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Geomorphology and anthropogenic impact including military constraints in a microtidal wave-dominated embayment in south western Sardinia (Porto Pino beach, SCI ITB040025, Mediterranean Sea). Implications for beach management.

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The coastal zones of the Mediterranean have undergone increasing pressure over the last century. The intensifying coastal development and the increasing tourist impact have led to an intense transformation of the coastlines and adjacent marine areas. The beach and the coastal dune play an important role in protecting the coastline. Thus, the study of its geomorphological evolution and of its anthropic modification is fundamental in order to adopt the best management practices. In this regard, the LIFE Project (LIFE13NAT/IT/001013) SOSS DUNES (Safeguard and management Of South-western Sardinian Dunes) aims to safeguard the dune habitats and the beach system in a site belonging to the Natura 2000 network, an EUwide network of nature protection areas established under the 1992 Habitats Directive. This project is focused on a microtidal wave-dominated embayment located in south western Sardinia (Italy, Mediterranean Sea) called Porto Pino beach comprised in the SCI (Site of Community Importance) “Promontory, dunes and wetland of Porto Pino (ITB040025)”. This research aims to investigate the geomorphological processes, the evolution and the main human impacts on Porto Pino beach as an useful tool for both conservation and coastal management.
The coastal area of Porto Pino is represented by sandy shorelines extending for a total length of 5 km characterized by a wide primary and secondary dune systems, a backshore wetland lagoon and marsh area arranged parallel to the coastline. This littoral area can be ideally divided into three parts: the first, about 600 m long, in the north-west part characterized by the highest human pressure due to touristic activity on the foredunes and deposition of beach wrack; the second part in the south-east, about 1100 m long, characterized by a complex dune system (primary and secondary foredunes); and the third southernmost part included in a military area, about 3300 m long, characterized by transgressive dune system with low human impact. The coastal dunes vulnerability status of this three parts was assessed using the Dune Vulnerability Index (DVI) based on 57 variables that described geomorphological condition, marine influence, aeolian influence, vegetation condition, and human effects. Results reveal the lowest vulnerability value in the area undergone military constraints.
Blowouts, breaches in the coastal dune system and deflation areas are observed in the first and second part where there is the greatest human transit to allow users access of the beach. The main pressures and threats identified that determine significant impacts on dune habitats are: transit of vehicles in the dune with the subsequent degradation of vegetation and the triggering of deflation processes; setting of infrastructure on the dune; removal of seagrass banquettes. In particular, the impact of trucks used to remove banquettes is significant on subaerial beach morphology. This traffic flattens the berms, modifies sand permeability and reduces organic sediment input to the shore.
This study has allowed to highlight the geomorphological processes, the anthropic pressure and the coastal dune vulnerability of this coastal area in order to mitigate the impacts.