The Physiological Ecology of Vertebrates: A View from Energetics

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DOI: https://doi.org/10.1644/1545-1542(2003)084<0774:TPEOVA>2.0.CO;2

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Journal of Mammalogy, 84(2):774–775, 2003

McNab, B. K. 2002. THE PHYSIOLOGICAL ECOLOGY OF VERTEBRATES: A VIEW FROM ENERGETICS. Comstock Publishing Associates, Cornell University Press, Ithaca, New York, 576 pp. ISBN 0-8014-3913-2, price (cloth), $75.00.

Brian McNab's work spans more than 40 years and covers a massive number of taxa. He is the author of more than 60 papers in the Institute for Scientific Information–listed journals, and a measure of the quality of his contribution is the number of citations some of these have received (at least 3 with more than 200 citations!). As most readers of the *Journal of Mammalogy* probably know, McNab has primarily worked on energetics, and this provides him with the ideal background to author his recent contribution to that field, which is monumental and timely. I say timely because ecologists, and evolutionary biologists in general have again become extremely interested in mechanisms, and now more than ever, students of higher levels of integration must understand the mechanistic underpinnings of their subject, be they molecular or physiological (although the reverse need not be true). It therefore seems that physiological ecology is becoming a field of wider importance, and this book will do much to define that field. Now having said all that, although I do not always agree with McNab, this is a good book, and as the frontispiece states, ''the road to truth lies much through argument.''

The book is divided into 5 parts, each containing 2–4 chapters. It covers a range of topics including energy budgets, water and gas exchange, diet and nutrition, and the energetics of locomotion. Importantly, the book is not just a review. McNab provides background, evidence for competing hypotheses, and usually makes his views clear. This is arguably clearest in his discussion of phylogenetic control (in one of the semiautonomous sections that discuss important issues underlying the major topics being examined, which appear throughout the book and are one of its strengths). In modern comparative studies it has become the norm to attempt to control for phylogenetic associations so that any patterns detected can be attributed to independent evolutionary events and not merely to shared ancestry. McNab sides with Westoby et al. (1995), who argue that the current infatuation with such methods gives primacy to phylogeny, and because of the correlation between ecology and phylogeny, cause variation that could be correlated with ecology to be allocated to phylogeny. Although this point is valid to a degree, and explained with superb clarity by McNab (in this discussion we also get a glimpse of a very dry sense of humor, as on p. 102), I do not have as great a problem with the issue as the author, partly because the overlap that McNab highlights makes analyses more conservative. In addition, comparative studies typically present both species level and ''controlled'' analyses, allowing readers to make up their own minds, as they do in most instances anyway. Moreover, if you truly have a problem with phylogenetic control (or primacy, depending on your view), then use a pairwise comparison (Møller and Birkhead 1992) when possible, as it seems to me to alleviate the correlational problem McNab discusses.

In any case, this is an isolated section of the book and not where the real beef lies. McNab is primarily concerned with energetics, and this is where he does his best work. In contrast to his chapter on the limits to adaptation (Chapter 1), which presents some rather unorthodox views and is in my view the weakest section of the book, subsequent chapters are top shelf. The chapter on the scaling of metabolism and thermal associations (Chapter 3) is but one example. Here there is also another thought-provoking interlude where McNab discusses the problems of using total or mass-specific metabolism. Again he does a great job, although it was a little surprising that a recent commentary on this issue by Hayes (2001) was not cited (too recent?). As

a brief aside, in spite of this omission, the reference list is huge and is fairly up to date, with citations as recent as 2000 (the only later one I could find while quickly trawling through the list was a 2001 article by the author). The chapter on temperature adaptation in ectotherms was also good (Chapter 4), and, not being schooled in dinosaur energetics, I enjoyed the discussion on their thermoregulation presented in this chapter. Again, McNab presents argument followed by counter argument and makes it exceedingly clear where his allegiances lay. He also makes it abundantly clear that as far as he is concerned, a grain of physical evidence outweighs a mountain of rhetoric: ''Although various kinds of evidence have been examined to determine the energetics of dinosaurs, . . . the most reliable characters are anatomical, at least because they are properties of the dinosaurs themselves and not some pseudoproperty *divined* by 'theoretical' arguments'' (italics mine). Theory guides a lot of my research, as it does for most of my colleagues, so I find the tone of this statement pretty amazing. There are also a few minor points in this chapter that are debatable. An example is the statement that ant- or termite-eating mammals are restricted to the tropics or subtropics. To the best of my knowledge, southwestern Australia has never been classified as either, at about 34°S and with a Mediterranean climate, yet this region is home to the numbat, a marsupial termite specialist. These issues do not detract from the bigger picture however.

The book also includes a very thought provoking and clear discussion of Bergmann's rule (Chapter 5) and correctly points out that most explanations have relied on mass-specific energy expenditure, and hence suggests energy saving as the selective force favoring increased size. However, total energy expenditure increases with size, making energy use per se appear an unlikely general solution to this phenomenon. I find the argument compelling that starvation resistance is likely to be a broader explanation for the increase in size at higher latitudes, especially because it also provides a reason for larger size in ectotherms there as well. McNab provides evidence supporting this view, but then in an abrupt about-turn suggests, ''An increase in energy storage and starvation time probably is, at best, a secondary contributor to a correlation of mass with latitude'' (p. 92). There also are a few oddities in this chapter. For example, Fig. 5.7 shows a negative association between mass-specific metabolic rate and mass across mammals, whereas in Fig. 5.8 that, judging by the axis labels, shows the same data for a subset of mammals, the association is positive. Presumably, the *y*-axis in the 2nd figure is mislabeled. And, while on the topic of figures, it was not (and has never been) clear to me what the areas surrounding data points on many of the graphs are (95% CIs?), nor how they are fitted. Again, this is a point that does little to detract from the book's strengths.

So, is there a simple take-home message that can be distilled from this large, comprehensive, and probably defining book? I think there is, and it is presented at the beginning of the penultimate chapter. The analysis of ecological energetics and their effects are complicated by interactions. This could be the message for biology as a whole, and is in large part why the study of the living world is so interesting and challenging. McNab has written a very good book and one that is likely to be of considerable influence and use to a broad readership, not just those with a direct interest in energetics. I cannot wait for a soft-backed version to come out so my students can afford a copy.—D. J. HOSKEN, *Zoology Museum, The University of Zürich, 8057 Zürich, Switzerland.*

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Imagine attempting to document the original status and decline of the wolf or grizzly bear in North America during the past 350 years based on the accounts of early travelers, newspaper ar-

Physiological Ecology of Tropical Plants. Marschner 1995. Mineral Nutrition of Higher Plants. McNab 2002. The Physiological Ecology of Vertebrates: A View from Energetics. Mooney & Saugier (eds) 2000. Terrestrial Global Productivity.Â Resource Physiology of Conifers. Smith, Monson, & Anderson 1996. Physiological Ecology of North American Desert Plants. Spicer & Gaston 2000. Physiological Diversity and Its Ecological Implications. Physiological ecology has grown in importance as an area of biology in the past thirty years and integrates the diverse approaches used in the comparative biology of organisms. Biologists segregate their approaches by technique and concept, but the boundaries among ecology, behavior, anatomy, and physiology are arbitrary and of no significance to organisms. Physiological ecology emphasizes the diversity of not only organisms, but also of solutions to (and evasions of) problems posed by the environment.Â The Significance of Energetics for the Population Ecology of Vertebrates. 431. Physiological Limits to the Geographic Distribution of Vertebrates. 447. References. Physiological ecology has grown in importance as an area of biology in the past thirty years and integrates the diverse approaches used in the comparative biology of organisms. Biologists segregate their approaches by technique and concept, but the boundaries among ecology, behavior, anatomy, and physiology are arbitrary and of no significance to organisms. Physiological ecology emphasizes the diversity of not only organisms, but also of solutions to (and evasions of) problems posed by the environment.Â @inproceedings{Vedder2002ThePE, title={The Physiological Ecology of Vertebrates: A View from Energetics}, author={A. Vedder}, year={2002} }. A. Vedder. Published 2002. Biology. The physiological ecology of vertebrates : a view from energetics. Item Preview. remove-circle.Â The physiological ecology of vertebrates : a view from energetics. by. McNab, Brian Keith, 1932