**Speciation and Patterns of Diversity, R.K. Butlin, J.R. Bridle, D. Schluter (Eds.). Cambridge University Press, Cambridge (2009). 345 pp., £75.00, 35.00, Hardback, ISBN: 978-0-521-88318-4; Paperback, 978-0-521-70963-7**

Charles Darwin would have turned 200 in 2009, the same year in which his grand epos *On the Origin of Species* celebrated its 150th anniversary. Inspired by the 2007 Annual Symposium of the British Ecological Society, last year's publication of 'Speciation and Patterns of Diversity' came at the ideal time for a blend of ecology and evolutionary biology, offering a fresh look at diversity patterns. As made clear by Roger Butlin and his co-editors Jon Bridle and Dolph Schluter in the introductory chapter, there are still large gaps in knowledge concerning mechanisms and rates of speciation and the documentation of biodiversity in general. Finding an explanation for the uneven distribution of global diversity and of diversity on the community level might become the big challenge of future research.

The reality of species is nowadays doubted by many, and any book dealing with speciation is in urgent need of doing justice to this intractable debate. Jody Hey (chapter 2) and Timothy Barraclough and colleagues (chapter 3) take a fresh and pragmatic look at this longstanding problem, asking for a study of diversity at all levels of the continuum. Their view might be best summarized by philosopher Elliott Sober, stating that the vague boundary between variety and species is no reason to deny the existence of individual species. A lesson we should learn from other vague concepts—from rich and poor, hairy and bald, tall and short; a vague boundary does not entail that no one is rich, or hairy, or tall.

Chapters 4 and 5 are devoted to the diversity and adaptive radiation in bacteria and other microbia, an area that appears to be flourishing and rapidly expanding. Chapters 6 and 7 provide theoretical background for adaptive radiation, illuminating the limits of adaptation in time and space, by Jon Bridle and colleagues, and the dynamics of adaptive radiation based on a genetic model, by Sergey Gavrilets and Aaron Vose. A wealth of empirical data is also presented, obtained from major model systems in evolutionary ecology research that significantly shaped the understanding of the speciation process in recent years. Patrick Nosil and Mark Harmon contribute data from their investigations of the North American *Timema* stick insects (chapter 8), suggesting that divergent selection between ecological niches can promote speciation. Based on a 'speciation transect' among Lake Victoria *Pundamilia* cichlid fishes (chapter 9), Ole Seehausen explores the sequence of events that leads to increasing trait divergence in populations and, ultimately, to speciation. James Mallett summarizes his influential work on hybridization of *Heliconius* butterflies in South America (chapter 10) and concludes that leaky reproductive barriers, which are more common in rapidly diversifying lineages than previously thought, enhance evolutionary flexibility and support adaptive radiation. Combining data from his own studies on the *Neochlamisus* leaf beetles with work on numerous disparate taxa, Daniel Funk reviews the role of ecological speciation in chapter 11. In chapter 12, Douglas Schemske proposes an intriguing explanation for the greater species richness in the tropics: Stronger biotic interactions facilitate speciation, because each new species provides opportunities for further community diversification.

In the final three chapters temporal patterns of diversification are explored, for instance, a slowdown of speciation after an initial rapid burst, that might be ecologically controlled through 'niche filling'. In addition, extinction rates have to be considered as discussed by Robert Ricklefs (chapter 15) and John Alroy (chapter 16).

A lot of detail is provided in each contribution and does not always allow for easy reading by the non-expert. The volume has the potential to stimulate large numbers of interdisciplinary collaborations and new research projects. Hopefully, this compilation will not be overlooked among the flood of books encouraged by Charles Darwin's bicentenary.

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**Critical Transitions in Nature and Society, M. Scheffer. Princeton University Press, Princeton (2009). 400 pp., £69.95 (Cloth), £30.95 (Paper), ISBN: 978-0-691-12203-8 (Cloth), 978-0-691-12204-5 (Paper)**

Marten Scheffer's 1999 rarely cited publication "Searching explanations of nature in the mirror world of math" (in Conservation Ecology) plausibly argued for how simple mathematical formulations may describe catastrophic (and irreversible) shifts in ecosystems, e.g. due to nitrogen enrichment in lakes. Throughout most of his work, Scheffer has tried to interest both theoretical and empirical ecologists in hysteresis effects and tipping points in ecological systems from where the way back would be impossible, or at least extremely difficult.

His latest and most elaborate opus in this line is this book. It presents a summary and overview of his *idee fixé*, featuring a wide range of approaches and variety of systems. The 18 chapters (plus mathematical appendix) fall into three parts: Theory, case studies and applications. The first part provides some theoretical background on chaos-related issues (bifurcations, limit cycles and attractors) in a very accessible way. It reveals little new to theoretical ecologists, but it furnishes the reader with the necessary concepts and phrases to effectively communicate the book's second part. The case studies are the core and most interesting part of this book. Scheffer goes through systems differing widely in temporal and spatial scales. In each, he argues, critical transitions show up, leading to collapse of the clear water state in lakes, the break-down of precipitation patterns in continent-scale climate, explosive radiation in evolution, knock-on effects of

overfishing, extinction thresholds following habitat loss and finally, in societies, avalanche-like spread of behaviour.

The third part, dealing with Critical Transitions, sees Scheffer moving from the scientific description of critical transitions to societal adaptation and mitigation options. Crucial is our ability to knowing whether a threshold exists and is near, and was reviewed by Scheffer in Nature last year ("Early warning signals for critical transitions"). There is a big problem, however: While scientists have a whole range of tools able to detect fluctuation patterns typical of systems on the verge of stability (e.g. prolonged return times, increased variance), these patterns are by no means *restricted* to critical transitions. Scheffer glosses over these problems and instead nimbly takes on the next big issues, that of turning science into policy. Here he makes comparatively vague recommendations for policy, such as the obvious proposal of enacting the Precautionary Principle near potential tipping, but specific details and a reflection on in what is politically achievable are missing. His closing chapter is on the burden of proof and its consequences for scientific research. If decision makers had to prove that no critical transition is near, rather than science having a 5%-error proof of its existence, natural experiments and their interpretation would receive considerably more importance than at present.

Overall Scheffer's book is a good read. It is fluently written and breathes authority, while still being highly consistent in its terminology. The "catastrophic cusp" appears literally dozens of times throughout the book, driving home his point on the irreversibility of catastrophic shifts in various systems. Yet, the case studies remain somewhat stale: None of the formal theoretical machinery developed in the first five chapters (and appendix) is actually employed for any of the case studies. It thus falls on the reader either to believe the author or to read up on the (extensively cited) literature. While Scheffer claims that many systems have witnessed catastrophic shifts and shows convincing graphs of system states undergoing qualitative changes, he never uses any of the detection tools of the closing part to demonstrate their usefulness. Summarising the book in one sentence, the logic of it reads like this: Mathematical models can produce hysteresis effects and we can indeed find similar patterns in various systems; difficult to do something about it, though, policy-wise.

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**Insect Species Conservation, T.R. New. Cambridge University Press, Cambridge, New York (2009). 272 pp., £75 (Hardback), £35 (Paperback), ISBN: 978-0-52-151077-6 (Hardback), 978-0-52-173276-5 (Paperback)**

Many species are threatened by the world's growing population and its impact on the environment. Hence active conservation is essential. Often neglected but gaining in public awareness is the necessity to conserve invertebrate species as they too are subject to threats and dangers, and to call for adequate conservation strategies in these cases. Our knowledge of insect species is often scarce or completely lacking (so that even their actual need of conservation is not known). In his short book, Tim New specifically discusses insect species conservation, stressing its challenges and difficulties. The book gives a sound introduction and overview of the specifics and challenges of conserving insect species, starting with defining criteria for identifying species in need of conservation, identifying priorities among threatened species and identifying and diminishing their threats, and ending with a rough guideline on the implementation of any species-focussed conservation plan, including the involvement of the wider public.

The book comprises 10 chapters. The first two chapters introduce general criteria needed to assess conservation requirements and criteria for sound conservation plans. Maybe the most severe threat to any species' survival is the deterioration and destruction of its habitat. Tim New introduces basic concepts regarding insect habitats, populations and dispersal (including the concept of metapopulation) and the special focus that any conservation plan needs to set on habitat quality, extent and interconnectedness (chapters 3 and 4). While the destruction of suitable habitats is often the single most important factor leading to the extinction of species, it is certainly not the only one: other threats (e.g. alien species, pesticides) are discussed in chapter 5. The subsequent chapters discuss habitat restoration and re-creation (chapter 6) as well as ex situ conservation and possible re-introductions (chapter 7) and the importance of a suitable monitoring scheme to assess the success of the measures taken (chapter 8). Chapters 9 and 10 stress the interaction of conservationists with the public. Insect species may be used as flagship species to promote the case of insects and conservation in general to a wider public, or as Tim New puts it to use insect species as "ambassadors for conservation" (chapter 9). The last chapter gives a step-by-step overview of how to best implement a conservation plan and strongly recommends integrating all parties concerned (involving, for example, political and legal responsibilities or funding sources) at the very early stages of the process of conservation planning as a crucial step for a successful conservation scheme (chapter 10).

The book is an important step to draw attention to the importance and peculiarities of insect species conservation and thus I recommend it to anyone involved or interested in animal conservation. As many of the issues discussed are not only applicable to the conservation of insect species, the book can also serve as a first introduction to animal conservation on a wider scale. The style of writing is easy and a pleasure to read and I appreciated the wealth of very interesting examples. Overall, I liked the book, but I also felt that it was at times a little repetitive (e.g. much of the last chapter has already been discussed in the first chapters). However, the basic concepts needed to understand the peculiarities of insect species conservation, such as the concept of metapop-