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The Holocene Isolation of Dalma Island

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Dalma Island can be broadly defined as an emergent salt diapir formed through the halokinetic emplacement of the Precambrian-Cambrian Hormuz Complex. The outline of the island, as seen today, has been much modified by anthropogenic dredge-and-fill activities. The lithofacies of Dalma Island can be subdivided into three distinct geological and geographical provinces. The core of the island is dominated by the sedimentary, evaporitic and volcanic lithologies of the Hormuz Complex. These chaotically distributed units are unconformably overlain by sediments and evaporites of the Miocene Fars Formation. The island's coastline is dominated by Recent bioclastic sediments, primarily derived from reefs at the island's northern coast.

Following exposure of the Arabian Gulf floor during the Last Glacial Maximum, marine waters entered the Strait of Hormuz in the latest Pleistocene and the Gulf once again became a shallow epicontinental seaway. Bathymetric surveys reveal that the sea floor surrounding Dalma Island and separating it from the mainland lies at a depth shallower than 40 m. The Holocene transgression would not have had any effect on this area until after 10.2 Ka. After this time, rising ground water levels, associated with the advancing shoreline, may have resulted in the localised formation of shallow lakes or marshes in depressions. As sea level continued to rise, these lakes coalesced and the Dalma Salt Dome became increasingly isolated from the mainland. Once the transgression had reached the -15 m contour, by 8.5 Ka, Dalma would have been completely isolated from the mainland. By 6 ka sea level had reached present levels with continued rise eventually peaking between 1-2 m higher than today. At this time the area of the island would have been much reduced with wide areas of the island's low-lying coastal plain being either submerged or lying in the intertidal environment.

The above figures for the isolation of Dalma make two assumptions. Firstly, it is extremely unlikely that the modern day bathymetry of the Gulf is exactly the same as that seen at the time of transgression. During transgression, marine waters would first have flooded areas to the north and east of Dalma Island thereby removing the source of much of the wind-blown sediment that contributed to the Gulf floor dune system. This resulted in deflation to the depth of the water table as sediment continued to be transported south-eastward. Flooding resulted in carbonate sedimentation becoming the dominant depositional process on the floor of the Gulf. Warm shallow water carbonate factories produce sediments at a rate far exceeding all but the most catastrophic rates of relative sea level rise. The sediment tail extending to the south of Dalma is formed of carbonate sediments up to 30 m thick and, as such, represents a considerable shallowing in the bathymetry to the south and south east of the island. Both of these factors would have resulted in a considerable reduction in water depths since flooding occurred. It is, therefore, very likely that the pre-flood topography/bathymetry around Dalma was much lower than that seen on bathymetric maps today. In this case isolation of the island would have occurred much sooner.

Secondly, the above flooding history assumes that there has been little subsidence or uplift since the last glacial maximum. The combined effects of the glacio-eustatic and hydro-isostatic components would result in isostatic perturbations over the Gulf region throughout the initial phase of flooding (Late Pleistocene). However, it is widely inferred that, with the exception of the northern side of the Strait of Hormuz, there was no significant Holocene tectonic subsidence in the region of the Gulf.