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REVIEW ARTICLE

EXTINCTION EVENTS AND THEIR GEOLOGICAL MARKERS IN BANGLADESH: A RESEARCH ARTICLE OUTLINE

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ABSTRACT

Extinction events have played a pivotal role in shaping Earth's biological and geological history, often leaving behind distinct markers in sedimentary and fossil records. These events, such as the Permian-Triassic and Cretaceous-Paleogene mass extinctions, are characterized by significant biotic turnover, often triggered by catastrophic phenomena like volcanic eruptions, asteroid impacts, or rapid climate changes. The unique geological and sedimentary framework of the Bengal Basin, Bangladesh, constitutes an important archive with which to reconstruct these events at the regional scale. The paper is about potential geological markers of global extinction events within Bangladesh, focusing aspects of sedimentary sequences, isotopic anomalies, and fossil assemblages. The study examines key formations such as the Gondwana sediments, Sylhet Limestone, and Quaternary deposits, analyzing their potential to preserve evidence of mass extinctions and associated environmental changes. By correlating these markers with global extinction timelines, the research aims to provide new insights into the regional impact of these events, while addressing challenges posed by rapid sedimentation, tectonic activity, and erosion. The findings are very important in showing the need for interdisciplinary approaches and advanced analytical techniques to unearth the geological legacy of extinction events in Bangladesh, offering a foundation for future research on Earth's dynamic history.

KEYWORDS

Extinction events, geological markers, Bengal Basin, sedimentary records, paleontology, Bangladesh geology.

1. INTRODUCTION

One of the most dramatic changes in Earth's history is through extinctions. Such times are marked by major biological and ecological change. Such events, very common in nature and initiated by some cataclysmic happening such as asteroid impacts, huge volcanic eruptions, or abrupt climatic shifts, have left significant imprints on the planet's geological record (Algeo et al., 2010). Understanding such events and their markers is very vital in the reconstruction of past environments and deciphering those processes that have shaped Earth's evolutionary path (Schulte et al., 2010).

Bangladesh, situated within the Bengal Basin, offers a unique setting to study the geological evidence of global extinction events (Ahmed and Rahman, 2000; Ghosh and Roy, 2013). The region's extensive sedimentary sequences, shaped by tectonic activities and fluvial processes, serve as a potential repository for recording environmental and biological changes linked to these events (Gani and Alam, 2003). However, challenges such as rapid sedimentation, tectonic deformation, and erosion complicate the identification and interpretation of these markers (Alam et al., 2003; Zachos et al., 2008). This study aims to explore the geological record of extinction events in Bangladesh, focusing on identifying sedimentary, isotopic, and fossil evidence, and correlating them with global extinction timelines (Islam et al., 1999). Such an investigation not only contributes to a broader understanding of extinction dynamics but also sheds light on the region's complex geological history (Stanley, 2016).

2. EXTINCTION EVENTS OVERVIEW

Summarize major global extinction events and their typical geological markers:

- Permian-Triassic (252 Ma): Volcanism, carbon isotope excursions.
- Cretaceous-Paleogene (66 Ma): Asteroid impact (iridium layer, shocked quartz).
- Younger Dryas (11,700 years ago): Abrupt climate shifts, megafaunal extinctions.

3. GEOLOGICAL SETTING OF BANGLADESH

- The Bengal Basin and its role in sediment deposition.
- Influence of tectonic activity from the Himalayan orogeny and Indo-Burman Ranges.

3.1 Sedimentary Environments

- Sylhet Limestone.
- Barail Formation.
- Deposits from the Surma Basin.

4. GEOLOGICAL FEATURES IN BANGLADESH

4.1 Permian-Triassic Extinction Indicators

- Sedimentary evidence from Gondwana sequences within the Bengal Basin.
- Potential carbon isotope anomalies.

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- Paleoclimate indicators found in coal and shale sediments.

4.2 Evidence for the Cretaceous-Paleogene (K-Pg) Extinction

- Search for iridium anomalies or microtektites in Sylhet Limestone or adjacent formations.
- Fossil evidence of marine or terrestrial faunal changes.
- Impact of sea-level fluctuations in the Bengal delta.

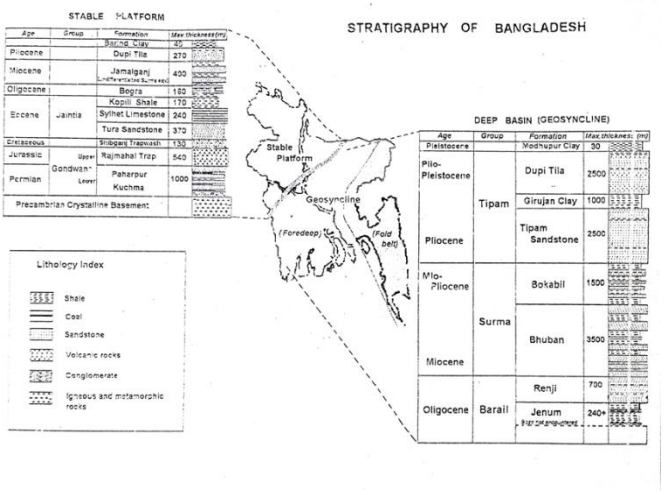

Figure 1: Stratigraphy of Bangladesh [Energy Resources of Bangladesh (Badrul Imam,2013)]

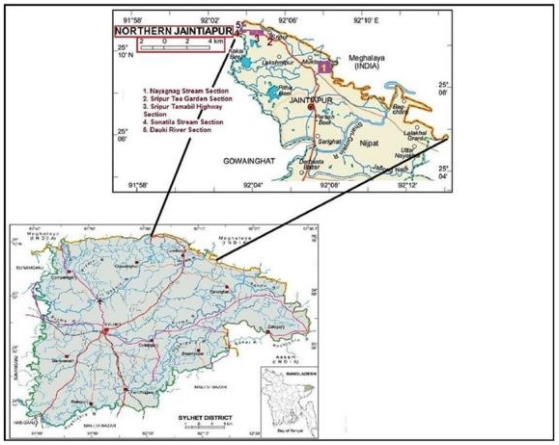

Figure 2: Local map area of Sylhet District (Jaintiapur Upazila)

Figure 3: Sylhet Limestone overlain by Jaflong Shale

4.3 Quaternary Extinctions and Climate Events

- Younger Dryas markers:
- Paleoclimatic reconstruction from pollen, speleothems, or foraminifera.
- Evidence of megafaunal extinction linked to climate changes.
- Sediment cores from riverine and deltaic deposits.

5. Methods

5.1 Field Studies

- Stratigraphic surveys in key sedimentary basins.
- Sample collection (e.g., cores, fossils).

5.2 Laboratory Analyses

- Geochemical assays for isotopes (e.g., $\delta^{13}C$, iridium).
- Paleontological studies (microfossils, vertebrate remains).
- Radiometric dating for age determination.

6. Discussion

- Correlation between global extinction markers and evidence found in Bangladesh.
- Impact of regional factors (e.g., tectonics, monsoonal climate) (Reimold and Koeberl, 2000).
- Challenges in identifying deep-time extinction markers due to rapid sedimentation rates.

7. Challenges And Limitations

- Erosion and reworking of older sediments.
- Lack of detailed studies on pre-Quaternary strata.
- Difficulties in accessing deeper geological layers.

8. Conclusion

This study highlights the importance of understanding global extinction events through the lens of Bangladesh's unique geological context. The Bengal Basin, with its rich sedimentary record, offers a valuable archive for investigating both deep-time and recent extinction events. While evidence for events like the Permian-Triassic and Cretaceous-Paleogene extinction may exist within older formations like the Sylhet Limestone or Gondwana sequences, challenges such as rapid sedimentation, tectonic overprinting, and erosion complicate the search for clear markers. Additionally, Quaternary climatic shifts have left discernible imprints in the form of pollen records, isotopic anomalies, and fossil evidence within riverine and deltaic deposits.

By bridging local geological markers with global extinction timelines, this research not only deepens our understanding of Earth's past but also underscores the dynamic interplay of regional and global processes. Future studies should prioritize interdisciplinary approaches, incorporating advanced analytical techniques such as radiometric dating, geochemical assays, and paleontological surveys. Enhanced collaboration between geologists, paleoclimatologists, and biologists will be crucial in unlocking the full potential of Bangladesh's geological record. This can significantly contribute to the global understanding of extinction dynamics and Earth's evolutionary history.

References

Ahmed, M.F., and Rahman, M.M., 2000. Water supply potential and risks in Bangladesh. Water Policy, 2 (2), Pp. 127–144.

Alam, M., Alam, M.M., Curray, J.R., Chowdhury, M.L.R., and Gani, M.R., 2003. An overview of the sedimentary geology of the Bengal Basin in relation to the plate tectonic framework and basin-fill history. Sedimentary Geology, 155 (3-4), Pp. 179–208.

Algeo, T.J., and Twitchett, R.J., 2010. Anomalous Early Triassic sediment fluxes due to elevated weathering rates and their biological consequences. Geology, 38 (11), Pp. 1023–1026.

Gani, M.R., and Alam, M.M., 2003. Sedimentation and basin-fill history of the Bengal Basin in relation to the tectonic framework. Sedimentary Geology, 155 (3-4), Pp. 301–316.

Ghosh, R.N., and Roy, S.K., 2013. Gondwana sedimentation and its economic importance in the Bengal Basin. Indian Journal of Geology, 85 (2), Pp. 207–219.

Islam, M.R., Begum, S.F., Yamaguchi, Y., and Ogawa, K., 1999. The Ganges and Brahmaputra rivers in Bangladesh: Basin denudation and sedimentation. Hydrological Processes, 13 (17), Pp. 2907–2923.

Reimold, W.U., and Koeberl, C., 2000. Impact structures in Africa: A review. Earth-Science Reviews, 52 (1-3), Pp. 1–49.

Schulte, P., Alegret, L., Arenillas, I., Arz, J.A., Barton, P.J., Bown, P.R., Bralower, T.J., Christeson, G.L., Claeys, P., and Willumsen, P.S., 2010. The Chicxulub asteroid impact and mass extinction at the Cretaceous-Paleogene boundary. Science, 327 (5970), Pp. 1214–1218.

Stanley, S.M., 2016. Estimates of the magnitudes of major marine mass extinctions in earth history. Proceedings of the National Academy of Sciences, 113 (42), Pp. E6325–E6334.

Zachos, J.C., Dickens, G.R., and Zeebe, R.E., 2008. An early Cenozoic perspective on greenhouse warming and carbon-cycle dynamics. Nature, 451 (7176), Pp. 279–283.