Predatory Behavior of a Giant Crocodyliform from the Woodbine Formation (Cenomanian) Of Texas

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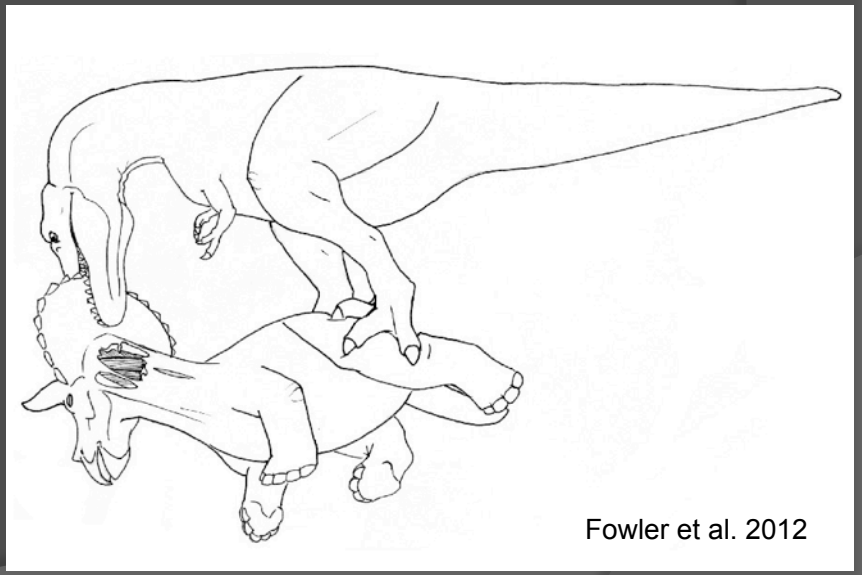
Introduction

- Rely on ichnofossils to understand behavior in extinct organisms
- Direct evidence of predatory behavior in vertebrate fossil record is rare
- Tooth marks can provide information on:
  - Carnivore feeding behavior
  - Trophic structure of community



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PALAIOS
Emphasizing the impact of life on Earth's history

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1926 SEPM Society for Sedimentary Geology

FEEDING TRACES AND PALEOBIOLOGY OF A CRETACEOUS (CENOMANIAN) CROCODYLIFORM: EXAMPLE FROM THE WOODBINE FORMATION OF TEXAS

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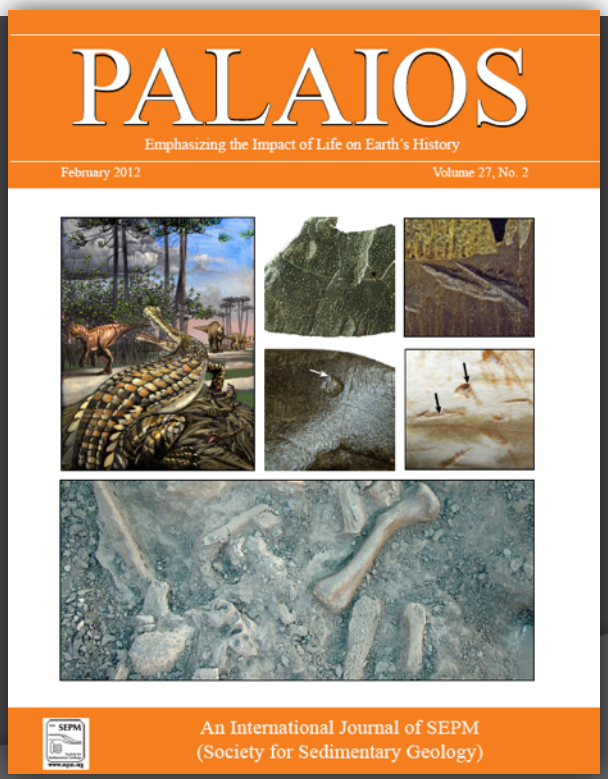
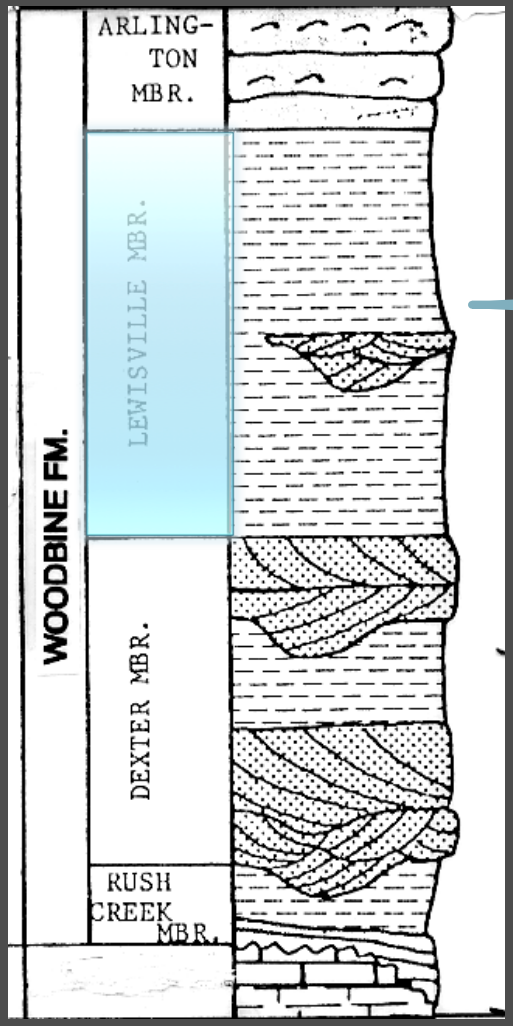
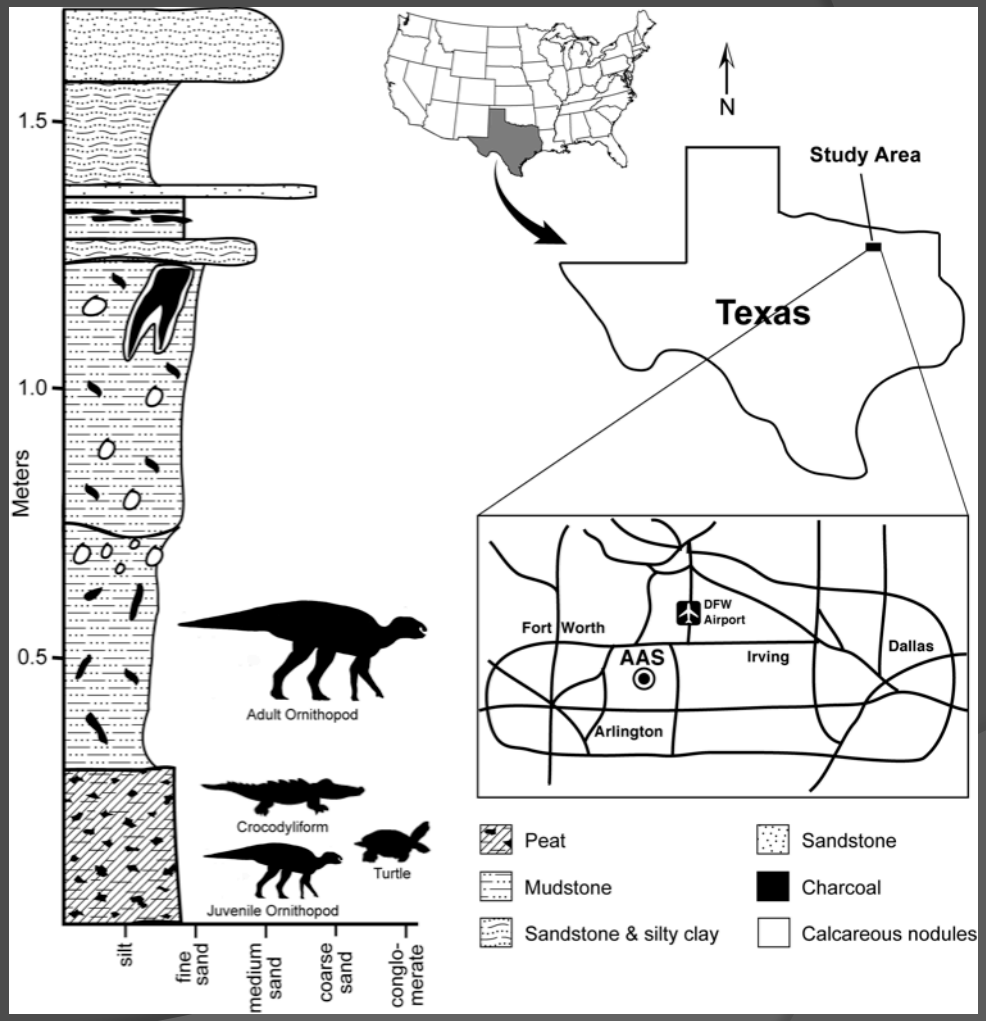
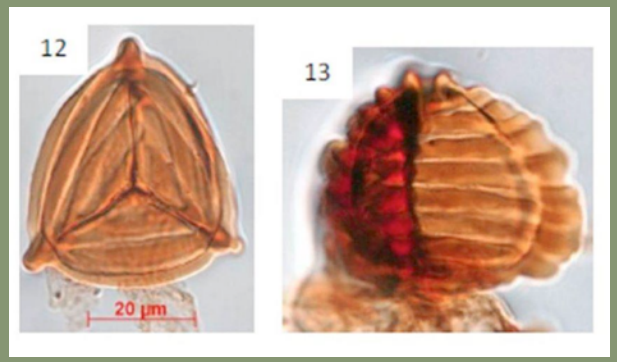


Arlington Archosaur Site





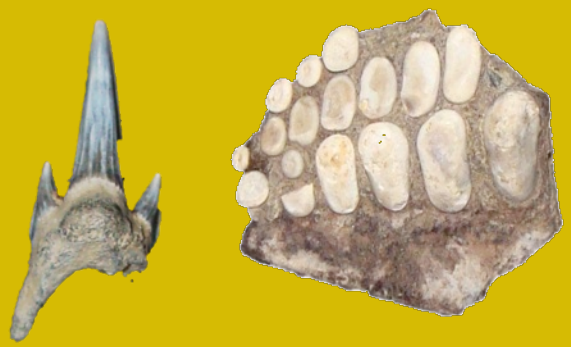
AAS Paleoenvironments



Predominant freshwater
Low angiosperm diversity
High fern diversity

AAS

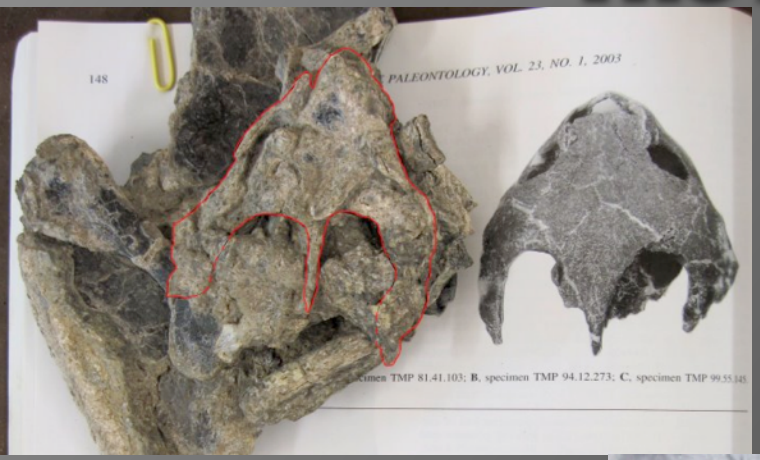
Delta plains and distributary channels



Marine influence

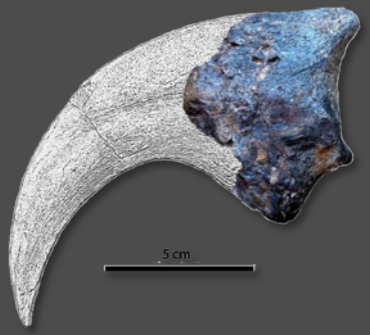
Google Earth map overlay by C. Scotese, available at http://www.globalgeology.com/

The AAS Turtles



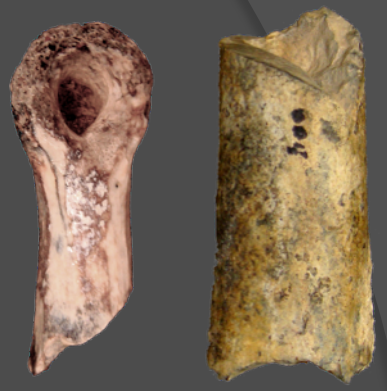
AAS Chelonia:
-3 shell morphotypes
-1 trionychid
- 2 unidentified

AAS Dinosaurs

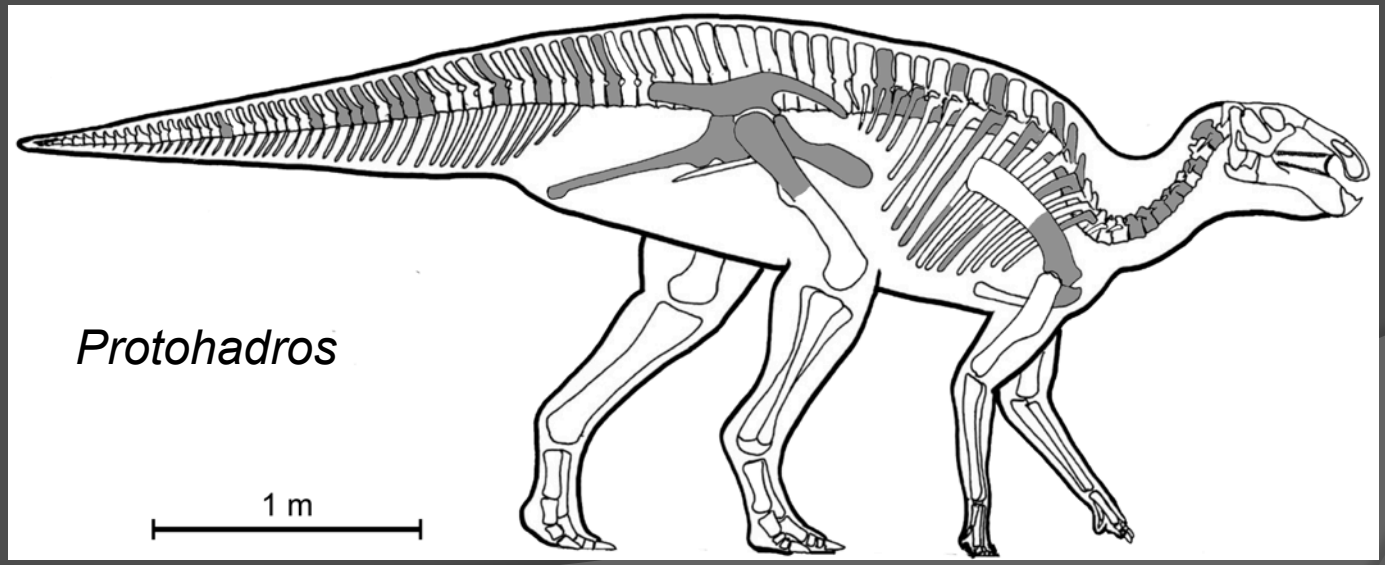


Tetanurae indet.

Dromaeosauridae indet.



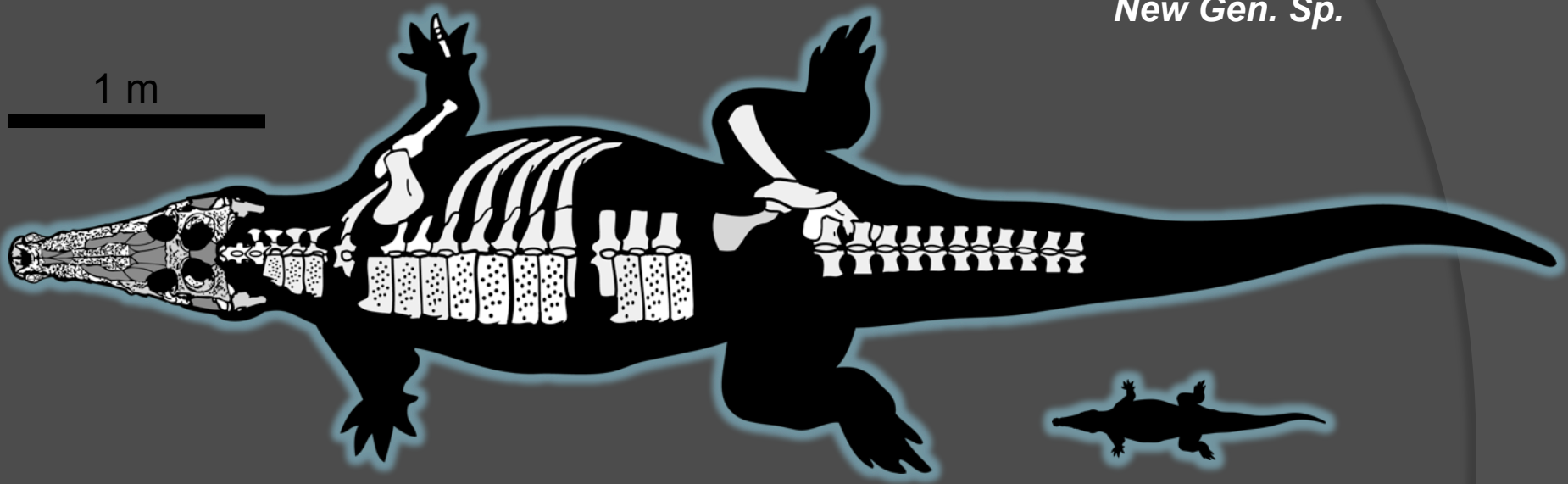
Theropoda indet.



AAS Crocodyliform

SYSTEMATIC PALEONTOLOGY

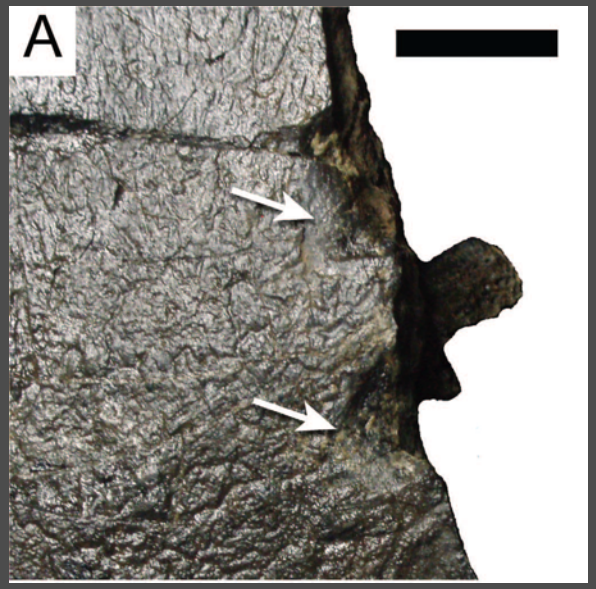
CROCODYLIFORMES
MESOEUCROCODYLIA
GONIOPHOLIDIDAE?
New Gen. Sp.



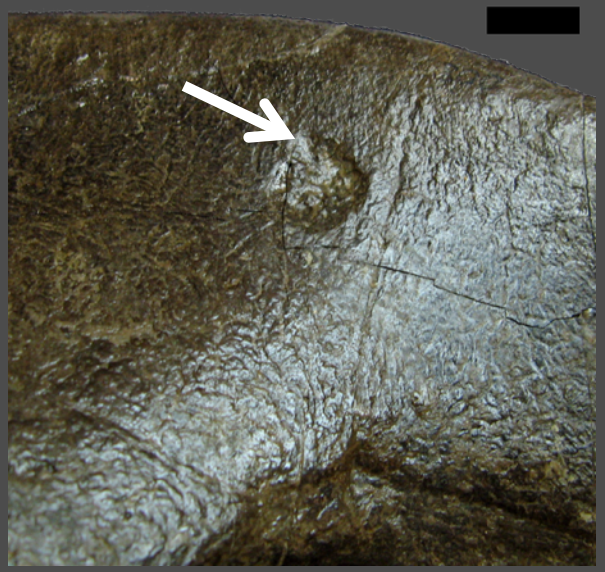
Methods

- Surveyed over 230 specimens
- 17 turtle fragments, 2 *Protohadros* elements with tooth marks
- 3 tooth mark morphotypes
  - Scores: shallow, U-shaped furrows
  - Pits: bowl shaped or irregular depressions
  - Punctures: rounded, collapsed region

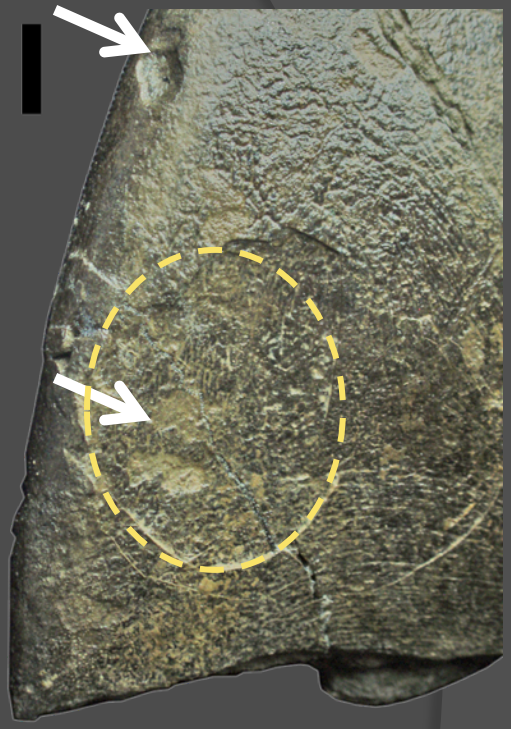
Results



Pit at broken edge



Bisected pit



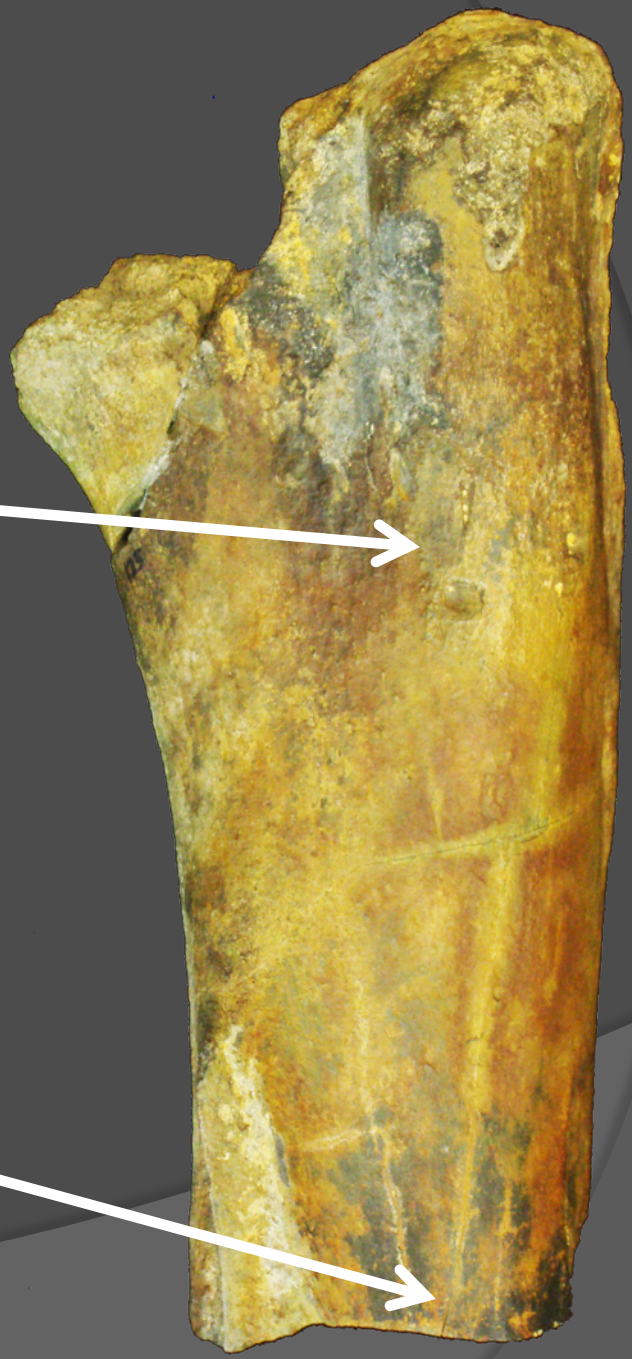
Crushed pit and puncture

- 54 total pits recorded (52% of specimens)
  - 52 on turtle, 2 on *Protohadros*
- Few pits bisected
- 1 potential puncture

Results

Two pits

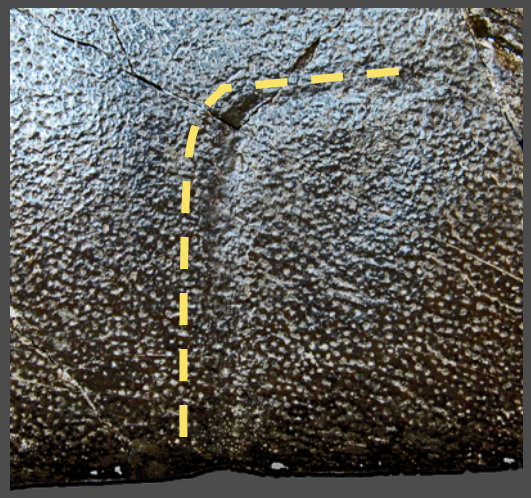
Pit and flake



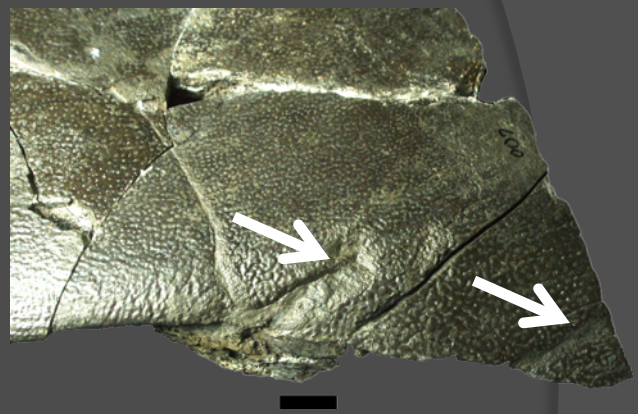
5 cm

Results

Parallel scores



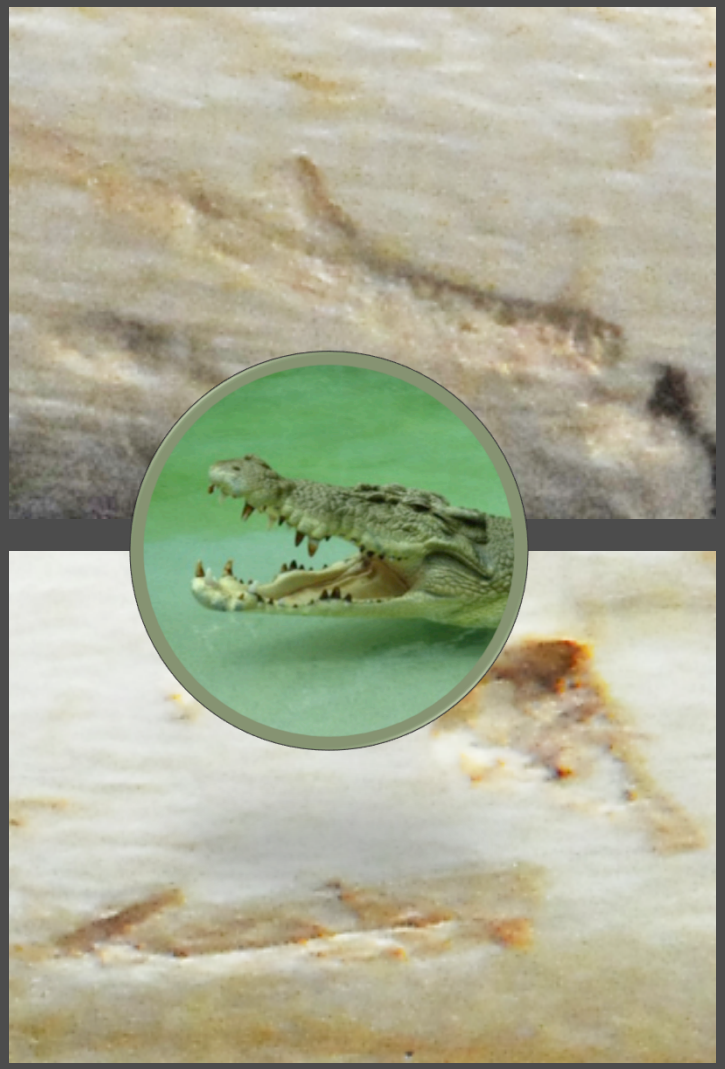
Hooked scores



Bisected scores

- 26 total scores on 12 fragments, all turtle
- 39% of specimens
- Bisected and hooked scores

Distinguishing the trace maker



Alligator

VS

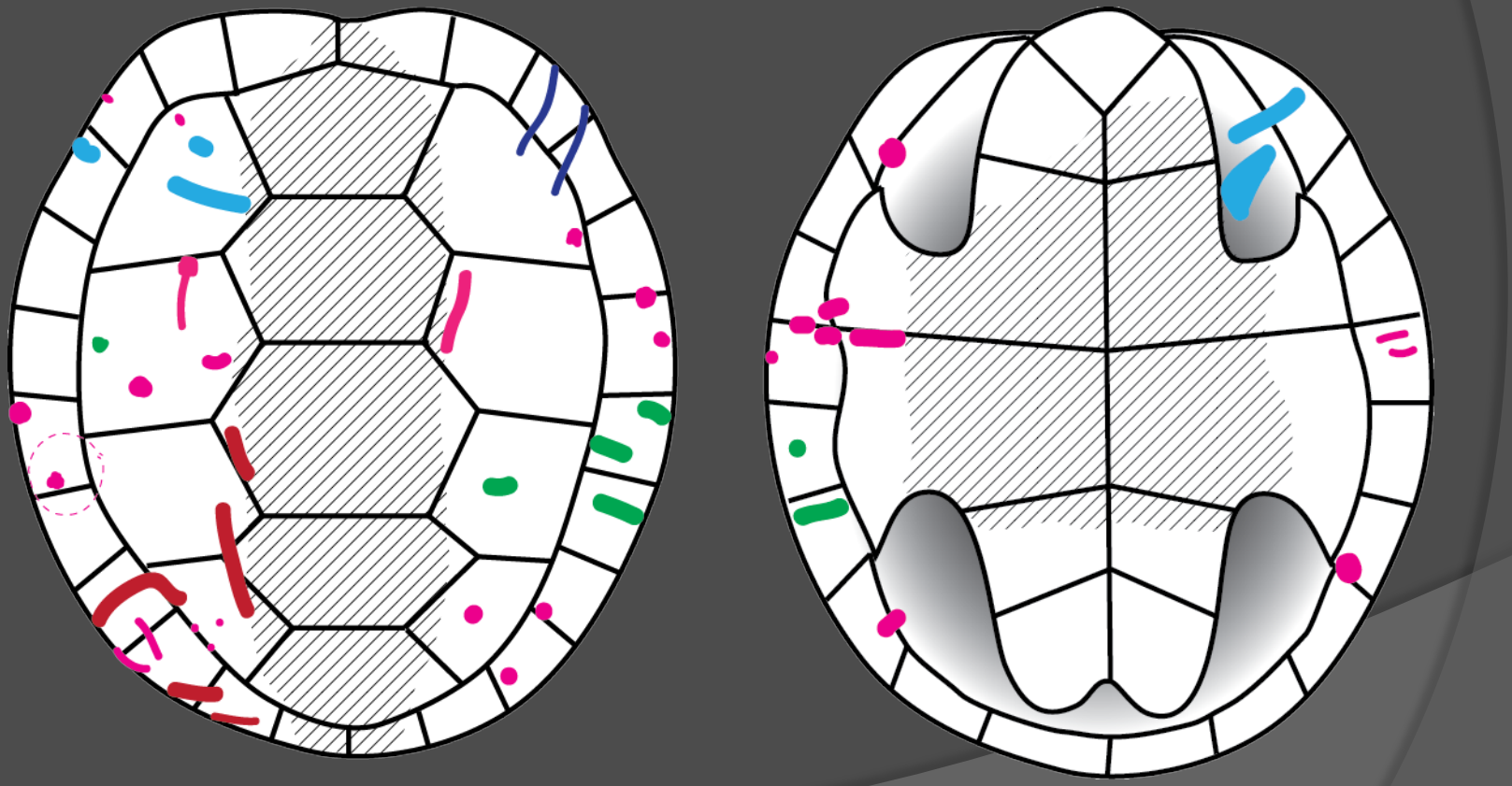
Theropod Dinosaur

Crocodyliform is the most likely predator

Crocodyliform maxilla with teeth (held by clay) fitted to two large scores on inside of turtle shell

Paleobiology

- Feeding behavior similar to living crocodylians



Composite turtle shell with locations of bite marks

Paleobiology

Modern alligators and crocodiles feeding on turtles, exhibiting “nutcracker” behavior


Art by Jude Swales

Paleobiology

- Positions of marks on dinosaur bones suggests disarticulation method: grasping limb near joint and shaking, pulling, or death rolling to separate it from the socket

AAS Coprolites

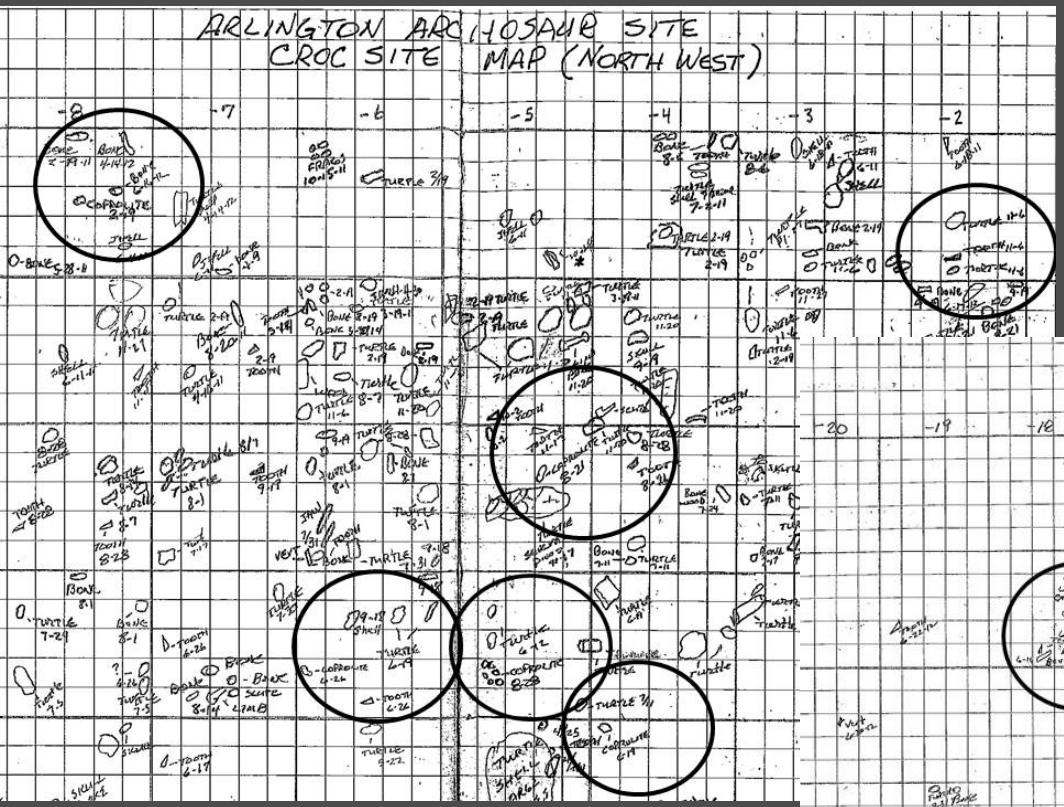
AAS Coprolites:

A) Dinosaur
B) Shark & fish
C.) Reptilian Spiral (croc?)
D- G) Reptilian scrolls (Crocodyliform)

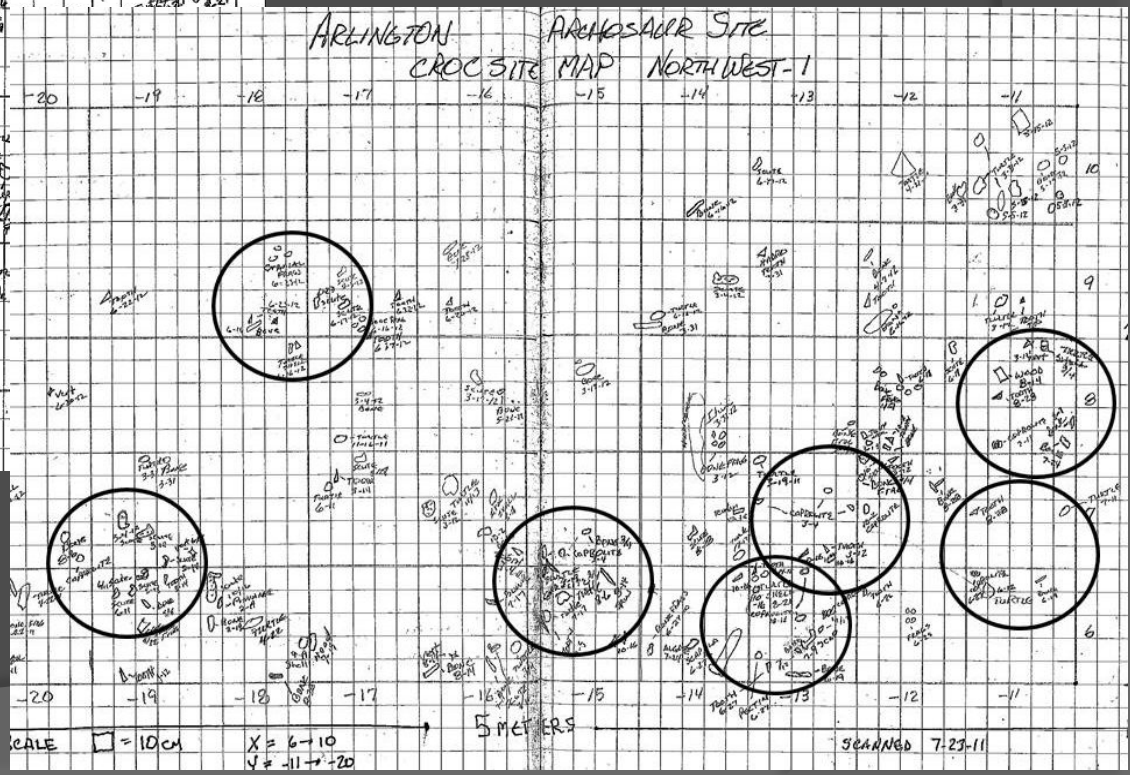
Classification based on:
Chin (1996)
Sawyer (1981 & 1998)
Thulborn (1991)


AAS Taphonomy

Does the AAS Represent Feeding Grounds?

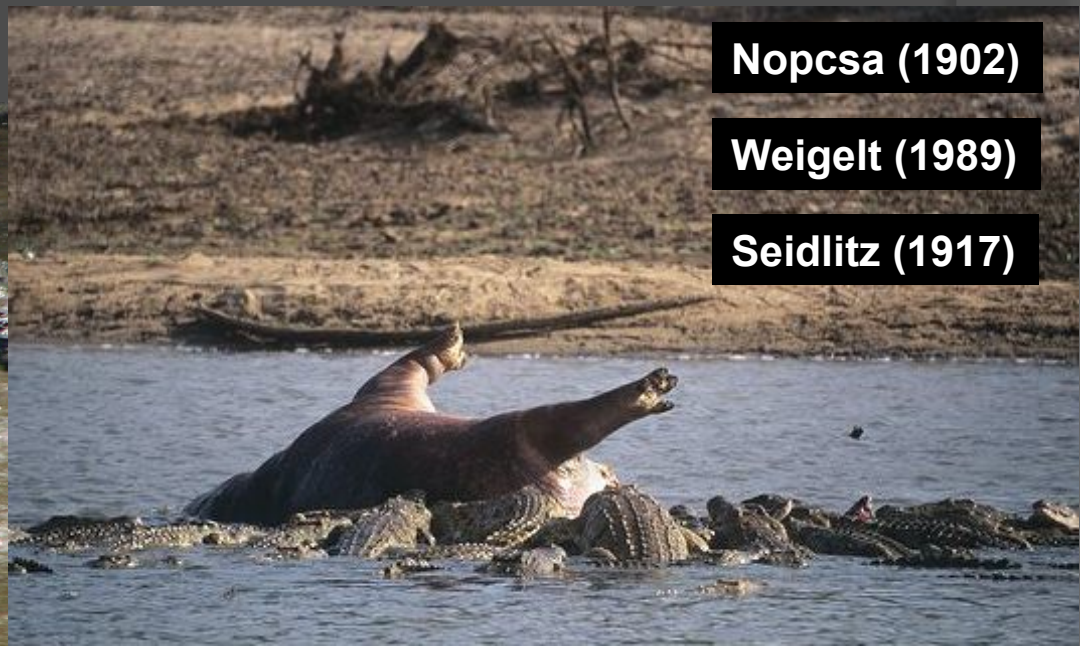


AAS maps show a broad distribution of coprolites, shed teeth, broken-bitten turtle shell occurring together (denoted by circles).



AAS maps, 1 meter Cartesian based grid (x,y), courtesy Roger Fry.

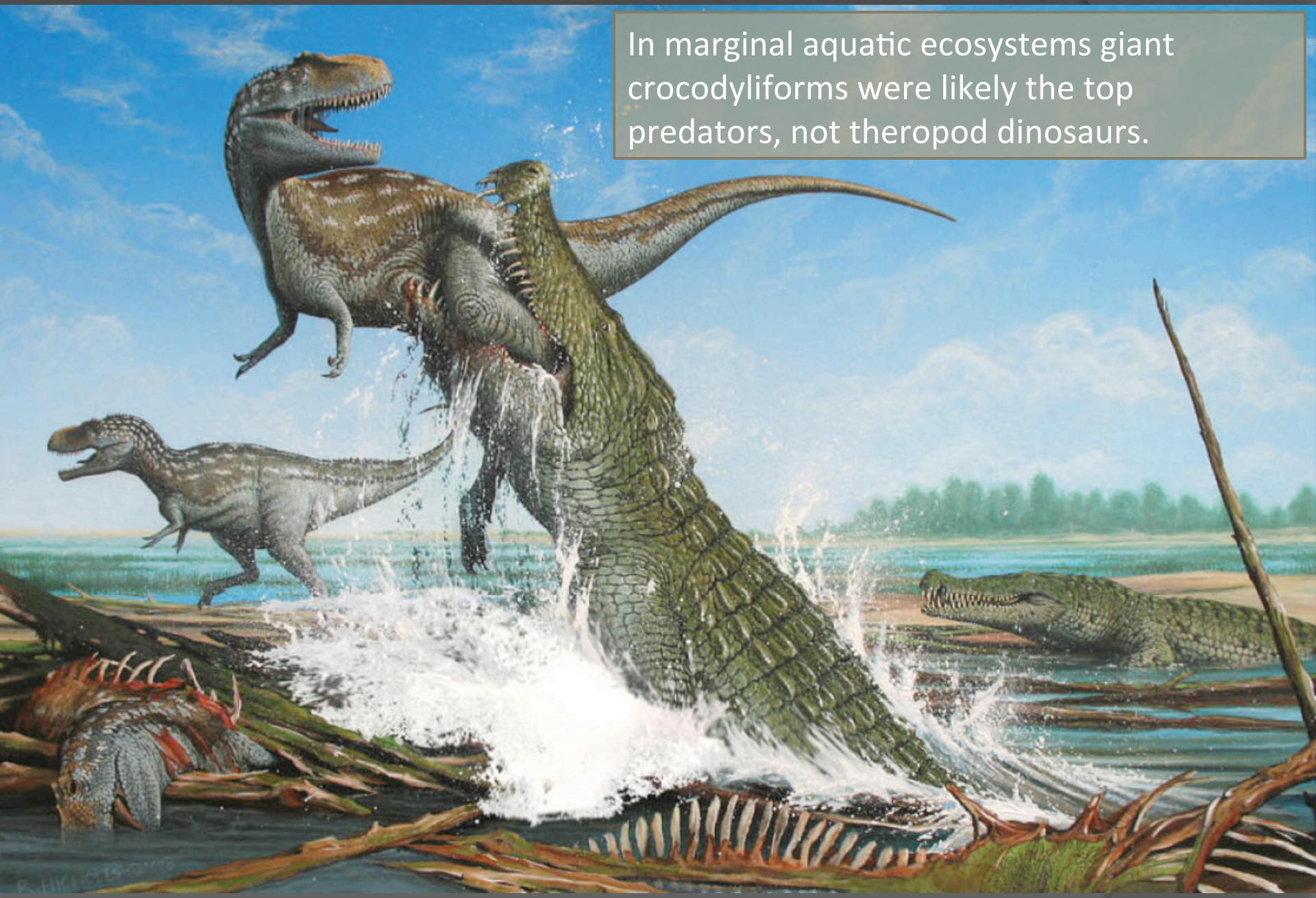
Crocodyliforms function as important taphonomic agents, accumulating bones from a variety of species in a depositional environment through activities at feeding grounds.



Nopcsa (1902)

Weigelt (1989)

Seidlitz (1917)


In marginal aquatic ecosystems giant crocodyliforms were likely the top predators, not theropod dinosaurs.

Conclusions

- Remains from the AAS suggest the crocodyliform behaved much like living crocodilians do today. It was an important predator in the ecosystem and reproduced in the area.
- Turtles made up a significant portion of the AAS croc's diet, but it also ate dinosaurs, especially juveniles. It consumed its prey much as living crocs today.
- Giant crocodyliforms remained the dominant large predators in and around aquatic ecosystems throughout the Cretaceous.
- Their specific feeding behavior likely contributed to the rich vertebrate fossil remains preserved at the AAS.

Acknowledgements

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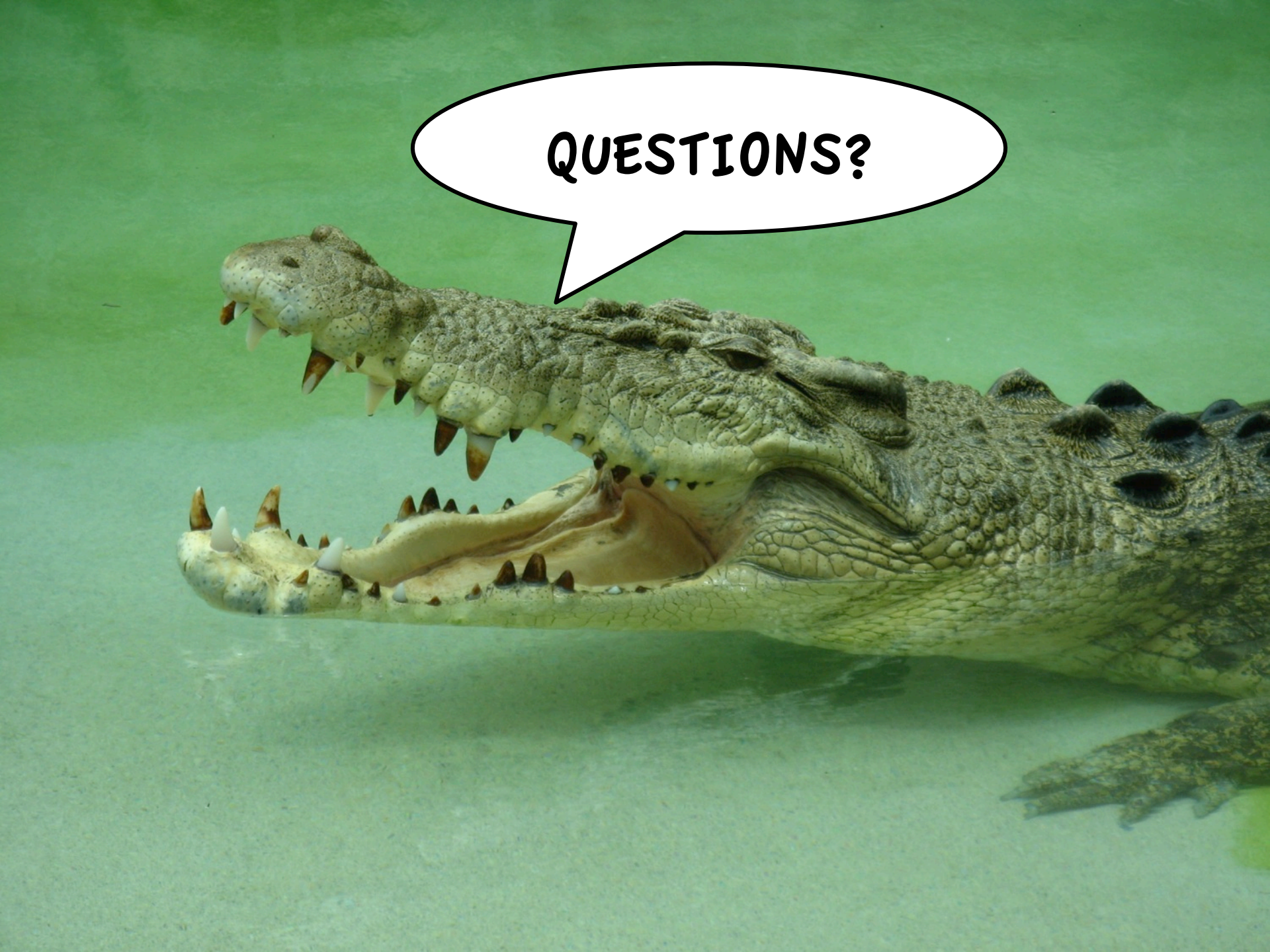
QUESTIONS?