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POPULATION AND COMMUNITY ECOLOGY OF ONTOGENETIC DEVELOPMENT. *Monographs in Population Biology*, Volume 51.

By André M. de Roos and Lennart Persson. Princeton (New Jersey): Princeton University Press. \$65.00. xii + 535 p.; ill.; index. ISBN: 978-0-691-13757-5. 2013.

The authors present a derivation, synthesis, and exposition of the consequences of juvenile-adult stage-structured models leading to biomass overcompensation with increasing mortality rates. They compile and elaborate upon their previous work, using the space afforded to provide a thorough explanation and examination of model variants.

They argue the most important stage-structure element to include is, minimally, a model with juveniles and adults. Fundamentally, these elements are linked by maturation of juveniles to adults and the reproduction of adults to produce more juveniles. The major result is that, for the empirically justified set of parameters presented in the book, increasing the death rate of the consumer can lead to an increase in the biomass of the consumer of either the juveniles or the adults, depending on the relative consumption of the juvenile and the adult. A critical condition for this result is having different limiting resources for the two stages. Their models reflect the idea that juveniles and adults often consume different resources or at least have different efficiencies of resource consumption due to their different sizes, if not their different morphologies. Biomass compensation has been previously documented in models, but I doubt it has ever been explored so thoroughly.

The bulk of the chapters examine the implications of this biomass compensation for a variety of increasing complex food web modules, exploring features such as the emergence of Allee effects to the consequences for intraguild predation. The authors make the book accessible by consistently describing model results in general, intuitive terms. Equations are presented sparingly when necessary, and results are compared to the empirical literature; however, this is still a volume about models, with long sections that verbally describe conditions under which biomass compensation occurs. Although not concise, the book is a coherent, complete argument. In an era of increasingly compact papers, it can be satisfying to read the long form of an argument from its historical basis and empirical justification, through

the development of all the model elements, and to the full implications.



The model is mechanistically constructed in that each of the components has meaningful units and represents processes that can be measured, often on individuals or in aggregate via macroecology regressions. Parameters are empirically justified, which is both a blessing and curse. The default parameters provide a meaningful, focused set of parameters on which comparisons can be based. This avoids the problem of a theory fixating on a particular outcome that may only occur in extreme parameter space. The appendix includes a general description of model conditions that lead to biomass compensation, but throughout the bulk of the book other parameter conditions are not examined. One is left wondering to what extent the examined parameter might represent a narrow range of parameter space or is more generally representative.

The authors examine many implications of their scenario, but noticeably do not address the evolutionary dynamics. For example, might there be selection for a system to evolve out of the biomass compensation dynamics upon with the book is based? As with all thoughtful contributions, the volume provides a basis for future work that will examine this and other questions arising from juvenile-adult populations. Given its thorough and in-depth analysis of a stage-structured model, the book is an unqualified reference for anyone doing modeling work with juvenile-adult models. The results, largely summarized in the first chapter, have important implications for anyone doing empirical work on juvenile-adult systems. And the authors make a compelling case that population models should explore juvenile-adult structure because it can result in qualitatively different outcomes.

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