

Review of "First remains of the enormous alligatoroid *Deinosuchus* from the Upper Cretaceous Menefee Formation, New Mexico (#45372)"

General comments:

Introduction: From reading the introduction, I did not get a sense of why this occurrence is important. Is it important for crocodilians? The authors mention the Menefee Formation is from a region that is poorly sampled and I commend them for increasing sampling, which is greatly needed. However, the Campanian of North America tends to be fairly well sampled (compared to earlier Cretaceous time intervals), so some additional discussion for why we need better sampling in southern Laramidia is warranted. I believe this will greatly strengthen the importance of this occurrence.

Geologic Setting and Fossil Occurrence: This section should be moved directly after the Introduction and before the Systematic Paleontology section rather than splitting up your Systematic Paleontology section into two parts.

I appreciate the great detail the authors provide for the fossil site, however, this section tends to jump around a bit. This section starts with a general overview of the Menefee Formation, then describes the Allison Member (where the specimens were collected) and then to the overlying formation. The exact positioning of the specimens are then described (again, greatly appreciated), but then the authors describe the local stratigraphic sequence before ending with a description of the flora and fauna found (with an interpretation of the depositional setting). I would suggest the authors rearrange this section so it flows in a more logical fashion from the general stratigraphic framework of the region, then moving to a fuller description of the Menefee Formation (including a brief description of all members), before describing the local stratigraphic sequence. The authors should then end this section with the specific description of the site and the fauna.

Discussion: The authors argue that WSC 285 should be referred to *Deinosuchus* based solely on the osteoderm morphology. The authors do a good job of describing some differences in osteoderms based on the three described *Deinosuchus* species. Since the authors provide images of *D. hatcheri* osteoderms, I suggest they include images from the other two named species so the reader can refer to the figure to understand that WSC 285 is morphologically compatible with *Deinosuchus*. The authors should expand their comparison among the scutes of the three species directly to their specimens as well as to closely related taxa in order to convince the readers that the scutes are diagnostic enough to warrant generic classification. In lines 228–233, it becomes confusing on whether morphological characters are sufficient on assigning these osteoderms to *Deinosuchus* or if size is the best differentiating factor.

While the novelty of this specimen is clearly assessed as a first occurrence of *Deinosuchus* from the Menefee Fm., I am not entirely convinced on the importance of this study. The new specimen increases the number of formations this taxon is found in, the impact of this fact is not well argued in this manuscript. The authors attempt to argue that this may represent the oldest specimen of *Deinosuchus* from Laramidia, yet do not clearly identify

the age ranges of all other potentially oldest specimens. This is most clear from the omission of the age range of the *Deinosuchus* specimen from the lower shale member of the Aguja Fm, which is estimated to the 82-80 Ma, older than the specimen from the Menefee Fm (Lehman et al., 2019). Therefore, this specimen is not the oldest specimen from Laramidia, drastically reducing the importance of this find. Due to this and the fact that the authors do not provide any further meta-analysis on *Deinosuchus* to their manuscript, this manuscript appears to be incomplete and lacks sufficient impact for publication. This is especially apparent in the discussion where the authors begin to argue about the potential radiation and origination of this taxon, but fail to make any meaningful conclusions. Did the volcanic island chain provide a path to cross between Laramidia and Appalachia or did the different species on either side of the Western Interior Seaway evolve via allopatric speciation? Both options are provided, but no further evidence is provided for or against either hypothesis. Again, the authors go back and forth between whether *Deinosuchus* was capable of surviving in marine settings. In Appalachia it appears that *Deinosuchus* was capable of tolerating saltwater, yet in Laramidia, *Deinosuchus* is primarily associated with terrestrial environments. Perhaps this is a species-specific trait rather than a generic-level trait? In order to have a seemingly more complete and impactful paper, I suggest the authors do one of two things: either provide additional meta-analyses on *Deinosuchus* distribution within the fossil record and a direct comparison of scute morphology among all known species, or include this description and discussion of *Deinosuchus* along with a full description of the fauna. As the manuscript is currently written, it seems to be a subset of a faunal description similar to Lehman et al. (2019) focusing entirely on *Deinosuchus*.

Specific comments:

Lines 95–96: I do not quite understand the importance of the quote from Pike (1947). Is this significant for identification of the member the specimens were collected from? Additional context and perhaps discussion is warranted here.

Lines 122–130: So were the two in situ vertebrae above the small "shelf" or directly lateral? Was the single osteoderm found in situ or collected as float? If collected as float and not in situ, how do you know this is from the same individual? If the locality is as steep as you say, I would expect all surface collect from the same individual would be below. Some clarification here would be appreciated.

Lines 162–175: This section does not actually describe your specimen, so should be moved to the Discussion section.

Line 189: cross-hatching?

Line 204: "...tapering to around half its basal length at its broken apex." Since the tip is broken, is this important to note? The actual apex would have been even shorter but there is no way of knowing what that length would have been.

Lines 264–267: This should be in the Geologic Settings section (and part of it is a repeat).

Lines 267–268: "...herein reported from the Juans Lake Beds..." You reported this in the introduction and the Geologic Settings.

Lines 270–277: You claim the age range of your specimen is 80–79 Ma, yet only justify why it is older than 78.5 Ma. Why decide to cutoff the youngest range at 79 Ma instead of just older than 78.5 Ma, which would be more precise? What is the justification for younger than 80 Ma if the lower boundary of the Menefee Fm. is estimated at 84.0 Ma?

Lines 279–305: You claim that the Menefee *Deinosuchus* is one of the oldest records from Laramidia, yet for most of the formations in Laramidia, no age ranges are reported (except for the Kaiparowits and Judith River fms). It is vital to your conclusions that you provide age estimates for the specimens from the lower shale member of the Aguja Fm., upper shale member of the Aguja Fm. in Texas and Coahuila, and the Wahweap Fm. According to Lehman et al. (2019), the *Deinosuchus* from the lower shale member of the Aguja Fm. is around 82–80 Ma, which is older than your specimen. Also provide age ranges for the Blufftown and Mooreville fms. You discuss the younger records in Laramidia, yet omit these records from Appalachia. Please provide ranges and ages from the other formations mentioned in North Carolina and New Jersey.

Lines 295–297: "...reported *Deinosuchus* from the Demopolis Formation... Mississippi." Is it important to separate out the Mississippi and Alabama occurrences if they are from the same formation? Do they have different reported ages? This sentence is a bit awkward as currently written.

Line 300: Demopolis Chalk or Formation? Are these two separate units? If not, be consistent.

Lines 311–316: You contradict yourself in these two sentences. First you say they could not have crossed the WIS, but then immediately state that it was possible via the presence of a volcanic island chain. Please clarify this section. Over the next few paragraphs you provide evidence suggesting *Deinosuchus* was not euryhaline, yet then state that specimens have been reported from brackish facies. I suggest that the authors synthesize the data and make a conclusion based on these facts. Is *Deinosuchus* purely terrestrial or was this taxon capable of living in brackish/marine facies?

Lines 364–366: This all depends on the age of the lower shale of the Aguja Fm.

Figure 1: Please consider whether it is useful to include images of the fragmentary specimens WSC 285.4, 285.5, and 285.6. Why is the caudal/cranial view missing for WSC 285.3? I would rearrange D, E, F, G, and H as it is very confusing having G and H above F. It is difficult to visually match F with D and E.

Figure 2: I would also include a cranial/caudal image of CM 963. What is the difference between A, B, and C? This is not specified in the figure caption.

Figs. 1, 3, and 4: If the scale bar is the same for all specimens, you do not need to include multiple scale bars, as I assumed at first they were different scales.

Figure 6: The text underneath the Biochronology Key is difficult to read.