ORGANOTINS ACCUMULATION IN THE NORTH-WESTERN ADRIATIC SEA FOOD WEB INVESTIGATED BY STABLE ISOTOPES RATIOS (13C/12C;15N/14N)

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Abstract

The accumulation of tributyltin (TBT), dibutyltin (DBT) and monobutyltin (MBT) in the North-western Adriatic Sea food web was investigated by evaluating contamination and stable isotopes ratios (13C/12C; 15N/14N) in biota and sediments. Results showed higher contamination in estuarine areas as well as their accumulation with increasing trophic levels.

Keywords: Food Webs, Adriatic Sea, Pollution, Bio-Accumulation

TBT has been directly introduced in the marine environment due to its extensive use as biocide in antifouling paints [1]. Several studies reported various toxic effects and a widespread bioaccumulation of butyltins (BTs) in different species of marine and coastal ecosystems [2]. Accumulation of tributyl and triphenyltin compounds in marine food webs of coastal waters was reported, however it is still unclear whether biomagnification through food-webs occurs [3]. Recent studies have rapidly advanced the understanding of biomagnification profiles of environmental pollutants using 13C/12C and 15N/14N but their application to BTs is still limited [4]. Sediments and biota samples (zooplankton, bivalves, crustaceans, cephalopods, bony fish; total number of samples = 41) were collected in autumn 2008 in an estuarine-riverine and a coastal-marine area of the North-western Adriatic Sea. Analyses were performed in bivalves on whole soft tissues while in crustaceans, cephalopods and bony fish on muscle pooled from several individuals. Stable isotopes (13C/12C; 15N/14N) were analysed by a CHN analyzer coupled with Isotope Ratio Mass Spectrometer. BTs were analysed on freeze-dried samples by high resolution gaschromatography coupled with ion trap mass spectrometer (HRGC-MS^2) after ultrasonic solvent extraction, Grignard methylation and clean-up. values ranged between -28.22 ‰ and -16.56 ‰ with lower values in biota and sediments from the riverine-estuarine area compared to the coastal-marine ones. 15N/14N ranged from 4.74 ‰ to 13.88 ‰, with higher ratios recorded for bony fishes (both in the riverine-estuarine and coastal-marine area) compared to cephalopods, crustaceans, bivalvia and zooplankton. ΣBT (TBT+DBT+MBT) ranges in sediments and in biota were <10 – 83 and <10 –114 ng Sn g^{-1} dw (dry weight), respectively. TBT generally accounted for the major fraction (average ~40%) of ΣBT. Higher levels of contamination were observed in the riverine-estuarine samples. The significant negative correlation found between TBT, DBT, ΣBT and 13C/12C (Spearman rank correlation; R ranged between -0.38 and -0.46 $p<0.05$) in the higher taxonomic groups (crustaceans, cephalopods and bony fish) could reflect higher BTs contamination in the riverine-estuarine area. Bioaccumulation of BTs increased with the trophic levels as highlighted by the significant positive correlation between TBT, DBT, ΣBT and 15N/14N (Spearman rank correlation; R ranged between 0.40 and 0.43; $p<0.05$). Further work is in progress in order to confirm the biomagnification hypothesis with a greater number of samples and *taxa* allowing a comparison with the few studies based on a similar approach [4], [5].

References

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