GENETIC CHARACTERIZATION OF RECENT AND ANCIENT SABKHA SYSTEMS

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ABSTRACT

Ever since modern sabkhas were introduced to the geological community and perceived as a concept applicable to ancient facies analysis, the literature has abounded with reports of inferred sabkha facies, many of which were compared to the modern Trucial Coast model of sabkha sedimentation. However, this well-described model probably has been overworked and stretched too far to be directly applicable to many ancient shallow-water to supratidal evaporite sequences. This predicament has risen partly because there is relatively little detailed information available on other modern sabkhas, despite the fact that there are other sabkhas around the world, few if any of which exhibit the same characteristics as those of the Trucial Coast.

Because all major depositional systems, such as marine deltas, for example (Galloway 1975), exhibit a continuous spectrum of morphologic types, it must be recognized too that not all sabkhas are the same. They show significant variations in terms of physical processes that govern their development, and of the sedimentary responses to those processes. Thus, sabkhas should be distinguished or characterized on a genetic basis to prevent oversimplification and overuse of any one model.

On the basis of dominant physical processes, three end members are recognized: 1) marine-, 2) fluvial-lacustrine-, and 3) eolian-dominated systems. Collectively, they may be displayed in a triangle diagram, upon which the positions of Recent sabkha systems can be superimposed (Fig. 1). In general, playas fall into the fluvial-lacustrine dominated field, interdune sabkhas are eolian-dominated, and coastal sabkhas are normally dominated by marine processes.

Marine processes are mainly storm-, spring-, and wind-tidal flooding, and discharge of marine-derived brines at the sabkha surface. Playas, as well as some coastal sabkhas, are dominated by fluvial-lacustrine processes. Alluvial fans, flanking the landward side of coastal sabkhas and surrounding playa basins, contribute most of the sediment and consist of aquifers through which continental groundwater flows, dissolves minerals, and discharges at the sabkha surface as saline brines. Wind, the third major process, is a factor in any sabkha, but is especially prevalent in interdune deflation depressions in both continental and coastal settings. It removes sediment above the groundwater table and enhances evaporation, resulting in precipitation of evaporites in interdune sediment.

Sediment composition is the other significant factor in characterizing sabkha types. Carbonate-sulfate minerals (gypsum-anhydrite), soluble salts (halite, sylvite, polyhalite, etc.), and terrigenous clastics are the dominant sedimentary components of sabkhas, but most are either dominated or distinguished by one or a mixture of those sediment types. By treating each of the three major sediment types as an end member, sediment variation between sabkhas can be displayed (Fig. 2).

A genetic examination of sabkha systems clearly reveals that the Trucial Coast is only one end member to a spectrum of sabkha types, both in terms of physical processes and sediment composition. Thus, care must be taken when comparing modern and ancient sabkha systems to correctly characterize the processes responsible for deposition of the strata in question and the dominant sediment composition.

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Galloway, W. E., 1975. Process framework for describing the morphologic and stratigraphic evolution of deltaic depositional systems: *in* M.L. Broussard, (ed.), Deltas, Models for Exploration, Houston Geol. Soc., p. 87-98.

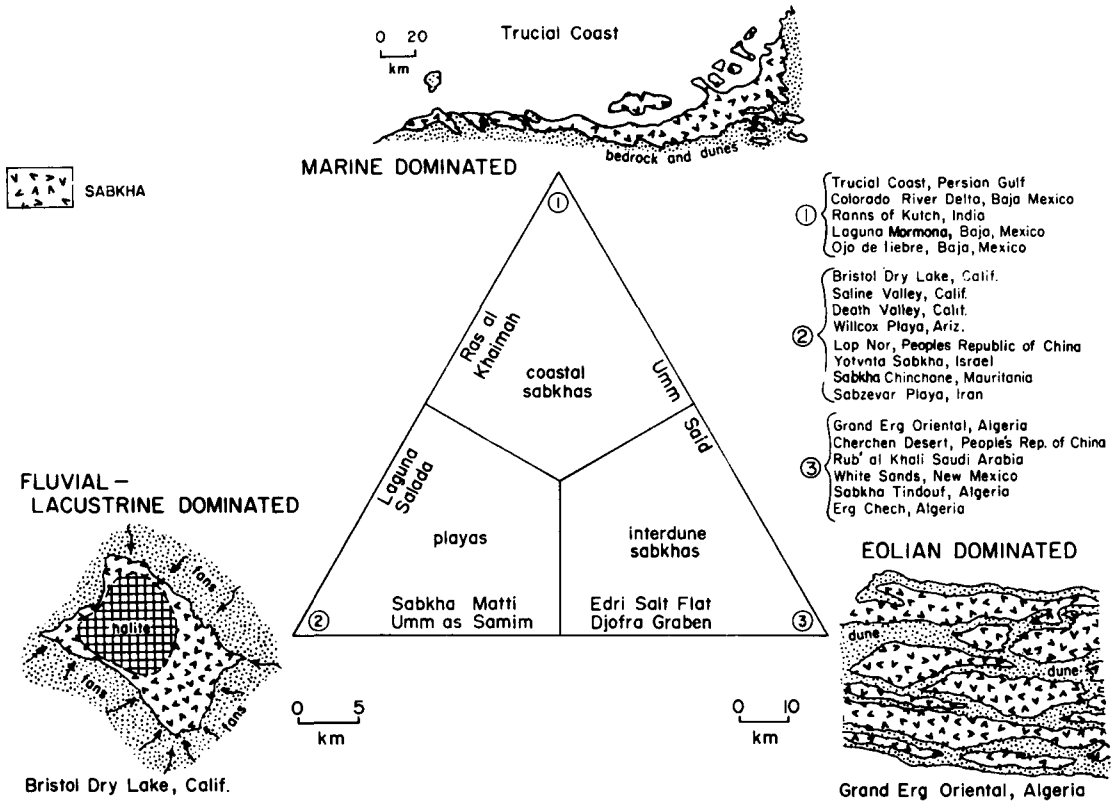

Figure 1. Triangular classification of sabkha systems on the basis of depositional processes.

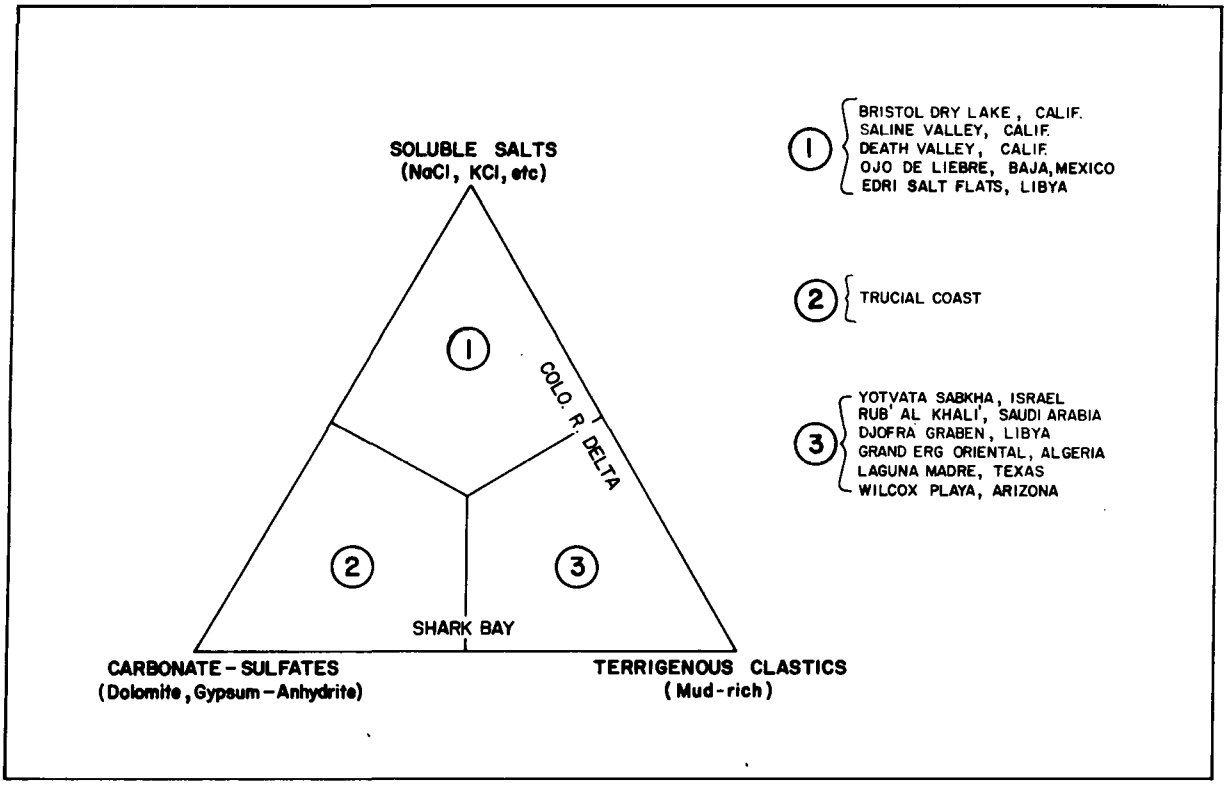

Figure 2. Triangular classification of sabkhas according to dominant sedimentary composition.