# Mapping vulnerable deep-sea habitats threatened by fisheries in the Cantabrian Sea, Bay of Biscay

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The complex Avilés Canyon System (ACS) is located in the western area of the Cantabrian Sea (Bay of Biscay, NE Atlantic), whose study is currently being carried out by the INDEMARES (LIFE+) project. The aim of this project is to provide the necessary information to establish a network of representative Marine Protected Areas (MPAs) for the purpose of biodiversity conservation on Spanish waters. For the effective design of MPAs, one of the main objectives of this project is identifying and charting the habitats and the biological communities that inhabit them. Three major submarine canyons are present in the area: Avilés, El Corbiro and La Gaviera canyons, together with a large rocky outcrops and a marginal shelf. Its structural complexity, in combination with a high gradient of environmental variables (from 150 to 4800 m depth) and the existence of a strong hydrodynamic activity produce a high diversity of habitats and biological communities. Also, due to the high productivity of the area, there is a strong fishing pressure and nearly 400 vessels currently operating in the ACS.
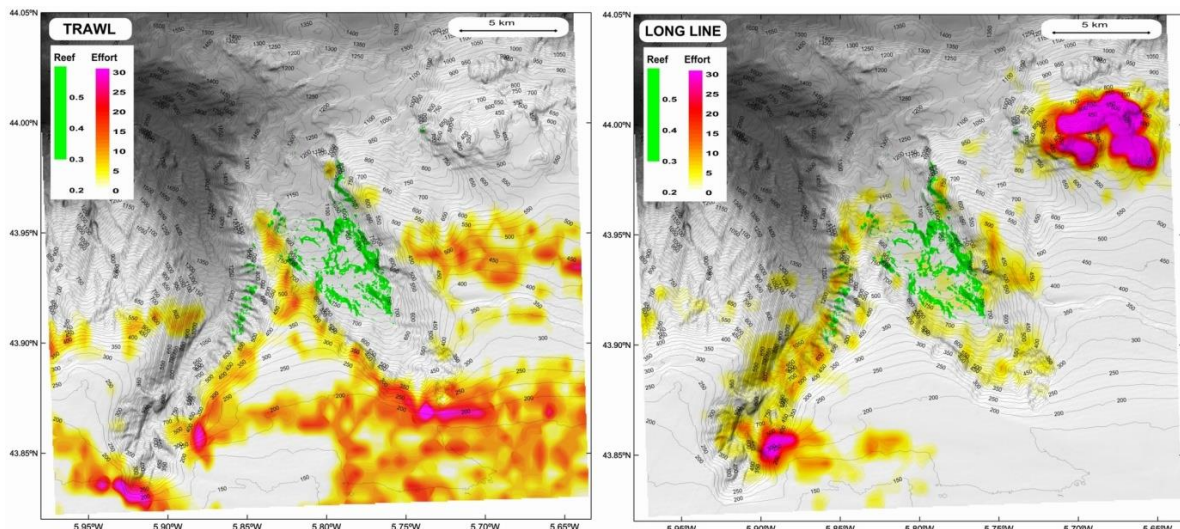


**Figure 1.** Coral-reef suitability map in relation with **A**) Trawl fishery effort and **B**) Longline fishery effort.

Surveys conducted in the ACS revealed the presence of noteworthy vulnerable habitats and threatened biological communities on deeper grounds (700 to 1200 m depth) less accessible to fishing gears. These communities observed in the canyons was dominated by cold-water corals and deep-sea sponge aggregations. These species are considered components of vulnerable ecosystems because they are very much exposed to impacts by fisheries and other human or natural disturbances. Fine-scale maps of their habitats are necessary in order to implement conservation measures and identify conflicts of use between the anthropogenic activities and the protection of vulnerable ecosystems required by European regulations and MPA network designs. Predictive models make possible to produce continuous distribution maps from limited sample data, estimating the contribution of certain environmental variables that can influence the presence of species. To ensure the reliability of the data and its precise spatial location, benthic vulnerable species presence records were obtained only from the ground-truthing of underwater vehicles (still images and video records). The high-resolution maps (30 m grid) of habitat suitability and the contribution of each environmental variable was obtained on ACS area based on this methodology. These maps, in combination with the spatial fisheries effort information obtained from VMS (vessel monitoring systems . satellite based tracking), are essential to establish the necessary criteria to define management rules and include these canyons into European MPAs net.