Recent and holocene beachrocks along the coasts of Sinaï, gulfs of Elat and Suez

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The coastal margins of Sinaï, along the Gulfs of Elat and Suez, are in most places covered by well lithified resistant beachrocks. These beachrocks occur as two distrinct strips, one in the intertidal zone and one in the supratidal zone, with the first partially overlapping the latter.

The beachrocks in the intertidal zone are forming recently with the lithification proceeding at the surface of the sediments and at a depth of up to 50 cm. In places where the shoreline is stationary and subjected to relatively high energy, the beachrocks are coarse grained, well lithified and exposed to the surface. In places where the shoreline is accretionary and partially protected, the beachrocks are weakly lithified or buried under loose sediments.

The beachrocks in the supratidal zone extend up to about 1.5 m above the present mean sea level and often their sedimentary strike is not parallel to the present shoreline. They are usually very coarse sediments of pebbles to boulders, strongly lithified by a carbonate matrix cement. At present these beachrocks are being physically and chemically destroyed. Their age is clearly older than recent, but younger than the raised Pleistocene reefs of southern Sinaï. Though no exact age dating has been done yet, it is a reasonable assumption that these beachrocks were formed in the mid-Holocene (about 4,000 years ago). The elevation of these beachrocks with respect to the present mean sea level of the Red Sea indicates two possibilities : one — the sea level has not changed appreciably since the mid-Holocene and the beachrocks formed in the intertidal zone were later raised tectonically by about 1.5 m; two — the sea level was somewhat higher and dropped to the present level about 3,000 years ago, leaving the beachrocks in the supratidal zone where they are being destroyed. Possibility one is plausible, because the area has been and still is tectonically active. But the vertical movement caused by the tectonism was not uniform all over the Sinaï peninsula, as is also shown by the general tilt of the raised Pleistocene reefs. The older beachrocks, however, occur as a rather uniform belt of almost constant elevation above the present sea level in both Gulfs. That would suggest that the second possibility of sea level change is also plausible and perhaps even more than the first one.

The sediment components of the beachrocks along the coasts of Sinaï depend on the provenance of the clastic material and therefore vary from place to place. The cement of the beachrocks is learly of marine carbonates — Mg-calcite and aragonite [FRIEDMAN & Gavish, 1971], with the dominance of either of the two minerals varying from place to place. No low Mg-calcite is attributed to the primary cement as was also observed in the Mediterranean beachrocks [ALEXANDERSSON, 1969, GAVISH & FRIEDMAN, 1969]. Texturally, the micritic and crypto-crystalline cements are often composed of Mg-calcite, while the better crystalline sparry cement is often aragonitic. Both cements may occur in the same rock, alternating within the intergranular pores.

Generally, the beachrocks along the Gulf of Suez, as opposed to the Gulf of Elat, are relatively wide strips, not so resistant to wave energy, and are lithified relatively slowly by mostly crystalline aragonite cement. The beachrocks along the Gulf of Elat, however, compose a much narrower strip, but of sometimes more resistant rocks than in the Gulf of Suez. Also, the lithification seems to be faster with a higher content of Mg-calcite micrite.

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The contribution of the biological activity to the physical and chemical environment in the intertidal zone in this area is immense. That influence is felt mostly in the daily cycles, when photosynthesis and respiration cause changes in the chemical parameters of the water, such as pH, which in turn determine if there is formation or destruction of the beachrocks [KRUMBEIN & GAVISH, 1971].

Most recently, a new factor has been introduced in this area — pollution of the shores by oil, mostly in the Gulf of Suez. That oil, accumulating in the intertidal zone forms in fact a new kind of cement which offsets the balance of material being transported along the shores, and eventually will alter the coastal morphology in these areas.

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