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ScienceDirect
Marine Pollution Bulletin 52 (2006) 957–961
MARINE POLLUTION BULLETIN
www.elsevier.com/locate/marpolbul

Note

Ideal width of transects for monitoring source-related categories of plastics on beaches

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Abstract

Although there is a consensus on the necessity of monitoring solid wastes pollution on beaches, the methods applied vary widely. Therefore, creating, testing and recommending a method that not only allows comparisons of places and periods, but also the detection of source signals, will be important to reach the objectives of the source-prevention principle. This will also allow the optimisation of time, resources, and processing of samples and data. A classification of the items found into specific categories was made according to their most probable source/use (fisheries, food packaging, hazardous, sewage/personal hygiene, beach user, general home). This study tested different widths of sampling transects to be used in the detection of plastics contamination on beaches, until all the categories were significantly represented. Each transect had its total width (50 m) sub-divided into eight intervals of 0–2.5 m; 2.5–5 m; 5–10 m; 10–15 m; 15–20 m; 20–30 m; 30–40 m; and 40–50 m. The accumulated number of categories in the 50 m (up to 2.5 m; up to 5 m and so on) was used to determine the minimal width necessary to qualitatively characterize the area regarding plastics contamination. The diversity of the categories was directly related to the area of the sampling transect. These results indicate that a significant increase in the number of categories in the first intervals tend to stabilize from 15–20 m onwards.

Keywords: Solid wastes; Beach contamination; Plastics on beaches; Sampling methods; Transects; Source-related categories

Plastics, rubber, polystyrene and nylon constitute the largest fraction of marine debris (Araújo and Costa, 2006, 2005, 2004; Silva-Iñiguez and Fischer, 2003; Derraik, 2002; Debrot et al., 1999; Thornton and Jackson, 1998; Garrity and Levings, 1993; Laws, 1993; Ross et al., 1991). These are one of the five main concerns to be tackled in marine pollution at global level (Gregory, 1999). Plastics have easy dispersion (low density), slow accumulation, persistency, increasing supply with time and broad dissemination (Derraik, 2002; Gregory, 1999; Dixon and Dixon, 1981).

Lists of solid wastes on beaches have limitations, and focus on the litter only from the raw material point of view, and do not consider their most probable source (Earll et al., 1997). Although there is a consensus on the necessity of monitoring solid wastes pollution in the aquatic environments, the methods applied in qualitative and quantitative studies vary widely. Probably, this is due to beaches themselves being variable in use and nature.

Most assessment methods of beach contamination by solid wastes (Velander and Mocogni, 1999; Earll et al., 1997; Ribic and Ganio, 1996; Rees and Pond, 1995; Dixon and Dixon, 1981), do not worry about the transference of the method or standardization of measures to allow comparisons of experimental and managerial results. A method that not only allows comparisons of places and periods, but also the detection of source signals, will be important to reach the objectives of the source-prevention principle. This will also allow the optimisation of time, resources, and processing of samples and data.

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0025-326X/$ - see front matter © 2006 Elsevier Ltd. All rights reserved.
doi:10.1016/j.marpolbul.2006.04.008

This study aimed to test different widths of the sampling transects to be used in the detection of plastics contamination on beaches, through the classification of the items found into specific categories, according to their most probable source/use.

Tamandaré beach has 9 km (Fig. 1), and is an important ecological and tourist area 100 km south from Recife, Pernambuco State Capital. The littoral is part of two marine conservation units, which include areas of the Atlantic Rain Forest, mangroves, estuaries, coastal reefs and continental shelf. The two main sources of solid wastes are beach users and the nearby rivers (Araújo and Costa, 2006, 2005, 2004). From September to March, tourists and holiday makers increase the population to 76,500 inhabitants (4.5 fold), increasing the amount of solid wastes and sewage produced. The solid wastes collected in the region are deposited in unplanned open-air landfills causing social, sanitary and environmental problems. Tamandaré receives river runoff at its north and south limits. Una River drains 32 urban centres and represents a permanent source of coastal pollution, degradation of the biological resources and threat to tourist activities (Fig. 1). Varzea do Una beach, at the mouth of Una River was also studied (Fig. 1). This second sampling area is inhabited by fishermen, and not used by tourists.

Four sampling transects (A, B, C and D) were delimited at Tamandaré beach (Fig. 1) based on the different morphodynamical characteristics of the beach, frequency and density of its use, presence of vegetation and level of urban occupation. Transects A and B are little frequented, and dunes are well preserved. Transects C and D are intensely visited during high season. Transect D has the dunes completely taken by urban occupation. At Várzea do Una beach only one transect (E) was delimited.

Each transect was 50 m wide, and run from the frontal dune to the water line at low tide. The beach is then approximately 50 m long and the total area of each transect was approximately 2500 m^2. Sampling took place in 2001 and 2002, during 10 months at Tamandaré beach and six months at Várzea do Una beach.

The marine debris in the area are predominantly plastics (>80%) (Araújo and Costa, 2006, 2005, 2004). In the present work it was decided to work with this fraction only, classified and grouped into categories according their most probable source: fisheries, food packaging and disposable utensils, hazardous, sewage and personal hygiene, beach user, general home.

Each transect had its total width (50 m) sub-divided into eight intervals (0–2.5 m; 2.5–5 m; 5–10 m; 10–15 m; 15–20 m; 20–30 m; 30–40 m; 40–50 m). The amount of categories present in each interval was recorded. The accumulated number of categories was used to determine the minimal width of a transect necessary to qualitatively characterize the area regarding plastics contamination (Earll et al., 1997).

To determine if the presence of the selected categories was dependent on transect width, and evaluate from which point onwards there was a stabilization of the number of

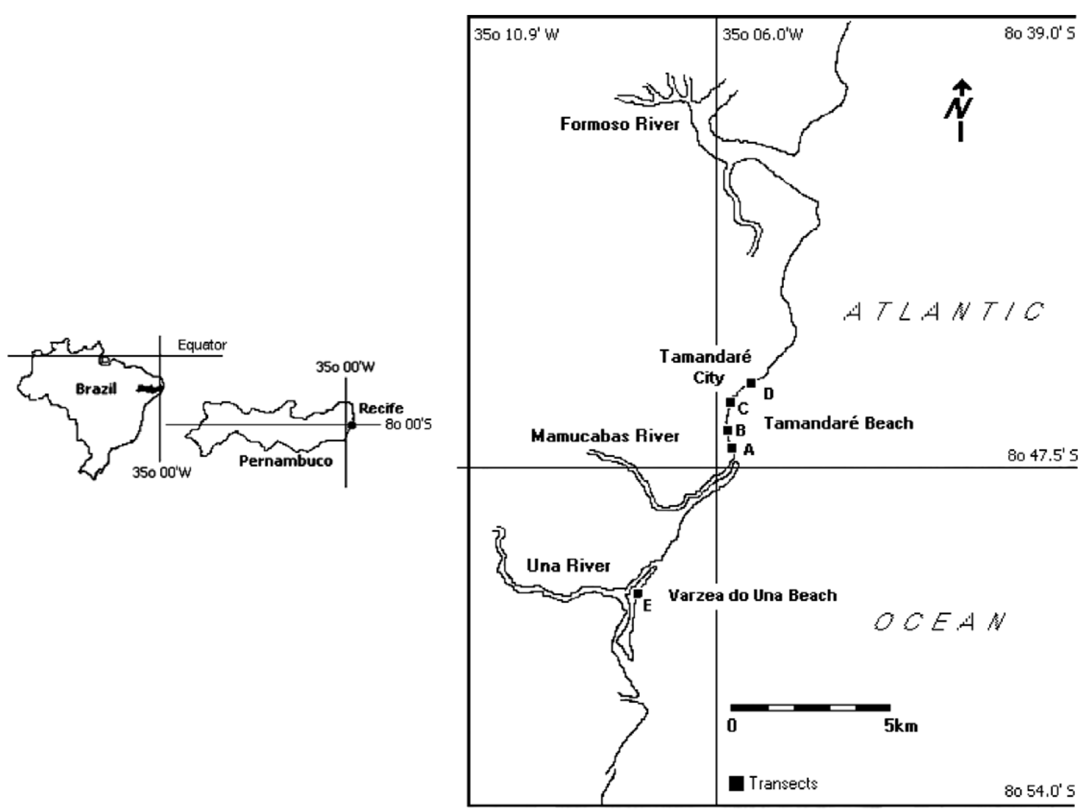

Fig. 1. Map of the area showing location of the sampling transects (A, B, C, D and E).