CHAPTER I

GENERAL GEOLOGY

Inasmuch as the published geological account of the Lower Gondwana rocks of the Pench Valley coalfield (Fox, 1934; Pascoe, 1959; Chandra, 1971) does not include appropriate details regarding stratigraphic, lithologic and sedimentary characters, it was desirable that the rock assemblage in and around the study area is adequately examined and re-mapped. Apart from examining each lithologic unit comprehensively, an attempt was made to recognise, wherever possible, smaller mappable units and to trace these up to as far as possible within the limits of the study area. Lithologic and sedimentary characters of each mappable unit have been described at length separately (Chapter II).

1.0 STRATIGRAPHIC NOMENCLATURE

Table 1 records two of the earliest classifications of the Gondwana rocks of India. One is the "two fold" classification proposed by H.B. Medlicott and W.D. Blanford in 1879 (see Fox, 1931, p.78) and strongly supported by Fox (1931) on the basis of floral content. The other is the "three fold" classification proposed by Vredenburg (1910) on the basis of depositional environments and prevailing climate following the tentative suggestions put forward by Fiestmantel (1882). However, subsequent workers found the former classification more practical and flexible than the latter, and currently this is the one followed by most workers including the Geological...
TABLE - 1  LOWER GONDWANA CLASSIFICATIONS

<table>
<thead>
<tr>
<th>Two-Fold classification (Medlicott and Blanford, 1879)</th>
<th>Three-Fold classification (Vredenburg, 1910)</th>
<th>Two-Fold classification followed by the Geological Survey of India (Krishnan, 1960)</th>
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</thead>
<tbody>
<tr>
<td><strong>LOWER GONDWANA</strong></td>
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<tr>
<td>Panchet Series</td>
<td>Parseena Stage</td>
<td>Mahadevas</td>
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<tr>
<td>Maleri Stage</td>
<td>Kamthi Maleri</td>
<td></td>
</tr>
<tr>
<td>Panchet Stage</td>
<td>Panchet</td>
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<tr>
<td>Damuda Series</td>
<td>Baniganj Stage</td>
<td>Damuda</td>
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<tr>
<td>Ironstone Shale Stage</td>
<td>Raniganj</td>
<td></td>
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<tr>
<td>Barakar Stage</td>
<td>Ironstone Shales</td>
<td></td>
</tr>
<tr>
<td>Talchir Series</td>
<td>Kharharbari Stage</td>
<td>Talchir</td>
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<tr>
<td>Talchir Stage</td>
<td>Boulder Bed</td>
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</table>
In this country, as elsewhere, stratigraphers of the later half of the nineteenth century commonly used a scheme of stratigraphic nomenclature which had evolved through usage and convention, and was apparently meant to be subjective. Thus among the earlier schemes of classification of Gondwana rocks, some used classificatory terms like 'System', 'Series', 'Stage' and 'Substage' (Hughes, 1885) whereas others used terms such as 'System', 'Series' and 'Group' etc. (Ball, 1877; Fiestmantel, 1882; Oldham, 1893). More or less a similar classificatory terms for Gondwana rocks were adopted indiscriminately by subsequent workers (Fox, 1931, 1934; Krishnan, 1949, 1960; Pascoe, 1950).

However, following the publication of 'Stratigraphic Code' by the American Commission on Stratigraphic Nomenclature (1961) which has since been widely accepted in the same form or modified form, it was felt by many workers that a revised stratigraphic nomenclature be framed for the "Lower" and "Upper" Gondwana rocks of India. Currently there seems to be little consensus as to the scheme of stratigraphic nomenclature to be followed in the case of Lower Gondwana rock sequence. Some workers have favoured a time-stratigraphic (Chrono-stratigraphic) scheme of classification (Krishnan, 1960, 1968; Ghosh and Basu, 1967) whereas others classified and named Gondwana rocks on the basis of litho-stratigraphic scheme of classification (Sen, 1965; Sengupta, 1970; Casshyap, 1970; Casshyap and Qidwai, 1971).

The 'Code of Stratigraphic Nomenclature of India' (1971), published recently, hardly differs in details with the American Stratigraphic Code referred to above.
Indeed the Lower Gondwana rocks of Peninsular India are fossiliferous, but mostly they contain a variety of plant fossils. Faunal remains occur only in two formations locally in small isolated outcrops which lie far apart, and include both invertebrate and vertebrate fauna. Invertebrate fossils have been reported only from three localities (Umaria, Manendragarh and Daltonganj) in eastern Madhya Pradesh and western Bihar and are restricted to rocks representing the basal unit of the Lower Gondwana sequence, called Talchir "Series" (Reed, 1928; Thomas, 1954; Sahni and Srivastava, 1956; Sastry and Shah, 1964). The vertebrate fauna is reported only from one locality in central Madhya Pradesh (Bijori) from rocks of the upper part of Lower Gondwana locally called Bijori "Series" (Lydekker, 1885, see Pascoe, 1959, p. 957). Likewise, an isolated occurrence of pelecypod is reported from a core sample of the Raniganj unit from Keridari locality in North Karanpura coalfield (Chandra, 1969).

Krishnan (1960, 1968, p.240) adopted the time stratigraphic classification but gave no justification for doing so. Recently Ghosh and Basu (1967, pp. 408-410) put forward interesting arguments to suggest that the Karharbari unit of Lower Gondwana (a rock unit known to lie in some places between Talchir "Series" below and Barakar "Series" above) can be given the status of a chronostratigraphic unit, and, without giving evidence or justification whatsoever, presented the time-stratigraphic classification for the Lower Gondwana assemblage of rocks as a whole. Perhaps the very basis of Ghosh and Basu's thesis to consider Karharbari
as a Chronostratigraphic unit is a subject matter of controversy
inasmuch as the 'Umria Marine Beds' has been regarded by them to
represent the lower most unit of Karharbari (loc cit., p. 410), although,
as argued by Ahmad (1957, p. 476), this marine bed is more likely the
upper part of Talchir unit. Furthermore, wherever recognised, in the
type area or elsewhere, and even at Umria, the Karharbari rocks are
known to be totally devoid of faunal remains, and so are most other
subdivisions of Lower Gondwana with the exception of a few isolated
and widely apart outcrops referred to above. Indeed these isolated
fossiliferous occurrences have been helpful in assigning a suitable age
to the respective stratum, but these sporadic faunal remains can hardly
provide a justification to conceive a time-stratigraphic classification
for the entire Lower Gondwana sequence. Similarly, a lot more study is
required before appropriate "index" fossils for plants and spores are
discovered, without which the floral elements should not be used as
suitable parameter for sub-dividing the Gondwana sequence into relevant
with the present stage of our knowledge it is not desirable to postulate,
on the basis of faunal or plant remains, a classification of the Gondwana
strata based on time-stratigraphic nomenclature, a view subscribed by
several workers recently (Baksi, 1967; Sengupta, 1970).

Indeed, plant fossils and (or) spores can be used to suitably subdivide
the Gondwana rocks following a biostratigraphic scheme of nomenclature as
recently attempted by Shah, et al., (1970) for Lower Gondwana rocks of
India and Hart (1967) for the Karroo sequence of south Africa. Several
workers in recent years have argued in favour of rock-stratigraphic
classification for the Gondwana sequence (Sen, 1965; Baksi, 1967;
Sengupta, 1970) and used in their respective studies a rock stratigraphic
nomenclature (Sengupta, 1966, 1970; Casshyap, 1970; Casshyap and
Qidwai, 1971). Inasmuch as the object of the present investigation is
mainly sedimentological, a rock-stratigraphic (litho-stratigraphic)
scheme of classification is the one most suitable and purposeful. Under
this scheme of classification, the fundamental rock unit is a 'Formation'
which apart from having a distinctive set of lithologic character should
Most of the Gondwana rock units satisfy the qualifications of a 'Formation'
and can be further subdivided into 'Members'. Thus the terms like 'Stage',
'Series' and 'System' of the Gondwana stratigraphy currently followed by
the Geological Survey of India should be suitably replaced by appropriate
terms like 'Member', 'Formation' and 'Group'. The geographic name used
in the existing scheme of classification have been retained, firstly
because each of the names is quite appropriate, secondly, all these are
deeply entrenched into the geologic literature. For the same reason the
term "Lower" Gondwana has been retained. However, pending the standardiza-
tion of this nomenclature, the terms 'Member', 'Formation' and 'Group',
have been used throughout the text informally without capitalising the
first letter.

2.0 STRATIGRAPHY

A generalised stratigraphic sequence of the Pench Valley coalfield as
recognised in the present study is given in Table 2 and the geological map in Fig. 2 (cover pocket). With a few exceptions, stated elsewhere in this chapter, the geological map prepared herein resembles closely with the unpublished Geological map prepared by C.S. Fox during 1923-25 (Fox, 1934, p. 276).

The Lower Gondwana rocks of the Pench Valley coalfield rest discordantly on the Archaean complex, and, in turn, are overlain unconformably in places by Infra-Trapoean pebbly conglomerate (Jurassic), but generally by the Deccan trap flows (Cretaceous-Eocene, Krishnan, 1960, p. 485). The sedimentary rocks occurring more or less in linear belts comprise Talchir, Barakar and Motur formations, in the ascending order. The total thickness of the sedimentary strata is approximately 900 to 1200 metres, and the overall structure of the area simple in that the regional dip is uniformly about 6° to 10° to the north with strike trending more or less east-west.

2.10 Archaean Basement

To the south and southwest of the Pench Valley coalfield, at most places, the Deccan lava flows have covered the contact between the Archaean complex and the Lower Gondwana rocks. The outcrops of the Archaean rocks occur mainly to the east and southeast of the coalfield and extend farther in that direction. In the vicinity of the coalfield and beyond, the Archaean complex comprises garnetiferous mica schist, porphyritic granite of Chhindwara, Bijawar limestones, banded hematite quartzite and shales, Dharwar metasedimentary rocks and gneisses and schists (Fox, 1934, p. 243).
## Table 2: Stratigraphic Succession Recognised in the Pench Valley Coalfield

<table>
<thead>
<tr>
<th></th>
<th>Alluvium</th>
<th>Unconformity/Intrusive Contact</th>
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<tbody>
<tr>
<td><strong>Quaternary</strong></td>
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<tr>
<td><em>Infra-trappean grits (Jabalpur 'stage')/Deccan trap intrusives</em></td>
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<td></td>
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<tr>
<td><strong>Permian</strong></td>
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<td></td>
</tr>
<tr>
<td>Supergroup (?) system</td>
<td>Group</td>
<td>Subgroup</td>
</tr>
<tr>
<td>Gondwana</td>
<td>“Lower” Gondwana</td>
<td>Motur</td>
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<td></td>
<td></td>
<td>Damuda</td>
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<td></td>
<td></td>
<td>Barakar</td>
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<tr>
<td><strong>Carboniferous</strong></td>
<td></td>
<td></td>
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<tr>
<td>? Talchir</td>
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**Archean Complex**
2.20 Talchir Formation

The oldest sedimentary formation of Lower Gondwana to occur in Pench Valley, as also in all other coalfields of Peninsular India, is the Talchir formation. It derives its name from the township of 'Talcher' in the state of Orissa (Blanford et al., 1856, p. 46) bordering the southeastern coast of India. This formation has a faulted contact with the underlying Archaeans and crops out in the study area in two belts (Fig. 2, cover pocket). The one in the west, is well exposed and occupies fairly large and extensive area, while the other in the eastern part occurs as a small narrow faulted patch. The Talchir rocks in the study area, as anywhere else in Peninsular India, are marked by a typical olive green colour. Among the best outcrops of this formation are those met with along the course of Bhangi Nala and Budhwara Nala in the western part.

By and large the Talchir formation consists of an interbedded sequence of paraconglomerate (Pettijohn, 1957a, p. 254), sandstone and shale with occasional lenses of pebble conglomerate (Table 2). The paraconglomerate which comprises pebbles, cobbles and boulders, sporadically dispersed in a muddy to sandy and calcareous matrix, is more appropriately a 'diamictite' (Flint et al., 1960, p. 1009).

A series of traverses along the drainage courses referred to above have yielded an orderly sequence of lithologic units most of which are laterally traceable and grossly mappable. The lithologic units are shown schematically in the geological map of the study area (Fig. 2, cover pocket),
and listed in Table 3 in descending order:

Table 3: Lithologic units and subunits of the Talchir formation.

<table>
<thead>
<tr>
<th>Formation</th>
<th>Units</th>
<th>Subunits</th>
<th>Gross lithology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talchir</td>
<td>D</td>
<td></td>
<td>Polymictic conglomerate and interbedded sandstone and shale</td>
</tr>
<tr>
<td></td>
<td>C₃</td>
<td></td>
<td>Shale</td>
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<td></td>
<td>C₂</td>
<td></td>
<td>Interbedded sandstone and shale</td>
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<td></td>
<td>C₁</td>
<td></td>
<td>Sandstone</td>
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<tr>
<td></td>
<td>C</td>
<td></td>
<td>Diamictite</td>
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<tr>
<td></td>
<td>B₁</td>
<td></td>
<td>Sandstone</td>
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<td></td>
<td>B</td>
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<td>Diamictite</td>
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<td></td>
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<td>Sandstone</td>
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<td>A₂</td>
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<td>Interbedded sandstone and shale</td>
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<td></td>
<td>A₁</td>
<td></td>
<td>Sandstone</td>
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<tr>
<td></td>
<td>A</td>
<td></td>
<td>Diamictite</td>
</tr>
</tbody>
</table>

The available Talchir strata in the study area particularly in the western part exhibits three mappable units of diamictite (Units A, B and C) separated by a variable assemblage of green sandstone and shale recorded as subunits. The uppermost unit D which represents a 46 m-thick gradational passage between Talchir and Barakar has been referred to herein as "transitional zone". The lithologic sequence comprises largely polymictic conglomerate, sandstone and shale. Several workers have referred to the possibility of occurrence of Karharbari "Stage" between the Talchir and Barakar formations in the Pench Valley coalfield (Oldham, 1893; Pascoe, 1959) although none specifies the locality where these
rocks occur. Recently Ghosh and Basu (1967, plate 1) illustrated the occurrence of Karharbari rocks in the Pench Valley coalfield at a locality which nearly coincides with the one where the conglomeratic sequence of unit D has been recognised in the present study. This conglomeratic sequence occasionally includes, interbeds of green sandstones and shale similar to those which characterise the underlying Talchir strata. Based on stratigraphic and lithologic evidence, the sequence of the transitional zone seems to represent a perfect continuation of the underlying Talchir, and there is little field evidence to regard these rocks as a separate stratigraphic unit equivalent to Karharbari "Stage".

Approximate minimum thickness of the Talchir formation in the western part is about 180 to 240 metres. There are a few outcrops within the Talchir strata of the study area showing well preserved plant fossils most of which are fragments of Glossopteris.

2.30 Barakar Formation

The group of rocks that lies above the Talchir was named 'Barakar Series' by Thomas Oldham (1861, p. 212) after the Barakar river which flows close to the border of the States of Bihar and West Bengal as a tributary to the Damodar river.

In most places the lower contact of Barakar formation is faulted against the underlying Talchir. Wherever this contact is normal, such as at a locality south of Nazarpur, the underlying Talchirs are separated from
the Barakar through a gradational zone about 48 m thick. The Barakar rocks occurring in linear belts seldom retain their lateral continuity along or across the strike of the beds because of frequent faults, with the result that in some places these rocks occur only in small narrow patches. The Gondwana outcrops near Sirgora and Haranbhata east of Parasia occurring as isolated outliers (Fig.2, cover pocket) are yet another example of a faulted patch. Some of the best outcrops of the Barakar formation are found south of Ambara near Barkuhi, southeast of Parasia and northwest of Chandametta village.

Lithologically, the Barakar formation is made up predominantly of sandstone which generally weathers to buff and earthy to gray colour, and exhibits a variable texture from very coarse, coarse to medium and fine grained. The bulk of the Barakar sandstone is soft or semifriable. However, locally, near some faults, it becomes relatively hard and compact. Interbedded with sandstones are, as a rule, thin beds of shale and banded bituminous coal. Approximate minimum thickness of this formation in the study area is 90 to 120 m. Plant fossils are on the whole rare in coarse sandstone members but parts of (?) Dadoxylon tree trunks (personal oral communication by P.K. Maithy, Palaeobotanical Institute, Lucknow) have been discovered at a few localities (Plate 1). However, poorly preserved plant fossils commonly occur in fine sandstone and shale, and among the common variety are fragments of vertebraria, Gangamopteris and Glossopteris.
2.40 Motur Formation

Medlicott (1873, p. 161) proposed the name 'Motur Stage' to the group of rocks which overlies the Barakar strata in the Pench Valley coalfield and westward in the Kanhan and Tawa Valley coalfields of Satpura basin. It derives its name from a village 'Motur' a place 50 km northwest of the study area, and, interestingly, not located on the rocks for which the name was proposed. Although a nomenclatural fallacy, the name is too popular and entrenched in the Indian geologic literature to be replaced (Fox, 1934, p. 17). This unit has been correlated by early workers with the 'Barren measures' of the Damodar Valley coalfields (Oldham, 1893; Fox, 1931; Pascoe, 1959; Krishnan, 1968).

In the study area the Motur formation generally shows a faulted contact with the underlying Barakar. In places, particularly in the eastern part near Parasia, and east of Harrai, the basal Motur are feldspathic conglomeratic sandstone and conspicuously include angular pebbles of feldspar, subsidiary jasper and small ciasts of sandstones (?Barakar). This unit grades upward into a sequence of red and green mudstone which are typical rock types of the Motur formation in this area. The above mentioned lithology of the basal Motur is indeed distinctive from the underlying Barakar strata and may imply a disconformity between Barakar and the succeeding Motur formation. Both Fox (1931, p. 161) and Pascoe (1959, p. 959) refer to the presence of disconformity between Motur and Barakar in Pench Valley coalfield although they neither cite evidence to prove their point nor any specific locality where this feature is observed.
However, for other localities in the area where the above mentioned feldspathic conglomeratic sandstone is not available there is indeed little evidence to support a disconformable contact. Among the best sections of Motur noteworthy are those exposed along the banks of river Mandhan, Pench, Sukri and Ghatamali, and creek near Jatachapar colliery and southwest of village Bichhua.

In the geological map prepared by Fox between 1923-25 the Motur formation is shown as a single rock unit. However, the geological mapping by the author recognises two members in the Motur formation: (1) lower member, called herein Unit A and, (2) Upper member, called herein Unit B (Table 2). Both the units are lithologically distinct, mappable and laterally extensive (Fig. 2, cover pocket). The contact between the two units is, however, marked by the Darwai fault (name proposed by the author) all along the length of study area.

2.41 Unit A (Lower Motur)

The aerial extent of Unit A, and the lithologic characters are almost exactly the same as those of "Motur Series" as recognised by Fox (1923-25; 1931, pp. 160-161) in the Pench Valley area. The bulk of this rock unit comprises an interbedded assemblage of brownish red and green clay and green, gray very coarse, coarse to medium sandstone.

2.42 Unit B (Upper Motur)

The outcrops of Unit B occur north of Darwai and Morkund faults all along from east to west and extend upto the northern limit of the study area.
Stratigraphically, this unit may well be a representative of upper Motur (Fig. 2, cover pocket). As opposed to the lower Unit A, the Unit B is predominently a grey to white pebbly, very coarse to coarse sandstone, red and green beds of clay are thin and sporadic. In the geological map prepared by Fox (loc cit.) this rock unit is shown as the 'Barakar' formation. Listed below are several arguments against this unit being labelled as 'Barakar' formation: (1) The Darwai fault which separates Unit A to the south ('Motur series' of Fox) from Unit B to the north ('Barakar' series of Fox), has in all probability a down throw to the north, which brings the outcrops of Deccan trap in contact with the Motur strata. With the general dip to the north, the patch under question cannot represent the Barakar formation which is a unit lying below the Motur. On the other hand it can well be a member younger than Unit A herein called, arbitrarily, upper Motur or Unit B. A schematic geological section in Fig. 3 elucidates the above interpretation. (2) Although predominance of sandstone in Unit B is a feature common to the Barakar formation at no place does Unit B exhibit outcrop of coal - a feature diagnostic of the Barakar strata. It is interesting to note that drilling made by the Shaw Wallace Co. (now called Poddar and Co.) some years back through the Unit B at Darwai and Bichhua villages near the northern limit of the study area failed to yield coal or even carbonaceous shale (Roy Chowdhry, Chief Surveyor Poddar and Co., Parasia, personal oral communication, 1970). (3) Red and green clay and mudstone beds, occurring prominently in Unit A, persist in the succeeding Unit B as thin and
Fig. 3  A schematic geological section illustrating the stratigraphic position of the upper Unit E of the Motur formation
occasional interbeds particularly in the lower part. Some good outcrops of the mudstone interbeds in Unit B occur near Dorli village.

Approximate thickness of Units A and B is about 600 m and 75 m, respectively. Plant fossils are extremely rare in the Motur formation. Pascoe (1959) reported the occurrence of a few silicified wood from this formation without citing a locality as also some plant fossils like *Glossopteris indica* and *G. conspicua*. As referred to earlier the author discovered silicified wood from the Barakar formation of the study area and none from the Motur formation.

2.50 Pebbly Conglomerate

A distinctive pebbly conglomerate unit, described by Fox (1934, p. 244) as "Intra-trappean grits", occurs locally in some disconnected outcrops at some places south of Khirsadoh, Haranbhata and Sirgora. This unit is conspicuous by its lithology in that it is largely made up of subangular to subrounded pebbles of red jasper, grey and yellowish quartzite, quartzose fragments and medium sandstone. These clasts are embedded in a coarse to medium sandy matrix which appears greenish where the outcrops is close to Deccan trap flows.

Fox (1934, p. 277) has expressed the opinion that "these conglomerates are possibly representative of the highest upper Gondwana beds, but it is not possible to fix their age without fossil evidence". However, Chandra and Ghosh (1960) have assigned this unit to the "Jabalpur Series" which apparently belongs to Jurassic period (Wadia, 1961, p.101; Krishnan, 1960).
2.60 Deccan Traps

The basic igneous bodies which occur extensively in the study area are commonly called Deccan traps (Krishnan, 1968, p. 304). These igneous bodies are mostly extrusives and occur as lava flows, though at some places they occur as sills and dykes. Petrographically the traps are reported to be doleritic and basaltic in composition (Krishnan, 1968, p. 295). The Deccan traps are more abundant in areas occupied by Talchir and Barakar formations and mostly run east-west. Additionally, the traps occur as small isolated outliers, possibly representing remnants of the uneroded portions of the lava flows. Owing to the large scale igneous activity related to Deccan trap flows, outcrops of Lower Gondwana rocks in the area occasionally occur in discontinuous patches. In some places the outcrops of traps continue into the adjoining Archaean country beyond the limits of Gondwana basin (Fig. 2, cover pocket).

2.70 Structure of the Area.

The Gondwana rocks in the Satpura area lie in a synclinal basin trending east-northeast-west-southwest (Fox, 1934, p. 244). The southern boundary of the Pench Valley coalfield, which is also the southern limit of the Satpura basin, is faulted. Structural strike in the area trend more or less east-northeast-west-southwest with dip varying 5° to 12° in northerly direction. Numerous strike faults have affected the sedimentary formations and some even the outcrops of Deccan trap. The effect of faults on lithologic units through which they cut across is seldom
noteworthy except at a few places where sandstones become indurated and compact. Abrupt termination of the outcrops is the only criterion to recognise and trace the faults laterally. Most of these faults are apparently 'normal strike faults' (Chandra and Ghosh, 1960). Many of these faults are local but some others are traceable laterally throughout the length of the basin. Noteworthy among these are the "Barkuhi fault", the 'Morkund fault' and the 'Darwai fault' (Fig. 2, cover pocket). Locally some diagonal and oblique faults are also present. Apparently most faults in the study are post-depositional and pre-Deccan trap whereas some are decidedly post Deccan trap. The former faults displace only the sedimentary formation of lower Gondwana, whereas the latter, like the Darwai fault, are those which affect both the sedimentary strata and Deccan trap bodies.

2.80 Regional Correlation

The three main linear belts of coal-bearing Lower Gondwana basins in Peninsular India shown in the inset of Fig. 1 are (1) The Damodar Valley coalfields of West Bengal and Bihar; (2) The Mahanadi and Son Valley coalfields of Orissa and eastern Madhya Pradesh; (3) The Godavari, Pench and Kanhan Valley coalfields of Andhra Pradesh and western Madhya Pradesh. These Gondwana basins although generally disconnected and occurring as isolated outliers in the Precambrian complex, exhibit a remarkably similar lithologic sequence. The different lithologic units of the Gondwana sequence in each coalfield show striking similarities of characters with their counterparts in other coalfields. Thus, the overall colour, texture,
associated sedimentary structure, gross mineral composition and the
assemblage of plant fossils of each lithologic unit remains practically
the same in all the coalfields of Peninsular India. Additionally,
the Lower Gondwana sedimentary rocks are, almost as a rule, coal-bearing.
Because of this overall but striking similarity, previous workers
recognised and correlated lithologic units of Lower Gondwana with those
occurring in the type areas. Fig. 4 is an attempt to correlate
the lithologic sequence recognised in the study area with the known
Lower Gondwana succession in other parts of Peninsular India. Evidently
there is a marked aerial variation in the thickness of Talchir, Barakar
and Motur (Barren measures) formations. The lowermost Talchir formation
is known to exhibit a variable thickness (Oldham, 1933, p. 159; Fox,
1934, p. 11) though it is nearly as thick in the Pench valley coalfield
(180 to 240 m) as in the Raniganj. The succeeding coal-bearing Barakar
formation which is only about 90 to 120 m thick in the Pench Valley and
Godavari Valley coalfields in the west is reportedly about 600 m thick
in the Jharia and Raniganj coalfields in the east (Fox, 1934; Pascoe,
1959). The Motur sequence is 600 to 700 m thick in the study area,
whereas its equivalent "Barren measures" is about 624 m thick in the
Jharia and Raniganj coalfields.
Owing to restricted occurrence of fauna in the Lower Gondwana sedimentary
deposits of India their age cannot be determined with any confidence.
However, Sastri and Shah (1964, p. 143) assigned Sakmarian to Artinskian
(Permocarboniferous; see Krishnan, 1960, p. 94) age to some of the
Fig. 4 Stratigraphic correlation of the Pench Valley region and Singrauli and Raniganj coalfields. The figure also shows the distribution of Lower Gondwana rocks of Peninsular India.
marine Lower Permian Beds of India including the Talchir 'Boulder Bed' at Umaria, Manendragarh and Daltonganj. Elsewhere, in Peninsular India, because of lack of fauna, it has not been possible to establish the age of the Talchir diamictites. Likewise, determination of the precise age is not possible for the succeeding Barakar and Motur formations both of which are devoid of faunal remains. However, on the basis of plant fossils that occur in these rocks and the fact that the Lower Gondwana sequence from Talchir upward is mostly conformable, the Barakar and Motur formations have been assigned broadly to Permian period by early stratigraphers (see Fox, 1931).