Palaeobathymetry of the Abderaz Formation using foraminifera, 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. Also the planktonic to benthic ratio was calculated using $_{Depth\ =\ e}{}^{(3.58718\ +\ (0.03534\ \times\ \%*p)}$equilibrium 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.

Keywords: Palaeobathymetry, Abderaz Formation, Foraminifera, Sea level change

Introduction

The Study on the morphotypes and planktonic to benthic ratio was calculated using $_{Depth\ =\ e}{}^{(3.58718\ +\ (0.03534\ \times\ \%*p)}$ equilibrium 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 44 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, °33′, 00″, N: 36^0, 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 was 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 individuals were 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).

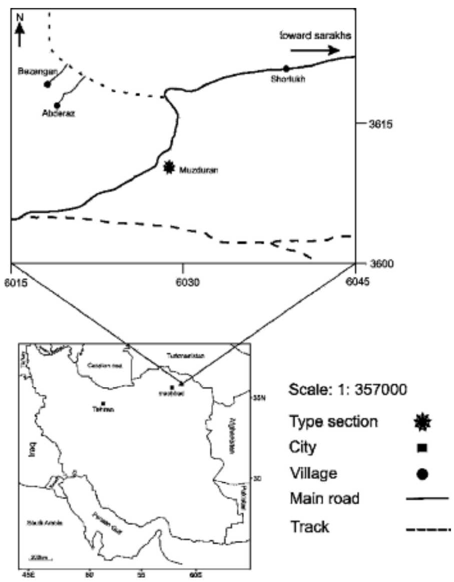

Fig1. The geographical map and the ways to the region of the study.

Discussion

Groups of planktonic morphotyes are distinguished by depth of living (Hart, 1980a, Hart, 1980b, Wonders 1980, Keller, 1999) (Fig2). that are consist 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 faunas .

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 les 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 portici 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,%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 was calculated using $_{\text{Depth} = e}{}^{(3.58718 + (0.03534 \times \%*p)}$ equilibrium(e=2.718281…)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).

Result

Groups of planktonic morphotyes are distinguished by depth of living that are consist 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,%P* increases but in the late Turonian that the percent of morphotype three increases that it would indicated the propotional 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,%P* increase and in Coniacian -Santonian boundary by increasing the shapes of morphotype three and %P,%P* became the most in this time. that this affair it is because of the advent of *Globotrancana* 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. And also the planktonic to benthic ratio was calculated using $_{\text{Depth} = e}{}^{(3.58718 + (0.03534 \times \%*p)}$equilibrium 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.

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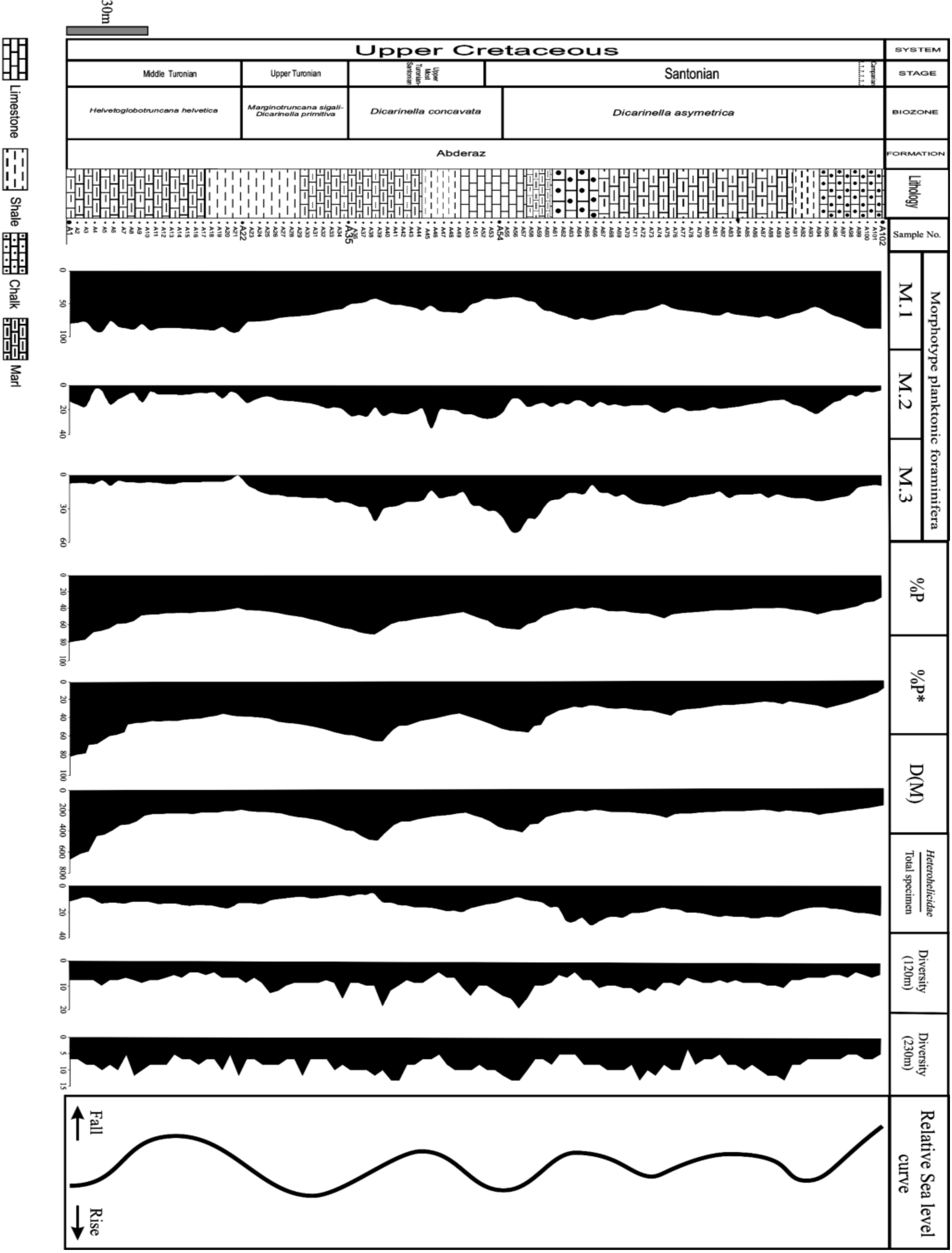

Fig2-Comparison of planktonic morphotype curves with %P,%P*,D)M1= Morphotype group1, M2= Morphotype group2, M3= Morphotype group3, %P=percentage of planktonic foraminifera, %P*= percentage of planktonic foraminifera(van der zwaan), D(M)=depth resulted in from van der zwaan *et al* (1999) equilibrium).

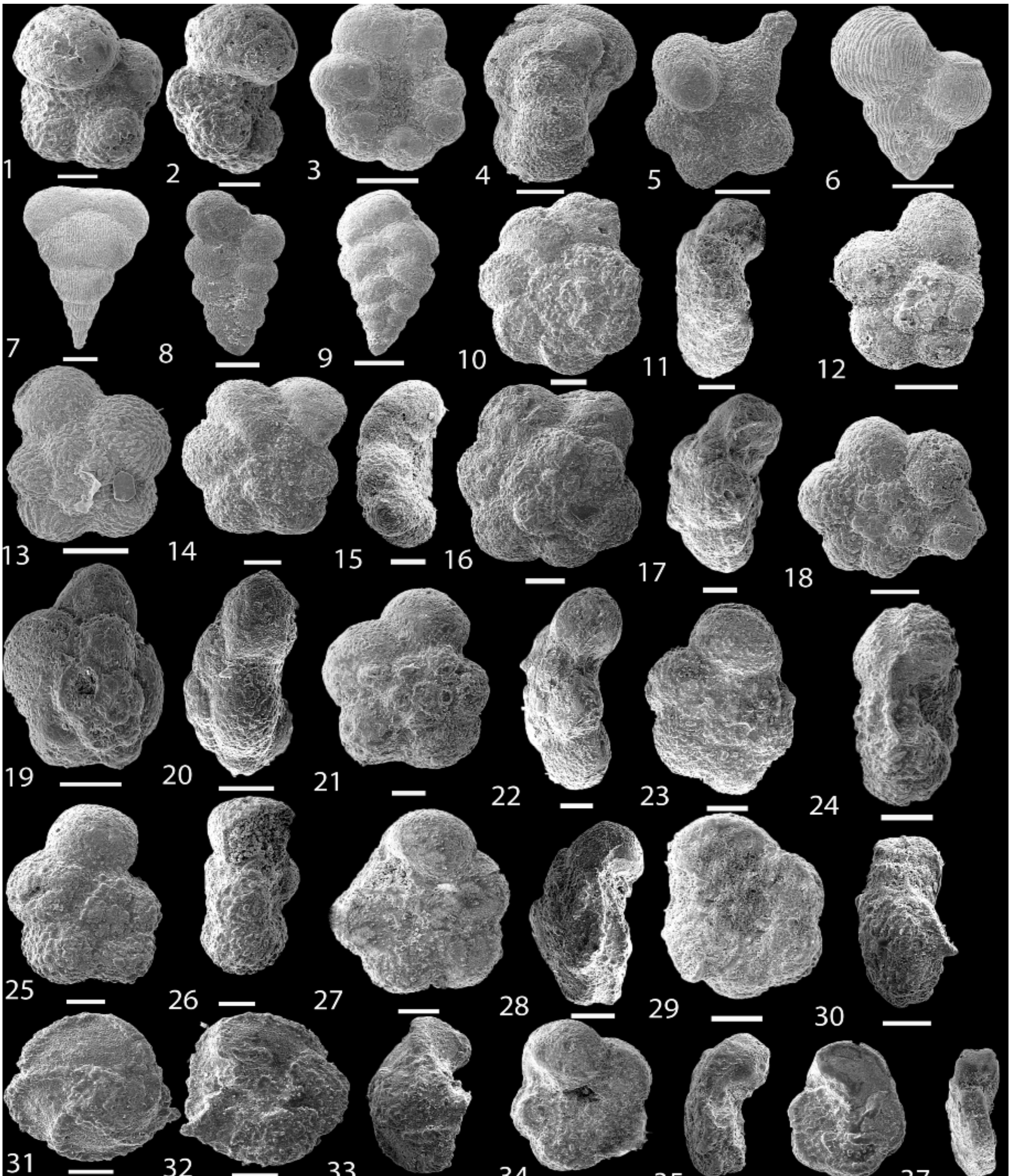

Plate1: 1-12 Morphotype 1: 1,2.*Hedbergella delrioensis* , (Sample4) . 3-4. *Globigerinelloides prairiehillensis,* (Sample56) . 5.*Globigerinelloides* sp, (Sample55). 6.*Heterohelix globulosa*, (Sample30). 7. *Pseudotextularia nuttalli*, (Sample55). 8.*Heterohelix moremani* (Sample11). 9. *Laeviheterohelix pulchera* (Sample54). 10-11. *Hedbergella planispira*, (Sample24). 12, *Hedbergella flandrini* , (Sample36) . 13-24 Morphotype 2: 13.*Rugoglobigerina rugosa*, (Sample70). 14-15. *whiteinella brittonensis* , (Sample21) . 16-17.*Praeglobotruncana stephani*, (Sample26). 18.*Whiteinella aprica* ,(Sample14). 19-20. *Whiteinella aumalensis*, (Sample18). 21-22. *Praeglobotruncana delrioensis*, (Sample16). 23-24.*Archeoglobigerina cretacea* (Sample60) . 25-44 Morphotype 3: 25-26. *Helvetoglobotruncana helvetica*, (Sample7) . 27-28. *Dicarinella imbericata* , (Sample11) . 29-30. *Dicarinella canaliculata*, (Sample12). 31-32-33.*Marginotruncana sigali*,(Sample24) . 34-35. *Dicarinella algeriana*, (Sample2). 36-37*Marginotruncana pseudolinneiana*, (Sample20). 38-39. *Dicarinella asymetrica*, (Sample60). 40.*Dicarinella concavata*, (Sample45). 41.*Globotruncana arca*,(Sample85). 42-43-44,*Contusotruncana pateliformis*, (Sample79). Scale bar presents 100µm except for sample 41-44 which presents 200µm.

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