

# LITTER COMPOSITION AND SOURCE IDENTIFICATION FOR 80 BEACHES IN GREECE

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## Abstract

Composition of beach litter was assessed for 80 beaches in Greece, with the participation of the volunteers of the international campaign "Clean up the Med 2006 & 2007", coordinated in Greece by the N.G.O Mediterranean S.O.S. This study showed that plastic is the dominant litter material, followed by paper and aluminium. Furthermore, public participation in beach litter surveys is proposed as an appropriate method to promote environmental awareness.

*Keywords: Pollution, Beach, Coastal Management, Eastern Mediterranean*

## Introduction

Although numerous studies have been carried out on marine debris globally, in Greece marine litter research is very limited [1]. The aim of this study is to (i) evaluate beach litter composition, for the first time in Greece for a significant amount of coasts (80), with the participation of volunteers [2] and (ii) explore the relations between the different litter materials and marine and land – based beach litter sources.

## Methods

For the purposes of the present study, data were collected with the collaboration of volunteers who participated in the "Clean Up The Med 2006 & 2007" Mediterranean campaign of voluntary beach clean - ups, that is coordinated by the Italian N.G.O. Legambiente and for Greece by the environmental N.G.O. Mediterranean S.O.S. In Greece, thousands of volunteers (2006: 10,938, 2007: 15,748) participate each year in the Clean up the Med campaign that not only aims at physical removal of beach debris, but also at raising public awareness and education on marine pollution issues, through dissemination of informational material as well as a questionnaire, the "Beach Observation Questionnaire" (B.O.Q). The B.O.Qs, which were filled in from the volunteers during the clean - up, acquire qualitative information regarding the probable beach litter sources, as well as litter composition data. The volunteers counted and classified the items of litter found in the beaches according to their composition, in eight categories: glass, plastic, paper, aluminium, other metals, rope, building materials and other materials (Table 1). The "other materials" category was excluded from the data processing for reasons of results interpretation. B.O.Qs from 49 beaches were processed in 2006 and from 31 beaches in 2007 (Fig.1).



Fig. 1. Map showing the 80 beaches (dots) studied in Greece.

The qualitative information includes the litter sources that affect each beach. Litter sources were distinguished in two major groups: land – based and

marine – based. Land – based litter sources, were separated in two minor groups: a) sources that are involved with recreational activities that usually take place on the beach (e.g. bathing) and b) sources that do not interfere directly with recreational activities, such as rivers, municipal drainage systems, ephemeral streams and sewage inputs, refuse dumps. Marine – based litter sources were separated in: a) sources referring to commercial and recreational fishery and b) sources concerning with navigation (merchant ships, ferries and recreational boats).

## Results and Discussion

Plastic was the dominant litter material (Table 1) in the majority (69 beaches) of the beaches that were surveyed, in accordance with the global tendencies [1, 3]. Plastic dominance was followed in both periods by paper and aluminium. However, in 11 out of 80 beaches paper was the most abundant material indicating recent pollution [3]. In two beaches the dominant litter material was aluminium and in one beach building materials suggesting local influence. The qualitative information in combination with the litter composition data, showed that the majority of beaches (56) were polluted by recreational activities while the most dominant marine based litter source was navigation (46 beaches). Moreover, land based sources that do not relate with recreation; seem to pollute the beaches with building material; while fishery appears to be responsible for metallic (apart aluminium) items of litter on the Greek surveyed beaches. The present large scale study would not have been achieved without the participation of volunteers whose involvement in coastal management issues can lead to environmental awareness [2].

Tab. 1. Mean values of the litter material categories. "Other metals": litter made of any metal but aluminium; "Building materials": material used for construction; "Other materials": litter that cannot be classified in any of the other categories.

Litter Material Categories	2006 Mean (%)	2007 Mean (%)
Glass	5	6
Plastic	43	51
Paper	13	18
Aluminium	12	7
Other Metals	4	3
Rope	8	6
Building Materials	5	2
Other Materials	10	7

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