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Assessment of marine debris on the coastal wetland of Martil in the North-East of Morocco

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ABSTRACT

Plastic waste at the coastal wetland in Martil beach in the North-East of Morocco is one of the problems that have appeared recently. This study aims to characterize the marine debris in the coast of Martil during the year 2015. The sampling is seasonally by type and size. The result shows, for the macro debris, the abundance of plastic (57%), lumber and paper (21.93%), cloth and fabric (7.8%), glass (5.42%), metal (4.40%), and rubber (3.4%). Micro debris is also present in the area in several forms such as wood, plants, and others by 75.63%. This was followed by the foam (26.95%), line (7.8%), and the film (1.23%). The seasonal variation (S1: January–March and S3: July to September) are the most polluted months of the year. The sources of marine debris are mainly tourism (beach users), land (run off), and commercial fishing in the four seasons of the year.

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1. Introduction

Marine debris refers to solid materials such as plastic waste on the beaches, resulting from human activities which threatens the coastal environment and affects the ecosystem health (Andrady, 2011). There are many types of pollution. However, plastic waste is one of the main types that became a global problem. This is particularly true for plastic waste in the marine environment, which can travel long distances, carried by currents or transported by (wildlife) which ingest it or become entangled in plastic. However, studies that are interested in this topic shows that the prescience of plastic waste in the sea is mainly due the land-based sources (Andrady, 2003). About 60–80% of the waste found on beaches, floating on the ocean on the sea bed, are plastic (Artuchelvi et al., 2008; Auman et al., 2004). Sources of plastic waste vary by region. For example, shipping and fisheries are significant contributors to the Mediterranean, North-East Pacific (Baird and Hooker, 2000). Therefore, tourism is a major source in the Mediterranean coastal region. More types of plastic take a long time to be biodegradable, against other types which are easy to degrade. They include landfill, but it is uncertain if this will occur under other conditions especially in oceans when the temperature is lower (Barnes and Milner, 2005). Even if it is plastic biodegrades, it will temporarily break into smaller fragments. This will then produce the so-called “microplastic”. However, the degradation process depends on chemical composition, molecular weight, additives, environmental condition, and other factors (Barnes et al., 2009).

Full degradation into carbon dioxide, water, and inorganic molecules is known as mineralization (Barreiros and Barcelos, 2001). Based on research till date, most commonly used plastic do not mineralize in the ocean, but instead they break down into smaller and smaller pieces.

Studies have shown that marine life, including seabirds, sea turtles, fish, marine mammals, and sharks, eat plastic (Beatriz et al., 2000; Boerger et al., 2010; Bouzid et al., 2011; Cliff et al., 2002; Cooper and Corcoran, 2010; Corcoran et al., 2009). However, no study has yet described in detail the physical damage caused by the ingestion of the plastic. Plastics could cause irritation or damage to the digestive system. The ingestion of inert, indigestible marine debris, has been documented to result in the obstruction of the digestive tract, mouth, and stomach lining of various species (Artuchelvi et al., 2008). Some obstructions can prevent organisms from taking in food, which can result in nutrient deficiency and starvation (Derraik, 2002). Therefore, the aim of this study is to determine the extent of pollution by studying solid and plastic waste, its types, intensity, and its sources. This is done through sample collection, sorting, classifying, and processing of the data on the costal Martil of Morocco. Furthermore, the second objective of this study is to determine the sources of marine debris in the Martil beach using recent methods by calculating the sources of waste by season.

2. Material and methods

2.1. Study area

Martil is a sea resort located at the North-East of Tetouan, Morocco, in the Mediterranean Sea. The resort constitutes the end of the Martil Valley. This is in the region of Tangier-Tetouan which is located

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Fig. 1. Martil beach in Morocco where samples were collected by season for each. (Source Google Map.)

in Morocco (GESAMP, 1990). It has coordinates: 35°37'N 5°16'W/ 35.617°N 5.267°W. In order to evaluate better the plastic pollution on the beach, we selected a section at the tidal region by a length of 100 m. Then, we divided that section into four transects (A–B–C–D) by a length of 25 m. Each transect was divided into five parts by a length of 5 m. Consequently, these transects were classified (1–5). After that, we put long and wooden marks (sticks) among the transects and short wooden marks (sticks) among the transects.

2.2. Samples collection

2.2.1. Macro debris

To obtain good results in the future, we collected 16 samples during four seasons in the year 2015. In each season, we took 4 samples we chose on the part from each transect (A–B–C–D) randomly. Also, there were a number of volunteers. Each one collected all the solid wastes that were found at their parts. Also, they were placed in large bags

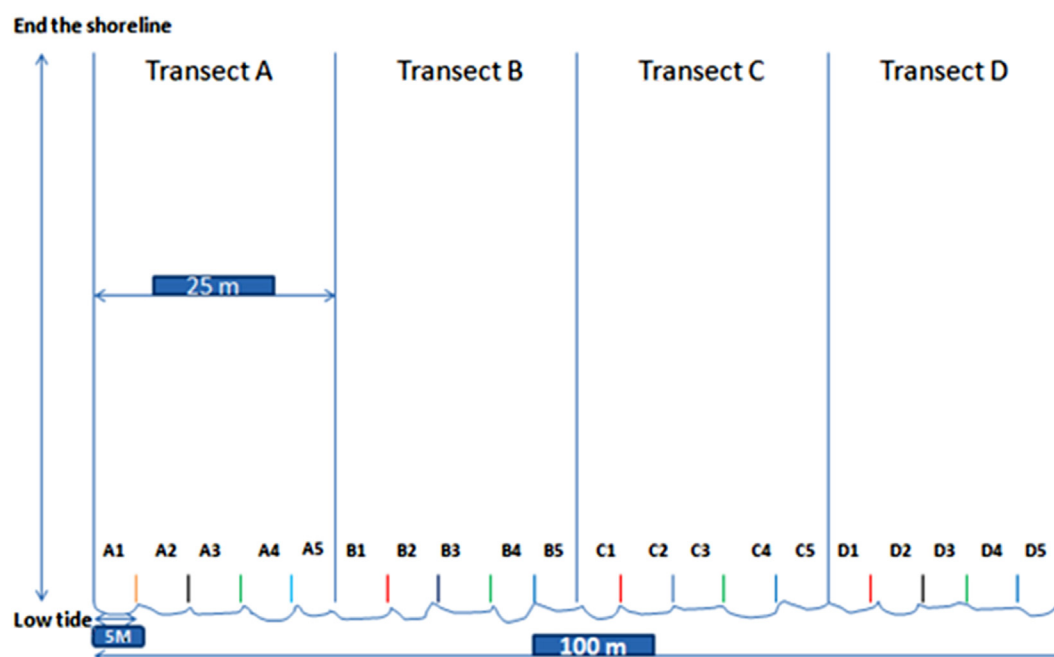


Fig. 2. Random sampling from the Martil coast (transects 4 = 4 samples/season).

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