

S'ENA ARRUBIA LAGOON - ITALY

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S'Ena Arrubia Lagoon (Figs. 1, 2 and 4), located along the centre-western coast of Sardinia (39.83 °N and 8.57 °E), is included between plain of Arborea and coastal dune line. It is 1.2 Km² wide, its mean depth is 40 cm and it is the residue of wider Sassu Pond, reclaimed in 1937.

Freshwater input is supplied from the watershed by two affluent rivers: Rio Sant'Anna (also called Diversivo), which drains an area of 78.4 km² and showed no runoff from April 2001 to March 2002; and the Canale delle acque basse, which drains 50 km² mostly originated from the drying up of a pond over 3000 ha wide and actually extensively dedicated to farming and zootechnia. This channel is under the sea level and water is pumped into the lagoon. The lagoon communicates with the sea through a channel about 40 m large, 230 m long and 1 m deep. The lagoon is very eutrophic (Sechi, 1982; Fiocca et al., 1997) and dystrophic crises and fish kills occasionally occur. Anoxia and dystrophic crises were already observed during the Sixties.

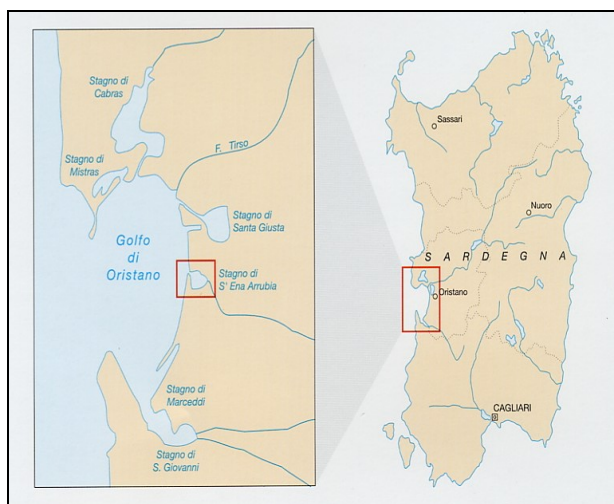


Figure 1: Position of S'Ena Arrubia Lagoon

Climate is Mediterranean with long hot summer and short mild rainy winter, generally precipitation and consequent water inflows are low, the year average is 650 mm.

The vegetation mainly consists of halophile and halo-tolerant phytocoenosis (Filigheddu et al.,

2000). Associations of Thero-Sudetea, Salicornietea fruticosae and Juncetea maritimi classes represent the communities. Phytoplankton component causes intense blooms in spring, especially due to *Cyclotella atomus* (Husted) and *Chlorella* sp. The other classes showing relatively high density were Prasinophyceae with *Tetraselmis* sp., Dinophyceae (*Prorocentrum gracile*, *Prorocentrum micans*, *Oxyrrhis marina*), Euglenophyceae (*Euglena* sp., *Eutreptiella* sp.), Cyanophyceae (*Anabaena* sp., *Oscillatoria* sp.). Macroalgal component, mostly consisting of *Ulva* sp. and *Enteromorpha flexuosa* (Kützing) DeToni, becomes abundant in late spring-summer; but *Cladophora albida* and *Gracilaria verrucosa* were also found.



Figure 2: View of S'Ena Arrubia Lagoon

Chemical parameters of water show very considerable variations. Salinity, for example, highlights high fluctuations relative to the prevalent inputs (fresh or marine waters), and nitrogen and phosphorus can reach very high values. Nitrogen dynamics show low concentration in the summer-spring period and very high and abrupt peaks in the autumn-winter periods (Trebini et al., 2002). This particular dynamic depends on way and quantity of input waters from the Canale delle acque basse which

substantially provides most of the freshwater flows into the lagoon. High fluctuations of oxygen are also characteristics, with unexpected variations from over-saturation values to concentrations lower than 50%.



Figure 3: *Canale delle acque basse and pumping station*

The lagoon is included in the Ramsar Convention, in I.B.A list (Important Birds Area); it was recognised as a U.E relevant site and is considered by the Sardinia Government as a protected area for animals. Jurisdiction resides with Sardinia Region Administration. The principal human activities in this wetland are fishing, outdoor recreation, education and scientific research. Fishing is an important economic activity of the lagoon and the “Sant’Andrea” is the regional company that manages fishery resources. The most common species are: *Mugil cephalus* (Linnaeus), *Liza saliens* (Risso), *Liza aurata* (Risso), *Liza ramada* (Risso), *Anguilla anguilla* (Linnaeus).

S’Ena Arrubia Lagoon has a great importance for its fauna. It is a wintering and nesting area for several species of waterfowl, such *Netta rufina* (Pallas), *Aythya nyroca* (Güldenstädt), *Porphirio porphirio* (Linnaeus), *Ardea purpurea* (Linnaeus), *Circus aeruginosus* (Linnaeus) and the *Phoenicopterus ruber roseus* (Linnaeus).

The principal problems affecting the site's ecological character are excessive human disturbance, use of water supply for agriculture and use of chemical pollutants in agriculture. These are causing evident silting and eutrophication phenomena.

The LOICZ biogeochemical flux model has been applied to S’Ena Arrubia Lagoon for two different periods: in 1995 by Giordani et al. and in 2002 by

our research group. In this way it was possible to compare nutrient fluxes and ecosystem functions, showing their evolution after some years.



Figure 4: *S’Ena Arrubia Lagoon*

Generally, through the LOICZ model application to the lagoon, it is observed that there is prevalence of nutrient storing processes rather than that of nutrient mobilisation. Nitrogen fixation always prevailed over denitrification. The productive processes in the lagoon thus seem to be prevalent over most of the year. These results confirm that S’Ena Arrubia Lagoon is to be considered an autotrophic system as far as the net total metabolism is concerned.

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