

ABSTRACT

The exposures of the Cretaceous-Paleocene carbonate sequences of the Ariyalur-Vridhachalam-Pondicherry areas consist chiefly of wackestones, packstones, grainstones and mudstones. Among different biotal groups bivalves are the most common fossil allochem in all the formations along with echinoderms, foraminifera and algae. While coral is the chief constituent of the Kallakkudi carbonates, bryozoans constitute an important member of the microfauna of the Kallankurichchi Formation. Sorting of allochems and detrital grains are poor to moderate indicating a somewhat low energy condition of the environment.

A correlation of nine microfacies types recognized (SMF 5,7,9,10, 11,12,16,22 and 23) with facies zones(FZ) depicts a repetition of carbonate beds belonging to different formations in the same facies zones(FZ 7), indicating a recurrence of a number of transgressive(and regressive) episodes of unequal areal extent and time interval. A decrease in the number of microfacies within a formation from the Kallankurichchi upwards has been inferred as due to comparative stabilization of the shelf area. Development of identical microfacies (SMF 9 & 10) in the younger formations (viz. Patti, Aladi, Turuvai, Kadapperikuppam and Niniyur) under same facies zones(FZ 7) - a feature corroborated by the similarity of geochemical parameters of carbonates belonging to these formations has indicated the presence of time-transgressive lithologic units.

Microbial micritization is the most pervasive phenomenon. SEM study of micrite has revealed minutest interparticle pores surrounded by rhomboid, scalenohedral, faceted and welded grains whose edges have lost much of their sharpness. While fibrous and bladed spars(marine cement) are infrequent, equant or granular spars and syntaxial rim cements (meteoric phreatic zone) are of common occurrence. Effects of alteration under meteoric water have conditioned the porosity types of these carbonates.

The present mineralogy of carbonates and fossil shells of different formations is of low Mg-calcite with little or no evidence of dolomitization. Predominance of montmorillonite in the IR of these carbonates is indicative of their deposition under shallow marine

environment and an absence of deep burial diagenesis. Low concentration of Mg, Sr and Na in these carbonates along with evidence from Mn-Sr and Mn-Na scattergrams are indicative of meteoric diagenesis. The variation in the concentration of Pb and Zn of these carbonates suggests normal to less saline shallow marine environment. Ba and K contents of these limestones show a positive correlation with the contribution of IR in respective samples. While the chemical parameters of these limestones have failed to characterize any microfacies or lithologic unit (Formation), most of the scattergrams of their distribution in formations have shown a gross similarity, which is quite enhanced at younger stratigraphic levels of the Patti, Aladi, Turuvai, Kadapperikuppam and Niniyur Formations.

Distinct temporal changes in the nature of biotal groups and their taphonomy have provided significant clues in reconstructing the paleoenvironment with regard to carbonate productivity, substratum, sedimentation rate, etc.

The carbonate deposition (Kallakkudi Formation) in the present area started over a shallow ramp of the pericratonic basin. During the deposition of the Paravay and Trichinopoly carbonates this ramp was prograding towards a shelf or platform at the margin of which the Kallankurichchi organic 'build up' developed. The Patti, Aladi, Turuvai, Kadapperikuppam and Niniyur carbonate beds and lenses developed over ramps formed at simultaneous or subsequent period.

Microbial micritization, a signature of stagnant marine phreatic zone, is a common phenomenon in these limestones. Syntaxial rim cement formed at the initiation of meteoric water influx is quite common. The low concentration of Mg, Sr and Na and prevalence of equant spars among cement types point to an all pervasive late meteoric diagenesis that has significantly masked the earlier signatures of active marine phreatic zone.

Key words: Cretaceous, Paleocene, petrography, diagenesis, taphonomy, microfacies, microbial micritization, wackestone, packstone, grainstone, bivalve, echinoderm, foraminifera, bryozoan, Kallakkudi Formation, Paravay Formation, Trichinopoly Formation, Kallankurichchi Formation, Niniyur Formation, Patti Formation, Aladi Formation, Turuvai Formation, Kadapperikuppam Formation,