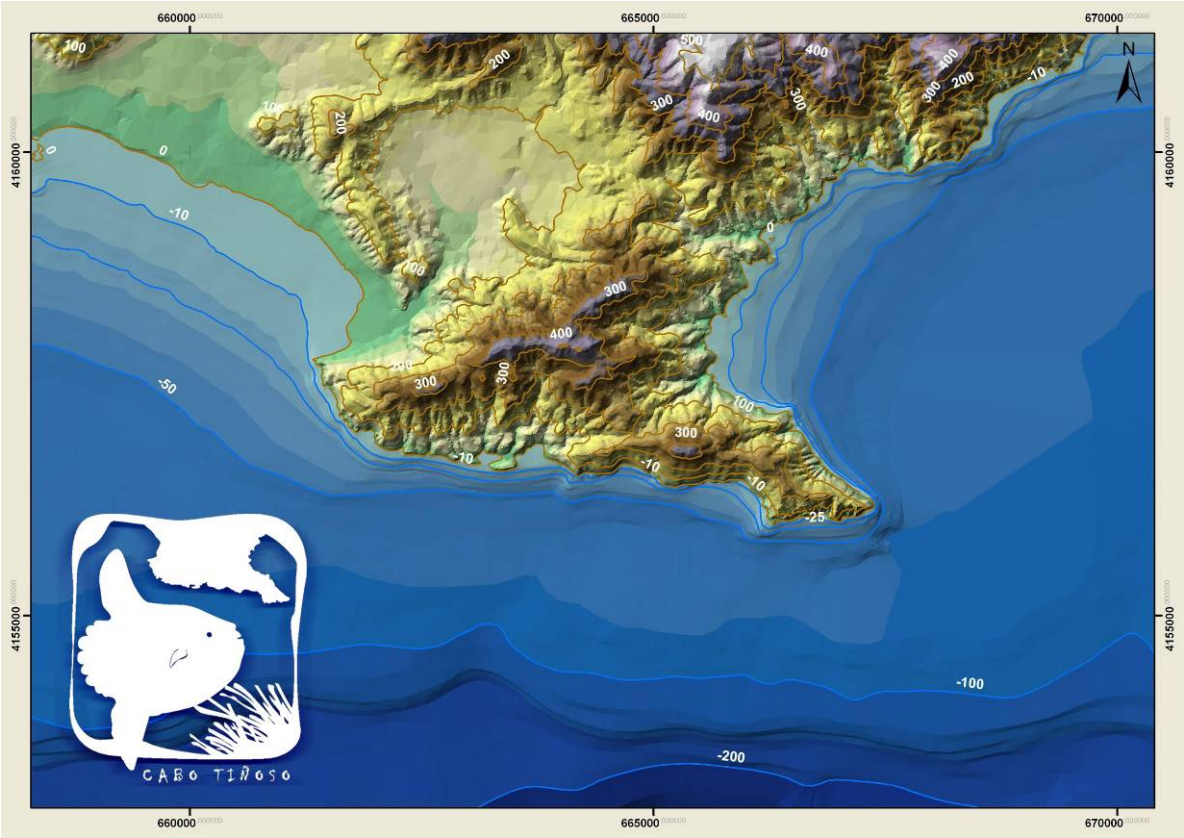
CHARACTERIZATION, DIAGNOSIS AND DEFINITION OF PROPOSALS FOR MARINE ECOSYSTEM MANAGEMENT INCLUDED IN THE AREA OF TIÑOSO CAPE (The Region of Murcia)

(Synthesis document)



December 2.007

CONSEJERÍA DE AGRICULTURA Y AGUA
Dirección General de Ganadería y Pesca
Servicio de Pesca y Acuicultura

Tragsatec
Grupo Tragsa

INDEX

1. Introduction, background data, justification and objectives

The marine environment of The Region of Murcia has specially valuable areas for the conservation of biodiversity and its resources.

The natural resources exploitation, in some cases in an unsustainable way and non respectful with the environment, together with the intensification of the pressures of the uses in the coast and the sea, justify the realization of activities of conservation and custody of determined areas to maintain the natural processes and to promote the biodiversity and the natural resources, which have a direct impact on the quality of life and on the survival of fishing.

Tiñoso Cape is a singular enclave with regional importance in which it is necessary to carry out an appropriate management, that should be compatible both with the conservation of the marine environment and the development of activities, guaranteeing the survival of traditional uses such as artisanal fishing.

The protection of marine areas through different regulations was promoted by the Protocol to the Barcelona Convention (1976), concerning Specially Protected Areas of the Mediterranean Sea (Geneva, 1982)

The Spanish Marine Protected Areas have been established by such different public administrations as the former General Secretariat of Maritime Fisheries of the Ministry of Agriculture, Fisheries and Food and the Ministry of Environment. Other Marine Areas have been declared by the governments of Regions, as in the case of The Region of Murcia in the implementation of the Marine Reserve of Fishing Interest of Palos Cape- Hormigas Islands in 1995.

But, not only the administration supports the establishment of Marine Protected Areas, increasingly, due to greater social conscience, more agents and/or organizations: Non-Governmental Organizations (NGOs), Universities, research centres, fishermen's associations, etc.., are demanding the implementation of this tool for planning and management.

In 1992, The Department of Agriculture, Husbandry and Fishery of The Region of Murcia carried out an study about some areas susceptible to being declared Marine Reserves of Fishing Interest (hereafter MRFI). **Palos Cape-Hormigas Islands-Grosa Island, Tiñoso Cape and Cope Cape were the areas selected of Fishing Interest.**

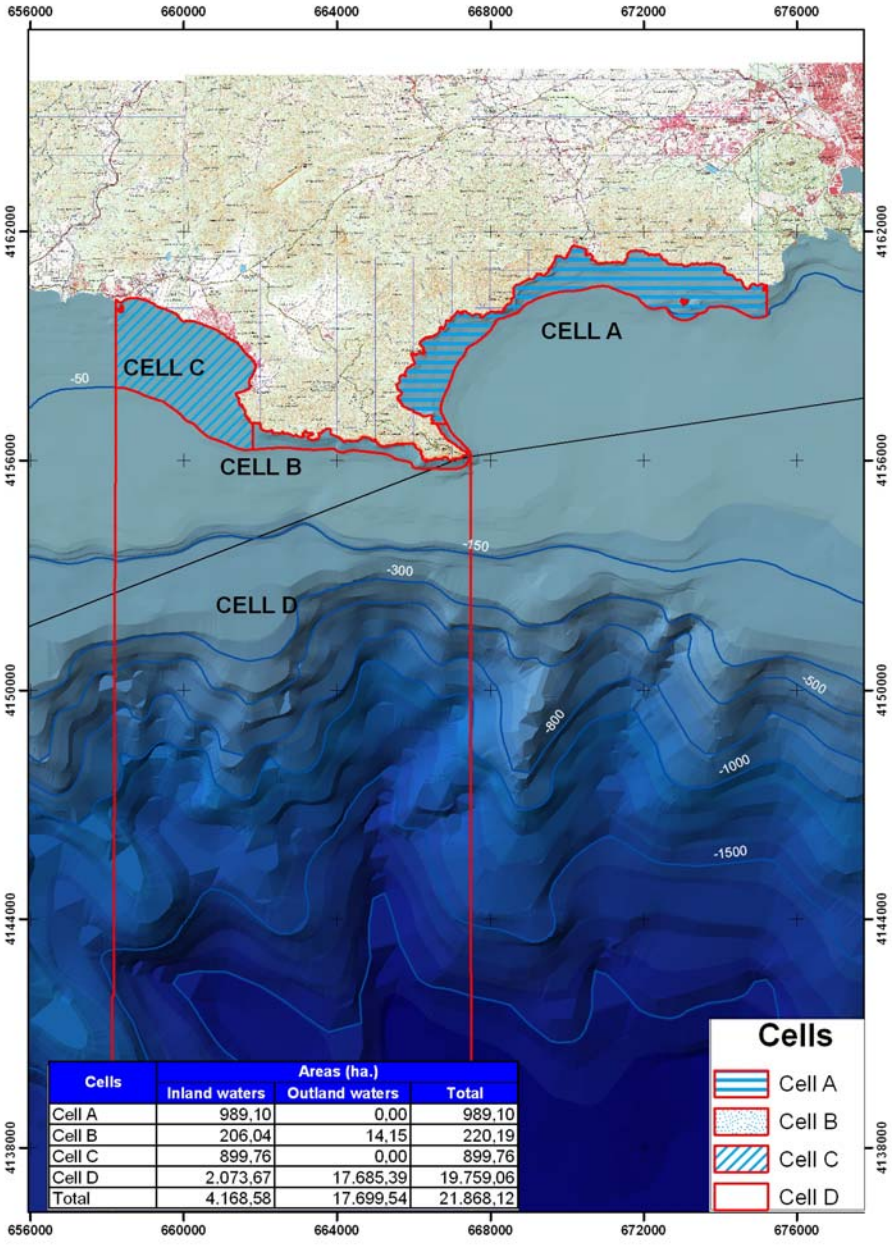
Based on these studies and in others complementary initiatives, the Cabo de Palos-Hormigas Islands was declared Marine Reserve of Fishing Interest (Official Gazette of The Region of Murcia. No.92 April 21 1995)

Once the effectiveness of the Marine Reserve of Fishing Interest of Palos Cape-Hormigas Islands was confirmed and taking on consideration the singularity and importance of Tiñoso Cape, the Department of Agriculture and Water of The Region of Murcia, find justifiable the necessity of analyze the suitability of implementing a similar model of management to the one carried out in Palos Cape-Hormigas Islands.

The final objective of this study is **to determine the suitability of the protection of Tiñoso Cape under the denomination MRFI**, getting simultaneously other specific objectives such as: the characterization of the marine environment of Tiñoso Cape, a comprehensive diagnostic of the area under study, the establishment of principles and guidelines appropriate to the protection criteria of the fishery resources of the area to define, establish a set of management objectives and proposals of management, to design and develop a public participation process and to design a management model based on a determined zoning.

2. Characterization of the physical environment and biotic of Tiñoso Cape

The field of this study covers the coastal strip from Las Palomas Island and Torrosa Island (L: 37º35´10,96´´N; l: 1º03´05,14´´W) to Mojón Beach and Plana Island (L: 37º34´22´´N; l: 1º12´30´´W).This area, that is proposed as " Marine Reserve of Fishing Interest" (MRFI), contains seabed that stretch to the 2000 m. isobath, including two of the most abrupt submarine canyons of the area (Fig. 1).



Cells	Areas (ha.)		
	Inland waters	Outland waters	Total
Cell A	989,10	0,00	989,10
Cell B	206,04	14,15	220,19
Cell C	899,76	0,00	899,76
Cell D	2.073,67	17.685,39	19.759,06
Total	4.168,58	17.699,54	21.868,12

Figure 1. Location of proposed limits as MRFI.

The submerged littoral of the studied area is characterized by its continental slope that starts on the 300 m. isobath and descends sharply until it reaches the 2.200m.

The characteristics of the studied area have favoured the development of habitats, biocenosis and associations of great importance and high ecological value. Nowadays, there is (available) information about the biotic environment only up to a depth of 50m.

The **habitats of the Habitat Directive 92/43/CEE** present in the selected area for the study are:

- 1120*: *Posidonia oceanica* meadows.
- 1110: Sandbank which is slightly covered by seawater all the time.
- 1170: Reef habitat.
- 8330: Submerged sea caves.

In the area proposed as (MRFI) exists biocenosis and associations of the Barcelona Convention, all of them, considered of interest for the selection of places for its conservation in the Mediterranean Sea. This characteristics grant an added value to study area.
These are the biocenosis and associations present in the different littoral belts.

Supralittoral belt

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

Mediolittoral belt

II.2.1.1 *Facies of banks of *Posidonia oceanica* dead leaves and other phanerogams

II.4.1.3. *Association with *Nemalion helminthoides* and *Rissoella verruculosa*

II.4.2.10. *Deep pools and lagoons sometimes associated to vermetids (infralittoral enclave)

Infralitoral belt

III.3.2.1.*Facies of Maërl (association with *Lithothamnion corallioides* and *Phymatolithon calcareum*)

III.5.1.*_Posidonia oceanica_ meadow (Association with _Posidonia oceanica_)

III.6.1.2. *Association with _Cystoseira amentacea_ (var. _amentacea_, var. _stricta_, var. _spicata_)

III.6.1.3. *Facies with vermetids

III.6.1.19. *Association with _Cystoseira spinosa_

III.6.1.25. * Association with _Cystoseira compressa_

III.6.1.35. *Facies and associations of coralligenous in enclave

Circalitoral belt

IV.3.2. *Semi-dark caves (also in enclave in the infralittoral)

IV.3.1.1.3 *Facies with _Paramuricea clavata_

IV.3.1.12 *Facies with _Lophogorgia sarmentosa_

IV.3.1.1 *Association with _Cystoseira zosteroides_

IV.3.1.11. *Facies with _Eunicella singularis_

Some singularities have also been observed which by its own nature grant an added value to the area of study.

Singularities analyzed up to date are:

- Submarine canyons
- Stable populations of cetaceans
- _Posidonia oceanica_ meadows
- Maërl seabeds
- Submerged and partially submerged caves
- Populations of ocean sun fish (_Mola mola_)
- Communities of rocky substrate

3. Socioeconomic characterization

3.1. Demography

A thorough socioeconomic study is crucial for the planification of the study area in order to determine the weaknesses and threats, as well as the strengths and opportunities of the area. It has been deemed appropriate to start from a regional frame considering the municipal territory of both Mazarrón and Cartagena.

The Municipality of Mazarrón has approximately 35,000 inhabitants though during the summer months can experiment a ten-fold increase in the number of residents.

Cartagena has approximately 211,329 inhabitants (107,736 male and 103,593 female) of whom 176,021 inhabitants live in the city and 35,840 in the rural districts (INE, 2006, National Statistical Institute).

As shown in Fig.2, the census of the population of The Region of Murcia presents an upward trend which in more noticeable in Mazarrón, actually above the Regional average. This factor implies an increase risk of anthropogenic pressures over the study area.

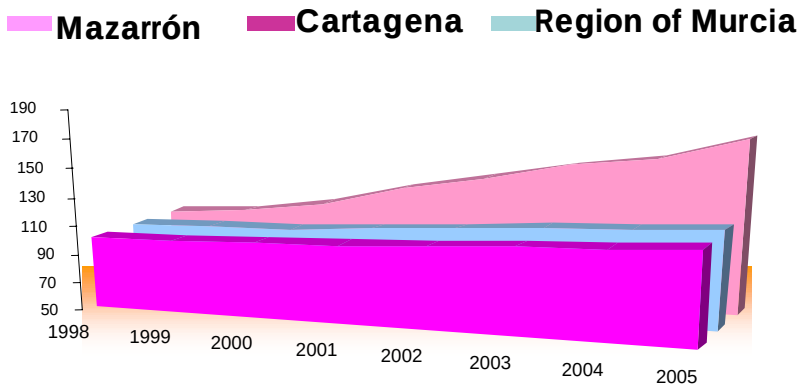


Figure 2. Evolution of the population (rate of change).

3.2. Tourism, fishing activity and diving,

Turism is developed around La Chapineta, La Azohia and San Ginés. It acts as a relief for residential tourism in Cartagena, while El Portús is chosen mainly by foreigners. This type of tourism has a strong seasonality, being summer the most crowded season because it incorporates the main leisure activities in the area including swimming, diving and maritime recreational fishing.

The declaration of protected natural reserves as Marine Protected Areas can be regarded as an incentive for tourism. These Areas, which will be seen as a tourist attraction could give a boost to the economic development.

The littoral of the Region of Murcia is one of the best places in the Iberian Peninsula for **scuba diving**. 12 Diving centres are listed in the study area in the surroundings of Cartagena and Mazarrón, 4 of which are situated in La Azohía.

The **marine recreational fishing** is one of the most popular activities in the study area in its two disciplines, scuba diving and surface supply diving. Marine recreational fishing is mostly practised by surrounding populations, but it is also a tourist resource of great importance

3.3. Fisheries

Currently, the fleet of Cartagena is composed of 65 boats while Mazarrón has 56 boats on its port although some of them anchor in La Azohía. Currently, the fishing methods used and its percentages are: fishing gear (61%), trawling (17%), seine fishing (18%) and longline fishing(4%).

In 2006, **output in the surroundings of Tiñoso Cape was 2,919 tons** of fresh fish approximately (2,191 tons in Mazarrón, including trap net for tunas; and 728 tons in Cartagena). This figure represents more than half of the production volume of Region of Murcia (4,935 tons in this year)

The **value of the production in the surroundings of Tiñoso Cape** was nearly **7,12 million Euros in 2006** (3,28 million Euros in Mazarrón including the trap net for tunas and 3,83 million Euros in Cartagena). These figures **represent approximately 55% of the value of the fresh fish landed in the whole Region of Murcia** in the same year (12,79 million Euros).

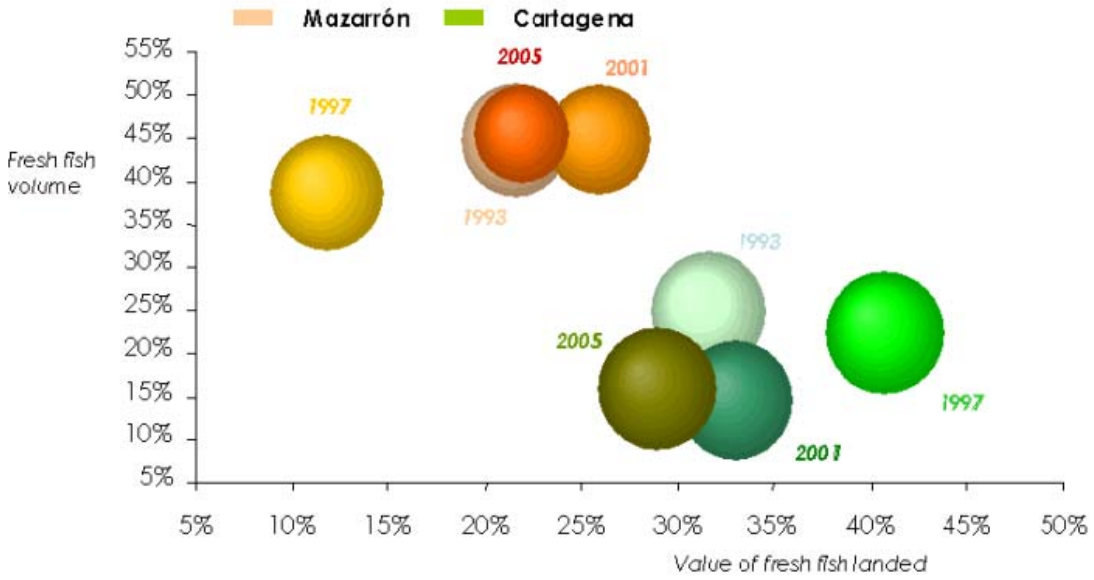


Figure 3. Commercial fisheries competitiviness.

Fig. 3 Shows the contribution of the catches in Mazarrón and Cartagena ports to the total volume of the landings in the Region of Murcia.

- Significant species: red shrimp

The red shrimp (Aristeus antennatus) is a decapod crustacean that is found in the muddy bottom of the continental slope and especially in areas close to the submarine canyons.

The shrimp red fishing is done by bottom trawling. This is a monoespecific fishery. Although bottom trawling is known to be responsible for a significant number of discards, discards from catching red shrimps represents a very low percentage (provided trawling is performed at depths exceeding 400 m) which allows a very high utilization of the catch, increasing its economic value.

The main landings of this species take place in Águilas, Cartagena y Mazarrón. The most visited fishing-grounds are located on the coast in front of Tiñoso Cape and in the area between Águilas and Mazarrón.

Taking into account the biologic characteristics and the socioeconomic value of this species in the Region of Murcia and more concretely, the importance of this species to the Guilds of Cartagena y Mazarrón, measures should be taken that will not limit the conservation of the fishery resource but and at the same time guarantee the preservation of the species.

This activity is regulated by the **Royal Decree 1.440/1.999 of September 10** that regulates trawling in the fishing-grounds of the Mediterranean Sea.

3.4. Assesment of the socioeconomic benefits

The protection of natural areas (whether terrestrial or marine) sometimes has among its objectives, to maintain the compatibility between the conservation of the natural characteristics and the preservation of its living resources and its socioeconomic and cultural values.

In brief, when managing the conservation of the natural resources of a determined area, economic plans on medium and long term will be allowed but always depending on the mentioned resources.

In the same way, we may value the social benefits arising from the creation of a MRFI. For this purpose, it is necessary to estimate the level at which is the best quality of life is guaranteed for the local population.

3.5. Analysis of activities and impacts

To take a more objective view of the activities and the impact they can have on the study area, a **DPSIR analysis** has been made which analyzes the pressure, state, impact and response for each activity in the area.

Of the driving forces identified in the DPSIR analysis, which exert a greater representation in the area and consequently a higher pressure, are fishing and tourism.

The validation of the DPSIR analysis will guarantee the definition of management indicators which will help to evaluate the effectiveness of the management model to implement in the future MRFI.

4. Social prospecting and participation process

4.1. Survey for the characterization of the area of Cape Tiñoso and possible declaration of it as Marine Reserve of Fishing Interest.

A survey has been carried out in order to define the characterization of the area of Tiñoso Cape and its possible declaration as MRFI. In that sense, two complementary and parallel studies have been made: one of them focuses on the closest population of the study area (Cartagena and Mazarrón) and another to analyse the productive sectors that can be affected by the declaration of the area as MRFI. These productive sectors should have their own opinion about the declaration: fishermen, sailing clubs and diving centres.

Thanks to this comprehensive survey, researchers have got a great volume of information of each one of the productive sectors involved. Furthermore, they have collected the perception of the mentioned productive sectors about ecological, cultural and fishery values in relation with the area of Tiñoso Cape.

About the opinion on the appropriateness of declaring the area included under the protection of MRFI, **78%** of the sample believed that it would be a good idea, **13%** believed that it would not be a good idea, and a **9%** were indifferent to such an option.

The public in general holds a positive opinion regarding the intervention of the Administration and feels that this decision will allow the regulation of any actions that contribute to the management of the resources as long as it does not involve a degradation of the environment.

Once the results of the Survey, that was obtained involving the affected sectors, have been analysed, researchers will get a general idea about the acceptance of the MRFI even though these sectors hold scepticism about its implementation.

4.2. Information process and public participation

This Information process and public participation seeks to keep informed and involved as many agents, sectors and local population as possible, regarding the project to implement a MRFI in the area of Tiñoso Cape.

The study, tied to the social field, has marked the first step to establish some previous contacts with essential sectors and the general public in the area.

To design the second part of the public participation process, the sectors and agents involved have been identified. Working parties have to be defined and these should be constituted by local agents. It is needed that this participation generates alternatives, contributions and suggestions that favour the managing of the future MRFI.

5. Legal analysis.

The legal framework for the characterization, diagnosis and definition of the maritime zone of the area of Tiñoso Cape is determinated by the principles system, regulations and institutions of International and National Law, that are applicable to the study area, making a special mention of the legal framework related to fisheries resources and the declaration of MRFI.

Community and International regulations will be taken into account in order to manage the future MRFI, as well as the National and Regional regulations in which it is highlighted that in accordance with the Constitution (articles 148.1.9º and 149.1.23º) and the Statute of Autonomy, Autonomous Communities are entitled to develop the law and execute the protection of the environment and fishery management and the right to issue additional regulation for protection, the State being in charge of dictating the basic legislation. The doctrine of the Constitutional Court has given substance to the jurisdictional titles «marine fishing» and «management of the fisheries sector».

5.1. Institutional framework

Several institutions have jurisdiction to Protect and regulate the area of Tiñoso Cape.

Ministry of Environment, Rural and Marine Environment

It is the department in charge of the proposal and execution of the Government policy in relation with nature conservation, sustainable development, environmental effect, management of the flora, and fauna, habitats and natural ecosystems, and the collaboration with Autonomous Communities to execute the plans in relation with these matters, the management and custody of the public domain, maritime and terrestrial, and all its existing powers.

Ministry of Defense

Has jurisdiction over the territorial sea, working in fisheries surveillance missions, prevention and fight against pollution.

Ministry of the Interior

Through the Maritime Service this Ministry collaborates in the inspection and environmental execution: conservation of nature and the environment, control and fishery inspection, protection of the submerged historical heritage and control of discharges from platforms, ships or from land.

Ministry of Public Works

It is the institution in charge of the general management of the maritime shipping and the Spanish civil fleet.

Department of Sustainable Development and Management of the Territory and Department of Agriculture and Water of The Region of Murcia

Created by the Decree 24/2007, July 2, it has jurisdiction to propose, develop and execute the functions and guidelines of the Government in relation with the environment.

6. Diagnosis

As in every planning process a first tentative proposal is put forward, about the limits of performance based on an analysis of the pre-requirements and determining factors of the area. These limits will be checked and adapted depending on the diagnosis and the contributions of the involved agents.
These are the limits and surfaces of the proposed cells:

CELL	AREA (has)
A	989,1
B	220,2
C	899,76
D	19.759,06

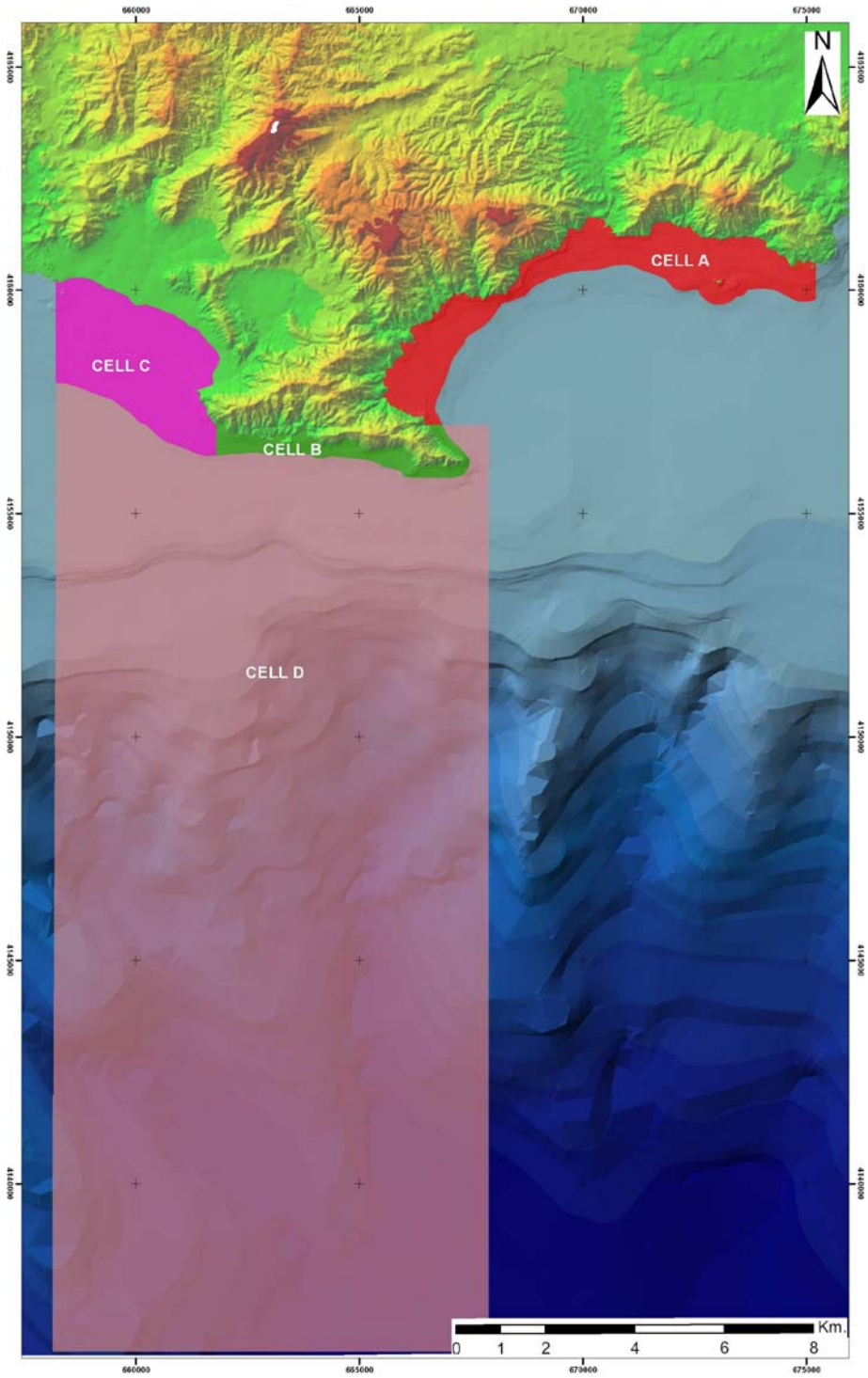


Figure 4. Cells management proposed.

Cell A

This cell extends from Mojarra Cove to Torrosa Island, up to 50m depth.

In this cell highlight: the *Posidonia oceanica* meadows, not very extensive due to the steep slope of the internal platform and the facies of Maërl in a good state of preservation, especially those located on the Las Palomas Island.

Cell A is under anthropic pressure linked to recreational and professional fishing and the Cartagena port activity.

Cell B

This area extends from Mojarra cove to Punta de la Azohía, up to the 50m. isobath.

It is characterized by the domination of reef habitat. Up to 30m. depth the biocenosis consists of infralittoral photophil algae in calm mode. Infralittoral seabeds are dominated by photophilic rock zones, overhangs, pre-coralligenous and a narrow and fragmented belt of *Posidonia oceanica* present up to 22 m. depth. Beyond this limit a biocenosis of detritic circalittoral extends, with facies of Maërl with a considerable level of development in some areas.

This biocenosis is under great anthropic pressure linked to recreational and professional fishing, navigation, diving and invasion of alien species.

Cell C

This area extends from Punta de La Azohía to Mojón Beach up to 50m. depth.

It is characterized by an extensive *Posidonia oceanica* meadow, which in its lower limit presents a significant regression due to trawling. From to the upper limit and towards the coast an extensive patch of well sorted fine sand exists known as “Banco de chirlas de San Ginés” (San Ginés striped Venus shoal), **currently under an indefinite closed period for fishing.**

This unit is under great anthropic pressure linked to recreational and professional fishing, navigation, diving and urban expansion, among other pressures.

Cell D

It extends to the East in front of Tiñoso Cape from 50m. depth. It borders on the outside part of Cell B and C. This cell includes two of the sharpest submarine canyons in the area, up to 2.000m depth.

It is characterized for being part of the migratory routes of species as bluefin tuna (*Thunnus thynnus*) and for the presence of cetaceans: bottlenose dolphin, striped dolphin and common dolphin, sperm whale and pilot whale and Risso´s dolphin.

Species of commercial importance such as king prawns, squids, scabbard fishes, hakes (*Merluccius merluccius*) find a temporal habitat suitable for breeding and spawring. In this area they are protected from predators.
This unit is under anthropic pressure linked to professional fishing and waste disposal.

7. Ecological and multi-criteria valuation

There have been two processes of valuation. An **ecological valuation**, which considered only physical-biotic parameters and a **multi-criteria valuation**, in which the uses that are developed in the study area were considered.

7.1. Ecological valuation

The ecological valuation led to the identification of areas with greater ecological importance of the future MRFI, using different criteria for assessing the space component. The proposal of the MRFI consists of four functional management cells.

Two valuation processes were conducted in the ecological valuation. The first of them, includes an assessment of the management cell A, B and C, applying similar criteria to all of them. Each of these cells in turn presents heterogeneous ecosystem units that display special characteristics and a certain degree of internal uniformity.

The ecosystemic units are:

1. *Posidonia oceanica* meadows
2. Rocky substrate
3. Sandbanks

The general criteria for ecological valuation of the management cells A, B and C of the MRFI in accordance to its ecosystemic units were:

- **Criteria 1:** Presence of Habitat of community interest

- **Criteria 2:** Level of rarity
  Subcriteria 2a.- Level of rarity in relation to Mediterranean Biogeographic Región of the Spanish State

  Subcriteria 2b.- Level of rarity inside MRFI

- **Criteria 3:** Valuation of the relative importance of each type of habitat regarding The Region of Murcia

- **Criteria 4:** State of conservation of habitats
  Subcriteria 4a.- Degree of conservation of the structure
  Subcriteria 4b.- Degree of conservation of the functions
  Subcriteria 4c.- Restoration possibility

- **Criteria 5:** Habitat representativity regarding the total area of the mentioned habitat in the MRFI

In the second valuation process an identification was included together with a characterization and a subsequent valuation of the environmental units of the Cell D, which were determinated from the geomorphologic classification of the seabeds, based on its topography and made from the Digital Elevation Model (MDE).

The valuation of the environmental unit of the Cell D was based on shared information from slopes analysis and cetacean sightings for each ha.

Finally, a global ecological valuation is presented as a final result.

7.1.1 Global ecological valuation

The sum of all the evaluation criteria gives us the following global ecological value, obtaining units of low, medium, high and very high ecological value.

Cell A

In this cell the most valued environmental units match with the surroundings of Las Palomas Island. In the *Posidonia oceanica* meadows the conservation degree of the functions is excellent, despite the fact that the degree conservation should be considered half or partially degraded.

Cell B

The whole rocky unit of the Cell B presents a very high global ecologic valuation. Due to the area that this cell covers, 21,868 ha, in relation to the total area, it is considered very strange regarding the proposal as it has an excellent conservation level. The conservation level of its functions is good and its has a medium term possibility of restoration in the photophilic zone. It is proven fact, in the majority of the MRFI, that the benthic and ichthic communities have a reserve effect. This was proved shortly after the protective measures were applied.

The *Posidonia oceanica* meadow of this area presents a great singularity due to its small size and for being essential for the conservation of the biodiversity of the whole area.

Cell C

This cell is characterized by the largest habitat of *Posidonia oceanica* meadow across the area. The pressure in its lower limit, due to the trawling, prevents it from achieving greater extension. However, the meadow presents a high state of conservation, except in areas such as anchorage zones of La Azohía and Plana Island.

Its role as a protection area (egg-laying and juvenile refuge) makes it essential for the recovery of fishes stocks.

On the other hand, large sandbands of well sorted fine sands, exists in this cell some of which with extensive *Cymodocea nodosa* seagrass beds. Traditionally, there was an important shoal of striped venus, which is currently overfished, but with certain potential for its restoration. This potential needs to be analyzed.

Cell D

Cell D exhibits different singularities from cells previously mentioned. It is characterized, among other aspects, by the lack of information and studies about the area. However, its geomorphology and the scant existing data transforms it into a cell of great interest for its conservation, among other factors, because of the importance of the processes that take place in it. Submarine canyons are particularly important because of their productivity, apart from a singular geomorphologic value.

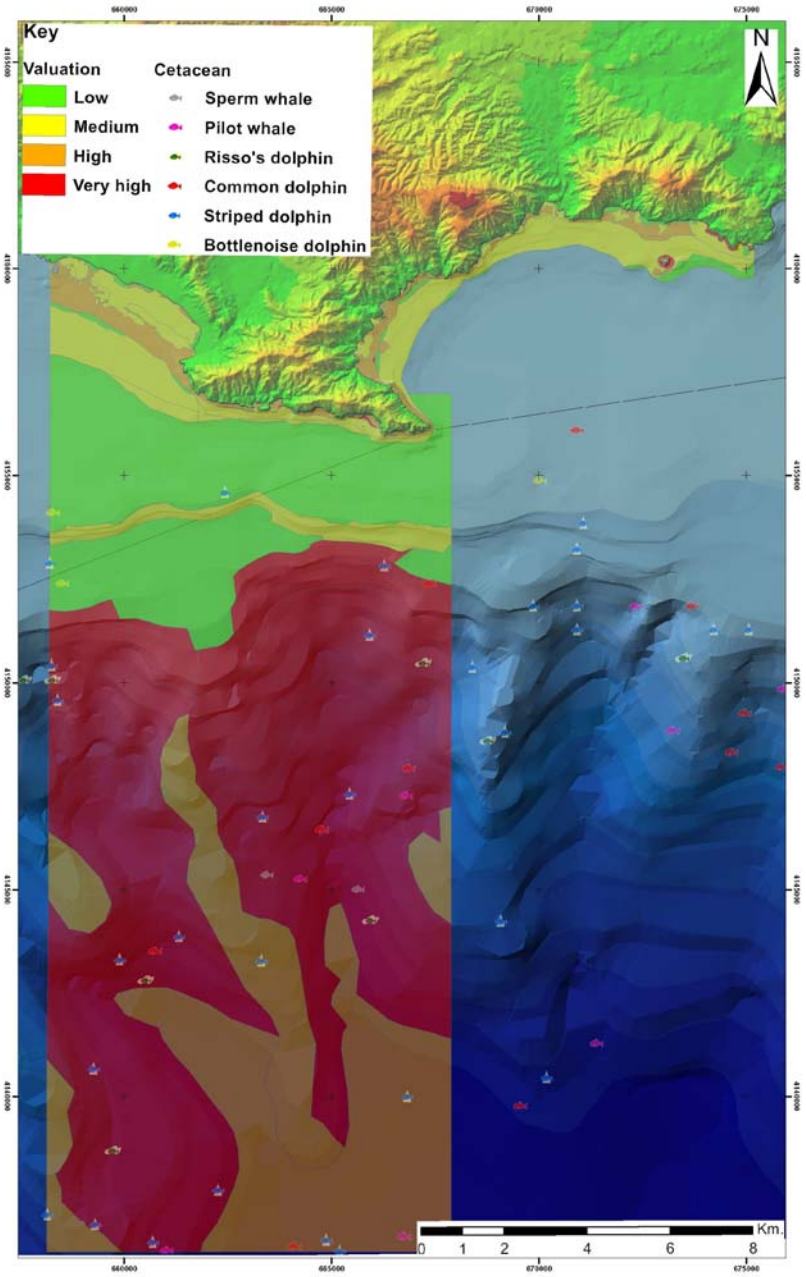


Figure 5. Global ecological valuation of Cells A, B, C y D

7.2. Multicriteria Valuation

Based on the ecological valuation, all the information, from uses of the area, is incorporated, to establish an environmental zoning.

7.2.1. Incorporation of uses in A, B, C and D Cell and general assesment

When analizing the uses that converge in cell A, on the one hand an affected area by previous utilizations is observed where, until some years ago an aquaculture activity exist. On the other hand, there are anchorage areas too close to the coast. In the same way, trawling takes place on some occasions inside the proposed limit. Diving is another activity developed in the area, especially in the surroundings of Las Palomas Island.

Cell B is the area, of the entire proposal, where fewer activities converge, it is an area eminently destinated to diving and some artisanal fishing. Therefore diving and tourist activities related with the observation of submerged nature, will have priority on this area.

In cell C converge a big number of different uses. The aquaculture activity, which was developed in this area for many years, affected a significant number of communities. Overexploitation of the shoal of striped venus is also noticeable. The coastal area is under great pressure from tourism and urban expansion which in spite of the fact that it is controlled, increases the risk of discharges in the area.

The anchorage areas of this cell affect, in a very significant way, the state of conservation of phamerogam meadows some artisanal fishing activities are carried out.

The main use that is developed in Cell D is trawling, which implies that in the areas where this method is developed (mainly, up to the 500m. isobath and concentred at the beginnings of the slope, in the most superficial part of the canyons), Cell D is expected to be affected by this method. Moreover, the existence of military use is known but not the area affected by it or the level of impact of this use.

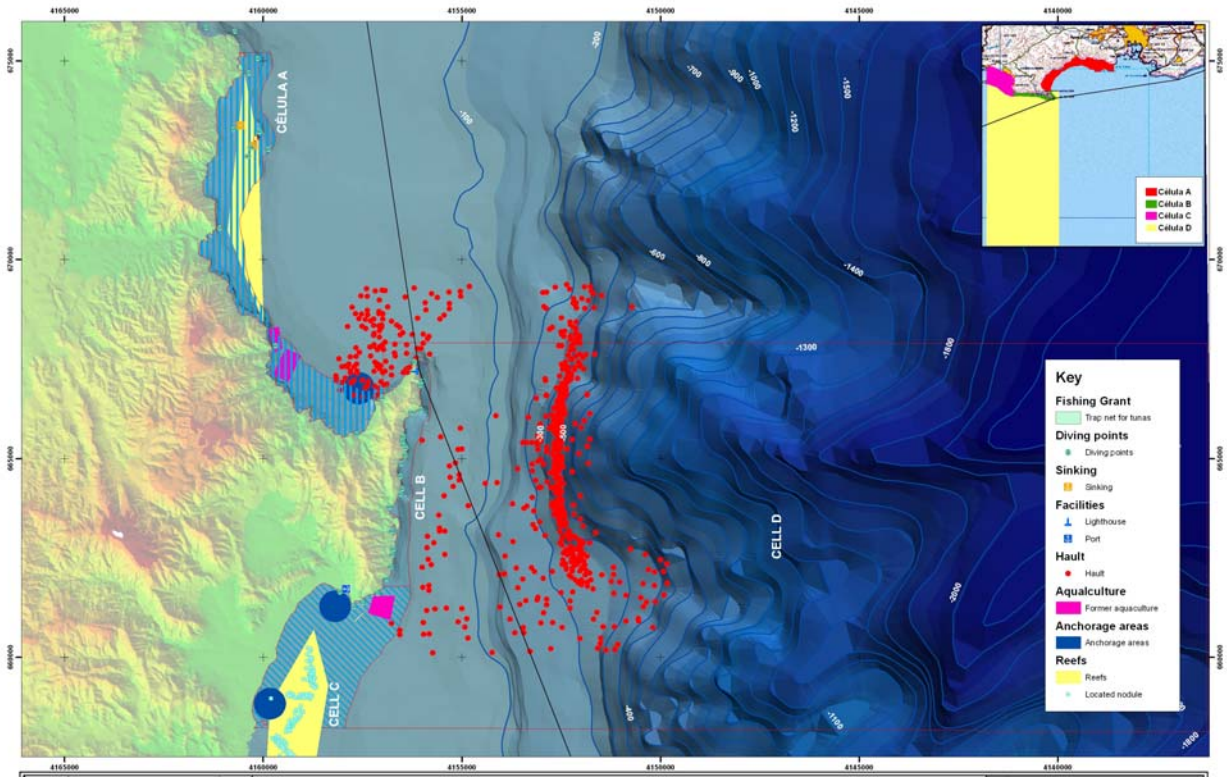


Figure 6. Total uses in study area.

8. Justification for the proposal of constitution

Right at the outset when the subject of the protection of a Marine Area is raised, it is very important to clearly define the objectives: conservation or productivity; biodiversity protection or resources protection, or both of them.

In this case, both objectives converge in a special way because this is an area with important values and crucial processes for the resources and environment conservation. Different typologies of units converge, biogeographic and ecological, all which relatively well preserved. Also, the area meets most of the criteria developed by IUCN for the selection of MPA, which are based on biogeographic and ecological criteria.

To summarize, we may conclude that the proposed area has great ecological significance characterized by:

- A wide variety of species in different stages of their life cycle, some of which threatened or endangered

- Great diversity of habitats and biocenosis with a large representation of those considered important for its conservation by different Directives and International Conventions
- Areas of particular importance due to the presence of feeding zones, molting, wintering or resting areas for many species, some pelagic
- It is an area with egg-laying and nursery zones and juvenile refugee
- It is an area with high levels of natural biological productivity
- It is an area representative of the Mediterranean ecosystems
- Relative naturalness in much of its habitats

The protection of the area will be essential for the sustainable development of the study area all the area of influence.

The creation of an MPA or MRFI is an element of attraction for recreational activities like diving and tourist activities related to the observation of the seabed or cetacean sighting, and so on.

Analyzing the importance in social and scientific terms and from a National and International point of view, the proposal for designation of the area of Tiñoso Cape as MRFI will mean the fulfilment of the following objectives:

- Protection and conservation of species, habitats, biocenosis and ecological processes in good condition
- Restoration of species, habitats, biocenosis and ecological processes and resources, affected by anthropic activities
- Prevention of possible damage and degradation of species, habitats and ecological processes implementing rules based on the precautionary principle

9. Zoning

In order to carry out a proposal for regulation of uses and activities within the proposed zone the following management areas were established:

a) Integral Reserve Zone
b) Priority Conservation Area
c) Compatible Conservation Area

The following table reflects the total area of the MRFI proposed and the area of each management cell and its management areas:

		ZONING (Has)			
		Priority	Compatible	Integral	TOTAL (Has)
Management cells	A	178,04	811,06	0	989,10
	B	136,04	0	84,16	220,20
	C	242,92	656,85	0	899,76
	D	14.699,31	5.059,76	0	19.759,06
	TOTAL (Has)	15.256,30	6.527,66	84,16	**21.868,12**

Figure 8. Summary of areas for management cell and area management.

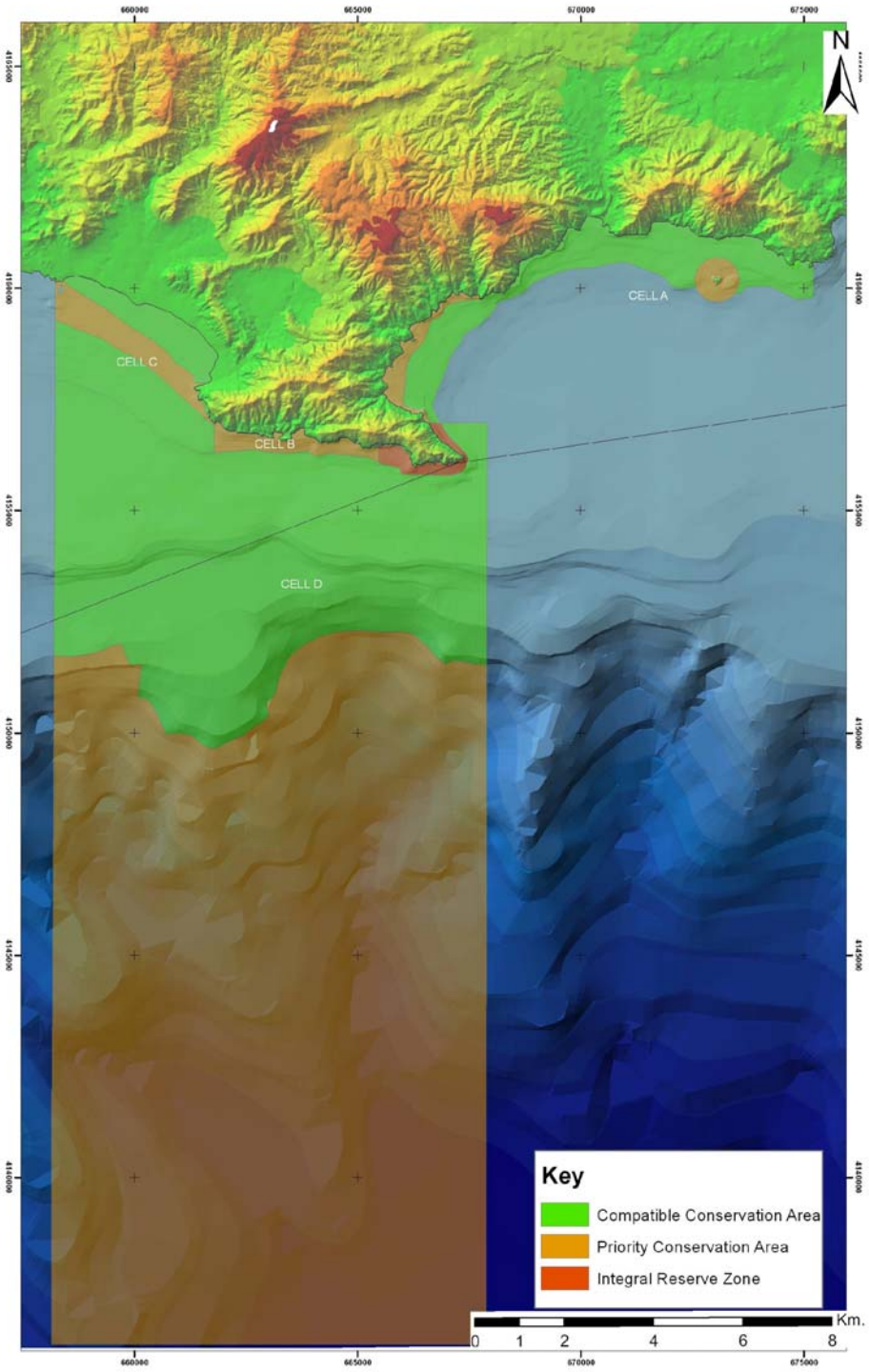


Figure 7. Zoning Cartography of the proposed area as "MRFI".

10. Guidelines and management proposal

The main conceptual sections defined to take up the management challenges arising from the suggested objectives are the following:

- Conservation and management
- Professional and recreacional fishing
- Ports, transport and maritime navigation
- Agricultural activities
- Tourist activities
- Coordination and participation
- Public use and environmental education

11. Management Objectives

Once researchers have made the proposal of management of the cell, the zoning of management uses, and have defined the guidelines for management the objectives to be achieved with the implementation of management model in Tiñoso Cape are suggested.

	CELL			
AREA	**A**	**B**	**C**	**D**
Integral	Does not exist	Restrict all uses Establish monitoring program for invasive species Develop programs for conservation and management of marine resources Develop research programs	Does not exist	Does not exist
Priority	Protect and conserve facies of Maërl and *Posidonia oceanica* Establish research programs	Control and manage the restricted uses and activities Establish monitoring program for *Caulerpa racemosa*	Protect and conserve *Posidonia oceanica*, *Cymodocea nodosa* and biocenosis associated with overhangs	Prohibit trawling Develop research programs
Compatible	Control and manage allowed uses and activities	Does not exist	Develop proposals for management of anchorage areas Control and manage allowed uses and activities Determine touristic capacity	Establish monitoring programs of species of fishing interest and research related to ecological processes Develop environmental education programs

12. Action Lines

The planning structure is built around four action lines, each of which consisting of a number of actions that will meet the proposed objectives. The fulfilled lines are:

- Line of Conservation and Management of Natural and Cultural Resources
- Line of sustainable development
- Line of coordination and participation
- Line of Public Use and Environmental Education

13. Regulations

13.1. General Regulations

The general regulation is focused on the following lines: General Regime of Protection, flora and vegetation conservation, wildlife conservation, species introduction, habitats and biocenosis conservation, landscape conservation, discharges, conservation of the geological, geomorphologic and edaphic resources, protection of the quality of the water, cataloguing and protection of the Historical Heritage, and environmental impact research.

A set of specific regulations was as well defined regarding the uses of the area, which are divided into:

13.2. Regulations for sustainable development

- Aquaculture and fishing activity
- Facilities and equipment
- Transit and anchorage of boats

13.3. Regulations for Public Use and Environmental Education

- Facilities, equipments and activities
- Diving and sport fishing activities
- Photography and filming

13.4. Special regulations for management

Based on each of the management areas established within the MRFI, researchers suggest to regulating the uses and activities and define the management criteria that should be followed for each of the following areas:

A. Integral Reserve Zone
B. Priority Conservation Area
C. Compatible Conservation Area

14. Geographic Information Systems

All the data were entered into the Geographic Information Systems (GIS) of Tiñoso Cape, which is available on digital format.

With this autorun application and through a viewfinder, different maps that have been included in the memory of the whole document can be consulted. Likewise, this application allows specific queries to databases related to: Management cells, zoning, ecological valuation, biocenosis, cetaceans sightings, uses and so on.

It will be a very useful and necessary tool to tackle the future management of the MRFI that is likely to be proposed in the area of Tiñoso Cape.

15. Authors

TRAGSATEC S.A.

Francisca Giménez Casalduero

Juan Carlos Rodríguez-Guerra

Candela Marco Méndez