A pilot study aimed at the establishment of Marine Protected Areas in the Maltese Islands

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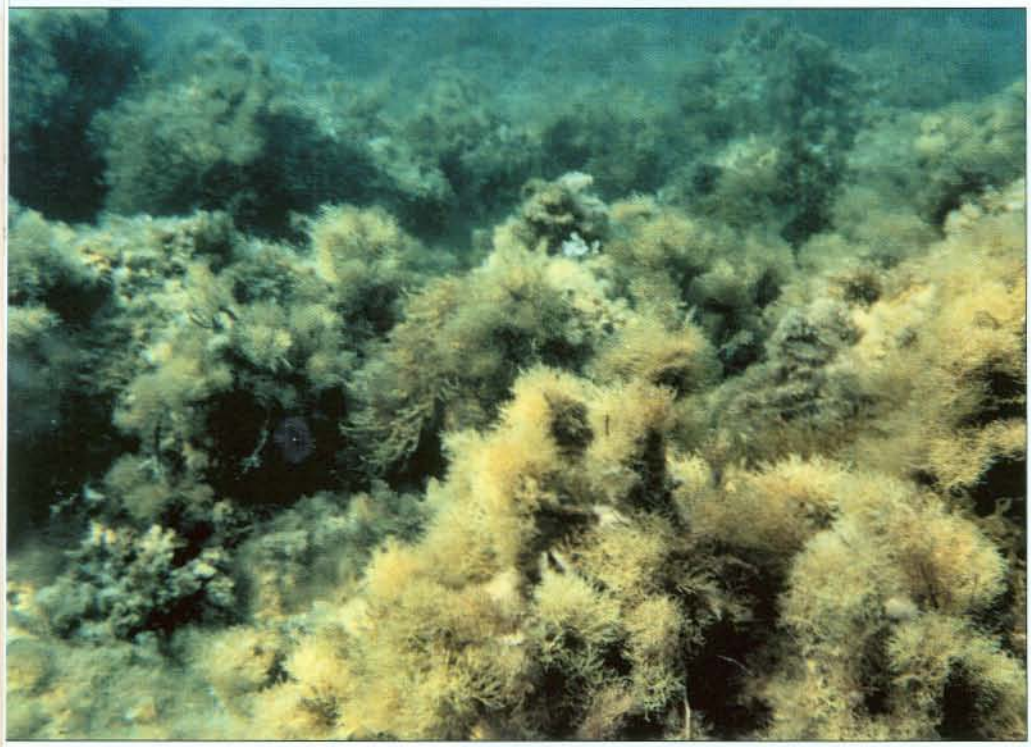

'Forests' of photophilic algae growing on bedrock and boulders in shallow water (3m). The dominant species in this image are *Cystoseira ercegovicii, Padina pavonica, Dictyota linearis* and *Sargassum vulgare*, but many different assemblages dominated by other species occur in the study area.

The Maltese Islands at the centre of the Mediterranean have a coastline of ca 190km and a submerged area (to a depth of 100m) of approximately 1,940km^2. They are densely populated and are now visited by over a million tourists every year. Human pressure on the environment has increased tremendously over the past four decades and, today, no part of the local environment is totally free from the effects of human activities. At sea, although it is difficult to ascertain the extent of human impact, one can claim with an appreciable degree of certainty that divers have probably trekked the entire seabed from the mean sea-level to a depth of about 65m, while bottom trawling, dumping of dredge spoil, major coastal projects and day-to-day uses of coastal resources and those of the sea adjacent to the coast, have all taken their toll.

Although protection of the coastal sea may be largely seen as a domestic issue, conservation of the marine environment at large now has an international dimension; this is especially true for the Mediterranean region where regional agreements concerning marine protection have existed since 1975 in the form of the Mediterranean Action Plan (MAP) adopted by the Mediterranean countries and the (then) EEC, followed by the Barcelona Convention in 1976, administered by the United Nations Environment Programme (UNEP).

CAMP-Malta

In the past decade, a number of the pilot projects implemented under the aegis of the Barcelona Convention and its protocols, and related to the conservation and rational use of the coastal zone, have been brought together and regulated under the Coastal Area Management Programmes (CAMPs). In December 1999, an agreement to implement a Coastal Area Management Programme in Malta (CAMP-Malta) was signed between the Government of Malta and UNEP. One thematic activity within this programme was the study of an 11km stretch of coastline on the northwestern coast of the island of Malta, and of the sea area off it to the 50m depth contour, covering 4.75 km^2 of seabed, with the aim of evaluating it for eventual designation as a Marine Protected Area (MPA) and to generate information upon which to base a management plan for the area. This area, known as Rdum Majjiesa, was selected as it is representative of the coastal and marine habitats present in the Maltese Islands and is relatively unaffected by human activities. Considering that at present there are no MPAs within Maltese territory, the importance of this pilot project is self-evident.

The primary objective of this study was the assessment of the biological characteristics of the proposed site. This assessment was intended to produce an inventory of the major biological complexes occurring within the site's boundaries, and to generate base maps for the use of environmental managers to draw plans for zoning, managing and protecting the site. Extensive benthic and bathymetric surveys of the study area yielded considerable data, including detailed maps (at a scale of 1:2500) of the bathymetry, submarine geophysical features, seascapes and benthic biotic assemblages of the area. As a result of these studies we are now able to make a strong case for the designation of this site as Malta's first MPA.

The most outstanding physical feature of the study area is the heterogeneity of the seabed geomorphology (seascape) and the bottom types present. The site consists essentially of two rocky shoals extending about 1km from the shore, generated from wave-cut shore-platform terraces. The seaward boundary of these shoals consists of stepped drop-offs or steep slopes. Collapse under gravity of blocks from the edges of the backing limestone escarpments on the terrestrial part of the area have resulted in aggregations of boulders along much of the coast; these boulders extend out to sea as submarine boulder fields at several locations. Bays with sandy pocket beaches and coves are also present in the area, formed at the seaward extremities of major fault systems that cross the island. The southern sector of the study area (an area known as Ras ir-Raheb) consists of vertical sea cliffs extending for about 1.9km of coastline and which give rise to continuous drop-offs below sea level; semi-submerged caves are also present in this sector.

Rich and diverse biota

Given the heterogeneous nature of the seabed it is hardly surprising that the area is characterised by an equally diverse and rich biota. Five main biotic assemblages are represented in the study area: those of **hard beds and rocks, seagrass meadows** and **fine sands** cover large areas of seabed, while those of **coarse sand** and **stones and pebbles** are more sparsely represented. Pockets of **maerl** are also present.

The Ras il-Qarraba promontory: one of the most conspicuous features in the study area. Note the boulder screes that extend underwater as boulder fields and the bays with sandy pocket beaches and seagrass meadows offshore.

Neptune Grass, *Posidonia oceanica*, dominates large areas of the seabed. Extensive meadows occur on sand as well as on bedrock overlain by a veneer of sediment. From north to south, the meadows are practically continuous, although showing different bed morphologies (so called 'ecomophoses') in different places. Although *Posidonia* efficiently colonises both hard and soft substrata, on sand it generates thick layers of matte, which, when extensive, develop an organic substratum that is colonised by a wide variety of photophilic and sciaphilic algae growing among the *Posidonia* shoots. Thick matte also produces matte walls at the edges of the meadow. In places, these walls may be over 2m high. A large variety of organisms occur within the *Posidonia* meadows, including some of conservation interest such as the bivalve *Pinna nobilis* (Noble Pen-shell), a regionally and locally protected species.

The Lesser Neptune Grass, *Cymodocea nodosa*, is also very abundant in the study area, where it occurs on sand and precedes and succeeds *Posidonia oceanica*. This seagrass forms a major association within the biocoenosis of fine sands. The *Cymodocea* beds are susceptible to extensive damage by strong waves due to their open morphology. *Cymodocea* meadows recorded during this study are some of the most extensive meadows known to date from the Maltese Islands.

Excluding bedrock colonised by *Posidonia oceanica*, hard substrata are almost completely dominated by photophilic algae. Phaeophytes are by far the most abundant macroalgae, and *Cystoseira spinosa* var. *tenuior* is the commonest and most conspicuous species. It occurs over large areas both as almost monospecific stands (in the sense that they are not accompanied by any other tall-growing, canopy-forming algae) and also accompanied by other, sub-dominant or co-dominant species. At depths greater than 13-15m, with hard beds and rocks, other photophilic and/or sciaphilic (if the light intensity is reduced) algae become dominant. Tall-growing species dominating these deeper water associations include *Dictyopteris polypodioides*, *Cystoseira squarrosa*, *Sargassum vulgare* and *Sargassum acinarium*.

Hard substrata occurring in deeper waters include drop-offs. Sciaphilic assemblages characterise these habitats, and *Flabellia petiolata*, *Halimeda tuna* and *Peyssonnelia* sp. are the most abundant dominants in these assemblages throughout the study area. Other rhodophytes such as *Jania* sp., a number of calcareous algae (mostly corallines) and low-growing hydroids may at times be very abundant as well, but are not conspicuous as they are overshadowed by the larger and more noticeable species. The same applies for a number of low-growing algae that occur as an 'undergrowth' beneath the other tall-growing species, where they may become covered with silt and form an algal turf. Two such examples are *Dasycladus vermicularis* and *Vidalia volubilis*.

Protection model

Given the heterogeneity of the study area and the diversity (and social and economic significance) of human activities occurring within it, applying the **Multiple Use Marine Protected Area** model seems to be the most realistic and appropriate approach to protect and manage this region. Adopting this model would allow the preservation and maintenance of biodiversity and the conservation of seascapes and adjacent landscapes on one hand, and the fulfilment of social and economic requirements and obligations on the other. One fundamental requirement of a Multiple Use Marine Protected Area is a management programme based on a multi-level protection system in which different regions within the same MPA are managed with regulations and prohibition of activities that vary from one region to another. Management plans must also include monitoring programmes.

The CAMP-Malta study, including our results and proposals for designation of our study area as an MPA and for its management and monitoring, have been submitted to the Government of Malta by UNEP and are currently being considered. Designation of this area as an MPA would signify formal acknowledgment of the special value of these waters and may discourage excessive new development and focus attention on the natural resources of the area. It would also act as a pilot for assessing the benefits of MPAs in the Maltese context, as a resource for marine research, and for refining environmental policies.

The Rdum Majjiesa area has been proposed by our group to the MARS network as a **European Marine Biodiversity Focal Site** (EMBiF), while UNEP-MAP is funding additional work on this area, mainly the formulation of a management plan, under its Med-MPA programme.