

## Study of planktonic morphotype of the Abderaz Formation at type section, IRAN

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### Abstract

*Abderaz Formation at its type section with an age of Turonian-Early Campanian and a thickness of 300 m contains light grey shale and marl. The study of the planktonic foraminifera in isolated form led to differentiate three morphotype groups. The first group is characterized by trochospiral tests usually indicate shallow waters, the second group contains forms with strong ornamentations and the primary keels representing mid waters and finally compact trochospiral tests with keels known as deep water indices are included in the third group. Studies on the morphotypes showed a regressive cycle for Abderaz Formation.*

**Keywords:** *Abderaz Formation, Foraminifera, morphotype*

### Introduction

The Study on the morphotypes and planktonic to benthic ratio was the major aim of the research. This study was intended to explore the marine sedimentation of Abderaz Formation in (outer neritic-upper bathyal) restrict. Then 168 SEM images have been obtained and demonstrated in frame of 1 plate.

**Material and Method** The section studied is located about 1 km to the Muzduran, north eastern Mashhad (a city of Iran), Kopet Dagh basin. At this locality (E: 60, 033/, 00//, N: 360, 10/, 40//)(Fig1). Type section of Abderaz Formation has 300m thickness. At the typical gap such as all regions under the surface sub-contact of Abderaz Formation are un-correlated with Aitamir Formation. But its upper layer with Abtalkh Formation is in continuous correlation. The upper layer has elected as chalk limestone upper border. A total of 130 samples were collected from the section, but only 102 samples were included in study, 7 samples due to the existence of salvation effects and 21 samples were obtained from reworking damages that were excluded from the study. Which were soaked in water with diluted hydrogen peroxide, washed through 63µm, 150µm and 250µm sieves, and dried until clean foraminiferal residues were recovered. About 200- 300 individual swere picked up for each sample in two size fractions (63-150µm and >150µm) and mounted on dark cardboard slides for identification. These two size fractions were analyzed in order to obtain statistically significant representatives of the small and large groups Species identifications are based on (Caron, 1985, Robaszynski and Caron, 1983-1984, 1995 Loeblich and Tappan, 1988, Nederbragt, 1990). Fig1. The geographical map and the ways to the region of the study.

## Discussion

Groups of planktonic morphotypes are distinguished by depth of living (Hart, 1980a, Hart, 1980b, Wonders 1980, Keller, 1999) (Fig2). Those are consisting of:

### 1- Shallow area faunas

Heterohelix and Hedbergella and a big part of Hedbergella small samples like Globotruncanids genus are related to faunas of shallow epicontinental seas or the border sea (Eicher, 1969, Eicher and Worstell, 1970, Sliter 1972).

### 2- Middle water faunas

Praeglobotruncana and Whiteinella are related to this fauna.

### 3- Deep water faunas (lower than 100)

These faunas were counted like keeled shapes there were 300 samples in the size of 120 mesh completely by chance, from every samples were counted that the result of this count shows at the First of successions and the time middle Turonian morphotype group one was conquering and the Amount of the morphotype group 3 and %P was less in the area that this paragraph. In the late Turonian the group of morphotype three was increasing in the area that it indicated the proportional increasing of depth in the area and by this time portico structure has been larger and in umbilical structure is born in this unicellular, and in Coniacian time has decreased the amount of morphotype three in the area again and the members of morphotype group one increased with the less %P in the area again and during Coniacian to Santonian the members of morphotype group 3(M3) with %P increase in the area for another time and in Santonian time, sea water shows a vacillation mood in the above-mentioned section. Also the planktonic to benthic ratio which explains that at the deposits 400 meter at total part of in this Formation. This study was intended to explore the marine sedimentation of Abderaz Formation in (outer neritic-upper bathyal) restrict and the provided curves from morphotypes changes are in full agreement with the curves of the sea level changes and planktonic foraminifer to epifauna benthic ratio(Fig2).

Fig2-Comparison of planktonic morphotype curves with %P) M1= Morphotype group1, M2= Morphotype group2, M3= Morphotype group3, %P=percentage of planktonic foraminifera)

## Result

Groups of planktonic morphotypes are distinguished by depth of living that is consisting of:

### 1- Shallow area faunas

### 2- Middle water faunas

3- Deep water faunas (lower than 100) in the time of middle Turonian simultaneous with subtraction of the percent of morphotype group three that indicates the dwindling of proportional in mentioned section. %P increases but in the late Turonian that the percent of morphotype three increases that it would indicated the proportional of depth increasing in area and the structured shapes in vicinity has increased and the structured shaped (tegilla) recently has born and in Coniacian time the morphotype group three diminished again and %P increase and in Coniacian -Santonian boundary by increasing the shapes of morphotype three and %P became the most in this time. that this affair it is because of the advent of Globotruncana and increasing the number of them in Santonian time but in the late Santonian and the early Campanian by diminishing the percent of morphotype three and increasing morphotype one, the lip shapes became more in area. This study was intended to explore the marine sedimentation of Abderaz Formation in (outer neritic-upper bathyal) restrict and the provided

curves from morphotypes changes are in full agreement with the curves of the sea level changes and planktonic foraminifer to epifauna benthic ratio.

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### **References**

- Caron M. Cretaceous planktic foraminifera. In: Bolli H.M., Saunders J.B., and Perch Nielsen, K. (Eds). *Plankton stratigraphy*. Cambridge University Press. pp. 17-86 (1985).
- Eicher, D.L.. Cenomanian & Turonian planktonic foraminifera from the Western Interior of the United States. In: Bronniman, P., Renz, H.H. (Eds.), *Proceedings of the First International Conference on Planktonic Microfossils*, vol. 2. E.J. Brill, Leiden, pp. 163–174, (1969a).
- Eicher, D.L. Cenomanian Turonian plankton foraminifera from the western interior of the United State. In: Bronnimann, P & Renz., H.H (Editors) *proceeding of the First International Conference on planktonic Microfossils*, 2, 163-174.(1969b).
- Eicher, D.L. & Worstell, P.. Cenomanian & Turonian, foraminifera from the Great Plains, United States. *Micropaleontology*, 16, 296-324.(1970).
- Hart, M.B., The recognition of Mid-cretaceous sea level changes by means of foraminifera. *Cretaceous Research*, 1, 289-297. (1980a).
- Hart, M. B.. A water depth model for the evolution of the planktonic foraminifera. *Nature*, 286, 252-254.(1980b).
- Keller, G., The Cretaceous-Tertiary Mass extinction in planktonic foraminifera: Biotic constrains for catastrophe theories, in: Macleod, N., & G.Keller, *Cretaceous-Tertiary mass extinctions: Biotic & environmental changes*, p.49-83, (1999)
- Loeblich A., Tappan H. *Foraminiferal genera and their classification*; Van Nostrand Reinhold Company, 970pp. 847 plates, (1988).
- Nederbragt A.J. Maastrichtian Heterohelicidae (planktonic foraminifera) from the North West Atlantic. *Micropaleontology*, 8: 183–206 (1990).
- Premoli Silva, I., Sliter, W.V.,. Cretaceous paleoceanography: evidence from planktonic foraminiferal evolution. *Geology. Soc Am. Spec.Pap.*, vol. 332, pp. 301–328. (1999).
- Robaszynski F., Caron M. Foraminifères planctoniques du Crétacé: commentaire de la zonation Europe-Méditerranée. *Bull. Soc. Geol. Fr*, 166: 681-692 (1995).
- Robaszynski F., Caron M., Gonzales-Donoso J.-M., Wonders A.A.H. and the European Working Group on Planktonic Foraminifera; *Atlas of Late Cretaceous globotruncanids*; *Revista Micropaleontologia*, 26(3-4):145-305 (1983-1984).
- Sliter. W.V., Upper Cretaceous planktonic foraminiferal zoogeography & ecology-eastern Pacific margin. *Palaeogeography, Palaeoclimatology, Palaeoecology*, v12, p.15-31, (1972).

Wonders, A. A.. Middle & late Cretaceous planktonic Foraminifera of the western Mediterranean area. Utrecht Micropaleontology Bulletin, 24, 1-158, (1980).

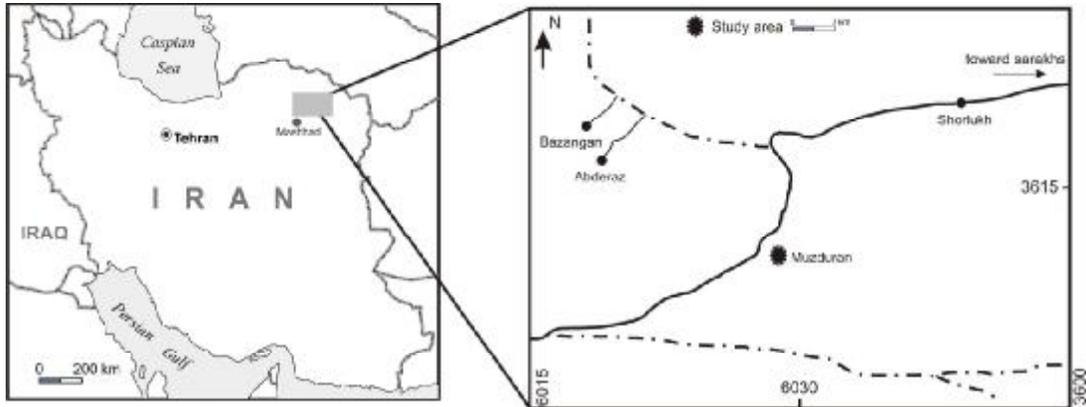


Fig 1. Location map of the studied area in the Iran

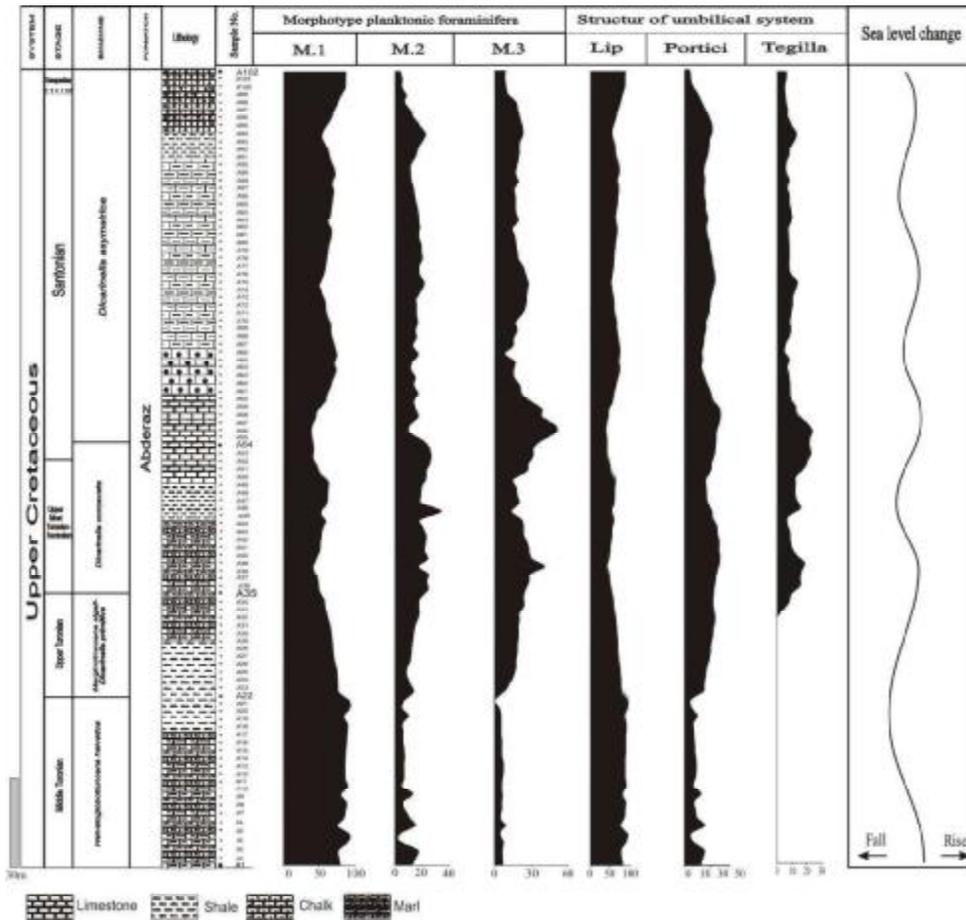


Fig 2. Determining Sea level change by Morphotype planktonic foraminifera