



The Cambrian trilobite fauna from the Shian (Saybang) section, Pin Valley (Spiti) and its biostratigraphic significance

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Abstract

The Cambrian trilobite fauna, illustrated for the first time from the Pin Valley (Spiti, Northwest Himalaya, India), comprises *Oryctocephalus indicus*, *Pagetia significans*, *Kunmingaspis pervulgata*, and *Bhargavia prakritika* and they ranges from the top part of the Cambrian Series 2 (Stage 4) to the basal most part of the Series 3 (Stage 5). On the basis of the trilobite fauna and their stratigraphic order of occurrence we recognize the *Oryctocephalus indicus* Zone (5.4 m), interval 1 of no zonation, and the *Bhargavia prakritika* Level (Cambrian Series 3, Stage 5). The *Oryctocephalus indicus* Zone is based on the FAD and LAD (local range) of the eponymous species in the Pin Valley section. The occurrence of fossiliferous section immediately below the Cambro-Ordovician angular unconformity in the Pin Valley indicates, in comparison to the Parahio Valley, nearly 1160 m of the Cambrian strata (deposited within about 2 Ma, i.e., 509 to 507 Ma) further eroded prior to the deposition of the Thango Formation.

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1. Introduction

Cambrian trilobites are well-known in the classic Parahio Valley (Spiti); there they range from the late part of the Cambrian Series 2, Stage 4 to upper middle part of the Series 3, Stage 5 (Hayden, 1904; Reed, 1910; Shah and Paul, 1987; Jell and Hughes, 1997; Peng et al., 2009; Singh et al., 2014, 2015a, 2016). However, in the adjacent Pin Valley a thick succession of Cambrian sediments is preserved between the Mud (previously known as Muth) and Baldur localities, which is relatively unexplored area in the region for recovery of the trilobite faunas (Hayden, 1904; Fuchs, 1982; Bhargava and Bassi, 1998). Hayden (1904) recorded a single specimen of *Redlichia noetlingi* (Cambrian Series 2, Stage 4) from a float some miles SSW of the Mud village, which is the only trilobite described and illustrated from the Pin Valley (Reed, 1910).

In the late nineties, Parcha (1996, 1998) claimed to have recognised four Middle Cambrian (Solvian to Menevian) trilobite assemblage zones in the Shian (locally known as Saybang) section (Pin Valley), but these trilobites have been neither described nor illustrated. Moreover, the stratigraphic order of the faunas mentioned in these trilobite assemblage zones includes faunas from different stratigraphic levels of Hayden (1904), which are mostly revised in the Parahio Valley (Jell and Hughes, 1997; Peng et al., 2009). The biostratigraphic zonation of the Pin Valley by Parcha (1996, 1998) does not accord with the order of stratigraphic succession recognized by Hayden (1904), and confirmed in the zonations of Peng et al. (2009) and Popov et al. (2015). This conflict encouraged us to re-examine the Pin section in detail.

The present work deals with (i) record of trilobite faunas from the Shian section, (ii) demarcation of one trilobite zone, one level and one interval of no zonation, (iii) critical evaluation of the biozonation erected by Parcha (1996, 1998) and (iv) regional and global correlations.

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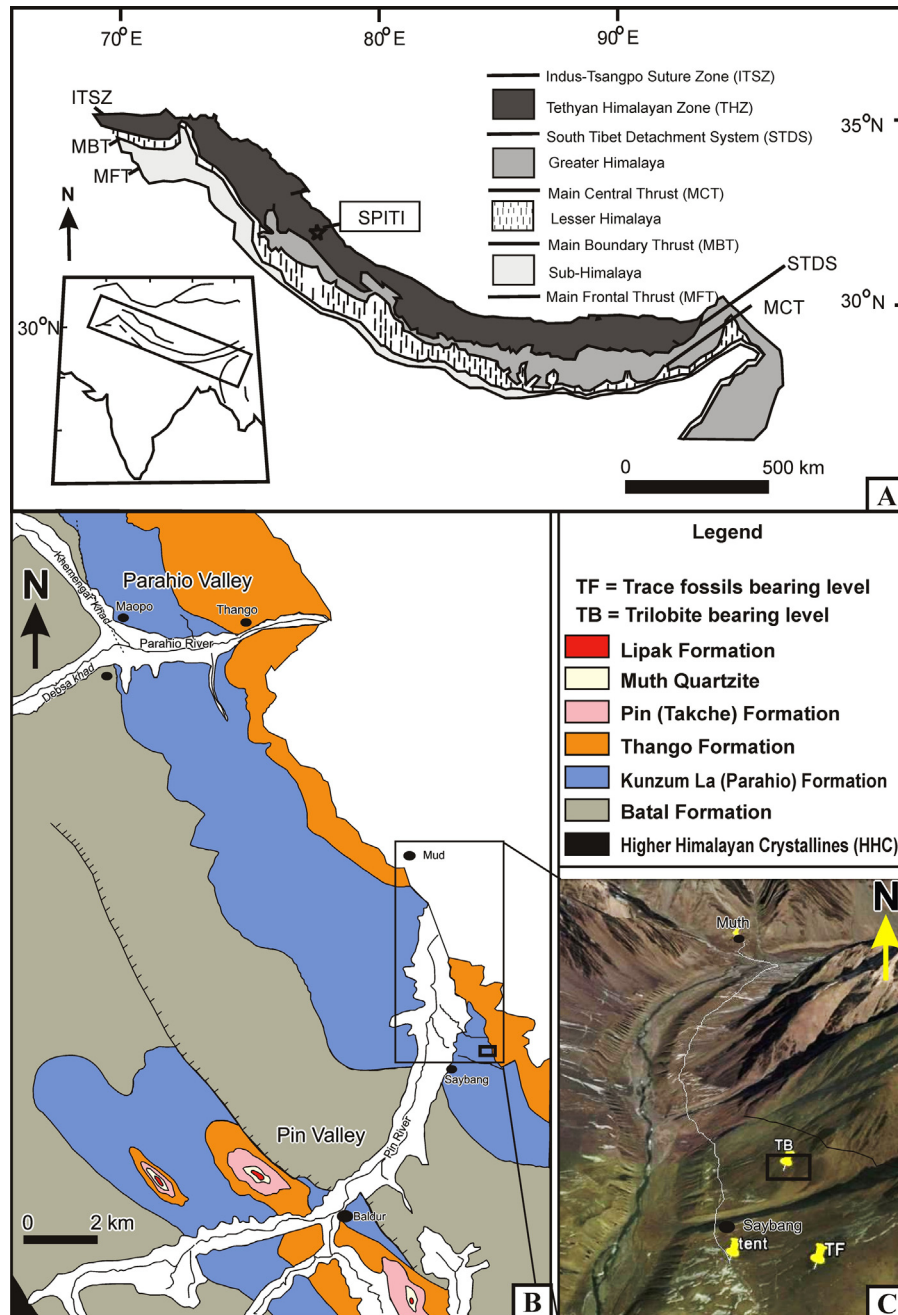


Fig. 1. (A) Map showing the lithotectonic zones of the Himalaya and location of the study area (Spiti). (B) Geological map of the Spiti region including the Pin and Parahio valleys (modified after Bhargava and Bassi, 1998). (C) Inset shows google image (looking North) of the location.

2. Geological setting and lithostratigraphy

The Cambrian trilobites in the Indian Himalaya are known from the two lithotectonic zones, i.e., Tethyan Himalayan Zone (THZ) and the Lesser Himalayan Zone (LHZ). The Zaskar-Spiti sub-basin lies north of the Greater Himalayan Zone (GHZ) and belongs to the THZ (Fig. 1A). The Spiti region lies in the northern most part of the Himachal Pradesh and is bound in the west by Lahaul, in the north by Ladakh and in the east by Kinnaur and Tibet. To the south, these rocks are bounded by the Vaikrita crystallines, which are believed to have been separated by the

South Tibetan Detachment System (STDS) and to the north by the Indo-Tsangpo Suture Zone (ITSZ) (Searle, 1986; Steck et al., 1993; Bhargava and Bassi, 1998; Vannay and Grasemann, 1998; Wyss et al., 1999; Corfield and Searle, 2000; Yin and Harrison, 2000; Wiesmayr and Grasemann, 2002; Vannay et al., 2004; Webb et al., 2013).

The Cambrian rocks in the entire Spiti region are exposed along NW-SE strike of the Haimanta Group (Hayden, 1904; Srikantia, 1981; Bhargava and Bassi, 1998) extending from the Kunzum La Pass in the NW to Baldur in the SE (Fig. 1B). These rocks extend further in the north-west into the Lahaul,

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