INVESTIGATIONS ON THE EFFECT OF ECOLOGICAL METHOD FOR PROTECTION AGAINST ILLEGAL BOTTOM TRAWLING IN THE BLACK SEA – PRELIMINARY RESULTS.

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Abstract
Illegal bottom trawling for harvesting of Rapana thomasiana along the Bulgarian Black Sea shelf during the last decade has raised ecological concern with respect to the bottom communities and especially the mussel beds. Protected area against bottom trawling by specially designed concrete blocks was constituted near Varna Bay in 1999. The implementation of this protection method has resulted in an increase of the habitat diversity and development of new fouling communities dominated by the black mussel. The soft sediment communities in the protected area give evidence for increased biodiversity, abundance and biomass due to the rehabilitation of the natural mussel beds.

Keywords : Black Sea, zoobenthos, restoration, trawl impact, Mollusca

Introduction

Bottom trawling for *Rapana thomasiana* represents a significant hindrance to the recovery of zoobenthic communities along the Bulgarian Black Sea shelf, degraded due to the cultural eutrophication (2).

Rapana invaded in the Black Sea from the Sea of Japan during the 60-s. Its commercial harvest is a relatively new activity that has developed rapidly since 1990-1991. Till 1994 the snail was gathered manually by divers, but during the last 5-6 years the harvest has been increasingly accomplished by illegal bottom trawling. This activity has been localised on the mussel beds, where the predator snail concentrates to feed on *M. galloprovincialis*. Most impacted is the northern Bulgarian shallow shelf as it is evidenced by cases of mass mortality of benthic invertebrates and demersal fish in 1999-2000.

Methods

Protected area (PA) against bottom trawling by specially designed concrete blocks was constituted near Varna Bay in November 1999. An intensively trawled area at depth 18 m with surface of 65 ha was covered chess-like by 45 concrete pyramids with surface of 1,53 m^2 each, accommodated with metal spikes and oval concavities that provide shelter for juvenile marine organisms. Submersed buoys with surface 0.8 m^2 were fixed to part of the pyramids.

In November 2000 four 400 cm^2 samples from the concrete blocks and the buoys were collected by divers. Six samples were collected from the Protected Area (PA) and the adjacent Trawled Area (TA) by Van Veen grab (0.05 m^2). The laboratory processing was done by routine methods, dominant species were determined according to (1).

Results

One year after the submergence the fouling community covered only one fifth of the concrete blocks surface, while the buoys were covered evenly by *M. galloprovinvialis*. This difference is due to the buoys' position in the water column, which provides better trophic conditions for the filter feeding mussels. Therefore the growth rate of buoys' mussels was higher (mean length 19.2 mm) compared to that of the blocks' mussels (12.3 mm). as well the buoys mussels abundance and biomass (calculated on a squire metre) are 2,3 and 12 times higher respectively. No significant difference was observed in the accompanying species, the most common of which were the polychaetes *Nereis succinea, Polydora ciliata, Harmothoe reticulata, the barnacle Balanus improvisus* and the tunicates *Molgula euprocta, Ctenicella appendiculata*.

In PA 48 taxa were established : 15 Vermes, 13 Crustacea, 17 Mollusca, 2 Ascidiacea and *Phoronis euxinicola*. The species diversity in the TA was significantly lower with 30 species : 14 Vermes, 4 Crustacea, 10 Mollusca, 1 Ascidiacea, Ph. euxinicola. The number of Vermes species is not considerably different but the number of crustacean species is three times lower and the number of mollusc species is two times lower in the TA, where *M galloprovincialis* was not encountered (Fig.1).

The two areas differed greatly in the dominant species. Representatives of the epifauna dominated the PA : *M. galloprovincialis, Mytilaster lineatus, Molgula euprocta* and crustaceans, while TA was dominated by infauna representatives : *Chamelea gallina, Spisula subtruncata* and *Pitar rudis*.

The abundance is 1.6 times higher in the PA. The most significant difference was observed with respect to the abundance of Crustacea and Ascidiacea, which were five times less abundant in the TA (Fig.2).

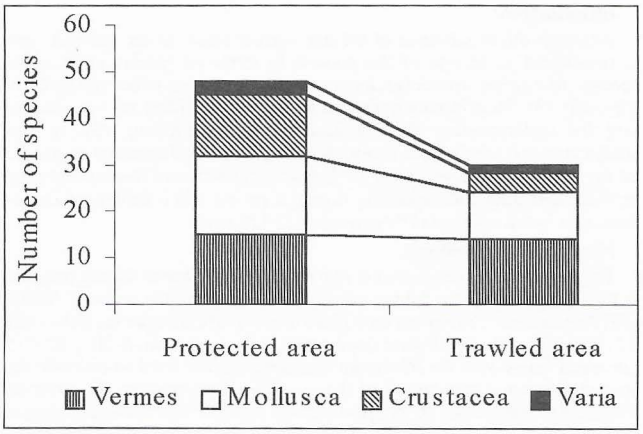

Figure 1.

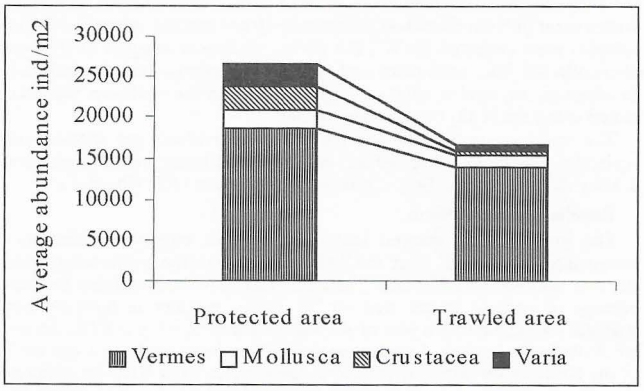

Figure 2.

The absence of *M galloprovincialis* in TA determined more than tree times lower biomass compared to PA biomass (338.255 and 1156.0 $g.m^2$ respectively).

The preliminary results of the study give evidence of the negative impact exerted by bottom trawling on the seabed communities. Degraded by the anthropogenic eutrophication these communities are particularly vulnerable to bottom trawling, which prevents them from recovery, despite the relative relaxation of the ecosystem regarding eutrophication. The results confirm the favourable ecological effect of the experiment : an increase of the habitat and species diversity, abundance and biomass due to the rehabilitation of the natural mussel beds.

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