Stratigraphy, foraminiferal micropalaeontology, and facies architecture of the Late Cretaceous post-emplacement Simsima Formation in the Sultanate of Oman

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Abstract The shallow marine carbonates of the Late Cretaceous Simsima Formation were deposited as part of the neo-autochthonous sequence on the eastern margin of the Arabian Plate. This deposition occurred post-obduction of the Semail Ophiolite nappes and resulted into the development of several foredeep basins. The Simsima Formation is a discontinuous belt of low mounts (“Jabels”) along the Oman Mountains from Jabel El-Rawdah north to Jabel Ja’alan in the south.

The distribution of the Simsima Formation is described in terms of lithostratigraphy, biostratigraphy (larger benthic foraminifera), facies development, and depositional environments based on field data and petrographic analysis. Sixty-eight samples were selected from four well-exposed measured sections in different localities along the Oman Mountains, including Jabel Ja’alan (Sharqiyah region), Jabel Huwayyah (Buraymi Governorate), Jabel El-Rawdah (Hatta zone), and Jabel Sa’ah (At the border with UAE). This study provides an overview of the litho-facies, microfacies, foraminiferal micropaleontology, and depositional model of the Simsima Formation in the Oman Mountains along a north-south transect.

The Simsima Formation thickness varies from 30 m in Jabel Sa’ah to 150 m thick in Jabel Ja’alan and mainly comprises bioclasts limestone. The common lithofacies are nodular limestone, rudists bed limestone, and thick to thin-beded limestone. Various microfacies types are recognized and classified into two main groups: the coarse microfacies groups are dominated by packstone, grainstone, and boundstone. The finer microfacies group, such as mudstone and wackestone, are less prevalent. The Simsima Formation is characterized by the abundance of skeletons grains such as algae, rudists, echinoids, shell debris, bryozoa, corals, and foraminifera (mostly benthic forms and some planktonic).

The Simsima Formation is characterized by the abundance of the typical Late Cretaceous larger benthic foraminifera species, based on the foraminiferal micropaleontological analysis, the following species are identified: Loftusia morgani, Lepidorbitoides minor, Siderolites calcitrapoides Omphalocyclus macroporus, Orbitoides media, and Orbitoides apiculate. Utilizing the encountered larger benthic foraminifera, the Simsima Formation is subdivided into two assemblage biozones. The first biozone is Orbitoides media - Lepidorbitoides minor.? (early Maastrichtian) in the Jabel El-Rawdah, and Jabel Huwayyah. The second biozone is. Orbitoides apiculata -Siderolites calcitrapoides- Omphalocyclus macroporus (late Maastrichtian) detected in the Jabel El-Rawdah, and Jabel Ja’alan. Therefore, the Maastrichtian age has been assigned to the Simsima Formation in the studied area.

Generally, the Simsima Formation of the Oman Mountains varies vertically and laterally in thickness, lithofacies, microfacies, abundance, and diversity of the faunal assemblages. All sections show a deepening-upwards trend, from shallowest to deepest facies. These variations are due to several factors, such as location, topography, sediment supplies, accommodation space, and subsidence/uplift rate.

Keywords: Simsima Formation, Late Cretaceous, benthic foraminifera, Maastrichtian, Oman Mountains.