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**Morphologic Features of shore platform
between Punta Sottile (Italia) and Punta Grossa (Debelj Rti - Slovenija)
and its sustainable development**

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Abstract

A project of landfill is foreseen for the Italian side of S. Bartolomeo Bay. As member of the Società di Studi Nettuno I have mainly studied the general geomorphology of the shore platform in order to understand the impact of this project and the opportunity to create a Natural Reserve as in Slovenija.

There have been few studies dealing with Istrian rock coast morphology, even though local economy and activities are closely connected to coasts. D'Ambrosi (1942) has focused on physiographic features of Istria, studying the general morphology of the peninsula, while Brambati & Catani (1988) focused on sedimentological, geomorphological and geotechnical features of the Trieste shoreline. The study of local shore platforms is totally neglected. They occur along most of Istrian coastline, so the aim of this paper is to discuss the observations on morphologic features, in particular in the small S. Bartolomeo Bay, between Punta Sottile and Debelj rtič. In the area the platform is an extensive, gently sloping surface up to 300 m in width.

The North-western Istrian coastline, in the Gulf of Trieste, is sufficiently rugged to consist of cliffed headlands, locally called "Punte", separated by bays, called "Valloni", with pocket beaches. This configuration allows the development of wide platforms. Tidal range in the North Adriatic Sea is typically in the order of 1 m, but, in particular meteorologic conditions, water sea level can rise until 2 m m.s.l. Waves are mainly due to Bora (NE) and Scirocco (SW) and are never high. Only sporadic Libeccio (SW) causes wave 3,4 m height. Wave intensity, however, differs because of changes in coastal orientation.

Shore platform is modelled in quasi-horizontal Flysch (Eocene Medium – Medium and High Lutetian). This kind of relatively attachable lithology determines a coastal configuration with high cliffs and deposits at the cliff toe and a wide shore platform seaward. The outcrop is quasi-horizontal (300/5), thus softly dipping North-east.

Recession of coastal cliffs is essential for platform development. In this case, cliff erosion rates are in the order of 10⁻² m/year (Sunamura, 1992). So, roman docks, sited 50 m seaward, were located just at the cliff toe. The surface of the platform is some centimetres above mean low tide level and is covered by fifty centimetres of water during high tides.

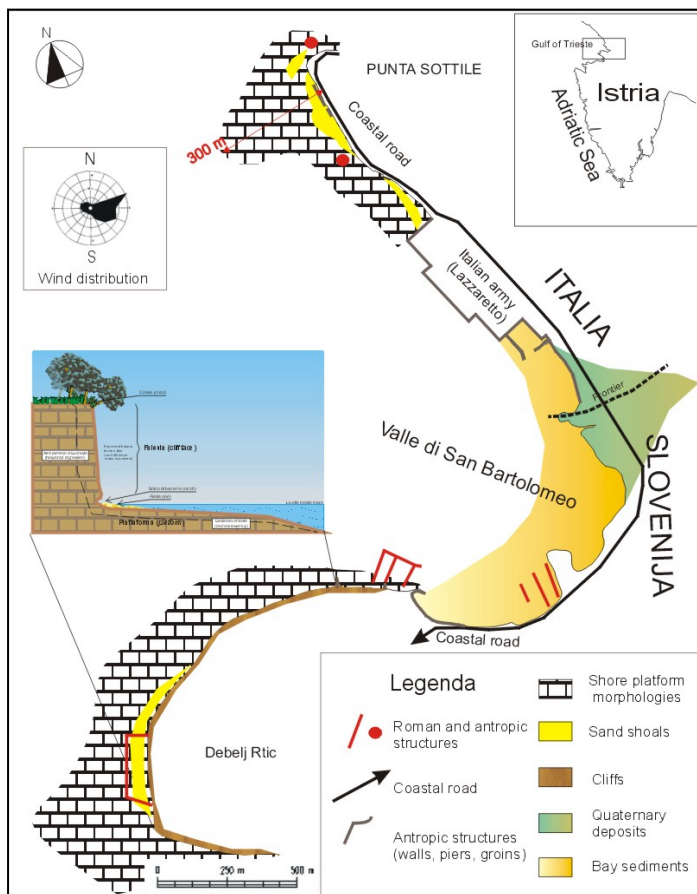


Figure 1. Geographical position of the area with Punta Sottile – Debelj rtič (Punta Grossa) shore platform

The surface is quite smooth, though arenaria strata is visible above the mean sea level, when their dip is steep. At the foot of the cliff, the surface slope gently upwards to form a ramp. The question of the width is quite difficult, because platform width (Trenhaile, 1999) was defined as the shore-normal distance between the cliff foot and the mean low spring tidal level, but in this case there are many submarine arenaria outcrops, sited some meters under mean low spring tidal level. They represent relict structures connected to the slow and continual sea level raising. Actual and relict platform however constitute a continual morphological structure. So, actual platform width is about 40-70 m, while the seaward extension of the relict platform is about 300m.

A coastal road built on the actual shore platform runs along the whole of Punta Sottile (Fig.1), so the normal interaction between cliff and platform is impossible. Sediments are quite coarse, mainly natural origin, produced as debris at the cliff toe. There is also trash connected with the construction of the road. Actual shoreline, along the Italian sector, does not show original morphology because of the road, but it shows the original features of the neighboring coasts (Brambati & Catani, 1988). Relict

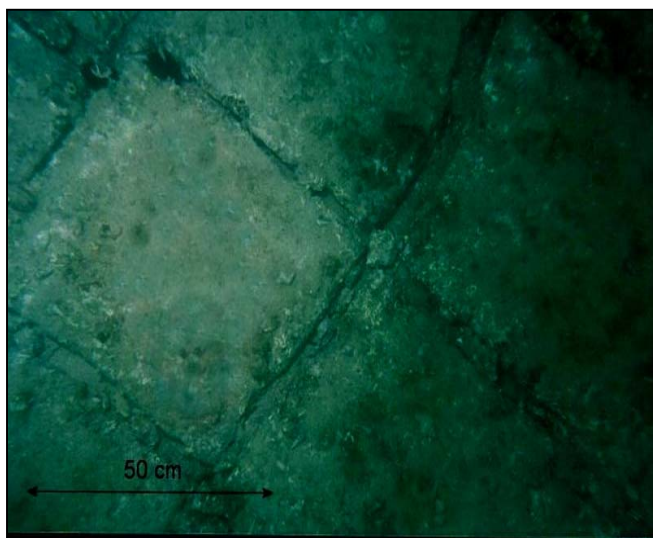


Figure 2. Sandstone blocks in the underwater outcrop (relict shore platform). Because of their regular shape, they are called “roman pavement”

platform, here, is very wide. It is possible to recognize some interesting outcrops. Here, sandstone blocks vary from some centimetres to half a meter. When these blocks are horizontal or nearly horizontal they look like a sort of antropic pavement (the so called “roman pavement”)(Fig. 2). This misunderstanding is also due to the discovery of some roman docks (Gobet, 1983; Frenopoulos et al, 2003) in the area.

Debelij rtič (Punta Grossa) is instead natural and is protected by a Natural Reserve. The broad characteristics of the platform are related to various morphometric factors but the detailed platform geometry is closely related to structure and lithology. Physical hardness is not the main measure of a rock’s resistance to erosion, as recognized also by Suzuki et al (1970).

In the case of this flysch platform, wave and biological aggression act more on the abundant fracture, joints and beds than on the rocks, so they are more important than the geotechnical properties of the rocks themselves. The removal of sandstone blocks is evident along layers on the platform. The interbeds are usually covered by sand or, in the exposed sections, by sandstone pebbles. In the most exposed sector (the south head), a pebble accumulation is evident due to storm-wave interference (Fig. 3). Just some



Figure 3. The southern head with pebble accumulation due to storm wave interference.

meters north, an antropic structure, probably roman, 200 m long and 30 m wide, borders an unexposed area in which a sand shoal has developed. The ramp is built with different grain-sized material, from pebbles to blocks, according to cliff availability. A little seaward, on the flat surface of the platform, marlstone is exposed to wave attack and to destroying organisms, and uncovers inferior sandstone layers. For this reason the subhorizontal stratification facilitates erosion (Trenhaile, 1999) and consequently the presence of a wide platform.

Except during particular tidal periods, shore platform remains below mean sea level, thus it is covered by seagrass (as the marine phanerogam *Cymodocea nodosa*) and organic crusts. It seems that shore platform erosion is mainly biological in the unexposed sectors, thanks to the protection offered by marine plants in the subtidal portion. However (Fornos J.J., et al, 2001) it is quite difficult to quantify the erosive or protective properties of organisms, because of the great variety of ecological and environmental factors controlling organism distribution such as seasonality, changes in population numbers and their biometry. The more exposed sectors are, instead, interested by wave action (Fig.3).

The intensity of attack on the main cliff is largely controlled by the width of the platform, other factors being equal (Edward, 1941). Here, the platform is wide, thus the attack to the cliff is intermittent and sand tends to accumulate intermittently on the back part of the platform and the ramp.

The geomorphologic evolution of this shoreline is partly natural, according to cliff-platform interaction, and partly anthropic, stabilized by a coastal road. The study of shore platform, and the observations of these features as a significant element of the coastal landscape is really important not only per se, but also because it would represent an important sector of the study of the environmental impact on the landscape. So I think that it would be better to improve the geological component of this underwater environment, for example by creating a protected area, rather than a drastic solution as a landfill. In the first case, in fact, the shore platform itself, with its archaeological and biological evidences, could represent the input to eco-touristic fruition, allowing a sustainable development of the area.

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