

THE DETERMINATION OF ORGANOTIN COMPOUNDS LEVELS IN SEDIMENT SAMPLES FROM TURKISH AEGEAN SEA COAST

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Abstract

In this study, from the North to the southern part of all the Aegean Sea coast line predetermined from 9 stations, the sediment samples were collected during summer-winter period in 2009 and organotin compounds (OTC) concentrations were detected at the ng g⁻¹ Sn dry weight (d.w.) within sediment. In this way, effects of the most important organic tin contamination points of maritime activities in the Aegean Sea were tried to determine in the coastal zone along the Turkish Aegean Sea.

Keywords: Aegean Sea, Coastal Waters, Sediments, Trace Elements, Pollution

INTRODUCTION

The purpose of the present study is determined OTC levels and assess the hot spots at the most important maritime points along the Aegean Sea. There are considerable maritime activities along the Aegean Coast, relating the heavy maritime activities, e.g., fishing and yachting.

Hence their high atomic weights and low aqueous solubilities, OTC tend to adsorb onto particles and sink directly onto the sediment, here it accumulate and release into water column by re-suspension of particles. Although its extremely hazardous to aquatic ecosystem, there are very few data for OTC levels and its detrimental impacts on the marine environment of Aegean Sea.

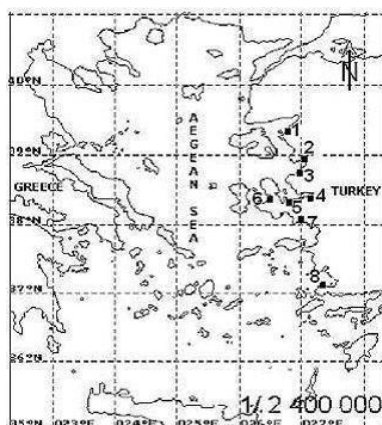


Fig. 1. The Map of the Sampling Locations

MATERIAL AND METHOD

Aegean Sea is 380 miles (612 kms) long and 186 miles (299 kms) wide with 83,000 square miles (215,000 square km) total area. It is located between 41-45 N latitude and 23- 27/28 E longitude [1]. Sediment samples were collected from 8 predetermined stations from northern stretch of Aegean Sea, Ayvalik Marina to southern stretch Bodrum Marina along the coastal zone between March 2009 and August 2009 (Fig.1.). Reference stations determined relatively far from the maritime activity where human and marine environment engaged as in beaches and piers.

Sediment samples were collected by standard (6x6x6) stainless steel Ekman Grab. Sample analysis carried out GC/MS, HP Agilent 6890 coupled 5973N Mass Selective Detector [2] (non-detected-nd. limits for MBT, DBT, TBT were 0.003, 0.001, 0.001 ng g⁻¹ Sn respectively).

In order to quality control of the analytical results CRM-462 (Coastal Sediment for Butyltins) is provided from IRMM (Institute for Materials and Measurements) and analysis of CRM-462 proved that the method is able to accurately determine OTC.

RESULTS AND DISCUSSION

As a result of winter sampling the highest Σ butyltin level was detected from the station 2 (1752.4 ng g⁻¹ Sn). The lowest Σ butyltin level was measured from the station 5 (nd.). Mean concentration of Σ butyltin for overall stations was 1091.5 ng g⁻¹ Sn. The highest concentration of Σ butyltin was detected in station 1 (1464 ng g⁻¹ Sn) and the lowest was measured at the stations 7, 3, 4, 5 from the reference points (nd.). Mean concentration of Σ butyltin for overall

reference points was 495.9 ng g⁻¹ Sn.

At the end of the summer sampling, the highest total Σ butyltin level was seen in station 2 (4278.4 ng g⁻¹ Sn). The lowest Σ butyltin level was measured at station 5 (983, 6 ng g⁻¹ Sn). Mean concentration of Σ butyltin for all stations was 2691,2 ng g⁻¹ Sn. For the reference stations the highest and lowest levels of Σ butyltin was measured 2207,6 ng g⁻¹ Sn for station 4 and nd. for station 7 respectively. Mean concentration of Σ butyltin for all reference stations was determined as 1343.9 ng g⁻¹ Sn. High levels of tin compounds measured in summer-winter period along the Coast of Aegean Sea may be the results of the numerous marinas (operating 100% or more capacity almost all year long) and strong adsorption tendency of TBT. Additionally, high concentrations of TBT suggesting the illegal usage of TBT-based anti-fouling paints, on ships smaller than 25 m [3]. Furthermore, ongoing contamination of Aegean Sea could be consequence of leaching from the boat, painted before the ban, or the compounds' long-lasting effectiveness time (5-7 years) [4].

Tab. 1. Reported OTC' levels from the world (ng g⁻¹ Sn d.w.) [4]

Sampling Areas Regions	Levels of OTC (ng g ⁻¹ Sn)		
	MBT	DBT	TBT
Marinas of the U.S.A.			
East-West Canada Coast	nd.-330	nd.-100	nd.-5100
Crystal Lake, USA	21.3-320	69-360	1.5-14000
Asian Marinas			
Osaka Harbor	nd.	nd.	10-2100
Malaysian Coast	5.0-360	3.8-310	2.8-1100
West coast of India	n.a.	nd.-469	5-2384
Vietnam Coast	3.9-30	8.1-42.7	8.3-51
European Marinas			
North-west Sicily coastline	nd.	nd.	3-27
Portuguese coast	5.2-78	5.3-65	3.8-12.4
North coastline of Spain	860-2870	150-710	50-5480
South-west of France	1.0-125	nd.-87	nd.-89
Marinas of Turkey			
Aegean Sea (In this study)	nd.-2598	nd.-1371	nd.-3008

Survey researches from all over the world reported that organic tin pollution is still a matter of concern. The two-way researches revealed that there are still significant TBT pollution along coastal zones of Pacific, Atlantic, Indian Oceans and of marinas and harbors. In conclusion; comparing the levels between measured OTC levels along Turkey coast of Aegean Sea and Mediterranean Marinas' former's levels are rather high (Table 1.). At the end of the results, we determined that the total TBT concentrations in the sediment samples showed the significant spatio-temporal changes .

References

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