NEW RECORDS AND ZOOGEOGRAPHICAL NOTES ON THE BIRDS OF ST. LAWRENCE ISLAND, BERING SEA

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St. Lawrence Island is a low arctic land mass of about 2000 square miles, situated in the northern Bering Sea, between northeastern Asia and northwestern North America (fig. 2). Its intermediate position and the fact of geologically recent connections with both continents (Hopkins 1967) have conferred a unique character on the fauna and flora of the island. Besides species of Holarctic and local distribution, it harbors some that are peculiar to Palearctic and Nearctic faunistic regions. With these points in mind, Fay and Cade (1959) described the distribution and ecology of the birds of the area, based mainly on field work covering the western half of the island. Their observations were supplemented by those of Sauer and Urban (1964), Bédard (1966), and Sealy (1967a, b, 1968, 1969), who worked in the same area, and were complemented by those of Thompson (1967) on the eastern end of the island and the outlying Punuk Islands.

The present paper reports several additions to the known avifauna of St. Lawrence Island, confirms a number of previous records of rare birds, provides evidence of nesting of some of these, and gives supplementary information on occurrence and nesting of a few of the more common species. The zoogeographical significance of these and the previous findings is considered in the light of recent advances of the geological and ecological history of the region.

METHODS

Our data were collected between 1958 and 1969. During this period Sealy was on St. Lawrence Island for 9 summer months in 1966 and 1967; Fay spent a total of 14 months in intermittent visits at various times of the year, 1958–1969; Bédard was on the island 14 summer months, 1964–1967; and Udvardy visited there briefly in June 1966. Fay's ornithological observations were incidental to field work on parasitological and mammalogical problems for the Zoonotic Disease Section, Arctic Health Research Center, and are supplemental to those reported earlier (Fay and Cade 1959; Fay 1961). Bédard's and Sealy's observations were incidental to ecological studies of alcids in connection with graduate programs at the University of British Columbia.

Geographical names of localities on the island (fig. 1) are taken from the United States Geological Survey map, "St. Lawrence, 1957 compilation," Alaska Topographic Series. Nomenclature of Nearctic birds follows the AOU Check-list (1957); nomenclature of Palearctic birds follows Vaurie (1959, 1965).

Specimens collected by and for the authors were deposited in several museums: American Museum of Natural History (hereafter abbreviated AMNH), Arctic Health Research Center (AHRC), National Museum of Canada (NMC), University of Alaska Museum (UAM), University of British Columbia Museum of Zoology (UBC), University of California Museum of Vertebrate Zoology (MVZ), University of Puget Sound Museum of Natural History (UPS), and the United States National Museum (USNM).

ANNOTATED LIST OF SPECIES

Red-necked Grebe. *Podiceps grisegena* (Boddaert). A Red-necked Grebe with downy young was photographed by Alexander H. Leighton of Harvard University on a small pond in the eastern interior of the island during the summer of 1940. The birds were identified by Fay from the photographs, which constitute the only record of nesting by this species on the island. Robert L. Rausch of the Arctic Health Research Center sighted four Red-necked Grebes about 24 km E of Siknik Camp on 16 July 1959 and collected one of them for parasitological examination. There are two previous records (Bailey 1956; Fay and Cade 1959).

Horned Grebe. *Podiceps auritus* (Linnaeus). A single bird of this species was sighted by David L. Chesmore of the University of Alaska, 3 June 1968, on the sea near Niyrakpak Lagoon.

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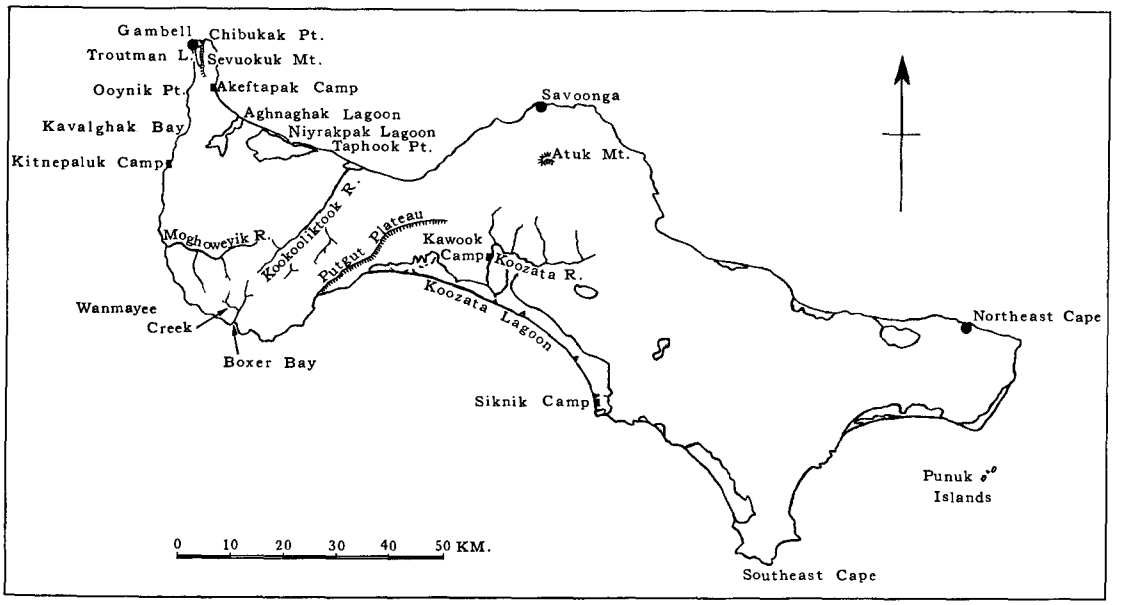

FIGURE 1. St. Lawrence Island, showing localities mentioned in the text.

Two Horned Grebes were observed and photographed 26 days later by Robert O. Stephenson, also of the University of Alaska, as they rested on a small bay on the southern coast of the island, about 32 km S of the first locality. Identification of the latter was confirmed by Fay from the photographs. These are the first records of Horned Grebes from the vicinity of the island.

Canada Goose. *Branta canadensis* (Linnaeus). A single Canada Goose was seen flying over Gambell by Sealy on 16 May 1966. Fay and Cade (1959) reported two previous sight records, and Friedmann (1934a) assigned bones from the middens to the race *minima*.

Black Brant. *Branta nigricans* (Lawrence). Brant are often seen during the spring migration of waterfowl to and from St. Lawrence Island, but they are usually scarce in summer. In the summer of 1965 they were unusually abundant on the western end of the island, and a group of at least 300 molted in the vicinity of Aghnaghak Lagoon, according to our Eskimo informants. Fay saw more than 100 flightless Black Brant on that lagoon on 29 July 1965. On 26 July 1966, Eskimos took 26 flightless brant (examined by Sealy) and about 50 Emperor Geese, *Philacte canagica* (Sewastianov), on the shores of Niyrakpak Lagoon. These lagoons are regularly used by Emperor Geese during their molt, but the occurrence there also of large numbers of brant was regarded by the Eskimos, as well as by us, as very unusual.

Bean Goose. *Anser fabalis* Latham. On two occasions, 19 May 1958 and 16 May 1966, Vernon K. Slwooko of Gambell saw what he described to Fay as Bean Geese. Both observations were of single birds near Gambell. The only previous record from the island is a young male taken at Gambell by Lawrence Kulukhon on 8 May 1952 (not "near Savoonga," Bailey 1956:560, or "7 April," AOU 1957:66; Gabrielson and Lincoln 1959:137). Details of that record were reported by Fay and Cade (1959). A single record from the Pribilof Islands is a specimen also taken in May (Sladen 1966).

Mallard. *Anas platyrhynchos* Linnaeus. A flightless, male Mallard with several Emperor Geese was observed at close range by Fay and V. K. Slwooko on the west-central shore of Aghnaghak Lagoon on 29 July 1965. Although the Eskimos inhabiting the island sometimes refer to the Pintail, *A. acuta* Linnaeus, as the "Mallard," this is the first definite record of *A. platyrhynchos* from the island.

Green-winged Teal. *Anas carolinensis* Gmelin. A Green-winged Teal taken by Hugo Apatiki, a Gambell resident, at Ooynik Point on 27 May 1958 was identified by Fay, who also saw a flock of four near Gambell on 30 May 1959. Another teal, probably of this species, was seen on two occasions, 12 and 13 July 1959, by R. L. Rausch and Fay near Kawook Camp on the Koozata River; Bédard saw a pair of Green-winged Teal near Gambell on 16 and 19 May and again on 6 June 1964. In their combined experience of several months

of field investigations, Sauer and Urban (1964) and Sealy saw no Green-winged Teals, and Thompson (1967) saw only one pair. Though the number of individuals is evidently small, we suspect that these birds do breed on the island. Two previous specimens were reported (Friedmann 1938; Fay and Cade 1959).

European Widgeon. *Mareca penelope* (Linnaeus). A pair of these birds in breeding plumage was observed by Sealy on the sea near Gambell on 23 May 1966. Friedmann (1932a) reported one specimen obtained at Gambell by Collins.

White-winged Scoter. *Melanitta deglandi* (Bonaparte). Specimen records on file at the Arctic Health Research Center show a pair of White-winged Scoters collected for parasitological examination by E. L. Schiller, formerly of the AHRC, near Gambell on 17 June 1951. A third specimen with no data was taken about the same time. Sealy obtained an adult male (NMC uncatalogued) taken on 28 May 1967 by Gambell resident Donald Ungott and saw five flocks of three to seven individuals on the sea near Gambell between 10 and 13 June 1967. Other sight records and one earlier specimen were recorded by Fay and Cade (1959).

Common Scoter. *Oidemia nigra* (Linnaeus). A male (UBC 13277), collected on 5 July 1966 near Gambell by Clement Ungott was given to Bédard. This is the first specimen of the species from the island, although there have been several previous sight records (Nelson 1887; Fay and Cade 1959) as well as osteological records from the middens (Friedmann 1934a).

Red-breasted Merganser. *Mergus serrator* Linnaeus. Two flocks, each comprising about 15 individuals, were seen by R. L. Rausch and Fay at the eastern end of the Koozata Lagoon on 14 and 16 July 1959, and Fay saw a single adult male at the western end of that lagoon on 18 July 1960. A pair in breeding plumage was sighted by Gambell resident David Shinen and Fay on the Moghoweyik River on 9 July 1966 and several other adult pairs have previously been seen in May and June (Fay and Cade 1959; Sauer and Urban 1964). This species seems to be more common than was formerly supposed, though it is certainly rare near Gambell. The observations of adult pairs lend support to Nelson's (1887) report of its breeding there; however, as yet no nests have been found. Specimens were reported earlier by Friedmann (1932a) and Murie (1936).

Peregrine Falcon. *Falco peregrinus* Tunstall. On 21 July 1967 Sealy found a rectrix of a falcon (NMC 55244) on Sevuokuk Mountain which was identified by W. E. Godfrey (in litt., 1967) as "almost certainly from a first year Peregrine Falcon. Although the Gyrfalcon is known to occur on St. Lawrence Island, your feather is much too small to be from a bird of that species. It fits *peregrinus* well, however." There is one other record of this species, an immature male taken at Savoonga on 15 September 1950 (Bailey 1956).

Ringed Plover. *Charadrius hiaticula* Linnaeus. A pair of plovers in distraction display was observed by Fay at the western end of the Koozata Lagoon on 16 July 1960, and one of the birds was collected. Moments later a downy chick was found by Tim Slwooko of Gambell in the area where the adult birds were first located. These specimens (USNM 530739, 530740) were identified by Fay as Ringed Plovers and presumed to be of the race *tundrae* by virtue of their geographic location. This was later confirmed by G. E. Watson (in litt., 1962), who found the adult more comparable to Seebohm's specimens of *tundrae* from the Yenesei and Pechora valleys of eastern Siberia than to the lighter and larger topotypes of the nominate race, *hiaticula*, from Sweden. These two specimens from St. Lawrence Island comprise the first distributional and nesting records of *C. h. tundrae* from within the political limits of North America, as well as from the island.

Semipalmated Plover. *Charadrius semipalmatus* Bonaparte. Observations of birds believed to be *C. semipalmatus* were reported by Nelson (1883), Sauer and Urban (1964), and Thompson (1967), but inasmuch as none of these observers was aware of the potential occurrence of *C. hiaticula* and could not, in retrospect, be sure of their identifications (Vaurie 1964; Sauer in litt., 1963; Thompson, in litt., 1965), their sight records are open to question. We also saw several plovers that could have been either *hiaticula* or *semipalmatus*: one at Punuk North Island on 18 June 1962 and two on the Moghoweyik River on 8 July 1966 (Fay); one near the northern end of Troutman Lake on 31 May 1966 and one near the base of Sevuokuk Mountain on 26 May 1967 (Sealy). The only definite record of *C. semipalmatus* from the island is a female (UBC 8265) collected by Fay on the Moghoweyik River on 28 May 1956 (Fay and Cade 1959).

Dotterel. *Eudromias morinellus* (Linnaeus). One of a pair of these birds was collected near Gambell on 6 June 1968 by Archie Slwooko of Gambell and given to R. O. Stephenson. The specimen (UAM 3113) was an adult female

with developing ova. Two adults were reported previously by Friedmann (1932b), and a pair was sighted by Sauer and Urban (1964).

Black-bellied Plover. *Squatarola squatarola* (Linnaeus). A Black-bellied Plover was observed foraging in tall grass at the northwestern end of Troutman Lake by Sealy on 20 August 1967. This is the first record of the species from the island.

Bristle-thighed Curlew. *Numenius tahitiensis* (Gmelin). An adult female Bristle-thighed Curlew was collected at Gambell on 18 May 1968 by Archie Slwooko and given to Larry Shults of the AHRC. This bird (UAM 3111), the second from the island, contained ova up to 3 mm in diameter. The previous specimen, a young male taken 24 August 1957 on the southern coast of the island, was reported by Fay and Cade (1959).

Long-billed Dowitcher. *Limnodromus scolopaceus* (Say). Two adults, presumed to be a pair, were seen near Gambell on 28 May 1959 by Fay; on 15 July 1960, Fay flushed an adult from its nest, containing four eggs, at the headwaters of the Kookooliktook River. This is the first definite breeding record of this species from the island. An adult male was collected by Fay for parasitological examination on 19 July 1959 at the western end of the Koozata Lagoon and another male (MVZ 142777) was taken near the southern tip of Aghnaghak Lagoon on 15 July 1960. Bédard collected an immature bird (UBC 12493), identified as *L. scolopaceus* by F. A. Pitelka of the MVZ (in litt., 1968), near Gambell on 5 September 1965. Earlier records were summarized by Fay and Cade (1959).

Ruff. *Philomachus pugnax* (Linnaeus). Five Ruffs, three in black plumage and two in brown plumage, were observed by V. K. Slwooko near Gambell on 17 June 1961. One of the black males was collected and given to Fay (USNM 530741). Another male (UAM 3112) was taken on 3 June 1968 near Akeftapak by Hugo Apatiki and given to R. O. Stephenson, who reported (in litt., 1968) that two others had been taken near Savoonga about the same time. Four specimens, taken in 1933, were reported by Friedmann (1934b) and Murie (1936).

Glaucous-winged Gull. *Larus glaucescens* Naumann. The status of this gull on St. Lawrence Island remains uncertain, for we have found no evidence to confirm Brooks' (1915) record of its nesting there. Sealy saw several Glaucous-winged Gulls in adult plumage over the auklet colonies on Sevuokuk Mountain during the summer of 1967, but neither Bédard nor Fay saw any adults in their extensive travels about the island. Fay investigated the small colony of nesting gulls on the Koozata Lagoon, reported earlier as "possibly . . . glaucous-winged" (Fay and Cade 1959:119), and found them to be Glaucous Gulls, *L. hyperboreus* Gunnerus. First-year Glaucous-winged Gulls, along with first-year Herring Gulls, *L. argentatus* Pontoppidan, and Glaucous Gulls, are usually abundant along the southern and western coasts from September to November, and it is from these assemblages that most of the specimens have been taken (Murie 1936; Fay and Cade 1959). Conceivably, the bones from the middens (Friedmann 1934a) also were from such immature birds.

Mew Gull. *Larus canus* Linnaeus. A flock of seven Mew Gulls was seen flying along the shore of Chibukak Point near Gambell by Sealy on 21 May 1966. This species was formerly known from the island only from bones from the middens (Friedmann 1934a).

Red-legged Kittiwake. *Rissa brevirostris* (Bruch). A Red-legged Kittiwake was observed near Gambell in June 1966 by Steven Young of Harvard University (pers. comm., 1966). There is one previous sight record by Fay near Taphook Point on 4 June 1953 (Fay and Cade 1959). The only definite record is a humerus found in a midden (Friedmann 1934a).

Ross' Gull. *Rhodostethia rosea* (MacGillivray). In early December 1966, Fay and Elmer T. Feltz of the AHRC observed several Ross' Gulls feeding in the surf along the shore near Gambell. These birds evidently arrived with a southwesterly storm, and they departed again when it subsided. While in the area they were continuously in company with Sabine's Gulls, *Xema sabini* (Sabine), and these assemblages appeared to include both adult and immature birds. The occurrence of Ross' Gulls at St. Lawrence Island was indicated earlier by the Eskimos' reports of a "pink gull" (Fay and Cade 1959:121). No specimens have been collected.

Dovekie. *Plautus alle* (Linnaeus). A male Dovekie (UBC 13339) was collected by Sealy on 28 June 1967 on the northeastern slope of Sevuokuk Mountain, where it was sitting on the snow in company with several Crested, *Aethia cristatella* (Pallas), and Least, *A. pusilla* (Pallas), Auklets. This specimen, which still retained much of its juvenal plumage, was assigned by W. E. Godfrey (in litt., 1968) to the race *alle*. Another subadult male (USNM 531516), taken in the same area by Keith Ozeva of Gambell on 29 June 1968 and given to Fay,

was also referred to *alle* by R. C. Banks (in litt., 1968). Godfrey (in litt., 1968) also examined the specimen (UBC 12492) collected by Bédard (1966) and referred it to the larger Asiatic race *polaris*. As such, it constitutes the most easterly record of that race and the first record from within the political limits of North America. Sealy observed another Dovekie on Sevuokuk Mountain on 24 July 1967, and Bédard (1966) saw four in addition to the specimen he reported.

Black Guillemot. *Cepphus grylle* (Linnaeus). The wing of a Black Guillemot was found by Sealy on 12 July 1966 near a small lake about one mile inland from Kavalghak Bay. The wing (AMNH 786650) was identified by C. E. O'Brien (in litt., 1967) as that of *C. g. mandtii*. This Atlantic–Arctic Ocean species has been reported twice before from St. Lawrence Island (Friedmann 1932a; Bédard 1966), but this is the first specimen that has been assigned to a subspecies.

Kittlitz's and Marbled Murrelets. *Brachyramphus brevirostre* (Vigors) and *B. marmoratum* (Gmelin). Fay and R. L. Rausch investigated the alleged "colony" of murrelets on Atuk Mountain (Fay and Cade 1959:124) in July 1959 but found no sign of the birds despite a thorough search of the area. In July 1966 Fay and D. Shinen watched for murrelets at the head of Wanmayee Creek, where they were also suspected earlier to occur (loc. cit.), but no alcids of any kind were seen. Bédard and Sealy collected an adult male Kittlitz's Murrelet just north of Gambell on 4 June 1966 (UBC 13268), and Bédard (1966) reported a Marbled Murrelet taken earlier. These are the only specimens of *Brachyramphus* from the island, other than bones from the middens (Friedmann 1934a).

Ancient Murrelet. *Synthliboramphus antiquum* (Gmelin). Bédard (1966) collected an Ancient Murrelet (UBC 11873) and observed another near Kitnepaluk on 29 July 1964; he observed two more in the same location on 27 July 1966 and collected one of these. The only previous record from the island was that of Gabrielson (Gabrielson and Lincoln 1959) who saw one Ancient Murrelet at Southeast Cape on 3 August 1946.

Rock Dove. *Columba livia* Gmelin. Several residents of Gambell reported to Fay that a domestic pigeon (= Rock Dove), wearing a leg band, was seen by them in the village during the autumn of 1964. Apparently one had been seen there about 20 years earlier. This is the first report of this species from the island.

Short-eared Owl. *Asio flammeus* (Pontoppidan). This owl occurs irregularly as a migrant in spring and autumn but is ordinarily absent during the summer (Fay and Cade 1959). However, in June 1959 a pair with a nest was found near the base of Sevuokuk Mountain by Conrad Ozeva of Gambell and reported to Fay. In the same year Fay saw two of these owls near Ooynik Point on 26 July and found an abundance of cast feathers of this species on the tundra in the same area. The following year Elmer Campbell, also of Gambell, reported another nest containing four eggs at the base of Sevuokuk Mountain about 1 July, and C. Ozeva found two more nests on 9 July near the southern end of Troutman Lake, one containing five eggs, the other, four. These records of nesting by Short-eared Owls, the first from the island, were regarded by the Eskimos as very unusual. They suggest that these birds do occasionally nest there in considerable numbers, contrary to the opinion expressed earlier by Fay and Cade (loc. cit.). Their occurrence in 1959 and 1960 was correlated with very low, rather than high population densities of northern voles, *Microtus oeconomus* Pallas (Fay, unpubl. data), the principal prey species in the area.

Hummingbirds. *Trochilidae*. V. K. Slwooko observed a hummingbird near the mouth of the Moghoweyik River in September 1960 and reported to Fay that the bird was "brown" with some greenish tinge. This is the third unconfirmed report of a hummingbird on St. Lawrence Island, and the description in this case suggests the Rufous Hummingbird, *Selasphorus rufus* (Gmelin). This species breeds in southern Alaska and may have been sighted previously as far north as Nunivak Island, some 400 km SE of the Moghoweyik locality (Gabrielson and Lincoln 1959). Earlier reports of hummingbirds on St. Lawrence Island (Fay and Cade 1959) could have been of this species.

Horned Lark. *Eremophila alpestris* (Linnaeus). A Horned Lark (UBC 9332) taken at Gambell on 14 May 1958 by Fay was identified by Herbert Friedmann (in litt., 1959) as belonging "with a series from northern Alaska, of the race *arcticola*," and showing "no intermediacy towards *flava*, the race of northern and northeastern Siberia." A second specimen (alcoholic in UBC) was collected by Bédard on 4 June 1966 near Gambell, and seven Horned Larks were seen in Gambell by Sealy on 31 May of the same year. Two more specimens (UBC 13356, 13357) were collected from a flock of six by Sealy (1968) on 25 August

1967. However, these were identified as belonging to the race *flava* (R. C. Laybourne, in litt., 1967). The specimens of *flava* are the most easterly on record, and those of *arcticola* are the most westerly for that race.

Tree Swallow. *Iridoprocne bicolor* (Vieillot). Two Tree Swallows were taken by Eskimo boys at Savoonga in July 1963 (M. C. Stryker, in litt., 1963), and Bédard observed one near the northern end of Troutman Lake on 30 May 1964. Sealy saw another between Gambell and Sevuokuk Mountain on 19 June 1967. A mummified swallow was found on the beach at Gambell by R. O. Stephenson on 2 August 1968 and given to Fay; the specimen (USNM 531923) was subsequently identified as an immature *I. bicolor* by R. C. Banks (in litt., 1969). Other sight records were reported by Sauer and Urban (1964); one specimen was reported by Fay and Cade (1959).

Cliff Swallow. *Petrochelidon pyrrhonota* (Vieillot). A non-breeding female Cliff Swallow was taken by Fay on 31 May 1962 at Gambell. The skin (USNM 530742) was identified by G. E. Watson (in litt., 1962) as that of *P. p. pyrrhonota* and is the first specimen of this species from the island. Two sight records from near the cliffs of Chibukak Point were reported earlier by Sealy (1967a).

Red-breasted Nuthatch. *Sitta canadensis* Linnaeus. On 28 September 1969 a juvenile male Red-breasted Nuthatch was collected on the beach near Gambell by V. K. Slwooko and forwarded to Fay. Identification of the specimen (USNM 532682) as *S. canadensis* was confirmed by R. C. Banks (in litt., 1969), who compared it also with "the similar appearing . . . *S. villosa* of China." This is the first record of *S. canadensis* on St. Lawrence Island and the farthest northwestern record of the species.

Robin. *Turdus migratorius* Linnaeus. On 21 August 1967 Sealy saw a Robin flying along the western slope of Sevuokuk Mountain. This is the first record of this species from the island.

Gray-cheeked Thrush. *Hylocichla minima* (Lafresnaye). A Gray-cheeked Thrush (UBC 13413) was found dead on Sevuokuk Mountain by R. L. Rausch on 23 July 1959 and was subsequently identified by Herbert Friedmann (in litt., 1959) as *H. m. minima*. Fay collected another specimen (USNM 530743) on 7 June 1962, also assigned to the race *minima* by R. C. Banks (in litt., 1968), and saw three others between 12 and 15 June of that year. The song of a Gray-cheeked Thrush was heard along the east side of Troutman Lake on 16 June 1966 by Bédard, Sealy, and Udvardy, and three were seen on top of Sevuokuk Mountain by Sealy on 3 September 1967. One of these, an immature female (UBC 13309), was collected and also identified as *minima* by W. E. Godfrey (in litt., 1968). One specimen was reported earlier by Murie (1938).

Wheatear. *Oenanthe oenanthe* (Linnaeus). A few Wheatears are ordinarily seen on Sevuokuk Mountain for a few days in May and August each year, apparently during their intercontinental migrations. During August 1958 and 1968 they were unusually abundant and were seen about as often as the very common Snow Bunting, *Plectrophenax nivalis* (Linnaeus), even within the village of Gambell. Sealy saw a few on Sevuokuk Mountain throughout June and July 1967, and on 17 June collected an adult female with two "bobtailed" young (UBC 13297, 13298, 13299) that were incapable of sustained flight. This is the first positive evidence of nesting by Wheatears on St. Lawrence Island, though observations of Sauer and Urban (1964) were highly suggestive of their nesting there. Specimens were reported earlier by Murie (1936), Friedmann (1937), and Fay and Cade (1959).

Yellow Wagtail. *Motacilla flava* Linnaeus. During August of 1966 and 1967 on Sevuokuk Mountain Sealy saw several large flocks of Yellow Wagtails, some of which contained at least 200 individuals. Smaller flocks were seen there also by Fay in mid-August 1969, but none was noticed in other years. Whereas Fay and Cade (1959) considered this species as uncommon on the island, these observations indicate that it is sometimes common in passage, at least during the autumn migration. An adult female (UBC 8263) taken on 26 August 1956 (Fay and Cade 1959) and subsequently assigned to the race *tschutschensis* (R. C. Banks, in litt., 1969), suggests that the passage birds comprise a segment of the population that nests in western Alaska and northeastern Siberia.

Courtship displays by Yellow Wagtails summering on the eastern end of St. Lawrence Island were reported by Thompson (1967), and, at the western end of the island, a displaying male was seen by Sealy near the northeastern corner of Troutman Lake on 15 June 1966. A male in display was observed in the same locality by Fay on 15 June 1962, and a nest was discovered there by Eskimo boys a few hours later. On the same day, Fay located another courting male near the northwestern corner of this lake and collected it. On the following day, a female was flushed from a nest beneath that male's display area. The

contents of the nest (5 eggs) were collected and deposited in the UPS, along with the skin of the adult male. This is the only definite record of nesting by Yellow Wagtails on the island. The male (UPS 769) was compared by R. C. Banks and R. C. Laybourne with examples of the races *tschutschensis* and *simillima* and was found to correspond most closely to the former in size and to the latter in color. They concluded that, since these birds seem to be more variable in size than in color, "the best course is to refer the specimen to *simillima*" (Banks, in litt., 1970). *M. f. simillima* has been recorded twice previously within the political boundaries of North America (Gabrielson and Lincoln 1959; Kenyon 1961; Thompson and DeLong 1969).

Water Pipit. *Anthus spinoletta* (Linnaeus). Pipits are infrequently encountered but are relatively common in the mountainous areas of the island in summer, and we suspect that the Water Pipit nests there regularly in small numbers. Two specimens of *spinoletta* have been reported (Friedmann 1937; Fay and Cade 1959). The first was assigned to the race *pacificus* (Gabrielson and Lincoln 1959); the race of the second (UBC 8264) has not been determined for the specimen seems to have been lost.

Red-throated Pipit. *Anthus cervinus* (Pallas). We also suspect that this pipit nests in the mountainous regions of the island, from which there are three specimens. The first was reported by Friedmann (1937), the second by Watson (1963), and the third (UBC 9331), previously unreported, is a juvenile female taken by Fay on Sevuokuk Mountain on 18 August 1958 and identified by H. Friedmann (in litt., 1959).

Indian Tree Pipit. *Anthus hodgsoni* Richmond. This species is represented by an adult male observed in courtship display near Gambell by Fay on 1 June 1962 and collected the same day. This specimen (USNM 530744) was assigned by G. E. Watson (in litt., 1962) to the race *yunnanensis*, and is the first record of the Indian Tree Pipit from within the political limits of North America. The second record, a specimen collected in Nevada on 16 May 1967, was reported by Burleigh (1968).

Wilson's Warbler. *Wilsonia pusilla* (Wilson). Between 28 and 31 August 1966, Sealy saw four Wilson's Warblers on Sevuokuk Mountain and another in the same area on 30 August 1967. The only other record of this species from the island is a specimen taken at Kukulik more than 30 years earlier (Murie 1936).

Rusty Blackbird. *Euphagus carolinus* (Müller). One specimen (USNM 510911) collected by Tom Antoghame of Gambell and V. K. Slwooko on the Putgut Plateau on 25 October 1960 was given to Fay. Another was reported previously by Murie (1938). According to Slwooko, this bird, rather than "*Corvus* sp.," is the small "crow" that is dominant over the Ravens, *C. corax* Linnaeus (see Fay and Cade 1959:128).

Bullfinch. *Pyrrhula pyrrhula* (Linnaeus). In July 1959 John Aningayou of Gambell reported to R. L. Rausch and later to Fay that an unusual bird had entered his house via an open window about one month earlier. From his description the bird was identifiable as a Bullfinch. One specimen was reported earlier by Friedmann (1937).

Hoary Redpoll. *Acanthis hornemanni* (Holboell). Redpolls occur irregularly on St. Lawrence Island, usually during the spring and fall migrations, and the Eskimos report that they occasionally nest in and around the villages and camps (Fay and Cade 1959). Since the islanders do not seem to recognize the paler *hornemanni* phenotype as being different from the darker *flammea*, we have not been able to determine from their comments which of the two is the more common breeder there. A nest containing four eggs was found by V. K. Slwooko and Lewis Iyakitan of Gambell on 10 June 1960 on a meat-drying rack near Slwooko's camp at the western end of the Koozata Lagoon. Judging from Sauer's observations there about the same time (Sauer and Urban 1964), we assume that this was a nest of *hornemanni*. Sealy observed a pair of Hoary Redpolls building a nest under the eaves of a house in Gambell on 12 June 1967 and found another in a similar location on 19 June. The latter nest was constructed of grasses, twine, cotton, and string, and lined with dogs' hair; it contained one broken and one intact egg (AMNH 17474). These are the first definite nesting records of *A. hornemanni* from the island. Three specimens were reported earlier by Murie (1936), Gabrielson and Lincoln (1959), and Fay and Cade (1959). Five additional specimens were collected by Fay: a male on 13 March 1958 (AHRC 21125) and three males and one female on 3 November 1959 (AHRC 23916–9).

Common Redpoll. *Acanthis flammea* (Linnaeus). In our experience, the darker *flammea*-type redpolls are less common than the lighter *hornemanni*-type and are more often seen in the summer than in the spring and autumn. Thus far, no mixed flocks or birds of intermediate plumage have been noticed (cf. Williamson

et al. 1966), and there is no definite record of nesting by *flammea*. Two adult specimens, including one taken by Brooks (1915), were referred to the questionable race *holboellii* by Friedmann (1932a). Two additional specimens were taken on Sevuokuk Mountain: an immature female (AHRC 23491) by Fay on 29 July 1959, and an immature male (AMNH 786649) by Sealy on 1 September 1967.

Pine Siskin. *Spinus pinus* (Wilson). A Pine Siskin was observed on the gravel plain between Gambell and Sevuokuk Mountain by Bédard and Fay on 19 July 1964, and a specimen (USNM 530747) was collected one week later in the same area by Eskimo boys. This bird, identified by R. C. Banks (in litt., 1968) as *S. p. pinus*, is the first record of this species from the island.

American Goldfinch. *Spinus tristis* (Linnaeus). Three Goldfinches were seen by Bédard near Gambell on 10 August 1964 following several days of strong easterly winds. This species has not been recorded previously in Alaska.

Red Crossbill. *Loxia curvirostra* Linnaeus. Two Red Crossbills, collected near Gambell on 15 August 1961, were preserved in ethanol by V. K. Slwooko and given to Fay. These specimens (USNM 510909, 510910) were identified by R. C. Banks (in litt., 1968) as belonging to the North American race *sitkensis*. Seven more preserved specimens of the same race (USNM unnumbered) and another prepared as a study skin (USNM 530745) were taken in the same locality on 26 July 1962 by Eskimo boys. Three more were seen by Fay on Sevuokuk Mountain on 29 July 1962.

White-winged Crossbill. *Loxia leucoptera* Gmelin. One White-winged Crossbill (USNM 530746) was taken by Eskimo boys near Gambell on 26 July 1962 and given to Fay. This specimen was identified by Max C. Thompson (in litt., 1966) and assigned to the race *leucoptera*. Another white-wing was seen by Fay on Sevuokuk Mountain on 29 July 1962.

These are the first definite records of crossbills from the island, although their occurrence there was suspected from a report of a bird killed 18 years earlier by a Gambell resident, Roger Slwooko (Fay and Cade 1959).

Slate-colored Junco. *Junco hyemalis* (Linnaeus). A junco of this species USNM (530748) was collected by Fay on 28 May 1962 at Gambell and identified by R. C. Banks (in litt., 1968) as *J. h. hyemalis*. Another was seen by Sealy on Sevuokuk Mountain on 10 September 1966. Two specimens were reported earlier by Murie (1938), and one sight record was reported by Fay and Cade (1959).

Oregon Junco. *Junco oreganus* (Townsend). The single specimen of this species, reported earlier by Fay and Cade (1959), was subsequently assigned by Alden H. Miller (in litt., 1959) to the race *montanus*, of the interior mountains of western Canada and the United States. As such, it comprises the westernmost record of the race, which was known previously as an "accidental" as far west as the Yukon Valley of central Alaska (Gabrielson and Lincoln 1959).

White-crowned Sparrow. *Zonotrichia leucophrys* (Forster). A White-crowned Sparrow was collected in Gambell by V. K. Slwooko on 15 August 1961 and given to Fay. Another was taken by Bédard on the western slope of Sevuokuk Mountain on 3 September 1966, and two more were taken by Fay in the same locality on 28 and 29 August 1968. These specimens (USNM 510907, 510908, 532680, 532681), all in juvenal plumage, comprise the first records of this species from the island. Each was assigned to the race *gambelli* by R. C. Banks (in litt., 1968, 1969).

Fox Sparrow. *Passerella iliaca* (Merrem). An adult female Fox Sparrow (AHRC 21460) was collected on 27 May 1958 at Gambell by Fay. This specimen, the first of its kind from the island, was identified by F. S. L. Williamson (in litt., 1969) as belonging to the race *sinuosa* of southcentral Alaska. It constitutes the farthest northwestern record of wandering by a bird of that race.

DISCUSSION

The avifauna of St. Lawrence Island, as now known (table 1), comprises 141 species, 22 of which are "new" since the publication of Fay and Cade's (1959) analysis. At least 14 of the new birds occur regularly on or migrate along the continental coasts opposite the island, or they occur regularly on other islands of the Bering Sea. The majority of these (i.e., *Podiceps auritus*, *Anas platyrhynchos*, *Charadrius hiaticula*, *Squatarola squatarola*, *Totanus flavipes*, *Eremophila alpestris*, *Petrochelidon pyrrhonota*, *Passerculus sandwichensis*, and *Plectrophenax hyperboreus*) could be expected to find suitable habitats for nesting on the island, as, indeed, some of them are now known to do. Others, such as *Turdus migratorius*, *Loxia leucoptera*, *Spizella arborea*, and *Zonotrichia leucophrys*, ordinarily nest in or near arborescent vegetation, which does not occur in sufficient quantity or suitable quality on the island. A reconnaissance by R. L. Rausch and Fay in 1959 of the area where Eskimos of the island had reported arborescent willows

TABLE 1. The known avifauna of St. Lawrence Island, arranged according to status and continental affiliation.[a]

Known and probable breeders	Non-breeding visitants
Palearctic land and freshwater	
Yellow-billed Loon (*Gavia adamsii*)	Bean Goose (*Anser fabalis*)
**Ringed Plover (*Charadrius hiaticula*)	Baikal Teal (*Anas formosa*)
American Golden Plover (*Pluvialis dominica fulva*)	European Widgeon (*Mareca penelope*)
Herring Gull (*Larus argentatus vegae*)	Mongolian Plover (*Charadrius mongolus*)
Wheatear (*Oenanthe oenanthe*)	Dotterel (*Eudromias morinellus*)
†Arctic Warbler (*Phylloscopus borealis*)	Polynesian Tattler (*Heteroscelus brevipes*)
White Wagtail (*Motacilla alba*)	Sharp-tailed Sandpiper (*Erolia acuminata*)
Yellow Wagtail (*Motacilla flava*)	‡Black-tailed Godwit (*Limosa limosa*)
†Red-throated Pipit (*Anthus cervinus*)	Ruff (*Philomachus pugnax*)
	Oriental Cuckoo (*Cuculus saturatus*)
	Bluethroat (*Luscinia svecica*)
	Mountain Accentor (*Prunella montanella*)
	*Pechora Pipit (*Anthus gustavi*)
	**Indian Tree Pipit (*Anthus hodgsoni*)
	Bullfinch (*Pyrrhula pyrrhula*)
	Common Redpoll (*Acanthis flammea holboellii*)
Palearctic coastal and marine	
†Bar-tailed Godwit (*Limosa lapponica*)	Short-tailed Albatross (*Diomedea albatrus*)
Ruddy Turnstone (*Arenaria interpres interpres*)	‡Ross' Gull (*Rhodostethia rosea*)
†Black Guillemot (*Cepphus grylle mandtii*)	
Nearctic land and freshwater	
Arctic Loon (*Gavia arctica pacifica*)	Common Loon (*Gavia immer*)
Whistling Swan (*Olor columbianus*)	Canada Goose (*Branta canadensis*)
†Green-winged Teal (*Anas carolinensis*)	White-winged Scoter (*Melanitta deglandi*)
†Greater Scaup (*Aythya marila nearctica*)	Surf Scoter (*Melanitta perspicillata*)
Sandhill Crane (*Grus canadensis*)	Common Scoter (*Oidemia nigra americana*)
†Semipalmated Plover (*Charadrius semipalmatus*)	Golden Eagle (*Aquila chrysaetos canadensis*)
Common Raven (*Corvus corax principalis*)	Bristle-thighed Curlew (*Numenius tahitiensis*)
†Water Pipit (*Anthus spinoletta pacificus*)	‡**Lesser Yellowlegs (*Totanus flavipes*)
Lapland Longspur (*Calcarius lapponicus alascensis*)	Glaucous-winged Gull (*Larus glaucescens*)
	Boreal Owl (*Aegolius funereus richardsoni*)
	‡Belted Kingfisher (*Megaceryle alcyon*)
	‡Hummingbird
	Tree Swallow (*Iridoprocne bicolor*)
	**Cliff Swallow (*Petrochelidon pyrrhonota*)
	**Red-breasted Nuthatch (*Sitta canadensis*)
	‡**Robin (*Turdus migratorius*)
	Gray-cheeked Thrush (*Hylocichla minima*)
	Wilson's Warbler (*Wilsonia pusilla*)
	Rusty Blackbird (*Euphagus carolinus*)
	**Pine Siskin (*Spinus pinus*)
	‡**American Goldfinch (*Spinus tristis*)
	**Red Crossbill (*Loxia curvirostra sitkensis*)
	**White-winged Crossbill (*Loxia leucoptera leucoptera*)
	**Savannah Sparrow (*Passerculus sandwichensis*)
	Slate-colored Junco (*Junco hyemalis*)
	Oregon Junco (*Junco oreganus*)
	‡**Tree Sparrow (*Spizella arborea*)
	‡Chipping Sparrow (*Spizella passerina*)
	**White-crowned Sparrow (*Zonotrichia leucophrys*)
	**Fox Sparrow (*Passerella iliaca*)
Nearctic coastal and marine	
Baird's Sandpiper (*Erolia bairdii*)	Snow Goose (*Chen hyperborea*)
Dunlin (*Erolia alpina pacifica*)	Black Turnstone (*Arenaria melanocephala*)
Long-billed Dowitcher (*Limnodromus scolopaceus*)	‡Semipalmated Sandpiper (*Ereunetes pusillus*)
Western Sandpiper (*Ereunetes mauri*)	
Glaucous Gull (*Larus hyperboreus barrovianus*)	

[a]*** New to the known avifauna since Fay and Cade (1959); * Reported by Friedmann (1938) and inadvertently omitted by Fay and Cade (1959); † Presumed to breed, but no definite record; ‡ Sight or hearsay record only.

TABLE 1. (Continued).

Known and probable breeders	Non-breeding visitants
Trans-beringian land and freshwater	
Red-throated Loon (*Gavia stellata*)	‡**Horned Grebe (*Podiceps auritus*)
Red-necked Grebe (*Podiceps grisegena*)	White-fronted Goose (*Anser albifrons*)
Pintail (*Anas acuta*)	‡**Mallard (*Anas platyrhynchos*)
Oldsquaw (*Clangula hyemalis*)	‡Shoveler (*Spatula clypeata*)
†Harlequin Duck (*Histrionicus histrionicus*)	Common Merganser (*Mergus merganser*)
†Red-breasted Merganser (*Mergus serrator*)	Peregrine Falcon (*Falco peregrinus*)
Rough-legged Hawk (*Buteo lagopus*)	‡Ptarmigan (*Lagopus* sp.)
†Gyrfalcon (*Falco rusticolus*)	‡**Black-bellied Plover (*Squatarola squatarola*)
†Whimbrel (*Numenius phaeopus*)	Mew Gull (*Larus canus*)
†Wandering Tattler (*Heteroscelus incanum*)	‡**Rock Dove (*Columba livia*)
Northern Phalarope (*Lobipes lobatus*)	**Horned Lark (*Eremophila alpestris*)
†Pomarine Jaeger (*Stercorarius pomarinus*)	‡Bank Swallow (*Riparia riparia*)
Parasitic Jaeger (*Stercorarius parasiticus*)	Barn Swallow (*Hirundo rustica*)
Long-tailed Jaeger (*Stercorarius longicaudus*)	
Arctic Tern (*Sterna paradisaea*)	
Snowy Owl (*Nyctea scandiaca*)	
Short-eared Owl (*Asio flammeus*)	
Hoary Redpoll (*Acanthis hornemanni*)	
Snow Bunting (*Plectrophenax nivalis*)	
**McKay's Bunting (*Plectrophenax hyperboreus*)	
Trans-beringian coastal and marine	
Pelagic Cormorant (*Phalacrocorax pelagicus*)	Fulmar (*Fulmarus glacialis*)
Black Brant (*Branta nigricans*)	Slender-billed Shearwater (*Puffinus tenuirostris*)
Emperor Goose (*Philacte canagica*)	Fork-tailed Petrel (*Oceanodroma furcata*)
Steller's Eider (*Polysticta stelleri*)	Red-faced Cormorant (*Phalacrocorax urile*)
Common Eider (*Somateria mollissima*)	Red-legged Kittiwake (*Rissa brevirostris*)
King Eider (*Somateria spectabilis*)	**Marbled Murrelet (*Brachyramphus marmoratum*)
Spectacled Eider (*Lampronetta fischeri*)	Whiskered Auklet (*Aethia pygmaea*)
Rock Sandpiper (*Erolia ptilocnemis*)	
†Pectoral Sandpiper (*Erolia melanotos*)	
Red Phalarope (*Phalaropus fulicarius*)	
Black-legged Kittiwake (*Rissa tridactyla*)	
†Sabine's Gull (*Xema sabini*)	
Common Murre (*Uria aalge*)	
Thick-billed Murre (*Uria lomvia*)	
†**Dovekie (*Plautus alle*)	
Pigeon Guillemot (*Cepphus columba*)	
†Kittlitz's Murrelet (*Brachyramphus brevirostre*)	
†**Ancient Murrelet (*Synthliboramphus antiquum*)	
Parakeet Auklet (*Cyclorrhynchus psittacula*)	
Crested Auklet (*Aethia cristatella*)	
Least Auklet (*Aethia pusilla*)	
Horned Puffin (*Fratercula corniculata*)	
Tufted Puffin (*Lunda cirrhata*)	

(Fay and Cade 1959:77) disclosed only isolated bushes up to 53 cm tall in sheltered sites (behind boulders, in depressions) and no significant stands comparable to those in riparian habitats on the nearby Alaskan mainland. Thus, we regard the birds of this group as "accidentals" on the island, for they are ecologically misplaced, though near the periphery of their normal range.

The remaining birds of table 1, new to the known avifauna, comprise a third group, the members of which also are recognized as "accidentals," but more on the basis of their geographical than ecological misplacement. These birds (*Brachyramphus marmoratum, Synthliboramphus antiquum, Plautus alle, Columba livia, Sitta canadensis, Anthus hodgsoni, Spinus pinus, Spinus tristis, Loxia curvirostra,* and *Passerella iliaca sinuosa*) occur ordinarily some 950–4000 km distant, and their presence on the island is somewhat enigmatic. However, they illustrate by their occurrence the remarkable mobility of birds in their dispersion from centers of abundance and their enormous potential for locating distant units of suitable habitat. St. Lawrence Island seems to be ecologically acceptable as nesting habitat for a few of these birds (e.g., *B. marmoratum*, S.

antiquum, *P. alle*), some of which are believed to have already established small breeding populations there.

Judging from the known ecogeographical history of the island, during the last 10,000 years (Hopkins 1959, 1967; Colinvaux 1967), it is probable that most of the species of birds now inhabiting this area have been there for several millennia. The dynamism of the island's avifauna in that time has been both negative and positive: some species that were apparently common even as recently as 1000 years ago are now scarce or absent (*Diomedea albatrus*, *Phalacrocorax urile*, *Anser albifrons*, *Larus canus*, *Rissa brevirostris*) (Friedmann 1934a; Fay and Cade 1959; Fay 1961); others seem to be newly arrived. For example, the largely allopatric species *Charadrius hiaticula* and *C. semipalmatus* may be now in the process of expanding their ranges to St. Lawrence Island, as they have done previously to Baffin Island (Vaurie 1964; Smith 1969). The number of individuals of each kind in this new area of sympatry is small, and it is not yet clear whether only one or, perhaps, both species nest there.

Plautus alle is another example of a recently arrived species on the island. These birds are mainly restricted to the North Atlantic–Arctic, where two slightly differentiated races, *P. a. alle* and *P. a. polaris*, are found. Juvenile and adult birds of *alle* and an adult of *polaris* have been taken in the auklet colonies of Sevuokuk Mountain, and hearsay reports indicate that some have occurred on this and other islands of the Bering Sea for many years (Bédard 1966; Breckenridge 1966; Holmes 1968). Their small numbers and bi-racial characters indicate that these pioneers reached this area very recently. While small breeding colonies may have become established already on some of the islands, their numbers are probably augmented occasionally also by the arrival of new immigrants from the North Atlantic centers. Specimens have been taken in recent years along the potential dispersion routes by which these birds must pass to reach the Bering Sea, e.g., Perry River, Northwest Territories (Gavin 1947), Melville Island, N.W.T. (Swainson and Richardson 1831), Barrow, Alaska (Bailey 1948), and New Siberian Islands (Kozlova 1957).

The spread to the Bering Sea of Dovekies, Black Guillemots, and some other arctic maritime birds in their present form has certainly taken place since the last inundation of the Bering Land Bridge some 10,000 years ago, for their passage from the north would have been barred prior to that time by the "bridge" itself (e.g., see Hopkins 1959). Differentiation of some of these birds from their North Pacific counterparts evidently took place earlier as a result of this barrier (Udvardy 1963), which served also as an unglaciated refugium for terrestrial birds at several times in the past. The importance of the intermittently emergent "land bridge" as a differentiating factor for birds was recognized by Fay and Cade (1959), who regarded 34 species with centers of abundance in the Beringian area as comprising an indigenous "Aleutican avifauna" (after Palmer 1899). While it is now clear (Gressitt and Lindroth 1963; Hopkins 1967; Ploeger 1968; Portenko 1968) that this group was a composite of birds of Beringian and Aleutian origins, the concept of an ecogeographical faunal group of local origin was useful for evaluation of the relative importance of indigenes, as opposed to continental immigrants, as colonizers of the island. In the present analysis we are primarily concerned with the birds of continental origin, for the relative numbers of Beringian, Aleutian, and Holarctic species in the island's avifauna have not been greatly changed by the additions since Fay and Cade's evaluation, whereas those with Palearctic and Nearctic affiliation have changed significantly and require reconsideration. Of the 22 species and subspecies new to the known avifauna of the island since Fay and Cade's report, 11 are of Nearctic derivation, while only two are from the Palearctic. Thus, as now known, the Nearctic component comprises nearly 60 per cent more species (47:30) than does the Palearctic component. This difference is of some importance in relation to the island's geographic location and, especially, in relation to the fact that most of the avifaunal investigations there have been conducted on the northwesternmost tip, some 60 km from the Chukotski Peninsula and nearly 300 km from the nearest point (Seward Peninsula) on the Alaskan mainland. On geographical grounds alone, one might have expected the representation to be exactly the reverse.

TABLE 2. Analysis of the avifauna of St. Lawrence Island by nesting habitat and faunal group affiliation.

Habitat	No. of species			
	Trans-beringian	Palearctic	Nearctic	Total
Land				
Arboreal and pararboreal	1	7	19	27
Tundra and grassland	32	18	20	70
Coastal and marine	31	5	8	44
Total	64	30	47	141

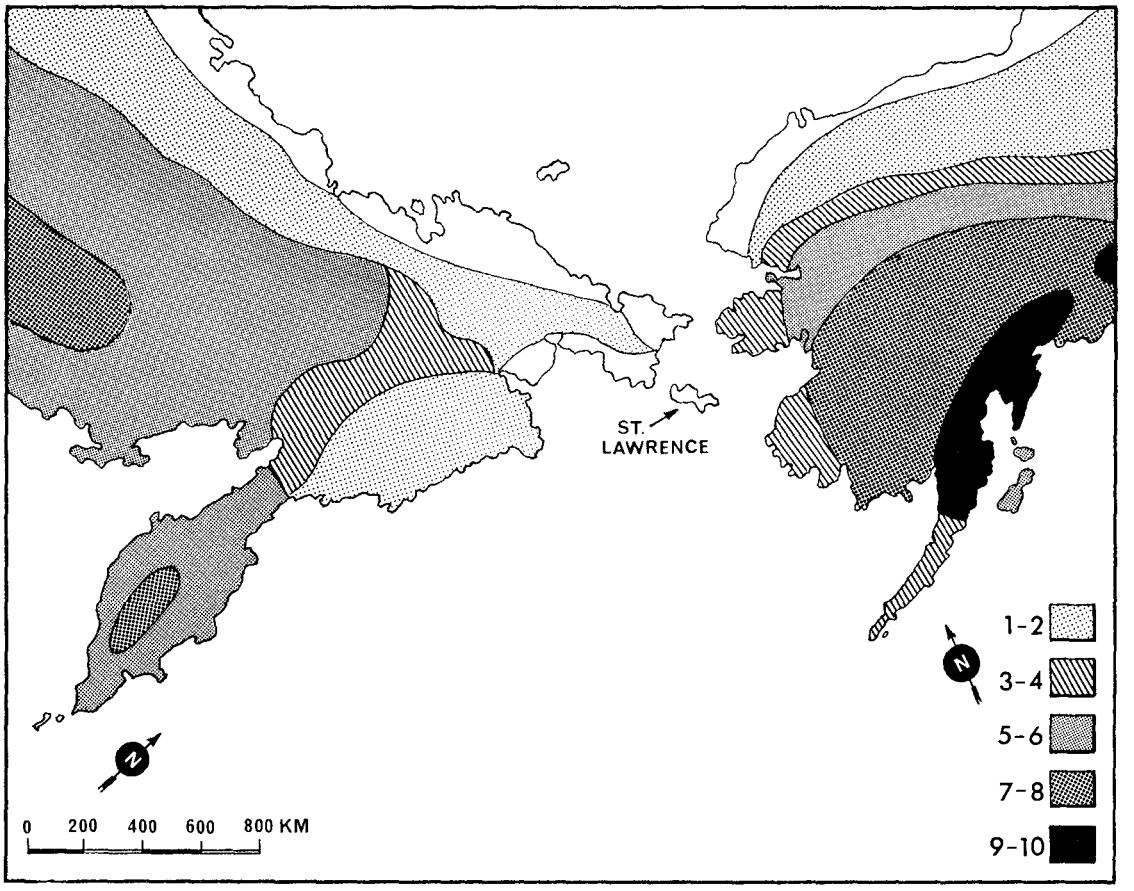

FIGURE 2. Distribution of forest and brushland fringillids in Beringia and contiguous areas, illustrating the relative nearness and diversity of Nearctic species to St. Lawrence Island. The number of species nesting in each area is indicated by differential shading. Eastern Siberia: *Chloris sinica, Pyrrhula pyrrhula, Carpodacus erythrina, Fringilla montifringilla, Leucosticte arctoa, Emberiza leucocephalos, E. aureola, E. rustica, E. pusilla, E. pallasi, E. variabilis*; Alaska–Yukon: *Leucosticte (arctoa) tephrocotis, Spinus pinus, Loxia curvirostra, L. leucoptera, Junco hyemalis, J. oreganus, Spizella arborea, S. passerina, Zonotrichia leucophrys, Passerella iliaca, Melospiza lincolni*, and *M. melodia*.

For our analysis of this situation, we combined the species in the island's fauna that have Amphiberingian, Aleutian, or Holarctic distributions under the collective heading "Trans-beringian" (table 1), to indicate their lack of continental affiliation. Each could have reached the island from either or both continents or from the intercontinental islands to the south. About half are coastal or marine birds; most of the remainder are birds of tundra or grassland habitats (table 2). In contrast to these are the species with centers of abundance and presumed origin on one or the other of the continents. The Palearctic birds probably could have reached the island only from the Eurasian continent. More than half of these nest in tundra or grassland situations; the remainder is about equally drawn from arboreal and maritime habitats. Species centered in the Nearctic region probably reached the island from the North American continent. The majority of these are birds of terrestrial and freshwater habitats of the interior as well as of the coast of Alaska; the remaining few are closely restricted to maritime situations. About half of the Nearctic terrestrial and freshwater species nest in trees or brush (arboreal) or nest on the ground in wooded or brushy areas (pararboreal), hence none of these nests on the island; they occur there only as visitants. It is this group that makes up the difference between the Nearctic and Palearctic components. About 70 per cent of the arboreal and pararboreal birds occurring on the island are ecologically misplaced accidentals from the North American continent.

The principal reason for the greater representation of arboreal species from the Nearctic than from the Palearctic seems to be the closer proximity of forests and brushlands in North America. This is illustrated in the distributions of northeastern Palearctic and northwestern

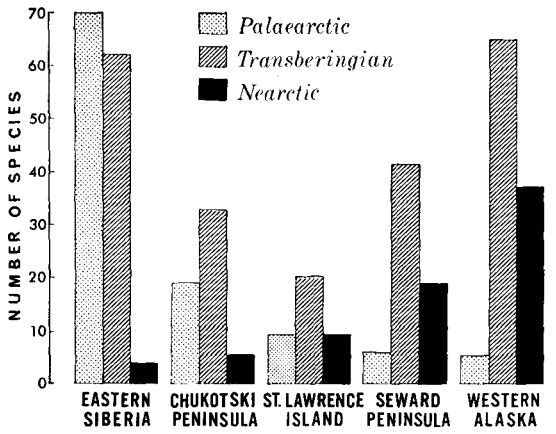

FIGURE 3. Number of species of land and freshwater birds nesting in each of five areas along an east–west transect of Beringia. The avifauna of each area is divided into three segments: Palearctic (species that occur only to the west), Nearctic (species that occur only to the east), and Trans-beringian (species that occur to both the west and the east of Bering Strait).

Nearctic fringillids of wooded habitats of figure 2. Whereas nine or ten species normally nest on the Alaskan mainland within 800 km of the island, only three or four come within that range in eastern Siberia. Only one of the Siberian birds has been recorded on the island, while nine of the Alaskan species have been taken there.

The greater probability of Nearctic birds reaching the island may be attributed also to the presence of a major north–south migration route along the nearby western coast of Alaska (Irving 1960), as well as of an east–west route via St. Lawrence Island (Fay 1961). Having a migration route in the vicinity often leads to the occurrence of many accidentals that are diverted from their normal routes or are involved in random dispersal flights. No corresponding routes are known to us that could carry arboreal birds along or from the Siberian coast to the island.

The real test of the continental affinities of an insular avifauna will be found in the comparison of its nesting land birds with those of the assumed source areas. Each of the two peninsulas (Chukotski and Seward) that flank St. Lawrence Island has a breeding avifauna slightly larger than that of the island itself; still larger faunas are present in the contiguous continental areas (northeastern Siberia, western Alaska). Along this faunal transect (fig. 3), we find that the number of breeding Palearctic and Nearctic birds diminishes rather evenly across the island; no abrupt change or major imbalance is discernible. This may indicate that at the time of the last basic faunal contact, i.e., via the now inundated Bering Land Bridge, nothing but ecological conditions barred the exchange of the continental faunas. The taxonomic and present ecological affiliations of most of these birds seem to indicate that they were not part of a Wisconsin or early post-Wisconsin Beringian avifauna but were subsequent invaders, following the northward shift of habitat zones. The arboreal birds occupy a special position among the immigrant species. Genuine forest birds occur far away from Bering Strait but are widespread in their secondary distribution area (e.g., *Bombycilla garrulus*, *Lanius excubitor*, *Troglodytes troglodytes*, the forest owls, etc.). It is generally assumed that they crossed the Beringian area on an earlier occasion (e.g., see Stegmann 1963). Those "exchange species" that occur near Bering Strait now are all tied to the scrub-tundra or riparian scrub habitats (*Parus cinctus*, *Hylocichla minima*, *Luscinia svecica*, *Phylloscopus borealis*, *Anthus cervinus*), indicating that the Asiatic and North American taigas were too far from this area, even in the Hypsithermal period, to permit intercontinental avian exchanges other than of the depauperate fauna of the scrub-tundra outposts.

Pertinent to this discussion is the recent paper by Portenko (1968), in which he argues against the existence of an extensive intercontinental land connection on the basis that (1) there are several species of land birds that extend to, but do not cross, the present water barrier, and (2) there are no terrestrial or freshwater endemic species (only coastal endemics) that originated in the Beringian area. However, it is clear from the geological evidence (Hopkins 1967) that there was an extensive land connection with a somewhat cooler, drier climate than now, and that during the interglacial periods this land was inundated, as it is now. In the interim between emergence and inundation, birds of the steppe–tundra would most likely have responded to the climatic warming by retreating to alpine refuges or by extinction. Thus we must look to the alpine tundra of this area for endemic birds of the Bering Land Bridge. There we find *Numenius tahitiensis*, *Heteroscelus incanum*, and *Calidris tenuirostris*.

Another condition that may have contributed to the paucity of endemic avian species in this area is the relative brevity of the Wisconsin–Würm emergence of the Beringian platform, in which period most of the resident birds probably could not have differentiated sufficiently as to retain their identity after the postglacial reinvasion of this area by their close

relatives. McKay's Bunting, *Plectrophenax hyperboreus* Ridgway, may be a singular exception to this condition. Previously considered an insular form with a very restricted range, this bunting is now known to have a wider distribution, into the range of its Holarctic congener, the Snow Bunting, with which it apparently interbreeds (Sealy 1967b, 1969). The hybridization of these two species under natural conditions, together with the scarcity of *P. hyperboreus* outside its normal range, suggest that the latter is a Beringian relict that persists by reason of its remote isolation on Hall and St. Matthew Islands and that is quickly absorbed by populations of its close relatives in areas of sympatry.

SUMMARY

This report presents new observations of 55 species of rare and uncommon birds on St. Lawrence Island, Alaska, between 1958 and 1969, with a discussion of the zoogeographical significance of these and previous records. The known avifauna of the island now comprises 141 species, including 19 unconfirmed sight records. Sixty-nine species are known or presumed to nest on the island.

Among the 55 species discussed here, first specimen records of *Melanitta deglandi*, *Oidemia nigra*, *Charadrius hiaticula tundrae*, *Plautus alle alle*, *Brachyramphus brevirostre*, *Eremophila alpestris arcticola*, *Petrochelidon pyrrhonota pyrrhonota*, *Sitta canadensis*, *Motacilla flava simillima*, *Anthus hodgsoni yunnanensis*, *Spinus pinus pinus*, *Loxia curvirostra sitkensis*, *L. leucoptera leucoptera*, *Zonotrichia leucophrys gambelli*, and *Passerella iliaca sinuosa* and first sight records of *Podiceps auritus*, *Anas platyrhynchos*, *Squatarola squatarola*, *Larus canus*, *Columba livia*, *Turdus migratorius*, and *Spinus tristis* from the island are reported. Three of these (*C. hiaticula*, *A. hodgsoni*, *S. tristis*) are new to the known avifauna of Alaska. Nesting by *Podiceps grisegena*, *Charadrius hiaticula*, *Limnodromus scolopaceus*, *Asio flammeus*, *Oenanthe oenanthe*, *Motacilla flava*, and *Acanthis hornemanni* on the island is recorded for the first time.

The island's avifauna is dynamic: subspecific identification and addition of several "extralimital" nesters indicate recent immigrations from the north (*Plautus alle*, *Cepphus grylle*), east (*Charadrius semipalmatus*), south (*Synthliboramphus antiquum*), and west (*Charadrius hiaticula*, *Motacilla alba*, *M. flava*).

The nearness of wooded habitats in neighboring Alaska and their remoteness in nearby Siberia account for the greater abundance of Nearctic than of Palearctic birds among the accidental visitants. However, a survey of breeding land and freshwater birds along a transect from northeastern Siberia to western Alaska shows a gradual attenuation of continental faunas via the island, instead of an imbalance or interruption at the sea "barrier."

The present distribution of breeding land birds does not refute the theory of a late Wisconsin land area across the present Bering Strait. Postglacial climatic and sea-level changes might explain the present paucity of Beringian endemic land birds, most of which probably were absorbed by re-invading populations of closely related forms. The few remaining today are restricted to small alpine and insular refugia.

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