



Short Review Paper

Guryal Ravine – Permian-Triassic (P-Tr.) fossiliferous treasure Khanmouh Srinagar, Kashmir, India

Mohsin Noor

Department of Geology and Mining, Government of J&K (UT), India
noormohsin0@gmail.com

Available online at: www.isca.in

Received 11th July 2023, revised 11th August 2023, accepted 23th August 2023

Abstract

The Valley of Kashmir is blessed with a large number of magnificent geological sites spread throughout its length and breadth, spanning over the entire length of the geological time scale. The Guryal Ravine fossiliferous zone (34°4'25.00"N 74°56'42.00"E) is one of the world's best known Permian-Triassic (P-Tr.) Type Section referred as the Great Permian Mass Extinction event which is defined both on faunal and lithological characteristics. The Section represents repository fossil beds with a record of 252 million of year old geological events. It is spread over an area of 983337 square meters with a face length of 1413 meters, amidst picturesque exposures of Zabarwan Mountain Range in the summer capital of Srinagar, Kashmir, India. The fascinating fossils of Guryal Ravine have gained world attention which eventually led to its development as tourist spot. A team of geologists from Department of Geology and Mining, Srinagar demarcated the boundaries of Guryal Ravine fossiliferous zone with the aid of Global Positioning Satellites (G.P.S) and Electronic Total Station (E.T.S). The surface map of the Guryal Ravine was prepared on GIS Platform which was submitted to the Government for declaration of protected fossiliferous zone. This paper discusses the techniques and procedure involved in the demarcation and preservation of Guryal Ravine, world famous fossil site.

Keywords: Fossiliferous Zone, Global Positioning Satellites (G.P.S) and Electronic Total Station (E.T.S).

Introduction

The Valley of Kashmir is blessed with a large number of magnificent geological sites spanning enormous timeframe of geological time scale. These geological sites attract not only the earth scientists from all over the world but have also gained the attention of common people. The Guryal Ravine located at Khanmouh village is one among these sites of utmost geological attractions. It is spread over an area of 983337 square meters with a face length of 1413 meters, amidst picturesque exposures of Zabarwan hills in the summer capital District Srinagar in the Kashmir Division. The fascinating fossils of Guryal Ravine have gained world attention which eventually led to its development as tourist spot thus promoting geo-tourism. A large and rare collection of invertebrate fossils recovered from Guryal Ravine fossiliferous zone are being preserved as well as displayed at Sri Pratap Singh Museum, Lal Mandi, Srinagar which were identified and documented by geologists of Geology and Mining Department Srinagar, including the author of the present study, during the period 2018 as per the request made by the Curator of Sri Pratap Singh Museum.

Geological Setting

The Permian rocks of Kashmir Himalayas shows a great variation in their lithology which include fluvio-glacial, volcanic, continental and marine deposits. These rocks have

attracted the attention of many workers in the past because of their stratigraphic and faunal interest¹. The last stages of Permian and succeeding the early stages of the Triassic period witnessed many changes particularly in atmosphere, climate and biota. To identify and understand such changes chronologically, the Guryal Ravine section provides the best site wherein the continuity of sedimentation and pre-*Otoceras* zone containing a mixed Permo-Triassic fauna and fossil assemblages are well preserved². The Guryal Ravine fossiliferous zone (34° 4'25.00"N 74°56'42.00"E) is one of the world's best known Permian-Triassic (P-Tr.) Type Section referred as the Great Permian Mass Extinction event which is defined both on faunal and lithological characteristics. The Section represents repository fossil beds with a record of 252 million of year old geological events. The section describes the most illustrious and well preserved faunal assemblage of mega fossils³. Well-preserved marine and some terrestrial remains, renders the section important in terms of biologic perception of the Permian-Triassic boundary (PTB) event. The Guryal Ravine fossiliferous zone is located in Khanmouh Syncline (KS) about 15 kilometers east of Srinagar District⁴. The Guryal Ravine (Fig. 01) is easily approachable and near to market place which has gained the attraction of world geoscientists. However, this type section is also exposed in Iran and China. But these sections are exposed in remote areas and are not easily approachable. The rocks of the Guryal Ravine consists of arenaceous sequence

grading upwards through argillaceous into a carbonate (Lime) sequence.

Zewan Formation is about 97.3m thick and has been divided into 4 members named A to D⁵. The rocks of Zewan Formation consists of Sandy Shale, Shale, Sandy Limestone and argillaceous/Muddy Limestone. Member A consists of Sandy Shale, B Shale, C Sandy Limestone and D Argillaceous/Muddy Limestone. Member D consists of Gastropods and Brachiopods of Permian Age^{6,7}.

Khanmouh Formation is about 100m thick and is divided into 6 members named E to J⁵. The Rocks of Khanmouh Formation consist of Black Limestone and Black Shale. The member E is sub-divided into E1, E2 and E3. The Unit E1 contains mixed fossils of Lower Permian and Early Triassic age. The Permian-Triassic (P-Tr) Boundary has been placed at the contact of E1 and E2 (base of E2). The *OCTOCERAS WOODWARDI* (Ammonoids) marks the beginning of Early Triassic Strata^{6,7}.

Protection and Preservation Measures

The eminent academicians, geologists who attended an International Geological Conference at University of Jammu on 24th of July, 2007 expressed deep concern regarding quarrying of stones in and around Guryal Ravine fossiliferous zone Khanmouh Srinagar. During the deliberations the world Geofraternity observed that this section being rare in the world was

extremely important for Geological research forming a geological heritage of Kashmir and urged the area to be declared as protected zone. Accordingly, grant of quarry permits for extraction and removal were stopped by the Department of Geology and Mining, Srinagar. Since 2007, all the approach roads were blocked by the Department by deep trenching and finally the area was fenced. In the spring of 2010 a team of Geologists comprising of Mohsin Noor, Dr. Ghulam ud Din Bhat and M. Yaseen Bhat headed by Mr. Nisar Ahmad Khawaja, Joint Director, Department of Geology and Mining, Kashmir under the supervision of Prof (Dr.) G. M Bhat, Department of Geology, Jammu University identified and subsequently demarcated the boundaries of Guryal Ravine fossiliferous zone with the help of Global Positioning Satellites (GPS) and Electronic Total Station (ETS)⁸. The plan of the Guryal Fossiliferous Zone was prepared on 1:1000 scale (Figure-2) and later the plan was processed on GIS Platform by Mr. Khursheed A Mir, Mineral officer. The Surface Plan and the GIS Plan was cross checked many times in the field for accuracy before submitting to the Administrative Department for declaration of protected fossiliferous zone. Accordingly, the Administrative Office of the Geology and Mining Department (Government of Jammu & Kashmir) in its order no 94-IND of 2017 dated 3rd of March 2017 declared and preserved it as fossiliferous zone⁹. Presently, the fossil park is maintained by the Department of Geology and Mining, through the funds of District Mineral Foundation Trust (DMFT), Srinagar¹⁰.

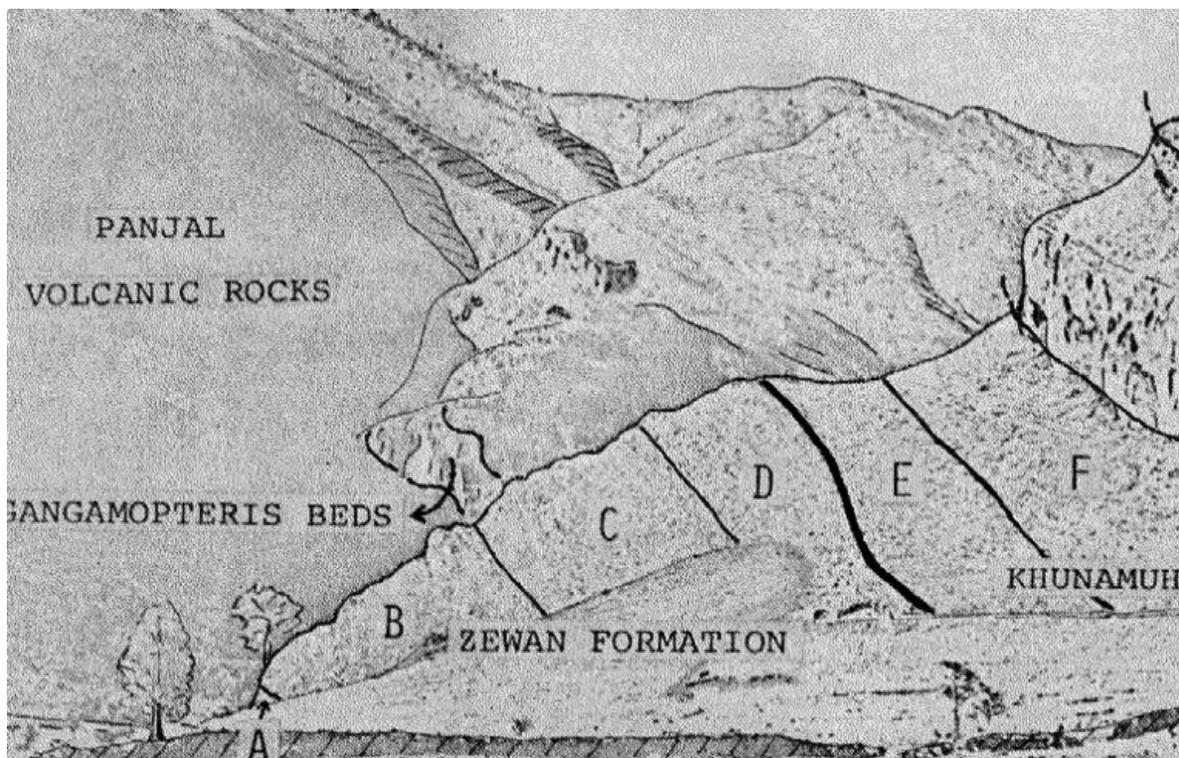


Figure-1: Geological sketch of Guryal Ravine⁵.

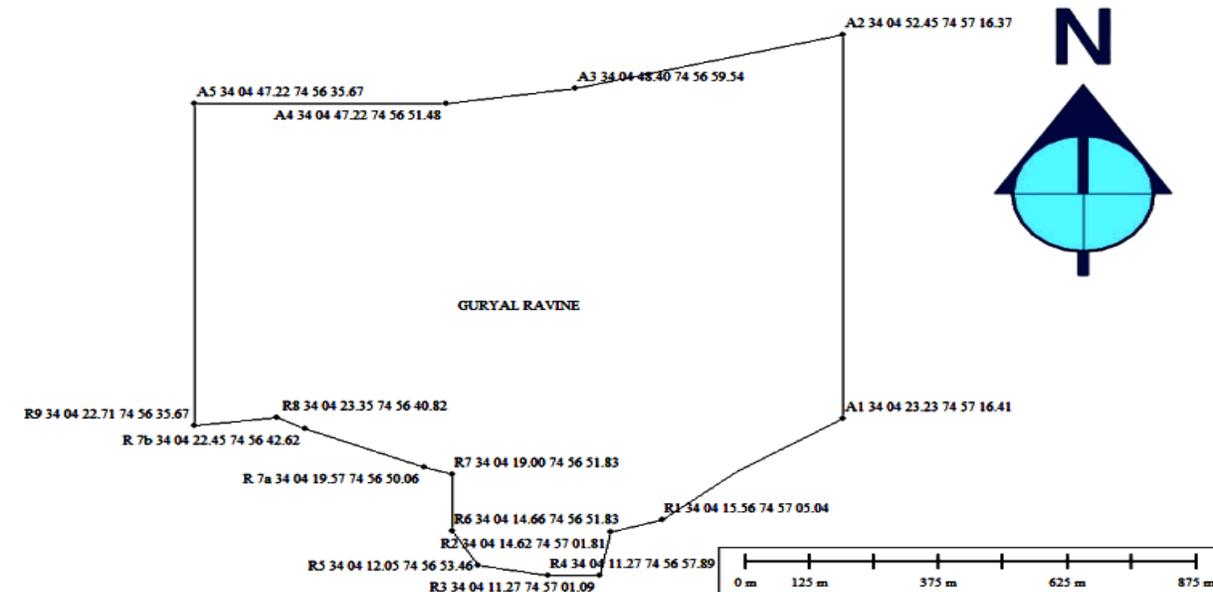


Figure-2: Boundaries of Guryal Fossiliferous Zone Khanmouh Srinagar.

Conclusion

The Guryal Ravine Permian-Triassic (P-Tr.) Type Section represents the repository fossil beds with a record of 252 million of year old geological history and Great Permian Mass Extinction event is a unique and potential Section developed as national geo-heritage site. It is the Natures library which holds the secrets of historical geology as well as the climate change impact on Lower Gondwana flora. The Guryal Ravine fossiliferous site is open to general public, tourists, students, researchers and earth-scientists all over the world for further studies and research work. Presently the fossil park is maintained by the Department of Geology and Mining, through the funds of District Mineral Foundation Trust (DMFT), Srinagar.

Acknowledgment

The contribution of Dr. G. M. Bhat (Retd. Professor, University of Jammu) is highly acknowledged for providing all the necessary help and research papers pertaining to Guryal Fossiliferous Zone and his association while demarcation of the boundary.

References

- Ahmad, F, Chib. C.S, and Singh, A.J (1978). Permian System in the north and north east part of Kashmir Himalayas. *Himalayan Geology*, 8 (1) 224-251.
- Nadeem Ahmad Bhat and Riyaz Ahmad Mir (2023). Potential of Guryal as Geotourism site in Kashmir; Permian–Triassic Mass Extinction Section. *Special Abstract Volume, Geological Survey of India*. 15-17.
- Patwardhan AM (2012). The dynamic earth system, 3rd edn. PHI Learning Pvt. Ltd, New Delhi.
- Mohsin Noor (2022). The Limestone Deposits of Sangari Khanmoh Srinagar Kashmir India. Conference paper: 38 Convention of Indian Association of Sedimentologists. New Delhi India.
- Nakazawa et al (1975). The Upper Permian and Lower Triassic in Kashmir, India. *Mem. Fac. Sci., Kyoto Univ., Ser. Geol. And Min.*, v. 42, p.1-106.
- Singh V, Pandita SK, Tewari R, van Hengstum PJ, Pillai, SS, Agnihotri D, Kumar K, Bhat, GD (2015). The camoebians (Testate Amoebae) Straddling the Permian-Triassic Boundary in the Guryul Ravine Section, India: Evolutionary and Palaeoecological Implications. *PLoS ONE* 10(8): e0135593.
- Kapoor, H. M. (1996). The Guryul ravine section, candidate of the global stratotype and point (GSSP) of the Permian–Triassic boundary (PTB). The Paleozoic-Mesozoic Boundary: Candidates of the Global Stratotype Section and Point of the Permian-Triassic.
- Mohsin Noor and S. Shaban (2018). Identification and Documentation of Rocks, Minerals and Fossils housed at SPS Museum Lal Mandi Srinagar. (Unpublished Report).
- Preservation of the Geological fossiliferous zone at Guryal, Khanmouh, Srinagar (2017). Industries and Commerce, Civil Secretariat, Jammu. Government Order No 94-IND of 2017 dated 3rd of March 2017.
- The Jammu and Kashmir minor Mineral Concession Rules 2016 Dated 31.03.2016.