TrawledSeas Project

Bottom Trawling as a Driver of Seascape Transformation

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Background

Bottom trawling is one of the most widespread fishing practices in the world's oceans. It has been estimated that the overall oceans' area used as trawling grounds amounts to 22 million km^2 (Halpern et al., 2008), 20% of which are located on the continental slope (Puig et al., 2012).

It is considered as the principal human activity causing damage to the seafloor and associated biological communities due to its widespread geographical presence, recurrence, and intensity (Fig. 1). As submarine canyons are increasingly targeted by trawlers, there is a growing need to quantify, monitor and mitigate the impacts of bottom trawling in these environments.

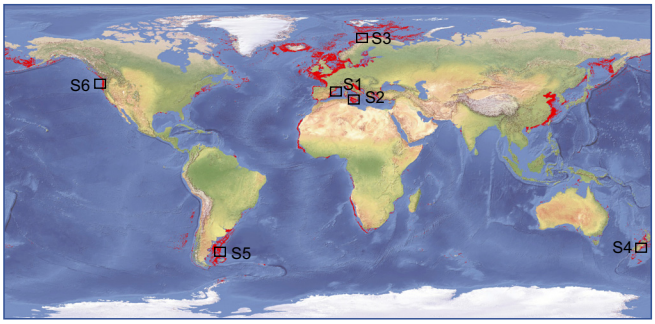


Figure 1. *Global distribution map of bottom trawling (in red) based on daily fishing effort data between 2012-2016 (Global Fishing Watch, 2020). The location of the study areas: submarine canyons incising the (S1) Catalan, (S2) Malta-Sicilian, (S3) Norwegian, (S4) Canterbury, (S5) Patagonian and (S6) W Canadian continental margins is also shown.*

It involves towing of nets to harvest benthic and demersal living resources. The dragging of trawling gears along the seafloor results in scraping and ploughing the seabed, which leads to the formation of turbid plumes of resuspended sediments, changes in the sediment erosion/accumulation rates and modifications of their fluxes and budgets, which results in measurable alterations of the submarine geomorphology (Fig. 2).

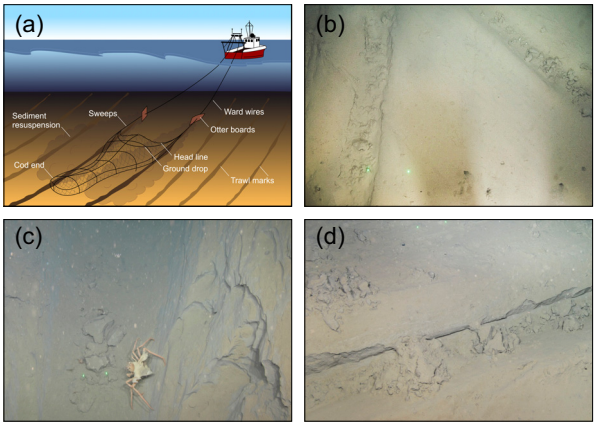


Figure 2. *(a) Sketch showing the design of otter board trawl. ROV images of trawl marks on the (b) Francoli and (c) (d) Blanes submarine canyons (NW Mediterranean) obtained during the ABIDES research cruise.*

Aim

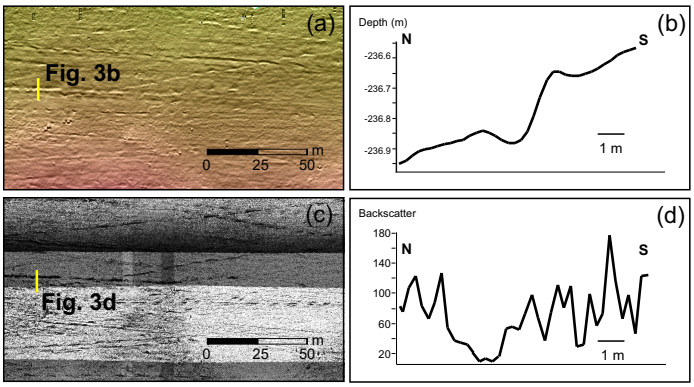
TrawledSeas is a 2 year research project that has received funding from the European Union's Horizon 2020 research and innovation programme (Marie Sklodowska-Curie Actions).

The TrawledSeas Project aims to **quantitatively characterise the contribution of bottom trawling on the geomorphic evolution of submarine canyons, over a range of spatial scales, from fine (m–dam) to mesoscale (5–100 km)**.

Approach

A new automated marine landscape mapping technique is being developed to quantify the morphological signature of bottom trawling, based on the analysis of high-resolution multibeam data implemented in a Geographic Information System (GIS).

It integrates standard general (e.g. curvature, rugosity, roughness) and specific (e.g. object-based image methods) geomorphic techniques with new ones developed in this project in a multiscale approach.



Small spatial scale	Large spatial scale
Automatic detection and quantification of trawl marks (bathymetry and backscatter)	Identification and quantification of trawling impact on large-scale morphology Potential temporal changes in the seafloor morphology of new fishing grounds from repeated surveys
Remotely Operated Vehicles (ROV) and autonomous underwater vehicle (AUV) data	Hull-mounted multibeam data
MAREANO-data from Vesterdjupet (HUGIN-HUS AUV in 2015) (Detail of trawlmarks showed in Fig. 3) ABRIC-data from Blanes Canyon (Gavia AUV, date to be confirmed)	Multibeam data sets from different study sites incised by submarine canyons (e.g. Catalan, Malta-Sicilian, Norwegian, Canterbury, Patagonian and W Canadian continental margins) (Fig. 1) These areas are representative of the most prevalent types of continental margin (siliciclastic, carbonate, volcanic and glacial)

To characterise the differential impact of bottom trawling on the canyons' seafloor, in terms of extent and volume change in different geologic and climatic settings.

Figure 3. *Example of trawlmarks identified in the EM2040 multibeam data collected in Vesterdjupet in 2015 using the HUGIN-HUS AUV. (a) Bathymetric map, (b) bathymetric profile, (c) backscatter imagery and (d) backscatter profile.*

Partnership

TrawledSeas is implemented in partnership with an international and multidisciplinary team of scientists from different institutions such as University of Malta, Geological Survey of Norway (NGU), Institut de Ciències del Mar, Tragsa for General Secretariat of Fisheries, National Institute of Water and Atmospheric Research (NIWA) and Ocean Networks Canada (ONC), University of Victoria

L-Università ta' Malta · Geological Survey of Norway · Institut de Ciències del Mar · CSIC · Tragsa · NIWA · Ocean Networks Canada

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