

FORAMINIFERAL FAUNA OF KORARA SHALE

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Abstract. Korara Shale has been included in 'Jakkher Group' by Colombo Plan Geologists and the type locality had been designated at Jakkher Lak. Microfaunal investigations of these shales have been carried out on samples collected at Goth Allah Baksh. These investigations reveal that Korara Shale ranges from Upper Cretaceous (Maestrichtian) to Paleocene (Montian). Evidence is at hand that this formation elsewhere extends into Eocene.

Pab sandstone or their equivalents are considered to represent the final regressive phase marking the Mesozoic-Tertiary boundary elsewhere, nevertheless, in their type of locality the Pab sandstone are overlain by a monotonous succession of shales. These shales have been mentioned in unpublished reports of various oil companies as 'Korara Shales' named after a pass of the same name in southern part of Pab Range. These shales which are of Upper Cretaceous to Paleocene in age are overlain by a limestone breccia has been termed as 'Jakkher Group' by Hunting Survey Corporation Ltd. who carried out under Colombo Plan a reconnaissance survey of part of West Pakistan¹ and the type locality has been designated at Jakkher Lak (Map ref 35 0/2). Earlier Vredenburg² had mapped this unit as Upper Khirthar.

Material

Present study is based on samples collected from Korara Shales at Goth Allah Baksh about 6 miles south of Jakkher Lak. The section measured covered Parh Limestone, Mughalkot formation, Pab sandstone, Korara Shale, limestone breccia and Shale of Nari formation. Present report, however, discusses the fauna of Korara Shale only and a brief mention has been made of the fauna contained in overlying limestone breccia so far as it has a bearing on the stratigraphic limits of Korara Shales.

A total of 29 samples were collected from Korara Shales and another 20 from overlying limestone breccia. Whereas the samples from Korara Shales were soft and yielded to washing techniques setting free beautifully well preserved tests of foraminifera, the samples from limestone breccia were studied mostly in thin sections.

Stratigraphy

Korara Shales lie with apparent conformity on Pab sandstone and consist of dark grey to olive grey shales with traces of clayey, dark grey, fine grained sandstones. In Goth Allah Baksh area these shales are 460 m thick and the overlying limestone breccia are 40 m thick. The contact of Korara Shale with limestone breccia is poorly exposed. The limestone breccia is a poorly cemented rock, fossiliferous and on account of its containing mixed Eocene to Oligocene fauna is regarded to represent a local disturbance

causing slumping of newly deposited strata (Colombo Plan Report p. 38). Elsewhere Korara Shale have been seen to underlie beds of Lower Eocene age.

Paleontology

The foraminifera recorded in samples from Korara Shales have been plotted on a 'Foraminifera Frequency Chart' (Fig. 1).

(a) *Upper Cretaceous (Maestrichtian)*. The basal 155 m Korara Shales are represented by fourteen samples (PL 215-230). The lower horizons of this unit (PL 215-217) are unfossiliferous, however, the rest of the samples have yielded *Globo truncana stuarti*; *G. gansseri*; *Pseudotextularia elegans*; *Heterohelix navarroensis*; *H. globulosa*; *H. straiata*; *Guembelitra cretacea*; and *Zeuuvigerina aegyptica*. The last two forms seem to be restricted to Korara Shales while other forms are known to occur in the Mughal Kot formation which underlies Pab sandstone, the Pab sandstone itself being virtually unfossiliferous.

The fauna recorded in the basal 155 m Korara Shales given above indicate a Maestrichtian age and has been recorded from many parts of the world. *Zeuuvigerina aegyptica* has been described from the Maestrichtian rocks of Sinai.³

(b) *Paleocene (Danian)*. After sample PL 230 collected at 153 m above base of Korara Shales there is an unexposed gap of 15 m. From the overlying shale bed which is 40 m thick five samples were collected (PL 231, 233-236). Whereas the lower horizons of these beds are unfossiliferous, the upper horizons (PL 235-236) have yielded a fauna totally different from the one discussed under 'a' above. The faunal constituents are *Lenticulina isidis*; *Planomalina mellahensis*; *Cibicides* spp; *Cibicides* sp. A (new species); *Globigerina daubjergensis*; *Globorotalia pseudobulloides*; *G. aff inconstans*; and *Bathysiphon* sp. After an unexposed gap of about 35 m the succession of shales represented by five samples (PL 237-241) has yielded fauna similar to the above with the addition of following new forms *Cibicides* sp. B; (new species) *Cibicides* sp. C; (new species) *Globigerina trilocolinoides*; *Globorotalia compressa* and *Globorotalia oclusa*. The fauna contained in samples PL 231-241 has been assigned Danian are on account of its similarity with the fauna of Tuff Chalk of Maestricht Holland, Danske Kalk of Denmark,⁴ zone A and B of Paleocene of Salzburg.⁵ The fauna is characterized by virtual abse-

nance of keeled *Globorotalia* except *G. oclusa* which has been found in occur in low frequency but attains its full development in overlying beds. *Lenticulina isidis* has been recorded from Cardita Beaumonti Beds of Lakhi range⁶ and *Planomalina mellahensis* has been regarded as an index fossil of Danian in Egypt.³

(c) *Paleocene (Montian)*. Samples collected at 382 and 412 m above base of Korara Shales (PL 242 and 243) have yielded abundant *Globorotalia oclusa*; and few forms of *Globorotalia pseudobulloides*; *Globigerina triloculinoides* and *Cibicides*. After an unexposed gap of about 43 m a solitary sample collected from a 2-m shale bed at the base of limestone breccia (PL 328) has yielded *Globorotalia angulata*; *G. pseudomenardii*; *G. aequa*.

The uppermost 97 m of Korara Shales have been assigned Montian age on the evidence of Planktonic fauna contained in them. *Globorotalia angulata* has been reported from Montian of Salzburg,⁵ Gulf Coast U.S.A.,⁷ and Trinidad.⁸ *Globorotalia crosswicksensis*, a New Jersey form,⁹ which has been described from Hornstown formation of Lower Tertiary age is considered synonym of *G. oclusa*. *Globorotalia pseudomenardii* seems to be slightly younger form. Montian fauna is characterized by appearance of keeled *Globorotalia*.

As shown above in the Goth Allah Baksh area (Korara Shale range in age from Upper Cretaceous (Maestrichtian) to Paleocene (Montian). They are overlain here by a limestone breccia of 40 m thickness which has yielded a mixed fauna of Eocene (*Nummulites perforatus*; *Assilina irregularis*) and Oligocene (*Nummulites fichteli*, *Lepidocyclina (Eu) dilatata*) age. The brecciated nature of limestone is evident in thin sections where two different lithologies are often seen in one slide. The limestone breccia are regarded to represent a local disturbance causing slumping of newly deposited strata. In Naka Pabuni area 12 miles south to the section Korara Shales are seen to underlie conformably rocks of possibly lower Eocene. A

solitary sample collected from the top of Korara Shale here was examined and found to contain *Haplophragmoides* sp. and *Globigerina linaperta*; *Globorotalia aequa*, *G. aequa simulatilis (G. rex)* and *G. soldadoensis*, indicating that Korara Shales possibly extend here into Eocene age.

Conclusions

Korara Shale offer an interesting opportunity for study of Cretaceous-Tertiary fauna in one complete and uninterrupted facies. The rich Planktonic foraminifera contained in them make them ideal for worldwide correlation and comparison. Here one can study transition of Maestrichtian through Danian into Montian and possibly younger stages.

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