Bottom trawl fishing has widespread impacts on benthic habitats and communities. The benthic response to trawling seems to be smaller or absent in areas exposed to high natural disturbance, leading to the hypothesis that natural and trawl disturbance affect benthic communities in a similar way. However, systematic tests of this hypothesis at large spatial scales and with data from sites spanning a large range of natural disturbance do not exist. Here, we examine the effects of trawl and natural (tidal-bed shear stress) disturbance on benthic communities over gradients of commercial bottom trawling effort in 8 areas in the North and Irish Seas. Using a trait-based approach, that classified species by life-history strategies or by characteristics that provide a proxy for their role in community function, we found support for the hypothesis that trawl and natural disturbance affect benthic communities in similar ways. Both sources of disturbance caused declines in long-living, hard-bodied (exoskeleton) and suspension-feeding organisms. Given these similar impacts, there was no detectable trawling effect on communities exposed to high natural disturbance. Conversely, in 3 out of 5 areas with low bed shear stress, responses to trawling were detected and resulted in community compositions comparable with those in areas subject to high natural disturbance, with communities being composed of either small-sized, deposit-feeding animals or mobile scavengers and predators. The findings highlight that knowledge of the interacting effects of trawl and natural disturbance will help to identify areas that are more or less resilient to trawling and support the development of management plans that account for the environmental effects of fishing.