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LEPIDOCHRONOLOGICAL CHARACTERIZATION OF TWO SEAGRASS MEADOWS OF *POSIDONIA OCEANICA* (LINNEAUS, 1813) DELILE OF THE WEST COAST OF ALGERIA (ORAN AND ARZEW)

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ABSTRACT

In this work, we conducted a study of lepidochronology of *Posidonia oceanica* in the Oran region (Ain Franin) and Arzew (Cap Carbon) to assess the state of health thereof. For this, a monthly sampling was conducted scuba at a depth of 10 meters during the period November 2008 to November 2009. According to the classification of Pergent, et al. [1] which takes into account the depth of seagrass study sites are considered "good." Recovery is estimated at 73.33% respectively at Cap Carbon and 70% in Ain Franin level.

Keywords: *Posidonia oceanica*, Lepidochronology, Seagrass, Recovery, Ain franin, Cap carbon.

Contribution/ Originality

This study is considered a pioneering work on ecosystem Posidonia oceanica at Mediterranean South West and particularly in the long west coast of Algeria 700 km. Latter is subject to significant pollution mainly caused by intense social activity economic essentially due to the presence of a high density of population living along the coastal fringe. Further studies are views namely biochemical and molecular aspects.

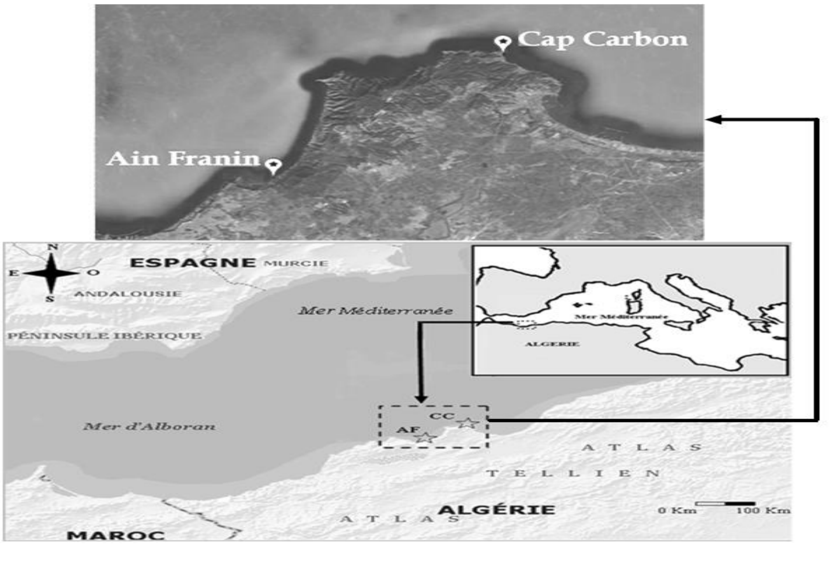
1. INTRODUCTION

The seagrass *Posidonia oceanica* is now considered one of the most important ecosystems or the central ecosystem all Mediterranean coastal areas. As well as forest land. The seagrass *Posidonia oceanica* is the climax of a series of stands and its presence affects the ecological balance of many Mediterranean coastal funds. This ecological importance has led us to conduct a study lepidochronological seagrass two sites in the West coast basin of Algeria , having, because of their geographical location of different environmental conditions , the first being a polluted site Cap Carbon (Arzew) [2] the second considered relatively as a reference site Ain Franin (Oran) [3]. We found it useful to compare the health status of two seagrass sites considered to better know the state of the latter.

2. MATERIALS AND METHODS

The lepidochronological parameters were studied in 30 orthotropic rhizomes taken at random from the two study sites (Figure 1). Scales each rhizome parts are carefully respecting the order of their insertion couplet starting from the oldest to the latest [4]. The thickness of the flakes is appreciated touch [5]. When the thickness of the shell is minimal, the rhizome is cut at the insertion of the shell. Rhizomes sections delimited by two minima of thickness of the flakes are numbered according to the year lepidochronological to which they belong , their length is measured and then placed in an oven (72 h at 70 ° C) , and weighed to determine their dry weight. The number of scales related to each section of rhizome is recognized. These parameters have enabled us to determine the evolution of the time reversal cycles of thickness, the periodicity, the growth rate of the rhizome, production of the rhizome and finally estimating the correlation between the growth rate and rhizome production.

Figure-1. Location of the two study sites (AF: Ain Franin, CC: Cap Carbon).



3. RESULTS AND DISCUSSION

Our surveys of seagrass beds in two different areas of the Algerian west coast helped us first define the lower limits of these structures and secondly their morphological structure that are related to the hydrodynamic and / or water temperature. We noticed that both seagrass beds studied are plain. The herbarium Ain Franin is in the form of a meadow more or less continuous, horizontal. As against that of Cap Carbon is in the form of a continuous moderate slope meadow.
The lower limit in the site Cap Carbon is 20 meters deep, while it reaches 29 meters in Ain Franin.
The lepidochronological study allowed us to determine the following parameters:

3.1.Évolution Date Thick Inversion Cycles

The inversion of the maximum thickness (from the upswing in the downswing) held in December at both study sites (Table 1). These results corroborate those of Pergent [6]. The study dates inversion cycles also allowed us to locate the minimum thickness of cycles (from the downturn in the ascending phase). This minimum appears in April and June Cap Carbon in Ain Franin (Table 1).

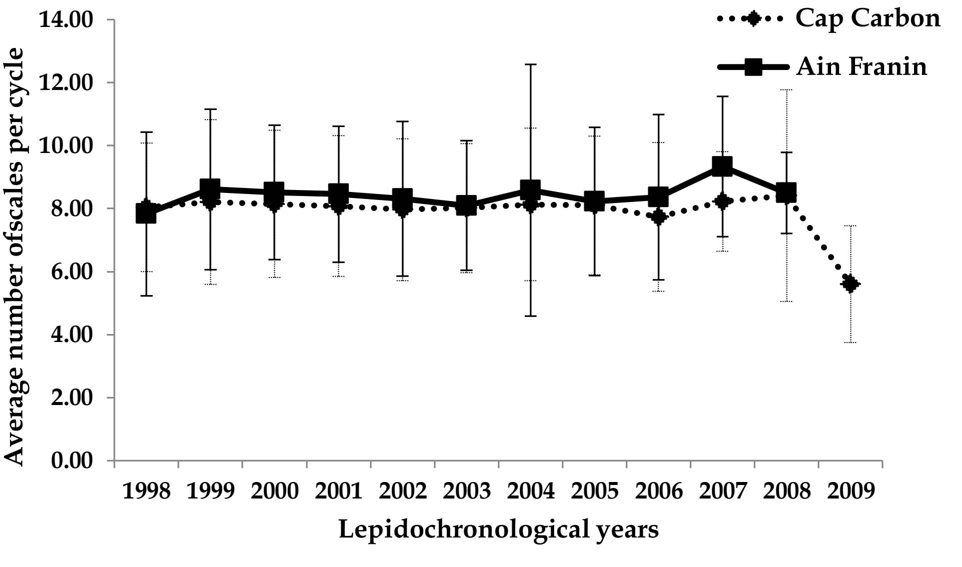
Table-1. Thickness of inverting cycles (minimum inversion and maximum inversion) dates.

Localities, Countries	Depth (m)	Inversion minimum	Inversion maximum	References
Port – Cros France	11	June	December	[4]
Banyuls- sur- Mer France	12	June	December	[4]
La Marsa Tamentfoust Algérie	8	April April	-------------	[7]
Plateau des Chèvres Ile de Riou France	10	Juin April	November January	[5]
Cap Carbon Ain Franin Algérie	10	April June	December December	This work

3.2. Number of Scales per Cycle: Periodicity

In both considered seagrass, variations in the number of scales per cycle, and therefore the number of sheets produced by year were recorded (Figure 2).

Figure-2. Evolution of the average number of scales per cycle in the study sites.



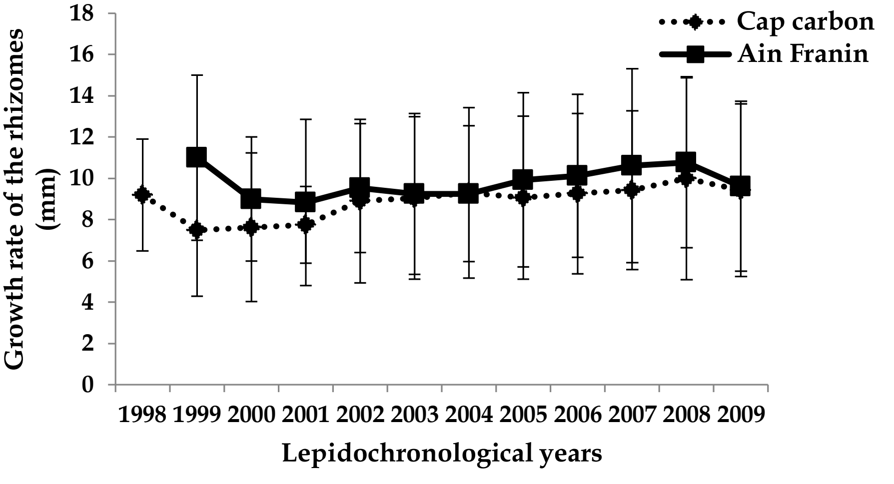
The number of scales per cycle varies herbarium considered. A Cap Carbon is an average of 7.89 / year and Ain Franin this cycle is an average of 8.44 / year. These values are our beds to be quite productive as they are higher than those observed in other locations, the Gulf of Gabes (Tunisia) is 7.79 leaves / year [8] and 7.45 leaves / year Villasimius (Sardinia) [9].

The analysis of variance shows no significant variations between the two study sites (ANOVA, P <0.01). This suggests that the two beds can be submitted to the same hydrodynamic influences the time that our study sites are located at similar depths.

3.3. Growth Rate of the Rhizome

For rhizomes with a large number of cycles, the length of the pieces of rhizome, corresponding to the insertion zone of the scales of each cycle is measured, due to the periodicity of cycles, it is possible to deduce the speed of growth of the rhizome [4, 10, 11].
In both beds considered, changes in growth rate of rhizomes have been recorded (Figure 3).

Figure-3. Evolution of the average growth rate of rhizomes at both study sites.



The average rate of growth of rhizomes varies depending on the site considered , which is in Ain Franin it is highest **(**9.90 mm / year (± 3.60) **)** and it is **(**8,88 mm / year (± 0.99) **)** to Cap Carbon. The growth rate of rhizomes is strongly correlated with the erythrocyte sedimentation rate [11-14] actually observed this phenomenon at the site Ain Franin view it is located at the foot of a cliff texture of clay that the winter period is supplied with large amounts of clay sediment due to rainfall fairly strong during this period.

Increasing the number of sheets causes an increase in the size of sections rhizomes on which they are inserted. Such correlation is highlighted at Cap Carbon (Figure 4), but this is not very significant (r = 0.44). However, there were similar fluctuations in the site of Ain Franin (r = 0.39) (Figure 5).

However, it seems logical to admit the growth rate of rhizomes, number of leaves produced annually and sedimentation rate are three parameters that interact more or less simultaneously in the two study sites considered.

Figure-4. Evolution of the average growth of rhizomes (■) and the average number of leaves produced per year (●) at Station Cap Carbon.

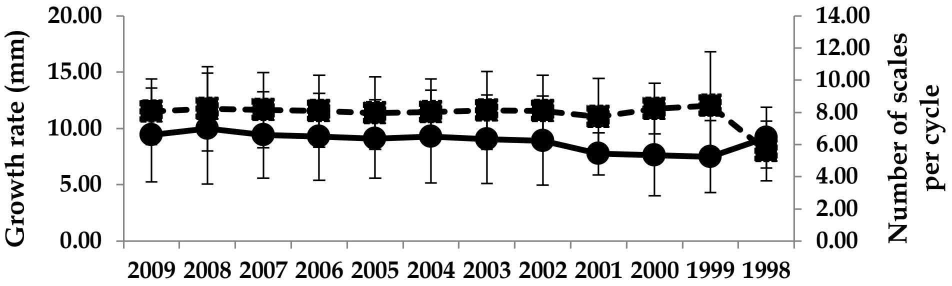
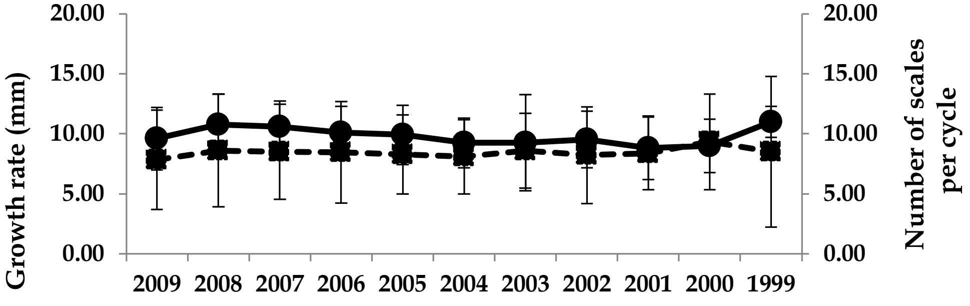


Figure-5. Evolution of the average growth of rhizomes (■) and the average number of leaves produced per year (●) in the Ain Franin station.



The values obtained for the growth rate, fall among the highest values reported in the literature. (Table2).

Table-2. Average Speed of rhizome growth (mm / year). Values found in the literature for different localities.

<table>
<tr><th>Localities, Countries</th><th>References</th><th>Depth (m)</th><th>Growth rate</th></tr>
<tr><td>Calvi (Corse)</td><td>[15]</td><td>10</td><td>1.50</td></tr>
<tr><td>Iles Medes (Espagne)</td><td>[16]</td><td>8.7</td><td>11.70</td></tr>
<tr><td>Banyuls-sur-Mer (France)</td><td>[4]</td><td>12</td><td>6.40</td></tr>
<tr><td>Tabarca (Espagne)</td><td>[17]</td><td>12.5</td><td>10.90</td></tr>
<tr><td>La Marsa (Algérie)</td><td rowspan="2">[7]</td><td rowspan="2">8</td><td>6.80</td></tr>
<tr><td>Tamentfoust (Algérie)</td><td>7.00</td></tr>
<tr><td>Anse de Kouali (Algérie)</td><td>[18]</td><td>10</td><td>7.74</td></tr>
<tr><td>El Kantaoui (Tunisie)</td><td rowspan="4">[19]</td><td rowspan="4">10</td><td>3.8</td></tr>
<tr><td>Monastir (Tunisie)</td><td>4.5</td></tr>
<tr><td>Hergla (Tunisie)</td><td>7.6</td></tr>
<tr><td>Mahdia (Tunisie)</td><td>8.1</td></tr>
<tr><td>Port-Princes (Tunisie)</td><td>[20]</td><td>6.5</td><td>6.60</td></tr>
<tr><td>Cap Carbon (Algérie)</td><td rowspan="2">This work</td><td rowspan="2">10</td><td>8.88</td></tr>
<tr><td>Ain Franin (Algérie)</td><td>9.90</td></tr>
</table>

3.4. Production of rhizomes

The dry sections of rhizomes weight, which corresponds to the insertion of the scales of each cycle field to assess the share of production is devoted to spreading rhizomes in *P. oceanica* [4] . The average production of rhizomes varies lepidochronological years. It is 123.7 ± 167.97 mg (dry weight/ rhizome/year) Ain Franin ± 87.58 and 107.87 mg (dry weight/ rhizome/year) Cap Carbon.

The growth rate (Figures 6 and 7) is significantly correlated with the production of rhizome [5,7,18, 21] (51% and 62% Cap Carbon in Ain Franin).

A rhizome, whose growth is fast, has a high average production. In the same way, a year during which the rate of growth will result in accelerated, at the rhizomes by a more substantial annual production [4]. This relationship is verified regardless of the study site.

Figure-6. Correlation between growth rate and the average production of rhizomes (Ain Franin).

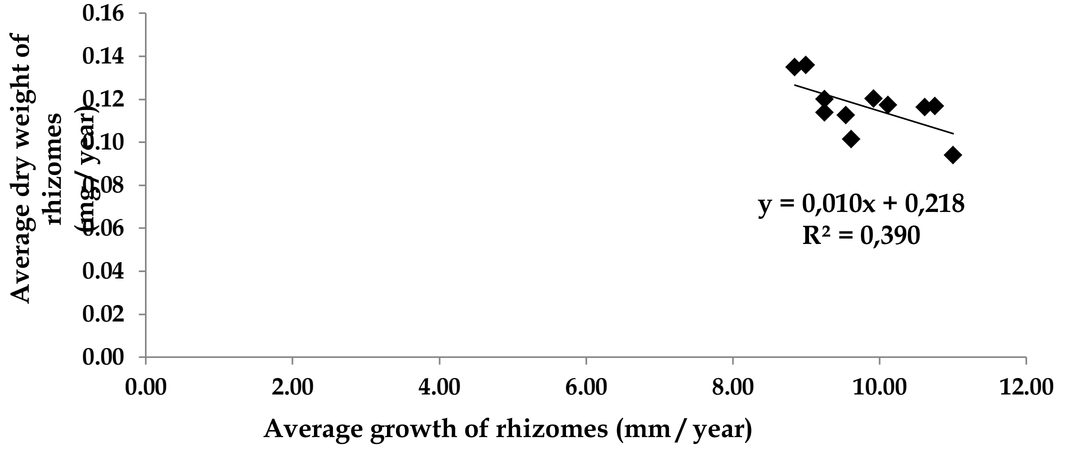
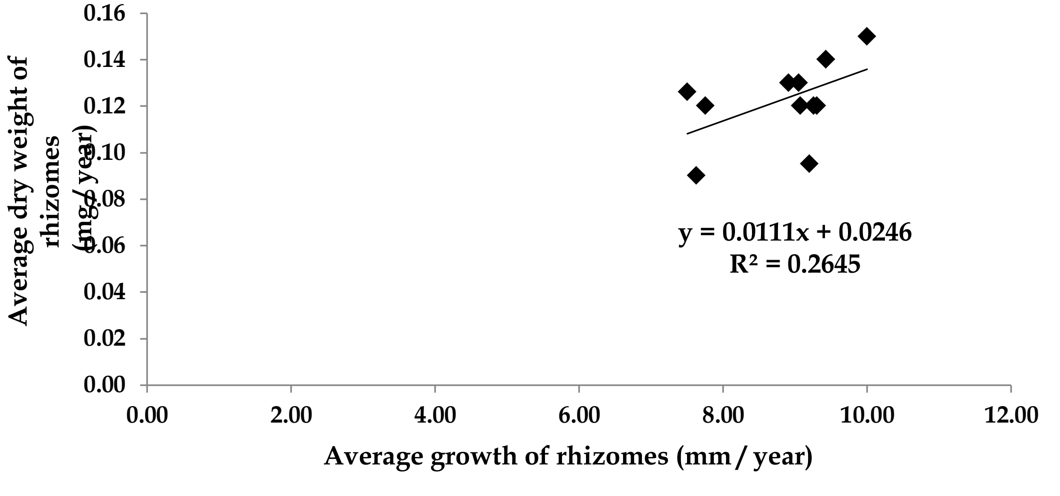


Figure-7. Correlation between growth rate and the average production of rhizomes (Cap Carbon).



4. CONCLUSION

This study to assess the status of seagrass meadows in the west coast of Algeria.

Indeed, according to the classification of Pergent, et al. [1] values vitality *P.oceanica* seagrass studied are satisfactory.

The annual production of leaves in our study sites appears to be dependent on the variability experienced by the entire ecosystem, but specific environmental parameters have no direct impact on this process. This observation confirms the results established in other studies in other Mediterranean areas [8][9] , and Dolce, et al. [22].

In the future, a greater level of protection to be granted to seagrasses. Seagrass should be integrated into reserves or protected areas to ensure their long-term protection and keep the current seagrass. It is also important to identify areas of particular ecological importance of seagrass beds or can be considered unique or rare [23].

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