

Frantsa-Iosifa, and those of other workers from elsewhere in the Soviet Arctic. She divides the vegetation of Zemlya Aleksandra into 12 eco-groups based on typical cryptogamic representatives. She also discusses seasonal development of Gramineae, Juncaceae, Caryophyllaceae, Papaveraceae, Cruciferae, and Saxifragaceae, which aids understanding the adaptability and tenacity of the impoverished vascular plant flora.

The text is clean and clear, with few typographical errors. The translator generally has chosen equivalent English terms for Russian expressions rather than more literal translations. This is particularly helpful in discussion concerning mosaics versus complexes and zonal vegetation. Figures are black and white; diagrams are remarkably clear and uncluttered. Unfortunately the maps, as in many Russian publications, are simplified, with little but letter symbols and patterns on the diagrams themselves and explanatory descriptions in the captions. Most geographical location maps are too simplified. Coordinates, scale, and even indication of North are absent. Zemlya Aleksandra, a major focus of the book, lacks good map coverage. I found it useful to read this book accompanied by the National Geographic Arctic Ocean map, a polar projection that provides both the Russian and English names in the Russian sector and a rough idea of the extent of glaciation and proximity to multi-year ice.

This book is an excellent compilation of botanical data, which summarizes inaccessible literature. There is a brief discussion of polar deserts elsewhere in the world, but there, too, little has been published. This documentation of the Russian region enables those working in similar areas to make their own comparisons.

This presentation does not rely on sophisticated statistical classifications currently popular in the Western scientific community, but the classifications, based on the author's own judgment, are realistic and most are readily recognizable. There is a noticeable lack, however, of details of soil chemistry and texture and their influence on the vegetation classes.

The recent death of the author is a loss to the Soviet and international scientific communities. We can be thankful for her long and productive life and her interest and persistence in researching such a harsh and remote environment. Gratitude is also expressed to the translator, ecologist Doris Löve, for making this work available to circumpolar botanists and ecologists.

REFERENCES

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ATLAS OF FINLAND, RELIEF AND LANDFORMS, FOLIO 121-122. Edited by PENTTI ALALAMMI. Helsinki: National Board of Survey and Geographical Society of Finland, 1988. Two map sheets, 2 full-page maps, 4 half-page maps, 24 small maps, 22 black-and-white photos, 15 aerial stereo pairs, 19 colour photos, 4 diagrams, 11 transverse profiles, index, bib. Softbound. No price indicated. The folios making up the atlas can be purchased either separately or in sets. In Finnish.

A substantial amount of information is provided in the three gigantic cardboard cases of folios already published, and an equal number are still being prepared for publication. The flood of information contained herein tends to swamp the user who is looking

for information only on the Arctic above the timberline. Most of Finland is in the boreal coniferous forest zone, with only the northern-most regions being above the timberline. This publication has quite a bit of source material to offer on this coniferous zone.

The cardboard cases accommodating the fifth edition, if put all together, are so voluminous and heavy that it takes a strong person to carry them all at once. To use even this folio (121-122) one needs a good deal of table space (2 × 5 ft.). Although the largest maps can be folded and fit into the covers of this volume (folio 121-122), it is hard to find room for it on the average book shelf. The maps are also too bulky to fit into a pack or plastic map case such as that used by hikers. Trying to manage this assemblage of information on paper makes one appreciate computer data banks. After all, the entire publication would fit onto a single diskette, which could be neatly tucked into an envelope. One would no longer need exceptional strength to carry the atlas around.

The authors of the folio seem to have had rather diverse goals in mind. The illustrative photographs provide direct information. Anyone can glance through the pictures to get a general idea of the landforms of that part of northern Europe. The micropetite type accompanying the color photographs is so small, however, that a magnifying glass is needed to read it. Some of the black-and-white photographs are in stereo pairs. The average reader, however, cannot make use of these stereo pairs without special glasses, which are not included. Not everyone can obtain the stereo effect even with the glasses. Those who can use the stereo pairs, however, can quickly get a good picture of the landforms: fell geomorphology, Ice Age eskers, peatlands, and other characteristic relief features of the area. The half-page detailed geomorphological maps, scale 1:50 000, are clear and very readable. They present drumlin and esker landscapes (Kuusamo, NE Finland), an ice marginal complex (Salpausselkä, S Finland), clay plains with protruding bedrock (S Finland), and the fell region above the timberline (N Finland).

Most of the maps and diagrams cannot be easily understood without searching through a thicket of explanations and comments. And since the text has to be looked for among giant sheets of paper, often at some distance from the pictures, the reader finds himself constantly turning pages. The text and visual layout do not cater to the general reader, either. The directions at the beginning of the folio say: "The subheadings are usually intended to be read with the main headings"; in other words, special directions are necessary just to get through the headings! Good advice would be even more in order to help readers with the text proper, considering the diversity of its contents. In parts it is the pedantic lecturer explaining fundamentals to his undergraduates, in others it reads like an encyclopedia, but without the conciseness and lucidity that space limitations exact. There is unnecessary repetition, e.g., "In Figure 4 B III we see that the relief of Finland is visible almost in its entirety in the contour zone of below 300 meters, with the exception of the northwest 'arm.' "

Much is made of banalities, viz., "The 50-200 meter area turns out to be surprisingly large." The general reader sees nothing surprising or startling in the fact that a relatively large proportion of a country's area lies lower than 200 meters a.s.l.

For the reader with the patience to work through the headings, subheadings, figure headings, captions, comments, and explanations, the folio is a wholly worthwhile package, offering information on higher and lower terrain, hill elevations, distribution of Ice Age formations, and terrain amplitudes. The maps were undoubtedly planned and drawn up by experts in the respective fields. Fluent written presentation of the subject matter is conspicuous by its absence.

Here and there the scarcity of relevant information can be inferred. There is not always enough material to occupy the allotted space. The biggest map sheets are not used in their entirety: the hypsometric layered map has two square feet of empty space, which is filled up with a road map. Since white space is an editor's nightmare,

this filler is understandable. It is harder for the reader to fathom why the geomorphological general map — clear and informative in its own right — has become the victim of overprinting. “Dominating relief altitude” has been tacked on using a color scale, although there are plenty of colors on the map otherwise. It gradually becomes obvious that this map, too, would have had “white space” had the additional material not been superimposed: there are so few clear-cut relief categories in the legend that they would not have been sufficient to cover all the relief types of the country. The additional colors provided by the “dominant relief amplitude” fill in the blanks, as it were. The result is unfortunate for the general reader, for the colors of one scale are not readily distinguishable from those of the other. Reading involves turning giant pages and looking for information in the labyrinthine explanations.

The beginning of the folio gives instructions in pedantic detail to the reader on how class widths have been indicated. This gives an impression of attention to detail and reliability. In reality, however, most of the maps, in particular many of the smaller ones, are the result of very broad generalizations.

The impression created in the beginning in “Instructions to the reader” is shattered and the harsh reality of the work becomes apparent. For instance, the hiker who would use the maps in planning his trip might run into considerable surprises in the field. One of the worst obstacles for hikers in northern Finland is hummocky moraine. This chaotic, truly important feature of the terrain has been neglected on one of the main maps, where in addition to bedrock-determined reliefs, eskers, for instance, are indicated. The “biogenetic relief,” however, stands the hiker in better stead. If he realizes that this formation means peatlands, then he will at least bring along suitable footwear.

The quality of reproduction and printing is wholly adequate. Color photographs are clear. The covers are stylish. Thanks are also due to those who have drawn up the diagrams. Some of the cartograms are elegant. A considerable amount of scientific expertise has been used in producing maps and diagrams, supplementary text, and photographs. Should it seem that the expertise has been buried under a pile of chaff, as it were, this is understandable when one looks at the date of publication. The entire assemblage was (and will be) published in the period just before computer data banks became common. The work has been produced in decades when electronic data storage methods were already becoming familiar, and books and atlases were trying to defend their position and existence. Paper data packages began to swell, becoming voluminous monsters. They were piling up on shelves and tables, large and heavy. They are authoritative looking, at least for the time being, rather like the giant reptiles before the evolution of smaller, more intelligent groups of organisms.

If you have enough shelf space, you can do worse than to fill it up with this bundle of data. Among the chaff the cartographer has put together much of worth.

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THE MUSKOXEN OF POLAR BEAR PASS. By DAVID R. GRAY. Markham, Ontario: Fitzhenry & Whiteside and National Museum of Natural Sciences, National Museums of Canada, 1987. 192 p., 26 figs., 24 colour plates, 6 black-and-white photos, 4 appendices, index, glossary, bib. Hardbound. Cdn\$50.00.

The Muskoxen of Polar Bear Pass summarizes the results of a decade of study of this arctic mammal on Bathurst Island in northern Canada. Written in a non-technical format, the book depicts the

behavior and natural history of muskoxen and the High Arctic environment in which they live. The text contains many narrations of field observations that describe the behavior of this unique animal in detail and relate the perceptions and experiences of the observers.

For short periods the herd grazed calmly, then suddenly a few muskoxen began moving; walking slowly at first, then breaking into a run. Others joined them until the whole group was galloping down the middle of the valley. In the orange and blue light of the sunless morning, the steam from those working lungs and the fine particles of snow dusted up from over a hundred hooves formed a wispy trail of fog above and behind the dark mass of the pounding herd. More impressive, however, was the sound. The crackle of hooves breaking through the wind-crust reached us on our hilltop over two kilometres away. The clear, almost windless, air created the odd illusion of disembodied sounds close at hand while their source, the muskoxen, galloped soundlessly across the distant snow [p. 73].

The book is arranged into an introduction, seven chapters, and a short epilogue. The introduction states the objectives of the study, which were to record and describe the behavior patterns of the muskoxen, and briefly summarizes study methods and other muskox research. Chapter 1 presents clear descriptions of physical characteristics, taxonomy, ancestry, and the present distribution of muskoxen, as well as the physical characteristics of Polar Bear Pass.

Different seasons in the annual cycle of muskoxen in Polar Bear Pass are described in the second chapter. The birth of calves, maternal behavior, calf development, and play behavior in calves and yearlings are detailed in the discussion of spring. The descriptions of aggressive and courtship behavior presented in the discussion of summer are some of the highlights of the book. Shedding, cooling mechanisms and play are also included in the discussion of summer, but food habits are not discussed. The sections on fall and winter are primarily limited to descriptions of the area and other animal species, with some discussion about movements, winter feeding and winter mortalities. During the one winter that observers remained in Polar Bear Pass, no muskoxen were seen from late November until early February. But the account of the scientists' activities during their long, dark arctic winter is interesting.

Chapter 3 discusses muskox social behavior. Sections on the herd, herd size, and herd dynamics contain several interesting observations. Descriptions of social organization and social dominance, including the relationship between leadership and dominance, the open social structure of muskox herds, and the unique defence formation, are excellent. Muskox locomotion and movement rates are detailed.

Population changes observed during this long-term study are covered in Chapter 4. A regional perspective of muskox numbers, distribution, and movements is lacking in this book, because of the focus on one geographic area. Although information on numbers of muskoxen on Bathurst Island is presented from a variety of sources, a discussion of these results would have been helpful. The documentation of variability in productivity and mortality, including the reproductive failures in 1968-70 and winter mortalities during severe conditions in 1973-74, are valuable contributions to understanding the dynamics of this species.

Chapter 5 depicts the relationships of muskoxen with other inhabitants of Polar Bear Pass. The descriptions of interactions with wolves, including wolves killing muskoxen, are detailed and fascinating. The scavenging role of arctic foxes and polar bears, lack of competition with other herbivores (caribou and arctic hares), and parasitism are discussed briefly.

Muskoxen and man is the subject of Chapter 6. The chapter begins with a discussion on disturbance by aircraft, snowmobile, and humans on foot, which might be more appropriately located at the end of the chapter in the discussion of the modern era. Archaeological evidence and early historical reports are interesting contributions, as is the discussion on recent activities in the area. Defining the dates of each historic period would add to the clarity of this section.