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CIBICIDES OF TIYON FORMATION, KAMBHU JABAL, LOWER INDUS BASIN, SINDH PAKISTAN

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H.N designed the study S.A.K compares the result and collected the samples from various sides and finalized the results.
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Tiyon formation, Kambhu Jabal, Middle eocene, Benthic biozone.

ABSTRACT
The biostratigraphical investigation of Kambhu Jabal section, Tiyon formation around laki range lower Indus basin Sindh on the basis of smaller benthic foraminiferal 7 species *Cibicides browni, C. newmanae, C. westi, C. lobatulus and C. howelli, Cibicidoides alleni* and *Eponoides polygonus,* belongs to super family Rotaliacea was carried out. According to modern shallow benthic biozone the exact age assigned to Tiyon formation is SBZ-13 (Early Lutetian). This data has been analyzed for first time.

1. INTRODUCTION

The geology of the area was first mapped and described by Blandford [1]. Noetling [2] considered this unit as "Ghazij Shale" (Lower Eocene) Vredenburg [3] considered it as a part of Kirthar series (Late Middle Eocene to Early Oligocene). Jones [4] Hunting Survey Corporation, prepared reconnaissance report and Geological Map on 1 inch to 4 miles scale and first time recognized this shale and limestone unit in between Laki and Kirthar as distinct unit and proposed the name Tiyon Formation after Tiyon Nai, Toposheet 35N16 represented by Late Ypresian to Early Lutetian age. The name "Tiyon" is derived from Teyoon a name of Hindu person Brohi *et al.,* [5].

Kambhu Jabal

The Kambhu Jabal (anticline) is situated in the north of Thano Ahmed Khan at a distance of 72 Km. road leading through Thano Bula Khan in Jamshoro district in Kirthar Range Fig. No. 1. The studied area covers,

Latitude 25° 32/ 33.64// N to 25° 35/ 12.26// N
Longitude 67° 45/ 48.01// E, to 67° 47/ 48.28// E

The Kambhu anticline is asymmetrical doubly plunging anticline with NW strike have more than 750 dip in the eastern side and 100 in western side. Both sections (eastern and western) are measured from Nala cutting, Minjhari ji Dhat at latitude 25° 33/ 14.04//N and longitude 67° 47/ 30.02//E. In the core of anticline Laki limestone is exposed. On the eastern limb the beds are steeply dipping at an angle greater than 750 due to overturning and faulting some beds are repeated and missing. Total 78 samples were collected from western limb; four (4) Laki Limestone, seventy eight (78) from Tiyon formation and four (04) from Kirthar Formation. The samples are labelled as Tel/Km/W, Tet/Km/W, Tek/Km/W, Tel/Km/E, Tet/Km/E, Tek/Km/E, T = Tertiary, e = Eocene and l = Laki Formation, t = Tiyon formation, k = Kirthar Formation, Km= Kambhu Anticline, W= western limb and E = eastern limb. The thickness of Tiyon formation on western limb is 205 m. (672 feet) Lithological columnar section (Fig. No. 2)

2. MATERIAL AND METHODS

The samples were collected from upper contact of Laki Formation with Tiyon formation and were continued upward upto Kirthar Formation. The samples were collected from Limestone, Shale and Marl, which varied from generally hard and compact to soft material. 78 samples were processed by the standard techniques for isolation and separation of microfauna. The samples were analyzed by Jeol 640LV Scanning Microscope at Center for Pure and Applied Geology, University of Sindh, Jamshoro.

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3. RESULTS

Systematics Paleontology

Sub family: Cibicidinae
Genus: Cibicides Montfort 1808

a. *Cibicides lobatulus* (Walker & Jacob, 1798)

Remarks:
Whorl: Sutures curved and prominent on the dorsal side, on ventral side depressed, aperture on the periphery with lip and extending both dorsally and ventrally along the base of the last chamber; Surface smooth, wall calcareous and perforate distinguished from *c. cantii* by its large number of chambers and the distinct perforation on the spiral side. *C. lobatulus* is the only species which is principally controlled by sediments. This species is found in areas of strong current activity and is restricted to area of coarse sediments.

Distribution:
Cibicides lobatulus was originally described from S.E.England. The figured specimen occurs abundantly in all samples.

b. *Eponides polygonus* Le Calvez 1949

Remarks:
The specimen from Tiyon Formation shows all the characteristic features of Le-Calvezs species Eponides polygonus. It differs only in the distribution of pores. In Tiyon specimen the pores are coarser than in the holotype. They are distinctly developed at the apertural face of the last chamber.

Distribution:
The specimen was originally described by Le Calvez from the sands of Cuise, (Ypresian) France. This species reported from Lutetian strata of Belgium (Eocene) [6]. In the Tiyon Formation this specimen has been reported from the Mari Nai Section.

c. *Cibicides newmanae* (Plummer) Cushman and Todd 1942

Remarks:
The figured specimen referable to this species has been recorded from the Tiyon formation. It shows almost all the characteristics features described by Cushman and Todd in the species *C. newmanae*.

Distribution:
This species are originally reported from the Bastrop County, Texas. The specimen from the Tiyon Formation has been collected from Mari Nai Section Sindh, Pakistan. The figured specimen has been recorded

d. *Cibicides howelli* Toulmin 1941

Remarks:
The recorded species from the Tiyon formation possess almost all characteristic features of Toulmin's species *C. howelli* described from the Eocene salt Mountain limestone, Clarke county Ala.

Distribution:
This species has been reported by Cushman [7] from Midway Formation, Arkansas, Salina country Texas.

e. *Cibicidoides alleni* (Plummer) Cushman, 1951

Remarks:
C. alleni differ from other species of *cibicides* by having the convexity of the test which is not equally biconvex.

Distribution:
The figured specimen recorded from sample no. Tm-26 in Mari Nai

f. *Cibicides westi* (Howe) 1939

Remarks:
The *C. westi* differs from *C. tenellus* in the absence of coarse pores on the umbilical side and in having relatively few coarse pores.

Distribution:
This species was originally described from the Eocene Cook Mountain formation of Louisiana. The figured specimen commonly occurred in all the samples in Mari Nai section.

g. *Cibicides browni* Kline 1943

Remarks:
The specimen described above is similar to Kline's species *C. browni* from the Paleocene Claytan formation. It differs some- what in dorsal side, which is slightly concave.

Distribution:
This specimen was originally described from Paleocene Clayton formation by Kline. Cushman [7] has also reported this species from Midway formation (Lower Part) Arkan-sas, Salina Country, Texas. The specimen from Tiyon Formation has been reported from Mari Nai Section Sindh, Pakistan, in the sample no. Tm-9.

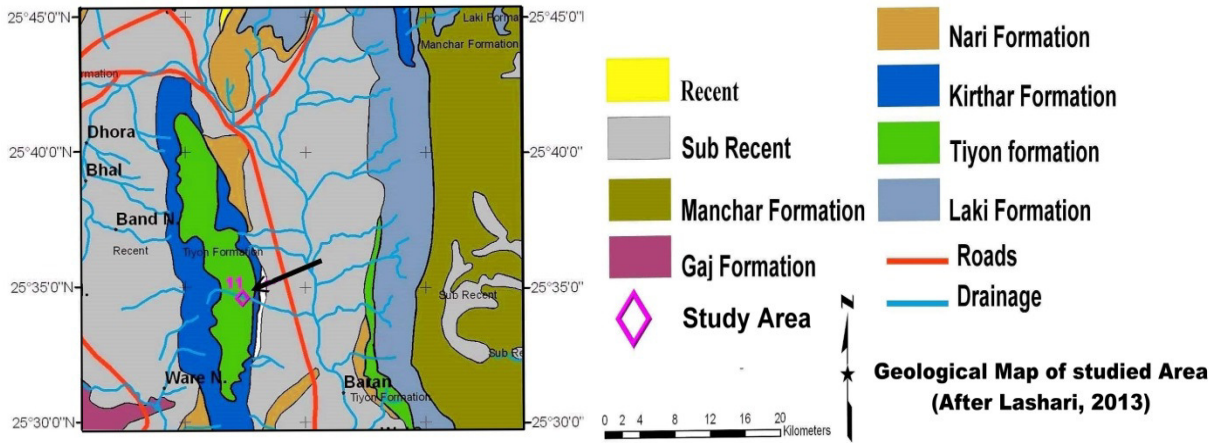


Figure 1- Geological Map of the studied Area.

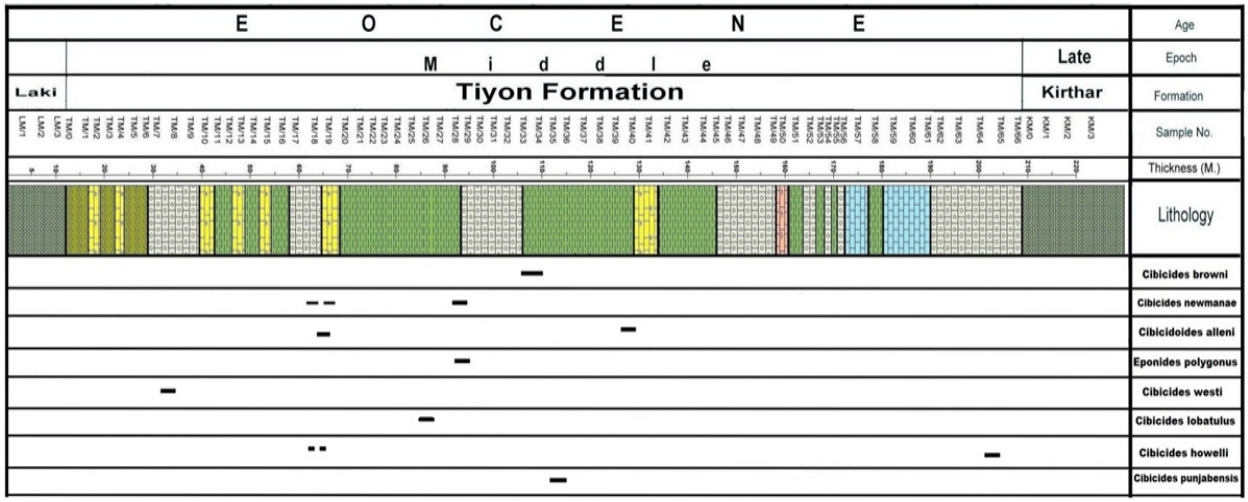
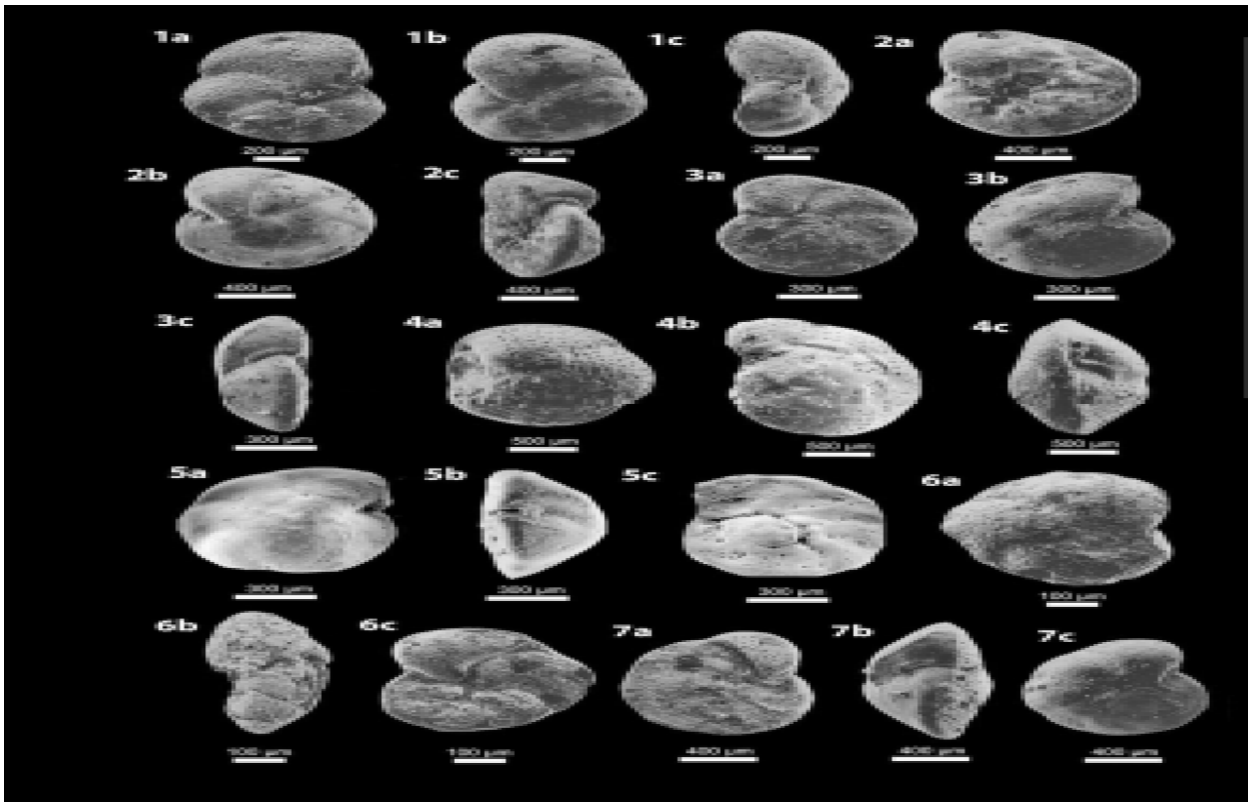


Figure 2- Stratigraphic distribution of Cibicides Species of Kambhu Section.



4. DISCUSSION

This section is dominated by abundant assemblage of *Nonion, Cibicides, Anomalinoides, Eponoides, Elphidum, Pararotalia* and *Textularia.* The samples show a general lake of *Miliolina*. The values of alpha diversity range α =5-7. This indicate the normal marine condition; abundant benthic genera and rare planktonic foraminifera mark the local encroachment of the sea in the early Lutetian time. The presence of gypsum in certain beds indicates normal to hypersalinity. Abundant presence of *Cibicdes* suggests a depth range 0-50 meter outer neritic environment Saidova [8].

5. CONCLUSION

To conclude, the Kambhu Jabal section of Tiyon formation from lower Indus basin Sindh biostratigraphy can be characterized by the abundance and variety of foraminiferal species of Cibicidae remarkably good state of preservation. The benthic foraminiferal studied of Cibicidae family shows a shelf outer neritic (0-50 m.) marine condition. On the basis of characterized benthic species. The specific composition of the faunules are coherent and reflects fluctuating bathymetry, with alpha diversity α=5-6 suggesting hyper saline to normal marine warm water condition. The benthic assemblage shows distinct affinities with the Lutetian fauna of Hampshire basin and Paris basin Gulf coastal region. Belgium (Kaasschister) [6] and Kutch of India.

6. CONFLICT OF INTEREST

The authors have declared that there is no conflict of interest regarding the publication of this article.

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