



BOOK REVIEW

The Mysteries of Reptilian Social Behavior

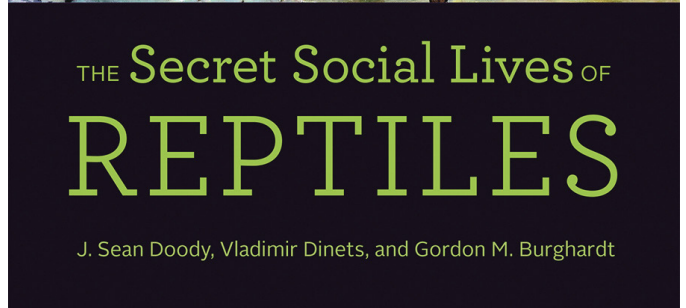
The Secret Social Lives of Reptiles. 2021. J. Sean Doody, Vladimir Dinets, and Gordon M. Burghardt. Johns Hopkins University Press, Baltimore, Maryland, USA. xvii + [3] + 400 pp. + 22 pls. ISBN 9781421440675 (hardcover). ISBN 9781421440682 (ebook). \$74.95.

Carlson (2021) summarized his impressions of this book by stating: “Overall, this is an excellent book on an underappreciated topic. The coverage is thorough and the insights are sharp, as is to be expected from a group of authors with tremendous expertise in the social behavior of diverse groups of [non-avian] reptiles.” In his review, Carlson had already made the point that “much of reptilian natural history [remains] mysterious and underexamined.”

Having spent most of my adult life trying to better understand how reptiles make a living, reproduce, and interact with their environment, I must admit that I rarely focused on behavior — especially social behavior. Overly enamored with questions of what, how, and why reptiles do what they do, I often overlooked the sometimes (but not always) subtle interactions between individuals that are the subject of this informative and even entertaining book. In hindsight, I believe two factors are largely responsible. As Carlson noted in his review, many reptiles are small, secretive, and difficult to watch, often exposed only fleetingly either because they spend much of their lives underground, under cover, or hidden in leaf litter or the forest canopy. However, even when dealing with the sometimes flamboyant species — such as the anoles I’ve spent endless hours admiring and which must constantly balance visibility to prospective mates and competitors with exposure to predators — I was confounded in my few efforts to study behavior. Merely describing their exploits in quantifiable ways is difficult, often requiring slow-motion videos to ascertain what’s actually happening. Adding to that the necessity to integrate context and motives that are quite different than our own experiences (despite a tendency to anthropomorphize) quickly causes the effort to exceed those needed to address simpler, more straight-forward questions like where are they hanging out, when are they active, what are they eating, and what eats them.

In the foreword to this book, Gordon Schuett asks why we “distance ourselves from nature” and “from experiencing the full breadth of its biodiversity,” and “why do we have

difficulty perceiving reptiles as having complex social lives and other behavioral attributes, such as personality, reciprocity, and family?” He suggests that at least part of the answer lies in “warm-blooded chauvinism” but I think that a combination of the afore-mentioned difficulties in studying and understanding often complex behaviors and an inability to appreciate how reptiles perceive their environments and one another are responsible. Fortunately for the rest of us, Doody, Dinets, and Burghardt have marshalled their experiences and expertise to open a door into this exciting field of study and have invited us into their world.



In the preface, the authors' stated goal "is to present the social behavior of reptiles in a comparative framework embedded in the biology and evolution of the various diverse groups," noting, however, that "so much is still unknown" that they chose not "to present any new phylogenetic or ecological analyses using the many modern tools ... that have been applied to systematic, morphological, physiological, or behavioral traits (such as those involved in foraging, displays, social organization, or predator defense)." Because "too much awaits discovery," they hope that their efforts "will facilitate or inspire future studies."

Chapter 1, "Social Behavior Research: Its History and a Role for Reptiles," establishes a foundation by defining terms and presenting a history of research on the sociality of reptiles. Social behavior is defined as "any interaction between two or more members of the same species." This very broad definition allows the authors to treat as a continuum what is frequently presented as a dichotomy between species that are social (those with evident group behaviors) versus those considered to be non-social (interactions largely between individuals). Chapter 2, "Reptile Evolution and Biology," explains what reptiles are, how they evolved, and how they function. Interestingly, the authors clearly state that they are addressing non-avian reptiles but that they also will "mention birds, mammals, and extinct relatives of mammals to provide the reader with a more universal picture of social behavior in amniotes."

In the introduction to Chapter 3, "Mating Systems, Social Structure, and Social Organization," the authors cited E.O. Wilson (1974), who "noted that while the average complexity of reptile social behavior is probably below that of mammals and birds, reptilian social life is considerably diverse, with a 'few flashes of sophistication' and 'some adaptations advanced even by mammalian standards'" before going on to say that "reptiles are ... a crucial pillar in the foundation underpinning social behavior evolution." This is possibly most evident in the continuum of mating systems that range from promiscuity and multiple paternity to long-term social and genetic monogamy. Citing Kappeler (2019), social structure is defined as the "content, quality, and patterning of social relationships emerging from repeated interactions between pairs of individuals belonging to the same social unit (e.g., dominance hierarchies and social bonds)," whereas social organization "refers to the size and composition of a social unit (solitary individuals, pairs, colonies, groups, etc.)." The authors then briefly discuss territoriality before moving on to group living, which includes both temporary and more stable aggregations of various types (including mating behaviors, mate-guarding, and for other reasons that include overwintering, floating "slicks" of seasnakes that might serve multiple purposes, and those related to food).

Citing Burghardt (1970), Chapter 4, "Communication," begins with a definition of communication that involves "a

sender emitting a cue that, when responded to, would confer a fitness advantage to the sender or his or her group (thus accommodating kin selection, altruism, and cooperation). Of course, the recipient of the cue could respond, leading to further responses from the initial sender." This chapter invests considerable effort in summarizing many aspects of avian and mammalian communication for purposes of comparison, sometimes, unfortunately, distracting from the focus on reptiles. For the most part, I did appreciate the descriptions of crocodilian communication (both postural and vocal), acoustic signals in turtles and tortoises (subheader: "not so silent after all"), chemical cues, and various displays by squamates and tuataras that employ color, pattern, and movements to convey information — the exception being the rather cursory coverage of visual signaling in lizards despite an extensive literature. The latter might merely reflect my own biases (being a lizard guy), although I first became aware of it as I was reviewing a manuscript and thought this book (as of then unread) might be the ideal means of finding the precise information so obviously missing in the manuscript — only to be disappointed.

Chapter 5, "Courtship and Mating," describes mating behaviors in various reptilian groups, including details from studies of a number of individual species and even a short section on fossil evidence of courtship in extinct archosaurs. Chapter 6, "Communal Egg-laying: Habitat Saturation or Conspecific Attraction," discusses the topic in sometimes excruciating detail (which, although interesting, made me long for comparable coverage of the visual displays of lizards). Nevertheless, the coverage of various hypotheses regarding the evolution of communal nesting was a highlight. I particularly liked the case studies. The length and detail might merely reflect one of the author's (Doody) interests but Carlson (2021), in his afore-mentioned review, suggested that it was necessary to "fill a general gap in the literature." Chapter 7, "Parental Care," begins with a brief commentary on what we know of the topic in extinct archosaurs, which leads into a more detailed section on crocodilians, and ends in a section on "other reptiles: from subtle self-sacrifice for formidable defense," which appropriately emphasizes thermoregulatory aspects (including facultative endothermy) and the extensive variation in the extent and duration of parental care by various groups and species, the latter demanding at least some of the detail of the previous chapter. Chapter 8, "Hatching and Emergence: A Perspective from the Underworld," which, like the previous two chapters, focuses on the aftermath of mating, stresses the possible explanations of how embryos and neonates communicate and synchronize these transitions, while acknowledging a lack of evidence for embryonic communication or any social implications of collective emergence.

Chapter 9, "Behavioral Development in Reptiles: Too Little Known but Not Too Late," deals with ontogenetic

development of behaviors beginning with interactions among hatchlings and neonates as well as between juveniles and adults. Toward the end of the chapter, the authors state that: “The processes of development are complex, and as we discover more about them, the complexities compound” before calling for more research to identify the multiple factors that play a role in this process, and ending with: “This is a frontier just beginning to be explored.”

Chapter 10, “The Reach of Sociality: Feeding, Thermoregulation, Predator Avoidance, and Habitat Choice,” addresses topics of at least some social relevance that “have received very limited attention from researchers.” The study of social feeding, for example, is fraught with difficulties that include the rarity of observed predation events (noting that most reptiles are predators) and that “social feeding usually represents only a small fraction of feeding episodes” in extant reptiles. Cannibalism is rarely considered in a social context but might serve a role as part of a reproductive strategy. Known examples of social predator avoidance in reptiles is largely limited to distress calls by juvenile crocodylians and chemical alarm signals emitted by some squamates. Whether rattling in rattlesnakes and tail vibrations by many other species of snakes can even be perceived by conspecifics is unknown (although they clearly influence other animals). Juveniles in species with extended parental care certainly minimize predation risk by remaining close to adults, but other examples of collective predator avoidance are largely limited to an individual responding to a predator triggering a similar response in nearby conspecifics. Habitat choice, thermoregulation, roosting, and hibernation are additional behaviors with social components that are “worthy of much more study.”

Chapter 11, “Looking toward the Future,” which summarizes the previous chapters and, as the chapter title indicates, suggests topics and methodological approaches worthy of further exploration. These include cognitive processes, social recognition, social learning, affective processes, play, the involvement of neuroscience and endocrine functions, and social evolution. In Carlson’s (2021) review, he stated that it highlights “again the main theme of the book: social behavior in reptiles is more common and complex than is often assumed, and we’ve only begun to understand it.” The book concludes with 96 pages of references, a veritable trea-

sure trove of information that will serve as the starting point for anyone with questions pertaining to reptilian social behavior, an index of species and genera, and a general index.

So, what did I think of the book? I found few errors and appreciated the figures and photographs, although many were largely decorative. I was not put off by an occasional reliance on anecdotal accounts of limited scientific rigor, probably because, as a natural historian, I am convinced of the value of such observations, even if they are of limited value until a critical number have accumulated (Henderson and Powell 2009). As mentioned previously, I was disappointed in the lack of detail on a topic of particular relevance to my own work — however, as I read the book and have since revisited it on several occasions, I find that almost every topic has some application to my own experiences in the field, even those that are only tangentially related to my research. That last point, I believe, will apply to most herpetologists — and to many biologists who focus on other animals or even naturalists of all kinds — by providing context to observations and experiences as varied as watching basking turtles drop into the water, discovering a communal nest, or watching lizards advertise their presence. The book’s greatest value, however, might be focusing attention on an important and underappreciated aspect of reptilian life and, in doing so, eliciting the interest of researchers who will attempt to answer at least some of the questions the authors have identified and posing new questions as yet unknown.

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