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BOOK REVIEW

The use of trait-based approaches from organisms to ecosystems

Plant functional diversity: organism traits, community structure and ecosystem properties, by Eric Garnier, Marie-Laure Navas, and Karl Grigulis, 2016
Oxford University Press, 256 pp. ISBN: 978-0-19-875736-8 (hardback)/978-0-19-875737-5 (paperback)

Diversity loss is leading to changes in multiple ecosystem functions, with consequences similar in magnitude to other environmental change drivers (Hooper et al. 2012; Tilman et al. 2012). Diversity has been traditionally grounded on the species level, but the study of functional diversity using trait-based approaches across organisational levels is key to understanding and predicting global environmental change impacts on ecosystem functioning (Violle et al. 2014). The use of trait-based approaches can link diversity directly and indirectly to multiple ecosystem processes (e.g. Cardinale et al. 2012). Therefore, these approaches help to better understand the underlying mechanisms of diversity effects on ecosystem functioning and the potential consequences of diversity loss (e.g. Paquette and Messier 2011, van der Plas et al. 2016, Ruiz-Benito et al. 2017). *Plant functional diversity: organism traits, community structure and ecosystem properties* covers topics from basic theoretical concepts – such as diversity, functioning and trait definitions – to the identification of how fundamental traits vary across environmental gradients, determinants and rules of community functional assembly and structure, and the implications of plant traits for ecosystem functions and services. The scope of the book is particularly useful to better understand, use and teach functional diversity concepts in a broad range of research and academic subjects, from physiological plant responses to community structure and dynamics.

First, the book shows the step from species-based diversity to trait-based diversity, introducing to the reader to basic concepts and research questions related to functional diversity, the functional characterisation of plants in major axes of variation and trait-based ecology and their applications for individuals, communities and ecosystems. The authors clearly explain concepts related to functional diversity, effect and response traits and major axes of trait variation in plants. The following chapters introduce how environmental and biotic gradients influence dominant response plant traits and the advantages of using of a functional approach when studying plant community structure. Next, the authors focus on the effects of plant traits, functional diversity and dominance on ecosystem properties and services. The main mechanisms underlying the diversity effect on ecosystem function are explained, largely as a study of complementarity and selection effects on productivity in plant communities. The book finishes with three chapters which consider the application of diversity concepts to ecosystem management, the availability and use of trait data, and future directions in functional research.

The book constitutes a good introductory text to theoretical and applied concepts of functional diversity effects in terrestrial ecosystems in an accessible way, which makes it a timely and useful contribution. On the one hand, each topic explained in each chapter could be the subject of a complete book in itself, so the authors have made a tremendous effort in synthesising and clarifying information. On the other hand, the concepts explained are easy to read and understand. The book is well written with good examples, figures and conceptual graphs to explain theoretical and applied concepts and effects of diversity. The organisation within the chapters helps the reader to understand basic concepts and encourages thinking on broad classical and novel ecological questions related to distribution, community assembly, multifunctionality and ecosystem services provision. The final sections within each chapter convey the key take-home messages.

Overall, *Plant functional diversity: organism traits, community structure and ecosystem properties* is likely to be a key reference when studying and synthesising information about plant functional diversity and its effects. The range of information covered in the book makes it suitable for learning and teaching, useful to both undergraduate and graduate students, while also supplying good information for preparing lectures. This book could be also interesting for researchers, managers and policy makers because the authors provide intuitive explanations of difficult concepts and link the causes and effects of plant change at different spatial scales. I will certainly both use and recommend this book.

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