ROOT AND RHIZOME BIOMASS OF POSIDONIA OCEANICA BED

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Résumé : Après la mise au point d'un critère de séparation entre le matériel mort et vivant, la biomasse hypogée (racines et rhizomes) de Posidonia oceanica a été estimée en deux stations (- 2 m et - 24 m). Celle-ci est toujours largement supérieure à la biomasse végétale épigée (feuilles et épiphytes).

Introduction : Vegetal biomass estimates of Posidonia oceanica (Linnaeus) Delile beds usually include both leaves and epiphytic organisms (1,2), but rarely underground parts (3, see review by 4).
Methods : Material was collected in Port-Cros Bay (Var, France, Mediterranean) between April and July. Two stations, 2 m and 24 m depth, of which the leaf biomass was already known (5), were sampled. Quantitative samples, randomly placed in the seagrass bed were performed by Scuba diving, using a metal frame 25 x 25 cm and a saw. The whole settlement within the frame, including both roots and rhizomes, down to 30 cm above the bottom level was sampled. Living roots are to be found down to 70 cm below the bottom level : a corrective factor (K=1.18) was therefore calculated to take into consideration biomass of roots ranging between 30 to 70 cm. On the other hand, rhizomes are not encountred below 30 cm. Samples were preserved with 10% formalin seawater, then washed in freshwater at the laboratory to remove the sediment. Rhizome epiphytes were removed by scraping and washing.
The most important part of the work was to establish a suitable criterion which did not require too much time and wich would allow us to distinguish, without cytological control, living from dead material in roots and rhizomes. Living rhizome sections range in color from pale pink near the apex to a reddish brown in the older portions; dead portions are dark brown to black in color and disintegrate into fibers. White or cream roots are always alive; as far as brown to black roots are concerned, a cytological survey pointed out that they can be alive or dead, even when hollow. Therefore an another test was used : root resistance for breaking. Live roots have clean break and offer some resistance to breaking, whereas dead roots tear rather than break.
Roots and rhizomes were dried at 60°C to constant weight (24 h for the roots and 48 h for the rhizomes), and biomass was expressed in g dw/m^2.
Results and discussion : The proposed criterion is easy to use, so that the sorting of a sample is relatively fast. Nethertheless, our margin of error must still be established by comparison of our method with a

cytological sorting for several whole samples.
Mean biomass figures are given in Table I. The underground biomass at the shallow site is three times larger than at the deep one. It seems likely that this difference is due to the difference in shoot density (500 vs 130 shoots/m^2 respectively). In fact, if biomass is expressed in g dw/shoot (Table II), there is no statistical difference between the two sites. Obviously, underground biomass is more important than overground biomass : at the shallow site, the over/under biomass ratio lies between 0.16 and 0.45.
If we compare the total vegetal biomass of Posidonia oceanica to biomass, including roots, rhizomes and leaves, of other marine phanerogam ecosystems, the former appears to be one of the most important (see review by 4).
These preliminary results emphasize the conspicuous importance of P.oceanica roots and rhizomes, a part of the seagrass usually omitted or underestimated.

Table I : Biomass (g dw/m^2) of P.oceanica roots, rhizomes, leaves and epiphytes

depth	Number of samples	Mean biomass (sd) roots	rhizomes	Leaves epiphytes	Total Biomass
- 2 m	6	1095.6 (329.0)	2713.0 (883.4)	595 - 1730[1]	4403.6 - 5538.6
- 24 m	3	422.0 (166.0)	901.8 (452.2)	87[2]	1410.8

1 : data from (5,6) : April-August
2 : THELIN and PAUL, unpublished data; leaves only : May

Table II : Mean biomass in g dw/shoot; sd in brackets

depth	shoots/m^2	roots	rhizomes
- 2 m	500	2.80 (1.26)	6.53 (2.00)
- 24 m	130	4.70 (1.23)	6.10 (0.62)

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References

(1) OTT J.A., 1980. Growth and production in Posidonia oceanica (L.) Delile. Mar. Ecol., Germ., 1 : 47-64.
(2) ROMERO-MARTINENGO J., 1981. Biomasa de communidades de algas bentonicas de las islas Medes (Girona). Oecologia aquatica, Sp., 5 : 87-93.
(3) OTT J.A., MAURER L., 1977. Strategies of energy transfer from marine macrophytes to consumer levels : the Posidonia oceanica example. in : B. KEEGAN, P. O'CEIDICH and P. BOADEN : Biology of benthic organisms. 11th European symposium on marine biology. Pergamon Press Edit., Oxford : 493-502.

(4) FRANCOUR P., 1984. Biomasse de l'herbier à Posidonia oceanica : Données préliminaires pour les compartiments matte, échinodermes et poissons. DEA Océanol. Biol., Univ. P. et M. Curie : 1-72.
(5) THELIN I. BEDHOMME A.L., 1983. Biomasse des épiphytes de Posidonia oceanica dans un herbier superficiel. Rapp. P.V. Réun. Comm. internation. Explor. sci. Médit., Monaco, 28 (3) : 125-126.
(6) LIBES M., 1984. Production primaire d'un herbier à Posidonia oceanica mesurée in situ par la méthode du carbone 14. Thèse Doctorat 3°cycle, Univ. Aix-Marseille II, Fr. : 1-199.