

Alpine Treelines: Functional Ecology of the Global High Elevation Tree Limits

Author: Smith, Melanie

Source: Mountain Research and Development, 33(3) : 357

Published By: International Mountain Society

URL: <https://doi.org/10.1659/mrd.mm124>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Alpine Treelines: Functional Ecology of the Global High Elevation Tree Limits

By Christian Körner. Basel,
Switzerland: Springer, 2012. xi +
220 pp. US\$ 89.95, £ 62.99, €
74.85. ISBN 978-3-0348-0395-3.

Alpine Treelines is a welcome addition to the literature on this subject. Embracing a significant challenge with ease, Christian Körner synthesizes the extensive literature on alpine treelines and presents new explanations and a theory for global treeline formation. Crucially, he challenges researchers in the field to new approaches. In the opening chapter, he sets out his case to include site and species-specific features as part of a “wide-angle lens view” (p 2), thus ensuring interpretation of treeline data in a global context. Körner then ensures, using a wealth of evidence and examples, that every chapter leads the way in showing how this view can be applied. The book is richly illustrated throughout, with color photos and excellent illustrations (by Susanna Riedl). Photos are particularly well selected, exemplifying key points and a range of taxa in context, as well as being of a good photographic standard.

The chapters work equally well read in isolation, or as part of the development of the global theme and functional biology of alpine trees. Chapter 1 covers a synopsis of work on treelines to date, including past and present theories, where the gaps and need for new approaches are clearly identified. Having set up the “task” (pp 1–4), Körner moves on to a precise and very useful chapter on definitions and conventions. The discussion on limitation, stress, and disturbance is particularly insightful and builds on the author’s critical

analysis of this subject set out in his earlier work, *Alpine Plant Life* (Körner 2003). The schematic presentation of treeline ecotone will no doubt be reproduced in many a student essay on the subject. Particularly enjoyable is Chapter 3, which presents a global synthesis of the nature of treeline patterns. This is a wide-ranging subject: with so many varying causes and effects of treeline distribution, there is the potential for the account to become simply a list, but the coverage and illustrations are equally comprehensive, and a strong narrative is retained.

Chapter 4 is an invaluable, up-to-date critical assessment of treeline climate data: data derived at the treeline. Previously unpublished follow-up data to the original work published in Körner and Paulsen (2004) is presented, which helps to fill gaps in global coverage of the information available to date. Figures and diagrams abound in this chapter, clearly illustrating effects of climate on all aspects of treeline biology. Chapter 5 brings together global statistics based on treeline elevation and thus defines the treeline isotherm, a potentially critical tool in modeling the effects of global climate change.

Anyone who enjoys all aspects of botanical investigation will not be disappointed by Chapters 6 to 10. These cover the structure and stature of treeline trees, growth and development, evolutionary adaptation, and reproductive strategies and demography. While presenting clearly and in detail, Körner is always questioning and identifying where research can significantly improve current knowledge. This is particularly insightful, highlighting a multi-disciplinary approach to certain questions, for example, in the discussion around seed production, size of seed and embryo, and seed dispersal and germination. In Chapters 10 and 11, the author returns to the

key subject of stress and fitness, critically reviewing and contributing thought-provoking challenges to theory in this area. The focus on freezing stress is especially valuable, as this literature is scant and has not been brought to the subject of treelines in this way before.

The final chapter returns to the central theme of the book, presenting a global synthesis of mechanisms for past and present treeline formation and proposing how projections for future trends can be predicted. The review of Holocene treelines is thorough and well placed in this chapter, effectively contextualizing and informing the final analysis and prediction of future treelines. The global biogeographic approach is what sets this book apart, significantly advancing understanding of the subject of alpine treelines and presenting new approaches and theories.

Alpine Treelines will surely stand the test of time as a definitive work on the subject and is a critical reference for the approach to analysis and interpretation of treeline data. If only this book had been available 20 years ago when, as an undergraduate, I was exploring the subject through a study of alpine juniper in the Highlands of Scotland.

REFERENCES

- Körner C.** 2003. *Alpine Plant Life: Functional Plant Ecology of High Mountain Ecosystems*. Second edition. Heidelberg, Germany: Springer.
- Körner C, Paulson J.** 2004. A world-wide study of high altitude treeline temperatures. *Journal of Biogeography* 31:713–732.

AUTHOR

Melanie Smith

melanie.smith.ic@uhi.ac.uk
Inverness College, University of the Highlands
and Islands, Inverness IV1 1SA, United
Kingdom

Open access article: please credit the authors and the full source.