

Comparison of the lower jaw and maxilla of *Homoroselaps lacteus*, *Atractaspis aterrima*, and *Atractaspis irregularis*

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Introduction:

- Due to their burrowing behavior, there is little information available on the ecological traits of burrowing asps. In this study, the lower jaw and maxilla of three venomous African species of burrowing asps were segmented and described; *Homoroselaps lacteus*, *Atractaspis aterrima*, and *Atractaspis irregularis*, commonly called the Sotted Harlequin snake, Slender Burrowing Asp or Mole Viper, and Variable Burrowing Asp.
- It is beneficial to look at the anatomy of these species because it can be used to make predictions about the behavior of these snakes. Looking at the dentary bones could help to learn more about eating or burrowing behavior (Shine, 2006). This could also be useful in comparing these to other snake species.
- A complete morphological analysis was last provided by (Gans, 2008) but only *Homoroselaps lacteus* was shown and not all bones were looked at individually. While *Atractaspis* species have not had a complete morphological analysis, there is generally more information about this family of snakes compared to *Homoroselaps*.

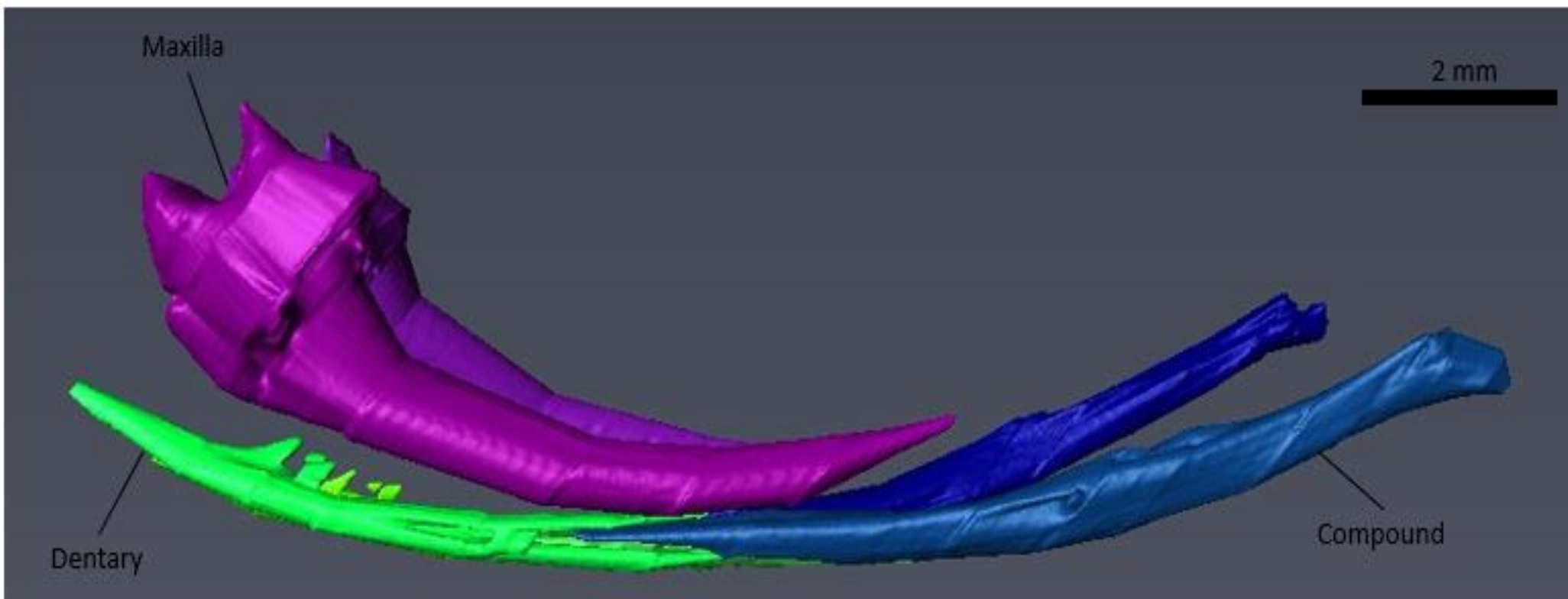


Figure 3. Left Lateral view of *Atractaspis aterrima* lower jaw and maxilla.

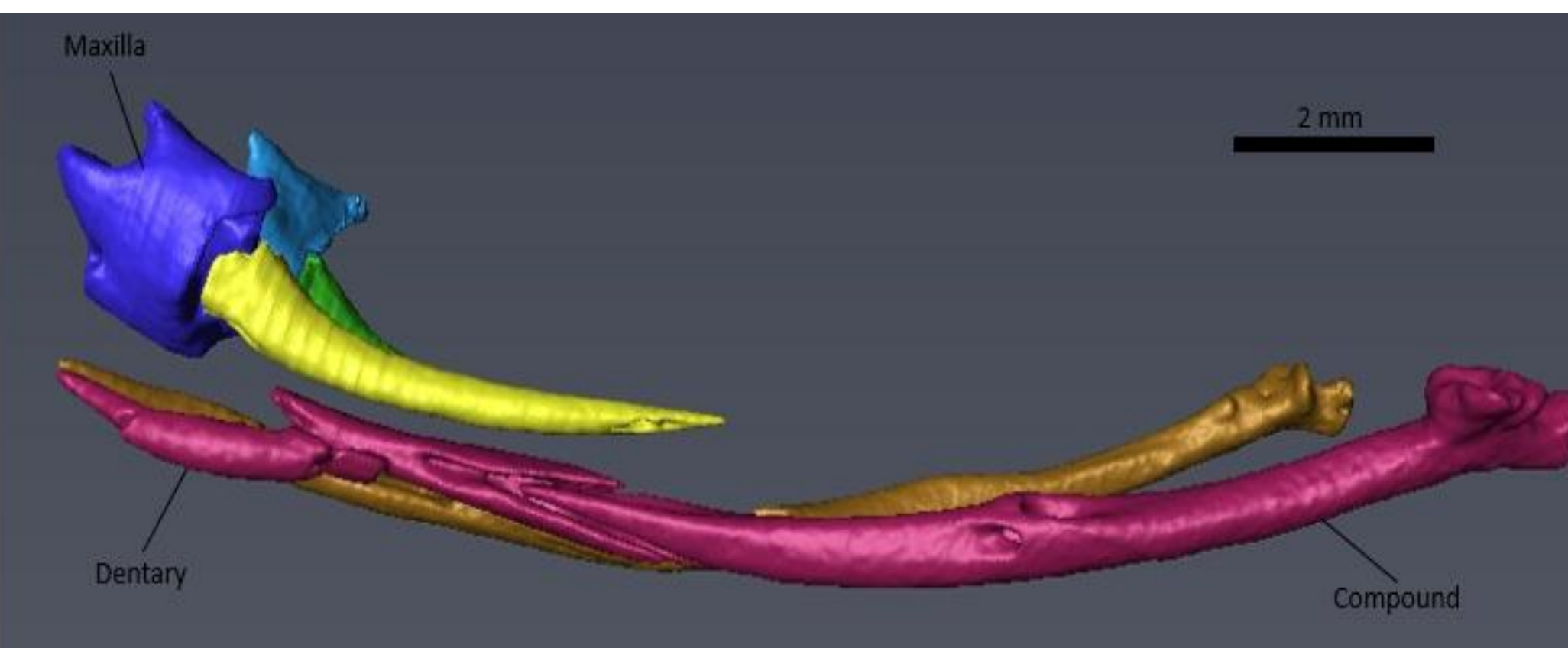


Figure 4. Left Lateral view of *Atractaspis Irregularis* lower jaw and maxilla.

Methods:

- CT scans of three snake species from Africa were segmented to compare the lower jaw and maxilla. The CT scans were put into Avizo software, which allows for the visualization of 3D models. These scans were segmented to show each individual bone of the lower jaw and the maxilla bone.
- Following segmentation, the bones were labeled by comparing them to other literature on the anatomy of snakes close to these on the phylogenetic trees (Gans, 2008; Pyron 2014).
- Screenshots were taken of the bones in lateral, dorsal, ventral, anterior, and posterior planes of view to compare the anatomy of the snakes.
- Anatomical terms and definitions that were used to describe the dentary were based on those of Gomez, (2011) and Comeaux (2010).
- This was used in relation to literature on burrowing asps to determine variation that could possibly explain behaviors otherwise not observable due to the burrowing habits of these species.

Results:

- The jaws of *Atractaspis aterrima* and *Atractaspis irregularis* are very similar which makes sense given that both snakes are within the *Atractaspis* genus. These species have thin, complicated dentary and compound bones with several projections. *Homoroselaps* has thicker compound and dentary bones that are not as irregular and asymmetrical.
- This could possibly be explained by a difference in diet or burrowing behavior. It is possible that *Atractaspis* and *Homoroselaps* have a difference in size of prey, burrowing techniques, or venom delivery systems but that has yet to be determined conclusively.
- The next step of this research would be to completely segment the skull of all three species to further explore possible variation of ecological traits associated with anatomical structure.

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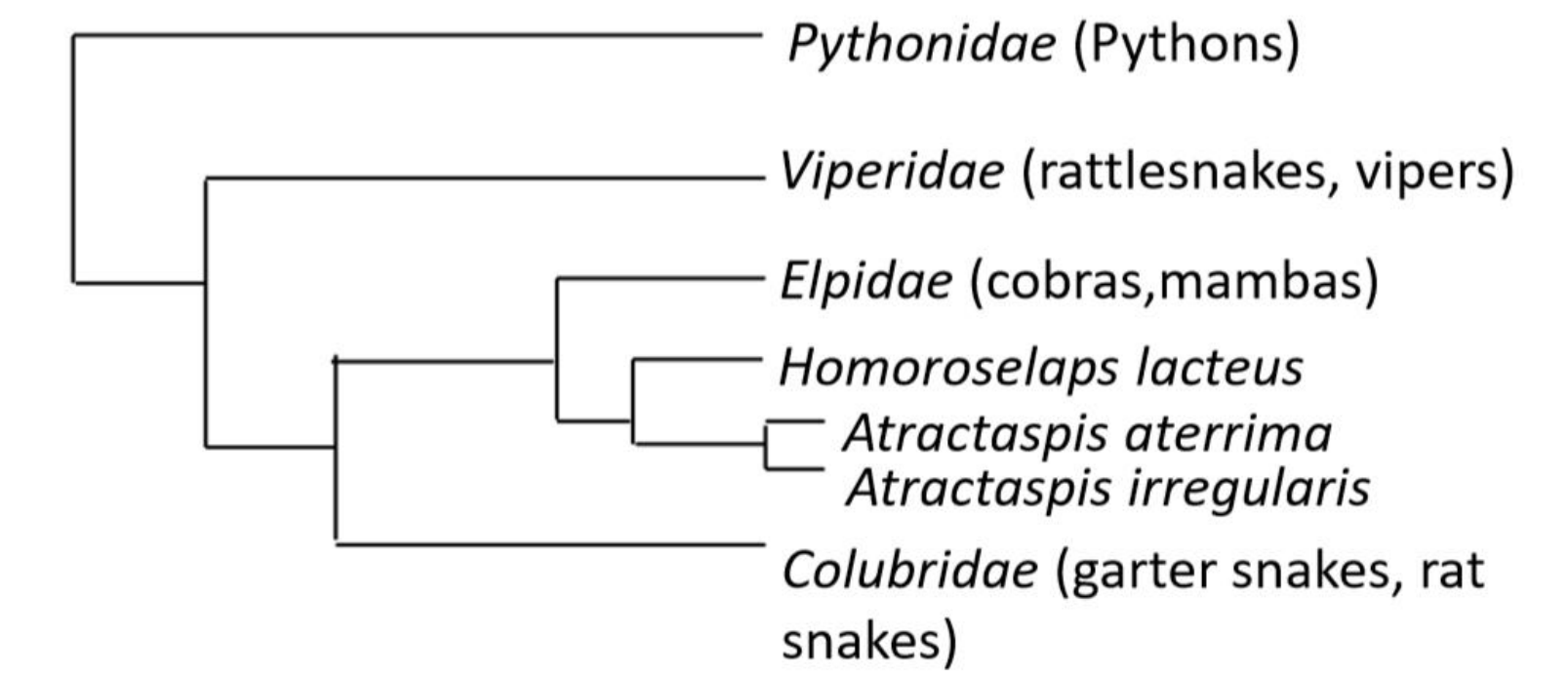


Figure 1. Phylogeny of *Atractaspis* and *Homoroselaps* according to Pyron, et al. (2014).

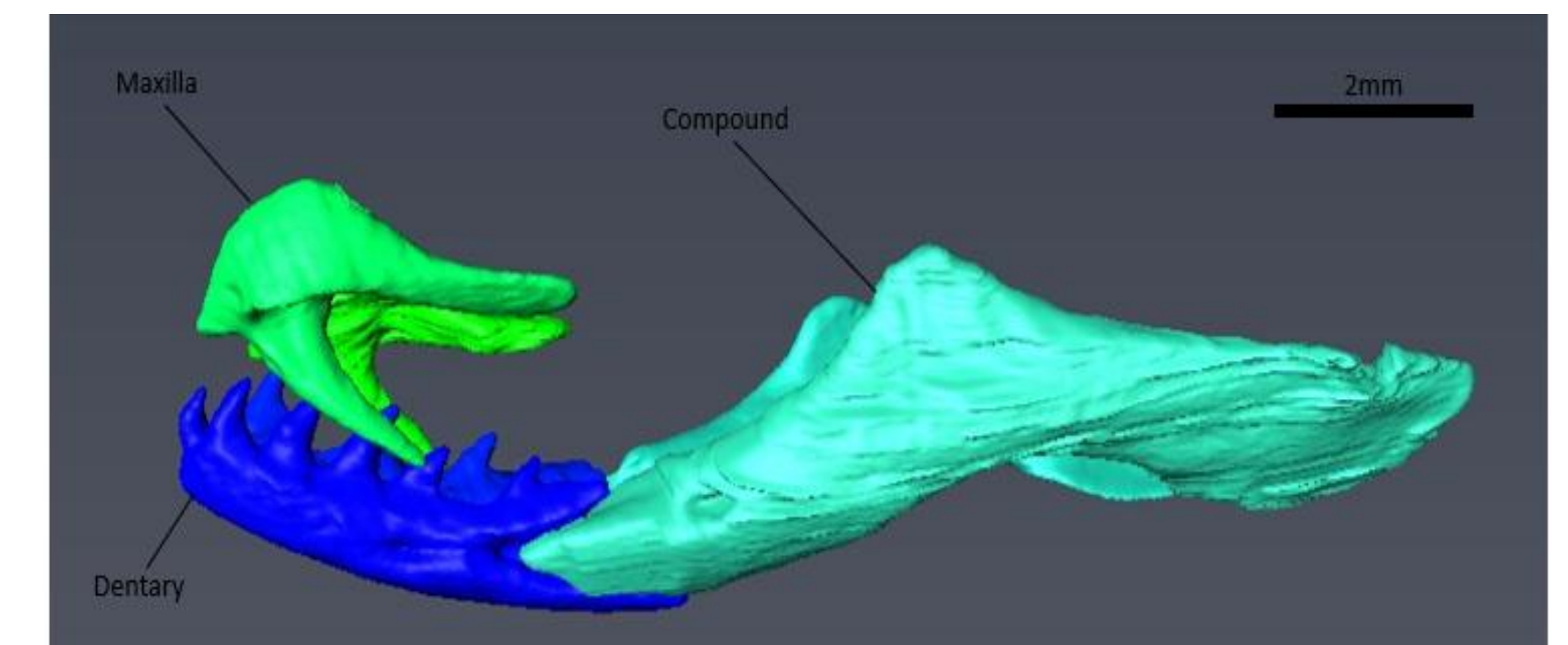


Figure 2. Left Lateral view of *Homoroselaps lacteus* lower jaw and maxilla.

Conclusions:

- One possible reason *Homoroselaps lacteus* has a thicker compound and dentary bone could be due to variation in digging stress that would require them to be able to put in more force in order to burrow properly (Gans 2006).
- *Atractaspis* has a front-fanged venom delivery system and a unique side-strike ability that could give them the advantage of striking their prey to envenomate them, opposed to *Homoroselaps* which could be less venomous. Therefore *Homoroselaps* would not be able to simply strike prey and would rely on thicker jaw bones to have the crushing force needed to kill its prey. (Terrat 2013).
- *Atractaspis* could afford to have thinner, more delicate bones in the jaw because if this species has a stronger venom system, it would be able to simply strike its prey and wait for it to become paralyzed or die instead of relying on strong biting force like *Homoroselaps*.