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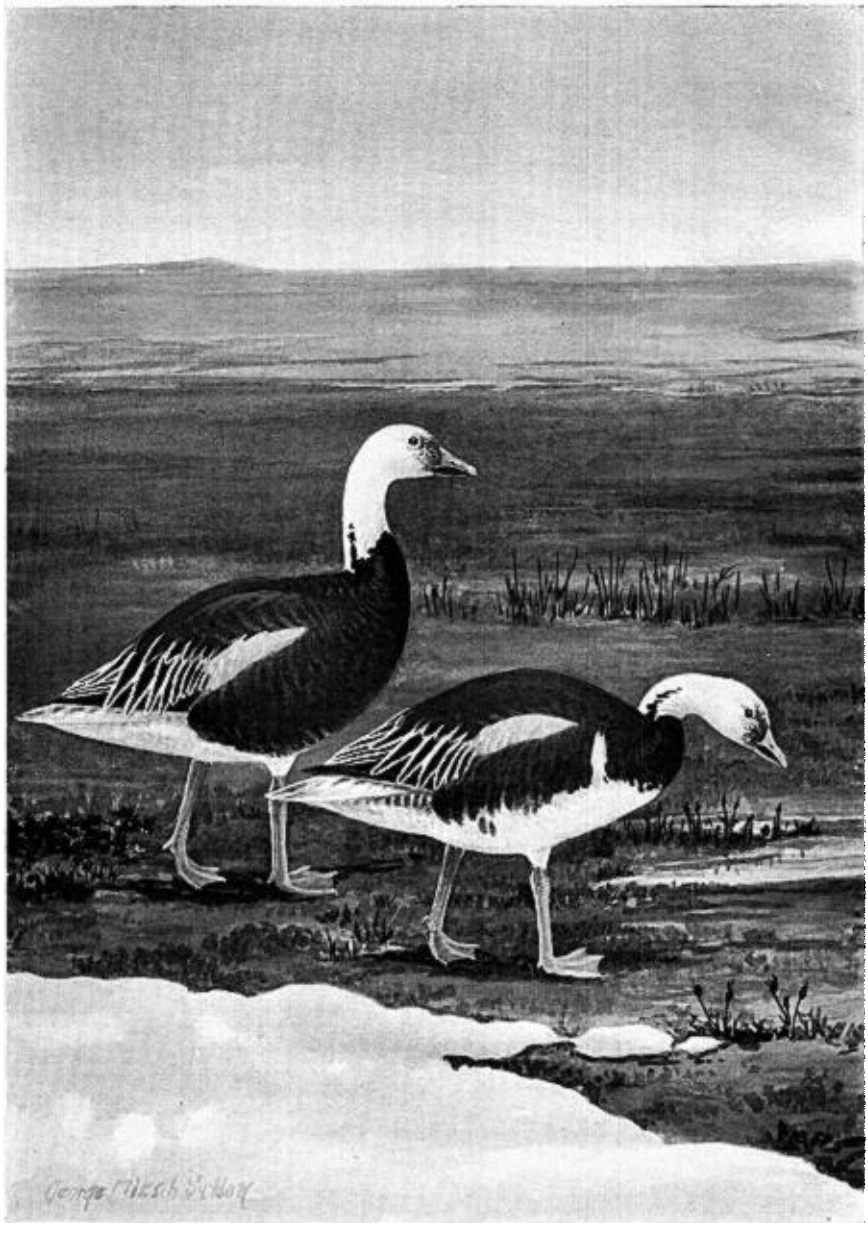
THE BLUE GOOSE AND LESSER SNOW GOOSE ON SOUTHAMPTON ISLAND, HUDSON BAY.[1]

BY GEORGE MIKSCH SUTTON.

THE Blue Goose, *Chen caerulescens* (Linnaeus), has for decades been a much discussed water-fowl. The fact that its nesting range and migration routes remained so long unknown in spite of its great abundance in winter at the mouth of the Mississippi River made it a creature of considerable mystery to sportsman and scientist alike. Some of this mystery has been dispelled, to be sure, with Mr. Dewey Soper's[2] finding of a large breeding colony on Baffin Island; but for those of us who have been interested in the status and racial history of the species, and who have been actively engaged in the study of it in the field, some of the mystery yet remains. Some of us still wonder whether the summer range of the bird can possibly be as restricted as at present it appears to be; and in our study we find ourselves deeply interested in its relationships with the obviously closely allied Lesser Snow Goose, *Chen hyperborea hyperborea* (Pallas), with which it is associated apparently during its entire existence, both in summer and winter and on migration.

[1] The author wishes to thank the following persons for assistance in the preparation of this manuscript: Dr. Arthur A. Allen and Prof. A. C. Fraser of Cornell University, Ithaca, New York; Mr. W. E. Clyde Todd, of the Carnegie Museum, Pittsburgh, Pa.; Mr. Percy A. Taverner of the National Museum, Ottawa, Ontario; Mr. Frederic H. Kennard, of Newton Centre, Massachusetts; Mr. Richard C. Harlow, of Westminster, Maryland; Mr. Olin S. Petingill, Jr., of Middleton, Massachusetts; and Mr. George B. Saunders, Jr., of Oklahoma City, Oklahoma.

[2] J. Dewey Soper, The Blue Goose [*Chen caerulescens* (Linnaeus)] An Account of its Breeding Ground, Migration, Eggs, Nests and General Habits. Bulletin of the Department of the Interior of the Dominion of Canada, Ottawa, 1930, pp. 1–64, with maps and many illustrations.



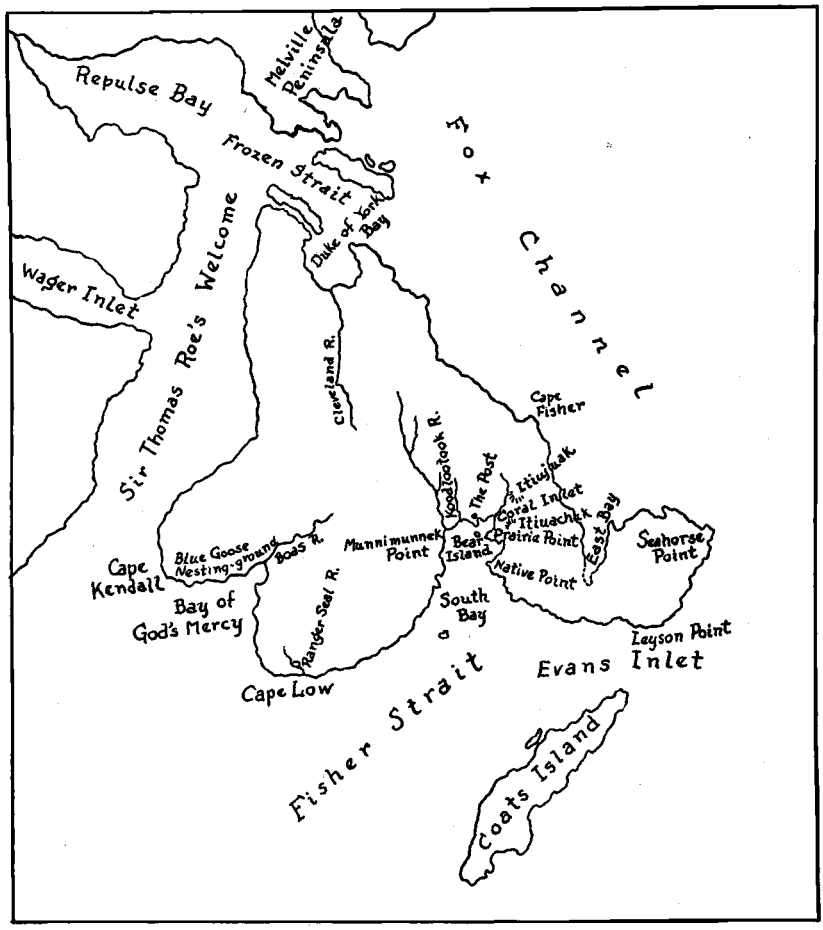
BLUE GEESE ON THEIR SOUTHAMPTON ISLAND NESTING-GROUND. THE FEMALE (RIGHT) IS A HYBRID BLUE × LESSER SNOW GOOSE.

[FROM PAINTING BY GEORGE MIKSCH SUTTON.]

Mr. Soper has published a most welcome account of the bird on its nesting ground, together with a résumé of its known life history. In this account we are given the first definite information as to its breeding range and nesting habits, and data regarding its migration are correlated so as to make clear its annual program, at least so far as the Baffin Island birds are concerned.

It was my good fortune in the spring of 1930 to have a part in the discovery, on Southampton Island, Hudson Bay, of a second breeding ground of the Blue Goose, five or six hundred miles to the westward of that found by Soper. In order to make a complete study of the bird-life of Southampton it was necessary to spend the entire year there, from August 17, 1929 to August 16, 1930. This I was able to do through the generosity of Mr. John Bonner Semple of Sewickley, Pennsylvania, the coöperation of the Department of the Interior of the Canadian Government, and the assistance and interest of the famous Hudson's Bay Company of London. A final report on the ornithological collections made and data gathered will appear later, in the 'Annals of the Carnegie Museum of Pittsburgh'. The finding of this additional Blue Goose breeding ground follows so closely upon Soper's discovery, however, and the behavior of the bird was found to differ so markedly in some essentials from that observed by Soper on Baffin Island, that the present paper is offered in advance of the final report.

Southampton Island is situated at the mouth of Hudson Bay, somewhat nearer the western than the eastern shore. It has an area of 19,000 square miles and is the largest of the islands of Hudson Bay. Its most northerly point lies just a little south of the Arctic circle. The eastern half of the Island is rough and rocky, the granitic ridges which parallel the shore of Fox Channel reaching their highest point at Mount Minto, which is said to have an altitude of 1050 feet. The western half of the Island, on the other hand, is exceedingly flat, the region of Cape Low and Cape Kendall having a tiresomely monotonous sky-line. Along the entire coast of Southampton there are numerous lakes, some of them of considerable size. Much of the country between these lakes is covered generously with grass during the summer, and here great numbers of birds of many species find an almost ideal nesting ground.



Sketch-Map of Southampton Island, Hudson Bay, showing the localities referred to in the present paper. Scale about seventy miles to the inch.[1]

The race of Eskimos which originally inhabited Southampton became extinct about thirty years ago as a result of an epidemic. This race was known as the Saglernmiut. The Eskimos living on

[1] This map is based upon maps published by Captain George Comer (Bull. Am. Geog. Society, Vol. XLII, 1910, p. 85), Captain H. T. Munn (Geog. Journal, Vol. LIV, 1919, p. 53) and Dr. Therkel Mathiassen (Archaeology of the Central Eskimos, 1927, p. 327).

the Island today are of two tribes—Aivilikmiut from the Repulse Bay country to the northward, and Okomiut from Baffin Island. At the time of my sojourn, there were one hundred and thirty-eight Eskimo men, women, and children living on the Island. There were also four white men, aside from myself: Mr. Sam G. Ford, Chief Trader of the Hudson's Bay Company and his son Jack, and Fathers A. Thibert and Eugène Fafard, Roman Catholic Missionaries of the *Pères Oblats* organization. All of these people, especially Mr. Ford and his son, helped me in my work, and one of the natives, Tommy Bruce (so-called) was of special assistance in collecting much of the Blue Goose material which I brought back with me.

Contrary to Soper's observations on Baffin Island, the Blue Goose and Lesser Snow Goose on Southampton were found to interbreed occasionally. It seems advisable, therefore, to consider each species independently of the other, before offering suggestions and opinions as to their ancestry, relationships and future status.

THE BLUE GOOSE.

Eskimo Name: The Aivilikmiut name for the Blue Goose was *Khavik*. Certain of the Southampton Island Okomiut also used the word *Khavik*, or a close equivalent, though the name for the species actually in use on Baffin Island, according to Mr. Soper (Ibid., p. 38) is *Kungovik*. *Khavik* and *Kungovik* are both, at least in part, onomatopoetic words, the first syllable being an imitation of the bird's characteristic warning cry. So far as I could learn, no Eskimo word for the species alludes in any way to its color.

Status: The Blue Goose is a locally abundant summer resident on Southampton Island. The largest breeding ground is near Cape Kendall, along the north shore of the Bay of God's Mercy. It also nests here and there, in isolated pairs, throughout the coastal lake-belt of the western part of the Island, but does not, according to our experience and to the reports of the natives, nest in the high country of the eastern part. It is my present opinion that all the Blue Geese which visit Southampton during the course of the year actually nest there; that is, that none of them stop on or fly over the Island en route to Baffin Island or other more northerly nesting grounds. According to Soper (Ibid., pp. 23–25) those which

nest on Baffin Island migrate northward probably only along the east coast of Hudson Bay.

Résumé of Fall Field Work: When I landed at Southampton Island in the late summer of 1929, I did not know that any nesting ground of the Blue Goose had been discovered, since, when the *Nascopie* called at Dorset, Baffin Island, Soper had not yet returned from the interior. Through Mr. Ford I immediately told the Eskimos, therefore, that data of any sort regarding the Blue Goose were of great value to me; and I was promptly assured that I had come to the right place for a *Khavik* nest.

On that very first day I was shown the well-preserved skin of an adult female Blue Goose which had been shot early in the preceding July, at Bear Island, in South Bay, by Jack Ford. The specimen was in full, though worn, plumage. There was no bare area on the belly, so I feel sure the bird had not been incubating eggs. The entire belly was dark in color, much of the plumage having a rusty-brown appearance. The head and neck were white, the lores and forehead being liberally sprinkled with rusty and the lower neck somewhat mottled with dark gray. According to the Eskimo woman who skinned the bird, the ovaries were enlarged; but none of the hunters would venture to affirm that the *Khavik* had ever nested on the half a square mile moss-covered expanse of Bear Island. The bird had been seen with another Blue Goose, however, and the Eskimos considered the two a mated pair.

Upon making inquiry, I found that all the natives who had travelled about on the Island were familiar with the extensive *Khavik* nesting grounds at Cape Kendall, and that both Mr. Ford and his son had seen many birds, both alive and dead, during the summer, and quantities of eggs which had been gathered for food. Every one seemed to regard the Blue Goose as regular and abundant, but decidedly local in distribution. I was told that the Eskimos were accustomed to making special trips to the western side of the Island every summer where they gathered box- and trunk-loads of goose and swan eggs. Formerly most of these trips were made to the Cape Low region; but during latter years the largest nesting colonies were thought to be in the vicinity of Cape Kendall.

Though the season was obviously too late for eggs or young birds, I decided to try to reach Cape Kendall as soon as possible, so as

to learn what I could of the late summer and fall conditions on the Blue Goose nesting ground. Accordingly, on August 27, Mr. Ford, Amaulik Audlanat (better known as John Ell) and I set out by motorboat for Cape Kendall. We found the entire southern coast of the Island dangerously shoal, and progressed with difficulty; but we finally made Cape Low. Owing to the lateness of the season, roughness of the weather, and absence of good anchoring places, we decided not to go on to Cape Kendall. At Cape Low we saw many Blue and Lesser Snow Geese.

On September 2, we camped at the mouth of the Ranger Seal River (a medium-sized stream called *Kashigiaksoak* by the Eskimos) only a few miles east of Cape Low. Here, according to Amaulik Audlanat, there had once been a colony of geese so vast that to one standing on the river bank the surrounding bird-filled tundras seemed to be covered with snow. I walked over much of the territory about this river and the nearby lakes, but found no trace of any such extensive nesting ground. I learned that in past years a great many eggs had been gathered by the Eskimos at this colony, but that few birds had been killed. I think it likely, therefore, that the geese had not been exterminated but that, due to fouling of the ground, or to diminution or change in the food supply, they had shifted their nesting grounds to the northward. Amaulik Audlanat told me that the geese were given to changing their breeding grounds thus, sometimes without any apparent reason. Assuredly they had not nested at Cape Low in any great numbers during the summer of 1929, for we found little trace of them there and subsequently learned that the Eskimos, during their mid-summer visit to the region, had not found more than a few scattered pairs.

Though we found no nests or undeveloped young, we saw great flocks of geese, most of them white. Noisy hordes of the great birds circled about restlessly, apparently searching a feeding ground, and then, after settling comfortably, rose with renewed clamor as though dissatisfied or alarmed. Obviously they were migrating. Probably few or none of these birds had nested at Cape Low. Among the snowy flocks were many dark-colored birds and a goodly proportion of these were adult Blue Geese, with white heads, but we collected no specimen. Although the two species mingled freely,

the Blues kept in small closely knit groups; and they did not always stay with the white geese either in flight or on their feeding grounds. I venture the guess that fully twenty-five percent of these flocks of migrants were Blue Geese, though it was impossible to distinguish satisfactorily the young of the Blue Goose from the young of the Lesser Snow.

The behavior of the two species was amazingly similar. Their call-notes, from the deep *kah, kah, kah* of warning, to the various gabblings and groanings of the feeding flock, or the high-pitched *whah, whah, kah, whak, whah* of the alarmed, winging birds were, as far as I could determine, identical.

On September 3, many Blue Geese were seen—probably four hundred birds in all, mingling with the hundreds of restless, wary, noisy Snow Geese. All the birds were busy feeding much of the time. They walked slowly about on the moss, nibbling at the grass. Part of the flock sometimes rested. At the merest hint of alarm, the nearer birds set up a loud calling, whereupon the entire flock began to gabble noisily and then to walk rapidly away, or to take flight in haste. The flocks were obviously gathering for migration. At about noon, we saw huge flocks of both Lesser Snow and Blue Geese flying southward or southeastward, headed, apparently, not for the nearest point along the western shore of Hudson Bay, but for Coats Island, less than a hundred miles away, where it may be they are accustomed to gathering before going on to James Bay.

Mr. Ford, who lived on Coats Island from 1919 to 1922, and later during part of the 1923–1924 period, believes that the Blue Goose did not nest on Coats Island during his residence there, though he saw them regularly in the fall. White geese weer, however, frequently seen in summer. Elsewhere in this general region where the Lesser Snow Goose nests the Blue Goose is likely also to occur and I am inclined to believe therefore that it may occasionally nest on Coats Island. The migration of Lesser Snow and Blue Geese from Southampton to Coats Island (providing this migration takes place regularly) suggests that these species may have inhabited Coats Island originally and thereafter spread over to Southampton, recapitulating their racial history to an extent by including Coats Island in their migration route. I do not have enough data to warrant any detailed attempt at explanation of the

migratory routes taken by these birds, but it is highly interesting that they do not make for the western shore of Hudson Bay direct from Cape Low or Cape Kendall, if they are interested *primarily* in reaching a territory which will furnish them contiguous feeding grounds as they pass to James Bay. I attempted to learn from the Eskimos more about the autumnal migratory customs of these species but could not gather much definite information.

I believe that we witnessed, on September 3, the departure of almost the last flocks of Snow and Blue Geese from the Cape Kendall region. Though the weather was not disagreeably chilly, nor had there been any heavy snowfall, yet the grass was brown and winter was obviously at hand. O. J. Murie (cf. Bent, Life Histories of North American Wild Fowl, 1925, p. 183) was told by natives that Blue Geese sometimes arrived from the north in the James Bay region as early as August. This date of departure, therefore, does not seem in any way unusual. All the young geese were evidently in full plumage, though among other species, such as the Snowy Owl, Black-bellied Plover, and Red-throated and Pacific Loons, half-grown or even third-grown young were noted. The great flocks were so restless and wary that it was evident they were eager to be off at the slightest excuse. Whether the Southampton Lesser Snow and Blue Geese regularly go direct to Coats Island, and whether, from Coats, they move westward, or southwestward to the coast of Hudson Bay, or whether indeed, they go eastward or southeastward, perhaps via the Belchers, and eventually on to James Bay, are questions which remain to be answered. At Cape Low, however, I received the definite impression that all the geese were moving eastward, rather than directly southward, and certainly not westward in leaving Southampton.

Résumé of Spring Field Work: During the winter, word reached me by radio that Soper had at last found a splendid colony of Blue Geese on Baffin Island. Inasmuch as the eggs and downy young of this species were now known to science, I was glad to adjust my plans for the coming spring so as to permit me to do more work in regions not so far from our base of supplies as Cape Kendall. I therefore decided to entrust the Cape Kendall Blue Goose expedition entirely to the capable, intelligent and very friendly Eskimo known as Tommy Bruce, who assured me he would get

THE BLUE GOOSE NESTING GROUND AT PRAIRIE POINT, SOUTHAMPTON ISLAND. ITIUACHUK IN THE BACKGROUND.

NEST AND EGGS OF LESSER SNOW GOOSE, PRAIRIE POINT, JUNE 20, 1930.

me what I wanted. He watched me preparing specimens and thus learned how to skin birds. In early June, just after he and I had made a vain attempt to cross the highlands east of the Post to Fox Channel, he set out for Cape Kendall with dog team and komatik, taking his family with him.

Tommy Bruce did not reach Cape Kendall in time to witness the arrival of the Blue Goose, so he had no opportunity to check Mr. Ford's belief that it "always comes from the southwest in the spring . . . in flocks of 5 to 20 at times."[1] I made considerable inquiry among the Eskimos as to the direction of flight among the earliest *Khavik* flocks noted in the spring, but did not get a very satisfactory response. According to our own observations, at least some of the birds come in from Coats Island to the east. Others may come in from the south or southwest, as Mr. Ford has suggested, but this matter will have to remain unsettled for the present.

At Coral Inlet the first Blue Goose (one bird only) was noted on June 10, by the native boy Santiana. This bird was flying about with a flock of the small Richardson's Goose, *Branta hutchinsi* (Richardson),[2] which had come in from the southeast. On June 12, Muckik saw a large flock passing westward over Bear Island, and Jack Ford saw many small flocks milling about with the larger flocks of Lesser Snow Geese in the partly snowless plains at the foot of Itiujuak. One reason for lack of information as to the direction of flight of the incoming birds is that they sometimes fly very high and are not seen by anyone.

In my own field work about Coral Inlet and Prairie Point, I kept a constant lookout for Blue Geese, and though I occasionally saw a pair or small flock passing over, I did not locate any nesting birds until the middle of the summer.

On June 25, Jack Ford returned to the Post from a several days' trip to Prairie Point and the southward, bringing with him a set of six eggs which were, according to the natives who had been with

[1] This opinion, based probably upon reports of the Eskimos rather than upon personal observations, was expressed by Mr. Ford in a letter to Mr. Frederic H. Kennard of Newton Centre, Massachusetts, who has consented to my making reference to it here.

[2] The name *Branta hutchinsi* is used here since I am of the opinion that the little goose of the coastal lake belt is of a species distinct from the larger, inland-nesting form, the bird Mr. Taverner has called the Lesser Canada Goose, *Branta canadensis leucopareia* Brandt.

him at the nest, *Khavik* eggs. He had cared for them meticulously, and was delighted that he should be the first to bring in these rare treasures. When I learned, however, that one of the parent birds at this nest had been a 'white' goose, I came to the conclusion that the eggs were not of the Blue Goose at all—but of a rather unusual pair of Lesser Snow Geese. Unfortunately no specimens were collected with this set,—but I am now certain that these eggs are hybrid—the female (or, at least, the incubating bird), a Blue Goose, the male a Lesser Snow.

On July 9, Tommy Bruce returned to the Post from Cape Kendall, bringing with him eight Blue Goose skins, and nine eggs, three sets of three eggs, most of them slightly damaged. In reaching Cape Kendall he had had difficulties. The whole region was badly flooded, and there were such hordes of lemmings in the dry spots that the children had had to kill these mice before camp could be made. Their *tepik* was pitched amongst the birds. Tommy estimated[1] that there were between eight hundred and a thousand pairs of geese in the vicinity of his camp. The majority of these were Lesser Snow Geese; but there were fully three-hundred pairs of Blue Geese and a good many scattered pairs of small Richardson's Geese as well as some Brant, *Branta bernicla hrota* (Müller). The Lesser Snow and Blue Geese nested side by side everywhere in the vicinity, usually on the higher stretches of land between the shallow lakes. On June 15, nearly all the Blue Goose nests held from one to three eggs, but were so sparsely lined with down that Tommy could not find any which he considered representative, so did not collect any. Several sets with a runt egg were found, and one of these sets was collected. Tommy told me that he had seen nests of the Blue Goose containing five and six eggs during previous years, but that he did not find any during 1930. As will be ex-

[1] I think it only accurate in this connection to call attention to the fact that the Eskimos are sometimes given to exaggeration when they feel that such exaggeration will produce a pleasurable effect. Actually friendly, and eager to please the visitor in their midst after he has proved to them that he is genuinely interested in their world and its activities, they sometimes over-state a matter a little so as to make him feel that his coming to an inhospitable land has not been in vain. Tommy Bruce's estimates may, therefore, have been a little high, though I talked to him many times about the matter and his comments were consistent. I am not sure, however, that even the most intelligent Eskimo has much conception of counting beyond one hundred, so even though I tried to get the most accurate information possible, the figures may be somewhat high.

plained later, these unusually large sets may have been laid by females of hybrid origin.

Among the possible one thousand pairs of geese observed near his camp near Cape Kendall, Tommy Bruce estimated that there were twenty pairs which represented definite interbreeding of the two species, where one parent was distinctly white, the other distinctly 'blue.' There were also several pairs of Blue Geese where one of the birds had considerable white blotching on the upper part of the breast (see color-plate), or where the whole region of the belly, rump, and even of the back was white. These white-bellied birds were fairly common, and one such specimen was included among the eight skins brought back from the colony.

Tommy should have used salt in preserving the skins; but the salt had been lost, I believe, in crossing a river. The specimens had been neatly skinned and stuffed with grass without any preservative whatever, and, since the *tepik*[1] had frequently been damp, and the weather at times warm, the skins were tainted. They had been carefully sewn up, their feet neatly crossed and tied, and strangely illegible, square, paper labels actually attached! The eggs, contrary to my advice, had been crudely blown. Nails had been used as drills and straws as blow pipes. Nevertheless they were Blue Goose eggs, and I got a definite thrill in unpacking them from their rough, moss-filled crate.

On June 20, some of the Okomiut men also visited the Cape Kendall colony and gathered numbers of goose eggs. They also found the Blue Goose about half as common as the Lesser Snow, and noted that in the nests there were usually fewer eggs than in those of the Snow Goose. Many of these eggs were brought to the Post loosely packed. It was painful to gaze upon these piles of cracked eggs—among them hopelessly mixed up sets of highly desirable species. These eggs, too, had been relatively fresh when gathered.

There is no way of precisely defining the Cape Kendall colony since it extends for miles along the north shore of the Bay of God's Mercy. The natives said they couldn't visit all the nests because they got "tired of wading through the lakes." It is interesting to

[1] The *tepik* is a summer tent formerly made of walrus or seal hide, but now frequently made of canvas.

note that, according to Tommy Bruce, there were no Whistling Swans or Little Brown Cranes in the entire region occupied by the Geese. It is also interesting to note that Captain George Francis Lyon (A Brief Narrative of an Unsuccessful Attempt to Reach Repulse Bay, 1925), Captain George Comer, who journeyed about in the region from 1896 to 1920, and A. P. Low (Cruise of the Neptune, 1906) do not mention the Blue Goose in their writings, though all three of these men were to some extent acquainted with the Cape Kendall region. Low includes the Lesser Snow Goose in his list (p. 317), but neither Lyon nor Comer makes any special mention even of this conspicuous species.

On July 12, I saw two Blue Geese which I thought were a mated pair, flying near the Post eastward toward the head of Coral Inlet. I decided at the time to make a special attempt to cover the region toward which the birds seemed to be flying. Two days later, I walked about eight miles from the Post, and reached an interesting region where several Richardson's Geese, a pair of Brant, and a pair of Blue Geese were nesting. There were also two other geese, a Lesser Snow and a Blue which were apparently mated, but whose nest was not found.

The Blue Goose nest contained four eggs which I collected for I feared I should not be successful in returning to procure the downy young. The nest was built of rather fine grass, lined with down and feathers, and placed among grasses and low willows not far from the edge of a lake, about four miles inland from salt water. The female, which was somewhat blotched with white below, left the nest while I was yet some distance away, and joined her mate, a normally colored bird, at the edge of the lake whence they both flew off, yapping and cackling noisily. They were very shy and I could not get anywhere near them. I waited for some time for them to return but they always flew high above me in swinging over the nest, and I did not have an opportunity for a shot. The eggs, which were well incubated in consequence of the lateness of the season, were difficult to prepare. I think the birds must have been delayed in their nesting. The set may even have been a second one for the season. The nesting birds at Prairie Point were so frequently disturbed by the Eskimos that it seems likely certain pairs may have been driven from their chosen nesting

ground and eventually built a delayed nest on the opposite side of the Inlet.

Two Blue Goose nests found in the Prairie Point region by the natives were not preserved. These nests both held four eggs. No downy young birds were collected.

Eggs: When first laid the egg of the Blue Goose is white, or, as Soper (Ibid., p. 53) says, "very pale creamy-white." The eggs brought in by Tommy Bruce had not been very thoroughly cleaned and were a little darker in appearance than those I found and prepared at South Bay. They are indistinguishable from eggs of the Lesser Snow Goose in color. The shell is firm and tough and it has a dull gloss which is more evident in heavily incubated than in fresh eggs.

Measurements in Millimeters of Blue Goose Eggs from Southampton Island.

Set No.	Egg No. 1	Egg No. 2	Egg No. 3	Egg No. 4
1	81.4 x 49	80.4 x 51.3	Runt	
2	85.4 x 52.7	80.4 x 50.2	83.2 x 54	
3	83.2 x 51.8	79.3 x 51.9	80.9 x 50.7	
4	73.5 x 49.2	77.2 x 50.9	78 x 50.8	79 x 51

From the above table it will be seen that the eggs do not vary greatly in size. The average of the twelve normal eggs which I brought back is 80.1 x 51.1, the largest specimen measuring 85.4 x 52.7, and smallest 73.5 x 49.2. The average size of the thirty-three eggs brought back from Baffin Island by Soper is 80.5 mm. x 51.1 mm. The largest egg in Soper's series measures 86.1 mm. x 53.4 mm. and the smallest 74.2 mm. x 50.2 mm.

Most of the nests found by Tommy Bruce at Cape Kendall contained three eggs. The nest I found at South Bay held four eggs. As noted before, however, larger sets have been seen by the Eskimos, and family groups with four and five young were noted at Cape Low. As regards the number of eggs in the set Soper says: "of the eleven sets of Blue Goose eggs collected, four consist of four eggs, three of three eggs, and four of two eggs each, making an average, therefore, of three eggs to the set."

Annual Program of the Blue Goose on Southampton Island: The Blue Goose returns from the south early in June, at the same

time as the Lesser Snow Goose. Some of the birds appear to be mated at the time of their arrival; others are in flocks, whether mated or not. At least some of the birds reach Southampton from the east or southeast, apparently by way of Coats Island. Others may come in from the west, or southwest, or even directly from the south.

Most of the birds make their way rapidly to the favorite nesting ground at Cape Kendall where, among the grass-lined lakes, nesting sites are promptly chosen. Nests are placed in the open, usually well separated, as described by Soper (Ibid., p. 54), on the driest ground available, and not often far from a lake. When the first egg is laid there is little down in the nest but as the set increases more down is added. The female incubates the eggs and the male usually stands on guard not far away. I have no definite data on the period of incubation or on the care of the young.

The enemies of the Blue Goose are the same as those of the other geese. Jaegers, Gulls, Ravens, and Arctic Foxes take a good many eggs and doubtless occasionally capture the young birds. The Snowy Owl and Weasel may occasionally capture young birds. The adult geese are so wary and so keen-eyed that they probably are caught only rarely by such predators as the foxes or wolves, and they are too heavy to be killed very often by Gyrfalcons or even Snowy Owls. The Eskimos take a great many eggs during some seasons and sometimes kill the adult birds with their rifles and shotguns. I was surprised to learn, however, that, probably due to the difficulty of reaching the nesting colony in mid-summer, the Eskimos almost never attempt to capture the birds during their flightless period.

During the summer the adults undergo a complete postnuptial moult. At this time, according to Amaulik Audlanat, they move inland, sometimes quite a distance, remaining together in family groups. As autumn approaches they come together in larger bands near the coast. They prepare to leave for the south in late August or early September. In leaving Southampton they frequently, perhaps customarily, fly to the south or southeast, apparently for Coats Island, where they may stop at a favorite feeding ground en route to James Bay where they are known to congregate in great numbers before passing on to the south. During their entire

summer existence they are closely associated with the Lesser Snow Goose. They arrive with that species in the spring and depart with it in the fall, sharing the same food, shunning the same enemies, and responding to the same stimuli of one sort or another in a remarkably similar manner.

THE LESSER SNOW GOOSE.

Eskimo Name: Both Aivilikmiut and Okomiut used the word *Khanguk* when referring to this species. The similarity of this name to that for the Blue Goose, *Khavik*, is marked. Obviously the first syllable of both words is an imitation of the cry of warning which is characteristic of both species, and this use of the same root with different qualifying suffixes suggests that the Eskimos themselves probably regard the two birds as closely related. Certain hunters even expressed a suspicion, that the *Khavik* might be a *Khanguk* only partly grown. All the natives appeared to be fully aware that the two species interbreed occasionally. One man told me that aged individuals of both the *Khanguk* and *Khavik* were white with black on their wings, but he could not, of course, offer any proof of his statement. There are, in the Eskimo language, many cases wherein strikingly similar words refer to strikingly dissimilar objects. To my way of thinking, however, the similarity of the words *Khanguk* and *Khavik* indicates that the Eskimos regard the two species as closely related, and with this belief Soper (Ibid., p. 38) evidently concurs. No Eskimo ever applied to either species, so far as I am aware, a term in any way reminiscent of the onomatopoeic *Wavy*, *Way-way*, or *Wewais* (George Barnston, 1862, cf. Bent, Life Histories of the American Water Fowl, 1925, p. 168) of the Indian tribes to the south; nor did they use a separate word for the gray-colored young of either the Lesser Snow or Blue Goose.

Status: The Lesser Snow Goose occurs as a summer resident all over the western half of Southampton Island. It is especially abundant at Cape Kendall and, irregularly so, at Cape Low. It does not nest far inland, so far as I have been able to learn. It is much commoner than the Blue Goose with which it frequently associates and occasionally interbreeds. I think it probable that all Lesser Snow Geese which come to Southampton during the

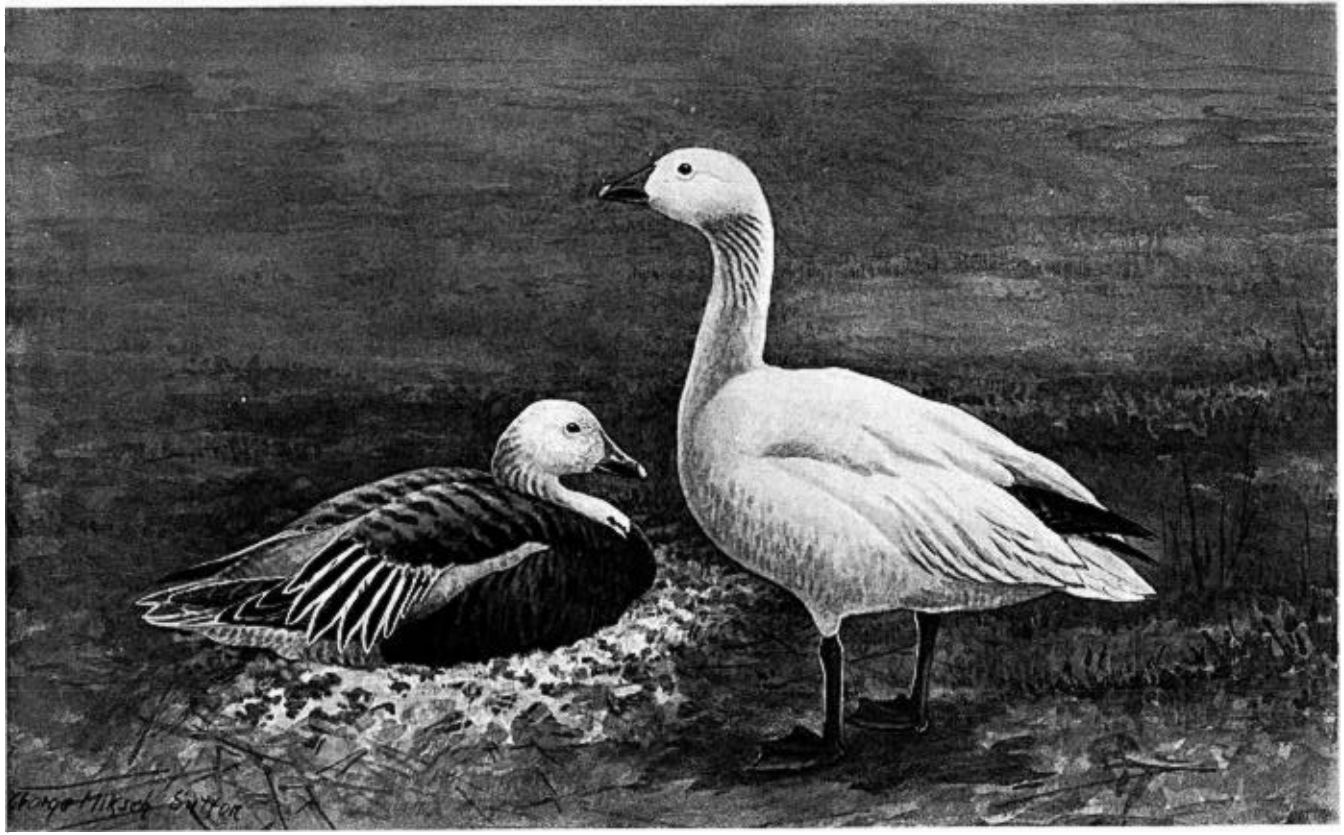
course of the spring nest there, and that those individuals which pass to the northward of the Island to breed probably do so either to the westward or the eastward of the Island.

Résumé of Fall Field Work: The Lesser Snow Goose was not seen about Coral Inlet, either near the Post or at Prairie Point, during the late summer or fall of 1929, though both Mr. Ford and his son had seen fair-sized flocks passing to the northward and the westward during the spring; several nests had been found at Prairie Point during June; and the Eskimos had brought in quantities of eggs from the Cape Kendall region during July.

At Cape Low, on September 2, however, we encountered tremendous flocks of the magnificent birds. The first were seen about 10 o'clock in the morning. I was crouching behind a low gravel ridge watching a pair of Red-throated Loons and their half-grown young. Suddenly I was aware of a moving shadow in the moss near me and of the rush of wings. Looking up I beheld four white geese swiftly flying toward a nearby lake. Their silken plumage somehow so caught and refracted the light rays as to present a rosy-orange color on their shadowed under sides. The flock made no vocal sound until I moved to see them the better; then they set up a loud, irregular, falsetto honking, circled around me once, and sped across the lake to join a distant flock which were feeding on the grass-lands and which, up to this time, I had not observed.

All that day and the next Lesser Snow and Blue Geese, in closely associated companies, were seen. Flocks of hundreds, perhaps thousands, swept along the lake shores, usually a mile or so inland from the salt water, now pausing to rest or to graze, now rushing upward with a mighty din to circle about aimlessly and to settle once more. I tried stalking the birds with my shot gun, but was unsuccessful. Even my rifle-armed companions could not get near enough for a shot. The country was exceedingly flat of course, and there were no trees, stones, or embankments behind which we could approach. The geese were feeding on grass which grew along the margins of the wide, shallow lakes. Here, among the innumerable tracks in the mud, were a few feathers, and droppings which were obviously fresh.

Their lines of flight were not, as a rule, V-shaped. Sometimes the birds flew abreast, or Indian file, the whole line shifting grace-



BLUE GOOSE (LEFT) MATED WITH LESSER SNOW GOOSE, DRAWN FROM DESCRIPTION OF JACK FORD AND THE AIVILIK ESKIMO, TOM BRUCE. [FROM PAINTING BY GEORGE MIKSCH SUTTON.]

fully, now this way, now that, the vibrant pink of their shadowed underparts glowing against the gray sky. As the flocks flew up from their feeding or resting grounds they sometimes had the appearance of a terrific snow flurry, and the wild clamor of their voices added to the impression of reckless tumult. Among them were numerous dark-plumaged birds, many of them their own young, no doubt, others both adult and young Blue Geese. The number of white birds, however, was much in excess of the number of dark-colored individuals, indicating either that relatively few young had been successfully reared, or that, due to immaturity, many of the apparently full-grown birds had not bred. While these large flocks were feeding I noted no tendency for the family groups to keep together. After they had risen high in air, however, they arranged themselves in smaller companies, some as though in family groups. According to our observations and to the reports of the Eskimos, the adults and young always migrate southward together.

It struck me as peculiar that birds of such an isolated place should be so wild; the larger and usually very wary Whistling Swans were not nearly so restless, and most of the shore-birds were quite fearless. Much of the apparent wariness of the birds was due basically, I now believe, to a desire to be off for the south. The post-nuptial moult had apparently been completed, and all the young birds as well, as far as I could see, were flying perfectly. Perhaps the food supply for the gathering hordes was inadequate. At any rate, whatever the cause of their state of confusion, the birds seemed to derive some satisfaction merely from flying about and from cackling and yapping loudly. Their feeding and resting periods were short and sporadic. On September 3, at about noon, we saw most of the geese tower higher and higher and finally separate into neatly arranged companies of from four or five to thirty birds; heard them change their tone of voice in some indescribable way; and watched them actually leave the region, apparently for good.

We did not find any sign of a nesting colony at Cape Low. On the extensive feeding grounds all the feathers examined had, obviously, just been plucked or preened from the birds and the droppings were all fresh. We might, of course, have missed the

precise place which the natives had visited in previous years. We all came to the conclusion, however, that the geese had shifted their nesting grounds to the north, to the shore of the Bay of God's Mercy, where Shookalook and other natives had reported them as exceedingly abundant during the spring and summer.

Résumé of Spring Field Work: A flock of six Lesser Snow Geese of the 1930 spring season appeared on May 15 at the edge of the ice-floe south of Munnimunnek Point, along the western shore of South Bay. The natives who reported them believed them to be mated. On May 18, one was seen at Bear Island and shot at by the Eskimos encamped there. This bird had flown in from the open water in company with a Richardson's Goose. It spent most of its time standing and walking about in the snow. It did not peck at the snow as though in search of food.

On May 31, a large flock passed over Coral Inlet, apparently headed northeastward for a nesting ground near Itiujuak. On June 5, while I was walking through the deep, damp snow near the mouth of the Koodlootook River, two handsome birds (probably a pair) flew not far above me, calling in dignified but shrill voices. They were headed toward the west where there seemed to be extensive snowless areas along some of the higher gravel ridges. In these bare areas, however, I found no goose droppings or feathers. On June 6 and 8, a pair were seen flying toward the head of South Bay. On June 9, a flock of four and a solitary bird were noted at Prairie Point.

On June 10, huge flocks were seen at the Post, flying high, and headed westward. They had evidently come to Southampton from the south and east and not from the west. There is a possibility, of course, that there are colonies of white geese on Southampton about which the Eskimos have never learned, and these flocks may have been such a colony returning *en masse* to their summer home; but I think it probable that they were the Cape Kendall birds.

On June 12, additional flocks were seen flying westward over the Post, and a very fat female specimen, weighing 5 lb. 9 oz., with much enlarged ovaries, was shot at the mouth of the Koodlootook River by the native Keetlapik. I noted that the inner surface of the delicate skin of this bird was marked with exceedingly fine grayish lines, which presented almost the appearance of vermicula-

tions. I do not know what caused this peculiar coloration. The gizzard contained little aside from gravel.

On June 13, Jack Ford shot four specimens in the plains near Itiujuak. Two of these (sex undetermined) were fed to the dogs. The two brought home, a male and a female, were not weighed because their viscera had been removed. The ovaries of the female were exceedingly large. It is likely that she would have laid eggs in a few days. Jack noted great numbers of Lesser Snow Geese, Blue Geese, and Whistling Swans in this region. The birds were passing back and forth constantly, often not far above him and his Eskimo companion. It is highly regrettable that, due to the impossibility of transporting outfits over the snowless tundras and particularly across the swollen waters of the streams, we could not study this nesting ground a little later in the season. We did, however, make a two-day attempt to reach the region, but had to give up because the dogs could not haul our komatik through the gravel, mud, moss and lakes.

On and about June 15, Tommy Bruce observed and shot many Snow Geese along the north shore of the Bay of God's Mercy. Here he found hordes of *Khanguk* nesting between the wide, shallow lakes, intermingled with the *Khavik*. He was fairly bewildered by the abundance of birds. Their clamor was deafening. All about his camp they flew ceaselessly. He found *amishualueet* ('very many') nests nearly all of them with five or six eggs; and he, his family, and his large team of dogs lived for several days on geese and goose eggs. All the birds near his camp appeared to be mated, the males standing guard as the females incubated. Resting birds frequently stood on one foot or ran along waving their wings wildly, calling loudly to pairs or small flocks which were flying over. They fed on grass which they nibbled off or pulled up as they walked slowly along. Their note of alarm was a deep, hoarse "*kha-ah.*"

Tommy Bruce collected several birds and eggs for me, but could not bring them in because his komatik was overloaded. He found what he considered full sets of five and six eggs as early as June 13, the season being earlier as a rule in the Cape Kendall region than at Coral Inlet. He did not see more than eight eggs in a nest, nor fewer than four. The usual clutch was six. The nests were built

on the driest available ground, among the grass, between the lakes. Early in the season the nests contained but little down; later, however, as more eggs were laid, more down was added and eventually there was enough to cover the eggs completely when the parent bird was not incubating. Many newly moulted body feathers were found all about the colony; large quills which were noted and brought in for my examination, however, had obviously been moulted during a previous year. It would appear from these data that the midsummer moult may be in progress at the time the birds arrive in spring, though the losing of the remiges and rectrices does not take place until later in the season, probably well after the young have hatched.

Several more or less isolated nesting pairs were discovered in the South Bay region at about the time Tommy Bruce was living near the large colony at Cape Kendall. The first of these was found by Jack Ford at Itiuachuk, on June 18. The nest, which held four fresh eggs (possibly not a complete set) was placed near the end of a long, narrow point of land which projected from the shore of a large lake about four miles inland from the Bay. The land here was comparatively dry, the ground about the nest having little vegetation. The parent birds were very wary. When first seen, the male was on guard not far from the nest, and the female on her eggs. The nest contained very little down.

On June 19, I noted a pair flying toward the gravel plateau at Itiujuak where they probably had a nest. On June 20, at Prairie Point, I found a well-built nest containing four fresh eggs, situated on a narrow strip of gravelly land between a little pond and a large shallow lake. I had seen the guarding male from afar and approached cautiously. As I drew nearer, he walked slowly toward the shore of one of the lakes, giving me no clue as to the whereabouts of the nest. All at once, almost under foot, the incubating bird stood up, ran clumsily a short way and rose noisily into the air. Though pure white and scarcely sheltered at all by the grasses about her, she had escaped detection, partly because she had held her neck low, partly because the shadow of the grasses had broken up the whiteness of her back, and partly, perhaps chiefly, because the male had kept himself in evidence so constantly. After the female flew off the male quickly joined her. Immediately they

were beset by a clamorous mob of Herring Gulls. They circled once or twice, calling constantly, then alighted about half a mile away where they appeared to preen and graze. I waited nearby. The gulls promptly drifted down toward the nest. I shot at them to drive them away and, of course, frightened the geese. After taking photographs, I collected the eggs. The nest was not heavily lined with down. It was placed among the gravel between several thin clumps of grass, about forty feet from the edge of a pond, and two hundred yards from the shore of a much larger lake. When I last saw the parent birds they were standing side by side on the tundra, about a mile away.

On June 20, the Okomiut Eskimos at Cape Kendall gathered hundreds of eggs, eighty of which they brought to the Post on July 10. One set of six they had kept separate and these I was able to save. They reported the *Khanguk* as about twice as abundant as the *Khavik*. All the eggs they gathered were fresh.

As noted under the discussion of the Blue Goose, a nest of mixed parentage was collected at Prairie Point on June 25. Further discussion of this nest will be given later. On the same date the female of another, an unmixed pair of *Khanguk*, was shot at Prairie Point not far from the place where the mixed pair were found. The region of the belly in this specimen was virtually devoid of feathers and the skin was thick, wrinkled and flabby. The inside surface of the skin showed the same grayish lines previously mentioned. The bird weighed 5 lb. 2 oz. The gizzard was virtually empty.

On July 14, Father Thibert and some of the Eskimos saw several flocks of white geese (perhaps forty birds in each flock) flying eastward over the Post. It is not known where these birds were going, but they were flying high, and the flight had the general appearance of a migration rather than of a daily quest for food. Perhaps they were sub-adult, non-breeding birds; or they may have been pairs whose nests had been robbed repeatedly by Eskimos, Gulls or foxes, and which had therefore given up attempting to rear a brood during the brief remaining period of the summer.

Eggs: The eggs of the Lesser Snow Goose when first laid are white or pale creamy white, sometimes, according to my personal observation, with a very faint bluish tinge. After the eggs have been in the nest for a while they become darker as a result of stain and

exposure. They are indistinguishable from eggs of the Blue Goose in color. They are firm-shelled, and have a slight gloss.

Measurements in Millimeters of Lesser Snow Goose Eggs from Southampton Island.

Set No.	Egg No. 1	Egg No. 2	Egg No. 3
1	82.8 x 54.3	78.2 x 51.2	79.7 x 52.7
2	76.8 x 58.3	85. x 56.	83. x 56.4
3	82.8 x 52	81. x 52.1	81.6 x 51

Set No.	Egg No. 4	Egg No. 5	Egg No. 6
1	81.9 x 54.7	78.6 x 53.2	77.3 x 51.5
2	81. x 56.8		
3	80. x 52		

Nests found at Cape Kendall by Tommy Bruce contained from four to eight eggs, but as a rule held five or six, six being the number most commonly seen. The two nests found in the South Bay region both contained four eggs, and these sets may not have been complete. The average measurements of the fourteen eggs brought back are 80.7 x 53.7; the largest of these measures 85 x 56 and the smallest 77.3 x 51.5. Bent (Life Histories of North American Wild Fowl, 1925, p. 166) found the average measurement of 103 eggs to be 78.6 x 52.3. Reference to the description and measurements of the eggs of the Blue Goose will show that the eggs of the two species are practically indistinguishable.

Annual Program of the Lesser Snow Goose on Southampton Island: The Lesser Snow Goose returns from the south sometimes long before the snow and ice have completely melted from their favorite feeding- and nesting-grounds, usually during the first week of June. If they find the tundras covered with snow they swim about in the salt water at the floe or rest on the ice at the floe-edge. What they eat at this time I cannot say. They do not dive, so they may have to live upon such bits of seaweed as they find attached to the ice, or upon crustaceans which swim about near the surface of the water. The earliest arrivals are eager to come inland to the gravel ridges where they can nibble at lichens, dig up roots, and swallow the coarse gravel. At Coral Inlet they make their way inland by way of Bear Island where they rest and feed, waiting for the sun to melt the winter's drifts.

Many of the *Khanguk* are mated when they reach Southampton; others arrive in flocks and mating apparently goes on after the nesting grounds have been reached. All of the birds which I noted in the spring appeared to be pure white, and the Eskimos told me that they rarely saw a bird which appeared to be other than a full adult anywhere in the Cape Kendall region, save during late summer when the young were about. I did not witness any courtship antics. The Eskimos told me that the birds were very noisy during the mating season, however, and that they chased each other a good deal, both while on the ground and in the air. The pairs feed together early in the morning and in the evening in a favorite meadow, where they may wade out into the shallow water to preen and bathe.

The nest is situated on dry ground at the edge of a lake, sometimes at some distance from the water's edge, and often three or four miles inland from the salt water. There is little down in the nest at the time the first egg is laid, but by the time the set is complete the lining is thick and warm, and capable of covering all the eggs while the parent is away from the nest. From four to eight eggs are laid, but the set is usually six. Only the female incubates. The male stands on guard, usually not far from the nest. The two birds are devoted to each other, and stay together all the time, during the period of incubation, while the young are attaining full size, at the start of the southward migration, and, perhaps, even during the winter. It is my belief that these birds frequently mate for life; but I think that if one mate is killed another is taken during the winter or in the following spring.

Unfortunately, I cannot offer much information as to the midsummer activities of the birds since I did not see the downy young or the adults during the period of the post-nuptial moult. The Eskimos told me that the old birds sometimes led their young inland a way while they were gaining their flight plumage. In the fall the family groups gather in large flocks at favorite feeding places and make ready for their southward migration. They leave during the first week in September. It is possible that they occasionally fly westward or southward in leaving the Island but large flocks are known to visit Coats Island to the south and east, and they were seen leaving in this direction during the fall of 1929.

The natural enemies of the adult *Khanguk* are few. The Eskimos do not often kill them for food unless the geese happen to be very abundant. The eggs, however, are gathered eagerly by the natives, and nests are often destroyed by Gulls, Jaegers, Foxes, and Ravens, especially if, for some reason or other, the eggs are left uncovered while the parent birds are away. So far as I could learn the Eskimos never organize mid-summer drives for capturing the adults and young during the period when they cannot fly. Young birds doubtless have many enemies, however, chief among them, perhaps, the Arctic Fox.

HYBRIDISM.

At the Cape Kendall colony among the thousand nesting pairs of Lesser Snow and Blue Geese there were, according to Tommy Bruce's estimates, about twenty pairs where one bird was distinctly white and the other distinctly 'blue.' As to those pairs wherein a Blue Goose with white belly or white blotching (see color-plate) was mated with a full-blooded Blue, Tommy Bruce was not so definite. He told me that he had seen a good many "spotted" birds among the Blue Geese, and that in a good many mated pairs both birds were "spotted" and blotched considerably. He did not, however, see anywhere such an example as I would call a *spotted* white Goose,—that is, a white bird marked with adventitious spottings or blotchings of dark gray. One of the eight birds which Tommy Bruce collected and brought back was a white-bellied Blue Goose, the female of a mated pair.

The other two cases of what we may at present call definite hybridism were observed at Prairie Point, on June 25, and at the head of South Bay on July 12, 13, and 14. In the first of these cases, the male bird (the bird which stood on guard at the nest) was apparently a full-blooded Lesser Snow Goose, and the female (the bird which was seen incubating the eggs) a full-blooded Blue. Jack Ford, who discovered this pair did not observe any noticeable white on the belly of the female. The lining of the nest, however, obviously contained a good many *white* feathers, since the portion of the nest which was brought in with the set contained *only* white feathers and down as far as I could see. The nest contained six eggs which were almost fresh. The measurements in millimeters of these eggs are as follows: 84 x 55.5; 79 x 54.5; 83 x 55.5; 83.5 x 55;

81.5 x 55.5; 81.5 x 54.5, the average being 82.1 x 55.1. This case is interesting in that though the female was apparently a pure Blue Goose, the size of the set of eggs was that of the Lesser Snow. That such association for a season or even a life-time between birds of distinctly different strains could be responsible for changing the size of the set laid by the female seems scarcely possible. More likely the female parent, though apparently a pure-blooded Blue Goose, was in reality a hybrid wherein the Lesser Snow Goose strain asserted itself in the size of the egg complement rather than in color.

In the second case, which may or may not represent a case of hybridism, two birds were seen flying about together in a region admirably suited to the birds' nesting requirements; but frankly, I am not even certain that the birds were of different sexes. They acted as though they had been together for a long time, but I did not actually find the nest, nor can I be sure they were mated. One bird was a normal Lesser Snow, the other a rather 'blotchy' Blue Goose.

The female of the nesting pair of Blue Geese which I found at the head of South Bay, and whose nest and four eggs I collected on July 14, was rather a 'blotched' bird also, the belly being white and the dark chest and sides marked with spots and mottlings of white. The nest contained some white feathers and some obviously dark of the normal color for a full-blooded Blue Goose.

Almost every thorough account which has been written of the Blue Goose has included some reference to these white-bellied birds.[1] At the famous feeding grounds of the species at the southern end of James Bay I personally saw many Blue Geese which were so much blotched as to merit the term 'piebald.' A more detailed account of these birds will appear in one of Mr. W. E. Clyde Todd's forthcoming reports. In some accounts the birds with white underparts have been called the "white-bellied phase." All these birds with excess white in their plumage, I now believe to be hybrids. They do not, as I see it, merely represent extremes in a species which tends toward variableness in coloration. After all, among

[1] The Blue Goose photographs reproduced in Bent's Life Histories of North American Wild Fowl, Bulletin 130 of the United States National Museum, show many of these spotted birds. In Major Allan Brooks' drawing illustrating Mr. Soper's report, a white-bellied bird is shown.

such species as the Blue and Lesser Snow Goose, where hybridism is known to occur, it is only logical to expect some noticeable external evidence of this hybridism in the progeny.

In all this discussion of hybridism I have, of course, assumed some points. Since I have never collected and personally examined what I am calling a 'mixed pair,' I am assuming that the white birds are pure-blooded Lesser Snow Geese rather than albinistic Blue Geese. This assumption may not be precisely warranted. We think of the albino among the familiar dooryard birds of the eastern United States as an individual which is considerably handicapped by a coloration not properly protective and which will, therefore, be so promptly eliminated from the picture that its unorthodox characters will have no opportunity to be perpetuated for any great length of time. In the Arctic, on the other hand, in a region where a pure white bird such as the Lesser Snow Goose has maintained itself successfully as a species for a long time, a pure albino individual of the structurally similar Blue Goose may encounter no out of the ordinary problems whatever, and may, therefore, succeed in living the full span of its existence and in perpetuating its type of coloration for some time. In view of the fact that all white birds in the crossed pairs were thought to have black primaries, however, it seems safe to assume that these birds were not albino Blue Geese, but pure-blooded Lesser Snows.

It is regrettable, of course, that we have so little definite knowledge of the effects of the crossing of the two strains. No one knows precisely what the individuals of the first generation look like, or what sort of progeny the crossing of a hybrid with a pure-blood of either strain would produce. We only know that among the resident Blue Geese of the Island there are a great many individuals which are variously blotched with white, and that there appear to be no Snow Geese which are blotched with "blue."

According to the experience which breeders have had with poultry, there might be an almost endless variation in a series of Lesser Snow × Blue Geese. The hybrids which we have observed, however, do not vary greatly. As has been stated before, there are no "blue-spotted" Lesser Snows. Personally I have never seen a bird which I should call "half-Snow" or "half-Blue." The hybrids apparently are *always* white-blotched Blue Geese.

The appearance of these hybrids, generally speaking, leads us to believe that the present problem is not one of simple Mendelian inheritance. It is easy to believe that the color-characters which play a part in the situation are exceedingly complex. Even in the pure-blooded Lesser Snow Goose whose color-pattern is very simple to all outward appearances, the interaction of the color characters which are responsible for this color-pattern may be highly involved.

The tendency for the hybrid progeny to resemble the Blue Goose rather than the Lesser Snow Goose parent must be traceable, somehow, to a dominance of the Blue Goose characters which govern the pattern of the back, wings, chest and tail. The fact that white patching and blotching occurs on the chest and rump, and extensively on the belly and sides, however, shows that the genes of the Lesser Snow Goose which regulate the coloration of these areas must be at least partially dominant over the Blue Goose genes.

The fact that the young of both the Lesser Snow and the Blue Goose are similarly dark-colored may have a bearing upon the matter. Since the young of both species are dark-colored, we may assume that the ancestral form was dark-colored also, probably considerably more like the adult Blue Goose than the adult Lesser Snow. This coloration of the ancestral form may to some extent account for the dominance of the color characters of the darker bird over those of the white-colored one.

SUMMARY AND CONCLUSIONS.

The Lesser Snow and Blue Geese, as observed on Southampton Island, are remarkably similar in many ways. Individuals of the two species which nest on the Island probably spend their entire lives together, not only in their summer range, but also during the period of migration and on the wintering grounds along the coast of the Gulf of Mexico. Their general behavior on the Island is very similar. They live on the same food, express themselves through similar call-notes, bodily attitudes and mannerisms, shun the same natural enemies, nest in the same sort of place and in the same way, and respond to the various elements of their environment in an amazingly similar manner. Their facial expression and

the colors of their fleshy parts are, so far as I have observed them, identical. Even in size and weight they appear to be counterparts. Some of this similarity may be traceable to an imitation of one species by the other, some of it to fundamental sameness in bodily structure indicative of common ancestry, and some of it to actual interbreeding of the two forms. For some time prior to my Southampton experience I entertained the belief that the two species might actually be one and the same. This belief was due chiefly to field experience in the James Bay region with birds which had such blotchy and mottled appearance as to suggest that they were a transition stage between a dark-colored, supposedly immature, 'blue' goose, and a fully adult white bird.

I now believe that the two species are distinct, though they are certainly closely related. My reasons for regarding them as distinct species are, briefly, as follows:

First: There is a well-defined breeding colony of Blue Geese on Baffin Island where very few Lesser Snow Geese are found. Second: According to Bent, Taverner, and others the recognized range of the Lesser Snow Goose includes much territory where the Blue Goose does not occur. Third: The number of eggs in sets of the two species is different, that of the Blue Goose ranging from one to five, that of the Lesser Snow from four to eight or nine. Fourth: The color of the downy young according to Soper (Ibid., p. 15) is distinctly different in the two species, as is also the color of the juvenal in its first flight plumage.

Soper did not find any evidence of hybridism between species on Baffin Island. On Southampton, however, the species are definitely known to hybridize to a limited extent. In the Cape Kendall region it is estimated that among 1000 pairs of breeding Lesser Snow and Blue Geese there were twenty pairs which represented a definite crossing of the species. There were also many birds with white belly or blotchy appearance which were probably of mixed blood. At Prairie Point, a locality 150 miles east of the Cape Kendall colony a mixed pair was found with a set of eggs similar in number to sets of the Lesser Snow rather than the Blue Goose. In the same general region (South Bay) another two birds, one a Lesser Snow, the other a Blue, were noted on several dates and thought to be nesting, and a set of four eggs was taken from

a nesting pair of Blue Geese, the female of which was a white-bellied bird. In the Prairie Point-South Bay region I think there were not more than twenty pairs of Lesser Snow and Blue Geese altogether, so the proportion of hybridism was apparently far greater here than at the centre of abundance of the two species at Cape Kendall.

At the present time it seems to me that the occurrence of all these white-bellied and blotched birds may most easily be accounted for through hybridism. It is possible that some of it may be partial albinism, and some of it individual variation in a species whose coloration tends to be inconstant and variable, but the fact that the two species do cross and that this crossing must produce progeny which resembles neither parent strictly and both to a certain extent, does account for the "piebald" birds in an easy manner.

Hybridism is known to occur among ducks and geese the world over, even between species which are thought to be only distantly related. Lesser Snow and Blue Geese have been known to mate in captivity. It is my belief that such hybridism as occurs between the Blue Goose and Lesser Snow Goose on Southampton results from the proximity and similarity of the two species, combined, first, with overabundance of one sex or the other in either species, and second, with the strong tendency toward monogamy which is known to be characteristic of geese in general. Were the birds polygamous or polyandrous, unmated birds could find an outlet for their amatory impulses without recourse to hybridism. The birds appear, on the other hand, to form strong individual attachments, and this results in the cross-mating of such lonely or stranded individuals as cannot find mates of their own species.

Strictly speaking, neither the Blue Goose nor the Lesser Snow Goose of Southampton Island can be considered today an *absolutely* pure-blooded species. So frequently do white-bellied and blotchy Blue Geese occur that one hesitates to attempt a description of a 'typical' Blue Goose. To call the Blue Goose merely a variable species somehow does not settle the matter. Whether the two species were once one and the same or whether, in time, they will merge, is an interesting problem to speculate upon. The two birds are structurally so similar, and in habit and expression of person-

ality so nearly identical that we can but marvel that they have succeeded as well as they have in retaining such characters as are usually accepted as diagnostic.

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