

AN ACTIVE BIOMONITORING OF ORGANOCHLORINATED COMPOUNDS IN THE EASTERN ADRIATIC COASTAL WATERS (CROATIA) USING CAGED MUSSELS

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Abstract

Within the framework of the MEDICIS programme, the regional project MYTIAD was undertaken in May-July 2008 to assess contamination along the coast of western and eastern Adriatic Sea. This research was a part of an interregional coastal water quality monitoring network in the Mediterranean basin based on active biomonitoring using caged mussels. In this paper, the distribution and levels of organochlorinated compounds (OCs) along Croatian part of the Adriatic Sea are presented. The possible influence of physiological parameters on OCs levels has been statistically examined.

Keywords: Adriatic Sea, Bivalves, Ddt, Pcb, Monitoring

Introduction

Since 1970s monitoring programmes were carried out to assess the quality of coastal environment. Therefore mussels have been successfully used as a good space and time-integrator of bioavailable contaminant fraction in the water. Active biomonitoring, i.e. transplantation of mussels from the same site and same population, provides comparable biological samples reducing possible sources of variation in the bioaccumulation process. Besides environmental parameters the resulting bioaccumulation in mussels is influenced by many physiological parameters such as lipid content and growth.

Materials and Methods

Using well-tested transplantation and caging technique [1], mussels of Italian origin, 16 month old and 50 mm length were immersed in plastic cages between 20 and 50 m at 12 locations along eastern Adriatic coast in May 2008 (Fig. 1). Mussel samples were collected after three months of immersion. Duplicate composite tissue samples (20 specimens) were freeze-dried, homogenized and Soxhlet extracted. The extracts were cleaned-up by concentrated sulphuric acid and passed through a florisil column for OCs separation. PCBs (IUPAC No. 28, 52, 101, 118, 138 and 180) and p,p'-DDTs were determined by GC-ECD.

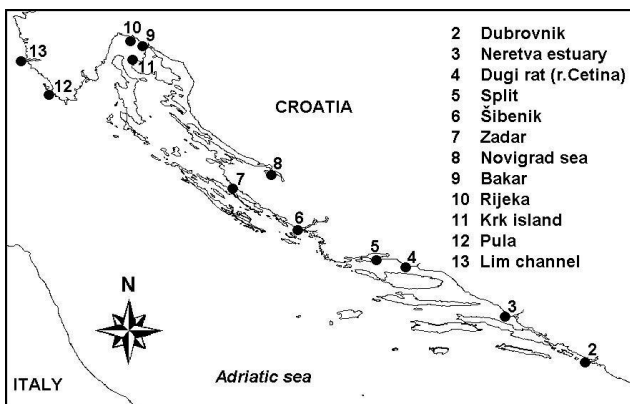


Fig. 1. Sampling locations of caged mussels along eastern Adriatic coast (Croatia).

Results and Discussion

The distribution pattern of OCs in the eastern Adriatic coastal waters (Croatia) was characterized by higher PCBs level in relation to DDTs (Fig. 2). PCBs concentrations ranged from 11 to 51 ng/g dw with the prevalence of congeners 153 (42%) and 138 (28%), followed by PCB 118 (12%) and PCB 101 (8%). The elevated PCBs concentration was found near urbanized and industrialized centres (Dubrovnik, Split, Bakar, Rijeka) with high wastewaters input. The concentrations of DDTs were low, ranging from 2.3 to 6.0 ng/g dw, being spatially almost uniformly distributed. p,p'-DDE metabolite dominated with mean amount for 66% of total p,p'-DDTs followed by p,p'-DDD (23%), suggesting a lack of recent DDT input into the research area.

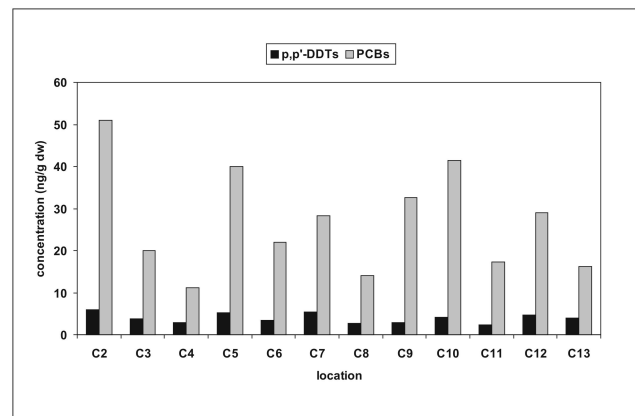


Fig. 2. Spatial distribution of p,p'-DDTs and PCBs concentrations at study area.

Statistical analysis revealed poor PCBs and moderate DDTs positive relationship with the percentage of hexane-extractable organic matter. Both PCBs and DDTs correlated positively and moderately with condition index of mussels. The OCs differences found in mussels were being primarily influenced by local sources of contamination rather than physiological parameters. The ratio of the contaminant concentration in mussels after and before immersion was lower than 1, indicating an adjustment of contaminant levels during the 3 months experiment. Then, the levels of target organic contaminants found in caged mussels were generally lower than those published for native mussels on the coast, being within the range of values usually found in low to moderately contaminated marine coastal areas [2]. The mussel transplantation can be useful and reliable technique for large spatial monitoring. This study pointed out the importance of collecting the initial mussels from a relatively clean area in order to achieve optimal monitoring results.

References

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