Preface

The Middle East has a rich natural history; however study of the diverse flora of the region has been intermittent, and usually localized. Human activities over time have both enriched and damaged biodiversity. Early on, medicinal plants and crops in the region were domesticated; on the other hand, environmental pollution, rampant coastal development, and overgrazing have all negatively impacted ecological functioning, while warfare and disputed borders have delayed systematic study, and to many outsiders the Middle East seems exotic, even mysterious. We believe a better understanding of the plant ecology of the region will allow us to understand and anticipate the effects of climate change in arid and semi-arid regions worldwide, and for that reason as well as the inherent fascination the region holds as a "cradle of civilization," a book on the current state of knowledge seems timely. Our goal is to provide a solid baseline and stimulate further research.

We have taken a "plant's-eye perspective" on the Middle East and include all the biogeographic regions contributing species. For us, the Middle East includes parts of Africa, Europe, Asia, and Arabia, covering some 13.5 million km^2. We integrate plant geography, and evolutionary and population ecology with information on the life histories of species found in the deserts, mountains, and coastal regions of the Middle East. We hope this integrative, empirical approach to the region's plant ecology, set in a context of plant evolution and adaptation to unpredictable resources, may be of interest to dryland specialists, ecologists, conservation biologists, and climate change researchers everywhere.

Chapter 1 introduces the several major elements of the book's scope that will help us understand the present day distribution and abundance of plants across the Middle East. We overview previous studies of the flora then outline the general nature of deserts and importance of water in these dryland environments. We explore effects of long-term climate change and the formation of "climate relicts," (the plants of the Middle East have experienced climate change in the past, too) and effects of heterogeneity in time and space on a species' "regeneration niche" (the particular environment that is necessary for successful seed germination and *juvenile* survivorship). In the Middle East various iconic tree species exist as stands of aging individuals that are simply not being replaced through natural regeneration. The region includes many precious and unique sites, for example vestigial "valley-forest" in Arabia, many of which have been reduced to a few highly degraded remnant populations in the southwest (exemplifying the urgency of regional conservation strategies to protect the flora of the Middle East).

Chapter 2 offers a tour of the region, outlining the plant ecology of some 24–25 countries, including parts of Africa and Eurasia as well as the Arabian Peninsula, with many mountain ranges, plains, plateaux, and some islands—not least the botanically fabulous Socotra. The tour is intended to give some overall sense of the entire region—a vast place with many different kinds of habitat. Some, like the montane cloud forests of Oman, Yemen, and Egypt, for example, are biodiverse and spectacular. Others are more homogeneous—often with few species because conditions are more extreme. . . these sites are typically hotter, flatter, and drier, as in for example, the sparse communities of the "Empty Quarter" of Saudi Arabia.

Chapter 3 shows how the Middle East and its plants came together as a product of geological "deep time," starting with major geological events at least some 23 million years ago. The plant

populations and communities we have today represent remnants of their past. We explore in some detail examples of ancient forest relicts—the spectacular Dracaena forests of Socotra, various oak-laurel forests, the refreshing juniper forests of the coastal areas, and the Djibouti Bankoualé Palm.

Chapters 4 and 5 explore the constraints of living in desert and dryland ecosystems, in particular dealing with unpredictable water supplies and spatial heterogeneity. These in turn generate habitat diversity and specialized plant forms, developing succulence, water-conserving photosynthesis and other adaptations to deal with excessive drought and salt in the environment. Given the significance of mountains throughout the region we discuss effects of elevation and isolation on plants and regional patterns of species richness and endemism.

Chapters 6–8 focus on plant reproduction in the dryland world. To succeed in this unpredictable environment plants need to be able to sense the environment and respond to opportunities with speed; it is easy to see how such life history strategies can be seen as evidence of plant "intelligence"—these organisms are integrating different stimuli and protecting their descendants through strategic seed dispersal and dormancy. In such environments plants often have complex "secondary chemistry," producing many anti-herbivore compounds and others that inhibit competitors. Chapter 9 explores the domestication of plants in the region and the many reciprocal effects of agriculture and its early development on plant ecology there.

Chapter 10 outlines the major challenges to plant conservation in the region and proposes strategies for successful conservation, starting with the major Middle Eastern "biodiversity hotspots." A final chapter draws together some general conclusions about the plant ecology of the region. As a general note on spelling and transliteration from the Arabic: is a mountain range here to be *gebel*, *jabal*, or *djebel*, etc.? Is the thirsty, stimulating plant *Catha edulis* to be described as *khat* or *qat*, etc.? For the most part we have simply adopted the style used by our sources; we generally do not hyphenate the definite article, but again follow precedent, thus Al Ain and El-Keblawy. . .

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