ABSTRACT

The siliciclastic-carbonate sequence of the Bagh Group (Albian-Cenomanian) outcropping in patches, extending from Zeerabad village in the east to Jobat town in the west in the Lower Narmada basin, was studied for the purpose of facies analysis and construction of depositional model, with special reference to carbonate rocks. A total of 19 lithostratigraphic sections were measured in the Zeerabad-Jobat area. The Bagh Group comprising a lower Nimar Sandstone formation and an upper Karondia Limestone formation unconformably overlies the Precambrian basement and is overlain by the Deccan traps (Maestrichtian).

Petrography, petrofacies and dispersal patterns of the Nimar Sandstone were studied for the purpose of understanding the overall depositional milieu of the clastic rocks. Thin sections of 57 sandstone samples were employed for grain size analysis. The sandstones are generally very fine to medium sand size, moderately sorted to moderately well sorted, near symmetrical to fine skewed, and dominantly mesokurtic. They are mostly texturally submature to immature.

The composition of the sandstones was determined in 54 thin sections. The average composition of the sandstones is quartz (75 percent), feldspar (5 percent), rock fragments (4 percent), micas (0.5 percent), heavy minerals (0.5 percent), clay matrix (4 percent) and cements (11 percent). The cements comprise carbonate, iron oxide and silica. According to Folk's classification the sandstones are predominantly subarkoses (94 percent).

The petrofacies and provenance of the sandstones were studied in accordance with Dickinson's scheme. The samples lie dominantly in the craton interior field with few in quartzose recycled field. These results were examined in the light of textural and compositional maturity of the sediments and the ancient climate. The sandstones are texturally submature to immature and their low degree of textural maturity indicates their deposition without much reworking and abrasion in the nearby Narmada rift. They are compositionally mature and their high degree of compositional maturity is ascribed to prolonged weathering under humid tropical climate and long residence time in soil. The sandstones do not belong to the stable platform succession since they are texturally submature to immature. The provenance of sandstones is interpreted to be fault-bounded uplifts of continental basement rocks.

Sediment dispersal patterns of the sandstones, on the basis of 123 azimuths collected at different localities, suggest sands were dispersed mainly in SW, S and WSW directions and sands were delivered to the basin from the northern uplifts.

Six terrigenous clastic facies were identified in the Nimar Sandstone. These facies are generally arranged in upward-fining sequences that were deposited in channels of different dimensions. The shales laterally passing into channel-fills represent interchannel deposits. The tidal influence in the channels and associated sediments is evidenced by bimodal-bipolar and quadrimodal cross bedding and flaser bedding. A nearshore environment for terrigenous clastic channel sequences is also supported by their position directly below the Karondia Limestone containing marine fossils.

Textural constituents and microfacies of the Karondia Limestone were studied in 97 thin sections. The lower, nodular bedded part of the Karondia Limestone differs markedly from the upper cross-bedded/flaser bedded part in the average percentage of various textural constituents.

13 types of carbonate microfacies were identified and grouped into five associations on the basis of their field and microscopic characters. The carbonate facies-sequences in different sections are interpreted as shallowing upward sequences comprising nudular bedded mudstones and wackestones of open marine shelf, followed upward by intertidal deposits comprising cross-bedded, flaser bedded and ripple bedded grainstones. Within the intertidal deposits, tidal channels are represented by grainstone bodies with scoured bases and containing herringbone cross-bedding. Small patch reefs were also developed.

The carbonate rocks of the study area were deposited on a platform of ramp type which came into existence during the Albian-Cenomanian marine transgression. The platform was dotted by shoals, banks or islands, seperated by subtidal areas, the lateral and vertical shifting of the whole complex produced a highly variable shallowing upward sequence.

Earlier paleogeographic reconstructions of the Narmada basin suggest that it was sloping and opening towards west. The gradual passage of intertidal grainstones westward into terrigenous micrite and calcareous sandstone facies association suggests that the western part of the basin received locally abundant terrigenous clastics which were also responsible for a reduction in biota. The terrigenous clastics were most probably delivered to the basin from land on the northern edge of the basin.

The basin originated as an incipient rift on the Early Cretaceous peneplain. Deposition of the basal Nimar Sandstone in tidally influenced channels indicates the onset of Albian-Cenomanian transgression in the basin. With the cessation of clastic sedimentation and continued transgression, a carbonate platform was formed on which the upward shoaling sequence of the Karondia Limestone was deposited mainly by accretion and lateral migration of shoals and islands. The top of the Karondia Limestone in the study area is erosionally truncated by a regional unconformity over which lie the Deccan traps of Maestrichtian age.