

World Atlas of Mangroves: Mark Spalding, Mami Kainuma and Lorna Collins (eds)

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The *World Atlas of Mangroves* (first edition Spalding *et al.* 1997, then entitled World Mangrove Atlas) is a classic masterpiece. Despite some shortcomings outlined below, this second edition is a must-have publication for every mangrove ecologist, conservation biologist or policy-maker working within or adjacent to mangrove ecosystems. As the title indicates, the *World Atlas of Mangroves* details the world distribution of mangroves along with a comprehensive overview at country level, a description of the situation in each country and an annex with country and mangrove statistics. The book has also a number of boxes on particular topics of interest written by mangrove experts, such as the coastal protection against tsunamis by mangroves on the Indian mainland (K. Kathiresan), or the Nicobar and Andaman Islands (M.V. Reddy). The distribution maps, the country fact sheets and the information provided as annexes are much improved over the first edition.

Nevertheless, there a number of errors in mangrove systematics and distribution, and at times a disturbing lack of relevant mangrove literature and introduction to ecological concepts. At best, the shortcomings listed below can be overlooked as the inevitable side effects of the necessary coverage of ‘a world atlas’ of global trends leaving seldom precise data at all levels below.

First, by far the most disturbing are the apparent errors in distribution of some species which have been otherwise documented in previously published peer-reviewed papers. Taking Sri Lanka as an example, there are errors in the distribution in the range maps in Annex 1: several species are listed as present along the entire 1,738 km of coastline of Sri Lanka, whereas in reality they can be found in only a single or a few locations, e.g., *Lumnitzera littorea* is found in only one lagoon, and *Ceriops tagal* in just four sites (Jayatissa *et al.* 2002). The same is true for *Nypa* and *Rhizophora*. This can be interpreted as the limitation that data in a world atlas are shown at country level and not below. What is even more worrying than imprecise distribution data in the first annex is the absence of species at country level where they have been well documented to be present, for instance *Bruguiera sexangula*, *Cynometra iripa* or *Scyphiphora hydrophyllacea* in Sri Lanka (Jayatissa *et al.* 2002). Yet these species are correctly shown as present in Annex 2, which contains a comprehensive tabulated species lists per country. Therefore I would advise readers to disregard the range maps in Annex 1, or to refer to the ‘*Mangrove Reference Database and Herbarium*,’ a regularly corrected and updated online representation of historic and current mangrove distribution beyond country level based mainly on herbarium collections and peer-reviewed and other literature (Massó i Alemán *et al.* 2010).

In contrast, the regional maps in the distribution section are much larger, better drawn and colored, and better marked than in the first edition, and the country information is well designed and explained. Apart from the excusable slip of using a photograph from Oman to open the section on Eastern and Southern Africa, the regional sections are also commendably well illustrated with extraordinary photographs collected from a wide range of researchers. The country information content is to my best professional

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judgment correct and up-to-date. A single exception is that the latitudinal limit of *Avicennia marina* in the Arabian Gulf extends about 400 km further north of the Mond Protected Area, i.e., all the way to the north of the gulf near Bandar Māhshahr (Iran). In fact, some of the latitudinal limits can easily be verified by screening very high resolution imagery (e.g., via Google Earth), which brings me to the question of methodology.

As in the first edition, the chapter on Mapping Mangroves fails to put the mapping exercise in a wider context of available sensors. Various studies exist on the use of Very High Resolution (VHR) imagery (e.g., Ikonos, Quickbird) to distinguish mangroves but there is no mention of them here (cf. Mumby and Edwards 2002; Wang *et al.* 2004). The global mapping of mangroves using TM and ETM + satellite sensors with a spatial resolution of 30 m only, an enormous and admirable effort, may in part explain why smaller stands at the latitudinal limits of the mangrove may have been missed. It is unfortunate that the editors did not correct this small inaccuracy with the insertion of a box, as they did in the other sections of the volume. In addition, it is worth keeping in mind that species distribution data sets may be the source for biogeography research which itself may be compromised if incomplete (cf. Jayatissa *et al.* 2002).

Second, on the level of taxonomic classification systematics, the failure to update or at least make reference to plant families according to the Angiosperm Phylogeny Group (APGIII 2009) is a missed opportunity. As a result the *World Atlas of Mangroves* lists Sterculiaceae instead of Malvaceae, Myrsinaceae instead of Primulaceae, or Avicenniaceae instead of Acanthaceae, among other errors. Also distracting are the typographical errors, for example, *Achrostichum* for *Acrostichum* on the very first page of the book. Other errors include *Scyphiphora hydrophylacea* for *hydrophyllacea*, and *Bruguiera gymnorhiza* for *gymnorhiza*. While the latter may be due to different views of the original spelling, this is unfortunately not discussed. Also the disputed presence of some species around the world is not sufficiently addressed, particularly the case of *Xylocarpus moluccensis*. Finally, rather puzzlingly, no less than six species (including *Acanthus volubilis*, *Ceriops zippeliana* and *Rhizophora* × *neocaledonica*) are listed either in the *World Atlas of Mangroves* or in Polidoro *et al.* (2010) (a contributing author to the *Atlas*), but not in both. On a more positive note, the book provides basic descriptions of the species listed in the annex, and refers to other appropriate publications for additional descriptions.

Third, in terms of ecological or socio-ecological descriptions, the introductory chapters ('Mangrove Ecosystems' and 'Mangroves and People') and the boxes therein notably omit any references to some significantly relevant publications and present confusing or erroneous informa-

tion. For instance, the classification of aerating roots into stilt, knee and buttress roots, and pneumatophores is quite misleading since all aerating roots are pneumatophores (literally 'carrier of breath' in Greek). According to Tomlinson (1986), more accurate classification uses pencil roots, peg roots, prop roots, plank roots, etc. The editors also fail to provide a link between the species list provided and the classification of true mangroves and mangrove associates in terms of functionality. For example, the concept of 'cryptic ecological degradation' (*sensu* Dahdouh-Guebas *et al.* 2005) refers to the fact that invasive mangrove-associated species such as *Acrostichum aureum* will slowly come to dominate a forest at the expense of vulnerable native, valuable and functional true mangrove species (qualitative degradation) but without any change of spatial extent.

As noted above, many sections draw heavily draw on references to text books or older papers. This is regrettable, as many recent references and issues are consequently missed, e.g., zonation and succession, propagule predation, or restoration and afforestation. On the latter issue, for example, there is no reference to the approaches of Kenyan researchers on the evaluation of mangrove growth, secondary floristic succession, faunistic recruitment, and changing environmental conditions in 20 year-old mangrove plantations. While the introductory chapters are greatly improved over the first edition of the *World Atlas of Mangroves*, I believe the next edition should ensure comprehensive coverage by using all relevant and recent literature. In the meantime, I would advise readers to supplement this volume with recent reviews on mangroves and other more detailed literature on mangrove ecosystems and people. But despite these shortcomings the *World Atlas of Mangroves* remains a useful scholarly work for any reader interested in mangrove ecosystems.

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