

# Book Review

## In defense of plants: An exploration of the wonder of plants

By Matt Candeias

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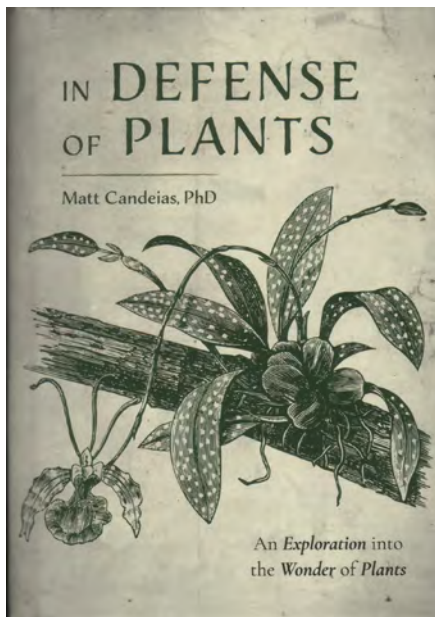
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Reviewed by Murray Dawson



Author Dr Matt Candeias is an ecologist and science communicator based in the USA. Since 2015, he has run a blog and weekly podcast named 'In Defense of Plants', the same main title as his current book (and using the American spelling of the word 'defence').

Both Matt's podcast and book aim to share his love of botany and ecology with the rest of the world. He is also one of seven authors of the 2018 book 'Flora: Inside the Secret World of Plants', which follows a similar premise.

In the preface of his current book 'Why in Defense of Plants?', Matt contends that plants don't have a voice in today's busy world, and are either overlooked, or noticed only for their weedy, poisonous, or economic values. The author rightly states that the attitude "we only seem to care what plants can do for humans" ignores the incredible complexity and

ecological relationships plants have in the natural world. The author defends plants against this human-centric and narrow view by drawing from his background to share stories about a deeper understanding of botany and ecology. The subtitle 'An exploration of the wonder of plants' conveys a sense of this message well.

Each chapter of this book introduces a topic that provides a springboard for telling a variety of plant stories.

In the first chapter, 'A Rocky Start: How I Learned to Love Plants in the Bottom of a Quarry', Matt confesses that he used to think that plants were boring. Growing up he describes himself as a 'nature nut', but one consumed by creatures that swim, crawl, or slither – especially fish, but also insects, lizards, and snakes. This led to university studies in zoology, with career aspirations in fisheries biology. Matt explains how that all changed following a field trip to a commercial fishery, with the overwhelming smell of dead fish. This led to a switch in majors to ecology, and the study of interactions between organisms. What followed was a job in habitat restoration in a limestone quarry. Matt highlights the challenges of establishing blue lupine (*Lupinus perennis*) to encourage Karner blue butterfly (*Plebejus melissa samuelis*), an endangered subspecies.

In Chapter Two, 'My Own Green Revolution', Matt tells the reader of the consuming interest he developed in gardening and growing plants, and the importance of encouraging native biodiversity. The author provides the example of his work in a local woodland to reveal several plant-insect-bird interactions and the negative effects of an invasive plant (garlic mustard) on the mycorrhizal fungi that the native plants rely upon. In this chapter, Matt also recounts being given an exotic orchid which leads to his exploration of orchid pollination systems. He concludes "If my time growing orchids and other curious plants has taught me anything, it's that plant sex is strange" which nicely introduces the next chapter.

The title of the third chapter, 'The Wild World of Plant Sex', is rather attention grabbing. Covered here is the reproductive biology of non-vascular plants (such as mosses and liverworts), ferns, cycads, and flowering plants. Interesting examples of pollinators are given, including various insects, lizards, bats, and even rodents. Orchids are featured for their food deception (where the pollinators are attracted to the plants for a food reward that does not exist) and sexual deception (where the flowers deceive insects through chemical and physical mimicry into 'pseudo-copulation' which achieves pollination for the plant rather than mating for the unwitting insect).

Chapter Four, 'Plants on the Move', naturally enough covers propagule dispersal: for seeds, "wind, explosions, shots, guts, fur, feathers, or skin". Explosive dispersal was fun to read, featuring the squirting cucumber (*Ecballium elaterium*) whose ripe fruit detaches to squirt a stream of mucilaginous liquid containing its seeds. On the micro scale we learn of "poop mosses" (family Splachnaceae) that use flies to spread their spores. On the macro scale the so-called jumping cholla cactus (*Cylindropuntia fulgida*) has spiny stems that detach when brushed by the merest touch effecting dispersal. Also covered are plants that produce or place their fruits directly underground (geocarpy). Peanuts (*Arachis hypogaea*) are the most well-known example of this (hence their other common name, groundnut). We are also told of a less well-known example of geocarpy, the ivy-leaved toadflax (*Cymbalaria muralis*), which uses negative phototropism that reverses the direction of its flower stems to push its seeds into wall and rock crevices where it likes to grow. Ivy-leaved toadflax is common in New Zealand.

In Chapter Five, 'The Fight for Survival', we learn of plant competition for growing space, light, and nutrients, and the strategies used to help ensure survival. The author states that "Chemical warfare

may be the most effective means of defense for plants.” He explains that some plants produce chemical compounds in their falling leaves that inhibit seedling germination and growth of competing species. And others translocate or hyper-accumulate heavy metals, or produce toxins, stinging cells, or sharp needle-shaped crystals of calcium oxalate (raphides) to discourage browsing. Matt Candeias then switches gears to show plant species that have adaptations for housing beneficial ant colonies that provide nutrients and defends them against plant and insect threats.

Chapter Six, ‘Eating Animals (and Other Things)’, is devoted to carnivorous plants. Matt tells us “There are pitfall traps and sticky traps, snap traps and lobster pots, suction bladders, and even catapults”, and that some form of carnivory has evolved in ten different plant families. Details are revealed of how pitcher plants, Venus flytraps, bladderworts, and sundews (and other plants that use sticky traps) gain insect-based and other nutrients. At the end of this chapter the author hopes he has convinced us that “carnivorous plants are among the coolest plants in the world.”

Chapter Seven is ‘Parasitic Plants’; those that “live off or in another organism, obtaining nourishment and protection, while the host organism receives no benefit in return.” As is usual in this book a really interesting account is given. A wide range of plants from several countries are featured, including orchids (a self-confessed favourite of the author and for good reason due to their diversity), mistletoes, dodders

(*Cuscuta* species), and the gigantic corpse flower (*Rafflesia arnoldii*) of Sumatra and Borneo. The author points out that angiosperms (flowering plants) such as these “have truly cornered the market on parasitism”, then discusses non-vascular plants that parasitise fungi (*Cryptothallus* liverworts that are now placed within the genus *Aneura*) and the world’s only known parasitic gymnosperm (*Parasitaxus usta* of New Caledonia, a species that is rare and lacks roots).

The final chapter, ‘The Problems Plants Face’ (Chapter Eight), highlights profound issues of habitat destruction and fragmentation; loss of biodiversity and genetic diversity; displacement by invasive species; plant poaching, over-collecting and illegal logging; impacts of climate change; and threats of extinction. Matt Candeias tells us that “40% of plants are at risk of extinction worldwide, and humans are to blame.” Rather than ending on a completely depressing note, Matt offers some hope by devoting several pages to what we can do as individuals. Suggestions include protecting local wild spaces, volunteering with and supporting conservation organisations, planting native species rather than exotics, reducing lawn and encouraging rewilding on domestic sections, and so on. The last sentence of this chapter ends quoting American author and environmental activist Edward Abbey, “It is not enough to fight for the land; it is even more important to enjoy it. While you can. While it’s still here.”

This summary of the chapters only scratches the surface of a huge range of stories that are told. As well as explaining the familiar, known to most

biology students for example, the author moves into the obscure and unusual. The flow within and between these chapters’ works well which is essential for good storytelling and makes the science communication approachable.

The book concludes with a useful chapter-by-chapter bibliography pointing to the underpinning research papers for those who want to delve more deeply.

The off-white colour of the pages gives this book a timeless and rather classy character, even though it’s slightly harder to read under dim light. The cover has a nice line drawing of an epiphytic orchid, which is apt as several stories of orchids are told. Perhaps in keeping with this aesthetic, the photographs throughout have been printed in greyscale. I feel this was a mistake, as without colour many of the photographs appear dull and the reader cannot always see what’s being described. “The stunning floral display of Oswego tea acts as a beacon for hummingbirds” (p. 56) and “The bright orange stems of dodder parasitizing a wild hydrangea” (p. 220) are examples of these let-downs – the ebook does, however, use full colour illustrations. I also noticed a few small mistakes in a printed text.

Minor criticisms aside, I enjoyed the journey this book took me on. There are many interesting stories that are well-told showing the wondrous world of plants from a botanical and ecological perspective.

**Details of the ‘In Defense of Plants’ book and podcast are available at [www.indefenseofplants.com](http://www.indefenseofplants.com)**