The Paleontograph

A newsletter for those interested in all aspects of Paleontology
Volume 2 Issue 2 February, 2013

From Your Editor

Welcome to our latest issue. Spring is nearly here and I am starting to plan my field season. That is something I always look forward to doing. It means I'll have some fun and see some friends. Maybe I'll even find a fossil or two. I had a good time at the Tucson show. In my mind there was not much new to see. Much of the usual stuff and prices were higher.

I did get a couple of articles in. Thanks for that. I need more so keep them coming. For next month, Alan Russo sent in an article on collecting that includes a lot of pictures. I think you will enjoy it. This month Bob has provided some good stuff on various topics and our German Correspondent, Frank Hasse offers a review of a book that he really enjoyed.

The Paleontograph was created in 2012 to continue what was originally the newsletter of The New Jersey Paleontological Society. The Paleontograph publishes articles, book reviews, personal accounts, and anything else that relates to Paleontology and fossils. Feel free to submit both technical and non-technical work. We try to appeal to a wide range of people interested in fossils. Articles about localities, specific types of fossils, fossil preparation, shows or events, museum displays, field trips, websites are all welcome.

This newsletter is meant to be one by and for the readers. Issues will come out when there is enough content to fill an issue. I encourage all to submit contributions. It will be interesting, informative and fun to read. It can become whatever the readers and contributors want it to be, so it will be a work in progress. TC, January 2012

Edited by Tom Caggiano and distributed at no charge

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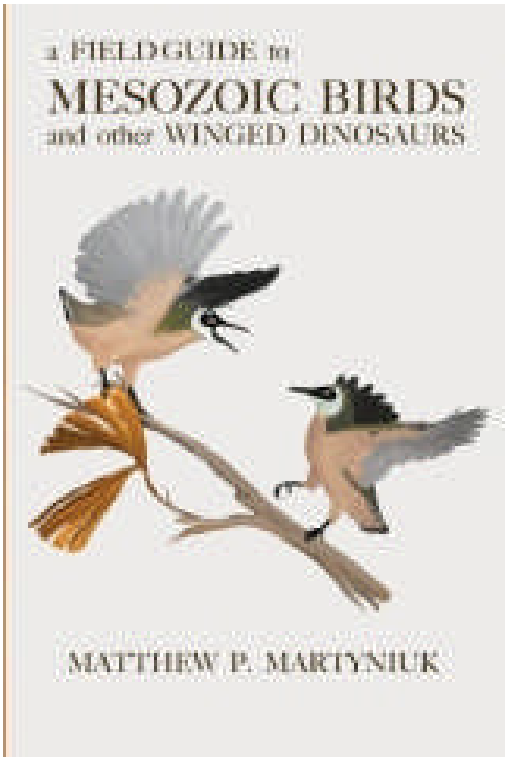
A Field Guide to Mesozoic Birds and Other Winged Dinosaurs- A Review

Bob Sheridan January 12, 2012

I don't know much about Mesozoic birds aside from what I know about feathered dinosaurs, so when I saw "A Field Guide to Mesozoic Birds and Other Winged Dinosaurs" on Amazon.com, I knew I had to buy it. The author Matthew Martyniuk is an illustrator and educator specializing in early birds. As you might expect from the title, the format of this books is a "field guide," very much like the type used by birdwatchers. There is about 40 pages of introductory material: Bird Ancestry, The Origin of Feathers, Restoring Mesozoic Birds, etc. Then we get to the field guide itself. For about 200 species, this book lists the common name, the scientific name, the location and time (e.g. 80 Myr. ago), size, characteristics, and something about the expected lifestyle. This material is fairly detailed and very up to date.



Of course, Mesozoic birds do not have a common name the way living birds do (e.g. "blue-footed booby"), so for the field guide, one must use the translation of the scientific name: "*Sinornithosaurus millenni*" becomes "Millennial Chinese Bird Lizard." For each bird there is a silhouette against the outline of a man for scale and a picture of the bird restored as a living animal, some with some striking colors.

A lot of animals we think of as classic dinosaurs, for example Deinonychus and Oviraptor, are restored as birds, fully covered in long, sometimes brightly colored feathers. This is within the realm of plausibility, certainly--who can say where feathered dinosaurs end and birds begin, but it is a departure of what is normally done in most paleoart.

Appendices include the list of excluded species (for which the remains are not sufficient to say much) and cladistic definitions of the bird groups.

Certainly, this book will help you with the names of Mesozoic birds, and learn who is in what group, who has teeth and who doesn't. On the other hand, if the idea is "science" rather than "art", the "field guide" format is not helpful. Feathers are preserved for only a few dozen dinosaur/bird specimens, and we can guess the feather coloration for at best a handful based on the shape of melanosomes in their preserved feathers. The restorations correctly show the shape of the beak, the length of the neck, and the length of the legs. However, the length of the feathers and the coloration for the large majority of the birds in this book is pure fantasy, and there is no obvious way to guess the level of reliability of the restoration from the picture alone. Moreover, having only the restoration, works against us learning something interesting about the differences between bird groups. For example, if one wanted to see the difference between enantiornithines ("opposite birds") and early "true birds," one would have to look at the details of the skeleton, in this case the joint between the scapula and coracoid.

So I would look elsewhere for a treatise on early birds. As with "All Yesterdays", this book is expensive ($37) for a small paperback.

Sources:

Martyniuk, M.P.
"A Field Guide to Mesozoic Birds and Other Winged Dinosaurs."
Pan Aves, Vernon, NJ 2012, 192 pages

Triassic Vorticella

Bob Sheridan January 19, 2012

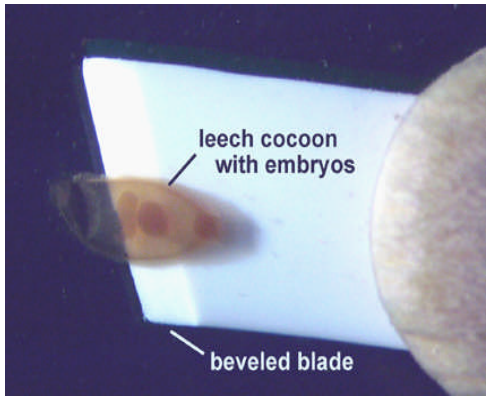
When I was young, photomicroscopy was one of my major hobbies. I examined a lot of pond water, and recognized a lot of different fresh water protozoa (single-celled animals). One of my favorites was Vorticella. This is a largish ciliate (largish for a protozoa-- ~100 micrometers long) with a "bell-shaped" body (more like the bowl of a wine glass to me) and an attachment stalk 3-5 times as long as the body. When the animal is disturbed, the stalk tightly coils into a "spring." Vorticella can break free from the stalk, swim to another location (in a form called a "telotroch"), attach, and grow a new stalk. Vorticella are often found in large groups.

A Modern Vorticella

Another part of our story deals with leeches, those blood-sucking segmented worms. I was not previously aware that they lay eggs in "cocoons." The cocoons are made of polysaccharides and fibrous proteins and solidify into rigid capsules with a spongy texture on the outside. Fossil leech cocoons are not uncommon.

Bomfleur et al. (2012) describe fossils in Triassic mudstone from Timber Peak, eastern Antarctica. To release organic material, the mudstone was treated with hydrofluoric acid for several months. Fossils in the organic residue were examined with a light microscope. Leech cocoons were easily picked out of the organic material. These are large, 1-2 centimeters long, and resemble those of modern leeches such as Hirudo.

Within the capsule was discovered an animal with a 25 micrometer-long teardrop-shaped body at the end of a coiled stalk. It is indistinguishable from a modern Vorticella in its details, including the horseshoe-shape nucleus and the spasmoneme fiber in the stalk. This implies that the outward appearance of at least some protozoa have not changed for hundreds of millions of years.

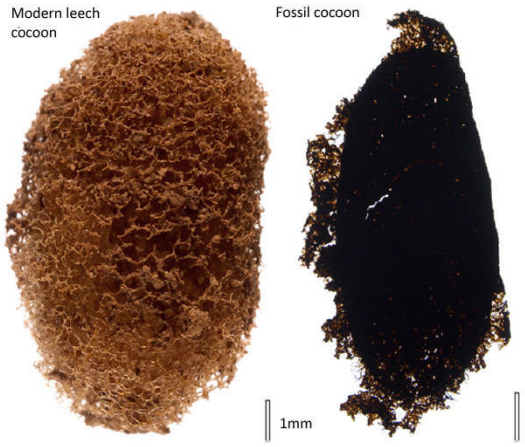


A Modern Leech Cocoon

It is very uncommon for protozoa, which are tiny and have no hard parts, to be preserved as fossil. However, there have been several examples of microscopic animals preserved inside fossil leech cocoons, as described here. In that sense one may regard leech cocoons, not just as fossils by themselves, but as a kind of "amber" preserving soft-bodied animals, and the contents of the cocoons ought to be examine routinely.

Sources:

Bomfleur, B.; Kerp, H.; Taylor, T.N.; Moestrup, O.; Taylor, E.L. "Triassic leech cocoon from Antarctica contains fossil bell animal." Proc. Natl. Acad. Sci. USA 2012, 109, 20971-20974.

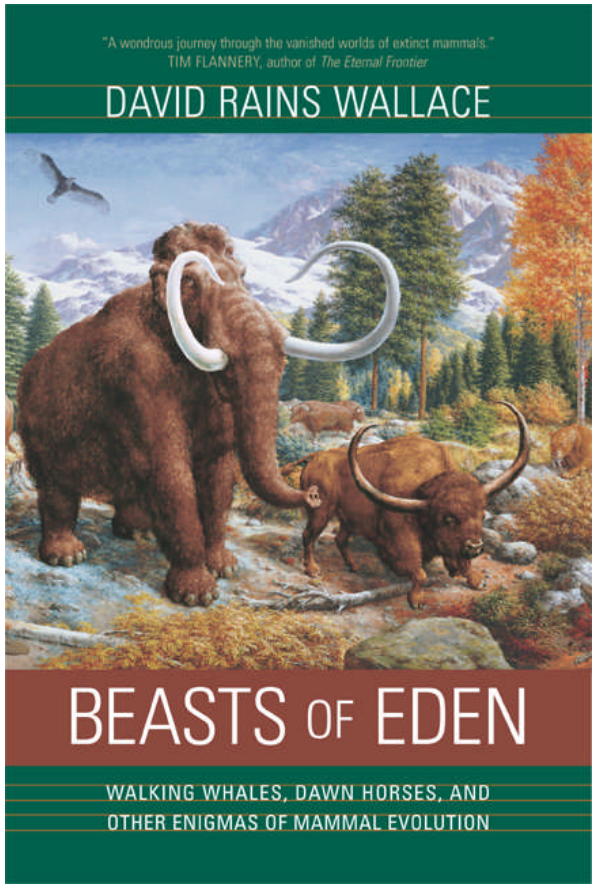


The Beasts of Eden

Review by Frank Haase, 2012.

This book purports to be an evolutionary history of the mammals, illustrated with snapshots of those who discovered fossils, interpreted them, and contributed to hypotheses of evolution. The author's guide in this excursion is Rudolf Zallinger's mural at the Yale Peabody Museum, *The Age of Mammals.* The mural plays the role of Virgil to Wallace's Dante, leading him through time and space to explore the murky events that developed the recent understanding of the origins of the mammals (and of our own).

My interest in this book was sparked by a review written by Bob Sheridan, which I noticed while compiling an index of Paleontograph articles. Bob's insightful comments and positive appraisal stimulated me to obtain a copy for myself. This proved to be difficult as the book is out of print. I finally found one on the Island of Jersey (English Channel), and delivery took more than a month. So I was understandably eager to delve into its promised riches. Chapter One begins with early finds of mammals, involving the familiar figures of Mantell, Buckland and Cuvier. Citation of people, places and things made the story seem factual, readable and reliable. I admit that the author's facile style easily led me deeper into the text. By Chapter Two I began to sense that Mr. Wallace had a personal list of heroes and villains who would introduce controversies and encourage the reader's interest in the customary tabloid manner. He was obviously enamoured of Stephen J. Gould, and used his pulpit to besmirch the characters of pioneers of paleontology. Wallace's favorite enemy is Henry Fairfield Osborn. Throughout the text, he is slightingly referred to as, "King Henry" without justification. Like Gould's treatment of Walcott, de Chardin and others, the targets of Wallace's scorn are long dead. There are living paleontologists who could be similarly criticized, but are not. This is because they are alive, and there are such things as libel laws.



As chapter followed chapter, disenchantment with the author grew despite his winning style. I began to see him as a post-modern, deconstructionist storyteller. For such people, anything spoken or written is simply a story without any intrinsic reality, and as a story, it can be rewritten and retold indefinitely. (Possibly, this philosophy originated within the legal profession. It is certainly widespread in the business community. And we won't mention politics.) This attitude is a growing trend among the younger generation; it is taught in our schools. Those who are unwilling to make the effort of learning consider this "liberating." Unfortunately, this produces successive generations that are increasingly error-prone and incompetent. In evolutionary terms, this is maladaptive behavior leading to extinction.

Cont'd

Beasts Cont'd

Mr. Wallace authoritatively presents a number of errors of fact, which will be absorbed and perpetuated by the uninitiated. Reading further, I learned more about the author than about the subject. I realized that he is not a paleontologist, biologist, chemist, or geologist. He is apparently innocent of Latin and Greek, and his translations of scientific names, to put it mildly, leave much to be desired.

Lest I leave a totally negative impression, the impulse toward balanced treatment leads me to add this: Advertising made me aware of a new genre of literature referred to as "Bathroom Reading." And some of us no doubt recognise the implications of running out of bathroom tissue (formerly known as toilet paper) just when diarrhea strikes. And so, I like to think that there is indeed a use for everything. Nonetheless, "Eden" in the title will remain meaningless to readers of Torah, Bible and Kur'an.

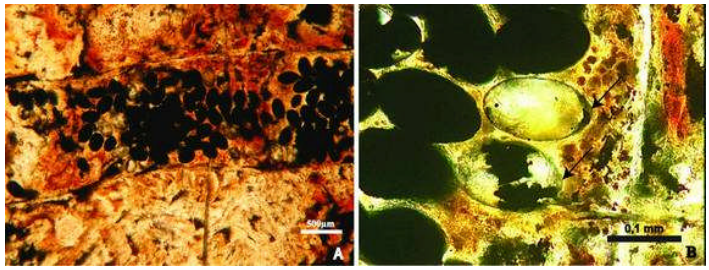
The Beasts of Eden
David Rains Wallace, 2004.
University of California Press, Berkeley and Los Angeles. pp. 340, ISBN 0-520-23731-5.

Permian Tapeworm Eggs

Bob Sheridan February 9, 2012

Two weeks ago I summarized a paper wherein a Vorticella-like protozoa was found in a fossilized leech egg cocoon. This week I am summarizing the paper of Dentzien-Dias et al. (2013), which continues the theme of unexpected preservation of soft-bodied tissue inside some kind of protective casing. These authors studied a shark coprolites from the Rio de Rasto Formation (mid- to late-Permian) in southern Brazil. The coprolites, typically a few centimeters long, were studied by transverse section. The coprolite is cut and ground flat and inspected by light microscopy. Typically, coprolites of sharks contain fish scales and bone fragments, as do these specimens.

One particular specimen is unusual in that it contains a cluster of several dozen ovoid bodies that are ~150 micrometers in length. Most are dark and filled with pyrite and/or hematite. These bodies closely resemble tapeworm eggs in a number of characteristics. The bodies are of the right size and shape, and seem to have an operculum (a small "lid") at one end. It is typical for tapeworms to release body segments called proglottids containing large amounts of eggs, and seeing many eggs in a mass is consistent with this. One "egg" contains what appears to be an embryo. The authors interpret structures on the embryo as "hooklets" which would be also characteristic of tapeworm anatomy. The authors admit that there is not enough information to identify the specific class of tapeworm, or completely eliminate the possibility that the eggs are from some other kind of parasite.



The Eggs

The presence of pyrites indicates that the fossils were formed under anoxic conditions, and this helped preservation. The authors interpret the environment in which the coprolites fossilized as a shrinking freshwater pond that trapped a number of fish in a small area; this would explain why there are so many coprolites. Freshwater sharks were common in the Paleozoic.

It is quite rare to find parasitic eggs in coprolites, and this is the earliest known example. The presence of parasitic tapeworms, at least among fish, is established as early as the Permian

Sources:

Dentzien-Dias, P.; Poinar, G. Jr.; de Figueiredo, A.E.; Pacheco, A.C.L.; Horn, B.L.; Schultz, C.L. "Tapeworm eggs in a 270 million-year-old shark coprolite." PLoS ONE 2013, 8, e55007.

The Curvature of Bird Claws and Lifestyle

Bob Sheridan January 27, 2012

A number of studies of extinct birds and dinosaurs have used the curvature of the foot claws as an indicator of lifestyle. This has intuitive appeal. One would expect the claws of perching birds to need to curve around branches, and one would expect ground birds to have straighter claws. But are these expected correlations really true? The only way to decide this is to look at living birds where the lifestyle is known.

A recent study by Birn-Jeffrey (2012) compiles data on a large number of extant species of birds and lizards. (The number of species here is much larger than in previous studies.) Also examined are a handful of small dinosaurs, including Archaeopteryx. These authors measured the "inner curvature," "outer curvature," and "relative thickness" (side to side width relative to the length) of the foot claws, in particular digit III (the middle digit--usually the longest). Note that the claw curvature of the living animals is measured using the keratin part of the claw, whereas the curvature of only the ungual bone could be used with the dinosaurs. (The authors admit this could be an issue because the relationship of the keratin and the bone is not well studied.) Lifestyles were assigned to the birds and lizards as follows: ground, perching, climbing, and predatory.

The results are someone underwhelming. Ground birds have inner curvatures on the average less than the other lifestyles. The outer curvature of climbing birds may be slightly larger than that of the other lifestyles. Larger birds have lower inner curvatures, regardless of lifestyle. However, the overlap among the different lifestyles in any of these parameters is very large, so that the correlations above are very weak and may not be statistically significant. The differences between lifestyle seem mostly about the range rather than average values. The perchers have the least variation in curvature, and ground birds the most.

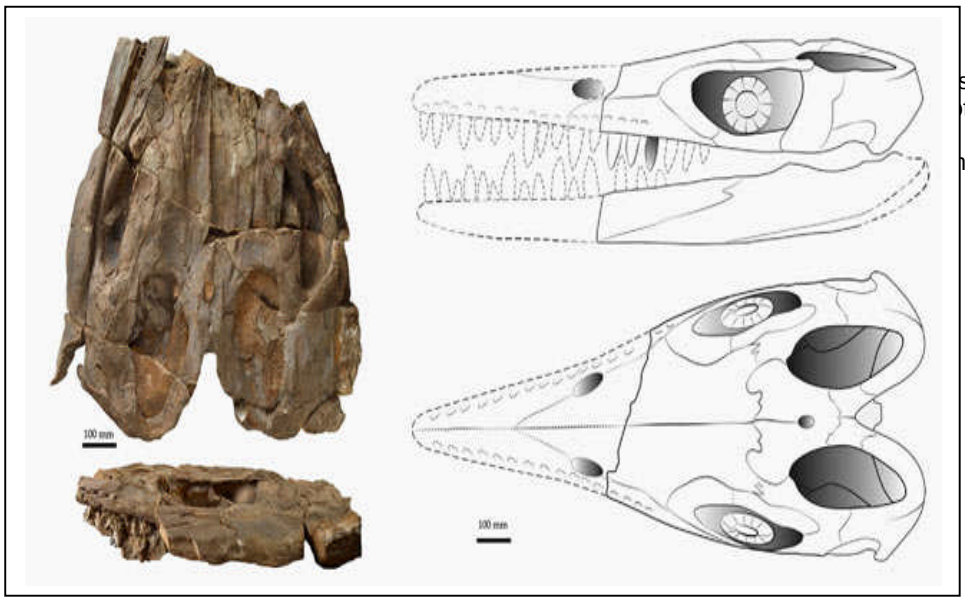
The distribution of dinosaur claw curvatures and relative thickness is very similar to that of extant birds. In particular, one notes that different specimens of Archaeopteryx are very variable, covering the whole range.

It would seem almost impossible to predict the lifestyle of any one bird (or dinosaur) species by looking at the curvature of its claws.

Why claw curvature is of so little use in predicting lifestyle is not clear. The authors suggest a few possibilities. The most obvious is that claws are used for a number of purposes; for example, predatory birds use their claws to perch but also to grab prey. Another is that several claw designs are compatible with any given lifestyle. Finally, it is possible that claws do correlate with lifestyle, but not the lifestyles that are defined here.

Sources:

Birn-Jeffrey, A.V.; Miller, C.E.; Naish, D.; Rayfield E.J.; Hone, D.W.E.
"Pedal claw curvature in birds, lizards, and dinosaurs - complicate categories and compensating for mass-specific and phylogenetic control."
PLoS ONE 2012, 7, e50555.



The skull of *Thalattoarchon saurophagis* in dorsal and left lateral view, Right: reconstruction of the skull. scale bar= 100 mm (Fröbisch NB et al)

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Giant Triassic Ichthyosaur with Unusual Teeth

Bob Sheridan February 2, 2012

The diversity of ichthyosaurs peaked in the Triassic, and we are constantly discovering new ones from that time with unexpected anatomical features. Recently Frobisch et al. (2013) described a new ichthyosaur specimen from the Favret Formation (Middle Triassic) in Nevada. This specimen consists of the rear half of a skull, the axial skeleton, the pelvic girdle, and parts of the hind fins. The authors have assigned the name Talattoarchon saurochophagis ("reptile-eating ruler of the sea").

Talattoarchon is estimated to be above 8.6 meters long, which makes it the third or fourth largest ichthyosaur known. (Himalayasaurus at ~15 meters is probably the largest.) The skull is large compared to the rest of the body and the eye sockets are large. Phylogenetic analysis shows that Talattoarchon is a fairly primitive ichthyosaur in the Merriamosauria family, not surprising since it lived so early.

Unfortunately, most of the snout of Talattoarchon is missing (plus the skull is crushed from top to bottom) and we have only the rear-most teeth. However, the teeth are the most unusual feature about this animal. Instead of the conical and/or peg-like teeth of most ichthyosaurs seen after the Triassic, they are flattened from side to side and have "cutting edges" (although no serrations). The preserved teeth are also larger compared to the skull than in most ichthyosaurs, and the teeth in the middle of the snout were probably even larger. Clearly, those teeth would be more of a cutting tool, as opposed to grabbing or crushing.

An aside from your writer: The assumption seems to be that blade-like teeth are sufficient to declare an animal an apex marine predator that attacked large animals. I presume that no one is claiming the converse, that such teeth are necessary. After all, giant mosasaurs from the Cretaceous have curvy conical teeth, rather than blades, and one must assume they must have gone after big prey. Similarly with very large pliosaurs and killer whales.

Sources:

Frobisch, N.B.; Frobisch, J.; Sander, P.M.; Schmitz, L.; Rieppel, O.
"Macropredatory ichthyosaur from the Middle Triassic and the origin of modern trophic networks."
Proc. Natl. Acad. Sci. USA 2013, 110, 1393-1397.