Fish trawling reshapes deep-sea canyons

Dredging stirs up slow silt storm and may disrupt marine life.

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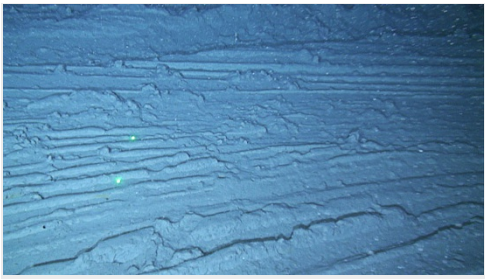

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Intensive bottom trawling leaves the seafloor looking like a ploughed field.

Deep-sea trawling smoothes out the wrinkles of canyons on the continental slope, making marine mountainsides look more like ploughed fields, changing the habitat of deep-sea creatures. The process rivals landslides and storms as a shaper of the deep sea, according to work published today in *Nature*[1].

For almost a century, fishing fleets have trawled for shrimp off Spain's Mediterranean coast by dragging nets along the flat, shallow coastal sea floor. But in the 1960s, they also started to pursue shrimp farther offshore and into rugged canyons as deep as 800 metres. The impact they had on this rougher terrain was a mystery.

In 2006, geoscientists surveying canyons off Spain's coast found smooth slopes which they attributed to an underwater cascade, but one of the smoothed slopes was in the lee of the proposed cascade[2]. While trying to come up with reasons, Pere Puig, a marine geologist at the Institute of Marine Sciences in Barcelona, Spain, and his colleagues realized that the anomalies occurred in a trawling zone and hypothesized that trawlers were scraping silt off ridge tops and dropping it into canyon bottoms.

For six months, the researchers measured silt flow in the canyons and took core samples from the sea floor and video footage of a canyon. Then they plotted the silt disturbances on a high-resolution map of the canyons and compared them with four years of detailed fishing records. They found higher silt flow during hours when the trawling fleet operated and smoother canyon walls in areas with the greatest trawling activity, and different sediments in trawled and untrawled regions. The team estimates that trawling has doubled the amount of sediment flowing down into the canyons since the 1970s.

Smoothing out the structure of marine canyons will reduce the number of species that can live there, says Elliott Norse, chief scientist at the Marine Conservation Institute in Bellevue, Washington. If shallower waters are any guide, it will also change the make-up of species, adds marine biologist Callum Roberts of the University of York, UK: "Big fish like complex habitats," he says, "things like prawns and scallops live fast, die young and like their habitats open and unstructured." Yet researchers do not yet know which species the prawns may be replacing. Puig says his team is planning surveys of the biodiversity of trawled and untrawled slopes next.

Yet fishing the stock this way may not be sustainable in the long term: in 2011 the United Nations Food and Agriculture Organization listed the shrimp as overfished and many conservation groups support a total ban of deep-sea trawling, though some marine managers think that the species can recover if left alone for long enough. In July, the European Commission said it wanted to ban the activity throughout the waters of the European Union, but Javier Garat, secretary-general of Spain's Fishing Confederation (Cepesca) says that industrial fishing groups would prefer regional bans, such as those enacted over the past decade in marine reserves, accompanied by scientific monitoring. They will lobby to modify the proposal when it is considered by the European Parliament and European Council this autumn. Puig agrees that bans should be evaluated on a case-by-case basis rather than as a blanket approach because sustainable fisheries may emerge in some places where the geological and ecosystem damage is "already done".

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References

1. Puig, P. *et al. Nature* advance online publication http://dx.doi.org/10.1038/nature11410 (2012).
2. Canals, M. *et al. Nature* **444**, 354–357 (2006).