Estimation of Past Primary Production of *Posidonia oceanica* using Lepidochronological Data

Gérard PERGENT*, Christine PERGENT-MARTINI* and Valérie RICO-RAIMONDINO* *

*CEVAREN, UFR Sciences et Techniques, CORTE **(France)**
LBMEB, Faculté des Sciences de Luminy, MARSEILLE **(France)

B

Estimation of primary production in marine phanerogams is usually based on :
(i) the growth rate of the biomass (leaf marking-method - ZIEMAN, 1974),
(ii) measurement of the intensity of photosynthesis (the oxygen method - OTT, 1980, and the carbon 14 method - Mc ROY, 1974).

These methods are time-consuming and involve certain technical difficulties; as a result, the site studied are usually few and relatively shallow.

A new method based on lepidochronological data has recently been tested (PERGENT & PERGENT-MARTINI, 1991). This method is very accurate and much quicker, and means that the limitations of the classic techniques can be overcome. A further advantage is that, for the first time, primary production can be estimated not only for the period under investigation, but also for preceding years.

As part of a European Communities Commission programme (N°EV4V-01 39-B), a study was carried out, between July 1988 and July 1990, at three sites (5, 10 and 20 m depth), in Lacco Ameno (Ischia Island, Italy). Primary production of these three sites was measured during this period by lepidochronological analysis (PERGENT, 1990; PERGENT & PERGENT-MARTINI, 1991). Parameters taken into consideration were :
(i) Number ot leaves produced per year,
(ii) Mean leaf length (over a one year period), and
(iii) Leaf density (SAND-JENSEN, 1975).

Primary production for preceding years can be estimated by using various parameters :
(i) Number of leaves produced for a given year (= number of petioles per cycle),
(ii) Length of fallen leaf during a given year, estimated by measuring the length of the petiole of the cycle (using the correlation between the length of the petiole and the total leaf length),
(iii) Leaf density, measured over a one year period,
(iv) Meadow density (number of shoots per m²).

Estimation of primary production, for the three sites, is based on a period of five years (Table I, Figure 1). Primary production decrease with depth, which is explained by the drop in meadow density (number of shoots per m²) and shoot production combined (Table II).

LA10	Number of leaves per year	Petiole length (in mm)	Leaf length (2) (in mm)	Leaf density (mg dw/cm)	Leaf production (g dw/shoot)	Meadow density (m²)	Leaf production (g dw/m²)
1990	8.7	42.1	400.6	4.5	1.57	351	551
1989	6.4	40.1	353.4	4.5	1.02	351	358
1988	7.6	41.7	391.1	4.5	1.34	351	470
1987	8.1	42.2	402.9	4.5	1.47	351	516
1986	7.3	44.5	457.2	4.5	1.50	351	527

Table I: Estimated primary production of *Posidonia oceanica* at site LA10.
* = Regression line between petiole length and total leaf length is : y = -593 + 23.6 x (in PERGENT & PERGENT-MARTINI, 1991).

Table II: Meadow density and shoot primary production (mean over 5 years) at Lacco-Ameno.

Sites	Meadow density	Shoot production
LA05	473	1.59
LA10	351	1.38
LA20	253	0.81

Primary production is relatively stable at depth (site LA20). Nevertheless there is greater variation by year for the shallower stations (site LA10 and LA05). These variations appear to be synchronous; primary production for these two stations reachesits maximum in 1986 and minimum in 1989.

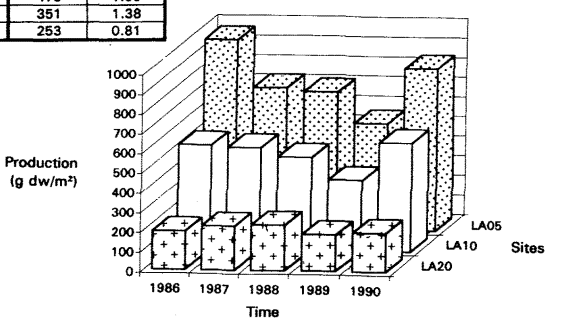

Figure 1: Estimated primary production of *Posidonia oceanica* meadow in three sites of Lacco-Ameno.

REFERENCES

Mc ROY C.P., 1974.- Seagrass productivity: Carbon uptake experiments in eelgrass, *Zostera marina*. *Aquaculture*, 4 : 131-137.

OTT J.A., 1980.- Growth and production in *Posidonia oceanica* (L.) Delile. *Marine Ecology*, 1 : 47-64.

PERGENT G., 1990.- Evaluation of *Posidonia oceanica* Primary Production using Lepidochronological Analysis: preliminary results. *Rapp. P.V. Réun. Commiss. internation. Explor. sci. Médit*, Monaco, 32 (1) : 6.

PERGENT G. & PERGENT-MARTINI C., 1991.- Leaf renewal cycle and primary production of *Posidonia oceanica* in the bay of Lacco Ameno (Ischia, Italy) using lepidochronological analysis. *Aquatic Botany*, 42 : 49-66.

SAND-JENSEN K., 1975.- Biomass, net production and growth dynamics in an eelgrass (*Zostera marina* L.) population in Vellerup Vig, Denmark. *Ophelia*, 14 : 185-201.

ZIEMAN J.C., 1974.- Methods for the study of the growth and production of the turtle grass, *Thalassia testudinum* Konig. *Aquaculture*, 4 : 139-143.