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Book Review

Biodiversity in Southern Africa. Volume 2: Patterns and Processes at Regional Scale

N. Jürgens, U. Schmiedel & M. T. Hoffman (eds). Klaus Hess Publishers, Gottingen and Windhoek, 2010. xii + 348 pp. Price €75.00 (For all three volumes. Sold as a set only). ISBN 9783933117465 (hardback). ISBN 9783933117441 (Volumes 1, 2 and 3, hardback).

Biodiversity in Southern Africa. Volume 3: Implications for Landuse and Management

M. T. Hoffman, U. Schmiedel & N. Jürgens (eds). Klaus Hess Publishers, Göttingen and Windhoek, 2010. xii + 226 pp + CD-ROM. Price €75.00 (For all three volumes. Sold as a set only). ISBN 9783933117422 (hardback). ISBN 9783933117441 (Volumes 1, 2 and 3, hardback).

Australia and southern Africa are both parts of the former Gondwana, so, although now separated by the Indian Ocean, they have a shared geological heritage. This heritage is also reflected in biology and ecology, although along with striking similarities there are also some large differences – Proteaceae and *Acacia* (*sensu lato*) are prominent in both areas, but Australia is distinct in the abundance of *Eucalyptus*; the fauna of southern Africa includes the large mammals of the grasslands and savannas (antelope, giraffe, zebras, elephants etc.), the equivalents are macropods. Southern Africa occupies similar latitudes to southern Australia, and, climatically there are similarities between the two areas.

Both areas have had a long history of ecological research, although in the first half of the 20th century it was South Africa which was the more advanced. In the 1920s and 1930s South African ecologists (particularly plant ecologists) formed one of the major camps in debates about ecological theory (this fascinating episode, about which most of today's practising ecologists are unaware is analysed in detail by Anker 2001). One of the major players on the South African side was Jan Smuts, soldier and leading politician who had long interest in botany and ecology, particularly of grasslands. Australia has yet to give rise to a political leader who could give plenary lectures at major conferences and universities around the world on ecology! Although some of the theoretical concepts developed in South African ecology would not be accepted today, the theoretical component was developed in parallel to practical study, involving heavy emphasis on fieldwork and survey. South Africa also had strong links with Continental Europe, reflecting its long (relative to Australia) colonial history so the polarization of ecological thinking that developed between Britain and mainland Europe was less apparent.

Cape Town was a stopover on voyages between Europe and Australia, so that most of the early biological explorers of Australia had at least some exposure to the African environment. Being on a trade route there has been considerable biological interchange, and in addition to numerous accidental introductions there have also been intended exchanges – most of which would now be classified as 'seemed like a good idea at the time'. The similarity of environmental conditions means that many agriculture cultivars and breeds developed in one of the countries are well suited to the other. The strong interest in recent years in Australia in Dorper sheep instead of the traditional English breeds reflects this.

There are therefore many reasons why those interested in biodiversity and resource management in Australia should be interested in, and learn from, studies in southern Africa.

These two volumes form part of the output of the BIOTA project, a major collaborative exercise involving a team of researchers from Germany working with collaborators in southern Africa. The work reported was largely based around two transects, the longer trending roughly north–south from northern Namibia (near the border with Angola) to Cape Town, and the second, a west-east transect extending from Swakopmond, on the Atlantic coast, across central Namibia.

Those transects encompass a diversity of vegetation types and habitats (described in detail in Volume 1 of the series – see Jürgens *et al.* 2010). Most of the vegetation types, despite the obvious dominance of species endemic to Africa, would not look too foreign to Australian eyes.

However, coastal Namibia provides opportunities to study environments absent in Australia. The Namib Desert and the coastal desert in Chile have exceptionally high biodiversity, largely due to the frequency of fog and dew. These climatic conditions developed because of the upwelling of cold oceanic currents close to the coast. Unlike the west coasts of Africa and South America, there is no cold current of Antarctic water extending north along the West Australian coast, so there are no opportunities for the development of fog deserts. Nevertheless, anyone interested in lichen ecology in extreme environments will find the chapter on fog deserts of interest, particularly the intriguing finding that although cover and biomass of lichens are highest closer to the coast, species richness is highest in the more open community further inland.

Outside the fog deserts, biological soil crusts (of lichens, soil algae and bryophytes) are a feature of

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many of the vegetation types along the transects, and a number of chapters discuss this. Chapter III.3.4 by Budel *et al*. provides an excellent summary overview of the topic. Biological soil crusts are an important feature of rangelands in Australia, and have been subject of a number of studies, although their importance for soil development and stability is not as widely appreciated as it should be. Biological soil crusts are a consistent feature of arid and semi-arid lands around the world, but detailed studies are few. Some of the sites in southern Africa had very high cyanobacterial diversity, probably the highest so far recorded. However, it is difficult to know whether this is a unique feature of southern Africa, or a more widespread phenomenon, under recorded elsewhere.

Environments and biodiversity in southern Africa are, like those elsewhere in the world, subject to a range of threats and pressures, including climate change, spread of exotic species, intensification of agriculture and resource use and an expanding human population. One of the aims of the BIOTA project is to equip managers with tools to address these impacts. In order to assess likely future change it is desirable to have an understanding of past change. Volume 2 commences with a short section on 'Reconstruction of historical changes'. One of the chapters, by Rohde and Hoffman, uses historical photographs at 48 sites in central and southern Namibia, to provide a comparison with the current vegetation. Such an approach is not uncommon; what is remarkable about the present study is that the baseline is provided by photographs taken by Palgrave in 1876, before the later establishment of German Southern-West Africa. Rohde and Hoffman retraced the 1500 km route which Palgrave travelled by ox-wagon. At some sites individual shrubs can be shown to have persisted from 1876 to 2009, while specimens of *Acacia erioloba* E. Mey., already large trees in 1876, appear little changed more than 125 years later.

In general there had been an increase in cover, particularly of trees and there is little indication of general decline in productivity or species richness. This contradicts predictions made from climate change models, and suggests the importance of using the historic record to improve our understanding of the extent and causes of vegetation change.

The majority of studies reported involve surveys of various sorts, but there was also an experimental component to the project. This included response to experimental climate warming at the plot scale to the possible use of sucrose application as part of restoration of native species in stands degraded by spread of introduced species, through reduction in soil fertility (Rowanza, Musil and Esler, Chapter III.6.4). This approach has been trialled in a number of other parts of the world, including Australia. In this African example, the authors conclude that slow release forms of carbon, such as sawdust, reeds and chopped wood, may be a more efficient and economical approach to reducing soil fertility.

Systems of land tenure are discussed in the context of future management. The importance of community involvement is emphasized and capacity building both in ecological research and agriculture is discussed. Despite the difference in context these sections will be of interest to workers engaged in community development in Australia. Compared with Australia the scale of farm units, even in rangelands, is smaller and the number of those directly engaged in agriculture is very much greater. The trend in Australia, in the face of global economic pressures, has been to minimize the agricultural labour force and maximize efficiency. Such a model would cause great social change in southern Africa, so that the future pattern of agriculture there is likely to remain different from Australia, even though pressure for increasing productivity will need to be met.

It is important that, however well-planned a major project such as BIOTA must be, there remains scope for taking advantage of serendipitous observations. One example from BIOTA is reported by Koch (Chapter III.4.2); the discovery that large empty snail shells provided microhabitat shelters for a range of arthropods, including several previously undescribed species. This discovery was made, not in the field, but in the Museum of Natural History Berlin, when various species emerged from what had been collected as empty shells. This led in subsequent years to deliberate further collections in the field, increasing the number of species found utilizing shells.

The two volumes are well produced and contain a wealth of detailed studies of taxonomic groups and other issues beyond the few examples mentioned in this review. As a source of data for the western edge of southern Africa they are of great value, as an example of the conduct of a biodiversity survey and the integration of the results into management in a complex human system they provide an important model, which modified for local circumstances could be widely emulated.

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