ORIGIN OF THE PINNACLES, NAMBUNG, WA

by David C. Lowry, WASG

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The Pinnacles are karst features which developed at a soil-limestone interface and which were subsequently exposed by deflation.

The Pinnacles consist of eolian limestone up to 3 metres high. They are roughly cylindrical or fluted with a diameter of 0.5 to 2 metres and are spaced about 2-10m apart. The geologic setting is been described by Lowry (1972) and the geomorphic features of the limestone have been discussed by Jennings (1968).

Dune systems of several ages can be recognised on the west coast of Western Australia and be following stages in a cycle of weathering can be pieced together:

1. Sand with varying proportions of grains of quartz and calcium carbonate is blown off beaches into dunes. The dunes become stabilized by vegetation and cementation of the sand begins around the roots of the shrubs. After 8,000 to 10,000 years has passed, there is weak cementation throughout the bulk of the dune.

2. After about 20,000 to 25,000 years, downward percolation of rainwater has removed all the calcium carbonate at the surface thus leaving a leached yellow sandy soil of quartz grains. The calcium carbonate is precipitated as a cement throughout the dune but is precipitated particularly strongly just beneath the soil where it forms a hard "cap-rock" consisting of cemented calcarenite. recrystallized micritic limestone and banded secondary limestone ("kankar"). Vertical solution pipes also develop. These downward tapering approximately circular pipes are 0.2 to 2 metres across and can reach as much as 10 to 15 m down into the dune. At first the pipes simply cut through the limestone and are filled with quartz sand that is continuous with the overlying soil; later they may become defunct and are gradually infilled with concentric layers of kankar.

3. Continued leaching sculptures the dune limestone into pinnacles. The pinnacles may have a relief of 4 or 5 m and be surrounded and covered by yellow quartz sand a further 4-5 m thick. This corrosion at the soil-limestone interface cuts across the early-formed structures of bedding, root concretions, solution pipes and kankar.

4. Ultimately the leaching reduces the dune to a subdued heap of loose quartz sand and lateral movement of ground water may cause ferruginization.

In the vicinity of the Pinnacles the wind has continually blown northwards, and successive dune systems have blown over the top of each other. In the last few centuries a dune system in Stage 3 was buried by a mobile parabiic dune, and the banksia scrub that covered the old dune was killed. When the young dune moved on, the yellow quartz soil, no longer stabilized, blew northwards with the younger dune, exposing the pinnacles.

i) There is a mobile dune to the north of the Pinnacles in which the quartz grains are a mixture of clear fresh grains and yellow-stained grains that are probably derived from the soil that covered the Pinnacles.

ii) The tops of the Pinnacles align to form a smoothly curved surface that probably represents the level of the top of the original cap-rock.

iii) Pinnacles that have been knocked over do not show the concentric lamination that would be expected if they were exhumed solution pipes as suggested by some earlier accounts.

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