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## A path through the tangled bank

Ecology of Lianas. Stefan A. Schnitzer, Frans Bongers, Robyn J. Burnham and Francis E. Putz, 2014, Wiley-Blackwell, 504 pp. £95.00 (Hardback) / £85.99 (E-book) ISBN: 978-1-118-39249-2 / 978-1-118-39248-5

Lianas are a neglected form of plant life. Foresters despise them, hacking them out of plantations and concessions. Logged and secondary forests are choked with impenetrable thickets of lianas. To a rain forest ecologist they are an inconvenience, as determining the rooting points of looping, forking stems is a nightmare. Whole clumps fall from the canopy and block paths like suspended Gordian knots. Traces of vestigial chauvinism creep through occasionally in this book where authors use terms such as 'liana infestation' to describe explosive increases in abundance. Much evidence exists of the impacts of lianas on trees, yet I found no studies regarding the reciprocal effects of trees on lianas. Old prejudices die hard.

Lianas are woody climbers acting as structural parasites on trees and shrubs. By investing fewer resources in self-support, they are able to maintain high leaf areas for a given stem size, and thereby have an effect on forest productivity which outweighs their biomass – they can reach the canopy with stems only a tenth the size of trees. On Barro Colorado Island (Schnitzer et al., chapter 7) lianas are present on almost half of trees, make up a quarter of the stems above 1 cm diameter and a third of woody plant species richness, but only 3% of biomass. Compared to trees they have greater amounts of storage parenchyma, longer and wider water-conducting vessels and deeper roots. These provide an advantage in dry conditions, which contributes to their abundance in seasonally dry forests and the environments created by disturbance or fragmentation. The cost is an increased risk of cavitation in wide xylem vessels which likely constrains their distribution when minimum temperatures fall below freezing.

The lianaceous habit has many independent evolutionary origins across the angiosperms, along with a number of gymnosperms, and even extinct ferns. As Burnham (chapter 16) reveals, there were already lianas in mid-Devonian forests 398–385 Mya climbing the fern-like trees. They have therefore been a component of forests almost from the very beginning.

The study of itself lianas has a noble ancestry; Darwin himself wrote a treatise “on the movements

and habits of climbing plants” (Darwin 1865). Yet it is only since the 1980s that ecologists have begun to regard lianas as a fundamental component of forest systems rather than aberrant curiosities. A collation of papers can be found at <http://lianaecologyproject.com>. Difficulties surrounding their measurement have been largely removed as a result of the publication of a standard protocol (Gerwing et al. 2006, Schnitzer et al. 2008). This has opened up the potential for comparative studies, and the most comprehensive previous treatment, Putz and Mooney (1991), was overdue an update.

The book is an edited volume of 30 chapters by a total of 84 authors, each a self-contained study with its own literature review and reference list. Almost all of the chapters meet a standard equivalent to a journal article, which is commendable, and a combined index helps track down specific themes. I even found myself enjoying chapters on liana wood anatomy, a topic which I'll confess to never considering before. Some are outstanding contributions to the literature in their own right; van der Heijden et al.'s chapter on the impacts of lianas on carbon storage in forests (Chapter 13) is worth the cover price alone and prompts many hypotheses which remain untested. For example, through higher turnover of leaves with high nutrient content, might lianas homogenise soil fertility across forests? Of all the chapters, Santiago et al. (Chapter 20) might make the most long-standing contribution by fixing an honest eye on the quality of the evidence behind many supposed mechanisms driving patterns of liana abundance. A number of cherished assumptions are ripe for scrutiny.

Biogeographers will find plenty of regional comparisons, though many of these are hampered by glaring gaps in the literature. If this book serves one function above all others then it will be to shine a light on the regions where little work has been done – only two sites in the whole African continent have received detailed study. Most biogeographers will turn directly to DeWalt's chapter (Chapter 11) on global patterns in liana abundance and diversity, and ponder some of the broader mysteries. Why is it that Asian forests contain only half the liana density of those in South American

and Africa? Is there a fundamental reason why Africa contains 50% more liana species than the neotropics and 140% more than Asia? Is the paucity of lianas in dipterocarp-dominated forests a cause or a consequence? Why are most neotropical lianas wind-dispersed, while in the palaeotropics animal dispersal assumes greater importance?

Given that regular fruit production by lianas makes them a valuable source of nutrition for many birds, primates and other species, it is likely that the repercussions of biogeographical patterns span whole communities. Lambert and Halsey (chapter 26) provide a thorough assessment of the hypothesis that relative liana abundance and diversity lies behind the preponderance of gliding mammals in southeast Asia versus those with prehensile tails in South America (Emmons & Gentry 1983). This is well-worn territory but their review provided a refreshing perspective. I wasn't won over by the conclusion that risk of falling lies behind the pattern (personally I favour the avoidance of ground-based predators), and the inevitable reliance on circumstantial and discursive evidence makes this an intriguing mystery.

One consequence of the format of the book is repetition across chapters, particularly in justifications for the study of lianas. There are also a few contradictions. Many of the chapters state firmly that liana abundances in tropical forests are increasing, and hence are an urgent priority for study. Most cite the final chapter of this volume as evidence (Schnitzer, chapter 30). Yet once one reaches the end it transpires that the evidence (though compelling) is confined to the neotropics. cursory mention is made of the absence of similar patterns in the small number of African studies (including one in this volume) or elsewhere. The chapter argues that disturbance is promoting increased liana abundance, yet also notes that increases are mostly observed in intact, old-growth forests. Lengthening dry seasons seem a more plausible driver and in line with the growth advantage which lianas have over trees in such conditions. I finished the book less convinced that lianas were taking over the world than when I first opened it.

In this final chapter, Schnitzer argues that an urgent priority should be a global network of large-scale, long-term monitoring plots to track changes in liana abundance. While we should always be in favour of

more data collection, without compelling evidence of consistent global-scale changes this sounds like a plea for a problem more than an answer. Perhaps a more realistic goal would be to convince existing forest plot networks (e.g. CTFs) to include liana censuses in their standard protocols. At present a lack of robust or extensive data constrains the conclusions which can be drawn on many issues.

I write this review from a field station in Western Uganda, where reading this book has opened my eyes to the central importance of lianas in forest structure and dynamics. The highest compliment I can pay it, however, is that it only took so long to review because my students kept borrowing it. If the aim of the authors was to inspire more studies of lianas and raise their profile then they have already succeeded. At the very least it will give you pause before swinging your machete.

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