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Biology of the Pitvipers by J. A. Campbell; E. D. Brodie,  
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and highly readable. How many undergraduate students will find Zug's book sufficiently stimulating to pursue graduate work in herpetology?

What about the six key features listed on the back cover? Yes, the book does provide an incisive survey, emphasizes biological diversity, and includes recent research, but "citing key references"—not at all! The reader can determine sources of information only by checking all appropriately titled references in the bibliography. The inclusion of investigators' names and dates of publication with appropriate verbs would make the text more readable and could save the serious reader much time.

The "more than 200 new illustrations and photographs" actually consist of 89 new drawings, 50 of which are distribution maps, 22 other drawings reproduced or adapted from other sources, and 69 photographs, 47 of which are examples in the accounts of the families. The total number of illustrations is 180! The graphics are acceptable. The line drawings are substandard, and most of the photographs lack contrast. The quality of illustrations taken from other sources has suffered. For example, compare figure 1.3 with figures 13-1, 13-10, and 13-15 in Duellman and Trueb (1986). Figure 8.3 was "adapted" from Duellman (1967) but in no way is comparable in quality.

So much can be shown by accurate and carefully executed drawings, which greatly enhance the text in any publication. The modern tendency for some authors, editors, and publishers to accept poor illustrations is all too common. Poor adaptation or reproduction of good illustrations existing in the literature is inexcusable.

Despite the claims on the cover, there is no history of herpetology, and the bibliography is not especially extensive. Academic Press needs to be more truthful in its advertising.

Comparison of the present book with *Introduction to Herpetology* by Goin et al. (1978) reveals that the organization of the two books is highly similar, and the text is principally an updating of an earlier book. The quality of the drawings and photographs is far superior in the 1978 book, which was criticized by Pisani (1979) for devoting a disproportionate amount of the text to taxonomic accounts of families. The same criticism applies to the present book.

Our discipline desperately needs a good text that covers the field of herpetology in a way that will stimulate students and perhaps lead many good ones into the exciting fields of research on amphibians and reptiles. Zug's *Herpetology* is a start, but to achieve the goal of an outstanding text, it necessitates considerable re-

vision. This can be accomplished within the publisher's constraints by enlivening the text, giving researchers' names and citations, expanding the text to treat more adequately some subjects, providing more examples, and adding more and better illustrations. To balance this expansion, the accounts of the orders and families could be presented in the abbreviated manner used by Dowling and Duellman (1978). The index needs to be upgraded, so that the user can find topics such as karyotype, hemipenis, and unken reflex.

Finally, I concur with Hartweg (1963:469) in his review of Goin and Goin's (1962) original text: "I hope that this book is successful enough to warrant an early, revised edition."

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BIOLOGY OF THE PITVIPERS. J. A. Campbell and E. D. Brodie, Jr. (eds.). 1992. Selva, Tyler, Texas. ISBN 0-9630537-0-1. 467 p., \$75.00 (hardcover).—This book contains the results of a symposium by the same name held November 1989 at the University of Texas at Arlington in recognition of the 50th anniversary of the Texas Herpetological Society (THS). Relative to many regional herpetological groups, the THS has enjoyed a long and distinguished history. Several noted professionals received early career boosts by affiliating themselves with

the THS. Two such members from the THS's earliest days, H. Smith and O. Sanders, were honored at the symposium. *Biology of the Pitvipers*, containing Smith's 1000th contribution, is offered in tribute to these two men.

After a Preface and Introduction by Campbell and Brodie, 50 different authors contribute to 30 different papers, grouped into sections on Systematics, Evolution, Technique, Natural History, Behavior, Snakebite, and Maintenance and Conservation.

*Systematics.*—Papers in this section contribute to the generally obscure phylogenetic relationships among pitvipers and suggest one, possibly two, new species. B. Crother, J. Campbell, and D. Hillis consider the biochemical and morphological evidence for the phylogeny and historical biogeography of *Bothriechis*. S. Werman uses biochemical and anatomical characters to investigate the cladistic relationships of *Bothrops*. J. Cadle addresses the immunological evidence for the phylogeny of viperids. Using data from mitochondrial DNA and venom proteins, A. Knight, L. Densmore, and E. Rael discuss the systematics of *Agkistrodon*. M. Dorcas examines morphological data to assess the relationships of montane populations of *Crotalus lepidus* and *C. triseriatus*. D. Barker uses morphological and biochemical characters to examine variation and biogeography of *C. willardi*.

*Evolution.*—H. Greene discusses the evolution of pitvipers in an ecological and behavioral context. A. Savitzky describes the unique embryonic development of the maxillary and prefrontal bones in relation to fang rotation and the pit. H. Lillywhite and A. Smits examine cardiovascular adaptations. S. Minton discusses serologic relationships in a paper that would have fit better in the Systematics section. E. Rael, J. Johnson, O. Molina, and H. McCrystal describe geographic variation in the occurrence of a Mojave toxinlike protein in *C. lepidus* venom. G. Schuett reviews the empirical evidence for long-term sperm storage and discusses the significance of the strategy in the reproductive biology of temperate crotalines.

*Technique.*—In the single paper in this section, H. Reinert reviews radiotelemetric techniques for collecting data on free-ranging snakes and discusses the analysis of such data relative to movements, habitat use, population parameters, and physiology.

*Natural history.*—This section includes general biology papers on *Bothrops jararaca* (I. Sazima),

*Porthidium yucatanicum* (C. McCoy and E. Censky), and *P. godmani* (J. Campbell and A. Solórzano). In separate papers, W. Brown and W. Martin discuss seasonal cycles of activity and habitat use in *C. horridus*. H. Lillywhite services the herpetological community by publishing T. Brown's (1970) dissertation on the biology of *C. cerastes* (T. Brown and H. Lillywhite). P. Weldon, R. Ortiz, and T. Sharp review the chemical ecology of crotalines to end the section.

*Behavior.*—In the most conceptual paper in the volume, D. Duvall, S. Arnold, and G. Schuett review mating systems and develop interesting theoretical models. O. Sexton, P. Jacobson, and J. Bramble investigate the effects of latitude and seasonal thermal profiles of soils on hibernation behavior. B. Savitzky analyzes feeding in *A. piscivorus*. D. Chiszar, R. Lee, C. Radcliffe, and H. Smith examine searching behavior after predatory strikes and W. Hayes, I. Kaiser, and D. Duvall present the quantity of venom expended in such strikes. Finally, S. Secor describes patterns of activity and movement in *C. cerastes*.

*Snakebite.*—Anyone who works in any capacity with these magnificent, but potentially dangerous, animals will read the papers in this section. R. Dart, J. McNally, D. Spaite, and R. Gustafson discuss the aftereffects of pitviper bites on humans. D. Hardy reviews snakebite treatment and appraises two controversial approaches, the Extractor<sup>®</sup> snakebite kit and stungun electroshock.

*Maintenance and conservation.*—In this section, E. Jacobson and J. Gaskin discuss infection by paramyxovirus, an extremely important and often fatal viperid pathogen. In one of the shortest, but possibly the most immediately consequential chapters, H. Greene and J. Campbell attempt the difficult task of assessing the worldwide status of pitvipers and discuss their conservation.

*Plates.*—The 17 color plates contain 116 photographs of viperids, four of habitats, one of a skull, and one of herpetologists (Smith and Sanders). The photographs are outstanding; however, I still am not convinced that there actually is a *C. horridus* in Plate 9-H. The dust jacket contains a magnificent color rendition of a *C. horridus*, prepared expressly for the *Biology of the Pitvipers*.

Space prevents comments on each of the 30 papers. I will, however, briefly address two matters of interest. Wildlife researchers sometimes

solicit information via questionnaires from sportspersons. This procedure may provide data otherwise unobtainable and give insight and direction for more substantive investigations. Many herpetologists will make significant, but anecdotal, observations over the course of their careers. Most of these observations will remain hidden in field notes because either we think the observations are not worthy of publication or perhaps we do not want to be accused of the "sin" of anecdotal writing (Fitch, 1987). However, by pooling such observations from competent fieldworkers, it might be possible to quantify the results and test specific hypotheses. This procedure is precisely what Sexton et al. did in their paper on hibernation behavior with some very interesting quantitative results. Snake biologists, there may be much unused data out there; let us find ways to access them.

Greene and Campbell's preliminary appraisal of the future of pitvipers is sobering and thought provoking. Based on the number of species with restricted distributions, those requiring specialized habitats, or those subject to high mortality by humans, Greene and Campbell estimate that approximately 56% of crotaline species ( $n = 80$ ) are currently vulnerable to extinction. Despite this risk, less than a dozen pitvipers are among the 186 snake taxa that have been identified as threatened or endangered. This disparity reflects both our ignorance of the biology of the animals and perhaps even irrational status assessments in the conservation process. Of the 80 species vulnerable to extinction, only four have been well studied anywhere in their ranges. Biodiversity is a buzzword of the 90s, and rightly so. Books on the topic are appearing by the dozens, increasing funds target biodiversity studies, and a proposal is before our legislature to create a National Center for Biological Diversity and Conservation Research. Thus, the appearance of *Biology of the Pitvipers* is timely. But the bottom line is that, although these animals always have played a significant role in human culture and although most people will admit a fascination with them, the average citizen (and some professionals) is interested only if the snakes are behind glass; few want to see them in nature. In fact, it may be desirable to ensure that they are not encountered in nature; after all, is not biodiversity in zoos sufficient? Greene and Campbell suggest that, with sufficient education, such ignorance and fear can be converted to knowledge and admiration. If this is to happen, many more snake biologists must make an effort to state their case.

*Biology of the Pitvipers* is large ( $8\frac{1}{2} \times 11$ " ), with a double-column format. The layout is visually

pleasing and easy to read, but some black-and-white multiple photographs were a bit small when reduced to a single column. The only index provided is to scientific names. Literature citations are found at the end of each paper. I found remarkably few errors in the text. However, lest the editors and authors go unscathed, is Radcliffe the fourth author as in the Contents or the third author as in the paper title; does the legend for Plate 12-G actually refer to Plate 12-F; how would D. Baldauf, a former THS "illustrious officer," regard his misspelled name; and how long is a month? To be honest, I had to look long and hard to find these minor errors. Were every book so meticulously edited!

Congratulations are in order to the THS, Campbell, Brodie, 50 contributors, and Selva for producing a well-conceived, quality publication of high scholarship. The book succeeds commendably in summarizing previous work, synthesizing, and providing new data and ideas in a context of solid evolutionary thinking. The editors claim that pitvipers rank among the world's most fascinating animals. If you doubt this claim, *Biology of the Pitvipers* just might convince you. I highly recommend this book to any serious student of snake biology and to academic libraries. The \$75.00 price tag and the technical nature of most of the book may turn most others away, except perhaps, members of the THS.

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THE ROCKPOOL FISHES OF NEW ZEALAND, TE IKA AARIA O AOTEAROA. Chris Paulin and Clive Roberts. 1992. Museum of New Zealand Te Papa Tongarewa, Wellington, New Zealand. ISBN 0-908953-01-1. xii + 177 p., \$38.00 (hardcover).—This volume joins a growing list of recent book-length contributions on New Zealand fishes. Prominent among these are offerings by Francis (1988), Paulin et al. (1989), and McDowall (1990). The first 20% of the book is given over to the kinds of things