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ALIGNMENT OF MARINE HABITAT DATA  
OF THE MALTESE ISLANDS TO CONFORM TO THE  
REQUIREMENTS OF THE EU HABITATS DIRECTIVE  
(COUNCIL DIRECTIVE 92/43/EEC)

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# 1. INTRODUCTION

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1. In 1992 the European Union (henceforth referred to as the EU) adopted a Council Directive on the conservation of natural habitats and wild fauna and flora that became known as the 'Habitats Directive'. This Directive contains a range of measures aimed at the protection of species and habitats of EU interest. One of these measures requires each Member State to forward to the European Commission a list of sites proposed for inclusion in a EU-wide network of protected areas known as NATURA 2000. Sites adopted at Community level will be designated by Member States as Special Areas of Conservation (SACs).
2. As part of the pre-accession process to join the EU, the Government of Malta is currently updating its environmental legislation to bring it in line with that of the EU. In this context the Planning Authority (which as of 01.03.2002 has become the Malta Environment and Planning Authority – MEPA<sup>1</sup>) requires to update all its existing habitat information about the Maltese Islands (terrestrial, freshwater and marine) to bring it in line with the requirements of Directive 92/43/EEC on the Conservation of Habitats and of Wild Flora and Fauna (the 'Habitats Directive').
3. To this end, the Planning Authority (henceforth referred to as the PA) has commissioned the present consultants to review and assess all existing available data on the marine habitats of the Maltese Islands in order to align the data formats to meet the requirements of the Habitats Directive.
4. Specifically, the 'Terms of Reference' provided to us by the PA are as follows:
  - TOR1.1 The work shall consist of the review of:
    - a) All existing marine habitat data collected by the PA as part of the environmental resources surveys carried out for Local Plan formulation between 1991 and 2001;
    - b) Other marine habitat data available at the PA; and
    - c) Relevant marine habitat data available at the University of Malta and collected through scientific research and/or student dissertations.
  - TOR1.2 All the data will subsequently be assessed against the requirements of Annex I and Annex II of the Directive and against the RAC/SPA standard data entry forms for marine species/habitats. Equivalent list/s for Malta shall be produced to as detailed a level as possible.
  - TOR1.3 The quality of the data shall be assessed and any shortcomings/gaps identified. Measures to rectify such situations shall be proposed.
  - TOR1.4 Where local species associations do not conform to the official lists, the consultants shall suggest new designations to be proposed to the relevant institutions for inclusion in the list/s. Scientific justification for such additions shall also be provided.

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<sup>1</sup> Although the Planning Authority has now been subsumed into the Malta Environment and Planning Authority, and no longer exists as such, since all documentation and correspondence in connection with this assignment originated from and refers to the Planning Authority, we shall continue to refer to the PA in this report in order to avoid confusion when referring back to the original documentation.

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- TOR1.4 The proposed list of habitats/species associations/biotopes so produced shall also be utilised for the production of a new marine habitats map for the Maltese Islands.
- TOR1.5 The consultants shall also utilise this information to propose marine areas for possible inclusion in the NATURA 2000 Network of the Habitats Directive and/or as eligible for scheduling.
5. This assignment concerns only to the marine environment<sup>2</sup> and excludes the supralittoral and upper mediolittoral zones.
  6. The primary aim of this assignment is the alignment of local marine habitat data with the EU's Habitats Directive (TOR1.2). However, assessment of existing data against the RAC/SPA standard data entry forms for marine species/habitats is also required (TOR1.2). This refers to the *Protocol for Specially Protected Areas and Biodiversity in the Mediterranean* (SPABIM) to which both Malta and the EU are parties. In addition, although not mentioned in the terms of reference, there is another international instrument that has a bearing on the present assignment: the Bern Convention. This convention requires the protection of certain marine habitats and species and establishes a network of protected areas known as the EMERALD Network; both Malta and the EU are parties to this convention.
  7. Therefore, there are three separate, broadly complementary, international instruments that require a cataloguing of marine habitats according to standard classificatory schemes, identification of particular habitats of special interest to the particular instrument, and designation of various types of protected areas in accordance with criteria established by the instruments; in addition for two of these instruments (the Habitats Directive and the Bern Convention), these protected areas are meant to form part of a wider network of such protected areas (the NATURA 2000 and the EMERALD networks, respectively). All three instruments also include lists of species to which various degrees of protection are afforded, and, in some cases, whose presence requires the obligatory designation of protected areas.
  8. Although complementary in terms of broad aims, these three instruments differ in a number of details and requirements. The matter is further complicated since a number of EU member states are individually party to one or both of the non-EU instruments, while the EU collectively is also party to both the SPABIM Protocol and the Bern Convention. Newly Associated States (NASs) such as Malta will have to adopt the EU's directives over and above their commitments as parties to the non-EU instruments. For countries such as Malta, accession to the EU will mean that on accession, the provisions of all three instruments will apply, as Malta will be individually or collectively (or both) party to these instruments.
  9. For these reasons, it is important to review all three instruments and their requirements and analyse points of convergence and differences between them as far as they relate to the present assignment.

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<sup>2</sup> For the purposes of this assignment, the "marine environment" is defined as starting from Mean Sea Level (MSL)

## 2. LEGISLATIVE INSTRUMENTS CONCERNING MARINE HABITAT PROTECTION

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### 2.1 THE 'HABITATS DIRECTIVE'

10. The European Union's **Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora**<sup>3</sup> has become known as the 'Habitats Directive'. The main aim of this Directive is to "...*contribute towards ensuring biodiversity through the conservation of natural habitats and of wild fauna and flora in the European territory of the Member States to which the Treaty applies.*"
11. The 'Habitats Directive' establishes the important principle that natural habitats should be preserved for their own sake, and not only because they support certain species of conservation interest. The 'Habitats Directive', together with the 'Birds Directive' (Council Directive 79/409/EEC on the conservation of wild birds<sup>4</sup>), are the European Union's main legislative instruments in the field of nature conservation.
12. In brief, the 'Habitats Directive' establishes a common framework for the conservation of animals, plants and natural habitats of interest to Union Member States, and provides for the creation of a network of "**Special Areas of Conservation**" to be called "**NATURA 2000**". The 'Habitats Directive' consists of four main parts. The first defines important terms used (Article 1) and sets out the aims of the Directive (Article 2). The second part (Articles 3-11) defines the procedures, criteria and time frame for the selection and designation of Special Areas of Conservation (SACs) as well as the obligations of Member States to establish priorities and conservation measures for the maintenance and restoration of those habitats and species of Union interest that are listed in the annexes to the Directive (Annexes I and II, respectively). The third part (Articles 12-16) describes the measures that Member States are required to take for the conservation of certain species of animals and plants designated as requiring "strict protection" (Annex IV). The final part of the Directive (Articles 17-24) concerns complementary activities for the implementation of the Directive, including dissemination of information and promotion of research and education.
13. A key part of the Directive is the annexes, of which there are six. Annex I lists natural habitats whose conservation requires the designation of SACs. Some 200 different types of habitat are listed, some of which are further designated as "**priority habitat types**"<sup>5</sup>. The listed habitats are not all those found in Europe, but rather, only those considered as the Union's most valuable. Included in the list are rare habitats and those that only cover small areas, habitats that are very rich in species, those that are essential for migratory species, and those that illustrate how the European environment has evolved. The NATURA 2000 network will include a representative sample of all habitats of Community interest, especially priority habitats.
14. Annex I marine habitats (within the scope of the present assignment, that is, excluding adlittoral, supralittoral and upper mediolittoral habitats) are the following:

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<sup>3</sup> *Official Journal of the European Communities* L 206, 22.7.1992, p. 7.

<sup>4</sup> *Official Journal of the European Communities* L 103, 25.4.1979, p. 1.

<sup>5</sup> Priority habitat types are defined in Article 1(d) of the Habitats Directive as natural habitat types in danger of disappearance, which are present the territory of Member States and for the conservation of which the EU has particular responsibility in view of the proportion of their natural range which falls within the territory of Member States.

- **Sandbanks which are slightly covered by seawater all the time**
- ***Posidonia* beds\***
- **Estuaries**
- **Mudflats and sandflats not covered by seawater at low tide**
- **Coastal lagoons\***
- **Large shallow inlets and bays**
- **Reefs**
- **Submarine structures made by leaking gases**
- **Submerged or partially submerged sea caves**

The asterisk signifies a 'priority habitat'.

15. Annex II lists species of plants and animals whose habitats must be protected for their survival. Annex II marine species that are found or may potentially be found in the Maltese Islands are: the Bottle-nosed Dolphin (*Tursiops truncatus*), the Harbour Porpoise (*Phocoena phocoena*), the Mediterranean Monk Seal (*Monachus monachus*), the Loggerhead Turtle (*Caretta caretta*), and the Killifish (*Aphanius fasciatus*). The Mediterranean Monk Seal and the Loggerhead Turtle are designated 'priority species'<sup>6</sup>.
16. Annex III lists criteria for selecting sites eligible for consideration as "Sites of Community Importance" and designation as SACs, while Annex IV lists species of Union interest in need of strict protection. This annex includes more than 170 species of plants, 160 species of vertebrates and 70 species of invertebrates. A number of marine species listed in this annex occur also in the Maltese Islands. These are: all species of whales and dolphins that occur in Maltese waters, the Mediterranean Monk Seal (*Monachus monachus*), all species of marine turtles that occur in Maltese waters, the Date Mussel (*Lithophaga lithophaga*), the Noble Pen-shell (*Pinna nobilis*), and the Long-spined Sea-urchin (*Centrostephanus longispinus*).
17. Annex V list species of plants and animals of EU interest whose taking from the wild and exploitation is subject to management, that is, their exploitation must be controlled such as to ensure their survival in the wild. Marine species of interest to Malta in this list are: (possibly) the Twaite Shad (*Alosa fallax*), the Red Coral (*Corallium rubrum*), the Mediterranean Locust Lobster (*Scyllarides latus*) and the rhodolith-forming coralline algae *Lithothamnium coralloides* and *Phymatholithon calcareum*.
18. Finally, Annex VI lists prohibited methods and means of capture and killing of mammals and fish, and prohibited modes of transport.

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<sup>6</sup> Priority species are defined by Article 1(h) of the Habitats Directive as species of EU interest (as defined by Article 1(g), that is, species that are endangered, vulnerable, rare, endemic and requiring particular conservation measures) for the conservation of which the EU has particular responsibility in view of the proportion of their natural range which falls within the territory of Member States.

19. It should be pointed out that no birds are listed in any of the annexes, as the protection of birds and their habitats are the subject of a separate Council Directive – the 'Birds Directive'<sup>7</sup>.
20. The ultimate aim of the 'Habitats Directive' is the designation of Special Areas of Conservation and their integration into a larger entity – the European "NATURA 2000" network. The main threat to European habitats and wildlife is seen as the fragmentation of natural habitats and the blocking of ecological corridors between different areas due to development. The "NATURA 2000" network will be a system of linked conservation areas aimed at the maintenance of European biodiversity primarily through sustainable land management in and around habitats of EU or wider importance.
21. The key obligation for EU Member States under the Habitats Directive is to prepare and propose to the European Commission a national list of sites, which will be evaluated in order to form a European network of Sites of Community Importance (SCIs). These will eventually be designated by the Member States as Special Areas of Conservation (SACs) in terms of Article 4.4 of the Directive. These SACs, and the Special Protection Areas (SPAs) classified under the Birds Directive (79/409/EEC) will form the NATURA 2000 network (Habitats Directive: Article 3.1.).
22. Article 4.1 of the Habitats Directive requires that Member States employ criteria set out in Annex III to make a selection of high quality sites for Annex I habitat types and Annex II species. It is therefore not required that Member States select all occurrences of each habitat type and species for inclusion on the national list. This is of particular importance to Malta since some habitats (e.g. *Posidonia* meadows, which are a priority habitat, are so widespread that their total designation would render huge areas of national territory protected areas.
23. It should be noted that the European Commission has pointed out that the Habitats Directives should be applied to the 200 nautical mile zone of Member States, if a country has either designated an EEZ<sup>8</sup> or is exercising its sovereignty in the 200 nautical mile zone (Thissen, 2002).
24. The Habitats Directive applies the aims of the Berne Convention<sup>9</sup> (see Section 2.3 below) and the Convention on Biological Diversity Convention<sup>10</sup>, to which the EU is party, to EU Member States at the same time creating a more detailed framework for site conservation and protection than these conventions themselves do.

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<sup>7</sup> Council Directive 79/409/EC of 2 April 1979 on the conservation of the wild birds.

<sup>8</sup> EEZ = Exclusive Economic Zone (out to 200 nautical miles from the baseline).

<sup>9</sup> Council Decision 82/72/EEC of 3 December 1981 concerning the conclusion of the Convention on the Conservation of European Wildlife and Natural Habitats. *Official Journal of the European Communities* L 38, 10.2.1982, p. 1.

<sup>10</sup> Council Decision 93/626/EEC of 25 October 1993 concerning the conclusion of the Convention on Biological Diversity. *Official Journal of the European Communities* L 309, 13.12.1993, p. 1.



## 2.2 PROTOCOL FOR SPECIALLY PROTECTED AREAS AND BIODIVERSITY IN THE MEDITERRANEAN

25. The *Convention for the Protection of the Mediterranean Sea against Pollution* (the **Barcelona Convention**) was adopted on 16th February 1976. A number of protocols were adopted under this convention, amongst which is the Protocol concerning Mediterranean Specially Protected Areas done at Geneva on 3 April 1982.
26. Parties to this protocol are obliged to establish specially protected areas and shall endeavour to undertake the action necessary in order to protect these areas and, as appropriate, to restore them as rapidly as possible. They shall also take measures with regards to their planning and management and develop scientific and technical research. Malta ratified the protocol for Specially Protected Areas on 11 January 1988. The parties later amended this protocol and its name was changed to *Protocol for specially Protected Areas and Biodiversity in the Mediterranean (SPABIM)*. This new Protocol was adopted on the 10 June 1995.
27. In order to promote cooperation in the management and conservation of natural areas, as well as in the protection of threatened species and their habitats, parties to the protocol are required to draw up a "*List of Specially Protected Areas of Mediterranean Importance*", referred to as the "**SPAMI List**". A similar provision already existed in the old Protocol. In addition, the new version of the Protocol provides for drawing up lists of endangered or threatened species and species whose exploitation is regulated<sup>11</sup>.
28. Annex I lists common criteria for the choice of protected marine and coastal areas that could be included in the SPAMI list. Annex II lists species that are endangered or threatened. Annex III lists species whose exploitation is regulated.
29. Malta signed the new Protocol on 10 June 1995 and ratified it on 28 October 1999. The EU is party to the new protocol<sup>12</sup>.

## 2.3 THE BERN CONVENTION

30. The *Convention on the Conservation of European Wildlife and Natural Habitats*, generally referred to as the '**Bern Convention**', is designed to protect threatened species of flora and fauna, the habitats of these species, the habitats of migratory species, endangered natural habitats, and to safeguard migratory species. It entered in force on the 1st June 1982 and is sponsored by the Council of Europe.

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<sup>11</sup> The Annexes to the Protocol were adopted on 24 November 1996 by the Meeting of Plenipotentiaries on the Annexes to the Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean, held in Monaco.

<sup>12</sup> 99/800/EC: Council Decision of 22 October 1999 on concluding the Protocol concerning specially protected areas and biological diversity in the Mediterranean, and on accepting the annexes to that Protocol (Barcelona Convention) *Official Journal of the European Communities* L 322 , 14.12.1999 pp. 1- 2.

31. The aims of the convention are to conserve those wild flora and fauna and their natural habitats whose conservation requires the co-operation of several states and to promote such conservation. Particular emphasis is given to endangered and vulnerable species, including endangered and vulnerable migratory species.
32. The Bern convention has four appendices. Appendix I lists strictly protected flora species. Each party is required to take appropriate steps to prohibit the deliberate picking, collecting, cutting or uprooting of such plants and to protect their habitats.
33. Appendix II lists strictly protected fauna species and the Convention prohibits the deliberate capture, the destruction of breeding or resting sites, the deliberate destruction or taking of eggs and the deliberate killing of and trade in these species.
34. Appendix III lists protected species of fauna can be exploited. Parties are obliged to keep these species out of danger by introducing closed hunting seasons, temporary or local prohibitions of exploitation, and the regulation of sale, keeping for sale, and transporting of these species.
35. Appendix IV lists prohibited means and methods of killing, capture and other forms of exploitation with regards to exploitation of birds and mammals listed in Appendix III.
36. The contracting parties are also obliged to take appropriate and necessary measures to protect the habitats of the wild flora and fauna listed in Appendix I and II, as well as those areas that are of importance for the migratory species listed in Appendix II and III, both as routes or as wintering, staging, feeding, breeding or moulting areas. On becoming a party, any state may enter a reservation with regards to any species listed in the appendices or to any method listed in Appendix IV.
37. Malta acceded to this Convention on the 26th November 1993 and entered two reservations in accordance with Article 22 of the Convention. These reservations were later amended and now regard the following:
  - Birds which can be trapped from 1 September to 31 January.
  - Following recent additions to the appendixes of the Bern Convention, another reservation was placed with regard to five species of marine animals that are commercially exploited in Malta<sup>13</sup>. Furthermore, one exception was placed with regard to two marine flora<sup>14</sup>.

### 2.3.1 The EMERALD Network of the Bern Convention

38. In 1989 the Bern Convention created the EMERALD network<sup>15</sup>. This is explicitly concerned with the protection of natural habitats, which are designated as **Areas of Special Conservation Interest (ASCIs)** and is a non-EU version of the Habitats Directive's NATURA 2000 network, although it expands upon this, enabling inclusion of sites important for species other than those listed in its annexes (unlike the Habitats Directive). For EU member States NATURA 2000 sites may also be EMERALD network sites (see Section 2.3.2 below).

<sup>13</sup> *Palinurus elephas*, *Epinephelus marginatus*, *Lamna nasus*, *Raja alba*, and *Squatina squatina*.

<sup>14</sup> The seagrasses *Posidonia oceanica* and *Cymodocea nodosa*.

<sup>15</sup> Standing Committee of the Bern Convention: Recommendation No. 16 (1989) on Areas of Special Conservation Interest [Adopted by the Standing Committee on 9 June 1989] and Resolution No. 3 (1996) concerning the setting up of a Pan-European ecological network [Adopted by the Standing Committee on 26 January 1996].

39. Recommendation No. 16 of the Standing Committee of the Bern Convention defines ASCIs as those designated by states where that area fits one or more of the following conditions:
- It contributes substantially to the survival of threatened species, endemic species, or any species listed in Appendices I and II of the Convention.
  - It supports significant numbers of species in an area of high species diversity or supports important populations of one or more species.
  - It contains an important and/or representative sample of endangered habitat types.
  - It contains an outstanding example of a particular habitat type or a mosaic of different habitat types.
  - It represents an important area for one or more migratory species.
  - It otherwise contributes substantially to the achievement of the objectives of the convention.
40. These conditions point clearly towards areas of significant ecological value for both the threatened and endemic species listed in the Appendices of the Bern Convention and for the endangered habitat types which are to be identified by the Standing Committee as "*requiring specific conservation measures*". As in the case of the NATURA 2000 Network, not any type of protected area can form part of the EMERALD Network, but sites have to be important and contribute **substantially** to the objectives of the Convention.

### 2.3.2 Relations of the EMERALD Network with NATURA 2000<sup>16</sup>

41. The Bern Convention (1979) and the Habitats Directive (1992) have a complete coincidence of objectives. Both are international legal instruments aimed at the conservation of wild flora, fauna and natural habitats. Their main differences come from the territory they apply to (EU member states for the Directive and the whole of Europe and part of Africa for the Bern Convention) and to the fact that the Habitats Directive is more explicit on the obligations concerning conservation of natural habitats.
42. For EU member states, Recommendation No.14<sup>17</sup> of the Standing Committee of the Bern Convention requires them to designate ASCIs like other states, and the same applies to the EU as a Contracting Party. However, given the convergence between the Habitats Directive and the Bern Convention and between the NATURA 2000 Network of the former and the EMERALD Network of the latter, the designation of SPAs within the Habitats Directive would be more than enough to fulfil the implementation of Recommendation No.16 of the Standing Committee of the Bern Convention and if the EU member states so wish it may be their contribution to the EMERALD Network. No other action would be expected from EU member states to fulfil their obligations under the Bern Convention and the procedures established by

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<sup>16</sup> Based on: Directorate of Culture and Cultural and Natural Heritage (2001) *The Emerald Network: a network of Areas of Special Conservation Interest for Europe* [T-PVS (2001) 51]. Strasbourg, France: Council of Europe; 54pp.

<sup>17</sup> Standing Committee of the Bern Convention: Recommendation No. 14 (1989) on species habitat conservation and on the conservation of endangered natural habitats [Adopted by the Standing Committee on 9 June 1989].

EU Directives 79/409/EEC (Birds Directive) and 92/43/EEC (Habitats Directive) will be the only rules to apply<sup>18</sup>.

### **2.3.3 Implementation of EMERALD**

43. The implementation phase of the EMERALD Network at the national level started in 1999 with a series of pilot projects aimed at developing a country database of sites from which ASCIs will be selected for eventual submission to the Standing Committee of the Bern Convention for designation. To date Bulgaria, Latvia, Moldova, Poland, Russia, Slovakia, Slovenia and Turkey have successfully completed pilot projects and a further nine countries including Malta have are in the pilot phase<sup>19</sup>.

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<sup>18</sup> Resolution No. 5 (1998) of the Standing Committee concerning the rules for the Network of areas of special conservation interest (Emerald Network) [adopted by the Standing Committee on 4 December 1998].

<sup>19</sup> *EMERALD Network Bulletin* No.1, August 2001.

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## 3. MARINE HABITATS CLASSIFICATION

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44. Each of the three legislative instruments relevant to the present assignment refers to a list of habitats (or biotopes)<sup>20</sup>: for the EU Habitats Directive, this is that in Annex I<sup>21</sup>; for the Bern Convention, that referred to in Resolution No. 4<sup>22</sup>; and for the SPABIM Protocol that referred to in Article 15. All three instruments therefore require inventorying of habitats and the selection of particular sites having habitats of conservation value as defined by the various instruments.
45. Each instrument has an associated habitats or biotope classification scheme. Therefore, at regional level (European/Pan-European/Mediterranean) there are three habitat classification systems in use for description, designation and monitoring of habitats. These systems have many similarities, but they also have many differences, which makes reporting at regional level difficult. These three systems are discussed below (Sections 3.1 and 3.2).
46. The problem of the classification of European habitats, marine habitats included, is even more complex because for some countries (e.g. those with coastlines on the Atlantic), there are other regional classifications in use that are designed for particular regions and which do not necessarily apply outside the region, especially in the Mediterranean. There are also a number of national classifications, which are even more difficult to extend outside the national territories they were devised for.
47. There is therefore great need for harmonisation at regional level of terminology and definitions in order to allow common reporting, comparison and analysis of habitat information in Europe and the Mediterranean.
48. As a first step towards this the European Environment Agency and its European Topic Centre for Nature Conservation (ETC/NPB) has therefore developed a common reporting language on habitat types at European level: The EUNIS Habitat Classification that builds upon previous initiatives (CORINE-Biotopes, followed by the Palaeartic Habitats Classification), but introduces agreed-upon criteria for the identification of each habitat unit and provides a correspondence with other classification-types (CORINE-Biotopes, Palaeartic Habitats Classification, CORINE-Landcover, Habitats Directive Annex I, Nordic classification system, and some national systems). Although not strictly relevant to the present assignment, for the sake of providing a complete picture of the present situations with marine habitats classification, a short discussion of EUNIS is also given below (Section 3.1.3).

### 3.1 THE MARINE HABITATS CLASSIFICATION USED BY NATURA 2000 AND THE BERN CONVENTION

49. Both the Habitats Directive and the Bern Convention schemes are derived from the CORINE/Palaeartic classification, but because they are fixed in a legal framework,

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<sup>20</sup> See Appendix 2 for a discussion of the ecological terminology used by the various legislative instruments.

<sup>21</sup> Annex I: Natural habitat types of community interest whose conservation requires the designation of special areas of conservation.

<sup>22</sup> Resolution no. 4 (1996) List of endangered habitats requiring specific conservation measures.

they have remained unchanged since they were defined in the Habitats Directive and the Bern Convention, while their parent classifications have developed further (as EUNIS in the case of the Habitats Directive, and as PHYSIS in the case of the Bern Convention). In both cases also, neither legislative list is in itself a complete classification, but only an extract of the habitats most in need of protection through designation made at a particular time from the parent classification.

### 3.1.1 Habitats Directive

50. The preamble to the original (1992) version of Annex I of the Habitats Directive cites the hierarchical classification of biotopes<sup>23</sup> prepared in 1988 under the CORINE programme<sup>24</sup> as the source of reference for interpretation of Annex I. This classification was partly updated in 1989<sup>25</sup>. While the Habitats Directive was being adopted, the CORINE biotopes classification was thoroughly revised and the new version was published in 1991<sup>26</sup>.
51. However, when first published in 1992, Annex I was still based on the original 1988 version of CORINE, with the result that many habitat types listed in Annex I either do not appear or have different names or numbers from those used in the 1991 version of CORINE. Moreover, the 1988 version of the CORINE Biotope Classification was simply a list of habitat names and provided little guidance about interpretation of Annex I.
52. In order to address these problems, the Habitats Committee<sup>27</sup> commissioned a Scientific Working Group to prepare an interpretation manual for Annex I. This manual, known as EUR12<sup>28</sup> was adopted by the Habitats Committee in April 1995.
53. The accession of Austria, Finland and Sweden to the EU necessitated a revision of Annex I to take into account habitats particular to these countries, as well as the extension of the distribution of already listed habitats as a result of the territorial expansion of the enlarged EU. This new version, known as EUR15<sup>29</sup> was adopted in April 1996 and incorporated new habitats, as well as corrected and updated the information already included in the old version, mainly on the basis of the 'Palaeartic Habitats Classification' which is an extension of the European (CORINE) classification to cover the entire Palaeartic region<sup>30</sup> and thus the area of responsibility of the Council of Europe in terms of the Bern Convention (see Section 2.3).

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<sup>23</sup> *CORINE biotopes* [working draft] 19 May 1988. See also: Commission of the European Communities (1991) *CORINE Biotopes: the design, compilation and use of an inventory of sites of major importance for nature conservation in the European Community*. Luxembourg: Office for Official Publications of the European Communities; 233pp.

<sup>24</sup> The CORINE Programme (CO-ordination of INformation on the Environment) ran from 1985 to 1990 as an experimental programme for gathering, coordinating and ensuring consistency of information on the state of the environment and natural resources in the (then) European Community.

<sup>25</sup> *CORINE biotopes* [Corine/Biotopes/89-2.2] 14 February 1989

<sup>26</sup> European Communities (1991) *CORINE biotopes manual. Habitats of the European Community* [EUR 12587/3] Luxembourg: Commission of the European Communities.

<sup>27</sup> This is the Committee set up in terms of Article 20 of the Habitats Directive.

<sup>28</sup> *Interpretation manual of European Union habitats, version EUR12* adopted by the Habitats Committee on xx April 1995, European Commission, DGXI

<sup>29</sup> *Interpretation manual of European Union habitats, version EUR15* adopted by the Habitats Committee on 25 April 1996, European Commission, DGXI

<sup>30</sup> Devillers, P. & Devillers-Terschuren, J. (1996) *A classification of Palaeartic habitats*. [Nature and environment series No 78] Strasbourg, France: Council of Europe;194pp.

54. In 1997, the EU issued a Directive<sup>31</sup> to replace the original 1992 versions of Annexes I and II with new updated versions. The preamble to this Directive establishes the EUR15 (April 1996) version of the Interpretation Manual of European Union Habitats as the new reference for Annex I.
55. A second version of EUR15 (known as EUR15/2) was adopted by the Habitats Committee on 4 October 1999 and this is the reference for Annex I habitats in use at the present time. The marine habitats of EUR15/2 relevant to the present assignment are described below in Section 6.

### **3.1.1.1 Recent developments**

56. The EU is currently in the process of enlargement and there are presently 12 candidate countries (Newly Associated States): ten from Eastern Europe and the Mediterranean islands of Cyprus and Malta. These countries will bring new habitats and species into EU territory, necessitating a revision of Annexes I, II, IV and V of the Habitats Directive and Annexes I, II and III of the Birds Directive to allow for their full and effective application in an enlarged Europe. The European Commission invited the NASs to make their proposals for revisions of the annexes of the Habitats and Birds Directives and the current EUR15/2 'Interpretation Manual' in two so-called 'tranches': a 1<sup>st</sup> tranche of proposals with a deadline set at March 2000, and a 2<sup>nd</sup> tranche with a deadline set at December 2000. These proposals are currently being discussed by the Scientific Working Groups associated with the Habitats and Birds directives.

### **3.1.2 Bern Convention**

57. The Habitats Directive is the implementation instrument of the Bern Convention in the EU Member States and thus in the EU, the establishment of NATURA 2000 and its complementary measures will meet the requirements for habitat conservation under the Bern Convention<sup>32</sup>. The two instruments are thus strictly complementary and adopt a common approach for most requirements. For example, the designation of ASCIs under the Bern Convention follows much the same process as that of the NATURA 2000 Network. In order to designate a ASCI, a government deposits a standard Data Form with the Secretariat of the Council of Europe to register the designation. The Standard Data Form is based on the original CORINE-biotopes database designated for NATURA 2000, but expanded as the 'Palaeartic Habitats Classification' to cover the larger geographical area of the Bern Convention. This 'Palaeartic Habitats Classification' is supported by a computer database known as PHYSIS<sup>33</sup> and maintained by the Institut Royal des Sciences Naturelles de Belgique.
58. In 1996, the Standing Committee of the Bern Convention, acknowledging that for contracting parties which are Member States of the EU the list of natural habitats requiring specific conservation measures corresponds to Annex I of the Habitats

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<sup>31</sup> Council Directive 97/62/EC of 27 October 1997 adapting to technical and scientific progress Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. *Official Journal of the European Communities* L 305, 08/11/1997 pp. 0042 – 0065.

<sup>32</sup> *EMERALD Network Bulletin* No.1, August 2001.

<sup>33</sup> Devillers, P., Devillers-Terschuren, J. & Van der Linden, Ch. (1993) *Palaeartic habitats: a database*. Bruxelles: Institute Royal des Sciences Naturelles de Belgique (PHYSIS Database).

Directive, adopted a Resolution<sup>34</sup> that identifies the following marine habitats (amongst others) as endangered natural habitat types requiring specific conservation measures.

## **11.2 Benthic communities**

11.22 Sublittoral soft seabeds

11.24 Sublittoral rocky seabeds and kelp forests

11.25 Sublittoral organogenic concretions

11.26 Sublittoral cave communities

11.27 Soft sediment littoral communities

## **11.3 Sea-grass meadows**

## **12.7 Sea-caves**

## **13.2 Estuaries**

## **14. Mud flats and sand flats**

## **21. Coastal lagoons**

[Note: codes are Palaeartic Habitats codes.]

59. Therefore as far as the marine environment is concerned there is now almost complete correspondence between the requirements of the Habitats Directive and those of the Bern Convention.

### **3.1.2.1 The Application of the Palaeartic Habitats Classification to Malta**

60. The existing PHYSIS Palaeartic Habitats Database does not explicitly cover Maltese habitats and mostly treats Malta as part of the Sicilian complex. As part of a revision of the database, a complete re-examination of all units possibly pertinent to Malta was made and an extract of the PHYSIS Database listing units certainly or probably present on Malta, together with their descriptive texts, was constructed<sup>35</sup> and submitted to the Environment Protection Department (as of 01.03.2002 subsumed into the Malta Environment and Planning Authority – MEPA) for its comments; an updated version of the PHYSIS Database is due to be published as soon as the consultations with Malta and other countries are completed (Devillers & Devillers-Terschuren, 2001).
61. The marine habitats listed in the PHYSIS Palaeartic Habitats Database as being present or potentially present in Malta include the following (from Appendix 1 of Devillers & Devillers-Terschuren, 2001):

<sup>34</sup> Resolution No. 4 (1996) of the Standing Committee listing endangered natural habitat requiring specific conservation measures [adopted by the Standing Committee on 6 December 1996].

<sup>35</sup> Devillers, P. & Devillers-Terschuren, J. (2001) *Application and development of the Palaeartic habitat classification in the course of the setting up of the Emerald Project – Malta*. [T-PVS/Emerald (2001) 7] Strasbourg: Council of Europe; 70pp.



**1. COASTAL AND HALOPHYTIC COMMUNITIES**

**11. OCEAN AND SEAS, MARINE COMMUNITIES**

**11.1. Open marine waters**

- 11.11. Oceanic waters
- 11.111. Blue ocean waters
- 11.12. Shelf and slope waters
- 11.121. Inshore waters
- 11.122. Offshore waters
- 11.1224. Subtropical offshore waters
- 11.12242. Mediterranean offshore waters
- 11.123. Continental slope
- 11.124. Offshore and coastal upwellings
- 11.1242. Minor offshore and coastal upwellings
- 11.125. Shoals

**11.2. Benthic communities**

- 11.21. Deep sea floor
- 11.211. Bathyal benthic communities
- 11.212. Abyssal benthic communities
- 11.214. Oceanic ridge benthic communities
- 11.22. Sublittoral soft seabeds
- 11.23. Sublittoral pebbly seabeds
- 11.24. Sublittoral rocky seabeds and kelp forests
- 11.25. Sublittoral organogenic concretions
- 11.251. Corallogenic concretions
- 11.252. Encrusting algae pavements
- 11.253. Gastropod and polychaete ledges
- 11.254. Mussel beds
- 11.255. Gas vent communities
- 11.26. Sublittoral cave communities
- 11.27. Soft sediment littoral communities
- 11.28. Pebbly shore littoral communities
- 11.29. Rocky shore littoral communities
- 11.291. Mediolittoral fringe rocks
- 11.292. Lower mediolittoral rocks
- 11.293. Upper mediolittoral rocks
- 11.294. Mediolittoral cave and overhang communities
- 11.295. Mediolittoral rock pools
- 11.296. Supralittoral rocks
- 11.297. Supralittoral rock pools
- 11.2A. Littoral communities of organogenic concretions

**11.3. Sea-grass meadows**

- 11.33. Mediterraneo-Pontic *Cymodocea* and *Zostera* beds
- 11.331. Mediterranean *Cymodocea* beds
- 11.34. *Posidonia* beds
- 11.36. Temperate *Halophila* and *Thalassia* beds
- 11.362. Mediterranean *Halophila* beds

62. It is clear that a great deal more work needs to be done to refine the above list of Maltese marine habitats since even at first reading it is obvious that some habitats do not occur within Maltese territory (for example, bathyal, abyssal and oceanic ridge benthic communities, gas vent communities, and others).

### 3.1.3 EUNIS Habitat classification

63. EUNIS is the European Nature Information System of the European Environment Agency (EEA), developed and maintained by the European Topic Centre on Nature Protection and Biodiversity (ETC/NPB) and aimed at identifying and organising access to existing information with the main purpose of reporting on the state and trends of nature and biodiversity in Europe.
64. EUNIS contains information on selected species, habitat types and sites, based on national data collected through EIONET (The European Environment Information and Observation Network coordinated by EEA) and from international organisations. EUNIS information is being used to support the NATURA 2000 process, for EEA reports and for international co-ordination, for example with the Bern Convention EMERALD Network and other conventions such as the Helsinki<sup>36</sup>, OSPAR<sup>37</sup> and Barcelona conventions.
65. The EUNIS habitat classification<sup>38</sup> started development in 1996 and represents a re-definition and restructuring of the Palaeartic Habitat Classification and augmenting of that classification from other sources, primarily those concerned with marine habitats. As far as the marine sector is concerned it has refined the Palaeartic Habitat Classification by the addition of units developed by marine conventions (Barcelona, Helsinki and OSPAR) and the EU-funded BioMar project<sup>39</sup>. The EUNIS Habitats Classification has been developed to facilitate harmonised description and collection of data across Europe through the use of criteria for habitat identification. It is a comprehensive pan-European system, covering all types of habitats from natural to artificial, from terrestrial to freshwater and marine habitats types.
66. The EUNIS habitat classification cross-references to all EU Habitat Directive habitat types used for EU Member States, to the CORINE Land Cover classification, to some regional and national classifications, and to other systems such as the European Vegetation Survey.
67. Mediterranean marine habitats units, as defined for the Barcelona Convention marine habitats classifications (see Section 3.2 below) have been included in the EUNIS classification after consultation with Denise Bellan-Santini<sup>40</sup> and Gérard Bellan; these are additional to Mediterranean marine units from the Palaeartic habitat classification (Davies & Moss, 1999).

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<sup>36</sup> Helsinki Convention on the Protection of the Marine Environment of the Baltic Sea Area.

<sup>37</sup> Convention for the Protection of the Marine Environment of the North-East Atlantic.

<sup>38</sup> For the EUNIS system of habitat classification see <http://www.mnhn.fr/ctn/products/eunishabuk.html>

<sup>39</sup> Connor, D.W., Brazier, D.P., Hill, T.O. & Northen, K.O. (1997) *Marine Nature Conservation Review: Marine biotope classification for Britain and Ireland. Version 97.06*. Peterborough: Joint Nature Conservation Committee.

<sup>40</sup> The original author of the RAC/SPA Mediterranean benthic habitats classification; see: UNEP(OCA)/MED WG.154/7 [Report of the Fourth Meeting of National Focal Points for Specially Protected Areas (Tunis, 12-14 April 1999)].

## 3.2 THE SPABIM MARINE HABITATS CLASSIFICATION

68. At their tenth Ordinary Meeting (Tunis, 18-21 November 1998) the Contracting Parties to the Barcelona Convention adopted common criteria for the preparation of national inventories of natural sites of conservation interest as required by the SPABIM Protocol and asked the Regional Activity Centre for Specially Protected Areas (RAC/SPA) to work on the formulation of reference lists of habitat types and of species for the selection of sites to be included in the national inventories.
69. A draft classification of benthic marine habitat types for the Mediterranean region was prepared by a meeting of experts on Mediterranean marine habitat types convened by RAC/SPA and held in Hyères (18-20 November, 1998). It was subsequently finalized by the Fourth Meeting of Focal Points for Specially Protected Areas (Tunis, 12-14 April 1999) and was ultimately adopted by the Eleventh Meeting of the Contracting Parties (Malta, 27-30 October 1999).
70. There were several reasons why the need for a specific classification of Mediterranean marine biotopes was felt (UNEP(OCA)/MED WG.154/7<sup>41</sup>): the classification used by the Habitats Directive and based on the CORINE biotopes manual was found difficult to apply to marine habitats and more so in the Mediterranean zone, while the Palaearctic Habitats Classification (Devilliers & Devilliers-Terschuren, 1996) used by the Bern Convention is a development and a geographical extension of the CORINE biotopes which does not provide significantly more information for the Mediterranean Sea. On the other hand, there were already a number of Mediterranean-specific marine habitat classification systems in use by individual countries, all based on the scheme of Pérès & Picard (1964). The classification scheme finally adopted is based on a draft scheme prepared by Denise Bellan-Santini and presented at the Meeting of Experts on marine habitat types in the Mediterranean region held at Hyères (18-20 November 1998). This scheme is based on one elaborated for French Atlantic and Mediterranean coasts<sup>42</sup>, revised and adapted for the specificities of the French Mediterranean zone and then extended to the whole of the Mediterranean Sea to meet the needs of RAC/SPA (UNEP(OCA)/MED WG.154/7).
71. The RAC/SPA scheme uses the CORINE biotopes nomenclature and is based on the zonation scheme defined by Pérès & Picard (1964) and the granulometric classification of the seabed of Dauvin *et al.* (1994). It classifies Mediterranean marine habitats in a hierarchy of groups and is mainly based on phytosociological principles (UNEP(OCA)/MED WG.154/7).
72. It should be noted that the RAC/SPA scheme is still not fully developed. Thus a number of delegations at the RAC/SPA Meeting of Experts held in Rome, 23-24 March 2000<sup>43</sup> stressed a lack of data concerning the eastern Mediterranean region in the RAC/SPA scheme. This is mirrored in the very small number of habitats typical of that region appearing in both the classification and reference lists. The meeting

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<sup>41</sup> Annex VI of UNEP(OCA)/MED WG.154/7 [Report of the Fourth Meeting of National Focal Points for Specially Protected Areas (Tunis, 12-14 April 1999)].

<sup>42</sup> Dauvin, J.C. [ed.] (1994). *Typologie des ZNIEFF-Mer, liste des paramètres et des biocoenosis des côtes françaises métropolitaines* (deuxième édition). [Collection Patrimoines Naturels Vol. 12] Paris, France: Secrétariat de la Faune et de la Flore, Muséum National d'Histoire Naturelle; 70pp.

<sup>43</sup> Meeting of experts for the finalisation of the Standard Data-Entry Form (SDF) for national inventories of natural sites of conservation interest. Rome, 23-24 March 2000.

acknowledged the importance of developing research efforts in the region to bridge this gap, and RAC/SPA was asked to help countries with this effort (MAP, 2000).

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## 4. METHODOLOGY

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73. The principal aim of this assignment is the alignment of existing local marine habitats data with the requirements of the EU's Habitats Directive. Therefore, the basic requirement is to transpose existing local habitat data to the list in Annex I of the Directive.
74. However, the TOR require an assessment of local marine habitats data against both the requirements of Annexes I and II of the Habitats Directive and against the RAC/SPA standard data entry forms for marine species and habitats. As far as habitats are concerned, this immediately presented us with a problem. The RAC/SPA marine habitats classification is a hierarchical one based on phytosociological concepts and is 'fine-grained', classifying marine habitats into biocoenoses, associations, ecomorphoses and facies (see Section 5). On the other hand, as far as the marine environment is concerned, the EUR15/2 European habitats classification used by the Habitats Directive is a 'coarse-grained' one classifying seascapes (that is, complexes of habitats – sandbanks, seagrass beds, estuaries, lagoons, reefs, mudflats and large shallow inlets and bays) rather than habitats themselves (see Section 6).
75. Since the TOR required that we propose a list of species/habitats/associations/biotopes that can be utilised for the production of a new marine habitats map for the Maltese Islands, we were faced with the problem of whether to base our proposed mapping scheme on the 'coarse-grained' seascape mapping required by the Habitats Directive or the 'fine-grained' biotope mapping required by the SPABIM Protocol.
76. In solving this problem we took into consideration the following points:
- The available local marine habitats data was collected without either Habitats Directive or SPABIM Protocol in mind, however, it is mostly fine-grained (although not always to the fineness of the RAC/SPA classification) and is mainly based on the scheme of Pérès & Picard (1964), which is itself part of the RAC/SPA classification (see Section 3.2).
  - Small ('fine-grained') units can always be lumped into larger ('coarse-grained') units, but the reverse is difficult.
  - The TOR require us to utilise the 'aligned' data to propose marine areas for possible inclusion in the NATURA 2000 network of the Habitats Directive and/or as eligible for scheduling under local legislation. Although the NATURA 2000 network will protect marine areas at a seascape level, the designation of Specially Protected Areas under the SPABIM Protocol as well as scheduling of marine areas under local legislation will require a good knowledge of the biotopes and species of each site in far greater detail than is necessary for the broadly defined marine habitat categories of the Habitats Directive.
77. We therefore proposed to the Environment Management Unit of the PA, that we would align the existing data with the RAC/SPA marine benthic habitats classification scheme (as modified to take into account the local situation) and then to use the resulting detailed biotope maps to produce a second set of maps of habitats as required for the NATURA 2000 network. This strategy was accepted.

78. We proceeded in our task by first taking stock of all the habitat maps and supporting data that were available to us (a list of these sites and their location is given in Fig.1) and comparing these to the RAC/SPA marine benthic habitats classification. On the basis of these analyses we were able to propose modifications to the RAC/SPA classification to make it applicable to the local situation.
79. In modifying the RAC/SPA classification we tried as much as possible to 'fit' local habitat units into the existing scheme and we only suggested modifications to the scheme when it was absolutely necessary as local habitat units could not be accommodated in existing RAC/SPA categories without distorting either the RAC/SPA categories or the local data.
80. The output of this first assessment of local data is the modified RAC/SPA classification as applied to the Maltese Islands given in Section 5 of this report. Further details of our philosophy in adapting the official RAC/SPA classification and of our methodology for doing this are given in the introduction to Section 5.
81. The next step was to use the adapted RAC/SPA classification to re-draw existing marine benthic habitat maps using the adapted scheme. To do this we had to go back to the original field data (where this was available) that listed the species present in each mapping transect. This was possible in most cases since we were the originators of these maps.
82. In redrawing these maps we had to take into account a number of considerations.
- The classification of habitats is very subjective since it is based on the more conspicuous species that can easily be mapped using the field techniques that we (and others) employed, which were mainly direct observation by SCUBA divers as they swam along pre-determined transects. Smaller, inconspicuous species may actually be more abundant or have a higher 'ecological value' than the species used for habitat delineation.
  - Habitat mapping of necessity compels the mapmaker to draw boundaries, which are actually difficult to delineate, especially where one biotope or biocoenosis merges into another. In most cases, habitat boundaries are diffuse rather than the definite lines shown on the maps.
  - Meadows of *Posidonia oceanica* presented a particular difficulty due to the large number of morphological types that occur locally. For example, ideally we should distinguish between continuous meadows (which have the greatest spatial extent and are the most homogeneous), reticulate meadows (which are intermixed with assemblages of sand and/or infralittoral algae and therefore constitute a 'mosaic' biotope) and smaller stands and collines<sup>44</sup> (which have a much smaller spatial extent and are present as enclaves within other biocoenosis). In reality however, a great many intermediate morphologies, complexes of different habitat types and even mosaics of different meadow morphologies exist. The issue is even more complex where the *Posidonia* meadows occur on rock. To accommodate the range of local situations, we have had to considerably extend the RAC/SPA classification for *Posidonia* meadows and even the extended scheme we have used is an oversimplification.

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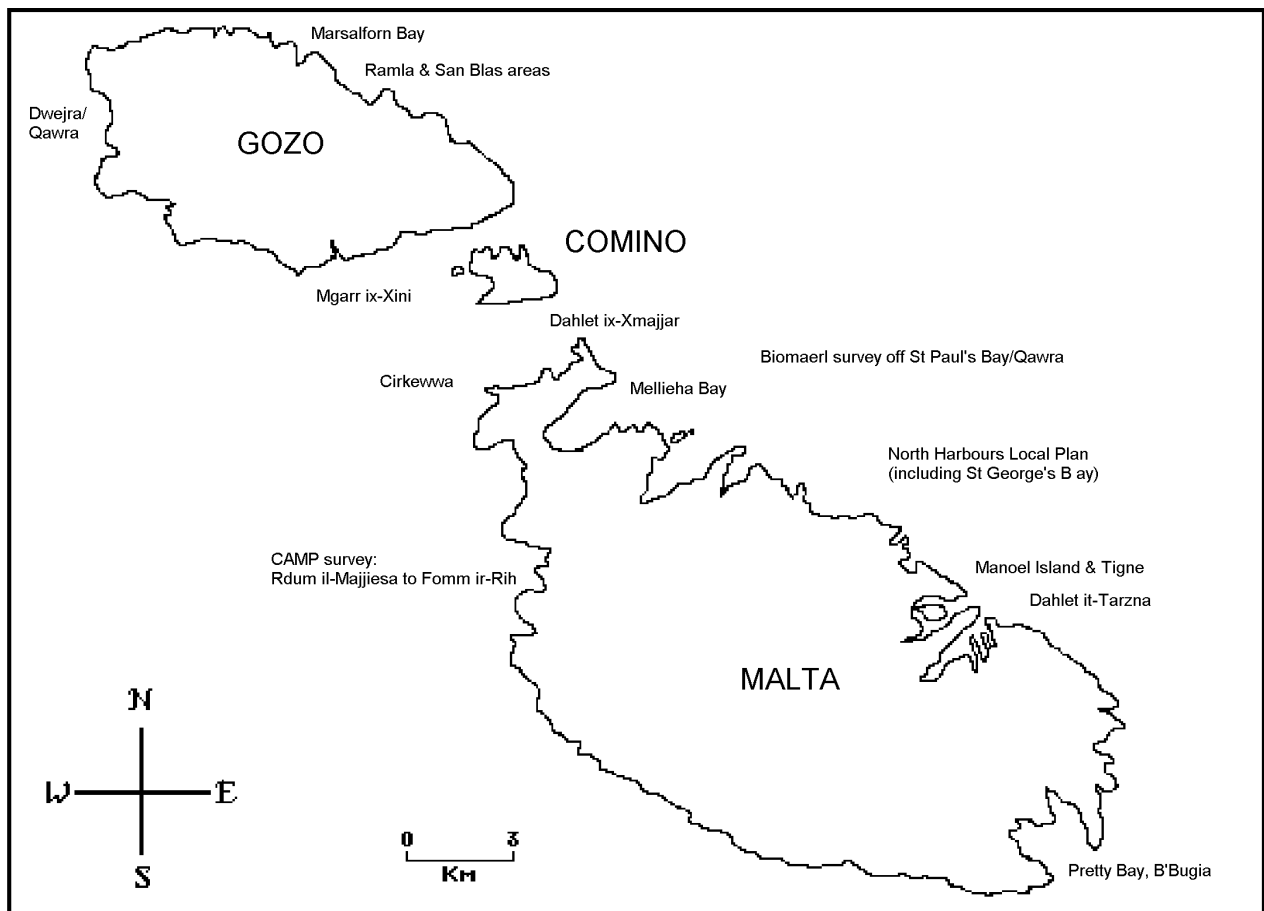
<sup>44</sup> Small patches of seagrass in the form of hillocks.

- In the case of photophilic and sciaphilic algal assemblages, we found that in most cases the spatial extent of specific associations and/or facies was not mapped in the original surveys as this was outside their scope. This is particularly the case for assemblages based on species of *Cystoseira* which are not only difficult to identify and to tell apart in the field, but the taxonomy of which is still confused. In such cases we mapped the assemblages under general headings (for example, 'Associations with *Cystoseira* spp.') rather than define them further in the absence of reliable data.
  - Since we lack data on the species composition of several local assemblages, particularly those that the RAC/SPA classification defines on the basis of the endobiota, at this point in time we cannot be certain if these are equivalent to a particular RAC/SPA category or not. We have mapped such assemblages at that high level category to which we are reasonably certain they belong, without attempting to classify them further.
83. In the actual mapping of units we have had to take several more or less arbitrary decisions in applying the RAC/SPA definitions<sup>45</sup> of the various units in the classification. These are as follows:
- **Association:** we have taken an 'association' to be present when the named species characterising it have a cover equal to or more than 70% of the bottom area and where the bottom area with such an association covers tens of square meters.
  - **Facies:** we do not consider the presence of occasional individuals or small clumps of individuals of the named species characterising a facies as meaning that the particular facies is present, but we only mapped facies if the named species characterising the facies covered an area of several square meters. We departed from the RAC/SPA definition of facies in showing no bias in favour of animals in defining new facies.
  - **Enclave:** We consider an enclave to be a particular mapped unit occupying a small area (e.g. a small patch) within a much larger area occupied by another different mapped unit. The cut-off values we have adopted are: <35% coverage by one of the units of the total area occupied by two units makes the former an enclave within the latter. The other unit with 65% coverage or more constitutes the 'main' unit.
  - Where two mapped units constitute a mosaic or are intermixed such that they are present in a ratio of 40%:60% coverage or any ratio between these limits, then we consider that we have a **complex** of units and we map it as such.
84. The marine habitat maps produced using the modified RAC/SPA classification scheme that we devised and which accompany this report are the main output of this assignment (Figs.2-14).
85. As a next step, we then considered the EUR15/2 habitat categories (European Commission, 1999) as used to define the marine habitats listed in Annex I of the Habitats Directive and considered which of these are actually applicable to Malta. The result of this analysis is presented in Section 6.

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<sup>45</sup> Appendix III of Annex VI of UNEP(OCA)/MED WG.154/7 [Report of the Fourth Meeting of National Focal Points for Specially Protected Areas (Tunis, 12-14 April 1999)].

86. Using the detailed habitat maps in conjunction with the analysis presented in Section 6 we then produced a second series of maps showing Habitats Directive Annex I habitats. It should be emphasised that these maps do not show every occurrence of Annex I habitats in those regions of the Maltese marine environment that have been mapped, but rather good examples of each that may be considered as a shortlist of sites from which particular areas may be selected by the Government of Malta (through MEPA) for eventual designation as NATURA 2000 sites.
87. For each of the areas proposed for consideration as potential marine NATURA 2000 sites we provide standardised explanatory text following Habitats Directive Annex III Stage 1 and Stage 2 criteria (Section 7.3).



**Fig.1 Map of the Maltese Islands showing the location of areas for which habitat maps and supporting data are available.**



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## 5. THE RAC/SPA CLASSIFICATION SYSTEM OF MEDITERRANEAN BENTHIC MARINE HABITATS APPLIED TO THE MALTESE ISLANDS<sup>46</sup>

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88. In the classification that follows, the nomenclature of habitat categories and subcategories and the numbering system is that of the original RAC/SPA classification<sup>47</sup>.
89. Our commentary on the various habitats is given in blue text immediately after the habitat number/name.
90. Those habitat types that do not occur in the Maltese Islands are listed in their correct place in the classification scheme but are greyed out.
91. Biocoenoses, associations, ecomorphoses and facies that we added to the RAC/SPA list in order to accommodate local assemblages are shown in dark red text. Such additions are given a progressive number code that fits in with the RAC/SPA code, however, the code for the 'new' additions is given in square brackets to make it clear that this is not part of the official RAC/SPA classification.
92. Only supralittoral, mediolittoral and infralittoral habitats are considered. Circalittoral and deeper life-zones are not considered as these are not well studied in the Maltese Islands.
93. We have based our interpretation of the various terms used in the RAC/SPA classification on the definitions provide in Appendix III ('Lexicon') of Annex VI of UNEP(OCA)/MED WG.154/7, even if some of these definitions are rather ambiguous and overlapping (see discussion in Appendix 2 of the present report). We have not limited the use of 'Facies' to animal character species as suggested by the RAC/SPA definition. We have used the category 'Enclave' more widely than in the original RAC/SPA scheme. We have also introduced the use of the term 'Complex' to describe the situation where there is a mixture of two distinct assemblage types that are of different 'rank' but which consistently occur together as a mosaic and are so finely interspersed that the two constituents cannot be practically mapped separately.

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<sup>46</sup> This section is based on an earlier draft by Pirota & Schembri (2000) made as part of the CAMP-Malta project.

<sup>47</sup> Annex VI of UNEP(OCA)/MED WG.154/7 [Report of the Fourth Meeting of National Focal Points for Specially Protected Areas (Tunis, 12-14 April 1999)].

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## I. SUPRALITTORAL

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### I.1 MUDDS

#### **I.1.1 Biocoenosis of beaches with slowly-drying wracks under glassworts**

Locally occurring Glassworts are angiosperms of the genera *Arthrocnemum* and *Salicornia*. The former occur in pockets of soil on rocky ground fringing the coast while the latter occur in saline marshlands. Where marine plant debris is deposited amongst these, this type of biocoenosis may occur; however it is very small scale and patchy, with the possible exception of certain saline marshlands (for example, Il-Ballut at Marsaxlokk) where considerable quantities of marine plant material may be deposited by large storms.

### I.2 SANDS

#### **I.2.1 Biocoenosis of supralittoral sands**

Occur although overall rare since only some 2.5% of the Maltese coastline consists of mobile sediments (the rest is rocky).

##### ***I.2.1.1 Facies with sands without vegetation, with scattered debris***

Possibly the commonest supralittoral sandy habitat<sup>48</sup>.

##### ***I.2.1.2 Facies of depressions with residual humidity***

Difficult to interpret but the wet depression behind the dunes at Ramla l-Hamra (Gozo) as also that behind the dunes at Il-Bajja ta' Santa Marija (Comino) might qualify.

##### ***I.2.1.3 Facies of quickly-drying wracks***

Possibly occur, although most wrack deposited on local sandy shores tends to be dominated by phanerogams debris and therefore falls under I.2.1.5.

##### ***I.2.1.4 Facies of tree trunks which have been washed ashore***

A little wood is sometimes deposited on sandy beaches after storms, but only in very small quantities and not tree trunks.

##### ***I.2.1.5 Facies of phanerogams which have washed ashore (upper part)***

Banks of (mainly) *Posidonia* debris washed ashore on sandy beaches are common especially in winter; in summer most are removed to clear the sand for recreational use and such banks only persist in remote pocket beaches.

We are assuming that the difference between this facies and that of quickly drying wrack (I.2.1.3) is that whereas the former desiccates rapidly, banks of phanerogam debris will only dry on the surface leaving the interior humid. If this assumption is correct, then a considerable thickness of phanerogam wrack must accumulate for this facies to form.

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<sup>48</sup> Deidun, A. (2001) *A study of the distribution and abundance of the supralittoral macrofauna of four Maltese sandy beaches*. Unpublished BSc (Hons) dissertation, Department of Biology, University of Malta.

## **I.3 STONES AND PEBBLES**

### **I.3.1 Biocoenosis of slowly-drying wracks**

Presumably, phanerogam (mostly *Posidonia*) debris washed ashore on shingle beaches. If so occur but quite rare since shingle beaches are rare. Present as small pockets (some inaccessible from the shore) within larger bays, for example St Julians Bay, Salina bay, Mellieha Bay, St Paul's Bay, Salina Bay and the Ramla l-Hamra/San Blas area in Gozo.

## **I.4 HARD BEDS AND ROCKS**

### **I.4.1 Biocoenosis of supralittoral rock**

#### ***I.4.1.1 Association with *Entophysalis deusta* and *Verrucaria amphibia****

Not know to occur locally, however, maritime lichens (including species of *Verrucaria*) occur but are patchily distributed. *Entophysalis deusta* is a cyanobacterium ('blue-green alga'); supralittoral cyanobacteria certainly occur but have not been studied.

#### ***I.4.1.2 Pools with variable salinity***

Such upper shore (supralittoral) rockpools occur and are very common on low-lying rocky shores.

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## **II. MEDIOLITTORAL**

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## **II.1 MUDS, SANDY MUDS AND SANDS**

### **II.1.1 Biocoenosis of muddy sands and muds**

#### ***II.1.1.1 Association with halophytes***

Presumably, what have been called saline marshlands in local habitat classifications. Occur but are rare and each saline marshland is different from the others. The vegetation of such saline marshlands is well known but the fauna has been inadequately studied. An interesting variant is what is referred to as 'transitional coastal wetlands' in local habitat classifications.

#### ***II.1.1.2 Facies with saltworks***

Not know if these occur. The only saltworks are the Salina salterns and the small areas with rock-cut salt pans that occur in a few places round the coast.

## **II.2 SANDS**

### **II.2.1 Biocoenosis of mediolittoral sands**

### **II.2.1.1 Facies with *Ophelia bicornis***

Occurs at Ramla I-Hamra (Gozo)<sup>49</sup> and some other beaches, but not all local sandy beaches display this facies and some are almost completely devoid of mediolittoral fauna<sup>50</sup>.

## **II.3 STONES AND PEBBLES**

### **II.3.1 Biocoenosis of mediolittoral coarse detritic bottoms**

#### **II.3.1.1 Facies of banks of dead leaves of *Posidonia oceanica* and other phanerogams**

Banks of (mainly) *Posidonia* debris washed ashore on sandy beaches are common especially in winter; in summer most are removed to clear the sand for recreational use and such banks only persist in remote pocket beaches. In many cases, locally facies grades into the supralittoral 'Facies of phanerogams which have washed ashore' (I.2.1.5). Extremely well developed banks occur at Ix-Xatt I-Ahmar (Gozo).

## **II.4 HARD BEDS AND ROCKS**

### **II.4.1 Biocoenosis of upper mediolittoral rock**

Four facies are listed under this heading in the RAC/SPA classification. They differ in which algae are dominant. The associations listed below may occur locally but in the absence of specific studies it is difficult to tell if they really fit the RAC/SPA classification. Our knowledge is too rudimentary for us to suggest the inclusion of 'new' associations to fit the local situation.

#### **II.4.1.1 Association with *Bangia atropurpurea***

Occurs where there is some organic pollution and wave action.

#### **II.4.1.2 Association with *Porphyra leucosticta***

Occurs where there is some organic pollution and wave action.

#### **II.1.1.3 Association with *Nemalion helminthoides* and *Rissoella verruculosa***

#### **II.1.1.4 Association with *Lithophyllum papillosum* and *Polysiphonia***

May occur but no information available to date.

### **II.4.2 Biocoenosis of lower mediolittoral rock**

Of the 10 facies/associations listed in the RAC/SPA classification, only some occur locally. However, many other facies/associations **not** included in the RAC/SPA classification also occur.

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<sup>49</sup> Sammut, M. (1995) *Aspects of the ecology of a sandy beach in Gozo*. Unpublished MSc. Dissertation, Department of Biology, University of Malta.

<sup>50</sup> Saliba, S. (2001) *Mediolittoral sandy bottom macrobenthic assemblages of Maltese beaches*. Unpublished BSc (Hons) dissertation, Department of Biology, University of Malta. Schembri, P.J.; Azzopardi, M.; Deidun, A. & Saliba, S. (2001) Low faunal diversity on Maltese sandy beaches: fact or artefact? Paper presented at *International Workshop 'Beaches – what future? An integrated approach to the ecology and evolution of beaches and sand dunes'* Dipartimento di Biologia Animale e Genetica 'Leo Pardi', Università di Firenze/Centro di Studio per la Faunistica ed Ecologia Tropicale del CNR/ European Commission; Florence, Italy – 18-23 October 2001 [abstracts book p.23]

#### **II.4.2.1 Association with *Lithophyllum lichenoides***

This refers to 'rims' or 'cornices' made of this species. Locally bioconstructions in the form of 'knobs' of this coralline alga are known from a few places but are however very rare.

#### **II.4.2.2 Association with *Lithophyllum byssoides***

Occurs.

#### **II.4.2.3 Association with *Tenarea undulosa***

#### **II.4.2.4 Association with *Ceramium ciliatum* and *Corallina elongata***

Common locally. *Corallina elongata* is particularly abundant in sheltered polluted inlets (e.g. the creeks in the Grand Harbour).

#### **II.4.2.5 Facies with *Pollicipes cornucopiae***

#### **II.4.2.6 Association with *Enteromorpha compressa***

Occurs on sheltered shores subject to some organic pollution and/or fluctuating salinity. *Enteromorpha linza* is more common locally than *Enteromorpha compressa* (e.g. at Marsaxlokk)

#### **II.4.2.7 Association with *Fucus virsoides***

#### **II.4.2.8 *Neogoniolithon brassica-florida* concretion**

This coralline alga occurs in the lower mediolittoral-upper infralittoral of local rocky shores, especially in shallow depressions where it forms a crust on the rock. It is not clear whether this RAC/SPA category refers to crusts of this species alone (which occur) or to associations of this species with vermetids (the vermetid 'trottoir'), which also occur<sup>51</sup>.

#### **II.4.2.9 Association with *Gelidium* spp.**

Occurs; common.

#### **II.4.2.10 Pools and lagoons sometimes associated with vermetids**

Occur and quite common, but most are very small.

### **II.4.3 Mediolittoral caves**

#### **II.4.3.1 Association with *Phymatolithon lenormandii* and *Hildenbrandia rubra***

Not studied but occur as, for example in the semi-submerged caves in the Qawra/Dwejra area (Gozo) and along the Ta'Cenc (Gozo) and Dingli Cliffs (Malta) coasts.

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<sup>51</sup> Azzopardi, L. & Schembri, P.J. (1997) Vermetid crusts from the Maltese Islands (Central Mediterranean). *Marine Life* 7(1-2): 7-16.

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## III. INFRALITTORAL

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### III.1 SANDY MUDS, SANDS, GRAVELS AND ROCKS IN EURYHALINE AND EURYTHERMAL ENVIRONMENT

Euryhaline and eurythermal environments are those with fluctuating salinity and temperature. We interpret this term in its broadest sense to encompass habitats that experience even small changes in salinity and temperature.

We have added another biocoenosis to the RAC/SPA list in order to include a number of distinct and well-characterised facies that occur locally in polluted harbour conditions but which do not fit in any present category of the RAC/SPA list.

#### **III.1.1 Euryhaline and Eurythermal biocoenoses**

Euryhaline biocoenoses occur where large volumes of freshwater runoff reach the sea, for example at Msida, Fomm Ir-Rih, Dwejra and where major *wied* systems open into embayments. These euryhaline environments are highly seasonal and in many cases where salinity fluctuations are small, the biota seems to be more dependent on other parameters (e.g. bottom type and depth).

Euryhaline biocoenosis may also occur where freshwater seepages from the terrestrial aquifers occur under water; quite a number of such seepages are known (for example, at Mgarr ix-Xini, Gozo) but none have been investigated ecologically. The hypersaline outflow from local Reverse Osmosis plants may also give rise to euryhaline environments but again none of these have been investigated ecologically.

Eurythermal biocoenoses occur at Marsa Creek and at Il-Hofra z-Zghira where the thermal effluent from the two power stations in these localities enters the marine environment. Marsa Creek is highly polluted and is very atypical, while the ecology of Il-Hofra z-Zghira has been investigated<sup>52</sup> and the effect of the thermal outflow was shown to be very localised; the benthos within the thermal plume at Il-Hofra z-Zghira is dominated by felts of cyanobacteria.

Of the 11 associations/facies listed in the RAC/SPA classification, the following seven occur (or may occur) locally:

#### **III.1.1.1 Association with *Ruppia cirrhosa* and/or *Ruppia maritima***

Occurs but is very rare.

#### **III.1.1.2 Facies with *Ficopomatus enigmaticus***

#### **III.1.1.3 Association with *Potamogeton pectinatus***

#### **III.1.1.4 Association with *Zostera noltii* in euryhaline and eurythermal environment**

#### **III.1.1.5 Association with *Zostera marina* in euryhaline and eurythermal environment**

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<sup>52</sup> Micallef, M.A. (2001) *Biological effect of the thermal effluent from the Delimara power station: a third study*. Unpublished BSc (Hons) dissertation, Department of Biology, University of Malta.

**III.1.1.6 Association with *Gracilaria* spp.**

Occurs.

**III.1.1.7 Association with *Chaetomorpha linum* and *Valonia aegagropila***

Associations with *Chaetomorpha* spp. occur but it is not certain if these are equivalent to the above RAC/SPA type; *Valonia aegagropila* has not been recorded from the Maltese Islands.

**III.1.1.8 Association with *Halopithys incurva***

Occurs but is rare.

**III.1.1.9 Association with *Ulva laetevirens* and *Enteromorpha linza***

Occurs and is common in embayments, especially those also receiving organic pollution. *E. linza* tends to be more abundant, for example, in Marsaxlokk Bay and in the Grand and Marsamxett Harbours.

**III.1.1.10 Association with *Cystoseira barbata***

Occurs. Locally this association is not restricted to eurythermal/euryhaline environments.

**III.1.1.11 Association with *Lamprothamnium papulosum***

**III.1.1.12 Association with *Cladophora echinus* and *Rytiphloea tinctoria***

This association may occur in modified form; *Rytiphloea tinctoria* has been recorded several times but is not common, however, *Cladophora echinus* has not been recorded. Another species of *Cladophora*, *C. prolifera*, is common in environments where organic pollution is present, for example, Il-Bajja ta' San Gorg and St Julians Bay.

**III.1.2] Biocoenoses of polluted harbour mud and sandy mud**

The sediment nomenclature used here follows that in Appendix II of the RAC/SPA habitats list, and mud is taken to be sediment with >75% fines<sup>53</sup> and sandy mud is taken to be sediment with 25-75% fines.

**III.1.2.1] Facies with *Cymodocea nodosa***

**III.1.2.2] Facies with *Halophila stipulacea***

**III.1.2.3] Facies with *Upogebia tipica***

**III.2 FINE SANDS WITH MORE OR LESS MUD**

In order to accommodate the biocoenoses actually listed under this heading in the official RAC/SPA list and at the same time be consistent with the sediment nomenclature adopted by the same list (Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7), we feel that the heading should more accurately read:

**III.2 FINE SANDS<sup>54</sup> AND FINE SANDS WITH MORE OR LESS MUD<sup>55</sup>**

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<sup>53</sup> 'Fines' = particles less than 0.063mm diameter, corresponding to the silt and clay fractions.

### **III.2.1 Biocoenosis of fine sands in very shallow waters**

What appear to be 'fine sands' in shallow water certainly occur; these have no macroscopic epibiota but have a moderately diverse endobiota dominated by bivalves and polychaetes; examples include the head of Mellieha Bay. Whether this is equivalent to the RAC/SPA type or not cannot be determined in the absence of appropriate granulometric and faunal studies. The descriptor "very shallow water" also needs quantification.

#### **III.2.1.1 *Facies with *Lentidium mediterraneum****

This tellinid bivalve does not appear to have been recorded from the Maltese Islands to date.

### **III.2.2 Biocoenosis of well-sorted fine sands**

#### **III.2.2.1 Association with *Cymodocea nodosa* on well-sorted fine sands**

*Cymodocea nodosa* occurs throughout the infralittoral from very shallow depths of less than 1m down to about 45-48m. It may occur as a dense meadow or very sparsely. It also occurs in creeks where turbidity is high and where there is organic pollution (e.g. Spinola Bay). It is usually rather short but may grow to about 20-30cm in shallow waters. It may occur as almost monospecific stands or in association with other seagrasses (*Posidonia oceanica* and *Halophila stipulacea*) and/or macroalgae (for example, *Caulerpa racemosa*).

#### **III.2.2.2 Association with *Halophila stipulacea***

This species is rare locally. It occurs in a few places, (e.g. at Cirkewwa) and is found in a wide depth range (1-32 m) often in association with *Cymodocea nodosa* (see III.2.2.1) and very rarely forms more or less monospecific stands.

**Locally may also occur as a facies.**

We have only found sparse patches of *Halophila stipulacea* and we consider it inappropriate to refer to these as an 'association'.

#### **[III.2.2.3] *Facies of well-sorted fine sands with *Caulerpa racemosa****

#### **[III.2.2.4] *Facies of well-sorted fine sands with *Diogenes pugilator****

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**NOTE:** Locally, the biocoenosis of well-sorted fine sands may also include enclaves with patches of *Posidonia oceanica* and/or patches of photophilic algae on bedrock and/or boulders are also to found.

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<sup>54</sup> In accordance with Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7, we interpret 'fine sands' to be sediments with <15% particles of 2mm diameter or over, <5% fines and Md<0.25mm.

<sup>55</sup> In accordance with Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7, we interpret 'fine sands with more or less mud' to be sediments with 5-25% particles of <0.063mm diameter.



### **III.2.3 Biocoenosis of superficial muddy sands in sheltered waters**

We interpret the descriptor “superficially muddy sand” to mean that the surficial layer of sediment consists of muddy sand<sup>56</sup> irrespective of what the subsurface sediment is.

#### **III.2.3.1 Facies with *Callianassa tyrrhena* and *Kellia corbuloides***

A facies equivalent to this one may or may not occur. *Callianassa tyrrhena* does not occur, but *Callianassa truncata* does. *Kellia corbuloides* does not occur but *Kellia suborbicularis* does. Thalassinid burrows occur in places where the marly Upper Globigerina Limestone or the Blue Clay are submerged, or where muddy sediment accumulates. Mixed populations of different species of thalassinid shrimps are also known (e.g. at Il-Bajja ta' San Gorg, St.Julians). We define a local facies with *Callianassa truncata* below (see [III.2.3.8]) which may be equivalent to this facies but which would be anomalous to include here as neither characteristic species of III.2.3.1 occur.

#### **III.2.3.2 Facies with freshwater resurgences with *Cerastoderma glaucum* and *Cyathura carinata***

It is difficult to decide if this facies occurs locally. *Cerastoderma glaucum* occurs in the brackish water pool at Ghadira so presumably it may also occur infralittorally (accumulations of empty shells occur in Marsaxlokk Bay, for example).

#### **III.2.3.3 Facies with *Loripes lacteus* and *Tapes spp.***

*Loripes lacteus* and *Tapes decussatus* occur in bays and harbours with muddy sand.

#### **III.2.3.4 Association with *Cymodocea nodosa* on superficially muddy sands in sheltered waters**

Meadows of *Cymodocea nodosa* are best developed on muddy sand bottoms. This seagrass grows to a considerable length, while the horizontal rhizomes interlace extensively producing a shallow ‘matte’ that may sometimes be up to 10-15cm high. However, this is very easily ripped off by moderate wave action. (e.g. Spinola Bay; Gnejna).

The associated dominant biota includes *Caulerpa racemosa* and *Halophila stipulacea*, both of which may grow extensively with, over and within the *Cymodocea nodosa* meadows.

**Locally may also occur as a facies.**

#### **III.2.3.5 Association with *Zostera noltii* on superficially muddy sands in sheltered waters**

#### **III.2.3.6 Association with *Caulerpa prolifera* on superficially muddy sands in sheltered waters**

This association has become rather uncommon locally. Extensive areas of this association have been recorded from St Paul's Bay.

**Locally may also occur as a facies.**

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<sup>56</sup> In accordance with Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7, we interpret ‘muddy sands’ to be sediments with 10-30% fines (particles <0.063 mm diameter) and 50-80% coarse material (0.063 mm to 2 cm).

**III.2.3.7 Facies of hydrothermal oozes with *Cyclope neritea* and nematodes**

This is difficult to interpret without further information. *Cyclope neritea* does occur locally.

**[III.2.3.8] Facies of superficially muddy sands with *Callianassa truncata***

**[III.2.3.9] Facies of superficially muddy sands with *Caulerpa racemosa***

**[III.2.2.4] Facies of superficially muddy sands with *Diogenes pugilator***

**[III.2.2.5] Facies of superficially muddy sands with *Upogebia pusilla***

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**NOTE:** Locally, the biocoenosis of superficial muddy sands in sheltered waters may include enclaves with patches of photophilic algae on bedrock and/or boulders and patches of stones and pebbles.

### **III.3 COARSE SANDS WITH MORE OR LESS MUD**

In order to accommodate the biocoenoses actually listed under this heading in the official RAC/SPA list and at the same time to be consistent with the sediment nomenclature adopted by the same list (Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7), we have taken the following sediment types to fall under this heading: coarse sand<sup>57</sup> and muddy heterogeneous sediment<sup>58</sup>.

The official RAC/SPA list does not include 'gravel' habitats (using the term as defined in (Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7). However it is obvious that the logical place for such habitats would be under the present heading, especially since the nomenclature of biocoenoses III.3.1 and III.3.2 in the official RAC/SPA list includes the term "fine gravel"<sup>59</sup>. Therefore we consider gravels<sup>60</sup> to also fall under this heading. Because of this we recommend that the category name be changed to:

### **III.3 COARSE SANDS AND GRAVELS WITH MORE OR LESS MUD**

This habitat as interpreted by us occupies extensive areas of bottom in deeper water. It may also occur in shallower water as pockets or patches

<sup>57</sup> In accordance with Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7, we interpret 'coarse sands' to be sediments with >50% sand, <5% fines and Md <2 mm.

<sup>58</sup> In accordance with Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7, we interpret 'muddy heterogeneous sediments' to be sediments with >5% fines, a 'high percentage' of pebbles/shells (i.e. particles >2mm diameter) and Md >0.5 mm. Note that Appendix II of Annex VI does not define the term 'high percentage'.

<sup>59</sup> Defined in Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7 as particle between 2mm and 5mm; actually there is no term "fine gravel" in this Appendix, but "small gravel and particles", which we interpret as the 'fine gravel' referred to in the list of habitats.

<sup>60</sup> In accordance with Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7, we interpret 'gravels' to be sediments with <50% pebbles (particles of >2cm diameter), <5% fines and Md >2 mm.

under and in between boulders, at the foot of drop-offs or as 'fill' in canals, trenches and large depressions on the seabed.

We needed to define two new biocoenosis in this section. That of '**coarse sands and muddy heterogeneous sediment**' (see [III.3.3]) is necessary to accommodate a number of distinctive assemblages that occur locally but which do not fall under any present category in the official RAC/SPA list, although they are obviously variants of the 'coarse sands with more or less mud' habitat. That of '**infralittoral gravels**' (see [III.3.4]) is necessary to accommodate local gravel habitats that again do not fit anywhere in the official RAC/SPA classification.

Locally the biocoenosis of coarse sands and gravels with more or less mud may include enclaves of other sediment types.

### **III.3.1 Biocoenosis of coarse sands and fine gravels mixed by the waves**

#### ***III.3.1.1 Association with rhodoliths.***

These shallow water accumulations of rhodoliths occur locally but are rare. Where present, the accumulations of rhodoliths are patchy and sparse.

### **III.3.2 Biocoenosis of coarse sands and fine gravels under the influence of bottom currents**

#### ***III.3.2.1 Maerl facies [=maerl association]***

We consider the term 'facies' to be a misnomer in this context at least for local use, since a distinct and extensive (up to 20km<sup>2</sup>) bottom type consisting of gravely sediment with a high cover of live rhodoliths and supporting a distinctive biota occurs in deeper water in the infralittoral to circalittoral transition zone<sup>61</sup>. We suggest that the term 'association' is therefore more appropriate.

The official RAC/SPA classification qualifies the maerl facies [=association] as being equivalent to the "Association with *Lithothamnion coralloides* and *Phymatolithon calcareum*". A study<sup>62</sup> of the maerl forming algae of Maltese maerl beds has shown that other species besides these two form the rhodolith component of Maltese maerl beds.

#### ***III.3.2.2 Association with rhodoliths***

Maerl is a habitat that occurs transitionally between the lower mediolittoral and the upper circalittoral; as such it may be found in both zones. The present category refers to infralittoral maerl and rhodolith habitats. The difference between the "maerl facies" [= maerl association (see III.3.2.1)] and the 'association with rhodoliths' listed in the RAC/SPA classification is presumably that maerl consists predominantly of rhodoliths and their fragmented remains while the association with rhodoliths refers to gravel with some rhodoliths. In our experience one type grades into the other.

<sup>61</sup> Borg, J.A.; Howege, H.M.; Lanfranco, E.; Micallef, S.A.; Mifsud, C. & Schembri, P.J. (1998) The macrobenthic species of the infralittoral to circalittoral transition zone off the northeastern coast of Malta (Central Mediterranean). *Xjenza* 3(1): 16-24. Schembri, P.J. (1998) Maerl ecosystems of the Maltese Islands. In: Dandria, D. [ed.] *Biology abstracts MSc, PhD 1998 and contributions to marine biology*. pp.35-37. Msida, Malta: Department of Biology, University of Malta; iv+38pp.

<sup>62</sup> Lanfranco, E.; Rizzo, M.; Hall-Spencer, J.; Borg, J.A. & Schembri, P.J. (1999) Maerl-forming coralline algae and associated phytobenthos from the Maltese Islands. *The Central Mediterranean Naturalist* 3(1): 1-6.

Locally maerl occurs as distinct beds (see III.3.2.1 above), however **sparse** accumulations of rhodoliths may occur as patches amongst other habitats, for example, *Posidonia* meadows.

### **III.3.3] Biocoenosis of coarse sands and muddy heterogeneous sediment**

#### ***III.3.3.1] Facies with *Spatangus purpureus****

#### ***III.3.3.2] Facies with *Cymodocea nodosa****

Note that this facies is different from all other assemblages with *Cymodocea nodosa* in that the nature of the bottom, which is best described as 'slightly gravely muddy sand' and that these are deep-water assemblages (usually >30m).

#### ***III.3.3.3] Facies with *Caulerpa racemosa****

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**NOTE:** Locally, the biocoenosis of coarse sands and muddy heterogeneous sediment may include enclaves with photophilic algae on bedrock and/or boulders as well as of other sediment types.

### **III.3.4] Biocoenosis of infralittoral gravels**

Here taken to refer to sediments consisting of <50% pebbles, <5% fines and Md >2 mm, in conformity with the sediment nomenclature in Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7.

## **III.4. STONES AND PEBBLES<sup>63</sup>.**

This is not a very common habitat locally. Examples occur at Ramla Bay (Gozo) and Gnejna Bay as well as in small coves and inlets all round the islands. The 'Inland Sea' at Dwejra is also a good example. An 'artificial' habitat of the same type occurs where building rubble has been dumped, such as at Tigne, Cirkewwa and Il-Bajja ta' San Gorg, St.Julians.

### **III.4.1 Biocoenosis of infralittoral stones and pebbles**

Here taken to refer to sediments consisting predominantly of particles with diameter in the size range 2-10cm, in conformity with the sediment nomenclature in Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7.

#### ***III.4.1.1 Facies with *Gouania wildenowi****

This suckerfish occurs locally so presumably the facies listed here also occurs.

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**NOTE:** Locally the biocoenosis of stones and pebbles may include enclaves with fine sands or with patches of photophilic algae on bedrock and/or boulders.

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<sup>63</sup> In accordance with Appendix II of Annex VI of UNEP(OCA)/MED WG.154/7, we interpret 'stones and pebbles' to be sediments with >50% pebbles (particles of >2cm diameter), <5% fines, and which may also include variable amounts of shell material.

## III.5 POSIDONIA OCEANICA MEADOWS

### **III.5.1 BIOCOENOSIS OF POSIDONIA OCEANICA MEADOWS**

Under this heading, the RAC/SPA classification lists four subcategories of which three occur locally. The only official RAC/SPA subcategory that has not been met with locally is the ecomorphosis of striped meadows. On the other hand, a number of other distinctive 'ecomorphoses' not listed in the official RAC/SPA classification occur locally. To accommodate these we have introduced a number of new categories. We had a particular problem defining a unit that consist of what is effectively a mixture of two distinct assemblage types that are of different 'rank' (for example, an association of macroalgae on rock interspersed with a particular *Posidonia* ecomorphosis). Although the two components are easily distinguished, they are too small to map individually and in any case consistently occur together as one mosaic. We have solved this problem by introducing the concept of a **complex** of assemblages, and we have defined two such complexes (see [III.5.1.8] and [III.5.1.9])

**III.5.1.1. Ecomorphosis of striped meadows**  
Not recorded locally.

**III.5.1.2 Ecomorphosis of 'barrier reef' meadows**

*Posidonia* 'barrier reefs' are very rare locally. Extensive barrier reefs are only known from two sites: Mellieha and Salina Bays. Both are degrading and need protection. *Posidonia* meadows with high matte walls (which are much more common) probably function similarly to barrier reefs as far as stability of sand and protection of coast are concerned; many of these are also threatened, however.

**III.5.1.3 Ecomorphosis of dead matte without much epiflora**  
Common.

**III.5.1.4 Association with *Caulerpa prolifera***  
Common.

**[III.5.1.5] Ecomorphosis of continuous *Posidonia oceanica* meadows on bedrock with enclaves of photophilic algae**

**[III.5.1.6] Ecomorphosis of continuous *Posidonia oceanica* meadows on sand with enclaves of bare sand**

**[III.5.1.7] Ecomorphosis of reticulate *Posidonia oceanica* meadows on sand with enclaves of bare sand**

**[III.5.1.8] Ecomorphosis of continuous *Posidonia oceanica* meadows on bedrock with enclaves of sciaphilic algae**

**[III.5.1.9] Complex of: Ecomorphosis of reticulate *Posidonia oceanica* on bedrock with enclaves of bare sand, mixed with the Association of *Peyssonnelia squamaria* and *Flabellia petiolata***

***[III.5.1.10] Complex of: Ecomorphosis of reticulate Posidonia oceanica on bedrock with enclaves of bare sand, mixed with the Association of Dictyopteris polypodiodes.***

***[III.5.1.11] Complex of: Ecomorphosis of reticulate Posidonia oceanica on bedrock with enclaves of bare sand, mixed with the Association of Cystoseira spp..***

## **III.6 HARD BEDS AND ROCKS**

The RAC/SPA classification lists one biocoenosis under this heading, that of 'infralittoral algae' with 37 separate associations or facies. Locally these assemblages (and others not included in the RAC/SPA list) occur on the following types of submerged rock or other hard surfaces:

Flat plateaux with exposed bedrock (mostly shoals and submerged rocky platforms).

Gentle slopes with exposed bedrock;

Steep slopes with exposed bedrock;

Boulder fields (occurring close to the shore or out at sea);

Boulder screes lining the shoreline (the infralittoral part of boulder shores);

Drop-offs at the shoreline (when the shore is a vertical cliff);

Drop-offs occurring out at sea (at the edge of shoals);

Shoals occurring out at sea (not continuous with the shore).

### **III.6.1 Biocoenosis of infralittoral algae**

Locally, photophilic algae, mostly phaeophytes, dominate the upper infralittoral (0-20m) on hard substrata in well-lighted situations wherever seagrasses are absent. They may also be co-dominant with seagrasses. Synoptically, local photophilic algal assemblages may be classified into a small number of sub-types:

(a) Mono-specific assemblages with one species completely dominant over several others that occur only in small numbers.

(b) Assemblages in which 2-3 species are co-dominant while other species occur in very small numbers.

(c) Mixed assemblages with no apparent dominant species but with 5-10 species co-occurring in more or less equal abundance.

The 'dominant' species used by us to characterised the different assemblages (and presumably also by RAC/SPA) refer mostly to 'tall-growing' forms, since these are the most conspicuous and the most easily seen when mapping benthic assemblages by our methods. This does not mean, however, that low growing and encrusting species are not present or are not important. Actually, at times they may be as abundant or even more abundant than the tall-growing species but are not conspicuous enough to be mapped as such without quantitative (i.e. quadrat) studies.

A special situation occurs in very shallow infralittoral waters. Here environmental conditions do not allow tall-growing species to survive or

they are ripped off periodically. Those normally tall-growing species that occur, do so as low-growing 'stunted' forms, for example *Sargassum vulgare*. Such associations probably warrant recognition as distinct assemblages, but we have not listed them as such as no studies have been made so far.

Semi-dark rocky substrata such as deep drop-offs, underhangs and the mouth of caves, are characterised by sciaphilic assemblages dominated by rhodophytes, by *Fabellia petiolata* and *Halimeda tuna*, and by *Halopteris* spp. and *Zonaria turneforti*. Away from the entrance, caves are dominated by rhodophytes, mainly encrusting species, together with bryozoans and sponges. Local cave assemblages have been little studied, however.

#### **III.6.1.1 Overgrazed facies with encrusting algae and sea urchins**

Occurs; often referred to as 'sea-urchin barrens'.

#### **III.6.1.2 Association with *Cystoseira amentacea***

Occurs on exposed shores

#### **III.6.1.3 Facies with vermetids**

It is not clear what this refers to. The two local facies with vermetids are that of *Dendropoma/Neogoniolithon* 'platform' ('trottoir'), which occurs at sea level and continues some way into the uppermost reaches of the infralittoral<sup>64</sup>, and that of the infralittoral *Serpulorbis arenaria*, which occurs on exposed rock in shallow water.

#### **III.6.1.4 Facies with *Mytilus galloprovincialis***

This mussel occurs only rarely and never forms mussel beds locally, except on the mooring lines of offshore fish-farms.

#### **III.6.1.5 Association with *Corallina elongata* and *Herposiphonia secunda***

The local association does not seem to include the second species named. *Corallina elongata* is usually restricted to shaded, vertical, submarine drop-offs in clean waters at a depth of 1-2 m and on rocky substrata in polluted creeks and inlets.

The following association also occurs:

#### **Association with *Corallina elongata***

#### **Association with *Corallina elongata* and *Amphiroa* sp.**

This association occurs in very polluted ports and harbours (e.g. the Cottonera creeks).

#### **III.6.1.6 Association with *Corallina officinalis***

Occurs

#### **III.6.1.7 Association with *Codium vermilaria* and *Rhodymenia ardissoni***

Occurs but locally has only been recorded in small patches (e.g. Manoel Island).

#### **III.6.1.8 Association with *Dasycladus vermicularis***

Occurs, particularly on rocky bottoms covered with a thin layer of sand (e.g. Marsalforn Bay, Gozo)

#### **III.6.1.9 Association with *Alsidium helminthochorton***

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<sup>64</sup> See Azzopardi & Schembri (1997).

**III.6.1.10 Association with *Cystoseira tamariscifolia* and *Saccorhiza polyschides***

**III.6.1.11 Association with *Gelidium spinosum* v. *hystrix***

**III.6.1.12 Association with *Lobophora variegata***

**III.6.1.13 Association with *Ceramium rubrum***

Might or might not occur.

**III.6.1.14 Facies with *Cladocora caespitosa***

This coral occurs and forms small colonies not more than 15cm in diameter. No 'reefs' (a continuous cover of colonies) such as found in the Adriatic are formed. This facies is rather rare and occurs as very small patches.

**III.6.1.15 Association with *Cystoseira brachycarpa***

Occurs; in previous studies recorded as *C. balearica*. Also, local records of *C. barbatula* may have referred to this species<sup>65</sup>.

**III.6.1.16 Association with *Cystoseira crinita***

Might or might not occur.

**III.6.1.17 Association with *Cystoseira crinitophylla***

Might or might not occur.

**III.6.1.18 Association with *Cystoseira sauvageauana***

**III.6.1.19 Association with *Cystoseira spinosa***

Locally *Cystoseira spinosa* may also occur accompanied by a variety of subdominants, including: *Cystoseira* cf. *squarrosa*, *Cystoseira ercegovicii* and *Dictyopteris polypodioides*.

**III.6.1.20 Association with *Sargassum vulgare***

Occurs, however an association in which *Sargassum vulgare* is co-dominant and one based on a different species of *Sargassum* also occur:

**Association with *Sargassum acinarium***

**III.6.1.21 Association with *Dictyopteris polypodioides***

Locally *Dictyopteris polypodioides* may also occur accompanied by a variety of subdominants, including: *Cystosiera* cf. *squarrosa* and *Cystoseira ercegovicii* (= *C. schiffneri* var. *tenuiramosa*)

**III.6.1.22 Association with *Calpomenia sinuosa***

Occurs.

**III.6.1.23 Association with *Stypocaulon scoparium* (= *Halopteris scoparia*)**

Occurs and associations with other species of *Halopteris* also occur.

The following association also occurs:

**Association with *Halopteris scoparia* and *Padina pavonica***

**III.6.1.24 Association with *Trichosolen myura* and *Ligora farinosa***

<sup>65</sup> Edwin Lanfranco (University of Malta), personal communication 2002.



**III.6.1.25 Association with *Cystoseira compressa***

Occurs.

**III.6.1.26 Association with *Pterocladia capillacea* and *Ulva laetevirens***

This occurs in polluted waters subject to wave action.

**III.6.1.27 Facies with large Hydrozoa**

Not clear what this refers to however, large Hydrozoa occur locally in on rocky substrata in polluted creeks and inlets (e.g. Marsamxett Harbour) and on the shaded, vertical submarine drop-offs in clean waters at a depth of 1-2 m.

**III.6.1.28 Association with *Pterothamnion crispum* and *Compsothamnion thuyoides***

This is a sciaphilic association that may occur however the sciaphilic assemblages of the Maltese Islands have not been studied.

**III.6.1.29 Association with *Schottera nicaeensis***

Associations with *Schottera* spp. occur in shady situations.

**III.6.1.30 Association with *Rhodymenia petiolata* and *Rhodophyllis divaricata***

A sciaphilic association that may or may not occur. The first species occurs but the second has not been recorded locally.

**III.6.1.31 Facies with *Astroides calycularis***

Common in shady situations

**III.6.1.32 Association with *Flabellia petiolata* and *Peyssonnelia squamaria***

Occurs in shade. Other associations in which *Flabellia petiolata* is dominant or co-dominant also occur.

**III.6.1.33 Association with *Halymenia floresia* and *Halarachnion ligulatum***

A sciaphilic association that may or may not occur; the first species occurs but the second has not been recorded locally.

**III.6.1.34 Association with *Peyssonnelia rubra* and *Peyssonnelia* spp.**

Occurs in shade. Locally species of *Peyssonnelia* may also occur accompanied by a variety of subdominants, including: *Flabellia petiolata*, *Halimeda tuna* and *Pseudolithophyllum* spp.

**III.6.1.35 Facies and associations of coralligenous biocoenosis (as enclave)**

Occur but not studied.

**III.6.1.36 Facies with *Chondrilla nucula***

This sponge occurs in well-lit conditions. It usually occurs in patches.

**III.6.1.37 Facies with *Microcosmus exasperatus***

May or may not occur; this ascidian has not been recorded but the ascidian fauna of the Maltese Islands has yet to be studied.

The following associations do not fit in the RAC/SPA list under any heading but have been encountered locally:

**Association with *Dictyota dichotoma* and *Halimeda tuna***

Occurs in polluted ports and harbours (e.g. the Cottonera creeks).

**Association with *Cladophora prolifera***

Occurs in polluted and mildly polluted ports and harbours (e.g. St Julians Bay).

***Association with Padina pavonica***

***Association with Acetabularia acetabulum***

***Association with Cystoseira cf. squarrosa***

***Association with Cystoseira ercegovicii (= C. schiffneri var tenuiramosa)***

***Association with Zonaria tourneforti***

***Association with Halimeda tuna***

***Association with Halopitys pinastroides***

***Association with Desenia simplex***

***Association with algal turf***

***Association with Caulerpa racemosa***

*Caulerpa racemosa* seems to grow extensively on all types of bottom including vertical drop-offs (for example at Cirkewwa and Fomm-ir-Rih, where it grows on vertical rock faces). This probably warrants the recognition of a new association such as the above.

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## 6. THE MARINE HABITATS LISTED IN ANNEX I OF THE HABITATS DIRECTIVE AND APPLICABILITY TO MALTA

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94. It must be stated at the onset that the EUR15/2 classification of EU habitats adopted by the Habitats Committee on 4 October 1999<sup>66</sup> and which is the reference classification presently used for Annex I habitats of the Habitats Directive, has not been designed for use in the marine environment and consequently, the Habitat Directive is generally difficult to apply to the marine environment.
95. One key problem with applying the EUR15/2 classification to the marine environment is that as far as sublittoral habitats are concerned, the classification does not actually refer to 'habitats' but to 'seascapes' (e.g. estuaries, mudflats, inlets, bays) – that is, complexes of habitats.
96. What follows is a list of the marine habitat categories listed in EUR15/2 that are relevant to the present assignment together with an analysis of their applicability to the Maltese situation. In performing this analysis we have drawn heavily on the interpretation of the EUR15/2 classification made by statutory conservation agencies of the United Kingdom (UK), since we found that of all EU member states, the UK had the most developed and logical interpretation supported by reasoned arguments and published documentation that could be adapted for local use. In this regard, we found the reports by Brown *et al.* (1997), Jones *et al.* (2000), and Davies *et al.* (2001) particularly useful.
97. In the following list, habitat definitions are taken from the EUR15/2 Interpretation Manual.

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<sup>66</sup> European Commission (1999) *Interpretation manual of European Union habitats. EUR 15/2* [October 1999]. Brussels: DG Environment, European Commission; 119pp.

## **SANDBANKS WHICH ARE SLIGHTLY COVERED BY SEA WATER ALL THE TIME**

**[EUR15/2 CODE: 1110]**

### **Definition**

Sublittoral sandbanks, permanently submerged. Water depth is seldom more than 20m below Chart Datum. Non-vegetated sandbanks or sandbanks with vegetation belonging to the *Zosteretum marinae* and *Cymodoceion nodosae*.

### **Discussion**

On the basis of the associated species and equivalent categories in the Interpretation Manual, this habitat is interpreted as consisting of soft sediment types, broadly described as 'sands' but which includes both clean fine to coarse sand as well as sand mixed with both finer and coarser material (gravelly sands, muddy sands, sand with occasional rhodoliths), permanently covered by shallow sea water, typically at depths of less than 20m below chart datum, which for the Maltese Islands practically translates to mean sea-level.

Thus interpreted, this habitat type corresponds to the following RAC/SPA major categories and their included units (with the exceptions noted below) as adapted by us for the Maltese Islands (see Section 5).

- III.1 Sandy muds, sands, gravels and rocks in euryhaline and eurythermal environments [except rock and assemblages occurring at depths >20m]
- III.2 Fine sands and fine sands with more or less mud [except assemblages occurring at depths >20m]
- III.3 Coarse sands and gravels with more or less mud [except assemblages occurring at depths >20m]

In the Maltese Islands this habitat type occurs widely in large shallow bays, smaller embayments, creeks and the harbours. The types of assemblages associated with this habitat type are determined primarily by the sediment type and by such other physical factors as shelter, depth, turbidity, salinity fluctuations and, for some impacted sites, the degree of nutrient enrichment. The biota is typically characterized by a burrowing infauna of worms, crustaceans, bivalve molluscs and echinoderms. An impoverished macro-epifauna of decapod crustaceans, prosobranch molluscs, echinoderms and benthic fish also occurs. If present, vegetation is limited to the pioneering seagrasses *Cymodocea nodosa* and to a lesser extent *Halophila stipulacea*, as well as a few algae such as *Caulerpa prolifera* and *Caulerpa racemosa*.

Where coarse material such as shells, gravel or pebbles is present, an epibiota of attached species including encrusting and foliose algae, hydroids, bryozoans and tubicolous polychaetes may develop. Heterogeneous sediments consisting of sand and coarser material have higher species richness than more homogeneous or finer sediments.

## **POSIDONIA BEDS (*POSIDONION OCEANICAE*)**

### **[EUR15/2 CODE: 1120] – PRIORITY HABITAT**

#### **Definition**

Beds of *Posidonia oceanica* (Linnaeus) Delile characteristic of the infralittoral zone of the Mediterranean (depth: ranging from a few dozen centimetres to 30 - 40 metres). On hard or soft substrate, these beds constitute one of the main climax communities. They can withstand relatively large variations in temperature and water movement, but are sensitive to desalination, generally requiring a salinity of between 36‰ and 39‰.

#### **Discussion**

This habitat corresponds to the following RAC/SPA major category and its included units as adapted by us for the Maltese Islands (see Section 5):

- III.5 *Posidonia oceanica* meadows

Dense and healthy *Posidonia oceanica* meadows cover large areas of bottom off the Maltese coasts and extend to considerable depths, in places down to 43-44m (Borg & Schembri, 1995). However, at some sites where there is a strong anthropogenic influence, *Posidonia* meadows have regressed or have been extirpated altogether (Borg & Schembri, 1995; Schembri, 1995).

Off the north and northeast coasts of Malta and Gozo, isolated patches of *P.oceanica* usually appear at the 3-4m depth contour, while continuous meadows usually become established at a depth of approximately 7-8m on soft sediment. Where submarine boulder fields occur on predominantly sedimentary bottoms or where there are rocky outcrops surrounded by sand, *P.oceanica* may also grow on rock, provided that a veneer of sediment is present. Continuous meadows in very shallow water (1-3 m) are only found in the more sheltered bays and inlets.

The Malta-Comino and Comino-Gozo Channels have particularly dense and healthy meadows. One of the deepest records of *P.oceanica* from the Maltese Islands (and also one of the deepest records for the whole of the Mediterranean) comes from off the southwestern coast of Comino Island, where sparse meadows occur at a depth of ca 43-44m (Borg & Schembri, 1995).

In the Maltese Islands, *P.oceanica* meadows occur as two main subtypes: the **continuous meadows** and the **reticulate or non-continuous meadows**, which are meadows in which seagrass beds are intermixed with channels and areas of bare sand or bedrock. At both the upper and lower depth limits, reticulate meadows tend to break up to give of small patches that intergrade with adjacent biotopes. Extensive patches of matte may also contain troughs free of seagrass that elongate and finally amalgamate to form 'intermatte channels'. These channels may in turn contain layers of dead leaves and other decomposing organic debris. *P.oceanica* may also form other structures such as the 'collines', which are small hill-like patches of *P.oceanica*, surrounded by bare sand.

*Posidonia* 'barrier reefs' occur at Mellieha Bay (Borg & Schembri, 1993) and Salina Bay. These reefs are characterised by a thick layer of matte (at least 1m), and healthy *P.oceanica* shoots forming extensive bands over considerable areas of the matte. Such reefs mostly occur where conditions for growth of *P.oceanica* are ideal and where vast areas of sandy sediments are readily available. In a fully developed reef, the matte usually originates close

to the shore and extends out to sea. Depths across the surface of the reef remain relatively constant when compared with the depth profile of the uncolonised substratum. This is because the thickness of the mat makes up for any increase in substratum depth. We have recorded mat as high as 2.5m at Mellieha Bay. Generally, a reef also extends for a considerable distance parallel to the shore. A second type of *P.oceanica* reef does not originate close to the shoreline but at some distance away. Such reefs may grow up to the surface until the taller shoots die back because they are exposed to the air by wave action or sea level fluctuations. The dimensions of both types of reef can be such that they act as wave breakers protecting the inner regions of bays and coves.

## **ESTUARIES**

### **[EUR15/2 CODE: 1130]**

#### **Definition**

Downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays', there is generally a substantial freshwater influence. The mixing of freshwater and seawater and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where the tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary.

#### **Discussion**

There are no rivers in the Maltese Islands and therefore no estuaries. During the wet season of the year, most local *widien*<sup>67</sup> drain runoff water following substantial rainfall episodes and brackish water and saline wetlands develop at the mouth of some of these *widien* where they open on coast, however, these habitats are not 'estuaries' as defined above and in any case, are identified as (non-marine) habitat types in their own right in Annex I of the Habitats Directive.

Submarine freshwater flows occur in some places (for example, at Mgarr ix-Xini). Their contribution to altering the salinity of the water (and therefore affecting the nature of assemblages present) is not known and in any case, such submarine freshwater flows are not 'estuaries' in any sense of the word.

Therefore this habitat type does not occur in the Maltese Islands.

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<sup>67</sup> The local name for dry river valleys.

## MUDFLATS AND SANDFLATS NOT COVERED BY SEAWATER AT LOW TIDE

[EUR15/2 CODE: 1140]

### Definition

Sands and muds of the coasts of the oceans, their connected seas and associated lagoons, not covered by sea water at low tide, devoid of vascular plants, usually coated by blue algae and diatoms. They are of particular importance as feeding grounds for wildfowl and waders. The diverse intertidal communities of invertebrates and algae that occupy them can be used to define subdivisions of 11.27, eelgrass communities that may be exposed for a few hours in the course of every tide have been listed under 11.3, brackish water vegetation of permanent pools by use of those of 11.4.

### Discussion

The 'Interpretation Manual' gives no explanation for the numerical codes used in the definition, however, it is assumed that these refer to the Palaeartic Classification codes as follows:

11.27. Soft sediment littoral communities: Invertebrate and algal communities colonizing soft sediments such as mud, sand or gravel of the intertidal zone.

11.3. Sea-grass meadows: *Zosteretea marinae*, *Posidonietae*, *Halodulo-Thalassietea*. Beds of submerged marine vascular vegetation of the oceans, seas and coastal lagoons, except those of brackish seas and lagoons.

11.4. Brackish sea vascular vegetation: *Ruppiaetea maritima*: *Ruppiaetalia maritima*: *Ruppion maritima*. Beds of submerged or slightly emergent vascular vegetation of brackish seas, sea inlets, estuaries, permanent pools of mud or sand flats, and coastal lagoons.

Maltese shores are microtidal with a maximum spring range of not more than 30cm, whereas meteorological oscillations in sea-level have a much greater amplitude. Consequently, there are no extensive areas of shore that are uncovered by the tide. In any case, only some 2.4% of the local coastline of 190km consists of mobile sediments, mostly sand and some shingle, and of which only a minute fraction consist muddy sand (Anderson & Schembri, 1989).

Therefore, in the Maltese Islands there are therefore no sandflats or mudflats (or any other sediment types) submerged at high tide and exposed at low tide such as defined above. Neither are there seagrass beds that are exposed to the atmosphere. Permanent brackish-water pools with submerge and partly emerged macrophytic vegetation exist, even if very rare, but these are excluded from the definition.

Therefore, this habitat type does not occur in the Maltese Islands.



## COASTAL LAGOONS

### [EUR15/2 CODE: 1150] – PRIORITY HABITAT

#### Definition

Lagoons are expanses of shallow coastal salt water, of varying salinity and water volume, wholly or partially separated from the sea by sandbanks or shingle, or, less frequently, by rocks. Salinity may vary from brackish water to hypersalinity depending on rainfall and evaporation, or the addition of fresh seawater from storms, temporary flooding of the sea in winter or tidal exchange. With or without vegetation from *Ruppiaetea maritima*, *Potamoetea*, *Zosteraetea* or *Charaetea* (CORINE 91: 23.21 or 23.22).

Flads and gloes, considered a Baltic variety of lagoons, are small, usually shallow, more or less delimited water bodies still connected to the sea or have been cut off from the sea very recently by land upheaval. Characterised by well-developed reedbeds and luxuriant submerged vegetation and having several morphological and botanical development stages in the process whereby sea becomes land.

Salt basins and salt ponds may also be considered as lagoons, providing they had their origin on a transformed natural old lagoon or on a saltmarsh, and are characterised by a minor impact from exploitation.

#### Discussion

As defined above, lagoons are areas of shallow, coastal salt water, wholly or partially separated from the sea by natural barriers (sandbanks, shingle or rocks). This definition is rather broad and accommodates a wide range of types with different origins, including: **isolated lagoons** (completely separated from the sea by a barrier of rock or sediment through which seawater enters by limited ground water seepage or by over-topping of the sea barrier); **percolation lagoons** (normally separated from the sea by shingle banks through which seawater enters by percolating through the shingle); **silled lagoons** (where water in the lagoons is retained a barrier of rock – the 'sill'; seawater input is regular and frequent by overtopping but although salinity may be seasonally variable, it is usually high); **sluiced lagoons** (where the natural movement of water between the lagoon and the sea is modified by human mechanical interference such as the construction of a culvert under a road); **lagoonal inlets** (sea water enters lagoonal inlets on each tide – or in the case of microtidal coasts, with variations in sea-level – and salinity is usually high).

A variety of situations that approximate lagoonal environments exist in the Maltese Islands: the fishponds at Il-Maghluq at Marsaskala (sluiced lagoon), the pool at the Il-Ballut marsh at Marsaxlokk (percolation lagoon), the pool at Ghadira s-Safra when this is filled with water (isolated lagoon), the pools at the Ghadira and Simar bird sanctuaries (sluiced lagoons), the salterns at Salina and various large saltpans round the coast (silled lagoon), and the 'canal' at Marsa and I-Sokkorsu at Salina (lagoonal inlets).

The water in these 'lagoons' can vary in salinity from brackish (owing to dilution of sea water by fresh water) to hypersaline (as a result of evaporation). The plant and animal communities vary according to the physical characteristics and salinity regime of the 'lagoon', and therefore there are significant differences between sites. Although a limited range of species are present compared with other marine habitats, these species are especially adapted to the varying salinity and some are unique to these 'lagoon habitats'.

However, none of these environments is entirely natural; some are actually natural features that have been partly altered for human use (e.g. Il-Maghluq, Il-Ballut), others are natural marshy habitats that have been engineered into bird sanctuaries, creating a lagoon in the process (e.g. Ghadira and Simar), others suffer a great deal of human disturbance (e.g. Ghadira s-Safra), and others are completely artificial (the salterns at Salina).

A particular situation occurs at Il-Qawra in Gozo, popularly called the 'Inland Sea'. Here a coastal solution subsidence structure (Pedley, 1975) has become connected to the open sea by a ca 100m long tunnel (Ghar Zirka) such that the deepest parts of the depression are flooded by seawater resulting in what is in effect a completely enclosed body of seawater with an average depth of ca 18m, whose only connection with the open coast is the Ghar Zirka tunnel. The marine assemblages within Il-Qawra are not notably different from those of the open coast, however, a short preliminary study by Wells (1984) provided data to suggest that significant differences in algal species richness and abundance exist between Il-Qawra and the open coast; it was also suggested that one factor that may account for these differences are the hypohaline conditions that prevail in Il-Qawra during freshets following rainfall episodes. Due to the sporadic hypohaline conditions at some times of the year and the partly restricted connection with the sea, the Il-Qawra 'Inland Sea' may be considered as a lagoon intermediate between a silled lagoon and a lagoonal inlet. However, much more study of the dynamics of Il-Qawra is necessary since the connection with the sea is not really all that restricted (the water in the tunnel is deep and only obstructed by boulders from rockfalls from the roof) and the duration of hypohaline conditions is not known but may be quite transient; moreover, other factors apart from fluctuating salinity may account for the impoverished algal assemblages within Il-Qawra, for example, Wells (1984) also implicates elevated rates of grazing by sea urchins.

## LARGE SHALLOW INLETS AND BAYS

### [EUR15/2 CODE: 1160]

#### Definition

Large indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited. These shallow indentations are generally sheltered from wave action and contain a great diversity of sediments and substrates with a well developed zonation of benthic communities. These communities generally have a high biodiversity. The limit of shallow water is sometimes defined by the distribution of the *Zosteretea* and *Potametea* associations. Several physiographic types may be included under this category provided the water is shallow over a major part of the area: embayments, fjards, rias and voes.

#### Discussion

As defined above, large shallow inlets and bays are complex systems composed of an interdependent mosaic of sublittoral, littoral and adlittoral (terrestrial) biotopes, several of which are habitat types included in Annex I in their own right (e.g. sandbanks, seagrass meadows etc.).

Being a complex of biotopes, the 'large shallow inlets and bays' of Annex I may encompass practically all the biotopes types of the RAC/SPA classification included under the domains of: I Supralittoral, II Mediolittoral and III Infralittoral, provided that they occur in shallow water.

The term 'shallow' is defined in the 'Interpretation Manual' with reference to the phytosociological units *Zosteretea* and *Potametea*, which are not appropriate for the Mediterranean and certainly not for the Maltese Islands. On the other hand, in a footnote (19), the 'Interpretation Manual' states that it is "*inappropriate to fix a maximum water depth, since the term 'shallow' may have different ecological interpretations according to the physiographic type considered and geographical location.*" Given that the intention is to use the seagrass *Zostera* (as an indicator of lower limit) and that some EU member states include water down to 30m in their interpretation of this habitat type (e.g. the United Kingdom<sup>68</sup>), we propose that the lower limit for 'shallow' in the case of Malta be taken as 40m, which is close to the maximum depth at which the seagrass *Posidonia oceanica* is normally found (see discussion on 'Posidonia beds' above).

Interpreted thus, 'large shallow inlets and bays' are large indentations of the coast, generally more sheltered from wave action than the open coast. They are relatively shallow, averaging less than 40m in depth. In the Maltese Islands, two main physiographic types can be identified that fall within the definition:

- Embayments – bays in which the line of the coast follows a concave sweep between rocky headlands, with a wide or narrow mouth.
- Rias – a drowned river valley which in the local contexts translates to the mouth of a *wied* where it opens on the coast which has been inundated by the sea due to a post-Pleistocenic rise in sea-level.

Another problem of definition, especially when it comes to designation sites, is the term 'large'. This term is not defined in the 'Interpretation Manual' and in any case 'large' is

<sup>68</sup> In the UK 'shallow' this has been interpreted as a depth of 30m below chart datum or shallower across at least 75% of the site (Brown *et al.*, 1997).

relative, since what constitutes a large embayment in Malta (e.g. Marsaxlokk Bay, Mellieha Bay, Ramla Bay) would be considered miniscule on a continental scale, whereas some very important bays and inlets are quite small. We therefore propose that designation be based mainly on biological importance of the assemblages and biotopes present and only secondarily on the criterion of size.

## REEFS

### [EUR15/2 CODE: 1170]

#### Definition

Submarine, or exposed at low tide, rocky substrates and biogenic concretions, which arise from the seafloor in the sublittoral zone but may extend into the littoral zone where there is an uninterrupted zonation of plant and animal communities. These reefs generally support a zonation of benthic communities of algae and animal species including concretions, encrustations and corallogenic concretions.

#### Discussion

As defined in the 'Interpretation Manual' reefs are rocky marine habitats or biological concretions that rise from the seabed. While they are sublittoral, they may extend as an unbroken transition to the littoral zone, where their upper reaches may be exposed to the air at low tide or, locally, due to sea-level fluctuation. Reefs are therefore composed of a complex of different biotopes, some of which may be included in Annex I of the Habitats Directive in their own right (e.g. *Posidonia* 'barrier reefs' – see below).

A number of biotopes of the RAC/SPA classification, especially those included under the category 'Hard beds and rocks' (III.4), as well as the 'Ecomorphosis of barrier reef [*Posidonia*] meadows' (III.5.1.2), constitute, or are components of 'reefs' as defined in the 'Interpretation Manual'.

Two main types of reef can be recognised, those where structure is created by the biota themselves (**biogenic reefs**) and those where animal and plant communities grow on raised or protruding rock (**rocky reefs**).

Only a few species are able to develop biogenic reefs, which are therefore restricted in distribution and extent. In the Maltese context, such species are mainly encrusting coralline algae that are able to form raised layered structures on the substratum or to consolidate loose substratum material into a massive concretion. Other species such as bryozoans and vermetid gastropods may contribute to these structures. The seagrass *Posidonia oceanica* also gives rise to raised structures from the seabed composed of rhizomes, roots and sediment ('matte') that have been described as 'barrier reefs'; these occur in the Maltese Islands (Pirotta & Schembri 1997b) but are rare. These are considered under 1120 *Posidonia* beds (see above).

There is a far greater range and extent of rocky reefs than biogenic concretions. These range from vertical rock walls rising from the seabed to the surface and beyond (the underwater continuation of coastal cliffs), dropoffs (underwater cliffs) which may be sheer or stepped (Pirotta & Schembri, 1997a), rocky shoals (in Maltese: *sikka*) which are the equivalent of underwater hills rising from a more or less level bottom, and boulder fields. The common feature between these different forms is that a more or less vertical rock face arises from a level bottom that may be sedimentary or rocky, and that due to the steep gradient, the biotic assemblages present are characterised by attached algae and invertebrates, quite often showing a distinct zonation with photophilic species on the lighted upper reaches of the reef, and progressively sciaphilic ones in the darker lower regions. The situation may be much more complex since particular physiographic features such as the presence of crevices, ledges, patches of sediment and screes will support additional assemblages associated with

these microhabitats. In addition, a range of mobile animals, both invertebrates and fish are usually associated with rocky reefs.

## **SUBMARINE STRUCTURES MADE BY LEAKING GASES**

**[EUR15/2 CODE: 1180]**

### **Definition**

Spectacular complex structures, consisting of rocks, pavements and pillars up to 4m high, formed due to aggregation of sandstone by carbonate cement resulting from microbial oxidation of gas emissions, mainly methane. The methane most likely originated from the microbial decomposition of fossil plant materials. The formations are interspersed with gas vents that intermittently release gas. These formations shelter a highly diversified ecosystem with brightly coloured species.

### **Discussion**

No such structures exist in the Maltese Islands.

## SUBMERGED OR PARTIALLY SUBMERGED SEA CAVES

[EUR15/2 CODE: 8330]

### Definition

Caves situated under the sea or opened to it, at least at high tide, including partially submerged sea caves. Their bottoms and sides harbour communities of marine invertebrates and algae.

### Discussion

Both submerged and partially submerged caves are common in the Maltese Islands. In addition other cave-like environments present include tunnels (caves open at both ends), deep overhangs (concavities that penetrate a considerable distance into the rock) and clefts (large, deeply-penetrating irregular fissures in the rock). Where boulder fields with multiple layers of massive boulders are present, the spaces between the boulders also give rise to a cave-like environment, although these last are not regarded as caves.

Locally caves arise by the direct action of the sea on the limestone rock at sea-level, where the force of the waves develop fissures in the rock into clefts and eventually caves and tunnels. This effect is enhanced if the water carries abrasive suspended material. Other caves originated on land due to karst-fluvial processes and then became totally or partially submerged due changes in sea-level. Some such caves continue above sea-level as terrestrial caves, and some may have freshwater seepages that give rise to a distinct halocline in the cave (e.g. Ghar Harq Hamiem). Some caves are formed by a combination of processes, both terrestrial and marine.

In general, there are three distinct zones in the deeper (in the sense of penetration into the rock) marine caves<sup>69</sup>: an outer section where some light penetrates and allows the growth of photophilic algae at the mouth and progressively more sciaphilic species further inwards from the mouth; a middle section dominated by sessile invertebrates (sponges, corals, tubicolous polychaetes, bryozoans, hydroids, branchiopods, foraminifera) with few algae, almost all encrusting corallines; and a completely dark inner section largely devoid of sessile organisms. This pattern results from the strong environmental gradients that exist, especially in light intensity and turbulence, as one proceeds inwards from the mouth. The extent of these three life-zones depends on a number of physiographic features, including depth (below sea-level) of the cave, aspect of the mouth, size and configuration of the mouth, depth (penetration into the rock) of the cave. Other factors that may also determine the type of biotic assemblages present include temperature, the presence of haloclines, the presence of side-branches, ledges and other geomorphological features in the cave itself, and the nature of the cave floor, which may be rock or covered with sediment that in turn may be coarse to very fine. The floor of local partially submerged caves tends to be strewn with cobbles and pebbles and small boulders, resulting from roof-falls.

Caves are thus complex habitats with a variety of biotopes. One of the most scientifically interesting features of caves in relatively shallow water is that the sciaphilic assemblages that live in caves consist predominantly of the same species as the circalittoral assemblages found in deeper waters (beyond 40-50m depth). In a sense therefore, the very steep light

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<sup>69</sup> Marine cave is here taken to mean either fully submerged caves or the submerged part of emergent caves. The terrestrial and supralittoral to mediolittoral component of emergent caves is not considered.



gradients present in caves allow normally circalittoral species to occur within the infralittoral zone where they accessible using normal SCUBA techniques.

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## 7. SELECTION AND ESTABLISHMENT OF NATURA 2000 SITES

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### 7.1 THE SITE SELECTION PROCESS

98. Article 4 of the Habitats Directive sets out the process for the establishment of SACs.
- Step 1 Member States prepare national lists of sites of importance for Annex I habitat types and Annex II species of EU interest, based on relevant scientific information and the criteria listed in Annex III Stage 1, and submit the lists to the European Commission.
  - Step 2 The national lists are reviewed by the European Commission in the light of the criteria listed in Annex III Stage 2 and within the context of biogeographical regions [Article 1(c) iii] and the EU as a whole. The European Commission, in agreement with each Member State, will adopt selected sites on the Member States' national lists as SCIs.
  - Step 3 The SCIs adopted in Step 2 above will be designated by Member States as SACs within six years of adoption by the European Commission.
99. Article 4 also sets out the time frame for this process for Member States. For NASs such as Malta, the national list of sites required by Step 1 has to be ready by the date of accession.
100. Annex III of the Habitats Directive breaks down the process that Member States and the European Commission must follow in drawing up the list of SCIs into two stages (see Step 1 and Step 2 above), as follows:
- Stage 1 - assessment of the relative importance of sites containing examples of the individual Annex I habitat types and Annex II species in each Member State;
  - Stage 2 - assessment of the overall importance of the sites in the context of the appropriate biogeographical region and the EC as a whole.
101. The criteria to be employed in Stage 1 are listed in Annex III. They can be summarised as:
- For habitats
    - (a) Degree of representativity;
    - (b) Area;
    - (c) Degree of conservation of habitat structure and function and restoration possibilities;
    - (d) Global assessment of the site (i.e. the overall assessment, based on (a)–(c) above).
  - For species
    - (a) Proportion of the total national population at the site;

- (b) Degree of conservation and restoration possibilities of the features of the habitat that are important for the species;
  - (c) Degree of isolation of the population;
  - (d) Global assessment (i.e. overall assessment, based on (a)–(c) above).
102. In addition, Member States are required to classify sites on their national lists according to their relative value for each habitat type and for each species and to identify which of the sites in their national lists are selected for priority habitat types and priority species.
103. The criteria used in Stage 2 are intended to assess the sites at the level of the six biogeographical regions and of the EU as a whole. The Stage 2 criteria may be summarised as:
- (a) Relative value of the site at national level;
  - (b) Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers;
  - (c) Total area of the site;
  - (d) Number of Annex I habitat types and Annex II species present;
  - (e) Global ecological value (i.e. overall assessment, based on (a)–(d) above) of the site at the level of the Biogeographical Region and/or EU as a whole.
104. The Stage 1 and Stage 2 criteria must be read alongside other site selection requirements or qualifications set out in the Directive. More specific requirements for site selection include:
- (a) Restrictions on the site selection obligations in respect of widely dispersed and aquatic species (Article 4.1);
  - (b) The requirement to contribute towards the maintenance of ‘favourable conservation status’ (Article 2.2 and Article 3.1.);
  - (c) The obligation on each Member State to select a series of sites that reflects the proportion of the EU resource of a given habitat or species within their national territory (Article 3.2.).
105. It should be noted that European case law has established that Member States may not take account of economic, social and cultural requirements or regional and local characteristics when selecting and defining the boundaries of the sites to be proposed under the Habitats Directive<sup>70</sup>.

## 7.2 PROBLEMS IN SELECTING SITES

106. The difficulty in applying the Habitats Directive to the marine environment has already been noted. Not only are the marine habitats in Annex I broadly defined – the ‘habitats’ being in reality complexes of habitats -- but the definitions in the

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<sup>70</sup> See ‘First Corporate Shipping’ (Case C-371/98); Bundesamt für Naturschutz (2002).

- 'Interpretation Manual' are based on the Northern Atlantic situation and do not always apply to the situation in the Mediterranean, especially the central Mediterranean where Malta is located (for example, it is obvious that the microtidal Mediterranean situation has not been considered).
107. One of the problems in selecting Maltese marine sites for NATURA 2000 is therefore the interpretation of the habitat types listed on Annex I of the Directive. We have made a first attempt at this in Section 6, however, this was only part of our assignment and much more work needs to be done on this aspect.
  108. A second problem is the lack of correspondence between the habitat classification (EUR15/2) scheme used by the Habitats Directive, and the main scheme in use in the Mediterranean, which is the RAC/SPA scheme. The former is mainly based on seascapes and the latter mainly on phytosociological units. Although in Section 6 we have tried to give some analysis of the correspondence between the two schemes, in reality it is only *Posidonia* meadows that approximate a one-to-one correspondence, even at a very broad level.
  109. There is also a certain lack of consistency in type of marine habitats included in Annex I. Some are selected on biological criteria (e.g. '*Posidonia* beds'); others on the basis of physical features, such as granulometry (e.g. 'sandbanks which are slightly covered by seawater all the time'); others by geomorphological features (e.g. 'large shallow inlets and bays'); and others still by a complex of features (e.g. 'estuaries'). The result is that one 'habitat' type very frequently includes others also listed in Annex I. For Malta a case in point is 'Large shallow inlets and bays', where local bays may include 'Sandbanks which are slightly covered by seawater all the time', '*Posidonia* beds' and 'Reefs'.
  110. The different nature of the habitat types included in Annex I makes it difficult to apply the same site-selection criteria for all listed types, and the particular characteristics of each habitat therefore have to be taken into account when identifying sites. Some sites are easy to select objectively (large scale, healthy '*Posidonia* beds' with a high shoot density, for example, are 'selectable'), but it is not so easy to decide about others (for example, should any of the anthropic Maltese lagoons be selected, even if they support the same types of biota, as 'natural' lagoons, including Annex II species such as *Aphanius fasciatus*, and are themselves Priority Habitats?)<sup>71</sup>.
  111. Yet another, and quite serious problem arises from the hugely different distribution patterns of the various listed habitats. Some habitats are restricted to a small number of sites (for example, marine caves), while others are widespread. Designating sites for the latter presents many problems. A case in point is '*Posidonia* beds'. This is a Priority Habitat that is extremely widespread round the Maltese coastline and moreover, the majority of beds are very well developed and in a good to excellent state of health (Borg & Schembri, 1997). Should all sites with such beds of *Posidonia* be designated as NATURA 2000 sites, this will mean that a large proportion of the Maltese infralittoral would be designated as SACs with obvious impacts on all marine activities in such sites. For such habitats, one solution would be to select sites with especially good examples of the range of architectures exhibited by these habitats

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<sup>71</sup> We opted to exclude all local lagoonal habitats from consideration since none have received adequate scientific study, particularly on their long term dynamics, all are heavily influenced by human activities and given their vastly more important terrestrial biotic component (apart from the Killifish *Aphanius fasciatus*), are probably better treated with the terrestrial and freshwater habitats than the marine ones with which we are concerned.

and of the different ecological conditions in which they are found as well as to differentiate between pristine and degraded meadows.

112. It is only relatively recently that the marine habitats of the Maltese Islands have started being investigated as units (Borg *et al.*, 1997) and therefore there is still limited information on the distribution and extent of habitats. The site selection process is limited to the data presently available. As future studies add to the knowledge of local habitats and species, it is almost certain that additional sites will be proposed.
113. Finally, although our suggestions of sites for designation have been based on our best scientific judgement, yet this is a subjective assessment of conservation importance, and other assessors may well have different opinions. In the absence of qualitative site selection criteria, this is inevitable.

### **7.3 PROPOSALS FOR THE INCLUSION OF MALTESE SITES IN THE NATURA 2000 NETWORK**

114. This section presents our proposals for the inclusion of Maltese marine sites in the NATURA 2000 network as required by the TOR for this assignment (Section 1 paragraph 4). Apart from the problems in selecting sites outline in the previous section (Section 7.2), our proposals are limited to those marine sites for which adequate data are available, that is, those sites shown in Fig.1 and for which benthic habitat maps 'aligned' to the RAC/SPA classification are appended to this document (Figs 2-14). Obviously, very many more sites within Maltese territorial waters may be suitable for inclusion in the NATURA 2000 network, however in the absence of good quality field data, we are refraining from proposing sites other than those we have considered in this report.
115. The presentation of sites is organized as follows:
  - The name of the site and the reference number of the benthic habitats map for the site that accompanies this report.
  - A discussion of the EUR15/2 habitats represented within the site.
  - An assessment of the Habitats Directive Annex III Stage 1 criteria for the site (Degree of representativity, Area, Degree of conservation of habitat structure and function and restoration possibilities, Global assessment of the site).
  - A discussion of species of conservation importance present, mostly limited to those listed in Annexes II, IV and V of the Habitats Directive and those listed in Annexes II and III of SPABIM, considering Habitat Directive Annex III Stage 1 criteria for species (Proportion of the total national population at the site; Degree of conservation and restoration possibilities of the features of the habitat that are important for the species; Degree of isolation of the population; Global assessment).
  - An assessment of the Habitats Directive Annex III Stage 2 criteria for the site if these are known or relevant

## **SITE 1 – DAHLET IX-XMAJJAR AND AHRAX POINT**

### **(MAP REFERENCE: FIG. 15)**

#### **Habitats present**

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Vegetation belonging to the *Cymodoceion nodosae* is present in several places inside the bay, where it forms both monospecific stands in deeper waters (>5m) and polyspecific stands (with *P. oceanica*) in shallower waters (<5m). Large patches of bare sand are also present throughout the inlet. In places, patches of bare sand occur amongst the *Posidonia oceanica* meadows that extend well beyond the mouth of the inlet into the Malta-Comino and Comino-Gozo Channels (see below).

**Posidonia Beds:** These occur throughout the inlet and extend well beyond its mouth into the Malta-Comino and Comino-Gozo Channels. The *P. oceanica* beds present here represent some of the healthiest meadows known from the Maltese Islands and, together with their associated flora and fauna, are the best studied locally (see Borg 1991; Borg, 1995; Borg & Schembri 1995a; 1995b; 1995c; Micallef, 1996; Howege, 1999). Furthermore, the shoot densities recorded from these meadows are some of the highest recorded from the Mediterranean (see Borg & Schembri, 1995a; Micallef, 1996) while the submarine areas located off this inlet (namely, the Malta-Comino and Comino-Gozo Channels) support the most extensive *P. oceanica* beds known from the Maltese Islands (Borg & Schembri, 1995b). The lower depth limit of the *P. oceanica* meadows present in the Malta-Comino Channel (Borg & Schembri, 1995b) is also one of the deepest known from the whole Mediterranean Sea.

In Fig.15 we have marked the distribution of *Posidonia* beds in the Malta/Comino and the Comino/Goza channels. For these two areas, the map is indicative only and not an accurate representation of distribution, since the channels have not been surveyed in detail. Moreover, we have not indicated the distribution of any other EUR15/2 habitat types apart from *Posidonia* beds in the two channels, but this does not mean that such habitats do not occur.

**Large Shallow Inlets And Bays:** Taking the interpretation of this habitat type as adapted for Malta and discussed in Section 6 under the heading 'Large Shallow Inlets And Bays', the Dahlet ix-Xmajjar inlet qualifies as such a habitat in terms of its biological characteristics, even if physically of limited dimensions.

**Reefs:** Rocky reefs are present beyond the mouth of the inlet, off Ahrax Point. These reefs rise vertically from a sandy bottom littered with large boulders to join the submarine bedrock platform jutting out from Ahrax Point. In places, the vertical face of these reefs is tens of metres high.

#### **Degree of representativity**

The habitats present in the inlet and beyond its mouth are typical of ones found along the northeastern coast of the Maltese Islands where the bottom is gently sloping (Pirota & Schembri, 1997a, 1997b) and supports extensive forests of photophilic algae and beds of *Posidonia oceanica* (Borg *et al.*, 1997).

## **Area**

Accurate maps that show the distribution and area occupied by benthic habitats in the whole of the area proposed are not available, since no detailed mapping surveys have been made. However, we estimate that *P. oceanica* beds occupy more than half the total seabed area shown in Fig 15. In the vicinity of Dahlet ix-Xmajjar, rocky reefs are only present as a narrow band below the shore at Ahrax Point, although these are continuous with other rocky reefs located below sealevel along most of the shore at L-Ahrax tal-Mellieha. Beyond the inlet's mouth, rocky reefs are present in various places below the western and eastern shores of the island of Comino.

## **Degree of conservation of habitat structure and function and restoration possibilities**

The area is prone to heavy passage of marine craft (especially in the summer months), mainly pleasure craft, passenger ferries, and professional and amateur fishing boats. Amateur fishermen frequently drop anchor at several places in Dahlet ix-Xmajjar and in the Malta-Comino and Comino-Gozo Channels while fishing using rods or hand-lines. Professional and amateur fishermen also lay small moorings for fish traps in several places in the Malta-Comino and Comino-Gozo Channels. A number of electricity power-grid submarine cables are present on the seabed in the Malta-Comino and Comino-Gozo Channels as well as other cables, some disused and a submarine pipeline connecting the islands' domestic water supply. In many places, these cables run through *Posidonia* meadows and severe disturbance to the seagrass probably occurs during maintenance works. A desalination plant located on the shore at Marfa (island of Malta) discharges cooling water into the Malta-Comino Channel.

Notwithstanding the above impacts on habitat structure and function, this area is still mostly pristine and the impacts listed above are more or less easily controlled and managed, especially by zoning and regulation of the activities within each zone. No habitat restoration is deemed necessary as impacted habitats are likely to regenerate naturally if the source of impact is removed.

## **Global assessment of the site**

This site is very important in the local context as it includes very good examples of a range of habitat types found off the north-eastern coast of the Maltese Islands, mostly in pristine condition. The extensive and very healthy *Posidonia oceanica* meadows that include those with one of the highest shoot densities anywhere in the Mediterranean as well as one of the deepest meadows in the Mediterranean make this site of regional importance as well.

## **Species**

**Annex II Species:** The Malta-Comino and Comino-Gozo channels are areas where frequent sightings of Bottle-nosed Dolphins (*Tursiops truncatus*) have been made (JAB, personal observation; see also records in Baldacchino & Schembri, 2002). Other cetaceans, including Striped Dolphin (*Stenella coeruleoalba*) and Common Dolphin (*Delphinus delphis*) have also occasionally been sighted in the area (see records in Baldacchino & Schembri, 2002). Although, less common than the Bottle-nosed Dolphin, sightings of the Loggerhead Turtle (*Caretta caretta*) have also been made in some places (JAB, personal observation).

**Annex IV Species:** The *P. oceanica* meadows present in Dahlet ix-Xmajjar and those present in the Malta-Comino and Comino-Gozo Channels support large populations of the Noble Pen-shell (*Pinna nobilis*). Since *P. oceanica* meadows present in the area under consideration are very extensive, the associated *Pinna nobilis* population is probably one of the largest locally. Small populations and occasional individuals of the Long-spined Sea-

urchin (*Centrostephanus longispinus*) occur below overhangs and in crevices present on the rocky reefs below the shore at Ahrax Point and L-Ahrax tal-Mellieha. However, since no detailed population studies have been made, the exact extent and population density of these two species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on the rocky reefs below the shore at Ahrax Point and L-Ahrax tal-Mellieha. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

#### **Proportion of the total national population at the site**

This is not possible to estimate reliably in view of the lack of detailed population data. The *P. oceanica* beds present (if ones located in Malta-Comino and Comino-Gozo Channels are also taken into account) may constitute a significant percentage (*circa* 10-20%; see Borg & Schembri, 1995b) of the whole seagrass population present within Maltese territorial waters.

#### **Degree of conservation and restoration possibilities of the features of the habitat that are important for the species**

Restoration is not deemed necessary. Conservation measures required include: prohibition of anchoring by large vessels (>10 m) and the control of trawling, discharge of polluting effluents, dredging and other activities that are known to damage *P. oceanica* beds (see section on 'Habitats' above).

#### **Degree of isolation of the population**

None of the populations of the species of conservation importance mentioned above are isolated locally. Seagrass meadows are continuous with adjacent ones present along the northern and northeastern coasts as are rocky substrata and sedimentary bottoms.

#### **Global assessment**

The *P. oceanica* meadows located in Dahlet ix-Xmajjar represent some of the healthiest known locally and are also the most studied locally. Data collected from these meadows can therefore be used as a baseline against which to compare the general state of health of other seagrass meadows in the Maltese Islands.

The extensive meadows present mean that seagrass-associating species, including those of local and international conservation interest are present as large populations.

### **Stage 2 criteria**

#### **Relative Value Of The Site At The National Level**

The site and the adjoining Malta-Comino and Comino-Gozo Channels are considered to have a high value for the reasons already outlined in the 'Global Assessment' for habitats and species above.

#### **Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

*P. oceanica* meadows serve as a feeding ground for a number of migratory fish species (e.g. *Seriola dumerilii*) since these feed on smaller fishes (e.g. *Boops boops*) that are found associated with the seagrass.



## SITE 2 – MELLIEHA BAY

(MAP REFERENCE: FIG. 16)

### Habitats present

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Vegetation belonging to the *Cymodoceion nodosae* is present in several places inside the bay, predominantly at the head where it forms extensive monospecific stands at depths of 5-8m. *Cymodocea nodosa* is also present as small patches amongst the *P. oceanica* meadows in several parts of the bay. Extensive areas of bare sand are present in the bay at depths of 0-4m. In places, patches of bare sand also occur amongst the *Posidonia oceanica* meadows that are present throughout the bay and which extend beyond its mouth.

**Posidonia Beds:** These occur throughout the bay and extend beyond its mouth. Because of its large size and relatively undisturbed state, Mellieha Bay supports the most extensive *P. oceanica* beds recorded from any one single embayment. Furthermore, Mellieha Bay has two of the only three *Posidonia* reefs known to occur locally. Of the two reefs present in this bay, the best preserved is located off the northern headland while the other reef, located off the southern headland, has undergone severe degradation due to the large number of boat moorings and heavy seacraft traffic present in its vicinity. Physical alterations of the shore close to the latter reef resulting from construction of roads, concrete jetties and quays, may also have accelerated the degradation of this reef through inducing changes in the hydrodynamic regime in this part of the bay. The *P. oceanica* meadows present in Mellieha Bay are also very good local examples of seagrass beds that exhibit a varied morphology ranging from very small patches to large and extensive continuous beds. As a result, this bay has been used as the main study area for an ongoing research project (Borg *et al.*, unpublished data) that focuses on the influence of different *P. oceanica* bed morphologies on the diversity of the associated macrofaunal assemblages. Once completed, this study will have important and wide implications for management and conservation of this seagrass since the results generated will give an insight into the relative importance of continuous *P. oceanica* beds and ones that are fragmented (e.g. continuous versus patchy beds) as habitats for benthic macrofauna. Furthermore, the *P. oceanica* meadows present in this bay are dense and healthy and compare well to the ones present at Dahlet ix-Xmajjar, which represent some of the healthiest beds known from local waters (see Borg & Schembri, 1995a). The *Posidonia* meadows in Mellieha Bay are not only important as a habitat; they also serve to bind the soft sediment bottom present in most of the bay and act as a buffer to strong wave action (in particular that prevailing during strong *gregale* storms), thereby reducing erosion of the beaches at the head of the bay.

**Large Shallow Inlets And Bays:** Taking the interpretation of this habitat type as adapted for Malta and discussed in Section 6 under the heading 'Large Shallow Inlets And Bays', Mellieha Bay qualifies as such a habitat in terms of both its biological characteristics and physically dimensions. In fact, it is one of the few bays in the Maltese Islands that may really be described as 'large'.

**Reefs:** Rocky reefs are mainly present off the two headlands flanking the bay. These reefs rise vertically from a sandy bottom littered with boulders. Other small reefs are also present inside the bay off the northern headland and one occurs in the central part. The *Posidonia oceanica* 'reefs' that occur in the bay have been discussed under '*Posidonia* Beds' above.

### **Degree of representativity**

The *P. oceanica* meadows habitats present in the bay and beyond its mouth are typical of ones found along the northeastern coast of the Maltese Islands, where the bottom is gently sloping (Pirota & Schembri, 1997a; 1997b) and supports extensive forests of photophilic algae and *P. oceanica* beds (Borg *et al.* 1997).

### **Area**

Accurate maps that show the distribution and area occupied by these habitats are not available, since the only survey that has been carried out covered only those parts of the bay that extend to a depth of 6m (see Borg & Schembri, 1993). However, we estimate that *P. oceanica* beds occupy more than half the total seabed area shown in Fig 16.

### **Degree of conservation of habitat structure and function and restoration possibilities**

The bay is prone to heavy passage of marine craft, mostly pleasure craft and amateur fishing boats. The inner parts of the bay are littered with boat moorings, which have been increasing in number over the past few decades. Boat moorings and boat anchoring have been shown to have an adverse impact on seagrass meadows (Hastings *et al.*, 1995; Francour *et al.* (1999). Furthermore, the bay is very popular with yachting enthusiasts, especially in summer. Yachts and other pleasure craft drop anchor haphazardly in the inner half of the bay with adverse consequences for *P. oceanica* since the anchors rip through the seagrass beds and uproot the plants in large numbers. Uprooted plants are then transported by currents to other parts of the bay where they are eventually either washed ashore or are carried to deeper waters where the plants do not re-establish themselves.

Once pristine, the bay is now showing signs of deterioration that will increase if they are not controlled. At present the bay is still of such a quality as to qualify as a candidate SAC under the Habitats Directive, but only if the area is managed and the impacts reduced and controlled. We recommend zoning and the regulation of activities within each zone, particularly anchoring and mooring. Although attempts to reconstruct *Posidonia* habitats have been made elsewhere in the Mediterranean, these have not been wholly successful and we do not recommend reconstruction at this stage but removal of the impacting agents such that natural regeneration is given a chance to proceed.

### **Global assessment of the site**

This site is very important in the local context as it include two of the three known *Posidonia* reefs in Maltese territorial waters. It also has very good examples of a range of habitat types found in large embayments off the north-eastern coast of the Maltese Islands, even if some of these habitats are degrading. The extensive and healthy *Posidonia oceanica* meadows present in the bay are of regional importance due to their density, architectural variety, easy accessibility and the baseline scientific data on them that already exists.

### **Species**

**Annex II Species:** Frequent sightings of the Bottle-nosed Dolphins (*Tursiops truncatus*) have been made in the marine area lying off the mouth of Mellieha Bay (JAB, personal observation). The Common Dolphin (*Delphinus delphis*) has also occasionally been sighted in and adjacent to this bay (see records in Baldacchino & Schembri, 2002). Although, less common, sightings of the Loggerhead Turtles (*Caretta caretta*) have also been made in the marine area lying off the mouth of Mellieha Bay (JAB, personal observation).

**Annex IV Species:** The *P. oceanica* meadow present in Mellieha Bay support large populations of the Noble Pen-shell (*Pinna nobilis*). Since *P. oceanica* meadows present in the area under consideration are very extensive, the associated *Pinna nobilis* population is large. Small populations and occasional individuals of the Long-spined Sea-urchin (*Centrostephanus longispinus*) occur below overhangs and in crevices present on the rocky reefs that occur in some places within the bay. However, since no detailed population studies have been made, the exact extent and population density of these two species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on the rocky reefs that occur in some places within the bay. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

**Proportion of the total national population at the site:**

This is not possible to estimate reliably in view of the lack of detailed population data.

**Degree of conservation and restoration possibilities of the features of the habitat that are important for the species**

Restoration is not deemed necessary if the agents impacting the habitats within the bay are controlled. Control measures necessary for the conservation of important habitats are the prohibition of anchoring by pleasure craft and amateur fishermen in all but designated areas, and the control of trawling, discharge of pollutant effluents and dredging within the bay, and other activities that are known to damage *P. oceanica* beds.

**Degree of isolation of the population**

None of the populations of the species of conservation importance mentioned above are isolated locally. Seagrass meadows are continuous with adjacent ones present along the northern and northeastern coasts, as are rocky substrata and sedimentary bottoms.

**Global assessment**

The *P. oceanica* meadows within Mellieha bay are extensive, dense and represent all meadow morphologies known to occur in the Maltese Islands, including *Posidonia* reefs. Extensive ecological data also exists for these meadows, making them important for monitoring purposes. The extensive meadows present mean that seagrass-associating species, including those of local and international conservation interest are present as large populations.

**Stage 2 criteria**

**Relative Value Of The Site At The National Level**

Mellieha bay is considered to have a high value for the reasons already outlined in the 'Global Assessment' for habitats and species above.

**Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

*P. oceanica* meadows serve as a feeding ground for a number of migratory fish species (e.g. *Seriola dumerilii*) since these feed on smaller fishes (e.g. *Boops boops*) that are found associated with the seagrass.

## **SITE 3 – MAERL BEDS OFF THE NORTHEASTERN COAST OF MALTA**

**(MAP REFERENCE: FIG. 17)**

### **Habitats present**

None of the marine habitats listed in Annex I of Habitats Directive are present in this area.

### **Species**

**Annex II species:** Frequent sightings of Bottle-nosed Dolphins (*Tursiops truncatus*), together with sightings of the Loggerhead Turtle (*Caretta caretta*) have been made in the area where the maerl beds are located (JAB, personal observation; see also records in Baldacchino & Schembri, 2002). Other cetaceans, including Striped Dolphin (*Stenella coeruleoalba*) and Common Dolphin (*Delphinus delphis*) have also occasionally been sighted in the area (see records in Baldacchino & Schembri, 2002).

**Annex IV species:** The maerl beds located off the northeastern coast of Malta support large populations of the Long-spined Sea-urchin (*Centrostephanus longispinus*). Some preliminary studies on the distribution and abundance of this species in the area have been made: this echinoid is particularly abundant on maerl at depths between 55m and 60m where the population density reaches a maximum of ca 0.4 individuals/m<sup>2</sup> (Schembri, 2000).

**Annex V Species:** *Lithothamnium coralloides* and *Phymatholiton calcareum*.

A study (Lanfranco *et al.*, 1999) of the maerl-associating algae of the Maltese Islands has shown that these two species are amongst those forming the rhodolith component of Maltese maerl beds, including the beds off the northeastern coast of Malta and Gozo. *Lithothamnium coralloides* is one of the major rhodolith-forming species in the Maltese Islands, in some areas forming up to 45% of rhodoliths (unpublished results); *Phymatholiton calcareum* is a minor constituent.

### **Proportion of the total national population at the site**

This is difficult to estimate since not all locally occurring maerl beds have been mapped. However, from the data presently available, the maerl beds off the northeastern coast of Malta cover an area of ca 20km<sup>2</sup> (Borg *et al.*, 1998a; Schembri, 1998) and represent one of the largest such accumulations of maerl known from local waters, accounting for an estimated 15-25% of the total area of maerl-covered bottom in Maltese territorial waters.

### **Degree of conservation and restoration possibilities of the features of the habitat that are important for the species**

The maerl beds off the northeastern coast of Malta are almost unimpacted by human activities bar occasional and mostly illegal trawling; although different regions of these maerl beds have been shown to be subject to different disturbance regimes, these are mostly of natural origin (Borg *et al.*, 1998b; BIOMAERL, 1999; Rizzo, 2001).

### ***Degree of isolation of the population***

These maerl beds are probably not isolated since maerl occurs more or less continuously along the eastern and southern coasts. However, maerl appears to be patchily distributed off other coasts and as such the maerl bed off the northeastern, eastern and southern coasts may be semi-isolated from other maerl occurring in Maltese territorial waters.

### ***Global assessment***

In the Mediterranean (and in the North Atlantic) maerl habitats are threatened by various human activities including direct exploitation, demersal fishing, eutrophication and commercial collection for use as a soil conditioner (BIOMAERL, 1999 and in press). Whatever the source of the disturbance, human impact on maerl grounds can have profound effects on this fragile ecosystem, since rhodoliths have a very slow growth rate and cannot be replaced easily (BIOMAERL, 1999 and in press). In this regard the extensive, highly biodiverse and unimpacted maerl beds off the NE coast of Malta a very important habitat for the maerl-forming algae themselves as well as for maerl-associating biota (Schembri, 1998).

### **Stage 2 criteria**

#### **Relative Value Of The Site At The National Level**

These beds have a very high ecological and conservation value. They are the largest maerl beds known from the Maltese Islands and amongst the largest known to date from the Mediterranean as a whole. They constitute an important habitat for maerl-associating biota, with an inventory that to date includes over 400 separate species of macroflora and macrofauna, and they provide a habitat and feeding ground for many species including commercially important ones such as cephalopods and fishes (Rizzo, 2001; BIOMAERL, 1999 and in press).

#### **Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

Maerl beds serve as a feeding ground for a number of migratory fish species that feed on organisms associated with such beds.

## **SITE 4 – NORTH HARBOURS AREA (EXCLUDING ST GEORGE'S BAY AND ST JULIANS BAY)**

**(MAP REFERENCE: FIGS. 18A, 18B, 18C)**

### **Habitats present**

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Vegetation belonging to the *Cymodoceion nodosae* is present in several places where it mainly forms monospecific stands and, to a lesser extent, polyspecific ones with *P. oceanica*. Large patches of bare sand are also present throughout the area. In places, these patches of bare sand occur amongst the *Posidonia oceanica* meadows that occupy a large area of the bottom.

**Posidonia Beds:** These occur throughout the area and constitute dense and healthy stands.

**Reefs:** Rocky reefs are mainly present at St George's Shoals and Merkanti where rocky outcrops rise vertically from a sandy bottom littered with large boulders. In places, the vertical face of these reefs is tens of metres high.

### **Degree of representativity**

The *P. oceanica* meadows present in the area represent one of the most extensive and continuous seagrass habitats found locally. The presence of such extensive beds is probably mainly due to the geology and geomorphology of the seabed in this area: a gently sloping bottom that is predominantly rocky at depths of 0-6m and sandy at depths greater than 7m (Pirotta & Schembri, 1997a; 1997b). While the rocky bottom supports extensive forests of photophilic algae, the sandy bottom supports vast *P. oceanica* beds (Borg *et al.*, 1997) that exhibit a wide range of morphologies including patches, collines, reticulate and continuous.

### **Area**

We estimate that *P. oceanica* beds occupy circa 3.42km<sup>2</sup> of the total seabed in the area surveyed. Rocky reefs occupy circa 0.1km<sup>2</sup> of the area (4.72km<sup>2</sup>) surveyed (Fig 18).

### **Degree of conservation of habitat structure and function and restoration possibilities**

The area is prone to heavy passage of marine craft (especially in the summer months), mostly pleasure craft, passenger ferries, and professional and amateur fishing boats. Amateur fishermen frequently drop anchor at several places in the area while fishing using rods or hand-lines. Professional and amateur fishermen also lay small moorings for fish traps in several places. Submarine communications cables are present on the seabed in the vicinity of the mouth of St George's Bay and in St George's Bay and run through the *Posidonia* meadows. Disturbance to the seagrass probably occurs during maintenance works that may be carried out occasionally.

Apart from the embayments, which are excluded from the present proposal, and notwithstanding the impacts discussed in the previous paragraph, this area is still mostly pristine and the impacts listed above are more or less easily controlled and managed, especially by zoning and regulation of the activities within each zone. No habitat restoration is deemed necessary as impacted habitats are likely to regenerate naturally if the source of impact is removed.

### **Global assessment of the site**

This site includes very good examples of a range of infralittoral habitat types found off the north-eastern coast of the Maltese Islands, especially those of mostly in very good condition. Particularly important are the extensive forests of photophilic algae and the healthy *Posidonia oceanica* meadows with a range of morphologies.

### **Species**

**Annex II Species:** Although no extensive data are available the area is frequently visited by Common Dolphins (*Delphinus delphis*) and Bottle-nosed Dolphin (*Tursiops truncatus*) (see records in Baldacchino & Schembri, 2002), as well as by Loggerhead Turtles (*Caretta caretta*).

**Annex IV Species:** The *P. oceanica* meadows present in the area support large populations of the Noble Pen-shell (*Pinna nobilis*). Since these *P. oceanica* meadows are very extensive, the associated *Pinna nobilis* population is probably also large. Small populations and occasional individuals of the Long-spined Sea-urchin (*Centrostephanus longispinus*) occur below overhangs and in crevices present on the rocky reefs at St George's Shoals and Merkanti. However, since no detailed population studies have been made, the exact extent and population density of these two species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on the rocky reefs at St George's Shoals and Merkanti. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

### **Proportion of the total national population at the site**

This is not possible to estimate reliably in view of the lack of detailed population data for the whole of Maltese territorial waters. However, we estimate that the *P. oceanica* beds present in the area constitute *circa* 3-6% of the total local seagrass population.

### **Degree of conservation and restoration possibilities of the features of the habitat that are important for the species**

Restoration is not deemed necessary. Conservation measures required include: prohibition of anchoring by large vessels (>10 m), and the control of trawling, discharge of polluting effluents, dredging and other activities that are known to damage *P. oceanica* beds.

### **Degree of isolation of the population**

None of the populations of the species of conservation importance mentioned above are isolated locally. Seagrass meadows are continuous with adjacent ones present along the northern and northeastern coasts as are rocky substrata and sedimentary bottoms.

### **Global assessment**

The *P. oceanica* meadows located in the North Harbours area represent some of the densest and healthiest seagrass populations known locally. Values of shoot density and other seagrass morphological measures recorded from *P. oceanica* present in this area compare to those recorded for the same seagrass at Dahlet ix-Xmajjar (see Borg & Schembri 1995a). Data collected from seagrass meadows present in the North Harbours area can therefore be used as a baseline against which to monitor the general state of health of *P. oceanica* beds in the Maltese Islands.

The extensive meadows present mean that seagrass-associating species, including those of local and international conservation interest are present as large populations.

## **Stage 2 criteria**

### **Relative Value Of The Site At The National Level**

The *Posidonia* beds found in the area are considered to have a high value for the reasons already outlined in the 'Global Assessment' for habitats and species above.

### **Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

*P. oceanica* meadows serve as a feeding ground for a number of migratory fish species (e.g. *Seriola dumerilii*) since these feed on smaller fishes (e.g. *Boops boops*) that are found associated with the seagrass.



## **SITE 5 – RDUM IL-MAJJIESA TO FOMM IR-RIH**

**(MAP REFERENCE: FIG. 19)**

### **Habitats present**

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Vegetation belonging to the *Cymodoceion nodosae* is present in several places in the area where it forms both monospecific stands in deeper (>5m) waters and polyspecific stands with *P. oceanica* in shallower waters (<5m). Large patches of bare sand are also present throughout the area. In places, these patches occur amongst the *Posidonia oceanica* meadows.

**Posidonia Beds:** These occur throughout the area and constitute dense and very healthy meadows. The *P. oceanica* beds present in the area exhibit a wide range of morphologies: patchy, colline, reticulate and continuous.

**Large Shallow Inlets And Bays:** Taking the interpretation of this habitat type as adapted for Malta and discussed in Section 6 under the heading 'Large Shallow Inlets And Bays', the two main embayments in the area (that defined by the headlands at Ras il-Wahx and Ras il-Pellegin, and the Fomm ir-Rih embayment) qualify as such habitats in terms of both biological characteristics and physical dimensions.

**Reefs:** Rocky reefs are abundant throughout the area. In many places, these rise vertically from a sandy bottom littered with large boulders to join submarine bedrock platforms that jut out below the shore. In places, the vertical face of these reefs is tens of metres high.

### **Degree of representativity**

The biotopes present in the area are unique in that they represent a heterogeneous mixture of different habitats concentrated in a relatively small coastal area. Furthermore, all of the habitats are in a pristine state and, except for the sandy beaches, are not much disturbed by human activities. In many parts of the area the habitats present are typical of ones found along the southwestern coast of the Maltese Islands where the prevailing bottom type is steep rocky slopes or vertical submarine cliffs (Pirota & Schembri, 1997a; 1997b) with extensive forests of photophilic algae growing in the lighted shallower regions and sciaphilic assemblages in the more dimly lit deeper regions of the rock faces.

### **Area**

We estimate that the area occupied by each habitat type is as follows:

Sand banks:	0.50km <sup>2</sup>	
<i>Posidonia</i> beds:	1.45km <sup>2</sup>	
Rocky reefs:	0.12km <sup>2</sup>	
Large shallow inlets:	3.72km <sup>2</sup>	
		Total survey area = 4.98km <sup>2</sup>

### **Degree of conservation of habitat structure and function and restoration possibilities**

The area is prone to heavy passage of marine craft (especially in the summer months), namely pleasure craft and professional and amateur fishing boats. Both small and large pleasure craft frequently drop anchor just off the sand beaches and in the centre of the two

main embayments present. Amateur fishermen frequently drop anchor at several places while fishing using rods or hand-lines. Professional and amateur fishermen also lay small moorings for fish traps in several places.

Notwithstanding the above impacts, this area is still mostly pristine and the impacts listed above are more or less easily controlled and managed, especially by zoning and regulation of the activities within each zone. No habitat restoration is deemed necessary as impacted habitats are likely to regenerate naturally if the source of impact is removed.

### **Global assessment of the site**

This site is very important in the local context as it includes very good examples of the range of habitat types found off the south-western coast of the Maltese Islands, mostly in pristine condition. The extensive and highly diverse assemblages of photophilic algae and sciaphilic biota make this site of regional importance as a reference site for long-term ecological studies.

### **Species**

**Annex II Species:** Frequent sightings of the Bottle-nosed Dolphin (*Tursiops truncatus*) and of the Loggerhead Turtle (*Caretta caretta*) have been made (JAB, personal communication from fishermen frequenting the area).

**Annex IV Species:** The *P. oceanica* meadows present in the area support small populations of the Noble Pen-shell (*Pinna nobilis*). Small populations and occasional individuals of the Long-spined Sea-urchin (*Centrostephanus longispinus*) occur below overhangs and in crevices in and at the base of rock faces in the area. However, since no detailed population studies have been made, the exact extent and population density of these two species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on the rocky substrata in the area. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

### **Proportion of the total national population at the site**

This is difficult to estimate in view of lack of detailed population data for the whole of the Maltese territorial waters.

### **Degree of conservation and restoration possibilities of the features of the habitat that are important for the species**

Restoration is not deemed necessary. Conservation measures required include: prohibition of anchoring by large vessels (>10 m), and the control of trawling, discharge of polluting effluents, dredging and other activities that are known to damage *P. oceanica* beds.

### **Degree of isolation of the population**

The *P. oceanica* meadows in this area are considered to be semi-isolated since there is little or no continuity with meadows present in other coastal areas due to the deep water present off most of the southern coasts of the Maltese Islands.

### **Global assessment**

The *P. oceanica* meadows, rocky reefs and inlets present in the Rdum il-Majjiesa to Fomm ir-Rih area represent some of the healthiest and most pristine such habitats known locally and have also been mapped in great detail. Data collected from these habitats can therefore be used as a baseline for monitoring the general state of health of similar habitats occurring elsewhere in the Maltese Islands and in the Mediterranean.

The extensive algal forests present mean that the associated species, including those of local and international conservation interest are also present as large populations.

### **Stage 2 criteria**

#### **Relative Value Of The Site At The National Level**

This site is considered to have a high value for the reasons already outlined in the 'Global Assessment' for habitats and species above. Additionally it has been the subject of detailed study as representative of the coastal and marine habitats unaffected by human activities present in the Maltese Islands, as part of the CAMP-MALTA project<sup>72</sup>. It is intended to declare all or part of this area a marine protected area as a pilot for declaring other such areas in the Maltese Islands. Additionally, UNEP-MAP has also indicated its willingness to fund additional work on this area.

#### **Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

Many of the habitats present in the area serve as a feeding, breeding and nursery grounds for a number of migratory fish species.

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<sup>72</sup> UNEP's Mediterranean Action Plan (MAP), through its CAMP programme (Coastal Areas Management Programme), has funded a survey of the coastal and marine habitats of the Rdum il-Majjiesa to Fomm ir-Rih area which encompasses a stretch of 11km of coastline and extends to a water depth of 50m, covering 4.75 square kilometres of seabed. Detailed maps (at a scale of 1:2500) of the bathymetry, submarine geophysical features, seascapes and benthic biotic assemblages of the area have been produced (Pirota & Schembri, 2000).

## SITE 6 – CIRKEWWA

### (MAP REFERENCE: FIG. 20)

#### Habitats present<sup>73</sup>

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Vegetation belonging to the *Cymodoceion nodosae* is present in several places in this locality, where it mainly forms monospecific stands in deep water (>30m). Large patches of bare sand are also present in the area. In places, the bare sand patches occur on bedrock and amongst boulders at the foot of drop-offs.

**Posidonia Beds:** These occur as continuous meadows growing on bedrock in the northern part of the area and as patches growing on bedrock in the remaining parts of the area. The *P. oceanica* beds present in these places represent some of the healthiest and most extensive meadows growing on bedrock recorded locally.

**Reefs:** Rocky reefs are present throughout the area and most rise vertically from a sandy bottom littered with large boulders to join the submarine bedrock platform jutting out from the shore. In places, the vertical face of these reefs is tens of metres high.

**Submerged Or Partially Submerged Caves:** A number of small caves are present in the area (see Fig. 20). Most are exposed to severe disturbance by the numerous SCUBA divers that frequent the area.

#### Degree of representativity

The biotopes present in the area are typical of the western coasts of the Maltese Islands where the prevailing bottom type is steeply sloping rock or consists of vertically faced submarine cliffs (Pirota & Schembri, 1997a, 1997b) and support extensive forests of photophilic algae.

#### Area

We estimate that the area occupied by each habitat type is as follows:

Sand banks:	0.003km <sup>2</sup>	Total survey area = 0.026km <sup>2</sup>
<i>Posidonia</i> beds:	0.002km <sup>2</sup>	
Rocky reefs:	0.004km <sup>2</sup>	

#### Degree of conservation of habitat structure and function and restoration possibilities

The area is prone to heavy passage of marine craft (especially in the summer months), mainly pleasure craft, passenger ferries, and professional and amateur fishing boats. Amateur fishermen occasionally drop anchor in some places while fishing using hand-lines. Professional and amateur fishermen also lay small moorings for fish traps in several places in the area. The area is also visited by large numbers of SCUBA divers, especially in summer.

<sup>73</sup> We are only considering the area west of the Cirkewwa Ferry Terminal because although detailed surveys of the seabed have been made east of the terminal, the marine works in connection with the Cirkewwa Ferry Terminal project that are still in progress are causing gross alterations to the habitats and assemblages present in the area.

With the exception of the caves, which are heavily impacted, most of the area is relatively pristine and the impacts listed above are more or less easily controlled and managed, especially by zoning and regulation of the activities within each zone, and by limiting entry of SCUBA divers into the inner parts of the caves. Habitat restoration is deemed necessary for the caves.

This area lies very close to the Cirkewwa Ferry Terminal that is presently being extended. The works already carried out there have already impacted the benthic assemblages around the site of operations as well as the water column for a considerable distance away from the site. Unless closely monitored and controlled, future phases of this project, which include the extension of the breakwater arm, have the potential to impact the marine environment in the area being proposed for designation.

### **Global assessment of the site**

This site is important in the local context as it includes very good examples of the range of habitat types found off the western coast of the Maltese Islands, mostly in very good condition. The extensive meadows of *Posidonia oceanica* on rock are amongst the largest such meadows locally.

### **Species**

**Annex II Species:** Bottle-nosed Dolphins (*Tursiops truncatus*) and Common Dolphin (*Delphinus delphis*) have also occasionally been sighted in the area (see records in Baldacchino & Schembri, 2002).

**Annex IV Species:** The *P. oceanica* meadow present at Cirkewwa support small populations of the Noble Pen-shell (*Pinna nobilis*), while small populations and occasional individuals of the Long-spined Sea-urchin (*Centrostephanus longispinus*) occur below overhangs and in crevices present on rocky substrata in the area. However, since no detailed population studies have been made, the exact extent and population density of these two species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on rock faces in the area. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

### **Proportion of the total national population at the site**

This is not possible to estimate reliably in view of the lack of detailed population data. However, the species present probably represent only a small percentage of the respective populations present in Maltese territorial waters.

### **Degree of conservation and restoration possibilities of the features of the habitat that are important for the species**

Apart from the caves, restoration is not deemed necessary if the agents impacting the habitats within the area are controlled. Control measures necessary for the conservation of important habitats are the prohibition of anchoring by pleasure craft and amateur fishermen in all but designated areas, and the control of trawling, discharge of pollutants, dredging and other activities that are known to damage *P. oceanica* beds. Access by divers to the caves needs to be strictly controlled and a code of practice for divers visiting these caves needs to be formulated and enforced. Some caves may need to be declared 'closed' to divers to allow regeneration, which may need to be artificially aided.

### ***Degree of isolation of the population***

None of the populations of the species of conservation importance mentioned above are isolated locally. Seagrass meadows are continuous with adjacent ones present along the northern and northwestern coasts as are the rocky bottoms.

### ***Global assessment***

The continuous *P. oceanica* meadows in the Cirkewwa area represent some of the densest and healthiest seagrass populations known locally growing on bedrock. The extensive meadows present mean that seagrass-associating species, including those of local and international conservation interest are present as large populations. Species associated with rocky shoals are also abundant.

### **Stage 2 criteria**

#### **Relative Value Of The Site At The National Level**

This site has been proposed as a candidate Marine Conservation Area (Malta Structure Plan, 1992). The *P. oceanica* beds present in the area are typical of ones growing on bedrock and are of special interest because of their close proximity to various other different habitat types (e.g. photophilic algae on bedrock). Since the site is very popular with SCUBA divers, especially tourists, the biotopes present and their biota have a high economical value.

#### **Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

*P. oceanica* meadows serve as a feeding ground for a number of migratory fish species (e.g. *Seriola dumerilii*) since these feed on smaller fishes (e.g. *Boops boops*) that are found associated with the seagrass.

## SITE 7 – MGARR IX-XINI

### (MAP REFERENCE: FIG. 21)

#### Habitats present

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Vegetation belonging to the *Cymodoceion nodosae* is present in several places inside the inlet, where it mainly forms monospecific stands. Large patches of bare sand are also present in the inlet. Beyond the mouth of the inlet bare sand is the predominant habitat type.

**Posidonia Beds:** These occur as a relatively small bed close to the mouth of the inlet and as patches growing on bedrock and at the base of drop-offs. The shoot density of these beds is not as high as that recorded from at the same depth from pristine areas elsewhere in the Maltese Islands and their overall state of health is fair.

**Large Shallow Inlets And Bays:** Taking the interpretation of this habitat type as adapted for Malta and discussed in Section 6 under the heading 'Large Shallow Inlets And Bays', the Mgarr ix-Xini inlet qualifies as such a habitat in terms of its biological characteristics, even if physically of limited dimensions.

**Reefs:** Rocky reefs are present below the shores of the headlands that flank the inlet and beyond its mouth. Generally, these reefs rise vertically from a sandy bottom littered with large boulders and are in continuation with the emergent cliff faces. In places, the submarine vertical face of the reefs is tens of metres high.

**Submerged Or Partially Submerged Caves:** Two fully submerged caves are present below the shore on the western side of the inlet. These caves support typical cave species, including some (for example the stony sponge *Petrobiona massilliana*) protected locally and internationally. However, the caves are exposed to considerable disturbance from SCUBA divers.

#### Degree of representativity

The biotopes in the inlet and beyond its mouth are typical of ones found along the southwestern coast of the Maltese Islands where the prevailing bottom type is steeply sloping rock or consists of submarine cliffs (Pirodda & Schembri, 1997a; 1997b) with extensive forests of photophilic algae.

#### Area

We estimate that the area occupied by each habitat type is as follows:

Sand banks:	0.0150km <sup>2</sup>	
<i>Posidonia</i> beds:	0.0023km <sup>2</sup>	Total survey area = 0.03km <sup>2</sup>
Rocky reefs:	0.0013km <sup>2</sup>	
Large shallow inlets:	0.0230km <sup>2</sup>	

### **Degree of conservation of habitat structure and function and restoration possibilities**

The area is prone to frequent visits by marine craft (especially in the summer months), mostly pleasure craft. Amateur fishermen occasionally drop anchor in some places while fishing using hand-lines. Professional and amateur fishermen also lay small moorings for fish traps in several places in the area. A few boat moorings are present in the innermost parts of the inlet. The inlet is also visited by large numbers of SCUBA divers, especially in summer.

In August 2001, the Sannat Local Council implemented an unauthorised project at Mgarr ix-Xini whereby the shingle beach at the head of the creek was covered by crushed coralline limestone aggregate from a Gozo hardstone quarry in order to turn it into a 'sandy beach'. The MEPA took direct action to remedy the situation and volunteers from the Authority, the Malta Tourism Authority and the Ministry for Gozo cleared the aggregate. MEPA has commissioned surveys of the seabed in the creek in order to assess its state following the remedial work carried out there. With the exception of a large patch of bare sand at the eastern corner at the head of the inlet, which appears to consist in part of aggregate that has been washed into the sea, a survey made in January 2002<sup>74</sup> did not find any changes in the benthic environment of the inlet that could be attributed to the dumping of quarry sand on the shore at the head of the inlet.

Apart from the beach and the sublittoral area immediately adjacent to it, the area is relatively unimpacted and the impacts listed above are more or less easily controlled and managed, especially by zoning and regulation of the activities within each zone. Habitat restoration beyond what has already been implemented to restore the beach is not deemed necessary.

### **Global assessment of the site**

This site presents typical examples of a range of habitats occurring in the Maltese Islands in a moderately pristine state, particularly those associated with sandy bottoms and steep rock faces. It is also a very popular diving site.

### **Species**

**Annex II Species:** No information available.

**Annex IV Species:** The *P. oceanica* meadows present support a small population of the Noble Pen-shell (*Pinna nobilis*), while small populations and occasional individuals of the Long-spined Sea-urchin (*Centrostephanus longispinus*) occur below overhangs and in crevices present on the rock faces in the area. However, since no detailed population studies have been made, the exact extent and population density of these two species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on rock faces in the area. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

### **Proportion of the total national population at the site**

This is not possible to estimate in view of the lack of detailed population data for Maltese territorial waters.

<sup>74</sup> Borg, J.A. & Schembri, P.J. (2002) *Survey of the marine infralittoral benthic communities at Mgarr ix-Xini (Gozo), following beach rehabilitation works. Report on the first session: January 2002. Survey commissioned by the Environment Protection Department (EPD), Ministry for the Environment.* Malta: Independent Consultants; 22pp.



***Degree of conservation and restoration possibilities of the features of the habitat that are important for the species***

Control measures necessary for the conservation of the habitats present are the prohibition of anchoring by pleasure craft and amateur fishermen in all but designated areas, and the control of trawling, discharge of pollutants, dredging and other activities that are known to damage *P. oceanica* beds. Access by divers to the caves needs to be controlled.

***Degree of isolation of the population***

The *P. oceanica* meadows in this area are considered to be semi-isolated since there is little continuity with meadows present in other coastal areas.

***Global assessment***

Moderately important site for species associating with the various habitats present.

**Stage 2 criteria**

**Relative Value Of The Site At The National Level**

In view of its interesting geomorphology and the presence of locally rare and protected species, this site has been proposed as a candidate Marine Conservation Area (Malta Structure Plan, 1992).

**Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

Not known.

## **SITE 8 – QAWRA/DWEJRA AREA (GOZO)**

**(MAP REFERENCE: FIGS. 22A, 22B)**

### **Habitats present**

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Large patches of bare sand are present on the bedrock platforms and at the base of submarine cliffs in many parts of the area. However, these do not constitute extensive sand banks.

**Posidonia Beds:** There is an extensive but non-continuous bed in the Qawra area where the stands are dense and healthy. Small patches of the seagrass also occur on bedrock in other parts of the area.

**Coastal Lagoons:** The 'Inland Sea' at Il-Qawra is being considered as a possible lagoon pending further studies on its ecology and hydrodynamics (see discussion in Section 6 under 'Coastal Lagoons').

**Large Shallow Inlets And Bays:** Taking the interpretation of this habitat type as adapted for Malta and discussed in Section 6 under the heading 'Large Shallow Inlets And Bays', the various inlets of the Qawra/Dwejra area qualify as such a habitat in terms of their biological characteristics, even if some of the inlets are physically of limited dimensions.

**Reefs:** Rocky reefs are present throughout the area and are of two types: (i) submarine continuations of emergent cliffs and (ii) reefs that rise vertically from a sandy bottom littered with large boulders to join submarine bedrock platforms (e.g. Il-Baqra). In places, the vertical face of these reefs is tens of metres high.

**Submerged Or Partially Submerged Caves:** A total of six fully submerged caves and seven semi-submerged caves are present in the area (see Fig 22). Most of the caves are exposed to considerable disturbance from SCUBA divers.

### **Degree of representativity**

The biotopes of the Qawra/Dwejra area are typical of those found along the western coast of Gozo where the prevailing bottom type is steeply sloping rock or consists of submarine cliffs (Pirota & Schembri, 1997a, 1997b) and support extensive forests of photophilic algae. Whether the Inland Sea at Il-Qawra is considered to be a lagoon or not, it is nonetheless a unique environment in the Maltese Islands.

### **Area**

We estimate that the area occupied by each habitat type is as follows:

Sand banks:	0.030km <sup>2</sup>	
Posidonia beds:	0.010km <sup>2</sup>	
Rocky reefs:	0.060km <sup>2</sup>	
Coastal Lagoons:	0.007km <sup>2</sup>	
Large shallow inlets:	0.420km <sup>2</sup>	
		Total survey area = 0.42km <sup>2</sup>

### **Degree of conservation of habitat structure and function and restoration possibilities**

The area is prone to heavy passage by marine craft (especially in the summer months), mostly pleasure craft and professional and amateur fishing boats. Amateur fishermen occasionally drop anchor in some places while fishing using hand-lines. Professional and amateur fishermen also lay small moorings for fish traps in several places in the area. A few boat moorings are present in the innermost parts of the inlet. The area is also visited by large numbers of SCUBA divers, especially in summer.

With the exception of the caves, some of which are heavily impacted, most of the area is relatively pristine and the impacts listed above are more or less easily controlled and managed, especially by zoning and regulation of the activities within each zone. Habitat restoration is deemed necessary for the caves.

### **Global assessment of the site**

This site presents typical examples of a range of habitats occurring in the Maltese Islands, particularly those associated with steep rock faces and marine caves. It is also a very popular diving site. The so-called 'Inland Sea' at Il-Qawra is a unique feature.

### **Species**

**Annex II Species:** Frequent sightings of Bottle-nosed Dolphins (*Tursiops truncatus*) and of Loggerhead Turtles (*Caretta caretta*) have been made (JAB, personal communication from fishermen and divers frequenting the area; see also records in Baldacchino & Schembri, 2002).

**Annex IV Species:** The *P. oceanica* meadows present at Id-Dwejra support a small population of the Noble Pen-shell (*Pinna nobilis*). Populations and single individuals of the Long-spined Sea-urchin (*Centrostephanus longispinus*) occur below overhangs and in crevices present on the rocky substrata in the area. However, since no detailed population studies have been made, the exact extent and population density of these two species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on rock faces in the area. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

### **Proportion of the total national population at the site**

This is not possible to estimate in view of the lack of detailed population data for Maltese territorial waters.

### **Degree of conservation and restoration possibilities of the features of the habitat that are important for the species**

Control measures necessary for the conservation of the habitats present are the prohibition of anchoring by pleasure craft and amateur fishermen in all but designated areas, and the control of trawling, discharge of pollutants, dredging and other activities that are known to damage *P. oceanica* beds. Access by divers to the caves needs to be strictly controlled and a code of practice for divers visiting these caves needs to be formulated and enforced. Some caves may need to be declared 'closed' to divers to allow regeneration, Degree of isolation of the population: The *P. oceanica* beds present in id-Dwejra are locally isolated.

***Degree of isolation of the population***

The *P. oceanica* meadows in this area are considered to be isolated since there is little or no continuity with meadows present in other coastal areas due to the deep water present off most of the western coast of Gozo.

***Global assessment***

The abundant rocky habitats at Qawra/Dwejra, including the numerous submerged and emergent sea caves, and the range of depths available within a short distance make this a very important site for species of hard substrata, including photophilic algae and especially sciaphilic assemblages.

**Stage 2 criteria**

**Relative Value Of The Site At The National Level**

This site has been proposed as a candidate Marine Conservation Area and the adjoining terrestrial area as a National Park; the Government of Malta has proposed the entire Qawra/Dwejra as a natural World Heritage Site (Malta Structure Plan, 1992).

**Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

Not known.

## SITE 9 – RAMLA/SAN BLAS AREA

### (MAP REFERENCE: FIG. 23)

#### Habitats present

**Sand Banks Which Are Slightly Covered By Seawater All The Time:** Vegetation belonging to the *Cymodoceion nodosae* is present in several places in the area, where it forms monospecific patches and stands. A particularly large stand of *Cymodocea nodosa* is present in the central parts of San Blas Bay. Large patches of bare sand are also present throughout the area. In places, the bare sand patches occur amongst the extensive *P. oceanica* beds present.

**Posidonia Beds:** These occur as patchy, reticulate and continuous meadows throughout the area, generally at depths greater than 4m. The *P. oceanica* beds present occur on both bedrock and sandy bottoms and constitute some of the healthiest and densest stands known from local waters. The *P. oceanica* at Ramla Bay forms part of a set of seagrass beds that have recently been the focus of detailed study of the influence of different bed morphology on the diversity of the associated macrofauna (Borg *et al.*, unpublished data).

**Large Shallow Inlets And Bays:** Taking the interpretation of this habitat type as adapted for Malta and discussed in Section 6 under the heading 'Large Shallow Inlets And Bays', Ramla and San Blas bays qualify as such a habitat in terms of both their biological characteristics and physical dimensions.

**Reefs:** Other than rocky outcrops a couple of metres high, rocky reefs having a high vertical face rising from a more or less flat bottom are not known from the Ramla/San Blas area.

#### Degree of representativity

The habitats present in the Ramla and San Blas area are typical of ones found along the northeastern coast of the Maltese Islands where the prevailing bottom is gently sloping (Pirotta & Schembri, 1997a, 1997b) and supports extensive forests of photophilic algae and *P. oceanica* beds (Borg *et al.*, 1997). The *P. oceanica* beds present in the area exhibit the full range of meadow morphologies known locally i.e. patchy, colline, reticulate and continuous. Furthermore, the *P. oceanica* beds present in the area are found growing on both bedrock and on sediment.

We estimate that the area occupied by each habitat type is as follows:

Sand banks:	0.95km <sup>2</sup>	
<i>Posidonia</i> beds:	1.73km <sup>2</sup>	Total survey area = 3.41km <sup>2</sup>
Large shallow inlets:	3.41km <sup>2</sup>	

#### Degree of conservation of habitat structure and function and restoration possibilities

The area is prone to heavy passage of marine craft (especially in the summer months), mainly pleasure craft and professional and amateur fishing boats. Both small and large pleasure craft frequently drop anchor in several parts of the area, particularly in the central parts of Ramla and San Blas Bays. Amateur fishermen also occasionally drop anchor in some places while fishing using hand-lines. Professional and amateur fishermen also lay

small moorings for fish traps in several places. During the summer, the area is visited by large numbers of bathers. A sewage outfall on the shore in San Blas Bay discharges raw sewage into the marine environment.

Apart from the sewage outfall at San Blas, this area is still mostly pristine and the impacts listed above are more or less easily controlled and managed, especially by zoning and regulation of the activities within each zone. No habitat restoration is deemed necessary as impacted habitats are likely to regenerate naturally if the source of impact is removed.

The outfall at San Blas should be removed outright. No habitat restoration is deemed necessary as natural regeneration is expected to take place spontaneously.

### ***Global assessment of the site***

This site is very important in the local context as it includes very good examples of the range of habitat types found off the northeastern coast of the Maltese Islands, mostly in pristine condition (excepting the environs of the San Blas sewage outfall). The extensive, dense and healthy seagrass beds present for which good ecological data exists, make this site of regional importance as a reference site for long-term ecological studies.

### **Species**

**Annex II Species:** Frequent sightings of the Bottle-nosed Dolphin (*Tursiops truncatus*) and of the Loggerhead Turtle (*Caretta caretta*) have been made (JAB, personal observation). The sandy beaches in the area were used as nesting grounds by the Loggerhead Turtle (*Caretta caretta*) previous to 1930, but no records of nesting have been made since and the degree of human use of these beaches is such as to make a return of the turtles unlikely (see Baldacchino & Schembri, 2002 and references therein).

**Annex IV Species:** The *P. oceanica* meadows present in the area support a large population of the Noble Pen-shell (*Pinna nobilis*). However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

**Annex V Species:** Small populations and occasional individuals of the Mediterranean Locust Lobster (*Scyllarides latus*) occur below overhangs and in crevices present on the rocky substrata in the area. However, since no detailed population studies have been made, the exact extent and population density of this species are not known.

### ***Proportion of the total national population at the site***

This is difficult to estimate in view of lack of detailed population data for the whole of the Maltese territorial waters.

### ***Degree of conservation and restoration possibilities of the features of the habitat that are important for the species***

Restoration is not deemed necessary if the agents impacting the habitats within the bays are controlled. Control measures necessary for the conservation of important habitats are the prohibition of anchoring by pleasure craft and amateur fishermen in all but designated areas, and the control of trawling, discharge of pollutant effluents (including total elimination of the San Blas outfall) and dredging within the bay, and other activities that are known to damage *P. oceanica* beds, including habitat engineering works at Ramla Beach and Ramla Valley.

**Degree of isolation of the population**

Not isolated. The *Posidonia oceanica* meadows of the Ramla/San Blas area are continuous with adjacent ones present along the northern and eastern coasts of Gozo.

**Global assessment**

The *P. oceanica* meadows within the Ramla and San Blas bays are extensive, dense and healthy. Very good ecological data also exists for these meadows, making them important for monitoring purposes. The extensive meadows present mean that seagrass-associating species, including those of local and international conservation interest are present as large populations.

**Stage 2 criteria**

**Relative Value Of The Site At The National Level**

The Ramla and San Blas area is considered to have a high value for the reasons already outlined in the 'Global Assessment' for habitats and species above. This site has been proposed as a candidate Marine Conservation Area (Malta Structure Plan, 1992). The *P. oceanica* beds present in the area represent some of the healthiest and most extensive meadows known from local waters.

**Relationship of the site to migration routes or its role as part of an ecosystem on both sides of one or more EU frontiers**

*P. oceanica* meadows serve as a feeding ground for a number of migratory fish species (e.g. *Seriola dumerilii*) since these feed on smaller fishes (e.g. *Boops boops*) that are found associated with the seagrass.

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## APPENDIX 1

### ABBREVIATIONS USED

ASCIs	Areas of Special Conservation Interest (Bern Convention)
Barcelona Convention	Convention for the Protection of the Mediterranean Sea against Pollution
Birds Directive	The European Union's Council Directive 79/409/EEC on the conservation of wild birds
CORINE	<b>CO-oRdination of INformation on the Environment</b>
EEA	European Environment Agency
EEZ	Exclusive economic zone
EIONET	European Environment Information and Observation Network
ETC/NPB	European Topic Centre on Nature Protection and Biodiversity
EU	European Union
EUNIS	<b>EUropean Nature Information System</b>
Habitats Directive	The European Union's Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora
MEPA	Malta Environment and Planning Authority
NASs	Newly Associated States (with the EU)
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PA	Malta Planning Authority (now MEPA)
RAC/SPA	Regional Activity Centre for Specially Protected Areas (of UNEP's Mediterranean Action Plan)
SACs	Special Areas of Conservation declared under the Habitats Directive
SCIs	Sites of Community Importance (NATURA 2000)
SPAs	Special Protection Areas under the Birds Directive
SPABIM	Protocol for Specially Protected Areas and Biodiversity in the Mediterranean
SPAMI	Specially Protected Areas of Mediterranean Importance under the SPABIM Protocol
TOR	Terms of Reference
UK	United Kingdom

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## APPENDIX 2

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### DEFINITIONS

The different legislative instruments and their supporting documentation and databases refer to the same ecological concepts (habitats, communities) but use different terminologies or define the same terms in different ways. Thus for example, the Habitats Directive defines 'natural habitats' as "terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural" [Article 1(b)], which is a legal definition rather than an ecological one. The RAC/SPA classification uses the same definition as the Habitats Directive but adds "the habitat can be compared herein to a biocenosis<sup>75</sup>, facies and association"<sup>76</sup>. This implies that RAC/SPA considers 'habitat' to be a collective term for biocenosis, facies and association, or that these units are subdivisions of habitat. Again, the EUR15/2 'Interpretation Manual' refers to 'biotopes' in the text but does not define biotope (and the Habitats Directive itself does not mention biotopes), whereas the RAC/SPA classification defines a 'biotope' as a "geographical area with variable surface or volume submitted to ecological conditions where the dominant elements are homogeneous". According to this definition, a biotope is a physical location where the environment is more or less homogeneous at least in terms of the main factors. How this definition differs from that of 'habitat' is obscure.

The RAC/SPA classification uses a plethora of ecological units, some of obscure derivation and which are not in use in the mainstream ecological literature: association, biocenosis, biotope, ecomorphosis, facies, stage...etc. The difference between these various units is not always clear. For example, in the definition of 'biocenosis', there is the following statement "The notions of community or association in the phytosociological sense of the word are very close to the notion of biocenosis although they cannot exactly replace it". The definition admits the very close relationship between these terms but does not explain the difference between them.

It is not the intention to give an analysis of the terminology used in the different legislative instruments and their supporting literature, although such an analysis is long overdue. The point being made is that given this situation, it is very important to keep in mind that there is a certain amount of confusion and ambiguity in the terminology used in the different instruments and also sometimes within the same instrument, and that this may lead to problems of interpretation when comparing the **same** units classified under **different** systems.

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<sup>75</sup> This is the spelling of biocenosis used in the definition.

<sup>76</sup> Appendix III ('Lexicon') of Annex VI of UNEP(OCA)/MED WG.154/7

## **APPENDIX 3**

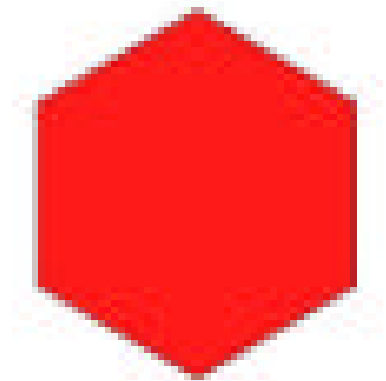
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**KEYS TO MAPS (FIGS 2-14) OF MARINE BENTHIC ASSEMBLAGES CLASSIFIED ACCORDING TO THE SCHEME USED BY THE REGIONAL ACTIVITY CENTRE FOR MARINE PROTECTED AREAS (RAC/SPA) OF UNEP**



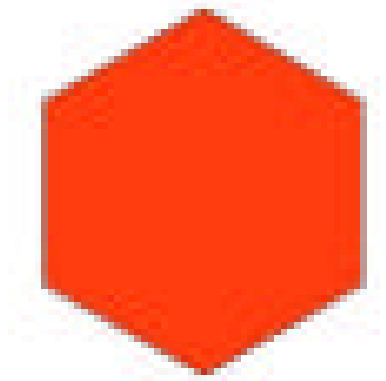
### III.1 Sandy Muds, Sands, gravels and rocks in Euryhaline and Eurythermal Environment

#### III.1.1 Euryhaline and Eurythermal biocoenoses



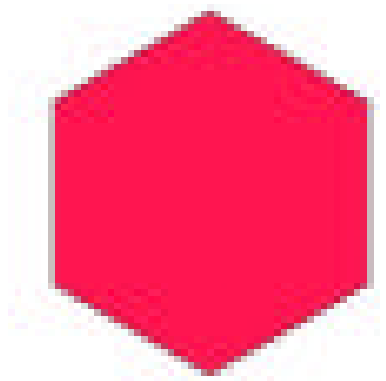
AA

III.1.1.9 Association with *Ulva laetevirens* and *Enteromorpha linza*



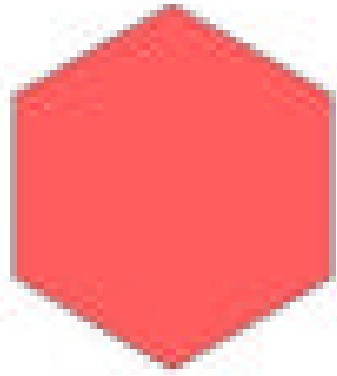
AB

#### [III.1.2] BIOCOENOSIS OF POLLUTED HARBOUR MUD AND SANDY MUD



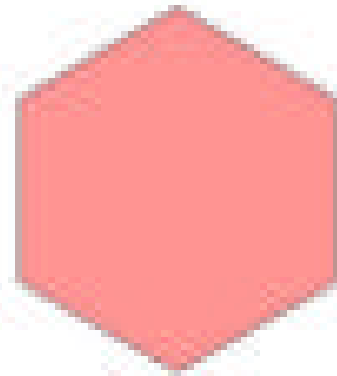
AC

[III.1.2.1] Facies with *Cymodocea nodosa*



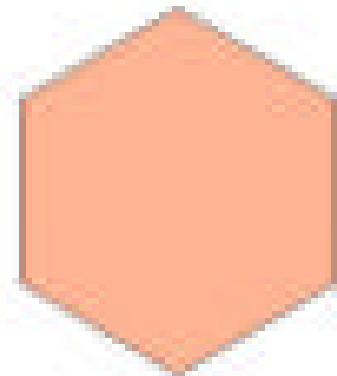
**AD**

[III.1.2.2] Facies with *Halophila stipulacea*



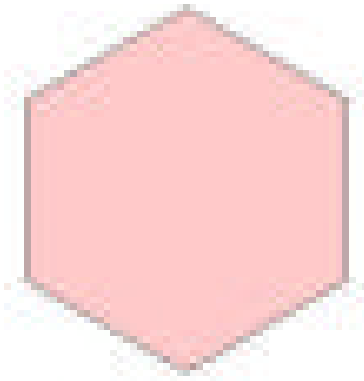
**AE**

[III.1.2.3] Facies with *Upogebia tipica*



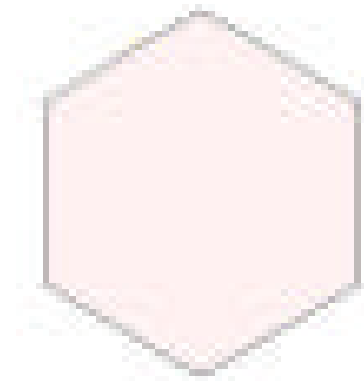
**AF**

Enclaves with photophilic algae on patches of bedrock and/or boulders



**AG**

Enclaves with biocoenosis of infralittoral stones and pebbles



**A**

Combination of assemblages occurring within Sandy Muds, Sands, gravels and rocks in Euryhaline and Eurythermal Environment

### III.2 FINE SANDS AND FINE SANDS WITH MORE OR LESS MUD



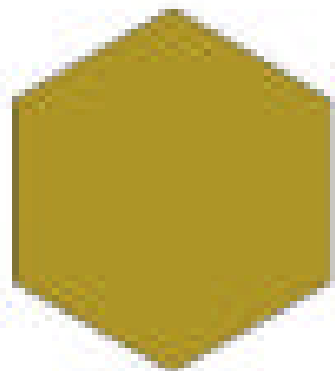
**BA**

#### III.2.1 BIOCOENOSIS OF FINE SANDS IN VERY SHALLOW WATERS



**BB**

#### III.2.2 BIOCOENOSIS OF WELL-SORTED FINE SANDS



**BC**

##### III.2.2.1 Association with *Cymodocea nodosa* on well-sorted fine sands



**BD**

III.2.2.2 Facies with *Halophila stipulacea*



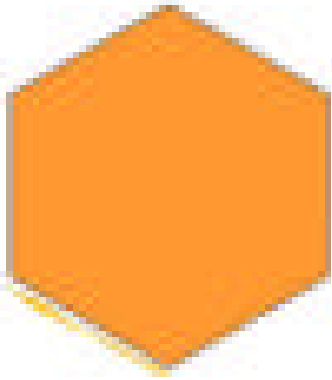
**BE**

[III.2.2.3] Facies of well-sorted fine sands with *Caulerpa racemosa*



**BF**

[III.2.2.4] Facies of well-sorted fine sands with *Diogenes pugilator*



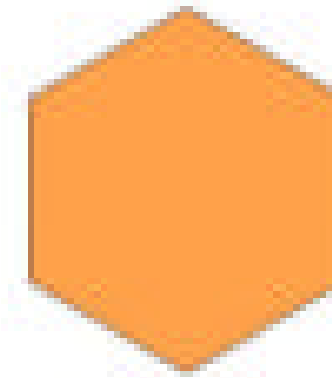
**BG**

Enclaves with *Posidonia oceanica* (patches and collines)



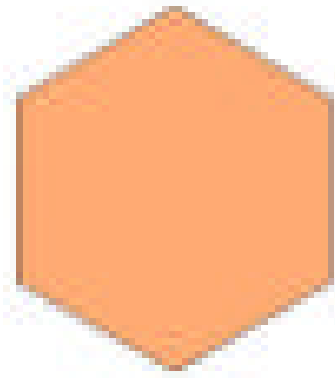
**BH**

Enclaves with mixed *Posidonia oceanica*/*Cymodocea nodosa* (patches)



**BI**

Enclaves with photophilic algae on patches of bedrock and/or boulders



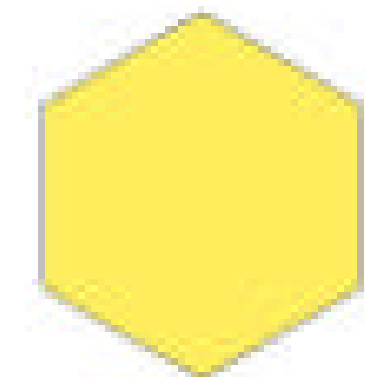
**BJ**

Enclaves with *Posidonia oceanica* (patches) and photophilic algae on patches of bedrock and/or boulders



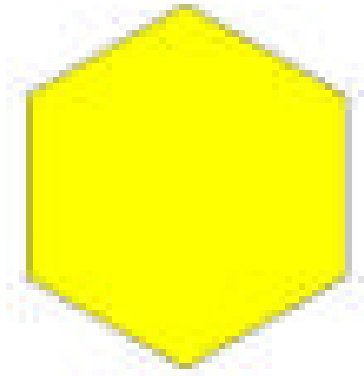
**BK**

### **III.2.3 Biocoenosis of superficially muddy sands in sheltered waters**



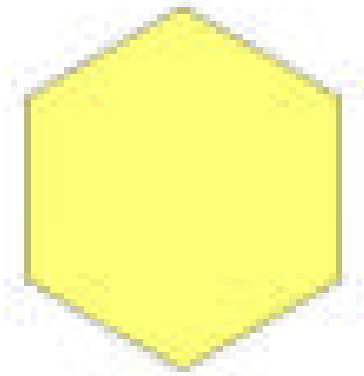
**BL**

III.2.3.4 Association with *Cymodocea nodosa* on superficially muddy sands in sheltered waters



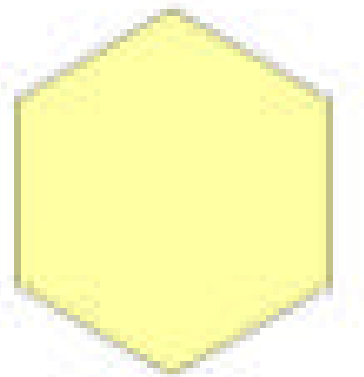
**BM**

III.2.3.6 Association with *Caulerpa prolifera* on superficially muddy sands in sheltered waters



**BN**

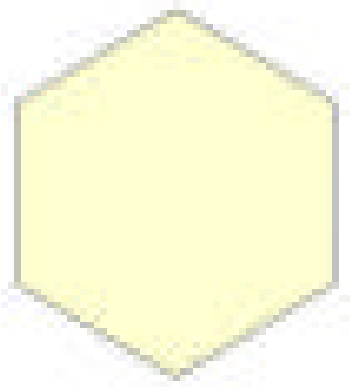
[III.2.3.8] Facies of superficially muddy sands with *Callianassa truncata*



**BO**

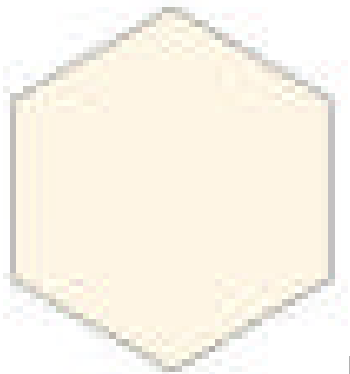
[III.2.3.9] Facies of superficially muddy sands with *Caulerpa racemosa*





**BP**

[III.2.3.10] Facies of superficially muddy sands with *Diogenes pugilator*



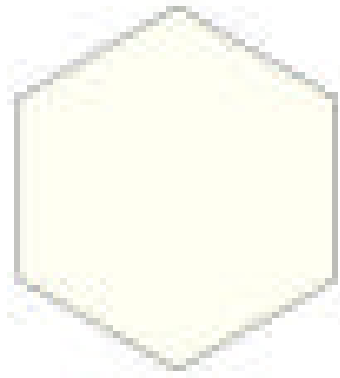
**BQ**

[III.2.3.11] Facies of superficially muddy sands with *Upogebia pusilla*



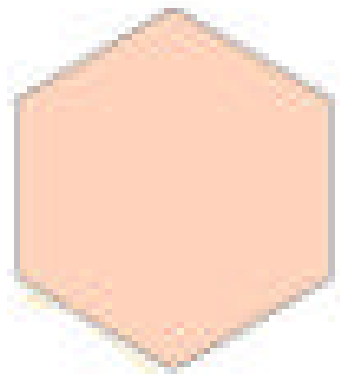
**BR**

Enclaves with biocoenosis of infralittoral stones and pebbles



**BS**

Enclaves with photophilic algae on patches of bedrock and/or on boulders



**B**

Combination of assemblages occurring within fine sands and fine sands with more or less mud

### III.3 COARSE SANDS AND GRAVELS WITH MORE OR LESS MUD

#### III.3.2 Biocoenosis of coarse sands and fine gravels under the influence of bottom currents



CA

##### III.3.2.1 Maerl association



CB

Enclaves with coarse sands and fine gravels and sciaphilic algae on bedrock



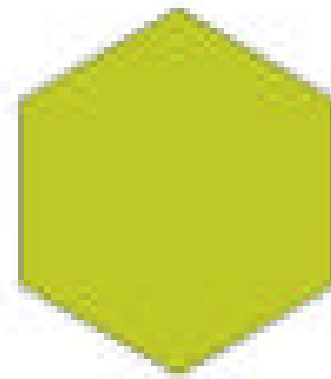
CC

Enclaves with patches of: *Posidonia oceanica*, coarse sands and fine gravels, and sciaphilic algae on bedrock.



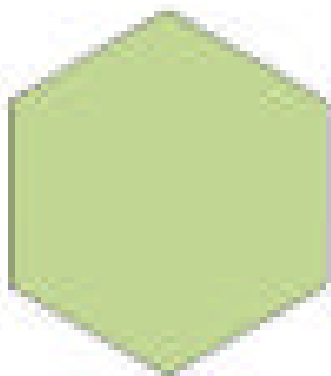
**CD**

Enclaves with patches of coarse sands and fine gravels



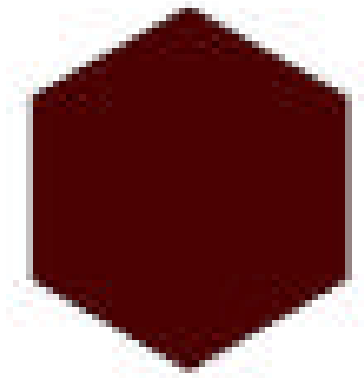
**CE**

**[III.3.3] Biocoenosis of coarse sands and muddy heterogeneous sediment**



**CF**

[III.3.3.1] Facies with *Spatangus purpureus*



**CG**

[III.3.3.2] Facies with *Cymodocea nodosa*



**CH**

[III.3.3.3] Facies with *Caulerpa racemosa*



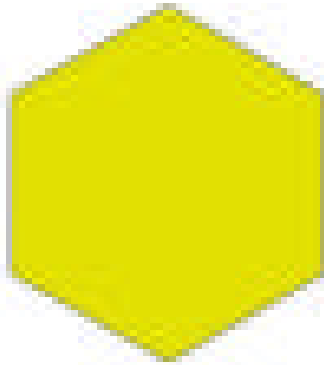
**CI**

Enclaves with *Posidonia oceanica* (patches and collines)



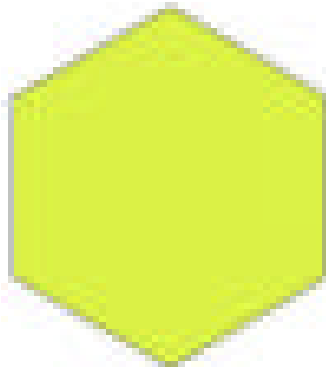
**CJ**

Enclaves with mixed *Posidonia oceanica*/*Cymodocea nodosa* patches



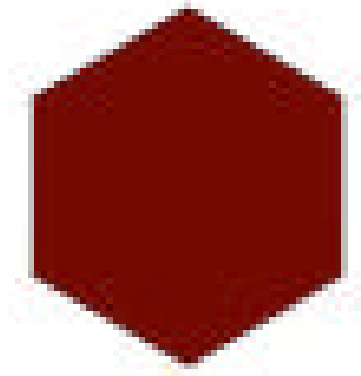
**CK**

Enclaves with *Posidonia oceanica* and sciaphilic algae on patches of bedrock and/or boulders



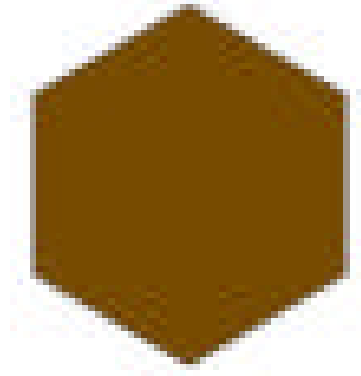
**CL**

Enclaves with sciaphilic algae on patches of bedrock and/or boulders



**CM**

Enclaves with Maerl (patches)



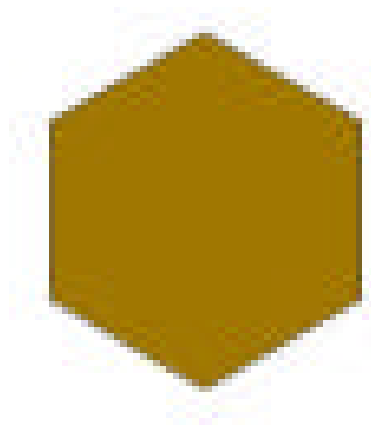
**CN**

Enclaves with maerl and sciaphilic algae on bedrock



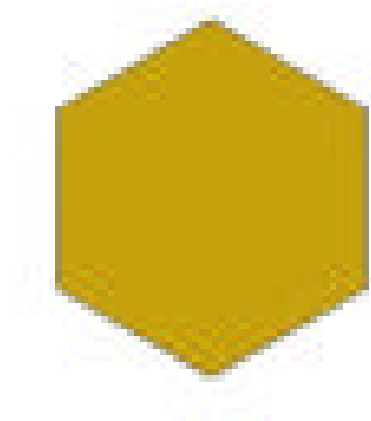
**CO**

Enclaves with maerl, sciaphilic algae on bedrock and *Posidonia oceanica* (patches)



CP

**[III.3.4] Biocoenosis of infralittoral gravels**



C

Combination of assemblages occurring within coarse sands and gravels with more or less mud



### III.4. Stones and pebbles



**DA**

#### III.4.1 Biocoenosis of infralittoral stones and pebbles



**DB**

Enclaves with photophilic algae on patches of bedrock and/or boulders



**DC**

Enclaves with fine sands



**D**

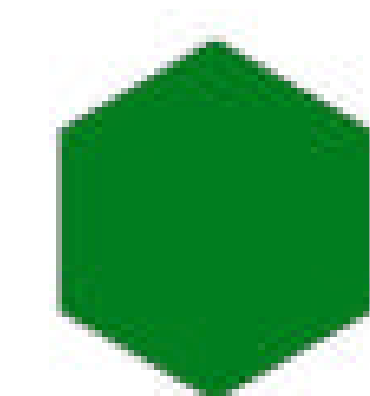
Combination of assemblages occurring on stone and pebbles

### III.5 *Posidonia oceanica* meadows



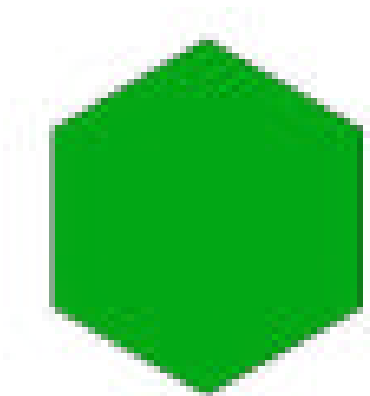
**EA**

#### III.5.1.2 Ecomorphosis of 'barrier reef' meadows



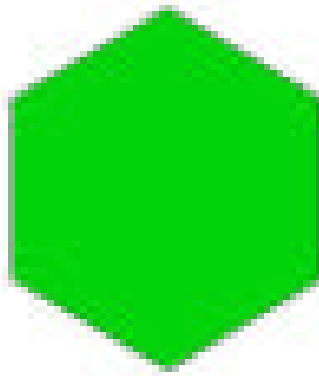
**EB**

#### III.5.1.3 Ecomorphosis of dead matte without much epiflora



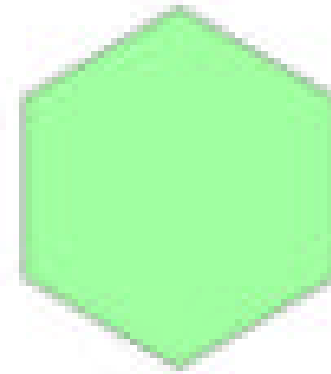
**EC**

[III.5.1.5] Ecomorphosis of continuous *Posidonia oceanica* meadows on bedrock with enclaves of photophilic algae



**ED**

[III.5.1.6] Ecomorphosis of continuous *Posidonia oceanica* meadows on sand with enclaves of bare sand



**EE**

[III.5.1.7] Ecomorphosis of reticulate *Posidonia oceanica* meadows on sand with enclaves of bare sand



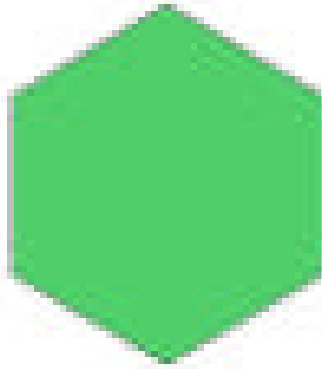
**EG**

[III.5.1.8] Ecomorphosis of continuous *Posidonia oceanica* meadows on bedrock with enclaves of sciaphilic algae



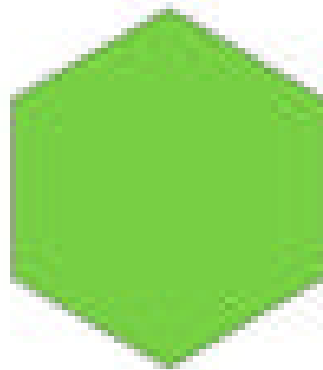
**EF**

[III.5.1.9] Complex of Ecomorphosis of reticulate *Posidonia oceanica* on bedrock with enclaves of bare sand, mixed with the Association of *Peyssonnelia squamaria* and *Flabellia petiolata*



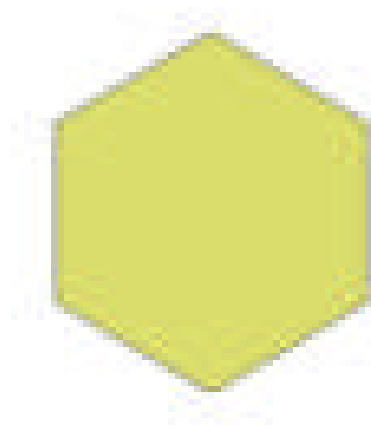
**EH**

[III.5.1.10] Complex of: Ecomorphosis of reticulate *Posidonia oceanica* on bedrock with enclaves of bare sand, mixed with the Association of *Dictyopteris polypodioides*.



**EI**

[III.5.1.11] Complex of: Ecomorphosis of reticulate *Posidonia oceanica* on bedrock with enclaves of bare sand, mixed with associations of *Cystoseira* spp.



**E**

Combination of assemblages occurring within *Posidonia oceanica* meadows

## III.6 Hard beds and rocks

### III.6.1 Biocoenosis of infralittoral algae



**FA**

#### III.6.1.1 Overgrazed facies with encrusting algae and sea urchins



**FB**

#### III.6.1.2 Association with *Cystoseira amentacea*



**FC**

Association of *Corallina elongata*



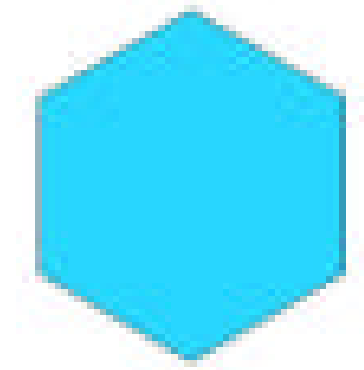
**FD**

Association of *Corallina elongata* and *Amphiroa* sp



**FE**

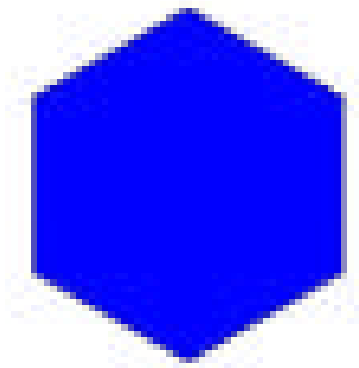
Association with *Dasycladus vermicularis*



**FF**

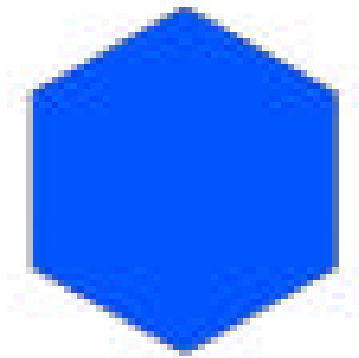
III.6.1.19 Association with *Cystoseira spinosa*





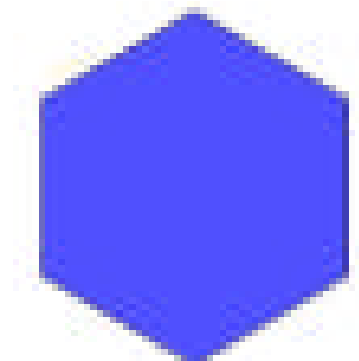
**FG**

III.6.1.21 Association with *Dictyopteris polypodioides*



**FH**

Association with *Halopteris scoparia* and *Padina pavonica*



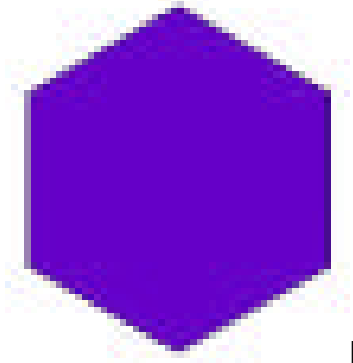
**FI**

III.6.1.25 Association with *Cystoseira compressa*



**FJ**

III.6.1.27 Facies with large Hydrozoa



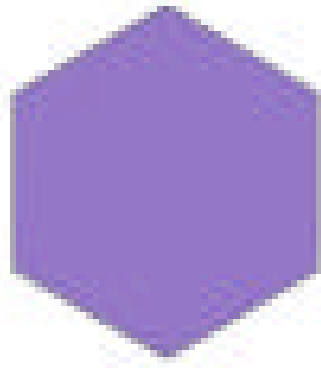
**FK**

III.6.1.31 Facies with *Astroides calycularis*



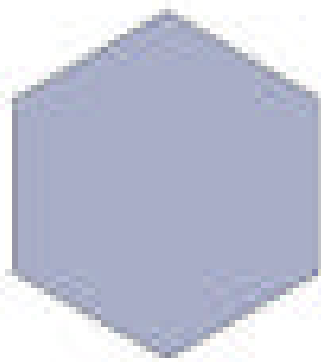
**FL**

III.6.1.32 Association with *Flabellia petiolata* and *Peyssonnelia squamaria*



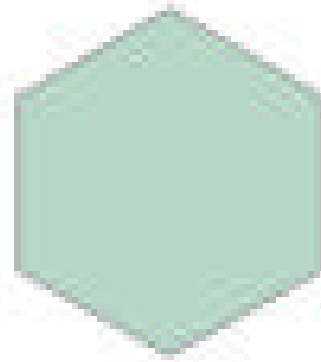
**FM**

Association with *Dictyota dichotoma* and *Halimeda tuna*



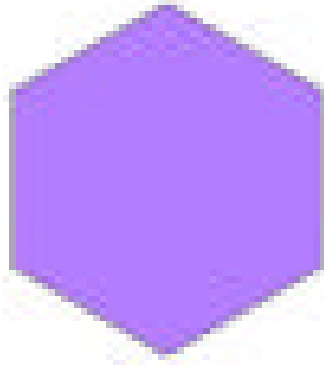
**FN**

Association with *Cladophora prolifera*



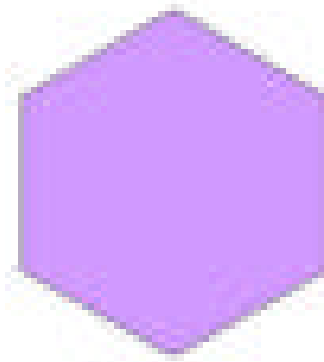
**FO**

Association with *Padina pavonica*



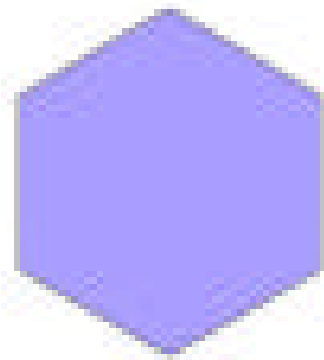
**FP**

Association with *Acetabularia acetabulum*



**FQ**

Association with *C. schiffneri* var *tenuiramosa*



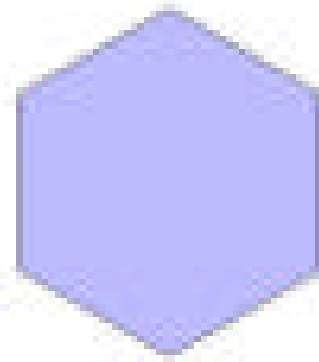
**FR**

Association with *Zonaria tourneforti*



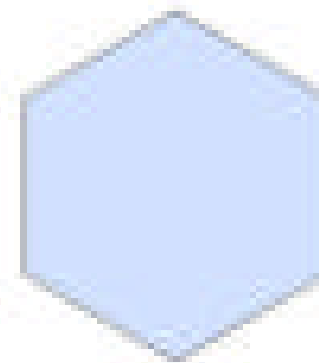
**FS**

Association with *Caulerpa racemosa*



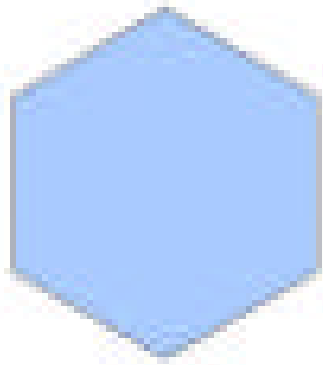
**FT**

Enclaves with biocoenosis of infralittoral stones and pebbles



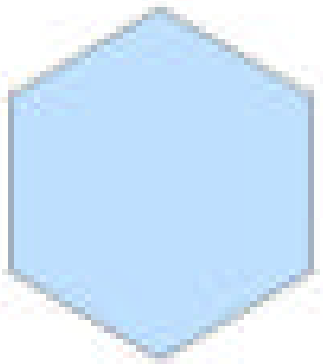
**FU**

Enclaves with patches of *Posidonia oceanica*



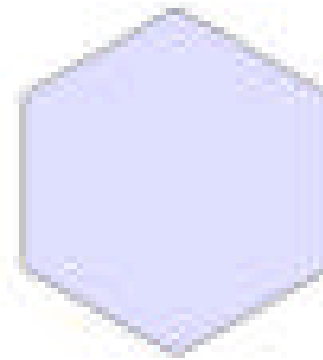
**FV**

Associations with *Cystoseira* spp.



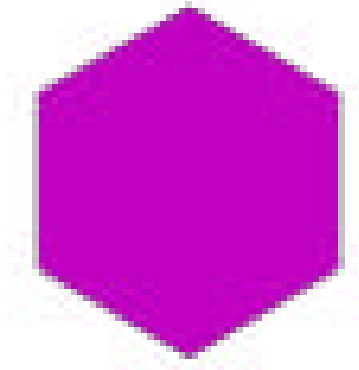
**FW**

Association with *Cystoseira squarrosa*



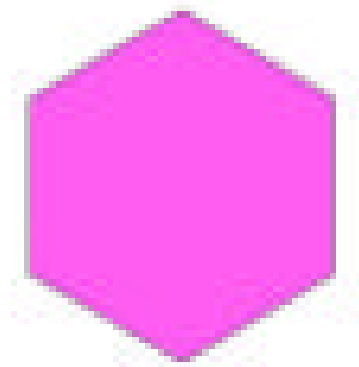
**FX**

Association with *Halopytis pinastroides*



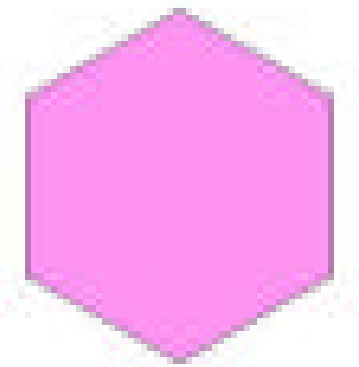
**FY**

Associations with algal turf



**FZ**

Association with *Sargassum acinarium*



**F**

Combination of assemblages occurring on hard beds and rocks

## **APPENDIX 4**

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**DATA CARDS FOR AREAS FOR WHICH BENTHIC HABITAT MAPS ARE AVAILABLE, INCLUDING AN ASSESSMENT OF QUALITY OF THE DATA.**



Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Dahlet ix-Xmajjar survey (Fig 2)	Summer 1990	Medium	Medium	The survey data is rather old (12 years) and needs re-assessment.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Mellieha Bay survey (Fig 3)	Summer 1992	Medium	Medium	The survey covered only the seabed between mean sea level and the 6 m depth contour. The data collected is also rather old (10 years) and needs re-assessment.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Biomaerl project (Fig 4)	April 1996	Indicative	Indicative	The survey methodology consisted of remote sampling by grab. Recording of positions relied completely on GPS, which at the time of the survey had a large random error (30 – 100m).

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							North Harbours Local Plan (Fig 5A-D). Please note that in the case of St George's Bay, the more recent map produced from the Beach Nourishment Project survey (summer 2000) has been used as template. See separate descriptor form for St George's Bay.	1996	Medium	Medium	Main survey techniques used relied heavily on position recording using GPS which, at the time of the survey, had a large random error (30 – 100m).

**Definitions:**

**SURVEY RESOLUTION**

High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.

Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.

Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.

Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.

Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Beach Nourishment Project at Bajja ta' San Ġorġ, St.Julians (Fig 5C)	August 2000	High	High	Main survey technique was supplemented by aerial photography and sampling of epibiota and infauna, thereby increasing the survey resolution and reliability of data collected.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Manoel Island/Tigne survey (Fig 6)	June 1998	Medium	Medium	Survey resolution limited due to low underwater visibility and the continual presence of navigating ships, motor vessels and other seacraft.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Cottonera Waterfront Project – Dahlet it-Tarzna Survey (Fig 7)	January/February 2001	Medium	Medium	Survey resolution limited due to limitations imposed by low underwater visibility and by the continual presence of navigating ships, motor vessels and other seacraft..

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Pretty Bay & Wied Buni survey (Fig 8)	Summer 1990	Indicative	Indicative	Data is rather old (12 years) and needs re-assessment.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.



Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							CAMP project (Fig 9)	2000-2001	High	High	Main survey techniques involved a very large number of dives and field-visits. These were also supplemented by aerial photography and sampling of epibiota and infauna, thereby increasing the survey resolution and reliability of data.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Cirkewwa survey (Fig 10)	Summers of 1997, 2000, 2001	High	High	Surveys of the same area carried out periodically, increasing the reliability of data and allowing for re-assessment during each repeat session. In one of the survey sessions (Summer 2000), the main survey technique was supplemented by aerial photography, thereby increasing the survey resolution and reliability of data collected.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Mgarr ix-Xini survey (Fig 11)	1997	High	High	Main survey technique involved a considerable number of dives but not enough to give a high resolution.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Dwejra/Qawra Gozo Local Plan survey (Fig 12A&B)	January 1997	Medium	Medium	Main survey technique involved a considerable number of dives but not enough to give a high resolution.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Marsalforn survey (Fig 13)	1994	Medium	Medium	Main survey technique involved a sufficient number of dives which were sufficient to achieve a high resolution. However, data is rather old and requires re-assessment, especially given that beach replenishment works were carried out in parts of the bay, following the survey.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

**RELIABILITY**

- High: the techniques used for the survey have allowed an accurate representation of the habitats in the area.
- Medium: the survey indicates the presence of habitat boundaries, but lacks a clear delineation of boundaries; further interpretation (particularly in the boundary areas) would require further surveys.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable, or the survey technique is unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

Feature ID	Category	Type of Habitat	Corine classification	Description	Unit Responsible	Contact Person	Source (Survey)	Date of Survey	Survey Resolution	Reliability	Comments
							Ramla & San Blas survey (Fig 14)	1999/2000	High	High	Main survey techniques were supplemented by aerial photography, thereby increasing the survey resolution and reliability of data.

**Definitions:**

**SURVEY RESOLUTION**

- High: the resolution is good quality; the techniques used for the survey have allowed the accurate delineation of the habitat boundaries.
- Medium: the resolution is of adequate quality; the survey indicates the presence of habitat boundaries, but the delineation of the boundaries is not clearly identifiable.
- Indicative: the survey results are merely indicative of the habitats present on site; the data is anecdotal/unreliable. The inclusion of this category is to avoid (as far as is possible) having blank areas on the map.

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