

**Helping fishers to reduce discards: a spatial approach.**

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Spatial management measures are currently being used to identify high-density discard areas and to manage discard quantities, given the spatial heterogeneity of species distributions. However, permanent fishing closures are poorly implemented, due to stock dynamics and do not achieve their management objectives. In this study we present a spatial statistical tool, based on the residuals auto-covariate Boosted Regression Trees (RAC-BRT) approach, that aims to reduce the negative ecological impact of fishing by providing fishers with real-time maps based on haul-by-haul catch and discard rates, indicating the most suitable areas for fishing. Real-time catch and discard information is shared among fishers to incentivize vessels to leave areas of high discards. These easy-to-interpret maps are to be accessible to users via an on-line geoportal. In addition, a penalization of the fishery effort, in terms of distance from the harbour, is included in this methodology in order to assess the economic relevance of each fishing ground. To illustrate the proposed approach, we used observer data from the Spanish discard sampling program from 2004 to 2008 for several species caught in the Cantabrian Sea (ICES area VIIIc). Results varied among species and seasons, with better results achieved for economically valuable target species with segregated life stages. We discuss how this real-time online tool could be useful for Marine Spatial Planning (MSP), particularly in the context of the European Common Fisheries Policy reform and the discard ban on commercial species.

**Keywords:** Discards, RAC-BRT, stakeholder integration.

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