BOOK REVIEW

Understanding mammals, hands-on

"When I grow up I want to be a firefighter!" That was the catch-phrase of a cartoon I grew up watching, uttered by "Grisu," a young fire-spitting dragon. I envied Grisu for having such a clear picture of his future profession, especially because I did not. This insecurity may stem from how schools provide theoretical training at the expense of practical experience. In comparison to passive reading, active experience puts a student one step closer to an actual job. James Ryan's book provides such an opportunity, and will surely inspire a new generation of mammalogists. Ryan's book provides an overview of several topics in mammalogy, with a special attention to fieldwork, anatomy, and analytical techniques.

The book is written in an engaging, simple, and enjoyable style, with a bit of humor here and there. Each of the 19 chapters starts with clear descriptions of learning objectives and required materials and time. No previous knowledge requirements are mentioned, probably because Ryan aims to provide self-contained chapters, embedded within a self-contained book. Some (Chapters 2, 3, 7, 8, and 19) focus on specimens, anatomy, and biological samples. Others (Chapters 6, 9, and 10) deal with trapping and capturing mammals, and the corresponding analytical techniques. In addition, animal tracking, in many of its forms, is covered in others (Chapters 11–14). Three (Chapters 15–17) focus on behavior and communication. The remaining deal with genetics (Chapters 18), phylogenies (Chapters 4), and data management (Chapters 5).

This book has many strengths and only a few weaknesses. One of its strengths is the use of exercises which are effective for learning (Anzai and Simon 1979). Concepts are embedded within exercises, rather than explained in the initial introductory text. For instance, in Chapter 16, the readers are introduced to the concepts of ad-lib, scan, and focal sampling through exercises. Ryan's pedagogical approach is effective and provides guidelines and tips on how to avoid mistakes. For instance, Ryan suggests making note of all information instead of leaving it to fallible human memory (Chapter 5), and states the importance of avoiding implicit observer bias (Chapter 16). The book is applied and practice-focused. A few more concepts about hypothesis testing and the scientific method could have helped to make the volume more self-contained.

Ryan also suggests avoiding the US American date format (month-day-year), because it is only used in a few countries. Here, Ryan could have gone one step further, and suggested the ISO 8601 format (year-month-day), which is even less prone to cross-cultural misunderstandings and works beautifully when sorting data chronologically across months and years. I appreciated how Ryan avoids discussing outdated analogue sound recorders. He could have also avoided mentioning the (soon to be obsolete) DAT and Mini Disk systems, focusing instead more on purely digital, low encumbrance solutions. For instance, SD cards can hold 1TB in about 1 cm^3 of physical space. Likewise, among digital formats, Ryan should have mentioned the importance of saving recordings in *uncompressed* formats (e.g., wav), rather than compressed formats (e.g., mp3).

A strength of the book is that it is self-contained. Supplementary materials specific to this book, public online resources, and smart practical suggestions enable the reader to perform most of the exercises from anywhere in the world. For instance, if one does not have skulls to practice classification with a dichotomous key, Ryan suggests to use nuts and bolts because the concept of pairwise morphological differences is the same. Concerning online resources, Ryan shows readers how they can build phylogenetic trees using genetic sequence alignment in a few easy steps with freely accessible data.

One concept which would have benefitted from more emphasis is the importance of digitizing materials and field notes. Digitization can dramatically enhance replicability and usability of data by others. For instance, when taking field notes, the standard for a secondary field journal should always be, whenever possible, a word-processed file, rather than "even a word-processed file on the computer," as Ryan writes. In addition to the description of standard note taking in field books, the author might have devoted some time to digital notes given that many field biologist have access to digital resources.

One of Ryan's great skills in this book is his ability to go from the general to the specific and vice versa. General, abstract knowledge has the advantage of being applicable to many cases. Specific knowledge and special cases are probably easier to learn and remember. By discussing mammalian skulls in general, and then zooming in on cetaceans' asymmetric skulls, Ryan gives us the best of both worlds. Likewise, the author discusses general bioacoustics techniques, but then zooms into an experiment testing whether conspecific alarm calls may trigger particular behavioral reactions in squirrels. Thus, Ryan elegantly suggests measuring the effect of playbacks on behavior

by counting the number of seeds a squirrel would (fail to) eat in response to simulated conspecifics' calls for danger.

This book would have benefited from more attention from the editor/publisher. Careful copy-editing would have prevented minor syntactic errors and improved appearance of the figures. Some figures look unevenly cropped and sometimes bleed into the margins. The book includes a glossary, which I did not find helpful. In some cases (e.g., "synapomorphies"), the glossary definition does not add to the information available in chapters, because the definitions simply repeat text from the chapter. In other cases (e.g., "fundamental frequency"), the definition is inexact (e.g., "the lowest or root tone of a chord") in the fields where this term is used, i.e., bioacoustics and music (Fitch et al. 2016). In addition, some terms in the acoustics chapter are equated (e.g., volume versus amplitude) but they actually define different psychophysical quantities. The same is true for some terms used interchangeably (e.g., loudness versus intensity—Fitch et al. 2016).

I learned a great deal by doing the exercises in this book. However, a few aspects could be improved. I would have appreciated a couple of chapters on cross-disciplinary, next-generation tools and techniques, such as motion capture (e.g., Dell et al. 2014; Oh and Fitch 2017). In addition, as we are mammals and the study of human behavior, evolution, and morphology has a relatively long tradition, a chapter on "human mammalogy" would have been interesting. Some in-text references, for example, Goodall (1986), may not be the most appropriate to support the existence of complex primate vocalizations (e.g., Kershenbaum et al. 2014). In general, the whole volume would have benefitted from including more recent references where applicable. It was peculiar to read a paragraph starting with "It is only in the past decade that" which cites literature from 1986, 1988, and 2003. The acoustics chapter (Chapter 15) could have benefited from a few sentences on the source–filter theory of sound production (Taylor and Reby 2010) because this framework explains vocal production in virtually all mammals, except cetaceans, with direct implications for the analysis of mammalian sounds and their ecological embedding. Likewise,

sounds emitted by bats are almost implicitly equated to echolocation sounds; drawing instead attention to the rich communicative world of bats beyond echolocation would have been desirable (e.g., Knörnschild 2014).

Overall, this book will be a great addition for introductory courses. At $39.95, this paperback book is relatively expensive, though comparable in price to other lab manuals. Instructors should ask their libraries to purchase some copies. This book will lead new generations of students to say "When I grow up I want to be a mammalogist!"

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