

Cambridge University Press

978-0-521-10064-9 - Ecology of Arctic Environments: Special Publication Number 13 of
the British Ecological Society

Edited by Sarah J. Woodin and Mick Marquiss

Frontmatter

[More information](#)

Ecology of Arctic Environments

SPECIAL PUBLICATION NUMBER 13 OF THE
BRITISH ECOLOGICAL SOCIETY

EDITED BY

SARAH J. WOODIN

Department of Plant and Soil Science

University of Aberdeen, Aberdeen

AND

MICK MARQUISS

Institute of Terrestrial Ecology

Banchory Research Station

Hill of Brathens, Glassel

Banchory



CAMBRIDGE
UNIVERSITY PRESS

Cambridge University Press

978-0-521-10064-9 - Ecology of Arctic Environments: Special Publication Number 13 of
the British Ecological Society

Edited by Sarah J. Woodin and Mick Marquiss

Frontmatter

[More information](#)

CAMBRIDGE UNIVERSITY PRESS

Cambridge, New York, Melbourne, Madrid, Cape Town, Singapore, São Paulo, Delhi

Cambridge University Press

The Edinburgh Building, Cambridge CB2 8RU, UK

Published in the United States of America by Cambridge University Press, New York

www.cambridge.org

Information on this title: www.cambridge.org/9780521839983

© British Ecological Society 1997

This publication is in copyright. Subject to statutory exception
and to the provisions of relevant collective licensing agreements,
no reproduction of any part may take place without the written
permission of Cambridge University Press.

First published on behalf of the British Ecological Society by Blackwell Science Ltd 1997

First published on behalf of the British Ecological Society by Cambridge University Press 2008

This digitally printed version 2008

A catalogue record for this publication is available from the British Library

ISBN 978-0-521-83998-3 hardback

ISBN 978-0-521-10064-9 paperback

Cambridge University Press

978-0-521-10064-9 - Ecology of Arctic Environments: Special Publication Number 13 of the British Ecological Society

Edited by Sarah J. Woodin and Mick Marquiss

Frontmatter

[More information](#)

Contents

	Preface	v
1	E.A. FitzPatrick. Arctic soils and permafrost	1
2	C.H. Robinson & P.A. Wookey. Microbial ecology, decomposition and nutrient cycling	41
3	R.E. Longton. The role of bryophytes and lichens in polar ecosystems	69
4	F.S. Chapin III, J.P. McFadden & S.E. Hobbie. The role of arctic vegetation in ecosystem and global processes	97
5	R.M.M. Crawford. Habitat fragility as an aid to long-term survival in arctic vegetation	113
6	J.S. Bale, I.D. Hodgkinson, W. Block, N.R. Webb, S.C. Coulson & A.T. Strathdee. Life strategies of arctic terrestrial arthropods	137
7	I. Stirling & N.J. Lunn. Environmental fluctuations in arctic marine ecosystems as reflected by variability in reproduction of polar bears and ringed seals	167
8	D.R. Bazely & R.L. Jefferies. Trophic interactions in arctic ecosystems and the occurrence of a terrestrial trophic cascade	183
9	E. Steinnes. Pathways and effects of contaminants in the Arctic	209
10	S.J. Woodin. Effects of acid deposition on arctic vegetation	219
11	L.O. Björn, T.V. Callaghan, C. Gehrke, D. Gwynn-Jones, B. Holmgren, U. Johanson & M. Sonesson. Effects of enhanced UV-B radiation on subarctic vegetation	241

Cambridge University Press

978-0-521-10064-9 - Ecology of Arctic Environments: Special Publication Number 13 of
the British Ecological Society

Edited by Sarah J. Woodin and Mick Marquiss

Frontmatter

[More information](#)

iv

Contents

12	W.C. Oechel, A.C. Cook, S.J. Hastings & G.L. Vourlitis. Effects of CO ₂ and climate change on arctic ecosystems	255
	Index	275

Cambridge University Press

978-0-521-10064-9 - Ecology of Arctic Environments: Special Publication Number 13 of the British Ecological Society

Edited by Sarah J. Woodin and Mick Marquiss

Frontmatter

[More information](#)

Preface

The ecosystems of the Arctic are inherently fragile, and thus susceptible to destabilization. Once thought of as a pristine environment, it is now all too apparent that the Arctic is a sink for pollutants transported northwards over long distances in the atmosphere and oceans. Furthermore, predictions in recent years have indicated that the Arctic will be subject to major climatic change as a result of global warming. It is this in particular which has prompted a great increase in interest in the Arctic. Not only is it quite possible that the first ecological changes attributable to global warming will be detected in this region, but the presence of a significant proportion of the entire world's soil carbon in arctic soils means that any destabilization of arctic ecosystems could have feedback effects on global climate systems. Many ecologists are currently seeking to further our understanding of how arctic ecosystems function, and to predict and detect anthropogenic changes which may occur within them.

Research in the Arctic by British ecologists was stimulated by a Natural Environment Research Council (NERC) funded research programme on arctic terrestrial ecology based at Ny-Ålesund, Svalbard, and similar national and international programmes have been established in other countries. A recent increase in availability of information on, and access to, arctic regions of the former USSR has provided a particular spur to international collaboration. This high level of interest and research activity in the Arctic, and the completion of the first phase of the NERC research programme in 1994, prompted the organization of a British Ecological Society Special Symposium on the Ecology of Arctic Environments. This was held at the University of Aberdeen on 27–29 March 1995, as part of the University's Quincentenary year celebrations.

This volume contains 12 of the 20 papers which were presented at the symposium. The first is a background chapter providing an introduction to the soils and periglacial processes and features of the Arctic: an essential starting place for ecologists. Current knowledge about the composition and role in ecosystem function of microbial communities and lower plant communities in the Arctic is reviewed in the next two chapters. Scaling up, this is followed by a discussion of how entire arctic plant communities influence ecosystem, regional and global processes, particularly in the context of climatic change. Relationships between individual arctic species and their environment are considered in Chapters 5–7, which also have climatic variation as a common theme. Chapter 5 suggests that the character traits which enable arctic plant species to survive in a very fragile and variable environment preadapt them to the consequences of climate change. Chapter 6

Cambridge University Press

978-0-521-10064-9 - Ecology of Arctic Environments: Special Publication Number 13 of the British Ecological Society

Edited by Sarah J. Woodin and Mick Marquiss

Frontmatter

[More information](#)

vi

Preface

describes the environments, physiological adaptations and life-cycle biology of arctic terrestrial arthropods, and reports population responses to simulated climatic change. Moving up the trophic levels, Chapter 7 summarizes data collected over nearly 30 years showing associations between the reproductive variability of polar bears, ringed seal populations and environmental fluctuations, including climate. Completing the theme of community and species ecology is an elegant chapter which draws together terrestrial and aquatic ecosystems, and all trophic levels, in a consideration of trophic cascades. This culminates with the application of the trophic cascade concept to the ecology of lesser snow geese feeding on arctic coastal marshes.

The volume ends with four chapters concerning man's impacts on the arctic environment. The sources, pathways and effects of radionuclides, toxic metals and persistent organochlorines in the Arctic are reviewed. The effects of acid deposition on arctic vegetation are discussed, concentrating particularly on nitrogen deposition which is potentially an increasing problem. Early results of experiments on the effects of UV-B radiation on subarctic vegetation are reported, and the final chapter describes the effects of increasing atmospheric CO₂ concentration and changes in climate on the net CO₂ flux of arctic ecosystems.

We are grateful to all the authors who have made this volume possible, and to all the referees who contributed to the quality of the finished product by their comments. Special thanks are due to Dr Ian Stirling who, in addition to his research paper, presented an inspiring University public lecture on the natural history of polar bears. The symposium would not have happened without much organization by Dr Mark Young, and Dr Clare Woolgrove and Christine Payne contributed enormously to its smooth running and cheerful atmosphere. We also thank 'The Gathering' and 'Spitting Guinness' for excellent music, the delegates for heroic attempts at ceilidh dancing, and Professor and Mrs Chapin for joining in on the fiddle and tin whistle!

S. J. Woodin