CHAPTER II

PREVIOUS WORKS

2.1 Previous Works

A review of both the published and unpublished geological reports on the "Shillong Plateau" have revealed that practically no reference has been made by early workers regarding the rock types of the present area viz. Mawryngkneng area (eastern border of East Khasi Hills district, Meghalaya). However, since the area under investigation constitutes a part of the "Shillong plateau" all available published works on the Shillong Plateau have been discussed here.

One of the earliest workers working on the "Shillong Plateau" was Medlicott (1871). In course of his study of Precambrian rocks of "Shillong Plateau" he observed that there were three groups of rocks Shillong series, epidiorites and granites. He reported that the epidiorites known, as "khasi greenstone" are the basic intrusive into the quartzites of the Shillong series. Regarding the granite which occur in the investigated area, he was of the opinion the "there can be little doubt that these granite masses were truly intruded".

Before Medlicott, Oldham in 1858 distinguished two types of metamorphic rocks in the Khasi Hills "an older and more altered group of rocks traversed by finely crystalline granite and younger group of rocks which is essentially slaty consisting of blue and gray flaky schists with some micaceous and quartzite layers".

Bose (1901) in his investigation in the Shillong plateau, encountered with the presence of xenoliths of quartzite of the Shillong series in the granite, which also cut the strike of the rocks of the Shillong series.

Palmer (1924) described the different rock types of the Shillong plateau in his published paper entitled "Geology of the Khasi and Jayntia Hills". Palmer states that Shillong plateau is an ancient mass of gneiss much intruded by coarse granite.

Bradshaw (1925) in his survey report of Shillong gave emphasis on the nature and character of the granites and confirmed the early report of Palmer (1924).

Evans (1932) wrote that some of the Shillong series rocks 'have a very young appearance and it mould be of interest to establish their age'.

Dasgupta (1934) described quartzitic inclusions from Mylliem granite and reported needles of sillimanite in them – caused by influence of granitic magma.

Wadia (1949) reported that the Shillong series is widely developed formation, consisting of a thick series of quartzites, slates and schists, with masses of granite intrusions and basic interbeded traps. He also reported that bedded cretaceous sandstones overlie a grater part of the extent of Shillong series horizontally

Pascoe (1950) dealt with the "Shillong Plateau" as a whole in which he included the Garo, Khasi and Jayantia Hills. This plateau is a continuation of the Archean of Bihar (Chotanagpur Plateau), but is separated from the latter by the Ganga-Brahmaputra valley. According to him the more northerly and by far the larger portion of the Shillong Plateau is covered by Archean gneisses and granites, which sink northwards beneath the alluvial deposits of Brahmaputra reappearing at various places as inliers. Pascoe also dealt in

detail the structural relationships, physical features and rock distribution of the plateau and expressed the view that in relation to the Himalayan. The Shillong plateau is a discontinuous portion of the Indian peninsula and bears resemblance to the Salt Range in the west. Pascoe included the granite gneisses, schists, phyllites, quartzites, conglomerates, epidiorites and some hybrid gneisses in his description of the Shillong series

Ghose (1952) discussed the nature of contact of the Shillong series with the granite gneiss on the Mairang plateau. He found that granite gneiss is intrusive into the schists, which he identified as the argillaceous facies of the Shillong series.

Krishnan (1956) states that the biotite granite gneiss is the oldest rock of the Shillong plateau. The gneissic complex is overlained by a younger group called Shillong group. According to him the Shillong Group is mainly of sedimentary origin and in the equivalent to Dharwar Supergroup. He also states that the rocks of the Shillong plateau in the vicinity of its western end exhibit the continuation of the Satpura trend while to the east they indicate the Eastern Ghats trend (the NE-SW strike). According to him Shillong Group was first intruded by khasi greenstones followed by the Myllium granite.

Rahman (1958) who investigated the area around Myllium village confined to geological mapping and petrographical work only.

Karunakaran (1959) described the rock units of the Shillong series of Barapani area as quartzites, quartz schists, phyllites, shales and conglomerates with probably contemporaneous epidiorites.

Choudhury and Barman (1960) studied the Khasi greenstone of the Shillong area. They reported that the Khasi greenstone have intruded into the quartzites as sills and dykes. According to them the epidiorites of Khasi greenstone are of dioritic composition.

Bhattacharjee (1968) reported that the basement rocks are tightly folded and well foliated in parts. The rocks of the Shillong series are less deformed with open gently plunging folds.

Baruah (1968) after his study of the geomorphology of the Barapani area reported that "after the prolonged denudation of the Basement complex the whole area might have submerged beneath a shallow sea in which the Dharwarian (Proterozoic) sediments were deposited. This sedimentation was accompanied by the intrusion of basic sills and dykes. Because of diastrophism the whole sediments were foliated, faulted, metamorphosed and eventually rose from the sea to form land. This might have formed by the intrusion of the Mylliem granite in the form of quart-tourmaline vein in the area". After this Dharwarian uplift, the area subsided below sea and thus had been subjected to sub-aerial erosion.

Baruah and Goswami (1972) divided the Shillong Group of rocks into two formations, separated by sheared conglomerate, the Tyrsad Formation (older and more metamorphosed) and the Shillong Formation (younger and less metamorphosed).

Mazumdar (1976) was of the opinion that regional metamorphism of a suite of rocks culminated in the growth of syn-tectonic granitoid migmatites before emergence and deposition of Shillong Group occurred. This implies of large hiatus. The two groups were both transected by the numerous plutons of younger porphyritic granite.

Ahmed (1976) made a petrofabric analysis from the quartz optic axis in quartzites of the Barapani area and found that most of the fabric diagrams show monoclinic system with imperfect cleft girdle. He also concluded that girdle pattern of the quartz fabric developed during a single deformation movement.

Ahmed (1977) made a detail account of the model analysis of the quartzite of the Barapani area of Khasi Hills and concluded that quartz percentage in quartzites decreases from NE to SW part of the area.

Yusuf and Sarawai (1977), who investigated the Sung valley of Meghalaya, reported the occurrences of carbonatite and apatite mineralisation in the valley.

Chattopadhyay (1979), Chattopadhyay and Hashimi (1981) surveyed the area and reported that the Sung alkaline complex is intrusive into the Proterozoic of the Shillong group. They further pointed out that the body is zoned with partial development of ring structure. In the course of their study on carbonatite, they carried out fission track dating of apatite and ascertained the age of the intruding carbonatite to be Upper Cretaceous age (84±13Ma).

Rahman (1981) was of the view that the khasi greenstone, in general are hydrous low-grade metamorphic rocks (lower greenschist facies) derived from the regional metamorphism of basic igneous rocks.

Ahmed (1983) was of the view that high sphericity and shape factor of the pebbles of Sumer conglomerate indicate their long transportation and strong chemical effects during metamorphism was responsible for the total disappearance of non-quartzose elements in the pebbles of the conglomerate.

Bhattacharjee and Rahman (1985) were of the opinion that the rocks of the Shillong group can be separated into two divisions based on lithological and structural evidences into a lower argillaceous division consisting of meta-argillites with calc-silicate rocks and an upper arenaceous division consisting of predominantly meta-arenites with beds of conglomerate, which are less intensely deformed.

Krishnamurthy (1985) after a preliminary survey into the area suggested that rocks were probably formed due to magmatic differentiation and fenitised the country rocks.

Mazumdar (1986) studied the development of porphyritic granites and the space-time relationship between the non-porphyritic migmatitic granitoids and the porphyritic granites. He was of the view that Gneissic complex represents a group subjected to repeated deformation and metamorphism, culminated in the growth of granitic migmatites before the deposition of the Shillong Group. He also stated that porphyritic granites are post tectonic having post dated the weak regional metamorphism of the Shillong group, and the syntectonic phases of intrusion preceding the porphyritic granites predated the Shillong Group as well.

Rahman and Sikdar (1990) were of the view that the thermal aureoles around the Umroi, Mylliem and Weiloi plutons of Khasi hills, Meghalaya, are very narrow (maximum 400 meters) compared to the vast extent of the country rocks with low-grade regional metamorphism. They suggested that these granite bodies are post-tectonic high-level plutons.

Baruah and Medhi (1990) after their preliminary study of the Sung complex opined that the rocks of the complex were formed in five different stages from a single alkaline magmatic emplacement. The five stages are – earliest ultramafic stage; melilite pyroxene rocks; ijolite; syenite and carbonatite. They further proposed from the location of the valley in the intersection of lineament, that probably there were rifting and arching of the area prior to alkaline magmatism.

Nath (1990) who worked in the Sung valley for his M.Sc. dissertation work stated that the Sung complex is intrusive into the Shillong group of rocks along fractures and faults and the members of the complex were derived from the crystallization of carbonated alkali rich ultramafic magma.

Das (1992) was of the opinion that raising of the Assam basin may be attributed to the direct compression experienced by the whole Assam basin and future large scale earth movement might cause catastrophic modifications of the Assam basin and existing fracture zones may be get reactivated causing further movement of the rock masses towards the basin.

Sarma *et al.* (1993) described the development of kink bands in strong anisotropic mylonitic and phyllonitic sequences of the highly strained Barapani shear zone.

Rao *et al.* (1995) studied the uranium bearing organic matter in the sandstone type uranium ore from Domiasat of Meghalaya and of the view that source of the uranium may be the fertile granite and gneiss members of the South Khasi batholiths which form the main provenance for the Mahadek Sandstone.

Nandy (1998) opined that though there is a record of formation of Proterozoic intracatonic basin of Shillong series and emplacement of late Proterozoic – early Palaeozoic granite within the plateau, late Mesozoic early Cretaceous tectonism is marked by the effusion of Sylhet Trap volcanism and emplacement of carbonatite ultramafic complex. He was of the view that Meghalaya plateau has been raising with its platform and shelf sediments along its southern and eastern margins since upper Cretaceous to the recent, mainly along the Dauki fault system, which is relatively dormant at present.

Sarma *et al.*(1998a) discussed in length about the Barapani shear heated zone structures, their rotational habit and opined that the Barapani shear zone is sinistrally moving, ductile and shear heated zone of high strain gradually decreasing towards the wall rocks.

Sarma *et al.* (1998b) studied in detail about the intra-formational Sumer conglomerate and considered the pebbles of this conglomerate as strain

marker and the associated planer fabric of the rocks of the Shillong group in working out the bulk strain of the rock. He found that the conglomerate suffered a flattening type of deformation with a partial affinity towards the constriction type.