

**FIRST ATTEMPT  
AT DATING BY  $^{14}\text{C}$  THE UNDERSEA  
BEDS OF DEAD  
POSIDONIA OCEANICA  
IN THE BAY OF PORT-MAN  
(PORT-CROS, VAR, FRANCE)**

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*Abstract:* An attempt is made to verify the reliability of a dating technique applied to dead *Posidonia* rhizomes in their growth position.

*Résumé:* La possibilité de dater des rhizomes morts de Posidonies en place (mattes mortes) est vérifiée.

Most of the undersea area of the bay of Port-Man is covered by a bed of dead *Posidonia oceanica* (Linnaeus) Delile rhizomes (AUGIER and BOUDOURESQUE, 1970). This bed of dead rhizomes (called « mattes » in French) was already in place around the year 1930 (FERRI, pers. comm.). Various hypotheses may explain the origin of these dead mattes : anthropic pollution, auto-pollution, ship-mooring, change of ecological conditions of the *Posidonia*, etc. In fact there is a possibility that these dead mattes are ancient.

In order to date by  $^{14}\text{C}$  the vestigial rhizomes, a core sampling was done in the dead mattes (CHP-11 to CHP-14). At the coring site (Fig. 1), as in the largest part of this wide area of dead mattes, no erosion marks appear : neither new nor old ; the depth is —16 m and the sea-bed slightly inclines towards S.E. The dead matte is smoothly connected without any gap or bluff to the present meadow eastward in the direction of the coast-line. Growing rhizomes with live leaves were also  $^{14}\text{C}$  dated (CHP-21) to test the dating method.

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N° of the sample	Depth in the matte in cm	<sup>14</sup> C age in years BP	Calendar year A.D.
CHP - 11/MC - 2362	0 to -10 cm	370 ± 50	1580 ± 50
CHP - 12/MC - 2457	-20 to -30 cm	400 ± 50	1550 ± 50
CHP - 13/MC - 2458	-30 to -40 cm	810 ± 50	1140 ± 50
CHP - 14/MC - 2459	-50 to -60 cm	1020 ± 50	930 ± 50
CHP - 21/MC - 2363	0 to -10 cm	present	

Two interpretations may be given to these results :

1st) Current data on *Posidonia* mattes report growth heights from 0.6 - 1.0 mm.year<sup>-1</sup> (NESTEROFF, 1965), and 1.0-1.5 mm.year<sup>-1</sup> (MAGGI *et al.*, 1977, TCHERNIA *et al.*, 1978, wreck of Giens) to 10 mm.year<sup>-1</sup> (MOLINIER *et* PICARD, 1952, PICARD, 1953, between Bagaud, Port-Cros and Levant Islands). The data presented here (Table I) are in fairly regular scale in ratio to depth and agree with the first value mentioned : about 100 mm by century. It can be imagine that even without any perceptible erosion, the dead matte may have been outscraped to a thickness of 30 to 40 cm, perhaps by the mooring-anchors of ships ; in these conditions the death of the meadow may have taken place recently, perhaps less than a century ago.

2nd) A recent investigation of *Posidonia oceanica* growth shows that the vertical lengthening of a rhizome may be much more rapid than hitherto admitted : 6 mm growth a year in Malta (DREW and JUPP, 1976), 20 mm.year<sup>-1</sup> in Corsica (BOUDOURESQUE, GIRAUD and MEINESZ, unpublished data), 80 to 120 mm.year<sup>-1</sup> in Giens, France (COOPER, 1977). The <sup>14</sup>C dating series recorded here would, in this case, be insufficient : for example, a vertical difference of only 10 cm between samples CHP-12 and CHP-13 cannot correspond to a period of continuous growth of 300 to 500 years. There would be a discordance between the year 1140 (± 50) and the year 1550 (± 50) ; between these dates, *Posidonia* must have disappeared and then reestablished themselves in this site of the bay of Port-Man. Of course, we do not know if any erosion of the dead matte took place and, therefore, how much time elapsed without the meadow. As far as the most superficial level of the dead matte is concerned (CHP-11 : 370 ± 50 BP), it would correspond to the approximate time of the death of the meadow. To invalidate this hypothesis, taking into account the altitudinal growth speed of the rhizomes, we would have to suppose that a height of several meters of matte had been torn out by erosion, which seems highly unlikely.

To the authors, the second of these hypotheses seems more probable. We suggest that the wide area where the dead mattes of the bay

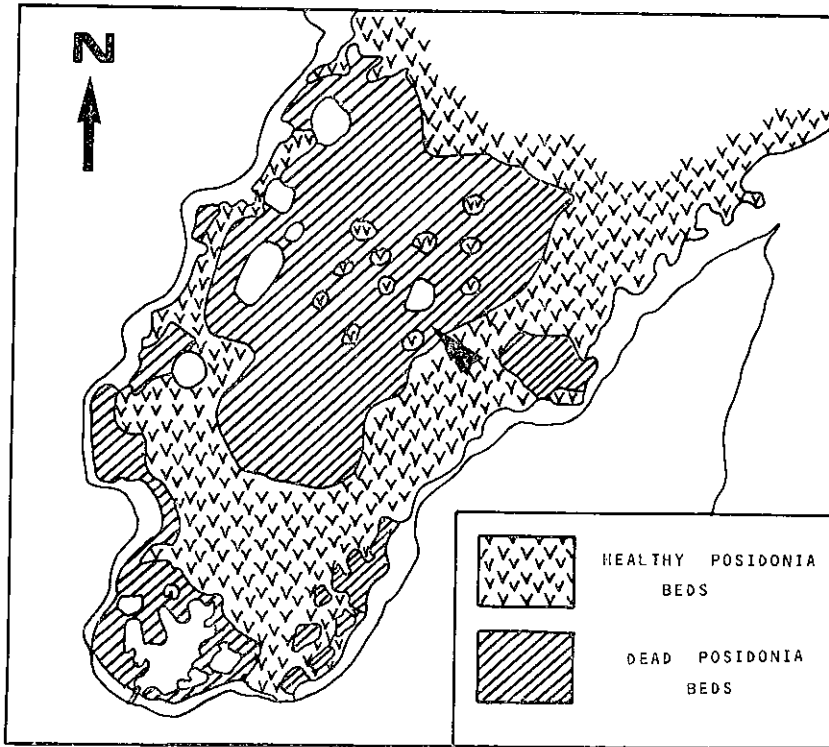


Fig. 1 : Simplified map of the floor of the bay of Port-Man. The *Posidonia* meadows and the dead mattes have been drawn (according to AUGIER and BOUDOU-RESQUE, 1970), and an arrow marks the coring site.

of Port-Man are found developed some centuries ago (between 1530 to 1630 in the site considered) and is in no way connected with modern human activity. It is to be noted that, for some periods of the historic Ages, in the Port-Cros island in a general way and particularly in Port-Man, the human population was much more intensely developed than it is to day ; after several centuries of extensive occupation by the pirates and/or the Moors, the period 1530 to 1630 A.D. corresponds to the time when Port-Cros was again under the rule of the French Kings (JAHAN-DIEZ, 1929 ; DUGELAY, 1973). The Tour de l'Eminence, The Estissac and Port-Man forteresses were built in 1634 A.D. ; civil and military population settled in Port-Cros. Not later than 1805 a soda and potash factory was established in Port-Man.

It is clear, however, that no conclusive data can emerge from a preliminary coring : we sought to verify the reliability of our dating technique applied to mattes in their growth position (this reliability not being obvious at first sight on the basis of some technical grounds). Furthermore, we attempted to define some problems : (1) is the death of the *Posidonia* meadows of Port-Man (and elsewhere) older than has been

supposed ? (2) is it possible to specify the periods of disappearance and reappearance of the *Posidonia* meadow during the historical Ages ?

A more extensive study must now be undertaken with a larger number of cores correctly distributed.

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