

Preface

There are many ways to appreciate ferns and lycophytes. We admire their shapes, from tiny, filmy ferns on tree trunks, to lacy maidenhair ferns in rock crevices, to sturdy tree ferns with their huge, dissected leaves. We wonder at the beauty of their leaves that vary from subtle shades of green to gray, pale yellow, reddish or even iridescent blue. As we become more acquainted with ferns, the fascination deepens and the questions begin. Some of the first questions are about fern habitats. How do they survive in the deep shade of forest understories? On flooded banks of streams? On wind-swept mountain tops? On hot, vertical rock faces? Why are they so abundant on tropical mountains and oceanic islands? Questions then arise about fern growth. How do they survive drought or freezing temperatures? How do they reproduce? How old are they? What is a spore and that always elusive little “gametophyte”? We also ponder how the presence of ferns impacts other organisms. Do ferns compete with seed plants? Do they get eaten by herbivores? Finally, how do humans interact with ferns? Which species are edible or have medicinal qualities? Why are some ferns a nuisance to us? What makes them weedy ferns? We, the editors of this book, have each pondered these questions, both as people who are fascinated by the beauty and variety of ferns and as scientists whose job it is to question how the natural world is assembled, collate information about it and synthesize what is known.

Most fern research in the past has focused on fern morphology, taxonomy and phylogenetics and the practical applications of ferns for horticulture. Published studies of fern ecology have increased rapidly in recent years, but have not been previously collated. This book was produced in order to provide a synthesis of fern ecology and to answer some of that long list of questions – answers that we have found from the literature, convinced colleagues to address or discovered in our own research. Of course, we end with a new list of questions to help direct future studies of fern ecology!

Each of us has approached the world of ferns from different perspectives. Klaus was fascinated by the ferns on Costa Rican mountain slopes, and wondered for

how long their leaves grew under these extreme climatic conditions. He marveled about the enormous fern diversity of the cloud forests and was concerned to see how this habitat was rapidly being lost. These concerns led to studies of the growth and seasonality of ferns, their adaptations to various tropical environments, interactions with herbivores and their conservation. Lawrence was first dazzled by tree ferns in a greenhouse in chilly Vermont (USA) but only began working on tree ferns and thicket-forming ferns when they were critical species in the recovery process (succession) on severely disturbed tropical landscapes (following volcanoes and landslides). His interest is thus in the ecological role that ferns have in changing plant communities. Joanne was amazed at the diversity of fern species and habitats in tropical Trinidad and learned the names of 100 species while on vacation from a management consulting job in upstate New York (USA). Frustrated by the lack of ecological and demographic information about these species in the local university library, she changed careers. Despite these different perspectives about ferns, we all eagerly undertook this task to describe and synthesize what is known about fern ecology. Joanne and Lawrence decided, over lunch in fern-rich Puerto Rico, that such a book needed to happen. Approaching Klaus with our idea we were delighted to hear that Cambridge University Press had recently asked Klaus to consider just such a project. The editorial team was established.

We are indebted to the early pioneers of fern ecology, including Hermann Christ, Michael Cousens, Adrian Dyer, Richard Holttum, Clive Jermy, Karl Kramer, Chris Page, Rolla and Alice Tryon, Herb and Florence Wagner, and Alexander Watt for seeing ferns as not just taxonomic oddities, but plants with a dynamic relationship to their environment. The recent book *Biology and Evolution of Ferns and Lycophytes*, edited by Tom Ranker and Christopher Haufler, provided us with an excellent and up-to-date reference work and the opportunity to complement their opus with our own, more ecological perspective. Alan Smith graciously provided his most recent checklist of genera of the world (see Appendix B). We gratefully acknowledge the assistance of external reviewers who provided us with invaluable feedback, shared their enthusiasm and expertise, and encouraged us to integrate details we would have otherwise overlooked. These generous individuals include: Victor Amoroso, Nan Crystal Arens, Mike Barker, Piet Bremer, Tim Brodribb, Beverley Clarkson, Bruce Clarkson, David Coomes, Adrian Dyer, Paul Hanson, Ruth Kirkpatrick, Rosario Medel, Sue Olsen, Elizabeth Powell, Tom Ranker, Gillian L. Rapson, Ann Russell, Harald Schneider, Alan R. Smith, Tamara Ticktin, James Volin, Margery Walker, James Watkins Jr., Paulo Windisch, and George Yatskievych. In addition, most chapter authors contributed reviews of one or more chapters. Arturo Piña amended images with graphical software. Jacqueline Garget at Cambridge University Press encouraged us to undertake this book project, Charlotte Broom,

Denise Cheuk, Chris Hudson, Rachel Eley and Dominic Lewis guided us through the publication process.

Klaus thanks his early teachers of botany and plant ecology Wilfried Bennert, Hermann Schraudolf, Focko Weberling, and especially Sieghard Winkler for directing him toward ferns; his parents and Ludwig Müller for encouraging him to follow his convictions even when they required distant travels; his students for asking all those supposedly easy questions about ferns that he tries to answer in this book; his wife, Sandra, for her unconditional love and support; and his son Lukas for holding out patiently when he would prefer to play with Dad. Klaus is grateful for the rewarding and inspirational collaboration and friendship of his coeditors. Klaus was supported by the Instituto de Ecología, A. C., Xalapa (902-11-796), CONACYT-SEMARNAT (2002-C01-0194) and CONACYT-SEP (2003-C02-43082), Mexico.

Lawrence humbly thanks his coeditors for reminding him how much botany he has forgotten and reawakening his love of detail and wonder about plant form and function in general and that of ferns in particular. This cooperative effort has helped him see outside his plant succession and disturbance ecology boxes. Lawrence was partially supported by the Luquillo Long-Term Ecological Research Program in Puerto Rico funded by the U.S. National Science Foundation.

Joanne thanks John Mickel who encouraged her to study ferns; Judy Jernstedt who was willing to guide a graduate student interested in ferns; her colleagues at the Luquillo Ecological Research site and the Holt Forest in Maine for their willingness to include ferns in their research programs; her coeditors for their unflagging enthusiasm and patience; and most of all her husband, Henry Minot, who has patiently encouraged and supported her quest. She dedicates this work to the memory of Joe Copeland who kindly identified her first ferns in Trinidad; Herb Wagner who asked and answered fern questions in Costa Rica; and Bruce Haines who was an inspiration throughout her graduate and professional career. Joanne was partially supported by the Luquillo Long-Term Ecological Research Program in Puerto Rico funded by the U.S. National Science Foundation.