## TROPHIC ECOLOGY AND TAPHONOMY OF THE LOWER PERMIAN CRADDOCK BONE BED USING QUANTITATIVE ANALYSIS OF ASSOCIATED DIMETRODON SKELETONS.

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## ABSTRACT

A quantitative analysis of 4 Dimetrodon skeletons of varying completeness identified numerous consistencies and irregularities in expected patterns of carcass preservation in a low-energy fluvial channel depos-. Through quantitative analysis of associated and articulated specimens, predation and scavenging are identified as the primary agents of skeletal destruction followed by natural drifting of bones by low energy hydraulic forces. The high diversity, multitaxic Lower Permian Craddock bonebed (CBB) of Seymour, Texas has yielded tens of thousands of fossil bones of amphibians, reptiles, and synapsids since its discovery in 1907. The trophic ecology of the CBB is marked by a high frequency of scavenging and predation which contributes to the distribution of individual bones and complete skeletons within the deposit. Evidence of scavenger/predator-induced bone alterations such as tooth marks and dismemberment, and evidence of suspected invertebrate necrophagichnia contribute to the complex taphonomic activity observed at the CBB. Dimetrodon skeletons used for this study are WMNH123117 (Abby), WMNH063019 (Michael), WMNH32518 (Leigh), and WMNH042017 (Bonnie). These specimens range from little to no articulation (Abby) to full articulation (Bonnie) and were collected between 2016 and 2020 by the WMNH from site Kennesaw of the Craddock Bone Bed. Of the 4 specimens, none have complete tails; this conforms to predictable scenarios involving pre-mortem predation and post-mortem food processing in which the anatomical regions of highest muscle density are consumed first. Cranial elements are found separated along their natural sutural surfaces; articulated skulls of Dimetrodon are rarely found at this site, which is consistent with bone drift by low-energy hydraulic forces. Specimens displaying separation between successive centra in correct vertebral order while maintaining fully articulated necks is problematic. Lethargic hydraulic movement as a kinetic influence of disruption rather than predator/scavenger food processing is more likely in this situation. In concert with predictable scenarios involving pre-mortem predation and post-mortem food processing, 3 out of 4 skeletons lack limb bones and shoulder complexes, with Bonnie as the exception. In conclusion, a higher frequency of predator-altered bone than lethargic hydraulic disruption is suspected to be the primary agent of taphonomic influence.

## Acknowledgments:

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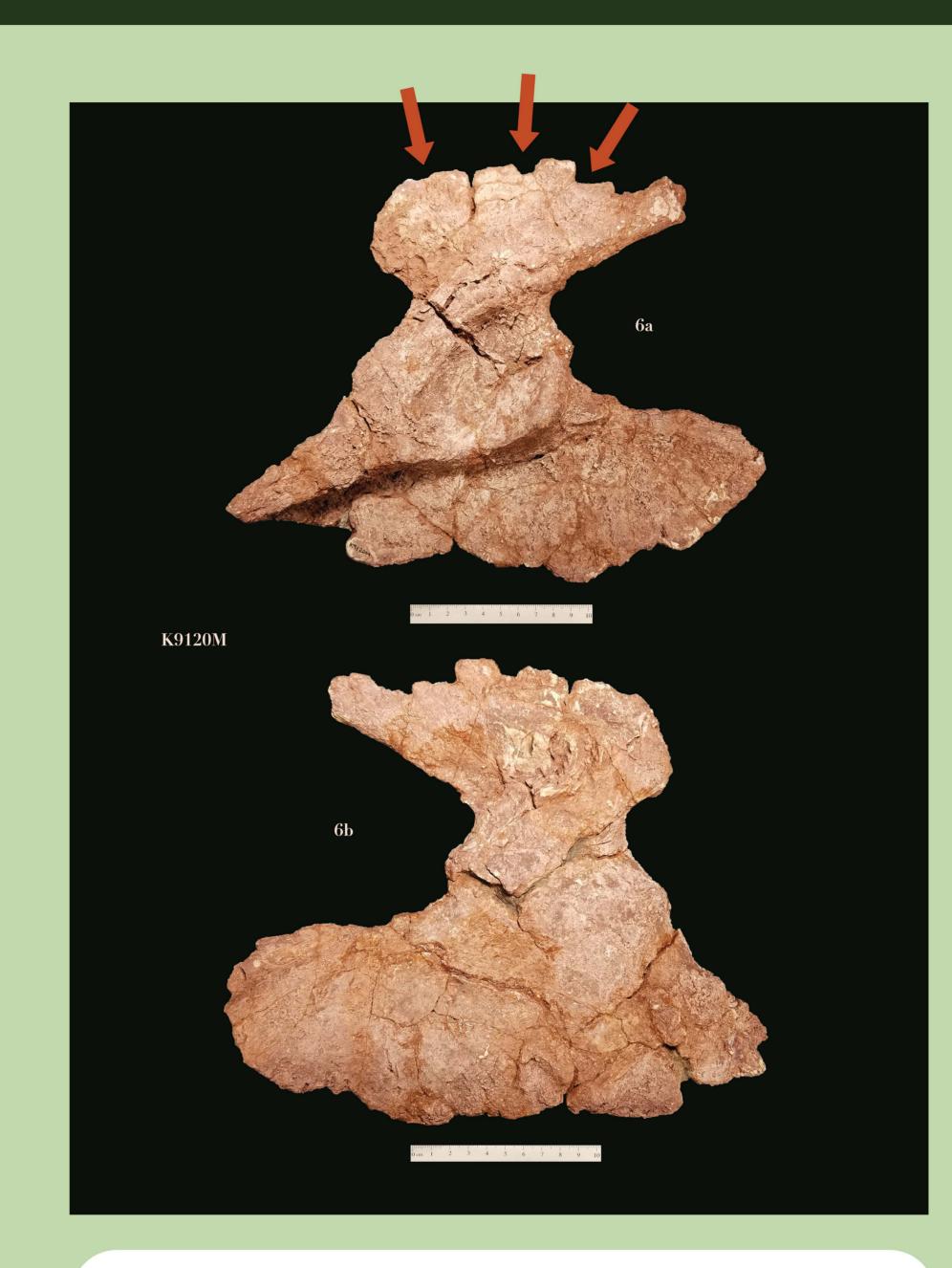


Figure 1 WMNH042017 (Bonnie) **Left Pelvis** 

Bite marks along the dorsal periphery of the illium; predation marks targeting the iliofemoralis and biceps femoris muscles on *Dimetrodon* pelves are abundant. The lack of bone healing suggests post-mortem scavenging is common in the ecosystem represented at the CBB.

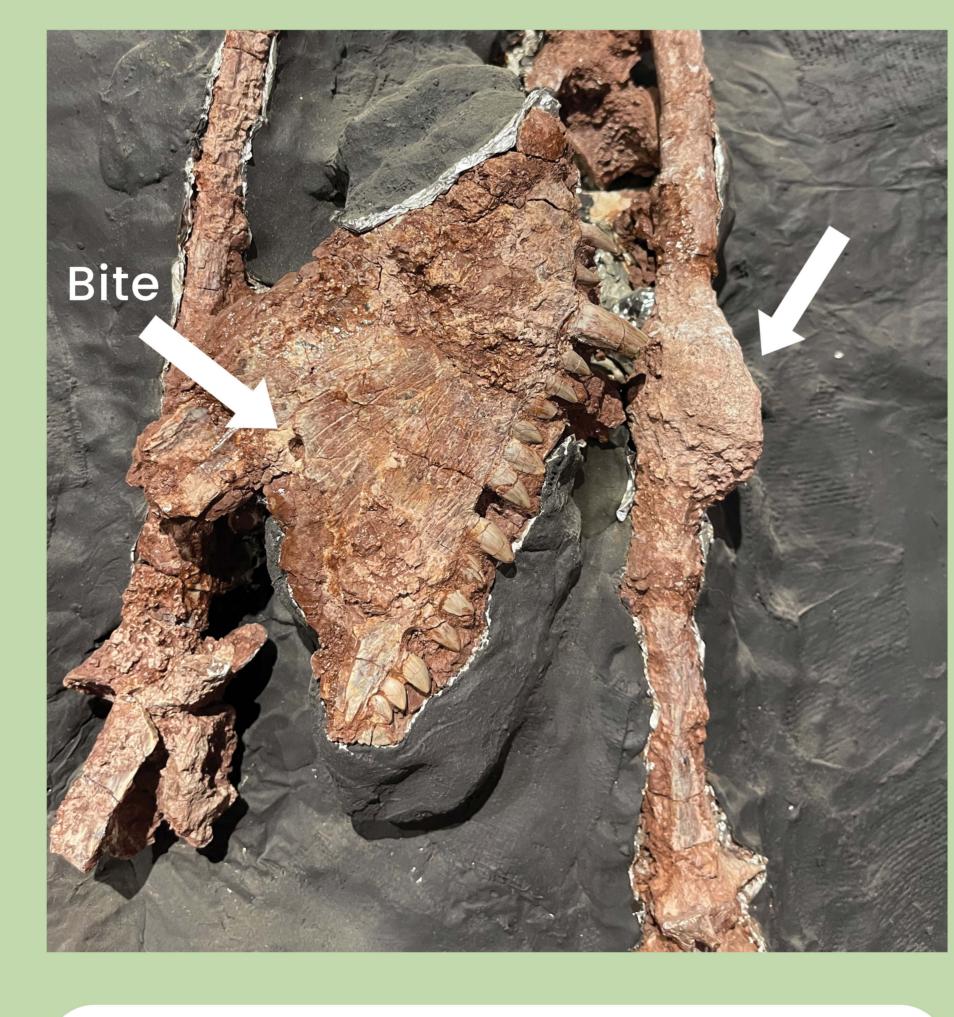


Figure 2 WMNH123117 (Abby) **Right Maxilla** 

The right maxilla contains a puncture mark. The neural spine on the right of Figure 2 displays a healed injury; this is a common feature seen in *Dimetrodon* neural spines from the CBB. Skull bones are consistently found disarticulated; articulated skull bones are rare.



Total Fin Spines	15
Caudal Vertabrae	0
Sacral Vertebrae	0
Thoracic Vertebrae	12
Thoracic Fin Spines	15
Sacral Ribs	0
Lumbar Vertebrae	0
Lumbar Fin spines	0
Cervical Vertebrae	0
Cervical ribs	0
Left Ribs	0
Right Ribs	9
Unidentified ribs	3
Femora	0
Pelvis	0
Humeri	0
Scapula	0
Ulnae	0
Radii	0
Fibula	0
Tibia	0
Carpals	0
<u> </u>	0
Metacarpals Cranial	0
Clavicle	0
Inner Clavicle	0
Claws	0
Inercentra	0
Metatarsals	0
Tarsal	0
Braincase	0
Rib Heads	0
Maxilla	0
Dentary	0
Splenial	0
Pterygoid	0
Eye Sockets	0
Quadrate	0
Jugal	1
Teeth Fragments	0
Left Articular	0
Left Angular	0
Sphenethmoid	0
Right prefrontal	0
Right post orbital	0
Unidentified Cranial	0
Left post orbital	0
Left palentine	0
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Total Fin Spines	(
Caudal Vertabrae	1
Sacral Vertebrae	
Thoracic Vertebrae	(
Thoracic Fin Spines	(
Sacral Ribs	(
Lumbar Vertebrae	
Lumbar Fin spines	
Cervical Vertebrae	7
Cervical ribs	(
Left Ribs	
Right Ribs	
Total Ribs	
Femora	
Pelvis	
Humeri	
Scapula	
Ulnae	
Radii	
Fibula	
Tibia	
Carpals	
Metacarpals	1
Left post frontal	١ ,
Clavicle	
Inner Clavicle	
Claws	(
Inercentra	1
Metatarsals	
Tarsal	
Braincase	
Maxilla	
Dentary	<u> </u>
Splenial	<u> </u>
Pterygoid Left	
Eye Sockets	
Quadrate left	,
Jugal	1
Teeth Fragments	7
Left Articular	,
Left Angular	1
Sphenethmoid	,
Right prefrontal	,
Right post orbital	<u> </u>
Unidentified Cranial	
Left post orbital	,
Left palentine	
Right rib head	<u> </u>
Left rib head	<del>                                     </del>

Total Fin Spines	4
Caudal Vertabrae	1.
Sacral Vertebrae	
Thoracic Vertebrae	1
Lumbar Vertebrae	
Cervical Vertebrae	
Thoracic Fin Spines	
Lumbar Fin spines	
Sacral Ribs	
Cervical ribs	
Rib Heads	
Left Ribs	2
Right Ribs	2
Total Ribs	5
Femora	
Pelvis	
Humeri	
Scapula	
Ulnae	
Radii	
Fibula	
Tibia	
Carpals	
Metacarpals	
Left post frontal	
Clavicle	
Inner Clavicle	
Claws	
Inercentra	
Metatarsals	
Tarsal	
Braincase	
Maxilla	
Dentary	
Splenial	
Pterygoid Left	
Eye Sockets	
Quadrate left	
Jugal	
Teeth Fragments	
Left Articular	
Left Angular	
Sphenethmoid	
Right prefrontal	
Right post orbital	
Unidentified Cranial	
Left post orbital	

1(Not Bonnies

Total Fin Spines	2
Caudal Vertabrae	
Sacral Vertebrae	
Thoracic Vertebrae	1
Cervical Vertebrae	
Lumbar Vertebrae	
Lumbar Fin spines	
Thoracic Fin Spines	
Rib Heads	
Cervical ribs	
Left Ribs	
Right Ribs	
Total Ribs	2
Femora	
Pelvis	
Humeri	
Scapula	
Ulnae	
Radii	
Fibula	
Tibia	
Carpals	
Metacarpals	
Left post frontal	
Clavicle	
Inner Clavicle	
Claws	
Inercentra	
Metatarsals	
Tarsal	
Braincase	
Maxilla	
Dentary	
Splenial	
Pterygoid Left	
Eye Sockets	
Quadrate left	
Jugal	
Teeth Fragments	
Left Articular	
Left Angular	
Sphenethmoid	
Right prefrontal	
Right post orbital	
Unidentified Cranial	
Left post orbital	
Left palentine	
Coricoid	