**The Convention on Wetlands**
**(Ramsar, Iran, 1971)**

# Montreux Record - Questionnaire

**(as adopted by the Conference of the Contracting Parties in Resolution VI.1)**

## Section One

## Information for assessing possible inclusion of a listed site in the Montreux Record

### Essential items

- Name of site

Stagno di Molentargius

- Ramsar Criteria for listing the site as internationally important

2a: It supports important numbers and quality of rare or endangered species of animals, with 55 endangered birds (with many numbers of specimens: over 10.000 exemplares)

- Nature of the change in ecological character/potential for adverse change

On 04.07.1990 this wetland was included within the Montreux Record "N. 31T017" at the end of the fourth Conference of Contracting Parties (Montreux, Switzerland 27/06-04/07/1990) and as a result of reporting by the Italian authorities who had highlighted problems of pollution and eutrophication in two Ramsar Sites:
• Santa Gilla, which belongs to called "Stagno di Cagliari;
• Molentargius pond;
The Italian government was in the process of allocating substantial funds for the rehabilitation of these sites. In the meantime, it requested their inclusion within the Montreux Record.

- Reason(s) for adverse change, or potential adverse change, in ecological character

Santa Gilla wetland included within "Stagno di Cagliari", was affected by problems of pollution and eutrophication. "

### Additional items which may be included

- Date Information Sheet on Ramsar Wetlands submitted (in Italian to be translated into English)

- Date and source of Information Sheet updates (e.g. National Reports, national wetland inventory, specific survey)

- Benefits and values derived from the site
- Extent to which values and benefits derived from the site have decreased or changed
- Monitoring programme in place at the site, if any (technique(s), objectives, and nature of data and information gathered)
- Assessment procedures in place, if any (how is the information obtained from the monitoring programme used)
- Ameliorative and restoration measures in place or planned (if any) so far
- List of attachments provided by the Contracting Party (if applicable)
- List of attachments provided by the Ramsar Bureau (if applicable)

**Section Two**

**Information for assessing possible removal of a listed site from the Montreux Record**

- Success of ameliorative, restoration or maintenance measures (describe if different from those covered in Section One of this questionnaire)

Hereby we expose the "Programme of measures" implemented to address the issues due to which the wetland of international importance "Stagno di Molentargius" was included once again in 1990 in the "Montreaux List" of the Ramsar Convention.
Interventions were carried out using the following legislation:
A. Law No 11/03/1988 67 - Article 17, paragraph 20;
B. Decree Law. No 31/03/1998 112 - art. 73, paragraph 3.

## 1. Introduction

Hereby we describe briefly relevant aspects of the "Program of measures" to safeguard and enhance the Molentargius wetland, ecosystem under concession to the Consortium Ramsar Molentargius, even after the "Sardinian financial resources programme", approved by the Regional Council of Sardinia with Resolution No. 20/21, 9/07/2003.
In summer 2000 the Region of Sardinia succeeded to the Ministry of Environment and Territory in the management of the grant, and through Environmental Defence Department, it contributed to the use of government funds and for implementation of the programme of measures, first through the delivery of a section of the State Salt Explotations ponds and then by an interface with the technical architecture of the Ramsar Molentargius Consortium.
After June 2002, such collaboration allowed development and implementation of studies that will enable the delivery of the Complex to Park, whose staff will be formed through a special programme to be held at the Park headquarters.

It should be noted that the preservation and protection of the Molentargius complex depends upon the establishment of an Authority responsible for the management of the area, identified by Sardinia Law N.5 (26.02.1999) "Establishment of the Park Salt Ponds Molentargius". The Park Consortium is finally established and based within the "Sali Scelti" building.

## 2. History

To respond to environmental issues such as the inclusion within the "Montreaux List", following the tender-competition granted by the Ministry of Environment and Territory in 1990, a special" Ramsar Molentargius Consortium was awarded the tender and signed Convention N. 41, 23/12/1991 wich regulates contractual aspects of the concession.
The activities were initiated by the Grantee on 23/07/1992 and developed with preliminary investigations, studies and experiments essential to the completion of the environmental characterisation, of "Ecosistemic Units" covered by the Rehabilitation Plan, needed and to define priority interventions and, consequently, the first intervention steps.
The project relates more specifically to measures implemented within of "Wetland" and "Is Arenas" sites, was approved by the Ministry of Environment 8.06.1995 with the exclusion of intervention carried out within coastal ecosystems.
The beginning of the implementation of the approved measures occurred on 29/04/1996, with the exception of works falling within areas managed under the Ministry of Finance interested by projects related to the building of Cagliari and restructuring of the administrative complex "Sali Scelti.
These were delivered on 8.10.2002 after signing an Act of Understanding between the Ministry of Environment and the Autonomous Region of Sardinia (June 2002), which had already confirmed the use of state grants.
In order to give completeness and functionality to the programme of measures "Ramsar Molentargius Consortium" made a proposal to reshape the financial program to include the implementation od measures dedicated to coastal ecosystems.
On 18.07.2003, after the formalisation of the new economic framework, the remaining design was developed and executed; their completion occurred in February 2005.
The Regional Environment Defence Department of the Autonomous Region of Sardinia, following the completion of the tasks performed by the Regional Authority, promoted and attended the constitution of the "Consortium Management of the Regional Natural Park "Molentargius - Saline, on 20/04/2005 between Cagliari Province and the municipalities of Cagliari, Quartu Sant'Elena, Quartucciu and Selargius.
In August of that year, the Board of Testing charged by the Ministry of Environment certified the completion of the works. The Board had to express itself specifically about the functioning of the works of water purification and water distribution system including the ponds of Bellarosa Minore and Perdalonga.
As mentioned the Sardinia Region, through the Head of the Environmental Defence Department, played a decisive role in defining the Statute and the preparatory acts to the establishment of the Management Authority, including the appointment of a High Commissioner who led, in harmony with the Regional Environment Defense Department, the start-up and the promotion of the park.

## 3. - Purpose of the Plan of Reorganisation Molentargius

The Molentargius represents a complex system of ecosystem units of great nature conservation. The ecosystem includes a diverse array of different nature and physical structure from freshwater

basins (Bellarosa Minore and Perdalonga) salt water basins (Bellarosa Maggiore and salt ponds), finally to coastal areas (Poetto beach) and a flat characterised by prevailing aridity (Is Arenas).
An essential precondition for the activation of an integrated rehabilitation action, including protection and management, has been the identification of key environmental issues and of the behavioural evolution of the ecosystem as a whole.
The three geo-biotopes or sectors mentioned above (wetlands, arid zone and coastal strip), substantially identify "problem areas" within the territory. Given the particular situation of the "Molentargius Complex" the purpose of preserving, protecting and recovering natural conditions have been pursued through an articulated rehabilitation action, which affected the following areas:

• freshwaters: through the reorganization of the hydraulic outflow system of Bellarosa Minore and Perdalonga Ponds (channels reshaped through ecosystem restoration techniques) by means of interception and interconnection
• saltwaters: by changing the salt ponds water connection system (run by gravity up to beyond the coastal road and demolition / recovery of the beach stretch covered by the old water pumping station), by the addition of the new greater tributary channel Bellarosa Maggiore and the reactivation of an outlet channel(of Basso Fondo)
• areas of greater conservation value by means of interventions for the Bellarosa and Perdalonga (physical demarcation of the sites), works to promote bird nesting and infrastructures dedicated to improving access to the park (trails and sighting points)
• Park management and control: by means of the construction of infrastructure for the control (Sali Scelti building and appliances) and access to the park (parking areas and recreation areas on Cagliari and Quartu Sant'Elena side)
• reuse of treated water: through the implementation of the water treatment and purification (ecological filter) to supply the Ponds with water of high quality
• monitoring environmental health: with the creation of an information system for the monitoring of the pond ecosystem and the management of future projects and programmes.

On the basis of these general criteria, the Molentargius Ramsar Consortium drafted number of management plans for the rehabilitation and of independent ecosystem units, namely the wetlands Is Arenas and the coastal strip Poetto.

4. The primary measures of the Plan Rehabilitation

The intervention area, characterised by saltwater to freshwater wetlands, covers a total surface of approximately 1,400 ha, and occupies an area falling within the municipalities of Cagliari, Quartu Sant'Elena, Quartucciu and Selargius, including The Poetto coast, which is an integral part of the Molentargius system.
Here below we introduce first by compartments and then individually the Functional Units of the Rehabilitatiopn Plan:

A . PI.6050 – Artificial channels
The rehabilitation strategy and the conversion and recreational wise use of the revolves around the reorganisation of the hydraulic system and the supply of properly treated and refined water to ensure the water balance and reduce the water residence time within the wetlands of Perdalonga and Bellarosa Minmore.
As part of this functional unit the outflow channels of Bellarosa Minore and Perdalonga were restored, maintaining the option to channel high discharde laminated flood events coming from the ponds. To do this, "Selargius" and "Is Cungiaus" creeks, were intercepted a new channel tributary to the Salt Pond System, was created and various interconnections were built along the

hydraulic delivery pathway. Selargius and Is Cungiaus, the new channel tributary to the Saline system, the implementation of various interconnected hydraulic works along the routes of these channels.

B. PI.6100 - Water distribution infrastructure
The completion of the works allows the distribution of water to be treated by the filter Ponds. Bellarosa Minore is connected to a channel trat allows water to flow to the mouth of the three tributaries (creeks "Rio Is Cungiaus", "Rio Selargius" and "Rio Mortu"). Perdalonga is connected through a channel that leads through the connecret lakes of "Is Arenas" and then continues east-wards of the pond ("Costa Bentu").

C. PN.6200 - Wetlands remediation
To reduce the state of hypertrophy due to the overall nutrients load with the contribution and sedimentation of suspended particles and the gradual pilling of the basins, in some parts of Bellarona Minore and Perdalonga bottom sediment was removed, and in Perdalonga the riparian fringe has been remodelled and restored including a reshaping of the embankment separating various tanks.
After the approval of the restoration works, measures were implemented to protect areas with greater conservation value, after full demarcation and fencing as well as measures designed to improve recreation activities and visitor areas.
Finally "Sasso Fondo" channel was reactivated creating an outlet outlook for fot the salt ponds. It was using ebcironmental engineering and restoration techniques to repair the existing masonry made of limestone rock.

D. PN.6300 - Rehabilitation of "Is Arenas"
Site clean-up resulted in the selection, collection and disposal of illegally damped garbage abandoned in the site of Is Arenas, affected by widespread environmental degradation and further aggravated by illegal damping..
More than 100 landfill sites were identified, characterosed by a great variety of product types.
E. PS.6400 – Water treatment and purification
The Ecosystem planned filter is located within the current salt basin, called "I Bellarosa", covering an area of about 37 hectares, bounded by a new embankment down South and internally subdivided into several tanks communicating by means of adjustable sluices.
The establishment of the biomass needed for water purification is obtained by implants of Phragmites australis, whose development is subject to great care.

F. PP.6600 - Transport within the park
The planned measures are designed to create two recreation and parking areas for the vehicles of park visitors. These are located:
-Cagliari-side, close to Sali Scelti Building next to the green areas
-S-E side Quartu, the area being completely inserted within the equipped recreation area crossing Is Arenas fron North to South.
To preserve and protect the "Is Arenas" territory from misuse and depending on the pivotal role that this area plays in Molentargius Park, these areas were assigned the function of car parks to continue the visit to the Park by alternative means such as bicycles, horses, canoes from "Sali Scelti"sock or simply walk on foot.

G. PP.6650 – Park Infrastructure
The measure contribute to the definition of interventation on the infrastructures of Is Arenas for the development of Molentargius Park.

These concern the realisation of the Park headquarters,of connection ponds between the two wetlands, Bellarosa Minore and Perdalonga.
The Park Headquarters were located in the renovated building of State Salt Explotation ponds abandoned for years and no longer used in the production process ("Sali Scelti"), which are of a highly distinguished architectural character dating to the early industrial period of the '30s characterised by highly refined details in the decorative exterior with specific "Liberty Stile".
In external areas, next to the creation of recreational spaces and car parks for Park operators, the planned measures opted for restoring the old Dock that housed the barges for the transportation of Salt from the court to the port, already connected with the "Palma" channel and enabling the berthing of light vessels.
The connection ponds have a function in creating and maintain an environmental and physical continuity between the two vulnerable wetlands. Incorporated within the Quartu side recreation, the ponds contribute to enhance the filter effect between the urbanised area of Quartu SE (Via della Musica) and areas of higher nature conservation value.

H. PP.6700 – Urban planning
The measures under this plan relate to the creation of areas for conducting scientific, educational and recreational activities and for the establishment of an internal road network within the park completing the infrastructures of the Is Arenas territory. In particular, the recreation areas located on the Cagliari and Quartu side complete the definition of access zone and mark limits between the urbanised and the nature conservation areas.
The role of filter conferred to those areas is much more marked on the Quartu side, given the greater concentration of buildings there, than on Cagliari side. Here, on the contrary, urban pressure is much less significant due to the presence of industrial salt works.
The internal road network, of macadam type, with trees and shrubs planted on the sites, retraces the routes existing along historical roads Is Arenas: "Don Giordi" and "Is Arenas" streets. The link with the road to Molentargius on then northern side was carried out along the canal Bassofondo which marks the border between Cagliari and Quartu.
At the heart of the territory of Is Arenas, in the area once intended to quarry fossil sand a scientific educational Botanical Garden is planned. Here there are wetlands at different degrees of characterised by the presence of diverse species of typical plant.
Under the four entrances sanitary, refreshment and information servise are located, hosted by a box-like building. A number of footpaths depart from here allowing visits to the different habitats within the Park and are equipped with benches descriptive panels portraying typical flora and fauna.

I. PF.6950 - Special Flamingo Project (Phoenicopterus ruber roseus)
The colony of pink flamingos which migrated to the State Salt works ponds of Cagliari, recorded during the period spring-summer 1993 was estimated at approximately 6000 specimen. Some 1400 couples nested in the abandoned Molentargius Salt, raising about 900 young ("*pulli*".
Two artificial islands were built to promote breeding located in protected areas of the ponds. Educational/scientific observation points were built to encourage disclosure among the population of a phenomenon of particular environmental value and to facilitate a constant control of the islands where nesting takes place.
For the safeguard of the flamingos in February 2007 10 ENEL poles and 12 kilometers of power lines were removed from within the park.

L. PS.7000 – Restoration of coastal ecosystems
The coastline strip, affected for a long time by the "Idrovora Poetto", was given back to its original seaside resort role, with the construction of a sub-marine channel that takes saltwater directly to the salt works, situated beyond Poetto road.

An important aspect of this project lies in the ability to ensure the removal of water under gravity up to the tank located on the other side of the road, avoing that suction pumps may remove sandy sediment from the shoreline, and allowing for big energy savings .

M. SI.8000 - Information System
The monitoring network: The monitoring network handles environmental data that are received and processed by the Computing Centre in order to analyze the behavior of the Environmental System. It consists of the monitoring system SIMO, which has the task of enabling control of environmental change within the Molentargius area, at the same time and following the completion of operations, and also includes a network of detection and a telecommunications system that is responsible for transmitting the data collected by SIMO sensors to the SIAM, where the database resides.
Computing by the Centre: The Computing Centre ensures the flow of information generated by the detection systems, providing an efficient and functional management of the many issues which characterise the Park territory. The architecture planned for the Computing Centre and the hardware and software configuration chosen favors the scientific users, but is also able to meet the diversified expectations first of all those related to environmental education.
Specialized environmental management software: SIAM – The Molentargius Environmental Information System is an integrated set of applications realized with software engineering tools and is designed to manage all issues:
• definition and maintenance of a cognitive framework describing the environmental characteristics of the area being studied;
• monitoring of qualitative and quantitative environmental conditions on the basis of information gathered by the monitoring network;
• early identification of the occurrence of unexpected risks and timely activation of the appropriate corrective actions to restore environmental conditions;
• support to environmental impact assessment studies and the implementation of new projects;
• provision of information assets for different users (managerial, scientific, educational, etc.).
• management of future Park Authority operational functions.

- Proposed monitoring and assessment procedures (describe if different from those in Section One of this questionnaire)

To ensure a natural and gradual transfer of responsibilities to the Park Consortium, Sardinia Region has entrusted the Ramsar Consortium Molentargius, for the year 2006, with the activities of maintenance hydraulic system, management, as well as providing the consortium with an adequate support for the management of its full administrative and technical operational capacity.
Today the managing body, which has its registered office in "Sali Scelti" building is equipped with environmental monitoring and verification tools realized in the management of the concession and that will be delivered once the full operational capability will be reached enabling a connection with the metropolitan area of Cagliari which is deemed to recover the social, educational and scientific role of the Park.
Ultimately after the transfer of the State grant to the Region, the final project was implemented on the basis of the initial terms of references and following an in depth analysis of the environmental phenomena observed in the intervention areas, validated by studies, surveys and tests.

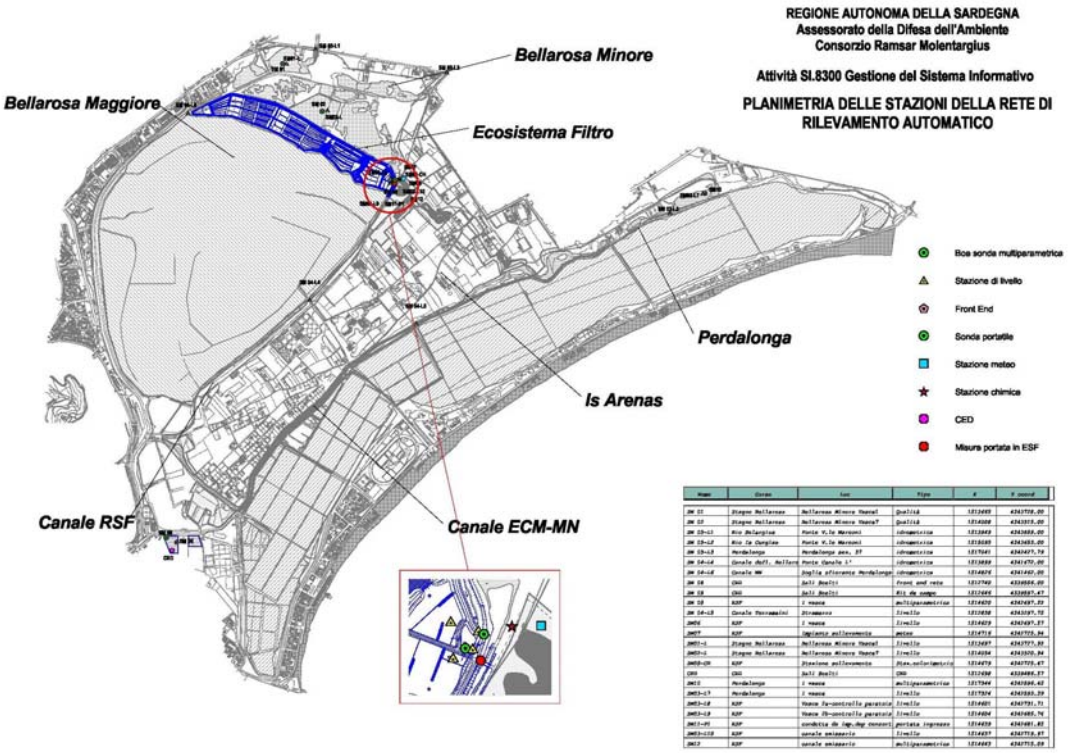
MOLENTARGIUS INFORMATION SYSTEM (SIAM)

The monitoring network: The monitoring network handles environmental data that are received and processed by the Computing Centre in order to analyze the behavior of the Environmental System. It consists of the monitoring system SIMO, which has the task of enabling control of environmental change within the Molentargius area, at the same time and following the completion of operations, and also includes a network of detection and a telecommunications system that is responsible for transmitting the data collected by SIMO sensors to the SIAM, where the database resides.

Computing by the Centre: The Computing Centre ensures the flow of information generated by the detection systems, providing an efficient and functional management of the many issues which characterize the Park territory. The architecture planned for the Computing Centre and the hardware and software configuration chosen favors the scientific users, but is also able to meet the diversified expectations first of all those related to environmental education.

Specialized environmental management software: SIAM – The Molentargius Environmental Information System is an integrated set of applications realized with software engineering tools and is designed to manage all issues:

• definition and maintenance of a cognitive framework describing the environmental characteristics of the area being studied;
• monitoring of qualitative and quantitative environmental conditions on the basis of information gathered by the monitoring network;
• early identification of the occurrence of unexpected risks and timely activation of the appropriate corrective actions to restore environmental conditions;
• support to environmental impact assessment studies and the implementation of new projects;
• provision of information assets for different users (managerial, scientific, educational, etc.).
• management of future Park Authority operational functions.



- Extent to which the ecological character, benefits and values of the site have been restored or maintained (provide details)

History and Nature

Historical reports refer the start of the exploitation of the salt work basins to about 2500 years ago: Phoenicians, Carthaginians and Romans in early times, through the various dominations (French, Pisans, Aragoneses, Spanish) and then under the Kingdom of Sardinia. Exploitation continued the until the nineteenth century; with the unification of Italy, the concessions introduced with 1800 industrial systems implemented during 1900, with the realization of "Salt Cities", which represent examples of 1930 architecture with a highly distinguished decorative exterior details.

Since 1977 the district is included within Ramsar Sites ;the presence of more than 200 species of birds was ascertained, including many accidental and real rarities. The Park boasts the only World hosting site large breeding colonies of Flamingo (*Phoenicopterus ruber roseus*)and Rosy Seagull (*Larus genei*) in a heavily urbanised area as well as more than 1% of the world population of Sultan Chicken (*Porphyrio porphyrio*), a rallid of Indo-African, characterised by a bright bluish coloration, living within extensive reedbeds.

Different salt concentration within the substrate promotes biodiversity in heavily urbanized areas: the flora, varied and heterogeneous, counts more than 400 species, including vast expanses of *Phragmites australis, Typha sp.pl., Myriophillum, Lemna sp.pl.*, etc. a considerable number of halophytic species, some of which are reported in the "red list" of plants threatened with extinction.


Birds - Monitoring

127 species were reported during the last two years (2005-2006) corresponding to 56.4% of the 225 species observed in the Molentargius ecosystem between 1850 and February 2005 (see Schenk et al., 1999; Schenk, 2004) . A new species, "*Cygnus olor",* was added to the Checklist of Molentargius, *Aythya nyroca*, an endangered species worldwide (LR - Lower Risk) was reported to be nesting for the first time.
Overall aquatic birds species (Non-Passeriformes) reproduced in the area:
14 species in "Bellarosa Minore";
13 species in "Perdalonga";
11 species in the "Canale di is Arenas";
6 species in the first filter ecosystem;
4 species in the second filter ecosystem;
16 species in the islands of "Bellarosa Maggiore";
8 species in the remaining part of "Bellarosa Maggiore";
8 species in "Perda Bianca";

22 species (75.9% of the total of 29) reproduced in the freshwater system including the ecosystem filter:
*Tachybaptus ruficollis, Ixobrychus minutus, Nycticorax nycticorax, Ardeola rallide, Bubulcus ibis,Egretta garzetta, Ardea purpurea, Tadorna tadorna, Anas strepera, Anas platyrhynchos, Anas clypeata, Aythya ferina, Aythya nyroca, Circus aeruginosus, Gallinula chloropus, Porphyrio porphyrio, Fulica atra, Rallus aquaticus, Himantopus himantopus, Recurvirostra avosetta, Charadrius alexandrinus* and *Charadrius dubius.*

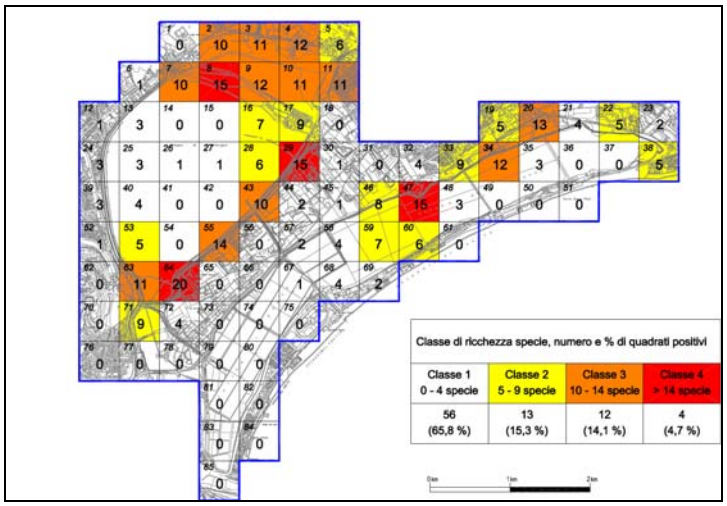
12 species (41.3% of the total of 29) reproduced in salt water systems:
*Phoenicopterus ruber, Tadorna tadorna, Himantopus himantopus, Recurvirostra avosetta, Charadrius dubius, Charadrius alexandrinus, Laris ridibundus, Larus genei, Larus michaellis, Gelochelidon nilotica, Sterna hyrundo* and *Sterna albifrons.*

Leading species of the saltwater system are:
*Phoenicopterus ruber, Tadorna tadorna, Himantopus himantopus, Recurvirostra avosetta, Charadrius alexandrinus, Larus genei, Gelochelidon nilotica, Sterna hyrundo* and *Sterna albifrons.*

The following 5 species (17.2% of the total of 29) nested doth in salt water and in the freshwater:

*Tadorna tadorna, Himantopus himantopus, Recurvirostra avosetta, Charadrius alexandrinus, Charadrius dubius,* Almost all in the second functional ecosystem filter.

Out of at least 2,256 pairs (minimum values) nesting within the Molentargius ecosystem, at least 1,733 (76.8%) reproduced in "Bellarosa Maggiore" and in "Perda Bianca" (salt water), while the remaining 523 couples (23.2%) nested in habitats (Bellarosa Minore, Perdalonga, Ecosystem Filter, Bellarosa Minore channel).
These figures show that the wealth of species nesting and their relative abundance within in the freshwater system are inversely proportional to the same parameters of saltwater system. High biodiversity of nesting species and low relative abundance in freshwater system - low biodiversity of breeding species and high relative abundance in the salt waters
The dominant species (minimum values) of the entire system monitored is *Phoenicopterus ruber* (48.8% of the more than 2,256 couples), followed by *Larus genei* (18.6%), and, later on by, *Gallinula chloropus* (7.1%), *Egretta garzetta* ( 4.4%), *Porphyrio porphyrio* (2.6%) and *Recurvirostra avosetta* (2.5%).
The distribution of 29 species of aquatic birds (Non-Passeriformes) nesting in the Molentargius system is represented on the map, using a grid of 85 to 500 square metres.

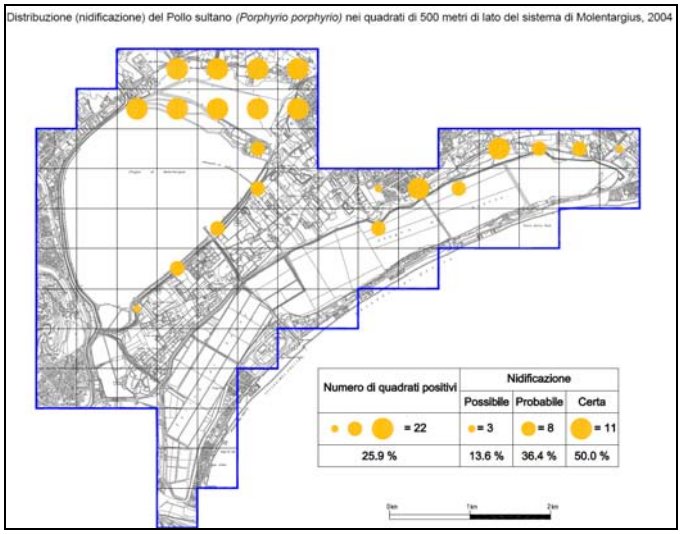



The figure illustrates nesting species richness within the study area, divided into 4 classes: from 0 to 4; from 5 to 9 species, from 10 to 14 species and > 14 species.
56 squares (65.9%) belong to the first class, 13 (15.3%) to the second, 12 squares (14.1%) to the third and 4 squares (4.7%) are home to more than 14 breeding species (fourth class).

Out of the 29 nesting waterfowl species (Non-Passeriformes), only eight (27.6%) are not threatened in the region: *Tachybaptus ruficollis, Anas platyrhynchos, Gallinula chloropus, Fulica atra, Rallus acquaticus, Charadrius dubius, Charadrius alexandrinus, Larus michaellis*; six species (20.7%) are at lower risk (LR), not evaluated (NE) or data deficient (DD): *Ixobrychus minutus, Anas strepera, Anas clypeata, Aythya ferina, Circus aeruginosus, Himantopus himantopus* ; 12 species (41.4%) were classified as vulnerable (VU) at the regional level: *Nycticorax nycticorax, Bubulcus ibis, Egretta garzetta, Ardea purpurea, Phoenicopterus ruber, Tadorna tadorna, Porphyrio porphyrio, Recurvirostra avosetta, Larus ridibundus, Larus genei, Sterna hirundo* and *Sterna albifrons two species (6.9%) are endangered (EN): Ardeola ralloides, Gelochelidon nilotica*, and one species (3.4%) is critically endangered (CR): *Aythya nyroca*

This budget highlights that the Molentargius ecosystem currently hosts 15 closely endangered (CR, EN, VU) breeding species (51.7% of the total of 29 species), 12 (80.0%) of which appear in Annex 1 of the Birds Directive as threatened at Community level.

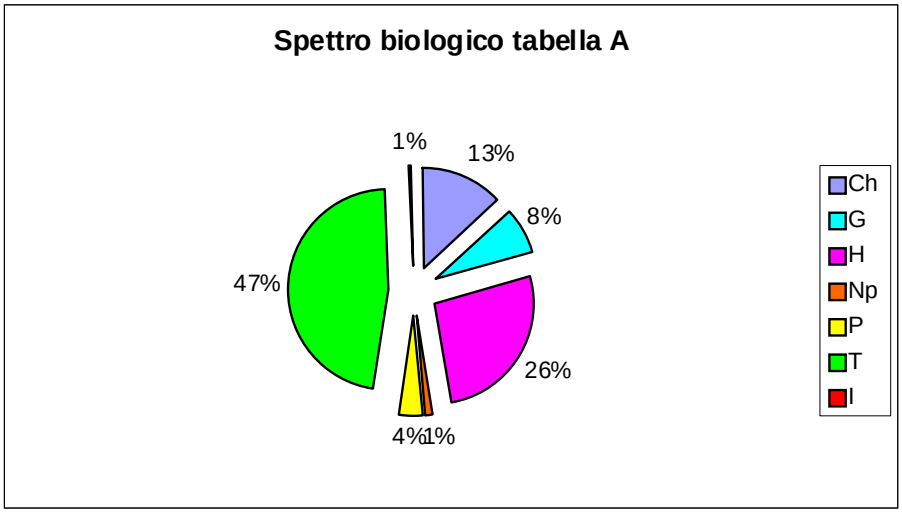
There is available information on nesting in 2004, distinguished between possible nesting (small circles), probable (average circles) and certain (large circles), as defined in annual checklist, which reproduced an example on the nesting of *Porphyrio porphyrio*.



Vegetation and Flora - monitoring

Wetlands are ecologically productive due to physical and biological factors ranging from limited water-depth - solar energy penetration, increased photosynthetic, formation of a carpet vegetal - nutrient leaching.
A typical succession of vegetation bands becomes established, easily identifiable by the presence of few dominant species, depending on the diversity of the occupied ecological niche.
Starting from these conditions in the monitoring of vegetation has been identified indispensable tool for the analysis of the state of ecosystem health as on, considering a 1994, baseline study "Activities IN.3600 - Investigations on the biological system - Identification of geo-biotipes to be preserved and selection of quality indicators.
The work on the vegetation component took place after identifying 40 major points, distributed within the most relevant areas by taking into account the environmental characteristics of the identified sites.
3 additional monitoring points were placed at the outlet to the sea Poetto beach pumping station.
The survey is repeated periodically and is still on-going, it provides several standard samples on surfaces that were representative of certain associations.
Each sample provided the identification of the plant species present, their quantification and the measurement of cover and dominance parameters, with the goal to deduce the data for the compilation of phytosociological special tables made according to the indexes of Braun-Blanquet.
As part of the phytosociological survey 159 sp. have been found during the last years distributed in 35 families, of which the most represented is the Leguminosae, followed by Compositae and Graminaceae.
The most widespread organic form (47%); is that of "terophytes": herbaceous plant achieving maximum development in the spring-summer while in autumn periods their number decreased significantly.
There is also a significant share of "emicriptophyites" and "geophyites" biological forms, the first characterising perilimnetic meadows and pastures, the second typical of wetlands pond shores. A general overview can be obtained by analysing the graph below:

**Biological Spectrum, table A**




Equally important is the Botanical survey which addressed the area of the Regional Park Molentargius Salt Works and started following the completion of the site restoration.

The flora of the Molentargius pond is extremely varied and heterogeneous. The species so far reported are in excess of 500. Those detected to date are more than 220
The diversity of plant species must be analysed in the light of biodiversity attributed to different ecosystems composing the pond, according to the different concentration of salts found in the substrate on which the plants live (water and soil). We move from "Bellarosa Minore" and "Perdalonga" freshwaters to the salty or hyperhaline "Bellarosa Maggiore" and the salt works.
The strip of "Is Arenas, an ancient fossil dune, at the centre of the park, suffers from salty aerosol blown by both landward and seaward winds.
In "Bellarosa Minore" freshwater there are vast expanses of *Phragmites australis*, *Thypha angustifolia* and *Thypha latifolia*. The species that live in water, Hydrophytes, are mainly represented by *Lemna gibba* and *Lemna minor*.
"Bellarosa Maggiore" and salt tanks host a large number of halophyte species, some of which are reported in the "red list" of plants threatened with extinction because of the fragility of their ecosystem. Among these, were are two species of Salicornia which are only in Italy within Europe, more precisely in the islands. They are: *Halocnemum strobilaceum* and *Halopeplis amplexicaulis*. *Salicornia amplessicaule is an important a*nnual species. Which has been found only recently. Today, in Molentargius, the watchful eye can identify it in small terrestrial sites on the edge of the explotation pans near "Rollone", and in areas which have not been trampled.


Halopeplis amplexicaulis


Cynomorium coccineum

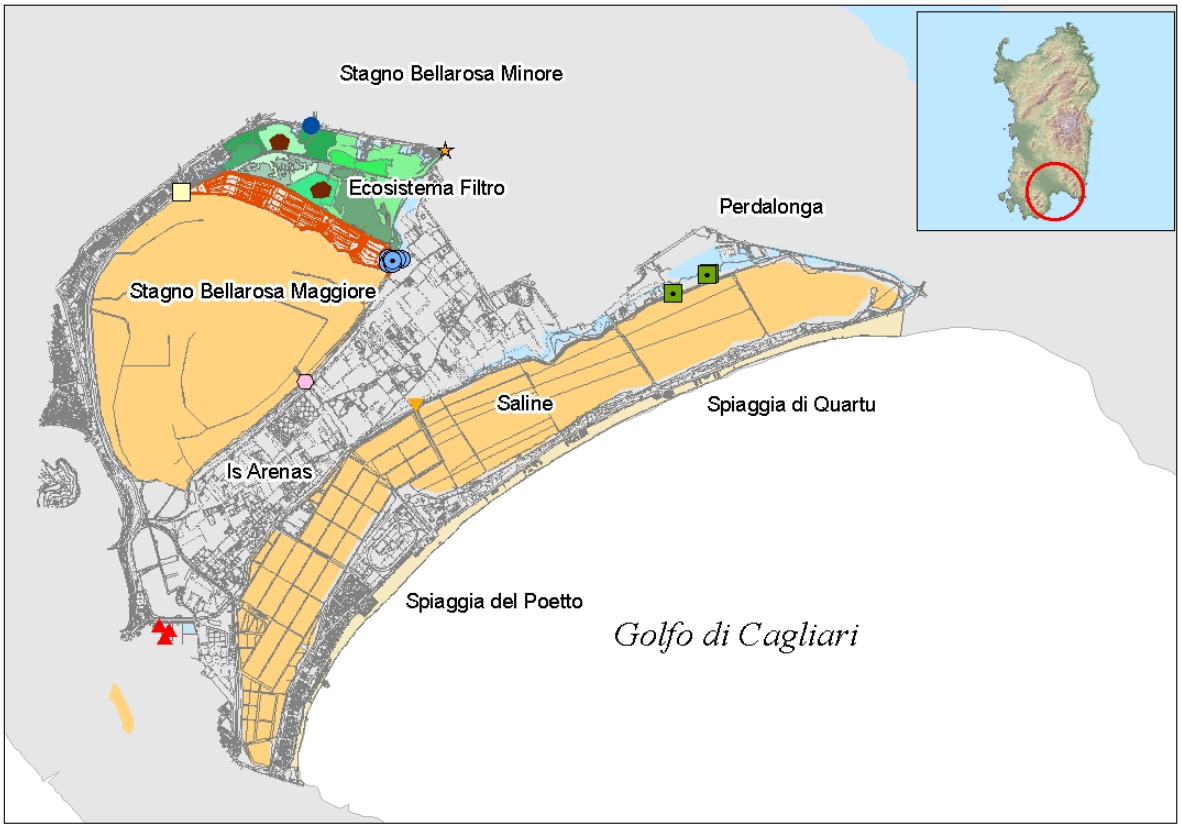
Among other grassland forming halophytes we should cite: *Artrocnemum macrostachyum* and *Arthrocnemum perenne*. Even *Halimione portulacoides* is well represented as well as *Cynomorium coccineum*. This species belongs to the red list of plants at risk of extinction, and can be found in desert areas from the Mediterranean to Central Asia. In Italy, it is present only in Sardinia and in Sicily.The "Molentargius Complex", located in the northern part of the Gulf of Cagliari, is a representative example of a coastal saline biogeographical Mediterranean region, and is of particular value for its geographical position within the most important urban complex of Sardinia

Summaries

In summary, the "Molentargius Comples" is characterised by the presence of freshwater, brackish and salt, it includes the two major basins of "Quartu" pond and the connected evaporation and crystallisation pans of the salt works (about 255 ha within the Ramsar Site and 122 outside the Ramsar Site) and Molentargius pond (evaporation tanks: 386 ha), separated by clays and sandy thyrrenian sediments.
Originally the Molentargius pond was fed by 4 streams (Saliu Riu, Riu of Selargius, Mortu Riu, Riu is Cungiaus) and the stretch of water was not in direct communication with the sea, with the partial draining during the summer.

During the second half of the 1800 Piedmont realized the first industrial salt work of Sardinia, using both the Molentargius and Quartu pond. The continental waters were separated by the natural evaporation basins of Bellarosa Maggiore (Molentargius) by means of a major embankment, creating a temporary freshwater wetland drained during summer (Bellarosa Minore). Later, in the'60s, Bellarosa Minore (92 ha)was transformed into a permanent freshwater wetland through the flow of wastewater from urban sources, rich in nutrients, giving rise to a characteristic vegetation of reeds (*Phragmites australis, Typha* sp.). Quick colonization occurred by avian breeding community (*Tachybaptus ruficollis, Aythya ferina, Fulica atra, Porhyrio porphyrio, Ixobrychus minutus* and other species) and guest species including many Anatidae. The growing influx of fresh water called for further intervention, such as the separation of an embankment of Bellarosa Minore and the construction of two channels for the "Terramaini" outflow channel which flows into the Gulf of Cagliari in the area of "Su Sicu".
Since the mid-'70s euthrophic phenomena and pollution of urban Bellarosa Minore were common and in the winter 1984/85 freshwater overflowed towards the salty Bellarosa Maggiore causing the interruption of the production of salt for reasons of hygiene and health (Contu et al., 1991, 1992; Schenk, 1989). In 1988 the Ministry of the Environment allocated 120 billion lire for environmental recovery system Molentargius, whose execution was entrusted to the Consortium concession "Ramsar-Molentargius", whose management was transferred to the Autonomous Region of Sardinia in June 2002 . Following this, a "Preservation Program" has been completedproviding, inter alia, a new system of salted water movement guaranteed by a hydraulic pumping station (outlet to the sea), an by an artificial canal adductor canal water bringing water to the marine Molentargius pond ( First evaporation basins), from where water flows through the Channel Bassofondo towards hydraulic pumping station of "S'Arrulloni" and are then pumped into the second and third evaporation tanks of Quartu. In the western side of Quartu, crystallization tank are located, where in the late summer salt is harvested. Currently, the implementation of the "program safeguard plans" is completed, the Consortium "Ramsar Molentargius" is providing for the entire year 2006 (by agreement with the Autonomous Region of Sardinia) the maintenance of infrastructures as well as the maintenance of the monitoring and environment evaluation.
Environment restoration projects led, among other things, to an increase of freshwater wetlands (Bellarosa Minor, Perdalonga, gutter channels, and Channel lakes' Is Arenas, ecosystem filter) to approximately 190 ha . This together together with evaporation pans ( 613 ha, of which 491 ha within the Ramsar site) and the salt work and other minor ponds (150 ha) belonging to Quartu and Molentargius pond complex contribute to ecosystem diversity and a high birds species richness with over 220 species observed so far out of about 340 for the entire Sardinia.
Because of the strategic position in the context of migratory currents in Tunisia-Sardinia, the legal protection they enjoy in high primary production, the pond Molentargius regularly hosts large quotas of water birds in the critical stages of wintering, steps pre/post-nesting and part of the breeding season (since 1993 an important breeding colony of *Phoenicopterus ruber roseus*).
The importance of wildlife and complex Molentargius is underlined by its inclusion, since 1977, in the list of wetlands of international importance under the Ramsar Convention, which commits the 81 signatory states to protect the heritage of wetlands and identify those greater importance for the conservation of water birds (Code Ramsar Molentargius 3IT017).
We attach the tab "Information Sheet on "Information Sheet on Ramsar Wetlands (RIS) - 2006-2008 version" adopted by COP8 (Conference of the Contracting Parties) Valencia, 2002 through which you provide data for a detailed analysis and constant wetland S. Gilla.
Further recognition of the regulatory nature of the complex resulting from its designation as a "Special Protection Area" under the Directive 79/409/EEC on the conservation of wild birds (SPAs code: Molentargius ITB04002) and the proposal for a "site Community Importance "under the Directive 92/43/EEC on the conservation of natural habitats, wild fauna and flora (SIC code: Molentargius ITB040022).

This underpin the importance of wildlife complex Molentargius is given by its inclusion in the list of areas important for bird life in Europe under the IBA Program (Important Bird Areas) coordinated by BirdLife International and prepared for Italy from Lipu (code name and IBA: Ponds of Cagliari: 188).
The site lies for the most part within the demarcated as "Nature Park Regional Molentargius-Saline" (1,600 has about), established by Law No Region Sardinia 26.02.1999 5, and is " Oasi Permanente di Protezione Faunistica e di Cattura " under Law No Sardinia Region 23/1998.
The wetland Molentargius has finally entered by the 04/07/1990 in the Montreux Record "No 31T017 at the end of the fourth Conference of the Contracting Parties (Montreux, Switzerland 27/06-04/07/1990) as a result of reporting by the Italian authorities who had highlighted problems of pollution and eutrophication in two Ramsar Sites (Santa Gilla and indeed Molentargius) for which the Italian government had allocated substantial sums for the rehabilitation, in the meantime requiring the inclusion of these sites in the Montreux Record "representative list of sites in a state of danger.




The main reasons which had led to the request for inclusion of the specific site in the Montreux Record "were:

- Pollution of the Ponds Bellarosa Perdalonga Minor and the effect of entering tributaries with water and sewer eutrofiche uncontrolled;
- Frequent tracimazione freshwater from Bellarosa Minor to Major Bellarosa with consequent interruption of millennial production activities of Salt (1985);
- Widespread deterioration in the territory of Is Arenas with the presence of the phenomenon of "spontaneous construction and landfill materials scattered in the territory.

Regarding the "Stagno di Molentargius", on the date of integration, the Ministry of the Environment had launched the tender competition for the realization of the program of safeguarding the coast and behind wetlands of international importance of the metropolitan area

of Cagliari, art. 17, paragraph 20, Law No 11/03/1988 67, for a budget of some € 61,000,000, given concession to the Consortium "Ramsar Molentargius" with formalization of 23/12/1991. The activities started on 23/07/1992 were developed with the beginning stages of preliminary investigations, studies and experiments essential to the completion of the cognitive, whose clarification has identified the "Ecosystemic Unity" covered by the program and aafeguarding to define the degree of priority interventions in the draft.

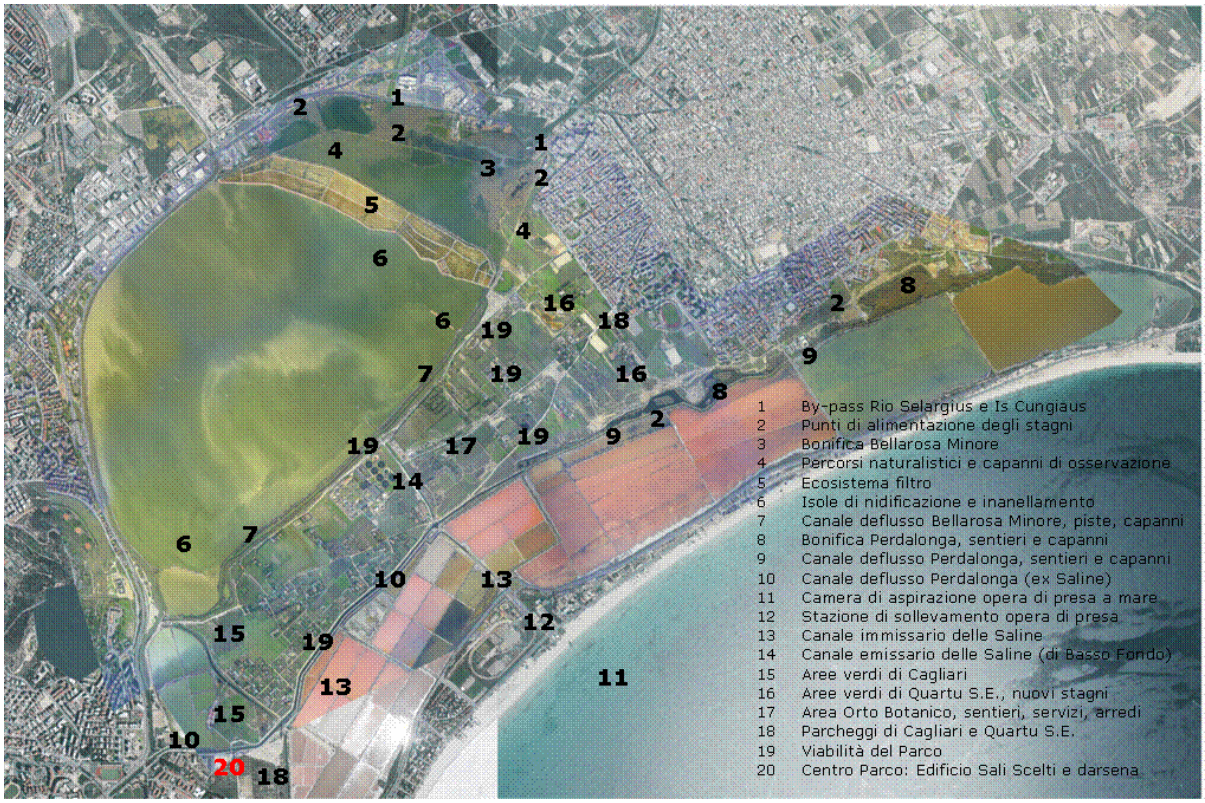
| CODICE | | TITOLO |
|---|---|---|
| **AC** | | **Acquisizione del quadro conoscitivo: finalizzati alla conoscenza degli aspetti antropici e territoriali del comprensorio. Propedeutici alla progettazione** |
| AC | 1100 | Raccolta e org..ne dei dati relativi al sistema antropico del Molentargius |
| AC | 1200 | Raccolta e org.ne dei dati relativi al sistema ambientale del Molentargius |
| AC | 1300 | Approfondimento dell'analisi conoscitiva dei piani territoriali di riferimento e del quadro legislativo vigente |
| AC | 1400 | Approfondimento dell'analisi conoscitiva degli interventi e delle iniziative progettuali in atto |
| AC | 1500 | Censimento attività fondiarie e attività agricola nell'area di Is Arenas |
| **RC** | | **Rilievi di campo: finalizzati alla completa conoscenza dello stato fisico e qualitativo del sistema. Hanno coinvolto sia gli aspetti fisici sia quelli legati al chimismo. Propedeutici alla progettazione** |
| RC | 3100 | Rilievo plano-altimetrico generale |
| RC | 3150 | Rilievi batimetrici dei canali e degli stagni |
| RC | 3200 | Rilievi geognostici di dettaglio |
| RC | 3300 | Rilievi pedo-litologici e freatimetrici a Is Arenas |
| RC | 3400 | Rilievi sulla qualità sedimenti degli stagni di Bellarosa e di Perdalonga. |
| **IN** | | **Indagini sistematiche: finalizzate alla conoscenza puntuale di alcune problematiche ambientali, in particolare gli aspetti biologici, di cui è necessario conoscere l'andamento nel tempo.** |
| IN | 3500 | Indagini fisico-chimiche e biologiche sulla qualità dell'acqua del Bellarosa e Perdalonga |
| IN | 3600 | Indagini del sistema biologico, individuazione dei geo-biotopi da preservare e selezione di indicatori di qualità |
| IN | 3650 | Misure meteorologiche, idrauliche e idrogeologiche di completamento ai rilievi automatici |
| IN | 3700 | Indagini meteomarine Poetto |
| IN | 3750 | Indagini fisico-chimiche e biologiche della qualità acque marine |
| **MN** | | **Monitoraggi: finalizzati al controllo della situazione ambientale dei fattori maggiormente coinvolti dalle opere previste** |
| MN | 3800 | Acquisizione immagini remote |
| MN | 3900 | Monitaraggio ambientale per il controllo degli impatti |
| **RS** | | **Ricerche e Sperimentazioni: finalizzati a determinazione sperimentale dei parametri fisico-chimici e biologici di interesse ed alla ricerca delle soluzioni ottimali in termini di funzionamento degli impianti.** |
| RS | 4100 | Approvvigionamento idrico Bellarosa e Perdalonga |
| RS | 4300 | Modello fisico degli interventi sul litorale |
| RS | 4400 | Modalità esecutive di bonifica degli stagni |
| RS | 4500 | Modalità di coltivazione ed irrigazione |
| RS | 4600 | Controllo acque reflue impianto di fito-biodepurazione |
| RS | 4700 | Capacità di adattamento specie vegetali (orto botanico e vivaio Bellarosa) |
| **SS** | | **Studi socio-economici: finalizzati all'approfondimento del quadro antropico e istituzionale e dei vincoli del territorio, per analizzare le prospettive di sviluppo del Comprensorio in sinergia con l'Ente del Parco.** |
| SS | 5050 | Analisi relazione del sistema antropico-ambientale del Molentargius ed individuazione dei fattori di degrado. |
| SS | 5100 | Studio degli aspetti giuridico/istituzionali ed operativi dell'ente di gestione |
| SS | 5150 | Aspetti legali legati all'abusivismo in Is Arenas |
| SS | 5200 | aspetti tecnici ed economici delle attività |
| SS | 5250 | Approfondimenti aspetti occupazionali |
| **SA** | | **Studi Ambientali: finalizzati ad una più precisa conoscenza di alcuni fattori ambientali, legati in particolare alla popolazione avifaunistica, ed alla definizione di alcuni modelli matematici che consentono di simulare le condizioni ambientali della zona** |
| SA | 5350 | Studio dell'evoluzione dell'ecosistema del Bellarosa |
| SA | 5400 | Studio sulla stabilità avifaunistica a seguto degli interventi sui geobiotopi |
| SA | 5450 | Studio idraulico-marittimo della fascia costiera |
| SA | 5500 | Studio, anche mediante modello dinamico-dispersivo, della qualità delle acque marine costiere |
| SA | 5550 | Studio di fattibilità di iniziative produttive da affiancare alle saline |
| SA | 5600 | Studi degli apporti inquinanti del bacino scolante e dei possibili interventi per ridurli |
| SA | 5650 | Sperimentazione integrata bonifica zone umide |
| **IA** | | **Studi d'impatto ambientale: finalizzati alla definizione dei possibili impatti dovuti alla realizzazione delle opere, alla ricerca di soluzioni progettuali ed attuative che ne consentano una loro mitigazione e ad un controllo degli effetti prodotti durante la realizzazione delle opere.** |
| IA | 5700 | Valutazione dell'impatto dello scenario globale di intervento |
| IA | 5750 | Studio impatto ambientale dei singoli progetti. |
| IA | 5800 | Studio degli effetti degli interventi in corso d'opera |
| **FZ** | | **Formazione ed Educazione Ambientale: finalizzati a processi di divulgazione ed alla formazione delle maestranza dell'Ente Parco** |
| FZ | 9300 | Divulgazione della iniziativa di risanamento ambientale |

In addition to the execution of works (started on 29/04/1996) institutional collaboration between the Ministry of Environment and Territory el'Assessorato Defence of the Environment of the Autonomous Region of Sardinia, launched early stages of ' establishment of the "Law

Financing Program Safeguard", has been strengthened by the provisions introduced by Art. 73, paragraph 3 of Legislative Decree No 31/03/1998 112 stated that "the conferment, after understanding, implementation of all interventions necessary for the implementation of the Program of the Preservation Region Sardinia.
Following the awareness of the social partners, and environmental policies, as stated in the "Programmatic Plan of Intervention", the Sardinia Region, Regional Law 26/02/1999, No 5 established the Regional Natural Park Molentargius-Saline, encasing the area of jurisdiction, the rules regulating the protection and preservation and delegate the management and exploitation to a body to be established between the competent Local Authorities for territory.
With the signing of Intesa (June 2002) the D. No Lvo 112/98 the Autonomous Region of Sardinia took over the State in relations licensees and conventional act, and through the Regional Assessor for the Defence of the Environment has given a strong impetus on the one hand, at the completion of operations and the other the establishment of 'Body Management Park, on 20/04/2005 between Cagliari Province and the municipalities of Cagliari, Quartu Sant'Elena, Quartucciu and Selargius.
The Region of Sardinia, through the Head of Defence of the Environment, played a decisive role in deciding the Statute and acts preparatory to the establishment of the Authority Management, including through the appointment of a "High Commissioner" who led, in keeping with the Regional Councillor, contacts with the Local Authorities.
The constitution of the Management Authority, the choice of key roles and training of staff stable, needs a startup phase and made arrangements Property particularly sensitive issues expectations management of the protected area.
To ensure a natural and gradual transfer of responsibilities to Management, Region Sardinia has therefore considered to maintain the Consortium head "Ramsar Molentargius", for the year 2006, the activities of maintenance works, management of hydraulic systems and environmental monitoring, as well as providing adequate support to management pending its full administrative and technical operation.

- Rationale for removing the site from the Montreux Record (refer to Guidelines for operation of the Montreux Record, together with Section One of this questionnaire)

Today the managing body, which has its registered office in the "Edificio Sali Scelti", is equipped with the tools of environmental monitoring and verification made in the management of the concession and that will be delivered once trained and reached full operational capability of the structure likely to perform that task connecting with the metropolitan area of Cagliari aimed, inter alia, to recover the role social, educational and scientific dell'Area Park
The concluded "Safeguard Program" (represented in the figure on the next page) has resolved permanently, all issues that had engaged the attention of the officials participating 4 ^ Conference of the Contracting Parties (Montreux, 1990) and, with the initialling of the transfer of land by the State to the Region, today to schedule allows reactivation of the primary production activities of Salt, from 500 BC, has allowed the continuation of this very valuable environmental area.




Description of operations Preservation Program

From interventions and monitoring systems active comes the affirmation that the site "pond Molentargius" can be removed from the Montreux Record, "to have resolved all the issues which are summarized briefly:
Interception and control of the tributaries of Ponds Bellarosa Minor Perdalonga and with the coming into operation of the ecosystem filter, whose operating system will allow to replace those taken with water quality
-- Elimination of risk overflow water from Bellarosa Minor to Major Bellarosa, tank 1 ^ evaporation of the production cycle of Saline, by building the ecosystem filter
-- Reordering hydraulic system of freshwater outflow
-- Perfecting the system of salted water through a new system of levy of salt and reorganization of tributary channels and emissary
-- Elimination of illegal dumps
-- Physical demarcation of the areas of greatest relevance environmental creating filter zones and rules for access
-- Implementation of a monitoring system (see the next section) through control stations of environmental components (water, air, soil) and specialist activities in the field (flora and fauna) with cataloguing and evaluating the environmental behaviour of the total system
-- Delimitation and establishment of the protected area and constitution dell'Ente Management competent, as well as the enhancement and upgrading of the park, the drafting of the Plan of the Park for the solution of spontaneous phenomenon construction
-- Control of the park by the Forestry and Environmental Supervision of Region Sardinia and Municipal Police Corps of Commons Park.
It also indicates the formalization of a memorandum of understanding on the development of the electricity network in Sardinia signed in May 2006 between the President of the Region of Sardinia and CEO of Terna SpA, which provides, in the wider investment programme, renaturalisation of the pond Molentargius.

The Terna, a company responsible for the development of the electricity network national transmission, concluded in February of this year, the removal of about 12 km of cables and the dismantling of the 10 trusses obsolete electrical line that stood in the park Molentargius.
The intervention, which involves a significant reduction of the environmental impact and the removal of a major risk factor for birdlife, is part of a plan for upgrading and the safe distribution system.

- List of further attachments (if applicable)

1. Regione Autonoma della Sardegna-Assessorato della Difesa dell'Ambiente, 2006, *Piano di risanamento del Molentargius*. Relazione dattiloscritta, 19 pp.
2. Terna, 2007, *Lo Stagno del Parco "Molentargius-Saline" libero dai tralicci*. Comunicato stampa dattiloscritto, 2 pp.
3. Ministero dell'Ambiente e della Tutela del Territorio e del Mare, 2007, *Ambiente: Ministro in Sardegna per rimozione tralicci nel parco Molentargius Saline*. Comunicato stampa (26 feb – 2007), 1 p.
4. Regione Autonoma della Sardegna-Assessorato della Difesa dell'Ambiente, 2007, *Relazione Molentargius – Sintesi Programma di interventi con riferimento al "Montreaux Record"*. Relazione dattiloscritta, 10 pp.
5. Comitato Scientifico Consorzio Ramsar-Molentargius, 2006, *Information Sheet on Ramsar Wetlands (RIS) . 2006-2008 version*. Scheda dattiloscritta, 11 pp.

For further information, please contact:
**The Ramsar Convention Secretariat**
Rue Mauverney 28
CH-1196 Gland, Switzerland
Tel: +41 22 999 0170, Fax +41 22 999 0169
E-mail: ramsar@ramsar.org
Web: http://ramsar.org