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Biologists in deserts

Plant Ecology in the Middle East, by Ahmad Hegazy & Jonathan Lovett-Doust, 2016

Oxford University Press, 368 pp. ISBN: 9780199660810

The Biology of Deserts, 2nd edition, by David Ward, 2016

Oxford University Press, 400 pp. ISBN: 9780198732754

What is the great emotional draw of desert environments? I first encountered the biology of deserts (or “desserts”, as our undergraduates are wont to write) in 1986. An Egyptian PhD student's scholarship mandated a trip to Egypt at the start of the project to plan the fieldwork. Thus it was that I got to spend ten days travelling about in the South Sinai mountains in the company of a set of young Egyptian students, my introduction to the scientific study of deserts in the shadow of Mt Sinai and the Monastery of St Catherine. It was a magical experience, and I returned raving about how beautiful it was. When my wife came with me a few years later, she was also instantly converted, and we have spent our academic lives involved with the ‘howling wilderness’ and its wonderful people.

On my return in 1986 I tried to get hold of a textbook on desert biology, and could only find the very old and out-of-date volume 'Biology of Deserts' edited by Cloudsley-Thompson (1954). There was a clear gap in the market. Today we are much better served, and these two recent volumes demonstrate it in spades.

The first edition of David Ward's *Biology of Deserts* was published in 2009 to some acclaim. It is a volume in the Biology of Habitats series of OUP, aimed at igniting the interest of young researchers rather than being a source of reference for specialists. The 2nd edition has more emphasis on land-use changes caused by humans. The book's great strength lies in the way that the author's extensive experience, especially with both Middle Eastern and South African desert systems, underlies and informs the understanding being communicated. He has set out deliberately to take an evolutionary approach and to integrate

knowledge from across all the desert systems of the world. The material is organised as a modern ecology textbook, from individual organisms to ecosystems, with chapters on the abiotic environment, adaptations of both plants and then animals to those abiotic conditions, before moving to considering species interactions in various forms, and ending with desert ecosystems, human impacts and the conservation of deserts. The combination of the more traditional description of some of the amazing adaptations of desert organisms with modern ecology's emphasis on species interactions, both direct and indirect, is especially effective.

The book certainly succeeds in its aim of stimulating interest in desert systems at a fairly straightforward level: I wish it had existed in 1986! However, the literature of today is slightly less well represented than perhaps it might have been. Ward might have included more of a prescription of what needs to be done, rather like the books on aphid ecology that Tony Dixon wrote in retirement -- short, deceptively simple, yet compelling guides to what theory we still lack. In Dixon's wonderful phrase, we need theory “to reveal patterns and processes so that we need no longer to record the fall of every apple” (Dixon 2000). Like a reviewer of the first edition, I think an opportunity was missed, for example, to consider processes as functions of aridity gradients. I only found one such plot in the book, the species richness (of rodents) versus mean rainfall. It would be very interesting to put together all such plots in the literature on 'arid' lands. I have been struck so many times when reading such papers that the arid end of the 'aridity' gradient often starts at values far higher than are ever recorded in Egypt. But then, Egypt is the most arid country in the world!

Plant Ecology in the Middle East is clearly a different kind of beast, geographically and taxonomically restricted, and co-written by an Egyptian specialist, Ahmed Hegazy of Cairo University, and a Canadian, Jon Lovett-Doust. It ties plant ecological characteristics to the features of the landscape and environment of the 'Middle East', understood here as a slightly wider concept than is usual to include peripheral countries (Libya, Ethiopia, Somalia, Iran) normally considered with other regions. Instead of the ecology textbook format, we have instead a greatly expanded set of introductory chapters detailing the features of the plants of each country, together with the vicariant events of Earth history that have contributed to present-day distributions, especially of relictual vegetation.

Then we have a series of chapters on the desert environment and plant adaptations, including some fascinating descriptions of sexual systems and of dormancy. For example, a plant I know well from Sinai, *Ochradenus baccatus* Delile, is unusual in being trioecious, i.e. it has three types of plant according to the flowers: males that produce only pollen, females producing only seeds, and bisexual flowers producing both pollen and seeds. However, most desert plants have normal bisexual flowers, and dioecious plants occur in many other kinds of habitat, so this kind of sexual specialisation cannot be a particular characteristic of desert plants (although this is not claimed by the authors). A plethora of such cases of adaptations make the book an interesting read for any biologist who studies evolution.

Unlike Ward's book, there is no real section on species interactions. The chapter that qualifies most under that heading is 'Chemical ecology in the desert', all about allelopathic interactions. Is this because the authors think that herbivory is not important for desert plants? There is no entry in the index for 'herbivory', although as is common in modern indices this one is very short and completely inadequate. Some ecologists regard allelopathy as rather unimportant in natural environments, only becoming a very significant force in the lab where there are no bacteria to break down the toxins rapidly.

In contrast, both books end in sections on human impacts, but in Hegazy & Lovett-Doust's it is very nice to see this starting with gardening and gardens, a positive win-win effect of humans on the biodiversity of the desert environment. It is a pity they do not mention South Sinai's unique Bedouin gardens (Zalat & Gilbert 2008), created using methods almost certainly learnt from the Byzantine anchorite hermits, thousands of whom dotted the landscape of the 2nd to 5th centuries before the building of the Monastery. No other Bedouin build such orchard gardens, except perhaps in Oman; the famous Swiss traveller Burckhardt described their oasis-like beauty in the early 19th century. These gardens enhance and support biodiversity in the landscape of the high mountains of Sinai, and it is vital that they are maintained and conserved.

Plant Ecology in the Middle East identifies traditional practices (wood collection, grazing, collection of medicinal plants) as the culprits in plant destruction, agreeing with the view that overgrazing is the 'single greatest problem affecting the natural vegetation of Saudi Arabia'. It sees no contradiction with also mentioning the traditional system of grazing rotation called *hema* or *hilf* underpinned by traditional 'urfi law, claiming that it has been 'largely abandoned'. But ideas of conservation have moved on. The role of traditional practices everywhere are now recognised as having shaped landscapes all over the world: fire in North America, grazing and woodcutting in the Mediterranean, cattle-grazing in Africa, and so on. There is no such thing as a pristine environment free of the influence of human beings. On the contrary, humans are and always have been part of the environment of the last two hundred millenia, altering and being modified by it, as is also the case with many other animals, large and small. The idea that local people are overgrazing the Middle Eastern landscape is a myth of western conservation ideology reinforced by national narratives of pastoralist destruction. And so is the idea that traditional rangeland management has been abandoned. On the contrary, *hilf* is certainly alive and functioning well in South Sinai, and I bet the same is true elsewhere. Overgrazing is caused

not by local practices, but is instead a temporary phenomenon created by governments forcing nomads to settle. It is about power, not traditions.

I wish these books had been available thirty years ago. They provide an excellent guide to researchers starting out on their careers, and are useful also to specialists because of their overview of an immense range of material, each in their defined area of concern.

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