

CHEMICAL CONTAMINATION OF WESTERN COASTAL MEDITERRANEAN WATERS: THE MYTILOS PROJECT

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Abstract

The MYTILOS project aimed to draw up a preliminary report on coastal chemical contamination on a Western Mediterranean scale (continental coasts, Balearic Islands, Sicily, Sardinia, Corsica and Maghreb), on the basis of transplanted mussel methodology. MYTILOS project allowed to identify background levels between the different sub-basin and contaminated sectors. The most highly-impacted zones were mainly situated adjacent to urban and industrial centers and the outlets of major rivers. On a global scale we can observe that the levels in the Mediterranean Sea are in the same range than other area worldwide. Main differences are concerning the maximum values that are related to local high contamination.

Keywords: *Monitoring, Bio-Accumulation, Chemical Analysis*

Most monitoring programmes now include the use of biological indicators (1). This is based on the assumption that levels of trace contaminants accumulated in biological tissues represent the time and space integrated value of these contaminants in the surrounding waters. In the Mediterranean Sea, the specie *Mytilus galloprovincialis* is widespread, but in some locations natural populations are rare or absent. The transplantation method compensated this scarcity and allows controlling the source, age, and stage of sexual maturity of the samples (2). MYTILOS project has backed by the INTERREG III B / MEDOC programme, steered by Ifremer and backed by Toulon Var Technologies, in cooperation with the ICRAM, IEO, PSTS, IMEDEA, CSIC, Catalan water agency, INSTM, ISMAL, INRH and University of Agadir. MYTILOS has also backed by the PNUE/PAM - MEDPOL. Tree cruises (2004, 2005, 2006) deployed 149 stations during 3 month, between march and july along Western Mediterranean shores. A total of 124 stations were retrieved (82.5 %). All the results are expressed by mg or µg/kg dry weight of flesh. The distribution of lead was relatively homogenous, with a median value of 1.17mg/kg. However, two sites were pinpointed as being particularly impacted by lead: the Portosucoso industrial site in Sardinia, with a maximum of 8.25 mg/kg and the zone spanning Portman to El Portus in Spain from 5.3 to 6.25 mg/kg which was home to a thriving mining industry during the period of 1960-1990. Levels of cadmium were globally homogenous throughout stations, with a median of 1.28 mg / kg. A few stations showed relative peaks of around 2 mg/kg: Filicudi and Ustica stations in Sicily, Aguilas and Adra in Spain. Several sites impacted by mercury were recorded: first and foremost the Portosucoso site, with a maximum level of 0.31 mg/kg, witnessing significant contamination generated by a large industrial complex. Concentrations of nickel were around 1.1 mg / kg. Extreme values were found in some sampling sites in Sud West sub basin especially in Tunisia (Tabarka [3.18 mg/kg]) and, Algeria (Oued Zhor [2.89 mg / kg]). The median value of the sum of DDT's compounds was 3 µg/kg. Significant peaks were recorded in the North West and Tyrrhenian sub-basin specially in front of Marseille (15.47 µg / kg), Barcelone (15.17 g / kg) and Napoli (15.34µg / kg). Algiers also showed a high level (10.23µg / kg) equivalent to the overall levels recorded at stations in front of the following rivers: Ebre, Rhôrne and Tevere. Regarding the sum of the 10 congeners of PCBs, the distribution show a similar profile. The median value of the sum of PCBs compounds was 8,98µg/kg.

The results show the presence of sites impacted by PCBs, in Barcelona (63.87µg / kg), Marseille (103.52µg / kg), Napoli (91.48µg / kg) and Algiers (51.13µg / kg). This characteristic presence off the coast of major urban centres is further confirmed by values obtained in Sardinia at La Madalena (58.49µg / kg), situated adjacent to a major naval base.

Results relating to the sum of the 16 dosed molecules for PAH showed a median value of 44.4µg/kg. Two peaks have been identified at Marseille (105.5µg/kg) and Piombino in Italy (80.8µg/kg), adjacent to a large industrial complex. On the campaign scale, all measured contaminants showed equivalent levels to those recorded by the RINBIO network (2). This similarity related to both highest levels and background noise recorded at the 124 study stations. This method is also valuable in that it makes it possible to confront the data to that available on *Mytilus galloprovincialis* and *Mytilus edulis* while respecting equivalent biometric criteria. Comparison of these findings with data from the National Observation Network of the water quality on French coasts. Comparison of data among different studies, however, are generally complicated by substantial changes that have been made in the analytical methods, seasonality of sampling, number of congener for the organic compound and must be exercised with caution. On a global scale we can observe that the levels in the mediterranean sea are in the same range than other area worldwide.

Tab. 1. Baseline for Mytilos project, RINBIO, RNO network and worldwide data (in mg or µg/kg dry weight).

Location	Year	Species	Date	Pb (µg/g)	Cd (µg/g)	Hg (µg/g)	Ni (µg/g)	DDT (ng/g)	DDT's (ng/g)	CB 153 (ng/g)	PCBs (ng/g)	Fluo (ng/g)	PAHs (ng/g)	Reference	
West Mediterranean coast	2004-2006	Transplants of Murex	Median	1,17	1,29	0,09	0,94	0,5	3	2,2	1,90	1,75	44,4	This study	
			Min.	0,4	0,16	0,05	0,42	0,5	1,5	0,5	1,03	0,5	21,9		
			Max.	8,25	2,91	0,3	3,10	6	19,5	45,3	100,5	56	109,5		
French Mediterranean coast	2006	Transplants of Murex	Median	1,07	0,10	0,07	0,93	0,50	6,60	4,94	12,46	2,10	33,05	Andral 2007	
			Min.	0,20	0,04	0,02	0,47	0,50	1,50	0,50	1,47	0,50	10,50		
			Max.	1,44	2,67	0,23	2,40	8,40	70,2**	44,30	126,74	12,30	12,30		
French Mediterranean coast	1995-1999	Murex	Median	1,0	0,12	0,12	1,40		15,1	11,7		15,2		RNO 2006	
			Min.	0,1	0,2	0,04	0,47		1,07	1,97		2,19		240	
			Max.	10	0,61	0,41			83,2**	993					
French Atlantic coastal coast	1995-1999	Murex	Median	1,4	0,6	0,12	1,55		5,3	19,4		21,4		RNO 2006	
			Min.	0,4	0,10	0,03	0,48		0,63	0,46		4		245	
			Max.	9,5	3,00	0,53	6		36,6	495					
North Sea	1993	Murex	Median	2,55	0,46	0,21	4		40		56		56	Burgman 1993	
			Min.	1,0	0,3	0,1	3		10		30		30		
			Max.	6,2	2,69	0,29	19		100,1						
Baltic Sea	1997	Murex	Median	2	2,10	0,101	1,5							Steffen 2002	
			Min.	0,935	3,37	0,002	2,16	0,499		3,028		10,35		103,5	HQAA Heland et al 2004
			Max.	10,51	21,06	0,058	13,9	15,14		19,10		137,8		199,6	
California	2004-2005	Murex	Median	0,45	0,59	0,04	0,54		2		4,4		43	Kimberly et al 2003	
			Min.	0,46	0,40		1,3	0,77		1,34		19,3		Fouquet et al 2004	
			Max.	2,43	5,31		4,18	330		640		10		392,4	
Australia	1993	Murex	Median	1,45	0,07									Hayner 1995	
			Min.	0,7	0,02										
			Max.	5,7	0,02										

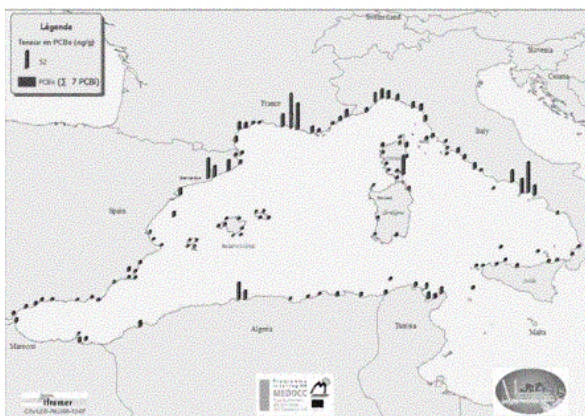


Fig. 1. PCB in mussels (ΣPCBi ng.g⁻¹ dry weight)

References

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