ORGANOTIN LEVELS IN MARINE ORGANISMS FROM EASTERN AEGEAN COAST (TURKEY)

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Abstract
The average concentrations of TBT ngSn g⁻¹ were found as 235 in fish, 116 in mussels and 635 in barnacles. All mussels sampled showed values of TBT+DBT, which were below the "tolerable average residue level (TARL)" as currently accepted. Barnacles have high potential as biomonitors for the presence of organotin in the Aegean Sea.

Keywords: Aegean Sea, Fishes, Bio-accumulation

Introduction
Since the early 1960s organotin compounds (OTs) have been used for several purposes, such as polyvinyl chloride stabilizers, fungicides and as antifouling agents in ship paints [1]. Many countries worldwide have banned the application of TBT-based paints to small vessels (<25m) and butyltins have been identified as priority hazardous substances [2]. Due to the ongoing legislative restrictions, various studies worldwide have shown a slow decline on TBT contamination [3]. There have been a few studies on the distribution of OTs in Turkish coastal areas. This study aims firstly to create a baseline regarding organotin levels in mussel, barnacle and fish tissues; secondly to gather more information on the use of selected species as biomonitors and finally to evaluate potential risks for butyl tin species contamination in seafood along the Eastern Aegean coast as sampled in 2009.

Material and Methods
In the present study, different marine species were sampled for BTs analysis in terms of their different feeding strategies. Samples were collected from the Saros, Candarli and Izmir Gulfs along the Eastern Aegean coast, during 2009. Marine biota samples were analysed according to Cassi et al. [4]. Mussel (ERM-CE477) sample was used as a control for the analytical methods.

Results and Discussion
TBT concentrations ranged between 134-368, 186-275, 157-198, 181-260, 276-327 ng Sn g⁻¹ ww for M. barbatus, D. annularis, M. merluccius, S. vulgaris, P. erythrinus, respectively. Total BTs concentrations, and in particular the TBT, in barnacles were generally higher (396-1163 ng g⁻¹ww) than those monitored in the mussel and fish species sampled along the Eastern Aegean coast. MBT was the dominant species in mussels, fish and barnacles. This may indicate that MBT is derived not only from the dominant breakdown product of TBT degradation but also from other sources, such as city sewage, industrial wastewater etc. Based on average seafood consumption for Turkey, TARL was found to be 680 ng TBT g⁻¹ (279 ng Sn g⁻¹). A comparison of the results of the present study with the TARL indicated that three samples for fishes were found to exceed the TARL when only TBT is considered. Only S. vulgaris samples were below the TARL if both the sum of TBT+DBT and TBT were considered. For mussel samples, whole values were below the TARL, thus confirming that this group is the one posing no risk for consumers. But, in contrast all barnacle samples exceeded the approved TARL.

Conclusion
Tolerable Average Residue Levels of TBT+DBT based on the average weight of 60 kg exceeded in 50% of the fish sampled. The levels of organotin compounds derived seafood in the Eastern Aegean Coast of Turkey constitute “a risk to humans” as presently defined. Although bivalves are the most commonly used organisms as biomonitors, this study showed that barnacle A. amphitrite may be considered among the most sensitive organisms for biomonitoring programs due to their high accumulation capacity for absorbing BT compounds from their surroundings.

References