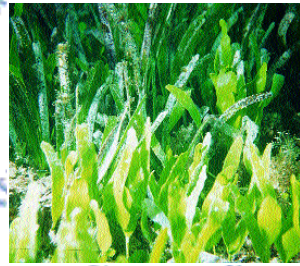
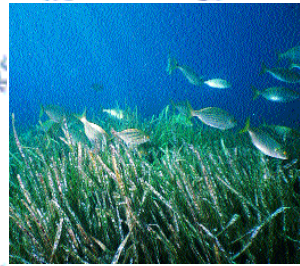


PROCEEDINGS OF THE FRIST MEDITERRANEAN  
SYMPOSIUM ON MARINE VEGETATION

(AJACCIO, 3-4 OCTOBER 2000)

ACTES DU PREMIER SYMPOSIUM MEDITERANEEN  
SUR LA VÉGÉTATION MARINE

(AJACCIO, 3-4 OCTOBRE 2000)



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*PROCEEDINGS OF THE FIRST MEDITERRANEAN  
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SUR LA VÉGÉTATION MARINE  
(AJACCIO, 3-4 OCTOBRE 2000)**

## FORWARD

The knowledge of the elements of the biological spectrum in the Mediterranean, in details, is a hard task to which the countries from the region, the qualified international intergovernmental organisations in the field and NGO's got down for a long time.; but the results were not convincing. Due to the fact that marine and coastal living world is facing an eternal mutation, in some case quickly, as a follow up to changes that affect certain components of the environment. The examples of these mutations and changes which are the cause are many : the proliferation, in some place quickly of invasive species, the rarefication of certain endemic species of the region etc...

Meanwhile, a perfect knowledge of biological diversity components at specific, genetic and ecosystemic level is necessary to country to undertake a sustainable and rational exploitation and management of their coastal and marine biological resources taken into account the human and ecological conditions that prevail in the region.

Aware of the importance of that task on which depend the future evolutions of the elements of the biological spectrum in the Mediterranean and convinced that only a complementary and integrated approach between all who have the possibility to produce and diffuse information and knowledge relative to the living world of these central sea, the serie «Med Nature» offer to contribute, within the limit of facilities available at the Regional Activity Centre for Specially Protected Areas (RAC/SPA) of MAP/UNEP in the enhancement of knowledge within these large field of biological Diversity.

The first issue, dedicated to Mediterranean marine vegetation, constitute a call to scientific communities and to biological resources managers in the Mediterranean to participate in an enhanced knowledge of the Mediterranean. The information and data produced by research activities and by technical reports are important to know and to promote between the specialists. Med nature aims to offer also a forum for discussion in these contexts.

**The Director of RAC/SPA**

## AVANT PROPOS

Connaître les éléments du spectre biologique en Méditerranée, dans leurs détails, est une tâche ardue à laquelle les pays de la région, les organisations intergouvernementales compétentes en la matière et des organisations non gouvernementales se sont attelés depuis longtemps ; mais les résultats n'étaient pas toujours probants. C'est que le monde vivant marin et côtier de la Méditerranée vit une éternelle mutation, par moment rapide, suite aux changements que subissent certaines des composantes de l'environnement de la biocénose. Les exemples de ces mutations et des changements qui en sont les causes sont nombreux : la prolifération, par endroit rapide, des espèces invasives, la raréfaction de certaines espèces endémiques de la région etc...

Cependant, une connaissance parfaite des éléments de la diversité biologique sur les plans spécifique, génétique et écosystémique est nécessaire pour que les pays puissent entreprendre une gestion et une exploitation rationnelle et durable de leurs ressources biologiques marines et côtières tenant compte des conditions écologiques et humaines qui prévalent dans la région.

Consciente de l'importance de cette tâche dont dépendent les évolutions futures des éléments du spectre biologique de la Méditerranée, et étant convaincue que seule une approche intégrée et de complémentarité entre tous ceux qui aient la possibilité de produire ou de diffuser des informations et des connaissances relatives au monde vivant de cette mer centrale, la série «Med Nature» se propose de contribuer, dans la limite des moyens du Centre d'Activités Régionales pour les Aires Spécialement Protégées relevant du PAM/PNUE, à améliorer les connaissances dans ce vaste domaine de la diversité biologique.

Ce premier numéro, consacré à la végétation marine méditerranéenne, constitue un appel à la communauté des scientifiques, et aux gestionnaires des ressources biologiques en Méditerranée pour participer à une meilleure connaissance de la Méditerranée. Les informations et données produites à l'occasion des travaux de recherche ou dans le cadre de rapports techniques divers sont importantes à connaître et à valoriser à travers l'échange entre les spécialistes. Med Nature ambitionne d'offrir également un forum de dialogue à cet effet.

**Le Directeur du CAR/ASP**

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# PROGRAMME

## *Tuesday 3 October 2000*

### 09:30 Opening session

- Welcome speeches
- Presentation on the Action Plan for the Conservation of Marine Vegetation in Mediterranean Sea and on the Symposium programme.
- Introductory conference on marine vegetation in the Mediterranean.

### 10:30 – 10:50 Coffee break

### 10:50 – 11:50 Poster session

### 11:50 – 13:00 Discussion on Posters (20 minutes)

#### Roundtable 1: Taxonomy and taxonomists (50 minutes)

### 14:30 Session 2: Threats to species

- Keynote speeches (East Mediterranean, 20 minutes)  
(West Mediterranean, 20 minutes)
- Poster session (1 hour)

### 16:30 Session 3: Threats to assemblages

- Keynote speech (30 minutes)
- Poster session (1 hour)

## *Wednesday 4 October 2000*

### 09:00 Roundtable 2: Marine Vegetation and coastal zone management (Impacts, Mapping, Databases)

### 11:00 Coffee break

### 11:30 Roundtable 3: Suggestions for additional species and assemblages to be considered as priorities in the implementation of the Action Plan

### 13:00 Session 4: Conclusions and recommendations

- Recommendation from the roundtables.
- Scientific objectives of the Second Mediterranean Symposium on Marine Vegetation

### 15:00 Closure of the Symposium



# PROGRAMME

*Mardi 3 octobre 2000*

09h30 Séance d'ouverture

- Allocutions de Bienvenue
- Présentation du Plan d'Action pour la Conservation de la Végétation Marine en Mer Méditerranée et du programme du Symposium.
- Conférence introductive sur la végétation marine en Méditerranée

10h30 – 10h50 Pause café

10h50 – 11h50 Séance Posters

11h50 – 13h00 Séance Discussion Posters (20 minutes)

Table ronde 1: Taxinomie et taxinomistes (50 minutes)

14h30 Séance 2: Les menaces aux espèces

- Exposés introductifs (Méditerranée orientale, 20 minutes)  
(Méditerranée occidentale, 20 minutes)
- Séance posters (1 heure)

16h30 Séance 3: Les menaces aux peuplements

- Exposé introductif (30 minutes)
- Séance posters (1 heure)

*Mercredi 4 octobre 2000*

09h00 Table ronde 2: Végétation marine et gestion de la zone côtière (Impacts, Cartographie, Bases de données)

11h00 Pause café

11h30 Table ronde 3: Suggestions pour l'ajout d'espèces et de peuplements pour être considérés prioritaires dans la mise en oeuvre du Plan d'Action

13h00 Séance 4: Conclusions et recommandations

- Recommandation des tables rondes
- Les objectifs scientifiques du Deuxième Symposium Méditerranéen sur la Végétation Marine

15h00: Clôture du Symposium

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## TRAWLING AS A MAJOR THREAT TO MEDITERRANEAN MAERL BEDS

### ABSTRACT

European project MAST III CT95-0020 studied the characteristics of European of European maerl beds and the effects of human activities upon them. In the Mediterranean, trawling appeared as the major impact on these habitats. In this study we compare the characteristics of maerl beds from a fished and an unfished site from 2 localities, Alicante (SE Iberian Peninsula) and Malta (central Mediterranean). We conclude that recurrent trawling affects negatively the maerl ecosystem by decreasing the size and cover of the component calcareous algae and increasing the relative proportion of fines thus diminishing mean sediment grain size.

**KEY WORDS:** Trawling, maerl beds, Mediterranean

### INTRODUCTION

Maerl is a term used to describe biogenic gravels formed by the accumulation of unattached non-geniculate coralline algae (Corallinales, Rhodophyta) and occasionally also from calcified peyssoneliacean algae. These algae typically take the form of nodules known as rhodoliths. Maerl beds are present in all oceans, from the intertidal to depths of over 100m (Bosence, 1983; Littler et al., 1991). In the Mediterranean, well developed maerl beds are patchily present in transition zone between the lower infralittoral where *Posidonia oceanica* reaches its lower bathymetric limit, and the upper circalittoral, hence at depths of between 25m and 100m (Pères and Picard, 1964; Ballesteros; Ballesteros, 1989); however sparse rhodoliths can be found outside these depth limits.

Maerl beds are ecologically interesting habitats for several reasons (Jacquot, 1962; BIO-MAERL team, 1998): i) they develop on fine sedimentary bottoms creating coarser substrata and increasing spatial heterogeneity; ii) they support a highly diverse biota, members of which are exploited commercially while others are rare or even endemic; and iii) rhodoliths are extremely slow growing and well developed maerl beds may take centuries to develop.

Mediterranean maerl habitats are not explicitly protected. Maerl is considered an «endangered landscape» by UNEP/IUCN/GIS Posidonie (1990), while some individual maerl-forming species are protected at a Mediterranean level: *Lithophyllum lichenoides* (SPA, 1999) and *Lithothamnion corallioides* and *Phymatolithon calcareum* in European Community waters, where their exploitation is regulated (EC Directive 43/92, Annex V).

In the Mediterranean trawling is considered the most important source of negative impact on the benthos (Bellan-Santini, 1994) and recent work has demonstrated the dramatic effect of

such fishing on benthic marine assemblages (e.g. Dayton et al., 1995; Watling and Norse, 1998), including on maerl beds (Hall-Spencer and Moore, 2000).

The present work focuses on Spanish and Maltese waters. Fishing regulation in these two countries are different: in Spain trawling is prohibited at depths shallower than 50m; in Malta trawling is prohibited closer than 3 nautical miles from the coast. However maerl occurs outside these prohibited zones and illegal practices are more frequent than desired. To study the impacts of trawling on maerl beds, we compared rhodolith characteristics and bed sedimentology of fished and unfished grounds in Alicante (SE Spain) and in Malta.

## MATERIALS AND METHODS

Within Alicante and Malta localities we selected two sites, one impacted by trawling and other unfished, thus serving as a control (figure 1) on the basis of published (see Ramos-Espla, 1985 for Alicante and Borg et al., 1998 for Malta) and unpublished work and after consulting with local fishermen.

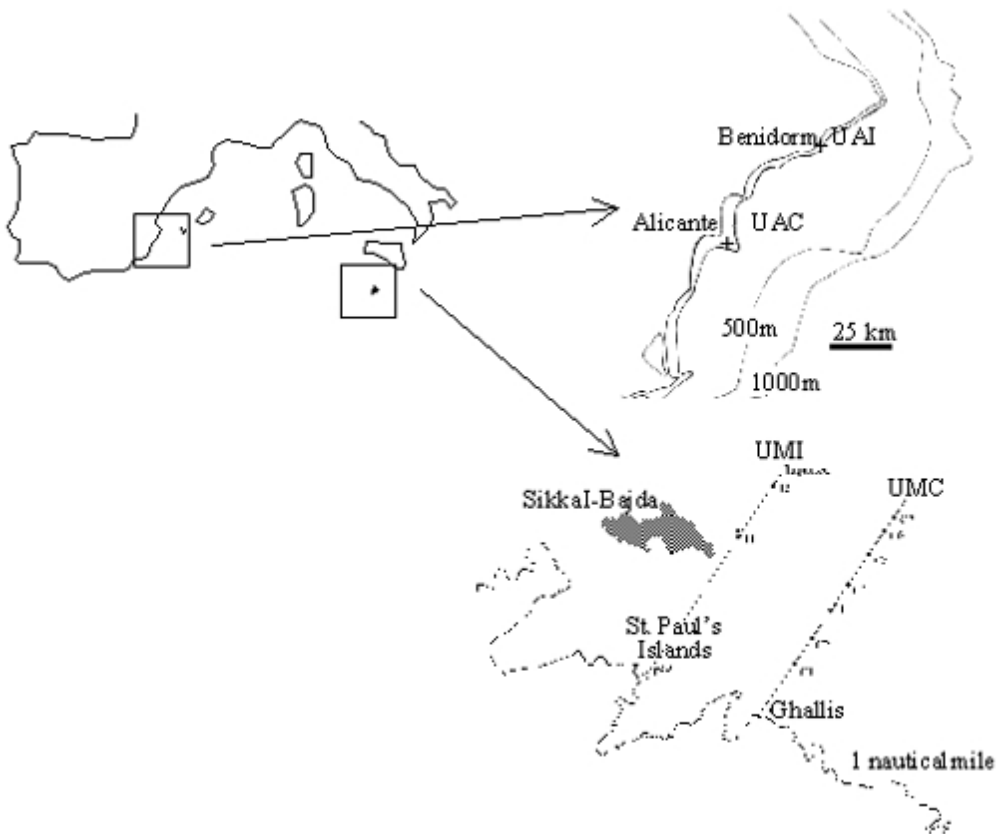


Figure 1. Location of the study sites. UMC, UMI: Malta control/impacted; UAC, UAI: Alicante control/impacted.

At Alicante samples were collected by SCUBA divers from 0.01 m<sup>2</sup> (x 4cm deep) quadrats fitted with a 1mm mesh bag. At Malta, we used a Van Veen grab (Khalisco) and samples were sieved through a 1mm mesh on deck. We obtained 6 replicate samples per season and per site, during two consecutive years (winter 1997-autumn 1999). We estimated total cover and

size of living rhodoliths. Sediment was sampled using diver-deployed corers (9 cm diameter x 15 cm deep).

## RESULTS

Figure 2A shows that UAC had a much higher cover of calcareous algae than UAI, but for Malta, UMC has less cover than UMI. Rhodolith size was bigger at UAC than at UAI, but the opposite occurred at UMC and UMI; however, note that rhodoliths from UMI, UMC and UAC had similar sizes. Figure 2B shows that median grain size was larger at UAC than at UAI, and the percentage of fines was much greater at UAI than at UAC. At Malta median grain size was larger at UMI, and fines percentage of fines greater at UMC. Note that the Maltese sites and UAC show the same pattern for both variables, but the opposite occurs at UAI.

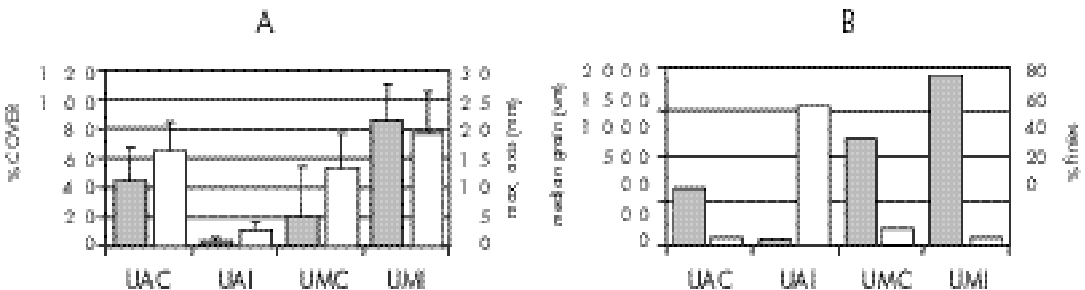


Figure 2. A) Mean rhodolith cover and length of maximum axis of living rhodoliths at each locality. B) Median grain size and percentage of fines (<63 µm) at each locality. (Gray and white bars correspond to left and right scales respectively; error bars are +1SD).

## DISCUSSION

Our results show that there is a large difference between UAC and UAI, but for the Maltese localities differences are not as large, being both sites similar to UAC. This pattern may reflect differences in fishing effort: in Malta there are only 6 trawlers and none can legally fish the maerl bed, whereas at UAI (La Vila harbour) there are at about 50 trawlers (IEO-SGPM, 1998). Differences in measured variables of UAI from the other three sites supports the hypothesis that intense and recurrent trawling activity could have changed the characteristics of this maerl bed: rhodoliths here are sparser and smaller, while the sediment is finer than any of the other sites. Furthermore, using grab sampling at UAI, we were able to collect large rhodoliths (15-50 mm diameter) in rocky bottoms precluded from trawling. At UAI we also observed a shift in the algal assemblage from hard Corallinales at rocky areas to more opportunistic soft Peyssonneliaceae in the trawled areas, probably due to changes induced by trawling (e.g. turbidity, physical damage, sedimentation increasing). A parallel study reported elsewhere showed a lower diversity of maerl-associating macrofauna and loss of mature ecosystem species at the impacted sites (BIOMAERL team, 1998). Although we cannot assert that differences at the UAI site are due exclusively to trawling, since we lack a formal BACI design (Underwood, 1994), our data coincide with experimental studies carried out in shallower waters in other seas (e.g. Hall-Spencer and Moore, 2000) where experimental work is possible, given the shallower water (< 30m).

## ACKNOWLEDGEMENTS

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