CANADIAN WILDLIFE SERVICE

Queen Elizabeth Islands Game Survey, 1961

by JOHN S. TENER

Occasional Paper No. 4

Environment Canada
Wildlife Service

Environnement Canada
Service de la Faune

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Issued under the authority of the
Honourable Jack Davis, P.C., M.P.
Minister of the Environment.

John S. Tener, Director
Canadian Wildlife Service

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Catalogue No. CW69-1/4

First edition 1963
Reprinted 1972

CONTENTS

5 ABSTRACT

6 INTRODUCTION

7 OBJECTIVE
- Personnel, 7
- Itinerary, 7

8 METHOD
- Logistics, 8
- Survey design, 8
- Survey method, 9
- Sources of error, 11

13 RESULTS
- Caribou and muskoxen on the Islands
  - Devon, 14
  - Cornwallis, 14
  - Little Cornwallis, 15
  - Bathurst, 15
  - Melville, 20
  - Prince Patrick, 23
  - Eglinton, 26
  - Emerald, 27
  - Borden, 27
  - Mackenzie King, 28
  - Brock, 29
  - Ellef Ringnes, 29
  - Amund Ringnes, 30
  - Lougheed, 31
  - King Christian, 32
  - Cornwall, 32
  - Axel Heiberg, 32
  - Ellesmere, 33

38 SPECIES SUMMARY
- Avifauna
  - American and black brant, 38
  - Snow geese, 39
  - Old squaw, 40
  - King eider, 40
  - Gyrfalcon, 40
  - Peregrine falcon, 41
  - Rock ptarmigan, 41
  - Snowy owl, 41
  - Raven, 41
- Mammalian fauna
  - Polar bear, 42
  - Arctic fox, 43
  - Arctic wolf, 44
  - Seals, 44
  - Peary caribou, 45
  - Muskoxen, 47

49 SUMMARY

50 REFERENCES

LIST OF TABLES

I Survey intensity of the Islands, 13
II Calculations, estimated caribou population, Bathurst Island, 18
III Calculations, estimated muskox population, Bathurst Island, 19
IV Observations from the ground of four muskox herds, Bracebridge Inlet, Bathurst Island, 19
V Caribou densities and age classes, from transect data, Melville Island, 22
VI Calculations, estimated caribou population, Melville Island, 22
VII Muskoxen observed on transect, Melville Island, 23
VIII Caribou observed on transect, Prince Patrick Island, 24
IX Calculations, estimated caribou population, Prince Patrick Island, 26
X Calculations, estimated caribou population, Eglinton Island, 26
XI Calculations, estimated caribou population, Emerald Island, 27
XII Calculations, estimated caribou population, Borden Island, 28
XIII Calculations, estimated caribou population, Mackenzie King Island, 29
XIV Calculations, estimated caribou population, Ellef Ringnes Island, 30
XV Calculations, estimated caribou population, Amund Ringnes Island, 30
XVI Calculations, estimated caribou population, Lougheed Island, 31
XVII Calculations, estimated caribou population, Cornwall Island, 32
XVIII Muskoxen seen on transect, by locale, Ellesmere Island, 37
XIX Snow geese observations, by island and locale, 39
XX Seal observations, by island and locale, 45
XXI Provisional total caribou populations and observed age structures, 46
XXII Provisional total muskox populations and observed age structures, 48

LIST OF FIGURES

1 Bathurst Island caribou herd-size frequency, 17
2 Melville Island caribou herd-size frequency, 21
3 Prince Patrick Island caribou herd-size frequency, 25
4 Ellesmere Island muskoxen herd-size frequency, 35

ABSTRACT

Eighteen of the islands of the Queen Elizabeth group in the Northwest Territories were surveyed from the air to determine the species, distribution, and a numerical index of the larger mammals and birds found there.

Two light aircraft were flown at 500 feet altitude at an air speed of 85 miles per hour along predetermined flight lines.

Totals of 25,845 Peary caribou and 7,421 muskoxen were calculated to be on the Queen Elizabeth Islands. The figures are provisional, being subject to more elaborate statistical treatment. Populations of caribou in excess of 1,000 animals are believed to be on Bathurst, Melville, Prince Patrick, Borden, Mackenzie King, and Lougheed Islands. About 4,000 muskoxen are on Ellesmere Island, while Bathurst, Melville, and Axel Heiberg Islands have about 1,000 each.

Greater snow goose concentrations were found either side of Eureka Sound, on Axel Heiberg, and Ellesmere Islands.

Some use of Peary caribou by Eskimos is feasible. Restricted use of muskoxen for scientific purposes is possible.

RÉSUMÉ

Dix-huit des îles de l'archipel Reine-Elisabeth, dans les Territoires du Nord-Ouest, ont fait l'objet d'un examen du haut des airs en vue d'établir les espèces des mammifères et des oiseaux de grande taille qui y habitent, ainsi que leur répartition et un indice numérique.

Deux avions légers ont survolé la région à 500 pieds de hauteur et à 85 milles à l'heure le long de lignes de vol déterminées d'avance.

On a calculé que 25,845 rennes polaires (caribous de Peary) et 7,421 bœufs musqués habitaient les îles Reine-Élisabeth. Ces chiffres sont provisoires et ils devront être soumis à une étude statistique plus poussée. Des populations de plus de 1,000 caribous existent, croit-on, dans les îles Bathurst, Melville, Prince Patrick, Borden, Mackenzie King et Lougheed. L'île Ellesmere possède environ 4,000 bœufs musqués, alors que les îles Bathurst, Melville et Axel Heiberg en ont 1,000 chacune.

Des concentrations plus importantes d'oies blanches ont été trouvées des deux côtés du détroit d'Eureka, dans les îles Axel Heiberg et Ellesmere.

Les Esquimaux pourraient faire un certain usage du caribou de Peary. L'usage restreint du bœuf musqué à des fins scientifiques est aussi possible.

INTRODUCTION

The Queen Elizabeth Islands are those islands north of M'Clure Strait, Viscount Melville Sound, Barrow Strait, and Lancaster Sound, in the Arctic Archipelago of the Northwest Territories. Those islands are of considerable historical interest and the reader is referred to Taylor (1955) for an excellent review of their exploration.

There were three reasons for assessing populations of animals on the islands. Firstly, their area, comprising a total of 165,518 square miles, was one of the last in Canada about which little quantitative information was available on wildlife resources. A much better understanding of game productivity of Arctic regions, and the causal factors behind it, would be obtained. Secondly, the dwindling stocks of wildlife used by Eskimos in southern regions made necessary an examination of the islands for possible relocation of those Eskimos still desirous of living off the land. And the third reason was that adequate information about game resources is essential to prevent undesirable destruction of the game or its habitat by increased human activity in the islands.

OBJECTIVE

The survey was designed to obtain information on the occurrence, numbers, and distribution of Peary caribou (*Rangifer tarandus pearyi*), muskoxen (*Ovibos moschatus wardi*), wolves (*Canis lupus arctos*), Arctic foxes (*Alopex lagopus innuitus*), Arctic hare (*Lepus arcticus monstrabilis*), and several species of waterfowl, particularly greater snow geese (*Chen hyperborea* subsp.), and brant (*Branta* sp.). Additional information on caribou and muskox ranges, calf crops, yearling survival, and age structure of caribou and muskox populations was recorded where possible, as were data on polar bears (*Thalarctos maritimus*) and seals (*Phoca* and *Erignathus* sp.). Incidental work, such as collecting plants for the National Museum of Canada and keeping records of birds and mammals observed from the ground, was also done.

Personnel

The survey crew consisted of two pilots from Bradley Air Services, Ltd., Mr. Ken McLennan and Mr. Wes Kellog; and three biologists from the Wildlife Service, Mr. C. R. Harington, eastern Arctic biologist, Mr. D. R. Thomas, student assistant, and the writer.

Itinerary

The party left Ottawa at midnight on June 4, 1961, and flew by commercial and Royal Canadian Air Force aircraft to Resolute Bay, Cornwallis Island, arriving on June 7. Survey flying commenced on June 10 and finished on August 18. Mr. Thomas returned south from Alert, Ellesmere Island, on August 10, taking with him all the camping gear except emergency equipment. By travelling light it was possible to survey the whole northwest complex of seven islands before winter weather arrived.

Mr. Harington and the writer flew to Frobisher Bay August 20 on an R.C.M. Police aircraft, through the kindness of Inspector Mudge, and arrived in Ottawa the next evening by commercial aircraft.

METHOD

Logistics

The purchase of gasoline, oil, and food and their shipment to Resolute Bay, Cornwallis Island, and Eureka, Ellesmere Island, were carried out in 1960. The R.C.A.F. base at Resolute Bay served as the main base of operation, from which supplies were ferried by R.C.A.F. Hercules aircraft during the April 1961 airlift to Mould Bay, Prince Patrick Island, and Isachsen, Ellef Ringnes Island. A Beaver aircraft ferried gasoline, oil, and food from those weather stations, and from Eureka, to the several sites on the islands where camps were to be established.

Survey design

The design of the survey presented a number of problems. There was little factual information about the numbers and distribution of animals on most of the islands. The reports of geologists of the Geological Survey of Canada (Macpherson, 1960), while helpful, were not detailed enough in their animal sightings to be of real value in selecting the method of survey. With little knowledge available it was decided that it would be impossible to stratify the sample in a manner necessary to take into account differences in distribution which might exist. From prior experience it was known that muskoxen were contagiously distributed, or grouped, where found, and that caribou, while widely distributed, were scarce in some areas and relatively numerous in others. In general, systematic sampling was chosen as best designed to provide data on both geographical distribution and numbers. Its chief disadvantage is that, unless a particular formula can be derived, no confidence limits can be placed on population estimates formed on the basis of such sampling; i.e., the degrees of accuracy of the estimates are unknown (Greig-Smith, 1957). Such a situation is difficult to avoid when an initial survey of a large, biologically unknown area is being carried out.

Some degree of variation in sampling intensity, i.e., stratification, was possible because of previous general knowledge of the terrain and the animal populations. Icecaps and high mountainous terrain were

omitted, while areas known to be virtually sterile floristically, such as the Beaufort formation found on the western islands, were surveyed lightly.

In selecting survey intensity (i.e., the percentage of the total land area of a particular island to be surveyed) a number of factors had to be considered. From a statistical point of view more accurate results can be obtained by employing a relatively large number of small samples than by using a few large samples. While the percentage covered of each of the islands is small, for most islands the relatively large number of transects, combined with the systematic sampling method, probably ensured adequate representation of the various habitats and of the geographical distribution of animals within them.

The percentage of area surveyed of Ellesmere Island was low, but the intensity of coverage was greater than Table 1 indicates, for there were large areas on the island which, although not glaciated, were not surveyed because of operational problems.

For each of the eighteen islands surveyed the first flight line was selected at random and additional transects were located parallel to it. The transects were equi-distant, their frequency being governed by the desired intensity of sampling.

Two map scales were chosen, eight miles to the inch and four miles to the inch. Flight lines (transects) were drawn on each. The larger scale facilitated map reading by the pilots. Details of transects are given in the initial discussion of each island.

Survey method

The surveying was done from two Piper Super Cub tandem-seated aircraft, specially equipped with large, low-pressure tires which enabled the aircraft to be landed on, and flown from, unprepared ground. The selection of the company providing the aircraft was done by tender, and Bradley Air Services, Ltd., Carp Airport, Carp, Ontario, was the successful tenderer. That company gave outstanding service to the survey. The technique, except on part of Devon Island, involved flying at an altitude of 500 feet above ground level at an air speed of 85 mph. Counts of animals and birds (when identifiable) were made within a strip one-quarter-mile wide on the right-hand side of the aircraft along each transect. Counts were recorded on forms previously prepared. The transect width and flight altitude were selected to facilitate sighting of all animals within the transect, and accurate identification of age and sex classes.

Devon Island was the first to be surveyed. The two Cubs were not yet serviceable, so a Beaver aircraft was used to take advantage of good weather. Also, the long flight lines over the island demanded an aircraft with greater range than the Cubs. The altitude flown was 1,000 feet above

ground level, and an observer on both sides of the aircraft enabled coverage of two one-half-mile transects.

The general descriptions of ungulate ranges, derived from the survey, have limited value and only detailed ground studies will provide information needed for accurate assessments of the amount and variety of forage in the different areas.

The raw data for all transects on all islands are in the files of the Canadian Wildlife Service, Ottawa.

A total of 500 hours was flown in the Piper Cub and 100 hours in the Beaver aircraft. It is interesting to note that only about 205 hours were flown on survey, the rest being necessary for support.

Calculations of population numbers of caribou and muskoxen

All animals observed during the survey flights were recorded, including those seen beyond the one-quarter-mile observation strip (recorded as seen "off transect"). But Peary caribou and muskoxen were the only species for which island population totals were attempted and those attempts involved only the animals seen within the strips.

The numbers of each animal species seen within the observation strips of the transects on each island were totalled. The miles flown on those transects were totalled and then divided by four to obtain the number of square miles observed over the island. The total number of each species was then divided by the number of square miles to obtain a figure per square mile. Multiplying that figure by the total number of square miles of potential habitat on an island, or in an island sub-unit, gave a theoretical population total of a species for that area. It should be noted that the total number of square miles derived from linear miles flown do not in all cases equal the total linear miles because of rounding off figures to the nearest one tenth of a mile.

The above method is based on a number of assumptions, the most important being that the caribou and muskoxen were distributed randomly. The survey revealed that such was not the case for muskoxen particularly, which were contagiously distributed. Population totals for muskoxen, therefore, could not be calculated except for some sub-units of Bathurst Island. For all other islands muskox populations were estimated on the basis of numbers and distribution observed and on knowledge of total available suitable habitat. Such estimates are only provisional guesses.

Caribou populations were not randomly distributed but were more nearly so than muskoxen. Distribution on some islands, such as Bathurst, was influenced by proximity of coastline vegetation and on other islands by topographical features, such as mountains or sterile sand plains. By stratifying areas containing such features, and by basing calculations on the numbers found within the areas, errors attributable to non-randomness probably were reduced. The calculations of caribou populations must be considered provisional, nevertheless.

A second assumption was that all caribou and muskoxen actually within the quarter-mile strip were counted by observers. The low altitude, slow speed, narrow strip, absence of concealing vegetative cover, and previous experience of the observers all favoured accurate counts. Some animals may have been missed, however.

Sources of error

A number of errors can be made in carrying out aerial surveys designed to count game animals. The survey crew was alerted to the possibility of such errors and every effort was made to minimize them. The three biologists on the survey had previous experience in aerial counts of the species encountered.

Biologists who have examined survey errors have agreed that one of the most important can be human in origin (Banfield, et al. 1954). There may be a marked difference among survey personnel in their ability to detect animals from the air, some being more efficient than others. Even the most efficient may miss 10 to 20 per cent of the animals, resulting in an underestimate of the total population surveyed. Fatigue is a principal factor in reducing observational efficiency and as the average (and maximum) flight in the present study was of three hours duration, it is probable that some animals were missed in the last hour of survey.

A prerequisite for a one-quarter-mile observed strip is a constant altitude of 500 feet above the terrain. Over relatively flat country no serious problems were presented, as sea-level readings were obtained at the start of most flights and the corrected altitude flown accordingly. Over hilly and mountainous terrain, such as Ellesmere and Axel Heiberg Islands, or over plateaus dissected with river valleys, it was at times impossible to maintain a constant altitude above ground for safety reasons. In those cases the observer had to adjust his angle of view according to the changed altitude, introducing possible errors of area covered. The precise degree of such errors is unknown, but it is believed that it was small enough to permit area-coverage calculations to be based on an average width of one-quarter mile.

An important factor which made observation more difficult on southern Bathurst Island was the presence of snow patches on bare ground. The intermittent patches of alternating dark and white colours presented a confusing ground pattern for ready identification of the animals. Tracks in the snow patches often assisted in locating animals within transects, but undoubtedly some animals, particularly caribou, were missed.

A few of the survey flights were flown around midnight, when the sun was low on the horizon and light conditions were not as good as

during the "day". Those flights were carried out after lingering patches of snow had disappeared from the terrain and animals could be identified more readily. In general the 24-hour daylight experienced throughout the survey facilitated operations considerably.

It may seem imprudent to have carried out the survey under conditions which would reduce its efficiency. The decision to fly under those conditions was made on the spot in the realization of the possibility of error, but also with the knowledge that if the vast area (122,047 square miles of potential habitat) were to be covered during the short summer, every reasonable opportunity for flying would have to be used. There were so many occasions when flying was impossible that it appeared at the end of six weeks of operation the survey would be only half finished when summer ended. The data, obtained under less than ideal conditions, may be subject to some error, but the result of that error would be the underestimating of population sizes of the species recorded, rather than overestimating. From a management viewpoint that is the desirable side on which to err. The successful completion of the survey without an attending sacrifice in accuracy may be attributed to luck, full support of all personnel, and adequate planning.

RESULTS

Caribou and muskoxen on the Islands

Table 1 gives information on the number of miles of survey flying done on each island, the dates the transects were flown, and the percentage of the total area of potential game habitat of each island covered.

TABLE I

Survey intensity of the Islands

Island	Flight dates, 1961	Linear miles flown	Square miles observed	Islands, potential habitat	Habitat, proportion surveyed
Devon	June 10, 12, 17	1,874	888.5	14,498*mi.^{2}	6.13%
Cornwallis	June 14, 16	743.5	186.0	2,670	6.96
Little Cornwallis	June 16	67	17.0	159	10.69
Bathurst	June 19, 27, 28, July 1, 3, 7	2,368.5	592.1	7,595	7.79
Melville	July 8, 9, 12, 15, 16, 18, 21, 22	3,827.5	957	15,959*	6.00
Prince Patrick	July 23, 24	1,027.0	256.7	6,081	4.22
Eglinton	July 24	140.0	35	551	6.35
Emerald	July 24	77.5	19.5	251	7.77
Brock	August 17	24	6.0	228*	2.63
Borden	August 17	135	34.0	550*	6.18
Mackenzie King	August 17	353.0	88.2	1,728*	5.10
Ellef Ringnes	August 14	693.0	173.2	5,139	3.37
Amund Ringnes	August 15	355.5	88.9	2,515	3.53
Lougheed	August 18	81	20.2	312*	6.47
King Christian	August 18	45	11	448	2.45
Cornwall	August 15	127	31.5	1,208*	2.60
Axel Heiberg	August 2, 3	1,108.5	277.0	10,004*	2.77
Ellesmere	July 30, August 1, 3, 4, 5, 7, 10, 11	3,868.5	967.0	52,151*	1.85
Total		16,915.5	4,648.7	122,047	

*Area covered by glaciers, sterile soils, etc., but not high mountains or other rugged terrain, subtracted from total island area.

The caribou and muskoxen observed on each island are treated separately in the following section. In addition, a summary of observations of each important species is given at the end of the report. In the files of the Canadian Wildlife Service are eight-miles-to-the-inch maps showing all transects on all islands, and the locations and numbers of all caribou, muskoxen, foxes, and wolves observed on and off the transects.

Devon Island

A large part of the island—6,363 square miles—is covered with glaciers. Much of the remainder of the island, particularly the area between Wellington Channel and the icecaps to the east, is over 1,000 feet in altitude and is underlain predominantly with lower Palaeozoic carbonate rocks (Thorsteinsson, 1958). At the time of the survey, June 10 to 17, the island was almost completely snow covered. The presence of caribou or muskoxen in the area was revealed by tracks. The fact that very few tracks were seen substantiates the relatively few observations of animals.

The area of the island south and east of a line between Macormick Bay and Thomas Lee Inlet was flown in a Beaver aircraft at 1,000 feet, permitting 560 square miles to be observed. The island area north and west of that line was flown in Piper Super Cubs in the manner described under Methods, giving an observed area of 328.5 square miles. Colin Archer Peninsula was not surveyed because of heavy, persistent fog.

Caribou

Only five caribou were seen on transect during 1,874 linear miles of flying. Save for one animal on the west side of Radstock Bay, and one south of Baring Bay, the remainder, as well as 11 seen off transect, were in the northwest portion of the island, chiefly on Grinnel Peninsula. The population of caribou on Devon Island is estimated to be about 150. Although this number is provisional, it is doubtful if the true figure is more than twice that. The vegetative barrenness of the limestone shale would preclude the existence of anything but a few caribou over large non-glaciated areas of the island. It is possible that some caribou live either side of Croker Bay, but that area was not surveyed because of operational problems.

Muskoxen

Not one muskox was seen on transect. A herd of 14 was observed at Brae Bay and two herds of six and two animals were found on the west side of Arthur Fiord. Also, on Grinnel Peninsula, a single animal was recorded off transect four. It is not possible to calculate a population total, but from previous information it is estimated that not more than 200 muskoxen are on Devon Island. The carcass of an adult bull that had died recently was found on the south shore of Griffin Inlet, and a dead yearling was observed near the camp of the Devon Island Expedition, near Cape Sparbo.

Cornwallis Island

Relatively few game animals have been reported on Cornwallis Island during the years since the establishment in 1947 of the Department of

Transport weather station at Resolute Bay. Occasional sightings of caribou have been recorded, and rarely more than 35 muskoxen have been observed on the island in any one year by crews of R.C.A.F. aircraft.

Thorsteinsson (1958) has discussed the vegetation on Cornwallis Island, emphasizing the absence or scarcity of plants over most of its area. He attributes that to three factors, solifluction, elevation above sea level, and the nature of the bedrock, factors which have application to the other Arctic islands as well. The result of these factors is sparse vegetation except on a relatively small area (15 square miles) in the northwest coastal region of Cornwallis Island. It follows that the numbers of caribou and muskoxen the island can support are restricted by the limited vegetation available.

Caribou

Only three caribou were observed on transect, one at the headwaters of a branch of the Eleanor River west of Helen Haven, and two near Pioneer Bay. The calculated population total is 43 caribou.

Muskoxen

Three small herds of muskoxen, totalling 13 animals, were sighted on transect 11, northwest of Allen Bay. Three additional groups were observed off transect, one herd of seven on the Eleanor River, and two herds of two and eight on the northwest coast bordering Pullen Strait. Because of the restricted area of vegetation, random distribution of muskoxen cannot be assumed, preventing a calculation of total population. An estimate, based on past records and on the current results, is that about 50 muskoxen are on the island.

Little Cornwallis Island

This low-lying island is moderately well vegetated. No caribou or muskoxen were observed on it, however. Mr. Donald Thomas saw a wolverine on June 16, the second most northerly record for the species.

Caribou have been observed in small numbers on the island in past years and it is likely there is movement of the animals between Cornwallis and Bathurst Islands.

Bathurst Island

Bathurst Island proved to be one of the more productive surveyed, in terms of wildlife. The island appears to be underlain with impure Devonian sandstone and siltstone, and Ordovician and Silurian graptolitic facies (Tozer, 1956). The relatively rich vegetation present over much of the island is, to a large extent, the result of the widespread sandstone structure. The numerous low-lying valleys and the long coastline resulting from the many peninsulas and bays have contributed also to the rich plant

cover. The distribution of caribou and muskoxen was markedly influenced by such topographical effects.

The initial survey flights were carried out when there was more than 50 per cent snow cover, the snow being heaviest on the higher plateaus and ridges. During delays caused by bad flying weather the snow melted rapidly, and by the end of the survey on the island, there was no snow except on lee sides of ridges and narrow valleys.

All flights originated from the base camp at the west end of Bracebridge Inlet. Seventy transects totalling 2,368.5 miles were flown. All transects were three miles apart. Transects 38 and 39 on Helena Island on the north coast were not flown because of fog and shortage of fuel.

The number of strata employed in the analyses of the data requires a word of explanation. The island is penetrated by several deep inlets, which serve to form large peninsulas or otherwise nearly isolated large sections of land. In addition, four small islands off the west coast were included as part of Bathurst Island. Stratum A is south of the low land joining Bracebridge Inlet on the west and Goodsir Inlet on the east. Strata B and C are delimited by large inlets and the surrounding sea. Those areas were further stratified to separate the coastal influence on distribution of caribou in the calculations. Strata D to G are islands off the west coast and were treated as separate entities.

Caribou

Two points were obvious immediately upon inspection of the mapped distribution. One was the virtual absence of caribou on the portion of the island lying south of the line joining Bracebridge Inlet and Goodsir Inlet. The central part of that area is a relatively high plateau (1,000 feet or more), and it is probable that the caribou moved to the lower-lying country to the north before the arrival of spring. The second point was the extent of the influence of coastal areas on caribou distribution. In the northeastern portion of the island (Stratum B) nearly as many caribou were observed within one mile of the coast as in the interior. In Stratum C the number of animals seen on the coast was more than twice that in the interior. An obvious reason was the quicker disappearance of snow from the lowlands, with consequent earlier appearance of new green vegetation.

Total number of caribou seen on transect on the island was 288, while 187 were seen off transect. Mean caribou herd size in 57 herds (22 solitary animals excluded) was 4.67. Figure 1 shows the frequency distribution of herd sizes. Fifty-one calves were observed on transect, a percentage of 19.84. That figure was based on a total of 257 caribou which were positively identified. There were nine yearlings, or 3.50 per cent. That percentage may be lower than reality because of difficulty experienced occasionally in ageing animals correctly.

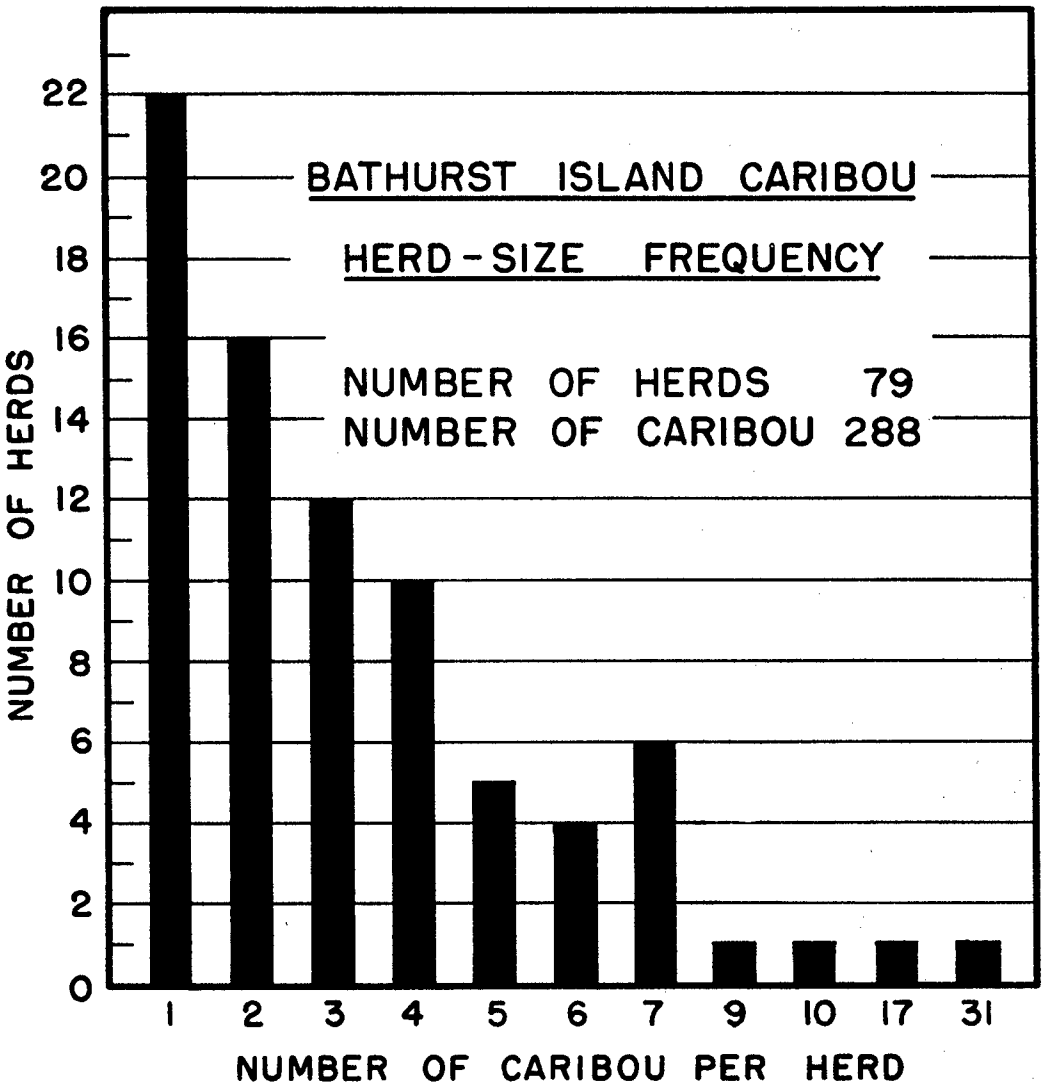

BATHURST ISLAND CARIBOU
HERD-SIZE FREQUENCY
NUMBER OF HERDS 79
NUMBER OF CARIBOU 288
NUMBER OF HERDS
0
2
4
6
8
10
12
14
16
18
20
22
1
2
3
4
5
6
7
9
10
17
31
NUMBER OF CARIBOU PER HERD

Figure 1

The provisional calculation of the total population of caribou on Bathurst Island is given in Table II.

The calculated total population of 3,565 caribou is for all the land area considered here as part of Bathurst Island.

TABLE II

Calculations, estimated caribou population, Bathurst Island, N.W.T., 1961

Stratum	Linear miles flown	Square miles observed	Caribou observed	Caribou per sq. mile	Total area (square miles)	Estimated caribou population
A	668.5	167.1	1	.0059	2,189	13
B (coastal)	101.5	25.4	63	2.480	226	560
B (interior)	746.5	186.6	73	.391	2,368	926
C (coastal)	79.5	19.9	60	3.015	284	856
C (interior)	410.5	102.6	28	.273	1,350	368
D	60	15	15	1.00	198	198
E	55	13.7	1	.073	175	13
F	116	29	26	.896	442	396
G	130.5	32.6	21	.648	363	235
Total	2,368.0	591.9	288		7,595	3,565

Muskoxen

Muskox distribution was not random over the island. In Stratum A three concentrations were apparent: the southeast corner, along the tributaries of a large river flowing into De la Beche Bay on the west coast, and along the south shore of Bracebridge Inlet. In Stratum B the animals were found along the west coast. The central portion and the north coast revealed no muskoxen and the east coast only five. In Stratum C the animals were found in the interior, as were those few found on the western islands, Strata D and G.

One hundred and eleven muskoxen were seen on transect, of which 10, or 9.0 per cent, were calves and three or 2.7 per cent, were yearlings. Mean herd size, omitting the four observations of single animals, was 5.63 muskoxen.

The distribution on Stratum B was so non-uniform that a calculation of the population of the area is not warranted without refined statistical technique. A tentative estimate of the number there is 200. Calculations of the numbers on Strata A and C are given in Table III, as is the total population estimate.

It was possible to examine four herds at Bracebridge Inlet when the observers were on foot. The age and sex structures of those herds are given in Table IV.

The proportions of calves and yearlings, 27.5 and 18.8 per cent respectively, were remarkably high, but must be considered as unrepresentative of the whole population because of the small sample. It is most interesting to note that in most herds the number of calves and yearlings together exceeded the number of adult cows. That suggests production

TABLE III

Calculations, estimated muskox population, Bathurst Island, N.W.T., 1961

	Strata				
	A	B	C	D, E, F, G.	Total
Linear miles flown	668.5	848.0	490.0	361.5	2,368.0
Square miles observed	167.1	212.0	122.5	90.3	591.9
Muskoxen observed	40	37	31	3	111
Muskoxen per square mile	.239		.253		
Total area (square miles)	2,189		1,634		7,595
Estimated muskox population	523	200*	413	25*	1,161

*Estimates only.

TABLE IV

Observations from the ground of four muskox herds, Bracebridge Inlet, Bathurst Island, N.W.T., 1961

	June 18	June 23	June 27	June 27	Total
Bulls	—	1	1	—	2
Cows	6	8	5	5	24
Three-year-old bulls	1	3	1	1	6
Male two-year-olds	—	2	—	1	3
Female two-year-olds	—	1	—	1	2
Yearlings	3	5	2	3	13
Calves	6	6	3	4	19
Total	16	26	12	15	69

of calves in successive years by at least some cows, the production of twins, or both.

One instance of wolf predation was recorded at Bracebridge Inlet. On July 1st during a short flight back to the base camp a pack of five wolves was observed on a hillside at a muskox carcass. We landed at the site and examined the carcass, which turned out to be a four-year-old female. The remains of twin calves, about six weeks of age, were lying about 15 feet from the female. The animals had been dead about 24 hours. A herd of muskoxen that was about one mile away from the carcasses had probably been attacked by the wolf pack and the cow with her calves cut off and killed.

Most of the flesh had been consumed. The paunch of the cow contained willow twigs, lichens, grasses, and sedges. No other evidence of predation by wolves was obtained during the summer.

Twins occur rarely in Canadian muskox populations. The above finding, plus the high proportion of calves found in herds observed from the ground at Bracebridge Inlet, and the indication of calving in successive years there, probably reflect the excellent forage conditions noted in the area.

Melville Island

The geology of Melville Island appears to be similar to that of Bathurst Island. On the basis of incomplete information, Tozer (1956) believes that large areas of Melville are probably underlain with impure Devonian sandstone and siltstone. That bedrock character has produced, along with altitudinal and micro-environmental effects, extensive vegetation over many sections of the island. However, the interior of the western half of the island, between the icecaps and Hecla and Griper Bay, is high (up to 3,500 feet) and appeared virtually barren of vascular plants. Very few animals were there, except along some of the low-lying valleys which penetrated from the east. Similarly, an extensive block of country immediately south of Sabine Bay appeared to be relatively poorly vegetated. Both of the above regions were surveyed, however. An area of 410 square miles not examined included the mountains and their icecaps east of Ibbett and Purchase Bays.

The survey was carried out from three base camps, Tingmisut Lake (west side of Weatherall Bay), Bridport Inlet, and the head of Ibbett Bay. One hundred and seven transects yielded a survey mileage of 3,827.5 (957 square miles), for a 6.00 per cent coverage of potential game habitat of the island. Transects were four miles apart.

Caribou

Caribou were widely distributed throughout the island. They were more numerous on Dundas Peninsula, in the Bridport Inlet and Skene Bay area, and east of Weatherall Bay, than elsewhere.

The island was divided on a geographic basis into three regions for purposes of statistical analysis; i.e., sampling was stratified on the basis of topography and the observed distribution of caribou. The three regions are as follows: Sabine Peninsula, Dundas Peninsula to Weatherall Bay, and the western half of the island.

Densities of caribou and the percentages of calves, yearlings, and adults observed in each region are presented in Table V. Seven hundred and sixty-nine were seen on transect and 473 off transect. Figure 2 illustrates the distribution of the frequencies of the various-sized groups of caribou recorded.

Coastal influence on distribution was far less marked than on Bathurst Island, possibly because of differences in terrain, but also possibly because Melville Island was examined two to four weeks later than Bathurst. During the time interval higher elevations had lost their snow cover and caribou may have been attracted by new vegetation there. As on Bathurst Island, caribou were found in small groups, the most frequent being two caribou per group (Figure 2). A cow and her calf constituted 14 of the 41 groups of 2. Larger groups were composed of cows, calves and, occasionally, of yearlings and/or bulls. Mean herd size excluding solitary animals was 4.08. Production of calves was 19.01 per cent.

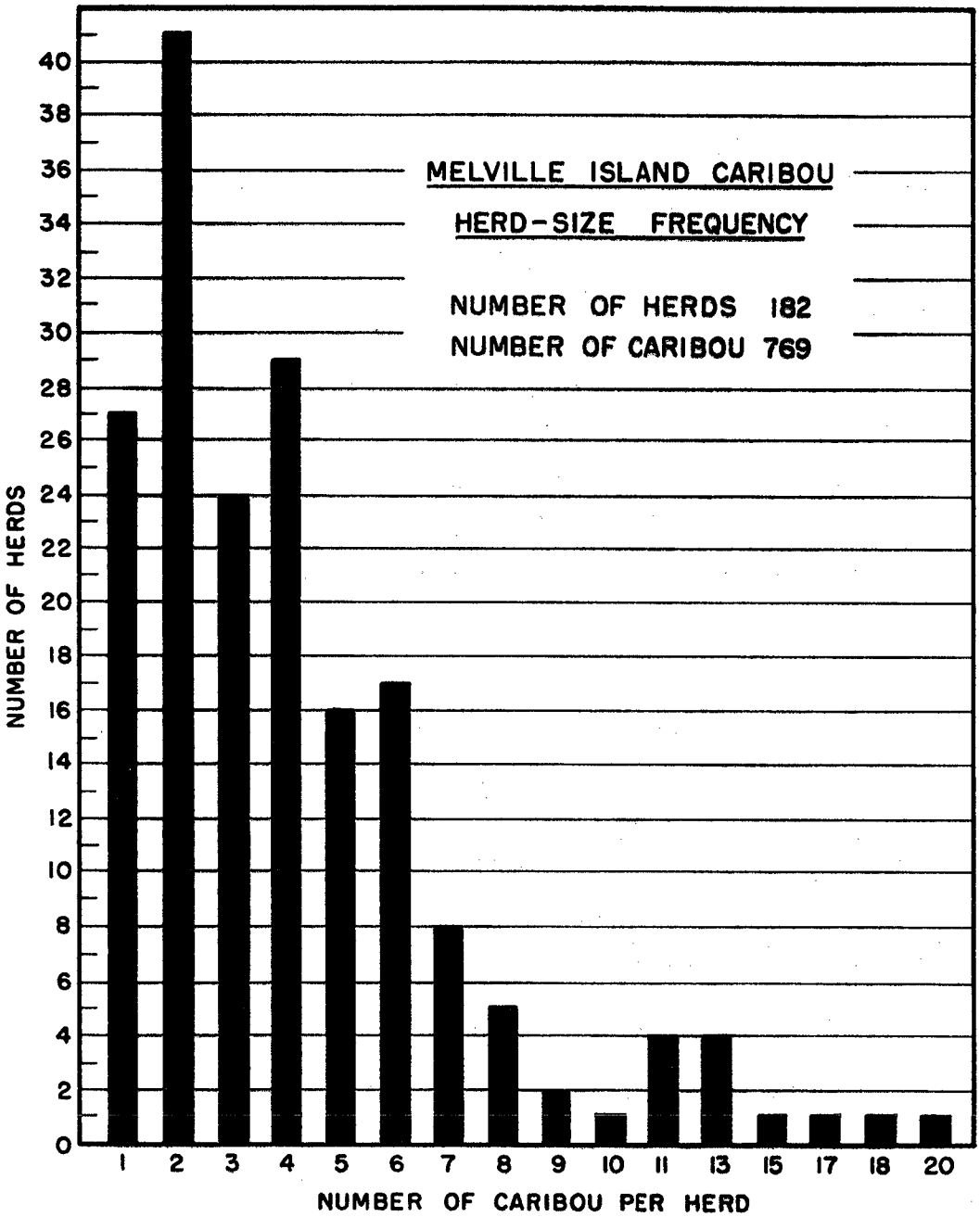

MELVILLE ISLAND CARIBOU
HERD-SIZE FREQUENCY
NUMBER OF HERDS 182
NUMBER OF CARIBOU 769
NUMBER OF HERDS
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
30
32
34
36
38
40
1
2
3
4
5
6
7
8
9
10
11
13
15
17
18
20
NUMBER OF CARIBOU PER HERD

Figure 2

TABLE V

Caribou densities and age classes, from transect data, Melville Island, N.W.T., 1961

Area	Densities (caribou per square mile)	Calves No.	Calves Per cent	Yearlings No.	Yearlings Per cent	Adults No.	Adults Per cent	Total observed
Sabine Peninsula	.339	7	18.42	2	5.26	29	76.32	38
Dundas Peninsula to Weatherall Bay	1.126	105	21.17	27	5.44	364	73.39	496
Remainder of Island	.581	41	17.45	5	2.13	189	80.42	235
Total		153		34		582		769
Average	.682		19.01		4.28		76.71	

Yearling proportions in the strata varied between 2.13 and 5.44 per cent. The stratified average was 4.28 per cent, indicating either a poor calf crop in 1960 or high mortality of a good calf crop. Again, as for Bathurst Island data, a few yearlings may have been confused with adults, resulting in a lower yearling percentage.

The total population of caribou on Melville Island is tentatively placed at 12,799 animals. Table VI gives the derivation of that figure.

TABLE VI

Calculations, estimated caribou population, Melville Island, N.W.T., 1961

	Sabine Peninsula	Dundas Peninsula to Weatherall Bay	Remainder of Island	Total
Linear miles flown	447.5	1,762.5	1,617.5	3,827.05
Square miles observed	111.9	440.6	404.4	956.9
Caribou observed	38	496	235	769
Caribou per square mile	.339	1.126	.581	
Total area (square miles)	1,835	7,284	6,840	15,959
Estimated caribou population	622	8,202	3,975	12,799

Because of the assumptions made in the analyses of the data, it is quite possible that the above estimates are open to modification. There is little doubt, however, that the total caribou population is in the thousands, far more than hitherto believed.

Muskoxen

Muskoxen on Melville were distributed in a highly contagious manner. A few herds were found on Sabine Peninsula, none on Dundas Peninsula and the remainder either along the southwest coast or in the vicinity of

McCormick Inlet on the west side of Hecla and Griper Bay. The 273 muskoxen seen on transect are recorded in Table VII. An additional 252 were recorded off transect.

The average calf crop was 17.22 per cent. On the western half of the island it was 17.96 per cent, and on Sabine Peninsula 11.54 per cent. The latter figure is based on too few animals to be significant.

Yearlings constituted only 1.11 per cent of all muskoxen seen on transect. There is some likelihood of confusing yearlings and calves from the air unless the observer is experienced and careful. It is possible, therefore, that the above calf figures include some yearlings, although every effort was made to avoid the error.

Mean herd size, omitting five single bulls, was 11.87 muskoxen.

The highly skewed distribution of muskoxen in the western half of the island makes it impossible to calculate total numbers in the area by the straight application of density figures obtained. An accurate figure of the total population will require more intensive survey, but a tentative conservative estimate for Melville Island is 1,000 muskoxen.

TABLE VII

Muskoxen observed on transect, Melville Island, N.W.T., 1961

	Calves	Yearlings	Adults and immatures	Total
Sabine Peninsula	3	1	22	26
Dundas Peninsula to Weatherall Bay	—	—	2	2
Remainder of Island	44	2	199	245
Grand total	47	3	223	273

Prince Patrick Island

About 63 per cent of the area of the island is covered by unconsolidated sands and gravels of the Beaufort formation. Although some relatively well-vegetated areas are on that formation, plants generally are sparse or absent, save for lichens. The remainder of the island is covered with a number of other geological formations (see Tozer, 1956) and the flora found there is relatively rich in some areas, rare or greatly restricted in others. The number of herbivores the island can support is limited, therefore, to the relatively small areas of good vegetation.

MacDonald (1954) undertook biological work for the National Museum of Canada in 1949 and 1952, largely in the vicinity of Mould Bay. He noted a marked decrease during that period in numbers of

caribou, 171 being counted during two months in 1949 and only 68 in the same months in 1952. Muskoxen were relatively common in the former year, up to 50 being seen at one time.

All survey flights in the present study were based at Mould Bay. Survey intensity was stratified by reducing the proportion of the area of Beaufort formation covered. Transects were not equi-distant. A total of 1,027 linear miles or 258 square miles of survey was flown, giving a 4.22 per cent coverage. The percentage over the non-Beaufort formations, however, was 5.93, and transects were four miles apart.

Caribou

Caribou were found on the four peninsulas along the east coast of the island and, surprisingly, northwest of Mould Bay, on Beaufort formation. Seven strata, A to G, on the map were established for purposes of analysis of the data, two strata lying within the Beaufort formation. The strata were selected to reflect contiguous areas of habitat (Strata A and B), absence of abundance of caribou (C and D) or areas of differing geological structure (E, F, and G). The selection is somewhat arbitrary, but is based on biological knowledge of the distribution of the animals and on the nature of the terrain on the island. Details of caribou seen in each stratum, and the total calf and yearling composition, expressed in per cent, are given in Table VIII.

TABLE VIII

Caribou observed on transect, Prince Patrick Island, N.W.T., 1961

	Strata								
	A	B	C	D	E	F	G	Total	Per cent
Calves	5	13	0	9	0	1	0	28	20.29
Yearlings	5	—	0	1	0	2	0	8	5.79
Adults	19	29	0	16	19	19	0	102	73.92
Total	29	42	0	26	19	22	0	138	100.00

The calf yearling crops were 20.29 and 5.79 per cent respectively.

It is immediately apparent in the above table that calves were virtually absent from the Beaufort formation strata (E and F), possibly because most cows with calves would seek the more richly vegetated peninsulas to the east.

Herd-size frequency is given in Figure 3. Mean herd size is 4.6, excluding solitary animals.

The total caribou population on the island is calculated to be about 2,254. It was particularly difficult to derive a figure for the population on the Beaufort formation, Stratum E, because of inadequate knowledge of the extent of the area occupied by the animals. The caribou-per-square

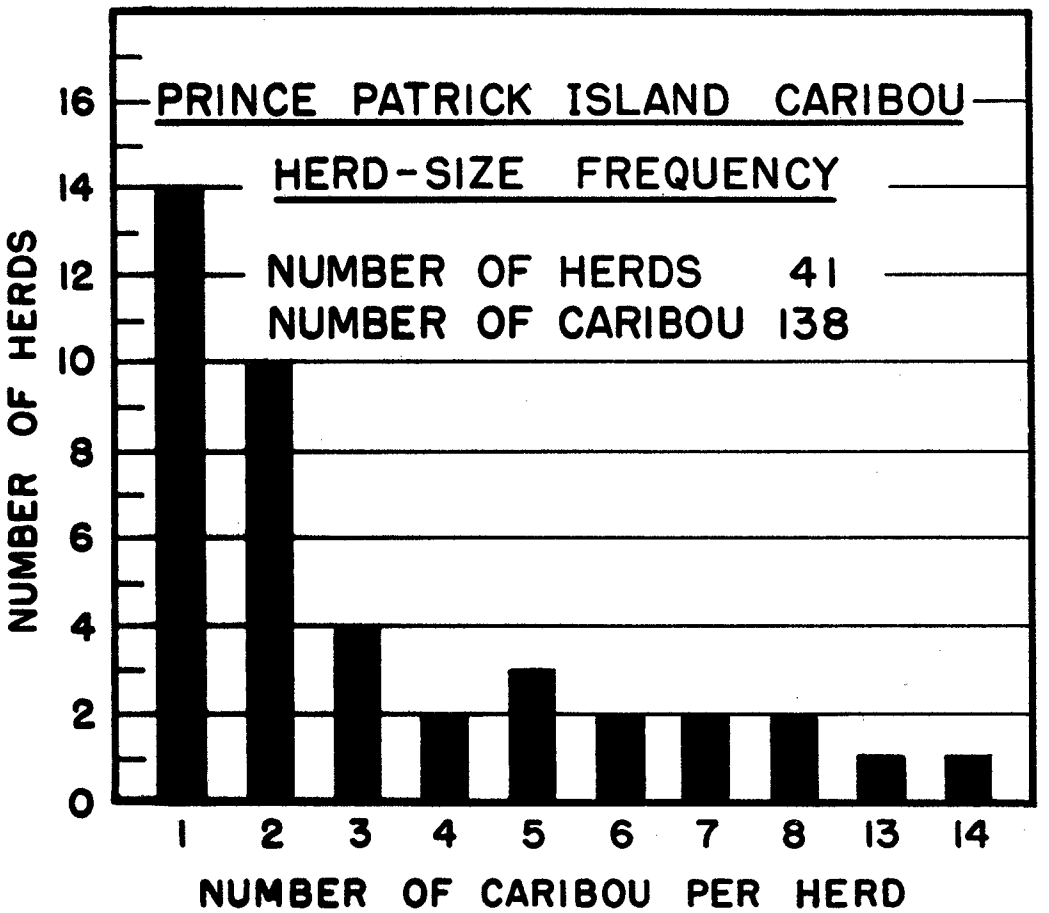

PRINCE PATRICK ISLAND CARIBOU
HERD-SIZE FREQUENCY
NUMBER OF HERDS 41
NUMBER OF CARIBOU 138
NUMBER OF HERDS
0
2
4
6
8
10
12
14
16
1
2
3
4
5
6
7
8
13
14
NUMBER OF CARIBOU PER HERD

Figure 3

mile figure could only be applied to an arbitrarily determined area of "potential" habitat. The derivation of the total population estimate is given in Table IX.

TABLE IX

Calculations, estimated caribou population, Prince Patrick Island, N.W.T., 1961

Strata	Linear miles flown	Square miles observed	Caribou observed	Caribou per square mile	Total area (square miles)	Estimated caribou population
A	330	82.5	29	.351	1,504	528
B	163.5	40.9	42	1.027	646.4	664
C	22	5.5	0	0	65.9	0
D	20	5.0	26	5.2	42.2	219
E	71	17.7	19	1.07	241	258
F	192	48.0	22	.458	1,278	585
G	228.5	57.1	0	0	2,303.5	0
Total	1,027.0	256.7	138		6,081.0	2,254

Muskoxen

No muskoxen were observed during the survey. The last recorded from the island were a group of three, seen in 1958 by Dr. R. Thorsteinsson. None has been seen since and it is probable that the species no longer lives on Prince Patrick Island.

Eglinton Island

This small island is an eroded peneplain, with the northern quarter producing little vegetation. No muskoxen were seen in 140 miles of survey flying along four transects, which were four miles apart, but 13 caribou (4 calves) were recorded. An additional 38 were found off transect. Table X presents the total caribou population calculation. Nearly all animals were found in the interior.

TABLE X

Calculations, estimated caribou population, Eglinton Island, N.W.T., 1961

	Total
Linear miles flown	140
Square miles observed	35
Caribou observed	13
Caribou per square mile	.371
Total area (square miles)	551
Estimated caribou population	204

Emerald Island

The island has low-lying coasts and elevations in the interior which do not exceed 500 feet. It presents a green, lush appearance from the air. Caribou were found only along the coast or on the low-lying coastal plain at the western tip. No muskoxen were seen, but eleven caribou were recorded on 77.5 miles of transect flying, an observed area of 19.4 square miles. Transects were three miles apart. Because of the coastal influence on distribution, the island was stratified into two areas, one consisting of a coastal strip one mile wide around the island and the other consisting of the interior of the island. Table XI gives the calculations for the total population estimate. Four of the 11 caribou observed on transect were calves. An additional nine caribou were recorded off transect.

TABLE XI
Calculations, estimated caribou population, Emerald Island, N.W.T., 1961

	Interior	Coastal	Total
Linear miles flown	55.5	22.0	77.5
Square miles observed	13.9	5.5	19.4
Caribou observed	4	7	11
Caribou per square mile	.287	1.27	—
Total area (square miles)	160	91	251
Estimated caribou population	46	115	161

Borden Island

Of Borden Island's 1,344 square miles, 794 are of Beaufort formation and 550 of late Paleozoic and early Tertiary formations (Thorsteinsson and Tozer, 1960). Vegetation and caribou were confined to the latter formations. Elevations on the island do not exceed 500 feet. Ninety-eight miles of survey were flown over the Beaufort formation and 135 over the remainder of the island. No muskoxen were observed. Transects were four miles apart.

Caribou

There were 22 calves and 2 yearlings in the 100 caribou recorded on transect. The animals were found in the southeast quarter of the island.

The total population of the animals is estimated to be 1,630, as outlined in Table XII. The proportion of calves was 22 per cent and of yearlings, 2 per cent.

TABLE XII

Calculations, estimated caribou population, Borden Island, N.W.T., 1961

	Beaufort formation	Remainder	Total
Linear miles flown	98	135	233
Square miles observed	24.5	33.75	58.25
Caribou observed	0	100	100
Caribou per square mile	0	2.963	—
Total area (square miles)	794	550	1,344
Estimated caribou population	0	1,630	1,630

The high density of animals was surprising. A number of tracks leading from Mackenzie King to Borden Island (11 miles apart at their nearest points) over the sea ice suggests that the density may be the result partly of occasional or seasonal immigration.

Mackenzie King Island

The island has no Beaufort formation structures, but the northeast segment of the island has large vegetatively barren areas. The highest elevation of 1,500 feet is a group of hills known as the Leffingwell Crags. Most of the island is under 500 feet elevation and produces relatively good vegetation, particularly on the west side.

Two strata were established for data analysis, a western segment, well vegetated and relatively heavily populated with caribou, and the remainder of the island (See map). The former area is a drainage basin, with natural topographical boundaries which permitted reasonably accurate area determination. The barren regions in the northeastern section of the island were plotted on the survey maps and their areas deducted from the number of square miles of total potential habitat. A relatively small southwestern segment of the island could not be flown because of fog. No muskox were seen.

Transect flying totalled 353.0 miles and all transects were four miles apart.

Caribou

Calves constituted 21.6 per cent (24 animals) of the 111 caribou recorded on transect. Only two yearlings were counted. Apart from 8 single animals, 103 caribou were in 23 herds, the mean herd size being 4.48. More than half of the caribou seen were within the western stratum. A total population figure of 2,192 caribou was derived as shown in Table XIII.

TABLE XIII

Calculations, estimated caribou population, Mackenzie King Island, N.W.T., 1961

	Western stratum	Remainder of Island	Total
Linear miles flown	73.0	280	353.0
Square miles observed	18.2	70	88.2
Caribou observed	71	40	111
Caribou per square mile	3.901	.571	—
Total area (square miles)	362	1,366	1,728
Estimated caribou population	1,412	780	2,192

Brock Island

The survey of Brock Island was not completed because of fog. A short flight of 24 miles over the vegetated southern portion yielded five caribou. Based on the above information and a vegetated area of 228 square miles, a tentative estimate of the population on the island is 190 caribou.

Ellef Ringnes Island

This relatively large island (5,139 square miles) is poorly vegetated and supports few terrestrial vertebrate species owing to the effect of low summer temperatures and large areas with soils not conducive to plant growth. Saville (1961) has presented an evaluation of the island's flora and MacDonald (1961) of its vertebrate fauna. Unless major climatic changes occur, the island is unlikely to support substantial numbers of game.

All survey flying of the island, as well as of Amund Ringnes, Cornwall, King Christian, Lougheed, Brock, Borden, and Mackenzie King Islands, was based from Isachsen, although gas caches on Mackenzie King and Amund Ringnes Islands were used.

Previous reports indicated a paucity of caribou and muskoxen, and survey intensity was therefore reduced (Table I). Transects were six miles apart. Six hundred and ninety-three linear miles, or 173.2 square miles, were flown, but only four caribou were observed. An additional 17 caribou were recorded off transect. So few caribou were seen that the population estimate must be accepted with reservation (Table XIV).

No reliable information can be given on the calf crop. Of the 21 caribou seen on and off transect, three were calves, but the numbers are too few for interpretation.

Not one muskox was observed during survey. The last report was of three animals seen in 1960 near the southeast tip of the island. It is possible that none is on the island at present.

TABLE XIV

Calculations, estimated caribou population, Ellef Ringnes Island, N.W.T., 1961

	Non-Beaufort formation	Beaufort formation	Total
Linear miles flown	625	68	693
Square miles observed	156.21	17.0	173.21
Caribou observed	4	0	4
Caribou per square mile	.025	0	—
Total area (square miles)	4,548	591	5,139
Estimated caribou population	114	0	114

Amund Ringnes Island

Amund Ringnes Island has a bedrock structure similar to that of Ellef Ringnes Island. Saville (1961) considered that the island's proximity to Axel Heiberg and the fact that it was less exposed to cold winds from the Arctic Ocean result in richer vegetation, although systematic collecting has yet to be done to prove the point.

Transects were six miles apart on the island and a total of 355.5 miles were flown over it, an area coverage of 88.9 square miles. Sixteen caribou, including 4 calves, were seen on transect, 17 off transect. Most of them were in the central portion of the island, although six were recorded at the northern tip. The population estimate was 452 caribou (Table XV). Numbers of caribou observed are too few to justify a calf crop percentage.

TABLE XV

Calculations, estimated caribou population, Amund Ringnes Island, N.W.T., 1961

	Total
Linear miles flown	355.5
Square miles observed	88.9
Caribou observed	16
Caribou per square mile	.18
Total area (square miles)	2,515
Estimated caribou population	452

Muskoxen

Four bull muskoxen were seen about eight miles inland from about the centre of the west coast. The absence of cows, calves, and other immature groups suggests that the four were immigrants, possibly from Axel Heiberg. There is also the possibility that they included the same group seen in 1960 on southern Ellef Ringnes Island.

Probably not more than ten muskoxen are on the island today.

Lougheed Island

This relatively small island (413 square miles) supported a surprisingly large number of caribou. The south-central portion of the island contained the most caribou, where the range was richly vegetated and dotted with many small ponds. The higher, hilly terrain at the northern end of the island possibly forms an important caribou winter range.

Saville (1961) has suggested that the flora of Lougheed Island is poor. The location of his study site on the east coast appears, according to description, to be in a small sand and clay barren. On the basis of our range observations and the abundance of caribou it would appear that Saville's conclusions are erroneous.

The barren areas totalled 101 square miles, leaving a vegetated area of 312 square miles. Transect lines were six miles apart. Details of the caribou population calculations are given in Table XVI

Table XVI

Calculations, estimated caribou population, Lougheed Island, N.W.T., 1961

	Total
Linear miles flown	81
Square miles observed	20.25
Caribou observed	86
Caribou per square mile	4.25
Total area (square miles)	312
Estimated caribou population	1,325

In addition to the 86 caribou seen on transect, 146 were observed off transect. Of the former group, 19 were calves and 5 were yearlings, 22.1 and 5.8 per cent respectively.

Density of caribou was similar to that found in the western segment of Mackenzie King Island. The excellent calf crop and at least "normal" (for the islands surveyed) yearling percentage would suggest that the population of caribou had not reached the carrying capacity of their ranges. No muskoxen were observed on the island.

King Christian Island

The island covers 448 square miles and has a low coastline and a central dry plateau about 700 feet above sea level. The coastal region was relatively well vegetated, but the dry interior appeared barren.

Forty-five miles of survey revealed only three caribou, too few for a population estimate of any value with the given survey intensity.

Cornwall Island

Cornwall Island is hilly, particularly in the north-central sector where land rises to about 1,500 feet. The northeast and southeast corners are sterile sand plains, whose areas were subtracted from the total area of the island for purposes of population calculations. Elsewhere, except on high, dry ridges, vegetation is present in varying degrees.

Three flight lines, each six miles apart, were flown over the island; the area covered was 31.75 square miles. Caribou were widely distributed over the island, although rather more were observed on the western half. No muskoxen were observed. Seven caribou were seen on transect, 37 off. No calves were seen on transect, but the off-transect group contained 11, giving a combined calf crop of 25 per cent, or 29.7 per cent considering the off-transect data alone.

Based on transect data, the population of caribou was calculated at 266 (Table XVII).

TABLE XVII

Calculations, estimated caribou population, Cornwall Island, N.W.T., 1961

	Total
Linear miles flown	127
Square miles observed	31.75
Caribou observed	7
Caribou per square mile	.22
Total area (square miles)	1,208
Estimated caribou population	266

Axel Heiberg Island

The island is mountainous and covered extensively with glaciers. The northern tip, the east side of the island and parts of the west, particularly the southwestern half, are ice free. However, elevations of the ice-free areas reach 4,000 feet or more near the glaciers, and slope generally toward the coast. Vegetation was relatively rich at lower elevations, particularly on the east side of the island adjacent to Eureka and Nansen

Sounds. The west side of the island, while ice free, appeared from the air to support more mosses and sedges and fewer grasses and herbaceous forms. The west coast south of Strand Fiord was not surveyed, but reports from those who have flown over it indicate moderately good vegetation.

The area of ice-free land on the island is 10,004 square miles. Transects were flown over most of it, with the above exception. Transect width was six miles. Survey flying totalling 1,108 miles resulted in an area coverage of 277 square miles, or about 2.77 per cent of the ice-free area. All flying over the island was based from Eureka, Ellesmere Island, but gas caches on the island were utilized to extend flying range.

Caribou

Only 42 caribou were seen on transect, with an additional 18 off transect. There were six calves in the former group and two in the latter, giving a calf crop of 14.3 per cent for those animals seen on transect. With the exception of three caribou seen at the head of Whitsunday Bay, Eureka Sound, all caribou were found at the north tip and along the northwest coast. Because of the low survey intensity, the sparseness and wide distribution of the species makes a population calculation meaningless. An intuitive guess is that there are about 300 caribou on the island.

It is interesting to note that distributions of caribou and muskoxen were nearly mutually exclusive. Discussion of that point is presented on page 47.

Muskoxen

Muskoxen were numerous on the east coast between the icecap and Eureka Sound, from the vicinity of Stor Island north to a point west of Schei Peninsula. A particularly dense concentration of 84 occurred in a well-vegetated river valley at the head of Gibs Fiord.

Survey flying revealed 157 muskoxen on transect and 229 off transect. Not all transect animals could be aged because of the rapidity with which they appeared in view. The calf crop figure is based on those animals for which reliable ageing data are available. In that group of 118 animals, 8 were calves, a percentage of 6.78. The yearling ratio was the same. Mean herd size, exclusive of single animals, was 8.5.

A total population estimate of the species on the island cannot be made because of the highly contagious distribution of the animals and of the limitations of the survey design. A conservative preliminary estimate is 1,000 muskoxen.

Ellesmere Island

Ellesmere Island is large and topographically varied. High mountains extend the length of the island, occupying the central, eastern, and

northern portions. Extensive glacier systems cap the mountains, forming continuous sheets of ice. The icecaps over the northern mountainous region rise to over 8,000 feet in altitude.

Lower elevations, less than 3,000 feet above sea level, are found on the west side of the island from Bjorne Peninsula to Fosheim Peninsula. A relatively low-lying plateau also extends from Alert south to the south end of Lake Hazen.

Vegetation is variable in its composition and density, as one might expect in such a large (82,119 square miles) and complex island. Plant growth is particularly rich along many slopes and stream banks; on low plateaus, such as Fosheim Peninsula; and in the vicinity of Lake Hazen. Previous range studies by the author in the latter two areas in 1951 and 1958 revealed excellent forage for muskoxen and caribou (Tener, 1954 and 1960b). During the current survey those animals were found almost exclusively at elevations under 2,000 feet, although those on the Lake Hazen-Alert plateau, were at elevations up to 3,000 feet.

Derivations of population estimates of caribou and muskoxen, as on Axel Heiberg Island, are exceedingly difficult because of the discontinuous and highly contagious distribution of the animals. Such distribution largely reflects the discontinuous nature of suitable habitat.

The ice-free area of potential caribou or muskox habitat on the island is 52,151 square miles. A total of 3,868.5 miles of flying over Ellesmere Island produced an area coverage of 967 square miles. Distance between transects alternated from two miles (Fosheim Peninsula) to eight miles (Raanes and Bjorne Peninsulas), depending on terrain and expected population densities. The south coast of Ellesmere between Grise Fiord and Simmons Peninsula could not be surveyed because of bad weather. Not surveyed also was the rugged east coast of the island, except on Bache Peninsula, and the northwest end of the island.

Caribou

Very few caribou were observed. Thirty-seven were seen in total on transect and the same number off transect. It was interesting to note that four calves were seen in each group, a percentage of 10.8, about one-half that of western islands.

Caribou were found at the head of Baumann Fiord (9, plus 2 off transect), the head of Bay Fiord (6), on Fosheim Peninsula (1), Raanes Peninsula (5, plus 6 off transect), north of Greely Fiord (3, plus 14 off transect), north of Nansen Sound (13, plus 2 off transect) and on the Lake Hazen-Alert plateau (13 off transect). Many of the animals were found at low elevations on coastal slopes or in river valleys at the head of bays and fiords. A few, such as those on Raanes Peninsula and on the Lake Hazen-Alert plateau, were at higher elevations.

The numbers of caribou were so small and so widely distributed over a topographically complex area that calculations of their total num-

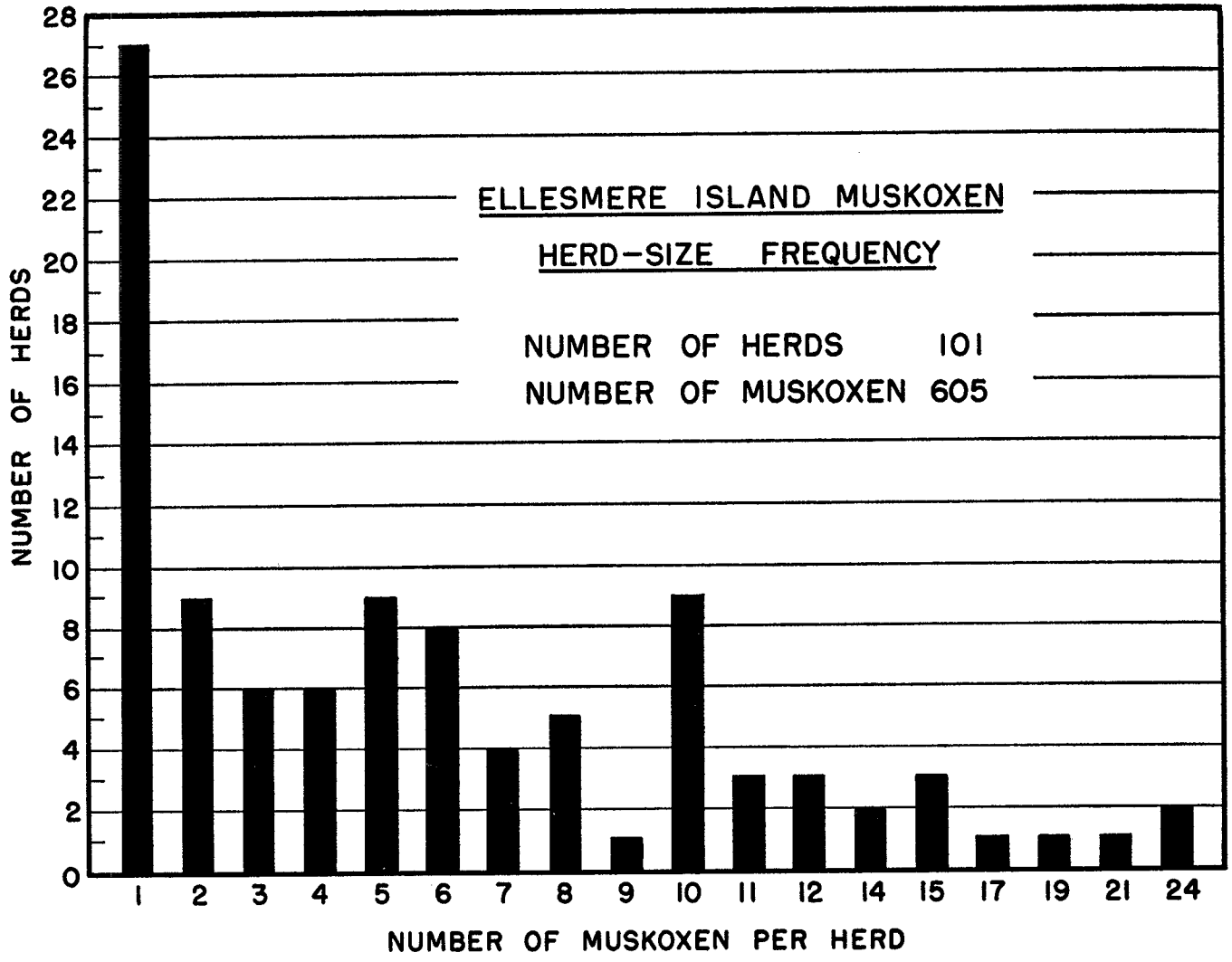

ELLESMERE ISLAND MUSKOXEN
HERD-SIZE FREQUENCY
NUMBER OF HERDS 101
NUMBER OF MUSKOXEN 605
NUMBER OF HERDS
0
2
4
6
8
10
12
14
16
18
20
22
24
26
28
1
2
3
4
5
6
7
8
9
10
11
12
14
15
17
19
21
24
NUMBER OF MUSKOXEN PER HERD

Figure 4

ber cannot be made with any assurance of accuracy. Considering the terrain covered and the few animals noted in over 3,800 miles of flying, it is my estimate that only about 200 caribou exist on Ellesmere Island. In view of the relatively substantial numbers of muskoxen found (see below) it is interesting to speculate on reasons for differences in abundance. That subject will be considered in the general species discussion at the end of this report.

Muskoxen

The species was found in all of the major areas of the island surveyed, from Bjorne Peninsula in the south to north of Alert. Concentrations were apparent at the head of Baumann Fiord, east of Vendom Fiord, Raanes Peninsula, Fosheim Peninsula, and the Lake Hazen-Alert plateau. Muskoxen were found also in isolated herds along the north coast of Greely Fiord and in Sverdrup Pass between Bay Fiord and Bache Peninsula.

Six hundred and five muskoxen were seen on transect. Mean herd size, excluding 27 single animals, was 7.8. There were 75 calves and 78 yearlings in the total. Off transect, 560 muskoxen were seen.

Figure 4 presents the herd size frequency. Ignoring the peak of single animals, the peaks of 5, 10, and 15 per herd probably represent family groupings.

In many cases muskoxen were found in well-vegetated river valleys or in flat areas with ponds and meadows. Those herds at relatively high elevations were in similar situations also. Some herds, however, were on dry hillsides or plateaus which probably supported willow and grasses. The pertinent point here is that the habitat for muskoxen is not uniform, being dissected by high mountains; high, barren plateaus; or other physical features which result in unsuitable habitat. Since those unfavourable areas are not distributed randomly, assumptions of randomness of muskox distribution cannot be made for calculations of the total population. The extreme complexity of the island's topography and habitats make it unlikely that any simple mathematical model can be derived which would provide a satisfactory description of muskox distribution and hence a means for calculating total populations, with confidence limits.

Muskoxen seen on transect are recorded in Table XVIII.

Table XVIII shows that 12.4 per cent of the animals were calves and 12.9 per cent were yearlings. The percentage of yearlings in the total observed is the highest recorded by this writer since commencing muskox studies in 1951. The explanation of the yearling percentage probably lies in the excellent survival of an unusually high calf crop in 1960. Between May 10 and 14 of that year, the writer undertook an aerial survey of part of Fosheim Peninsula, north and south of Slidre Fiord, and counted 312

TABLE XVIII

Muskoxen seen on transect, by locale, Ellesmere Island, N.W.T., 1961

Locale	Adults and immatures	Yearlings	Calves	Total
Baumann Fiord area	41	5	14	60
Raanes Peninsula	41	8	5	54
Bay Fiord	16	2	2	20
Sverdrup Pass*	33	4	10	47
Bache Peninsula	13	—	2	15
Fosheim Peninsula	163	37	27	227
North and south shores Greely Fiord	61	8	5	74
Lake Hazen—Alert Plateau	84	14	10	108
Total	452	78	75	605

*complete count

muskoxen of which it was possible to age and sex 232. A ground count of 70 animals in 6 other herds provided additional information (Tener, 1960a).

The latter records revealed a calf crop of 30 per cent and a yearling percentage of 7.1. The aerial-count calf-crop figure was 14.2 per cent. The discrepancy in the two figures is believed to be the result of slightly greater efficiency in counting calves from the ground and a non-random selection of herds in ground counts. In the latter case, flights over herds were made to select those herds with calves, for purposes other than age structure determinations and the aircraft was landed nearby to permit closer inspection of the animals.

The calving season at the time of the 1960 survey had about two weeks remaining, so the figures obtained do not necessarily represent the final calf crop for the area. The true calf crop figure probably was between 15 and 20 per cent. In any event the calf crop and the surviving number of yearlings were the highest recorded up to that time. It was interesting to note that the proportion of immature animals, other than calves and yearlings, was unusually low, suggesting that between 1956 and 1959 either calf production or calf survival was poor. The results obtained in 1960 and 1961 suggest that production of calves since 1959, and their survival, have been excellent. Absence, or a reduction, of wolf predation may be an important factor, but it is more likely that favourable winter weather and particularly good forage conditions produced the results observed.

A calculation of the total population of muskoxen on the island requires the sort of data only an intensive survey can provide. The data from the present study, which can be interpreted tentatively only, suggest that at least 4,000 muskoxen are on Ellesmere Island. Probably one-quarter of that number are on Fosheim Peninsula and the Lake Hazen-Alert plateau.

SPECIES SUMMARY

The following discussion pertains to all of the larger bird and mammal species observed during the survey. It is a summary of observations, with pertinent comments as they apply.

Avifauna

Identification of species was by sight only, as no specimens were collected. Information has been presented in as full detail as possible for use by interested ornithologists.

American brant and Black brant (*Branta* sp.)

Brant were seen on two occasions on lakes at Bracebridge Inlet, Bathurst Island. On June 21, 14 were seen feeding by a small lake, and on June 27, 96 were counted on a large lake. Those birds were American brant (*Branta bernicla* (Linnaeus)). Additional American brant recorded on the island include about 50 on the easternmost lake between Goodsir and Bracebridge Inlets and between 40 and 50 at the east end of Water Sound at the northeast corner.

Small flocks of brant (species not identified) were recorded on Melville Island. Twelve were resting on Tingmisut Lake, Sabine Peninsula, July 8; 40 were sighted on a lagoon west of Chevalier Bay, Liddon Gulf, on July 16; and about 12 were sighted on the southwest coast of the island on July 22.

On Prince Patrick Island about 24 brant of undetermined species were seen near Mould Bay on July 23. On the 24th, flocks of 30 at Wolley Bay, 200 at Carter Bay, 15 at Mould Bay, 50 near Snowpatch Point, and 250 on a pond near the west coast of Intrepid Inlet, were recorded.

Fourteen black brant (*Branta nigricans* (Laurence)) were seen on the east side of Cornwall Island on August 15.

On August 4, about 250 black brant were at the head of Augusta Bay, Bay Fiord, Ellesmere Island.

No evidence of nesting was obtained.

Snow geese (*Chen hyperborea* subsp.)

The many observations of snow geese have been recorded in tabular form (Table XIX). Without specimens, it is not possible to specify whether greater or lesser snow geese were involved, although on Axel Heiberg and Ellesmere Islands we probably saw the former subspecies.

TABLE XIX

Snow geese observations, by island and locale

Date 1961	Island	Locale	Number Adult	Number Juvenile	Remarks
June					
10	Devon	Cape Sparbo	"flock"		on bare north slope
14	Cornwallis	interior	5		heavy snow cover
18	Bathurst	Bracebridge Inlet	8		on open pond
19	Bathurst	south of Bracebridge Inlet	18		along creek
21	Bathurst	Bracebridge Inlet	21		on open pond
27	Bathurst	transect No. 43, 16 miles from south coast	2		along creek
		Erskine Inlet	6		coastal slope
July					
3	Bathurst	Island "E" (Bathurst)	2		
8	Melville	southwest Drake Point	5		
24	Prince Patrick	Walker Inlet	2		
August					
2	Axel Heiberg	south of Schei Peninsula to south of Stang Bay, numerous ponds, well vegetated	405		non-flying
2	Axel Heiberg	Middle Fiord	100		
3	Axel Heiberg	Gibs Fiord	80		
		south of Fair Cape	110		
		peninsula between Stor Island and Mokka Fiord	352		
Total for Axel Heiberg			1,047		
July					
30	Ellesmere	Baumann Fiord region	95	1	
August					
1	Ellesmere	south shore Greely Fiord, east of Canon Fiord	62		non-flying
		north shore Greely Fiord	19		
		west side, Borup Fiord	70		
		between Hare and Borup Fiords	25		
3	Ellesmere	north shore Greely Fiord	150		
4	Ellesmere	head of Blind Fiord	10	—	
		Raanes Peninsula	25	—	
		north of Holden Hills	140	—	
		Augusta Bay area	71	—	
		inland Strathcona Fiord	12	—	
		South Bay	6	—	
5	Ellesmere	Fosheim Peninsula	1,090	4	first flying geese noted
7	Ellesmere	east of Lake Hazen	390	—	
		north shore, Lake Hazen	155	1	non-flying
Total for Ellesmere			2,320	6	
Grand total, all islands			3,436	6	

The virtual absence of young birds is revealed in the table. Spring on the Queen Elizabeth Islands in 1961 was about two weeks late and was cold and wet. The absence of young may reflect a phenomenon reported in other years for waterfowl in high Arctic areas, i.e., the failure to produce young in certain years, presumably because of adverse weather on the nesting grounds. It would be most interesting to know the age and sex structure of observed birds, however, for there possibly may be a proportion apart from yearlings which would not nest under even the most favourable environmental conditions. Some birds may have attempted nesting further south also, and finding inclement conditions moved further north for moulting. Only detailed studies will reveal answers to the above postulates.

Old squaw (*Clangula hyemalis* (Linnaeus))

Relatively few of these birds were observed during the summer. On June 14, 20 were seen off Cape Phillips on Cornwallis Island and on the 27th two were noted on a large lake south of Bracebridge Inlet, Bathurst Island. On Melville Island 40 were observed on July 15 on a lake near Shellabear Point, Liddon Gulf. The survey of Prince Patrick Island revealed nine old squaws on ponds on the peninsula between Mould Bay and Walker Inlet, and four at Discovery Point, on the west coast. Ten were sighted on a pond southeast of Mokka Fiord, Axel Heiberg Island, on August 3. At Lake Hazen, Ellesmere Island, flocks of 8, 15, 4, and 12 were seen on August 7, and a flock of 7 on August 11.

No evidence of nesting was found.

King eider (*Somateria spectabilis* (Linnaeus))

A large flock (340 in pairs) was observed June 12 in northward migration along the east coast of Dundas Island. Open water patches were present in Wellington Channel at the time. On the 17th, 45 (mostly females) were sighted flying along a shore lead near the south coast of Cornwallis Island.

On Bathurst Island king eiders were seen on two occasions, near Bracebridge Inlet on June 21 when 18 were recorded, and on June 27 when 3 males were observed.

The only other king eiders recorded on the survey were seven seen August 7 at Lake Hazen.

No evidence of nesting was seen.

Gyrfalcon (*Falco rusticolus* (Linnaeus))

Only one bird was recorded during the survey, a white-phase individual seen July 30 at the head of Makinson Inlet, Ellesmere Island.

Peregrine falcon (*Falco peregrinus* (Tunstall))

One individual was seen at what was believed to be its nesting site about three miles southwest of the head of Winter Harbour, Melville Island, July 16. From the bird's activities it is thought that a nest was nearby.

Rock ptarmigan (*Lagopus mutus* (Montin))

The species was not evident from the air on Devon or Cornwallis Islands, presumably because of almost solid snow cover. Unless the birds flew upon seeing or hearing the survey aircraft, they were difficult to observe from the air, even over snow-free terrain. Once full summer plumage had been achieved they were nearly impossible to see. Numbers recorded therefore do not bear any relation to actual densities.

Ptarmigan were observed frequently from the ground in the vicinity of the base camp at Bracebridge Inlet, Bathurst Island, courting males being particularly conspicuous. Only 12 ptarmigan were seen from the air but if the density in the Bracebridge Inlet area is a reliable index, the species must have been exceedingly abundant on the island.

Individuals were widely distributed on Melville Island, being observed on Dundas and Sabine Peninsulas as well as on the western half of the island. Only 14 were recorded in all.

Ten ptarmigan were seen on Prince Patrick Island, a flock of 30 on Mackenzie King, 5 on Lougheed, 1 on King Christian and only 2 on Ellesmere. Population estimates could not be made for any of the islands surveyed.

Snowy owl (*Nyctea scandiaca* (Linnaeus))

Snowy owls were recorded first on Bathurst Island. Thirteen were seen over the island from the air.

Snowy owls were particularly abundant on Dundas Peninsula, Melville Island, 1 being seen July 12, 4 on July 15, and 31 on July 16. Three were recorded July 9 on Sabine Peninsula and 15 on the western half of the island July 18, 21, and 22. No information was obtained on the population status of the lemming on the island.

On Prince Patrick Island three owls were recorded July 23 and seven on the 24. On the latter date six were observed on Eglinton Island and four on Emerald Island.

Borden, Ellef Ringnes, and Amund Ringnes Islands each revealed one owl; Mackenzie King, two. Two were seen also on Axel Heiberg and 14 were recorded on Ellesmere Island.

No breeding evidence was found, all birds seen being adults.

Raven (*Corvus corax* (Linnaeus))

One bird was heard in the early morning of July 22 at Ibbett Bay, western Melville Island. No others were heard or seen during the survey.

In addition to the above avifauna recorded largely during the aerial survey, a number of other observations were made while at the various base camps on the Islands. Those observations are concerned with shorebirds and other small species and will be discussed elsewhere in publication.

Mammalian fauna

Most aerial observations of land mammals were of caribou and muskoxen. Arctic foxes were difficult to see even from 500 feet altitude when their white coats blended with snow cover. As the snow melted the animals became more visible until their pelage moulted into a brown summer coat. As a consequence very few observations of foxes were recorded. Den sites, however, were recorded with greater frequency.

Polar bear (*Thalarctos maritimus*)

Polar bears were sighted during the first three weeks of the survey only, during operations over and between Devon, Cornwallis, Bathurst, and Melville Islands.

On Devon Island tracks were observed about five miles inland from the southern arm of Thomas Lee Inlet. Other tracks were seen on transect between Thomas Lee and Sverdrup Inlets. On flights to Devon Island from Resolute Bay a large number of tracks and some bears were recorded on sea ice in Wellington Channel. On June 17, for example, a female bear with a cub was sighted 10 miles south of Dundas Island. On the same day, 28 sets of bear tracks were noted between Baillie-Hamilton Island and Devon Island, and a female and two yearlings were sighted one-half mile west of Macormick Bay, off the west coast of Devon. Many seals were found (see below) along open leads in the sea ice between southern Cornwallis and Devon Islands and without exception bear tracks were also present along the leads.

What was thought to be a bear den was seen June 16 on the north coast of Pioneer Bay, Cornwallis Island.

Bear tracks were recorded at several points on Bathurst Island. On June 19 two sets were observed on the sea ice north of the peninsula north of Hooker Bay, one track north of Allison Inlet, one along the south coast east of Allison Inlet and one about 10 miles inland from Dyke Acland Bay. Five sets of bear tracks were noted in different locations inland west of Dundie Bight and May Inlet, and one den was sighted on a river bank near a small inlet on the south coast. A single set of tracks

was recorded on a frozen pond on the island, Stratum B. Only one bear was sighted during the Bathurst Island survey, an animal on the sea ice seven miles north of Rapid Point, on the east coast, June 28.

Polar bear tracks were seen on Melville Island, but only on Sabine Peninsula. On July 8 tracks were observed north of Roche Point on the northwest coast, north of Cape Colquhoun on the northeast coast, and in the interior. Not one animal was observed.

No other evidence of polar bears was noted during the survey.

Arctic fox (*Alopex lagopus*)

Signs of foxes were extremely scarce on Devon Island. A single track was present north of Griffen Inlet on June 17, and on the same day a den was sighted 19 miles from Thomas Lee Inlet. A single animal was observed 14 miles inland from Cape Osborn on the west coast.

Three dens and three foxes were sighted on Cornwallis Island June 14. Snow cover was still extensive at that time. One den and one fox were found on the south coast four miles west of Cape Dungeness and another den and animal were seen on Snowblind Creek, northwest of Read Bay. An individual was observed seven miles south of Cape Phillips, and a den was spotted near a headwater stream of the Eleanor River.

Three foxes, two near the base camp at Bracebridge Inlet and one on the west coast of Dundee Bight, and one den 20 miles west of Hooker Bay were observed on Bathurst Island. On Melville Island six dens and five foxes were recorded. Dens were seen in the interiors of Dundas and Sabine Peninsulas and at the head of Ibbett Bay. The foxes were observed northeast of Dundas Peninsula and on Sabine Peninsula.

Eight dens were found on Prince Patrick Island, six west of Mould Bay, one on the west coast of Intrepid Inlet, and a large colony was sighted north of Jameson Bay. One fox was sighted on Eglinton Island.

One den was found near the northeast coast of Borden Island, one fox on Brock Island, but neither a den nor a fox was seen on Mackenzie King Island.

The survey of Ellef Ringnes Island revealed six dens as follows: four between Kristaffer Bay and Haakon Fiord and two on Meteorologist Peninsula. Three foxes were seen as well. On Amund Ringnes four dens were seen in the central interior of the island. On Cornwall Island dens were seen in the northwest quarter. A single den was seen on King Christian Island.

Not one observation of foxes or dens was made on Axel Heiberg. On Ellesmere Island single dens were recorded between Svarte and Vendom Fiords, Fosheim Peninsula, east coast of Cañon Fiord, and north of Conybeare Fiord. Two foxes were observed on Fosheim Peninsula.

It is obvious that assessments of fox numbers from the air are not truly indicative of real populations on the ground, particularly if the survey has been designed to count the larger game animals. Apart from an intensive fox study, probably the best way to assess fox numbers on an island is to institute an Eskimo trapping program.

Arctic wolf (*Canis lupus arctos*)

Surprisingly few wolves were seen during the survey. Frequently wolves will remain still or crouch at the sound of an aircraft, making recognition difficult. Somes wolves were observed at the base camps and those records will be included here.

The first wolf was recorded June 14 near the north coast of Cornwallis Island in the vicinity of the Eleanor River. Not one wolf was seen from the air on Bathurst Island but reference has already been made to five individuals seen July 1 at the carcasses of a cow and two calf muskoxen on a hill at Bracebridge Inlet. One wolf was smaller and more ragged than the others, possibly being a female which had recently pupped.

One wolf was observed from the air on Melville Island, a single animal seen July 18 on the southwest coast of Hecla and Griper Bay. A pack of six wolves visited our campsite at Ibbett Bay July 21. The animals were attracted by some segments of reindeer sleeping skins discarded in the garbage pit.

On Prince Patrick Island a single wolf was seen July 23 a few miles inland from Dyer Bay.

A provisional record of what was thought to be a wolf was made August 12 on Mackenzie King Island.

On August 14 a single wolf was seen near the east coast of Ellef Ringnes Island.

The Axel Heiberg Island survey revealed eight wolves east of Flat Sound, August 2. Muskox herds were in the area.

Five wolves were recorded on Ellesmere Island, August 4. The wolves were about four miles inland from Blind Fiord.

As with foxes, the aerial counts of wolves are not indicative of the real populations present. Nevertheless, if the species had been abundant on the islands, they should have been more apparent from the air.

Seals (*Phoca* and *Erignathus* sp.)

Seals were noted in the waters and on the ice between Devon, Cornwallis, Bathurst, and Melville Islands. The records obtained are presented in Table XX below. Genus identification in most cases was not recorded, though both ringed seals and a few bearded seals were observed.

TABLE XX

Seal observations, by island and locale

Date	Locale	Island	No.	Remarks
June 12	Between Cape Phillips, Cornwallis Island and Prince Alfred Bay, Devon		52	along open leads
14	Copeland Point	Cornwallis	8	
	Assistance Bay to Resolute Bay	Cornwallis	94	
	Southwest Lady Hamilton Bay	Cornwallis	65	
16	Intrepid Bay	Cornwallis	28	
	Claxton Point	Cornwallis	3	
	Midshipman Bay	Cornwallis	3	
	Pullen Strait	Cornwallis	4	
	Little Cornwallis area		31	
17	Arthur Fiord	Devon	10	
	Dragleybeck Inlet	Devon	5	
	Between Bowden Point, Devon, and Cape Hotham, Cornwallis		44	
	Between Macormick Bay, Devon, and Cape Hotham, Cornwallis		127	
19	West of Dyke Acland Bay,	Bathurst	19	
	Bedford Bay	Bathurst	4	
	West of Cape Capel	Bathurst	7	
	West of south end of transect 1,	Bathurst	5	
	Dyke Acland Bay	Bathurst	22	
July 24	Wolley Bay	Prince Patrick	1	
	Crozier Channel	Prince Patrick	1	
Total			533	

Peary caribou

The provisional total population of Peary caribou in the Queen Elizabeth Islands is placed at about 26,000 animals (Table XXI). The calf and yearling percentages observed are given in the table also.

Even though the totals for the islands are provisional, Table XXI indicates that six islands support caribou in excess of 1,000 each. Utilization by Eskimos is feasible, although the remoteness of Lougheed, Borden, and Mackenzie King Islands will require a different approach to harvesting. Bathurst and western Melville Islands can be reached by Eskimos presently at Resolute Bay.

The policy of the Department of Northern Affairs and National Resources on locations of new Eskimo settlements will be the determining factor in how caribou are harvested. The desire to retain Eskimos in communities where educational, health and welfare, and other facilities can be made available and where possible employment may exist, suggests that caribou hunting on the above six islands could be done as a community project, supported by the government as required. Densities of caribou in certain areas of some of the islands are such that a party of six hunters flown to those areas with their dog teams, could obtain probably 100 caribou within a week or so. Besides providing food, skins

for clothing could be obtained if hunting were done in late summer or early autumn. Quotas for each island would have to be set, subject to current biological knowledge.

TABLE XXI

Provisional total caribou populations and observed age structures, Queen Elizabeth Islands, N.W.T., 1961

Island	Estimated caribou population	Observed calf per cent	Observed yearling per cent
Devon	150*	—	—
Cornwallis	43*	—	—
Bathurst	3,565	19.84	3.50
Melville	12,799	19.01	4.28
Prince Patrick	2,254	20.29	5.79
Eglinton	204	—	—
Emerald	161*	—	—
Borden	1,630	22.0	2.0
Mackenzie King	2,192	21.6	1.8
Brock	190*	—	—
Ellef Ringnes	114*	—	—
Amund Ringnes	452*	—	—
Lougheed	1,325	22.1	5.8
Cornwall	266	29.7*	0*
Axel Heiberg	300	14.3*	4.76*
Ellesmere	200	10.8*	8.1*
Total	25,845		

*few data

The calf crops observed during the survey were excellent, except for Axel Heiberg and Ellesmere Islands, whose data were relatively few. The good calf production indicates good forage conditions, but the poor crops cannot be attributed to poor range because the few observations of animals probably biased the true crop figure. The fact that data from some of the other islands, such as Cornwall, revealed an unusually high percentage of calves, can likewise be attributed to small samples. It is interesting to recall that the 1961 spring in the high Arctic was cold, stormy, and wet and was about two weeks late. Peary caribou calving probably takes place in late May or early June, before the onset of rain and spring storms. Cold, dry weather is probably less lethal to new-born calves than the cold, wet weather which has been postulated to be a mortality factor of barren ground caribou calves born in mid-June on the continental Arctic mainland (Hart, et al. 1961).

The proportion of yearlings was the cause of some concern. Those islands on which large numbers of caribou were observed did not have yearling percentages exceeding six. As pointed out earlier, low yearling counts may be partly the failure to differentiate between that age class and adults, although every effort was made to minimize that error. It may also reflect poor calf crops in 1960 or poor survival during the first year of life following good calf production. The figures obtained in 1961

suggest that the yearling increments to the populations are such that utilization of those populations will have to be only two or three per cent per year. Future studies likely will show different calf and yearling proportions, but until their results are known, harvesting must be confined to the suggested figure.

If there was any indication of over-population of any of the islands it should have been revealed in calf production as well as yearling survival, for reproductive performance of females is affected if severe competition for forage occurs. An unusually harsh winter could reduce materially the survival of calves following an excellent calf crop, but such a winter probably would reduce calf production also. As a good calf crop was produced in 1961 it is concluded that the preceding winter was not unduly severe and did not contribute to the shortage of yearlings.

During the survey I developed a distinct impression that Peary caribou are associated with more primitive plant communities than the other Arctic ungulate, the muskox. No muskoxen were found on Mackenzie King or Borden Islands, for example, although caribou were relatively numerous. On Axel Heiberg Island the two species were virtually mutually exclusive. Undoubtedly, food habits and feeding behaviour are important factors, caribou utilizing more sedges, mosses, and some lichens while muskoxen require willow, grasses, and herbaceous forms. There is some overlap of feeding requirements, caribou eating willow and grasses and muskoxen sedges and mosses. The floral compositions of the islands concerned were not determined adequately, but aerial observations suggest that on those islands noted above on which no muskoxen were found, or where a distinct difference existed between the two species in the nature of ranges occupied, caribou were confined to areas with high proportions of sedges and mosses. Differences in winter range requirements may be important also, but these speculations can be answered only by further investigation. Post-pleistocene occupation of the islands also may be a factor here, but little is known about that aspect of Arctic biology.

A striking difference between Peary caribou herds and those herds of the Arctic mainland caribou (*Rangifer tarandus groenlandicus*) is that of size. In the latter species, during migration herds of 1,000 animals or more are not uncommon and on summer ranges densities of animals have exceeded 68 caribou per square mile (Banfield, 1954). The small groups observed in Peary caribou and their sparse distribution is probably a direct consequence of limited food.

Muskoxen

The numbers of muskoxen estimated to be on each of the islands surveyed and on which they were found, are given in Table XXII. The provisional total for the Queen Elizabeth Islands is 7,421 animals.

TABLE XXII

Provisional total muskox populations and observed age structures, Queen Elizabeth Islands, N.W.T., 1961

Island	Estimated muskox population	Observed calf per cent	Observed yearling per cent
Devon	200*	—	—
Cornwallis	50	—	—
Bathurst	1,161	9	2.7
Melville	1,000	17.22	1.1
Amund Ringnes	10*	—	—
Axel Heiberg	1,000	6.78	6.78
Ellesmere	4,000	12.4	12.89
Total	7,421		

*few data

Ellesmere Island had more muskoxen than were found on the rest of the Queen Elizabeth Islands in total. The population of the species throughout Arctic Canada probably exceeds 10,000 animals, but a more precise figure must await aerial assessments of populations on the islands immediately north of the Arctic mainland.

The absence of muskoxen on Prince Patrick Island, following a decline since 1947, is at present inexplicable. The species at one time lived on Mackenzie King Island (Macpherson, 1961) and was sighted on Ellef Ringnes Island by the RCAF in 1949 (Tener, 1958), but today muskoxen appear to be absent from the westernmost islands, i.e., Prince Patrick, Brock, Borden, Mackenzie King, Lougheed, and Ellef Ringnes.

Calf crops were variable, but are within the range observed in other years from the same and other populations (Tener, 1960). The production of calves on Melville Island was unusually high, though comparable to the 1960 calf crop on Fosheim Peninsula, Ellesmere Island. The very low yearling count on Melville Island is compatible with the high 1961 calf crop, as cows usually produce a calf every second year.

The evidence gathered during the survey indicates that, while local populations of muskoxen vary in their productivity and density, as a species they are faring well and with continued protection will probably increase in the future to the point where limited utilization is feasible. The low rate of population increase will restrict utilization to a small annual kill, but such a kill, if for museum or other scientific purposes, or for a limited degree of trophy hunting, in the future could serve a valuable purpose for science and for the Eskimo economy.

SUMMARY

1) The population of Peary caribou on the Queen Elizabeth Islands is provisionally estimated to be 25,845, with about 12,800 on Melville Island, 3,600 on Bathurst Island, 2,200 on both Prince Patrick and Mackenzie King Islands, 1,600 on Borden Island, and 1,300 on Lougheed Island.

2) The population of muskoxen on the Queen Elizabeth Islands is provisionally estimated to be 7,421 with 4,000 on Ellesmere and about 1,000 on each of Bathurst, Melville, and Axel Heiberg Islands.

3) Waterfowl concentrations were confined largely to areas on Axel Heiberg and Ellesmere Islands, either side of Eureka Sound. Brant were relatively numerous on Prince Patrick Island, in the southeast sector.

4) Caribou calf crops were excellent wherever significant numbers of caribou were found. Calf percentages varied between 19.01 and 22.09.

5) Caribou yearling counts were low, the percentages ranging between 1.8 and 5.8.

6) Muskox calf crops varied between 6.78 and 17.22 per cent.

7) Muskox yearling counts were generally low, the percentages in the larger populations being 1.1, 2.7, and 6.78. An exception was the high yearling count of 12.89 per cent on Ellesmere Island.

REFERENCES

Banfield, A. W. F. 1954. Preliminary investigation of the barren ground caribou. Ottawa, Queen's Printer. Pt. 1. 79 p. (Canadian Wildl. Service, Wildl. Mgmt. Bull., Series 1, No. 10A).

Greig-Smith, P. 1957. Quantitative plant ecology. London, Butterworths Scientific Publications. 197 p.

Kelsall, John P. 1957. Continued barren-ground caribou studies. Ottawa, Queen's Printer. 148 p. (Canadian Wildl. Service, Wildl. Mgmt. Bull., Series 1, No. 12).

MacDonald, S. D. 1954. Report on biological investigations at Mould Bay, Prince Patrick Island, N.W.T., in 1952. Ann. Rep. Nat. Museum Canada, 1952-53, Bull. 132. p. 214-38.

MacDonald, S. D. 1961. Report on biological investigations at Isachsen, Ellef Ringnes Island, N.W.T. Ottawa, Queen's Printer. (Nat. Museum Canada, Biol. Ser. 65, Bull. 172. p. 90-97).

Macpherson, A. H. 1961. On the abundance and distribution of certain mammals in the western Canadian Arctic Islands in 1958-59. Arctic Circular. XIV(I):1-17.

Saville, D. B. O. 1961. The botany of the northwestern Queen Elizabeth Islands. Can. J. Botany. 39:909-942.

Taylor, A. 1955. Geographical discovery and exploration in the Queen Elizabeth Islands. Geograph. Branch, Mem. 3. Ottawa.

Tener, J. S. 1958. The distribution of muskoxen in Canada. J. Mammal. 39(3):398-408.

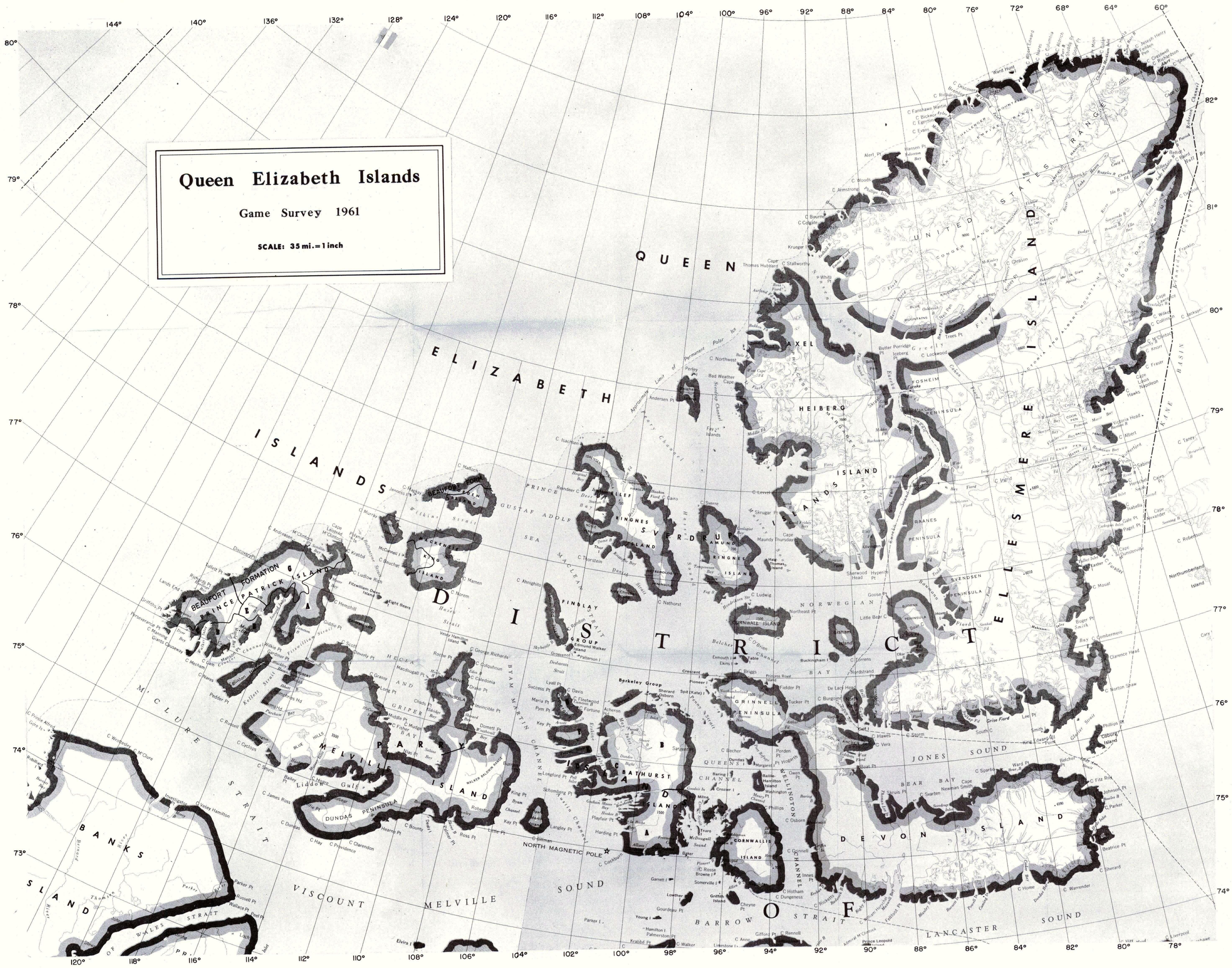
Tener, J. S. 1960(a). Muskox survey, Fosheim Peninsula. Ottawa, Canadian Wildl. Service, filed rep. 4 leaves.

Tener, J. S. 1960(b). The ecology of the muskox in relation to its environment. Ottawa, Canadian Wildl. Service, filed rep. 258 leaves.

Thorsteinsson, R. 1958. Cornwallis and Little Cornwallis Islands, District of Franklin, Northwest Territories. Ottawa, Geol. Survey Canada, Mem. 294. 134 p.

Thorsteinsson, R. and E. T. Tozer. 1960. Summary account of structural history of the Canadian Arctic Archipelago since Pre-Cambrian times. Ottawa, Geol. Survey Canada, Paper 60-7. 25 p.

Tozer, E. T. 1956. Geological reconnaissance, Prince Patrick, Eglinton, and western Melville Islands, Arctic Archipelago, Northwest Territories. Ottawa, Geol. Survey Canada, Paper 55-5. 32 p.


Queen Elizabeth Islands
Game Survey 1961
SCALE: 35 mi. = 1 inch
QUEEN ELIZABETH ISLANDS
DISTRICT OF FRANKLIN
AXEL HEIBERG ISLAND
EUREKA
FOSHEIM PENINSULA
EUREKA SOUND
ELLESMERE ISLAND
UNITED STATES
GRINNELL PENINSULA
BEAUFORT FORMATION
PRINCE PATRICK ISLAND
MELVILLE ISLAND
BATHURST ISLAND
CORNWALLIS ISLAND
DEVON ISLAND
BANKS ISLAND
M'CLURE STRAIT
VISCOUNT MELVILLE SOUND
NORTH MAGNETIC POLE
BARROW STRAIT
LANCASTER SOUND
JONES SOUND
BEAR BAY
NORWEGIAN BAY
PRINCE GUSTAF ADOLF SEA
KANE BASIN
Northumberland Island
Coburg Island
Grise Fiord
Alert
Ward Hunt
Cape Columbia
Cape Sheridan
Cape Lawrence
Cape Louis Napoleon
Cape Alexander
Cape Dunsterville
Cape Hawes
Cape Vera
Cape Storm
Cape Sparbo
Cape Newman Smith
Cape Henrietta Maria
Cape Hotham
Cape Dungeness
Cape Home
Cape Warrender
Cape Sherard
Cape Beatrice
Cape Fitz Roy
Cape Parker
Cape Robertson
Cape Taney
Cape Mouat
Cape Clarence Head
Cape Norton Shaw
Cape Liverpool
Cape Lady Ann
Cape Walker
Cape Cockburn
Cape Clarendon
Cape Providence
Cape Hay
Cape Bounty
Cape Hearne
Cape Dundas
Cape Russell
Cape Parker
Cape Wallace
Cape Prince Alfred
Cape Wrigley
Cape Smith
Cape James Ross
Cape Lyall
Cape Davis
Cape Fletcherwood
Cape Fortune
Cape Becher
Cape Hawks
Cape Albert
Cape Sabine
Cape Herschel
Cape Cairn
Cape Gale
Cape Paget
Cape Isabella
Cape Victoria Head
Cape Taney
Cape Mouat
Cape Clarence Head
Cape Norton Shaw
Cape Fraser
Cape Collinson
Cape Jackson
Cape Wilkes
Cape Joseph Henry
Cape Richardson
Cape Sherman
Cape Crewdson
Cape Columbia
Cape Stuart
Cape Sydney Smith
Cape Knorr
Cape Hardy
Cape Lady Ann
Cape Walker
Cape Cockburn
Cape Clarendon
Cape Providence
Cape Hay
Cape Bounty
Cape Hearne
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Cape Hotham
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