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**a re-evaluation of the evidence by G. R. Parker**

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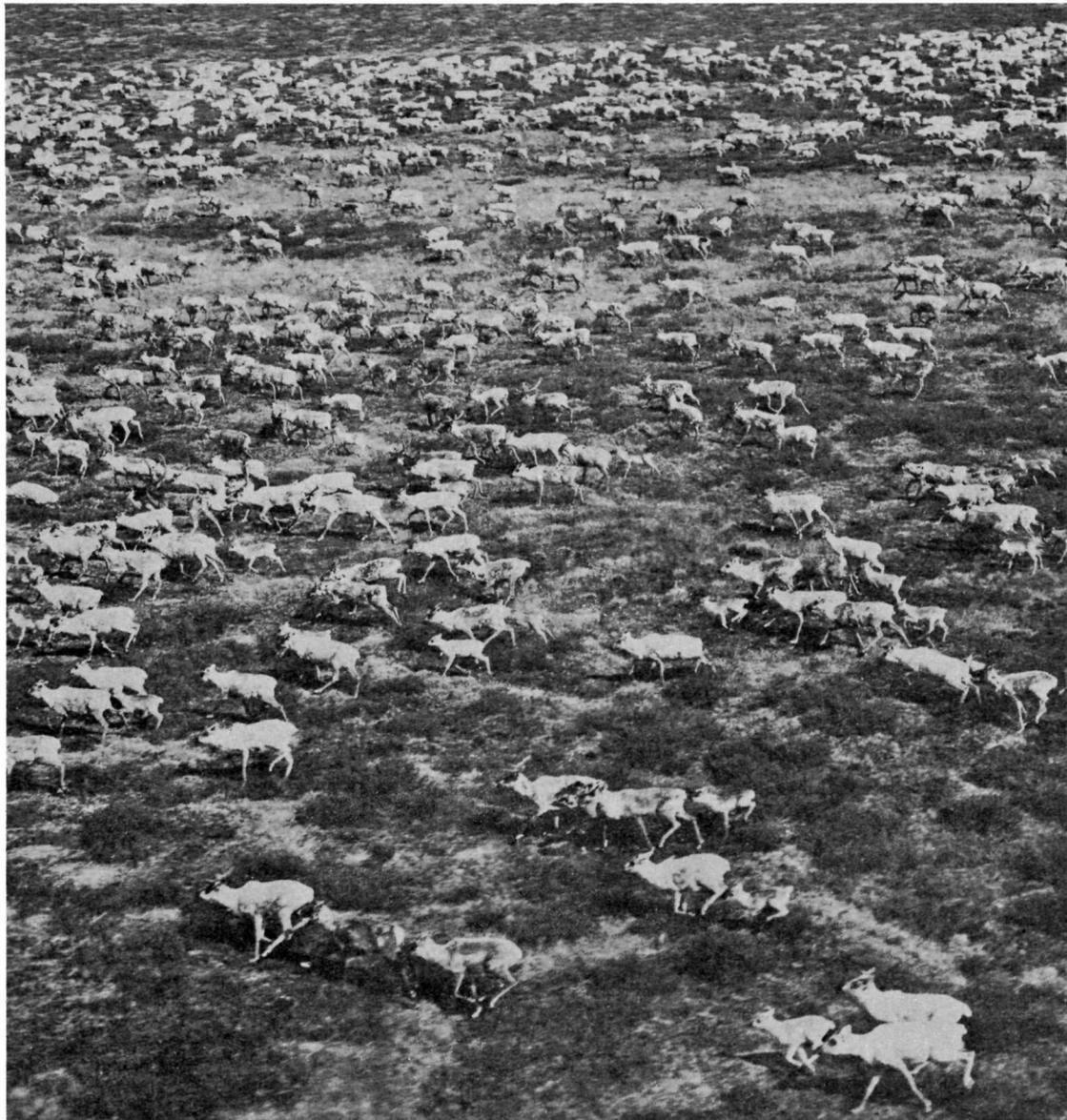
## Abstract

Aerial surveys by the Canadian Wildlife Service in 1967 and 1968 produced an estimate of 385,000 barren-ground caribou for the four major populations on mainland Canada. A direct comparison of this estimate to results of the 1955 aerial survey of the same populations suggests an increase of approximately 50 per cent during the 12 years between surveys. Closer examination of both surveys, with standardization of treatment of raw data, shows that the final estimates from both aerial surveys are actually very similar and that a direct comparison of estimates is misleading. Contrary to a major increase, it appears the total number of barren-ground caribou in northern Canada changed only slightly during the period 1955 to 1967.

## Résumé

Le Service canadien de la faune, à la suite de relevés aériens effectués en 1967 et 1968, a estimé à 385,000 les quatre grands troupeaux de caribous des toundras du Canada. Une comparaison directe de ces résultats avec ceux du relevé aérien de 1955 pour les mêmes troupeaux, révèle une augmentation de 50 p. 100 environ pour les douze années écoulées entre les deux relevés. Toutefois, un examen plus attentif, au moyen d'une méthode normalisée de traitement des données brutes, démontre que les deux estimations globales par relevé aérien sont en réalité presque identiques et qu'une comparaison directe des dénombrements pourrait nous induire en erreur. Non seulement l'augmentation est moins considérable, mais il semble que le nombre total des caribous des toundras dans le Nord canadien n'aurait que très peu changé au cours de la période de 1955 à 1967.

A low level photograph for determining the composition of post-calving aggregations south of Baker Lake, N.W.T. in late July. Photo by G. R. Parker.



In 1948–49 the first aerial survey of barren-ground caribou yielded the alarmingly low estimate of 670,000 caribou for the ranges within northern Manitoba, Saskatchewan, Alberta and the Northwest Territories (Banfield, 1954). Previous surveys, using subjective methods, had estimated up to 3,000,000 caribou (Clarke, 1940). A sharp decrease was presumed to have occurred, and the mortality and recruitment rates documented by Banfield suggested that it had continued.

Kelsall and Loughrey (1955) surveyed the entire mainland range in spring 1955, and their estimate of 278,900 gave supporting evidence of a continued decline. Although this was the last survey until 1967 some surveillance continued, from which Kelsall (1960) estimated that the number had decreased to 200,000 by the winter of 1957–58. In the absence of other data, these 1955 and 1960 estimates were cited for over a decade in every published report on barren-ground caribou.

In the mid-1960's, however, came a growing belief that caribou were no longer as scarce as had been thought. Kelsall's 1955 estimates were thought to be out-of-date and Ruttan (1966) published unsubstantiated reports of an uncontrolled population explosion in Canadian barren-ground caribou that would culminate in death by starvation of hundreds of thousands of animals.

These unfounded reports brought pressure on the Northwest Territories Game Management Service to relax its restrictions on caribou hunting by white residents. Lacking facts on the actual status of the caribou populations, the territorial government proceeded to liberalize hunting and finally allowed commercial exploitation of the herds in 1968.

To obtain up-to-date information and fulfill its advisory responsibilities to federal and territorial bodies, the Canadian Wildlife Service began, in

**Table 1**

The numbers of caribou estimated on western mainland barren-ground caribou ranges in 1955 (from Kelsall and Loughrey, 1955).

Geographical area	Estimate
1. Anderson River	2,100
2. Tsoko Lake	2,400
3. Caribou Point	500
4. Lever Lake	7,000
5. Fort Franklin	26,100
6. Lac Grandin	3,000
7. Gordon Lake	3,900
8. Indian Mountain Lake	16,600
9. Lake Athabasca — Great Slave Lake	29,300
10. South Keewatin	113,600
11. Clarke-Thelon Rivers	6,000
12. Peter Lake	16,600
13. Fort Reliance	3,400
14. Coast near Eskimo Point	8,600
15. Hicks Lake	1,100
16. Artillery-MacKay Lakes	2,900
17. Islands in Great Slave Lake	3,100
18. Northeastern Manitoba	10,000
19. Northern Manitoba (summer)	1,000
20. Padlei	500
Total	257,700

March 1967, a three-month aerial survey of the Bluenose, Bathurst and Beverly populations and arrived at an estimate of 322,500 caribou (Thomas, 1969). With Parker's (1970) 1968 estimate of 63,000 for the Kaminuriak Population, the total for the four major mainland populations was 385,500 caribou. The 1955 estimate, minus the results for areas not surveyed in 1967 or 1968 (areas of the Back and Bullen River, Aberdeen Lake, north-central Keewatin, Melville Peninsula and Ross Welcome Sound) was 257,700 for the same four mainland populations (Table 1). The results of the 1955 survey, showing type of survey and location, are presented in Table 2. A direct comparison of the two estimates suggests that caribou had increased by 127,800 (49.5 per cent) during the 12 years between surveys.

**Table 2**  
1955 survey estimates, showing type of survey and location.

Type of survey	Area number*	Estimate
Transect strips, tundra	1	2,100
	2	2,400
	10	113,600
	11	6,000
	12	16,600
	13	3,400
	14	8,600
	15	1,100
	16	2,900
	Total	156,700
Transect strips, taiga	3	500
	4	7,000
	5	26,100
	6	3,000
	7	3,900
	8	16,600
	9	29,300
	17	3,100
	Total	89,500
Observations and reports	18	10,000
	19	1,000
	20	500
	Total	11,500
Grand total		257,700

\*From Table 1

This has been used to justify increased exploitation of the caribou populations. However, closer study shows that the two population estimates should not be compared directly.

First, of the two surveys, the one in 1967 is believed to be the more accurate. Its main advantage was its timing—most of the caribou were counted during spring migration across the tundra, north of the treeline, where comparatively few animals would go unseen. Other reasons for greater accuracy were its reliance on the extensive use of aerial photographs to count animals in large concentrations, and that the proportion

of the caribou range surveyed was much greater in 1967 than in 1955.

Second, and more important in this comparison, the two surveys used comparable data but derived population estimates differently. The 1955 estimate was made directly by extrapolating densities of caribou observed on transects. No adjustments were made, as in 1967, for caribou unobserved on transect, caribou outside the areas surveyed or, in the census of certain groups migrating northward in spring, for lagging adult males. Obviously, for a comparison to be valid both estimates must be similarly adjusted.

The adjustments used by Thomas to derive final estimates from raw data are shown in Table 3. In the tundra, transects in 1955 ranged in width from 0.71 to 1.42 miles and in 1967 from 0.51 to 0.68 miles; and in 1955 covered an average of 6.4 per cent of the tundra areas occupied by caribou but in 1967 more than 20 per cent. In 1967, with narrow transects and high aerial coverage, Thomas utilizes adjustments up to 25 per cent for animals presumed missed within transects (Table 3, Adjustments 1 and 2) and up to 20 per cent for animals outside the area surveyed (Table 3, Adjustment 3).

Whether the 1967 adjustments are justified is open to question. Accurate totals, however, are perhaps less important than the trend of the mainland populations during the 12 years between surveys. This trend can only be determined if the raw data from the 1955 and 1967 surveys are treated in the same manner. The 1955 data are therefore re-adjusted by 10 per cent—the least correction that might reasonably be made—for animals presumed missed within transects and for animals outside the areas surveyed (Table 4).

In 1955 the estimate of caribou numbers in southern Keewatin (113,600) was based on surveys over migration routes leading to the calving ground in early June when almost all migrants

**Table 3**  
Original data and adjustments applied to obtain final 1967 barren-ground caribou population estimate (Thomas, 1969).

Population	Type of Survey	Location	Original est.	Per cent adjustments* (revised est.)				Final est.	Est. used in population calculations
				1	2	3	4		
<b>Bluenose</b>									
	Transect & Photo.	Tundra	17,490			8 (approx.) (19,011)		19,011	19,000
<b>Bathurst</b>									
Herd 1	Census 1	Transect	Taiga	40,088	20 (50,110)	20 (62,637)	10 (69,597)	69,597	
	Census 2	Transect	Tundra	72,039			5 (75,830)	75,830	
	Census 3	Photo.	Tundra	83,945	5 (88,363)		5 (93,014)	93,014	93,000
Herd 2	Photo. & count	Tundra	7,613	25 (10,151)				10,151	10,000
Herd 3	Extrapolation†						21	27,379	25,000
Herd 4	Observer est.	Tundra	5,000					5,000	5,000
Herd 5	Transect	Tundra	10,422			10 (11,580)		11,580	11,500
<b>Beverly</b>									
Herd 1	Census 1	Transect	Tundra	77,829	20 (97,286)		20 (121,607)	121,607	
	Census 2	Transect	Tundra	127,000				127,000	127,000
Herds 2 & 3	Extrapolation‡						20	31,750	32,000
Est. total (Thomas, 1969)									322,500
Kaminuriak (Parker, 1970)									63,000
Est. total — 4 major mainland populations									385,500
*Adjustment 1 — proportion missed due to observer error					†Missing adult males for Herds 1 & 2: assumes 21% of herd = adult males				
Adjustment 2 — proportion missed because transect too wide					‡Missing adult males for Herd 1: assumes 21% of herd = adult males and 1% of herd surveyed were adult males				
Adjustment 3 — proportion missed because outside area surveyed									
Adjustment 4 — missing adult male segment = 21% of total population									

**Table 4**  
Adjustments applied to the 1955 barren-ground caribou estimate, with revised estimate, based upon calculations used by Thomas (1969).

Type and location of survey	Original est.	Per cent adjustments* (revised est.)				Adjusted est.	
		1	2	3	4		
Transect survey	Tundra	156,700	10 (174,111)		10 (193,456)	21 † (223,653)	223,653
	Taiga	89,500	20 (111,875)	20 (139,843)	10 (155,381)		155,381
Other est.	11,500					11,500	
Totals	257,000					390,534	

\*Adjustment 1 — proportion missed due to observer error  
Adjustment 2 — proportion missed because transect too wide  
Adjustment 3 — proportion missed because outside area surveyed  
Adjustment 4 — missing adult male segment = 21% of total population

†Missing adult males for the 113,600 caribou estimated for southern Keewatin during spring migration = 30,197. Final est. for tundra = 193,456 + 30,197 = 223,653.

## Conclusions

are cows and immatures. Adult bulls tend to remain in the taiga long after the cows have left. Thomas (1969) estimates adult males comprise approximately 21 per cent of the total mainland populations, and that figure has been used to further adjust the 1955 data (Table 4).

For the aerial survey of Bathurst Herd 1, while it was still within the taiga, Thomas made three adjustments. Twenty per cent was added to account for caribou missed in that part of the strip in which animals were generally visible, 20 per cent for caribou on each strip not visible to the observer and 10 per cent to account for animals outside the area surveyed (Table 3). In 1955, the taiga transects were 0.71 miles wide; in 1967, 0.55 miles wide. Thomas' adjustment of 40 per cent for animals missed within taiga transects may be correct for the 1967 survey, but is conservative for the 1955 survey. Applying the 10 per cent correction, which Thomas used for animals outside the 1967 survey area, to the 1955 taiga data also seems fair (Table 4).

Finally, no adjustment can be made to the informal 1955 estimates of caribou numbers in areas 18, 19 and 20. Adjusted 1955 estimates are shown in Table 3. The total adjusted figure of 390,000 for 1955 is slightly *larger* than the similarly adjusted figure of 385,500 for 1967.

1. The 1967–1968 barren-ground caribou surveys give no evidence that the four mainland populations have increased since 1955.
2. The relaxation of hunting regulations for barren-ground caribou may be based on invalid comparisons of data treated in different ways.
3. It is not valid to compare the results of the 1955 and 1967 surveys unless the same method is used in obtaining total population estimates from observed data.
4. When minimal adjustments—based on those accepted for refining the results of the 1967 survey—are applied to the 1955 estimates, the total estimate is raised from 257,700 to 390,500, 5,000 more than the combined 1967–1968 estimate of 385,500.
5. Proposals for managing barren-ground caribou should be based on accurate, up-to-date knowledge of the status of each population. Management badly needs information on total harvest from, and recruitment to, each population, and periodic total population inventories.

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