

Open questions regarding identification and function of gastroliths

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Abstract:

Stomach stones (geo gastroliths) are considered a rather special case of ichnologic objects, but they occur commonly in fossil and extant lithophagic vertebrates and can reveal valuable insights into the paleobiology and spatial distribution of their bearers. These stones and their use are still surrounded by many puzzles. Two pressing questions are discussed.

1. Gastroliths identification. Gastroliths have a high potential for paleogeographic and lithogenetic reconstructions, but this potential can only be accessed when stomach stones can be unambiguously identified. There are very few comparable published studies about gastroliths identification which hold up to a scrutinized evaluation of scientific methods. For example, polish was often regarded as a prime criterion for gastroliths identification, but it occurs rarely on verified gastroliths and is more commonly formed by several geologic processes (e.g., wind polish or tectonics). Additional research on parameters like rock type, surface texture, or shape will reveal the variety of existing appearances among gastroliths and support the identification of isolated stomach stones.

2. Gastroliths function. Herbivorous birds utilize grit to triturate and to mix foodstuffs. No sufficient explanation has been found for the purpose of gastroliths in other vertebrates. While lithophagy has also been reported from several insectivorous clades, this is especially relevant for aquatic taxa. In extinct as well as extant clades, such as Permian tetrapods, plesiosaurs, crocodylians, and pinnipeds, gastroliths were or are utilized on a regular basis. For aquatic taxa, several functions were proposed and need crucial reinvestigation. The two most plausible hypotheses are digestive help and buoyancy alteration as ballast in water. However, evidence for both hypotheses is poor and investigations are hampered because gastroliths distribution and amounts within individuals of certain taxa are highly variable and gastroliths functions may overlap.

Consequently, an investigation of relevant stomach contents of lithophagic animals is essential. While the gastroliths collection at the ZNS is still growing, acquisition of new material from lithophagic animals from varied sources is limited, encumbering future research. Hence, acquiring material from other regions and/or taxa would be an invaluable help. If you would like to donate or participate in gastroliths research, please contact the author.

Keywords: lithophagy, gastroliths identification, surface textures, gastroliths function, sample acquisition