A PRELIMINARY STUDY ON MARINE LITTER IN THE AEGEAN SEA

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Abstract
Solid Marine Wastes present on the seabed and floating on the sea surface were investigated in the Aegean Sea. Compared to other locations in the Mediterranean, litter concentration on Northern to Mid Aegean Seabed is moderate even in populated gulfs, whereas floating marine debris concentrations are low and dominated by recreational items, probably restricted to summer season.
Keywords: Aegean Sea, Plastics, Pollution

Solid waste materials (SMW) in the marine environment have become an important pollution issue with impacts on marine life and negative economic impacts. Only one study on litter has been conducted in the Aegean Sea [1]. The Aegean has, isince 1st May 2009, the status of "Special Area" under Regulation 5 of Annex V (MARPOL) which prohibits any discharges of garbage in sea. Regarding land-based pollution, the Barcelona Convention and its relevant protocol is the most effective international instrument.

SMW present on Northern to Mid Aegean Seabed were investigated in August, October and December 2008 (Fig. 1). Litter items were collected by trawling in depths ranging from 65 m to 880 m. Litter items caught in nets were collected, dried, separated, counted and weighted. The swept area method was applied for the calculation of the amount of litter on seabed. Floating Marine Debris (FMD) sightings were also recorded during August 2008 cruise by an observer with a handheld GPS and binoculars. The strip transect method (width=60m; length= distance of legs in km) was used in order to determine the abundance of FMD.

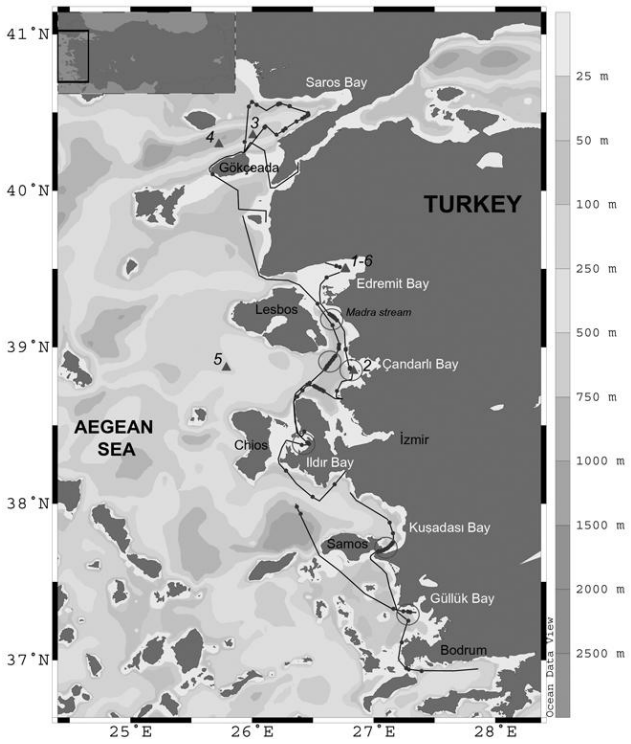

Fig. 1. Map of the study area. Small circles = FMD observations (n= 140). Triangles = trawling stations (1-6). Large circles = FMD tufts.

FMD were observed mainly in areas close to land (1,75–3,52 items/km^2) whereas offshore areas were generally clean of litter (0–0,18 items/km^2). However we should specify that one of the offshore transects was run under poor weather conditions. There is a significant correlation between the number of items and distance from land (r_s=-0,86). FMD were widespread in gulfs and some places seemed particularly concentrating litter items causing tufts of litter (Fig. 1). The highest abundances were found in the Dikili Strait located between Lesbos (Midilli) Island and Madra Stream-Altinova.

Accordingly bottom ML were mainly abundant in gulf areas (299,98-211,75 items/km^2; 27,6-2,85 kg/km^2) whereas the abundance of SMW was very low (48 items/km^2 and 2,26 kg/km^2) in the open sea location between Lesbos and Chios (Sakiz) Islands. Litter pollution in gulfs is significant and similar to other sites in the world but lower than other locations in the Aegean Sea [1] and Black Sea [2]. SMW pollution is not very high compared to the value of 1935 ± 633 Items/km^2 which is estimated for the NW Mediterranean [3].
The highest values of FMD reported in this study are considerably low compared to other locations in the Mediterranean (2000 items/km^2, [4]; 1,5-25 items/km^2, [5]) and in the world (1-250 items/km^2, [6]). It is interesting to find such low values for the Aegean Sea which is an enclosed sea within the Mediterranean and an area of recreation and fisheries. ML tufts observed in gulfs make 1/3 of all litter items and could be the result of convergence zones of wind induced Langmuir cells. This natural collection system could facilitate the removal of ML in high season when FMD values arise.
Plastics were the dominant material type among both bottom (84,13%) and surface (75%) SMW. Most of litter items on seabed were nylon bags and wrappings whereas FMDs consisted of recreational items such as plastic sea beds and sea balls, followed by plastic bags, PET bottles and food wrappings. The recreational origin of most FMD items indicates a probable restriction to the summer season. Litter items seem to have mainly land-based origin considering their types and usage categories. Other litter sources could be fish farms (items such as fish feed bags and sacks were found) and pleasure boats. Only 5 items had labels readable on and 2 of them were overseas garbage.

This study reports low to moderate levels of bottom and floating ML pollution for some locations in the Aegean Sea. Although this result is promising, the limited number of stations and transects of this preliminary study does not allow to make a general conclusion on Aegean Sea ML pollution. More studies and monitoring programs are necessary in order to estimate pollution levels and develop appropriate mitigating solutions in the Aegean Sea.

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