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BIOLOGICAL INVESTIGATIONS NORTH OF GREAT BEAR LAKE, 1953

by

John P. Kolsall

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INTRODUCTION

The herd of caribou which inhabits the area north and west of Great Bear Lake is one of the more interesting study herds since it is the only one that appears to be consistently under-utilized. A reconnaissance study of the animals of this herd on their summer ranges and of the ranges themselves has long been desired. It was suspected that they were widely scattered during summer - probably far more so than other study groups. It would be necessary to travel on the ground in order to be sure of seeing enough caribou and enough of their ranges to make such a project worth while. How such travel could be effected, with limited necessary equipment, was a problem, since known lakes were all small and rivers appeared unnavigable. The proof copies of the new eight mile to the inch map sheets for the area involved appeared to offer a solution. A new, large, and hitherto unsuspected lake had apparently showed up in aerial photographs and was mapped in on the proofs. It was about 40 miles long and up to ten miles wide, and had adjacent waterways that might possibly be navigable in a small canoe. As nearly as could be ascertained, Mr. Ernie Boffa, bush pilot at Yellowknife, was the only man who had ever visited this lake. Such enquiries as could be made at Paulatuk and Coppermine indicated that the coastal Eskimos had no current knowledge of it. It was quite large enough, and properly situated (Fig. 1), so that the risk of not finding caribou somewhere near it did not appear too great.

The following studies were undertaken:

1. A quantitative analysis of the ranges was of prime importance. Ten transects, each 2,800 feet long, were established and 1,000 vegetative sample points were read along each. Flowering plants, mosses, and lichens which could not be readily identified as to species were collected. A report on this aspect of the work cannot be presented until the necessary plant identifications have been made.

2. As a possible future aid in assessing range utilization, 90 sample plots of 600 square feet each were examined for caribou fecal pellets.

3. Caribou were enumerated, and segregated when possible. Two autopsies were performed on freshly killed caribou.

4. The musk-oxen west of the Coppermine were observed on the ground in summer for the first time by wildlife field workers. Segregation counts and general observations were conducted.

5. General observations were conducted on small mammals. In this respect we were most fortunate in finding the lemming cycle at a peak.

6. A bird list was carefully maintained. Numbers seen daily of the various species were recorded and general observations were made.

7. Motion pictures were made of musk-oxen, Arctic foxes, snowy owls, whistling swans, ptarmigan and some general subjects. Black and white and Kodachrome still pictures were taken.

8. Weather records and temperatures were kept.

9. Fish caught were weighed and measured.

10. The large lake was circumnavigated and explored on the ground perhaps for the first time by white men.

This large lake where the work centered has no name. Considerable thought was devoted to giving it an appropriate name for convenience sake, but no obvious name, such as might be suggested by a topographical feature presented itself. No Eskimo name for it is known. Because both investigators are Nova Scotians we called it Bluenose Lake and that name is used for it in this report.

ITINERARY

Plans were laid during the winter of 1952-53. An effort to visit the lake and have a preliminary look at the countryside was made on February 11, 1953 but, as discussed below, the lake was not found, due to an unexpected aberration in the maps available. A 16-foot, double-end canoe was secured on loan from the Geological Survey and on April 8 was taken in a freight aircraft to Port Radium where it was stored for later use. This was done because we anticipated that our initial flying load from Yellowknife would be so great that two flights would be necessary. Having the canoe at Port Radium would save the expense of another 600-mile ferry flight. This later proved unnecessary.

In late July Mr. James Mitchell of Hazel Hill, Nova Scotia, temporarily working in the Northwest Territories, was secured as an assistant, a position which he filled admirably. On August 4 we were flown with our gear first to Port Radium, where we picked up the canoe, and then directly to the area of investigation.

The aircraft carried us about two-thirds of the way up the west shore of Bluenose Lake and left us in a reasonably well sheltered cove. The pilot was given instructions to return and pick us up some time between the 1st and 5th of September.

From August 4 to 6, we worked in the base camp (Camp 1) area and on the 7th we moved to Camp 2 (Fig. 1). On August 9 we proceeded to Camp 3 (Figs. 3 and 4) at the outlet of the Croker River. We worked from this camp for three days. Because the river was too swift and shallow for navigation we did not descend it by canoe. On the 12th we moved down the sheltered west side of the lake since a strong wind was blowing from the west. We crossed the lake at the narrows and re-established at Camp 4. At this point the highest ridge was adjacent to the lake near our camp, and the small bay on which we stopped was deep and long enough to give nearly perfect anchorage for aircraft or boats. On the top of the high ridge we erected a 5½-foot cairn, visible with binoculars for over ten miles, and left the following note in an empty milk can: "Continuing caribou study; Canadian Wildlife Service; Department Resources and Development. Represented by John P. Kelsall, Yellowknife, N.W.T.; James Mitchell, Hazel Hill, N.S. Landed on this lake by aircraft August 4, 1953. Circumnavigating it by canoe and conducting wildlife investigations until about September 1, 1953." (Fig. 5)

By August 17 we had worked slowly down the west shore to the point shown as Camp 6. Here we were stormbound until the 23rd. Strong north winds, sometimes of nearly gale force prevailed, and rain, sleet, and snow were frequent. Following this period several inches of snow clung to the higher inland hills for a number of days. On August 23 we moved camp to a small island near the southwest corner of the lake (Fig. 9) and additional moves were made on August 25 and 28. At Camp 9 which we reached on the 28th we were only a few miles from our rendezvous point but, it was well after dark on August 31 before the heavy wind abated sufficiently so that we could travel back to Camp 1. We arrived there about 1.10 a.m. on September 1, thus completing the circumnavigation of Bluenose Lake.

On September 3 the aircraft, again with pilot Dave Floyd, arrived to return us to Yellowknife. En route we first made a sweep to the southwest and then cut diagonally southeast to Fort Confidence (Fig. 1). At Fort Confidence we landed briefly and took photographs of the old stone and clay chimneys which are still standing after about 130 years. Following this we stopped briefly at Port Radium to refuel, at Sawmill Bay and at Saddle Lake, and then returned to Yellowknife.

En route back to Yellowknife we first flew a course about southwest and then turned southeast to Fort Confidence (Fig. 1). This course was designed to allow observation of some sections of country previously uninvestigated during the caribou study, to search for caribou concentrations, and to intersect the musk-ox range discovered during the previous winter. Despite an excellent, low-altitude flight no musk-oxen were seen.

A curious situation developed, however. Examination of Figure 1 will show that a large lake was our westerly turning point during the survey flight. This lake is shown on the advance proofs for the new eight mile to the inch map sheets and it was believed that it was the lake visited in 1951 by Tener and the author, and again in 1953 by McEwen and the author in the course of caribou and musk-ox winter aerial surveys. As we approached this lake it appeared to have various points, islands, surrounding lakes, high rugged hills on the north shore, and a large level plain on the south that were familiar. However, it was soon seen that this was not the lake previously visited, since the latter was known to have small growths of stunted spruce in certain places. There is no spruce along the mapped lake.

From the western end, however, another lake, not on the new map sheets, could be seen. It was estimated to be 15 to 20 miles farther west and a little north and appeared to be almost identical in shape with the lake shown on the map but somewhat larger in size. This second lake is in Figure 1. Unfortunately our gasoline supply was too limited to permit us to fly over it.

There is little doubt, however, that it was this second lake, and not the mapped one, which was visited on previous occasions; and this explains why on our February 1953 flight we failed to find Bluenose Lake.

After flying up the Haldane River and striking what we believed to be the mapped lake we changed course approximately northeast to strike Bluenose Lake. After flying this course somewhat longer than should have been necessary to reach Bluenose Lake, and having failed to reach it, we changed to a northerly course on the possibility that we were too far south. We soon crossed a branch of the Hornaday River and, since our gasoline supply was low and daylight was fading, we went on to Paulatuk without having reached our objective. The dotted line on Figure 1 shows our flight course on that occasion and a revised and corrected position for the musk-ox sighting which we made at that time is also shown.

GEOGRAPHY AND TOPOGRAPHY

A few notes in regard to the geography and topography of the Bluenose Lake area may be of interest.

It was a considerable surprise to find that the elevation of the lake above sea level was about 1,800 feet. This figure was taken from the aircraft altimeter and is subject to considerable error, but it was checked both upon our arrival, and when the aircraft returned to pick us up a month later, and the reading was

the same both times. The height of land between Great Bear Lake and the Arctic Coast is some miles southward from Bluenose Lake and is probably somewhat more than 2,000 feet above sea level.

Bluenose Lake is a large one, being approximately 35 miles in length in an almost due north and south direction and varying from ten miles to only a few hundred yards in width. The latter width is found only at a narrows about 28 miles from the south end where a long, high, narrow peninsula from the west coast almost reaches the east coast. The lake appears to be reasonably deep with very clear blue water. Islands are not abundant except in the south end which is much shallower than any other part. From the air numerous small shoals could be seen, dotted throughout the southern third of the lake. Probably many of these can be seen only because the water is extremely clear and they may be ten feet or more below the surface. From the air, and from the canoe, most of them appear to be conical in shape and of essentially the same structure as the conical hills referred to below, which were found near the southwest lakeshore.

On the west coast of Bluenose Lake there are few running streams and only scattered small lakes back from the main lake. On the east coast, however, there are several fair-sized streams and a large number of lakes adjacent to the main lake. The largest of these lakes are up to eight miles in length and three miles in width.

The lake itself lies in a relatively shallow "bowl" of gently rising hills. The upper waters of the Brock and Hornaday rivers, which flow into Darnley Bay, are only a few miles to the west and the headwaters of the Rae River, which flows into Coronation Gulf, are less than a day's walk from the southeast end of the lake. The lake has its outlet at its extreme northern end where the Croker River commences a run of little over 50 miles to the sea (Figs. 3 and 4). This river, for the few miles which we descended it on foot, is generally less than 100 yards wide and is shallow, rocky, and swift flowing. Descending it by canoe would probably be exceedingly laborious. For the most part the hills surrounding Bluenose Lake are gently rising and reach a maximum elevation three miles or more from the west coast and five to ten miles inland from the east coast. Probably the highest of them are not more than 450 to 500 feet above the level of the lake. Inland from both east and west shores long ridges, broken only here and there by streams, parallel the lake (Fig. 9).

In addition to the broad land contours there were, in many places, local hilly areas. In some places, particularly on the east-central coast, hills rose several hundred feet and were surprisingly precipitous. Figure 5 shows such a hill; this one is in the form of a short razor-back ridge which drops on its west side directly into the lake. At the southwest corner of the lake there was an area of very gently rising plain many miles in extent, and this area was dotted with individual conical hills which superficially greatly resembled the pingoes in the eastern Mackenzie Delta area. Figures 9 and 10 were taken from one of the highest of these cones - possibly 250 to 300 feet above lake level - and the latter illustration shows three more in the background. A similar formation is an island at the north end of the large bay on the southeast coast. This island is visible for many miles and we called it Vesuvius because of its resemblance to a volcanic cone. It is thought that these hills are probably the result of glacial action; possibly deposits from melting glaciers. Certainly they did not have the characteristics of pingoes on close examination.

The existing eight mile to the inch maps indicate the Melville Mountains, and in particular Mount Davy, between the north end of Bluenose Lake and the Arctic Coast, and only 18 miles from the lake. At the farthest north point reached by walking we could not have been more than 15 miles from the mapped location of these mountains, but they were not apparent. There were, indeed, hills in view in the appropriate direction, but they appeared to be no higher than those which could be seen from the lake in almost any other direction. It is believed that the term "mountains" is greatly misleading in this instance. Possibly from the coast the rise to a 2,000-foot altitude (which is claimed for Mount Davy) appears impressive, although the coast itself is precipitous, rising in sheer bluffs and cut-banks up to 500 feet in the vicinity of the Croker River. The author has flown along the coast in winter, and has talked to bush pilots who have seen it many times at all seasons, and nothing which could properly be dignified by the term "mountains" has been seen or reported. Possibly the position for the Melville Mountains is improperly shown. Certainly there is much equally high country north of Great Bear Lake which has not been referred to as mountainous.

We found no rock outcropping of any sort, and the nearest exposed rock which we saw from the aircraft was some 20 miles southwest of the lake. Some of the higher inland hills which we did not reach might have had exposed rock in places, and some appeared to have it when viewed through binoculars. For the most part the country was sandy or gravelly. Frequently there was a heavy mixture of reddish clay in areas of fine gravel. Coarse gravel and rocks of various sizes were particularly common on higher erosion surfaces and all had the appearance of being pure glacial drift.

Vegetative cover in the lake area was not impressive. Figures 7 and 8 show local areas where sedge and other growth achieved about as good a growth as it did anywhere. Figures 4 and 5 show the more usual condition with frequent bare earth and clay areas between vegetative cover. In 10,000 point samples, taken on ten different 2,800-foot transects, unvegetated areas comprised almost exactly one-third of the total points. On the specific transects unvegetated areas varied from a little over 20 per cent to a little less than 60 per cent.

HUMAN OCCUPATION OF BLUENOSE LAKE AREA

Since approximately a year ago enquiries have been made whenever possible regarding human use of the Bluenose Lake area. It was possible to make limited enquiries at Paulatuk and Coppermine - the two closest inhabited points. From all sources the only information of a positive nature was from bush pilot Ernie Boffa who had once been forced down by bad weather and had spent a night on the lake. None of the other persons questioned even knew positively of its existence.

On the way around the lake, careful watch was kept for signs of human occupancy. The only recent evidence was in the form of a 45-gallon steel gasoline drum left possibly by an R.C.A.F. survey party since it contained some aviation gas. Other signs were frequent but ancient. At most these signs took the form of stone tent rings with occasionally a bit of recognizable debris. At the southwest corner several tent ring sites were seen, the largest having at least six separate tents.

Around them were bones of fish, birds, small mammals, and caribou. About mid-way down the east coast a site on the lakeshore had several rings, a few pieces of wood, and the front of a small hand made wood-burning stove. Most sites were on, or near, prominent hills near the lake shore, but a few were inland as far as an estimated three miles. Many sites had only a single small tent ring, indicating occupancy by wandering hunters, but others had the look of semi-permanent camps with platforms of flat rocks built both inside and outside the tent rings.

Two sites were obviously more recent than the rest. One was well inland on a high hill particularly exposed to the wind and here a single rectangular tent and numerous circular tents had been in use at one time. At the other site were the shredded remnants of a rectangular canvas tent. This site was of particular interest because of the large number of wood chips about it. A fair-sized armful of small pieces of wood were gathered there although the site appeared to have been used by no more than two tents. Also found were a crudely constructed fish spear and a trap anchor chain fastened to a block of wood. It seemed curious that, in a country utterly devoid of wood of any sort, so much wood had been used, particularly for such unnecessary purposes as anchoring traps. Someone had obviously hauled a great many boxes, crates, and poles into the country. Even fragments of tongue-and-groove boards were seen. It is thought most likely that the occupants were Eskimos accompanied by a white man since the presence of children was attested to by a crudely lettered alphabet and some numerals on a well preserved board. This site appeared to be the most recent of those seen but might have been occupied no later than 1920.

At the few sites where debris other than stones could be seen, examination was made for anything that could be found. The most common refuse was broken caribou bones. The complete absence of recognizable musk-ox bones was interesting. From the number of delicate fish bones and small mammal and bird bones found it was concluded that the inhabitants must have eaten great numbers of smaller animals. In only one spot was found a structure that might have been a meat cache. The scarcity of these structures indicated a hand-to-mouth existence.

Possibilities for present occupancy by humans living entirely off the land are not very good. A few families could certainly make a fair living trapping white foxes if they fished diligently, but caribou are too scattered and few in number to be counted on as the main source of support. We saw only 287 caribou in over a month. The scarcity of tracks, fecal pellets, and trails indicated that caribou are possibly never more abundant, and the number we saw was not sufficient to supply even one large Eskimo family.

WEATHER

When moving camp frequently by canoe it is not usually possible to keep regular or complete temperature records. However, maximum temperature readings were taken on 22 of the 30 days that we were at Bluenose Lake and minimum readings were taken for the nights preceding 23 days. Daily maximums varied from a high of 70° F. (August 11 and August 23) to a low of 41° F. (August 22), with a mean maximum temperature of 55.7° F.. Minimum temperatures varied from a high of 49° F. (August 15) to a low of 27° F. (August 31) with a mean minimum temperature of 36.6° F..

Temperatures of freezing or lower were recorded during five of the 23 nights and the first frost came on August 17. The average mean temperature was 45.9°-F.

Precipitation, as is to be expected on the barrens at this season, included heavy fog and mist, light showers, heavy rain, hail, and snow. We experienced some precipitation on 13 of the 30 days we were at the lake. From August 18 to 21 precipitation was almost constant. A considerable amount of snow fell (about four inches at the camp site) on August 21 and it stayed on the higher inland hills for several following days. On August 29 we had 12½ hours of steady, heavy rain. Fogs, and penetrating mists, occurred on four days.

The most frequent and by far the strongest winds were from the north and northwest. From August 18 to 21 the wind blew continuously from this quarter and sometimes it was estimated to be of gale strength. Nearly as frequent, however, were winds from all other quarters although these were usually neither as strong, nor of as long duration. A frequent phenomenon was a wind shift of up to 180 degrees or more a day. None of the days which we were at Bluenose Lake were recorded as flat calm ones although calm periods sometimes lasted up to half a day. The frequency of winds made travel on the water difficult, the lake being so large that even light winds stirred up waves too large for our 16-foot canoe. At one camp we waited five days before we were able to proceed, and a number of camps were established because we had to get off the lake, rather than from choice.

No correlation was seen between caribou movements and wind direction although on August 21, when wind and precipitation were continuous and extreme, the few caribou seen were feeding into the wind.

BIRDS

During our investigation every effort was made to identify and record birds seen. The area was found to be relatively poor in regard to number of species. Thirty-five species were identified but in a number of cases the birds seen were almost certainly only migrants and some species were represented by only a single individual. Thus the mallard, the golden eagle, the short-eared owl, the buff-breasted sandpiper, and the tree sparrow were each recorded only as a single individual on one occasion. Other species, such as the peregrine and the raven, were each recorded only as a pair seen only on a single occasion. A few species which might very reasonably be expected in the area, especially during the migration, were not seen. Thus we saw no redpolls, horned larks, snow geese, sandhill cranes, or gyrfalcons. That only eight species of shore-birds were seen, despite specific effort to locate others, was thought surprising.

The absence of some species is undoubtedly due to the lack of varied habitat. There were no willow and birch thickets such as are used extensively in the Coronation Gulf area by thrushes, Gambell's sparrows, Harris's sparrows, and redpolls. There were no very extensive marshes or well vegetated damp tundra areas such as are used by numbers of shorebird species. There were no rock outcrops of any sort to provide nesting habitat for falcons, eagles, and hawks.

The following list enumerates the species seen. An attempt has been made to illustrate the relative abundance of each species by stating the number of days each was seen as a fraction of 30 (the total number of days spent working at Bluenose Lake). Thus

yellow-billed loons were seen on 17 out of the 30 days and that species is presented thus: Yellow-billed loon (Gavia adamsi) - 17/30.

1. Yellow-billed loon (Gavia adamsi) - 17/30. Yellow-billed loons were generally distributed around the lake and are probably a fairly common nesting species. The number observed daily varied from one to seven.

2. Arctic loon (Gavia arctica) - 10/30. Arctic loons were well distributed for the most part in smaller lakes back from the big lake. A number of flightless young birds were seen. The number seen daily varied from one to three.

3. Red-throated loon (Gavia stellata) - 3/30. Red-throated loons were not common. Only eight in all were seen but six of these involved adult pairs accompanied by flightless young.

4. Whistling swan (Cygnus columbianus) - 10/30. Swans were generally distributed in smaller lakes or in sheltered bays of the big lake. Eliminating possible duplications, about two dozen different birds were seen. A fairly large additional number of swans were seen from the aircraft when approaching and leaving the big lake. Several pairs of adults were accompanied by flightless cygnets. Most pairs had only one or two young but one pair had four. The number seen daily varied from two to seven.

5. Canada goose (Branta canadensis) - 1/30. Geese were seen during the 30 days only once, and then at a considerable distance. This was on August 15, when a flock of 15 were seen heading south. An additional flock of larger size was seen shortly before take-off on the day we left.

6. Mallard (Anas platyrhynchos) - 1/30. A single mallard drake was seen August 16, at a reasonably good range for identification, as it flew from a small marsh.

7. Pintail (Dafila acuta) - 5/30. Pintails were commonly seen on the northwest part of the lake up to August 15. Following that date none were seen. Most appeared to be drakes. The number seen daily varied from two to nine.

8. Old-squaw (Clangula hyemalis) - 8/30. Old-squaws, while not numerous, were distributed generally in small lakes and occasionally in the big lake. A number of groups of adults and young birds were seen. The number seen daily varied from two to 14.

9. King eider (Somateria spectabilis) - 4/30. Eliminating duplications, a total of nine eiders were seen. Without exception these were females or large juveniles. As a result identification as king eiders is not certain. That these were nesting birds is evidenced by a group which included young birds and by a recently used nest which was found on a rocky islet on the big lake. King eiders nest habitually in fresh water areas, and frequently in small fresh water lakes such as those in which we saw several of them; whereas Pacific eiders, the species with which they are apt to be confused in this area, prefer salt water habitat during nesting. The number seen daily varied from two to four.

10. Red-breasted merganser (Mergus serrator) - 4/30. Mergansers, for the most part flightless, were seen mostly in the northern end of the lake. All appeared to be red-breasted mergansers. The number seen daily varied from one to 14.

11. Rough-legged hawk (Buteo lagopus) - 12/30. Rough-legged hawks were generally distributed although nowhere numerous. The absence of rock outcroppings and cliffs resulted in inferior nesting habitat for these birds. However, a number of young birds

were seen, including one dead, fully-feathered specimen. Many of the rough-legs were the palest in coloration that the author has ever seen. In some the head and breast appeared to be wholly white or cream-coloured, and one specimen at least was believed to be a white gyrfalcon or a snowy owl until close inspection made identification certain. The number seen daily varied from one to four.

12. Golden eagle (Aquila chrysaetos) - 1/30. A single eagle was seen, and observed for some time, on August 17 about halfway along the east shore of the lake. This was a juvenile bird but was almost certainly a golden eagle.

13. Peregrine falcon (Falco peregrinus) - 1/30. A single pair of peregrines were seen August 27 on the east shore of the lake. When observed they were pursuing a small passerine bird. Suitable nesting habitat was not seen.

14. Willow ptarmigan (Lagopus lagopus)
15. Rock ptarmigan (Lagopus rupestris) - 12/30. Due to summer plumage, which was only partially moulted by the time we left the area, it was difficult to separate the two ptarmigan species. However, both species were identified on various days, and at least one mixed flock was seen. Some groups included young of the year. The number seen daily varied from one to 26.

16. Golden plover (Pluvialis dominica) - 6/30. Golden plover were observed most frequently on high, dry barrens back from the big lake in typical nesting habitat although toward the end of our stay a few were appearing along the shores as migrants. Downy young were seen on August 6. The number seen daily varied from two to 15.

17. Black-bellied plover (Squatarola squatarola) - 3/30. A single black-bellied plover was identified on August 9 and again on August 11, and a flock of 11 migrants was seen on August 28.

18. Pectoral sandpiper (Pisobia melanotos) - 5/30. Pectoral sandpipers were generally distributed but not common. Flightless young were seen on August 9 and 10. The number seen daily varied from one to three.

19. Baird's sandpiper (Pisobia bairdi) - Baird's sandpipers were seen daily until August 16 in numbers up to 50 different birds per day. After August 16 the number seen daily diminished rapidly and between August 24 and September 3 only one was seen.

20. Semipalmated sandpiper (Ereunetes pusillus) - 7/30. Semipalmated sandpipers were seen mostly along the east shore of the lake and generally in small numbers or as single birds. However, on August 15 an estimated 40 migrants were seen.

21. Buff-breasted sandpiper (Tryngites subruficollis) - 1/30. A single buff-breasted sandpiper was seen August 22 on the margin of a small lake. Neither observer was familiar with the species but observation was prolonged and at very short range, and the identification seems reasonably certain.

22. Sanderling (Crocethia alba) - 2/30. Very light coloured shorebirds in groups of three were seen on August 26 and 28. They were seen only in flight and for short periods. It appears reasonably certain, however, that they were sanderlings.

23. Northern phalarope (Lobipes lobatus) - 1/30. A total of eight northern phalaropes were noted on August 11, in typical summer phalarope habitat, about the shores of a small lake. No others were seen.

24. Parasitic jaeger (Stercorarius parasiticus) - 13/30. Parasitic jaegers, including young which were just becoming proficient in flight, were commonly seen until August 10 and numbered two to seven different birds per day. Following August 10, however, their numbers diminished rapidly and from August 17 until September 3 only six were seen. It is worth mentioning that a good number of unidentified jaegers were seen, sometimes numbering as many as ten in one day.

25. Long-tailed jaeger (Stercorarius longicaudus) - 12/30. Long-tailed jaegers, and flying young, were seen almost daily, in numbers varying from one to five per day, until August 16. Their numbers then diminished even more remarkably than those of the parasitic jaegers and between August 17 and September 3 only two were seen.

26. Glaucous gull (Larus hyperborus) - 6/30. Glaucous gulls were seen in small numbers generally around the lake. An adult with three flying young was seen near a recently-used nest on August 25. Only one or two were seen on any other day.

27. Herring gull (Larus argentatus) - 25/30. Herring gulls were among the most generally distributed birds encountered and undoubtedly nest commonly on the lake. They were seen in numbers varying from one to 21 per day. On occasion these birds were a nuisance, eating anything inadvertently left uncovered outside of the tent.

28. Arctic tern (Sterna paradisaea) - 9/30. Terns were not seen frequently but in some areas were locally abundant. They were noted both at suitable nesting areas and as migrants. Numbers seen varied from two to 40 per day.

29. Snowy owl (Nyctea nyctea) - 26/30. Snowy owls were among the most common, and excluding longspurs and pipits, the most abundant of the birds seen. This was plainly correlated with the obvious abundance of voles and lemmings. Except at a few points along the south and west parts of the lake it was unusual to climb a hill and not be able to see at least one owl; of course this was partially because they can be seen and recognised easily at great distances. A number of nesting pairs was observed and the number of young varied from one to four per pair. Until about August 10 some of the young still could not fly. The observers were somewhat surprised at the wariness of the adult birds. Despite considerable effort adult birds were not photographed successfully even with a six-inch telephoto lens, and it was unusual to get within 150 yards of an adult. Numerous pellets indicated that the owls were living almost exclusively on lemmings and tundra voles. From one to 30 were seen per day.

30. Short-eared owl (Asio flammeus) - 1/30. A single short-eared owl was seen August 4 shortly after the aircraft left us at the site of our base camp.

31. Raven (Corvus corax) - 1/30. The raven, generally well distributed and reasonably common on the barrens, was rare at Bluenose Lake. This may have been largely due to the absence of suitable nesting habitat. A single pair were seen August 7 over the northwest part of the lake.

32. Pipit (Anthus spinoletta) - 16/30. No pipits were seen until August 15 but thereafter they were seen almost daily - sometimes in large migratory flocks. It was concluded that they were probably only occasional nesters in the area. The number seen daily varied from one to 100 or more.

33. Tree sparrow (Spizella arborea) - 1/30. A single tree sparrow was seen at short range, and for a considerable time, on August 15 near the lake shore.

34. Lapland longspur (Calcarius lapponicus) - 27/30. Lapland longspurs were the most commonly seen birds during our investigations. During the latter part of our stay many of them were clearly migrants and often they were mixed with flocks of migrating pipits. The species probably nests commonly in the area. Numbers seen per day varied from one to nearly 100.

35. Snow Bunting (Plectrophenax nivalis) - 12/30. Snow buntings appeared to be casual nesting birds in the area of investigation but after August 21 the majority which we saw were migrants. The number seen varied from one to 30 or more per day.

MAMMALS

While the Bluenose Lake area did not support a large number of mammal species, the ones which were there were mostly relatively abundant. A few species which we did not encounter might well be expected to occur. Among these might be listed such species as coloured fox, wolverine, and a number of small mammals. An annotated list of mammals follows.

1. Barren-ground grizzly bear (Ursus sp.) - Grizzly sign was more frequent about Bluenose Lake than at any other point in the mainland barrens ever visited by the writer. From nearly any high hill along the lakeshore or even from the canoe off-shore, it was scarcely possible to find a point lacking sign of bears having dug for small rodents. In some places sections of good lemming hillside one-quarter mile by one-half mile had been systematically dug up, and there were overturned sods and holes every few yards. In spite of this the only tracks seen were at least a week old and a bear was encountered only twice, possibly the same animal both times. The first was seen August 6 by Mitchell and will be mentioned below in the discussion on musk-oxen. The point where it was seen was revisited on August 7 but the bear had left. The second was seen from near Camp 3 on August 9. This animal was at a great distance across a river which barred closer approach. It was watched for some time and was apparently moving along a vegetated hillside, digging for lemmings. The bear seen by Mitchell was observed at comparatively close range - one-quarter mile or less - and the description fits perfectly other grizzlies seen by Wildlife Service personnel at such widely varying points as the Eskimo Lakes, Bathurst Inlet, Musk-ox Lake, Thelon River, and Whitefish Lake.

The tracks of a cub and an adult - presumably the cub's mother - were measured in inches as follows:

	HIND FOOT		FORE FOOT	
	Length	Width	Length	Width
Cub	7⅛	5	4	5⅛
Adult	9⅛	6¼	4	6¼

Measurements do not include claws.

2. Arctic fox (Alopex lagopus) - While seen on only five different days Arctic foxes were relatively abundant. On previous occasions the author has spent more than three consecutive months in the barrens in good fox country without seeing any of these elusive little animals. Foxes were seen on August 7, 10, 11, 16, and 28. Numbers of different animals seen per day varied from one to eight. Fox tracks and scats were seen commonly and several den sites in current use were discovered. One den, at which motion pictures were taken, contained at least seven young foxes. A very few pieces of well chewed caribou bone were found at den sites but for the most part the animals were living on lemmings and voles. It is interesting to note that no coloured foxes were seen, and there were no tracks which we could attribute to this species.

3. Wolf (Canis lupus) - Wolves were unexpectedly scarce in the area investigated. We had been on the lake for six days before we saw a wolf track and it was not until August 19 that we saw the first wolf. Wolves were also seen on August 24 and 25, in each case only a single animal. The last one seen was white with a faint dark saddle; the other two were either entirely white or very nearly so. The first wolf was sitting and watching our camp from a high ridge nearby when spotted. It ran off immediately when fired at with a rifle. The other two were travelling on the tundra; both saw the observers at distances greater than one-quarter of a mile, and both made off on the run. Tracks indicating a pack, or family group, of wolves were seen only on the east coast and only in two areas. A wolf visited the site of Camp 1 in our absence and cleaned up the forequarter of a caribou left there.

The last wolf seen got the observers' wind at one-third to one-half a mile and trotted away. It passed close to two single caribou both of which saw it and trotted off in a most unhurried and unconcerned manner, pausing to feed as they went. A group of nine other caribou, including three calves, ran quickly to a hilltop from a small valley when the wolf passed through. These brief observations tended to confirm the established belief that caribou are generally less concerned at the presence of a wolf than at the presence of a man.

No positive evidence of caribou predation by wolves was seen, although wolf scats found contained caribou hair and bones.

4. Short-tailed weasel (Mustela erminea) - Short-tailed weasels were relatively abundant. They were seen at Camps 3, 5, and 6. At Camp 3 a family was particularly active, coming into the tent while we were sleeping and getting into the food cache. The adult male of a family of at least four weasels was collected at Camp 6 but unfortunately the skull was subsequently lost.

5. Arctic hare (Lepus arcticus) - Hares were not seen during the investigations but old fecal pellets showed that they occurred. A few weathered bones at one ancient Eskimo camp site were believed to be those of a hare.

6. Parry's ground squirrel (Citellus parryi) - Ground squirrels were abundant and were seen, generally distributed, on 21 of the 30 days spent at Bluenose Lake. Probably they were not seen on the other days only because weather greatly restricted our range of movement from camp or because cold kept the squirrels relatively inactive and quiet.

7. Back's lemming (Lemmus trimucronatus) - Live Back's lemmings were not seen but skulls were noted in snowy owl pellets and there was no reason to suppose that they were less common than collared lemmings.

8. Collared lemming (Dicrostonyx groenlandicus) - Collared lemmings were well distributed, particularly on the west side of the lake, in dry tundra areas. In some places they were very numerous or had very recently been very numerous. Only a few were actually seen but burrows of the current year were everywhere.

9. Tundra vole (Microtus operarius macfarlani) - Voles were extremely abundant in well vegetated wet areas. On August 19, five were collected by running them down as they travelled between burrows. Unfortunately, a weasel carried off all five the same evening. More voles were seen, but no subsequent concentrations were thick enough so that individuals could be caught by hand. Lacking specimens, the animals are referred to the above species since they were certainly not yellow-cheeked voles, the only other vole species to be expected in the area according to Anderson's "Canadian Recent Mammals".

10. Barren-ground caribou (Rangifer arcticus) - Caribou were not found in large numbers during this investigation but it is believed that a considerable amount of useful information about them was gathered. Caribou were seen every day from August 4 to September 3 but the numbers varied greatly and were always small. On two days only a single animal was seen and the highest number seen on any one day was 37 animals. The total of 287 caribou gave an average of 9.6 animals per day. Every effort was made to ensure that individual caribou were not counted more than once during any one day but a few duplications may be present in the total figures. It is interesting to note that the caribou numbers and distribution are exactly like those reported in the area inland from Paulatuk which were seen in the summer of 1951 by a Geographical Branch field party led by J. Keith Fraser.

It was readily apparent, even during the flight to Bluenose Lake, that caribou could not be expected in considerable numbers, or large herds. The flight from tree-line north of the Dease River and Great Bear Lake to Bluenose Lake showed us a representative cross section of the country and revealed a condition that anyone who has done much summer barren-ground flying would notice instantly: there were hardly any caribou trails. This is unusual, since most barren-ground areas, even where caribou are only sporadic visitors, have deep worn trails which show up even from high altitudes around lake margins, along eskers and the like. It was assumed even during the flight northward, that caribou could not be very numerous in the area and did not gather frequently in large groups as they do in other areas. Our ground observations tended to confirm this assumption.

The ground observations showed another rather unusual habit of this group of caribou. They are seemingly resident, in the Bluenose Lake area at least, a large part of the year. Shed antlers, of varying age, and from all age and sex classes were found, indicating the presence of caribou from late November, when the bulls start shedding, through to the following July, when the pregnant cows are through shedding. Previous study areas on the barrens have been considered summer range only, although known to be used sporadically by caribou in winter, and shed antlers of adult and sub-adult bulls were almost entirely absent in them. In such areas the ratio of bull antlers to adult cow antlers found is 1:20 or even less.

At Bluenose Lake the ratio was about 1:1. This should not be taken to indicate that adult cows and adult bulls are present in equal numbers. Cows are almost certainly present in dominant numbers, as in other herds, but their shed antlers are much more difficult to see than the larger bull antlers. The presence of frequent winter type fecal pellets also attested to winter residence of caribou in at least small numbers.

Segregation work was nearly impossible among the caribou seen because most of them were travelling alone or in groups of only two or three. It would have taken more working time than we had at our disposal to get close enough to most of them to make positive segregations, and in view of the small numbers it would not have been worth the effort. Calves and bulls are apparent at great distances and were noted whenever seen. Of the total of 287 caribou seen, 34 or 12 per cent were plainly calves. This is a low calf percentage, but the figure cannot be considered significant. Many cows were so distant that there may have been calves which we did not see, and the sample is too small to be taken as representative. However, numbers of adult cows without calves were seen and the calf crop is tentatively considered as only fair. For example, a group of nine caribou were seen on September 1 - the largest single group of caribou encountered incidentally. Eight of these were adult cows and only one was a calf.

Adult bulls are easily distinguished from other age and sex classes even at great distances and our count of these animals is probably very accurate. Of 287 animals, 62 were adult bulls, a percentage of 22 per cent. This is close to what is usually considered a "normal" bull percentage. A rather startling factor was noted, however, in our observations of bulls and calves. These are set forth in the following table.

	Bulls	Calves
Total seen on east coast	56	0
Total seen on west coast	6	34
Total Seen	62	34

As can be seen above not a single calf was seen on the east coast, while 56 of the 62 adult bulls which we encountered were seen there. Of a total of 66 animals seen on the east coast 56, or 84.8 per cent, were adult bulls; while of a total of 221 animals seen on the west coast only six, or 2.7 per cent, were bulls. Two possible explanations may account for the obvious fact that most cows, calves, and young animals were on the west side of the lake and most adult bulls on the east side. The first explanation is that the animals came in from the east in spring migration - the cows leading the bulls as they very frequently do - and while the cows proceeded westward to drop their calves the bulls were caught by spring break-up and open water on the east shore. The second explanation is that the animals came in from a southerly direction, with bulls and cows separate, and that the two groups diverged, Bluenose Lake acting as a wedge-shaped barrier. If there were large numbers of caribou, a body of water as small as Bluenose Lake would provide no obstacle to either bulls or cows if they wished to join forces. With the small numbers and scattered distribution which we found, however, the animals might well remain nearly static during the summer. In summer a large herd of caribou

is in almost constant motion, since every time a few caribou start a movement the whole herd moves. When single animals and very small groups are involved, movement is much less frequent and distances covered are generally less.

It was thought that a count of caribou scats in sample plots might eventually provide indices of utilization which could be useful in assessing such things as numbers of animals on a given range, suitability of range for utilization, or frequency of use of given areas. It was believed necessary first to establish many sample plots over a very wide area. The simplest way to do this is in conjunction with range analyses. During the range studies of the past two years, therefore, fecal pellets have been counted every time a line point vegetative sample was taken. Each plot extends for three feet on each side of a 100-foot line giving a 600-square-foot plot. Generally these plots are read in series of ten along straight lines with a 200-foot interval between individual plots. Ninety such plots were established during this investigation. These are the first established on summer ranges and as a consequence they have no comparative value at present. The results, presented below, are of some interest, however, since the large number of plots in which no feces were seen demonstrates light utilization over a longer period than our actual ground observations of caribou cover. Over most of the mainland barrens it would be unusual to find a 600-square-foot plot that did not contain at least one pellet group.

NO. OF FECAL GROUPS (SINGLE DEFECATIONS) PER PLOT

	0 pellets	1 pellet	2 pellets	3 pellets	4 pellets	5 pellets
No.of plots (west coast)	38	5	4	2	0	1
No.of plots (east coast)	27	7	3	1	1	1
Total plots	65	12	7	3	1	2

Two caribou were autopsied and the data gathered will be added to the growing accumulation of such material. One of the animals was an adult bull possibly four or five years old, and the other was a yearling bull. Both animals were in splendid condition except for the usual warble scars on their backs. The adult, however, had a malformed left antler and an atrophied left eye. The antler was normal in size but the main beam was somewhat twisted and straightened so that it pointed backwards and sideways at its terminal instead of upward. (Figure 7). The eye was complete but greatly sunken into the eye socket, and apparently useless. The eyelids and surrounding area were normal and no sign of injury was apparent. Somewhat similar conditions have been noted in reindeer in the Mackenzie Delta.

The following table presents the measurements and weights of these animals (Nos. 1 and 2, Figures 7 and 8) as well as comparable data for two adult males taken in September, 1952. It is interesting to note that the recently-taken adult bull exceeds in every measurement the other two, which were the largest taken previously in the caribou investigation. Its weight, however, was somewhat less than that of the other adults. Strangely, it did not look particularly large, no larger, in fact, than two other bulls with which it was travelling when shot.

Measurements and Weights of Various Caribou
(Measurements in millimeters; weights in pounds.)

	Total Length	Height	Hind Foot	Tail	Ear	Weight
1. Yearling male	1486	940	495	127	121	138.5
2. Adult male	2083	1181	543	165	133	286
3. Adult male	1829	1061	503	121	121	338
4. Adult male	1905	1041	501	114	114	291

11. Musk-ox (Ovibos moschatus) - It seems probable that the Bluenose Lake area is a regular summer range for musk-oxen and very possibly at least a casual winter range as well. We saw musk-oxen on five separate occasions. Four of these observations involved single adult bulls and it is possible that two bulls were observed more than once, for although found in different localities they were seen on dates far apart. The fifth sighting involved a herd of 25 animals. It is therefore considered that we saw 27 to 29 musk-ox. These sightings are plotted on Figure 2.

It will be noted that we found no musk-oxen on the east side of the lake. However, we saw one or two sets of tracks on the east side which we identified as probable musk-ox tracks. Tracks were very frequent on the west shore and indicated either the presence of a number of animals which we did not see or a very wide range for the ones which we did see. For example, at Camp 1 on our arrival there were very fresh tracks of a large musk-ox and older tracks of several others. When we returned to Camp 1 after an absence of nearly four weeks there were again fresh tracks of what must have been a fair-sized herd. In the four weeks there had been heavy rains to obliterate the tracks seen on the first visit.

The assumption that the animals are also present at least casually in winter is based on the presence of scarce, but well distributed, winter-type feces. A winter-type musk-ox fecal pellet is unique in its size and in its shape, which is square or rectangular with concave ends. These are dropped to some extent in summer, late spring, and early autumn - depending on the feeding habits of the individual animals - but most are dropped in winter. Such pellets were seen on one occasion on the east shore of the lake toward the south end, and several times on the west shore of the lake. The fresh feces which we saw in quantity were all of the typical shapeless summer type, which can often be confused with summer caribou feces.

The herd of 25 animals was thoroughly photographed with a movie camera and observed in undisturbed and disturbed states for several hours. The difficulties connected with ageing and segregating sexes, and indeed in obtaining a total count, were illustrated in this case. Initial counts from over two miles distance gave a possible maximum of 13 animals. Our first close counts - from a distance of less than one-half mile - gave a maximum of 23 animals. It was not until we had been watching the animals for possibly more than an hour at ranges of 300 yards or less that the total of 25 animals was finally apparent. In this group there were five animals which could only be classified as mature bulls. One of these was the darkest adult bull and had the longest horn growth the author has ever seen. Five additional animals were classed as bulls approaching maturity - probably 2½ years old, and older. These were keeping noticeably to themselves while we

watched; most of them lying in a group a hundred yards or more from the main herd and well over 200 yards from most of the adult bulls. Three animals were plainly calves of the year and three were yearlings. The remaining nine animals were all believed to be adult cows and juveniles over 1½ years old. Some might have been sub-adult males but it is thought that they were more likely females. Both our sight observations, and the number of calves and yearlings present, indicates that certainly six of these animals were adult cows.

The preponderance of adult bulls was surprising, particularly since an additional adult bull was seen not over two miles from the herd on the same day. An adult bull percentage of 23 per cent, and a percentage of bulls over 2½ years old of 42 per cent seems considerably higher than would be desirable. There may have been herds of cows and calves that we did not see. The calf percentage in this group - including the single nearby bull - is 11.5 per cent, approximately the same as the writer has determined in the Thelon and other areas at various times. The yearling percentage was also 11.5 per cent.

The musk-oxen were resting and feeding when first observed. They had to be approached in the open. For this reason we photographed them by walking slowly in on them from a distance of possibly 700 yards, and stopping about every 50 to 100 yards to take pictures. They gave no clear indication of seeing us until we were within a distance of approximately 400 yards. Flurries of movement, and a tendency to bunch together showed shortly thereafter but they did not run until we were little over 150 yards from the nearest animals. They finally started away on the run, with frequent stops to bunch up and look back. Their speed prohibited close pursuit.

On three occasions different bull musk-oxen were seen to wade into water to feed on aquatic grasses and sedges. One of these was a single bull seen from the aircraft on August 3, which was well out in a small lake when first seen.

Mitchell had a unique experience on August 6, when he walked inland some miles for a closer look at a lone musk-ox which we had spotted earlier in the day. He found the animal in a small, luxuriant river valley, feeding about the margin of a small pool. The animal, either alarmed at his presence, or for some other reason, ran 100 yards or so up the river bank. Simultaneously a barren-ground grizzly erupted from a depression where it had been lying hidden and appeared to stalk the musk-ox. The bear was probably not much over 100 yards from the musk-ox and the two animals were less than one-quarter of a mile from Mitchell. The bear finally went back to its hiding spot; the musk-ox returned to its feeding; and Mitchell being unarmed, prudently withdrew.

The musk-ox encountered August 26 (Fig. 2) was a lone bull. A quotation from the field notes of that date, written up that evening, might be of interest.

"In a.m. a male musk-ox was visible about 2½ miles north on lake-shore heading south. Intercepted him back of camp and took movies on a bare hill without benefit of cover. This animal first saw us at one-third of a mile, or less, but continued on until within about 150 to 200 yards away. It paused frequently, finally turning, running away, looking back at one-quarter mile and running a good mile around a lake. Proceeded SW by S - nearly his original course - at a rapid walk. Intercepted him again on a hilltop but he ran ahead and when last seen was pursuing his "bee-line" course three to four miles away. During the approximate two hours he was under observation he paused only briefly to feed - a mouthful at odd intervals - and

covered a good six to seven miles in a straight line, not counting his running back when scared by us. Obviously a musk-ox with a purpose! It was an adult male, very dark with a light tan 'hump'."

It is interesting to note that this animal was heading in a southerly direction and that his course was very closely toward the area where the animals were found wintering in February, 1953. This was the last musk-ox which we saw despite an additional week spent on the lake.

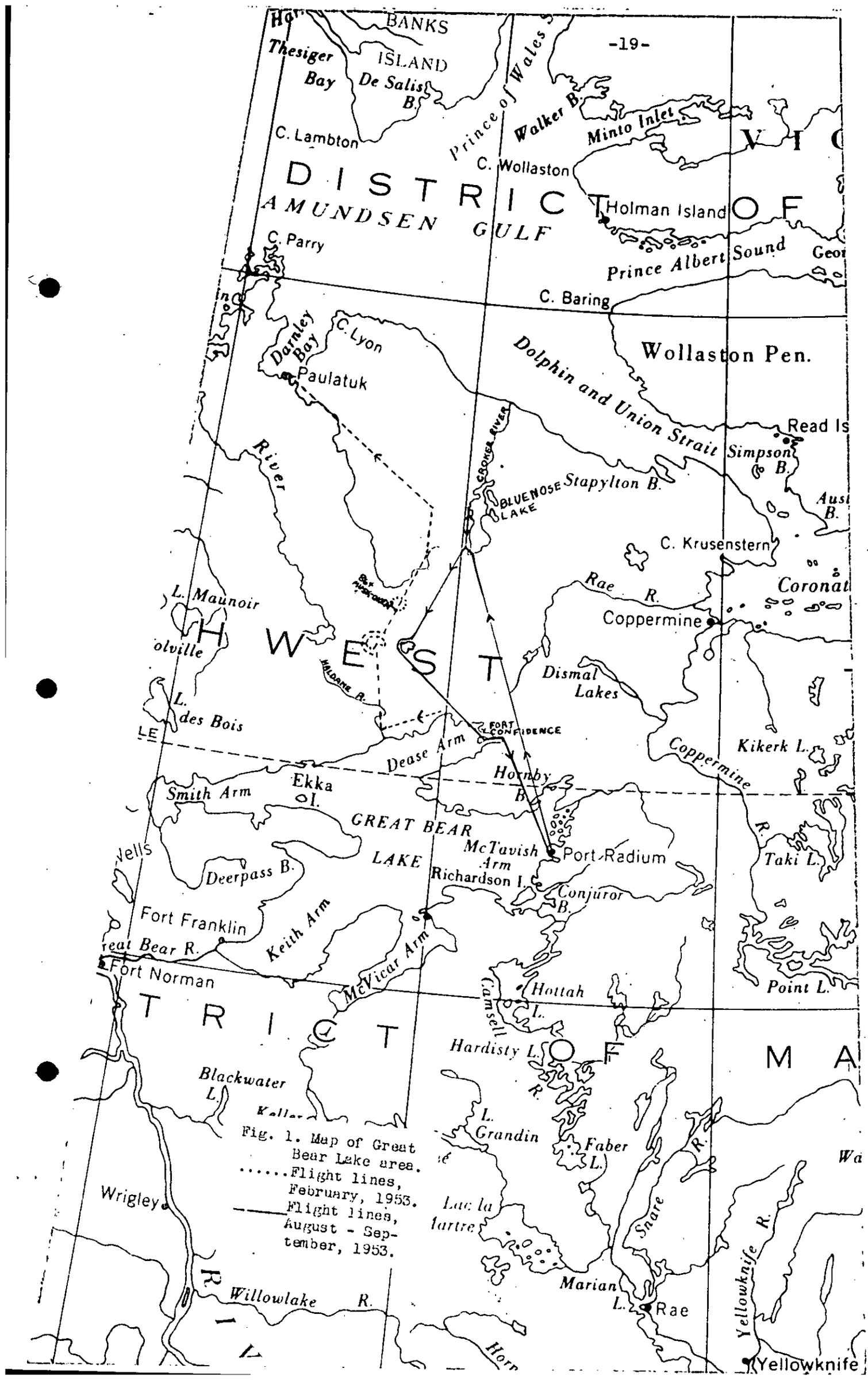

Fig. 1. Map of Great Bear Lake area.
.....Flight lines, February, 1953.
——Flight lines, August - September, 1953.

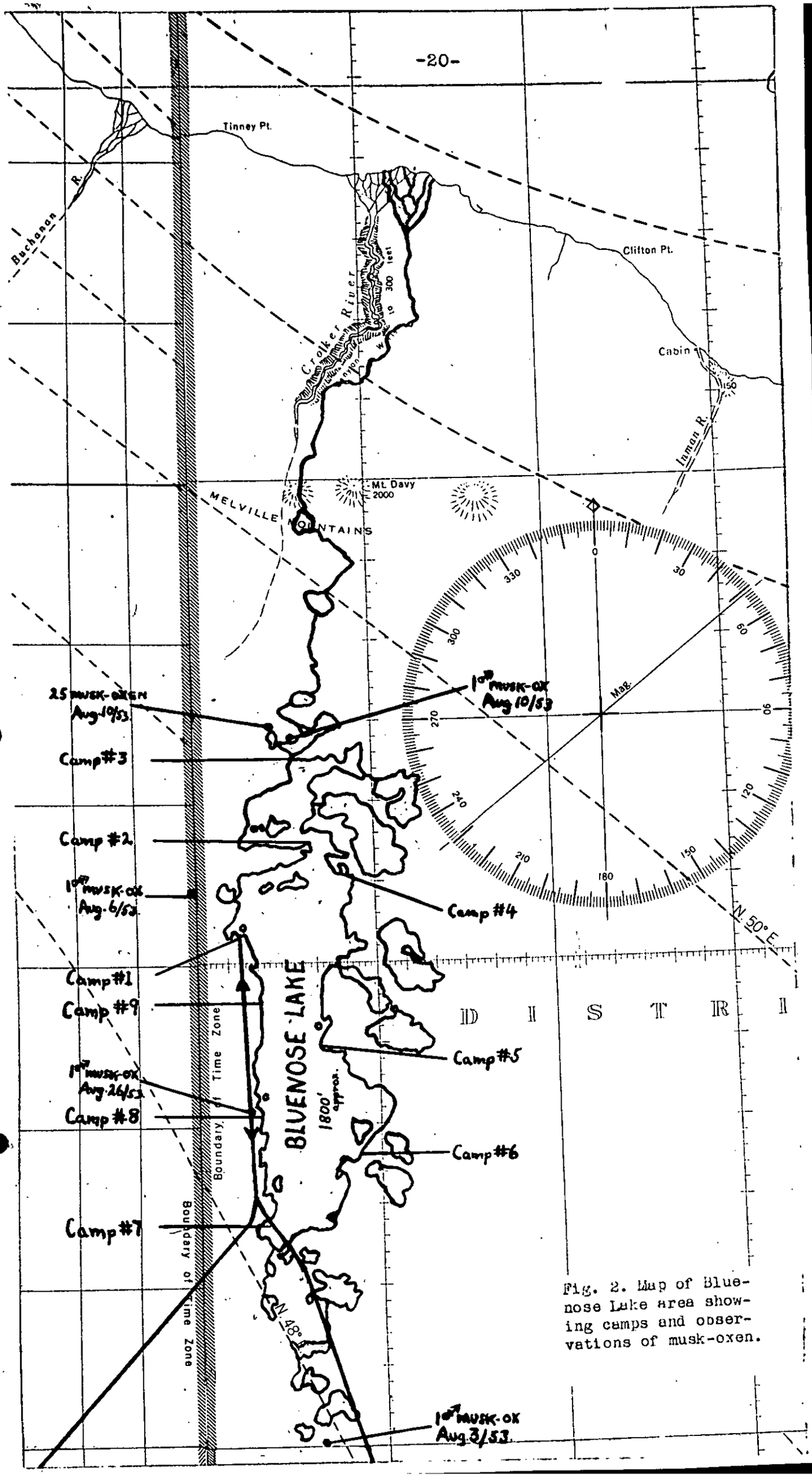

Fig. 2. Map of Bluenose Lake area showing camps and observations of musk-oxen.

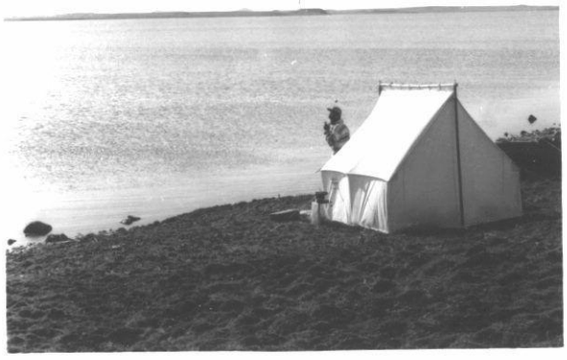

Fig. 3. View south from Camp 3 at north end of Bluenose Lake. High hills in centre background are near the narrows on the main part of the lake.

Fig. 4. Camp 3 looking northeast and showing point where Croker River flows out of the lake.

Fig. 5. Typical high, [illegible] rock and gravel hill on east coast near Camp 4. The view faces west and the Wildlife Service cairn is just visible on the top of the hill.

Fig. 6. Mitchell on gentle slope of a hill. Shows vegetative cover typical of much of the Bluenose Lake country.

Fig. 7. Adult male caribou, the largest taken up to date during the caribou investigation, showing abnormal left antler and atrophied eye. This area is comparatively well vegetated.

Fig. 8. Yearling male caribou lying in an area of superior vegetation.

Fig. 9. View northeast from the southwest corner of Bluenose Lake. Camp 7 is visible on island in left foreground.

Fig. 10. View west from the southwest corner of Bluenose Lake showing plugs-like earth formations on the lakeshore plain and ridge running north-south in background.

Kelsall, John.P.
Biological
inverstigations north of
Great.Bear Lake, 1953.

DATE	ISSUED TO