

THE EROSION OF THE DELTAIC AND LAGOON

COAST AT THE MOUTHS OF THE DANUBE

Metodiu RADULESCU

Romanian Marine Research Institute - CONSTANTZA (ROMANIA)

RESUMÉ: Comme suite de l'amointrissement de la source de sable du débit solide du Danube, l'érosion par les vagues sur la rive lagunaire-deltaïque aux bouches du fleuve est accélérée, en provoquant un recul progressif des cordons littoraux.

The 145 km of deltaic coast passing to a lagoon-type to the south are subjected to a wave-climate dominated by northeasterly winds. Consequently, net southerly and southwesterly wave-induced longshore currents transport the sand from the Danube bed-load discharge far down the coast, of which the very genesis was based on this process.

The survival of the sand-banks forming the greatest part of the shore is dependent on the availability of a constant continental input to supply the losses by wave-erosion. Nowadays, while river bed-load is ever poorer, particularly because of the upstream dams, the almost every year longer jetties of Sulina throw an important volume of sand brought by the two northern branches out of the nearshore circulation. A progressive anastomosis of St. George Branch has been practically completed with the recent development of Sacalin Island, which also acts as a natural jetty, deviating the nearshore southwesterly sediment transport. All these result in accelerating beach erosion in the lee of the river branches, where the shoreline draws back at average rates reaching 25, even 30 m/y, as assessed for 1962-1979, so that the sand-bank is completely destroyed in some portions, where the lacustrine reed of the delta still grows at an indefinite sea-shoreline. A similar narrowing and translation of the sand-banks over the lagoon formations is being recorded in the southern region, at a rate of 5 to 10m/y.

Once the rugged reed remainders have been exposed at the shoreline and the lacustrine fines more rapidly scoured, the suspended sand ever more difficulty settles here, in a more agitated zone, on a degraded submerged

profile. It is gradually re-distributed according to grain-size on the submerged beach, of which the slope is steepening as a result of a similarly scarce sediment supply in the offshore, causing shoreward withdrawal of the isobaths. Three short depositional portions (except those at the root of the jetties) alternate with the longer erosional ones, being localized where the net sediment transporting currents reappear in the nearshore zone after undergoing the above mentioned jetty-effects or due to the coast topography:

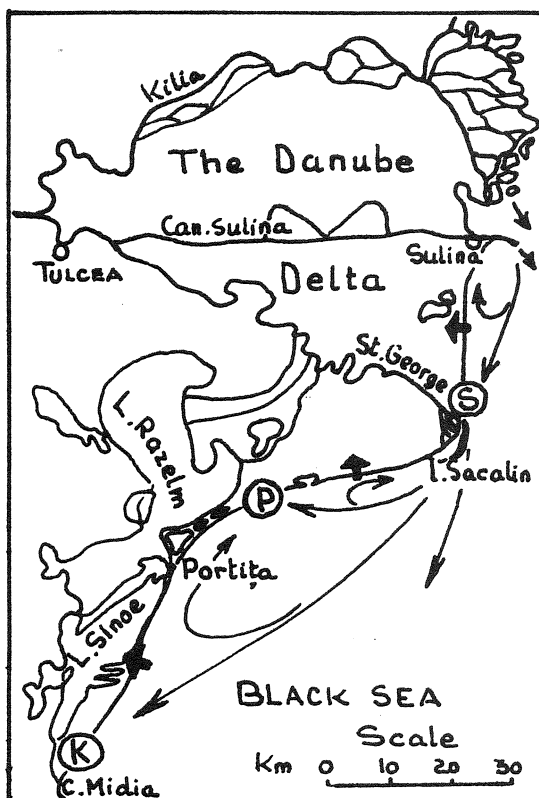
the sand-banks of Sărăturile (S), Periser - Periteasca (P) and Kituc (K).

They totalize 18% of the coast, as against 67% of erosional portions, and their lengths have been constantly reduced to local nuclei of accumulation (encircled in Figure) on the course of a general longshore current of which both sediment load and transport power are variable. The accretion of the beach reaches a maximum of 10m/y (1962-1979) at P and there is evidence (organic detritus and lacustrine sand) that this is much due to the northeastern erosion. In the zones S and especially P several submerged ridges, more closely series

shorewards, also prove a sediment input from offshore.

Concurrently with the general diminution of the Danubian siliceous sand source, an increase in the percentage of calcareous sand and debris derived from mollusc shells has been noticed on all the beaches.

The eustatic rise of the sea level at an average rate of 3mm/y (Constanța, 1933-1976), combined with the subsidence of the deltaic area, intensify the erosional processes by moving the wave erosion base shorewards. Marine transgression is characteristic of the whole Romanian coast, but it is nowhere so active as in the region of the Danube Delta. About 13 km² of land was lost between Sulina and Cape Midia during 1962-1979. The



average annual balance is as follows: 0.14 (deposition) - 0.94 (erosion) = - 0.80 km² (loss); these amounts widely differ from year to year as a function of the Danube discharge and occurrence of storms. On a tridimensional scale, the sand loss is spectacular: 30,000 m³/km/y (1975-1979) along Kituc - Since sand-bank.

A conclusion is drawn from all recent data: that the natural tendency of the shoreline is to draw back to its ancient positions held during previous evolution stages of the Delta, with reduction in surface and return to the lagoon phase of the actual lakes to the south, if no intervention were undertaken.

