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MORPHOLOGICAL, SEDIMENTOLOGICAL AND HYDROGEOCHEMICAL STUDIES OF SABKHAS IN SOUTHERN KUWAIT

ABSTRACT: AL-HURBAN A.E. & GHARIB I.M., *Morphological, sedimentological and hydrogeochemical studies of sabkhas in Southern Kuwait*. (IT ISSN 1724-4757, 2003).

Sabkhas are one of the various types of Quaternary sediments covering appreciable areas of the surface of Kuwait. They are part of a landform sequence extending from the shoreline, with barrier islands or dunes, through a lagoon before truly terrestrial systems are reached. Sabkha surfaces are extremely flat and often extends for 15 or 20 km. The sabkha deposits are essentially composed of quartz sand of variable sizes, mixed with carbonate mud and scattered crystals of gypsum, covered by salts and gypsum that are formed after rainy seasons. Some of these sabkhas are bare of vegetation, and others are vegetated. Due to the nature and mode of occurrence sabkhas are classified into two types: coastal and inland sabkhas. The surfaces of inland sabkhas are partially covered by active sand sheets caused by northwesterly winds forming blankets of variable thicknesses. The aim of this study is to identify the coastal and inland sabkhas and to study the differences in their environments by identifying the main morphological, sedimentological and hydrogeochemical features of these sabkhas.

KEY WORDS: Coastal sabkha, Inland sabkha, Morphology, Hydrogeochemistry, Sedimentology, Kuwait.

INTRODUCTION

The state of Kuwait is located in the northwestern corner of the Arabian Gulf, between Longitudes 46° 30' and 48° 30' East and latitudes 28° 30' and 30° 08' North. Kuwait is an arid region, characterized by dry hot and dusty summers, and relatively cool winters with scarce and irregular rainfall.

Kuwait was affected to a certain extent by the tectonic movements and geomorphic processes. These processes

such as weathering, aeolian and coastal ones that occurred during late Pliocene-Pleistocene age. This is reflected by the occurrence of different geomorphological features along the coastal area (Kassler, 1973; Al-Sarawi & *alii*, 1993; Al-Sulaimi & El-Rabaa, 1994).

The surface of Kuwait is mostly covered by Quaternary sediments, which include Al-Dibdibbah Pleistocene gravel deposits, and Holocene sediments. These include desert surface deposits, alluvium, aeolian sands and beach and coastal deposits such as sabkha deposits, sand shoals, beach rocks and tidal flat deposits (Khalaf & *alii*, 1984b).

«Sabkha» is an Arabic term generally used for coastal flat areas extending above the high tide level and are covered by evaporite-rich clastic sediments (Khalaf & *alii*, 1984a). In the present study, sabkhas are defined as low coastal and inland areas dissecting the underlying shallow groundwater table.

The sabkha deposits are essentially composed of quartz sand of variable sizes, mixed with carbonate mud and scattered crystals of gypsum, covered by a thin veneer of salts that is formed after rainy seasons. Calcrete (locally named as Gatch) occasionally exists beneath the surface of some of these sabkhas as friable or hard-consolidated sediments. The gatch is a near surface layer containing a heterogeneous mixture of gravel, sand, mud and authigenic minerals. This is represented mainly by calcium carbonate and gypsum that originated mostly by chemical precipitation from mineral bearing waters within the pore spaces of the clastic deposits to act as cement.

Due to the nature and mode of occurrence sabkhas are classified into two types (Reda, 1986; Saleh & *alii*, 1999): coastal and inland sabkhas. The coastal sabkhas extend along the coastal strip of Kuwait in the elongated depression in Al-Jailaiah and Al-Khiran areas, and are divided into old and young sabkhas. The old sabkhas are located at the western end of the elongated coastal ridge belt that runs parallel to the coastline, while the young sabkhas are located in the inter-ridge areas (fig. 1 and 2) (Al-Hurban,

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