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Shedding light on Southeast Asia's complex biogeography

Biotic Evolution and Environmental Change in Southeast Asia. David J. Gower, Kenneth G. Johnson, James E. Richardson, Brian R. Rosen, Lukas Rüber and Suzanne T. Williams (editors), 2012, Cambridge University Press. 496 pp. £70 (hardback) ISBN: 978-1-107-00130-5; http://www.cambridge.org

After reading this book I regretted having missed the 2009 Southeast Asian Gateway Evolution (SAGE) meeting at Royal Holloway, University of London (UK) on which the content is based. It is clear that biogeographic research is in a new renaissance brought about not only by accumulation of past knowledge, but especially by availability of many new methodologies that help shed light on, and in some cases even solve, some long-standing questions about Southeast Asia's complex biogeographic history. The editors have managed to put together a good overview of current research directions and approaches for both the terrestrial and marine realms, based on a multitude of subjects, including geology, the history of science, palaeobotany, patterns of species composition and distribution, phylogenetics and modelling of past climates.

Reconstructions of plate tectonics and vegetation for the past 60 million years have become better and more detailed, providing important background information for biogeographic reconstructions of species dispersal and evolution across the region. However, it is the combination of available data sources and methodologies, as exemplified by many of the chapters in this book, that is currently advancing the field at a rapid rate. Collections of species in museums and herbaria can be used to model species' niches and distributions, while their DNA can be used to construct phylogenies which can be dated with fossils. This makes it possible to determine where and when taxa evolved, when and how they dispersed across the region and whether and how these patterns are related to geological and environmental changes over time. For plants, my favourite subject, there is now clear evidence that most of the dispersal happened from west to east, to such an extent that actually most of the tropical flora of the region, including that of New Guinea and Australia, should be considered of Asian origin. Also, the relatively young age of most of the mountain chains and many of the islands in the equatorial region mean that many floras in the region are rather young, consisting mostly of colonisers from the older regions, such as Borneo and the Asian mainland. Therefore, reconstructing dispersal pathways, using knowledge of past land configurations, is of prime importance for understanding the biogeography of the region. What I still missed, however, was a thorough analysis of the relationship between dispersal of species across the region and their morphological, reproductive and ecophysiological traits. Such an approach could provide valuable information on the drivers of the dispersal events.

The book ends with a conservation perspective, highlighting the dire state the Asian tropics are currently in. I was especially astounded by the scale of the wildlife trade, but also by the continuing lack of ecological responsibility in land-use development, trade monitoring and environmental law enforcement. It's a frustrating paradox that, at this time of environmental crisis, when almost no natural systems remain and evidence of past biogeographic patterns is destroyed carelessly, our ability to study biological systems is better than ever and developing at an unprecedented pace. Fortunately some signs of ecological responsibility are beginning to develop within the region, brought about by an increasing awareness of the value of the natural world, both ecologically as well as economically, as exemplified by some of the coastal protection projects initiated after the 2004 tsunami.

For anybody interested in the biogeography of the Asian tropics, who wants a quick update of current knowledge and research approaches, this is a must-read.

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