

THE RETURN OF CARIBOU TO UNGAVA, BY A. T. BERGERUD, STUART N. LUTTICH, AND LODEWIJK CAMPS. 2008. McGill-Queen's University Press, Montreal, Quebec, Canada. xxxvii + 586pp.; 36 plates; index, bibliography; \$49.95. ISBN 978-0-7735-3233-5 (hardcover).

'The Return of Caribou to Ungava', is as much a passionate telling of a northern saga as it is a scientific monograph about caribou. Bergerud and his co-authors tell the story of the rise (1950-88) and fall (1988-2001) of the George River Herd. At its peak, it was the largest herd of migratory tundra caribou in North America. To tell that story, the authors go back to the events unfolding as the last glaciers retreated (Chapter 3) and how the journeys of the caribou and early people became inter-twined (Chapter 5). It is not just the human predators but also the wolverine, bears and wolves whose fate follows the sweeping changes in caribou abundance. The inter-play of climate, weather and vegetation with caribou ecology are all part of the story of the George River Caribou herd on the Ungava Peninsula.

Tom Bergerud is one of the world's most influential caribou biologists and his passion for caribou rings through the book. The book has the stamp of his authority from his decades of experience and his voice in the book is unmistakable. Bergerud's concern is for the future of caribou and whether insights within the book will provide a way of ensuring a future for caribou rather than run the risk of losing them as was done for the Atlantic cod " . . . for not having asked the right questions" (Preface xxxvii). The book seeks to answer questions about why caribou distribution changes with abundance; how caribou use the vast space of their annual range; whether the George River is a model for other herds and if its dynamics are understood, can the pattern be managed? The authors also raise the question about global warming. Bergerud and his co-authors present a compelling amount of evidence that it is summer range, rather than lichen abundance on the winter range, that influence herd abundance. Wolves did not regulate the George River herd because rabies outbreaks limited the wolves. However, predation (wolves and humans) can extend the time of low caribou numbers triggered by the high caribou densities on

the summer range. The authors' appraisal of other herds especially Alaskan herds is that global warming is a threat to caribou because warmer winters will mean deeper snow and greater vulnerability to predation. This line of argument leads the authors to conclude the wolf management will be necessary for the future of caribou and this point is emphasized for the future of the sedentary caribou herds in southern Ungava.

The book is mostly but not only about migratory tundra caribou. Bergerud has long drawn the distinction between how caribou fall into two groups depending whether they disperse at calving (sedentary) or migrate to a common calving ground (migratory). The authors devote a chapter to outlining the declining abundance and contracting distribution of the sedentary caribou of southern Ungava Peninsula (Chapter 4) – such herds as the Red Wine, the Mealy Mountain and the Lac Joseph. The description leads inescapably to the role of wolves in the declines.

In one of the earlier chapters (Chapter 6), a chapter rich in history of Ungava Peninsula; the authors describe historical fluctuations in abundance of the George River herd. Caribou abundance has a periodicity of about 80-100 years. The authors reject earlier arguments that fires, harvest, predation and snow cover drove the fluctuations in abundance in favor of the premise that caribou reduce forage on the summer range. The arguments are further developed in Chapters 7 and 8 where the changes in time over the summer ranges are described especially the reduced growth of shrubs such as birch at the peak of caribou abundance in the late 1980s. The state of the summer range influences caribou body weight and growth, pregnancy rates and survival (Chapters 9, 10 and 11). The authors maintain that the birth weight of the calf, which affects its survival, is strongly influenced by the state of the maternal cow during the last 6 weeks of pregnancy and in turn, the timing of spring plant growth and migration distance affect the cow's condition. Changes in migration distance correlated with changes in herd abundance and this takes the authors into the second theme of the book.

About halfway, the book shifts from abundance to the annual and seasonal distribution of the George River herd (Chapters 12 to 15). One of Bergerud's strongest contributions to caribou ecology has been his emphasis on how and why caribou use their annual ranges. And this theme is well-explored showing how as abundance increased and decreased, the annual ranges expanded and contracted away from a tundra center of habitation. Seasonally, caribou movements are distinguished by shifts and then pauses as insect harassment (warbles and mosquitoes), wind, snow, forage and the caribou themselves all affect the movements. One of the best known characteristics of tundra caribou is the annual migration of the cows to their traditional calving grounds. Chapter 15 delves in detail into the return of the cows to their calving grounds arguing that the cows are spacing themselves from their predators although the influence of forage availability also plays a role in the location of the calving grounds. The book's final chapter re-asserts conclusions of the earlier chapters and summarizes the authors' arguments about the applicability of their conclusions (the interaction between caribou reducing forage on their summer ranges and predation) to other herds in North America. Surprisingly, the authors do not explore the implications of the markedly small extent of the George River's summer range in the comparisons with other herds.

The book achieves its objectives partly through amassing a huge amount of detail which is both a strength and a weakness. It is a hefty 600 pages of text interspersed with frequent tables, graphs and maps. It is easy to get lost in the details but equally, presenting the data is a necessity for the reader to make their own judgments (although more use could have been made of appendices and text boxes). Data analyses heavily depend on descriptive statistics and linear regressions. In part, the value of the book is that the authors present their own data much of it not available previously. However, reliance on their data brings the detailed story to an end by 1993 although there is reference to the 2001 census. The sheer amount of data do reveal the effort needed to understand caribou in the northern landscape and that answers only come from extended efforts over time.

The maps are a delight and a strength of the book. The 8 pages of historic photos are a reminder about the role of caribou in the lives of the aboriginal people. The book is generously endowed with many other photographs which admirably capture the feeling of the caribou and their world. The writing is clear with few lapses into jargon (such as negative demography). All in all the book is well-produced with care taken to minimize errors. Perhaps my only regret is the index is superficial and not particularly helpful.

And for the future of the North America's spectacle of large migratory caribou herds, the book is not a recipe for conservation beyond a general plea "Treat the Land with respect". The book offers nothing in the way comments beyond a few regrets about the effects of hydro developments on how and if the seasonal ranges need management of human activities. However, the authors' insights into caribou ecology do map out a pathway for both what to monitor and where management is most effective – the low phase of caribou numbers where caribou deaths from predation and hunting can prolong the low numbers.

The book's structure, its writing, the photos and maps mean the book is attractive to readers and the detailed graphs and tables will mean the book is a treasure for students and biologists. Anyone with an interest in Canada's North would want this book on their shelves as it has so much insight into caribou, people and their shared landscape over time immemorial to the present. For wildlife biologists, not just caribou biologists, but any biologist with an interest in large mammal ecology, the book is a gift in the amount of information and ecological insights.

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