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THE OCEAN CHANGE: MANAGEMENT PATTERNS AND THE ENVIRONMENT

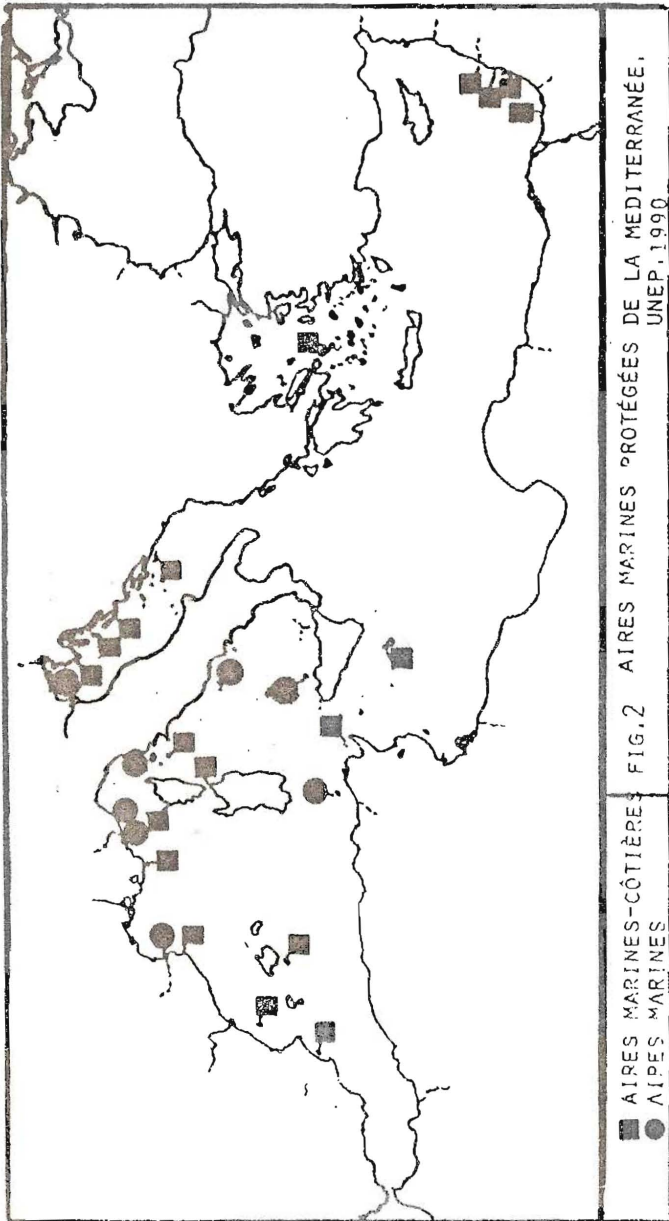
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COASTAL ZONE SURVEYS OF THE MALTESE ISLANDS: ONSHORE AND OFFSHORE

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INTRODUCTION

Since the 1960s, the rapid development of the international Law of the Sea has outstripped the capacity of most maritime states for developing and implementing policy. The delimitation of the Exclusive Economic Zone (EEZ), which resulted from the United Nations' Convention on the Law of the Sea (1982) brought about an extension of its area, within which the state exercises control over all resources and economic activities. At the same time as the jurisdiction of the state has encroached seawards, there has been a significant increase in the range of opportunities for the use of the offshore zone. Thus, land-use competition on the landward side of the coastal zone has been complemented by sea-use competition on the seaward side. If patterns of sea-use are to be developed effectively, they must clearly be compatible with the land-use designated for the contiguous area of coastal zone. For example, water sports and diving cannot be developed offshore from a heavy industrial complex and, equally, a protected area of marine environment cannot be established immediately adjacent to a major tourist beach. Thus, development plans, both onshore and offshore, are mutually dependent. However, whereas to seaward, the state exercises comprehensive authority, to the landward there are likely to be many competing separate sectors, all with maritime interests, but, frequently, little in the way of formal planning links.

Coastal zones and contiguous marine habitats therefore often prove to be the sites of extreme resource conflicts in any part of the world. In the case of the Maltese archipelago, the situation is quite critical, since the islands support one of the highest population densities in the world. Thus, it is not surprising that Malta was instrumental in the promulgation of the Law of the Sea Treaty, which is aimed at providing a rational and objective basis for allocating marine resources. Article 192(5) of the Treaty charges states with the obligation to protect and preserve the marine environment.

The same article also provides a legal framework for preserving coastal and marine ecosystems.

However, Malta is still rather lacking in protected areas. An important step forward was the establishment of Filfla Island as a nature reserve, but the surrounding sea does not enjoy such status. Fishermen are allowed to operate right up to the shoreline of the island, while scuba diving or swimming in the same area are banned by a Port Regulation. At present, no marine protected areas exist anywhere around the Maltese Islands. With mounting development pressure all along the coastal zone and increasing offshore resource exploitation, the need for marine protected areas becomes even more necessary. It must be emphasized, however, that the establishment of such areas must not be undertaken piecemeal and in isolation from a Marine Management Plan/Coastal Zone Management Plan. For this reason, it is difficult to define precise locations and boundaries, especially with the present lack of information on the marine environment.

THE MALTA STRUCTURE PLAN

Until now, the most common approach to managing Malta's marine and coastal resources has been to regulate activities. Thus, regulations concerning constructions on the foreshore, transport of sand, recreational activities on the coast, commercial fishing, control of pollution, shipping and other related marine activities exist (see for example, Macelli 1985). These regulations are not sufficient to safeguard marine resources or to ensure maximal sustainable use. Some regulations are outdated, others are not enforced and different sets of regulations may actually conflict. This situation is not unique to the coastal zone, but it is also true for the whole island. In general, Malta's development has been haphazard and piecemeal and not regulated by any national plan, formulated on the basis of a scientific study of the country's physical, economic, social and cultural characteristics, existing and projected needs and the necessity for maintaining environmental quality. Recognizing this, the Maltese government is in the process of drafting national planning guidelines in the form of the Malta Structure Plan.

Legislation enacted in 1988 (Act X of 1988) *inter alia* binds the Minister responsible for the development of the infra-structure to draft a Structure Plan for the Maltese Islands within two years. This Structure Plan is defined as

a written statement ... formulating the national Planning Policy and general proposals in respect of the development and other use of land including measures for the improvement of the physical environment and the management of traffic, and interpreting the relationship of national policies in terms of physical and environmental planning in so far as these policies concern the integration of the economic, social and environmental policies. (Act X of 1988 Section 4(3)(a & b))

The Structure Plan has as its basic objective

the optimal physical use and development of land which respects the environment and at the same time ensures that the basic social needs of the community are, as far as is practical, satisfied. (Ministry for Development of Infrastructure 1988)

The Structure Plan is a policy document which lays out general guidelines for

development of the country for the next 20 years, based on an analysis of the existing situation and on projections of the country's needs in the future.

Recognizing that the sea is one of the country's main resources, the Structure Plan pays particular attention to the coastal zone. Thus, the Structure Plan brief requires that the planners drawing up the Plan consider the coast as a resource of which the maximum economic, social and environmental use is to be made and to devise a global coastal management policy for this purpose (Ministry for Development of Infrastructure 1988).

THE COASTAL ZONE SURVEY

As a first step towards fulfilling this objective, the Planning Services Division of the Ministry for Development of Infrastructure commissioned a Coastal Zone Survey of the Maltese Islands. As part of this, a survey of the terrestrial part of the coastal zone was carried out over a six-week period from early July 1989 by a joint team from the Universities of Durham and Malta. The output of this survey comprised a report of the survey, coastal land-use maps on a scale of 1:2,500, a series of synoptic land-use maps on a scale of 1:25,000, and a series of synoptic maps on various scales, depicting coastal features of ecological importance (Anderson and Schembri 1989).

Of particular relevance to potential offshore land-use are the broad geomorphological characteristics of the coastline, which can be related closely to the adjacent underwater seascape. For coastlines, the form of which was not obscured by buildings, a basic threefold classification was adopted for the coastal survey. The most distinctive feature is the *rdum*, which comprises a short cliff free face of upper Coralline limestone, below which is far longer, more gently angled, boulder covered slope. In some cases, this slope reaches sea level, in others it is succeeded by a free face of the underlying lower Coralline limestone.

Of the other categories, a low rock coast indicates one form of gently shelving coastal platform, without cliff development. The term 'bare cliff' is used for coastlines where there is a single, usually vertical, free face, but no boulder covered slope.

The percentage of the coastal length which can be classified within each category is (Figures 1 and 2):

Mainland Malta 30.5 obscured by buildings

17.0 *rdum*

22.0 bare cliff

30.5 low rock coast

Gozo and Comino 7.5 obscured by buildings

14.5 *rdum*

62.0 bare cliff

16.0 low rock coastline

Mainland Malta thus possesses a considerably higher percentage of low rock coast than Gozo and Comino, which are dominated by bare cliffs. Given the relationship between the onshore and offshore coastal zone landscape, this point is of significance in the delimitation of underwater protected areas. The type of coastline also controls accessibility, a factor of vital importance in the development of marine parks and reserves. Using, as a measure, accessibility for all members of the average family, the Coastal Zone Survey produced the following results:

Mainland Malta 50% inaccessible with 75% of this due to physical features

Gozo and Comino 74% inaccessible with 99% of this due to physical features

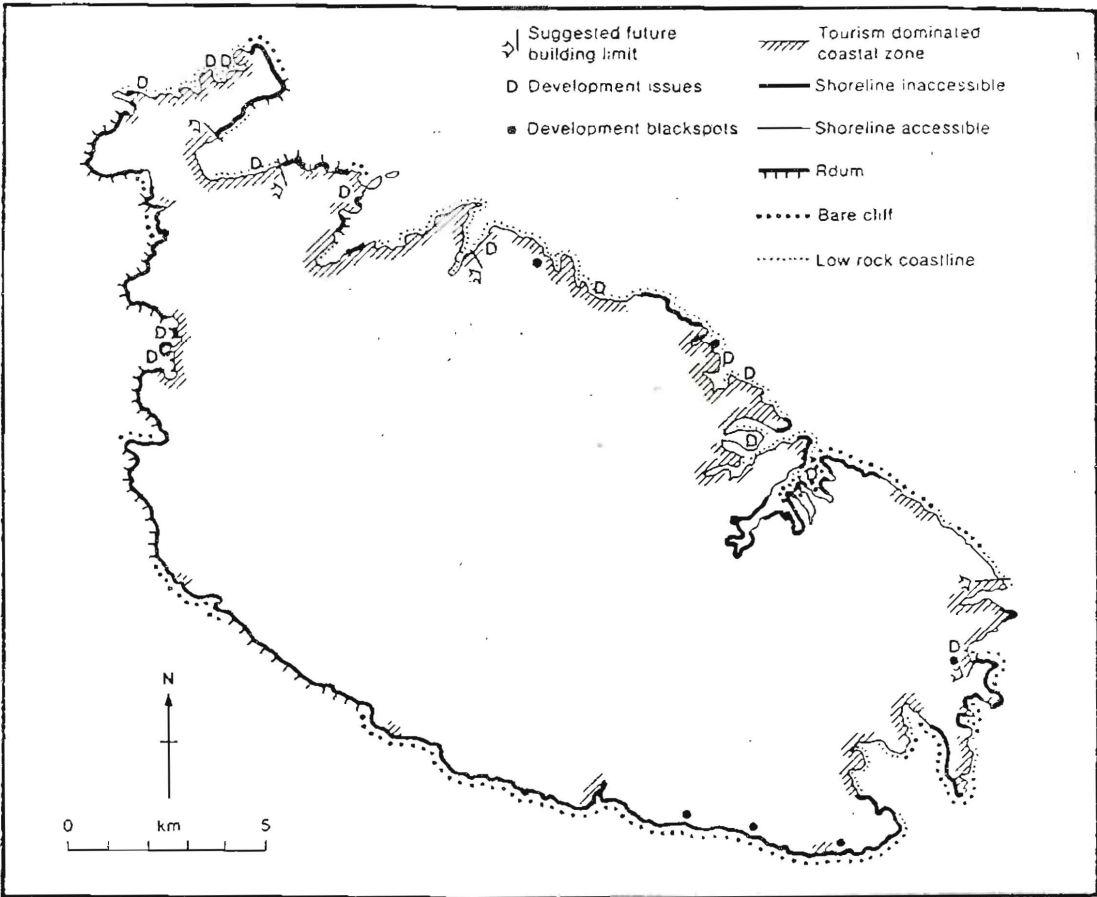


Figure 1: MALTA: Coastal Zone Variables

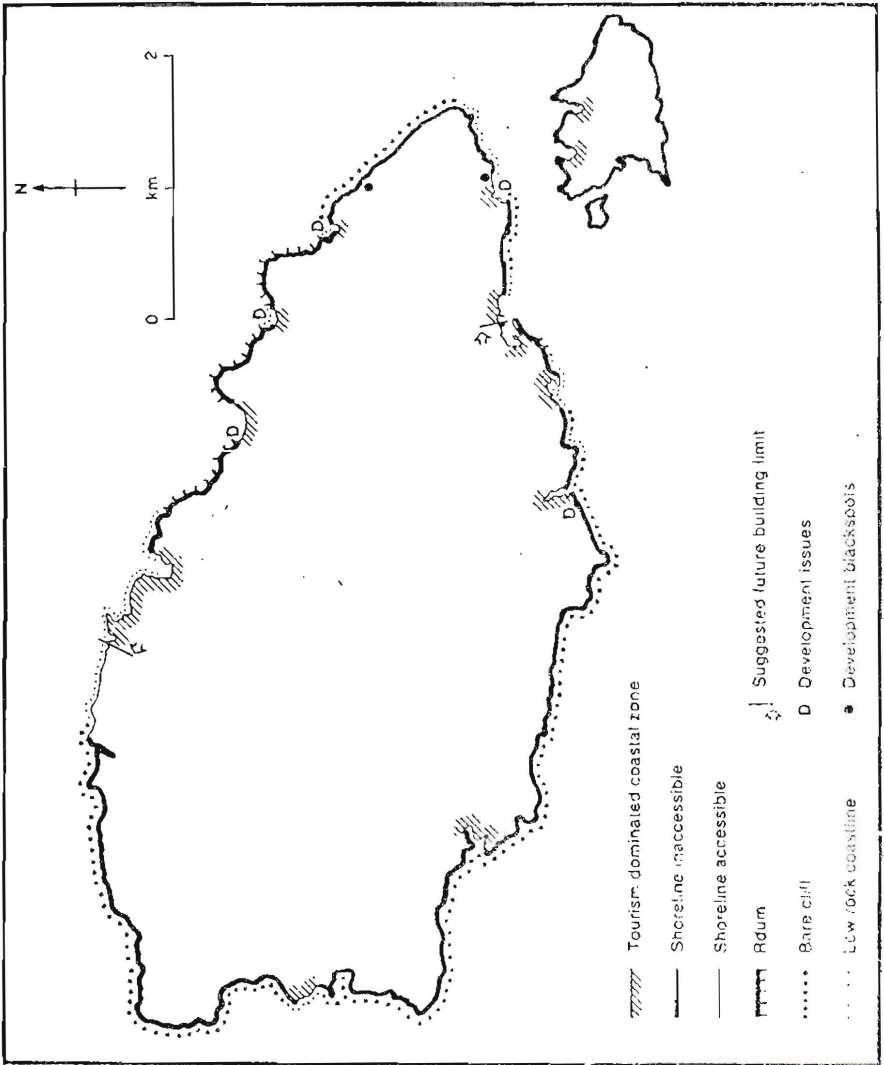


Figure 2: GOZO and COMINO: Coastal Zone Variables

These results are relevant for the siting of reserves with limited access and the development of parks which may require improved access. In the Survey, accessibility values were calculated for a large number of sites around the coast.

One of the most important criteria for the siting of marine parks and reserves is their contiguity with terrestrial protected areas and the two should be viewed, ideally, as extensions of each other. The Coastal Zone Survey identified natural landscapes of national and international importance.

They included:

Mainland Malta White Tower peninsula and Ahrax Point
Delinara peninsula
Qalet Marku peninsula
Blue Grotto
Stretch from Golden Bay to Gnejna Bay

Gozo and Comino The Inland Sea (Qawra)
Dwejra Bay area (international importance)
Coastline including Mgarr ix-Xini and
the Ta' Cenc cliffs
Ramla Bay sands
Blue Lagoon

From the ecological point of view, the terrestrial part of the coast is particularly important because:

a) Many coastal localities support habitat types which are rare in the islands. Examples include communities of low-lying rocks, coastal cliff, sand dunes and saline marshlands and transitional coastal wetlands. These localities are valuable, firstly as examples of their particular habitat and, secondly, because they support specialized biota which, since its habitat is rare in the islands, is itself rare. Some of this biota is also endemic to the Maltese Islands.

b) Some localities are important primarily because of certain species or groups of species which live in them. Examples include the only known localities of occurrence of certain endemic species, type localities and important bird nesting sites.

Seventy eight sites of scientific importance were also identified, their primary significance being that they contained certain individual species or groups of species of flora and fauna. The selection of marine protected areas can provide some measure of safeguard for these sites.

Key recommendations, distinguished as high priority and immediate, of the Survey were advanced, taking into account the intimate relationship between the landward and seaward sides of the coastal zone. The four such recommendations were:

1. Black spots, such as refuse dumping sites, areas of oil pollution and points where the actual coastline has been violated by quarrying, either be removed, their development checked or their effects minimized.
2. Protection areas be established for coastal zone stretches of international importance.
3. Key building lines, restricting any further construction, be introduced as a temporary measure.
4. Water activity separation zones be established and demarcated in the most vulnerable locations.

THE EXISTING SITUATION

There is one legally defined Nature Reserve in the Maltese Islands, the Island of Filfla, with a land area of 2.02 ha, which was established in 1988. Although legally a Bird Sanctuary, the alme marshland at Ghadira and the surrounding land, covering a total area of 6.07 ha, functions as a nature reserve, since it is fenced off, access is strictly controlled and all the biota is fully protected. Additionally, the island of Comino, 16 sites in Malta and two sites in Gozo are bird sanctuaries; some of these are coastal sites. There are no marine nature reserves or other marine protected areas in the Maltese Islands.

The Filfla Nature Reserve has only recently been established and no management policy exists other than permission for landing on the island or carrying out any activities on its land area or marine environs being granted only for scientific and educational purposes. The managing authority is the Environment Secretariat of the Ministry of Education and the Interior. The Ghadira Reserve is managed by the Environment Secretariat with the help of a local non-governmental organization. In effect, a great deal of the work in establishing the Reserve, and its management was, and continues to be, carried out by volunteers through this non-governmental organization.

Other coastal and marine protected areas are also being considered. Recently, a local non-governmental organization made a proposal to government to declare two coastal wetlands, the marshes at Il-Ballut (Marsaxlokk) and Il-Magħlug (Marsascula) Nature Reserves. In addition to this, the Ministry of Education and the Interior is also considering declaring the islet of General's Rock (Fungus Rock), off Dwejra, Gozo, as a nature reserve. A proposal has also been made to declare the whole of the Dwejra and Qawra (the Inland Sea) area as a site of international scientific importance (perhaps as a World Heritage Site under the 1972 Paris Convention for the Protection of the World Cultural and Natural Heritage), because of the complex of important geological, geomorphological, archaeological, historical and natural features and processes that this area contains (Anderson and Schembri 1989).

Malta is also party to a number of international treaties, protecting wildlife and their habitats, including marine species and habitats, which provide another legal basis for declaring certain coastal and maritime sites as protected areas. In January 1988, Malta acceded to the 1982 Geneva Protocol on Mediterranean Specially Protected Areas, but has not yet declared any sites as protected areas under this protocol. In September of the same year, it acceded to the Convention on Wetlands of International Importance, Especially as Waterfowl Habitats (Ramsar 1971), declaring the Ghadira Reserve as a wetland of international importance.

The Maltese government is seeking membership in the European Community. If Malta's application is accepted, Malta will automatically have to become party to a number of other treaties, including the Convention on the Conservation of Migratory Species of Wild Animals (Bonn 1979) and the Convention on Conservation of European Wildlife and Natural Habitats (Berne 1979), besides becoming subject to EC directives and decisions on wildlife and habitat conservation and the setting up of marine and terrestrial protected areas.

MARINE LIVING AND NON-LIVING RESOURCES

Malta's marine living natural resources are:

- a) individual species;
- b) biotic communities, that is, groups of interacting species and the habitat they occupy; and
- c) seascapes, both geomorphological structures and living elements.

These results are relevant for the siting of reserves with limited access and the development of parks which may require improved access. In the Survey, accessibility values were calculated for a large number of sites around the coast.

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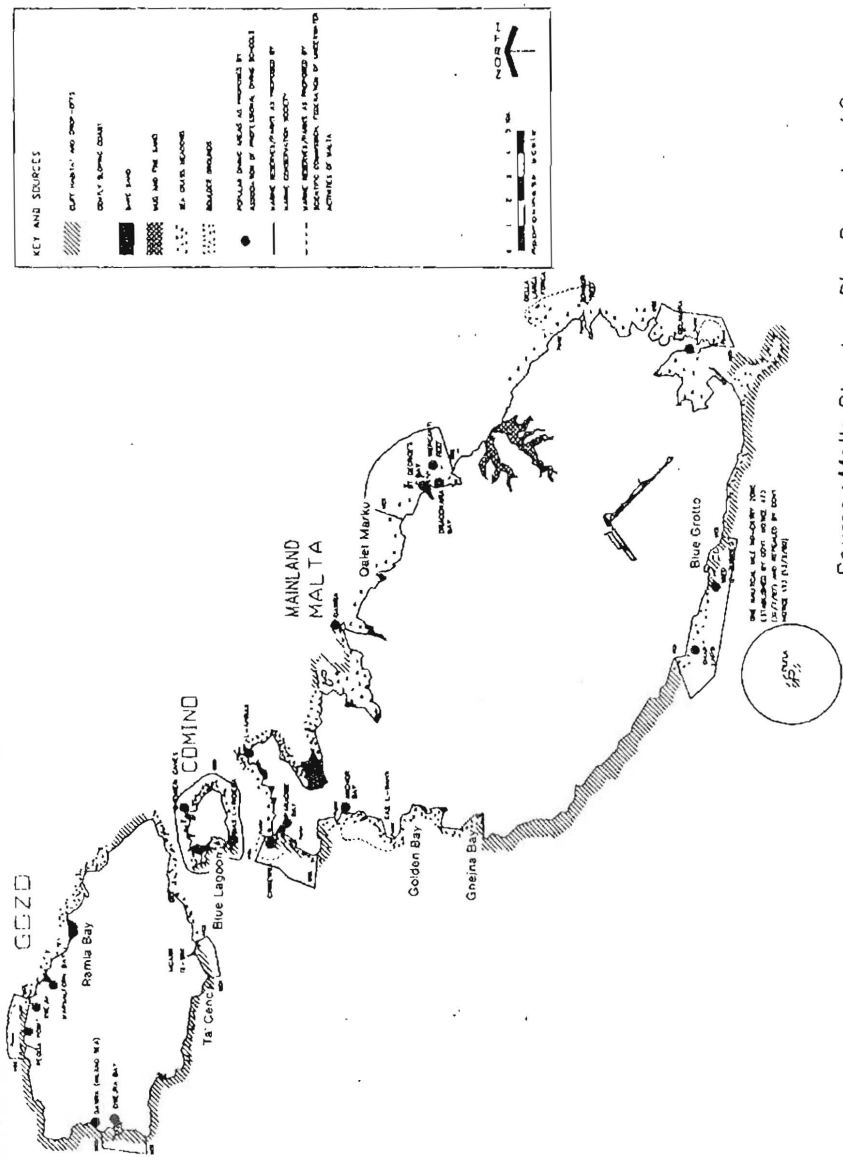
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Source : Malta Structure Plan Report and Survey

Figure 3: Underwater Habitat Survey: General Zoning

Spatially, marine living resources can be classified as littoral or sublittoral. In the littoral zone, conditions are predominantly terrestrial. In the sublittoral zone, conditions are predominantly aquatic. While the littoral zone has been more or less adequately studied and knowledge of littoral species and biotic communities is good, the same cannot be said for the sublittoral. Here, very little work has been done and knowledge of sublittoral species and biotic communities is very poor.

What is required therefore is:

a) the compilation of an inventory of the marine biota and geomorphological features of the Maltese Islands, to include information on their distribution, status, economic importance, extent of exploitation and conservation;

b) an ecological survey of the shallow sea round the Maltese Islands with the aim of identifying and mapping marine habitats and analyzing their status and conservation needs;

c) the designation of specific marine areas as protected areas of various types, e.g., marine nature reserves, marine parks, fishing-free zones, etc; and,

d) the immediate legal protection of marine species and habitats, which are in grave danger of disappearing from the Maltese Islands unless measures are taken to safeguard them; sea-grass beds in particular are in need of immediate protection for both economic and scientific reasons.

Three preliminary surveys have already been made and results have been incorporated into the Malta Structure Plan, report of Survey, volume one (1990).

SURVEY OF INFRALITTORAL MARINE COMMUNITIES

A preliminary Survey of Infralittoral Marine Communities was carried out during December 1989. This survey was initiated as a short term necessity for the Structure Plan, pending the underwater field survey which will be carried out in conjunction with UNEP/MAP/RAC/SPA (United Nations Environment Programme/Mediterranean Action Plan/Regional Activity Centre/Special Protected Areas). This survey utilized the extensive knowledge of underwater seascapes amongst veteran and highly experienced scuba (self contained underwater breathing apparatus) divers and spear fishing snorkellers.

Gaps and uncertainties in the mental maps of individual divers were solved by the pooling and cross checking of mental images and logged dives until consensus was reached. The result was checked against British Admiralty charts and was found to conform very closely to its hydrographic values. This is not surprising, since divers are well trained in navigation techniques and use their skills extensively to locate their position in relation to the charts. Moreover, a good mental map of underwater communities is essential to scuba divers looking for interesting underwater features, or to spearfishermen in search of good fishing grounds.

The results are shown in Figure 3. The areas covered by the map are restricted to those frequented by divers. Except for Filfla Island, offshore sites have not been represented, due to uncertainty of the results.

INFRALITTORAL MARINE COMMUNITIES AT DWEJRA/QAWRA, GOZO

This pilot study, presented at a scale of 1:2,500, should be considered as a sample of the UNEP sponsored survey, mentioned in the previous section. Such samples are useful as feasibility tests, indicating potential problems in the realization of the survey. They also show the potential benefits of the survey for the drafting of Local Plans. The results of the study are given in Figure 4.

The Dwejra/Qawra area was chosen for the following reasons:

1. The Coastal Zone Survey (Anderson and Schembri 1989) attributes to the area the status of "Coastline of International Importance", mostly due to its geomorphological characteristics.

2. It provides spectacular underwater scenery and a wide variety of habitats: sea-grass meadows, sheer dropoffs, massive boulder grounds, marine caves, sea stacks, archways and an enclosed lagoon.

3. Building development has been limited to a number of boat houses at Qawra Bay, but proposed tourist development projects place the area under considerable pressure.

4. The site is ideal for designation as a National Park/Marine National Park (World Conservation Union definition). Fungus Rock itself deserves protection as a Scientific Reserve, and steps to this end are already being taken by the Secretariat for the Environment.

The survey was carried out between 27 and 29 December 1989. A three man diving team was required, which included an underwater photographer and back up diver, entrusted with the collection of samples. Underwater plotting of major benthic groups was done on plasticised base maps. Due to limitations imposed by decompression tables, most of the dives were spent at depths which varied between 10 to 20 metres. Consequently, the divers were handicapped when examining the deeper biocenoses. It was only the excellent visibility which permitted surveying the deeper waters. In such cases, divers could swim at 20 meters and see reasonably well down to 45 metres, although the deeper biocenoses of the circumlittoral may be under-represented in the map. Samples were collected, representing the main habitat groups and these have been examined, desiccated and stored for future reference. Also, a large number of underwater photographs, depicting the major habitat groups, were taken.

DWEJRA/QAWRA, GOZO LINE TRANSECT

The vertical distribution of various biocenoses can only be examined by means of representative line transects. This field technique allows the construction of profiles, showing variations according to changes in environmental conditions, such as light and temperature.

A schematic profile is included with this report, showing various biocenoses (Figure 5). This was compiled from field notes as well as two sets of photographs. The first set was taken at a distance of one metre from the subject and each photograph covers about one metre of ground. The second set was taken with a wide angle lens (15mm) and covers more ground, while losing some of the detail. The results are representative of a large percentage of the cliff coast at Dwejra and Qawra (excluding Dwejra Bay) and they corroborate the map of Marine Infralittoral Communities (Figure 4).

BENEFITS TO MALTA

The benefits to Malta of declaring areas of coast and/or the adjacent shallow sea as protected areas of various types, can be summarized under the following headings:

1. Provision of nursery, breeding and feeding grounds for commercially important fish and other marine organisms. These species include both those of direct commercial importance as well as others of indirect importance (e.g., prey species of commercially important predators).

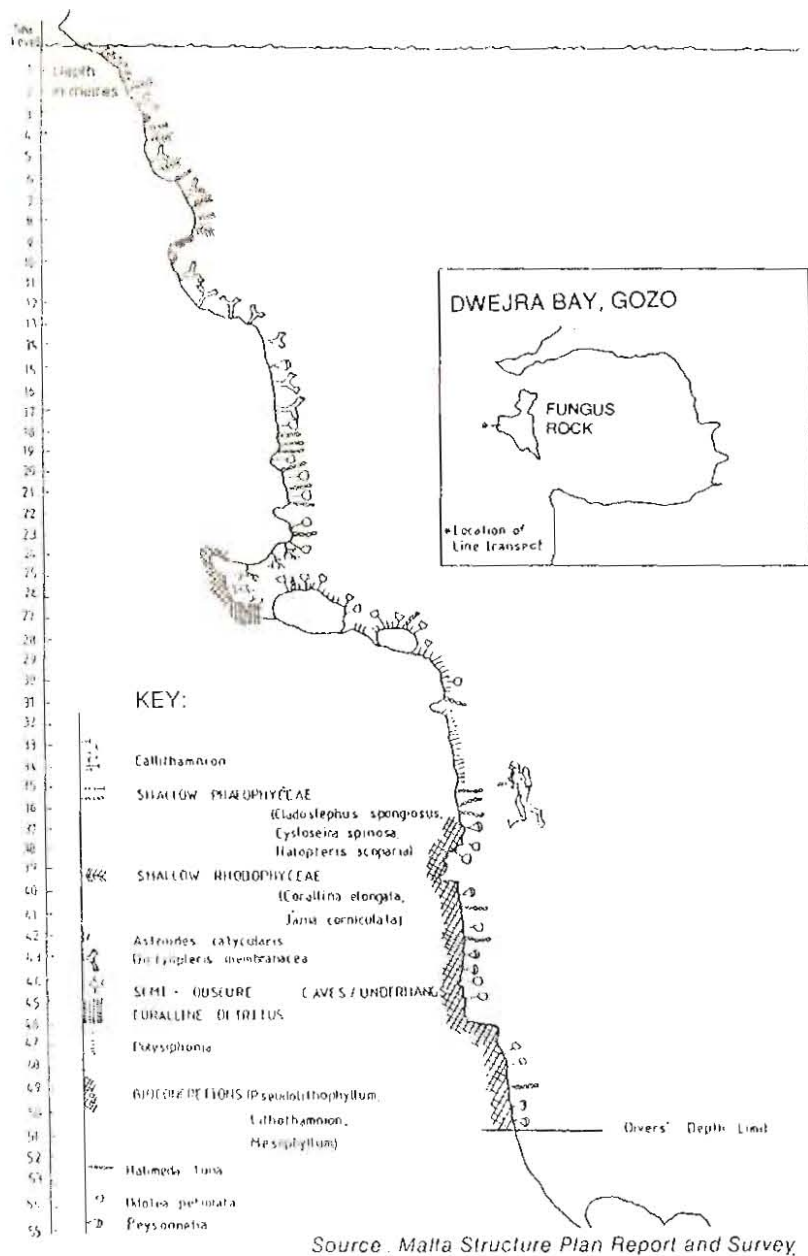


Figure 5: Dwejra Bay: Line Transect

Because of the rich marine life in protected areas, they have great potential as tourist attractions.

4. Servicing of the ecosystem. The sea provides a number of general life-sustaining services, including filtering out pollutants (e.g., the bulk of local sewage is discharged untreated into the sea), protection against coastal erosion (e.g., eel grass meadows act as wave breakers, protecting the shore from the full impact of waves), feeding grounds for terrestrial species (e.g., migrating waders feed in the few coastal wetlands which occur locally), and as safe enclaves from where damaged ecosystems can regenerate (e.g., following major coastal constructions or pollution disasters).

5. Education and research. The sea is a natural scientific laboratory, both for education and for scientific research. The Maltese Islands are ideally suited to provide research facilities to the international scientific community in general, not least because of the unpolluted waters, easy access, benign climate and the central position of the islands.

6. Marine tourism. Over the past 25 years, the Maltese Islands have been marketed to diving enthusiasts as an underwater paradise and the islands have been a leading centre for tourist diving. Unfortunately, now that this type of tourism is expanding worldwide, Malta may be dropping out of the market. The main cause of this is the deteriorating state of the underwater environment. This is ignored because it is not visible to the majority of people, however, people who dive in Malta, regularly report a decline in marine life, the erosion of geomorphological features such as caves and an increase in dumped refuse. One remedy for this is the establishment of various types of marine protected areas. These should be clearly marked, cleaned, maintained and policed to ensure the observance of regulations concerning access and permitted activities.

THE DESIGNATION OF MARINE PROTECTED AREAS IN MALTA

On an international level, methodologies for the assessment and selection of marine protected areas are much less developed than those for terrestrial ones. The Regional Activity Centre for Specially Protected Areas (RAC/SPA), set up under the UNEP's Mediterranean Action Plan to implement the 1982 Geneva Protocol on Mediterranean Specially Protected Areas, is particularly active in this field and has published a number of guidelines on the selection, establishment and management of such marine protected areas. Malta acceded to the Geneva Protocol in January 1988 and has full access to the information held by the RAC/SPA and can also request technical assistance from this Centre. At the time of writing, the Maltese government has requested the RAC/SPA to fund a sublittoral survey of the shallow seas round the Maltese Islands, with a view to identifying areas to be designated Specially Protected Areas under the Geneva Protocol.

Management of marine Specially Protected Areas is based on the same standard categories used by the World Conservation Union (formerly known as the International Union for the Conservation of Nature and Natural Resources) and include the following: Strict Marine Reserve, Marine National Park, Natural/Cultural Monument, Marine Sanctuary, Resources Reserve, Natural Biotic Area/Anthropological Reserve, Fisheries Reserve.

Knowledge of the seas round the Maltese Islands is scanty. It is therefore very important that the proposed RAC/SPA funded sublittoral survey be given priority. Although it is not at present possible to list specific sites, yet current knowledge does allow the identification of certain biotic and geomorphological features, which render a marine site in which they occur, valuable from the scientific point of view. Such features include:

sea-grass meadows formed by *Posidonia oceanica* (in deep water), *Cymodocea nodosa* (in shallower water) and *Halophila stipulacea* (in some muddy bays, e.g., Marsaxlokk in Malta and Mgarr Harbour in Gozo);

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algal communities, dominated by species of *Cystoseira*, specially those based on *C.spinosa*, *C.dubia* and *C.zozteroides*, which grow in deep water;

coralligenous bottoms, formed by coralline algae and their fragmented remains with their characteristic fauna and flora;

vermetid/coralline algal trottoirs, which form in the mediolittoral/upper infralittoral zone of rocky shores;

trottoirs, formed by coralline alga *Lithophyllum lichenoides*;

sheer cliff faces (e.g., such as found at Fomm ir-Rih and Migra Ferha);

rocky shoals (sikek, singular sikka) (e.g., such as the ones off Zonqor Point and Ghar Lapsi);

boulder grounds (e.g., such as at Ras il-Wahx and off Cirkewwa);

marine caves;

underwater erosional features such as arches, eroded limestone beds etc; and

subsidence structures (e.g., such as the Dwejra/Qawra area).

In addition, typical examples of the different types of marine habitats should also be protected, e.g., muddy bottoms (such as found in the harbours and some sheltered bays), sandy bottoms (bare sand and sand bars such as found at Mellieha Bay) and different types of rocky bottom (e.g., *Globigerina* limestone, Coralline limestone etc).

MARITIME GEOGRAPHIC INFORMATION SYSTEM (MGIS)

Good planning and good management require a suitable information system. The establishment of a Maritime Geographic Information System (MGIS) should be a prerequisite for any Coastal Zone Management Plan. This may be envisaged as an extension of the Geographic Information System which is being set up by the Ministry for the Development of Infrastructure's Mapping Unit. A more practical alternative may be the setting up of a separate interlinked system, joining government and private organizations, sharing some interest in marine affairs. This may be more desirable, since an MGIS deals essentially with three dimensional oceanographic phenomena (e.g., thermoclines/haloclines/currents found at different depths). Such an MGIS would provide an ideal system to include all the required components: physical, ecological and human, which provide the basis for coastal zone management.

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