugarinov (1929, p. 660) wrote: The avifauna of the Chukchi peninsula is so characteristic and its composition resembles that of the fauna of the adjoining parts of America to such an extent that it is entirely in order to raise the question: should this part of Far East Asia belong to the Palearctic or the Nearctic zoogeographic region?" It was essential therefore to clarify on site, in the actual natural environment, whether or not the American element is strongly present in the avifauna inhabiting the Asiatic coast of Bering Strait.

There is no doubt about the existence of land routes between Asia and America in the geological past, nor the mutual interchange between the two regions. However, it was necessary to find evidence of this faunal intercourse and to establish incontrovertible proof of past links in faunal composition.

Shortly before his death, Academician P.P. Sushkin developed the hypothesis that Beringia once joined the mainlands of Asia and America as a land in the northern latitudes. This hypothesis received rather widespread distribution and acceptance in the Soviet Union. Following his lead, Beringia began to be viewed not only a bridge for the migration of animals from one continent to another but as an independent origin of tundra fauna (Tugarinov, 1929, p. 674; 1934, p. 272) and taiga fauna (Shtegman, 1932). Regardless of how true these hypotheses were, they created a great interest among ornithologists and zoogeographers in the northeast extremity of Asia. Until recently, the region of my studies has remained a very interesting, if not the most interesting, area in the Soviet Union from an avigeographic point of view.

For the species descriptions given in this work, I collected as much as possible all the information known and accessible concerning the distribution and life of birds in the Chukchi peninsula and Wrangel Island. Since the overall pattern of bird distribution was submerged in a mass of factual details, I am setting out to give a general description of the local avifauna, to seek to establish its connections to the fauna of adjacent territories, and to subject it to a comprehensive zoogeographic analysis.

I would like to emphasize again that the extreme northeastern region of Asia played the role of a "passageway" through which an intense exchange of fauna occurred. What is seen today in faunal composition constitutes the barest traces and remnants of the large-scale migrations which led to the formation of a fauna that still continues to evolve. It is entirely evident that the composition of the animal population as I found it on the Chukchi peninsula and Wrangel Island has not yet stabilized in the course of its evolution; continuing changes are apparent to contemporary scientists. As the history of ornithological studies conducted over the last century has shown, some irregularity has been observed in the distribution of arctic species of birds, which can be explained by climatic and other natural conditions of the Arctic. For far Northeast Asia it is intensified by its close proximity to North America.

Since it is not possible to analyze the distribution and probable history of colonization of each species individually, whole groups of fauna must be differentiated. For the purposes of a comparative analysis it is advantageous to cover as many regions as possible. I will therefore attempt a brief review of this aspect in the reciprocal links of mainlands and continents: South America—North America—Asia—Europe—Greenland.

With this end in mind it is expedient to look at pertinent continents from a more objective, although somewhat unconventional point of view. The American element in the Chukchi fauna is of particular interest to us, but its essence, and roots of American avifauna should be sought not just in Alaska alone, but farther south, right up to Tierra del Fuego.

There are many species of birds which are widely distributed and which reach the southern extremities of the continents, but there are remarkable instances also of interrupted ranges, or instances of closely-related forms presently separated by vast distances over land and sea. Since the avifauna under study is partly subarctic and partly arctic, instances of bipolar distribution are of particular interest.

## THE BIPOLAR DISTRIBUTION OF BIRDS

The question of bipolar distribution has been discussed many times in zoogeographic literature but requires further amplification. It is appropriate to touch upon it here, though only casually, to emphasize just how far south the roots of northern fauna can extend.

The Antarctic Fulmar [*Fulmarus antarcticus* (Steph.)] until recently had been included in another genus and known as *Priocella antarctica,* even though the Northern Fulmar [*Fulmarus glacialis* (L.)] is its direct descendant. There is no doubt that between the subantarctic Fork-tailed Storm Petrel, *Oceanodroma* and cormorants of the genus *Phalacrocorax,* are close relatives in the region of the Bering Sea. Even more direct relationships have yet to be established. Genetic links also exist between geese of the genus *Chlöephaga* and *Philacte canagica* and have been detailed in the review of the species. The Widgeon *Mareca sibilatrix* (Poepp.) is very similar to the North American *M. americana* (Gm.) and ranges down to Tierra del Fuego, whereas the Palearctic species *M. penelope* (L.) reaches the Anadyr region. The Pintail is represented in the far South by *Dafila eatoni* (Sharpe) and nests in Kerguelen and Crozet Islands. A particularly outstanding example of Anseriformes is the merganser *Mergus octosetaceus* Vieill., which inhabits southern Brazil and northeast Argentina, whereas *M. australis* Hombr. and Jacq. was found in the Auckland Islands. I am fully convinced that ducks of the type *Merganetta*—a genus distributed in the hilly sections of South America—represent the ancestral form of goosanders.

A Gyrfalcon [*Falco* (or *Nesierax*) *novaezeelandiae* Gm.] resides in New Zealand, which is very similar to our light-colored Gyrfalcon; the White Goshawk [*Accipiter novaehollandiae* (Gm.)] is seen in the Australian zone.

A series of species in the suborder of gulls which are bipolar in distribution can be similarly cited. The Great Skua [*Catharacta skua* Brünn.] has six subspecies in the Antarctic and Subantarctic. *Larus dominicanus* Licht., which inhabits the southern extremity of South America, is considered by some a substitute for the northern *L. marinus* L., and the species most closely related to *L. fuscus* L. by others. The Swallowtailed Gull [*Creagrus furcatus* (Neb.)], nesting in Galapagos Islands, deserves special attention. It differs so insignificantly from the arctic *Xema sabini* (Sab.) that the two species ought to be combined under the common generic name *Xema* (for more details see species No. 92). Among terns, the Arctic Tern *Sterna paradisae* Pontopp. has as its closest relative in the Antarctic, *S. vittata* Gm.

The question of the origin and relationships of arctic plovers has not been accurately defermined, but one could suggest on the basis of certain data that they lie in the southern hemisphere. I studied skins, although extremely few, kept in the collection of the Zoological Museum. Thus *Zonibyx modestus* (Licht.), ranging from Patagonia to Tierra del Fuego and the Falkland Islands, is similar to *Eudromias morinellus* (L.) in size and general coloration, although the beak of the latter is longer and the digits thin and long. Another plover, *Oreophilus ruficollis* (Wagl.), inhabiting the Cordilleras from northern Chile to Magellan Straits, also has much in common in coloration with *E. morinellus* but the latter is larger and has a long beak, long legs, and a different body build. However great the differences, the characteristics of similarity still suggest that the South American mountain plovers are in all probability related to the Asian plovers.

The Palearctic Plover is very similar to the Australian Plover *Peltohyas australis* (Gould), and has been placed repeatedly in the genus *Eudromias.* It inhabits deserts plateaus or slightly hilly deserts in the interior. This bird was recently studied in detail anatomically by W.J. Bock (1964) and K.A. Udin (oral communication). Its taxonomic position was determined as a genus which is very close, if not identical, to *Eudromias.* Thus one can see the links among a given group of dotterels with bipolar distribution in South America and Australia.

In the Berlin Museum I became acquainted with the South American thrushes. One of them, *Turdus falcklandii* Quoy and Gaimard, reaches Tierra del Fuego and the Falkland Islands. Species similar to it in body proportions and coloration inhabit South and North America (as well as Africa and Asia), and although there is no visual evidence here of a bipolar distribution, the presence of *T. falcklandii* in the Subantarctic is an example of overland migration of some ancestral thrush from the North to the Far South right to the tip of the South American continent.

In the mountains of South America two species (sometimes classified as a single species) of dippers are found: *Cinclus leucocephalus* Tchudi and *C. schulzii* Cab. Why these species do not penetrate very far south and reach only Peru and the northwest Argentina is not clearly understood. I examined specimens in the Berlin Museum and found that they differed much from the northern species. It seems to me that they originate from the same South American mountain zone as the plovers mentioned above.

Finally, a few words about pipits. Several species of the genus *Anthus* inhabit South America. The general coloration, similar to that of *Anthus hellmayri* Hart., *A. bogotensis* Sclat., and *A. antarcticus* Cab., resembles the clear olive shade on the upper body of young *A. cervina* Pall. in new plumage. *A. correndera* Vieill. has a few subspecies living in the mountains from Peru to southern Patagonia and the Falkland Islands. In coloration, they are extremely similar to *A. gustavi* Swinh. By directly matching several specimens, I was literally amazed at the total agreement of coloration and pattern down to the smallest detail. In size *A. correndera* is somewhat smaller than *A. gustavi,* but the claw of the hind digit is long and almost straight.

Even an extremely cursory review of the species of birds penetrating partly from north to south of the American continent and emanating partly from the Subantarctic, demonstrates convincingly that in the Neotropical region there are elements of avifauna with direct relations with birds of areas around the Bering Sea. Let us briefly look at the general composition of the avifauna of the Neotropical zone.

## NOTABLE DIFFERENCES AND UNIQUENESS OF THE NEOTROPICAL ZOOGEOGRAPHIC REGION

The Neotropical region surpasses any other region in richness and uniqueness of avifauna. South America has been nicknamed in zoogeography the "bird continent". About 1,500 endemic species are found here, with a series of exclusively characteristic orders, suborders, families, and genera, including such old and primitive forms as members of the superorder Palaeognathae: order Rheiformes (two species) and Tinamiformes (33 species).

The following suborders of the superorder Neognathae belong to the Neotropical region: Anhimae, Opisthocomi, Eurypygae, Cariamae, Steatornithes, and Galbulae. Some members of the suborders Cathartae and Trochili extend beyond the boundaries of the region, but only in the case of a very small number of genera and species; the overwhelming majority are distributed in the Neotropical region.[1]

Furthermore, entire superfamilies are characteristic of this region. Among these are Thinocoroidea, Todoidea, Momotoidea, Ramphastoidea (with 37 species), and Furnarioidea (with 5 families and almost 500 species).

Such endemic families as Psophiidae, Nyctibiidae, Bucconidae, Pipridae, and Phytotomidae are characteristic of the Neotropical region. Certain families are very richly represented in this region and particularly associated with it both in respect to their origin and long history, but contain genera and species found in the Nearctic, namely, families Cotingidae, Coerebidae, and Thraupidae.

The above-listed superorders, orders, suborders, superfamilies, and families characterize the degree of variety in Neotropical avifauna. The much smaller taxonomic subdivisions likewise underscore these differences. The uniqueness of the Neotropical fauna, which evolved independently during the course of very long periods in extremely diverse ecological conditions, from the alpine heights of the Andes to the Amazon basin with its tributaries, and from the tropics to the Subantarctic, is explained basically by factors of geographic and ecological isolation.

The separation of South and North America was completed at the end of the Tertiary period. The influx of immigrants occurred from the north into the Neotropical region through the Isthmus of Panama and along the Rocky Mountains and the Andes. In turn, many species of birds migrated North to the Nearctic and some even to the Palearctic.

[1]Since the discussion pertains to contemporary distribution of birds, I am not going into the origin of individual groups or species. E. Mayr (1964, p. 287) points out that fossil remains of Cathartae, Cracidae, Aramidae, and Cariamae have been found in North America in the Eocene and Oligocene, when the North and South Americas were separate. Thus these birds are not strictly Neotropical in origin.

## THE NEARCTIC IS NOT AN INDEPENDENT ZOOGEOGRAPHIC REGION

Under the heading Nearctic, I refer to the avifauna inhabiting North America north of the boundary of the Neotropical region, which runs through Mexico, crossing its more northern sections. Compared with the Neotropical region, the avifauna of the Nearctic is much poorer. Not a single superorder, order, or suborder, or even superfamily or family can be regarded as exclusively characteristic of this region. Turkeys Meleagrididae essentially belong here but they penetrate into Central America, although not very far. The family Ptilogonotidae, not as isolated, also extends into Central America. The Chamaeidae, long regarded as a family has recently been broken up and its single species has a direct link in China.

The poverty of the Nearctic avifauna in this epoch can be explained primarily by terrain. With a few exceptions, the Nearctic has no tropical forests and the number of species usually decreases toward the north. The individuality of Nearctic avifauna is diminished by the significant admixture of Neotropical elements in the south, while individual species, such as hummingbirds and the Tyranni even reach the boundaries of the Arctic or Subarctic. On the other hand, mixing of American and Eurasian fauna is seen in the north, in regions adjoining the Palearctic. There is justification, therefore, for considering the Nearctic fauna as transitional (Mayr, 1946) between Neotropical and Palearctic faunas. The transitions observed south and north of the Nearctic and the mixed avifauna may be explained logically by the intermediate geographic position of North America in the chain of continents: South America—North America—Asia—Europe.

The proximity and similarity of Nearctic and Palearctic avifauna increases in a northward direction, and one encounters in the Arctic region a circumpolar avifauna, which to a great extent is common or similar in both hemispheres, i.e., Eurasia and North America.

In any zoogeographic comparison, the nature of the boundaries between the objects under differentiation plays an important role. Studying the arctic avifauna where Eurasia and America are closest, I was astonished (as would any observer in my place) at the surprising similarity of avifauna on both sides of the Bering Strait.

## ROLE OF THE ARCTIC AS A CONNECTING LINK BETWEEN THE PALEARCTIC AND NEARCTIC

The avifauna of the Arctic has been studied *in situ* by comparatively few ornithologists and not one has covered its entire expanse. Therefore, no zoogeographer has described it in sufficiently concrete terms. The arctic fauna is regarded by some as a unique appendage of Nearctic fauna, and by others as a corresponding part of the Palearctic fauna. Another viewpoint delineates the Arctic as an independent zoogeographic entity. I subscribe to this view.

If circumpolar fauna is taken as a whole, sector by sector, it emerges as an exceptionally complete zoogeographic unit. Differences in the composition of avifauna in different sections of the Arctic are insignificant. If we compare arctic avifauna with Neotropical (or with one of its subregions), its poverty is painful. One cannot cite endemic families, let alone orders for it.

Numerical relationships do not always serve as the main method for determining zoogeographic regions. Sometimes, as in the present case, it is necessary to take into consideration the uniqueness of the fauna and its ecological integrity or, so to speak, its typicalness as usually expressed by the word "characteristic". Finally, the geographic position of a region plays an important role in zoogeographic regionalization. Geographic relations in particular emphasize and determine the position of the arctic fauna among neighbors.

The poverty of arctic avifauna is further intensified by the fact that several species of birds characteristic of the Arctic region exceed its boundaries at places. Moreover, there are species which are closely related to those species living further south. For example, *Anser albifrons* Scop. is related to *A. anser* (L.), *Buteo lagopus* Pontopp. to *B. hemilasius* Temm. and Schleg., *Hierofalco gyrfalco* (L.) to *H. cherrug* (Gray), etc. It is not easy to draw the southern boundary of the territory inhabited by arctic species, not only because the ornithology of the northern countries has not yet been adequately studied, but also because of the very nature of the distribution of birds, the habitats of which are scattered in adjacent terrain.

Nevertheless, arctic avifauna is so original and homogeneous that dividing it into Eurasian and American constituents is quite impossible. Yet the question arises: How should it be classified? The status of a separate zoogeographic region for the Arctic is too liberal. Taking into consideration the geographic position of the Arctic and the small number of species as a result of the severe living conditions for animals there, I find it more practical, in relation to the fauna of Eurasia and North America, to regard the arctic fauna as a zoogeographic subregion at par with other subregions of the Holarctic.

Having deprived the status of zoogeographic regions to the Palearctic and Nearctic, I do not deny using these terms as general concepts, and consider them as collective nouns for the corresponding subregions—four in the Palearctic and two in the Nearctic. I have already listed these subregions in an earlier work (Portenko, 1965).

## SUBREGIONS OF THE HOLARCTIC

1. Sonorean } North America (Nearctic)
2. Canadian }
3. Arctic, including the arctic desert and arctic tundra provinces
4. Sibero-European, including the taiga, mixed forests, forest-steppes, and steppe provinces
5. South Palearctic, including the Mediterranean, Sahara-Arabian, Sumerian, Irano-Turanian, Indo-Baluchistan, and Mongolian-Tibetan provinces
6. Sino-Himalyan, including the Japanese, Chinese, and Himalayan provinces.

Having thus arranged in proper order the avifauna into large territories, I studied where to place arctic avifauna among them and I adopted the more precise terminology in the discussion that follows.

## THE ARCTIC ZOOGEOGRAPHIC SUBREGION

Before discussing the Arctic subregion, it is essential to agree exactly where its boundaries are for the purposes under consideration. Opinions differ widely about the southern boundary, which is explained mainly by differences in approach in different scientific specialities. For ornithogeographic purposes, one should be primarily guided by the boundaries of the ranges of the more characteristic tundra birds and the factors determining their distribution. In drawing the southern boundary of the Arctic, H. Johansen (1956) chose the climatic feature of the July isotherm of +10° C, which more or less coincides with the northern limit of tall forests. Except for certain areas one could agree with the boundaries he drew (see his map in pt. I, p. 14); moreover, his map takes into account ornithological requirements.

Academician A.A. Grigor'ev (1946) introduced a new concept concerning the Subarctic, in which he shifted the usually accepted boundaries of the Arctic farther north. In his Subarctic (Grigor'ev, 1946, p. 104) he distinguishes more zonal subdivisions: neararctic and nearboreal zones, with a transitional zone toward the neararctic zone as well as the northern and southern subzones. The characteristics of the Subarctic, supported with examples from the animal world, are given in overly general terms, and sometimes with obvious mistakes. The very selection of species of birds and mammals was not always satisfactory. They serve only to illustrate the zonal subdivisions which have, however, not been formulated on the basis of an analysis of the ranges of arctic life. Hence I can find no justification for supporting the concept of the Subarctic in general, and its interpretation by A.A. Grigor'ev in particular.

A.A. Grigor'ev (1946, p. 127) added to the Far Eastern Subarctic the lower basin of the Anadyr River, the western fringe of Anadyr Strait, and the Pacific coast of the Chukchi peninsula. The coast of the Chukchi Sea, the entire mountain terrain between this shore and the Anadyr plain, and Wrangel Island were excluded from the Subarctic. These boundaries do not agree with mine.

In my understanding of the Arctic zone, the northern boundary is set by the polar limits of the distribution of birds, and the southern by the boundaries of the typical arctic terrain, i.e., tundra. Elements of tundra terrain as well as individual species of birds extend even beyond the limits of the Arctic: on the one hand, along the Alpine belt of the adjacent mountain ridges, and on the other, along the sea coasts. Tundra or tundra-type associations are encountered in a highly altered form in the open marshy sections in the forest zone, while some species of tundra birds are found even more to the south. As an example, *Lagopus lagopus maior* inhabits birch groves in the western Siberian forest steppe.

It would have been quite easy to draw the southern boundary of the Arctic with its characteristic avifauna if the forest extended up to the tundra in a continuous wall. With minor exceptions, the transition from tundra to the forest zone is gradual, forming a forest-tundra zone. From a zoogeographic viewpoint, its boundaries have not been ascertained with accuracy, primarily due to a lack of appropriate faunistic studies. I have discoussed the problems of the forest-tundra in my Anadyr work.

In the region of Northeast Asia, from Chaun Bay to the Bering Sea, I have drawn the southern boundary of the Arctic subzone along the Anadyr range, but I am compelled to draw it schematically since I have not surveyed the entire montane country separating the Anadyr range and the Chukchi peninsula. I am sufficiently acquainted with the avifauna of the Anadyr forest-tundra and the avifauna in the interior of the Chukchi peninsula, and I have explained sometime ago (Portenko, 1935a) that, insofar as can be judged from the general characteristics of the terrain and by the avifauna, the Anadyr range and the Chukchi peninsula represent two different regions from the viewpoint of zoogeography.

I would also place the broad coastal zone surrounding the Anadyr basin coast south to at least Cape Navarin in the Arctic subregion. Farther away, the tundra plain terrain changes into the coastal elevations of Koryatsk uplands in which forest-tundra conditions predominates and an entire series of arctic species of birds disappears.

Along the western coast of Alaska the tundra terrain, and with it the arctic avifauna, descends south almost up to Cook Inlet*.

I shall discuss the avifauna characteristics of the Arctic subregion in greater detail since the Chukchi peninsula and Wrangel Island fall completely within its boundaries.

I have already stated that the compostition of the arctic avifauna is extremely poor since a very large number of birds characteristic of temperate horizons do not reach the Arctic. Birds adapted to living in tall forests naturally do not find an appropriate habitat in the tundra, but species associated in some way or the other with water bodies extend much farther north.

The following species of birds nesting in the Arctic subregion do not go outside its boundaries and should be considered most characteristic of it:

| | |
|---|---|
| *Chen caerulescens* | *Crocethia alba* |
| *C. rossii* | *Calidris canutus* |
| *Anser albifrons* | *Pisobia ruficollis* |
| *Branta bernicla* | *Actodromas fuscicollis* |
| *B. leucopsis* | *A. bairdi* |
| *B. ruficollis* | *Heteropygia melanotos* |
| *Somateria spectabilis* | *H. acuminata* |
| *Polysticta stelleri* | *Erolia ferruginea* |
| *Arctonetta fischeri* | *Pisobia pusillus* |
| *Pluvialis squatarola* | *P. mauri* |
| *Limosa lapponica* | *Micropalama himantopus* |

* In the original text given as Kuskokwim Inlet—Ed.

| | |
|---|---|
| *Tryngites subruficollis* | *L. glaucoides* |
| *Phalaropus fulicarius* | *Rhodostethia rosea* |
| *Pagophila eburnea* | *Xema sabini* |
| *Larus hyperboreus* | *Plotus alle* |

An entire series of species, highly characteristic of the Arctic and widely distributed throughout it, extend its limits to adjacent coasts or hinterlands in the northern part of the Atlantic Ocean (some as far south as the British Isles) and Pacific Ocean (up to the Komandorski and Aleutian Islands). Among others, these include:

| | |
|---|---|
| *Clangula hyemalis* | *S. longicaudus* |
| *Buteo lagopus* | *Uria lomvia* |
| *Hierofalco gyrfalco* | *Cepphus grylle* |
| *Arenaria interpres* | *Brachyramphus brevirostris* |
| *Phalaropus lobatus* | *Nyctea scandiaca* |
| *Stercorarius pomarinus* | *Calcarius lapponicus* |
| *S. parasiticus* | *Plectrophenax nivalis* |
| | and others. |

These forty or so species mentioned above comprise at least half of the nesting birds found in the Arctic subregion. It follows that there is a high degree of endemism here. Moreover, an entire series of subspecies characteristic to the arctic alone have adapted to conditions of habitation in the tundra.[2] These are:

| | |
|---|---|
| *Cygnus cygnus bewicki* | *Pelidna alpina arctica* |
| *C. cygnus columbianus* | *P. alpina centralis* |
| *Branta canadensis hutchinsi* | *Larus argentatus taimyrensis* |
| *Lagopus lagopus birulai* | *L. argentatus birulae* |
| *L. lagopus leucopterus* | *L. argentatus thayeri* |
| *L. mutus captus* | *Uria lomvia arroides* |
| *L. mutus saturatus* | *U. lomvia eleonorae* |
| *L. mutus hyperboreus* | *U. lomvia heckeri* |
| *Pluvialis apricaria dominica* | *U. aalge hyperborea* |

[2]It is interesting to note incidentally that a particularly rich plumage and white coloration are seen more often among Arctic than among Boreal birds. It is sufficient to mention the Snow Goose, Willow Grouse, White Gyrfalcon, Ivory Gull, Snowy Owl, etc. White coloration predominates in many of the winter plumages: loons, Black Guillemots and some sandpipers. At the same time, a rusty-red coloration, especially on the underside of the body, is often seen among the many summer inhabitants of the tundra, viz., the Red-throated Loon, Redbreasted Goose, Snipe, Iceland Knot, Redshank, Curlew Sandpiper, phalaropes, Bluethroat, Red-throated Pipit, and Lapland Longspur. Attention has been drawn to this aspect in ornithological literature by, for example, M.D. Haviland (1915).

Quite often a dense black coloration is also seen, for example in Brant Geese, on the under side of loons, several sandpipers, guillemots, and Lapland Longspurs. Shades such as pure green, raspberry, cinnabar, orange, lilac, or blue, which adorn tropical birds, are never seen among arctic birds.

Although it would seem that aspects of coloration do not concern zoogeographic zoning, nevertheless the above characteristics of plumage color do place arctic birds in a highly specialized class.

| | |
|---|---|
| *Fratercula arctica naumanni* | *O. oenanthe leucorhoa* |
| *Chionophilos alpestris flavus* | *Acanthis flammea exilipes* |
| *C. alpestris hayti* | *A. flammea rostrata* |
| *Oenanthe oenanthe oenanthoides* | *A. flammea hornemanni* |
| | and others |

Division of the Arctic subregion into provinces runs into difficulties due to the general uniformity of circumpolar avifauna. It is evidently more useful to follow the same zonal distribution of fauna as adopted by Russian zoogeographers from the time of N.A. Severtsov (1877). I divide the Arctic subregion into two provinces: 1) the province of arctic deserts, and 2) the province of arctic tundras (Table 49).

For continuation of zoning to the south—for Anadyr region, Koryatsk uplands, and farther away—see L.A. Portenko, A.A. Kishchinskii, and F.B. Chernyavskii (1963, p. 124).

## The Province of Arctic Deserts

The concept of arctic deserts and the term itself were introduced by the botanist B.N. Gorodkov (1935) for purposes of zoning the Arctic Flora, and it seemed to me highly suitable for use in zoogeography as well. Territorially this province includes the high polar zone with the tundra terrain and glaciers and the most severe habitats for the birds in the Arctic. The zone covers the north coast of Greenland as well as adjacent sections of the west and east coasts, Spitsbergen with Medvezhi Island, Franz-Josef Land, the northern island of Novaya Zemlya, Severnaya Zemlya, northern part of Taimyr peninsula (south up to a line drawn from Pyasina Bay to Lake Taimyr), Novosibirsk Islands, Wrangel Island, in North America a small center near Cape Barrow, and finally in the Canadian archipelago, all of the Franklin Islands up to the polar limits.

The composition of the avifauna of the arctic desert province includes such high Arctic species as *Chen caerulescens, Calidris canutus, Crocethia alba,* and *Pagophila eburnea.* The follwing are characteristic and very common: *Pluvialis squatarola, Arenaria interpres, Phalaropus fulicarius, Stercorarius pomarinus, Uria lomvia, Cepphus grylle,* and *Plectrophenax nivalis.* Even such Arctic species as: *Cygnus cygnus* (subspecies *bewickii* and *columbianus*), *Clangula hyemalis, Hierofalco gyrfalco, Buteo lagopus, Phalaropus lobatus, Anthus cervina, Acanthis flammea exilipes* either are absent or nest here only irregularly here in small numbers.

My provincial division of the Arctic subregion corresponds absolutely to the zonal division proposed by H. Johansen (1956) who thoroughly characterized the avifauna of the Arctic suggested distinguishing the High and Low Arctic (*Hocharktis* and *Niederarktis*). Much acclaim has been given to this division since its author is first of all a prominent specialist in ornithology, and secondly has analyzed the avifauna of the entire Arctic in both hemispheres.

The term "arctic desert" entered zoogeographic zoning very slowly. I have used it often (Portenko, 1949, p. 206; 1950, p. 18). Let me repeat that for arctic studies it is

**Table 49. Ornithogeographic Zoning of Far Northeast Asia**

| Subregion (Holarctic) | Province | Subprovince | District | Section |
|---|---|---|---|---|
| Arctic | Arctic deserts | Glacial | Within the USSR :<br>Franz–Josef Land,<br>Northern island of Novaya Zemlya,<br>North Zemlya,<br>De Long Island, etc. | |
| | | Arctic desert proper | North Taimyr,<br>Novosibirsk,<br>Wrangel Island | |
| | Arctic tundras | Within the USSR :<br>Arctic-Atlantic,<br>European-Ob,<br>East Siberian | | |
| | | Bering | Chukchi | Western Chukchi<br>Eastern Chukchi<br>Coastal Anadyr |
| | | | Alpine Anadyr<br>St. Lawrence Island | |
| | | Outside the USSR :<br>Alaskan<br>Arctic-Canadian | | |

extremely suitable. In 1960 S.M. Uspenskii devoted an article to the latitudinal zoning of birds found in the Arctic (Uspenskii, 1960b) and used this term as being totally reliable and already established.

Further subdivision of the arctic desert province encounters difficulties, caused by primarily certain features in the distribution of arctic birds. Ornithogeographic zoning is based on the distribution of breeding birds. Despite established variations of the boundaries of nesting ranges or the quick dispersal of certain species, these have not altered the basic well-established ranges associated with so-called "nesting conservatism". This striking expression does not reflect the heart of the matter and is mostly incorrectly understood as an inborn and instinctive property of birds. In fact, the selection of nesting sites by birds is primarily regulated by the presence of seasonal food required by flegelings and adults. True, food is not the only factor, but certainly one of the most important.

Food conditions in the Arctic may change sharply from year to year and depend on weather, especially the spring-summer period, snow cover, ice conditions, and similar factors. An unfavorable late spring with snow, frosts, and blizzards can result in birds not nesting at all or losing their clutches. The number of eggs and chicks decreases sharply. Coastal ice off rocky coasts with bird colonies can often separate them from open water by such a distance that the cliff dwellers cannot regularly visit their feeding sites, and must move to some other site. The nesting of Snowy Owl depends on the presence of lemmings; it does not nest in Spitsbergen, a typical arctic country, simply because there are no lemmings in the islands of this archipelago. Numerous examples can be found where species of birds found common by researchers to arctic regions were later found by subsequent researchers to be entirely absent and vice versa.

The distribution of birds throughout the same arctic zone (provinces or subprovinces) often lacks the consistency which we are accustomed to see in more temperate latitudes. In other words, it is a highly variable character.

Subdivision of the Arctic subregion within the eastern hemisphere was attempted by T. Pleske (1928, p. 356). There is much in his division that is correct but there is also much that requires considerable correction as new information has accumulated. Furthermore, the avifauna in many places in the Soviet sector of the Arctic as well as in Canada has yet to be studied. The inconsistency of bird populations mentioned above requires regular surveys year after year. At the same time, due to the difficulties involved in organizing arctic expeditions, the avifauna of this region has been studied almost exclusively in quick trips, by fits and starts, together with other assignments, through incomplete specimen collections usually made in the second half of summer, which is a period generally less favorable for ornithological studies. Nevertheless, given the currect state of our knowledge of the birds of the High Arctic, two faunal groups stand out which could be described as subprovinces: 1) the Glacial (or snowy) subprovince, and 2) the subprovince of the Arctic desert proper.

### Glacial Subprovince

This subprovince comprises the High Arctic region falling within the limits of distribution and nesting of birds. It has generally been less studied because access is difficult for the study of terrestrial fauna, and although it covers quite a large territory and is characterized by extremely typical living conditions, it nevertheless has not attracted adequate attention. L.S. Berg wrote incidentally (1930, p. 26, footnote 5) that: "a glacial zone could be isolated north of the tundra zone, where the mean temperature of the warmest month is around zero degrees. This zone includes northern island of Novaya Zemlya, Franz-Josef Land, Severnaya Zemlya, and others". In regard to Soviet territory should also be added De Long Island, and in the western hemisphere the northern group of islands of the Canadian archipelago and possibly the adjacent part of northwest Greenland. Here the subprovince has not been delineated even schematically to date.

From among the birds within the High Arctic proper, the following are found to nest there: *Gavia stellata, Fulmarus glacialis, Branta bernicla, Crocethia alba, Larus hyperboreus, Rissa tridactyla, Pagophila eburnea, Sterna paradisaea, Plotus alle, Uria lomvia, Cephus grylle,* and *Plectrophenax nivalis.* Even such characteristic birds of the arctic as *Anser albifrons, Pisobia ruficollis* (including *minuta*) and *Calcarius lapponicus* do not nest there. Of the breeding species listed above, some are not present in every island, which illustrates the impovrishment of the fauna of the islands in general.

The uniqueness of the ecological conditions in these high altitudes is striking. They are found nowhere else. It should also be emphasized that the endemic subspecies *Uria lomvia arroides,* which evolved under conditions of High Arctic isolation, lives here. A large population of these murres nest on Franz-Josef Land.

### Subprovince of the Arctic Desert Proper

With the exclusion of the Glacial subprovince, this subprovince embraces the remaining territory of the Arctic desert province. In it are found many species of birds not distributed far north, while the above subspecies of murre, endemic to Franz–Josef Land, does not enter the arctic desert from the glacial subprovince.

Several districts can be delineated in the arctic desert subprovince. I shall discuss later the subdivisions of T. Pleske, as he divides the Arctic by cutting across latitudinal zones. It is difficult to assess the Canadian archipelago without having conducted a detailed analysis of the avifauna inhabiting individual islands. This is a special problem that, strictly speaking, does not concern us. A comparison of the ranges of birds given in L.L. Snyder's book (1957), demonstrates convincingly that the avifauna of Arctic Canada is divisible into distinct two halves—a western and eastern half. There is much in common between the avifauna of the eastern half and the avifauna of west Greenland, whereas in the western half, the avifauna is influenced by the proximity of the arctic coast of Alaska, although to a much less degree.

Three districts have been delineated within the Soviet sector of the Arctic: 1) the North Taimyr, 2) Novosibirsk, and 3) Wrangel Island. In the Novosibirsk district, the avifauna of certain islands is not homogenous and Lyakhovskii Island should in any case be considered an independent entity (see Birulya, 1907; Pleske, 1928; Rutilevskii, 1958). Even on Wrangel Island there are faunal differences between its lowland northern section, Tundra Akademii, and the south coast hemmed in from the north by mountain ranges.

The avifauna of North Taimyr district has much in common with that of the islands of Novosibirsk. Passing over details of distribution and qualitative differences, I shall mention the following characteristic features. In North Taimyr the Willow Ptarmigan is absent, but the Rock Ptarmigan *Lagopus mutus pleskei* is widely distributed. On the islands of Novosibirsk the opposite prevails; the latter is absent, and the willow ptarmigan, represented by the endemic subspecies *L. lagopus birulae,* is common. There are also notable differences between the subspecies of some birds. *Branta bernicla* and *Larus argentatus taimyrensis* nest on North Taimyr, while other distinct subspecies of these same species nest in the islands of Novosibirsk: *Branta bernicla nigricans* and *Larus argentatus birulae.*

The avifauna of these two districts are more similar to each other than either is to the avifauna of Wrangel Island.

These are fairly common, partly even abundant, on the islands of Novosibirsk, but absent on Wrangel Island:

| | |
|---|---|
| *Charadrius hiaticula* | *Larus argentatus birulae* |
| *Anser albifrons* | *Uria lomvia eleonorae* |
| *Cepphus grylle mandti* | *Erolia ferruginea* |
| *Calidris canutus canutus* | *Lagopus lagopus birulae* |
| *Pisobia ruficollis minuta* | |

The following species usually nest, some are even abundant on Wrangel Island, but all are absent on the islands of Novosibirsk:

| | |
|---|---|
| *Chen caerulescens* | *Uria lomvia heckeri* |
| *Somateria mollissima* | *Cepphus grylle taiani* |
| *Calidris canutus rodgersi* | *Corvus corax kamtschaticus* |
| *Larus argentatus vegae* | |

This description could be supplemented with rarer species or with vital differences in the abundance of nesting birds.

"*Wrangel Island" District*—I have just compared the avifauna of Wrangel Island with that of the islands of Novosibirsk; let me continue the comparison in the arctic deserts lying more eastward.

The arctic coast of Alaska and in particular the territories adjoining Point Barrow are colonized by birds characteristic of a genuine tundra. Over 40 such species and a few subspecies absent on Wrangel Island nest there. Among the species particularly characteristic of the arctic desert are *Chen caerulescens* and *Calidris canutus* but at present, the Snow Goose no longer nests in the vicinity of Cape Barrow while the Knot rarely nests. The avifauna of the arctic coast of Alaska therefore cannot be compared with that of Wrangel for the even more important reason that it is closely connected with the mainland. The composition of birds inhabiting Wrangel Island is poor because of the fact that it is an island.

Consequently such a comparison must be shifted more toward the east, to the Franklin Islands. The following species of birds nesting in the western sector of the Canadian archipelago are not regularly encountered in Wrangel:

*Cygnus cygnus columbianus*
*Branta canadensis parvipes*
*Anser albifrons frontalis*
*Chen rossii*
*Buteo lagopus johannis*
*Hierofalco gyrfalco obsoletus*
*Falco peregrinus* subsp.
*Lagopus lagopus leucopterus*
*L. mutus rupestris*
*Grus canadensis canadensis*
*Charadrius hiaticula semipalmatus*
*Actodromas fuscicollis*
*Pisobia pusilla*
*Tryngites subruficollis*
*Limosa haemastica*
*Crocethia alba*
*Phalaropus lobatus*
*Pagophila eburnea*
*Anthus spinoletta rubescens*

The following note must be appended to this list. I have not taken it upon myself the problem of zoning the Canadian archipelago from primary sources and I have never been there either. The western part of the archipelago differs notably from the eastern in fauna and its territory is very large and thus a comparison involves dimensions which are wholly incomparable. This territory is not densely inhabited by the above-listed species and the southern boundary of arctic deserts in it is not known for certain. Nevertheless, in general the very same species found on Wrangel Island or the islands of Novosibirsk inhabit the western part of arctic Canada. Only five species from the above list are purely American: *Branta canadensis parvipes, Chen rossii, Actodromas fuscicollis, Tryngites subruficollis,* and *Limosa haemastica.* Moreover, the last one is rare and may be regarded as a geographic vicarious species of *Limosa limosa,* which is common in Eurasia.

There are species nesting on Wrangel Island which are absent from the west Franklin Islands: *Rissa tridactyla pollicaris, Uria lomvia heckeri, Cepphus grylle taiani, Oenanthe oenanthe oenanthoides,* and *Acanthis flammea exilipes.*

Either way the avifauna of Wrangel Island should not be combined with either that of the Canadian or the Novosibirsk sections. I have stated before (Portenko, 1937e, p. 383): "Compared with the avifauna of the islands of Novosibirsk, the Wrangel avifauna is distinguished by details in spite of the leveling role of circumpolar species common to them. They should not be combined as island avifauna: each is subordinate to its native section of the mainland." In other words, the avifauna of the Novosibirsk Islands is closer to the fauna of the Lena delta, while the birds of Wrangel Island have a more direct relation with the avifauna of the Chukchi peninsula.

In order to characterize the originality of the island faunas selected in the present case, it is sufficient to note differences in the subspecies of common species. Thus, the following nest on—

| Novosibirsk Islands | Wrangel Island |
|---|---|
| *Calidris canutus canutus* | *Calidris canutus rogersi* |
| *Pelidna alpina centralis* | *Pelidna alpina sakhalina* |
| *Larus argentatus birulae* | *Larus argentatus vegae* |
| *Xema sabini palaearctica* | *Xema sabini tschuktschorum* |
| *Uria lomvia eleonorae* | *Uria lomvia heckeri* |
| *Cepphus grylle mandti* | *Cepphus grylle taiani* |
| *Calcarius lapponicus calcaratus* | *Calcarius lapponicus alascensis* |

The following subspecies nest:

| Western part of Franklin | Wrangel Island |
|---|---|
| *Gavia arctica pacifica* | *Gavia arctica viridigularis* (n ?) |
| *Arenaria interpres morinella* | *Arenaria interpres oahuensis* |
| *Calidris canutus canutus* | *Calidris canutus rogersi* |
| *Pelidna alpina pacifica* | *Pelidna alpina sakhalina* |
| *Larus hyperboreus hyperboreus* | *Larus hyperboreus pallidissimus* |
| *L. argentatus thayeri* | *L. argentatus vegae* |
| *Xema sabini sabini* (?) | *Xema sabini tschuktschorum* |
| *Corvus corax principalis* | *Corvus corax kamtschaticus* |
| *Calcarius lapponicus subcalcaratus* ? | *Calcarius lapponicus alascensis* |
| *Plectrophenax nivalis nivalis* | *Plectrophenax nivalis vlasowae* |

Although the differences between the subspecies of Wrangel Island and the Canadian archipelago are greater than between those of the islands of Novosibirsk and Wrangel Island, they are, nevertheless, not so significant.

An admixture of the American element can be distinctly established in the avifauna of Wrangal Island, but it is insignificant. If we take into consideration the affinity of a given subspecies as well as the direction of flight routes, only four or five species breeding on the island can be considered American: *Chen caerulescens, Pluvialis apricaria dominica* (nesting assumed), *Actodromas bairdi* (lone find of a fledgeling), *Heteropygia melanotos* (rare in nesting sites), and *Calcarius lapponicus alascensis.* But since the same Alaskan subspecies of Lapland Longspur nests in the Chukchi peninsula, it is still not known from where it colonized Wrangel Island—directly from Alaska or from the Chukchi coast.

The Siberian element is far more intensely and distinctly delineated. Thus, the following breed on Wrangel Island: *Arenaria interpres oahuensis, Larus argentatus vegae, Larus hyperboreus pallidissimus, Rissa tridactyla pollicaris, Xema sabini tschuktschorum, Uria lomvia heckeri, Cepphus grylle taiani, Crovus corax kamtschaticus,* and *Oenanthe oenanthe oenanthoides.*

In the process of colonization of the island by birds, their migratory stopovers also played a certain role. At present this phenomenon, though accidental, still fits a systematic pattern. The following nine species have been sighted or collected from among American birds: *Grus canadensis canadensis, Heteroscelus incanus incanus, Limnodromus griseus scolopaceus, Pelidna alpina pacifica, Iridoprocne bicolor, Petrochelidon pyrrhonota hypopolia, Passerculus sandwichensis anthinus, Junco hyemalis hyemalis,* and *Zonotrichia atricapilla.* The following Siberian birds have likewise been sighted or collected: *Gavia arctica viridigularis, Anser albifrons albifrons, Nettion formosa, Dafila acuta acuta, Aythya fuligula, Eudromias morinellus, Numenius phaeopus variegatus, Philomachus pugnax, Pagophila eburnea* (mass flight west to east), *Rhodostethia rosea, Chionophilos alpestris flava, Acanthopneuste borealis hylebata, Prunella montanella badia, Motacilla alba ocularis, Anthus cervina cervina,* and *Lanius cristatus cristatus.* The latter total 16 species, i.e., almost twice that of American birds. Thus the influence of American avifauna cannot be disputed, but it is still insignificant.

Endemism in the composition of the avifauna on Wrangel Island is expressed weakly, but it does exist. Very good signs of differences are seen among the subspecies *Calidris canutus rogersi* and *Cepphus grylle taiani,* while the long-winged race *Plectrophenax nivalis vlasowae* can only be weakly differentiated. The pale Wrangel murre also nests in large numbers on Kolyuchi Island.

The marine fauna of the northern part of the Pacific Ocean has also had an influence on the composition of the avifauna of Wrangel Island. The following nest on Wrangel Island: *Phalacrocorax pelagicus aeolus, Somateria mollissima v-nigrum, Brachyramphus brevirostris,* and *Fratercula corniculata;* furthermore, the western boundary of the nesting range of all of these falls on the islands of the Arctic Ocean.

The above discussion creates the impression that the avifauna of Wrangel Island is diverse and even rich. Let me hasten to discuss the poverty of its fauna due to its situation as an island.

A reduction in the composition of the avifauna on any island depends to a significant extent on the distance between it and the nearest mainland. Let us attempt a comparison between Wrangel Island and the Novosibirsk Islands.

The Novosibirsk Islands are situated close to the mainland. Sannikov and Lantev Straits are more than twice as narrow as Long's Strait. The distance to Anzhu Island is lessened by the Lyakhovskii Islands which lie between them and the mainland. The adjacent tundra on the mainland from the Lena delta to the Indigirka River estuary is broader as well as richer in natural resources than the narrow coastal strip of tundra on the northern Chukchi peninsula coast, squeezed between the Arctic Ocean and the mountains. On Wrangel Island itself the mountains extending along the entire island from west to east form a major boundary and obstacle, separating the richer southern coast from the surprisingly desolate Tundra Akademii.

The extent of the area covered by the islands of Novosibirsk is considerably greater than the territory of Wrangel Island. Each island of this archipelago is characterized by its own particular features, while the Lyakhovskii Islands, as mentioned before, could even be considered as special zoogeographic unit. The avifauna of the islands of Novosibirsk is far richer than that of Wrangel and, as follows from what has been said above, Wrangel Island and Novaya Siberia archipelago are incomparable in several respects.

St. Lawrence Island is more appropriate for comparison. It covers an area which is nearly the same as that of Wrangel Island, but falls on a latitude which is 8° more to the south. This island is 1.5 times closer to the mainland than Wrangel Island. The composition of the avifauna of both is compared in Table 50.

The figures given in Table 50 would probably undergo minor changes with the availability of more complete and accurate information, but not by much. In general, the reciprocal relationships would remain almost the same. Consequently the composition of avifauna on Wrangel Island is half as poor as in the eastern section of the Chukchi peninsula, while the composition of avifauna on St. Lawrence Island is poorer by 10 to 20%.

Apart from historic and other factors, the poverty of avifauna is also explained by the severe breeding habitat. Winter blizzards are extremely acute and may occur even in summer. Spring weather, often determining the fate of arriving birds, is highly variable since it depends on the ice in the surrounding sea. In the spring of 1939 floes surrounded the island for quite some time and hence there were more clear sunny days. Birds were very animated. In 1931, according to A.I. Mineev (1936, p. 185), spring was particularly unfavorable, and cold weather continued until the latter half of June with frequent blizzards, and the snow was slow to disappear. Geese were unable to nest and consequently migrated early. In such years the composition of breeding birds decreases sharply. Winds and mists may facilitate arrivals. This was true in the fall of 1938 and I caught a few American and Siberian birds, and again in the spring of 1939 when Siberian species flew onto Wrangel Island. In the fall of 1960, A.G. Velizhanin collected a few *Passerculus sandwichensis.* The black mountain chain of Wrangel Island against the background of ice of open ocean serves lost birds as very good landmarks.

The icy environment enveloping the island can be highly unfavorable for birds. The following circumpolar species inhabit the bird colonies along the seashore on Wrangel Island: *Uria lomvia, Cepphus mandti* and *Rissa tridactyla.* A small number of *Phalacrocorax pelagicus* and *Fratercula corniculata* reach it from the side of the Bering sea, but *Fulmarus glacialis, Lunda cirrhata, Aethia cristatella, A. pusilla,* and *Cyclorrhynchus psittacula* are absent. In spite of the abundance of murres and guillemots these colonies have not attracted such predators as *Falco peregrinus* or *Hierofalco gyrfalco,* which in other colonies of seafowl survive quite often on the inhabitants of bird bazaars.

On Wrangel Island there are no large and deep lakes with sufficiently rich aquatic flora and fauna, a phenomenon which explains the absence of river ducks (excluding instances of sporadic flights). *Mergus serrator, Arctonetta fischeri,* and *Polysticta stelleri* do not nest on the island. Even *Somateria spectabilis* is rare. Only *S. mollissima* is abundant, but then it is a duck of the lagoon and not of lakes or rivers. Loons are likewise a rarity on Wrangel Island.

As in the Arctic desert, the grassy tundra on Wrangel Island is inhabited and

**Table 50. Numbers of recorded and nesting species of birds in the eastern section of Chukchi peninsula, St. Lawrence Island, and Wrangel Island**

| Locality | Species recorded | Species nesting | Doubtful nesting species | Species recorded* as % of Chukchi composition | Species nesting* as % of Chukchi compostion |
|---|---|---|---|---|---|
| Eastern section of Chukchi peninsula | 127 | 66 | 3 | 100 | 100 |
| St. Lawrence Island | 119 | 53 | — | 94 | 80 |
| Wrangel Island | 71 | 33 | 3 | 56 | 50 |

* The data in columns 5 and 6 have been rearranged as they were printed incorrectly in the Russian original —Ed.

grows richly only in some well-protected valleys. Only the High Arctic species of geese such as *Chen caerulescens* and *Branta nigricans* are adapted to these conditions. On Wrangel Island *Anser albifrons* and *Melanonyx fabalis* do not nest at all, even though they reach much higher latitudes at places in other sectors of the Arctic. For some reason they also do not nest even in the eastern section of the Chukchi peninsula. Here they are replaced to some extent by *Philacte canagica,* which in the arctic desert reaches only up to Wrangel Island and Point Barrow.

Among the Wrangel fauna one sees such high latitude stints such as *Calidris canutus, Pluvialis squatarola,* and commonly, *Arenaria interpres.* Other species of stints nest sporadically, evidently not every year, and none are seen in abundance. *Pelidna maritima* has not reached here from the side of the Bering Sea, but *Erolia ferruginea* is seen on Point Barrow. It nests on the islands of Novosibirsk and is very common in North Taimyr, but is totally absent on Wrangel Island.

I have often pondered why *Pagophila eburnea* does not nest on Wrangel Island. Perhaps it does settle in the nesting area in a favorable year, but so far this species has been sighted only flying over. In the fall of 1938 I witnessed a mass flight, an event probably seen only once in a lifetime. In fact, little is known about the characteristic features of the life of high-latitude birds.

The absence on Wrangel Island of Willow Ptarmigans (*Lagopus* spp.) is striking. There is an analogy here with Novaya Zemlya, but there they do land occasionally, but not a trace of their residence on Wrangel Island has been found to date. There are no Willow Ptarmigans on St. Lawrence or the Diomede Islands. Apparently conditions on these islands generally are not favorable to ptarmigans, yet *Lagopus mutus* inhabits Spitsbergen where even a distinct subspecies, *L. mutus hyperboreus,* has evolved. It is remarkable in its regular migrations from the islands to the mainland and back. Obviously, particularly severe conditions exist on the Arctic islands, posing a great dilemma for ptarmigans—to leave or to adapt to conditions uncommon for mainland forms. Ptarmigans have to fly far to reach Wrangel Island. The Diomede Islands, contrarily, are quite close and yet no ptarmigan has been found there. I once encountered a hare on Bol'shoi Diomede which had evidently run across the ice from the mainland.

One possible reason for the absence of ptarmigans on Wrangel Island is the inadequacy of shrubs. Small passerine bush birds are absent there apparently for the same reason, but are common on the Chukchi peninsula where the same conditions prevail, i.e. *Acanthopneuste borealis, Budytes flavus, Anthus cervina, Cyanosylvia svecica, Hylocichla minima,* etc.

In the mountains of Wrangel Island an inanimate environment predominates between the broken rock and talus. In low hills I found nests of *Calidris canutus* and on higher mountains encountered *Plectrophenax nivalis* and more rarely *Oenanthe oenanthe.* The long-lasting snow cover and severe winds repel even such undemanding mountain birds as *Anthus spinoletta* and *Leucosticte arctica.* Conceivably *Brachyramphus brevirostris* may nest here and there in the hills. I was the first to record it for the island and later others observed it.

*Nyctea scandiaca* and jaegers inhabit Wrangel Island because of lemmings, but they alone do not attract *Buteo lagopus,* which requires small voles as well.

The avifauna of Wrangel Island has no more secrets, but much work needs to be done to fully understand it. Changes of fauna in time must be studied first, i.e., the degree of faunal variation in different years needs to be established.

## Province of Arctic Tundras

The term arctic Tundras covers tundras of all types characteristic of arctic plains and differing from hill tundras. A detailed study of the avifauna of tundras convincingly demonstrated that a tundra is far from homogeneous, that as a habitat of nesting birds it sometimes exhibit subtle features not always discernible at first glance. On the other hand, unrelated species of birds are sometimes found to colonize sections which are visually quite similar.

As mentioned before, considerable difficulties arise in delineating the boundaries of the tundra zone. Its southern boundary should coincide with that of arboreal vegetation, but in nature it is a highly vicarious, winding, and frequently broken line with isolated islets of forest or tundra. Trees growing along the river valleys extend far into the forestless tundra and many forest birds extend beyond the boundaries of continuous forest. Some species do not reach the forests edge, while others extend more to the north, being satisfied with mere shrubs. Some birds inhabit only tall shrubs, while others nest even in small creeping willow groves and so on.

The boundaries of the tundra zone vary from specialist to specialist. Quite systematically and logically, each specialist bases his conclusions on his own material and experience.

Zoogeographers are not alone in encountering difficulties in the determination of the boundaries of forest and tundra zones. The botanist and geographer, B.N. Gorodkov (1935, p. 12), for example, wrote: "Drawing a boundary in nature between different zones is not easy, not only because the transition of vegetation is gradual, but also because there are as yet no universally recognized principles for classifying tundra vegetation and expressing how it differs from other types, for example, from marsh vegetation . . . These factors largely explain why some workers have recently been inclined to place forest-tundra in the forest zone (Dedov), others in the tundra zone (Gorodkov and Berg), and still others consider it an independent zone (Tsinzerling)."

I expressed my reasons for considering the forest-tundra an independent landscape zone in two of my 1937 works (Portenko, 1937a and 1937e). In one (*Ornithogeographic Relations. . .*, p. 387) I wrote: "The concept of the forest-tundra as a landscape is far from being considered as established. L.S. Berg does not consider it erroneous to refer to forest-tundra as related to the southern sections of the tundra and the northern sections of the taiga. If one analyzes carefully what has been written about the boundaries of forest-tundras, we will be amazed at how different specialists understand it differently. There is no doubt that this is explained by the subordinate values usually assigned to it." In my work on the Urals (Portenko, 1937a, p. 173) I wrote: "It does not follow that the forest-tundra is some unstable, disintegrating concept, the very concreteness of which can be doubted. Having studied the predominant distribution of birds throughout the Palearctic, I have naturally come close to understanding the landscape elements directly influencing their distribution, and firmly believe that the forest-tundra with its avifauna is a fairly independent entity in the sense of a landscape zone." I hold the same view today.

The forest-tundra may be wedged out altogether at places in northeast Europe where the northern fringe of forests forms a continuous wall. Consequently, what is important is not that it should form a mandatory transition zone at the junction of forest and tundra. On the other hand, a forest-tundra may occupy a very extensive territory as, for example, south of Yamal and especially in the Anadyr region and Koryatsk Zemlya. The fauna of the forest-tundra is not more–or–less an even mixture of forest and tundra forms, but consists instead of a limited number of species essentially characteristic of forest or tundra. It is the combination of these species that characterizes forest-tundra. It supports no endemics. Nevertheless, such species as *Falco gyrfalco* and *Anthus gustavi* inhabit mainly forest-tundra.

An analogy can be drawn between the forest-tundra and forest-steppe; the latter acquired the right of usage in geographic and biological literature without controversy. The forest-tundra zone was identified long ago by American biologists under the name "Hudsonian life zone".

Zoogeographic zoning calls for a comparison of territories with equivalent faunal values; this has led to a series of graded coordinated subdivisions. In finding an appropriate place for the fauna of forest-tundra, four possibilities present themselves: 1) include it in the Arctic province; 2) include it in the Siberian-European province; 3) consider it a transitional zone to forest-steppe as suggested by M.A. Menzbir (1882, pp. 165 and 187); or 4) assign it the rank of an independent subregion.

It is quite evident that with respect to the area of coverage as well as territorial features, the forest-tundra and its avifauna are not comparable with adjoining provinces—the Arctic and Siberian-European. To eliminate it from the network of zoogeographic subdivisions as a transitional foreign zone of a different rank is absurd. Let me expand on the foregoing preliminary concepts concerning forest-tundra. In my 1937 and 1939 works on the fauna of the North Urals and Anadyr region, I included forest-tundra districts and sections in a "tundra province," and in 1958 (Portenko, 1958, p. 200) and 1963 (Portenko, Kishchinskii and Chernyavskii, 1963, p. 124) in a "taiga province". After a lapse of 20 to 25 years I had to revise my former zoning due to the accumulation of new information, particularly that collected by me in continuation of the Kamchatka expedition of 1959-1960, especially in Koryatsk Zemlya. I could now move the boundaries of the tundra southward not only up to the northern coasts of the Okhotsk Sea, but also along the west coast of Kamchatka and into the northern parts of this peninsula. Lowering the boundaries of the Arctic subregion so far south would be fanciful.

Splitting the tundra province into much smaller subdivisions has its own history. N.A. Severtsov (1877) distinguished the "Polar Province" (*Provincia arctica*) in his

Northern subregion. He acknowledged that in his time the Polar fauna had not been adequately studied throughout the entire expanse. The western parts of the Polar region from Iceland in the east to Novaya Zemlya were already well known, but of the territory between the Kara Sea and the Lena mouth, only the Taimyr peninsula had been studied by A.F. Middendorf. The zoological differences of this area from the western part were few indeed—only a few geese, primarily the "Red-necked Goose, *Anser ruficollis*". More typical forms were seen in the Chukchi fauna, in particular the "primitive and unique Kolpic Sandpiper *(Eurynorhynchus pygmaeus*) and some other highly peculiar sandpipers with a high dispersal during migration in winter and with an extremely limited nesting zone." Such were the early zoogeographic concepts on the distribution of arctic fauna in Eurasia.

The term "forest-tundra" was not used by Severtsov for the simple reason that it did not yet exist. Severtsov simply points out (p. 135) that to the south, the Polar tundra "intersected by forest extensions, primarily stunted conifers and birch with a few forest aminals".

M.A. Menzbir (1882) in his *Ornithological Geography of European Russia* mostly followed N.A. Severtsov. He distinguished in the Palearctic region the "tundra zone" as a subregion with a single "Arctic" province: "A zone of drawf woodland extends along the southern boundary of the tundra; this zone to some extent can be considered an independent zoological section since its fauna contains some characteristic forms such as *Archibuteo lagopus,* Redpolls, and some other forms" (p. 168).

Within the European section of our country, M.A. Menzbir "divided" the Arctic province into three ornithological districts: Novozemel'sk, Murmansk, and Nizhnepechorsk. In the 1920's M.A. Menzbir (1934, p. 17) placed Murmansk section in the Northern Province together with Lapland and Finland. In my book *Avifauna of the Extrapolar Sections of the North Urals* (Portenko, 1937a, p. 177) I made a very detailed zoning of the tundra adjoining the Polar Urals from west to east. In the European tundra district I distinguished the sections Vaigach, Kolguev, and Nizhnepechorsk (Bol'shezemel'sk and Malazemel'sk tundras), and in the Ob'-Yenisey district North Yamal, South Yamal, and Polar-Ural sections. Their boundaries were plotted on a map (ibid., Table XIII). I extended the Ob'-Yenisey district eastward up to Taimyr district. B.M. Zhitkov (1913, pp. 363–368) divided Yamal territory into three zones. The southern boundary of real tundra, according to his observations, reached 67.5° north. However, the author himself considered the information he collected inadequate.

S.P. Naumov (1931, pp. 89–104) dealt with the zoogeographic zoning of the Gydanskii peninsula. He was guided by the zonal distribution of vegetation established by B.N. Gorodkov and correlated it with the distribution of the fauna. He could not base his work primarily on bird distribution since he had studied only a small part of the Gydanskii tundra in the breeding period. Some of his information about bird distribution is outdated and has undergone basic changes due to the accumulation of new data. Nevertheless, one cannot disregard S.P. Naumov and much can still be inferred from his works.

S.P. Naumov drew the northern boundary of forest–tundra deep into the

Gydanskii peninsula, up to 68° 50′ N (upper course of the Messo-Yakha River), i.e., a degree more north than done by B.M. Zhitkov in Yamal. This boundary rose even higher in Yenisey. In the tundra zone S.P. Naumov distinguished Typical and Arctic tundra, but regarded zonal subdivisions as ecological, differing essentially from zoogeographic subdivisions (p. 97). In general, he was inclined to accept the division of A.Ya. Tugarinov (1927b), but thought it necessary to label the Ob'-Yenisey district of Tugarinov "Ob'-Gydayamsk" and did not wish to include the Yenisey River valley in it. The avifaunal differences between Ob'-Gydayamsk district and Taimyr, according to Naumov, pertain only to subspecies, and not to species. S.P. Naumov lacked lists of the full complex of breeding birds, requisite to an accurate description of the zoogeographic district studied by him.

A few years before Naumov, A.Ya. Tugarinov (1925, 1927b) was engaged in the ornithogeographic zoning of Yenisey-Siberia. This was the first step toward analyzing the distribution of birds in Central Siberia. Subsequent studies of avifauna of this part of Siberia revealed many inaccuracies in zoning, but these should not belittle the services of A.Ya. Tugarinov, the first to tackle the problem of the zoological zoning of Central Siberia. He relied primarily on geography, topographic zoning, and sought to find appropriate species of birds conforming to it. It is enough to read the characteristics he gave (Tugarinov, 1927b, p. 36) for Primorsk and Tundra Ob'-Yenisey sections as well as Primorsk and Tundra Taimyr sections to see how inadequate and irregular his lists of bird species characterizing these sections were. Tugarinov handled the tundra sketchily and his boundaries were incorrect (see map appended by him); nevertheless he made a contribution to zoning.

I could partly judge the Taimyr fauna from my field experience since I was engaged in detailed ornithological studies in the summer of 1949 in its northern section. I later paid attention to the zoning of this peninsula in joint endeavors with A.V. Krechmer, my graduate assistant and student. He had rich field experience from ornithological studies in the western part of Taimyr. His zoogeographic conclusions were incorporated briefly in his thesis (Krechmar, 1965, pp. 17–20).

If the changes in the composition of tundra avifauna commencing from Scandinavia and farther east are considered, a series of species and subspecies not encountered more westward is instantly detected in Taimyr. In spite of the differences between west Siberian tundra avifauna and east Siberian, no sharp boundary can be drawn. The Yenisey River, itself a water boundary, does not restrict bird movements, but the landscape on both sides of it is not similar today. Thus the Yenisey does not play the role of a perfect zoogeographic boundary throughout its length. Intrazonal elements of vegetation and animal colonization penetrate its broad floodplains and intersect the exposed topography of the tundra zone. The entire natural complex of the Yenisey floodplains must be excluded from our considerations here.

From the conditions of exposed topography, the boundary between the fauna of Ob'-Gydanskii and Taimyr tundras, as stated before, is not sharp. The studies of A.V. Krechmar convincingly show that the fauna of west Taimyr bears a transitional character, representing a mixture of western and eastern elements. The territory commencing partly from west Taimyr and extending east is inhabited by east Siberian forms of birds, which I have placed in the east Siberian tundra subprovince.

The following species of birds usually do not go west of the Yenisey: *Nettion formosa, Erolia ferruginea, Heteropygia melanotos,* and *Xema sabini,* while the following are not encountered west of Putoransk uplands: *Heteroscelus incanus brevipes* and *Anthus spinoletta härmsi.* Moreover, an entire series of well-defined subspecies are distributed from west or east Taimyr only toward the east: *Hierofalco gyrfalco grebnitzkii, Arenaria interpres oahuensis, Pelidna alpina centralis, Larus argentatus taimyrensis,* and other subspecies of herring gulls (*L. a. birulae* and *L. a. vegae*), *L. hyperboreus pallidissimus, Rissa tridactyla pollicaris, Uria lomvia eleonorae, Motacilla alba ocularis, Budytes flavus plexus, Anthus cervina cervina,* etc.

The following are not distributed beyond west Taimyr from west to east: *Rufibrenta ruficollis* and *Pluvialis apricaria altifrons,* and among the subspecies, *Hierofalco gyrfalco uralensis, Arenaria interpres interpres, Pelidna alpina alpina, Larus argentatus antelius, L. hyperboreus hyperboreus, Rissa tridactyla tridactyla,* and *Anthus cervina rufogularis,* while *Branta bernicla bernicla* reaches up to Khatanga.

Farther eastward the tundra avifauna becomes richer and the number of subspecies grows steadily even as the number of western forms decreases. Thus *Gavia arctica arctica, Melanonyx fabalis fabalis, Pisobia ruficollis minuta,* and *Xema sabini palaearctica* reach the Lena. The distribution zone of the following commences from the Lena to the east: *Branta bernicla nigricans* and *Limosa lapponica menzbieri;* from the Yana—*Gavia arctica pacifica, Arctonetta fischeri, Falco peregrinus harterti, Limnodromus griseus,* and *Rhodostethia rosea;* and from Indigirka—*Stercorarius longicaudus pallescens* and *Larus argentatus vegae.*

According to N.M. Mikhel' (1935, p. 92): "The Indigirka region (covering taiga as well as tundra zones) undoubtedly comes closest in avigeographic relations to the Kolyma River basin, forming with it an indivisible whole". Mikhel' approved the formation by A.Ya. Tugarinov (1927b) of an independent zoogeographic district covering "Kolyma-Indigirka Region" which he named the Yano-Kolyma district.

In 1905 S.A. Buturlin undertook prolonged expedition in the Lower Kolyma. His own observations formed the basis for the avigeographic zoning of northeast Siberia (Buturlin, 1908a). He distinguished four subprovinces: 1) Yakutia, or Leno-Anadyr; 2) Kamchatka-Okhotsk; 3) Dahur; and 4) Yenisey. He divided the first into several districts: 1) Chukchi, 2) Kolyma, 3) Yana, and 4) Yakutia. He populated these districts with tundra and well as taiga birds. The boundaries of these districts are depicted on a map given in another work (Buturlin, 1913, p. 227). These boundaries were the very first preliminary draft of districts in which zoogeography had not been thoroughly studied until his time. Although Buturlin covered a significant part of northeast Siberia in his division into districts, it was nevertheless essentially a local zoning and unrelated to other territories of the Palaearctic.

A.Ya. Tugarinov correlated his division with the zoning of P.P. Sushkin (1925a), who was not particularly concerned with the North but rather the territories adjoining the Upland-Asian subregion of the Palearctic.

F.D. Pleske (1928) was the first to present a zoning of the whole of the Eurasian sector of the Arctic, but it too is essentially a local division because not correlated with the rest of the subdivisions of the Palearctic. Pleske cut right across the zone of arctic deserts, tundras, and forest-tundras to designate the following provinces:

1. Atlantic-European—from northeast Greenland to the west coast of Novaya Zemlya and the White Sea.
2. European-Siberian—from the east coast of Novaya Zemlya, Kolguev, and Kanin up to Khatanga.
3. Siberian-American—from Khatanga up to Chaun Bay.
4. North Pacific—farther east, encompassing west Alaska.

In this work I shall not attempt a detailed zoning of the arctic tundras since our present concern is the avifauna of the Chukchi peninsula. The existing literature on fauna and zoogeography, partly cited above, generally provides a basis for dividing the province of the arctic tundras into the following subprovinces: 1) Arctic-Atlantic, 2) European-Ob', 3) East Siberian, 4) Bering, 5) Alaskan, and 6) Arctic-Canadian.[3]

The western and eastern boundaries of the Arctic-Atlantic subprovince coincide fairly well with those of the "Atlantic–European Province" of Pleake. The coasts and islands in this zone are exposed to the influence of the Atlantic. Colonies of seabirds form large "bazaars" at places. Murres, eiders, puffins, and auks do not range east of the Kola peninsula and Novaya Zemlya.

My western boundary of the European-Ob' subprovince coincides with Pleske's, but excludes Taimyr in the east as done by Pleske for his "European-Siberian Province". I have mentioned above the differences in avifauna between this subprovince and the next one, the East Siberian tundra.

Now let us look at the differences in the avifauna of the East Siberian and Bering subprovinces. S.A. Buturlin (1908a) drew the boundary between them along the Bol'shaya Baranikha. He himself reached Baranov Kamen' and is probably right in the placement of the boundary. As at other places in the tundra, it is difficult to define sharp border lines in this region. Chaun Bay intersects the coastal tundra, but its coasts apparently (according to the information collected) do not differ in faunal composition.

In comparing the composition of avifauna of the East Siberian and Bering subprovinces, it is essential to consider that the farther east one travels, the farther the Chukchi peninsula coast dips south along a gradient. The avifauna, especially coastal, is thereby increasingly exposed to the influence of the sea as Bering Strait is approached.

The following species of birds do not penetrate the Chukchi peninsula from the west: *Cygnus cygnus bewickii, Antigone leucogeranus, Philomachus pugnax, Limicola falcinellus, Rhodostethia rosea,* and *Asio flammeus.* The following are encountered in the Chukchi peninsula, but not farther than Kolyuchin Bay: *Anser albifrons albifrons, Melanonyx fabalis serrirostris, Erolia ferruginea, Chionophilos alpestris*

[3]N.N. Danilov (1966, pp. 115–121), independent of me, has likewise undertaken zoning of the Arctic ("Subarctics"). A few differences aside, our schemes accord well and fully correspond to the actual situation in nature.

*flava, Riparia riparia, Leucosticte arctoa curilica,* and *Calcarius lapponicus calcaatus.*

On the contrary, the following do not extend west from the Chukchi peninsula or reach only Kolyma: *Phalacrocorax pelagicus, Aythya marila mariloides* (up to Kolyma), *Histrionicus histrionicus* (at least at this latitude), *Somateria mollissima v-nigrum* (reaches Chetyrekhstolb Island as a rarity and even farther), *Grus canadensis canadensis* (reaches Alazeya), *Pelidna alpina sakhalina, Eurynorhynchus pygmaeus, Xema sabini tschuktschorum* (up to Kolyma), *Corvus corax kamtschaticus, Hylocichla minima minima* (up to Kolyma), *Acanthopneuste borealis hylebata* (up to Kolyma), and *Budytes flavus tschutschensis.*

The limitations I set do not lessen the degree of differences between the Bering and East Siberian subprovinces, since their territories are large and transitions are inevitable along the border zones as in other subprovinces under similar circumstances.

An entire series of species and subspecies do not go west of Kolyuchin Bay. This boundary, as will be seen later, is extremely important for a more detailed subdivision. Some species significantly do not reach Kolyuchin Bay. The series includes: *Philacte canagica* (common species), *Charadrius mongolus* (not found in significant numbers), *Heteroscelus incanus incanus, Limosa lapponica baueri, Pelidna maritima tschuktschorum, Pisobia mauri, Actodromas bairdi, Sterna camtschatica* (not found in significant numbers), *Uria aalge inornata* (ditto), *U. lomvia heckeri, U. lomvia arra* (ditto), *Cepphus columba columba, Brachyramphus brevirostris, cyclorhynchus psittacula, Aethia cristatella, Aethia pusilla, Fratercula corniculata, Lunda cirrhata,* and *Calcarius lapponicus alascensis.*

These lists are sufficiently adequate to reveal that the Bering subprovince differs sharply and notably from the East Siberian. For obvious reasons, I shall go into this subprovince in greater detail.

**Bering Subprovince**

I place in this subprovince (Portenko, 1970) the territory from the tundra lying between Chaun Bay and Kolyma up to Bering Strait, in the south up to Anadyr mountain (or, more correctly, the mountain range) and, in addition, the coastal tundra in the Anadyr region. The avifauna of this region differs more strongly from the Alaskan than from the avifauna in the subprovinces located more westward.

The following do not enter from the Bering subprovince into the Alaskan: *Fulmarus glacialis, Melanonyx fabalis, Eudromias morinellus, Charadrius mongolus, Pisobia ruficollis, Limonites temminckii, Motacilla alba,* and *Anthus gustavi.* Of these, *Limonites temminckii* and *Anthus gustavi* serve as more convincing examples. They are distributed right up to the eastern limits of the Chukchi peninsula and have not been found even once in the nesting area in Alaska. On the other hand, *Eudromias morinellus, Charadrius mongolus, Pisobia ruficollis* and *Motacilla alba ocularis* have been seen only exceptionally in the nesting area in Alaska. *Fulmarus glacialis* does not cross over to the low-lying coast of Alaska due to the nonavailability of suitable conditions for nesting in colonies; it nests instead on the Aleutian islands.

Finally, *Melanonyx fabalis,* in my opinion, represents a vicarious subspecies of Canada Goose, i.e., it is found in the same relationship to the latter as *Nucifraga caryocatactes* to *N. columbiana.*

The following species are widely distributed in Alaska but do not migrate in a reverse direction, i.e., from the Alaskan subprovince into the Bering subprovince: *Iridoproche bicolor, Wilsonia pusilla, Passerculus sandwichensis,* and *Spizella arborea.* The following also have a very limited range: *Arenaria melanocephala, Numenius tahitiensis, Tryngites subruficollis, Pisobia (Ereunetes) pusilla, Sayornis saya, Zonotrichia atricapilla,* the very rare *calcarius pictus,* and others.

Greater differences can be seen among subspecies which replace each other in these provinces:

| Bering subprovince | Alaskan subprovince |
|---|---|
| *Anser albifrons albifrons* | *Anser albifrons frontalis* |
| *Aythya marila mariloides* | *Aythya marila nearctica* |
| *Falco peregrinus harterti* | *Falco peregrinus anatum* |
| *Lagopus lagopus lagopus* | *Lagopus lagopus alascensis* |
| *L. mutus pleskei* | *L. mutus nelsoni* |
| *Charadrius hiaticola tundrae* | *Charadrius hiaticola semipalmatus* |
| *Gallinago gallinago gallinago* | *Gallinago gallinago delicate* |
| *Pelidna alpina sakhalina* | *Pelidna alpina pacifica* |
| *Larus argentatus vegae* | *Larus argentatus smithsonianus* |
| *L. hyperboreus pallidissimus* | *L. hyperboreus barrowianus* |
| *Xema sabini tschuktschorum* | *Xema sabini woznesenskii* |
| *Chionophilos alpestris flavus* | *Chionophilos alpestris arcticola* |
| *Corvus corax kamtschaticus* | *Corvus corax principalis* |
| *Acanthopneuste borealis hylebata* | *Acanthopneuste borealis kennikotti* |
| *Anthus spinoletta härmsi* | *Anthus spinoletta pacificus* |
| *Plectrophenax nivalis pallidior* | *Plectrophenax nivalis nivalis* |

Furthermore, some subspecies of which the Asian counterparts nest more to the south in the forest-tundra do not emerge from Alaska. Our Bean Goose is replaced in Alaska by the Canada Goose with the subspecies *Branta canadensis minima, B. c. occidentalis, B. c. leucopareia,* and *B. c. parvipes.* The Whooping Swan is replaced by *Cygnus cygnus columbianus.* The following do not reach the Chukchi coast: *Gavia immer immer, Nettion erecca carolinensis, Mereca americana, Tringoides macularius, Numenius phaeopus hudsonius, pisobia minutilla minutilla, Larus canus brachyrhynchus, L. philadelphia, Lanius excubitor invictus,* and others.

Thus there are many differences in the composition of avifauna of the subprovinces under comparison, but they are rather superficial, consisting mostly in the replacement of some subspecies by others.

The Bering and Alaskan subprovinces are sharply divided by a natural boundary—the Bering Strait—but even then features of transition are encounterd in the islands between Asia and America. I became acquainted with Bol'shoi Diomede Island during my personal trip there in June, 1934. The majority of birds inhabiting this island were marine species, mostly *Aethia* spp. and Parakeet Auklets, which are equally common on the adjoining coasts of Asia and America. Unfortunately, I could not collect *Larus hyperboreus,* the subspecies of which would have determined the origin of the population of Glaucous Gulls nesting on Diomede. From among land birds I shot *Actodromas bairdi* and *Calcarius lapponicus alascensis*—species of the Alaskan region—but since they have also been found in the breeding grounds in the eastern part of the Chukchi peninsula, the question remains unresolved. Finally I sighted some American sparrows, undoubtedly transitory. K.W. Kenyon and J.W. Brooks (1960) encountered many species, Siberian and even more American, in flight on Little Diomede Island, but among nesting birds, they did not find a single species characteristic of either Alaska or the Chukchi peninsula. *Larus hyperboreus* nests also on Little Diomede Island and the rocky Faeroe Islands, but subspecies are not known. Thus the Diomede Islands exhibit no characteristic features in terms of zoogeography. They are extremely small and their fauna probably changes significantly in various years. Their position in the strait does not create favorable conditions for supporting the faunal elements of either mainland coast.

St. Lawrence island, in spite of its large area and relatively abundant fauna, is also largely devoid of a typical zoogeography. According to F.H. Fay and T.J. Cade (1959), 53 species of birds, predominantally circumboreal range nest on it. There is not a single species among them which does not also nest on the Chukchi peninsula. Fay and Cade did not set out to accurately identify the subspecies in order to resolve the affinity of the island fauna with America or Asia. Purple Sandpipers were identified by B. Conover (1944) as *Pelidna maritima tschuktschorum* with transitional features toward *P. m. ptilocnemis*, but both of these subspecies also nest on the American side, while *P. m. tschuktschorum* has been described by me from the Chukchi coast. Loons on St. Lawrence Island are represented by two subspecies: *Gavia arctica viridigularis* and *G. a. pacifica;* both nest on both sides of Bering Strait. Rough-legged buzzards have been identified as *Buteo lagopus kamtschatkensis* and *B. l. s.-johannis;* both nest in Alaska. In spite of its proximity to the Chukchi coast, the Rufous-necked Stint *Pisobia ruficollis,* common on the Chukchi peninsula, has not penetrated to St. Lawrence Island. This island is located 40 miles from the Asian and 100 miles from the American mainland. I am more inclined to consider its avifauna Chukchian, but F.H. Fay (1961) came to the opposite conclusion, not because of patriotic considerations, but due to a lack of acquaintance with Chukchian avifauna.

The southern boundary of the Bering subprovince concides with the southern boundary of the Arctic subregion. Identifying in nature the junction of two subregions from a zoogeographic point of view is as important as it is interesting. I could not test the boundary here by means of special field studies, but nevertheless did clarify somethings in site. The mountain ranges seperating the Arctic fauna from forest-tundra and taiga still remain unstudied. I personally studied thoroughly the avifauna of the low hills (below 1,000 m) in the eastern part of the Chukchi peninsula and along the midreaches of the Amguéma River, Gorelov hills and Uankat-negti knolls in the Anadyr region, and finally, I organized special studies of the Alpine zone in Koryatsk uplands. A few brief and inaccurate references occur in the travelogue of G. Maydell (1894) with regard to the southern slopes of the Anadyr range.

Besides the inadequacy of factual information, an even greater obstacle is encountered. The mountains with their landscape features and characteristic fauna penetrate the plains with several projections, capes, and islets. Hence the boundaries of the mountain country inevitably form confused patterns that greatly complicate zoning. The fauna of the Alpine zone intersects the zonal distribution of the fauna in the plains everywhere; methodology would correctly exclude it from zoogeographic subdivisions of a zonal character. However, such an exclusion would need small-scale maps and detailed studies of the distribution of fauna habitats at a level which has not yet been achieved in present-day studies of fauna.

The tundra encircling the coast of the Gulf of Anadyr continues southward to cover the coastal strip on the eastern part of the Anadyr region west to Kanchalan and Velikaya Rivers and probably even farther. The western boundary there evidently coincides with the eastern fringe of the continuous dwarf cedar belt (Portenko, 1939b, II, p. 161). In the south the level tundra continues up to Ukvushvuinen mountains to the northeast of Koryatsk uplands. The fauna of the plains around Mainapyl'gyn and to the southwest of Cape Vararin still has features common to the fauna of the coastal strip of the Anadyr range. Colonies of polar foxes and lemmings are seen there, but farther southwest, mountains displace the tundra. I conducted extremely thorough studies of the avifauna in the basins of Apuk and Achai-Vayam Rivers and conclusively showed that the Koryatsk uplands fall not into the Arctic subregion but into the Siberian-European subregion (Portenko, Kishchinskii, and Chernyavskii, 1963, p. 125).

Further west, the southern boundary of the Bering subprovince encompasses the so-called Anadyr range, in fact a system of several mountain ranges. The slopes of these hills were traversed by two expeditions a century ago: J. Billings in 1791/1792, from east to west along the northern slopes, and G. Maydell in 1869, from west to east along the southern slopes, from the upper courses of the Belaya River to the upper courses of the Kanchalan. It is a great pity that these two remarkable expeditions provided almost nothing of interest to zoogeography. The results of the expedition led by J. Billings are particularly disappointing.

I can judge the fauna of the Anadyr range only by the two sites studied by me: near the Amguéma, by Kilometer 91 and Gorelov hills. However, E.M. Meller gave me a small collection of birds from Pereval'naya station.

The question naturally arises as to what extent the alpine avifauna of the Anadyr range differs from the corresponding fauna on the Koryatsk uplands. Since the alpine avifauna in northeast Asia is very poor, I have associated them together in my analysis. The following nest on—

| Anadyr range | Koryatsk uplands |
|---|---|
| *Histrionicus histrionicus* | *Histrionicus histrionicus* |
| *Buteo lagopus* | *Buteo lagopus* |
| *Lgopus mutus* | *Lagopus mutus* |
| *Eudromias morinellus* | *Charadrius mongolus* |
| *Calidris tenuirostris* | *Calidris tenuirostris* |
| *Heteroscelus incanus* | *Heteroscelus incanus* |
| *Nyctea scandiaca* | *Motacilla cinerea* |
| *Chionophilos alpestris* | *Anthus spinoletta härmsi* |
| *Anthus spinoletta härmsi* | *Leucosticte arctoa curilica* |
| *Plectrophenax nivalis* | *Plectrophenax nivalis* |

These two lists are so similar that a doubt arises as to whether the avifauna under comparison ought to be placed in two different subregions. After some hesitation I nevertheless placed the alpine Anadyr district in the Bering subprovince. Such arctic birds as *Nyctea scandiaca* and *Chionophilos alpestris flava* nest in this district, while *Leucosticte arctoa* and *Charadrius mongolus* are absent or extremely rare, and *Motacilla cinerea* totally absent. Such taiga birds as *Nucifraga caryocatactes, Prunella montanella, Pinicola enucleator, Rubicilla erythrina,* and others do not nest in the subalpine belt of the Anadyr range. These species are also absent in the backwater shrubs and in the shrub tundra on the Chukchi peninsula.

Still further to the west, the boundaries of the Bering subprovince are lost somewhere in the totally unstudied montane country along the Anyui River.[4]

I divide the Bering subprovince into three zoogeography districts: 1) Chukchi, 2) Alpine Anadyr, and 3) St. Lawrence Island.

*Districts and Sections of Bering Subprovince*

The Chukchi district encompases the plain and slightly hilly tundra extending in the east from Kolyma and from Chaun Bay to the Bering Sea and the Anadyr coast belt; if we exclude the high Anadyr mountain range, it represents the core of the Bering subprovince. Kolyuchin and Krest bays cut deeply into the massif of the Chukchi peninsula and, as far as one can deduce from the information available on bird distribution they form a fairly distinct barrier separating the peninsula into two parts. In accord with this, I have established West Chukchi and East Chukchi ornithogeography areas.

*West Chukchi section*––The northern coast of the Chukchi peninsula represents an inclined line dipping southeast; the difference in the geographic latitude between Cape Shelagskii and Cape Dezhnev is a full four degrees. Apart from its more

[4]In the forests along the Bol'shoi Anyui I have encountered Hazel Grouse, a true representative of forest fauna (Portenko,1941, p.107). In 1966 F.B. Chernyavskii found in the nesting sections in the basin of the Malyi Anyui *Penthestes cinctus, Turdus ruficollis,* and *Phylloscopus trochilus*; the following have additionally been encountered in the upper reaches of the Énmen-Véem River: *Rubicilla erythrina, Schoeniclus pallasi,* and *Chrysophrys pusilla* (a few nests detected).

northern situation, the West Chukchi section, unlike the East, is subjected to the influence of the cold Chukchi Sea. *Pluvialis squatorola* and *Erolia ferrugina* still nest under these more northern conditions. Kolyuchi Island is inhabited by colonies of Northern Murres (*Uria lomvia heckeri),* while the Black Guillemot *(Cepphus grylle mandti)* lives on certain capes on the north coast. Snow Geese (*Chen caerulescens)* nest sometimes along Chaun Bay. From among the subspecies of Lapland Longspurs, the more northern *Calcarius lapponicus calcaratus* nests there. In the tundra of West Chukchi district *Anser albifrons* and *Melanonyx fabalis* are quite common at places. At the western limites of the district the following species, common in Kolyma, are still encountered: *Dafila acuta, Nettion crecca, Gavia arctica viridigularis, Riparia riparia,* and others.

*East Chukchi area*—It is located in the south and falls under the influence of a much warmer Bering Sea. Its shore for the most part is elevated and rocky, convenient for the formation of seashore bird colonies, and very large colonies nest there at places, not extending west of Kolyuchin Bay where low flat coasts begin and are often interrupted by small rocky capes such as Cape Schmidt, etc. Hence the following do not nest to the west of Kolyuchin Bay: *Fulmarus glacialis, Uria aalge, U. lomvia arra, Cepphus columba, Cyclorrhynchus psittacula, Aethia cristatella, A. pusilla, Fratercula corniculata,* and *Lunda cirrhata.*

Certain migrants from Alaska are absent west of the East Chukchi section, for example *Pisobia mauri* and *actodromas bairdi,* or very rare—scoter *Melanitta perspicillata* and the inhabitant of the Bering Sea coast, *Pelidna maritima,* and *Charadrius mongolus.*

*Anadyr coastal area*—It extends from Krest Bay to Koryatsk uplands and Mainapyl'gyn and is situated in the lowland tundra. The flat coasts are devoid of cliffs and colonies although *Fratercula corniculata* and *Lunda cirrhata* nest on Alyumka Island in the Anadyr River estuary. *Anser albifrons, A. erythropus, Melanonyx fabalis, Dafila acuta, Aythya marila, Oidemia nigra, Melanitta fusca, Chrysophrys pusilla,* and others reach there from the Anadyr backwaters. From among the subspecies of Lapland Longspurs, the more southern *Calcarius lapponicus kamtschaticus* nests there. As a result of the more southern geographic position, Northern Eiders are not seen there—*Arctonetta fischeri* and *Polysticta stelleri*— Gray Plover, or Curlew Sandpiper. *Nyctea scandiaca* does not nest there.

*Avifauna of St.Lawrence Island*—It serves to isolate the Bering subprovince into a distinct section as mentioned above. Its composition comes closest to the avifauna of the East Chukchi section. Forty-eight species of birds are common for the eastern part of the Chukchi peninsula and St. Lawrence Island. The following do not nest on the island: *Fulmarus glacialis, Falco peregrinus, Lagopus lagopus, L. mutus, Charadrius hiaticola, C. mongolus, Gallinago gallinago, Pisobia ruficollis, Eurynorhynchus pygmaeus, Limonites temminckii, Nyctea scandiaca, Cyanosylvia svecica, Budytes flavus, Anthus gustavi,* and others. Thus the avifauna of St. Lawrence Island is an impoverished version of east Chukchian fauna.

Apart from the species listed above, such rare birds as *Melanitta perspicillata, Eudromias morinellus,* and *Sterna camtschatica* do not enter St. Lawrence Island from the East Chukchi section. Nesting of the following has yet to be accurately established: *Actodromas bairdi, Hylocichla minima, Acanthopneuste borealis, Anthus cervina,* and *A. spinoletta.* They might possibly prove at some future date to be rare nesting species. Not a single species of bird can be labeled widely distributed and common in the nesting sites of St. Lawrence Island, but absent on the Chukchi peninsula.

**Alaskan Subprovince**

The territory of this subprovince encompasses the tundra of western and northern Alaska, in the south almost up to the base of the Alaskan peninsula (see map: Merriam et al., 1910). Typical tundra occupy the largest area in arctic Alaska where the tundra zone commences from the upper forest boundary on the southern slopes of Brooks Range and stretches to the sea. The strip of tundra extending along the Bering Sea does not exceed 100 miles in width and in places narrows to a few miles. It is penetrated by woody vegetation growing along river banks. The mountains are inhabited by an arctic-alpine avifauna, especially in the alpine zone of the Alaskan Range, and others with such characteristic representatives as *Leucosticte arctoa, Oenanthe oenanthe, Anthus spinoletta,* and *Chionophilos alpestris.* From among the passerines, the most widely distributed in the lowland tundra are Ravens, Snow Buntings, and especially *Calcarius lapponicus* and *Passerculus sandwichensis.* The largest avian population is seen in the delta of the Kuskokwim and the Yukon Rivers, along the northern bank of the Seward peninsula at the apex of Kotzebue Bay, by Point Barrow, and in the Colville River delta. At places where short willows grow in the tundra, one sees such inhabitants of shrubs as *Acanthis flammea, Zonotrichia atricapilla, Wilsonia pusilla, Dendroica petechia,* and *D. straita,* as well as *Hylocichla minima, Acanthopneuste borealis,* and *Budytes flavus.*

The eastern boundary of the Alaskan subprovince is customarily extended up to the Canadian boundary. J.A. Allen (1893, p.122) divided the arctic zone of North America into two parts: 1) Barren Ground and 2)Alaskan-Arctic. He placed in the first all of arctic Canada and Greenland, and in the second the Alaskan tundra within the limits marked by Merriam. There is no doubt that the Mackenzie River and its lower courses represent a natural boundary, just as the Kolyma, Lena, Yenisey, and other rivers do in Siberia.

Nunivak Island undoubtedly belongs to the Alaskan subprovince (Swarth, 1934). Its avifauna is of interest compared with the avifauna of St. Lawrence Island. Nunivak is located away from the American mainland, almost at the same distance (slightly less) as St. Lawrence Island from the Chukchi peninsula. Its area is slightly less, covered with tundra, and boasts shrubs of less than a foot high. Most of the birds inhabiting it are widely distributed species, but those nesting are indicative of Alaska: *Charadrius hiaticola semipalmatus, Passerculus sandwichensis, Zonotrichia atricapilla,* and others. The Asian species, *Charadrius mongolus* and *Pyrrhula pyrrhula,* have also been taken in flight, but most are American.

Differences in the composition of the avifauna of the Alaskan and Bering subprovinces have already been discussed.

As far as I can judge from the available literature and field data, an ornithologist stepping ashore onto the Alaskan tundra in his very first trip would meet *Passerculus sandwichensis,* a widely distributed species in America and common in Alaska, and in the bushes, *Zonotrichia atricapilla,* and so on. Consequently, in spite of the overall similarity between the avifauna of Alaska and the Chukchi peninsula, these territories appear separated, as if sliced by a knife, along the excellent natural boundary of the Bering Strait and Sea.

As far as I know, no one has undertaken a division of the Alaskan subprovince of tundra into smaller districts and sections, even though the avifauna of all of Alaska has already been studied satisfactorily, and the impressive monograph by I.N. Gabrielson and F.C.Lincoln (1959) could be used for comparative studies of avifauna. In an interesting popular monograph by E. Ingersoll (1914, p. 9) a schematic map of faunal sections is given, admittedly in a very general form, characterizing bird distribution.

**Arctic-Canadian Subprovince**

The Arctic-Canadian subprovince is situated between the Alaskan and Arctic-Atlantic subprovinces. It has its own endemic—*Chen rossii* (Cass.)—but since this bird is distributed in very small numbers only in the Perry River basin in the middle of the subprovince, it cannot be considered representative of the entire area. Its great "brother"—*Chen caerulescens*—is more widely distributed in arctic Canada, not rare, and encountered in two color types—"blue" and white. In northern Alaska, the Snow Goose nests sporadically and is presently rare.

A few endemic, or in any case characteristic, subspecies can be listed for the Arctic-Canadian subprovince: *Lagopus lagopus albus* and *L.l. ungavus, L. mutus rupestris, Calidris canutus rufa, Spizella arborea arborea,* and *Calcarius laponnicus subcalcaratus. Larus hyperboreus hyperboreus, Xema sabini sabini,* and *Oenanthe oenanthe leucorhoa* have spread there from Greenland.

The avifauna of this subprovince appears generally impoverished compared with the Alaskan and Arctic-Atlantic subprovinces. From the Alaska side an entire series of species do not penetrate it: *Phalacrocorax pelagicus, Philacte canagica, Arctonetta fisheri, Polystica stelleri, Arenaria melanocephala, Numenius tahitiensis, Cepphus columba, Brachyramphus brevirostris, Cyclorrhynchus psittacula, Aethia cristatella, A. pusilla, Fratercula corniculata, Lunda cirrhata, Cyanosylvia svecica, Acanthopneuste borealis,* and *Budytes flavus.* In addition, some subspecies are absent: *Larus hyperboreus barrowianus, Xema sabini woznesenskii, Oenanthe oenanthe oenanthoides, Spizella arborea ochracea, Calcarius lapponicus alascensis,* and others. Several species penetrate the Arctic from the northern part of the Pacific Ocean and others from the northern part of the Atlantic Ocean. Neither series has reached the continental sections of arctic Canada.

*   *   *

The zoning of tundra and arctic desert I suggest does not generally contradict the entire unified complex of bird species which are circumpolar in distribution. South of the Arctic this unity is increasingly disturbed as one advances toward warmer latitudes. The ocean expanses dividing the continents become broader and represent for most birds an insurmountable barrier under contemporary conditions. On the other hand, areas of the continents with varying landscapes increase, giving rise to a richer fauna than found in the Arctic.

## EXCHANGE OF FAUNA AT THE POINT OF MAXIMUM PROXIMITY OF THE ASIAN AND AMERICAN CONTINENTS

The Bering Strait represents today a stable and insurmountable barrier for the migration of most land birds. Nevertheless, there are exception that attest to the dynamism of the avifauna on both coasts of the strait, and to the tendency among some species to enlarge their range by migrating to the opposite mainland. This mobility of range has been observed by several generations of ornithologists and cannot be ignored in hypothetical constructions of faunal histories over very large segments of time, usually reckoned as geological periods.

The following species of birds found in the nesting sections can be considered pioneer settlers of Alaska from the side of the Chukchi peninsula.

*Gavia arctica viridigularis*—few finds of nests established on Cape Prince of Wales.

*Buteo lagopus kamtschatkensis*—nests in the western section of Alaska, north of St. Michael.

*Hierofalco gyrfalco grebnitzkii*—evidently nests in the western parts of Alaska (but the reader should take note that the taxonomy of the subspecies of gyrfalcons has become totally confused in the recent past).

*Pluvialis dominica fulva*—nests on the west coast of Alaska from Wainwright to Nunivak.

*Eudromias morinellus*—female with an egg in its oviduct caught on Point Barrow.

*Charadrius mongolus stegmanni*—probable instance of nesting sighted in Goodnews Bay, south of the Kuskokwim estuary.

*Erolia ferruginea*—nesting colony found unexpectedly in 1962 near Point Barrow.

*Pisobia ruficollis ruficollis*—six clutches found at different times on and near Cape Prince of Wales.

*Oenanthe oenanthe oenanthoides*—nests in the western half of Alaska, but is not numerous.

*Cyanosylvia svecica svecica*—nests in the northwestern part of Alaska, from Cape Prince of Wales north along the Colville River.

*Acanthopeneuste borealis kennicotti*—nests mainly in the Alaskan avigeographic subprovince, from the main Alaskan peninsula and Mackinley National Park, along the coast of the Bering Sea and Straits, up to Colville River. Common at times and disappears at others in the same locality.

*Budytes flavus tschutschensis*—common in the nesting section in the western and arctic Alaska, from Nushagak River and Nunivak Island to Umiat on the Colville River.

*Anthus cervina cervina*—a nest with eggs found in Wales; a few flights have been noticed in addition there.

All of the above-listed species are encountered in Alaska in the form of the same subspecies that nests on the Chukchi peninsula with the exception of Eversmann's Warbler. The subspecies *A.b. kennicotti* puzzles me. The specimens from Alaska I examined had very small beaks; small-beaked specimens were also found in a large Siberian series in which Eversmann's Warblers with a very long beak predominated. One way or the other, the residence of this bird in Alaska was a solidly established phenomenon. Although Eversmann's Warblers change residence, their flight routes can nevertheless be charted as in the case of Bluethroats, Northern Wheatears, and Yellow Wagtails. The nesting of other species is evidently accidental, as indicated by stray instances of the nesting of Dotterel, Mongolian Plover, Curlew Sandpiper, and Red-throated Pipit.

Roughly the same number of species and subspecies have colonized northeast Asia from America, especially from Alaska.

*Gavia arctica pacifica*—neither species nor subspecies of the Black-throated Loon are widely distributed along the north of America. In Asia they regularly nest in the tundra of the Chukchi district and reach in the west up to the Yana along a narrow strip of tundra.

*Chen caerulescens caerulescens*—distributed formerly on the arctic coast of East Siberia, but save for rare exceptions, now nests even in large numbers on Wrangel Island.

*Melanitta perspicillata*—a lone find of a young bird in Mechigmensk Gulf was reported.

*Grus canadensis*—extensively distributed in extreme northeast Siberia, in the tundra up to the Chukchi River in northeast Yakutia. Common in the eastern part of the Anadyr range and still nests at places in Koryatsk Zemlya.

*Pluvialis dominicus dominicus*—in the last century it was abundant in North America and nested even in the Anadyr range and on the Chukchi peninsula. At present, it is even more widely distributed in Alaska and arctic Canada. Nests as a rarity on Wrangel Island.

*Heteroscelus incanus incanus*—subspecies of the Ash-colored Wandering Tattler has a small nesting range in America—Alaska and far northwestern Canada. Small numbers nest in the eastern part of the Chukchi peninsula and the Anadyr range. A small colony found in Koryatsk uplands near Ledyanoi range.

*Numenius borealis*—dying species or probably subspecies of the Eskimo Curlew. It was abundant even in the last century in North America; it has been taken in the Anadyr range and in Kolyuchin Bay.

*Limnodromus griseus scolopaceus*—undoubtedly nests in the west today. Nesting established up to the Yena and perhaps up to Anabar. In summer it is found on Bennet Island, Wrangel Island, and in Tilichik on Koryatsk Zemlya.

*Heteropygia melanotos*—nests in the tundras up to Taimyr inclusive; also found on Gydansk peninsula.

*Actodromas bairdi*—nests in the eastern part of the Chukchi peninsula and on Wrangel Island.

*Pisobia mauri*—nests on the eastern fringe of the Chukchi peninsula.

*Hylocichla minima minima* —nests in shrub tundra and forest tundra in the west up to Kolyma. Population varies in different years and does not always colonize the same places.

## Role of Accidental Stopovers

Stopovers in birds are usualy considered an accidental phenomenon. Stray birds are not included in the basic composition of local avifauna, but in regions where stopovers are often observed they cannot be ignored when analyzing the fauna. Their appearance plays various roles.

A stopover can be caused by severe weather conditions such as storms, winds, fogs, etc., or by the opposite—exceptionally favorable weather which facilitates access to distant coasts, particularly for good fliers. There are other types of stopovers, such as when a species setting out to occupy its range explores a new territory for occupation. This happens very often during population migrations. As the number of stopovers increases, the accidental element diminishes. For example, stopovers of the Snowy Owl into the British Isles was initially registered as a rare, chance phenomenon. When in due course of time a large number were reported, such flights could no longer be considered an accidental phenomenon. The Snowy Owl had to be recognized as a very rare wintering bird.

Instances have been accurately established where birds which stopped over, began later nesting and colonized the new territory. A classic example is *Turdus pilaris* L., flocks of which were transported to Greenland in a Force 9 to 10 storm. Fieldfares nested there in successive years (Salomonsen, 1951b). Likewise, stray instances of nesting of *Erolia ferruginea, Pisobia ruficollis,* and other birds in Alaska might later lead to regular breeding. One may assume that in all probability the colonization in Alaska of *Oenanthe oenanthe, Cyanosylvia svecica, Acanthopneuste borealis,* and *Budytes Flavus* began at sometime with stopovers, in the same manner as the colonization of Northeast Asia took place by *Grus canadensis, Limnodromus griseus, Heteropygia melanotos, Actodromas bairdi, Pisobia mauri,* and *Hylocichla minima* from Alaska.

Thus, in some stopovers (and possibly a significant percentage also) one cannot help but see the first attempts or the initial stage of migration of birds to an adjoining country. From this point of view the paradox that everything accidental is essential becomes justifiable indeed.

Academicians M.A. Menzbir (1886, p. 64; 1934, p. 61) and I.A. Palmén (1887, p. 511) have written about the role of migratory birds in enriching the avifauna of new territories. More recently, E.V. Kumari (1959, pp. 144–145) has propounded very substantial theories about this aspect.

Special circumstances sometimes compel birds to stopover when their nesting territories become overpopulated or unfavorable for habitation. The cultivation of steppes, construction of artificial reservoirs, destruction of forests, and other factors unfavorable for the survival of local bird populations compel them to seek new pastures. In Arctic conditions a late or severe spring with storms and snows or delayed melting of snow cover on the tundra, induce migration of birds and consequently their stopovers.

Stopovers are particularly frequent in coastal countries and a large number of them in the British Isles, for example, are explainable not only because ornithological studies have improved! The coasts of the Chukchi peninsula, Wrangel Island, and the Alaskan coast provide particularly hospitable conditions for birds lost at sea in inclement weather. On the way to Wrangel Island I saw from the plane the black tip of a hill standing out amidst the ice on the south coast. I could understand what an attractive haven it offered birds finding themselves on the icy expanses of the Chukchi Sea for some reason or the other.

The following species have been observed to date stopping over on the Chukchi peninsula and Wrangel Island from Alaska:

*Cygnus cygnus columbianus*
*Tryngites subruficollis*
*Brachyramphus marmoratus*
*Surnia ulula caparoch*
*Iridoprocne bicolor*
*Petrochelidon pyrrhonota*
*Dendroica coronata*
*Seiurus noveboracensis*
*Euphagus carolinus*
*Passerculus sandwichensis*
*Junco hyemalis*
*Spizella arborea*
*Zonotrichia atricapilla*
*Passerella iliaca*

With some degree of probability, even hummingbirds could assumably fly into the Chukchi peninsula and Wrangel Island (see review of the subspecies, p. 171).

Keeping in mind that long-range observations of birds in the Chukchi peninsula and Wrangel Island have been scanty, the number of species listed above is sufficient to demonstrate the role played by transitory American species in the general composition of local avifauna. There is no doubt that this number will increase substantially in the future.

Instances of the stopovers of the following Asian birds have been established in Alaska:

*Falco peregrinus harterti*
*Calidris tenuirostris*
*Heteropygia acuminata*
*Eurynorhynchus pygmeus*
*Cuculus saturatus*
*Philomachus pugnax**
*Hirundo rustica gutturalis*
*Locustella ochotensis*
*Prunella montanella**
*Motacilla alba ocularis*
*Anthus gustavi**

*Species marked with an asterisk have been found on St. Lawrence Island.

A large number of birds fly into Wrangel Island from the Chukchi peninsula. With rare exceptions, these flights are truly accidental in character:

*Cygnus cygnus*
*Anser albifrons*
*Philacte canagica*
*Nettion formosa*
*Dafila acuta*
*Aythya fuligula*
*Polysticta stelleri*
*Arctonetta fischeri*
*Hierofalco gyrfalco*
*Eudromias morinellus*
*Heteroscelus incanus*
*Numenius phaeopus*
*Pelidna alpina pacifica*
*Asio flammeus*
*Chionophilos alpestris*
*Acanthopneuste borealis*
*Prunella montanella*
*Motacilla alba*
*Budytes flavus*
*Anthus cervina*
*Lanius cristatus*

*Puffinus tenuirostris* and *Rhodostethia rosea* reach Wrangel Island from time to time in their wanderings. These migrations by their very nature have no precisely designated boundaries. Neither species in its wanderings is tied to dry land, although they are sometimes sighted right on the coast. To these, perhaps, can be added *Aesalon columbarius* and *Aethia cristatella,* but their presence on Wrangel Island has yet to be proved beyond doubt.

It is indisputable that many birds stopover in the territory of the Chukchi peninsula from the Anadyr region and Kolyma. To date the number of precisely established species is relatively low:

*Anas platyrhynchos*
*Aquila chrysaetos*
*Glottis nebularia*
*Tringa erythropus*
*Rhyacophilos glareola*
*Larus glaucescens*
*Lanius excubitor*
*Delichon urbica*
*Corvus corone*
*Acanthis flammea flammea*

The arrival of *Cerchneis tinnunculus* is most exceptional case; this bird had evidently lost all orientation. At times *Diomedea albatrus* and *Oceanodroma furcata* approach the south Chukchi coasts during their distant travels on the sea.

Recording instances of stopovers, which on the Chukchi peninsula and Wrangel Island are relatively frequent, is of considerable interest in understanding the dynamic changes in the composition of local avifauna.

### Direction of Flight Routes

I have written about the flight characteristics of birds in the arctic on the basis of personal observations (Portenko, 1947, 1960b). In Northeast Asia the flight routes run in varied directions. Banding on the Chukchi peninsula has been conducted on a negligibly small scale, but it has already given positive results, as evident from the works of T.P. Shevareva (1959, 1960) and others. Unfortunately, in the countries of Eastern Asia the study of bird flights has not yet reached the proficiency enjoyed in

Western Europe and America. Due to lack of public awareness, banding of birds provides almost no results. Faunistic studies have to be relied on exclusively for information concerning flights.

The direction of historical migrations determines the routes along which a given bird species entered a given country. An examination of these routes leads to an important conclusion from the viewpoint of ornithogeography, namely, that the composition of avifauna in Far Northeastern Asia is extremely complex, i.e., the collection of species of extremely diverse origin.

A significiant percentage of the species fly over a fairly broad strip parallel to the coastline of Northeast Asia from the Chukchi peninsula into Southeast Asia. The length of the flight path varies from species to species. The route of some runs through the Anadyr region, Koryatsk Zemlya, Kamchatka, Kuril Island, Japan and into East China; that of others runs parallel to the Okhotsk coast and leads into China through the Primorsk region and Korean peninsula. Farther south the routes fork along the regions of Indochina and the islands of Southeast Asia, reaching Australia. Pelagic birds such as gulls and stints are confined for the most part to the coasts; land birds fly over the mainland. The following species, for example, follow such flight routes:

*Gavia stellata*
*G. arctica*
*Phalacrocorax pelagicus*
*Anser albifrons*
*Melanonyx fabalis*
*Branta bernicla*
*Calangula hyemalis*
*Mergus serrator*
*Buteo lagopus*
*Hierofalco gyrfalco*
*Erolia ferruginea*
*Pelidna alpina*
*Pisobia ruficollis*
*Euryonorhynchus pygemeus*
*Limonites temmincki*
*Heteropygia acuminata*
*Phalaropus lobatus*
*Larus argentatus*
*L. hyperboreus*
*Nyctea scandiaca*
*Falco peregrinus*
*Pluvialis squatarola*
*P. dominica*
*Charadrius mongolus*
*Arenaria interpres*
*Heteroscelus incanus*
*Numenius phaeopus*
*Limosa lapponica*
*Gallinago gallinago*
*Calidris canutus*
*C. tenuirostris*
*Asio flammeus*
*Chionophilos alpestris*
*Acanthopneuste borealis*
*Motacilla alba*
*Budytes flavus*
*Anthus cervina*
*A. gustavi*
*A. spinoletta*
*Acanthis flammea exilipes*
*Calcarius lapponicus*
*Plectrophenax nivalis*

From among these, *Phalacrocorax pelagicus, Pluvialis squatarola, Arenaria interpres, Heteroscelus incanus, Eurynorhynchus pygmeus,* and *Larus hyperboreus* stick predominantly to the coastline, though even such "land" species as owls *Nyctea scandiaca* and *Asio flammeus* are not afraid of the sea. Both have been seen flying over the open sea or ice floes. *Limonites temminicki* and small passerine birds fly mainly over the mainland.

The route followed by Eversmann's Warbler is particularly interesting. Its Alaskan subspecies *Acanthopneuste borealis kennicotti* flies over Bering Strait, and evidently even farther together with the Chukchi subspecies *A. b. hylebata*—along the mainland coast of Asia, in particular flying through the Primorsk region, and turning to wintering sites right along Thailand and the Philippines.

The species listed above are highly diverse in origin and distribution, and fly by other routes in other parts of their range (outside Northeast Asia).

Marine birds follow routes over the sea to wintering sites. Minor exceptions are known, however. I observed a flock of King Eiders flying through the Chukchi peninsula, which landed to rest on the ice hummocks. Many species of marine birds remain close to the coasts during flight, but do not land on fresh-water bodies on the mainland. These are: *Gavia adamsi, Histrionicus histrionicus,* all guillemots, *Fulmarus glacialis,* all jaegers, *Pagophila eburnea, Rissa tridactyla, Rhodostethia rosea, Xema sabini,* and *Phalaropus fulicarius.*

Eiders winter in the Bering Sea and do not go far from it.

One group of species flies far to the west, namely *Eudromias morinellus, Charadrius hiaticula, Oenanthe oenanthe, Cyanosylvia svecica,* and *Phylloscopus trochilus.* The last additionally nests in the Anadyr region adjoining the Chukchi peninsula, and its route is truly remarkable. This bird (extremely small and weak in appearance) has to negotiate an immense stretch of land, from the eastern parts of the Anadyr basin to northeastern Africa.

Finally, there is a route that runs in exactly the opposite direction—to America. This route is taken by *Chen caerulescens* although a small percentage of Snow Geese fly to Japan. Even in the last century they were not a rarity in Japan and were abundant in much earlier times. Most *Branta bernicla* and a significant number of *Dafila acuta* fly into America; Canadian cranes and sandpipers such as *Pisobia mauri, Actodroma bairdi, Heteropygia melanotos,* and *Limnodromus griseus* migrate regularly; from the passerines the American *Hylocichla minima* is seen. *Acanthopneuste borealis* and other Asian migrants such as *Oenanthe oenanthe, Cyanosylvia svecica,* and *Budytes flavus* turn toward Alaska in spring.

*Sterna paradisaea* follows an interesting route. I personally observed its departure from the Chukchi coast to the north. It circles arctic America and later turns into the southern hemisphere, following an Atlantic route.

*Puffinus tenuirostris* is a lone bird that spends its "winter" with us in the summer and arrives for "wintering" in an opposite direction—the northern part of the Pacific Ocean and Arctic waters.

*Rhodostethia rosea* also flies north. At the end of the breeding period it wanders along open water patches amid the ice, and into places with abundant food, at times gathering in large numbers. In its winter wanderings southward, it reaches the southern edge of the ice in the Sea of Okhotsk but its winter residence is generally still shrouded in mystery.

Ptarmigans *Lagopus lagopus* and *L. mutus,* like *Corvus corax,* are resident birds on the Chukchi peninsula. All of them wander for some distance but do not migrate beyond the boundaries of the region. Only the Raven remains on Wrangel Island for winter.

A study of the flight routes emphasizes once again the mobility of Chukchi Avifauna , and provides me with yet another basis for the expression "transit door" for Far Northeast Asia.

In the faunal exchange between the two continents at the point of their greatest proximity, seasonal movements have played a prominent role. To a large degree, any immigration followed by nesting commences with spring migrations.

Migratory routes should not be considered totally static. True, they have been repeated for thousands of years and their established rhythm cannot be easily disturbed. Nevertheless, changes in routes do take place. For instance the Snow Goose, which in the eighteenth century appeared regularly in the spring in Yakutia, later flew northward. These migrations are not performed now; massive wintering sites in Japan have also disappeared. In general, however, migratory routes are repeated year after year by the majority of birds. Such examples as migratory route of Eversmann's Warblers and Willow Warblers or species arriving from America remain facts of great zoogeographic importance in understanding age-old changes in the composition of local fauna.

## CHANGES IN THE COMPOSITION OF AVIFAUNA RECORDED OVER THE HISTORICAL PERIOD

It has been accurately established that even in the last century two species have disappeared—*Numenius borealis* and *Pluvialis dominica dominica*—once nesting in Far Northeast Asia.

*Numenius borealis* was caught by L.F. Grinevetskii in the Anadyr region at the end of the 1880's or early 1890's (Portenko, 1939b, I). E.W. Nelson (1883) sighted four of these birds in Vankarém on August 6, 1881. He encountered solitary Eskimo Curlews throughout the period of his visit to the Chukchi coasts. The subsequent fate of these Eskimo Curlews is well known. The bird is nearly extinct; some recently solitary individuals have been recorded in the USA.

A similar fate has befallen the Lesser Golden Plover *Pluvialis d. dominica.* In 1869 four specimens were caught by G. Maydell on the southern slopes of the Anadyr range. In the Anadyr region two specimens were caught by L.F. Grinevetskii in the 1890's and two by N.P. Sokol'nikov later. In 1879 the *Vega* expedition caught Lesser Golden Plovers around Kolyuchin Bay and Lawrence Bay. E.W. Nelson mentions this species for the Siberian coast; subsequently no one has recorded the Lesser Golden Plover in Northeast Siberia. Due to the sharp reduction in its overall population, this bird began to retreat eastwards and its territory was gradually occupied by the Siberian Plover, *Pluvialis dominica fulva.* Even in the time of Nelson the latter was encountered in the western parts of Alaska. Thereafter the population of Lesser Golden Plover began to increase and, perhaps as a consequence of this increase, I caught a specimen on Wrangel Island in 1939.

I shall not repeat here the history of the Snow Goose which has been detailed in the species review. According to the information gathered by the Commission for Nature Conservation (Uspenskii, 1959; 1960a) the number of Brant Geese has decreased noticeably in Northeast Asia. In the wintering sites, about 175,000 *Branta bernicla nigricans* were counted in 1953, but their number in the recent past was far higher.

In the descriptions of sea voyages in the eighteenth century, there are bits of information about the very large number of sea birds. With a general reduction in the pelagic population of wildlife, the stock of birds on the Chukchi peninsula was obviously affected.

Nevertheless, even today the abundance of sea birds is astounding in certain cases. Please see my review of species, especially the Eiders and Slender-billed Shearwater. Masses of King Eiders spend the summer in the Chukchi Sea and I sighted flocks of shearwaters created the impression of an inexhaustible multitude. E. Leffingwell (1919) once attempted to count such an abundant flock. According to his observations in May, 1910, along Point Barrow near 50,000 eiders of all species flew past daily for over two weeks, and the total could well have been almost a million. A single shooting expedition bagged 400 to 500 ducks.

E.W. Nelson (1887) noted that there were fewer birds on the Chukchi coast than on the Alaskan, and A.E. Nordenskjöld wrote that he found smaller numbers of birds on the Chukchi peninsula than on Novaya Zemlya, Spitsbergen, or Greenland. These records of persons who directly studied birds in the above regions are undoubtedly interesting, but their impressions pertain mainly to bird colonies. Bird populations in colonies depend not on the geographic location of the region, but on the nature of the coast, availability of food in adjacent sections of the sea, and other ecological factors.

F.H. Fay (1961, p. 70) states that, judging from the fossils of kitchen middens studied by archaeologists on St. Lawrence Island, the number of American forms of pelagic birds one or two thousand years ago was greater than at present, which is an observation worthy of note.

Since systematic ornithological studies have not been conducted in the Chukchi peninsula and Wrangel Island, changes in bird population occurring year after year cannot be stated with accuracy. All the same, such changes have and do take place, and cannot but influence the composition of the local avifauna. Changes in time reckoned over decades and thousands of years obviously vary. Small changes become large and what has been seen as such by observers could well a century later represent the initial stage of a faunal change occurring over the course of geological epochs.

# SIMILARITY AND FEATURES COMMON TO THE AVIFAUNA OF EURASIA AND NORTH AMERICA IN THE NORTHERN AND MIDDLE LATITUDES

In the preceding discussions I explained the composition of the avifauna in the territories directly adjoining Bering Strait, but not all of the differences existing between the fauna of Eurasia and North America, at least in the northern and middle latitudes, are evident within the confines of the Bering Sea. A comparative analysis of the avifaunas of the Palearctic and Nearctic poses a large and particular problem. For our purposes it is sufficient to mention only the most important features of similarity. Numerical data for such comparisons are unsuitable since they summarize zoogeographic units of unequal status. Different species largely colonize different types of territories with respect to their geographic disposition, the area or territory occupied, their ecological conditions, their proximity to the Bering Strait, etc. There are, for example, species for which the range falls mostly in America, but which penetrate slightly into Asia; conversely, there are species which penetrate America from Asia. Therefore, one has to resort to a direct comparison of lists of bird species which are identical in, or fairly common to, comparable parts of the mainland under study.

The most significant similarity of the faunas under comparison is seen in the presence of an entire series of the same species, which do not differ even at the subspecies rank:

| | |
|---|---|
| *Gavia stellata* | *Crocethia alba* |
| *Plegadis falcinellus* | *Phalaropus fulicarius* |
| *Anas platyrhynchos* | *P. lobatus* |
| *Chaulelasmus streperus* | *Stercorarius pomarinus* |
| *Dafila acuta* | *S. parasiticus* |
| *Spatula clypeata* | *Sterna paradisaea* |
| *Clangula hyemalis* | *Hydroprogne tschegrawa* |
| *Mergus serrator* | *Nyctea scandiaca* |
| *Pluvialis squatarola* | *Asio flammeus* |
| *Heteropygia melanotos* | and others |

The above list does not include bird species inhabiting the coasts and islands in the northern part of the Pacific and Atlantic Oceans.

The following list includes species which are identical for both mainlands, but represented by different subspecies. These are far more numerous than the preceding list.

| Eurasia | North America |
|---|---|
| *Podiceps auritus auritus* | *Podiceps auritus cornutus* |
| *P. nigricollis nigricollis* | *P. nigricollis californicus* |
| *Egretta alba alba* | *Egretta alba egretta* |
| *Nycticorax nycticorax nycticorax* | *Nycticorax nycticorax hoaetli* |

| Eurasia | North America |
|---|---|
| *Anser albifrons albifrons* | *Anser albifrons frontalis* and others |
| *Bucephala clangula clangula* | *Bucephala clangula americana* |
| *Mergus merganser merganser* and others | *Mergus merganser americanus* |
| *Accipiter gentilis gentilis* and others | *Accipiter gentilis atricapillus* |
| *Buteo lagopus lagopus* and others | *Buteo lagopus s.-johannis* |
| *Circus cyaneus cyaneus* | *Circus cyaneus hudsonius* |
| *Pandion haliaetus haliaetus* | *Pandion haliaetus carolinensis* |
| *Aesalon columbarius columbarius* | *Aesalon columbarius suckleyi* |
| *Lagopus lagopus lagopus* and others | *Lagopus lagopus albus* and others |
| *L. mutus mutus* and others | *L. mutus rupestris* and others |
| *Gallinula chloropus chloropus* | *Gallinula chloropus cachinnans* |
| *Charadrius hiaticula hiaticula* and others | *Charadrius hiaticula semipalmatus* |
| *C. alexandrinus alexandrinus* | *C. alexandrinus nivosus* and others |
| *Pluvialis dominica fulva* | *Pluvialis dominica dominica* |
| *Arenaria interpres interpres* and others | *Arenaria interpres morinella* |
| *Gallinago gallinago gallinago* | *Gallinago gallinago delicata* |
| *Numenius phaeopus phaeopus* and others | *Numenius phaeopus hudsonicus* |
| *Calidris canutus canutus* and others | *Calidris canutus rufa* |
| *Pisobia minutilla subminuta* | *Pisobia minutilla minutilla* |
| *Limosa lapponica lapponica* and others | *Limosa lapponica baueri* |
| *Larus argentatus argentatus* and others | *Larus argentatus smithsonianus* and others |
| *L. canus canus* and others | *L. canus brachyrhynchus* |
| *Gelochelidon nilotica nilotica* | *Gelochelidon nilotica aranea* and others |
| *Sterna albifrons albifrons* | *Sterna albifrons antillarum* and others |
| *Thalasseus sandvicensis sandvicensis* | *Thalasseus sandvicensis acuflavidua* |

| Eurasia | North America |
|---|---|
| *Chlidonias niger niger* | *Chlidonias niger surinamensis* |
| *Tyto alba guttata* and others | *Tyto alba pratincola* |
| *Surnia ulula ulula* | *Surnia ulula caparoch* |
| *Strix nebulosa lapponica* | *Strix nebulosa nebulosa* |
| *Asio otus otus* | *Asio otus wilsonianus* |
| *Aegolius funereus funereus* | *Aegolius funereus richardsoni* |
| *Picoides tridactylus tridactylus* and others | *Picoides tridactylus fasciatus* and others |
| *Chionophilos alpestris flava* and others | *Chionophilos alpestris alpestris* and others |
| *Hirundo rustica rustica* and others | *Hirundo rustica erythrogaster* |
| *Pica pica pica* and others | *Pica pica hudsonia* |
| *Corvus corax corax* and others | *Corvus corax principalis* and others |
| *Penthestes cinctus cinctus* and others | *Penthestes cinctus lathami* |
| *Certhia familiaris familiaris* and others | *Certhia familiaris americana* and others |
| *Troglodytes troglodytes troglodytes* and others | *Troglodytes troglodytes hiemalis* and others |
| *Anthus spinoletta spinoletta* and others | *Anthus spinoletta rubescens* and others |
| *Bombycilla garrulus garrulus* | *Bombycilla garrulus pallidiceps* |
| *Lanius excubitor excubitor* and others | *Lanius excubitor borealis* and others |
| *Pinicola enucleator enucleator* and others | *Pinicola enucleator leucura* and others |
| *Leucosticte arctoa arctoa* and others | *Leucosticte arctoa tephrocotis* and others |
| *Loxia curvirostra curvirostra* and others | *Loxia curvirostra pusilla* and others |
| *L. leucoptera bifasciata* | *L. leucoptera leucoptera* and others |

Finally, in both continents there are many related, geographically vicarious species. Most are recognized as good, independent species: quite a few have attained the genus rank but some are so similar that they must be considered species or subspecies. Be that as it may, all of the vicarious forms listed below are of recent origin and each pair of vicariates could be considered descendants of the same ancestral species.

| Eurasia | North America |
|---|---|
| *Podiceps ruficollis* | *Podiceps dominicus* |
| *Ardea cinerea* | *Ardea herodias* |
| *Butorides striatus* | *Butorides virescens* |
| *Botaurus stellaris* | *Botaurus lentiginosus* |
| *Platalea leucorodia* | *Ajaja ajaja* |
| *Melanonyx fabalis* | *Branta canadensis* |
| *Nettion crecca* | *Nettion carolinensis* |
| *N. querquedula* | *N. discors* |
| *Mareca penelope* | *Mareca americana* |
| *Aix galericulata* | *Aix sponsa* |
| *Aythya ferina* | *Aythya americana* |
| *Polysticta stelleri* | *Camptorhynchus labradorius* |
| *Oxyura leucocephala* | *Oxyura jamaicensis* |
| *Mergellus albellus* | *Lophodytes cucullatus* |
| *Elanus caeruleus* | *Elanus leucurus* |
| *Accipiter nisus* | *Accipiter striatus* |
| *Buteo buteo* | *Buteo jamaicensis* |
| *B. hemilasius* | *B. regalis* |
| *Haliaeetus albicilla* | *Haliaeetus leucocephalus* |
| *Falco cherrug* | *Falco mexicanus* |
| *Canachites falcipennis* | *Canachites canadensis* |
| *Tetrastes bonasia* | *Bonasia umbellus* |
| *Grus grus* | *Grus americanus* |
| *Porzana porzana* | *Porzana carolina* |
| *P. exquisita* | *P. noveboracensis* |
| *Porphyrio porphyrio* | *Porphyrula martinica* |
| *Fulica atra* | *Fulica americana* |
| *Haematopus ostralegus* | *Haematopus palliatus* |
| *Scolopax rusticola* | *Philohela minor* |
| *Numenius arquata* | *Numenius americanus* |
| *Actitis hypoleucos* | *Actitis macularia* |
| *Rhyacophilos ochropus* | *Rhyacophilos solitarius* |
| *R. glareola* | *R. flavipes* |
| *Tringa erythropus* | *Totanus melanoleucus* |
| *Limosa limosa* | *Limosa haemastica* |
| *Recurvirostra avosetta* | *Recurvirostra americana* |
| *Himantopus himantopus* | *Himantopus mexicanus* |
| *Larus ridibundus* | *Larus atricilla* |
| *L. minutus* | *L. philadelphia* |
| *Otus bakkamoena* | *Otus asio* |
| *Bubo bubo* | *Bubo virginianus* |
| *Glaucidium passerinum* | *Glaucidium gnoma* |
| *Ceryle lugubris* | *Ceryle alcyon* |

| Eurasia | North America |
|---|---|
| *Dendrocopos maior* | *Dendrocopos villosus* |
| *Xylocopus minor* | *Xylocopus pubescens* |
| *Perisoreus infaustus* | *Perisoreus canadensis* |
| *Corvus corone* | *Corvus brachyrhynchus* |
| *Nucifraga caryocatactes* | *Nucifraga columbiana* |
| *Penthestes montanus* | *Penthestes atricapillus* |
| *P. palustris* | *P. carolinensis* |
| *Penthestes superciliosus* | *P. gambeli* |
| *Baeolophus dichrous* | *Baeolophus inornatus* |
| *Lophophanes cristatus* | *Lophophanes wollweberi* |
| *Remiz pendulinus* | *Auriparus flaviceps* |
| *Aegithalos fuliginosus* | *Psaltriparus minimus* |
| *Sitta villosa* and others | *Sitta canadensis* |
| *Chrysomma poecilotis* | *Chamaea fasciata* |
| *Cinclus pallasii* | *Cinclus mexicanus* |
| *Cichloselys sibiricus* | *Ixoreus naevius* |
| *Regulus ignicapillus* | *Regulus satrapa* |
| *R. regulus* | *R. calendula* |
| *Bombycilla japonica* | *Bombycilla cedrorum* |
| *Lanius excubitor* | *Lanius ludovicianus* |
| *Coccothraustes coccothraustes* | *Hesperiphona vespertina* |
| *Rubicilla erythrina* | *Rubicilla purpurea* |
| *Spinus spinus* | *Spinus pinus* |
| *Chrysophrys spodocephala* | *Spizella atrogularis* |
| *C. pusilla* | *Passerculus sandwichensis* |
| *Junco siemsseni* | *Junco hyemalis* and others |
| *Emberiza jankowskii* | *Spizella arborea* |

The lists given above are far from complete, but even the species listed therein fairly convincingly demonstrate how broad and deep has been the faunal exchange.

Unfortunately, we have no material on bird fossils from the Chukchi peninsula and Wrangel Island which would help us understand the local Tertiary avifauna. Bone remains were found in the archaeological excavations on St. Lawrence Island (Friedmann, 1934a), but were not more than one or two thousand years old.

The migration of bird species from one continent to another could occur in the northern part of the Pacific as well as Arctic Ocean. Various views have been expressed about the land links between Europe and North America. B.K. Stegmann (1934, p. 485; 1936, p. 80), for example, is very convincing in his arguments for a land route in the first half of the Tertiary period between Europe and North America; it was used for migration by birds of tropical and subtropical zones, whereas numerous representatives of boreal and arctic zones passed through the Bering Bridge. B.K. Stegmann supports Wegener's theory of continental drifts, according to which North America was joined to Europe in some past era.

Quite a few authors have written about faunal connections between Europe and Asia through the northern parts of the Atlantic Ocean. Recently, C.H. Lindroth (1957) denied such a contact, basing his arguments essentially on entomological material. Many authors, commencing with Buffon, have attempted to explain the faunal exchange between Europe and North America through Iceland and Greenland, or through a more southern link, relying on the legendary Atlantis. The penetration of *Oenanthe oenanthe* into Greenland and northeast Canada undoubtedly occurred from the Palearctic which is confirmed by the migratory route of *O. oenanthe leucorhoa* (Gm.). However, this still does not prove the presence of a bridge since the penetration of *Turdus pilaris* L. right before our eyes into the nesting sites of Greenland from Norway occurred without the help of a bridge (Salomonsen, 1951b). I shall not discuss further the Atlantic link since the Bering link is more obvious and evident, and more closely concerned with the territory under examination here.

That America and Asia were once joined was commonly believed before the discovery of Bering Strait. Past contacts between the continents were assumed by the earliest seafarers in these regions. For example, O.E. Kotzebue (1821, I, p. 139) found himself on August 19, 1816* on the northern side of Cape Dezhnev, closer to Inchoun, and theorized that: "The destruction of these immense cliffs compelled a man to meditate upon the tremendous transformations which must have occurred there some point ago. Both the appearance and position of the coasts suggests the possibility that Asia was once joined with America. Govozdeva Island (i.e., Diomede—L.P.) is only a remnant of the former junction of Cape East (i.e., Dezhnev—L.P.) with Cape Prince of Wales". During my visit to Bol'shoi Diomede in June, 1934, I noticed from the peak of the island very similar elevations on both sides near Cape Dezhnev and Cape Prince of Wales. The possibility of the two mainlands having been joined together appeared quite probable. Elderly Chukchians going to the Alaskan coast were amazed at its similarity to the Chukchi coast, and shared with their youth an ancient legend that it was once possible to reach America by land routes.

The first view concerning the connection of the two continents based on zoogeographic premises was apparently first expressed by Buffon (1802, new edition, pp. 192-193), even in the 1760's. Referring to the discoveries of mammoth bones in Eastern Siberia and North America, he explained the distribution of fossil elephants in the New World by a land bridge which used to exist between Asia and America in the distant past. It is possible that Buffon borrowed his information from P.S. Pallas (1769a, p. 461, footnote *t*), who himself later refers to Buffon by name. Pallas wrote (p. 442) that since there were no elephants or hippopotami in present-day America, but their fossil remains have been found there, it was evident that they could not have reached Canada any other way except through the extreme end of Eastern Asia, which in the past was separated from America straits not as wide as the present ("quaeque olim minus forte lato ab America freto diremta fuit"). In another work,

* Appears in text as 1876—Ed.

Pallas (1811, p. 241) placed *Urus* as coming from America into the New World, relying on the legend of Atlantis.

T. Pennant (1785) later used the concepts introduced by Pallas. He explained the penetration of fossil bison from Eastern Siberia into America by the existence of a narrow channel between the Chukchi peninsula and the opposite Alaskan coast. He developed in greater detail the idea of a former connection between the two continents. According to him, the Aleutian and fox Islands were fragments of the land which used to join the two continents. The islands could have been formed as a result of an upheaval which also caused the separation of Asia from America, Spain from Africa, Britain from France, Iceland from Greenland, and Spitsbergen from Lapland. Emphasizing the shallowness of Bering Strait, Pennant suggests that land covered the entire expanse between the Aleutian Islands and bering Strait. He also considered the migration of animals over ice a possibility, since the strait is often frozen in winter.

Finally, Pennant suggests another route of animal migration—through the Komandorski and Aleutian Islands. Zoogeographers later assigned little importance to this route, but did not reject it completely. L. Rütimeyer (1867) proposed that as soon as the Gulf Stream broadened its course to the North and restricted the movement of faunal contacts between Europe and Asia, migrating mammals began to use the volcanic Aleutian arc to the same extent as the narrowing coasts of Bering Strait. N.A. Severtsov (1870) referred to an assumption about a former contact between Asia and America through the Kuril' and Aleutian ranges. It is highly probable that *Troglodytes troglodytes* penetrated Eurasia by this path from America. According to B.K. Stegmann, *Leucosticte arctoa* and *Anthus spinoletta* migrated from Asia into America by this route.

A.F. Middendorf's views (1877, II, p. 60) about an ancient isthmus between Asia and America are interesting. Emphasizing the extremely limited range of the sea cow, which in the past was distributed without doubt even farther than the Komandorski Islands, Middendorf wrote: "Commencement of its extinction should be placed in a period when the intermediate strip of land formerly serving as a bridge between East Asia and Northwest America, disappeared; the latter event is becoming more likely and is supported with a close examination of the mollusks of Bering Strait and the flora of eastern Siberia (I, p. 659). It could well have been that this connecting strip was intersected by large rivers, affording the sea cow an opportunity to take to fresh water in the same manner as its southern relatives, the manatees. It is generally known that even on Bering Island, Steller encountered sea cows mostly in the estuaries of small brooks."

After the Russian possessions in Alaska were transferred to the USA, interest by our researchers in Bering Strait and its coasts receded. In the 1920's, it again attracted attention largely due to the hypothesis of Academician P.P. Sushkin (1925a, 1925b) about "Behringia". Sushkin states that the land joining Asia and America evidently represented a significant land mass at least during some periods in the Tertiary. In order to understand the biogeographical contacts of eastern Asia with America, he gave it the importance of the birthplace of some forms, characterizing these links on a level with species originating in Angara Mainland and in America.

As we have seen, the concept of land existing at sometime between the northern parts of Asia and America arose long ago and even the very name "Behringia" was anticipated. W. Kobelt (1903) in his work *Geographic Distribution of Animals,* traced in detail, the courses of faunal contact in the area of the Bering Sea, and called the hypothetical land "Beringiad". It was thus that V.L. Bianki translated the German word "Behringis" suggested by Kobelt (1901, p. 329) in the original text of his work. Kobelt made no suggestions as to the area covered by his "Beringiad," but thought that it did not extend beyond 60° N. According to him, land routes between Northeast Asia and Northwest America continued to exist until relatively recently ("bis in eine verhältnismässing neue Zeit").

P.P. Sushkin did not analyze the question of faunal relations between eastern Siberia and North America, and Beringia was touched upon only incidentally while analyzing the avifauna of Central Siberia and the adjacent parts of mountainous Asia. However, his idea was immediately seized upon by his ornithological successors and other specialists as well.

A.Ya. Tugarinov (1929) in discussing the origin of arctic fauna, depicted Beringia as an immense country including the Chukchi peninsula and Alaska, with adjoining parts of the Bering Sea, Novosibirsk, Bennet, and Wrangel Islands (pp. 666 and 671). This country was distinguished by a severe continental climate and served as a center for the origin of arctic animals in the Quaternary period. The coasts of the Bering Sea represented the second largest center for the origin of polar species (p. 679). The coasts of the Atlantic Ocean constituted the secondary center of origin. Finally, some arctic species arose south of the region of Quaternary glaciations, in particular in southwestern Siberia. A.Ya. Tugarinov considered his conclusions preliminary; if now in various respects they seem to have found no support, it should be kept in mind that no exhaustive faunistic studies whatsoever had been made in 1929 either in northeastern Asia or Alaska.

In a later work, A.Ya. Tugarinov (1937) continued to consider Beringia an immense country extending from the Taimyr peninsula to the Canadian archipelago, 300 to 350 miles north of the present-day Siberian coast.

B.K. Stegmann (1931, 1932, 1963) developed the idea of Beringia mainly while discussing the origin of taiga avifauna. From the very beginning (Stegmann, 1931, p. 356), he referred to a "Bering continent" and later (Stegmann, 1932, p. 391) to "Behringsfestland," considering it one of the centers of the origin of taiga avifauna ("Behringszentrum") in the Tertiary period. Finally, he depicted the territory of the hypothetical Beringia schematically (p. 387). Stegmann returned to the question of Beringia repeatedly until his death. In an article specially devoted to the problem of land connections between Asia and America, he disputed my hypothesis about the existence of an archipelago rather than an extensive land mass between these continents in the geological past.

My present work is not specifically devoted to the problem of Beringia, but as it is indirectly related I will only say a few words about it.

In an article devoted to geological proofs of the past connection of northeastern Asia with Northwest America, the geologist A. Knopf (1910) complained that there was insufficient factual information to resolve this question. He conducted studies himself in northwest Alaska and drew the following conclusions: The stratigraphy of parts of the mainlands adjoining the Bering Sea sheds little light on the land routes extant during the Cenozoic era. All of the available evidence point only to periods in which the land was extensively submerged and the mainlands separated even more. During the Late Miocene, there was general flooding and, at the end of it there arose the present-day land expanses with short intervals in the post-Miocene period. Observations made in the decade preceding the publication of Knopf's articles convinced him that it would be incorrect to draw broad generalizations for the entire region of the Bering Sea and its vicinity. Diastrophic movements were extremely complex; variations in the shoreline were too frequent and occurred locally, while information about them generally scarce.

The Eocene and Miocene were periods of relative stability; Asia and America were joined through land routes. At the beginning of the Pliocene, the Seward peninsula acquired roughly its present-day shoreline and was uplifted in the remainder of the Cenozoic era. The instability of the earth's crust in this region, its relatively well-developed folding, and the shallowness of the Bering Sea all provide a basis to hypothesize with a high degree of probability the existence of short periods of land communication between the two continents. A. Knopf came to the general conclusion that physico-geographic premises favored the theory of probable interruptions in the prolonged interconnection of the land masses of Asia and America.

In the 50-year period following Knopf's publications geologists acquired more knowledge, but a solution to the problem of a Bering land bridge has not advanced very far. The latest monograph by D.M. Hopkins (1959) contains a well-detailed scheme of events concerning the joining of Asia and America; but the author cautions the reader, however, that his article is merely a synthesis of fragmentary information gathered from many sources and from several disciplines; it thus should be considered only as an inquiry and discussion. Each new collection of Cenozoic mollusks or any new stratigraphic study could lead to a review of historical transformations. Such reservations notwithstanding, Hopkins' conclusions are extremely interesting even if not acceptable in all respects. More importantly, they are those of a geologist.

According to D.M. Hopkins, the bottom of the northeastern part of the Bering Sea and Strait and also the Chukchi Sea represent an extensive platform covered with water to a depth of 100 to 500 ft. This platform was separated from the deep bottom on the western part of the Bering Sea by an underwater slope exceeding 5,000 ft in depth. On the northern fringe of the Chukchi platform the slope is not as severe. The surface of the Bering-Chukchi platform is flat and uniform; except for the islands, there are no underwater valleys or shorelines. The bottom of Bering Strait is sandy and rocky and lies somewhat below the general level of adjacent parts of the platform. The structure of its crust under the outer cover resembles more the structure of the mainland than the bottom of a typical ocean basin. Most of the islands in the Bering Sea and Strait consist of typical bedrock similar to those in adjacent parts of Asia and America. The geological structure of Wrangel Island and Cape Lisburn is very similar. They evidently represent segments of a low mountain chain now submerged for much of its extent.

Geological data rather clearly demonstrates that northeast Siberia and Alaska are parts of one and the same continental mass, only temporarily separated by a strait. Paleontological data, however, shows that inundations occurred several times over the course of 50 to 60 million years.

Eocene formations with Sequoia and other plant remains have been found on St. Lawrence Island while marine Pliocene formations have been found at several places on the Seward peninsula and Pribylov islands. Apart from these isolated finds, no other Tertiary formations are known in western Alaska, and questions of land and sea migrations of animals must inevitably be resolved on the basis of indirect inferences.

Fossil fauna points to the existence of land links between Asia and America in the Early and Late Eocene, Early Oligocene, Late Miocene, and from the middle to Late Pliocene. The almost complete absence of a faunal exchange in the Middle Miocene seems to indicate that the bridge was only temporary although physical proof of this has yet to be found. It follows that the area now occupied by the Bering and Chukchi Seas over the course of 50 or 60 million years lay much of the time above sea level.

About a million years ago, toward the end of the Pliocene, the Bering and Chukchi seacoasts in Alaska acquired roughly their present-day features. Yet even in the Middle Pliocene and closer toward its end an intensive faunal exchange occurred through land routes. Marine mollusks could have penetrated from the Pacific Ocean into the Arctic before the first Pleistocene interglacial interval.

As soon as the strait opened up, its bottom began to fill with sediment and its depth decreased. Thus a land link rose again in the Pleistocene. Shoaling followed each interglacial interval, but the strait may have been considerably deeper in the Early Pleistocene than in the Late Pleistocene. The strait opened up in each interglacial interval and in the warmest of them, the sea rose by 100 ft above its present level. When the Ice age set in, the water level dropped, and in the coldest of these, it exceeded 300 ft. Moreover, the land link was restored. This last land link could have existed some 10,000 to 11,000 years ago.

Variations in the sea level have been traced in detail over the last 10,000 years; only fragmentary data has been obtained for the preceding 30,000 years. Most specialists think that during the Early Wisconsinian stage, the level of the sea rose slowly but steadily from 300 ft below the present sea level 35,000 years ago, to 180 ft just 11,000 years back. Significant worldwide warming of air and water 11,000 to 9,000 years ago was accompanied by a nearly catastrophic recession of glaciers. The level of the sea rose 60 to 80 ft and reached its present level about 7,000 years ago.

A major portion of the Bering bridge was always free of ice. Glaciers in the adjoining sections of the mainlands blocked access to their interiors but did not prevent the migration of animals through the bridge.

In the Pleistocene there were never any forests on the Bering bridge. Tundra was present on the Seward peninsula even in the Wisconsinian interglacial stage. The northern boundary of the forest advanced only by a few dozen miles for short intervals of 8,000 to 10,000 years ago when the summer was warmer than at present.

The hypothetical and extensive "Behringia" suggested by D.M. Hopkins, although he does not call it by this name, still falls short of the boundaries suggested by other researchers. One could list the extremely large number of links (and corresponding number of disjunctions) he presents, but resorting to the creation of bridges is an outdated method in zoogeography. Attempts have been made by many investigators in different countries to bypass their use.

The ornithologist G.S. Swarth (1934) in his analysis of the avifauna of Nunivak Island expressed scepticism of the bridge hypothesis, correctly cautioning that such a concept is assumed *a priori* as an obligatory precondition with which collected facts are arbitrarily fitted. He refers to Dall, who not only disputed the existence of a bridge between Northeast Asia and Alaska commencing from the Miocene, but emphasized that Bering Strait at present was narrower than at any time previously. Swarth, like myself, has also referred to A. Knopf.

As a matter of fact, is a bridge, i.e., a continuous strip of land, indispensable for the migration of animals from one continent to another? E. Mayr in one of his articles (1953, p. 8) cited, in answer to this question, the example of the fate of the fauna of Krakatoa Island. Volcanic eruption in 1883 totally destroyed it, but 50 years later its fauna recovered and it attained the faunal composition of other islands of the Malayan Archipelago, which are similar in size and ecological conditions. According to Mayr, the evolution of land bridges is not only unnecessary, but could even lead to difficulties in analyzing extant fauna.

Therefore, as early as 1937, I proposed the hypothesis of the existence in the past of an archipelago rather than an extensive and continuous land mass between Northeast Asia and North America. Later, based on increasing evidence, I became convinced of the expediency of such a conjecture (Portenko, 1949, 1957, 1961, 1968). The existence of an archipelago is harmonious with the presence of endemics in the Bering Sea region, including marine and coastal birds simultaneously, without contradicting the undoubted routes of migration of land animals. Some parts of the archipelago were joined with others at different times and faunal exchange occurred between the continents but with alternating favorable and unfavorable periods of invasion. I do not imagine an historic process whereby there used to be an identical fauna in Eastern Siberia when it was joined with America, and that later was separated by Bering Strait, nor do I believe that the same fauna continued to exist on both sides. In fact, the exchange of animals was continual, with interruptions of different intensities and durations and various obstacles to surmount. There is a good English expression for such a transition— "on stepping stones". It refers to small stones lying in a shallow brook on which one can step to cross the water without wetting one's feet.

It is possible that the Diomede Island represent remnants of islands which once covered an immense expanse; the eastern part of the Chukchi peninsula was set off from the western by a strait between Kolyuchin Bay and Krest Bay, etc.

Movements of animals, including birds, from Asia to America and vice versa did not occur in a smooth, even fashion over the ages. Different species penetrated the mainland at different times and to different depths. Wrens emerging from America, for example, crossed the entire Palearctic, while the Horned Lark from Asia reached the northern parts of South America. On the other hand, the American Sandpipers (*Pisobia mauri* or *Actodromas bairdii*) colonized no farther than the eastern sections of the Chukchi peninsula, while *Oenanthe oenanthe, Cyanosylvia svecica, Budytes flavus,* and *Acanthopneuste borealis* of Siberia penetrated only into the westernmost part of Alaska. There are species which took root in the new territory long ago, those which are simply transitory, and those which reach right up to the coast of Bering Strait, stopping short of it. Is it not strange, therefore, that the Spoon-billed Sandpiper *Eurynorhynchus pygmaeus,* which migrates thousands of kilometers, has not "decided to fly" the 100-km width of Bering Strait to a coast lying literally before its eyes?

The entire Bering region is colonized by avifauna comprising species which have entered it at different times. The stabilization of its varying composition could hardly have lasted very long in a geological sense. An entire group of either tundra or taiga avifauna could not have penetrated the site of this route of constant migrations. The relative abundance of species in such an arctic and subarctic country can be explained not by their evolution there, but by a simple combination of diverse landscape conditions, mountains and plains, at the boundaries of two seas, the Arctic and Subarctic.

The avifauna of Northeast Asia evolved in an arena of great geological events and the process of its formation proceeded at a livelier tempo and on a larger scale than in the contiguous regions of Siberia and Canada, where the avifauna preserves features of a high degree of uniformity over extensive territories.

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