INTRODUCTION

The classical Gondwana formations of the Indian subcontinent occur as isolated outliers, mainly in the northern half of peninsular shield area. These isolated outliers, more commonly called the Gondwana basins or coalfields, generally occur in linear belts and have been grouped by early workers (Oldham, 1893; Fox, 1931, 1934; Pascoe, 1959; Krishnan, 1960, 1968; Wadia, 1961) arbitrarily and for the sake of convenience into five geographic belts, designated after a prominent landmark of the region—either a drainage or a hill. Thus from east to west there are Rajmahal coalfields of north Bihar, Damodar Valley coalfields of West Bengal and Bihar, Son and Mahanadi coalfield situated in Madhya Pradesh and Orissa, Godavari Valley coalfields of Andhra Pradesh, and coalfields of the Satpura basin in central Madhya Pradesh (Fig. 1).

The Gondwana rocks of India, particularly the Lower Gondwana sedimentary rocks, have been a subject matter of keen geological interest ever since the discovery was made by the Geological Survey of India in the year 1774 that these rocks form the principal repository of banded bituminous coal. Most of the early geological investigations were confined to the productive coalfields of Bengal and Bihar and were directed toward the exploration of coal, and less so toward the objective examination of associated sedimentary rocks. However, a great deal of sedimentological work has been carried out in the last decade or so particularly on the Lower
Fig. 1 Index map showing the location of the Pench valley coalfield and also the distribution of more important Lower Gondwana coalfields in Peninsular India.

1.0 PURPOSE OF INVESTIGATION

The Satpura Gondwana basin in general and the Pench Valley coalfield in particular have not attracted so far the attention of modern sedimentologists, and whatever little we know about the Lower Gondwana sedimentation of this area is based on generalised accounts of early workers (Fox, 1931, 1934). The present investigation in the Pench Valley coalfield is an attempt to examine closely and objectively the lithologic and sedimentary characters of the Lower Gondwana rocks, their texture and mineral composition and to carry out systematically paleocurrent analysis with a view to determine the dispersal pattern and paleoslope, provenance, and depositional environments of the Lower Gondwana rocks. An attempt is also made to analyse the relative role of tectonism and climate in controlling the evolution of Lower Gondwana sedimentation. The choice of this particular area was based on the reason that it formed a part of the outliers (Satpura basin) which represents the western-most outcrops of the Lower Gondwana rocks of peninsular India. It is hoped that the sedimentation history of the Lower Gondwana rocks of this area may provide clues which may be vital for the reconstruction of Lower Gondwana paleogeography in this part of peninsular India.
2.0 LOCATION AND ACCESS

The Pench Valley coalfield situated in the district of Chhindwara, Madhya Pradesh, about 100 km north-northwest of Nagpur, forms the southeastern limit of the Satpura basin (Fig. 1). The name "Pench Valley" is derived from the river Pench which drains from northwest to southeast through the length of the coalfield. The entire area about 250 sq km falls in 55J/12 and J/16 topographic sheets of the Survey of India, and is easily accessible by railway connecting Parasia Junction, the main Railway station of the coalfield with Amla Junction on the main line of the Central Railway about 84 km to the west, and Chhindwara Junction on the narrow gauge line of South Eastern Railway about 27 km to the southeast. Parasia is also connected by road by way of Chhindwara and Piparia. The Pench Valley coalfield represents a rolling topography in which the low lying areas of Gondwana sedimentary rocks are frequently interrupted by large and small hills of Deccan trap flows.

3.0 SCOPE OF PRESENT INVESTIGATION

The present study is mainly concerned with the stratigraphy and sedimentology of the Lower Gondwana sedimentary rocks of the Pench Valley coalfield. Geological mapping of the study area was carried out on a scale of 5 cm = 1.6 km (2 inches to a mile) in the three winter sessions of 1968, 1969 and 1970. The three Lower Gondwana formations that occur in the study area are as follows in ascending order--Talchir, Barakar and
Motur. Apart from geological mapping suitable stratigraphic sections for each formation were measured in as many localities as possible. A systematic paleocurrent study of the rocks was made with the help of directional structures which include large- and small-scale cross-bedding, ripple marks and azimuth of plant fragments. Wherever possible, the paleocurrent data was supplemented by dimensional pebble fabric of the embedded clasts in diamictite units. A detailed and systematic particle size study of the rocks was carried to examine the variation in the character of sediment load as also to analyse the attending depositional processes. Heavy mineral study was undertaken from randomly selected samples of each formation. Thin sections of rock samples were examined under a petrographic microscope to determine the mineral composition separately for Talchir, Barakar and Motur strata. For reasons of genetic interpretation, particular emphasis was laid on the relative size and roundness of detrital quartz and feldspar.

An integrated account of stratigraphic and lithologic characters, primary sedimentary structures, paleocurrent analysis, texture and mineralogy of the three formations was used to reconstruct the sedimentation history of Lower Gondwana rocks of the Pench Valley coalfield, as also to analyse the possible factors which controlled the evolution of Lower Gondwana sedimentation.

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