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VULNERABILITY OF THE BEACH-CLIFF SYSTEM OF PRAIA DA ROCHA

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Abstract

Praia da Rocha is an artificialized coastal system example, where the beach is stable, but the cliffs are in a precarious stability. The heavy urban pressure (car and truck traffic as well as buildings up to near 3 m from the cliff top) strengthens the system instability.

Key words: replenished beach, unstable cliff, urban pressure.

1. INTRODUCTION

Until the early 50's, Praia da Rocha (which means "Beach of the Rock") was an estuarine beach connected to a cliff cut into the Miocene very karstified marls. The beach-cliff system (Fig. 1) has also several reefs and rocky islets, which prove the fast cliff retreat. Its natural conditions for tourism and leisure allowed the development of hotels and cottages along the cliff and, in some cases, even on its top.

Nowadays, Praia da Rocha is an important Western Algarve tourist resort. The major growth of the small town of Praia da Rocha took place in the 80's and reached 7 400 hotel beds in 1991.

2. FROM BEACH EROSION TO THE REPLENISHED BEACH

The first signs of important beach erosion date back from between 1951 and 1957 (*Weinholtz*, 1980) after the starting of the Portimão harbour works. These included the construction of jetties (the bigger one was about 600 m long) dividing the beach from the estuary, and blocking the natural feeding of the beach by the ebb-tide sands. As a consequence of these works, the beach disappeared and the sea began to attack the cliff base. These circumstances would improve the cliff retreat endangering houses and hotels (Fig. 2).

At the same time, the infilling of the navigation channel in the contiguous Portimão's fishing harbour was taking place. Being one of the most important harbours in Algarve, it was necessary to drag the navigation channel, in 1970. The dragged sand was then used in the artificial nourishment of the beach, which reached 150 m width. Despite being a successful human intervention, a new nourishment was necessary in 1983. Nevertheless, the monitoring done by *Psuty & Moreira* (1990) until 1988 shows a beach thinning in its W section and also in the beach of Três Castelos (Fig. 3).

3. THE UNSTABLE CLIFF

The most recent human intervention in the beach-cliff system took place in the cliff itself. In spite of being no longer reached by the sea, the cliff's evolution went on through rill and gully erosion and mass movements. The rill and gully as well as slides with a flow component are the main erosion processes on the infilled karst holes[1], while the rockfalls, less frequent, occurred in the marls.

[1] The karst holes are infilled by a clayey-sandy deposit.

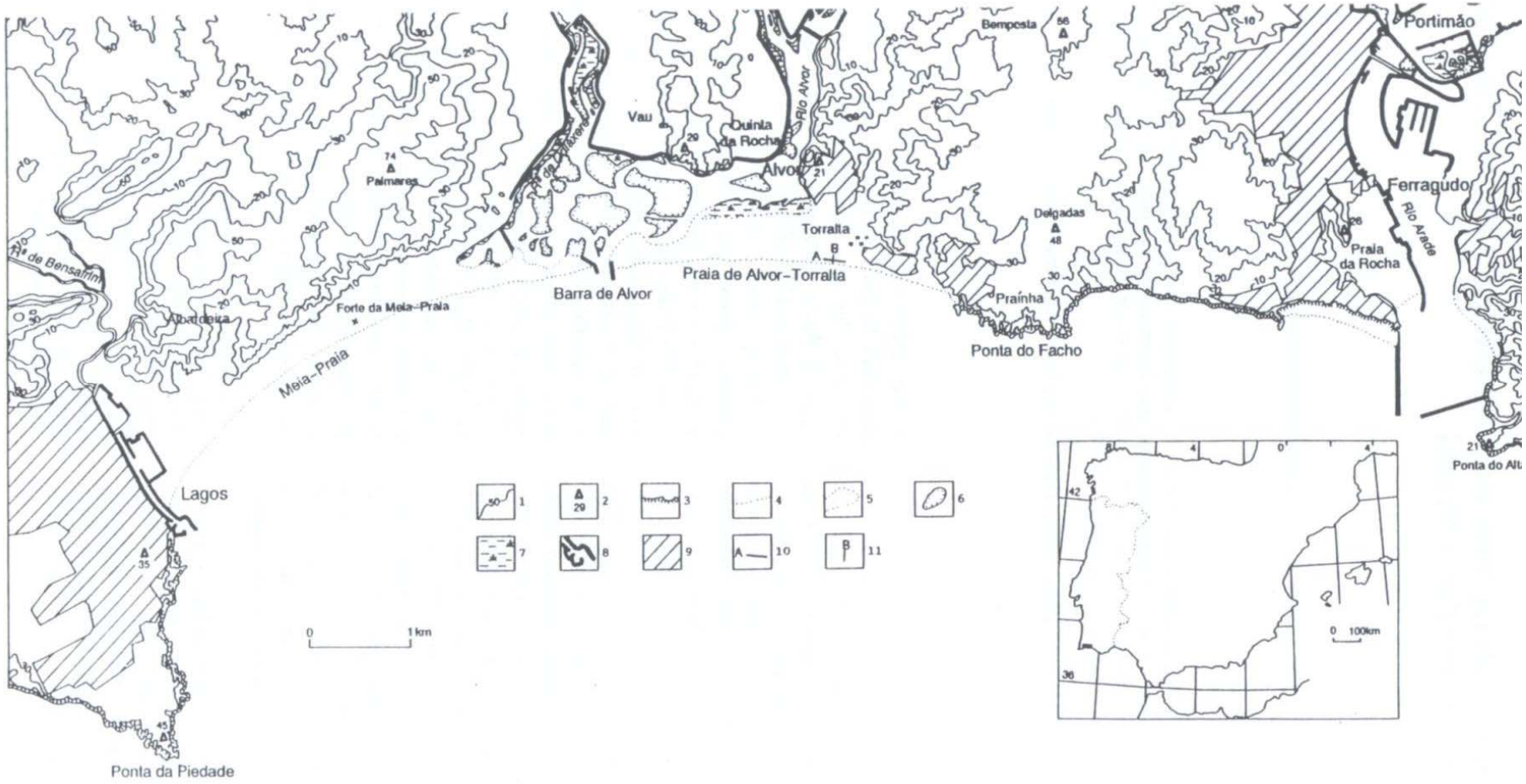

Fig. 1 – The Bay of Lagos. Legend: 1 – line contour; 2 – high; 3 – cliff, 4 – beach; 5 – spit; 6 – sandy shoal; 7 – swamp/marsh; 8 – embankment and jetties; 9 – urban centre; 10 – cliff position in 1990 where the radiocarbon dated sediments were found (*Pereira et al*, 1994).

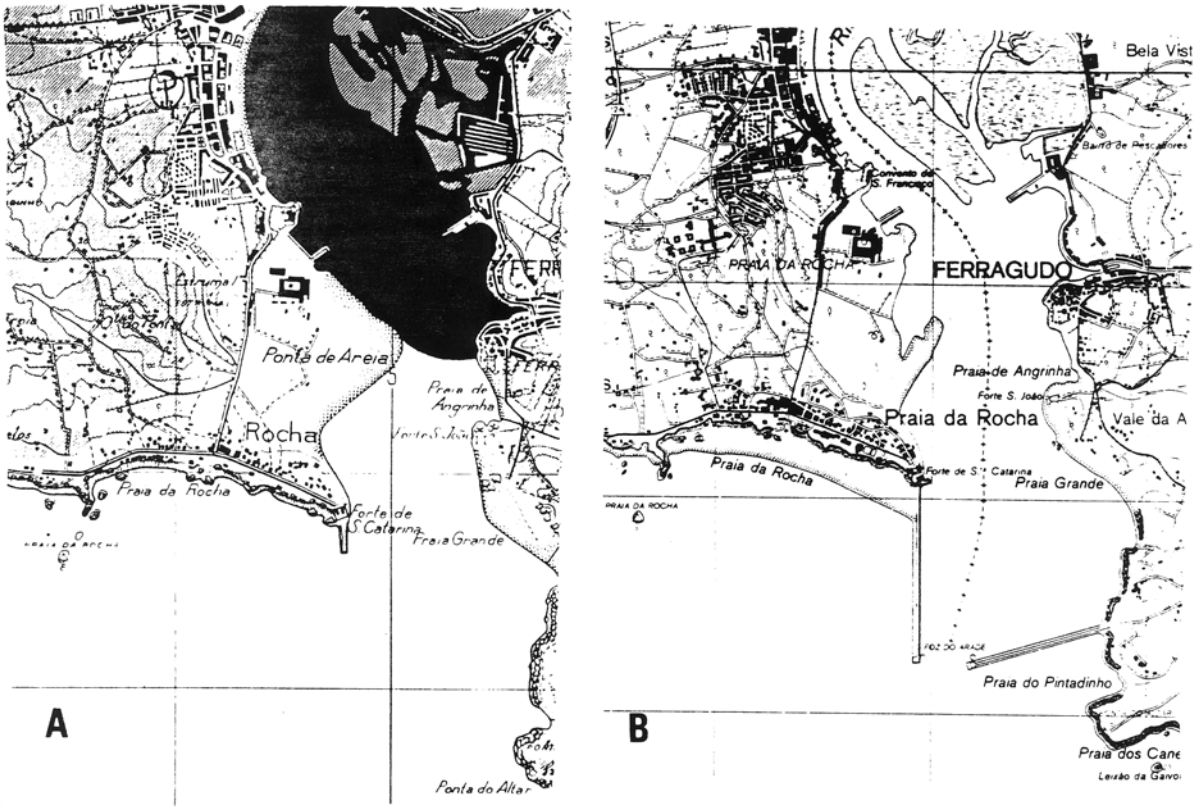

Fig. 2 – Praia da Rocha near the estuary of the Arade River and the small town of Portimão. The two charts show the beach evolution and the urban nucleos of Praia da Rocha, between 1952 (A) and 1978 (B).

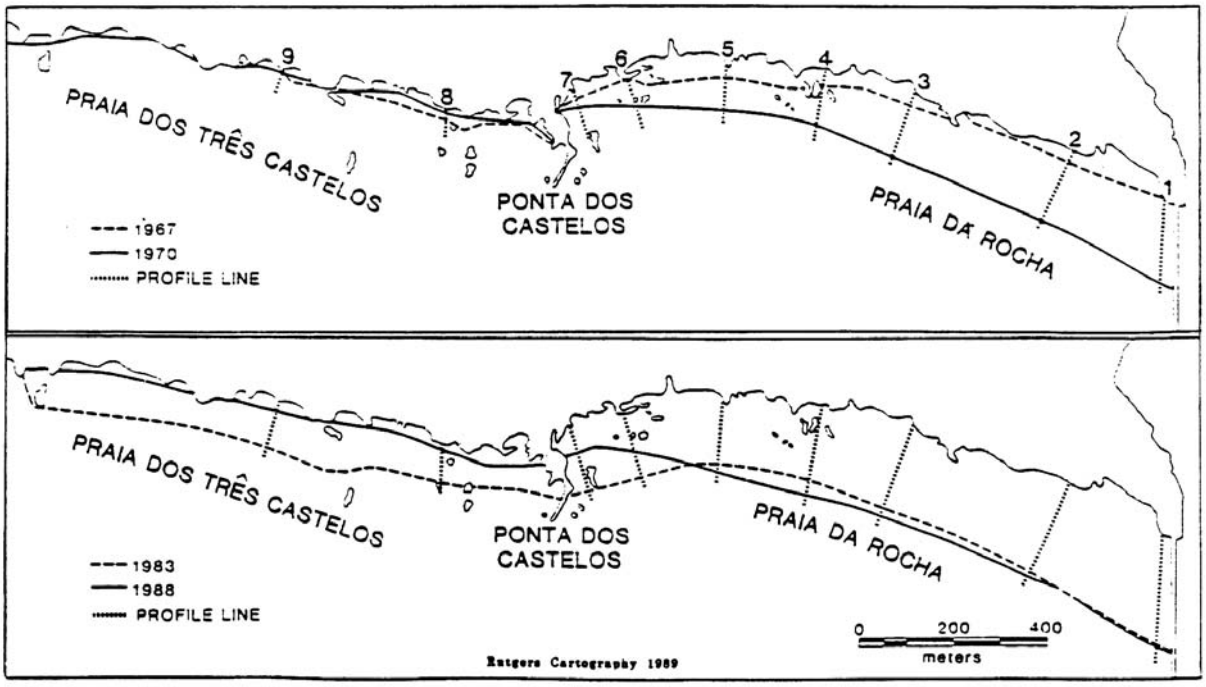

Fig. 3 – The shoreline evolution at Praia da Rocha (from *Psuty* & *Moreira*, 1990).

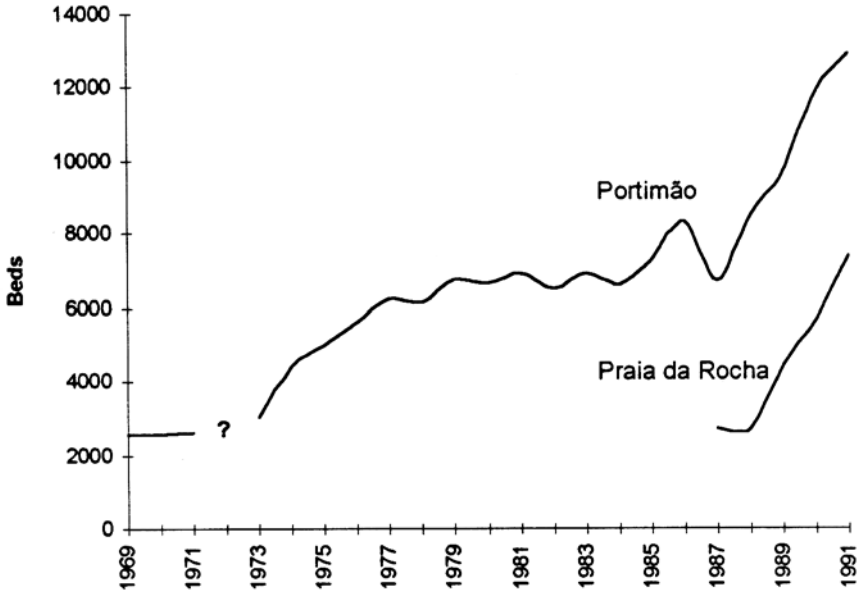

Fig. 4 – Evolution of the lodging capacity in Portimão and Praia da Rocha.

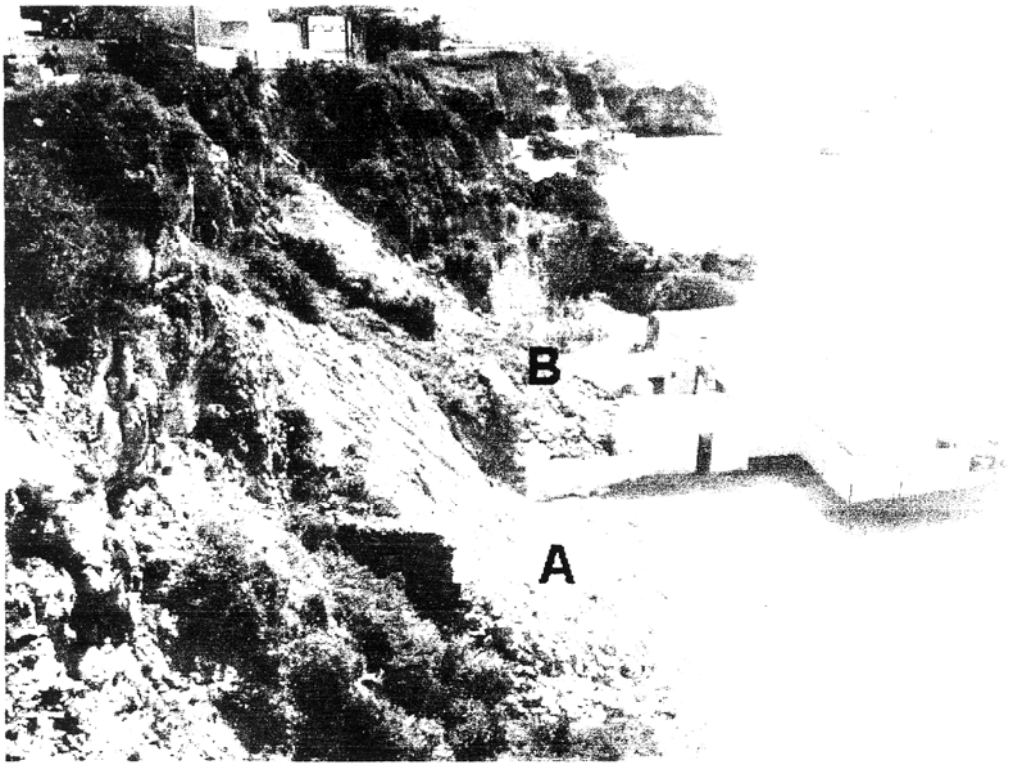

Fig. 5 – Cliff of Praia da Rocha affected by landslides. **A** took place in January 1996 and B occurred between 8 p.m. of the 17th March and 8 a.m. of the 18th, affecting the base of the cliff.

At Ponta dos Três Castelos, the cliff's evolution caused the destruction of a secondary path and endangered a belvedere. To provide protection to the belvedere and to another more inland road, the cliff was submitted to a consolidation by means of coloured cement with the propose the step stabilisation, trying to maintain its natural look.The growth of the Praia da Rocha urban area took place, as referred to, in the 80's, when the lodging capacity almost duplicated (Fig. 4). The Summer tourist demand is very strong nowadays. In spite of the conditioning measures applied to the top of the cliff, the traffic still exists as well as the recovering and broadening of old houses and even the construction of new buildings for leisure. The vibration and the opening of foundations for new buildings near the top of the cliff are responsible for bed-rock weakening and are also the main cause of rockfalls and slides. Those processes endangered the small restaurants on the beach. Early in 1996, after a period of heavy rainfalls, the mentioned situation was illustrated by a landslide (Fig. 5). The phenomenon occurred once again during the night of the 17th to the 18th March, between 8 p.m. and 8 a.m., and this time it damaged the restaurant itself.

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