PRELIMINARY RESULTS ON MEGAFAUNA VARIATIONS DUE TO EXPERIMENTAL TRAWLING DISTURBANCE

P. Figuerola*, P. Sánchez, M. Demestre
Instituto Ciencias del Mar (CSIC), Barcelona, Spain - perefig@icm.csic.es

Abstract

Experimental trawling disturbance on a muddy seabed was carried out in order to study the effect on fish and benthic fauna. Immediate and short-term changes in the structure of fish and the benthic community due to extraction of number of specimens and biomass as a direct effect of fishing activity has been analysed. Possible indirect effects as an increase of scavenging species attracted to the area by carrion generated by the fishing activity have been examined. Effects on day-night variations have also been considered.

Keywords: Western Mediterranean, fisheries, demersal, zoobenthos

Introduction

Fishing activities using bottom trawl gears are thought to have the potential to cause changes in marine seabed habitats and the animal communities associated with them.

Multispecies commercial Mediterranean otter bottom trawl produce high mortalities both direct and indirect varieties. Catch and discards are the mainly direct mortality due to trawling (1). Furthermore, trawling also damages and kills an important proportion of benthic fauna. This study tries to achieve some knowledge about direct impact of trawling on the seabed analysing the evolution of both biomass and abundance of demersal and benthic taxa along either 7 or 14 consecutive tows. Special attention was made to animals with significant changes.

Material and methods

The study was carried out on a muddy seabed off the Catalan Coast (NW Mediterranean) (41° 10'N – 2° 04'E to 41° 17'N – 1° 56'E). A typical commercial trawl otter bottom trawl was used to create two different intensities of fishing disturbance: 7 hauls in wayline 1 (single disturbance) at 30m deep, and 14 hauls in wayline 2 (double disturbance) at 40 m deep. Samples were collected from each of four stations on both the experimental waylines (a box 200x40 m) and in adjacent control areas without fishing disturbance. This protocol effectively ensured that each line was entirely swept once or twice by the trawl gear (2). A Sercel differential global satellite positioning system (DGPS) was installed on board. The co-ordinates of two experimental waylines were transcribed onto the DGPS system, such that trawling and sample collection was possible with a high degree of precision (Fig. 1). The experiment was conducted on 1996 and 1997 but only 1997 results are considered. The trawler began fishing the wayline 1 at 10:50 am over a period of 14 hours. The second wayline was trawled over a period of 21 hours from 9:45 am. The length of each haul was about 2700 m, and fishing speed was about 3 knots. Data were standardised to hauls of 30 min to avoid differences between hauls due to time of trawling. All hauls were sorted to species level and weighted separately. In order to study the effect of disturbance, all species were pooled into four groups: benthic fishes, crustaceans, pelagic fishes and cephalopoda. Moreover, subsamples were stored to further analysis of composition of stomach contents, length frequencies distribution and length-weight relationship (data not presented in this paper). The possible effect of scavengers aggregation due to reject the rest of samples was avoided by keeping this material out of the experimental area. Furthermore, survival experiments were conducted in order to evaluate mortality rates of fauna caught by the trawl (3).

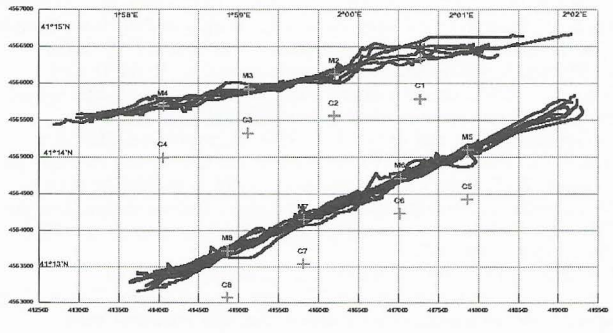

Figure. 1. Plotted trawl tracks of line 1 and 2

Results and discussion

During both 7-14 consecutive hauls a total of 89-84 species were caught in each wayline, respectively: 39-35 fish, 12-9 crustaceans, 19-17 mollusc and 19-23 others invertebrates. Around 40% of benthic fish on both Line 1 and Line 2 decrease in biomass comparing control haul, the first three hauls and the last three haul, but only *Trigla lucerna* (p=0.0036) decrease significantly in Line 1. In contrast, other species as Arnoglosus laterna, *Cepola rubescens* and Gobidae increased considerably in biomass although not significantly on both Line 1 and Line 2. Much more evident is the case of crustaceans *Liocarcinus depurator, Medoripe lanata, Goneplax rhomboides* and *Squilla mantis* but only the last one differed significantly (p=0.001), presenting a strong tendency to aggregate with increasing trawl disturbance on both lines. Some target species as *Merluccius merluccius* and *Scophtalmus rhombus* tended to avoid the experimental area after disturbance.

The survival of the organisms captured by the trawling process varied according to species. Gobius niger showed high percentage of mortality after three days (88.9%). On the contrary the percentage of Solea vulgaris was lower (28.6%). Invertebrates, in general, showed lower mortality rates after three days: Liocarcinus depurator and Medoripe lanata presented only a 14.3% and 0% of mortality, respectively.

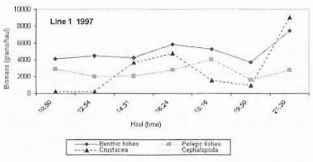

Figure 2. Variation of biomass along hauls in line 1.

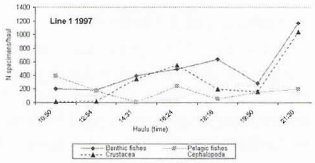

Figure 3. Variation of abundace along hauls in line 1.

Well known scavenging groups such as crabs and some benthic fishes aggregate immediately in recent trawled areas to feed with the carrion left by the passage of the trawl (4), as it shown in figures 2 and 3. Furthermore, the results showed that the effect of consecutive trawl disturbance was much more important that effect day-night confirmed by as pelagic species response. Number of specimens and biomass of pelagic species was highly variable but not evidenced an increase during night towns. In the case of sardine and anchovy the response is on the contrary (Fig. 4 and 5).

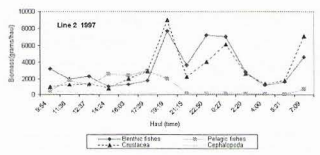

Figure 4. Variation of biomass along hauls in line 2.

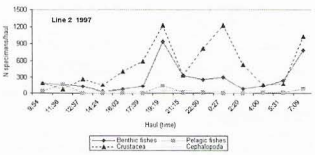

Figure 5. Variation of abundace along hauls in line 2.

The end results of this study suggest that changes in the abundance (number of specimens and biomass) on the fished lines could be attributed either to the depletion of organisms by the trawling activity or due to aggregation of mobile predators or scavenging species in response to animals killed by the passage of the trawl.

References

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