

First record of extinct *Paraconularia* (Cnidaria, Scyphozoa) from Tethyan sequence (Upper Permian) of Spiti valley, Himachal Himalaya, India

Narendra K. Swami, Satish C. Tripathi, Ramesh Laishram, and Amit Dharwadkar

ABSTRACT

An almost complete Tethyan marine sedimentary succession ranging in age from Precambrian to Cretaceous is exposed in Spiti valley in the Himachal Himalaya, India. The present study records and describes, for the first time, the occurrence of *Paraconularia* sp., belonging to the conulariids, from the Gungri Formation of Upper Permian age, in the Pin River (a tributary of the Spiti River) valley in the Himachal Pradesh. The specimen is quite well preserved, and its discovery from Tethyan sequence adds to the knowledge of the Permian conulariids from India.

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INTRODUCTION

Geological record of the extinct group of conulariids (Cnidaria, Scyphozoa) ranges in age from Ediacaran to Triassic period (Feldmann and Babcock, 1986; Van Iten et al., 2006; Van Iten et al., 2008; Leme et al., 2008; Sendino and Darrell,

2009; Van Iten et al., 2016). A rare conulariid fossil specimen has been discovered for the first time from the lower part of the Siltstone Member of the Gungri Formation, about 500 m to the west of village Guling, on the left bank of the Pin River (a tributary of Spiti River), in Lahaul and Spiti district of Himachal Pradesh, India (Figure 1).

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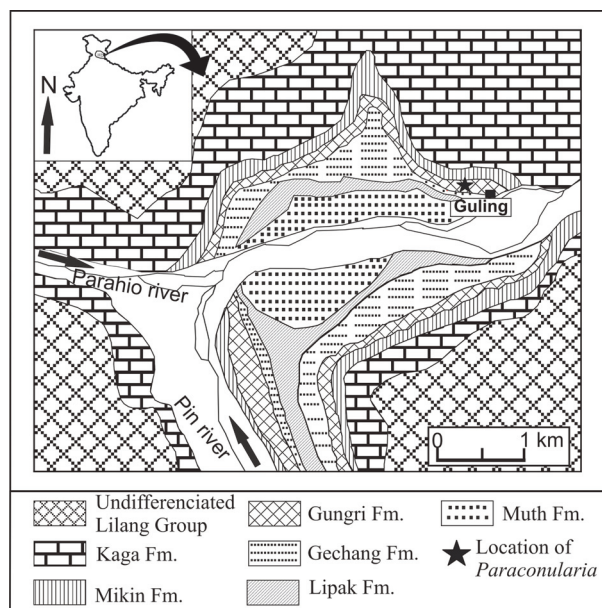


FIGURE 1. Geological map of the Pin River valley, Lahaul and Spiti district of Himachal Pradesh, India, showing location of the fossil specimen demarcated by star.

GEOLOGICAL SETTING

The Tethyan sequence of the Himachal Himalaya represents a more or less complete sedimentary succession ranging in age from the Precambrian to the Cretaceous. The Permian succession of Kuling Group of Spiti valley is subdivided into Gechang and Gungri formations in ascending order. The lower Gechang Formation consists of medium grained, grey to buff coloured argillaceous sandstone, which is often calcareous and contains recrystallised brachiopod shells. The Gungri Formation gradationally overlies the Gechang Formation and consists of a lower micaceous Siltstone Member and upper Nodular Black Shale Member (Figure 2).

The Siltstone Member of the Gungri Formation is richly fossiliferous and is characterized by brachiopods (*Neospirifer* and *Linoproductus*) and trace fossil *Zoophycus* (Figure 3.1). This member is succeeded upward by black shale containing phosphatic nodules (Figure 3.2). A continuous 1 to 6 cm thick, ferruginous layer representing Permian-Triassic boundary is ubiquitous in this region (Figure 3.3). The Permian strata in the study area are overlain by the Triassic limestone sequence, represented by the Mikin Formation, which yields typical cephalopods (*Octoceras* and *Ophioceras*; Figure 3.4). The Gungri Formation has been assigned an age ranging from Dzulfian to Dorashmian of the

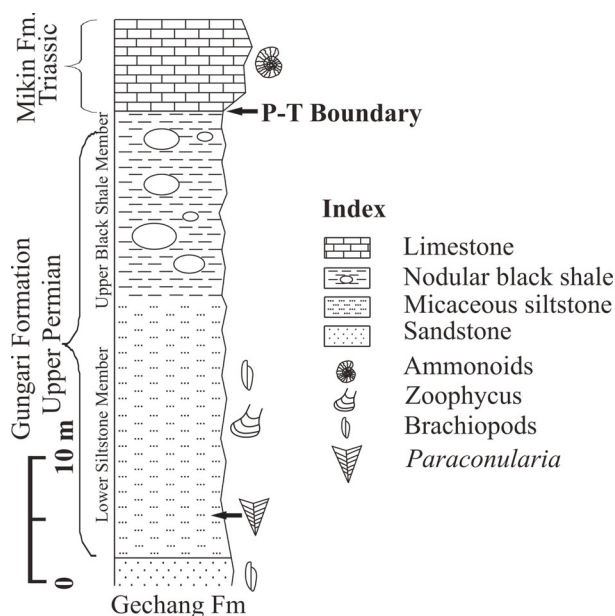


FIGURE 2. Litholog showing the stratigraphic level of the *Paraconularia* sp. with respect to Gungri Formation.

uppermost Permian on the basis of the faunal assemblages (Bhargava and Bassi, 1998; Bhargava, 2008).

MATERIAL

Single relatively quite well-preserved specimen. The original sample is in the Repository of the Geological Survey of India, Northern Region, Lucknow, India, registration number NRS-2/467.

SYSTEMATIC PALAEOLOGY

Phylum CNIDARIA Hatschek, 1888

Class SCYPHOZOA Gotte, 1887

Order CONULARRIDA Miller and Gurley, 1896

Family CONULARIIDAE Walcott, 1886

Genus PARACONULARIA Sinclair, 1940

Type species. *Paraconularia inaequicostata* de Koninck, 1883.

Paraconularia sp.

Figure 4

Horizon. Lower Siltstone Member of the Gungri Formation, Upper Permian.

Locality. About 500 m to the west of the village Guling, Lahaul and Spiti district, Himachal Pradesh, India.

Description. Relatively large (35mm long), incomplete specimen preserves the apical wall but does not preserve the apertural margin. The specimen shows unequal width of faces, has moderately high

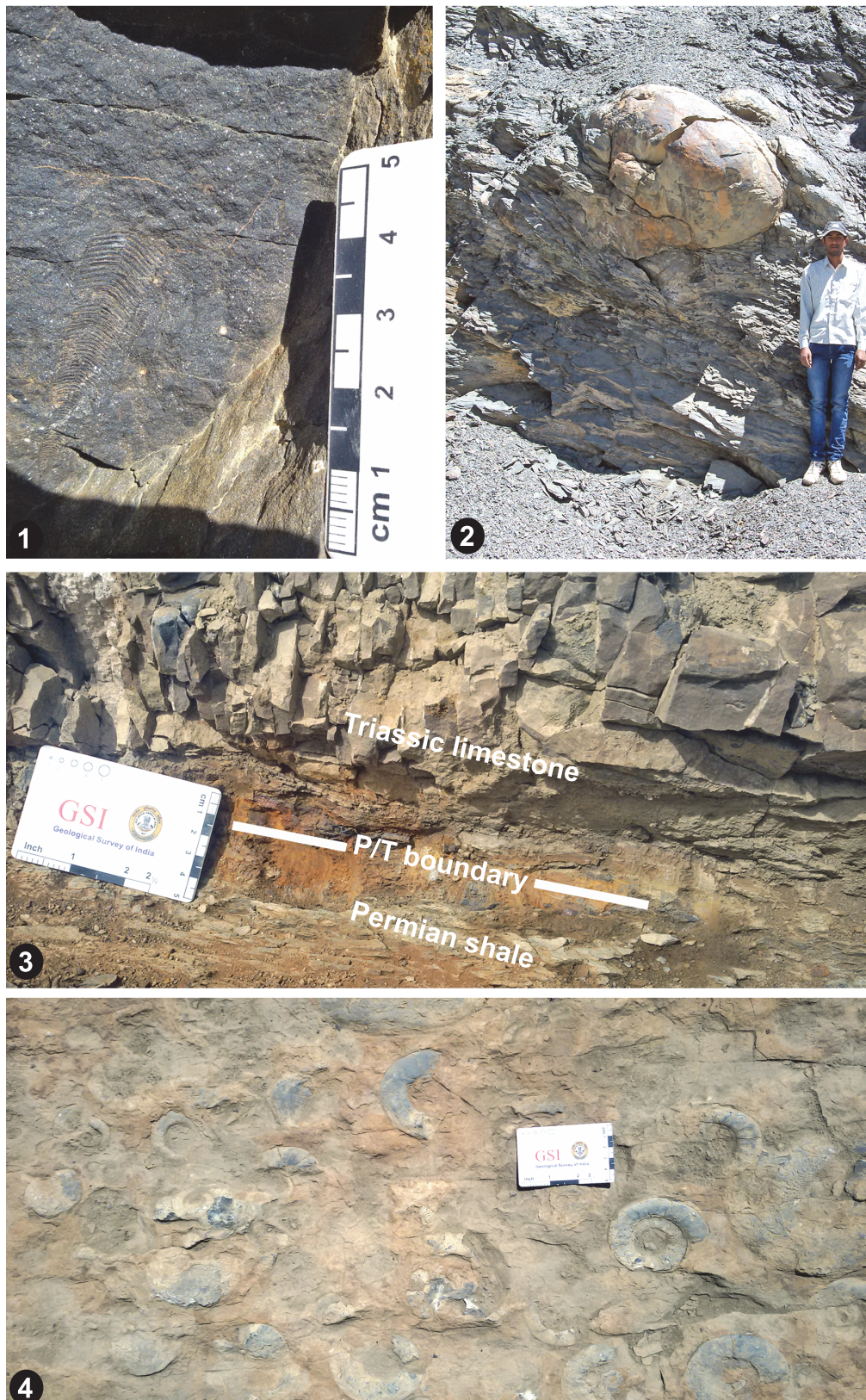


FIGURE 3. 1, *Paraconularia* embedded in the Micaceous siltstone of the lower part of Gungri Formation, Guling village. 2, Upper Nodular Black Shale Member of the Gungri Formation. 3, Permian-Triassic boundary, Guling village. 4, Ammonite bearing Triassic limestone of Mikin Formation, opposite to Guling village.

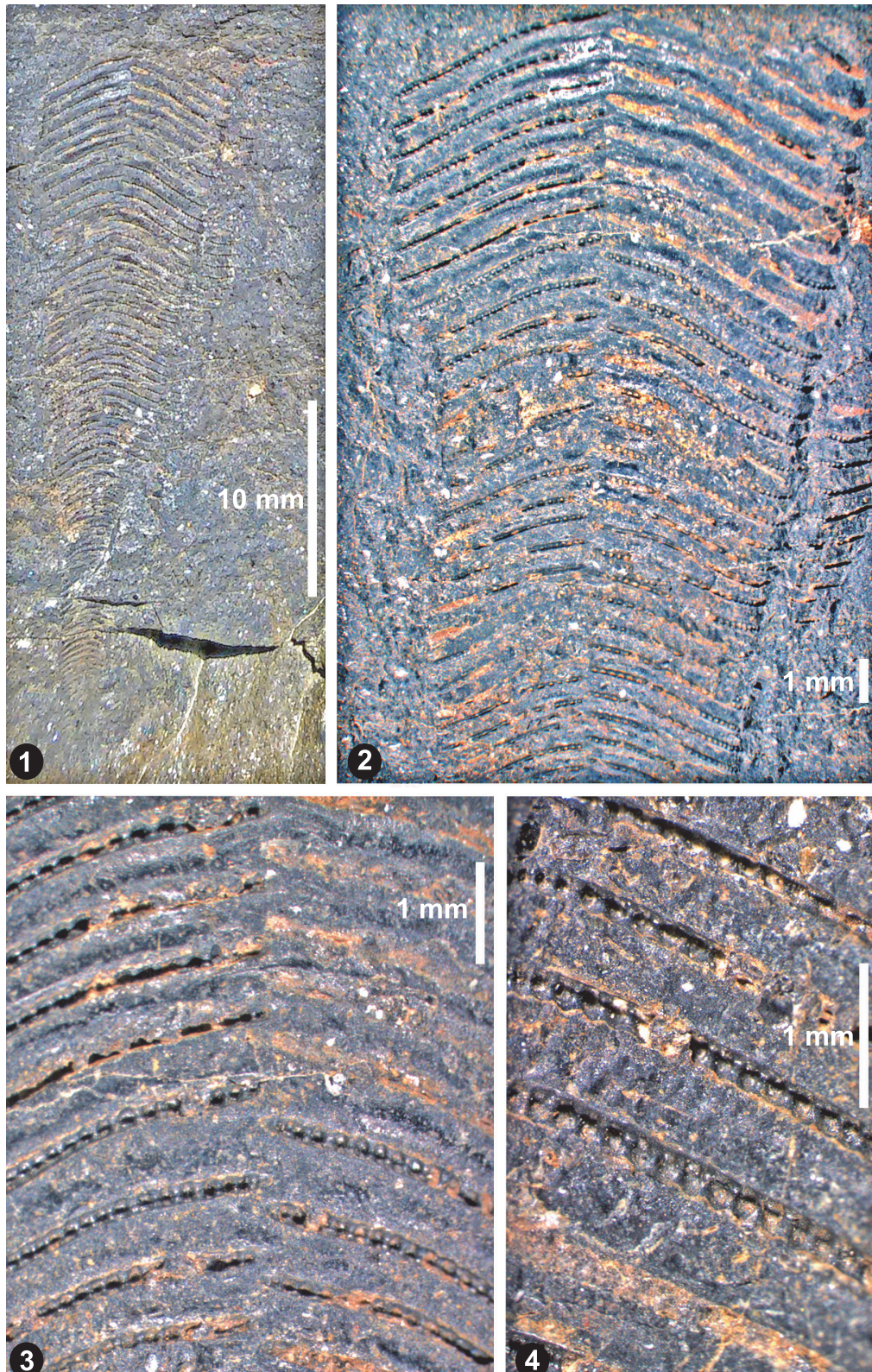


FIGURE 4. *Paraconularia* sp. embedded in the micaceous siltstone of the Gungri Formation. 1, View of single face. 2, Close-up view showing well-developed nodes on facial ridge (transverse rib) and interspace. 3, Apertural side showing widely spaced facial ridges, which alternately arranged either side of the midline. 4, Close-up view of the apertural side showing nodes on facial ridge.

apical angle (20°) and is conical in shape. The facial ridges (transverse ribs) are around 52–55 in number, are moderately strong, thickening on the apertural side and thinning towards the apical side. The facial ridges occur at regular intervals, show slight curvature near the midline, exhibit chevron-like features but do not oppose each other. They are widely spaced (two ribs per millimeter) and terminate at the corner groove. Facial ridges are associated with well-preserved fine, closely spaced (six to seven nodes per millimeter), circular nodes on both sides (apical and apertural). The midline is faintly developed. Interspace (Interridge area) is smooth, slightly curved. Corner groove is partly preserved, and spines are completely absent.

Close resemblance. Based on the ornamentation and dimension of the present specimen, it closely resembles the *Paraconularia quadrisulcata* (Sowerby, 1821).

DISCUSSION

Fossils of conulariid have been reported earlier from Eastern Himalayas in the Lachi pebble bed of the Sagaramatha region (Acharyya and Shah, 1975); *Conularia laskari* from the Bighunala, Ranga valley in the Subansiri district of the Eastern Himalayas (Sahni and Srivastava, 1956); *C. laevigata* (Morris, 1845), *C. warthi* (Waagen, 1891), *C. salaria* (Reed, 1936), *C. punjabica* (Reed, 1936), and *C. chelensis* (Reed, 1936) from the Salt Range of Carboniferous/Early Permian age (Reed, 1936; Waterhouse, 1979). The *Conularia* bed of the Salt Range has been correlated with the *Paraconularia* of Badhaura Formation (Permian) of the Rajasthan and the fauna of Chumik Formation of the Kashmir (Waterhouse and Ranga Rao, 1989; Gaetani et al., 1990; Jain and Kumar, 2010).

While *Paraconularia* has been reported from the Lower Permian strata from other parts of the Himalaya, this study, for the first time, records its occurrence in the Gungri Formation of the Upper Permian age. Furthermore, faunas like brachiopods (*Neospirifer* and *Linoproductus*) and *Zoophycus*, which are associated with *Paraconularia*, suggest the presence of open marine, deep water, warm, muddy and sandy substrate condition.

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