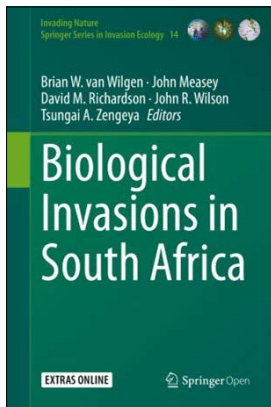




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Invasion science in South Africa: The definitive collection

Biological invasions by alien pests, weeds and pathogens are a global phenomenon, with increasing impacts on the environment, economy and human health. Traditionally, the poster children of the impacts of biological invasions have been oceanic islands such as Hawai'i and New Zealand, with continental areas being viewed as less prone to the ravages of invasive alien species. Yet this perspective is rapidly changing as continental areas begin to address the threat of biological invasions. For over a decade, the DSI-NRF Centre of Excellence for Invasion Biology (CIB) in South Africa has played a leading role in this changing perspective through outstanding research to reduce the rates and biodiversity impacts of biological invasions by furthering scientific understanding and predictive capability. Now, the major advances in current understanding of biological invasions delivered by the many researchers affiliated to the CIB have been captured in an encyclopaedic volume entitled *Biological Invasions in South Africa*.

The volume sets a new standard in the dissemination of information on biological invasions, not only through its comprehensiveness but also through its philosophy of open access publication, ensuring a global readership irrespective of income or library subscriptions. In the four months after publication in March 2020, the individual chapters were downloaded more than 6000 times each, which reflects the widespread global interest in this topic as well as the considerable outreach achieved by the authors.

The book covers the historical context of biological invasions in South Africa; overviews the invasive taxa and invaded ecosystems; and examines the drivers of invasions, their impacts and subsequent management before exploring new insights from the study of biological invasions in South Africa and tracing out what the future might hold for the country. Many of the invasive species covered in this book are also problems in other parts of the world (e.g. red swamp crayfish, German wasp, pine trees) such that the experiences and progress in South Africa provide valuable lessons to a global audience. South Africa occupies only 2% of the world's land area but it is one of the most biologically diverse countries globally. Thus the chapters play out across this diverse cultural and environmental landscape, bringing to life the values threatened by biological invasions and the urgency of action. The chapters are lavishly illustrated with colour maps and photographs, ensuring that this resource will be valuable both to seasoned practitioners or academic researchers as well as to students just embarking on their careers. Many of the chapters include additional supplementary information that is only available online and which includes a wide range of different material ranging from additional case studies through to promulgated legislation and even detailed data sets.

The coverage is broad, encompassing marine, freshwater and terrestrial ecosystems with reference to plant, insect and vertebrate invaders. However, although the impacts of alien pathogens on vertebrates are described, there is no equivalent chapter for plants, suggesting that the impacts of plant pathogens on South African biodiversity might be underestimated. For example, several pathogens are widespread on introduced crops in South Africa (e.g. myrtle rust and phytophthoras) but little is known of the consequences for native species should these pathogens spill over into natural ecosystems. This is not an oversight of the editors but simply reflects the current state of knowledge – which suggests plant pathology in natural ecosystems would be an area in which greater research investment might be warranted. Indeed, one clear message within this book is that, despite the concerns regarding biological invasions, quantitative assessments of impacts of alien species on biodiversity are relatively few. This is true of many parts of the world and is a significant stumbling block when arguing for a precautionary approach to the introduction of alien species. In the case of South Africa, this lack of information on impacts may also impede the development of a formal biological invasions policy. Yet despite this limited background on impacts, South Africa has led the way in many aspects of invasive species management, especially the use of biological control agents. Some of the most dramatic images from the book are those depicting how landscapes infested with invasive plants changed markedly after the release of biological control agents. The challenges and opportunities for restoring these landscapes following the widespread control of invasive species are discussed in detail. Nevertheless, successful management cannot occur in a vacuum and several chapters touch upon the social dimension of tackling invasive species and especially the situations in which conflicts arise between different groups of stakeholders. There is no easy solution to such conflicts, and once again a key aspect is the need for a clear evidence base that captures the economic, social and environmental benefits of any decisions.

While the undoubted emphasis of the book is on species from other regions that have invaded South Africa, the book points out that this has not been a one-sided exchange and that South Africa has provided the rest of the world with plenty of invasive plant and animal problems as well. My home country of New Zealand seems awash with South African plants but in return a few of our natives, such as our pōhutukawa, have also become invasive in South Africa. These examples illustrate the increasing interconnectedness of world floras and faunas and the need for international collaboration to address these issues. The CIB has been crucial to the internationalisation of research on biological invasions and its contribution to furthering such understanding is provided in the penultimate chapter. A measure of its success is captured in its more than 1700 peer-reviewed publications that include 4237 authors from 110 countries.

The final chapter looks forward to what might be expected in terms of biological invasions in South Africa over the next several decades. The outlook is cautiously positive, indicating that solutions are within reach when science, policy and capacity align. Whatever the future might hold, one thing is for sure: the publication of *Biological Invasions in South Africa* will be seen as a pivotal milestone on the path to achieving these positive outcomes.