

COMPARISON OF ECOLOGICAL QUALITY STATUS EVALUATED BY SOFT-BOTTOM MACROFAUNA AND BY FORAMINIFERA ALONG A SEWAGE OUTFALL TRANSECT IN CALVI BAY, CORSICA

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Abstract

In Calvi Bay (Corsica, France), comparison of ecological quality statuses obtained by foraminifera and soft-bottom macrofauna studies is done along an outfall transect during two seasons. Depending of the macrofauna index calculated, results are comparable with the foraminifera's index or more precise. More samples are needed to confirm those preliminary results.

Keywords: *Ligurian Sea, Zoobenthos, Foraminifera, Sewage pollution, Monitoring*

Introduction

The water quality statuses are defined according to different physico-chemical and biological indicators among which soft-bottom fauna. Several biotic indices based on soft-bottom macrofauna are traditionally used [e.g. 1, 2]. More recently, a foraminiferal index has been developed for the Mediterranean Sea [3]. Thanks to the STARE-CAPMED research program [4], we were able 1) to compare Ecological Quality Status (EQS) based on macrofauna and foraminiferal biotic indices and 2) to validate a new macrofauna index adapted to Corsica habitats [5]. This study is located in Calvi Bay (NW Corsica) with samples done twice a year, in May and in September. This is a presentation of the first year results 2013.

Material and methods

Four stations were sampled (35-40 m water depth): three along a sewage outfall transect (Source, Middle, Far) and one out of human influences (Ref). In each station, triplicate cores were sampled for foraminifera and triplicate grabs were sampled for macrobenthos. Supplementary cores were sampled for sediment analysis. In the lab, the first cm of each core was sampled and stored in Rose Bengal/Ethanol solution for foraminiferal analyses. Sediment was sieved and organisms were sorted, identified and analyzed from the 150-500 µm size fraction, the index proposed by [3] was calculated. For soft-bottom macrofauna, sediment was sieved (1 mm mesh size) and preserved in 5-10% formaldehyde solution. Organisms were sorted and identified until the lowest level with WORMS as reference list. AMBI and M-AMBI were calculated as well as the J'MAMBI proposed by [5]. TOC (%), OM (%) and grain size analysis were performed by an accredited lab.

Results and discussion

The sediment characteristics allowed identification of different habitat weakly to moderately enriched in OM and TOC (Table 1).

In all foraminiferal samples, tolerant species are almost absent whereas pollution-sensitive species dominate the assemblages. The EQS evaluated by the Foram Index are high for all stations before and after summer (Table 1).

The soft-bottom macrobenthos assemblages are dominated by pollution-sensitive to tolerant invertebrates. The AMBI or M'AMBI EQS are good or high for all the stations. The M-AMBI gives the same evaluation as the foraminiferal index whereas AMBI give slightly lower quality statuses. The J'MAMBI EQS are slightly higher in May than in September (Table 1). Results are good or high except for Source Sept 13 where the status is moderate. In this time the high abundance of the sipucilian *Aspidosiphon mullerei* could be responsible of this unbalanced assemblage. Therefore, the J'MAMBI seems to be more sensitive than the other indices in this study area and could highlight small perturbation of the ecosystem.

The preliminary foraminiferal analyses of 2014 samples show a degradation of the ecosystem especially after the touristic period. Further analyses and comparisons of the different indices will confirm those preliminary results.

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Tab. 1. Main characteristics of the sediment and Ecological status for Foraminifera and Macrofauna along the outfall sewage transect in May and September 2013 in Calvi Bay (STARE-CAPMED research program). CS: Coarse Sand, FS: Fine Sand, +35: depth more than 35 m; EQS: Ecological Quality Status

		May 2013				September 2013			
		Source	Middle	Far	Ref	Source	Middle	Far	Ref
Sediment	Median (µm)	1203.6	525.4	123.1	685.1	1023.5	179.9	117.8	773.8
	TOC (%)	0.33	0.27	0.21	0.661	0.524	0.523	0.442	0.524
	OM (%)	1.46	2.02	1.09	2.22	2.35	2.14	1.83	3.49
	Fraction < 63 µm	5.46	5.81	12.64	11.78	10.22	10.69	17.27	7.67
	Habitat	CS+35	CS+35	FS +35	CS+35	CS+35	FS +35	FS +35	CS+35
Foraminifera	Foram Index	2.16	0.50	1.13	0.99	1.87	1.28	2.08	0.48
	Foram Index EQS	High	High	High	High	High	High	High	High
Macrofauna	AMBI	1.38	1.39	1.40	1.42	0.56	1.55	1.51	1.54
	AMBI EQS	Good	Good	Good	Good	High	Good	Good	Good
	M-AMBI	1.01	0.95	0.98	0.88	0.87	0.87	0.85	0.88
	M-AMBI EQS	High	High	High	High	High	High	High	High
	J'	0.84	0.88	0.83	0.82	0.53	0.90	0.87	0.83
	J'MAMBI	0.85	0.83	0.81	0.73	0.46	0.79	0.74	0.72
	J'MAMBI EQS	High	High	High	Good	Moderate	Good	Good	Good