19. Multitemporal Analysis of Ionian Coastal Dunes Using UAV Surveys and Historical Geospatial Data

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Coastal dune ecosystems provide essential ecological and socio-economic services. However, they are increasingly threatened by erosion, urbanization, and anthropogenic pressure, particularly within the Mediterranean context. Long-term monitoring of these fragile environments is therefore essential, although traditional field-based approaches can be costly and difficult to apply consistently over time. This study presents a preliminary GIS-based methodological framework for the multitemporal monitoring of a small coastal dune system located at Lido Conchiglie (Gallipoli, Puglia, Italy). Historical aerial photographs (1954, 1972), multi-year orthophotos covering the period 1988–2023, and a highresolution multispectral UAV survey conducted in 2026, were integrated within an open-source GIS environment. The analysis focused on three main components: qualitative shoreline evolution, land-cover transformation in the area surrounding the dune, and the diachronic assessment of a conservation-relevant Juniperus spp. dune habitat. Results suggest an overall, spatially uneven tendency toward shoreline retreat and a marked increase in artificial land cover around the dune, largely at the expense of natural and agricultural areas. Despite increasing anthropogenic pressure, several Juniperus spp. habitat patches show substantial spatial continuity across the available historical imagery. These findings highlight the potential of integrating historical and UAV-derived geospatial data within an open-source GIS framework as a cost-effective and replicable firstlevel screening approach for assessing dune vulnerability. The proposed workflow provides a methodological basis for future quantitative monitoring and restoration-oriented studies in similarly threatened coastal environments.