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Can persuasive and demonstrative messages to visitors reduce littering in river beaches?

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ABSTRACT

Littering of public areas is a significant problem worldwide. Here we evaluate the success of persuasive and demonstrative messages at reducing littering in highly visited river beaches in Argentina. We made an intervention at the beaches which consisted of a personalized verbal request asking visitors to take their litter to the waste cans (persuasive message) while they were exposed to the example of picking up the litter already left on the beach (demonstrative message). We conducted 102 observations distributed over 29 dates, two years and four beaches. Each observation consisted of three or four rounds: before the presence of visitors we cleaned the beaches, during the stay of visitors we made the intervention (once or twice) in two out of the four beaches, and early next morning we estimated the amount of litter left per beach. Litter weight ranged from 0 to 53 g visitor^{-1} day^{-1}. Littering per visitor was reduced an average of 35% due to the intervention ($p = 0.049$). We also found differences among beaches ($p = 0.001$), and an increase in littering with crowding ($p = 0.005$). We show for the first time that the personalized request combined with the example of picking up litter is effective in reducing littering in a Latin American country.

1. Introduction

The deterioration of the environmental quality of beaches and natural areas as a consequence of inadequate waste disposition by visitors is a worldwide problem, which has been aggravated in the last decades because of an increase in tourism and population (Rodriguez-Santos et al., 2005; Araújo and Costa, 2006; Ariza et al., 2008; Brown et al., 2010; Eastman et al., 2013; Becken and Jobb, 2014; Cingolani et al., 2015a). Litter accumulation threaten the conservation of beach environments in touristic areas, particularly in highly visited beaches (Rodriguez-Santos et al., 2005; dos Santos et al., 2008; Rodríguez-Rodríguez, 2012). The most evident negative effect of litter accumulation is visual contamination; however, it can also contaminate the soil and water bodies, damage wildlife and risk human health (Mayer et al., 2007; Brown et al., 2010; Campbell et al., 2016). Also, littering in inadequate sites directly affects the satisfaction of tourists, which can, along with other factors, negatively influence the local economy (Pizam et al., 1978; Balance et al., 2000; Barragán Muñoz et al., 2003; Marion and Reid, 2007; Ariza et al., 2008).

One way of avoiding litter generation in natural areas may be encouraging visitors to dispose of their litter at sites suitable for litter collection and/or treatment. Persuasive communication, as a tool of environmental education, can be very useful for maintaining natural areas free of litter (Marion and Reid, 2007; Brown et al., 2010). Persuasive messages, whether through personalized verbal requests, signs or brochures, intend to communicate the reason for the norms without transmitting a threat of a sanction for non-compliance (Duncan and Martin, 2002). Persuasive messages to reduce littering stimulate visitors' awareness of the problem, thereby achieving their good predisposition to behave adequately (Orams, 1997; Marion and Reid, 2007).

In addition, if persuasive messages are combined with demonstrative messages, even better results can be obtained regarding compliance with rules of environmental protection by visitors (Cialdini, 2003; Keizer et al., 2008; Ardoin et al., 2015). Demonstra-

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tive messages are designed to show people how most people behave in a given setting, and may be used as a tool for environmental education. They can consist of weak signals, such as simply maintaining the place clean, or stronger signals, such as picking up litter at the sight of the visitors (Schultz et al., 2013; Keizer et al., 2013). Demonstrative messages are effective due to the evolved human tendency to imitate what others are doing, as this tendency may be adaptive (Cialdini, 2003; Vugt et al., 2014). For these reasons, combining a verbal request (persuasive message) with an example of "good behavior" (demonstrative message) may be an effective technique to improve littering behavior of visitors (Brown et al., 2010; Rodríguez-Rodríguez, 2012; Gusmerotti et al., 2016).

Several studies have been conducted in Latin American countries, particularly in Chile, Brazil and Argentina, indicating the severity and high priority of the littering problem in protected areas, urban zones and beaches (e.g. Rodriguez-Santos et al., 2005; dos Santos et al., 2008; Bravo et al., 2009; Thiel et al., 2011; Seco Pon and Becherucci, 2012; Eastman et al., 2013; Cingolani et al., 2015a). Many of these studies propose environmental education as a strategy for improving people littering behavior. However, to the best of our knowledge, its effectiveness has not been experimentally evaluated in the region, but for one study of our own authorship (Cingolani et al., 2015a). Additionally, although it has been demonstrated that persuasive and demonstrative messages may influence the attitudes and behavior of people towards environment, few studies have assessed the effects of these tools directly on environmental quality (Marion and Reid, 2007).

In our previous study (Cingolani et al., 2015a) we evaluated whether it is possible to reduce visitors' littering through a personalized intervention in river beaches within a protected area in central Argentina. The intervention consisted in a personalized verbal request to visitors asking them to take their litter to the waste cans (persuasive message) while exposing them to the example of picking up the litter already left on the beach (demonstrative message). We found a non-significant trend suggesting a reduction of the amount of litter left by visitors after our intervention. We interpreted that the lack of significance was due to the lack of statistical power. A possible additional explanation may be that only one intervention during the day was not enough, as there existed a small but unquantified replacement of people during the evaluation period and thus not all visitors were exposed to the single daily persuasive and demonstrative coupled messages (Cingolani et al., 2015a). In turn, we found large significant differences among beaches related to their size. Interestingly, on small beaches each visitor left in average less litter than on larger ones. It was not clear if the differences were due to different people visiting each beach (i.e. different attitudes towards nature, age, socio-economic level and/or educational level), or to the lower absolute visitors' numbers "per se" on small beaches (Roca and Villares, 2008; dos Santos et al., 2008; Páramo, 2010; Keizer et al., 2008; Schultz et al., 2013; Cingolani et al., 2015a).

In the present study we strive to improve our understanding of littering behavior and better evaluate, through a more intensive sampling effort, the effectiveness of coupled persuasive and demonstrative messages in the same study area as before (mountains of Córdoba, Argentina). Specifically, the aims of the present study were (1) to analyze if the intervention can reduce the amount of litter that people leave behind when visiting the beaches in the protected area, (2) to evaluate if two daily interventions are more effective than only one, (3) to analyze if the total amount and/or density of people have an influence on the quantity of litter that visitors left on the beach, and (4) to analyze if differences among beaches are maintained when we control for density and/or quantity of people.

2. Methods

2.1. Study area

The study was conducted at an ecological and recreational reserve in the small locality of Cuesta Blanca (31°28′59″S, 64°34′34″W, 770 m a.s.l.), close to Carlos Paz city (Córdoba, Argentina, Fig. 1). The Cuesta Blanca Reserve is administrated by the local government, covers 14 ha and was created in 2009 with the aim of preserving a buffer area along the banks of San Antonio River. The river provides water to over three million people, and its basin is highly degraded. Degradation includes deforestation, invasion by exotic species, wildfires and overgrazing, which have increased soil loss and reduced rain water retention capacity, as well as the advance of the urban frontier, which basically involves sewage pollution (Cingolani et al., 2008, 2015b; Fernández et al., 2012; Berardo, 2014; Giorgis et al., 2016).

The climate is subtropical, with a mean annual temperature of 15.8 °C and 745 mm rainfall (Hijmans et al., 2005), concentrated in the warmest months (from October to March). The maximum temperature attained during the study period (2013–2014) was 38.1 °C, in January 2014 (R. Renison pers. com.). Visitors reach maximum numbers during January and February, coincident with the southern hemisphere summer. They consist of family groups, couples and groups of youngsters from near or distant localities in the country or from abroad (Cingolani et al., 2015a). The average density of visitors registered in the Reserve during the summer season was 7.35 people per 100 m^2, with peak visitation from 16 to 19 h (Cingolani et al., 2015a).

The reserve is dominated by xerophytic mountain woodland vegetation in different successional stages, mainly open and closed shrubland, with some sectors invaded by exotic species (Giorgis et al., 2011). The natural vegetation extends along a strip of variable width (5–80 m) on the river banks and alternates with rocky areas and sandy beaches that are highly valued by visitors (Fig. 1). Rivers in the region have a flooding regime after large summer storms which flood the beaches and maintain the sand clear of vegetation (Cingolani et al., 2015b). The aims of the reserve are to contribute to the conservation of water quality, avoid soil erosion, restore the original ecosystem at invaded or eroded sites, protect the native species, and provide an educational and recreational space for local inhabitants and visitors (Cingolani et al., 2015a). The reserve has a specific sign system indicating, among other things, the expected littering behavior of visitors, who should use the trash bins. Also, a group of resident volunteers contribute by providing information to visitors about the reserve objectives and indications to behave adequately, complementing the work of the remunerated park ranger.

2.2. Sampling design and data collection

We selected four beaches, two of them with high and two with low littering per visitor, according to the previous study (Cingolani et al., 2015a). One of the four beaches resulted from the union of two small beaches which were almost contiguous (but not visible from each other), as only a small rocky outcrop separated them (Table 1, Fig. 1). As those beaches were also the less frequented, we decided to treat them for this study as the same beach, to count with higher numbers of visitors per day and beach during the study. The beaches were located along 500 m on both margins of San Antonio River. People access the beaches by walking along trails of 46–204 m from the nearest parking site, where the trash bins are located. Beaches are generally separated by rocky areas that are less frequently used by visitors (Fig. 1).

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