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Mapping bottom features of the site selected for the Underwater Observatory in Sharm el Sheikh (South Sinai, Egypt)

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Abstract. As part of the "Pilot project for the sustainable development of environmental sound management in South Sinai, Sharm el Sheikh, Ras Mohammed National Park" funded by the Italian Environmental Ministry we undertook underwater visual, photographic and video surveys along 15 belt transects. A bionomic and topographic map (scale 1:100) of the site selected for construction of an Underwater Observatory was made as part of the building plan of the structure.

Key words: Mapping, Belt transect, Coral reef, Red Sea, Egypt.

Introduction

Cartography of the sea bottom plays a key role in coastal management. Knowledge of the distribution of the main marine biocenoses is of fundamental importance in conservation and monitoring programs (Piazzi et al. 2000). The creation of habitat or geomorphology maps is a critical step towards the assessment and management of reef ecosystems (Andréfouët and Guzman 2005). Current applications of coral reef habitat maps include biogeochemical budgets (Andréfouët and Payri 2001) or resource assessment and exploitation planning (Long et al. 1993; Andréfouët et al. 2004). An interesting recent application is to use remotely sensed habitat maps as indirect guides for assessing biological diversity in the context of marine conservation, or to identify the scale of processes that controls the structure of a mosaic of habitats (Mumby 2001).

The present study was part of the "Pilot project for the sustainable development of environmental sound management in South Sinai, Sharm el Sheikh, Ras Mohammed National Park" funded by the Italian Environmental Ministry. Within this project the realization of a bionomic and topographic map of the site selected for construction of an Underwater Observatory was proposed in order to minimize direct impact on benthic organisms.

Material and Methods

The study area was located at Marsa Ghoslani in front of the Visitor Center of the Ras Mohammed National Park Park, Sharm el Sheikh (Egypt).

Due to the limited dimension of the area to be investigated and the high level of detail needed, it was decided to operate using a direct method of survey instead of indirect methods like those based on acoustic instruments or satellite images, better suited for broader scale investigation.

Visual, photographic and video surveys were made by SCUBA diving along 6m wide x 50m long belt transects (n=15) perpendicular to the coastline (Bianchi et al. 2003; Hill and Wilkinson 2004) (Fig. 1).

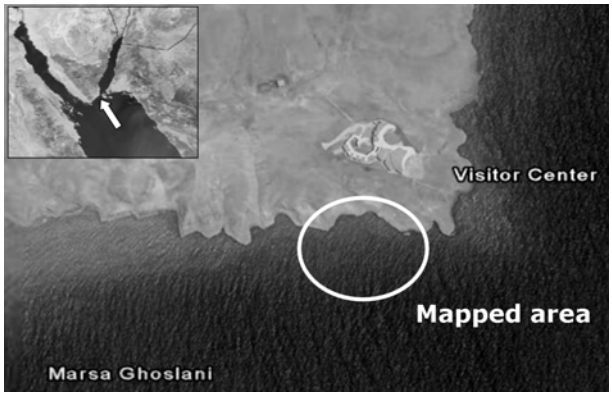

Figure 1: Study location along the coast of Sharm el Sheikh, Egypt.

The transects started from the reef crest and each starting point was positioned and georeferenced using a dGPS.

Visual recording of bottom features included type of substratum (rock, sand and rubble) and type of organisms (hard coral, soft coral). Bathymetric data were obtained measuring depth at each metre along the lines. Data were gridded using SURFER v. 8.0 (Golden Software, Inc.) to obtain the map.

Results

A bionomic and topographic map was obtained of a portion of marine bottom of about 5.000 m^2 (scale 1:100; reference point at 27°49.55'N, 34°16.14'E) (Fig. 2).

The map shows a fringing reef of only a few meters width. The reef flat is not continuous along the mapped coast, the interruption is visible on the map as the light grey area between the darker areas representing the fringing reef. When present, the reef descends from the crest to a depth of about 5 meters reaching a rocky platform covered by patches of sand, rubble and scattered living corals. In the mapped area this platform reaches depths of about 15-18 meters with a mean inclination of about 20%. The map clearly shows the presence and the distribution of living corals and some columns covered by a rich benthic community.

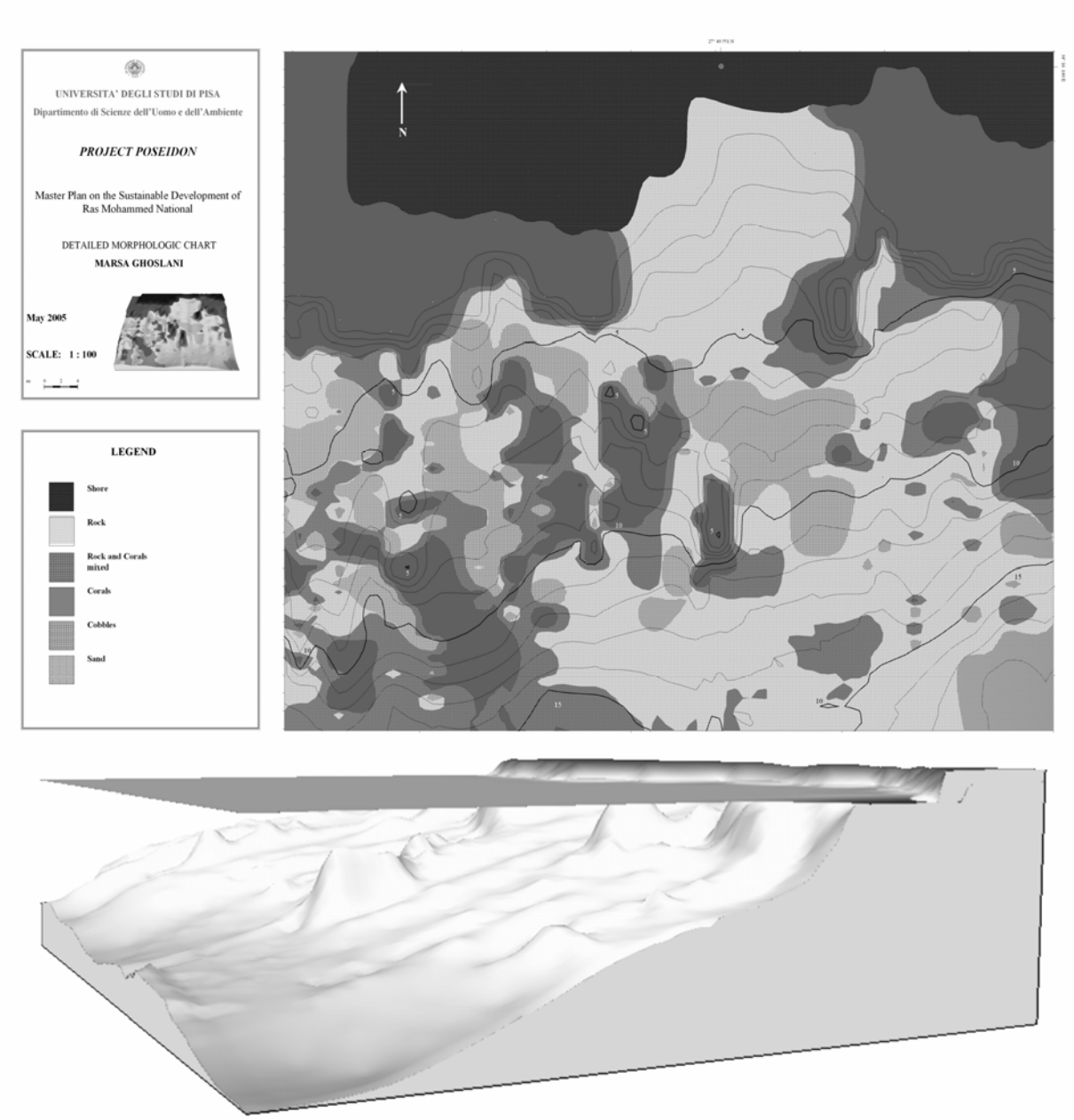

Figure 2: Bionomic and topographic map and three-dimensional representation of the bottom.

Discussion

Mapping bottom features is one of the essential steps to address environmentally sustainable solutions for underwater construction works. Of course, the knowledge of the extension and distribution of living corals must be considered as only part of the information necessary to manage this resource (Piazzi et al. 2000).

The map obtained from this study was used to elaborate the building plan of the Underwater Observatory. Suggestions were made regarding the type and shape of the structure and the route that it had to take in order to minimize direct impact on benthic organisms.

The Underwater Observatory consists of 3 structures: the underwater pipe-shaped tunnel, 58m long and with a diameter of 3m; the tower-lift, with a diameter of 6.5m that links the tunnel to the surface and that is connected to the coastline through a wharf 20m long and 5m wide.

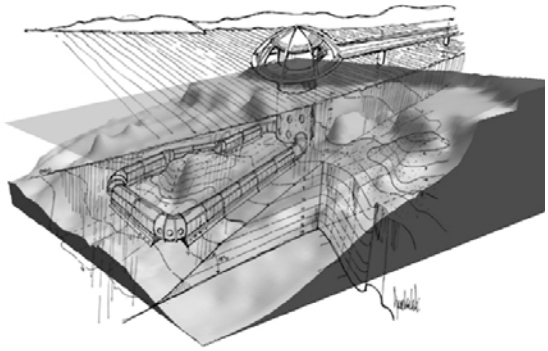

Figure 3: Sketch of the Underwater Observatory.

As can be seen in the sketch in Fig. 3, thanks to the map obtained, the ideal concept of the project plans to locate the underwater tunnel on the rocky bottom present in the area, thus avoiding the pinnacles covered by living corals. Moreover, it was possible to locate the wharf and the tower-lift where the fringing reef is naturally interrupted.

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