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Illegal discharges in Spanish waters. Analysis of the profile of the Alleged Offending Vessel

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ABSTRACT

There is at present a growing concern, on an international level, over environmental offences caused by oil discharges into the sea from vessels. The objective of the Spanish Maritime Administration is to prevent the illegal discharges of polluting substances in Spanish maritime waters by vessels in transit. To combat such discharges, since 2007 Spain has reinforced its means of response with the use of aircrafts that provide services of maritime surveillance, identifying the Alleged Offending Vessels and acting as a deterrent.

The objective of the present study is both to introduce the concept and to analyze certain aspects of the so-called "Alleged Offending Vessel" (AOV) that have been detected within Spanish Search and Rescue (SAR) jurisdiction waters in the period 2008–2012, in order to build a profile of such a vessel. For this purpose, an analysis methodology is formalized based on the GINI index and Lorenz curves, associated with certain aspects of vessels: type, flag and sailing area.

1. Introduction: Illegal discharges of oil from vessels

World maritime traffic grew by 4% in 2011, reaching unprecedented volumes that reached 8700 million tons, according to the annual report of the United Nations Conference on trade and development (UNCTAD) in 2012 (Hoffmann, 2012). A significant percentage of this traffic sails off the Spanish coast in the Atlantic and in the Mediterranean Sea. Therefore, in Spain, these areas are considered highly vulnerable to oil slicks, both those caused by maritime accidents and those caused by illegal discharges of oil from vessels. This latter form of contamination is very difficult to detect and it is much more difficult to identify who is responsible, since vessels take advantage of the absence of effective controls against these actions. In the present work, our analysis will be focused on this latter problem: illegal oil discharges from vessels.

Spain has three marine areas sensitive to oil pollution: the coast of Galicia and the coastline bathed by the Mediterranean Sea and one area, the Canary Islands, classified as a particularly Sensitive Sea Area (PSSA); these, along with the Strait of Gibraltar, will be the four areas on which this study focuses. The Spanish maritime authorities are aware that illicit oil discharges must be closely investigated and, since the year 2007 (Gobierno de España and Ministerio de Fomento, 2007) have reinforced their means of response, based on international cooperation in research and on the exchange of information and experiences. This strategy is intended to lead to the strengthening and effectiveness of the activities undertaken for the implementation of existing national and international legislation and, ultimately, to contribute to preserve the marine environment.

In this context, the objectives of the Spanish maritime administration, in collaboration with other coastal States, are twofold: first of all, to avoid the illegal discharge of polluting substances in Spanish maritime waters by vessels that are in transit. For this purpose, aircrafts are used to provide services of maritime surveillance and pollution control, actively helping with their presence to minimize the illegal discharge of oil into the sea through the detection of vessels which are allegedly committing the offence and at the same time, having a deterrent effect on the rest. We must clarify that illegal discharges are those that occur against the rulings of the International Convention for the prevention of pollution from vessels of the IMO, known as MARPOL (International Maritime Organization, 1973, 2011), which in its annex I establishes rules to control pollution in terms of service, i.e., what discharges can be performed in a legal and controlled manner from vessels that have a system of surveillance and control of discharge of hydrocarbons and their corresponding filter equipment.

The second objective of the Spanish maritime administration is the incorporation into the national legislation of articles 3 and 7 of Directive 2005/35/EC of the European Parliament and of the

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Council (European Parliament and the Council, 2009d) relating to pollution from vessels and the introduction of penalties for infringements.

The tool that the Spanish Administration disposes of in order to achieve its objectives is the Spanish Maritime Safety Agency (SASEMAR), a public entity, ascribed to the Ministry of Public Works, through the General Directorate of the Merchant Navy, of the Government of Spain.

SASEMAR is the agency responsible for the provision of prevention and the fight against pollution of the marine environment and the detection of illegal discharges into the SAR (Search and Rescue) waters of Spanish jurisdiction, also taking as its mission the diffusion of the culture of prevention in the maritime sector. This organization pursues its objectives by empowering the rules and instruments that ensure compliance, as for example reinforcing the monitoring and inspection of vessels in waters under Spanish jurisdiction or adopting criminal measures against those who pollute the sea, thus making these practices or the repetitive nature of minor offences a "crime" against the environment.

Aerial surveillance is proving to be the most useful and effective tool for the prevention and detection of marine pollution (Lagring et al., 2012). Certainly, this resource is the one that allows the most direct information, data and evidence about an alleged illegal activity to be obtained for the implementation of the administrative sanctioning procedure. Note that for these aircraft to fulfill their mission, the Spanish maritime authorities deploy more than 80% of their operational missions on the fight against pollution. Spain has experience in large-scale maritime accidents and is aware of the economic and environmental costs arising from any type of accidental or deliberate marine pollution. Therefore, aerial surveillance, in addition to the assigned missions, has a deterrent effect against potential illegal discharges.

Currently, in order to avoid such illicit practices, the International Maritime Organization (IMO) is adapting its conventions and regulations in order to minimize the risk of accidents and to establish measures to recover from environmental damage.

In this context, we believe that any national, regional or international strategy aimed at preserving the marine environment from illegal discharges of hydrocarbons from vessels requires a prior knowledge of the profile or stereotype of the AOV, in order to be able to develop prevention policies, plans of action and for the allocation and distribution of resources in an efficient manner.

In that regard, for the purposes of the present work, we understand as "Alleged Offending Vessel" (AOV) the vessel that has been identified through the Spanish discharge detection system, as a possible pollutant by means of the illicit discharge of hydrocarbons, for which the Spanish maritime administration will subsequently open an administrative sanctioning procedure, charging the vessel with this discharge.

The objective of the present study is to analyze certain aspects of the AOV that have been detected within the Spanish SAR jurisdiction waters in the period 2008–2012, in order to build a profile of them. These aspects are of a spatial character (area in which the AOV is detected), a functional or typological character (type of AOV) and an administrative character (flag of registry of the AOV). The profile or stereotype of the AOV will be defined by determining and analyzing the degree of concentration of each of the above aspects.

This objective is pursued under the following hypothesis: ships registered on open registers, are more likely, given their permissiveness, to be an AOV, understanding the terms "open registry" or "flag of convenience" (FOC) (Perkins, 1997) as those adopted by civil vessels, whose relationship between the ship-owner and the State whose flag they are flying is accidental, these States offering a system of registration of vessels whose controls are minimal as well as important economic advantages with respect to the country of origin.

The rest of this paper is structured as follows: first the methodology formalized which allows us to analyze the degree of concentration of the Alleged Offending Vessels is presented; next, the data used in this analysis are described; Section 4 outlines the results obtained, and finally, some conclusions on the research are drawn.

2. Methodology

2.1. Gini index of Alleged Offending Vessels

Concentration indices are used to highlight the greater or lesser degree of proximity in the total distribution of values of a variable in a population. Therefore, they are indicators of the degree of distribution and concentration of the variable.

Concentration indices have been used widely in health research. They have also been applied successfully to work on maritime accidents. Concentration indices have some advantages over Multivariate regression analysis in the type of research that we are addressing. It offers, for example, the possibility of reaching conclusions without having to have historical data series. Variations in the concentration of the individuals of the analyzed population can be learnt with just two periods. In the case of multivariate analysis, a higher number of observations (around 20) is required. In addition, multivariate analysis requires that there is a correlation between the analyzed variables, while analysis of concentration does not. For studies such as the present one where the data generated are still scarce, using concentration indices allows some specifications to be made about the analyzed population. In terms of the variables, even though only the number and capacity (GT) of the vessels is available for the analysis, concentration indices are able to make groupings based on the type of vessel, flag and list. This is another advantage of concentration indices since its use allows different analyses to be made according to the group or type of concentration that we are dealing with.

Gini indices are a methodology of analysis of concentration or inequality widely used by researchers in various scientific fields, such as sociology (Fang, 2012), economy (Corvalan, 2014), health sciences (Cabieses and Espinoza, 2013) and studies of biology and environmental sciences (Chen et al., 2012; Guiasu and Guiasu, 2012). To analyze the concentration of AOVs, we have resorted to Gini indices and associated Lorenz curves since this is a tool that has also been used successfully in recent years in the field of marine accidents in fishing vessels (Perez-Labajos et al., 2009; Perez-Labajos, 2012). The present study, however, is the first time that this tool has been applied to the analysis of marine pollution. To do this, it is necessary to formalize a series of indices of concentration for certain variables related to Alleged Offending Vessels, which, in our study will be the number of vessels and the capacity or size of these in Gross Tonnage (GT).

In particular, the starting point of the study of the concentration of AOVs will be the type of vessel (chemical tanker, tanker, passenger/ferry, refrigerator, ro–ro, container, bulk carrier and general cargo), the second area will be the zone of navigation (Finisterre, Canary Islands, Strait of Gibraltar and Mediterranean) and finally the different flags of the flying vessels will be classified in four groups: those belonging to countries of the EU-15 (EUR15): Germany, Austria, Belgium, Denmark, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, United Kingdom and Sweden; those of the other countries of the OECD (ROCDE): Australia, Canada, Chile, Korea of the South, United States, Slovenia, Estonia, Hungary, Iceland, Israel, Japan, Mexico, Norway, New Zealand, Poland, Czech Republic, Switzerland and

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