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Reproductive cycle of *Posidonia oceanica*

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Studies on the reproductive cycle of Posidonia oceanica were conducted in situ in a meadow off Lacco Ameno, Ischia (Gulf of Naples) along a depth transect from 1m to 32m for several years. Occurrence of both flowering and fruiting were recorded over a long temporal scale. Simultaneous measurements of leaf biomass and production were performed in different stands of the same meadow.

P. oceanica flowering had occurred almost every year since 1979. Fruiting was not always recorded, and dead inflorescemces at an initial fruiting stage were often found. Between shallow (up to 15m) and deep stands (from 15m to 28m) P. oceanica showed a persistent phase-difference, whereby there was a flowering delay of about two months in the deep meadows, always following the summer maximum temperature. In shallow beds the first flowers were usually recorded in September, occasionally at the beginning of October. In the deep meadows this stage was observed in November or beginning of December. Fruit developed from December to March-April in shallow stands, and from February to May-June, sometimes to July, in deep stands (Fig. 1). After fruit maturation, this floats on the water surface transported by water movements and once opened, the seed might germinate in areas far from the mother meadows. Germination was studied only once at environment light and temperature. This phenomenon seems to be succesfull and almost 70% of collected fruits germinated. At the time of collection (end of May) the seeds already beared the cotyledon, very young leaves and a primitive root. This finding excludes seed dormancy. After one month the seedlings had an average of 5 leaves and 2 roots per shoot. The maximum leaf number (11) in seedlings kept in an aquarium was found after 3 months (August) following germination (BUIA & MAZZELLA, in press).

In situ, production of new leaves on mature plants occurs almost continuosly. However the maximum leaf appearence was recorded from August to October in shallow stands and from October to November in deep stands. The leaf growth also showed a persistent phase-difference between stands at different depths. Two peaks in leaf production have been found at 5m, one in October-November and one in March-April for the shallow plants, while for the deep plants only one peak has been recorded in April-June. The lowest growth rate was found to be in summer at shallow stands and in autumn for deep ones. In shallow meadows the highest leaf biomass was consequently found from March to June reaching 965mg per shoot, while at deep stands the maximum was reached from April-May to July-August with 899 mg per shoot. The lowest values of biomass were found from September to November in shallow waters, after the period coinciding with maximum leaf shedding and after the minimum growth rate, and from November to February in the deep stations, preceeding the maximum growth period (Fig. 2a, 2b). These minimum biomass values seem to coincide with the appearence of flowers. The epiphyte biomass trends reflected those of the leaves, but in following years great differences in values were found in both stations (Fig. 2a, 2b) (BUIA et al., in press).

Rhizome growth, followed in a shallow stand of the same prairie, differed according to rhizome type. The plagiotrope rhizome had a **growth** of 4.1cm per year while the orthotrope showed an elongation of **1.5-1.8**cm per year (PIRC, 1983). In the same stand, similar findings

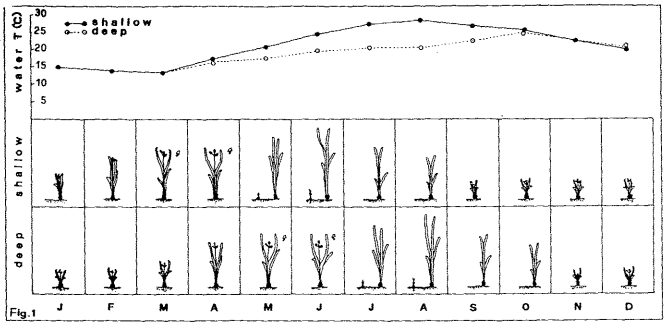

Fig.1

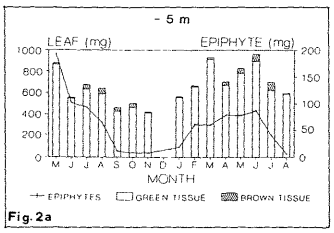

Fig.2a

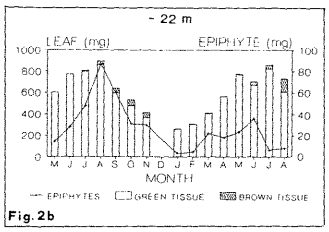

Fig.2b

were recorded by WITTMANN (1984): yearly production of 274mg per shoot for plagiotrope rhizomes and 30mg for the orthotropes.

Temperature and quantum irradiance changes during one year seem to regulate the reproductive cycle of P. oceanica. Moreover, sedimentation rate can be of fundamental importance for growth processes.

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A Compared Phenology between the Mar Menor (Murcia, S.E. Spain) seaweeds and the Mediterranean ones

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Mar Menor is a coastal-lagoon placed in the South East of Spain. Its area is about 135 Km² and its deepest profundity is 6.5 m. The salinity varies between 42‰ and 49‰ along the year. Its water is oligotrophic and the temperature varies between 9ºC minimum and 31ºC maximum (PEREZ-RUZAFA, 1989).

A research on 75 benthic macrophytes species has been carried out in the period 1985-1987. They were taken from 124 samples: 40 in Spring (March-November), 46 in Summer (June-August), 18 in Autumn (September-November) and 20 in Winter (December-February). The patterns carried out by CORMACI et al. (1984) in their study about the reproduction in East Sicily Ceramiales has been followed. The comparation has been made with the phenology data given by FELDMANN (1937-42), RIBERA (1983), BARCELO (1987) and SOTO (1987).

Summer has been the season with the highest number of species (60 taxa) present in the zone, followed by Spring (54 taxa), Winter (45 taxa) and Autumn (38 taxa). Only 26 of the 75 studied taxa fit to the vital-cycles described for the Mediterranean sea. All the rest choose different strategies in order to adapt themselves to the notable seasonal dynamism of the lagoon.

During the warmest mounths the number of taxa with a tropical affinity increases (Acetabularia calyculus, Alsidium corallinum, Spyridia filamentosa, etc). The presence of Boreal taxa, however, hasn't been observed during the Winter period.

Other taxa have been only observed in the lagoon when they are more frecuent in the Mediterranean sea. We are talking about Wrangelia penicillata, Antithamnion cruciatum, Stypocaulon scoparium, Dictyota dichotoma, Boergeseniella fruticulosa and Callithamnion corymbosum. During the cold mounths Padina pavonica, Alsidium corallinum, Cystoseira compressa and C. ercegovicii disappear from the lagoon.

Species that are fertile during the whole year in the Mediterranean sea tend to be unfertile or just disappear in the lagoon during Autumn-Winter. That is the behaviour of Fosliella farinosa, Chondria tenuissima, Herposiphonia secunda, Titanoderma litorale and Chylocladia verticillata.

In other cases the species usually loose some parts of their thallus during Autumn and Winter. This is the strategy of Sphacelaria rigidula, S. tribuloides, Gelidium crinale y Cladophora spp.

Cladophoropsis modonensis, Acetabularia acetabulum y Siphonocladus pusillus are fertile during the warm season in the Mediterranean sea. In the lagoon they have a precocious development (February-March), related to the swift rissing of the temperature of the lagoon.

Ectocarpus siliculosus, an opportunist species appears in Mar Menor in Autumn and Spring, when the pioneer communities settle the lagoon.

In the Mediterranean sea (Figure 1) the presence of the taxa is almost stabilized (77-86‰) along the year. In the lagoon a deep seasonal fluctuation appears (79-89‰ in Spring-Summer to 54-56‰ in Autumn-Winter).

A light decrease of the maximum fertility can be observed in this lagoon comparing it with the Mediterranean sea (55‰ in the Mediterranean sea and 47‰ in Mar Menor). The presence and fertility have a similar behaviour, we mean that in the Mediterranean sea the fertility index is stabilized (55-44‰) and in Mar Menor we can see a clear seasonality (47-49‰ in Spring-Summer and a 20-17‰ in Autumn-Winter).

The plants that settle these environments modify their phenologic behaviour from the one that they have in the close Mediterranean sea. In Mar Menor we can see a clear unfavorable period during Autumn-Winter specially in Rhodophyceae, they are reduced to a 24% in the cold mounths. In the Mediterranean sea the maximum decrease is in Autumn (68‰).

The percentage of annual taxa against the perennial ones is, here, higher than in the Mediterranean sea. MATHIESON & PENNIMAN (1986) observed the same in the stuary of New Hampshire (USA).

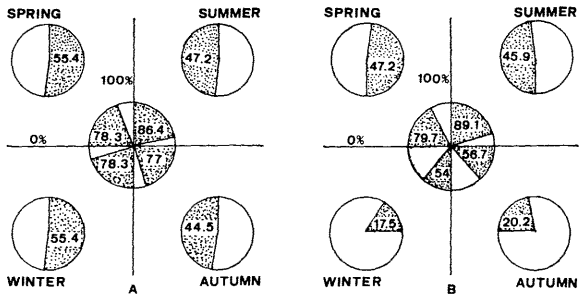

Figure 1. Percentages of taxa present in each season (large circle) and percentage of fertile taxa in each season (small circle) in the Mediterranean sea (A) and Mar Menor (B).

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