

Biostratigraphy and trace fossils of Chehel-Kaman Formation at the type section (East of Kopet-Dagh Basin)

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Introduction

Chehel-Kaman Formation is one of the carbonate successions of the Kopet-Dagh Basin which is exposed from east to west. This Formation (Paleogene) in the Kopet-Dagh basin is mainly composed of limestone, dolomite and interbeds of marl, shale and evaporite sediments. It conformably overlies the siliclastic sediments of Pestehligh and underlies the olive shale of Khangiran Formations. The type section of this formation is located at the Chehel-Kaman village in the eastern Kopet-Dagh basin. Based on lithostratigraphic study of the Chehel-Kaman Formation at type locality, it is divided into 4 units. The most important features in the second and fourth units is palaeosol horizon that shows exposures of platform at that time. During the field study, 82 samples were collected to determine associated larger benthic foraminifera in the carbonate rocks. Thin sections were stained by Alizarin red S to differentiate calcite from dolomite and studied using standard petrographic microscope techniques. Trace fossils have been identified in sandy limestone which include: *Ophiomorpha irregulaire*, *Ophiomorpha nodosa*, *Ophiomorpha* isp., *Bergueria* isp, and vertical trace.

Discussion

Larger benthic foraminifera were major carbonate builders in tropical and subtropical shallow seas especially in Para-Tethys realm. They were photosymbiotic biota and lived in warm, oligotrophic, shallow waters within the photic zone. During the Late Paleocene (shallow benthic zone 4), the low latitudes sea was dominated by larger foraminifera (*Miscellanea*, *Ranikothalia*, *Assilina*). Knowledge about the larger foraminifera in the Middle East has not much changed since Henson's monographs (1950), followed up by Sampò (1969). However, between 1973 and 1983, the National Iranian Oil Company published a series of monographs by Rahaghi (1976) on larger foraminifera from Iran. These monographs enlarged the census of available taxa to a considerable extent. Here, however, only Rahaghi's works of 1983 are relevant. The aim of this work is to determine lithostratigraphic units and larger benthic foraminifera in the Chehel-Kaman Formation. As a result of biostratigraphic studies, the following taxa were identified at the type locality: Rotalid forms, *Daviesina iranica*, *Valvulina* sp., *Cuvillierina sirelii*, *Laffitteina turcica*, *Laffitteina melona*, *Hottingerina anatolica*, *Sakessaria* sp., *Cidenia soezerii*, *Pseudocuvillierina sireli*, *Lokarthia diversa*, *Ranikothalia* sp., *Orbitokathina saravensis*, *Haymanella paleocenica*, *Haymanella elongata*, *Miscellanea juliettae*, *Miscellanea* sp., *Miscellanea miscella*, *Miscellanea primitiva*, *Akbarinaprimtiva*, *Lokartia* sp., *Lokartia conditi*, *Malatyna dorbneae*, *Smauyina cruysi*, *Modocia blayensis*, *Kathina selveri*, *Kathina* sp., *Rotalia trochidiformis*, *Idalina sinjarica*, *Austrotrillina eocaenica*, *Raoia indica*, *Quinqueloculina* sp., *Operculina subgranulosa*, *Eorupertia* sp., *Ornatonion moorkensi*, *Rhapydionina* sp., *Triloculina* sp., *Biloculina* sp., *Textularia* sp., *Spirolina* sp., Rotaliidae indent, *Assilina granulose*, *Storrsella haastersi*, *Nonionella* cf. *soldensis*, *Lenticulina cultrata*, *Cibicides proprius*, *Anomalinoidea* cf. *capitatus*, *Lagena tenuistriata*.

Paleontological studies reveal the age of Middle Paleocene (Selandian) to Early Eocene (Ypresian) at Type locality for this succession. In addition, the Paleocene/Eocene boundary has been studied in detail using the record of planktonic and larger benthic foraminifera. This boundary is located probably within a thin red horizon (~10cm) representing a palaeosol. Close to this boundary is the basal calcareous test dissolution interval, with the dominance of agglutinated benthic foraminifera and a sudden decreases in the richness of benthic foraminiferal species.

Results

Chehel-Kaman Formation is one of the Paleogene formations of the Kopet-Dagh basin in northeast Iran that conformably overlies and underlies the siliciclastic Pesteligh and Khangiran Formations, respectively. Lithologically, it mainly consists of limestone and dolomite with interbeds of sandstone, shale and evaporates sediments. Two Palaeosol in units 2 and 4 were identified and studied. Based on biostratigraphic studies, 33 genera and 32 species of larger benthic foraminifera have been identified. Based on identified *Laffitteina*, *Miscellanea* and Rotalid, the age of Chehel-Kaman Formation is Selandian to Ypresian (?). The Paleocene/Eocene boundary has been probably recorded as a thin red palaeosol horizon (~10-15 cm). Identified Trace fossils are belonging to Skolithos and Cruziana ichnofacies. This indicates that these successions have been deposited in a carbonate ramp system in the semi consolidated substrate to sublittoral zone.

Keywords: Kopet-Dagh; Chehel-Kaman; Biostratigraphy; Larger benthic foraminifera; Selandian; Ypresian; Trace fossils; Paleoecology.

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