



Oceans of Kansas: A Natural History of the Western Interior Sea,
Michael J. Everhart, 2005, Indiana University Press, Bloomington, Indiana,
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Plesiosaurs, mosasaurs, and sharks, OH MY! Thanks to Mike Everhart the secret is out. The Land of Oz is actually a treasure trove of fossils. The images of Kansas as a flat, tornado-laden ranchland are quickly changed to a fossil collector's paradise. In *Oceans of Kansas: A Natural History of the Western Interior Sea*, Mike Everhart has compiled a wealth of information. He brings the Western Interior Sea back to life with stories that have detailed imagery of what a typical day must have been like for many of the animals living during the Cretaceous. Everhart states (p. x) the goal of this book is to "... provide information about many of the animals that lived during the Late Cretaceous and, to some extent, the people who discovered their fossil remains and described them..." He easily surpasses these two goals in this book and provides balanced coverage rather than overly stressing one group of animals or one particular collector. The book has a common pattern for the chapters. They typically begin with a fictional story about the animal group being discussed, which transports the reader back in time with its vivid descriptions. The fictional story is followed by a historical retrospective of the fossils and concludes with a detailed scientific analysis, typically on morphology, behavior, or taphonomy of the group.

The invertebrates and plants are limited to the 17 pages of Chapter 3. The book does discuss key groups such as rudists, ammonites, and crinoids, but a few more pages on these topics would have been a welcome addition. Of course, a book stressing the coccoliths of Kansas would obviously not arouse the interest of the general public quite the same as sharks, mosasaurs, and dinosaurs. Chapter 1, "Introduction: An Ocean in Kansas?" and Chapter 2, "Our Discovery of the Western Interior Sea," are both general introductions to the setting, stratigraphy, and history of the area. They stress the early paleontological work of the area, beginning with Lewis and Clark's notations of a fossil fish collected in 1804, but focus on the late 1800s and early 1900s and collectors such as Cope, Marsh, Mudge, Williston, and the Sternberg family.

About two-thirds of Chapter 4, "Sharks: Sharp Teeth and Shell Crushers," is dedicated to the sharp teeth that most imagine in Cretaceous sharks and the other one-third discusses shark topics that some authors would have ignored. The chapter opens with a vivid account of one possible way a mosasaur perished

by a shark attack (depicted on book cover). The story is inspired by an actual mosasaur specimen with bite marks and embedded shark teeth. This chapter also covers two areas that I was pleased to find—shell-crushing shark teeth and taphonomic features caused by sharks. Shell-crushing teeth are not rare in western Kansas but receive little attention due to the much larger interest by most people in sharks bearing sharp teeth. Including shell-crushing teeth displays complete coverage of the topic and also serves as an example of how complete Everhart's coverage is in all the chapters. The detailed taphonomic analysis is supported with three figures showing bite marks and embedded teeth on mosasaur bones.

Chapter 5, "Fishes, Large and Small," begins with a fictional scenario depicting the final moments of one of the most famous Cretaceous fossils, the so-called fish-in-a-fish specimen housed in the Sternberg Museum of Natural History in Hays, Kansas. The chapter also gives a nice history of fossil fish collecting in Kansas. Included are the interesting behind-the-scene stories associated with famous paleontologists such as Cope, Leidy, Marsh, Mudge, the Sternbergs, and others. Most of the stories involve embarrassing misidentifications, renaming of species, and other issues that still cause problems with identifications today. The bony fish classification table (p. 79–81) in this chapter cannot be praised enough. Many of these bony fish fossils were called by multiple names in the late 1800s and early 1900s making it quite confusing, so this cheat sheet has already been immensely helpful for me. For example, five bony fish specimens that Charles H. Sternberg collected for Park University were all shipped with Sternberg's classification terms. None of the five names listed by Sternberg are used today. The chapter also includes detailed descriptions of morphology and behavior of many of the species listed in the classification table.

Chapter 6, "Turtles: Leatherback Giants," is a short chapter. Everhart does go into as much detail as possible when discussing the turtles, but there is just not much to report. To summarize the chapter—complete specimens are rare, most are skulls, and most of those are from *Toxochelys*. Chapter 7, "Where the Elamosaurs Roamed," gets readers back to what most are probably seeking: sea monsters. This chapter once again conveys the early history of elasmosaur fossils but with one of

the finds delivering an odd set of circumstances. It appears very likely that one specimen was found in sections by four different collectors over a period of 131 years. The end of the chapter discusses the functional morphology of the neck, eyes, nostrils, and gastroliths of long-necked plesiosaurs. Everhart does point out, especially to scientific illustrators, that a long neck has its functional limitations. Just like a *Tyrannosaurus rex* did not drag its long tail, *Elasmosaurus* was not designed to support a long neck straight up and out of the ocean, especially in a curved swan-neck position. The portion of the chapter that I enjoyed, but which may not be as interesting to most readers, is the section on *elasmosaur* gastroliths. The author obviously has experience collecting, identifying, and studying gastroliths, but he might have considered deleting one of the three gastrolith figures to gain another figure elsewhere in the chapter or book.

Chapter 8, “Pliosurs and Polycotyliids,” is one of the shortest chapters in the book at 13 pages. The history of several finds, including one plesiosaur theft from the field in 1971, was a good start, but this was the only chapter that did not seem quite as complete. Perhaps it could be expanded if a second edition were ever created. Chapter 9, “Enter the Mosasaurs,” is the opposite of Chapter 8, with every page stuffed with information about mosasaurs, famous finds, and stratigraphy. Like the table on bony fish in Chapter 5, there are three useful tables on mosasaurs in this chapter. The chapter definitely gives complete coverage to mosasaurs. Proof of this is the discussion on shell-crushing mosasaurs, which are not common in Kansas.

Chapter 10, “Pteranodons: Rulers of the Air,” takes us in a slightly different direction. Which organisms were flying and why were they flying over a large sea in the Cretaceous? This chapter covers early pteranodon finds and descriptions by Cope, Marsh, the Sternbergs, and others. Included is one story of how identifying fish teeth as pteranodon teeth can take paleontologists down the wrong path for years. Pteranodons seem to be portrayed by these early paleontologists as relatively common, but as Everhart points out (p. 191), “In the years I have spent collecting in the chalk, I have only found half a dozen sets of remains, most of which were very fragmentary.” Since these flying reptiles were most likely only passing by this large expanse of water, it seems logical that the remains would be rare. As Everhart suggests on page 214, these pteranodon fossils were the old and sick individuals unable to keep pace during a migration or who perhaps encountered a bad weather day in Kansas. Perhaps Kansas was known for their Cretaceous waterspouts before their Holocene tornadoes? The functional morphology to generate and sustain flight by pteranodons is also discussed. Chapter 11, “Feathers and Teeth,” stays with the flying theme but focuses on a group that is commonly forgotten—the aquatic birds. This would be an easy topic to disregard and add another ten pages about sharks or mosasaurs, but the author has taken the time to focus on the fauna of the Cretaceous of Kansas. Obviously, where there are fish there would have been aquatic birds, and the middle of the Western Interior Sea definitely has its share of bird fossils, making them an essential group to mention.

Chapter 12, “Dinosaurs?,” is perhaps going to help sell extra copies because it has the “D” word in it, but honestly dinosaurs in Kansas is a story worth telling! For those supporters of the bloat-and-float concept of transportation, this chapter contains several

classic examples. The chapter covers all six sets of dinosaur remains (one hadrosaur and five nodosaurs) ever discovered in Kansas and includes the fossil collector, the details of the find, and the specific bone(s) recovered.

Chapter 13, “The Big Picture,” is a nice breakdown of the late Coniacian, Santonian, and early Campanian of the Cretaceous. The author has very generously broken the information housed here into a table on pages 244–246. In other words, if you have read this book and have some of the basics in your head, this three-page cheat sheet has all the answers to the fauna of the Cretaceous of Kansas.

Unfortunately, no book is perfect and there are a few items I will mention that are probably more my selfish wishes versus real problems with this book: 1) While reading this book, I found myself wondering if it were written for amateurs interested in fossils or professionals in vertebrate paleontology. Most chapters open with the fantastic imagery of a fictional novel that novices would like or that would help them visualize and comprehend the Western Interior Sea, but then later in the chapter the scientific names become so overwhelming that it would take an experienced paleontologist to fully appreciate them. In the end, perhaps Everhart created something for everyone by writing portions for a novice and portions for an expert in each chapter. It is worth pointing out that any novice would quickly become an expert on the Cretaceous of Kansas if they did absorb the wealth of information presented in this book. 2) Another minor issue for me is the fact that so many name changes have occurred with these fossils over the years that it would be helpful for Everhart to complete what he already started in some portions of the book, specifically by providing lists that incorporate previous classifications. For example, on page 80 he uses *Bananogmius* Whitley 1940 (*Anogmius* Cope 1877) or *P. evolutus* (Cope 1878) = *B. polymicrodus* Stewart 1898 to help clarify the classification. Unfortunately, Sternberg and others used different names than the currently established taxonomic list on pages 79–81. Sternberg constantly refers to *Portheus* in his notes, so if the book included all these variations, such as *Xiphactinus* = (*Portheus*), it would make a useful book even more useful. It might actually be easier to make an appendix that would function as a guide for all the classification variations (misidentified, renamed) that are associated with these fossils. 3) I am a visual person so I love the eight pages containing 12 color plates, but I wish there had been more coverage in some of the chapters. The obvious omission is bony fish, which have a lengthy chapter in the text, but only one plate. If there were an endless supply of money for publishing, I would add some additional color plates. An *Elasmosaurus* platyurus to support Chapter 7 and a bloat-and-float nodosaur to support Chapter 12 would be welcome additions. I would like to see the addition of *E. platyurus* because there is no complete skeleton or detailed illustration of an *elasmosaur* in Chapter 7. A good illustration would also support Everhart’s comments on the myth of long-neck plesiosaurs raising their necks up out of the sea. I recommend cutting one of the three gastrolith photos at the end of Chapter 7 and substituting one very detailed *elasmosaur* image. The last suggestion for an additional figure would be for the Introduction or Epilogue. There is a map of the Western Interior Sea in the Introduction (p. 6), but a series of three or more maps might help the reader understand the rise

and fall of sea level during the Cretaceous; even a Vail sea-level curve would suffice.

Overall, at \$39.95 for a hardback book, Everhart's book is more than just a fun read. It is a reference book for the fauna of the Cretaceous and, for that reason, the price is a steal for the scientific information housed within these pages. The book also does a great job of delivering valuable, detailed information about the specimens, such as who collected them, when they were collected, in what rock unit, if it is a type specimen, museum numbers, and other useful information. Many authors would probably skip some of these important details since they are very cumbersome to manage, but it is obvious to me that Everhart's years of experience have taught him that sometimes the smallest detail can help another paleontologist now or perhaps even 100 years from now.

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