CHAPTER 3

METHODOLOGY

3.1 Introduction

Research in any field implies a thorough and vivid understanding of the subject under consideration with due importance to its conclusive outcome. So to attain an in depth knowledge about the subject, it is very important to adhere to some standard procedure thereby assisting in completion of the research in a systematic way. These protocols together with relevant literatures from different sources provide an insight to the subject thereby helping to conduct the field study as well as laboratory investigations in a comprehensive manner.

3.2 Methods of investigation

The method of investigation that is applied for the present study can be broadly divided into two groups.

3.2.1 Field investigation

Field investigation of the limestone units is comprised of study of their stratigraphical relationship with overlying and underlying lithological units, geological mapping of the area to show the distribution of different lithological units, measurement of vertical profile sections, drawing lithologs and sampling of lithounits in systematic, desired interval. GIS software is used to prepare the base map as well as geological map of the study area. The base map preparation and review of literature may be considered as pre-field investigation techniques where as geological map preparation in GIS with the help of the data collected during field work is included in post-field investigation techniques.
3.2.2 Laboratory investigation

Laboratory study of samples collected from the five studied sections namely Shella, Ichamati, Mawlong, Mawmluh and Sa-I-Mika are grouped as sedimentological analysis, geochemical analysis and micropalaeontological study.

3.2.2.1 Sedimentological analysis

Sedimentological observation includes petrographic study of thin sections of limestone samples prepared following standard procedure of thin section preparation. Volumetric analysis of constituent framework grains are done with the help of manually operated point counter and their recalculated percentages are considered for Folk (1959, 1962) classification. Textural attributes observed in thin section under microscope are considered for Dunham (1962) classification. Outcomes of both these approaches are used for classifying the rock types and deciphering their depositional environment.

3.2.2.2 Geochemical analysis

Geochemical studies have been carried out for quantitative measurements of major oxides, trace elements, insoluble residue (IR) and loss on ignition (LOI). X-ray fluorescence spectrometry (XRF) analysis of total 32 samples are done by using Axios PAN analytical machine at SAIF (Sophisticated Analytical Instrument Facility), USIC (University Science Instrumentation Centre), Gauhati University for both major and trace elements. The differences between weight percent before and after ignition (Carver, 1970) are considered as loss on ignition (LOI). Percentage of insoluble residue (IR) is determined by digesting 100 gram of crushed limestone samples in HCl. After complete digestion, dissolved
contents are removed by washing and weighted the dried residues in order to get weight percentage of insoluble residue. Statistical software such as Microsoft Excel, Origin Pro8 and Biovinci are used to plot various diagrams such as scatter diagrams and to derive regression correlation coefficient matrix as well as principal component analysis.

3.2.2.3 Micropalaeontological study

Micropalaeontological observation includes taxonomic identification of foraminifera in thin section, quantitative analysis of foraminiferal distribution, biozonation based on identified larger benthic foraminifera and their correlation with SBZ Zone of foraminifera. For taxonomic identification of larger as well as smaller benthic foraminifera total 354 numbers of thin sections are prepared following the normal thin section preparation technique. From each of the collected limestone samples minimum two thin sections are prepared. The prepared thin sections are carefully observed under microscope and taxonomic identification of foraminifera is carried out in a phased manner. Quantitative analysis of foraminiferal distribution involve genus, species, subspecies wise frequency count in each of the studied samples and their section wise variations in percentage are tabulated. For each studied sections considering FAD (First Appearance Datum) and LAD (Last Appearance Datum) of identified benthic foraminifera biozones are established and correlated with Tethyan Shallow Benthic zonal (SBZ) framework of Serra Kiel et. al.(1998). Further benthic foraminiferal assemblages of each section are also studied carefully for palaeoenvironmental interpretation of the basin.
3.3 Database

The database utilised in the present work may be categorized as primary and secondary database. Primary data are generated during field study as well as laboratory investigation. In order to acquire primary data systematic field investigation of Shella, Ichamati, Mawlong, Mawnluh and Sa-I-Mika sections are carried out. Observable physical, lithological and megascopic palaeontological characteristics of the stratigraphic units are recorded during field investigation and their interrelationships with overlying and underlying units are also noted. These primary data are considered for careful description of sections, preparation of geological map and lithologs. To derive a clear understanding of the sedimentology and palaeontology, sampling of limestones from studied sections are done and their laboratory analysis forms an integral part of primary data collection process. Secondary source of database used for the study include published literatures of earlier workers in the form of book, research paper, research report, Ph.D and dissertation thesis, maps of Survey of India, GSI report etc. These datas are collected from different sources like K. K. Handique library of Gauhati University, department library of Geological Sciences department (Gauhati University), various journals and e journals etc. Besides these, to attain a conclusive picture of this work various theories, classification schemes, diagrams, plots of earlier pioneer workers are also taken into consideration by giving due citation.
3.4 Synthesis and integration of data

Petrographic, geochemical and micropalaeontological data are compiled and synthesized appropriately to achieve outcomes and derived results are interpreted to understand depositional environment as well as biostratigraphic positions of the Sylhet Limestone Formation of Khasi hills, Meghalaya.