

BOOK REVIEW

The Ecology of Seeds

Michael Fenner and Ken Thompson. x + 250 pp.

Cambridge University Press, Cambridge, UK. 2005. ISBN 0-521-65311-8 \$90.00 (hardback), 0-521-65368-1 \$45.00 (paperback)

Looking for a book that covers the life of a seed from fertilization to seedling establishment or death? Look no further. The recent book, *The Ecology of Seeds*, written by two well-known seed ecologists, Michael Fenner and Ken Thompson, is for you. Interest in seed ecology has grown astoundingly in nearly all areas of the field since the publication of Fenner's *Seed Ecology* in 1985. The current book is a much updated version of *Seed Ecology*, being reflected in a threefold increase in number of references cited and a twofold increase in number of words. Eighty-two percent of the references in the 2005 book are from the past two decades and 15% are post-1999.

The Ecology of Seeds, measuring 245 mm (length) × 174 mm (width) × 13 mm (thick) and weighing 0.71 kg, has 94,000 words and cites 1117 references. It contains a wealth of information, summarized succinctly in a well-organized manner that is easily read and comprehended. Two aims of the authors were to present: (1) a broadly representative overview of the current literature on seed ecology, rather than a comprehensive review of it; and (2) a reasonably balanced account of the field, reflecting current thinking. In the eyes of this reviewer, the authors should be commended for a job well done on these aims. On the other hand, the authors 'have not refrained from nailing our colours to the mast' where they have felt strongly on particular topics, e.g. defining dormancy based on the 'Wageningen view'. That is, dormancy is a characteristic of the seed and not of the environment, and it should not be identified with the absence of germination.

The book contains a two-page preface, and nine chapters organized by following the progress of seeds through the stages of their life cycle in approximately chronological sequence. The first chapter (31 pages long) addresses reproduction (sexual versus asexual, cost, allocation and effort), life histories and survival schedules, variability of seed crops and seed size (versus number and phenotypic variation). Pre-dispersal hazards, such as incomplete pollination,

ovule abortion, resource limitation and predation, are covered in Chapter 2 (15 pp.). We learn about the various vectors of seed dispersal (wind, animals, water, ballistic, human) and evolutionary considerations in Chapter 3 (29 pp.). In the next chapter (21 pp.), aspects related to soil seed banks are discussed: seed banks in practice, dormancy and seed size, hard seeds, seed-bank dynamics and ecological significance of seed banks. In addition, there is a short section on serotiny. Types, function and definitions of seed dormancy are addressed in Chapter 5 (13 pp.). Also included in this chapter are sections on microbes breaking dormancy and the effects of the parental environment on dormancy. Chapter 6 (26 pp.) deals with the influences of temperature, light, water and soil chemicals on germination. Post-dispersal predation, fatal germination at depth and loss of viability with age are covered in Chapter 7 (9 pp.). Issues related to seedling establishment are contained in the next chapter (18 pp.): early growth of seedlings, seedling morphology, relative growth rate, seedling mineral requirements, factors limiting establishment, mycorrhizal inoculation, facilitation and plasticity. Chapter 9 (16 pp.) concludes the book, discussing gaps and their role in the regeneration of plants, paying particular attention to safe sites and microtopography of the soil surface, defining and detecting gaps, limitations to recruitment in gaps and promotion of species diversity. The reference section occupies 25% of the book. An index includes subject matter, genera and the scientific and/or common names of species.

Specialized topics are presented in eight 'self-contained boxes' scattered throughout the book. Subject matter in the boxes include: trade-offs, low seed set in sparse populations and the Allee effect, poisonous fruits, parent–offspring conflicts in germination and dispersal, seed persistence in soil, response to smoke, seed traits and plant abundance and the role of leaf litter in regeneration.

The book covers more than the empirical aspects of ecology *per se*. The authors blend theoretical

components of ecology with empirical studies, e.g. discussing the game-theory approach to predict a range of seed sizes (pp. 26–28) and mathematical models on seed dispersal (pp. 47–50). Evolutionary biology is explored throughout the book, such as on pages 28–29 where the role of adaptation versus phylogenetic constraint on seed size is presented, and starting on page 52 where coevolution between plants and dispersers is discussed in detail. Aspects of conservation biology are addressed as well: small populations (e.g. pp. 36–38), exotic species (pp. 61, 63), fragmentation (p. 67), effects of climate change (pp. 131–135) and rarity (pp. 164–165, 169–171).

Examples of various phenomena are from a broad range of vegetation types – from the tropical and temperate forests to tundra, grasslands and fynbos. Where appropriate, both common and scientific names are used for species in the text, often accompanied by a description of the habitat, e.g. ‘In a study of *Calyptrogyne ghiesbreghtiana*, a bat-pollinated rainforest palm in Costa Rica...’. Moreover, extensive reviews that have been published previously on a particular subject are mentioned explicitly, and information is cross-referenced within the book.

The authors ‘hope that this text will be useful to students of plant ecology at all levels’. It certainly will. Fenner and Thompson are excellent at explaining the basics of seed biology. For example, on page 1 we read ‘Each seed is genetically unique because of the shuffling of the parents’ genetic material (by crossing

over between the chromosomes) during the formation of the gametes, followed by random combination of the male and female gametes at fertilization’. On page 13, we see an account on the meaning of coefficient of variation and its use in measuring masting. Moreover, subjects that deserve further study are pointed out by the authors, providing a superb stimulant for investigators. Examples include the following: modification of seed persistence by environmental conditions, or how far seeds travel, how often and their subsequent fates. Therefore, the book would be very appropriate for an upper-level undergraduate or graduate class, and even for advanced undergraduate students that have taken a relatively small amount of course work in biology. On the other hand, topics are covered in sufficient detail and depth so that active researchers will find the book very useful, both as a reference guide and as a refresher ‘class’ on the field.

The Ecology of Seeds was a joy to read. There are very few typographical errors, and the text and graphics are well produced. My paperback copy held up fine during the review. Congratulations to the authors for a job well done.

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