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Résumé

L'AMP de Capo Carbonara a été créée en 1998 et est gérée par la Municipalité de Villasimius. L'aire protégée se situe sur la côte sud-est de la Sardaigne. Elle couvre une aire marine de 8.598 hectares et s'étend de *Capo Boi*, dans le secteur ouest, à *Punta Is Procheddus* au nord-est, comprenant également la côte des deux îles principales, *Cavoli* et *Serpentara* et plusieurs îlots rocheux et récifs immergés éparpillés tout le long du littoral et des principales îles. De façon générale, l'AMP comprend 48 km de côte, dont près de 7 km de plages de sable et 2 km de plages de galets et de pierres.

Il est possible d'identifier deux secteurs, séparés par le promontoire de *Capo Carbonara* et l'île de *Cavoli*. Par conséquent, l'aire présente divers degrés d'exposition aux vents et aux vagues et n'est abritée que des vents du nord. Toutefois, les vents dominants viennent de l'ouest.

La zone terrestre se caractérise essentiellement par une végétation psammophile, de la garrigue et des formations de buissons typiquement méditerranéens. Seules quelques zones à l'intérieur des terres font l'objet d'activités agro-pastorales alors qu'une végétation artificielle prévaut aux alentours de Villasimius et au milieu de villages et de centres touristiques. Une petite lagune barrière à l'intérieur des terres (la lagune de *Notteri*, environ 34 ha) est adjacente à l'AMP et est séparée de la mer par une petite frange de sable. Il s'agit du point de zone humide le plus important pour les oiseaux migrateurs, dont les flamands (*Phoenicopterus ruber*) sont les plus représentatifs.

La morphologie du littoral est irrégulière et distincte ; les paysages terrestre et marin sont tous deux essentiellement dominés par la présence d'une lithologie granitique qui alterne avec des systèmes sablonneux quartzo-feldspathiques ; des plages rocheuses, de grandes prairies de *Posidonia oceanica* et des sédiments bioclastiques augmentent la valeur environnementale et offrent un certain nombre de niches, cachettes, de zones de nidification et de nursery pour la flore et la faune marines.

Bien que l'AMP comprenne essentiellement une superficie maritime, la zone côtière immédiatement adjacente à la mer, de même que les principales îles, *Cavoli* et *Serpentara*, abritent un certain nombre d'habitats et d'espèces terrestres qu'il convient de préserver. En outre, plusieurs espèces endémiques ont été enregistrées : 13 plantes, 6 coléoptères, 1 reptile et 1 amphibien. Ainsi, les zones côtières font partie des Zones de protection spéciales et des Zones spéciales de conservation du Réseau Natura 2000.

De façon générale, 42 habitats marins ont été identifiés ; 30 d'entre eux sont considérés habitats prioritaires, conformément au protocole ASP/BIO ; 20 types d'habitat côtier et de zones humides d'intérêt pour la préservation ont été enregistrés le long du littoral et des principales îles.

Certaines des biocénoses de la mer Méditerranée les plus productives et riches en diversité sont présentes au sein de l'AMP. Des socles peu profonds sont dominés par des assemblages de photophiles, avec la prévalence de ceintures de *Cystoseira* et de constructions biogéniques (*Lithophyllum* spp. et vermetes) ; ceci indique la bonne qualité de l'eau de même que de vastes prairies de *Posidonia oceanica* ; ces dernières recouvrent 23% de la superficie totale (voir carte en annexe) ; il s'agit des prairies les plus productives de Sardaigne et leurs limites inférieures sont proches de la limite de la distribution bathymétrique de l'espèce. Les peuplements coralligènes et les grottes immergées s'étendent sur l'ensemble de l'aire ; des sédiments biogéniques comportant des formes de corallines libres et des rhodolites sont présents à la limite inférieure des prairies.

En raison du niveau élevé d'hétérogénéité et de complexité de l'habitat, l'aire comprend une diversité d'espèces considérable : plus de 700 espèces marines ont été enregistrées ; plus de 180 espèces sont considérées importantes en raison de leur caractère endémique ou du fait qu'elles sont inscrites sur les listes des principales conventions et directives internationales ; 49 d'entre elles sont protégées dans le cadre du Protocole ASP/BIO.

Les assemblages benthiques mais également la faune piscicole sont divers, abondants et de grande taille, en particulier les mérours bruns (*Epinephelus marginatus*), les corbs (*Sciaena*

umbra), les sparidés (*Dentex dentex*, *Diplodus* spp.), les sphyraenidés (*Sphyraena viridensis*), les mullidés (*Mullus surmuletus*). En outre, les observations de mammifères marins (*Monachus monachus* et *Balaenoptera physalus*) et de reptiles (*Caretta caretta*) ont été documentées.

Il convient de noter l'occurrence de plusieurs espèces à affinité pour les eaux chaudes, que ce soit pour des raisons scientifiques ou pour des raisons de gestion, et, par conséquent, l'AMP pourrait être considérée comme un site critique pour le biote thermophile qui s'étend vers le nord depuis d'autres régions méditerranéennes (*Astroides calycularis*, *Dendropoma petraeum*, *thalassoma pavo*, *Sphyraena viridensis*, *Balistes carolinensis*, *Sparisoma cretense*) ou extra-méditerranéennes (*Caulerpa racemosa* var. *cylindracea*, *Percnon gibbesi*, *Fistularia commersonii*).

Tous ces aspects font de l'AMP une zone d'une valeur particulière pour la recherche dans le domaine de la nature ou des sciences du patrimoine.

L'AMP se situe dans un lieu relativement peu perturbé. La commune de Villasimius compte près de 3.600 habitants. Les principales activités économiques sont consacrées au tourisme (hôtels, chambres d'hôtes, camping, restaurants et toute autre entreprise touristique, notamment les activités de tourisme de pêche, bateaux pour le transport local des touristes, activités de location, centres de plongée). Toutes ces activités, de même que la navigation de plaisance, ne sont pertinentes que pendant la saison estivale. Le tourisme est essentiellement lié à la beauté naturelle de la zone émergée (tourisme nautique et de plage), à l'attractivité des paysages sous-marins et à la diversité et à l'abondance de poissons (tourisme de plongée).

Parmi les activités de consommation, seule la pêche récréative (pêche à la ligne et à la traîne) est significative tandis que la pêche artisanale est bien intégrée dans les objectifs de l'AMP, en raison de sa faible pression sur les stocks.

Les menaces potentielles sur les habitats et les espèces marins et côtiers au sein de l'aire sont liées au petit port de navigation de plaisance (*Marina di Villasimius*) en raison de l'altération de la dynamique des courants marins et de son rôle en tant que source potentielle de pollution due aux rejets de gasoil et au largage de peinture anti-salissures et de métaux lourds.

Les activités touristiques peuvent avoir des répercussions néfastes en raison de dommages mécaniques (notamment l'enlèvement de la litière de feuilles de *Posidonia oceanica* des plages de sable, le tassement des systèmes de dunes et des assemblages du mediolittoral, le mouillage sur les prairies de *Posidonia oceanica*, la plongée et la pêche sur les peuplements coralligènes et les populations de gorgones). Des nuisances potentielles pour les mammifères marins et la faune piscicole pourraient déboucher de l'importante fréquentation des yachts et plongeurs pendant la saison estivale.

Certains écosystèmes/habitats/espèces sont potentiellement vulnérables à l'impact des espèces non indigènes, notamment les chlorophytes *Caulerpa racemosa* var. *cylindracea*, très répandues et très abondantes dans l'ensemble de la zone.

Toutes ces menaces, de même que les écosystèmes potentiellement vulnérables, sont suivis en permanence afin de réduire les risques d'altération des habitats et des espèces et d'identifier les mesures appropriées pour atténuer ces impacts.

L'éducation environnementale et le renforcement de l'utilisation durable des ressources marines font partie des objectifs institutionnels de l'AMP de Capo Carbonara. Le Centre de services de l'AMP, en collaboration avec une coopérative locale, organise et gère des programmes pédagogiques visant la diffusion des connaissances locales sur l'AMP et le territoire marin côtier de Villasimius, parallèlement à la promotion de l'utilisation responsable de l'environnement et de la prise en compte des questions écologiques et environnementales.

En sa qualité de partenaire au Réseau régional pour le rétablissement de la faune marine sauvage, l'AMP gère un centre de premiers soins, de rétablissement et de libération des tortues, des mammifères et des oiseaux de mer en difficulté physique.

L'AMP de Capo Carbonara a été identifiée comme Aire marine protégée en 1991 (Loi nationale N° 394/1991) ; elle a été créée en 1998 par Décret du Ministère de l'Environnement (D.M. 15.09.1998), modifié en 1999 (D.M. 03.08.1999) (Journal officiel N°229/1999).

Le Décret établit le périmètre de trois zones avec différents niveaux de protection : la Zone A ou la réserve intégrale, la Zone B ou la zone à utilisation limitée et la Zone C ou la zone de gestion à multiples utilisations.

Des panneaux et des affiches sont présents le long du périmètre côtier et décrivent également les interdictions qui doivent être respectées.

Les gardes-côtes, la douane, les carabinieri et les gardes-forestiers participent à la surveillance, effectuée sur terre ou sur mer. De même, des associations bénévoles et le personnel de l'AMP participent à la surveillance, bien qu'ils ne soient pas habilités à imposer des sanctions.

L'efficacité du service de surveillance est au plus fort pendant la saison estivale, du fait que l'ensemble des corps soient impliqués. La surveillance devrait être appliquée pendant l'hiver.

Chaque année, l'organisme en charge de la gestion de l'AMP met en place un plan d'action qui requiert des ressources financières ad-hoc de la part du Ministère, afin de développer les mesures de gestion et les activités de suivi. Le budget financier est divisé en trois catégories : l'administration courante, les interventions et les investissements. D'autres sources de financement supplémentaires peuvent émaner de projets européens, nationaux et régionaux.

Ce budget vise à garantir les principaux objectifs de l'AMP : protéger les ressources biologiques et géomorphologiques ; diffuser les connaissances sur l'écologie et la biologie des milieux marins et côtiers ; mettre en œuvre des programmes pédagogiques afin d'améliorer le niveau de connaissances générales dans le domaine de l'écologie et de la biologie marine ; mettre en œuvre des programmes d'étude et de recherche scientifique dans les domaines de l'écologie, de la biologie marine et de la protection environnementale ; promouvoir le développement socio-économique.

Les universités et d'autres institutions scientifiques participent au suivi scientifique, de même que des consultants extérieurs et des bénévoles sont impliqués dans les questions techniques et d'entretien.

Plusieurs programmes de suivi ont été réalisés au sein de l'AMP et, de façon générale, le niveau de connaissances, tant des aspects environnementaux que socio-économiques, est bon.

L'AMP de Capo Carbonara offre des caractéristiques biologiques et écologiques considérées comme critiques pour sa préservation. La biodiversité côtière et marine est impressionnante et c'est pour cette raison que l'aire comprend 2 Zones spéciales de conservation et 3 Zones de protection spéciales du Réseau Natura 2000. En outre, l'aire chevauche la zone d'importance pour les oiseaux, "Caps et îles du sud-est de la Sardaigne".

Rapport de présentation soumis

1. AREA IDENTIFICATION

1.1. COUNTRY/COUNTRIES (in the case of transboundary areas)

Italy

1.2. ADMINISTRATIVE PROVINCE OR REGION

Province: Cagliari

Region: Sardinia

1.3. NAME OF THE AREA

Capo Carbonara Marine Protected Area

1.4. GEOGRAPHIC LOCATION

Describe its geographical boundaries, e.g. rivers, roads, geographical or administrative boundaries (do not describe the co-ordinates here; please make a separate annex with a map and a description of geographical co-ordinates as stated in the legal declaration of the area).

Capo Carbonara Marine Protected Area is located on the south-eastern coast of Sardinia, it is close to the municipality of Villasimius (42 kilometres south of the city of Cagliari). The area can be reached through two main routes, from Cagliari (SP 17) and Muravera (State Route 125).

The coastline is washed by both the Sardinian Channel and the Southern Tyrrhenian Sea; the promontory of Capo Carbonara separates the west coast from the east one. The MPA boundaries are represented by the coastline from *Capo Boi*, in the north-west coast, to *Punta is Proceddus* to the east. The area includes two main rocky islands, *Cavoli* and *Serpentara* that are respectively the southernmost and easternmost portions of the coast; the MPA extends seaward about 1,5 and 0,5 nautical miles, from the two islands, respectively.

The MPA covers only the marine surface in front of the coast of the town of Villasimius; the coastal areas and islands belonging to the Maritime Domain are also included in the site description.

1.5. SURFACE OF THE AREA (total)

8598 ha

1.6. LENGTH OF THE MAIN COAST (Km)

30.4 km (continental coastline)

17.5 km (coastline of main islands)

2. EXECUTIVE SUMMARY (maximum 3 pages)

Capo Carbonara MPA was established in 1998 and it is managed by the Municipality of Villasimius. The protected area is located on the south-eastern coast of Sardinia; it covers a marine area of 8.598 hectares and it is extended from *Capo Boi*, in the western sector, to *Punta Is Procheddus* at North-East, including also the coast of two main islands, *Cavoli* and *Serpentara*, and several rocky islets and submerged reefs scattered all around the coast and main islands. Overall, the MPA includes 48 km of coastline, with about 7 km of sandy beaches and 2 km of pebble and stony beaches.

Two sectors can be identified, separated by the promontory of *Capo Carbonara* and the Island of *Cavoli*. Thus, the area has different degrees of exposure to winds and waves and it is sheltered only from wind blowing from North; however, the prevailing winds are those from West.

The terrestrial area is mainly characterized by psammophilic vegetation, garrigue and Mediterranean shrub formations; only a few inland areas are subject to agro-pastoral activities while artificial vegetation prevails in the neighbouring of Villasimius and in the middle of tourist villages and resorts. A small inland barrier lagoon (*Notteri* lagoon, about 34 ha) is adjacent to the MPA and it is separated to the sea by a small sandbar. It is the most important wetland spot for migratory birds among whom flamingos (*Phoenicopterus ruber*) are the most representative.

The coastal morphology is irregular and articulated; landscape and seascape are both mostly dominated by the presence of granite lithology alternated by quartzo-felsphatic sandy systems; beach-rocks, extensive *Posidonia oceanica* meadows and bioclastic sediments increase the environmental value and offer a number of niches, hides, nest and nursery areas for marine flora and fauna.

Although the MPA includes merely marine surface, the coastal area immediately adjacent to the sea as well as the main islands, *Cavoli* and *Serpentara*, are home for a number of terrestrial habitat and species that are relevant for conservation purposes. Moreover several endemic species have been recorded: 13 plants, 6 coleoptera, 1 reptile and 1 amphibian. Thus, the coastal areas are part of Special Protection Areas and Special Areas for Conservation of Natura 2000 Network.

Overall, 42 marine habitats have been detected; 30 of them are considered priority habitats according to the SPA/BIO protocol; 20 coastal and wetland habitat types of conservation interest have been recorded along the coast and the main islands.

Some of the most productive and rich in diversity biocoenosis of the Mediterranean Sea are present in the MPA. Shallow stands are dominated by photophilic assemblages, with the prevalence of *Cystoseira* belts and biogenic constructions (*Lithophyllum* spp. and vermetids); these indicate the good status of water quality, as well as the extensive *Posidonia oceanica* meadows; the latter cover the 23% of the total area (see attached map); they are one of the most productive meadows in Sardinia and their lower borders are close to the limit of the bathymetric distribution of the species. Coralligenous assemblages and submerged caves are widespread throughout the area; biogenic sediments with free corallinales and rhodolithes are present over the lower limit of the meadows.

Due to the high level of habitat heterogeneity and complexity, the area supports a high level of species diversity: over 700 marine species have been recorded; more than 180 species are considered important because they are endemic or listed in the main international conventions and directives; 49 of them are protected according to the SPA/BIO protocol.

Not only benthic assemblages but also fish fauna is diverse, abundant and large sized, especially groupers (*Epinephelus marginatus*), corbs (*Sciaena umbra*), sparidae (*Dentex dentex*, *Diplodus* spp.), sphyraenidae (*Sphyraena viridensis*), mullidae (*Mullus surmuletus*). Moreover, the sightings of marine mammals (also *Monachus monachus* and *Balaenoptera physalus*) and reptiles (*Caretta caretta*) have been documented.

The occurrence of several warm water affinity species is noteworthy, either for scientific and management matters, hence the MPA can be considered as an hotspot for thermophilic biota that is spreading northwards from other Mediterranean (*Astroides calycularis*, *Dendropoma petraeum*, *Thalassoma pavo*, *Sphyræna viridensis* *Balistes carolinensis*, *Sparisoma cretense*) or extra-Mediterranean areas (*Caulerpa racemosa* var. *cylindracea*, *Percnon gibbesi*, *Fistularia commersonii*).

All these aspects make the MPA an area of particular value for research in the field of natural or heritage sciences.

The MPA is located in site with relatively low disturbance. Villasimius counts about 3.600 inhabitants. The main economic activities are devoted to tourism (hotels, B&B, camping, restaurants and other tourist enterprise, i.e. fishing tourism activities, boats for local tourist transport, rental and leasing activities, diving centres). All these activities, as well as pleasure boating, are relevant only during the summer season. Tourism is mainly linked to the natural beauty of the emerged area (nautical and beach tourism), to the attractiveness of the underwater landscape and to the diversity and abundance of fish (scuba diving tourism).

Among consumptive activities only recreative fishing (angling and trolling) is significant, while the artisanal fishery is well integrated with the MPA purposes, because of its low pressure on stocks.

Possible threats to marine or coastal habitats and species within the area are linked to the small harbour for leisure craft (*Marina di Villasimius*) because of the alteration of the dynamic of marine currents and its role as potential source of pollution for discharge of fuels oils and release of anti-fouling paints and heavy metals.

Tourist activities can have detrimental effects because of mechanical damages (e.g. removal of beach-cast *Posidonia oceanica* leaf litter from sandy beaches, trampling on dune systems and mediolittoral assemblages, anchoring on *Posidonia oceanica* meadows, diving and fishing on coralligenous assemblages and seafan populations). Potential nuisance for marine mammals and fish fauna could result from the high frequentation of yachts and divers during the summer.

Some ecosystems/habitat/species are potentially vulnerable to the impact of non indigenous species i.e. the chlorophyta *Caulerpa racemosa* var. *cylindracea*, widespread and very abundant in the whole area.

All these threats as well as the ecosystems potentially vulnerable are constantly monitored in order to reduce the risks of alteration for habitats and species and to identify proper measures to mitigate the impacts.

Environmental education and enhancement sustainable use of marine resources are among the institutional objectives of Capo Carbonara MPA. The Service Centre of the MPA, in collaboration with a local cooperative organizes and manages educational programmes aiming at the dissemination of the local knowledge of the MPA and the marine-coastal territory of Villasimius, besides promotes the responsible use of the environment, ecological and environmental issues.

As a partner of the Regional Network for recovery of marine wild fauna, the MPA manages a Centre for first aid, recovery and release of marine turtles, mammals and birds in physical difficulty.

The MPA of Capo Carbonara identified as Marine Protected Area in 1991 (National Law n. 394/1991); it was established in 1998 by decree of the Ministry of the Environment (D.M. 15.09.1998), modified in 1999 (D.M. 03.08.1999) (G.U. n. 229/1999).

The decrees establish the perimeter of three zones with different levels of protection: zone A or integral reserve, zone B or restricted use zone and zone C or multiple used management zone.

Informative signs and posters are present all along the coastal perimeter and also describe the bans that have to be respected.

The Coast Guard, the Revenue Guard Corps, the “Carabinieri” Corps and the Forestall Corps are involved in the surveillance that is carries out by land or by boat. Also voluntary associations and the staff of the MPA participate in the surveillance although they are not empowered to impose sanctions.

The effectiveness of the surveillance service is highest during the summer season because all the Corps are involved. Surveillance should be enforced during the winter.

Every year the MPA Management Body organizes the action plan, and it requires ad hoc financial resources to the Ministry, in order to develop management measures and monitoring activities. The financial budget is divided in three categories: ordinary administration, intervention and investment. Other additional sources could come from European, National and Regional projects.

This budget is addressed to achieve the main MPA objectives:

protect the biological and geomorphological resources; disseminate the knowledge of ecology and biology of marine and coastal environments; implement educational programs to improve the general knowledge in the field of ecology and marine biology; implement programs of study and scientific research in the fields of ecology, marine biology and environmental protection; promote the socio-economic development.

Universities and other scientific institutions are involved in scientific monitoring as well as external consultants and volunteers are involved in technical and maintenance issues.

Several monitoring programmes have been carried out within the MPA and, in general the state of knowledge of both environmental and socioeconomic aspects is good.

Capo Carbonara MPA has biological and ecological features considered critical for conservation purposes; coastal and marine biodiversity is impressive and this is the why the area include 2 Special Areas for Conservation and 3 Special Protection Areas of Natura 2000 Network; moreover, the area overlaps the Important Bird Area “Capes and islands of South-Eastern Sardinia”.

3. SITE DESCRIPTION

3.1. TYPOLOGY OF THE SITE

3.1.1. Terrestrial surface, excluding wetlands (ha):

Not applicable to the proposed area

3.1.2. Wetland surface (ha):

Not applicable to the proposed area

3.1.3. Marine surface (Sq. Km): Marine internal waters

Not applicable to the proposed area

Territorial sea

86

High sea

Not applicable to the proposed area

3.2. MAIN PHYSICAL FEATURES

3.2.1. Geology/Geomorphology

Give a brief description of: (i) geological aspects (lithologic and tectonics); (ii) processes of sedimentation and erosion observable in the area; (iii) coastal geomorphology and (iv) island system. Indicate bibliographical sources.

The coastal area around Capo Carbonara - Villasimius is mostly dominated by the presence of morphological highs, where granite is the main lithology, alternate with quartzo-felsphatic beaches and wide dune systems.

The seaward delimitation of the area is naturally considered being the external part of the continental shelf, which extends down to an average depth of 125 m.

The southeastern shelf can be structurally subdivided into two different portions: the Eastern one, which is bounded by tectonic structures, extends averagely for about 7 Km, whereas the western block is characterized by clear fault lineations oriented NW-SE, which are thought have been triggered by the Alpine orogeny.

At the north side of the *Serpentara* Island, the edge of the shelf presents a very sharp shape which is considered generated by the same N-S structures which bound the island. On the other hand in front of the *Simius* Bay, the shelf edge shows a slightly prograding shape.

The western side of the *Capo Carbonara-Capo Boi* Gulf is characterized by a sharp edge generated by erosional surfaces covered by a considerably amount of sediments. Evidence of fossil shore lines (beach-rocks) have been studied and recognized along the *Sarrabus* Continental Shelf between 25 to 125 m below the sea level. Specific studies on significative beach-rock facies appointed the depth of -45 m as the "key-depth" of the Eastern-Sardinian Continental Shelf.

The Carbonara Gulf plain is filled by a non consistent amount of sediments so the granitic substrate outcrops largely at depths between -50 and -70 m, showing some colonization from encrusting coralline algae. The southern portion of the external shelf, the *Simius* Gulf, and the eastern side (*Sarrabus* Shelf), show a very thick package of Holocene sediments from which the basement rocks outcrop only in scattered and isolated reliefs. In the study area, the dominance of silty-sandy sediments with dominance of bioclastic composition is observed. The organogenic content varies in relation to bathymetry: foraminifera are dominant in the external shelf, encrusting red algae and bryozoa prevail in the outer portion whereas, molluscs and echinoids are the most abundant in the shoreface where sediments, lying above the upper limit of the *Posidonia oceanica* meadow, are prevalently medium to coarse quartzo-feldspathic sands.

The shallowest zone of the area presents sedimentary structures mostly derived from current traction and mega ripples that force coarser biogenic clasts (gastropods shells, echinoids fragments etc.) to settle down within the troughs. It has been noticed that within troughs a large amount of carbonatic bioconstructions, like *maërl* and rhodoliths occur.

The sedimentary dynamics is well developed and can be observed in the middle portion of the shelf where large extended (often for some kilometres), submarine dune fields are very well observed and show an extremely sorted granulometry. On these dune surfaces, secondary sedimentary structures, like ripple marks and mega ripples are well developed, with orientation in concordance with primary structures.

Coastal beach-rocks appear in wide outcrops, lying over the granitic basement and are particularly visible in some small and sheltered bays like “*Cala Caterina*”, “*Cala di Ponente*” in *Cavoli’s* Island, and “*Cala is Traias*”. Within the continental shelf instead, beach-rocks outcrop and extends for several kilometres and are well exposed and observed north off the *Serpentara* Island as well in the most north-eastern portion of the area at depths between -27 and -45 m.

The shoreface environments in the area are quite variables as for their morphology as for fabric and depositional dynamics. In fact, active marine abrasive surfaces that mark the granite basement, bound the main reliefs in the area. The homogeneity of littoral abrasive surfaces is interrupted by erosional channels that are developed following the dense network of fractures. The developing of these surfaces and their external limit, are mostly sub-horizontal, slightly dipping seaward, with sharp edges and planimetrically developed over the wider erosional channels. The average depth of these surfaces varies from -1 to -10 m.

Beneath the limit of the maximum wave action, very interesting paleo erosional surfaces are observed, and their depth is variable in relation to the different morphology and exposition of the shore line to the paleo wave action.

References

LECCA L., LENAZ R., LEONE F., ROSSI S., ULZEGA A., 1979. La piattaforma continentale della Sardegna sud-orientale: indicazioni metodologiche e primi risultati. Atti Conv. P.F. Oceanografia C.N.R

ULZEGA A., LEONE F., ORRÙ P., 1984. Late quaternary sea-level evidence in Sardinia the submerged beach-rock of *Serpentara*. International Symposium on late quaternary sea-level changes and coastal evolution. Mar de Plata, Argentina.

3.2.2. Other interesting physical features: Such as hydrodynamics, volcanic formations, caves, underwater formations, etc.

In this region, the main wind regimes are the Mistral, from North-West, with the 52%-54% of events the Sirocco from the South-East with the 26% of the events and the Libeccio from South-West, with the 15% of the events.

The large scale water circulation in front of the interested area is characterized by the presence of a large cyclonic eddy which carries the waters from North-East to South-West in the nearby of the coast.

The local water circulation is strongly influenced by the wind. Mistral wind increases the North to South flow, whereas the Sirocco wind reduces the current speed and often generates an northerly coastal current. Libeccio wind also generates a northerly local flow also associated with up-welling phenomena. Tidal currents can be neglected.

3.2.3. Length of beaches (in Km), including islands:

a) Length of sandy beaches:

6.82

b) Length of pebble or stony beaches:

2.16

c) Length, height and depth of active sand-dunes:

3.3. FRESHWATER INPUTS

3.3.1. Mean annual precipitation (in mm)

266 mm/year (data regarding the annual precipitation in Capo Carbonara pluviometric station (39° 10'N; 009° 52' E) and available for the period 1961-90.

(http://www.euroweather.net/italian/climate/city_LIEC/id_Rtot/weather-report.htm)

3.3.2. Main water courses (permanent and seasonal)

Rio Foxi is the main and the only permanent water course in the area: it stretches over 9 km and its water catchment is about 45 km².

Rio Trottu, *Riu Cani Prandiu*, *Riu Pari Mannu*, *Riu Is Casas* are seasonal torrents strongly influenced by rainfall inputs, with summer runoff almost zero and sudden floods of short duration in the winter season.

3.3.3. Estuarine areas: Existence and brief description

Rio Foxi river mouth is closed by a sandbar that prevents the opening to the sea for most of the year. In the backshore, the riparian vegetation consists of dune communities with pioneer vegetation (e.g. *Ammophila arenaria*, *Cakile maritima*) and halophytic vegetation dominated by *Juncus acutus*, *Tamarix gallica* e *Tamarix africana*, *Vitex agnus-castus*, *Typha angustifolia*, *Holoshoenus vulgaris*, *Equisetum ramosissimum* and *Arundo donax*.

3.3.4. Freshwater springs: Existence and brief description, including marine offsprings

Not applicable to the proposed area.

3.4. BIOLOGICAL FEATURES (B2, Annex I)

3.4.1. Habitats: A brief description of dominant marine and terrestrial habitats, on the basis of the habitat classifications adopted within the framework of MAP (and their coverage in ha)

The main biocenosis present in MPA of Capo Carbonara are:

I.2.1 Biocenosis of supralittoral sands

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

II.1.1. Biocenosis of muddy sands and muds

- II.1.1.1. Association with halophytes
- II.3.1. Biocenosis of mediolittoral coarse detritic bottoms
 - II.3.1.1. Facies of banks of dead leaves of *P. oceanica* and other phanerogams
- II.4.1. Biocenosis of the upper mediolittoral rock
 - II.4.1.3. Association with *Nemalion helminthoides* and *Rissoella verruculosa*
 - II.4.1.4. Association with *Lithophyllum papillosum* and *Polysiphonia spp.*
- II.4.2. Biocenosis of the lower mediolittoral rock
 - II.4.2.1. Association with *Lithophyllum lichenoides* (= entablature with *L. tortuosum*)
 - II.4.2.8. *Neogoniolithon brassica-florida* concretion
 - II.4.2.10. Pools and lagoons sometimes associated with vermetids (infralittoral enclave)
- II.4.3. Mediolittoral caves
- III.2.2. Biocenosis of well sorted fine sands
 - III.2.2.1. Association with *Cymodocea nodosa*; 34 ha
- III.2.3. Biocenosis of superficial muddy sands in sheltered waters
 - III.2.3.3. Facies with *Loripes lacteus*, *Tapes spp.*
- III.3.2. Biocenosis of coarse sands and fine gravels under the influence of bottom currents (also found in the Circalittoral)
 - III.3.2.1. Maërl facies (= Association with *Lithothamnion coralloides* and *Phymatolithon calcareum*) (can also be found as facies of the biocenosis of coastal detritic)
 - III.3.2.2. Association with rhodolithes
- III.5.1. *Posidonia oceanica* meadows (=Association with *Posidonia oceanica*); 1916 ha
 - III.5.1.1. Ecomorphosis of striped meadows
 - III.5.1.2. Ecomorphosis of "barrier-reef" meadows
- III.6.1. Biocenosis of infralittoral algae
 - III.6.1.2. Association with *Cystoseira amentacea* (var. *amentacea*, var. *stricta*, var. *spicata*)
 - III.6.1.3. Facies with Vermetids
 - III.6.1.14. Facies with *Cladocora caespitosa*
 - III.6.1.16. Association with *Cystoseira crinita*
 - 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 biocenosis (in enclave)
- IV.2.2. Biocenosis of the coastal detritic bottom
 - IV.2.2.10. Facies with large Bryozoa
- IV.3.1. Coralligenous biocenosis
 - IV.3.1.10. Facies with *Eunicella cavolinii*
 - IV.3.1.11. Facies with *Eunicella singularis*
 - IV.3.1.13. Facies with *Paramuricea clavata*

IV.3.1.15. Coralligenous platforms

IV.3.2. Semi-dark caves (also in enclave in upper stages)

IV.3.2.2. Facies with *Corallium rubrum*

V.3.2. Caves and ducts in total darkness (in enclave in the upper stages)

Currently, it is not possible to give an absolute value of coverage, a part from *Posidonia oceanica* (1916 ha) and *Cymodocea nodosa* (34 ha) meadows.

3.4.2. List of regionally important species (flora and fauna) (B-2a, Annex I)

List here ONLY those species protected by international agreements, particularly those marine species included in Annex II of the Protocol, which are present in the area. Any other species may be listed if it is clearly considered of regional importance given its high representation in the area. Display the species list under the headings Marine Plants, Terrestrial Plants, Marine Invertebrates, Fish, Amphibians and Reptiles, Birds, and Mammals. For each species state:

- its relative abundance as Common (C), Uncommon (U) or Occasional (O),
- Its global status as rare (r), endemic (e) and/or threatened (t), and
- its status as an important resident population (R), or important for its breeding (B), feeding (F), wintering (W) or migratory passage (M)

SPECIES	Rel. Abundance (C) (U) (O)	Global STATUS (r) (e) (t)	Local STATUS (R) (B) (F) (W) (M)
MARINE PLANTS			
<i>Posidonia oceanica</i>	(C)	(e) (t)	(R)
<i>Cystoseira amentacea</i> var. <i>stricta</i>	(C)	(e)	(R)
<i>Cystoseira spinosa</i>	(U)	(r) (e)	(R)
<i>Lihophyllum byssoides</i>	(C)		(R)
MARINE INVERTEBRATES			
<i>Aplysina</i> sp. plur.	(C)	(e)	(R)
<i>Axinella polypoides</i>	(C)		(R)
<i>Geodia cydonium</i>			(R)
<i>Ircinia foetida</i>		(e)	(R)
<i>Spongia agaricina</i>			(R)
<i>Spongia officinalis</i>			(R)
<i>Tethya</i> sp. plur.	(U)	(r)	(R)
<i>Astroides calycularis</i>	(U)	(r)	(R)
<i>Corallium rubrum</i>	(U)	(r)	(R)
<i>Savalia savaglia</i>	(U)	(r)	(R)
<i>Asterina pancerii</i>		(e)	(R)
<i>Centrostephanus longispinus</i>	(U)		(R)
<i>Ophiodiaster ophidianus</i>	(C)		(R)
<i>Paracentrotus lividus</i>	(C)		(R)
<i>Hornera</i> sp.			(R)
<i>Ranella olearia</i>			(R)
<i>Dendropoma petraeum</i>	(C)	(t)	(R)

<i>Lithophaga lithophaga</i>		(t)	(R)
<i>Luria lurida</i>	(U)	(t)	(R)
<i>Pinna nobilis</i>	(C)	(e) (t)	(R)
<i>Homarus gammarus</i>	(C)	(t)	(R)
<i>Maja squinado</i>	(C)	(t)	(R)
<i>Palinurus elephas</i>	(C)	(t)	(R)
<i>Scyllarides latus</i>	(C)	(t)	(R)
<i>Scyllarides arctus</i>	(U)	(t)	(R)
FISH			
<i>Alosa fallax</i>			
<i>Epinephelus marginatus</i>	(C)	(t)	(R)
<i>Sciaena umbra</i>	(C)	(t)	(R)
<i>Thunnus thynnus</i>	(O)		(M)
<i>Umbrina cirrosa</i>	(O)		
<i>Xiphias gladius</i>	(O)		
REPTILES			
<i>Caretta caretta</i>	(O)	(t)	(M)
BIRDS			
<i>Calonectris diomedea</i>	(C)		(M)
<i>Larus audouinii</i>	(C)		(R)
<i>Phalacrocorax aristotelis</i>	(C)		(R)
<i>Phoenicopterus ruber</i>	(C)		(M)
<i>Puffinus puffinus yelkouan</i>	(O)		(M)
<i>Sterna sandvicensis</i>	(O)		(M)
<i>Sterna albifrons</i>	(O)		(M)
MAMMALS			
<i>Balaenoptera physalus</i>	(O)	(t)	(M)
<i>Delphinus delphis</i>	(O)	(t)	(M)
<i>Monachus monachus</i>	(U)	(t)	
<i>Physeter macrocephalus</i>	(O)	(t)	(M)
<i>Stenella coeruleoalba</i>	(O)	(t)	(M)
<i>Tursiops truncatus</i>	(C)	(t)	(M)

3.4.3. Flora: Describe in a few sentences the main plant assemblages significant in the area.

The upper midlittoral rocks in Capo Carbonara MPA are characterised by the association with *Nemalion helminthoides* and *Rissoella verruculosa* and the association with *Lithophyllum papillosum* and *Polysiphonia* spp.; inconspicuous *Lithophyllum byssoides* bends develop in the lower midlittoral, essentially in the main islands.

The infralittoral fringe is dominated by the association with *Cystoseira amentacea* and the association with *Cystoseira compressa* while the biocoenosis of infralittoral algae is found deeper, on more or less lit rocks, where photophilous assemblages prevail. The more frequent conspicuous species are *Anadyomene stellata*, *Dasycladus vermicularis*, *Cystoseira crinita*, *Dictyota fascialis*, *Padina pavonica*, *Amphiroa rigida*, *Corallina elongata*, *Jania rubens* and *Laurencia obtusa*. Encrusting red algae are common mainly where grazing activity of sea urchins is high.

Coralligenous biocoenosis are widespread on poorly lit substrates, in particular on cliffs, rock overhangs and under large stones and caves; *Halimeda tuna*, *Flabellia petiolata*, *Codium* spp., *Palmophyllum crassum*, *Lithophyllum stictaeforme*, and *Peyssonnelia* spp. are the commonest algal species.

The invasive species *Caulerpa racemosa* is also very common throughout the area, on rocky and sandy beds, from the surface up to 60 m depth.

Posidonia oceanica covers the 23% of the whole area, colonizing both rocky and sandy beds until a depth over 38 meters. In S. Stefano Bay a *Posidonia oceanica* barrier-reef meadow is present but rather discontinuous probably because of physical damages, due to the presence of the harbour pier and anchoring and trampling during the summer. Patches of *Cymodocea nodosa*, on well sorted fine sands up to 15 m depth, overall cover about 34 ha.

Coarse sands with a high biogenic fraction characterize the circalittoral detritic sediments where associations with rhodoliths and maërl are locally abundant. Here *Lithothamnion corallioides* and *Phymatolithon calcareum*, both protected according to the Habitat Directive, and *Osmundaria volubilis* are quite frequent.

The coastal area adjacent to the MPA is characterized by typical Mediterranean vegetation with some habitats of conservation interest; vegetated sea cliffs are colonised by several endemic plants or species with limited geographical ranges (*Limonium* spp., *Helicodicerus muscivorus*, *Limonium dictyocladum*, *Verbascum conocarpum*, *Urginea fugax*, *Brassica insularis*); most of them are also present in the inland of the main islands (*Cavoli* and *Serpentara*); psammophilous communities and pioneer annual vegetation inhabit the dunes of sandy areas. Agriculture is quite limited while the vegetation of residential areas and gardens are relevant, due to the presence of summer houses, tourist villages and resorts.

3.4.4. Fauna: Describe in a few sentences, which are the main fauna populations present in the area.

Midlittoral rocks are characterized by populations of *Chthamalus* spp., *Balanus perforatus* and *Patella ulyssiponensis*, while *Patella coerulea* is more abundant in the first few meters of the infralittoral. In these zones vermetids are well represented, in particular *Vermetus triqueter* and *Dendropoma petraeum*. The latter forms bioconstructions, sometimes several decimeters thick and a few meters wide, in the upper infralittoral and in midlittoral enclaves; these calcareous reefs are widespread in the whole MPA, sometimes covered and hidden by *Cystoseira* belts.

The first meters of benthic infralittoral populations are characterized by abundant invertebrate fauna with sponges (*Chondrosia reniformis*, *Crambe crambe*, *Crellia mollior*, *Ircinia* spp., *Petrosia ficiformis*) encrusting bryozoans (*Reptadeonella violacea*, *Schizoporella longirostris*), solitary and colonial corals (*Astroides calycularis*, *Balanophyllia europaea*, *Cladocora caespitosa*), actiniaria (*Aiptasia diaphana*, *Aiptasia mutabilis*, *Anemonia viridis*), echinoderms (*Arbacia lixula*, *Paracentrotus lividus*, *Hacelia attenuata*, *Ophidiaster ophidianus*), nudibranchs (*Cratena peregrina*, *Flabellina affinis*, *Discodoris atromaculata*). The alien crab *Percnon gibbesi* is very common in the rocky splits in the first two meters of depth.

Within the *Posidonia oceanica* meadows some typical species occur, such as anthozoans (*Cerianthus membranaceus*) echinoderms (*Holoturia tubulosa*) and bivalves molluscs (*Pinna nobilis*).

Coralligenous assemblages are not continuous but widespread in the area with local high density of gorgonians (*Paramuricea clavata*, *Eunicella cavolinii*, *Eunicella singularis*), sponges (*Axinella damicornis*, *Axinella verrucosa*, *Oscarella lobularis*, *Petrosia ficiformis*, *Phorbast tenacior*, *Spirastrella cunctatrix*), bryozoans (*Myriapora truncata*, *Pentapora fascialis*, *Sertella septentrionalis*, *Smittina cervicornis*, *Turbicellepora avicularis*), anthozoans (*Parazoanthus axinellae*, *Polycyathus muelleriae*), ascidians (*Clavelina lepadiformis*, *Halocynthia papillosa*) and serpulidae (*Protula tubularia*).

Some species are recorded occasionally: the sponge *Tethya aurantium*, the gastropods *Luria lurida*, the diadematid sea urchin *Centrostephanus longispinus*, the red coral *Corallium rubrum* is reported to be present below 60 m depth.

The geographical position and the geomorphological heterogeneity helped the development of a large variety of habitats that are home for cephalopods (*Octopus vulgaris*, *Sepia officinalis*), crustaceans (*Homarus gammarus*, *Maya squinado*, *Maya verrucosa*, *Palinurus elephas*) and numerous species of fish: groupers (*Epinephelus marginatus*), corbs (*Sciaena umbra*), sparidae (*Dentex dentex*, *Diplodus* spp.), sphyraenidae (*Sphyraena viridensis*), mullidae (*Mullus surmuletus*) are quite abundant and large sized.

3.5. HUMAN POPULATION AND USE OF NATURAL RESOURCES

3.5.1 Human population

a) Inhabitants inside the area:

	Number	Date of data
Permanent	3,576	2009
Seasonal number (additional to permanent)	ca. 50,000	2006

Description of the population

The working population in the district of Villasimius is employed as follows:

38% Hotels and restaurants

13% Commerce and public services

14% Building trade

9% Transports

8% Manufacturing activities (food and shipyards)

6% School and education

5% Other community, social and personal

3% Public Administration

2% Health and social services

Main human settlements and their population

There are no residents in the MPA; the nearest urban area is Villasimius with 3,576 inhabitants.

3.5.2. Current human use and development

a) Briefly describe the current use of the area by subsistence, artisan, commercial and recreational fishing, hunting, tourism, agriculture and other economic sectors.

The main economic activities within the area are devoted to seasonal tourism, mainly composed by families; congress tourism is also significant due to the presence of two big resorts. Hotel industry (83% hotels, 4% B&B, 14% camping) has about 7000 beds.

Tourists support most of the commercial activities within the area; hotels and restaurants are the main employment sectors together (about 80 units); tourism enterprises also includes fishing tourism activities (5), boats for local tourist transport (3), rental and leasing activities (19), diving centres (12). Offshore sailing school and sailing courses for tourists are organized by National Navy League.

The tourist harbour (Marina di Villasimius) has about 800 mooring places for pleasure boats. Recreative fishing (angling and trolling) counted 738 licenses in 2009.

Other economic enterprises are related to commerce (84), building trades (46), manufacturing and handicraft production (37); small-scale agricultural holdings are 64; they cover about 1400 ha. Artisanal fishing counts 9 fishing vessels, one or two employed per vessel.

b) Enter how many of the users depend on these resources, seasonality, and assessment of the social and economic importance of their use and of the perceived impact on the conservation of the area, in a score of 0-1-2-3 (meaning null, low, medium, high).

ACTIVITY AND CATEGORY	ASSESS IMPORTANCE OF Socio-economic Conserv. Impact		Estimated No. of Users	Seasonality
FISHING				
Subsistence	1	1	8	NO
Commercial, local	1	1	8	NO
Commercial, non-local	0	0		
Controlled recreational	0	0		
Un-controlled recreational	1	1	738	YES
TOURISM				
Regulated	3	3	50.000	YES
Unregulated				
Indicate the type of tourism				
– Hotel/beach turism	3	2		
– Boating/sailing	2	2		
– Diving	2	1		
Tourism facilities	3	2		
FOREST PRODUCTS				
Subsistence	0	0		
Non-timber commercial, local	0	0		
Non-timber commercial, non-local	0	0		
Timber commercial, local	0	0		
Timber commercial, non-local	0	0		
Agriculture	1	1		NO
Stockbreeding	1	1		NO
Aquaculture	0	0		
EXTENSIVE STOCK GRAZING				
Subsistence	1	1		NO
Commercial, local				
Commercial, non-local				
OTHER ACTIVITIES				
Construction industry	3	1		NO

3.5.3. Traditional economic or subsistence uses

Name any environmentally sound traditional activities integrated with nature, which support the well being of the local population. E.g. land, water use, target species, if closed seasons or closed zones are used as management techniques.

The environmental tourism is well developed mainly during the summer season. It is mainly linked to the natural beauty of the emerged area (nautical and beach tourism), to the attractiveness of the underwater landscape and to the diversity and abundance of fish (scuba diving tourism). Up to now these activities are well integrated with nature even if they have to be monitored because of their potential detrimental effects on the environment.

Also the artisanal fishery is well integrated with the MPA purposes, because of its low pressure on stocks.

4. MEDITERRANEAN IMPORTANCE OF THE SITE

This Section aims at stressing the importance of the site for conservation at the regional or global scales, as set in Art. 8 para. 2 of the Protocol and B2-a, B2-b and B2-c in Annex I.

4.1. PRESENCE OF ECOSYSTEMS/HABITATS SPECIFIC TO THE MEDITERRANEAN REGION

Name the type of habitats considered of Mediterranean specificity, on the basis of the habitat classifications adopted within the framework of MAP, and their estimated cover (Ha).

- I.2.1.5. Facies of phanerogams which have been washed ashore (upper part)
- II.3.1.1. Facies of banks of dead leaves of *P. oceanica* and other phanerogams
- II.4.1.3. Association with *Nemalion helminthoides* and *Rissoella verruculosa*
- II.4.1.4. Association with *Lithophyllum papillosum* and *Polysiphonia spp.*
- II.4.2.1. Association with *Lithophyllum lichenoides* (= entablature with *L. tortuosum*)
- II.4.2.8. *Neogoniolithon brassica-florida* concretion
- II.4.2.10. Pools and lagoons sometimes associated with vermetids (infralittoral anclave)
- III.2.2.1. Association with *Cymodocea nodosa*; 34 ha
- III.2.3.3. Facies with *Loripes lacteus*, *Tapes spp.*
- III.3.2.1. Maërl facies (= Association with *Lithothamnion coralloides* and *Phymatolithon calcareum*) (can also be found as facies of the biocenosis of coastal detritic)
- III.3.2.2. Association with rhodolithes
- III.5.1. *Posidonia oceanica* meadows (=Association with *Posidonia oceanica*); 1916 ha
- III.5.1.1. Ecomorphosis of striped meadows
- III.5.1.2. Ecomorphosis of "barrier-reef" meadows
- III.6.1.2. Association with *Cystoseira amentacea* (var. *amentacea*, var. *stricta*, var. *spicata*)
- III.6.1.14. Facies with *Cladocora caespitosa*
- III.6.1.16. Association with *Cystoseira crinita*
- III.6.1.19. Association with *Cystoseira spinosa*
- III.6.1..25. Association with *Cystoseira compressa*

IV.2.2.10. Facies with large bryozoans

IV.3.1. Coralligenous biocenosis

IV.3.1.10. Facies with *Eunicella cavolinii*

IV.3.1.11. Facies with *Eunicella singularis*

IV.3.1.13. Facies with *Paramuricea clavata*

IV.3.1.15. Coralligenous platforms

Currently, it is not possible to give an absolute value of coverage, apart from *Posidonia oceanica* (1916 ha) and *Cymodocea nodosa* (34 ha) meadows.

4.2. PRESENCE OF HABITATS THAT ARE CRITICAL TO ENDANGERED, THREATENED OR ENDEMIC SPECIES

A critical habitat is an area essential to the conservation of the species concerned. These species should be those included in Annex II of the Protocol. E.g. Islets and sea stacks, as **small islands in the sea or in large bodies of water, mostly important for water-bird colonies; caves appropriate for monk seals; undisturbed sand beaches where marine turtle nesting occurs; coastal lagoons where threatened fish or bird species feed or breed**; tidal flats, coastal or benthic substrates important for marine invertebrates, etc. Name the habitat types and the species linked to it.

Marine habitats:

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

III. 5. 1. *Posidonia oceanica* meadows (*Posidonia oceanica*, *Paracentrotus lividus*, *Pinna nobilis*, *Luria lurida*)

III.5.1.2. Ecomorphosis of "barrier-reef" meadows (*Posidonia oceanica*)

III. 6. 1. 3. Facies with Vermetids (*Dendropoma petraeum*, *Lithophaga lithophaga*)

III.6.1.35. Facies and Associations of Coralligenous biocenosis (in enclave) (*Astroides calycularis*, *Aplysina* spp., *Axinella* spp.)

IV.3.1. Coralligenous biocenosis (*Ophidiaster ophidianus*, *Centrostephanus longispinus*, *Parazoanthus axinellae*, porifera, bryozoans)

IV.3.1.10. Facies with *Eunicella cavolinii* (*Eunicella cavolinii*)

IV.3.1.11. Facies with *Eunicella singularis* (*Eunicella singularis*)

IV.3.1.13. Facies with *Paramuricea clavata* (*Paramuricea clavata*, *Eunicella cavolinii*)

IV.3.2. Semi-dark caves (*Aplysina* spp., *Axinella* spp., *Homarus gammarus*, *Palinurus elephas*, *Scyllarides latus*, *Epinephelus marginatus*, *Sciaena umbra*)

Terrestrial habitats

I.5.1. Lithogenic rock stacks and islets: *Phalacrocorax aristotelis desmarestii*, *Calonectris diomedea*, *Puffinus puffinus yelkouan*, *Larus audouinii* and *Sterna sandvicensis*

A small, inland barrier lagoon (*Notteri* lagoon, about 34 ha), adjacent to the MPA and separated to the sea by a small sand barrier, is the most important wetland spot for migratory birds (*Phoenicopterus ruber*).

4.3. OTHER RELEVANT FEATURES (Art. 8 paragraph 2 in the Protocol)**4.3.1. Educational Interest (B-3 in Annex I)**

E.g. particular values for activities of environmental education or awareness

Environmental education and enhancement of knowledge and sustainable use of marine resources are among the institutional objectives of Capo Carbonara MPA. Because of the presence of particular geomorphological features (granite morphologies, sand dunes) and the high levels of diversity, in terms of habitat and species, natural values of educational interest are present in both coastal and marine environments.

As a partner of the Regional Network for recovery of marine wild fauna, the MPA manages a Centre for first aid, recovery and release of marine turtles, mammals and birds in physical difficulty; the centre also updates the information about marine mammals present in the MPA and implements activities for environmental information and public awareness.

The environmental education is carried out by a local cooperative that collaborates with the Service Centre of the MPA.

The Centre organizes and manages educational programmes, for schoolchildren and tourists, addressed to promote information about the MPA, to disseminate the knowledge of marine-coastal territory of Villasimius and ecological and environmental issues and also to promote the responsible use of the environment.

The MPA is operating to integrate the current activities of the Service Centre with a range of services and facilities to achieve and certify a CEAS (Centre for Environmental Education and Sustainability), which will be part of the network INFEA (Regional Network for Environmental Education). The accreditation process to the INFEA is close to its completion.

4.3.2. Scientific Interest (B-3 in Annex I)

Explain if the site represents a particular value for research in the field of natural or heritage sciences.

In Capo Carbonara MPA several aspects are of interest for research.

It is remarkable the scientific importance of the granite basement, which is part of the backbone of the Sardinia Island. Fractures and diaclasis are well developed and thought to be the result of the Hercynian orogeny. These features are responsible to lead the granites of this area to an high process of arenization in some places. The resulting geomorphological heterogeneity has favoured the development of a high degree of biodiversity and many endemic species.

The scientific interest of the MPA also resides in the presence of some environments of EU interest (Habitat Directive, Bird Directive, Barcelona Convention). Moreover the presence of several thermophilic species and the monitoring of their spread and dynamics is relevant for studies related to the climate change and global warming; alien species are abundant and their scientific interest is due to the possibility to study their evolution, invasive potential and their influence on native communities.

Because of its pristine or almost pristine conditions, the area is considered a reference location for researches related to the assessment of ecological status of coastal waters according to the WFD (2000/60/EC).

4.3.3. Aesthetic Interest (B-3 in Annex I)

Name and briefly describe any outstanding natural features, landscapes or seascapes.

Landscape and seascape are characterized by granite rocks that form pinnacles, hollows, cracks and *tafoni* of high aesthetic value; these particular morphologies, as well as some little sandy coves with clear waters or long white beaches and sandy dunes, and wildness of *Cavoli* and *Serpentara* islands, enhance the attractiveness of the area. Some views of the *Gulf of Carbonara* (from *Capo Boi*) and the Gulf of *Simius* in front of the two islands (from *Capo Carbonara* and *Punta Molentis*) are unique and impressive.

Moreover, the diversity of habitats and species and the occurrence of spectacular species, both in the coastal area (e.g. flamingos) and in the marine environment (e.g. marine mammals, groupers, gorgonians and corals), strongly increases the aesthetic interest of the site.

4.3.4. Main cultural features

Indicate if the area has a high representative value with respect to the cultural heritage, due to the existence of environmentally sound traditional activities integrated with nature which support the well-being of local populations.

The area around the site has high representative values of cultural heritage due to his history. Archeological remains of past civilizations are present in the territory of Villasimius; the first records date from the Neolithic period and relates to a "*domus de Janas*" necropolis ("witches' house" in Sardinian language) close to the "*Riso*" beach. A massive nuragic system of territorial control is represented by a number of "*nuraghi*" (i.e. megalithic towers) perched on top of steep hills and along the coast.

The presence of the Phoenicians is witnessed by remains of a temple on the hill western *Cuccureddus*; the finds from excavations at *Cuccureddus* can be seen at the Municipal Archaeological Museum. The local cooperative is involved in the management of Archeological Museum and the Old Fortress.

Several Spanish watchtowers, in visual communication with each other, are spread in the main headlands along the coast (*Capo Boi*, *Fortezza Vecchia*, *Isola dei Cavoli*, *Porto Giunco*, *Punta Is Proceddus*, *Serpentara*).

Two granite quarries (*Cava Usai* and *Punta Molentis*) have both historical and scenic values; they were active from the late nineteenth century and are now disused.

Several wrecks are present within the MPA boundaries, most of them were are vessels sunk during the Second World War; moreover, ceramics and amphorae from the Roman period are widespread throughout the area. Sunken wrecks are a great attraction for dive tourists.

5. IMPACTS AND ACTIVITIES AFFECTING THE AREA

5.1. IMPACTS AND ACTIVITIES WITHIN THE SITE

5.1.1. Exploitation of natural resources

Assess if the current rates of exploitation of natural resources within the area (sand, water and mineral exploitation, wood gathering, fishing, grazing...) are deemed unsustainable in quality or quantity, and try to quantify these threats, e.g. the percentage of the area under threat, or any known increase in extraction rates.

Fishery, both artisanal and recreational, is the only exploitation activity carried out within the MPA.

Artisanal fishing does not seem to be able to produce serious threats to natural resources, given the low number of artisanal fishing boats (9), the use of selective gears (mainly trammel nets) and the consequent low pressure.

Recreational fishing is relevant in terms of number of licences (738 in 2009) but, although the captures are not under control, its influence on fish stocks does not seem to be particular relevant.

5.1.2. Threats to habitats and species

Mention any serious threats to marine or coastal habitats (e.g. modification, desiccation, disturbance, pollution) or to species (e.g. disturbance, poaching, introduced alien species...) within the area.

Possible vulnerable habitats are: sandy beaches and dunes due to the high tourist frequentation and the removal with heavy machines of beach-wrack made of *Posidonia oceanica* leaf litter (*banquettes*); shallow *Posidonia oceanica* meadows as a consequence of mechanical perturbations (anchoring, trampling), as well as coralligenous assemblages and seafan populations (anchoring, diving, artisanal and recreational fishing). The mechanical damages caused by divers are strictly localized in some sites with a very small extension relative to the surface of the MPA.

Some ecosystems/habitat/species are potentially vulnerable to the impact of non indigenous species, i.e. the chlorophyta *Caulerpa racemosa* var. *cylindracea*, widespread and very abundant in the whole area.

The construction and development of the tourist harbour "*Marina di Villasimius*" has caused the erosion of nearby beaches and *Posidonia oceanica* meadows; it also represents a potential source of water and sediment pollution due to the oil spill from recreational and commercial boats.

The high frequency of motor boats during the summer may discourage the presence of marine mammals (as a consequence of noise) and damage the sea turtle *Caretta caretta* (due to the impacts with the hulls and propellers).

Rare cases of poaching (illegal fishing) have been reported during the winter season, whenever surveillance is reduced.

Pollution and contamination are not significant because urban and industrial pressures are very low (it is noteworthy the presence of a very efficient sewage treatment system).

Also the input of freshwaters, and the consequent possible organic and inorganic pollutants, is not significant.

5.1.3. Demand by an increased population and infrastructures

Assess whether the current human presence or an expected increase in frequentation (tourism, passage of vehicles and boats) and any human immigration into the area, or plans to build infrastructures, are considered a threat.

Summer tourist frequentation has experienced a steady grow over the years; a further increase is expected in the coming years. A growing demand for housing facilities and infrastructure and the increasing of wastes are also expected.

Building industry is expected to increase, but mainly inland, thus without direct effects on the MPA.

Nevertheless, the increase in tourist visits and, consequently, the increase of people on the beaches, pleasure boats and diving, could threaten the area and some special habitats (such as dunes and beaches of bioconstructions vermetids, seagrass beds and coral assemblages).

5.1.4. Historic and current conflicts

Make a brief statement of any historic or current conflicts between users or user groups.

No relevant historical and current conflicts among users to report.

5.2. IMPACTS AND ACTIVITIES AROUND THE SITE

In Art.7.2-e the Protocol calls for the regulation of activities compatible with the objectives for which a SPA was declared, such as those likely to harm or disturb species or ecosystems (Art.6.h), while Section B4 in Annex I asks to consider “the existence of threats likely to impair the ecological, biological, aesthetic or cultural value of the area” (B4-a in Annex I), recommending the existence, in the area and its surroundings, of opportunities for sustainable development (B4-d) and of an integrated coastal management plan (B4-e).

5.2.1. Pollution

Name any point and non-point sources of external pollution in nearby areas, including solid waste, and especially those affecting waters up-current.

A remarkable source of external pollution is represented by the solid waste produced by the increasing human pressure during the summer season all around the area.

The harbour for leisure craft (*Marina of Villasimius*) is well organized, but it is a potential source of pollution for discharge of fuels and oils and release of anti-fouling paints and heavy metals.

5.2.2. Other external threats, natural and/or anthropogenic

Briefly describe any other external threat to the ecological, biological, aesthetic or cultural values of the area (such as unregulated exploitation of natural resources, serious threats on habitats or species, increase of human presence, significant impacts on landscapes and cultural values, pollution problems, any sectorial development plans and proposed projects, etc.), likely to influence the area in question.

The intense maritime traffic in the Sardinia Channel is the most noteworthy threat due to potential leakage of oil.

Risks associated with oil spill also concern the maritime traffic to and from industrial and commercial ports on the Gulf of Cagliari; sometimes oil tankers and ferries pass through a few miles away from the boundaries of the MPA.

5.2.3. Sustainable development measures

Comment whether the area is covered by an integrated coastal management plan, or bordering upon a zone under such a plan. Are there other opportunities for sustainable development provided for in the neighbouring areas?

Based on monitoring activities, management measures addressed to nature conservation and sustainable development are annually developed.

Some of these measures relate to the protection of threatened dune systems and beaches (e.g. provision of wooden footbridges to the beach access, re-nourishment actions); other are addressed to regulate both extractive (commercial or recreational fishing) and non-extractive (eco-tourism) activities.

Since several years, a system of re-use of reclaimed wastewater from a treatment plant is operative for irrigation of green areas, gardens and the municipal golf course, in order to meet the demand of tourism and hotel loads (winter flow 2000 m³/day, summer flow 5000 m³/day). A photovoltaic system attached to the sewage treatment plant is in phase of the initial installation.

Information campaigns on the responsible use of the environment are continuously promoted. The vision is to enhance the awareness of users of marine resources (citizens, tourists, fishermen, yachters and divers) as a driving force for sustainable development, not only inside the MPA.

6. EXPECTED DEVELOPMENT AND TRENDS¹

The foreseeable development and trends of the site do not appear in the list of common criteria for the choice of protected marine and coastal areas that could be included in the SPAMI list, as established in the Protocol and its Annex I. Moreover, this is not always easy to assess and it is necessary to have knowledge about the site, which is not always available to all managers of protected areas; Thus, it is not obligatory to fill in the boxes in this Section 6.

On the other hand, the assessment of this foreseeable evolution and trends constitutes a dynamic supplement to the static knowledge of the site, as it appears in Sections 3, 4 and 5 above. Moreover, it is of significant importance for the definition of the objectives and the management plan of the site.

It thus appears desirable to bringing out the main outlines at least in respect to the following points:

6.1. EXPECTED DEVELOPMENT AND TRENDS OF THREATS TO AND PRESSURES UPON THE AREA

Deal briefly in succession with:

- The demographic development in and around the site
- The development of economic activities (other than tourism and recreation) within the area
- The development of local demand on tourism and recreation
- The development of tourism pressure on the area

¹ By expected development and trends are meant the development, which is thought most likely to occur in the absence of any deliberate intervention to protect and manage the site.

The town of Villasimius has a population of 3,576 inhabitants (2009) and a growing demographic trend of 23% over 2001. The area is increasingly specializing in the tourism product and, thanks to the summer season, reaches a total of 600,000 esteemed presences per year (80,000 beds available). All activities in the area are strategically adapted to the dynamics of this leading sector.

6.2. POTENTIAL CONFLICTS IN THE AREA

Make a brief statement of potential use conflicts between the users or group of users of the site.

No information about current conflicts between the users of the site

6.3. EXPECTED DEVELOPMENT AND TRENDS OF THE NATURAL LAND ENVIRONMENT AND LANDSCAPES OF THE AREA: as expected arising from the evolution of the pressures

A stabilization of the tourism offer is expected, along with an active policy for the redevelopment of the traditional beach tourism in an environment-related tourism, more sustainable, in order to achieve the maintenance of current condition of environmental quality.

Because of the high frequentation of beaches during the summer season, the monitoring of the carrying capacity of beaches is among the most important activities expected for coming years.

6.4. EXPECTED DEVELOPMENT AND TRENDS OF THE MARINE ENVIRONMENT AND SEASCAPES OF THE AREA: as expected arising from the evolution of the pressures

The orientation of the Management Body is to develop a system for monitoring of marine traffic (frequencies, speed, emissions, anchoring). The aim is to reduce the threats despite the increasing pressures of boating. In this perspective is also the request to create a buffer zone to move the maritime traffic of vessels bound for, or coming from, the ports in the Gulf of Cagliari.

In addition, because of the number of dives, it is expected to continue the monitoring of diving sites and their carrying capacity, along with policies to redistribute the flow of divers throughout the year.

7. PROTECTION REGIME

7.1. LEGAL STATUS (General Principles “e” and Section C-2 both in Annex I)

7.1.1. Historical background of the protection of the site

The MPA of Capo Carbonara was identified as Marine Protected Area in 1991 (National Law n.394/1991); it was established in 1998 by decree of the Ministry of the Environment (D.M. 15.09.1998), modified in 1999 (D.M. 03.08.1999) (G.U. n.229/1999).

7.1.2. Legal texts currently ruling the protection on the site

Enter the national conservation category, the dates and the present enforcement status of the legal instrument declaring the protection of the area. Consider both the land and the marine areas of the site. Include the full text(s) as an annex.

National Law no. 394. 6.12.1991. Framework law on Protected Areas. G.U. - Official Gazette - of the Italian Republic no. 292 - Ordinary Supplement - of 13. It identified the area as a recognized marine area "Capo Carbonara" (attached).

Decree of the Ministry of the Environment (D.M. 15.09.1998), modified in 1999 (D.M. 03.08.1999) (G.U. n.229/1999). It established the "Capo Carbonara Marine Protected Area" (attached).

Ordinances of the Coast Guard of Cagliari n° 70/2000 and n° 79/2000. It provides the regulations of activities in the "Capo Carbonara Marine Protected Area" for the preservation and protection of the ecosystems (attached).

7.1.3. Objectives (General Principles "a" and D-1 in Annex I)

Name in order of importance the objectives of the area as stated in its legal declaration.

The main objectives of Capo Carbonara MPA are:

- to protect the environment in the interested marine area;
- to protect and increase the value of biological and geomorphological resources of the area and the restocking of fish fauna;
- to spread and disseminate the knowledge of ecology and biology of marine and coastal environments as well as the special environmental and geomorphological features of the area;
- to implement educational programs to improve the general knowledge in the field of ecology and marine biology;
- to implement programs of study and scientific research in the fields of ecology, marine biology and environmental protection in order to ensure the systematic knowledge of the area;
- to promote the socio-economic development compatible with the relevance of the natural landscape, also favouring traditional local activities already present.

7.1.4. Indicate whether the national protection regime arises from international treaties enforced or from implementation measures of treaties (Art. 6.a in the Protocol).

Not applicable to the proposed area.

7.2.INTERNATIONAL STATUS

7.2.1. Transboundary or high seas areas

Complete this section only if the area is transboundary, totally or partially in the high sea, or within areas where the limits of national sovereignty or jurisdiction have not yet been defined. In this case, mention the modalities of the consultation (Art. 9 para. 3A in the Protocol and General Principles "d" in Annex I).

Not applicable to the proposed area.

7.2.2. International category

Mention if the area, or part of it, has been designated and on what date, with an international conservation category (e.g. Specially Protected Area, Biosphere Reserve, Ramsar Site, World Heritage Site, European Diploma, Natura 2000, Emerald network, etc.).

Currently, the area is interested by 5 areas included in the Natura 2000 Network that partially overlap with the MPA:

2 Special Areas of Conservation

- "*Isola dei Cavoli, Serpentara, Punta Molentis and Campulongu*" (ITB040020);
- "*Costa di Cagliari*" (ITB040021);

and 3 Special Protection Areas:

- "*Isola di Serpentara*" (ITB043026);
- "*Isola dei Cavoli*" (ITB043027);
- "*Capo Carbonara and Stagno Notteri - Punta Molentis*" (ITB043028);

In 2010, the Special Area for Conservation ITB040055 (*Campu Longu*) was included in the Special Area for Conservation ITB040020 formerly designated as "*Isola dei Cavoli, Serpentara and Punta Molentis*" and that is currently referred as "*Isola dei Cavoli, Serpentara, Punta Molentis and Campulongu*".

Moreover, the area overlaps the Important Bird Area (IBA) 187 designated as "Capes and islands of South-Eastern Sardinia".

7.3. PREVIOUS LEGAL BACKGROUND AND LAND TENURE ISSUES

Briefly mention if the area or part of it is subject to any legal claim, or to any file open in that connection within the framework of an international body. Describe the land tenure regimes within the area, and append a map if existing.

Not applicable to the proposed area.

7.4. LEGAL PROVISIONS FOR MANAGEMENT (Section D-1 in Annex I)

7.4.1. Zoning

Briefly state if the legal text protecting the area provides for different zones to allocate different management objectives of the area (e.g. core and scientific zones in both land and sea, fishing zones, visitation, gathering, restoration zones etc) and in this case the surface area in ha of these zones. Include a map as an annex

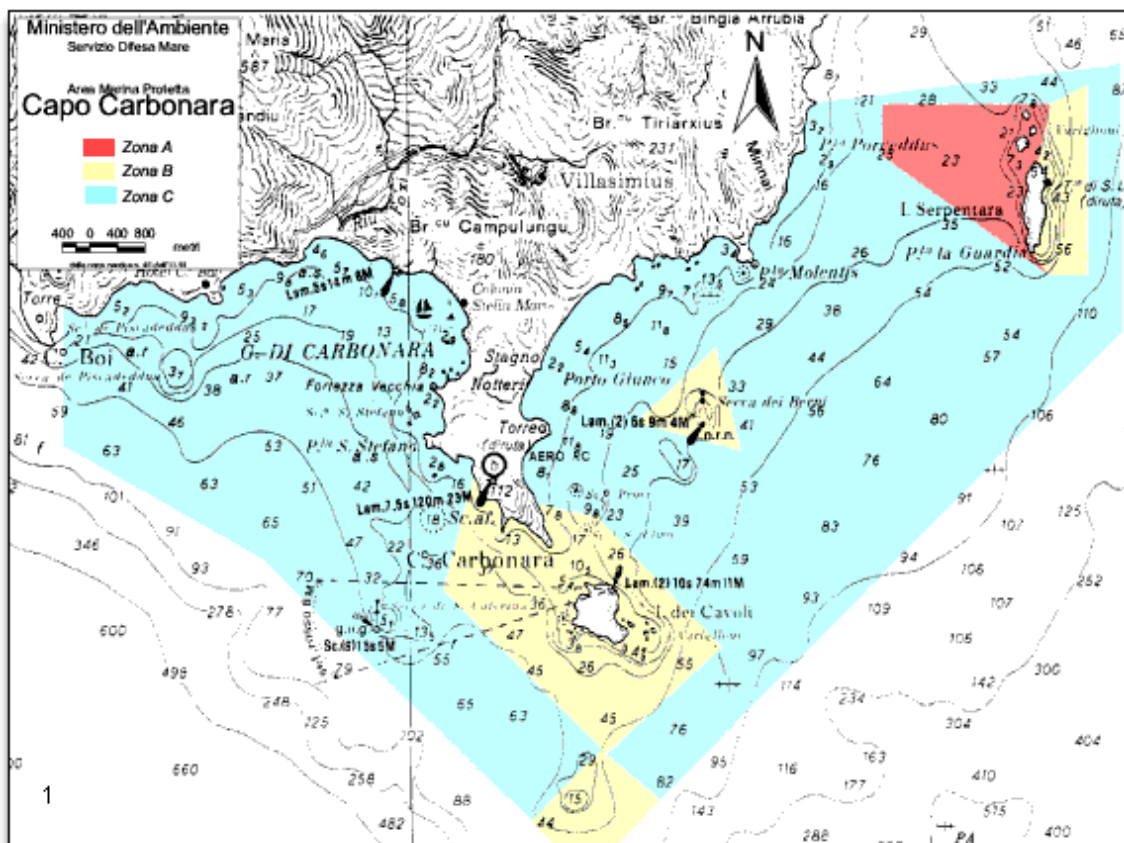
The MPA is divided in three zones with different degree of protection established by the Decree issued by the Department of the Environment (D.M. 03.08.1999) (G.U. 29.09.1999).

Zone A or integral reserve (no-take zone); it covers 332 ha (about 4% of the entire area) in the west sector of *Serpentara* Island.

Zone B or general reserve (buffer or restricted use zone); it covers about 1191 ha (about 14%) and includes the east sector of *Serpentara* Island, the triangular area around the reef "*Secca dei Berni*" and the area around *Capo Carbonara*, *Isola dei Cavoli* and the southernmost reef "*Secca di Libeccio*".

Zone C or partial reserve (multiple used management zone). It covers the remaining 82% of the area.

For the further information relative to the extension and the coordinate points of the different zones see the MPA attached map and the Ordinance of the Coast Guard n. 70/2000.



7.4.2. Basic regulations

Mention the provisions, which apply to the area concerning the implementation of Article 6 of the Protocol (paragraphs a to i), Section D5 (a to d) in the Annex I and Article 17 of the Protocol.

A Zone: integral reserve (332 ha). No-take area in the western sector of *Serpentara* Island. The boundaries of the no take zone are listed on the map. Only research scientific activities and SCUBA diving, along fixed trails in delimited areas and under the regulation/permission of the Management Body, are allowed.

B Zone: general reserve (1191 ha). This zone includes four sites: the eastern sector of *Serpentara* Island, the rocky outcrop of *Berni*, the system *Capo Carbonara - Cavoli* Island, and the area in the south of *Cavoli* Island. The boundaries of each sub-areas are listed on the map. In this area, sailing up to 10 knots, SCUBA diving activities, bathing and mooring regulated by the Management Body are allowed. Small scale fisheries are allowed to professional fishermen resident in the municipality of Villasimius and to recreational fishermen, under the regulation of the Management Body.

C Zone: partial reserve (7075 ha). This zone corresponds to the remaining area of the marine reserve. In this area are allowed: sailing, regulated mooring, regulated SCUBA diving, regulated recreational fishing, professional fishing for fishermen resident in the town of Villasimius and for those not resident but licensed by the Management Body.

Trawling and spear fishing are not admitted in the whole MPA.

All protection measures refer to the Decree D.M. 03.08.1999. The 70/2000 and 79/2000 regulates all activities into each different Zones in MPA of Capo Carbonara.

7.4.3. Legal competencies

Section D4 in Annex I states that the competence and responsibility with regard to administration and implementation of conservation measures for areas proposed for inclusion in the SPAMI List must be clearly defined in the texts governing each area. Additionally Art.7.4. of the Protocol calls for the provision of clear competencies and co-ordination between national land and sea authorities, with a view to ensuring the appropriate administration and management of the protected area as a whole. Mention in which way do the legal provisions clearly establish the institutional competencies and responsibilities for the administration and conservation of the area, and if being the case, their co-ordination means, including those between land and sea authorities.

The MPA Istitutive Decree constitutes the juridical tool of the management. It is applied to the marine area of the MPA and the terrestrial boundaries are marked by the State demesne competencies.

7.4.4. Other legal provisions

Describe any other relevant legal provisions, such as those requiring a management plan, the establishment of a local participation body, binding measures for other institutions or economic sectors present in the area, allocation of financial resources and tools, or any other significant measures concerning the protection and management of the area or its surrounding zones.

8. MANAGEMENT

Through the General Principles, para. (e) in the Annex I, the Parties agree that the sites included in the SPAMI List are intended to have a value as examples and models for the protection of the natural heritage of the region. To this end, the Parties ensure that sites included in the List are provided with adequate legal status, protection measures and management methods and means.

8.1. INSTITUTIONAL LEVEL

8.1.1. Authority/Authorities responsible for the area

The Management Body is the municipal administration of Villasimius Municipality, under the supervision of the Ministry of the Environment (Convention of 21.12.1998 for the entrusting the AMP management to the Municipality of Villasimius).

8.1.2. Other participants in the management body

Such as other national or local institutions, as stated in Section D6 in Annex I.

The management organs of the MPA are the Director and the Reserve Commission of Italian Ministry of Environmental.

8.1.3. Participants in other committees or bodies

Such as a scientific committee, or a body of representatives from the local stakeholders, the public, the professional and non-governmental sectors, as in Sections B4-b and B4-c in Annex I.

Temporary committees of economic operators:

- fishermen;
- diving clubs;
- tourist operators.

8.1.4. Effectiveness

As stated in Section B4 of Annex I, assess as very low, low, moderate, satisfactory, very satisfactory, and comment as needed on the following aspects:

a) Effectiveness of the co-ordination, where existing:

Moderate

b) Quality of involvement by the public, local communities, economic sectors, scientific community:

Moderate

8.2. MANAGEMENT PLAN (as set out in D7 of Annex I)

8.2.1. Management Plan

State if there is a management plan (MP) and in this case include the document as an annex. In the absence of a MP, mention if the main provisions governing the area and the main regulations for its protection are already in place and how (D7 in Annex I) and if the area will have a detailed management plan within three years (D7 in Annex I).

Since 2009 all management activities have been included in the document EMAS comprising the mission and the objectives that the MPA should achieve in term of conservation.

The first EMAS Regulation No 1836 was enacted in 1993; it was replaced by Regulation No 761 in 2001 and, afterwards, by the new Regulation No 1221 in 2009

The management system EMAS and the activities of registration, accreditation and supervision of environmental verifiers EMAS are carried out, with annual audit and three-yearly certification, in accordance with ISO 9001:2008 (Certificate 9175 issued by IMQ-CSQ).

EMAS is primarily intended to improve the environment and to provide organizations, enforcement authorities and citizens (the public at large) a means by which to find information on the environmental performance of the organization

There are also actions that overlap and will complement the activities of the approved management plans of Natura 2000 areas which include parts of the sea (e.g. monitoring of *Posidonia oceanica* meadows).

Every year the MPA Management Body organizes an action plan, inspired by the purposes indicated in the establishing decree, and requires ad hoc financial resources to the Ministry, in order to annually develop management measures and monitoring activities within the Capo Carbonara MPA.

Together with the aspects described under 8.2.3, this programming makes up the management plan for Capo Carbonara MPA.

8.2.2. Formulation and approval of the Management Plan

Mention how the MP was formulated, e.g. by an expert team and/or under consultation and/or participation with other institutions or stakeholders. State the legal status of the MP, whether it is officialized, and how, and if it is binding for other institutions and sectors involved in the area.

The action plan is powered by the biological, geological, ecological and socio-economical aspects. The annual analysis included the ecological needs of habitats and species together with the clarification of specific and general management objectives.

The schedule of activities is carried out by the Director with support from the scientific and administrative staff.

The annual action plan represents the guide line for the activities of management also for the public and private authorities involved.

8.2.3. Contents and application of the Management Plan

State the degree of detail in the MP by entering YES or NO in the following list of potential contents, and assess the degree of implementation of the MP by using the 0-1-2-3 score on the right hand side:

	Existing in MP	Degree of application
Detailed management objectives	YES	3
Zoning	YES	3
Regulations for each zone	YES	3
Governing body(ies)	YES	3
Management programmes as:		
Administration	YES	3
Protection	YES	3
Natural resource management	YES	2
Tourism and Visitation	YES	2
Education and Training	YES	2
Research and Monitoring	YES	2
Services and Concessions	YES	3
Fund raising activities	YES	2
Periodic revisions of the MP	YES	1

8.3. PROTECTION MEASURES

By Art. 6 of the Protocol the Parties agree to take all the necessary protection measures required for the conservation of the area, particularly the strengthening the application of the other Protocols to the Convention, and through the regulation of any other activity likely to harm the natural or cultural value of the area, such as economic, recreation or research activities. As per Section D2 in Annex I, the protection measures must be adequate to the site objectives in the short and long term, and take in particular into account the threats upon it.

8.3.1. Boundaries and signing

Briefly, state if the boundaries of the area and its zones are adequately marked in the field, both on land, in the sea, and at the principal points of access.

Informative devices and posters are present all along the coastal perimeter; they also describe the bans that have to be respected

The no-take zone is signalled by yellow buoys that are illuminated during the night. At the moment the yellow buoys are being repositioned.

Currently, the Marine Protected Area is awaiting the publication in the Official Gazette of the new regulations approved in April 2009 by the Conference of the State, Regions and Cities. The new regulation concerns the definition of new boundaries of zones with different degree of protection (zones A, B and C) and a new buffer zone (zone D) around the edge of the MPA.

8.3.2. Institutional Collaboration

Name the different national and local institutions or organisations with legal responsibilities or involved in the protection and surveillance of land and sea zones, and any measures or mechanisms through which their co-ordination is pursued.

The Coast Guard, the Revenue Guard Corps, the "Carabinieri" Corps and the Forestall Corps are involved in the surveillance. Surveillance activities are carried out by land or by boat.

8.3.3. Surveillance

Consider the adequacy of the existing protection means (human and material), and your present ability to survey land and sea uses and accesses

The effectiveness of the surveillance service is highest during the summer season because all the Corps are involved. Surveillance service continues throughout the year but is lower and should be enforced mainly during the winter.

Another source to enforce the surveillance comes from voluntary associations and the staff of the MPA. The MPA has two 6 m inflatable boats and one jeep for the surveillance and rescue service.

8.3.4. Enforcement

Briefly, consider the adequacy of existing penalties and powers for effective enforcement of regulations, whether the existing sanctions can be considered sufficient to dissuade infractions, and if the field staff is empowered to impose sanctions.

The existing penalties are appropriate to dissuade infractions. However only Coast Guard and the other corps involved in the surveillance, are empowered to impose sanctions.

MPA operators and volunteers involved in surveillance can only inform people about bans and alert the institutional surveillance corps in case of infractions. Sanctions imposed each year are very few and the surveillance should be strengthened mainly during the winter.

9. AVAILABLE RESOURCES

9.1. HUMAN RESOURCES (Art. 7.2.f in the Protocol)

9.1.1. Available staff

Assess the adequacy of the human resources available to the management body, in number of employees and training level, both in central headquarters and in the field. Indicate if there are staff training programmes.

1 President (the Major of Villasimius), full time
 1 Director, full time
 1 Chief financial service sector, part time
 1 Support of financial service sector, part-time
 1 Responsible general affairs, part-time
 1 Responsible Technical office, part-time
 3-4 external collaborations (consultants and scientific experts) to support the scientific monitoring and the environmental education services.

9.1.2. Permanent field staff

Answer YES or NO on the current existence of the following FIELD staff categories. If YES, enter the number of staff either permanent or part-time in that category, and evaluate on a 0-1-2-3 score (0 is low, 3 is high) the adequacy of their training level.

	YES/NO	NUMBER Permanent/Part-time	ADEQUACY OF TRAINING LEVEL
Field Administrator	YES	1	3
Field Experts (scientific monitoring)	NO	1	3
Field Technicians (maintenance, etc.)	NO		
Wardens	NO		
of which			
Marine wardens	NO		
Guides	NO		
Other	NO		

9.1.3. Additional Support

Briefly, describe if the area currently has the advantage of other external human resources in support of its objectives, either from other national or local institutions, volunteer programmes, non-governmental organisations, academic or international organisations. Mention if there are any significant changes in prospect for the near future.

For scientific monitoring and technical issues (e.g. boat maintenance) the MPA is supported by external consultants and volunteers (non-profit local association).

Collaboration with the staff of other regional MPAs through an agreement that supports the network of marine protected areas of Sardinia for the management and care of Cetaceans and Testudines distressed.

Other collaborations, based on specific programs, involve scientific institutions such as the universities of Cagliari and Sassari, the National Research Council and the Fondazione IMC, International Marine Centre, ONLUS.

9.2. FINANCIAL RESOURCES AND EQUIPMENT

By Art. 7 in the Protocol, the Parties agree to adopt measures or mechanisms to ensure the financing of the specially protected areas (Art.7.2.d), and the development of an appropriate infrastructure (Art.7.2.f). The General Principles para. "e" in the Annex I call upon the Parties to provide the areas with adequate management means.

9.2.1. Present financial means

Note if the basic financing is ensured: a core funding for basic staff, protection and information measures. Who provides this core funding? Briefly assess the degree of adequacy of the present financial means for the area, either low, moderate, satisfactory; e.g. the implementation of the management plan, including protection, information, education, training and research.

The MPA of Capo Carbonara is annually financed by the Environmental Ministry. The financial budget is divided in three categories: ordinary administration, intervention and investment.

These financial means are low, especially those addressed to the personnel, and this penalizes the implementation of the management actions, including protection, information, education, training and research.

Core funds are integrated by the Region of Sardinia through specific projects.

9.2.2. Expected or additional financial sources

Briefly describe any alternative sources of funding in use or planned, and the perspectives for long-term funding from national or other sources.

The main additional sources of funding comes from grants based on European, National and Regional projects and autonomous incomes (authorization for recreational fishing). The latter are very low.

Projects in progress:

- the regional network for the recovery and care of marine life in trouble;
- environmental education (with different projects)
- *Providune*; the MPA is partner of a project, co-financed by the European Union (Programme LIFE+), aimed at the conservation and restoration of dune habitats

At the moment do not exist any long-term funding sources.

9.2.3. Basic infrastructure and equipment

Answer YES or NO to the following questions, and if YES, assess with a score of 1-2-3 (1 is low, 3 is high) the adequacy of the basic infrastructure and equipment.

	YES/NO	ADEQUACY
Office and/or laboratory in the field	YES	2
Signs on the main accesses	YES	2
Guard posts on the main accesses	NO	
Visitors information centre	YES	3
Self guided trails with signs	NO	
Terrestrial vehicles	YES	2
Marine vehicles	YES	2
Radio and communications	YES	3
Environmental awareness materials	YES	3
Capacity to respond to emergencies	YES	3

At the moment the infrastructures of the MPA consist of three offices: administrative office, technical-scientific office and environmental education office (visitors information centre).

Terrestrial vehicles are two cars and three scooters; only one car and one scooter are used by MPA staff.

Marine vehicles are two inflatable boats: only one is used by MPA staff, the other one is used by volunteer local association that collaborate for surveillance; moreover there is also a boat to collect floating rubbish and debris

9.3. INFORMATION AND KNOWLEDGE

By Section D3 of Annex I, the Parties agree that the planning, protection and management of a SPAMI must be based on an adequate knowledge of the elements of the natural environment and of socio-economic and cultural factors that characterize each area. In case of shortcomings in basic knowledge, an area proposed for inclusion in the SPAMI List must have a programme for the collection on the unavailable data and information.

9.3.1. State of knowledge

a) Assess the general state of knowledge of the area.

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b) Briefly describe the extent of knowledge of the area, considering at least specific maps, main ecological processes, habitat distribution, inventories of species and socio-economic factors, such as artisan fishing.

The general state of knowledge of Capo Carbonara MPA is good in terms of habitat distribution, inventories of species and socio-economic aspects.

Maps of the main biocoenosis and geomorphological features have been produced prior the institution of the MPA (the feasibility research programme, in 1997) and after (mapping of *Posidonia oceanica* meadows, in 2001 and mapping of zones of integral protection and shoals of higher importance for the conservation of biodiversity, in 2008).

Information on physical-chemical features of water column and sediments are available from Ministry monitoring programme that is monthly carried out by the Regional Agency for the Protection of the Environment in Sardinia (ARPAS).

With reference to flora and fauna, several studies have been realized on both coastal and marine environments. Overall, 950 species have been detected: 800 fauna species (153 coastal, 647 marine) and 150 flora species (78 coastal, 72 marine). Most of studies on marine environment are qualitative, there are few quantitative data on key species and fish communities as well as on fish stocks and captures.

More detailed studies concern the coastal vegetation and the bird fauna of the main islands.

9.3.2. Data collection

Describe and assess the adequacy of any programme and activities to collect data in the area.

In the MPA the following monitoring programmes have been carried out.

- *Posidonia oceanica* meadows, annually since 2006;
- sensitive habitats and species;
- aliens species: the invasive *Caulerpa racemosa* var. *cylindracea* since 2006, the fish *Fistularia commersonii* and the crab *Perchnon gibbesi*: presence, spread and possible impacts on native communities
- benthic communities on hard and sandy beds;
- acoustic and visual monitoring of *Tursiops truncatus* and other marine mammals;
- pleasure boating and diving frequentation and their impact on benthic assemblages;
- monitoring of ecological status of water bodies;
- beach and underwater systems monitoring, coastal dynamics and marine hydrodynamism;
- monitoring and recovering of dune systems and assessment of carrying capacity of tourism on beach systems;
- monitoring of inshore plant diversity;
- monitoring of marine sea birds.

Most of studies are qualitative, more quantitative surveys will be implemented.

9.3.3. Monitoring programme

Section D8 in Annex I states that to be included in the SPAMI List, an area will have to be endowed with a monitoring programme having a certain number of significant parameters, in order to allow the assessment of the state and trends of the area, as well as the effectiveness and protection and management measures, so that they may be adapted if need be (indicators may, for instance, supply information about species status, condition of the ecosystem, land-use changes, extraction of natural resources -sand, water, game, fish-, visiting, adherence to the provisions of the management plan, etc.).

a) Is there a monitoring programme?

YES	<input type="checkbox"/>
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b) If NO, are there plans to start one, and when?

c) If YES, assess as low, medium, satisfactory, its adequacy and present level of development.

Medium

d) If YES, who is/are carrying out the monitoring programme?

Monitoring activities are carried out by consultants and scientific experts with the coordination of MPA director.

e) If YES, briefly describe how the monitoring programme will be used in reviewing the management plan.

The results of the monitoring programmes will be used to draw up and implement the Management Plan.

In the meantime, each year, temporary management measures are applied in order to regulate the activity of diving clubs, fishermen, pleasure boaters and to assure the maintenance of the ecological quality of the site and the state of health of more vulnerable ecosystems (e.g. *Posidonia oceanica* meadows, coralligenous assemblages).

10. OTHER INFORMATION, IF ANY

Since 20/11/2009, Capo Carbonara MPA is awarded of the EMAS certification (Cod. NACE 91.04), which guarantees that its System for Environmental Management is compliant to EU regulation CE 761/2001. In the document EMAS, environmental objectives are defined and updated at each environmental review.

11. **CONTACT ADDRESSES** (name(s), position(s) and contact address(es) of the person(s) in charge with the proposal and that compiled the report)

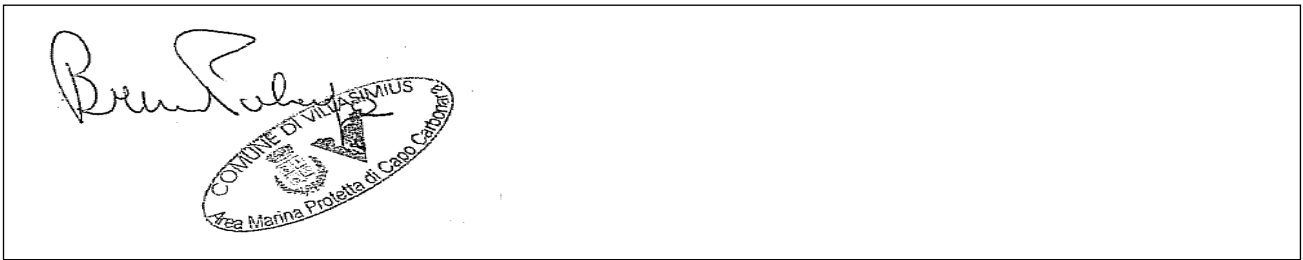
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12. SIGNATURE(S) ON BEHALF OF THE STATE(S) PARTY/PARTIES MAKING THE PROPOSAL



13. DATE

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