

Ostracoda and Foraminifera associated with macrofauna of marginal marine origin in continental sabkha sediments of Tayma (NW Saudi Arabia)

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The oasis Tayma in northwestern Saudi Arabia (27°38'N, 38°33'E) is well known for its rich archaeological heritage and also hosts a key sedimentary record of Holocene environmental change. The palaeontologically investigated material comes from two 5.5 m long sediment cores taken in the northeastern and central part of the sabkha and two outcrops of shoreline deposits at the northeastern and southwestern margin of a large lake. Microfossil-rich layers have an age of about 9.2–ca. 8 ka BP. The sandy and carbonate-dominated sediments contain autochthonous balanids, the gastropods *Melanoides tuberculatus* and hydrobiids as well as the foraminifers *Ammonia tepida* (Cushman, 1926), *Quinqueloculina seminula* (Linnaeus, 1758), and *Flintionoides labiosa* (d'Orbigny, 1839). This brackish water association is completed by partial mass-occurrence of *Cyprideis torosa* (JONES, 1850), an euryhaline and generally widely tolerant ostracod species. Only the smooth shelled morphotype *littoralis* occurs. The association indicates a large brackish water lake with temporary freshwater inflows. All species documented originate in the marginal marine environment of the Red or Mediterranean Sea within the intertidal zone and hence they are adapted for strong environmental changes. We assume negative water balance under arid climatic conditions as cause for the high salinity of this athalassic lake. Sieve-pore analyses and shell chemistry suppose a trend of increasing salinity towards the top of the studied microfossil-bearing sections. This pattern is confirmed by increasing test malformation ratios of foraminifers.

The marine origin of the fauna is surprising in this area 250 km away from the sea in an altitude of about 800 m a.s.l. We assume an avian-mediated transport of eggs, larvae or even adult animals to this site. The brackish water character of the lake enabled a permanent settling of marginal marine foraminifers, ostracods and even macrofauna as gastropods and balanids.

The studied microfauna, morphological and shell chemistry analyses reveal the athalassic but saline character of the palaeo-lake and indicate a more humid climate phase in the early Holocene of northwestern Saudi Arabia. Furthermore, the increasing salinity at the younger part of the sections confirms a climatic shift to drier conditions during the mid-Holocene.

This study is a contribution to the research project "CLEAR - Holocene CLimatic Events of Northern ARabia" (<https://clear2018.wordpress.com/>).