

National Park Service I.S. Deptartment of the Interior

Abstract:

Morphotype B, 9 specimens; entirely groundmass, no shells, sinusoidal to kidney shape with few ovoid, on average 14.67mm by 9.5mm, diameter average 4.75mm. Unresolved specimens, 3, contain both shells (small quantity and crushed) and a high quantity of groundmass, irregular to sinusoidal in shape, and on average 17.33mm Bromalitic specimens from the Florissant Formation, 34.07 ± 0.10 Ma, from the Florissant Fossil Beds National Monument, were analyzed via taxonomic and taphonomic by 10mm. Due to the shape, size and content of the specimens, the Florisssant bromalites are thought to originate from different biological processes. Morphotype A: methods to elucidate potential origins and predation dynamics present within the ancient lake system. The Florissant Fm. represents a lacustrine and fluvial depositional regurgitalites, Morphotype B: coprolites, and the unresolved type as general consumulites. Morphotype A, composed of crushed invertebrate shells; identified as environment with associated volcaniclastic shales, mudstones, pumice and ash conglomerates. These sediments contain a highly diverse, excellent and uniquely sphaeriids, lymnaeids and planorbids, are generally homogenous in shell type, and rarely show heterogeneity. These differences could reflect additional selective preserved flora and fauna. Major work has been completed on the paleo- botanical, entomological, micro-vertebrate and invertebrate specimens of the formation, tendencies within the predatory behavior of the lake. Likely producers of these bromalites are fish and or shore-birds found within the Florissant Fm., though they may though little work has been done on the bromalites. Preliminary analysis of 25 specimens showed an affinity, based on content, to two major morphotypes, A and B, reflect behavior of previously unknown vertebrates. In the comparison of these morphotypes, potential identification of specific consumers and their biologic functions with an intermediary unresolved morphotype combining the former. Morphotype A, 13 specimens; high content of crushed invertebrate shells, ovoid (rarely sinusoidal) is possible; elucidating larger trophic structures present within the ecology of the Florissant Lake system. in shape and are on average 19.68mm by 13.19mm, with little to no groundmass (organic rich).

Florissant Fossil Beds National Monument, CO

The Florissant Formation at the Florissant Fossil Beds National Monument, Colorado, (Fig. 1) presents a unique view of a paleolacustrine system immediately preceding the Eocene-Oligocene boundary (33.7 Ma). These richly fossiliferous sedimentary deposits represent a single lake that existed on a restricted temporal and spatial scale.

Preserved flora and fauna: Within the lake shales and mudstones, a high diversity of leaf, flower, fruit, pollen, insects, arachnids and vertebrate fossils are preserved and have been well described. In addition, there are a diverse group invertebrates, mollusks and ostracods, present in the sediments. (Fig. 2) Found singularly and in bromalites.

Geologic History: A series of lahars, from the nearby Thirtynine Mile volcanic field damned the paleo-Florissant River valley over the course of its history, providing the setting for exceptional preservation of fossils

Sediments: Stratigraphic layers cropping out at Florissant consist of paper shales, mudstones and conglomerates. Many of the clasts are volcaniclastic and originated from the Guffey stratovolcano and others that are part of the Thirtynine Mile volcanic field. (Fig. 3 and 4)

Age: Mean ⁴⁰Ar/³⁹Ar date of single-crystal sanidine, **34.07 ± .10 Ma** (Evanoff et al., 2001)



Figure 3: Diagram of the origin of the Florissant Lake Beds. Multiple lahar flows from the Guffey Volcano damned the stream valley that created the paleo-Florissant lake. Inset is an mage showing the stratigraphic sequence of the locality. Drafted by J. Hall.

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Figure 4: Stratigraphic sequence described at the Florissant Fossil Beds National Monument, CO. Radiometric ages of the wall mountain tuff are 36.73±0.07 Ma, and of the middle shale unit are 34.07±0.10 Ma. (Evanoff and Doi, 1992).



Analysis of 25 bromalitic specimens revealed two major and one unresolved morphotypes based on shape, size and content:

Morphotype A: High content of crushed invertebrate shells, ovoid (rarely sinusoidal) in shape and are on average 19.68mm by 13.19mm, with little to no groundmass (organic rich).







BR-10h

Unresolved specimens: Contain both shells (small quantity and crushed) and a high quantity of groundmass, irregular to sinusoidal in shape, and on average 17.33mm by 10mm.

WHO'S EATING WHO? PRECURSORY ANALYSIS OF ENIGMATIC BROMALITES FROM THE FLORISSANT FM, CO BRET L. BUSKIRK, M.S., Earth and Space Sciences, University of Washington, Seattle, WA **ADRIAN P. HUNT, Flying Heritage Collection, Everett, WA** SPENCER G. LUCAS, New Mexico Museum of Natural History, Albuquerque, NM

Florissant Bromalites

Morphotype B: Entirely groundmass, no shells, sinusoidal to kidney shape with few ovoid, on average 14.67mm by 9.5mm diameter average 4.75mm.

BR-13a





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Discussion

Initial analysis of these 25 bromalitic specimens point to primary vertebrate producers, and are most likely related to fossil vertebrates already described from the Florissant formation.

ctaluridae (catfish

re 9: Ictalurus pectinatus (Orde

noto courtesy of NP

rmes, Family Ictaluridae) AMNH-FF-8070

Florissant Vertebrates:

Catostomidae (sucker):



Figure 8: Genus Amyzon (Order Cypriniformes, Family Catostomidae UCM-19344. Photo courtesy of NPS.

Bromolitic Origins:

BR-3b

<u>Morphotype A</u> – Ornithoregurgitalites (Bird pellets)

- ovoid shape and undigested content (shells) (Fig. 11 and 12)
- sinusoidal specimens are potential coprolites, shelly material
- having passed through digestive tract
- varying ovoid shapes/sizes due to degradation of the pellet material (Fig. 13)
- Morphotype B Coprolites (fish) - sinusoidal and 'pinched' shape and organic/digested content (dark groundmass)
- <u>Unresolved specimens</u> General Consumulites - potential mixture of Ornithoregurgitalites and Coprolites

Charadriidae (shorebirds – plovers):

Figures 11 and 12: Left: Shorebird expelling a pellet, right: He cellet containing shells www.birdingisfun.com. Mia McPher

Preliminary Conclusions

Analysis of 25 enigmatic bormolitic specimens from terrestrial lacustrine sediments of the Florissant Formation reveal higher trophic structures related to predator and scavenging behaviors. Two major morphotypes, A and B, were established, based on morphological features, which were then related back to dietary and physiologic behaviors of known vertebrates from the Florissant Fm. Morphotype A, generally ovoid and having large shell content, is believed to be ornithoregurgitalites, evidence of predatory behavior of shorebirds. Morphotype B, sinusoidal and high organic content, are understood to be coprolites of bottom-feeding fish (suckers and catfish). While the unresolved bromalites represent general consumulites, or intermediary forms of the previous, additional analyses need to be performed to rule out potential behavior of previously unknown vertebrates. Through the comparison of the above recognized morphotypes, identification of specific consumers and their biologic functions were possible; elucidating larger trophic structures present within the ecology of the Florissant Lake system.