Quantitative Paleozoology

Quantitative Paleozoology describes and illustrates how the remains of long-dead animals recovered from archaeological and paleontological excavations can be studied and analyzed. The methods range from determining how many animals of each species are represented to determining whether one collection consists of more broken and more burned bones than another. All methods are described and illustrated with data from real collections, while numerous graphs illustrate various quantitative properties.

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PREFACE

Several years ago I had the opportunity to have a relaxed discussion with my doctoral advisor, Dr. Donald K. Grayson. In the course of that discussion, I asked him if he would ever revise his then 20-year-old book titled *Quantitative Zooarchaeology*, which had been out of print for at least a decade. He said "No" and explained that the topic had been resolved to his satisfaction such that he could do the kinds of analyses he wanted to do. A spur-of-the-moment thought prompted me to ask, "What if I write a revision?" by which I meant not literally a revised edition but instead a new book that covered some of the same ground but from a 20-years-later perspective. Don said that he thought that was a fine idea.

After the conversation with Grayson, I began to mentally outline what I would do in the book. I realized that it would be a good thing for me to write such a book because, although I thought I understood many of the arguments Grayson had made regarding the counting of animal remains when I was a graduate student, there were other arguments made by other investigators subsequent to the publication of Grayson's book that I didn't know (or if I knew of those arguments, I wasn't sure I understood them very well). I also knew that the only way for me to learn a topic well was to write about it because such a task forced me to learn its nuances, its underpinning assumptions, the interrelations of various aspects of the argument, and all those things that make an approach or analytical technique work the way that it does (or not work as it is thought to, as the case may be).

As I mentally outlined the book over the next several months, it occurred to me that at least one new quantitative unit similar to the traditional ones Grayson had considered had become a focus of analytical attention over the two decades subsequent to the publication of Grayson's book (MNE, and the related MAU). And an increasing number of paleozoologists were measuring taxonomic diversity – a term that had several different meanings for several different variables as well as being measured several different ways. What were those measurement techniques and

what were those measured variables? Finally, there were other kinds of phenomena that zooarchaeologists and paleontologists had begun to regularly tally and analyze. These phenomena – butchering marks, carnivore gnawing marks, rodent gnawing marks, burned bones – had become analytically important as paleozoologists had come to realize that to interpret the traditional quantitative measures of taxonomic abundances, potential biases in those measures caused by differential butchery, carnivore attrition, and the like across taxa had to be accounted for. As I indicate in this volume, there are several ways to tally up carnivore gnawing marks and the like, and few analysts have explored the fact that each provides a unique result.

Finally, it had become clear to me during the 1990s that many paleozoologists were unaware of what I took to be two critical things. First, zooarchaeologists seemed to seldom notice what is published in paleontological journals; at least they seldom referenced that literature. Thus, they were often ignorant of various suggestions made by paleontologists regarding quantitative methods. Paleontologists were equally unaware of what zooarchaeologists have determined regarding quantification of bones and shells and teeth. Therefore, it seemed best to title this volume *Quantitative Paleozoology* for the simple reason that were it to be titled "Quantitative Zooarchaeology," it likely would not be read by paleontologists. A very interesting book with the title *Quantitative Zoology* coauthored by a paleontologist (Simpson et al. 1960) already exists, so that title could not be used, aside from it being misleading. *Quantitative Paleozoology* is a good title for two reasons. The first reason is that the subject materials, whether collected by a paleontologist or an archaeologist, do not have a proximate zoological source (though their source is ultimately zoological) but rather have a proximate geological source, whether paleontological (without associated human artifacts) or archaeological (with associated and often causally related human artifacts). I conceive of all such remains as paleozoological. The second reason *Quantitative Paleozoology* is a good title is that the volume concerns how to count or tally, how to quantify zoological materials and their attributes, specifically those zoological remains recovered from geological contexts. Not all such topics are discussed here, but many are; for an introduction to many of those that are not, see Simpson et al. (1960), a still-useful book that was, fortunately, reprinted in 2003.

The second critical thing that many paleozoologists seem to be unaware of is basic statistical concepts and methods. I was stunned in 2004 to learn that an anonymous individual who had reviewed a manuscript I submitted for publication did not know what a "closed array" was and therefore did not understand why my use of this particular analytical tool could have been influencing (some might say biasing, but that is a particular kind of influencing) the statistical results. In the 1960s and early 1970s, many archaeologists and paleontologists did not have very high levels of statistical sophistication; I had thought that most of them did have such sophistication (or at

least knowledge of the basics) in the twenty-first century. The anonymous reviewer's comments indicate that at least some of them do not. Therefore, it seemed that any book on quantitative paleozoology had to include brief discussions of various statistical and mathematical concepts. In order to not dilute the central focus of the volume – quantitative analysis of paleozoological remains – I have kept discussion of statistical methods to a minimum, assuming that the serious reader will either already know what is necessary or will learn it as he or she reads the book. I have, however, devoted the first chapter to several critical mathematical concepts as well as some key paleozoological concepts.

Many of the faunal collections used to illustrate various points in the text were provided over the years by friends and colleagues who entrusted me with the analysis of those collections. Many of the things I have learned about quantitative paleozoology are a direct result of their trust. To these individuals, I offer my sincere thanks: Kenneth M. Ames, David R. Brauner, Jerry R. Galm, Stan Gough, Donald K. Grayson, David Kirkpatrick, Lynn Larson, Frank C. Leonhardy, Dennis Lewarch, Michael J. O'Brien, Richard Pettigrew, and Richard Ross. Perhaps more importantly, any clarity this book brings to the issues covered herein is a result of the collective demand for clarity by numerous students who sat through countless lectures about the counting units and methods discussed in this book. A major source of inspiration for the first several chapters was provided in 2004 by the Alaska Consortium of Zooarchaeologists (ACZ). That group invited me to give a daylong workshop on the topics of quantification and taphonomy, and that forced me to think through several things that had previously seemed less than important. I especially thank Diane Hansen and Becky Saleeby of the ACZ for making that workshop experience memorable.

An early draft of the manuscript was reviewed by Jack Broughton, Corey Hudson, Alex Miller, and an anonymous individual. Broughton and the anonymous reviewer ensured that a minimum of both glaring errors in logic and stupid errors in mathematics remain in this version. Broughton and the anonymous reviewer insisted that I include several recently described analytical techniques, and they identified where I overstepped and where I misstepped. These individuals deserve credit for many of the good things here.

I wrote much of the first draft of this volume between July 2005 and August 2006. During that time, I lost my younger brother and both parents. They all had an indirect hand in this book. My parents taught me to hunt and fish, and all of the things that accompany those activities. My brother did not discourage me from collecting owl pellets from his farm equipment shed, or laugh too hard when I collected them; he even grew to appreciate what could be learned from the mouse bones they contained. I miss them all, and I dedicate this book to the three of them.

June 2007