

{rokbox title=|The study area with the sampling stations and management area boundaries. NTZ = no-take zone :: Image: Authors| thumb=|images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-cambios-depredador-presa-arrastre-hiddink-et-al-2016-thumb.jpg|}images/stories/ieo/imagenespublicaciones/centro-oceanografico-baleares-cambios-depredador-presa-arrastre-hiddink-et-al-2016.jpg{/rokbox}

Jan G. Hiddink, **Joan Moranta**, Stephen Balestrini, Marija Sciberras, Marine Cendrier, Rosie Bowyer, Michel J. Kaiser, Mattias Sköld, Patrik Jonsson, Francois Bastardie, Hilmar Hinz, 2016.

[Bottom trawling affects fish condition through changes in the ratio of prey availability to density of competitors](#)

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Abstract:

1. Bottom-trawl fisheries are widespread and cause mortality of benthic invertebrates, which in turn may lead to a decrease in the availability of prey for target fish species. Exploitation also reduces the abundance of the fish species themselves. Modelling studies have shown that bottom trawling could lead to both increases and decreases in fish production, but so far empirical evidence to test these ideas has been very limited. We hypothesize that the effect of bottom trawling on the food intake and condition of fish depends on how the ratio of prey to consumers changes with increasing fishing pressure.
2. We assessed the impact of bottom trawling on the food availability, condition and stomach contents of three flatfishes and the Norway lobster in an area in the Kattegat that is characterized by a steep commercial bottom-trawling gradient due to the establishment of an area closed to all fisheries, but otherwise has homogeneous environmental conditions.
3. For plaice, prey biomass initially decreased at a slower rate with trawling than the biomass of fish, and as a result, the amount of food available per plaice increased before decreasing at trawling frequencies >5 times year⁻¹. This pattern was mirrored in both the condition and stomach contents of plaice and for long-rough dab.

4. No effect of trawling on dab prey and condition was found. Conversely, the condition of the main target species – Norway lobster – increased as its biomass decreased with increased trawling intensities.

5. Together, these results support the idea that when the abundance of the prey declines in response to exploitation, the ratio of the prey to consumer biomass will determine whether exploitation will result in an increase or a decrease in the food intake and condition of the predator.

6. Synthesis and applications. Our study indicates that fish production may be maximized by keeping bottom-trawling intensities relatively low, although this may negatively affect the economically more important Nephrops fishery. The effects of bottom trawls may be mitigated by switching to gears, which affect prey availability to a lesser extent, such as pots or creels.

Keywords: benthic invertebrates; benthivorous fish; bottom trawling; density dependence; ecosystem effects of fishing; Kattegat; marine protected area; otter trawl; prey availability