

## AUTOECOLOGY AND PRODUCTION OF *ZOSTERA MARINA* IN VENICE LAGOON

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The presence of the three seagrasses *Zostera marina* L., *Zostera noltii* (Hornem.) and *Cymodocea nodosa* (Ucria) Aschers. plays an important role in Venice lagoon ecosystem for trophic balancement, for reducing erosion, improving water clarity, trapping suspended material, producing accumulation of organic and inorganic material. The whole area of the lagoon can be divided into three different hydrological basins with three inlets connecting the lagoon to the Adriatic Sea. The entire lagoon averages about one meter in depth. There are tidal flats which drain almost completely at low tide, islets covered with halophylous vegetation and flooded by the high tide and shallow and deeper canals (ranging from few centimeters to 4-5 m). In the southern basins *Zostera marina* is the most widespread species.

Previous studies concerning autoecology and phenology of *Cymodocea nodosa* in Venice lagoon pointed out the importance of the belowground compartment of the plant and the high values of belowground biomass (rhizoms and roots), in comparison with other mediterranean sites. For this reason a similar research was carried out for *Zostera marina*, considering the importance of this species and its very restricted distribution in Mediterranean Sea. It is also important that, due to pollution and other factors, *Zostera marina* is confined to some areas of the lagoon, with clean water and high current velocities, but in general the lagoon *Zostera marina* beds are not in a satisfactory condition and for this reason this is generally considered an endangered species (DEN HARTOG *et al.*, in press).

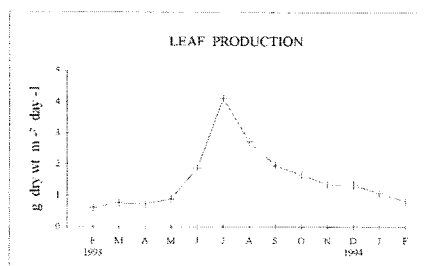
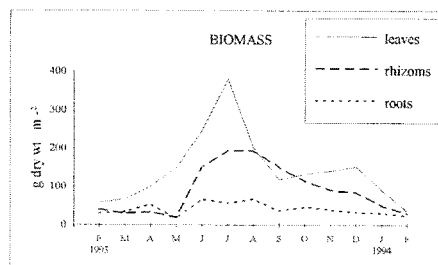
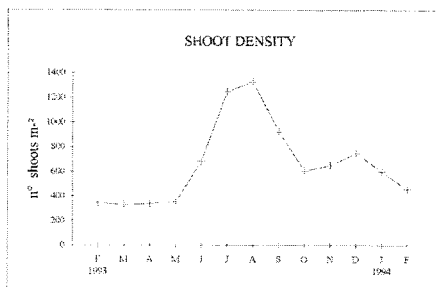
Sampling was carried out monthly from February '93 to February '94, in a pure homogeneous *Zostera marina* stand, close to the central inlet of Malamocco (central lagoon). Shoot density samples were collected by using 40 cm quadrats. Biomass was measured by coring, with a dedicated circular device 25 cm large and 30 cm deep. Following Zieman's method, all the shoots in three quadrats were monthly punched. Plastocronic interval (PI) was also calculated.

Density values reached a 1,328 shoots.m<sup>-2</sup> maximum in August and a 330 shoots.m<sup>-2</sup> minimum in winter time. Total biomass followed a regular trend during the observation year, ranging from February (89 g(d.w.).m<sup>-2</sup>) to July (630 g(d.w.).m<sup>-2</sup>). Belowground fraction represented, during almost the whole year, the dominant compartment, reaching always over 50% of the total biomass. Leaf density results positively correlated with LAI (leaf area index), ranging from 0.5 (winter) to summer value between 5 and 7 (7.7. in July). Highest production values were collected in July, with a high 4.1 g(d.w.).m<sup>-2</sup>.d<sup>-1</sup>, while in winter time no values under 0.6 g(d.w.).m<sup>-2</sup>.d<sup>-1</sup> were collected. The annual set of data showed a regular increasing trend until July and a similar decrease until winter time.

During same period observations, *Zostera marina* did not showed so high density and total biomass values as for *Cymodocea nodosa*. Belowground biomass represents only 40-50 % of the total, while for *Cymodocea nodosa* this datum ranges from 55 to 90%, pointing out the importance of the root apparatus for this species in compacting sediment and preventing erosion. Leaf production is lower for *Zostera marina* than for *Cymodocea nodosa*, but it presents a more regular trend during the year.

Some *Zostera marina* beds in Venice lagoon, far from urban outputs and critic

light transmission sites are expanding (SCARTON *et al.*, in press). An estimate of leaf annual production for *Zostera marina*, is 5,500 kg (d.w.) per ha, and 20,000 tons(d.w.) for the entire lagoon.



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