ABSTRACT

A thick sequence of Eocene sediments occurs in the shelf facies on both the sides of the Tura Range of the Garo Hills. These sediments include the following formations: the Tura Sandstone, Siju Limestone, Rewak Limestone and Sandstone, in a chronological order. The bottommost formation rests upon the Pre-Cambrian rocks. Three type areas chosen for detail mapping were: Nangwalibra, Siju Sonmone-Rewak Songmong, and Tura. The detailed mapping, together with reconnaissance of the adjacent areas, is used to construct a comprehensive geological map of the Garo Hills, showing the distribution of the Eocene Formations for the first time.

The Tura Sandstones are of micaceous quartzite and orthoquartzite types. From the genetic groups of quartz and heavy minerals, the sandstones are found to be derived mainly from igneous rocks and occasionally from metamorphic and sedimentary rocks. The statistical parameters of the sandstones display river and beach environments on the one hand and tectonic disturbances on the other, during the time of deposition. Clastic sediments are generally loosely cemented with iron-oxide and silica.

The Siju Limestones are named petrographically as the 'foram-pelcypod biomicroparite and biosparite', and the 'fossiliferous microsparite and micrite'. The petrographical
studies also reveal their development in shallow-water marine and submerged environments, where high-and-low-energy levels prevailed. Non-ferroan low-magnesian calcite is the most dominant cement with subordinate amounts of ferroan low- and high-magnesian calcite and aragonite cement in the limestones. Porosity is medium to high and the calculated permeability is medium to low. As the pore-diameters increase, the calculated permeability also increases but the porosity decreases. High percentage of calcium in the limestones indicates closed basin deposition. The manganese and phosphate contents manifest their deposition in pelagic facies, under humid and warm conditions. Chemically, particularly from Ca/Mg and Mg/Ca ratios, these carbonate sediments are mostly 'pure limestones'. Distribution of $\delta^{13}C$ in the carbonate rocks suggests their deposition in marine environment. The higher value of $\delta^{13}C$ and low percentage of the insoluble residue elucidate deposition of the limestones in the central portion of the basin. Three stages of diagenesis are identified from petrographical, geochemical and stable isotopical studies.

The Rewak Limestones are, petrographically, 'fossiliferous micrite', and 'foram–pelacypod biomicrosparite' with subordinate amounts of 'Intramicrite'. These were deposited in shallow-water, under submerged and low-energy environments. These limestones are usually cemented by ferroan low- and high-magnesian calcite with less amounts of non-ferroan calcite and
Aragonite. Porosity is low to medium, but the calculated permeability is high to medium. Low percentage of calcium suggests open basin deposition of the limestones. The manganese and phosphate contents suggest humid and warm conditions of deposition of the limestones. On the basis of Ca/Mg and Mg/Ca ratios, the limestones are 'magnesian limestones'. Distributions of $^{8}\delta^{13}C$ inform about the changes of marine and freshwater conditions during deposition. High percentage of the insoluble residue and lighter carbon isotope ratio ($^{8}\delta^{13}C$) illustrate accumulation of the limestones near the shore of the basin. As in the Siju Limestone Formation, three stages of diagenesis are recognized in this formation.

The Rewak Sandstone Formation is comprised of a thin sequence of the sandstones, petrographically consisting of orthoquartzite, quartzose arkose and feldspatic quartzite. These were derived mainly from igneous terrains with subordinate amounts from metamorphic and reworked sedimentary rocks. From the mutual relationships of statistical parameters, the sandstones are found to have been deposited mainly in river with subordinate beach environments. The rate of deposition was slow. The sandstones are loosely cemented with iron-oxide, silica and calcite.