THE IMPORTANCE OF THE LATE PENNSYLVANIAN KINNEY BRICK QUARRY LAGERSTÄTTE OF CENTRAL NEW MEXICO FOR THE DEVELOPMENT OF THE STUDY OF VERTEBRATE CONSUMULITES AND OTHER BROMALITES

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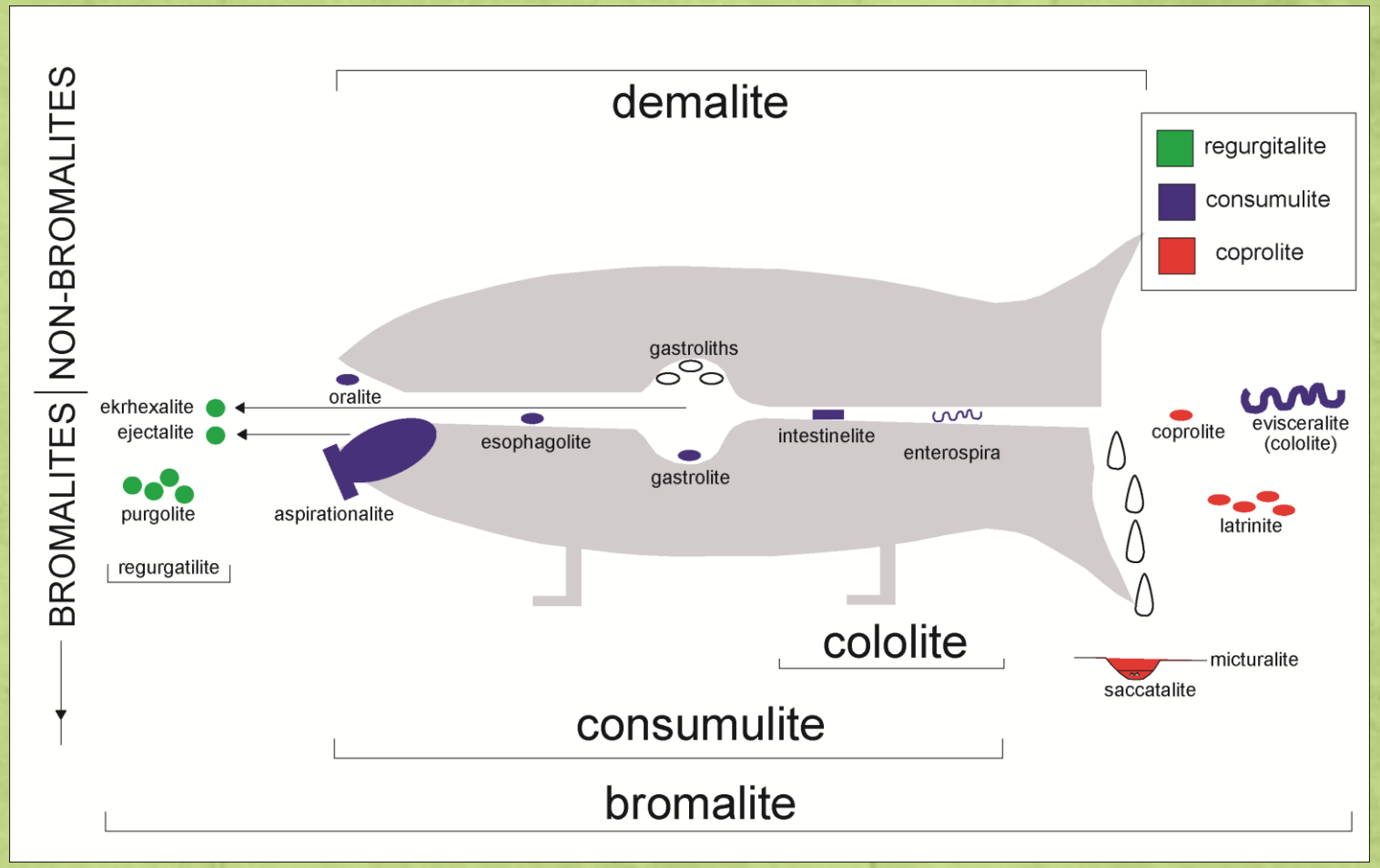
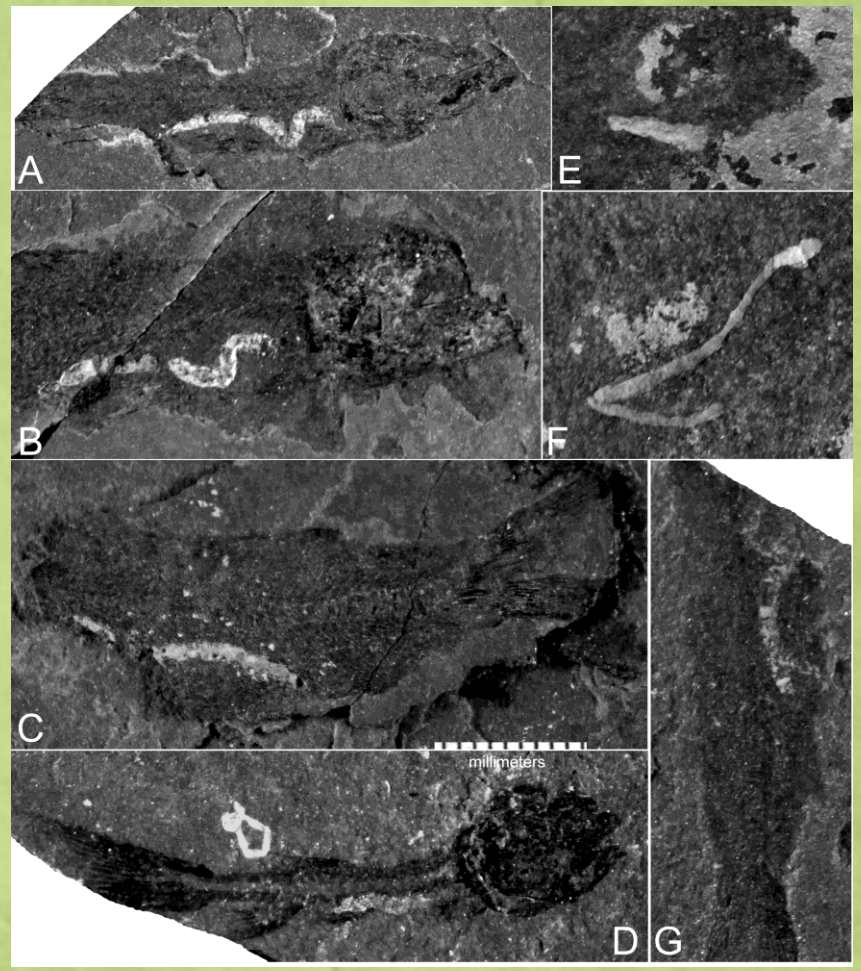
WHAT IS A CONSUMULITE?

- Bromalites
  - Regurgitalites
  - Consumulites
  - Coprolites
- Consumulites: preserved within GI tract
- Buckland (1829) Ichthyocoprus



EVISCERALITES

- Agassiz (1833) postulated
- Digestive tract preserved in absence of body
- Carcass decays and infilled tract remains



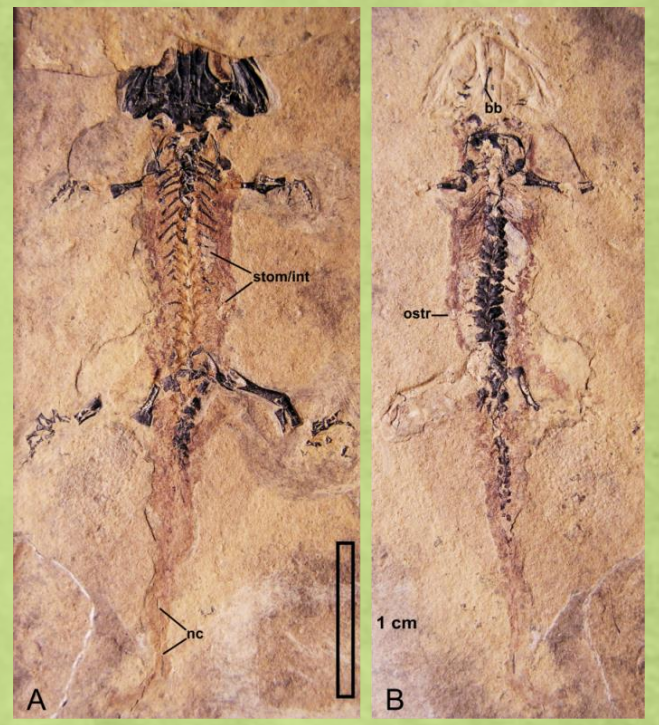
FOSSIL RECORD

MARINE

- Early Devonian- *Cephalaspis* within shark *Ptomacanthus,* ostracoderm within an acanthodian
- Late Devonian Cleveland Shale >50 specimens
- Mesozoic – sharks, bony fish (> 120 Solnhofen) and all main clades of reptiles (ichthyosaurs, plesiosaurs, mosasaurs)
- Cenozoic – less common, mainly fish, some whales and a bird

NONMARINE

- Middle-Late Carboniferous amphibians, Late Permian first herbivores
- Late Triassic phytosaurs, paracrocodylomorph, dinosaurs
- Early Cretaceous Jehol –frog, choristodere, theropods, birds, pterosaur, mammal
- Eocene – Green River and Messel
- Pleistocene – frozen mummies



TAPHONOMY

- Articulated skeletons
- Most articulated skeletons in aquatic environments
  - marine/lacustrine fine grained, low energy
- Common in Lagerstätten
- Large body size favors the recognition

- Coprolites are Lagerstätten (Qvarnström et al., 2016), regurgitalites are Lagerstätten (Gordon et al., 2020) and so……
- Preserve a wide range of organic elements with poor fossil record, from lepidopteran wings to hair to embryos
- Dominantly carnivores – preservation, collector bias

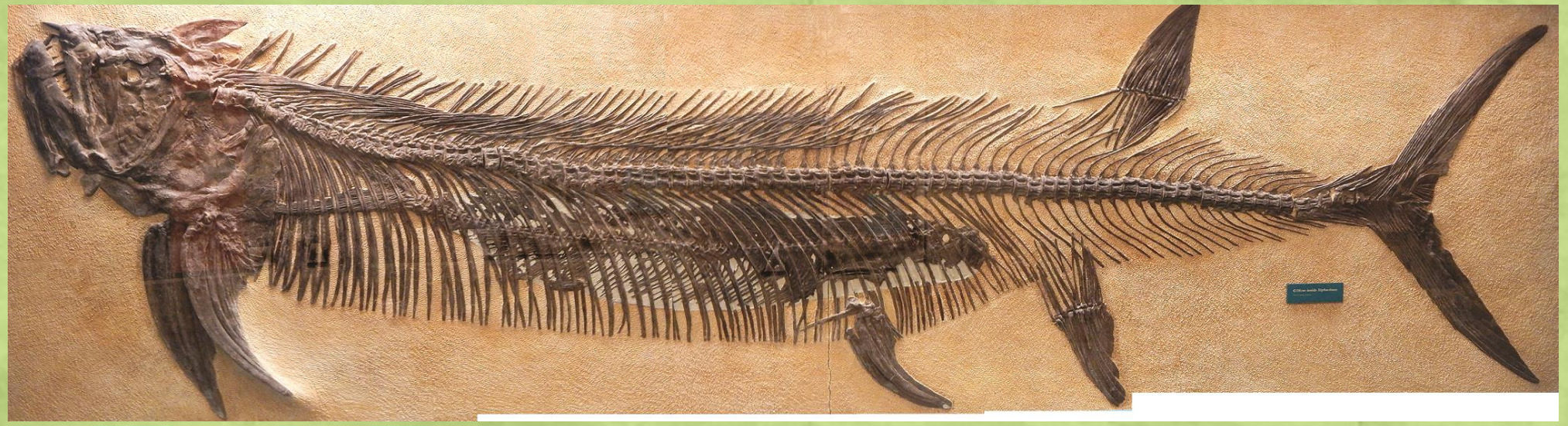
UTILITY

- Unambiguous attribution
- Chemistry of digestive systems (e.g., mosasaurs: Strganac et al., 2015)
- Evolution of the components of digestive system, early birds (e.g., O'Connor et al., 2019)
- Dietary changes through ontogeny, "branchiosaurs"

  (e.g., Werneburg et al., 2007)
- Evolution of diets within clades (e.g., ichthyosaurs)
- Lagerstätten

CONSUMULITE CONCLUSIONS

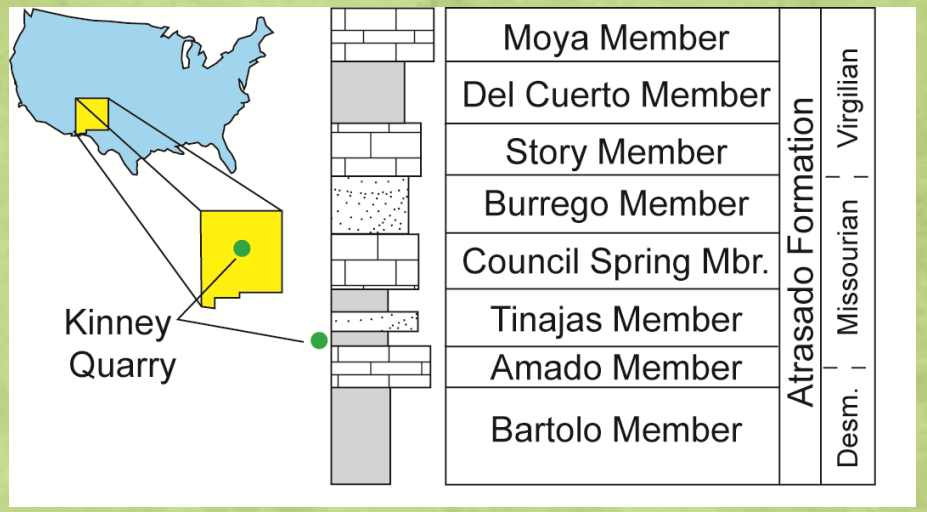
- Consumulites:
  - Abundant
  - Multiple uses
  - Need more study



Thanks to Mike Everhart, Ralf Werneburg and Vincent Santucci for images

KINNEY BRICK QUARRY LAGERSTÄTTE

- Central New Mexico
- Late Pennsylvanian (Missourian/Kasimovian) age
- Atrasado Formation (Tinajas Member)
- Diverse fossils (and soft tissue preservation):
  - palynomorphs, plants, crustaceans, insects, fish
  - brachiopods, molluscs, fishes, amphibians, etc.

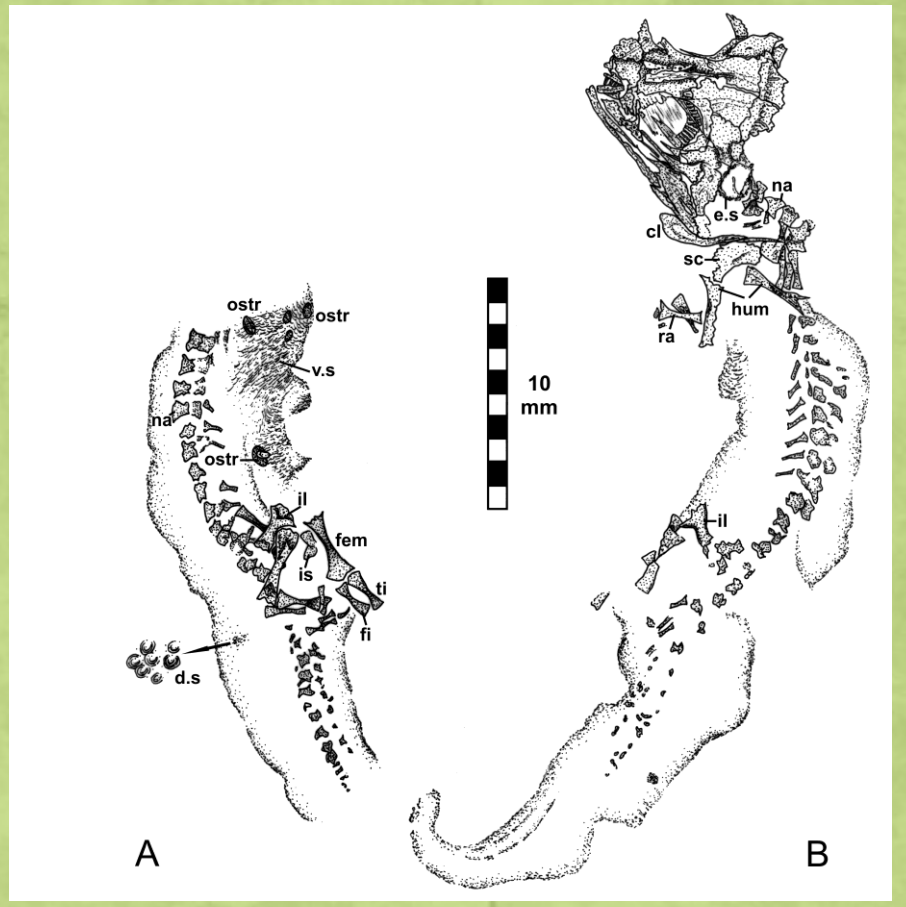


KINNEY: BROMALITE TERMINOLOGY AND ICHNOTAXONOMY

- Hunt (1992) reviewed Kinney coprolites and introduced terms now widely used:
  - Bromalite - trace fossils to refer to fossil food material regurgitated, defecated or maintained within the body cavity
  - Regurgitalite for regurgitated food remains
- Hunt and Lucas (2021) named first non-evisceralite consumulites from Kinney

WERNEBURGICHNUS KINNEYENSIS

- Several small amphibian skeletons
- *Milnererpeton huberi* (two)
- Ostracods in consumulites



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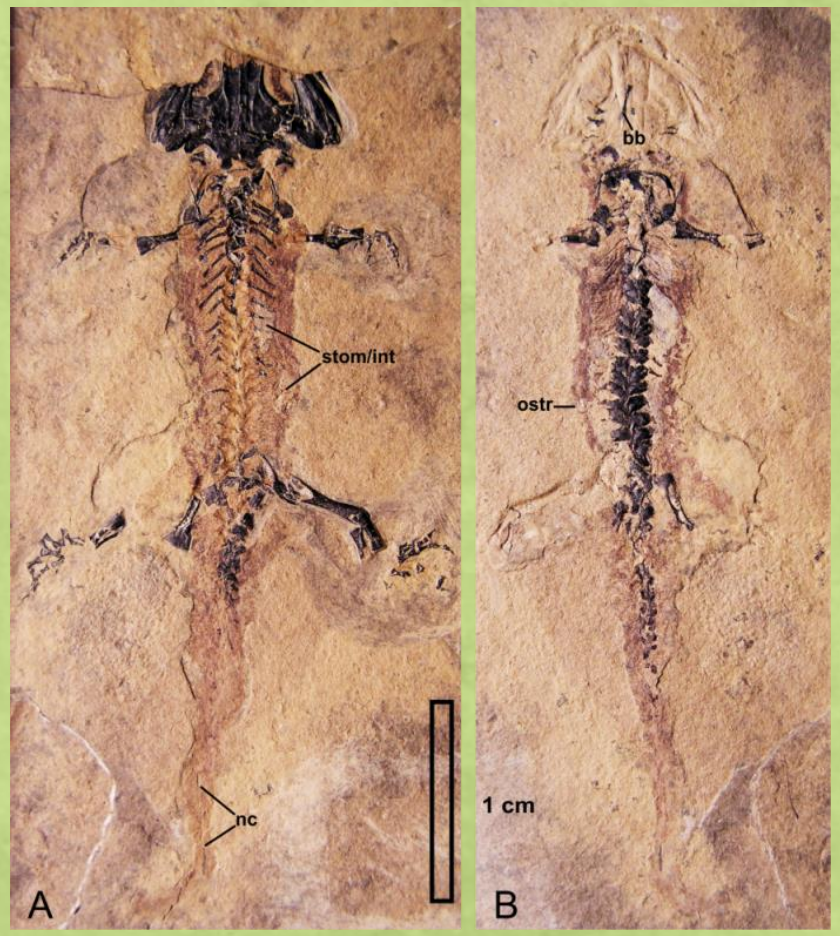
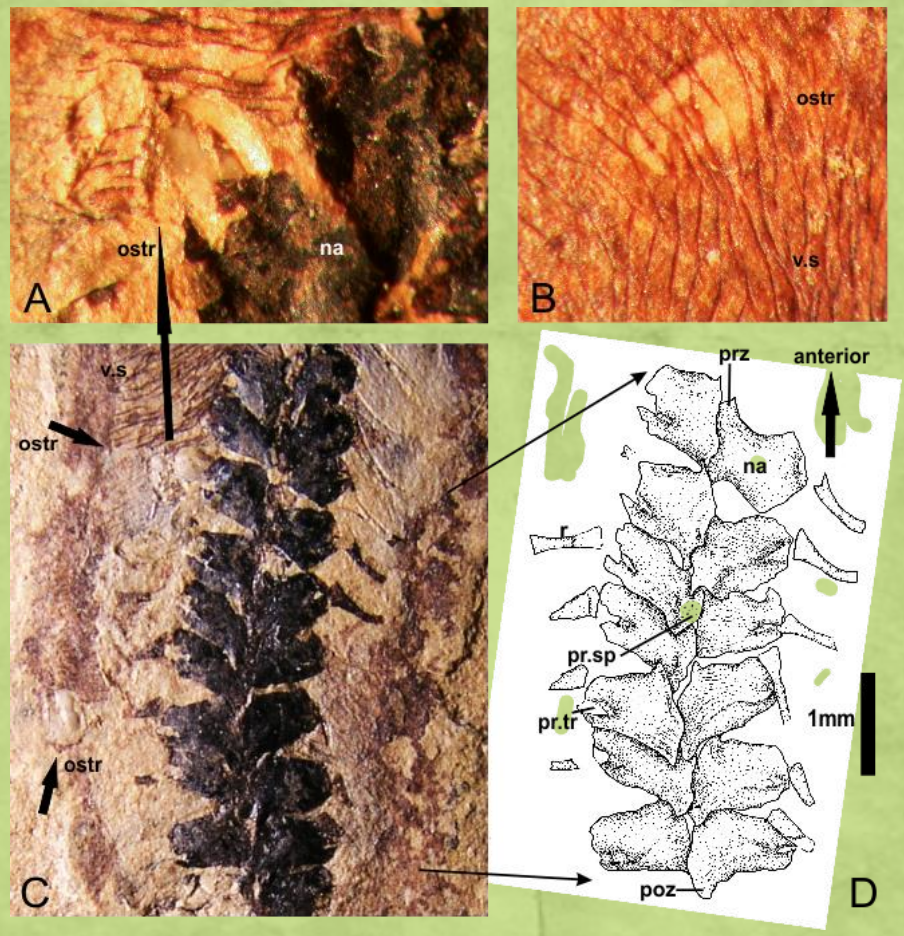
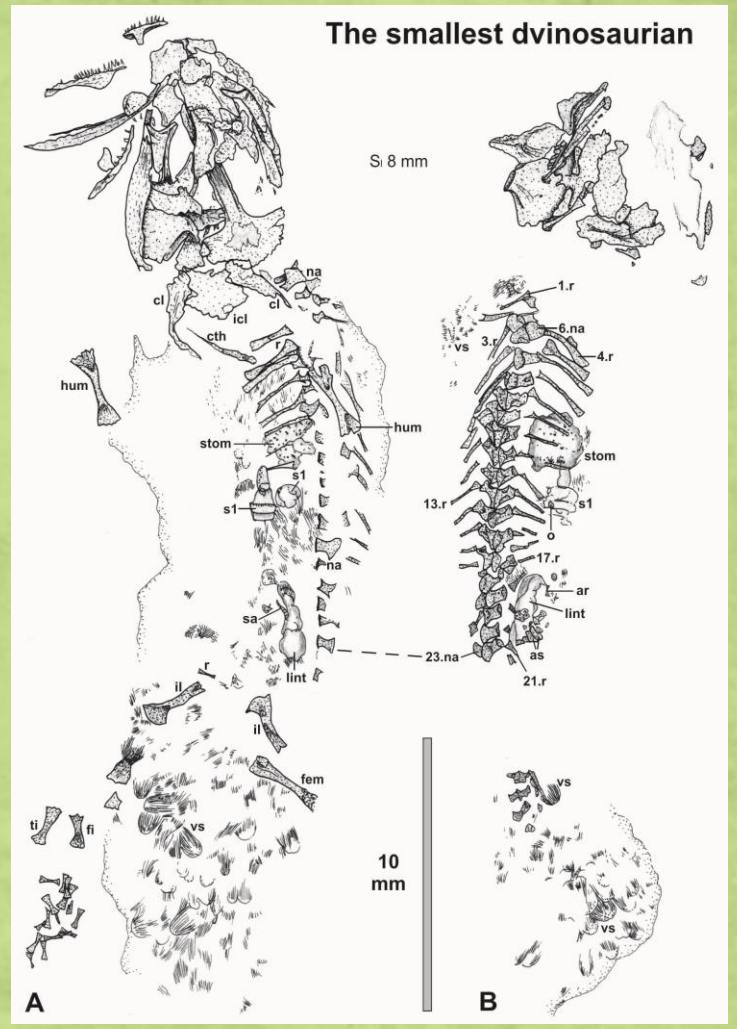


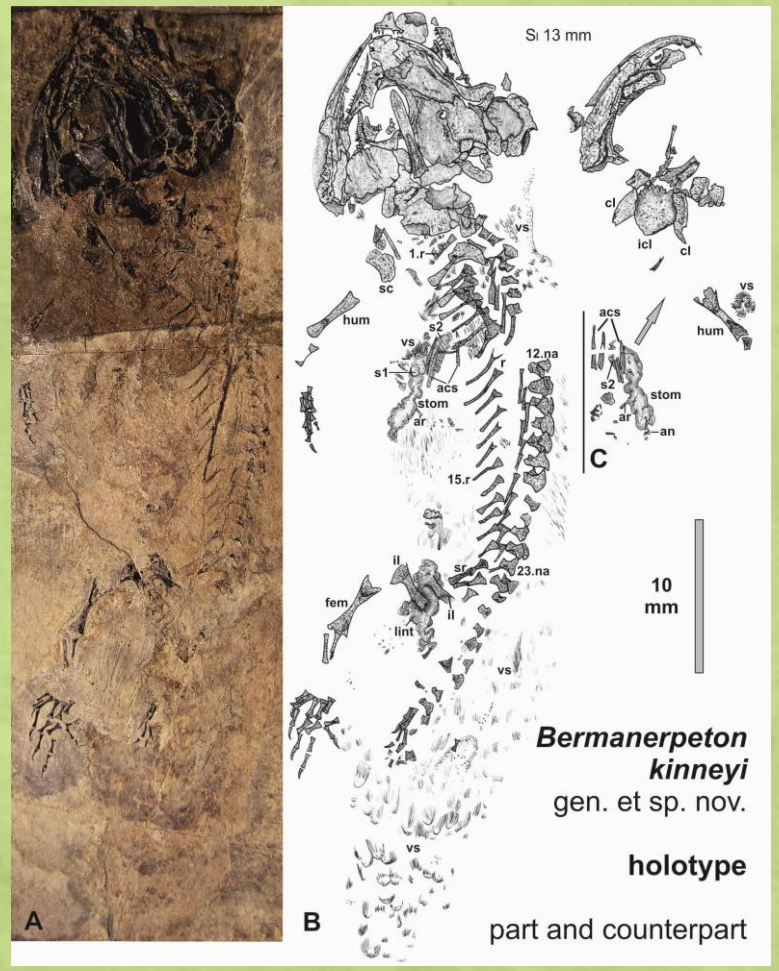


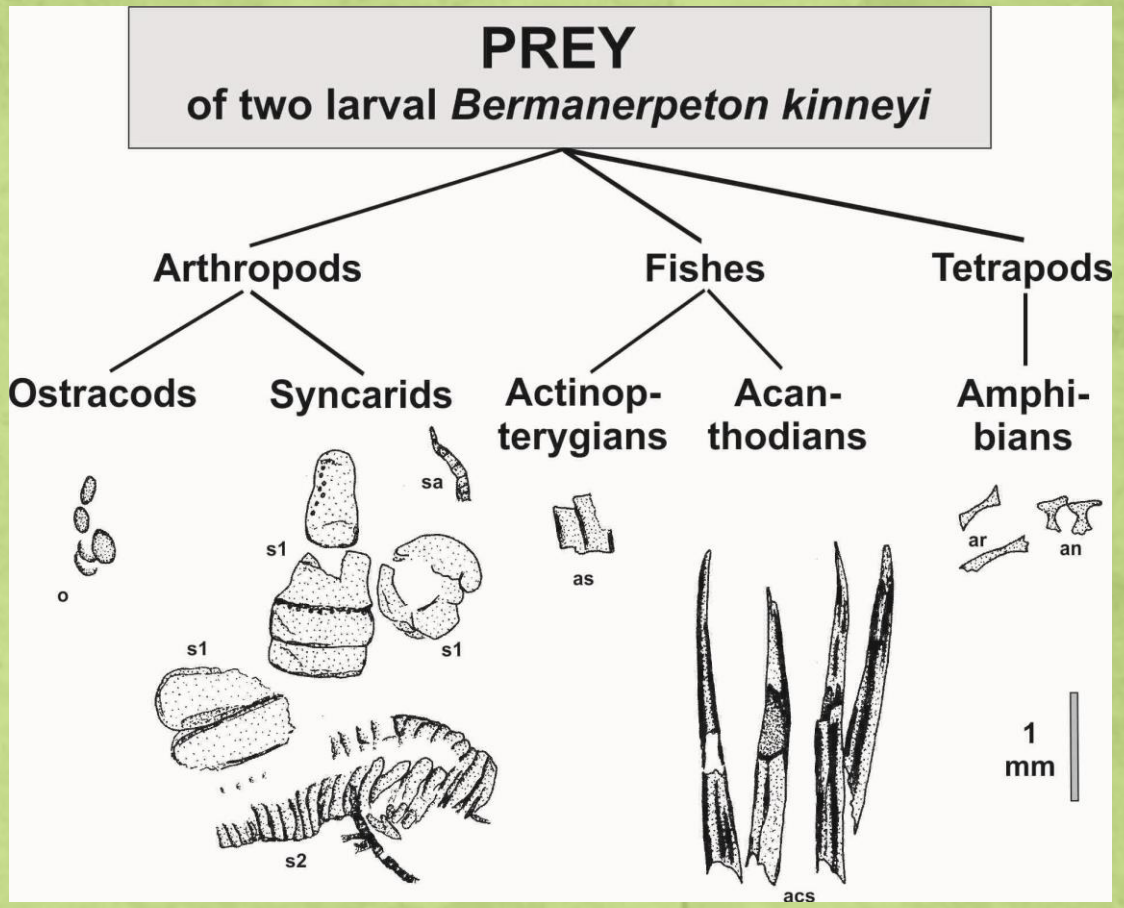
WERNEBURGICHNUS VARIUS

- *Bermanerpeton kinneyi* (two specimens)
- Varied materials in consumulites

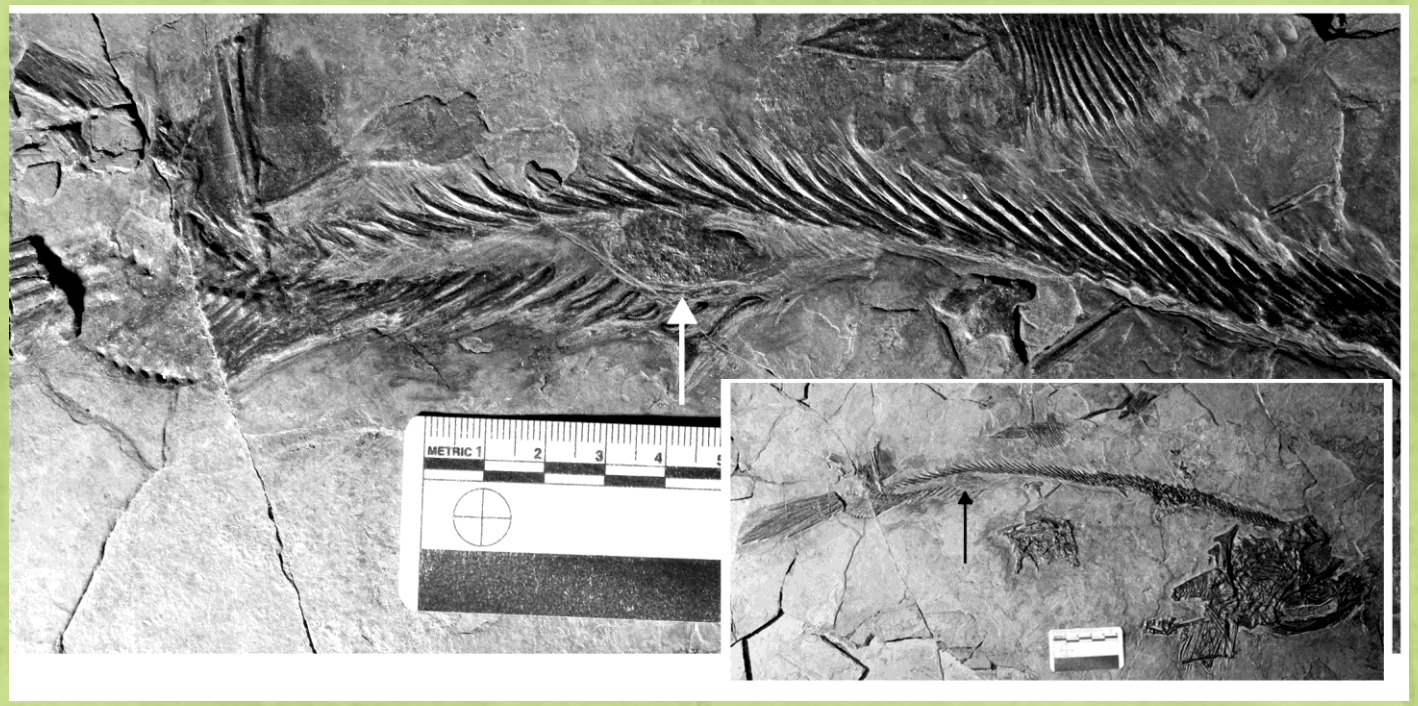


WERNEBURGICHNUS VARIUS



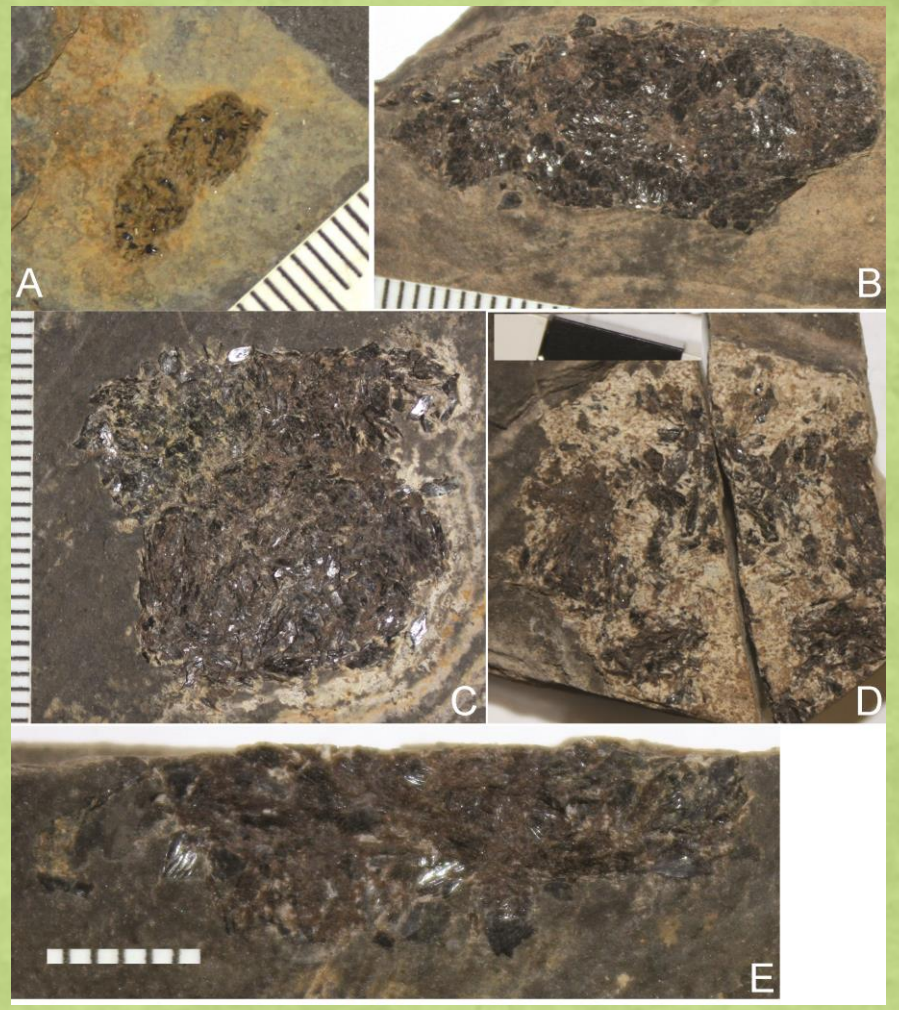


CHONDRIPILULA ZIDEKI

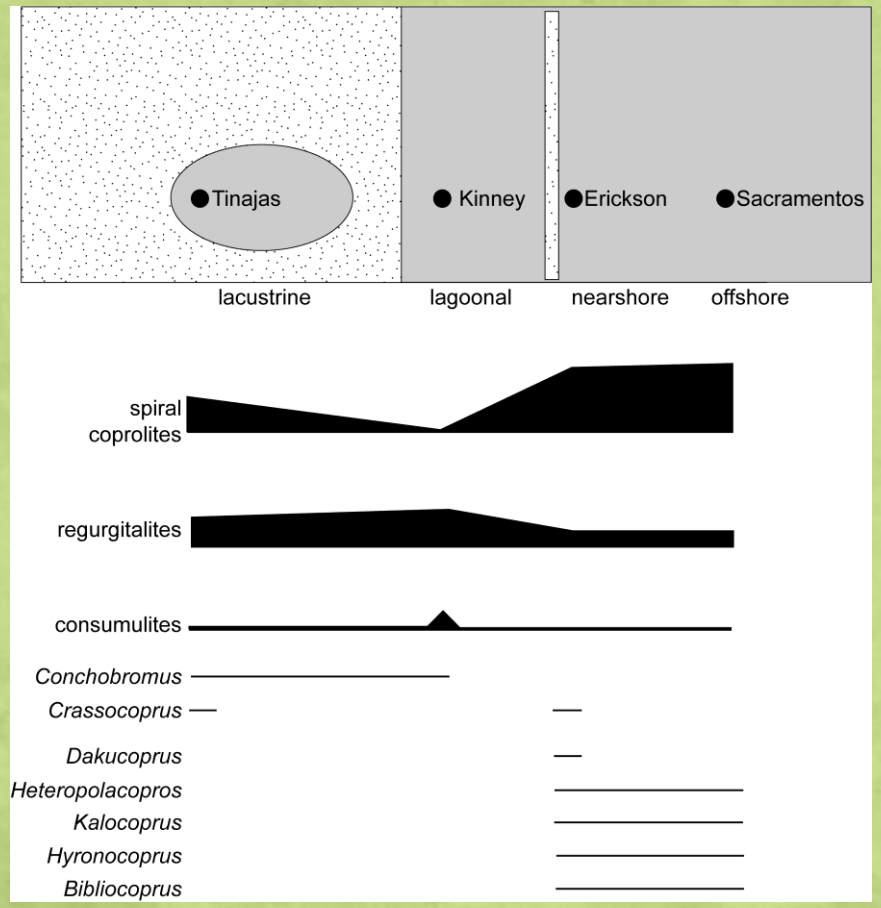


LOTS OF COPROLITES (AND REGURGITALITES)

- *Huberobromus ovatus*
- *Maculacoprus ateri*
- *Virgacoprus brevis*
- *Kinneybromus jurgenai*
- *Conchobromus kinneyensis*
- four unnamed morphotypes



ECOLOGICAL TRANSECT



IMPORTANCE OF KINNEY BRICK QUARRY LAGERSTATTE (TO STUDY OF BROMALITES)

- Contains the most studied bromalites of any Paleozoic ichnofauna and includes the highest number of named ichnotaxa
- Its study stimulated the development of a synthetic nomenclature, with the introduction of the terms bromalite and regurgitalites
- Includes the first named non-evisceralite consumulite taxa
- Ichnofauna provides a reference for bromalites in lagoonal and estuarine/deltaic environments