Facies Characteristics, Depositional Environment, and Biostratigraphy of the Late Cretaceous Shallow Bioclastic Simsima Formation along the Oman Mountain Belt

Mithaa S. Al-Jabri[1]

[1]Sultan Qaboos University

Abstract

The Late Cretaceous Simsima Formation, comprising shallow marine carbonates, was deposited as part of the neo-autochthonous sequence on the eastern edge of the Arabian Plate. This deposition occurred after the Semail Ophiolite nappes were obducted, leading to the formation of multiple foredeep basins. The Simsima Formation is discontinuously distributed as low mountainous areas ("Jabels") along the Oman Mountains, stretching from Jabel El-Rawdah in the north to Jabel Ja'alan in the south.

The distribution of the Simsima Formation is explained through lithostratigraphy, larger benthic foraminiferal biostratigraphy, and depositional environments, utilizing field and petrographic data. The formation was studied from 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 (bordering the UAE). A total of sixty-eight samples were collected from well-exposed measured sections. The thickness of the Simsima Formation varies from 30 meters in Jabel Sa'ah to 150 meters in Jabel Ja'alan, primarily consisting of bioclastic limestone. The prevalent lithofacies include nodular limestone, rudist bed limestone, and limestone with thick to thin bedding. The microfacies are further classified into two primary groups: coarse microfacies dominated by packstone, grainstone, and boundstone, and finer microfacies like mudstone and wackestone, which are less common. The Simsima Formation is notable for its abundant skeletal grains, including algae, rudists, echinoids, shell debris, bryozoa, corals, and foraminifera, with a prevalence of larger benthic forms and some planktonic forms.

The Simsima Formation is characterized by an abundance of typical Late Cretaceous, larger benthic foraminifera species. Identified species include Loftusia morgani, Lepidorbitoides minor, Siderolites calcitrapoides, Omphalocyclus macroporus, Orbitoides media, and Orbitoides apiculate. Using these larger benthic foraminifera, the Simsima Formation is divided into two assemblage biozones. The first biozone, consisting of Orbitoides media - Lepidorbitoides minor, is assigned to the early Maastrichtian and is found in Jabel El-Rawdah and Jabel Huwayyah. The second biozone, featuring Orbitoides apiculata-Siderolites calcitrapoides-Omphalocyclus macroporus, corresponds to the late Maastrichtian and is observed in Jabel El-Rawdah and Jabel Ja'alan.

Therefore, the Simsima Formation in the studied area is assigned to the Maastrichtian age.

In general, the Simsima Formation in the Oman Mountains exhibits vertical and lateral variations in thickness, lithofacies, microfacies, as well as the abundance and diversity of faunal assemblages. These variations are influenced by several factors, such as location, topography, sediment supply, accommodation space, and rates of subsidence and uplift.