The Ecology of Trees in the Tropical Rain Forest

Current knowledge of the ecology of tropical rain-forest trees is limited, with detailed information available for perhaps only a few hundred of the many thousands of species that occur. Yet a good understanding of the trees is essential to unravelling the workings of the forest itself. This book aims to summarise contemporary understanding of the ecology of tropical rain-forest trees. The emphasis is on comparative ecology, an approach that can help to identify possible adaptive trends and evolutionary constraints and which may also lead to a workable ecological classification for tree species, conceptually simplifying the rain-forest community and making it more amenable to analysis.

The organisation of the book follows the life cycle of a tree, starting with the mature tree, moving on to reproduction and then considering seed germination and growth to maturity. Topics covered therefore include structure and physiology, population biology, reproductive biology and regeneration. The book concludes with a critical analysis of ecological classification systems for tree species in the tropical rain forest.

IAN TURNER has considerable first-hand experience of the tropical rain forests of South-East Asia, having lived and worked in the region for more than a decade. After graduating from Oxford University, he took up a lecturing post at the National University of Singapore and is currently Assistant Director of the Singapore Botanic Gardens. He has also spent time at Harvard University as Bullard Fellow, and at Kyoto University as Guest Professor in the Center for Ecological Research.

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PREFACE

> It is the detail of the . . . tropical forest, in its limitless diversity, that attracts.
>
> F. Kingdon Ward (1921) *In Farthest Burma*, Seeley, Service & Co. Ltd., London.

Trees make a forest: they are both the constructors and the construction. To understand the forest we must know about the trees. This book is about the trees of the tropical rain forest. It was written with the aim of summarising contemporary understanding of the ecology of tropical rain-forest trees, with particular reference to comparative ecology. The analysis of patterns of variation among species is a valuable technique for identifying possibly adaptive trends and evolutionary constraints. It may also provide a means of classifying species in ecological terms. A workable ecological classification might mean that the rain-forest community could be conceptually simplified and made more amenable to analysis.

The organisation of the book follows the life cycle of a tree. The living, growing mature tree is introduced with reference to form and process. Reproduction, including pollination and seed dispersal, follows. Then come consideration of seed germination, seedling establishment and growth, and the completion of the life cycle. At each stage a range of different characteristics and phenomena relevant to tree species growing wild in the tropical rain forest are considered. I have tried to give some idea of what is typical, and what is rare, the range and central tendency exhibited among species, and whether discrete groupings, or a continuous variation, are observed within the forest, and also whether one character tends to be correlated with another. Finally, I have tried to bring all the observations together in a critical analysis of ecological classification systems for tree species in the tropical rain forest. I have deliberately avoided the 'historical approach' to reviewing the scientific literature. There are points in favour of following the chronological development of ideas in a particular field, but in this case I felt it was not absolutely necessary. Firstly, there are several excellent texts that summarise much of the older work on tropical rain forests, notably P.W. Richards' *The tropical rain forest* (Richards 1952, 1996) and T.C. Whitmore's *Tropical rain forests of the Far East* (Whitmore 1975, 1984). Secondly, I wanted to avoid the problems of

interpreting history with the benefit of hindsight. Glimmerings of ideas that later became important can often be found by careful sifting through earlier writing, but at the time such works were published those ideas had little if any impact. Thirdly, I believe many readers are more interested in the contemporary state of knowledge and understanding than how we arrived at that position.

I estimate that there are some 50 000–60 000 tree species occurring in the tropical rain forests of the world. We have a detailed knowledge of the ecology of perhaps a few hundred of these at best. This book is therefore written from a perspective of abject ignorance, which I hope readers will bear in mind when consulting these pages.

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The research for this book involved raking through a plethora of publications on various aspects of tropical forests. I bothered many different people with requests for copies of articles, leads on references or visits to libraries. Special thanks must go to the various librarians at Harvard University whom I confronted with long lists of things to find, particularly the team, led by Judy Warnement, in the Botany Libraries, who were ever willing to meet the next bibliographic challenge.

I have asked many people to read and comment on all or parts of the book. Nearly all have willingly done so and provided much valuable and constructive criticism. I thank Peter Becker, David Burslem, Richard Corlett, Stuart

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