



Full length article

An appraisal of the Permian palaeobiodiversity and geology of the Ib-River Basin, eastern coastal area, India



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ARTICLE INFO

Keywords:

Ib-River Basin
Palaeovegetation
Ichnology
Palaeoclimate
Marine incursion
Vegetational reconstruction

ABSTRACT

The Ib-River Basin situated in the east coastal area of India, in Odisha State is a south-eastern part of the Mahanadi Master Basin. A large number of plant macrofossils belonging to the *Glossopteris* flora were described and documented between 2006 and 2010 from various localities of the Barakar and Lower Kamthi formations of this basin. The floral components representing leaves, roots and fructifications in these assemblages belong to the Lycopodiales, Equisetales, Sphenophyllales, Filicales, Cordaitales, Cycadales, Ginkgoales, Coniferales and Glossopteridales. In the present study, all the available data pertaining to the biological remains, petrological analyses as well as the geology of this basin are reviewed and analyzed to deduce and reconstruct the biostratigraphy, palaeoclimate, palaeoenvironment and the landscape of this basin during Permian time in general and during the deposition of Barakar (Artinskian - Kungurian) and Lower Kamthi (Lopingian) formations in particular. The floral composition suggests the prevalence of a temperate climate with a slight change from warm moist to warm dry conditions during the deposition of the Barakar Formation and warm and humid during the deposition of Lower Kamthi sediments. Distribution of various plant groups in the Barakar and Lower Kamthi formations have been shown to depict the biodiversity trends. Vegetational reconstructions during the deposition of the Barakar and Lower Kamthi formations around the Ib-River Basin have also been attempted based on all the fossil records from this area. The status of unclassified Barakar and Kamthi formations has been redefined. Apart from megaflorestics, the palynology of the basin is also discussed. Possible marine incursions and marine marginal environment in the Ib-Basin during Permian are overtly summarized on the basis of records of acritarchs, typical marine ichnofossils and evidences of wave activity in Lower Gondwana sediments of this Basin.

1. Introduction

The Ib-River Basin is part of the Mahanadi Master Basin, which is one of the six major Gondwana sedimentary basins of Peninsular India. It is named after the River Ib, a tributary of the Mahanadi River, and occurs in the Sundargarh, Jharsuguda and Sambalpur districts of the State of Odisha (Raja Rao, 1982). Although most Indian Gondwana deposits are richly fossiliferous and have been extensively studied, those of the Ib-River Basin have been comparatively overlooked. Since 2006, however, a thorough programme of investigation of the basin including four excursions has resulted in a huge cache of plant macrofossils of Lycopodiales, Equisetales, Sphenophyllales, Filicales, Cordaitales, Cycadales, Ginkgoales, Coniferales and Glossopteridales (Goswami, 2006; Goswami et al., 2006a; Goswami and Singh, 2010; Singh et al., 2006a, 2006b, 2007). Some scale leaves and a few stem

casts have also been recorded.

The present paper will review all of the available palaeobotanical data from the Ib-River Basin, together with the associated data on the palynology and trace/ichno fossils. The data will be analyzed in terms of the palaeofloristics, biostratigraphy, palaeoclimate and palaeoenvironments, and will be used to show how the localities vary in age across the basin. The stratigraphical distribution of various plant groups within the Barakar and Lower Kamthi formations are also used to depict biodiversity trends during Artinskian – Kungurian and Lopingian times, respectively. Vegetational reconstructions are attempted using macrofloral and palynological data from the area. The data are used to redefine the status of unclassified Barakar and Kamthi formations strata in the area. Finally, possible marine influence in the Ib-Basin during Permian times is discussed based on records of acritarchs, typical marine ichnofossils and evidence of wave activity in the desposits.

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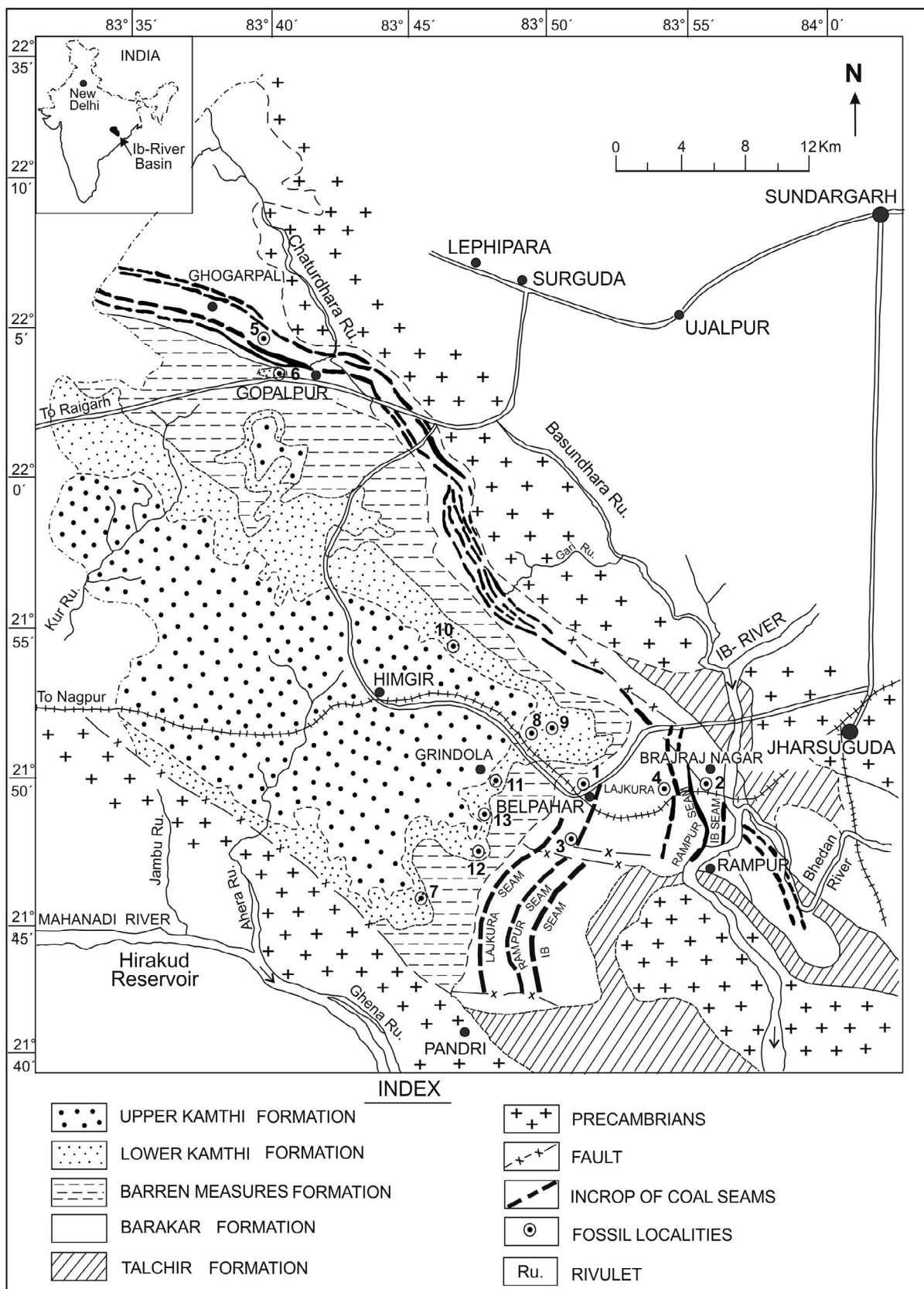


Fig. 1. Locality map of Ib-River sub-basin in Odisha State showing various plant fossil localities. Plant fossil localities are denoted as numbers (1–13). 1. Locality near Belpahar Railway Station. 2. Locality near Brajraj Nagar Railway Station, 3. Jurabaga Colliery, 4. Lajkura Colliery. 5. Ratanpur Fireclay Quarry. 6. Gopalpur Hillock. 7. Lakhampur Hillock, 8. Dungi Hillock. 9. Sitaram Hillock. 10. Garjan Hill Himgir. 11. Grindola. 12. Kuraloi. 13. Belpahari.

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