Tooth Trails: Tyrannosaurid Tooth Measurement and Spacing

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Introduction

- The spacing of the teeth directly impacts how Dinosaurs make contact with objects such as bone, which impacts the spacing of the marks left on the bone.

Figure 1, UALVP 10, Gorgosaurus by Dawn Graves

- Tooth wear marks are also left on the teeth themselves from where they contacted the bone.

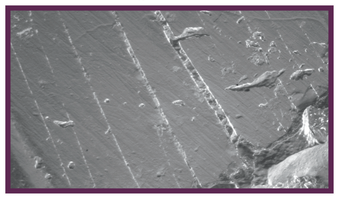


Figure 2, Microwear image of UALVP 52981 LM7 lingual-2-4 Photo.

Purpose

- This project is to gather data of tooth spacing to help distribute teeth on a mechanical biting rig called “Chomp-E”. Which will be used to recreate various different tooth marks on cow bones as a part of a grad students PhD thesis of Tyrannosaurs eating behaviors.

Figure 3, Photo of Mechanical biting rig (“Chomp-E”) Photo by Taia Wyenberg-Henzler

- Furthermore, I am testing the hypothesis of whether the angle of mouth alters the distance between the tooth marks.

Method

The data is obtained either using software called Image-J or by measuring Tyrannosauridae maxillae and dentaries to determine the distal-distal spacing distance.

- **Step 1**: Taking the calipers and measuring the distal-distal value in millimeters.

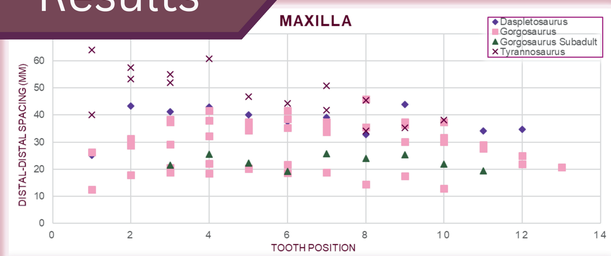
Figure 4, showing how to do the distal-distal spacing.

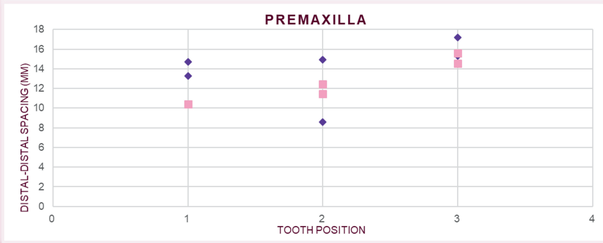
- **Step 2**: After measuring, input the values in excel to create a graph as shown on the results.

Specimen	front tooth position	back tooth position	bone	mesial-distal tooth space (mm)	distal-distal tooth space (mm)
CMN 8506	1	2	RM	5.06	25.1
CMN 8506	2	3	RM	11.85	43.34
CMN 8506	3	4	RM	7.94	41.25
CMN 8506	4	5	RM	9.83	42.5
CMN 8506	5	6	RM	9.39	40.07
CMN 8506	6	7	RM	10.26	37.67
CMN 8506	7	8	RM	8.67	39.16
CMN 8506	8	9	RM	10.12	32.88
CMN 8506	9	10	RM	13.48	43.82
CMN 8506	10	11	RM	9.29	31.7
CMN 8506	11	12	RM	9.46	34.22
CMN 8506	12	13	RM	11.99	34.67

Figure 5, the Excel graph showing measurements categorized from specimen.

Results





The distal graph measurements shows us an estimate distance of one tooth tip to the next tooth tip, so it is expected that when the teeth make contact with a bone, the spacing of the tooth marks should reflect the spacing between the contacting teeth.

Practical Experiment

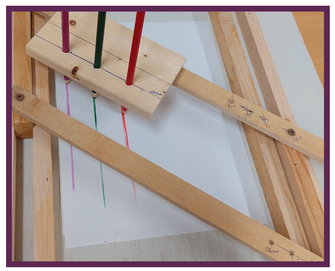


Figure 6, Device used for testing the tooth spacing.

My supervisor created this apparatus to mimic what the mechanical biting rig may do. Using pencil crayons, my supervisor created different angles on wood to see whether the angle changes the distance of the teeth.

As shown in the practical experiment, the angle the dinosaurs head can alter the distance between the tooth marks. The image shows how it becomes narrow as it is on a 50 degree angle.

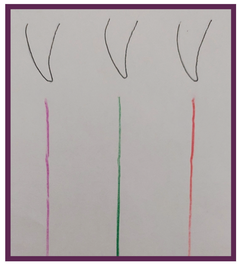


Figure 7, results with teeth at a 90 degree angle.

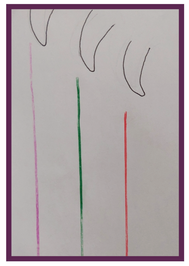


Figure 8, results with teeth at a 50 degree angle.

Conclusion

- Understanding how the angle affects the distance between teeth can help paleontologists improve their statistics and calculations by providing more accurate data.
- Future work will consist of mounting the teeth on the mechanical biting rig based on the the data from the averages gathered from this experiment.
- Following this, further testing of how the angle of teeth alters the spacing of teeth marks will also be tested.

Figure 9, image of an example of tooth marks on bone by Taia Wyenberg-Henzler.

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1. “Dinosaur+Landscape Images – Browse 33,986 Stock Photos, Vectors, and Video.” Adobe Stock. Accessed July 24, 2024. https://stock.adobe.com/ca/search?k=dinosaur%2Blandscape.
2. Taia Wyenberg-Henzler. “Teeth Measurement”.2024-07-9.Personal Communication
3. Lei R, Tschopp E, Hendrickx C, Wedel MJ, Norell M, Hone DWE. 2023. Bite and tooth marks on sauropod dinosaurs from the Morrison Formation. PeerJ 11:e16327 https://doi.org/10.7717/peerj.16327

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