Posidonia oceanica L. (Delile) Meadow from Messioua

POSIDONIA OCEANICA L. (DELILE) MEADOW FROM MESSIOUA BANC (TUNISIA)

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ملخّص

أعشاب بوسيدونيا أوسيانكا لبنك مسيّوة جنوب البلاد التونسيّة : تهتمّ هذه الدراسة بالأيكولوجيا القاعيّة لبنك مسيّوة (30 ميلا بحريا غرب مدينة جرجيس جنوب البلاد التونسيّة) وهي منطقة معروفة عادة بصيد الإسفنج.

لقد قمنا بأربع حملات على متن الباخرة العلميّة "حنّبعل" امتدت من أكتوبر 2000 إلى أوت 2001. استهدفت المهام الثلاث الأولى دراسة ميدانيّة محيّنة لأعشاب البوسيدونيا ومجتمعات الاسفنج للبنك قصد تدعيم المعطيات المتحصل عليها خلال العمليّة الرابعة الّتي تركّزت أساسا على وضع خريطة قاعيّة لمنطقة الدّراسة وتعداد أعشاب الـPosidonia باستعمال مسبر متعدّد الحزم SEABAT 9001 (Reason co)

وقد مكننا العمل الميداني من استكشاف ستة عشرة موقعا ممتدّا من عمق 21 إلى 33 م أين توجد أكبر كثافة للمتر المربّع وأعلى مؤشر جوهري للبوسيدونيا بالبحر الأبيض المتوسط.

كلمات مفاتيح : بوسيدونيا أوسيانكا – كثافة الأوراق – مؤشّر جوهري للبوسيدونيا – إسفنج – بنك مسيّوة - تونس

RESUME

L'herbier de P*osidonia oceanica* l. (delile) du banc Messioua (Tunisie) : Cette étude intéresse l'écologie benthique du « banc Messioua » (30 MN à l'Est de Zarzis, au Sud de la Tunisie), zone traditionnelle de la pêche aux éponges. Quatre campagnes marines ont été conduites à bord du NRO « Hannibal » d'octobre 2000 à août 2001. Les trois premières avaient pour objectif de valider, par des prospections dites de « réalité » terrain, les données obtenues lors de la quatrième campagne. Ces données traitent de l'herbier de *Posidonia oceanica* L. (Delile) et de la population d'éponges associée. Lors de la dernière campagne, le travail a été effectué à l'aide d'un sonar multi-faisceaux SEABAT 9001(Reason Co). Cette étude a permis la prospection de seize stations s'étendant entre 21 et 33 m de profondeur et l'analyse phénologique de l'herbier méditerranéen ayant la plus haute densité de faisceaux/m^2 et l'Indice Foliaire Global (IFG) le plus élevé.

***Mots clefs** : Posidonia oceanica, d*ensité des faisceaux, indice foliaire global, éponges, banc de Messioua, Tunisie

ABSTRACT

In order to study the benthic ecology of the "Messioua banc" (30 NM east off Zarzis, Southern Tunisia), a traditional Tunisian sponge fishing ground, four marine campaigns were conducted with the R/V "Hannibal" from October 2000 to August 2001. The objectives of three of these campaigns were field validation, focusing on the sampling of the *Posidonia oceanica* meadow and of the sponge population. However the goal of the fourth one, with the use of a multi-beam sonar SEABAT 9001 (Reson Co.), was the mapping of bottom of the surveyed area and the scanning of the *Posidonia* meadow and its sponge population. The field work allowed the study of sixteen stations covered by a dense meadow extending from 21 to 33 m depth, which present the highest density of shots/m² and the biggest Leaf Area Index in the Mediterranean region.

Keywords: *Posidonia oceanica*, shoot density, leaf are index, sponges, Messioua banc, Tunisia,.

INTRODUCTION

In the Mediterranean Sea, seagrass, *Posidonia oceanica* is one of the most important producer in the coastal waters. They support fisheries resources, as well as, the

impact of several human activities that might present a threat to them (Anonyme, 1991; Ben Mustapha et al, 2002 under press). Nevertheless several regions such as the three man bancs east off Zarzis, have (in general) dense meadows that host one of the most important population of commercial sponges in the Mediterranean sea (Ben Mustapha et Vacelet, 1991; Ben Mustapha *et al*, (2003, *under press*).

MATERIAL AND METHODS

Sampling was always made by scuba diving, with a metallic square of 40*40 cm². The choice of an area of 0,16 m² is well documented elsewhere (Ben Mustapha et

Hattour, 1992; Ben Mustapha *et al*, 1999; Ben Mustapha *et al*, sous presse). In each station three samples were taken from the meadow, and brought back on board. Where we took 10 to 15 shoots of *Posidonia* from each sample. The expression of the density and the coverage of the meadow where done using the classification of Giraud (1977), Meinesz et Laurent (1978) and Augier (1986)[a].

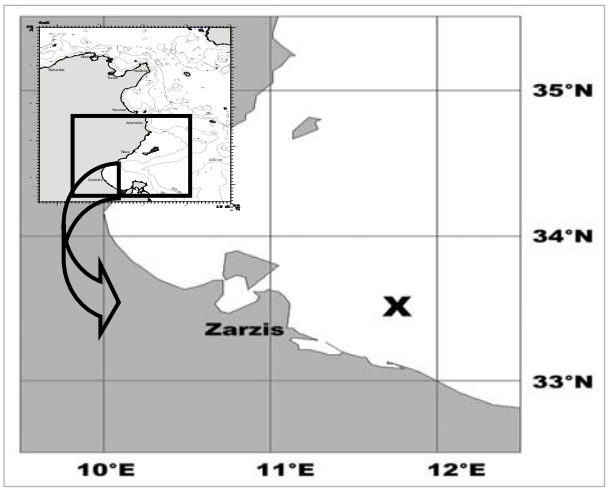

Figure 1. Map showing the survey site in Messioua Banc off Zarzis in Tunisia (from Komatsu *and all*)of sediments

The following measures were done for each shoot: Number of shoots per sampling area, number of adults, intermediaries and juveniles leaves, as well as their length and width. Consequently, we were able to calculate the mean length and width for each kind of leaf, for each shoot. These data were used to calculate the covering area of the shoots; the area covered by 1 m² of meadow as well as the leaf area index (LAI). Sixteen stations were sampled from a depth of 21 to 33 m[b]

RESULTS

A. General Overview

A series of banks constitute the most important topographic features of the southern Tunisian waters off Zarzis. The first banc, Ras Dzira is located 12 NM east off Zarzis at a depth ranging from 6 to 11 m, followed by Bancacou and Messioua bancs, respectively located at 20 to 30 NM east off Zarzis, at a depth ranging from 20 to 33 m. Finally this series ends with El Greco banc at 35 NM in the same direction at a depth ranging from 25 to 35 m.

These bancs are all covered by sea grass meadows, mainly *Posidonia oceanica*, while in the sandy bottoms of the "inter-mattes" channels, *Cymodocea nodosa* is well represented. Nevertheless, rocky and biogenic buildup bottoms are also a main feature of these bancs, specially in Messioua and Greco bancs.

The *Posidonia* meadows of these bancs present several types of development: From type IV (i.e the least "healthy" one) observed in rare places of Messioua bancs at a depth of 20 or 30 m, to type I (Ben Mustapha et al, 2002, *under press*; Augier, 1986; Meinesz et Laurent, 1978) (i.e. the healthiest one) recorder from Messioua and Greco.

These meadows can present a continuous covered area as seen in Greco, Messioua and Ras Dzira, or can present large patches as seen in Bancacou, and some stations of Messioua and Greco. The Posidonia mattes can be short (30 cm high) or inexistent, mainly near the deepest limit of the meadows (as seen at a depth of 30 m in Messioua) or even at a depth of 20 m in Banacaou. Elsewhere, the height of the matte varies between 0.7 and 1.5 m. The covered area (coverage) also varies from less than 40 % (Bancacou) to near 100 % (Messioua, Ras Dzira and Greco). The density of shoots/m² is very high in general in Messioua, Greco and Ras Dzira (meadows of Type I). Nevertheless, meadows of type III to type IV (low density) were seen in few places mainly in Bancacou and the deepest stations of Messioua

B. Messioua Meadows

In the surveyed area of Messioua (Fig 1), from the sixteen sampled stations, 14 of them were covered by *Posidonia* meadow; two stations showed a mosaic of sandy - rocky - meadows substratum (St H 15 and H 16) while Stn H11 was not covered by *Posidonia*.

Posidonia meadows usually grow on small mounds, called "mattes", which can reach 0.3 to 1.8 m high (starting from the bare sand). The mattes, made with a root system and sediments trapped by *P. oceanica*, are covered by *P. oceanica* leaves erected by about 1 m high above the bottom (Komatsu *et al*, 2001).

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[a] According to Giraud (1997) Posidonia meadows are classified in five types in relation to the shots density per m² (type V < or = to 150 s/m²; type IV: 150 – 300 s/m²; type III: 300 – 500 s/m²; type II: 500 – 700 s/m²; type I > 700 s/m²); while Augier (1986) and Meinesz & Laurent (1978) adopt a classification (Type 1 to type 3) based on % of coverage, rhizome position, mattes presence, colonisation

[b] For the study of the distribution, composition, abundance and structure of the sponge population, an area of 240 m² was sampled.

As seen in Table I, the meadows cover almost all the bancs, with a high density of shoots/m². The lowest figures were recorded from Stn H1 and H5, where the lack of light at such range of depth (29 to 33 m) seems to be the limiting factor of growth for these meadows. The highest density, recorded from Stn H6 and H9 i.e. 1125 S/m², is also the highest in the Mediterranean for such off shore meadows (Ben Mustapha *et al*, 1999; Ben Mustapha *et al*, sous presse; Pergent *et al*, 1995).

The number of adult leaves varies from 2 to 6 per shoot. They measure 65 cm in length and 1 cm in width at the most; while intermediaries leaves (maximum length 55 cm, maximum width 0.9 cm) and juveniles leaves (maximum length 0.6 cm, maximum width 0.6 cm) range from 0 to 3 leaves/shoot. These data are not in contradiction with the hypothesis of the generally small size of the *Posidonia* leaves recorded from the eastern Mediterranean basin (Ben Mustapha *et al*, 1999).

Nevertheless, the small size structure of the leaves seems to be compensated by the high density of the meadows (coverage up to 100% in several stations) translated by the density of shots per m² as well as the number of leaves per shoot.

The Leaf Area Index (Fig 2), that indicates the total area of *Posidonia* leaves available per m² of substratum, ranges from 108 m² (Stn H1) to 602 m² (St H7), with a mean value of 353 m² of *Posidonia* leaf/m² of substratum.

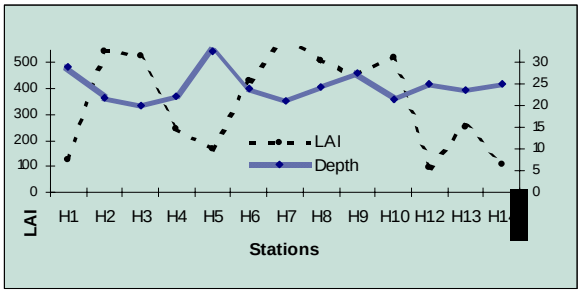

Figure 2. Leaf Area Index distribution among 14 stations of *Posidonia* meadows

CONCLUSIONS

The *Posidonia* meadows of Messioua bank present a healthy state in general. Compared with other meadows from Tunisia and abroad, their density is the highest in the Mediterranean, with very high values of LAI ; not comparable to other LAI recorded elsewhere (Ben Mustapha *et al*, 1999; Ben Mustapha *et al*, under press), while the density of shoot/m² is the highest in the Mediterranean for such off shore meadows.

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Table I: Shoot of *Posidonia oceanica* per station and depth

Stn	Depth (m)	shots/m²
H1	***29***	425 – 550 Mean 458
H2	***22***	350 – 550 Mean 833
H3	***21***	825 – 1000 Mean 900
H4	***22***	450 – 650 Mean 542
H5	***32.8***	425 – 550 Mean 483
H6	***24***	550 – 1125 Mean 842
H7	***21***	725 – 1050 Mean 858
H8	***24***	700 – 1100 Mean 866
H9	***27.5***	525 – 1125 Mean 925
H10	***21***	775 – 825 Mean 816
H11	***33***	Absent
H12	***25,2***	656 - 813 Mean 731
H13	***23,5***	587 - 1000 Mean 791
H14	***25,5***	594 - 937 Mean 733
H15	***21***	See H4
H16	***25***	See H4

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