CHAPTER VII

STRATIGRAPHY AND CORRELATION

The study of geological setting, structure and metamorphism of the rocks of the Rampur area has revealed that the present disposition of these rocks is due to their tectonic superposition which does not represent a normal stratigraphic succession in order of deposition. Folding and thrusting of rocks have caused repetition and inversion as a result of which older rocks (Jakhri Formation) are apparently resting over the younger rocks (Rampur Formation). The junction between them is tectonic one. Such stratigraphic inversion or reversed stratigraphy is characteristic of the Simla Himalaya (Pilgrim and West, 1928) and also in general of Lesser Himalayan Formations. This reversal is attributed to recumbent folding and thrusting (Pilgrim and West, 1928; West, 1939; Gansser, 1966; Pande and Saxena, 1968; Fuchs, 1968; Pande, 1975).

The two rock units of the area are unfossiliferous, devoid altogether of any organic remains, highly folded and faulted. These features have rendered the task of establishing their normal stratigraphic correlation very difficult. The absence or deformed nature of sedimentary
features further add to these difficulties. However, on the basis of indirect evidences and conventional methods, such as lithological similarities, structural features and grade of metamorphism as also based on the previous work (Chapter I), an attempt has been made in this chapter to establish a probable stratigraphic correlation. Primary structures such as current bedding, graded bedding, wherever preserved have been utilized with utmost care to decipher the facing (Shackleton, 1958) of these rocks. However, on the basis of conventional methods such as lithological similarities, mineral composition, structural features and grade of metamorphism, a probable litho-stratigraphic sequence has been proposed (Table 2.2).

No significant data regarding the age and correlation of the rock types of Rampur area is available except in the form of sporadic notes. The nearby areas, like Shali, Simla and Chor, have been subjected to detailed investigations ever since the appearance of the classic Memoir by Meddlicott (1864).

In the present investigation, the rocks of the Rampur area have been correlated on the basis of work by earlier workers like Pilgrim and West, 1928; West, 1939; Pascoe, 1965; Berthelsen, 1951, 1967; Pande and Saxena,
1968; Bhargava, Kedar Narain and Dass, 1972; Pande, 1975 and others. According to them, the rocks of the map area represent the north and northwestern extension of rocks of Simla and Shali areas.

McMahon (1887) considered the rocks of the author's Jakhri Formation as metamorphosed Simla slates (Infra Blaini) and proposed a Cambrian (?) age for them. Berthelsen (1951) correlated them with the rocks of the Jutogh Formation. His findings were supported by the work of the officers of Geological Survey of India. Kedar Narain and Dass (1959—60) designated them as Sarahan Series. Further, they have suggested that the Sarahan Series and Narkanda Thrust sheet are parts of a continuous thrust sheet. Bhargava, Kedar Narain and Dass (1972) also concluded that the Jutogh Formation, wrapping around the Rampur Formation in the Sutlej Valley, forms a continuous belt commencing from the Higher Himalaya to the Chor-Simla area and represent the principal metamorphic belt of the Kumaon Himalaya as also suggested by Pande and Saxena (1968) and Pande (1975).

It is, therefore, evident that the rocks of the Jakhri Formation, occurring in the study area represent a part of Jutogh Formation, and may be correlated with Salkhalas and Darjeelings (Wadia, 1925, 1957) and are
homotaxial to Vaikratas of Lahaul and Spiti (Greisbach, 1891; Hayden, 1904). Further, the Jutogh nappe of Simla Hills (Pilgrim and West, 1928) can be compared with Crystalline nappe (Fuchs, 1967) or Garhwal nappe (Auden, 1937; Heim and Gansser, 1939), representing meso- and kata zone Chandpur (Inner schistose series, Middlemiss, 1887). These may be referred to more metamorphosed Chandpurs.

However, there is the paucity of available data dealing with the correlation and age of the rocks of the Rampur Formation. Rocks of the Larji-Banjar area have been considered to be equivalent to the Rampur Formation and are referred to as Banjar Formation by Auden (1933) and Dass and Srikantia (1964). These rocks consist of sequence of ortho-quartzite with carbonate rocks which have been designated as Larji series by Auden (1933) and correlated with the Shali Formation (Shali series of West, 1939).

According to Bhargava, Kedar Narain and Dass (1972), the Rampur Formation has a close lithological resemblance with the Nagthat and Chandpur Formation. These workers have considered rock succession of the Rampur Formation as equivalent to Chandpur Formation which in part may also be homotaxial to Nagthat Formation. Sharma (1977) designated the green basic schist, massive traps and greenish phyllite with bands of massive quartzite phyllite and
greywacke as Green beds. The appreciably thick bands of white grey and banded massive quartzite, at places schistose, with basic flows and sills have been named as Manikaran quartzite in the Kulu-Rampur belt and assigned Devonian to Carboniferous age by him. The stratigraphic position of the Rampur Formation has not been very well defined. McMahon (1887) correlated the quartzite and trap succession of Rampur area with the similar succession of Chamba. According to Berthelsen (1967), it is not known with certainty whether the Rampur Formation represents an autochthonous or an allochthonous unit, or it comprises more than one tectonic unit.

The lithology of the Rampur Formation as revealed by the present work corresponds to metavolcanics and white to grey quartzite. The association of greenschists (metabasics), grade of metamorphism, and tectonic position imply that their indirect correlation with Shali Formation as attempted by a few workers is untenable. On the basis of present study, it may be suggested that the Rampur Formation may be correlated as equivalent to Chails.

Homotaxial correlation of Chails and Chandpur has been proposed by many authors (Pilgrim and West, 1928;
Auden, 1937; Pascoe, 1955; Krishnan, 1960; Valdiya, 1964b; Pande and Seth, 1967; Fuchs, 1967). It is also suggested by Fuchs (1967) that Chails and Chandpur represent two different facies of the same formation. These correlations may refer to less metamorphosed Chandpur. Therefore, the Rampur Formation can also be correlated with Chandpurs. Further, the Chails have also been correlated with the Dalings of Assam (Pascoe, 1950; Wadia, 1957; Krishnan, 1960; Valdiya, 1964b; Pande and Seth, 1967).

The age consideration of the rocks of the present area is a difficult question. It is more so because of the absence of fossils and lack of geochronological data. Besides this, effects of the Himalayan orogeny have been so widespread that the earlier events, if any, have been completely obliterated. However, in spite of the above complexities, an attempt has been made to correlate these rock formations on the basis of observations of various workers in different parts of the Himalaya as given in Table 7.1.

The rocks of the Jutogh Formation of Simla, crystalline rocks of Garhwal, Salkhalas and Darjeeling with which the rocks of the Jakhri Formation (Unit A) of the present area have been correlated are regarded as
Table: Probable correlation of rocks of the Rampur area with other Himalayan regions.

<table>
<thead>
<tr>
<th>Rampur area</th>
<th>Equivalents in</th>
<th>Probable</th>
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<tbody>
<tr>
<td>Rock Formation</td>
<td>Vimala (Middlemiss, 1937)</td>
<td>Upper Proterozoic to Lower Palaeozoic (?)</td>
</tr>
<tr>
<td>Chandpur Series</td>
<td>Chail Series (Less metamorphosed)</td>
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<tr>
<td>Jakhri Thrust</td>
<td>Jutogli Formation</td>
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<tr>
<td>Jakhri Formation</td>
<td>Jutogli Series Crystalline of Chandpur Series (Core metamorphosed)</td>
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</tbody>
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(Original text is not directly transcribed into a table format due to its complex nature and the need for specific technical expertise to accurately represent it in tabular form.)
Precambrian (Pilgrim and West, 1928; Pascoe, 1965; Krishnan, 1960; Gansser, 1964; Valdiya, 1964b; Fuchs, 1967; Frank and Fuchs, 1970; Pande, 1975). Similarly the Chails, Dalings and epizonal Chandpurs with which the rocks of the Rampur Formation of the area are equated are regarded as Algonkian (Purana) in age.

Fuchs (1967) regarded Chails and Chandpurs as Devonian and correlated them with the Ladhya Formation. The Devonian age for Chails has been supported by the find of Lower Palaeozoic hystrichospheres from Ladhya Formation (cf. Frank and Fuchs, 1970) which is considered to be equivalent of Chails by Fuchs (1967). Valdiya (1963) proposed the name Ladhya Formation and Misra and Valdiya (1965) have, in fact, correlated this formation with Nagthat (Jaunsar) for which Devonian age is generally accepted (Wadia, 1957; Krishnan, 1960; Pascoe, 1965). Valdiya further regarded Chail-Chandpur sequence as older than Jaunsar-Nagthat sequence and Simla slates and USSR Algonkian in age. Further, Nagthats are found to overlie Chails in Bhanjyang region of Nepal (Fuchs, 1967). The Chails may, therefore, be regarded as Pre-Devonian in age.

In brief, it may be proposed that the rocks of the Rampur Formation (Unit B) of the present area may be
correlated to Chails and therefore may be tentatively assigned Algonkian or at the most Upper Proterozoic to Lower Palaeozoic age. The rocks of the Jakhri Formation (Unit A) which are correlated with Jutogk may be assigned a slightly older age probably from Lower to Middle Proterozoic.

Regional mapping and correlation, aided by radiometric age data, may be able to assign the most probable age to these and correlatable Formations.