Marine areas and zoning

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The incompatibility of certain activities (conservation and tourism or hunting and fishing for example) within both terrestrial and marine protected areas has very often lead to conflicts of interest and hostility on the part of local communities towards the setting up of protection regulations. Strong opposition to the setting up of marine Reserves is usually expressed from various points of view by certain specific types of associations (professional and amateur fishermen, hotel and restaurant owners). Often there is no real problem and proper information usually suffices to settle the disputes: under certain circumstances, however, restrictions are required on activities which were under way prior to the setting up of the regulations and in this case harsh measures must be enforced to ensure the regulations are observed. In any case traditional-type activities (including several kinds of fishing) must be considered as being an integral part of the environment to be protected: these activities, which have sometimes been associated with the territory for hundreds of years, have an extremely low environmental impact due to their nature and in the very interests of those people who take part in them. One of the systems which has been most experimented on for the planning of both terrestrial and marine protected areas, in order to allow different types of activity within sufficiently large zones, involves dividing the entire territory into various sections which are used for a variety of purposes and controlled by different protection measures: this process (known as zoning) has already been used for planning the marine Reserves which have so far been set up in our country, although criteria have been used which are sometimes subjective and not standardized. It is also common practice to divide the overall area into 3 zones (A, B and C) controlled by regulations which may or may not be common to all the Reserves: this highlights (particularly in light of experiments carried out abroad) certain negative affects on the various separate local communities.

In order to correctly assess the potential of the various areas, detailed information regarding the biological characteristics of the location must be made available with particular reference to the environments and rare or threatened species. It must then be discovered whether these characteristics are compatible with the current and planned uses for the location in question: in order to do this characteristics

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Chart for recording down data about the habitants

I. Habitat/Ecosystem: type (e.g. salt marshes, atolls, grabens)

II. Distribution: general environment and specific location

III. Area

IV. System of nutrients: general notes on probable sources of nutrients and energy

V. Legal/legislative position controlling or protecting the area: restrictions

VI. Importance from a human point of view: role in fish production, other types of industry, research, recreation, coastal protection etc.

VII. Dangers: natural (natural forms of deterioration), anthropical (uses which cause deterioration or alteration), potential (activities or developments which might occupy or deteriorate the habitat)

VIII. Specific conservation requirements

IX. Socio-economic problems in protecting the habitat: existing or potential clashes between exploitation and protection

X. Bibliographical references consulted and people contacted.

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such as fishing seasons and locations and places whose characteristics make them suitable for a certain type of tourism etc. must be taken into consideration.

Some points matrixes (which must be filled in by the planner) have been devised to make an objective assessment of the peculiar characteristics of the individual zones. These matrixes in the form of check-lists give all the various aspects which must be numerically assessed based on existing or specially carried out studies for each of the zones into which the area has been divided: the overall points score for each zone and each of the groups of criteria (ecological, social etc.) will indicate the ideal use for the area.

The entire area, whose differing degrees of potential need to be assessed, is divided into smaller zones whose dimensions vary according to the overall size of the area.

However, it should be remembered that the zoning should be carried out on relatively extensive areas for it to be functional for the purposes of the planned protection targets and the chosen zones must also be relatively large, except in extremely unusual cases

(rocks for birds to build nests on, beaches where turtles can lay their eggs). Therefore, it is a good idea to choose the number of square units (and thus their area) taking into account the environments to be protected, the size of the habitats and the volume of work to be carried out.

The next stage involves allocating a value within a range which varies according to the matrix used (generally speaking 0-3) to each area for each criterion in the matrix, basing the assessment on data obtained during the preliminary survey for setting up the protected area, supplemented by any further information available about these special aspects: if these data are not already available in a concise form, it would be a good idea to group them together in a special chart, where possible using one chart for each square unit (tab. 1).

The first type of matrix shown here is rather complicated and requires detailed knowledge about the area where the protection measures will be introduced: it is taken from a similar matrix used for assessing the possibility of setting up protected marine areas (Salm and Clark, 1984).

Valutation

The values will be allocated taking into account the parameters shown in tab. 2 and the meanings of the terms used in the matrix, as follows:

Ecological criteria.

Diversity: the variety of ecosystems, habitats, communities and species.

Naturalness: the absence of disturbance and decay.

Representativeness: the extent to which an area is representative of a particular kind of habitat, ecological process, biocenose, physiographical feature or other natural features.

Uniqueness: the rarity of the environments enclosed in the area (habitat of rare, threatened or endemic species.

Autonomy: the degree to which the area constitutes a functional unit or ecological entity which is actually self-sufficient. The more ecologically independent the area is, the easier it is to protect.

Productiveness: the extent to which the manufacturing processes in the area contribute to man's well-being or the survival of the species. Highly productive areas deserve a high points score, except for eutrophic zones in which high productivity may have damaging effects.

Fragility: how sensitive the area is to impacts caused by natural events or anthropical activity. More fragile areas will be awarded higher points scores.

Compatibility of the conservation measures with local activity.

Criteria regarding research and education.

Importance: the significance the area takes on as a "control" zone in a scientific sense i.e. as a zone which is not affected by human activities and can be used as a comparison with the changes which have taken place elsewhere. Vital areas for monitoring studies.

Demonstration area: the extent to which an area can be used as an example of scientific methods and techniques.

Scientific interest: provided by the existence of ecological features stimulating research and studies.

Social and Economic Criteria.

Possibilities in terms of tourism and recreational activities: the degree to which the area has developed or could develop infrastructures for accommodating tourism and the possibilities it has to offer in terms of recreational activities.

Teaching Possibilities: the variety of habitats found in the area and whether or not the area is large enough to make conservation possible and accommodate teaching activities.

Safety.

Compatibility of the tourist uses with local activities.

The sum of the values for each group of aspects (ecological Criteria, Criteria regarding research and teaching, social and economic Criteria) will quantify the potential of each square unit: thus, square units with particularly high points scores as regards the Ecological Criteria will be indicated for the adoption of integral protection measures, while those with higher points scores for the social and economic Criteria will be more functional if used for tourist purposes: areas with intermediate points scores will be used for applying more carefully structured forms of protection (specially designed reserves where some forms of fishing, teaching etc. are permitted). Adjacent square units with similar points scores will, of course, be combined together to be used for the same purposes. If an area has a similar points score for both tourism and conservation, priority will always be given to protection measures, unless the points scores are particularly low.

Simpler matrixes may be used for quick assessments

■ *Tab. 2. Defining of the values.*

Defining of the values

Low Value (1 point):	low quality; not significant but of interest anyway; of less importance; other equally valid examples can be found in more suitable areas.
Average Value (2 points):	moderately high quality; significant but of no great interest; support area for other species but not critical; few other similar examples are available; supporting the regional ecology but only in a secondary manner or on a general basis.
High Value (3 points):	exceptionally high quality; extremely important due to the significance of the species; of great interest in terms of ecological characteristics and processes; Regional ecology would be notably altered by any deterioration; no other significant similar examples can be found; best available example on a Regional level.
Unknown Value (0):	requires further research to determine the value; the criterion either is not applicable, does not exist or does not need to be applied.

whenever it is necessary to set up different types of protection measures without having enough data (or time) available to compile more complex matrixes. The matrix shown below (tab.4) has been drawn up from a model adopted for zoning the Marine Park in the Bunaken Islands in Indonesia (Salm and Clark, 1984) and has been altered and adapted for the Mediterranean as far as the threatened species and habitats are concerned. Compared to the original model the Tourism and Conservation Values have also been altered. These values originally represented the theoretically obtainable percentages of the maximum values for each area. However, the difference in these theoretical maximum values for the two matrixes made it impossible to compare these values: therefore, it was decided to give the percentage values in relation to the maximum value actually obtained by one or more areas, allowing the values obtained from these areas to be immediately compared with the two different matrixes.
The use of matrixes proves to be extremely useful for illustrating complicated factors to people with no specialist know-how (administrators, local communities, the press etc.) in quantitative terms highligh-

ting the validity of the choices which have been made.
A study into the natural and anthropical aspects of the area involved in the setting up of the Portofino Marine Reserve (provided for by Law 979 of 1982) was recently carried out within the framework of ICRAP's (Central Institute for Scientific and Technological Research Applied to Fishing) programme of action for Parks and Reserves. After the study had been completed, a zoning proposal (which is currently being assessed by the competent bodies and will be discussed with the representatives of the local communities) was worked out using matrixes 3 and 4 described above. The area which ought to be protected (which has been located on a preliminary, schematic basis) has been divided. The zones have been devised by dividing the coastline into sectors of approximately the same length, taking into account the overall size of the area and bearing in mind that shorter or longer stretches of coast would, respectively, have either been insufficiently homogenous or inadequate in terms of their importance.
As far as the matrix 4 is concerned (i.e. the one regarding the tourism values) there were no particular problems given the amount of highly up-to-date information which was collected during the study. The concept of value from the point of view of tourism in the context of a protected area needs to be explained more clearly: this term is meant to refer to the assessment of an area in order to allow, develop and guarantee the influx of visitors whose activities are compatible with the area's protection measures, making the best possible use of the area's characteristic features: therefore, the safety and ease of access to the individual zones, the appearance of the shores and water, the negative interactions which might occur between fishing and tourist activities like walking, bathing, scuba-diving etc were all taken into consideration.
There were more problems with the matrix 3 regarding conservation values due to the lack of data available : indeed, although an enormous amount of scientific work has been carried out on the area, a lot of the information comes from publications which are now rather out-of-date or the works are of a general nature on either a large or medium scale and do not allow small size areas to be assessed; this means that parameters like the percentage of substratum covered by marine phanerogams or coralligenic biotic

Matrix for quickly calculating the tourist values of the areas

Criteria	Area 1 (e.g.)	Area 2 (e.g)	Area 3	(etc.)
Apparence				
Safety				
Ease of access				
Fishing activity				
Total				
Tourist value				

Definitions:
Appearance: *high percentage covering of biotic communities,*
variety and interest value of the morphology of the waters and coasts, clearness of the waters (0 = low, 1 = average, 2 = high appearance
value).
Safety: *little wave action, no dangerous currents, no dangerous nets or motor-boats (0 = low, 1 = average, 2 = high safety factor).*
Ease of access: *worked out from the availability and vicinity of tourist accommodation, roads and landing points (0 = nil, 1 = low, 2 =*
average, 3 = high).
Fishing activity: *this estimate is based on the number of active local fishermen in the area (0 = high, 1 = low value*
for fishing activity).
Tourist Value: *this is worked out as a percentage of the maximum points score obtained.*

■ *Tab. 3. Matrix for quickly calculating values of the areas.*

communities which constitute an extremely important factor in assessing the quality of a system which it is difficult to examine on site without direct, quick recordings. So, as well as existing bibliographical references, the assessment given in the second matrix was also carried out taking into account personal knowledge of the site and will soon be supplemented by a special recording campaign.

The values of the individual areas regarding the parameters given in the second matrix were worked out as follows:

Area 1: *Lack or relative insignificance of the parameters given.*

Area 2: *Scanty covering of* Posidonia *grasslands.*

Area 3: *Less than 40% covering of coralligenic biotic communities. Presence of* Cladocora cespitosa *(and probably also* Corallium rubrum*).*

Areas 4, 5 and 6: *Between 41% and 75% covering of* Posidonia *grasslands and coralligenic biotic communities. Presence of* Corallium rubrum.

Area 7: *Not over 40% covering of* Posidonia *grasslands and coralligenic biotic communities. Presence of* Corallium rubrum.

Area 8: *Between 41% and 75% covering of* Posidonia *grasslands and coralligenic biotic communities. Presence of* Corallium rubrum.

Area 9: *Between 41% and 75% covering of* Posidonia *grasslands and coralligenic biotic communities. Presence of* Corallium rubrum.

Area 10: *Between 41% and 75% covering of* Posidonia

grasslands. *Presence of* Cladocora cespitosa.

Area 11: *Scanty covering of* Posidonia *grasslands*

Area 12: *Lack or relative insignificance of the parameters given.*

Although the Cala dell'Oro Integral Reserve Area is quite small (approximately 27 hectares) it has been taken as a repopulation and "control" zone for assessing the capacity to salvage the environment in the absence of human activity. The problems related to access via land, the lack of interest on the part of local tourist-transport organisations, the comparatively small amount of fishing, and of course the current and potential richness of the waters make this the most suitable area for setting up this kind of protection measures.

Part of the Reserve Area is planned to be used for the controlled exploitation of the marine environment by a non-destructive form of tourism and a traditional type of fishing. Special guided routes for divers with or without aqualungs should be developed in this area: this activity should, however, be carefully planned to avoid damage (even accidental) due to the stream of tourists. Semi-submergible boats with see-through walls like those currently in use in Port-Cros Park in France could also be used to allow even non-divers to view the underwater depths.

A reception centre for the visitors would be organised in the village of S. Fruttuoso and some of the underwater trips could leave from here: access to the bay through a passage marked by buoys and moo-

■ *Tab. 4. Matrix for quickly calculating the conservation values of the areas.*

Matrix for quickly calculating the conservation values of the areas

Criteri	Area 1 (e.g.)	Area 2 (e.g.)	Area 3	(etc.)
Variety of habitat				
Uniqueness				
Covering				
criticalness				
Total				
Conservation value				

Definitions:
Variety of habitat: this is the sum of the following
habitats found in the area: grasslands of marine phanerogams, estuaries and / or deltas, coralligenic biotic communities, vermetid-biocenose, fields of Pinna nobilis, Lithophyllum lichenoides "trottoir", sand and Amphioxus, populations of Cladocora caespitosa, special underwater caves.
Uniqueness: this marks the existence of a kind of habitat which cannot be found in the other areas (0 = not-found, 1 = found).
Covering: this is given from an estimate of the percentage of substratum covered by marine phanerogams or coralligenic biotic communities (0 = less than 40%, 1 = 41%-75%, 2 = over 75%).
Criticalness: this marks the existence of rare or threatened species in the area (see Enclosure) (0 = no rare or threatened species, 1 = at least one class I species, 2 = at least one class II species).
Conservation Value: this is worked out as a percentage of the maximum points score obtained.

Enclosure:
Specie Rare or threatened species (from Augier, H. 1982, modif.; AA.VV. Minutes from the conference "Les Especes Marines Protger en Mediterrane", 1989).

Class I
   Algae: Green: Caulerpa olivieri, Caulerpa prolifera, Penicillus mediterraneus
            Brown: Fucus virsoides, Cystoseira adriatica, Sargassum hornschuchii.
            Red: Gelidium sesquipedale, Gelidium crinale, Pterocladia capillacea, Gracilaria compressa.

   Fauna: Fish: Ephinephelus gen.
             Shellfish: Scyllarus arctus, Palinurus elephas.
             Molluscs: Pinna nobilis, Patella ferruginea, Lithophaga lithophaga (*)
             Others: Cladocora cespitosa, Pollicipes cornucopia, Centrostephanus longispinus.

(*) the type of fish shown here is highly destructive for the whole environment.

Class II
   Fauna: Fish: Euscarus cretensis, some endemic species of fish.
             Marine mammals: Marine mammals: Monachus monachus, Tursiops truncatus.
             Reptile: Dermochelys coriacea, Caretta caretta, Chelonia mydas.
             Molluscs: Conus mediterraneus, Charonia sspp.
             Others: Corallium rubrum.

Criteria / Zones	1	2	3	4	5	6	7	8	9	10	11	12
Appearance	0	1	1	2	2	2	2	2	2	1	1	1
Safety	1	1	0	1	1	1	0	2	1	1	0	1
Ease of access	3	1	2	1	0	0	1	0	0	1	0	2
Fishing activity	1	1	1	1	1	0	0	0	0	0	0	1
Total	5	4	4	5	4	3	3	4	3	3	1	5
Tourist value	100	80	80	100	80	60	60	80	60	60	20	100

Criteria / Zones	1	2	3	4	5	6	7	8	9	10	11	12
Variety of habitats	0	1	1	1	1	1	2	2	1	1	1	0
Uniqueness	0	0	0	0	0	0	0	0	0	0	0	0
Covering	0	0	0	1	1	1	0	1	1	1	0	0
Criticalness	0	0	1	2	2	2	2	2	2	1	0	0
Total	0	1	2	4	4	4	4	5	4	3	1	0
Conservation value	0	20	40	80	80	80	80	100	80	60	20	0

ring in specially allocated areas would be reserved for the transport service only, including the small motor-launches of the companies currently operating in the area and small boats belonging to the local residents. Another access route through the passage near Porto Pidocchio would also allow small private boats to reach the coast. It might be interesting to entirely/partly protect zones 5 and 6 over alternating periods of at least five years as part of the reserve's regulations: this would allow tourist-divers to visit salvaged systems which would clearly be of considerable interest. The alternating closure of the two zones might also be of scientific interest, particularly on an experimental level (assessing the damage due to fishing and underwater tourism, capacity to salvage damaged biotic communities etc.).

The experimenting to be carried out in the Specially Designed Reserve Area (reintroduction of precious fish species for example) is considered to be of particular interest: this zone (which has also been chosen because it is exposed to the west and, therefore, is less affected by the frequent rough seas from the southwest) is currently of little interest from a tourist point of view and is in fact quite dangerous because of the landslides which occur along the coastal-walls. However, this zone could be an example of fish-diffusion and benefit fishing in the nearby areas.

The General Reserve Area was devised for the duel purpose of creating two "cushioning" zones between the real protected zone and the outside area of the park and rather permissively controlling the number of people visiting areas which combine fairly low conservation values with reasonably good tourist capacities: as regards this it will have been noted that the initial assessment was carried out on zone 1 and part of zone 2, which later was not included in the proposed controlled area. This was due to its conservation value of zero and the proximity of Santa Margherita Ligure with the obvious impact caused by human activities (particularly in connection with tourism) which it is difficult to control in relation to the results which may be obtained.

Housing and accommodation facilities for the Park and Marine Reserve, tourist centres and departure points for the guided tours towards the promontory and sea need to be developed in the General Reserve Area. Bathing will also be allowed and the underwater excursions will mainly be developed along the coast of the Portofino peninsula. ■

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