SEASONAL CHANGES IN DISTRIBUTION OF WOOD BISON IN THE MACKENZIE BISON SANCTUARY

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ABSTRACT

Periodic aerial surveys were conducted between 27 February 1981 and 1 March 1982 to study changes in the distribution of wood bison (Bison bison athabascae) within the Mackenzie Bison Sanctuary.

The movements of bison prior to June 1981 and in late February 1982 were greater than during other times of the year. Falaise Lake, Calais Lake, and Lake 650 appeared to be the only areas used for calving. Mean and maximum group sizes were highest in June and July as new calves entered the population.

Observations of other wildlife species were also recorded.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

INTRODUCTION

Bison are gregarious and have affinity for traditional areas. Some mature bulls, though, tend to wander. By examining the spatio-temporal utilization of the range by groups of mixed sexes and ages, wildlife managers may be able to delineate habitat critical to the bison population and gain some insight into behavioural patterns.

Changes in distribution have been reported for the other populations of northern bison in the Slave River Lowlands (SRL) (Calef 1976, Calef and Van Camp in press, and Jalkotzy 1979), and in Wood Buffalo National Park (WBNP) (Fuller 1966). It was observed that herds generally start increasing in size on large prairies with the onset of calving and reached very large post-calving concentrations. At the same time as the rut, these large groups broke up and remained widely distributed in small groups throughout the winter.

In the Mackenzie Bison Sanctuary (Fig. 1), the March distribution of bison has been quite variable from year to year (Hawley 1980). Data from five ground and aerial surveys from January to March 1981 showed that an apparent movement of over 200 animals occurred in February (Chowns 1986).

A study carried out between 27 February 1981 and 1 March 1982 was designed to monitor changes in bison distribution (movement and herd size) throughout a period of one year in the Sanctuary.

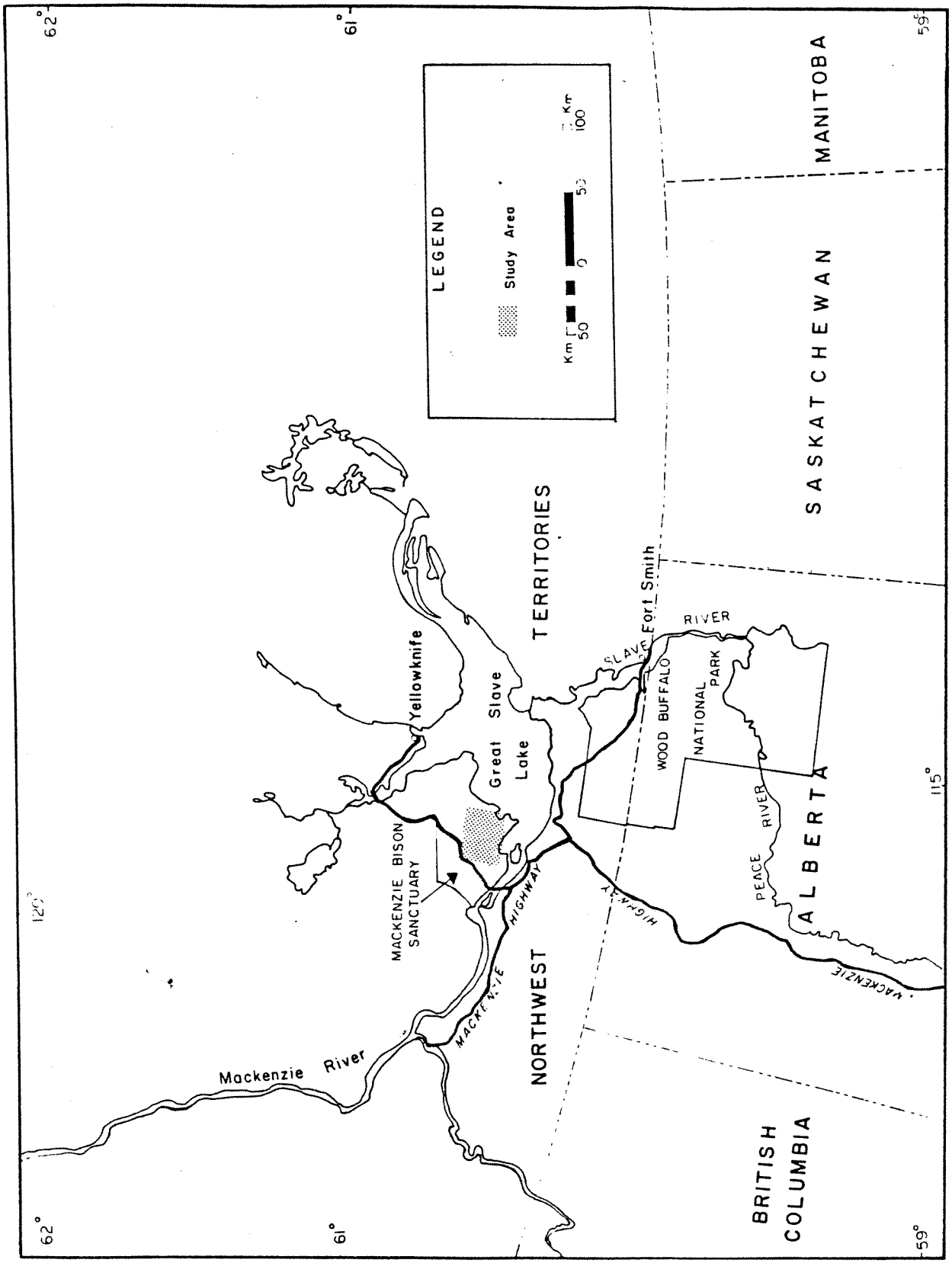

Figure 1. Mackenzie Bison Sanctuary showing study area of 27 February 1981 to 1 March 1982.

METHODS

Six aerial surveys were conducted from one to three months apart, over the span of a year. On each flight, the same areas were searched around mid-day with a Cessna 185 aircraft. Dry lake basins, in particular Boulogne, Falaise, NU lakes*, Dieppe, 690+, Calais, 650+ and Caen, were given most attention as they constitute the preferred bison habitat and would be expected to contain almost all of the herds of mixed sexes and ages in the population.

Observers on the left and right recorded all bison sightings on maps. For verification of numbers, herds were photographed with a camera equipped with a telephoto lens. Information on probable direction of fresh bison trails between lake basins, environmental conditions and other fauna was also recorded.

Unnecessary disturbance of the bison was carefully avoided. The aircraft was flown as low as 200 m above ground level (agl) when surveying small numbers not exhibiting a strong flight reaction. As herds of at least 20 were approached, altitudes of at least 300 m agl were maintained in order to minimize disturbance and to include all animals in the fewest number of overlapping photographs.

*denotes lakes located at NU 4731 and NU 4935 by the Universal Transverse Mercator Grid designation.

+denotes lakes by their elevation in feet above sea level

The numbers of bison among the main lake basins were compared to show apparent movements between each survey. Also, mean group sizes and numbers of bison occurring in units of less than 20, 21-100 and greater than 100 were recorded to show herd size tendencies throughout the year.

RESULTS

27 February 1981

All of the larger lake basins contained bison except Lake 690, while it, along with most of the smaller ones in the study area, contained recent tracks indicating a scattered distribution of some bison (Fig. 2). The trail leading to Dieppe Lake had been made since the last storm on 9 February 1981 and had been used by a great number of animals. Nearly all of the calves spotted were on Falaise and Dieppe lakes, where the largest groups occurred (Table 1).

Big game sighted included 22 moose (Alces alces) dispersed throughout the study arae, and one woodland caribou (Rangifer tarandus caribou) northeast of Falaise Lake.

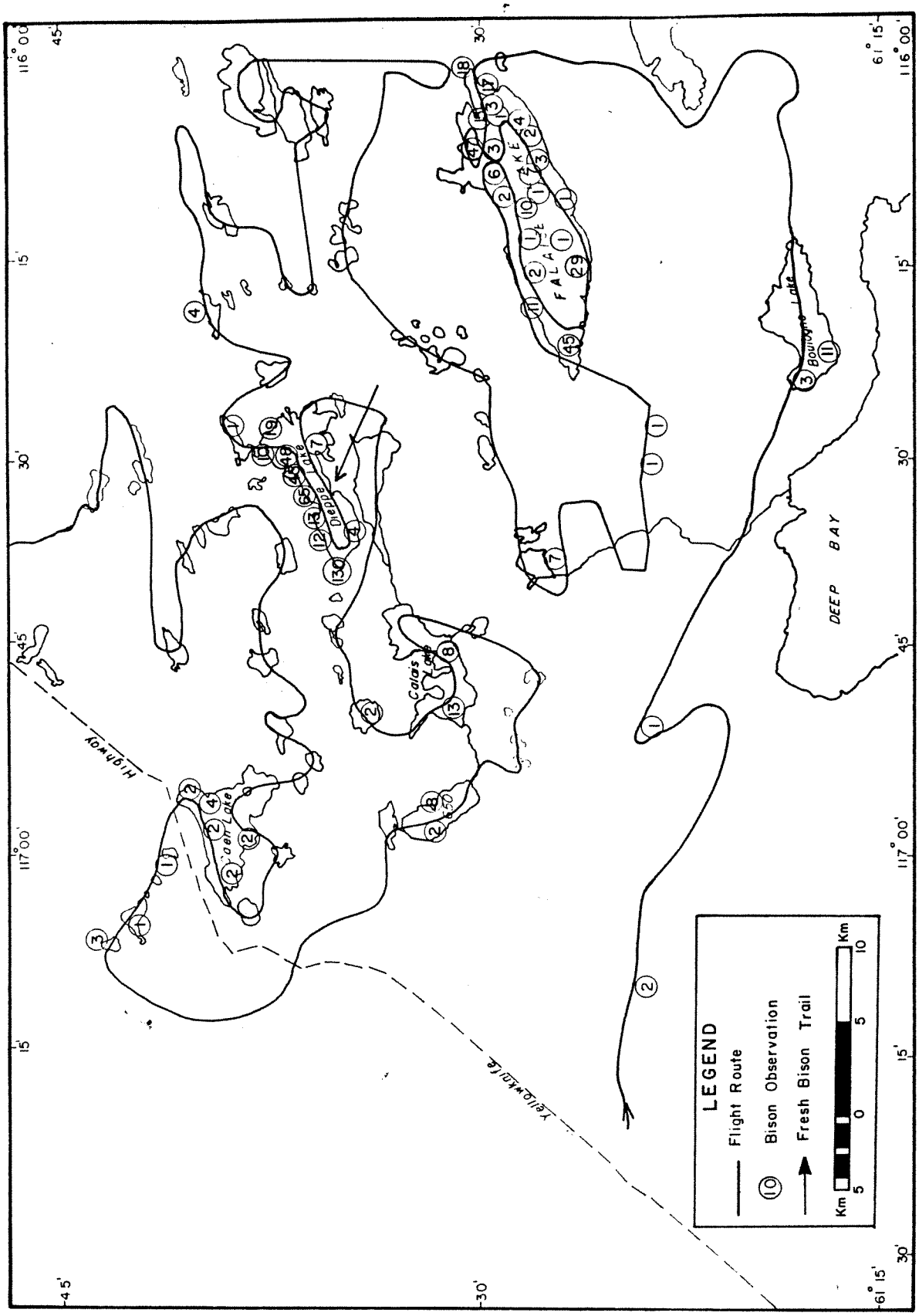

Figure 2. Survey of Mackenzie Bison Sanctuary showing numbers of bison on 27 February 1981.

Table 1. Changes in bison numbers (including calves) on the main lake basins in the Mackenzie Bison Sanctuary, 27 February 1981 to 1 March 1982.

Basin	27 Feb.	3 June	29 July	31 Aug.	12 Nov.	1 Mar.
Boulogne	14	0	0	0	33	50
Falaise	222	569	373	302	500	72
NU Lakes	3	3	0	1	15	18
Dieppe	353	6	0	2	1	405
Lake 690	0	19	0	25	0	1
Calais	21	165	322	72	0	90
Lake 650	10	4	187	49	2	1
Caen	12	12	1	53	8	14
Other	26	0	0	12	43	62
Total	661	778	883	516	602	713

03 June 1981

On this flight (Fig. 3), only traces of snow remained and many of the lake basins were inundated with meltwater. All bison observed were on dry ground, though there was evidence that some had crossed wet expanses on Boulogne Lake and smaller basins.

A total of 117 more bison were observed than on the first survey (Table 1). This was not compensated for by new calves as only four could be distinguished in the tightly congregated herds.

Two moose were seen wading in Sulphur Bay. A woodland caribou was observed crossing one of the larger ponds on Falaise lake. In total, five black bears (Ursus americanus) were spotted in the meadows of Falaise, Dieppe and Caen lakes.

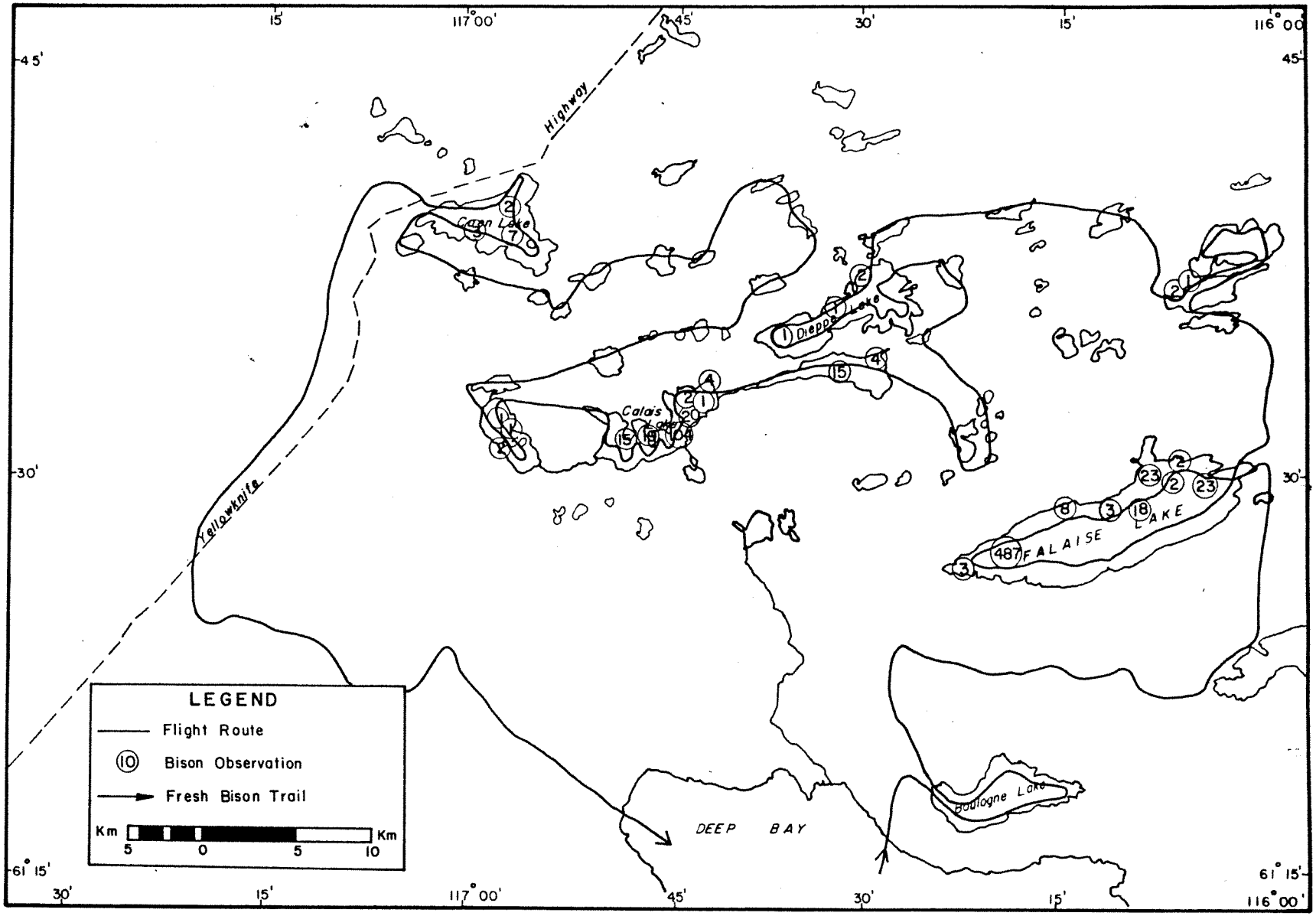

Figure 3. Survey of Mackenzie Bison Sanctuary showing numbers of bison on 3 June 1981.

29 July 1981

All bison were found on Falaise Lake, Calais Lake and Lake 650, except for one animal on Caen Lake (Fig. 4). Water levels had receded considerably and bison were generally observed at dry sites or near bare-edged pools.

Several large groups of bison were found on this survey. Although there were 55 new calves, the number of bison on Falaise Lake had declined by 196 from the previous survey. Calais Lake had gained 157 animals, of which 45 were calves, and Lake 650 had increased its number from 4 to 187 including 22 calves.

While no other mammals were sighted, large numbers of Canada geese (Anser canadensis) and sandhill cranes (Grus canadensis) occupied many of the lakes.

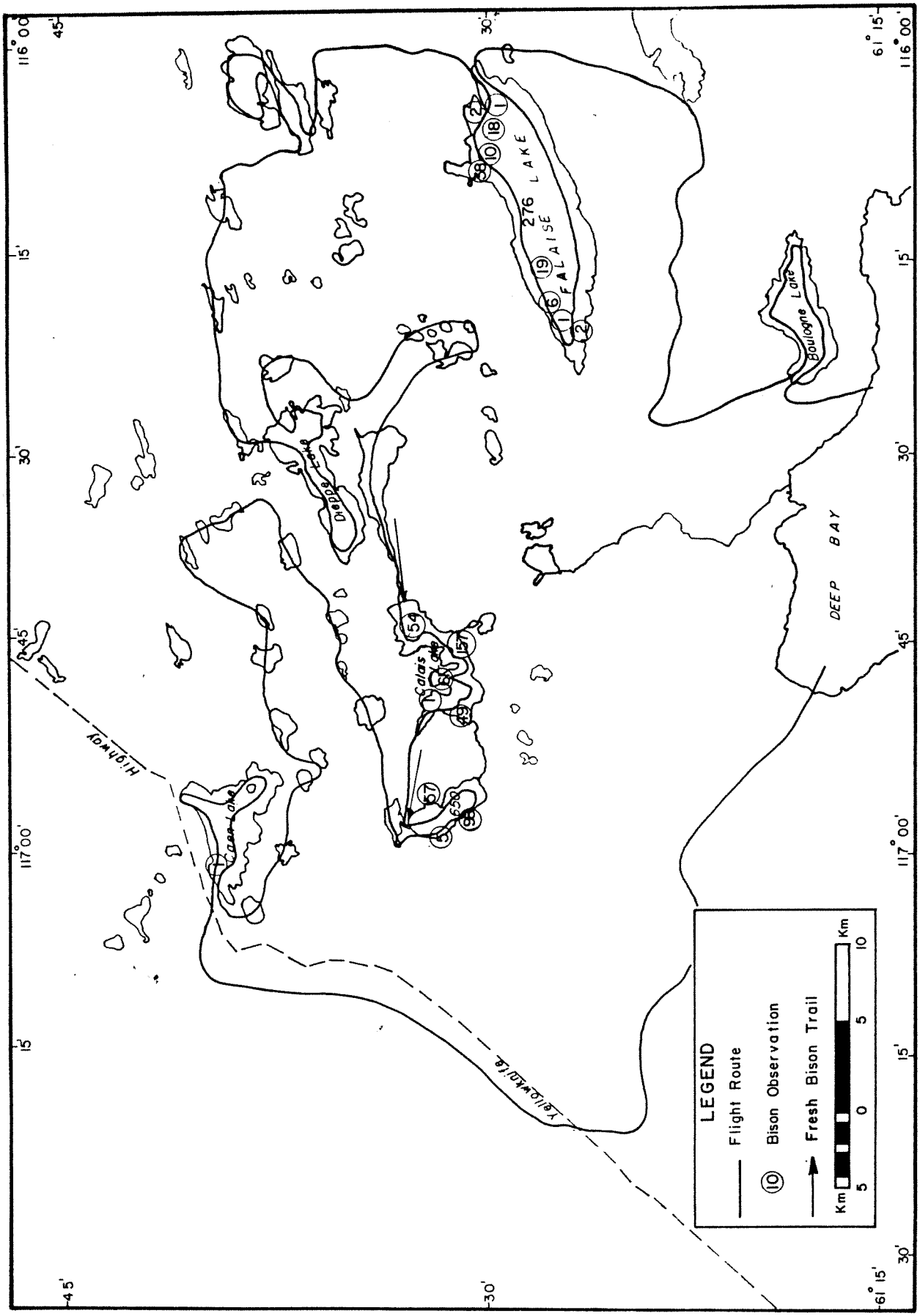

Figure 4. Survey of Mackenzie Bison Sanctuary showing numbers of bison on 29 July 1981.

31 August 1981

This survey fell within the breeding season for bison. There were numerous groups ranging in size from 9 to 58 bison on all of the large lake basins in the study area except Boulogne Lake and NU lakes (Fig. 5). Numerous trails crossing muddy areas were present throughout the northwest half of the study are. South of Falaise Lake there were no observations of recent activity. Almost all groups had calves, even in regions as remote from the calving areas as Caen Lake. Of the total number of 92, Falaise Lake had the most calves at 51. Very few retained a reddish coat.

No other big game species were encountered although waterfowl were much more prevalent.

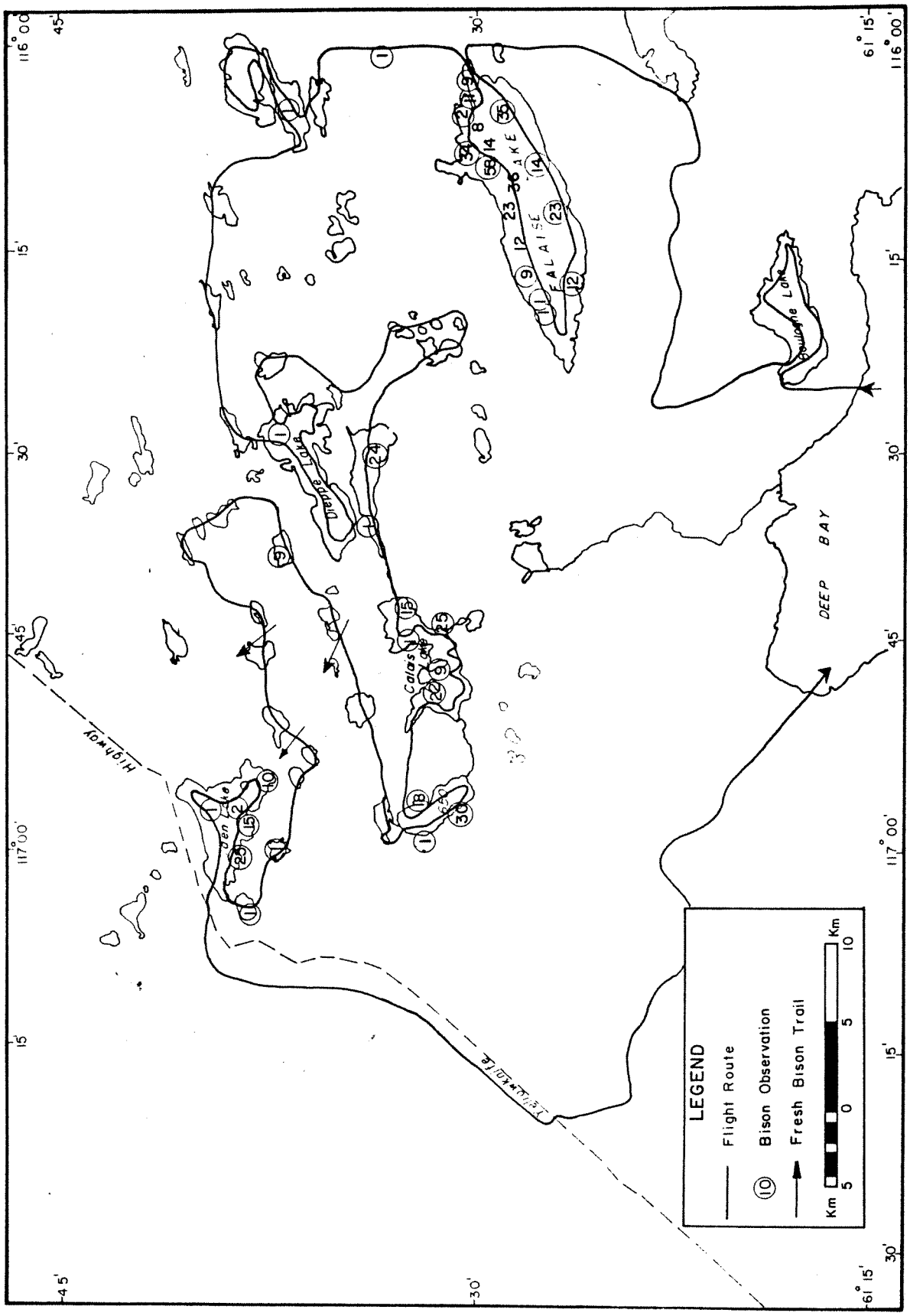

Figure 5. Survey of Mackenzie Bison Sanctuary showing numbers of bison on 31 August 1981.

12 November 1981

Figure 6 shows that for the first time since February there was considerable bison activity on Boulogne Lake, and to the north of it. Although the northwest half of the study area contained few bison, extensive feeding craters on Lake 650 and Calais Lake had been created since the arrival of snow about three weeks previously. Travel lanes radiated in a southerly direction from both lakes.

Of the 602 bison observed, 500 were found on Falaise Lake, including all calves but one (Table 1). Over 200 animals remained unaccounted for from the July survey.

A total of 15 moose was observed at various locations.

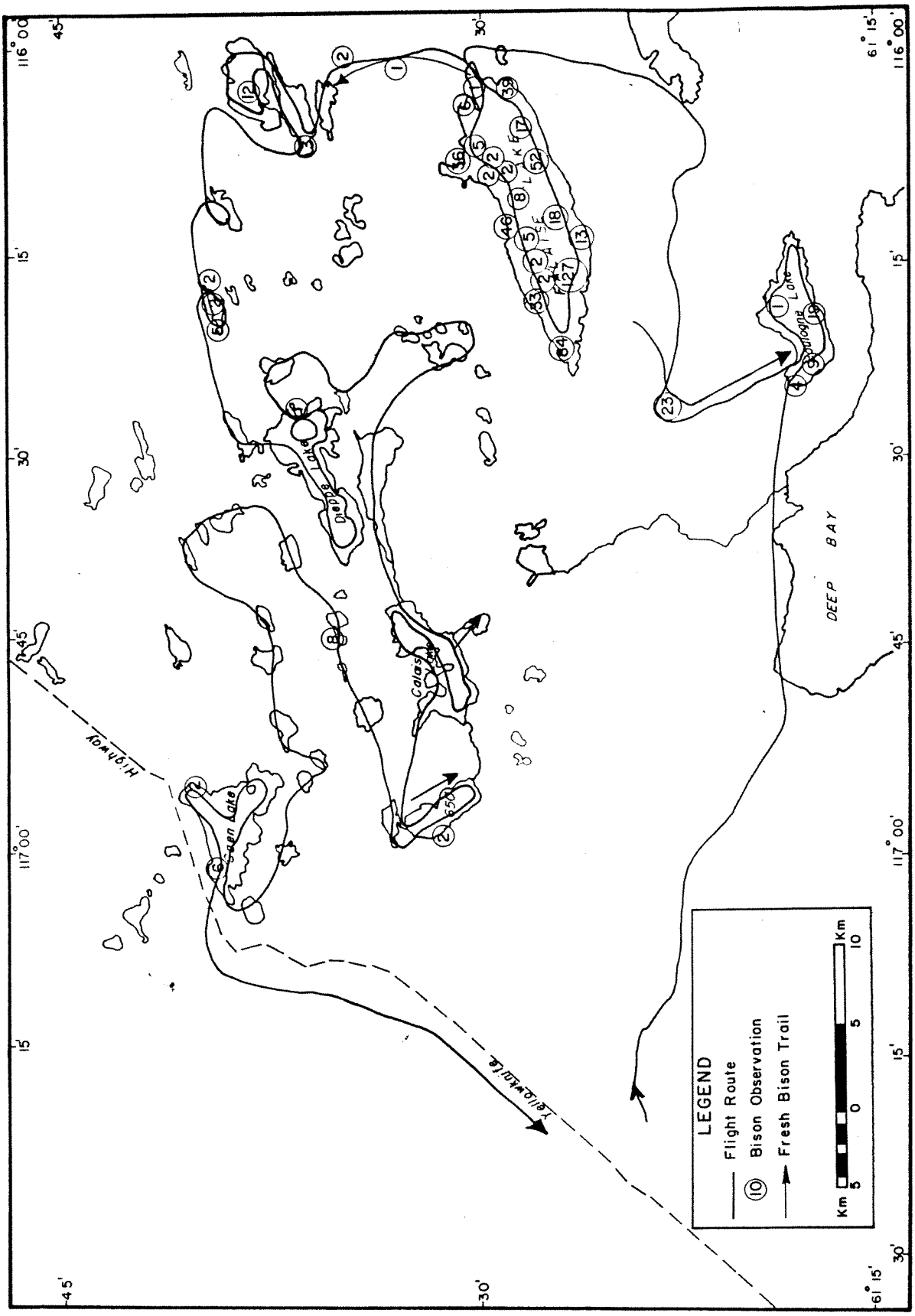

Figure 6. Survey of Mackenzie Bison Sanctuary showing numbers of bison on 12 November 1981.

01 March 1982

During the last flight of the study, the bison were more widely distributed on the main lake basins (Fig. 7). Except for Boulogne Lake, all lakes which contained groups of bison also contained calves. Small numbers and tracks appeared on most small lakes and in non-wooded areas. Because the last storm had occurred three days earlier, all but the most recent feeding craters and tracks were snowed in.

The total number of bison was 111 more than the previous survey (Table 1). The count of 71 animals on Falaise lake was the lowest tallied there at any time in the study. A well-defined trail provided evidence of a late February movement of about 400 bison from Falaise Lake to Dieppe Lake.

A total of 13 moose was observed on this flight.

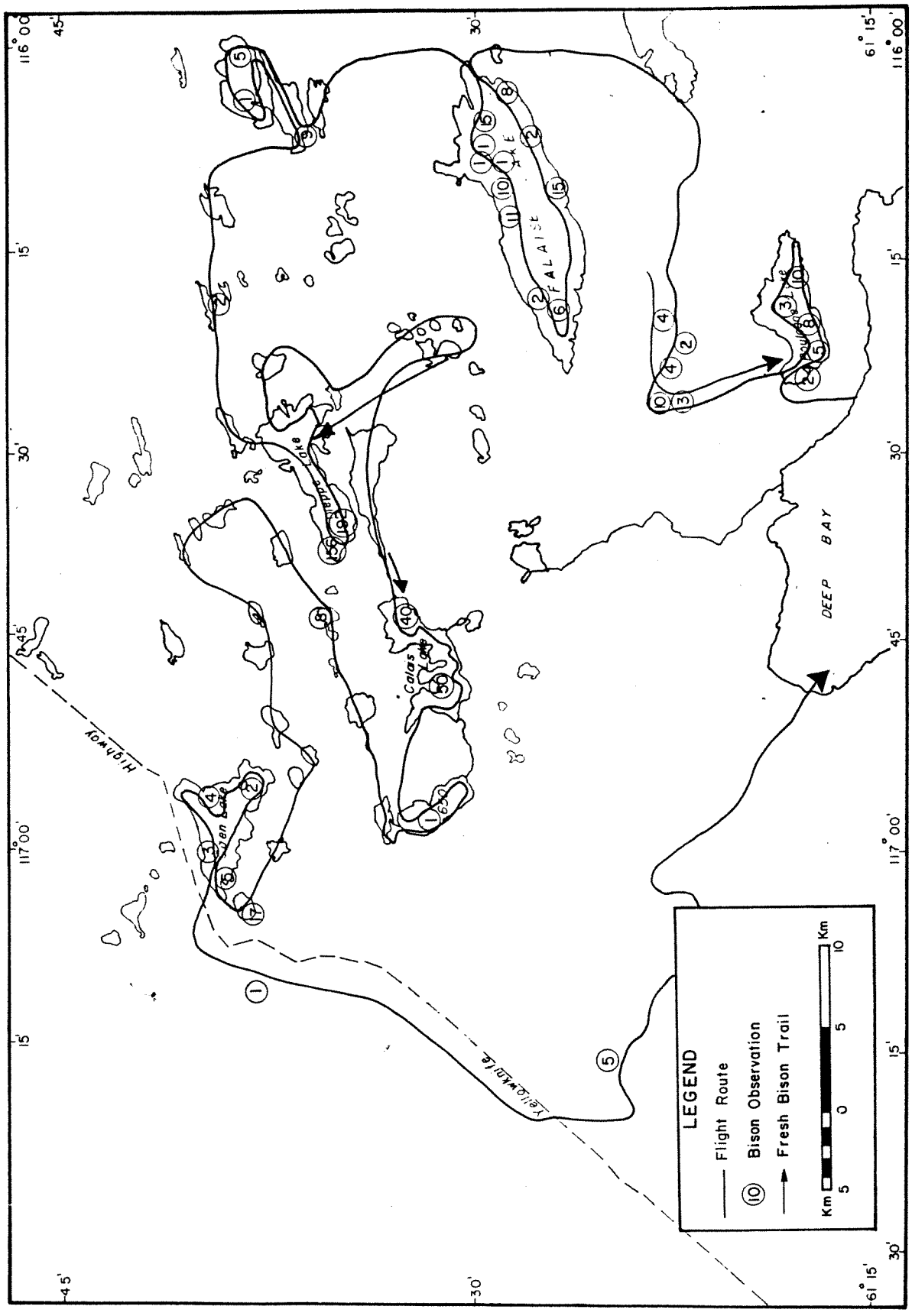

Figure 7. Survey of Mackenzie Bison Sanctuary showing numbers of bison on 1 March 1982.

DISCUSSION

Changes in distribution of bison in the Sanctuary during the year between 27 February 1981 and 1 March 1982 involved large proportions of the population (Table 1). Numbers on each of the main dry lake basins rarely remained static from one survey to the next. It cannot be discounted that notable movements were missed, for example, where immigration equalled emigration, it would not necessarily be detected.

Variations from February to June, and November to February were observed to be considerably larger than at other times in the study (Fig. 8). The spring gravitation to the largest lake bed, Falaise Lake, corresponded with movements onto the largest and most open habitats in the SRL (Calef 1976, Calef and Van Camp in press, Jalkotzy 1979) and in the WBNP (Fuller 1966), in readiness for the calving season. In the Sanctuary it began around the beginning of June and probably finished by early July, since almost all of the reddish coats of the calves had been shed by the end of August. The rut began in August and the bison were greatly dispersed by the end of the month (Fig. 9 and Table 2). Calef and Van Camp (in press) determined that the calving season extended from mid-April to mid-June, and that the rut commenced in late July. This earlier and longer calving season may have been influenced by such reproductive disturbances as brucellosis and hunting, and other factors such as climate and genetics.

Table 2. Changes in bison group size in the Mackenzie Bison Sanctuary, 27 February 1981 to 1 March 1982.

Date	No. of Groups	Mean	Median	Range
27 Feb.	56	11.8	4.0	1-130
3 June	30	25.9	3.0	1-487
29 July	20	44.2	18.5	1-276
31 Aug.	39	13.2	10.0	1-58
12 Nov.	36	16.7	5.5	1-127
1 March	42	17.0	3.0	1-192

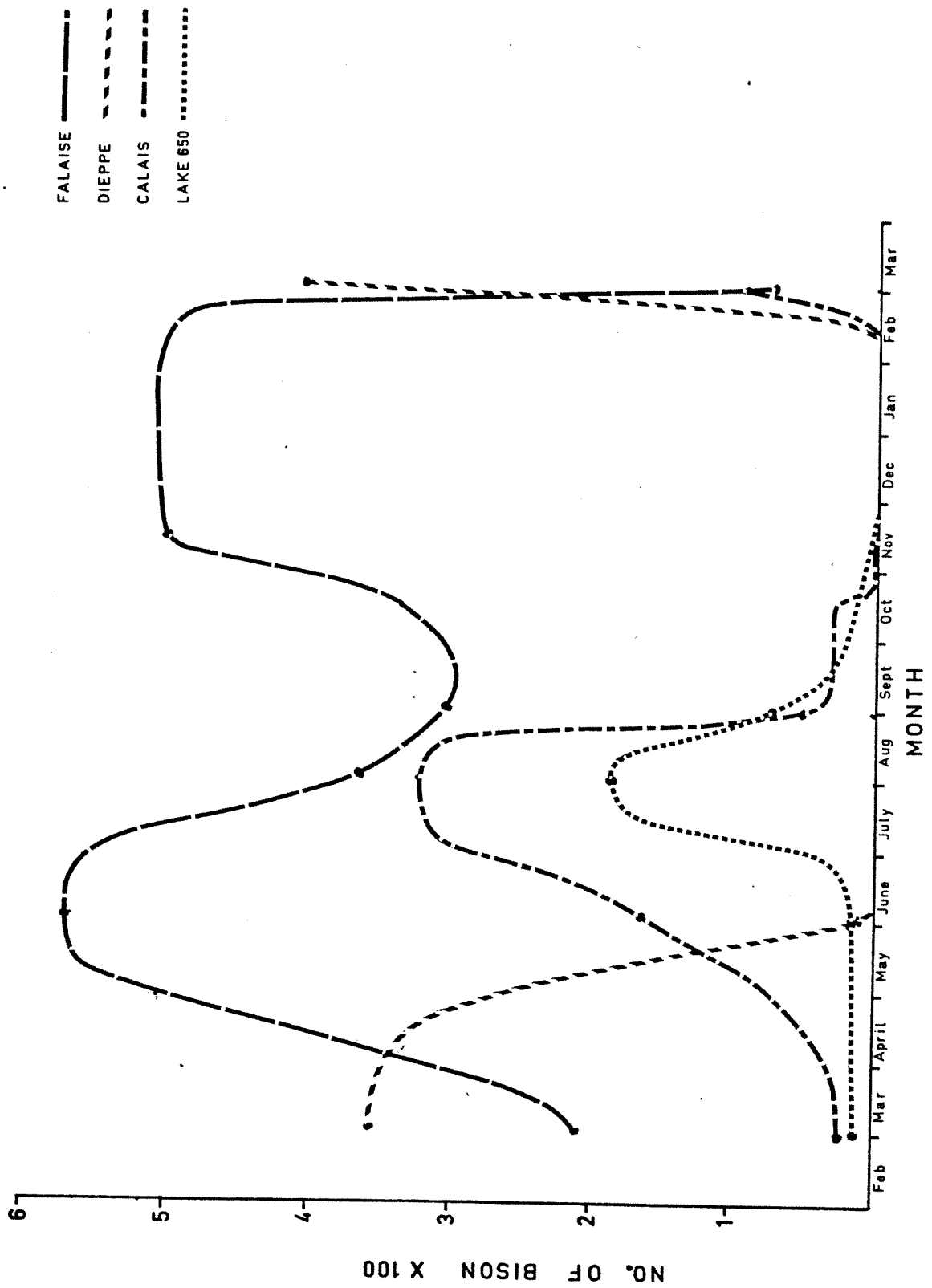

Figure 8. Estimated changes in number of bison on the main lake basins of the Mackenzie Bison Sanctuary - 27 February 1981 to 1 March 1982.

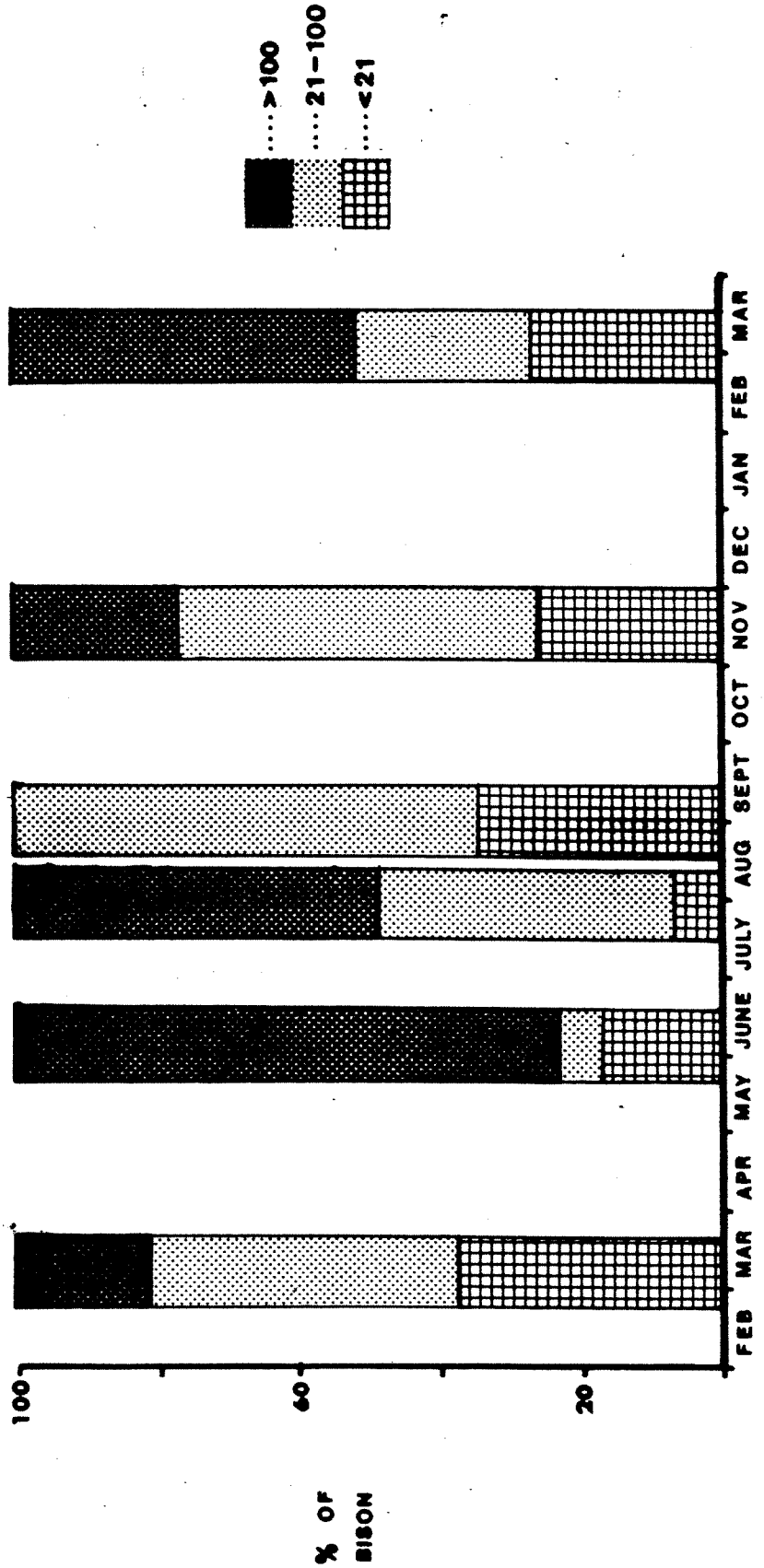

Figure 9. Changes of bison group size in the Mackenzie Bison Sanctuary - 27 February 1981 to 1 March 1982.

Late winter mass movements have not been reported for other populations of northern bison. The late February 1982 movement of bison from Falaise Lake to Dieppe Lake occurred with a similarly large proportion of the population as in the February 1981 movement from Falaise Lake to Dieppe Lake (Chowns 1986).

The major changes in distribution in the Sanctuary may have been actual migrations demonstrating a preference for Falaise Lake at calving time, Dieppe Lake as a late wintering area, and a large territorial requirement for the breeding season. Some movements may have been the result of localized overgrazing or responses to environmental factors. If they were no more than manifestations of innate propensity for travel, the distribution of mixed groups among the main lake basins would be expected to remain random throughout the year. Because these bison have been in the study area for less than two decades and are continuing to expand their population, it is quite possible that well-defined annual movements are continuing to be developed which will be unique to this population. The area of dry lake basins, separated in most cases by extensive coniferous forests, is quite different from habitat occupied by the other northern bison populations; therefore, movement patterns to meet basic requirements of the bison could also be different. The SRL and Lake Claire area of WBNP are characterized by very productive prairies which are fairly continuous or are separated by willow (Salix spp.) parkland. The bison that winter on the Salt Plains of WBNP regularly migrate to the Alberta Plateau in summer. This is

likely due to the shortage of fresh water on the Salt Plains (Fuller 1966).

The greatest mean group size (Table 2) and fewest number of groups of less than 20 (Figure 9) occurred on the 19 July survey, while the smallest mean was on the 31 August survey, when no herds greater than 100 were observed. This trend concurs very closely with the post-calving and rutting observations of the SRL researchers. Calef and Van Camp (in press) speculated that large post-calving herds may be advantageous in the defense against predation and insects, while their subsequent fragmentation into small groups may facilitate breeding. At other times of the year, the herds were generally of greater size in the Sanctuary than the SRL, with the largest group recorded in the study occurring at the onset of calving. Although singles, pairs and small groups, predominantly of bulls, occurred at all times, they were less frequent during the post-calving period.

Median values are somewhat lower than corresponding mean group sizes. The high frequencies of small units of animals, along with decreasing frequencies of large groups indicate that the distribution is probably asymmetric. Because few observations were close to the means, consideration of the range of group sizes may be more appropriate for inferences on the behaviour of the population.

Several game species were noted in this study. Moose were ubiquitous throughout the Sanctuary, except when heat and insects prevailed. According to fishermen and hunters, the moose prefer the shallows of Great Slave Lake during the

summer. The several hundred woodland caribou estimated by Jacobson (1974) to be using the bison feeding meadows, were not encountered. Too few were observed in this study to speculate on their seasonal habits. No wolves or bison kills were sighted in these surveys. With commercial fishing pursued extensively in the parts of Great Slave Lake adjacent to the Sanctuary, it is possible that a major source of food for the wolves in winter is rough fish discarded on the ice. All black bears observed were sharing meadows with bison on the June survey. Although these bears were likely feeding on the abundance of new, green vegetation, they may also have been scavenging bison placentas, stillbirths and post-natal mortalities, and preying on young calves. Van Camp (in press) suspected that bears in the SRL may have a significant impact on the survival of bison calves in the summer, but it has never been verified. Permanent water in the Sanctuary is utilized by ducks, geese and sandhill cranes during nesting and migration.

ACKNOWLEDGEMENTS

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