

# SYSTEMATIC BEACH STRANDED LITTER MONITORING AND SOURCE ESTIMATION IN TWO CONTRASTING BEACHES IN W. GREECE, EASTERN MEDITERRANEAN

T. Tsokou<sup>1</sup>, S. Kordella<sup>1</sup>, M. Geraga<sup>1</sup>, H. K. Karapanagioti<sup>2</sup> and G. Papatheodorou<sup>1\*</sup>

<sup>1</sup> University of Patras, Department of Geology - gpatathe@upatras.gr

<sup>2</sup> Department of Chemistry University of Patras, Greece

## Abstract

Beach litter (BL) were monitored and their sources were estimated in two contrasting beaches in Western Greece, using the master list of categories of the TGML/JRC guidance document. This study proved that plastic is the dominant litter material (75%-92%) while plastic caps from water/beverage bottles and cigarette butts are the most abundant litter types per item in each beach, respectively. Urban/domestic activities, recreational activities, and fishery comprise the main litter sources.

*Keywords: Pollution, Beach, Plastics, Gulf of Corinth, Mediterranean Sea*

## Introduction

Marine litter are identified as a global environmental issue that poses a threat to marine ecosystems and negatively affects marine-based human activities. In this study, the results of the systematic BL monitoring and source identification in two beaches are presented; Dafnes (A) and Agios Vassilios (B) located in Western Greece, in Gulf of Patras and of Corinth, respectively (Fig.1). These two beaches are characterized by different geomorphological settings and uses. More specifically, beach A has been formed by an ephemeral river that flows to the Gulf of Patras and is a non organised and occasionally recreational beach, while beach B is a popular, organised, touristic beach. Both beaches are mainly composed of pebbles.

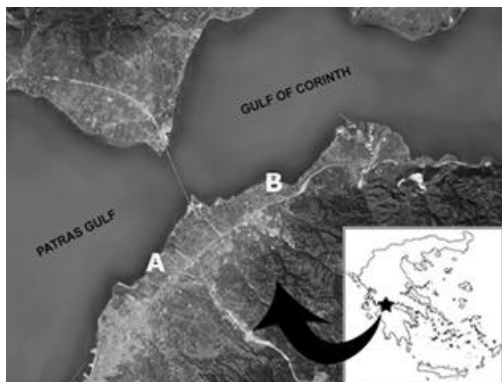


Fig. 1. Map showing the location of the two studied beaches; A and B.

## Methodology

All BL were collected from each beach almost on a weekly basis during winter/spring and summer period; from December 2014 to March 2015 and in August 2015. All BL (>2.5cm) were counted and classified in terms of litter type according to the master list of categories of the TGML/JRC guidance document [1]. All data were statistically processed, and source indicative litter types were clustered, in order to identify the main litter sources in each beach and monitoring period (winter/spring and summer).

## Results

A total number of 937 and 6,977 litter items was counted in beaches A and B, respectively. Higher BL abundance was identified during the winter/spring months (Fig. 2). Plastic was the dominant material in both beaches (A:75%; B:92%) in accordance with a previous study performed on Greek beaches [2]. In beach A, plastic caps (16%) from water/beverage bottles, appeared to be the most abundant litter item, followed by straws and stirrers (12%), plastic bottles >0.5 L (12%), and plastic bags (11%). This beach appears to be affected by a combination of recreational activities, stemming from the high abundance of litter related to that source (beverage containers, food packaging) [2] and domestic activities, based on a high abundance of litter items related to domestic use (plastic bags, home use products) [2]. The two sources contribute almost equally during winter/spring (~13%). Whilst, pollution related to recreation was found to

affect the beach strongly during August contributing with 38% of total litter items, as opposed to domestic activities that have a much lower effect during the summer (6%). In beach B, the dominant litter type was cigarette butts (52%), followed by plastic caps (10%) from water/beverage bottles, and straws and stirrers (8%). The main litter sources seemed to be recreation activities, which is the dominant source in all monitoring periods, contributing with 12-25% of all BL items, followed by fishery, with ropes, nets etc. contributing with 3% of BL, and urban/domestic sources contributing with ~1% of all items. In beach B, much higher abundance of the total amount of BL, from all 3 sources, was observed during the winter/spring period (6,773 items) than in August (204 items), due to beach cleanings performed on this popular swimming beach during the summer. Both beaches show the same tendencies (Fig. 2; highest and lowest values) during the winter/spring months, showing that they both are affected by the same meteorological and oceanographic regime (predominant direction of wave propagation, longshore currents), due to their proximity. The different geomorphological setting and use of each beach is apparent from the contribution of each BL source. In beach A, although the main littering source is recreation throughout the monitoring periods, the contribution of urban sources, is much higher than in beach B, especially during the winter/spring, probably due to the ephemeral river. In beach B, there is a much higher abundance of BL related to recreational activities and there is a lower contribution of urban sources than in beach A.

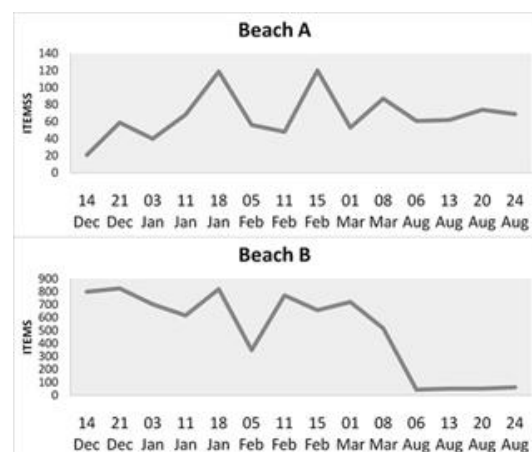


Fig. 2. Chart showing total litter items per beache in each recording date.

## References

- 1 - Galgani et al., 2013b. Guidance on Monitoring of Marine Litter in European Seas. MSFD Technical Subgroup on Marine Litter (TSGML).
- 2 - Kordella, S. et al., 2013. Litter composition and source contribution for 80 beaches in Greece, Eastern Mediterranean: A nationwide voluntary clean-up campaign. *Aquat Ecosyst Health Manag* 16 (1) 111-118.