Leaf Biomass and Production of *P. oceanica* at Spanish Eastern Coast

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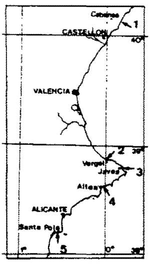
P. oceanica is the most important phanerogam in the Mediterranean Sea. Its role as primary producer and as ecological system has been repeatedly enhanced. Measures of leaf production allows to discern its real importance in the energetic processes at the shallow coastal systems, and gives a parameter to evaluate its conservation stage as a reflect of its growth capacity.

MATERIAL AND METHODS

This paper gives leaf biomass and production values of orthotropic shoots, at five meadows with different structure, whose particular characteristics are briefly pointed out:



1. - P. oceanica meadow over mixed substrata on sand and gravel coast, at CABANES. Study area: Upper limit area. Terrace and deeper mat between rock blocks. 3 to 5 m depth. 560 sh/m² density. No apparent alterations.
2. - P. oceanica reef at exposed areas at VERGEL. Study area: External front area, 0.5 to 1.5 m depth, 1200 sh/m² density. Alteration by water pollution and touristic use.
3. - P. oceanica bed over rock substratum at SAN ANTONIO CAPE. Study area: Homogeneous bed over a rock floor, 5 to 6 m depth. 479 sh/m² density. No apparent alteration but sudden increase of sedimentation rates in early summer.
4. - Stable P. oceanica meadow on roky coast at ALTEA. Study area: Elevated terrace 2 m depth and bottom mats 4 m depth. Complicated morphological structure but no alterations.
5. - P. oceanica reef at sheltered areas at SANTA POLA bay. Study area: External front and central area, 1.5 to 2.5 m depth. 400 sh/m² density. Alterations caused by regeneration of the beach with fine sediments, and intense touristic use.

More detailed description of the meadows in (5).

Orthotropic shoots were marked bimonthly at each place. A hole were made through all leaves in a shoot with a hypodermic needle. 15 shoots were analyzed for each period. Leaves were separated and numbered following the GIRAUD (7) classification. Each leaf was cut into three parts: The Basal part (B), situated down the original mark level. The New part (A) is the elongation of the leaf, situated between the actual position of the hole and the original level. And the distal part (K), that is the rest of the leaf blade.

Epiphytes were cleaned with a razor blade and length and width were measured for each part, and weighted after drying at 60 ºC, 24 h.

		Biomass mg DW / shoot					Production mg DW /sh. day				mg/year	
Locality	depth	F-A	M-J	A-S	O-J	Mean	F-A	M-J	A-S	O-J	total	Author
Santa Pola			592		256	423		5.6		2.4	1182	This work
Vergel		167	397		214	288	1.4	3.5		1.7	998	"
C.S.Antonio			528		257	359		3.7		1.6	1163	"
Altea			498		178	339	1.5	3.5	1.5		796	"
Cabanes			560		317	403		3.5	1.8	4.1	1188	"
I. Medas	5			759	339	594		4.8	0.9		1470	ROMERO 1985
Ischia	4		1137		356	820	10.6		2.0		2732	OTT 1981
Corcega	10		150	411		787		10.7	1.4		1718	BAY 1984
Port Cros PB	0.7			807	271	510	6.2	-0.2		7.5	1200	THELIN & 1984
" Fl	0.2	575			156	354	5.5			0.7	300	THELIN & 1984
" HPP	2.2		768		208	489		10.4	3.3		1800	" "
Carry	3			625	200	381						AUGIER &
"	6			736	138	450						CRISTIANI 1984
Bauset	3	293		527		384						"
"	6			625	250	388						"
Beaumontes	6		500		208	367						"
"	3		385		13	176						"
"	6		387		97	262						"
F. Carry	3		453		310							"
Ischia	5		963		250	517						MAZZELLA & 1984

Table 1. Leaf biomass and production extreme seasonal values

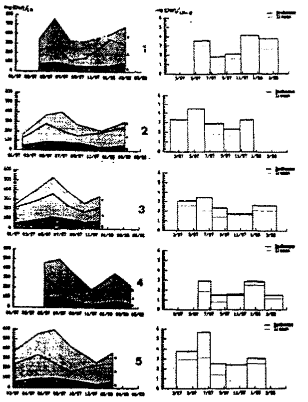


Figure 1. Leaf biomass (left) and production rates (rigth) per shoot at Cabanes (1), Vergel (2), San Antonio (3), Altea (4) and Santa Pola (5).

Biomass was calculated for each leaf part.

Production was calculated by ZIEMAN method (14) as the mean dry weight of the new parts (A) per shoot, and reestimated taking in account range changes and variations in density following the BEDHOMME et al. method (3).

CONCLUSIONS AND DISCUSSION

- Leaf biomass and production of Posidonia oceanica at Eastern Spanish coast are included into the range of values reported from other places of the Mediterranean (Tab 1).
- Annual variation of leaf biomass follows the same pattern at the five localities studied, increasing from Autumn to Summer. Low biomass values of B (Basal parts with ligules) and K (leaf blade of old leaves) reflects high leaf fall in autumn. At the opposite, during summer, formation of ligules is active and B biomass is high.
- Leaf production always exists. Minimal values are in Summer, and high values are reached in Spring and Autumn. In Autumn most of the production is caused by leaf elongation as suggest low differences between values obtained by both methods (3,14). In Spring changes in density of leaves are important and these differences are greater.
- At Cabanes, high autumn production rates could be related to optimal stage of conservation of this meadow. Its stable structure with a developed rhizome system allows a great capacity of storage of reserve substances (11) that supports leaf growth when disfavourable conditions are present (low temperatures and light intensity), adopting an adaptation strategies for competition with its epiphytes (9).
- At Altea, there must be similar conditions, but a hard winter storm caused strong damage to the meadow structure, tearing out many leaves and complete shoots and rhizomes (Only six shoots could be restored in this time). This fact produced lost of alive leaf material and rhizome reserves, showing low biomass and productions values in winter.
- At Santa Pola, there is a high level of alteration and the meadow is in a constant degradation-regeneration process, and even though there are important production rates, the growth pattern must be mostly regulated by environmental conditions (light and temperature).
- At San Antonio Cape, a sudden increment of sediment rates could alter the growth cycle of shoots (4), appearing as intermediate between both kind of meadows.
- At Vergel, intense hydrodynamic conditions may be the cause of low leaf biomass and production. Most of its growth energy must be directed to shoot division. In this way the barrier reef maintain a high shoot density (1200 sh/m²) to resist the constant wave action.

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