BOTTOM TRAWLING FISHING EFFECTS OVER *POSIDONIA OCEANICA* SEAGRASS MEADOWS AND SEAGRASS-ASSOCIATED FAUNA : PRELIMINARY RESULTS

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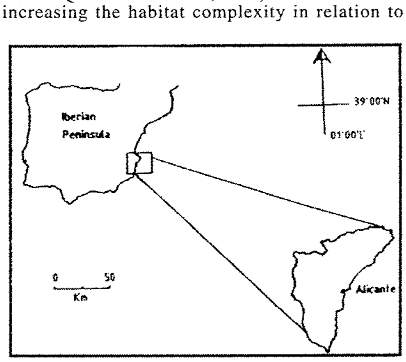
Posidonia oceanica is an endemic mediterranean seagrass which is widely distributed along the infralitoral bottoms. It forms extensive meadows with great ecological importance (BOUDOURESQUE & MEINESZ, 1982). One of the most important is its capacity of increasing the habitat complexity in relation to surrounding unvegetated bottoms. In the Iberian Southeast, the bottom trawling fishing affects greatly the *Posidonia* meadows and their associated communities. At the moment, it is not well known the effect of this perturbation on the marine benthos (JONES, 1992). However, many papers have studied the effects of habitat complexity on the tropical seagrass-associates macrofauna community structure. This paper is a preliminary study to look for relationship between changes in the *Posidonia* meadows features and the community structure of seagrass-associated vagil fauna (fish and macroinvertebrates).



Study Site : El Campello (Alicante, SE Spain). The seagrass meadow is irregularly affected from trawl fishing and grown between 1-24 m deep on sand-muddy bottoms.

Sampling was carried out in summer of 1992, in two stations (-16 m deep): an unperturbed and a frequently trawling perturbed station.

- Fish: The fish assemblage was sampled by visual census on 750 m^2. Eight censuses were done in each station (HARMELIN-VIVIEN *et al.*, 1985). The linear coverture of the seagrass meadow was measured on each sample.
- Macroinvertebrate: The crustacean community was sampled by suction bombs in a 0.125 cm^2 quadrat (VADON, 1981). Twelve samples were taken in each station. The shoots density and litter necromass (detritus) were measured on each sample. All the individuals of Decapoda, Amphipoda and Isopoda were identified to species level.

ANOVA was applied to compare the variables between stations. CCA (Canonical Correspondence Analysis) was applied to fauna abundance in relation to features of seagrass meadows (TER BRAAK, 1988).

The figure 1 shows the result of ANOVA for the seagrass meadows features and the total faunal abundance in relation to the two stations. The vegetal litter has increased in the perturbated station, while the unperturbated station has a great coverture. Their changes would take importance over the seagrass-associated fauna.

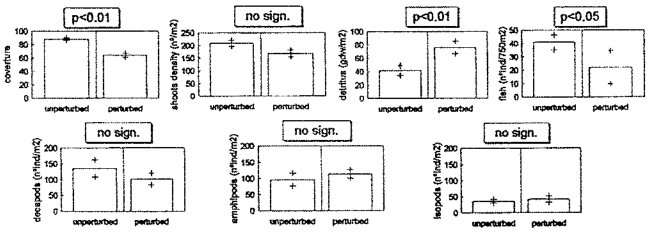


Table 1 shows the correlation between the community structure and the environmental factors. The seagrass meadow's coverture has an important weight over the fish assemblage. Samples from perturbed and unperturbed station are segregated in the ordination diagram. The unperturbed station is related to the "coverture" variable.

TABLE 2	Linear Coverture	
Fish	0.59	
	Shoots density	Detritus necromass
Decapoda	0.54	0.64
Amphipoda	ns	0.68
Isopoda	ns	0.6

Decapods, amphipods and isopods are correlated with detritus variable and only decapods are correlated with shoots density. In the ordination diagram, the unperturbed station is associated with the shoots density variable and the perturbed station with the detritus variable. The modification of ecological characteristics of *Posidonia oceanica* seagrass meadows by trawl fishing -reduction of seagrass complexity and increase of litter necromass- could be detected in two ecological scales (fish and macroinvertebrates) by changes on seagrass-associated epifaunal community structure.

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PRELIMINARY RESULTS OF THE GROWTH RATES OF DEEP "CORALLIGENE" ALGAL BANKS IN THE BAY OF MARSEILLES (RIOU ISLAND) AND IN CORSICA (SCANDOLA RESERVE), WITH THE RADIOCARBON DATING METHOD

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Since the end of the nineteenth century (MARION, 1883), coralligenous formations in the Mediterranean have been the subject of an important series of biological and geological descriptions, especially along the French and Italian coasts (PÉRES and PICARD, 1952; LABOREL, 1961; LAUBIER, 1966; SARÀ, 1969; FROGET, 1974; HONG, 1980). Despite the importance of their distribution in the Mediterranean sea (LABOREL, 1987), the study of growth and erosion rates of these bioconstructions has never been initiated. Our work was carried out in the Bay of Marseilles (Grand Congloue-Riou Island) and in the Reserve of Scandola (Corsica). These sites present structures which are notable for their size and their beauty. We have tried to date the beginning of their development and to determine their mean growth rate. The southern point of Grand Congloue Island shows concretions between the depths of 35 m and 68 m. Coralline Algae predominating as primary frame builder, construct horizontal banks 1 m high at a depth of - 40 and - 60 m, and rims (1 to 2,50 m long) in coves of cliffs between - 45 and - 58 m. The site of "les Orgues" (Scandola) presents coralligenous rims and lips between - 40 and - 60 m. Although they are not as large as Marseilles' structures, in some places they are 2 m long.

In these stations, we have removed segments of sections terminal parts of 5 algal lips (30 to 40 cm long from apex) with hammer and burin by scuba diving : 3 in Grand Congloue and 2 in the Reserve of Scandola. These blocks have been measured and longitudinally cut with a circular saw. We have extracted 2 or 3 samples per bloc at different distances from apex. The algal framework has been cleared from recently formed calcareous (Serpulid worms, Bryozoans, etc.). Samples weighing about 40 grams cooked for 12 hours in an oven at 300°C for destruction of organic matter, attacked by orthophosphoric acid and dated by the method of liquid scintillation on benzene (ÉVIN, 1992) in the Laboratory of Geochronology of Quaternaries (L.G.Q. Luminy, Marseilles). We have calculated the net accretion rate in coralligenous rims between two consecutive dated samples.

Datings showed in table 1 have not been corrected, because in the Mediterranean sea there are no references in literature allowing the correction of the errors due to contamination by the large-scale testing of thermonuclear weapons and by the apparent age of the surface of water (BARD, 1988). Nevertheless, our results show that deep "coralligene" algal banks in the Bay of Marseilles and in Corsica are old (dated between 3830 and 7140 years B.P in our study.). Net accretion rates are low (< 1 mm.year^{-1}) and are comparable to those of infralittoral bioconstructions of *Mesophyllum lichenoides* (SARTORETTO, 1994). However, as for the Rhodolithes studied by LITTLER *et al.* (1991), they decrease in time. In the Bay of Marseilles and in Corsica, banks have stopped growing and have recently started their development again. Thus, the taking zone of the sample S2B (table. 1) is separated, by a thick layer of iron oxide, from a 15 mm thick layer of current Coralline algae (Sample : L.G.Q. 987) located in the upper side of the apex of the algal lip.

As we have dated the terminal part of massive rims, our results lead to suppose that theses bioconstructions must have developed on the littoral coasts during the Holocene transgression, which confirms the hypothesis of LAUBIER (1966) about "coralligene" algal banks of Banyuls (France). These first results also confirm the stop of the growth observed by LABOREL (1961) in the Bay of Marseilles. Despite the absence of references concerning the bioerosion rates, it allows to suppose that this stop took places over a long time in which eroding agents have left bare the old parts of structures on which recently new thalli of Coralline algae settled. Considering our data as new and preliminary, complementary measures are essential along the Mediterranean coast. Therefore the using of under-water drilling techniques in scuba diving will be necessary in great depth.

Station	Depth	Sample	H : Samp/apex (mm)	Age (years B.P.)	Growth rate (mm.y^{-1})
Riou	55 m 55 m	L.G.Q. 964 R1B L.G.Q. 963 R1A	350 195	6840 ± 160 6640 ± 150	0,78
Riou Riou	55 m 55 m	L.G.Q. 963 R1A L.G.Q. 965 R1C	195 60	6640 ± 150 6240 ± 140	0,34
Riou Riou	55 m 55 m	L.G.Q. 990 R2A L.G.Q. 1088 R2B	300 150	6480 ± 150 6250 ± 160	0,65
Riou Riou	55 m 55 m	L.G.Q. 989 R3A L.G.Q. 1040 R55A	300 100	7140 ± 190 6360 ± 220	0,26
Riou	40 m	L.G.Q. 1047 R40A	700	3830 ± 180	0,18
Scandola Scandola	50 m 50 m	L.G.Q. 992 S2A L.G.Q. 986 S2C	620 400	6260 ± 180 5910 ± 150	0,63
Scandola Scandola	50 m 50 m	L.G.Q. 986 S2C L.G.Q. 1045 S2B	400 210	5910 ± 150 4740 ± 190	0,16

Ages and growth rates of "coralligene" algal banks in Riou Island and in the Reserve of Scandola. H : , distance between the sample and the apex, for a same algal lip.

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