D-41: Heavy mineral distribution and textural characteristics of beach sands in the coastal stretch between Payagala & Ahungalla, South Western Sri Lanka

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The South-western coast of Sri Lanka has long been known for beach mineral sands rich in monazite, zircon, ilmenite and garnet. At Kaikawela, Induruwa concentrations reaching up to 20 and 40% of monazite aggregating about 500 tons of refined mineral have been recorded.

The monazite content of the beach sands varies considerably from, day to day and from place to place. A few random analyses from Beruwala made during 1954 illustrate such daily variations. According to Searle (1962) the maximum width of the beach (at Beruwala) in which concentrates were found in 1962 was 15 ft, the concentrate extending down to 9 in, below the surface on the land side but thinning rapidly towards the sea.

Although exploitable deposits are available in several localities very little work has been carried out on the distribution and textural characteristics of the sands in this coastal stretch. Therefore, Geological Survey and Mines Bureauhas initiated a preliminary survey of these coastal sands for determining those factors in order to delineate beach placers of economic significance.

Auger sampling has been carried out at 30 cm depths in the coastal stretch between Payagala and Ahungalla at every 1 km. Across the shore, samples were taken at high water mark, the adjacent berm and dune, wherever available.

A fixed quantity of material from each sample was washed thoroughly with water, dried and sieved through a set of standard ASTM sieves using 25, 36, 60, 100 and 200 mesh sizes. Magnetite, if present, was, first separated with hand magnet and each sieved fraction was then subjected to electromagnetic separation at 0.5, 1.0 and 1.5 amp to obtain magnetic and non - magnetic fractions. Bromoform (sp.gr.2.82) was used to separate quartz and other light minerals from heavy minerals of the 1.5 amp non-magnetic fraction. Each fraction was weighed and used for grain counting to calculate weight percentages, using a petrological microscope.

Ilmenite, garnet, monazite and sillimanite form the major heavy -mineral constituents, of the beach sands and zircon, rutile and spinel occur in subordinate amounts. Magnetite, pyroxene, hornblende, biotite, limonite and hematite are present in trace amounts. The distribution patterns of individual and total heavy minerals show wide variation from place to place. For example:

a. With increase in grain size, there is a consequent decrease in heavy - mineral content and increase in calcareous matter/quartz ratio.

b. Individual minerals such as ilmenite, rutile and zirocon also decrease in weight percentages with increasing grain size, while garnet behaves in the opposite way.

c. The concentration of heavy minerals is more at places where the sands are well sorted; rutile and zircon show prominent concentrations in the fractions below 100 mesh.

The higher proportion of ilmenite, garnet and sillimanite in the mineral suites of these sands is attributed to the preponderance of granulite grade metapelites in their provenance, and absence of pyroxene, hornblende and magnetite suggests relative scarcity of mafic/ultramafic rocks in the area.

The higher concentrations of monazite appears to be due to the presence of monazite-bearing pegmatites in the hinterland of this part of coast.

The increase in concentration of heavy minerals with decreasing grain size may be due to long distance of transportion and sorting undergone by the sediments before reaching the sea, and because the river inputs overshadow the effects of longshore drift.