A new design of multi-mesh survey gillnets to sample fish community in the Adriatic Sea

Polona Pengal, Aljaž Jenič*, Nastja Pajk*, Mihael Jožef Toman***
Fisheries Research Institute of Slovenia, Spodnje Gameljne 61a, SI-1211 Ljubljana-Šmartno, Slovenia,
**University of Ljubljana, Biotechnical Faculty, Department of Biology, Večna pot 111, SI-1000 Ljubljana,*
Slovenia, Presenter contact details: polona.pengal@zzrs.si, *Phone: +38631885953*

Summary

Three types of multi-mesh benthic survey gillnets were tested for their performance in the uniform muddy bottom habitat of the Bay of Piran. We describe the compared methods, present their positive and negative aspects and suggest a sampling design that could be used with different research goals. The research sampling was performed in winter in the years from 2010 to 2012. The sampling site is situated close to a sea bass rearing fish farm in the Northern Adriatic Sea. With the Nordic 1.5 type nets 5 species were detected compared to the 23 and 20 species detected with the Adriatic 2.5 and 5.0 nets. In the Nordic 1.5 type nets only demersal species were caught and even for those a much greater sampling effort would be required to reach a representative sample. On the other hand, both the Adriatic type nets also caught benthopelagic and pelagic species, and a correlation between net height and size of fish in these two nets was detected. While both the Adriatic type nets proved successful in achieving a representative sample of fish assemblage, the Adriatic 2.5 nets performed better in terms of CPUE and as such also reached a better cost-benefit ratio.

Introduction

A research has been launched in 2010 in the Portorož Fisheries Reserve in the Bay of Piran to determine the effect of the fish farm on wild fish assemblage and its seasonal variability. Standardized techniques for long-term monitoring and predictions of the size and productive capacity of fish populations, as well as continuous control of their health in a wide context thus are required (NEUMAN *et al.*, 1997). When low visibility prevents the use of visual counts and the buoys, mooring blocs and ropes prevent the use of conventional fishing gear close to the fish farm, a different approach is needed. The goal of this survey was to develop a new, Adriatic type of benthic multi-mesh survey gillnet by adapting the Nordic 1.5 and Coastal survey nets used in Europe to suit the specific conditions and constraints of our study area and purpose. These survey nets were not only designed to estimate the impact of aquaculture on the wild fish assemblage where environmental and anthropogenic factors prevent the use of conventional fishing methods and visual counts, but they also enable population monitoring and sampling of fish in all the oligotrophic coastal seas with low visibility and unstructured bottom.

Material and methods

The studied area is situated in the southern part of the shallow Gulf of Trieste, which is the northern most part of the Adriatic Sea (Fig. 1). The sampling site is specific in that the fish farm lies within the Portorož Fisheries Reserve inside the Bay of Piran. The water depth at sampling was 12,35 m ± 0,35 m and the sea temperature in the sampling period was 14,42 ± 1,51 °C.

The Nordic 1.5 survey nets were tested because they have already been used in freshwater research in Slovenia and their modification was suggested as an alternative method for monitoring the Baltic Sea (Appelberg *et al.*, 2003). The benthic **Nordic 1.5** survey nets are 30 m long and 1.5 m deep, composed of 12 2.5 m long panels with different mesh sizes (SIST EN 14757: 2005). The **Adriatic** survey nets were designed by studying and adapting the different types of multi-mesh survey gillnets in use throughout Europe. These nets are 200 m long with 10 panels, each 20 m long and with similar mesh sizes as the Nordic type nets. To compare the different net types, the nets were set on 4 different occasions at a predetermined sampling location around the fish farm following the protocol.

Results and Discussion

The Nordic 1.5 type nets correspond to 9 % and 4.5 % of the net surface of the Adriatic 2.5 and 5.0 nets, so the relative effort of one net night is much higher for the Adriatic type nets and this should be kept in mind throughout the results analysis. In the Nordic 1.5 type nets predominantly demersal, small and species that are common in Slovenian coastal seas (BIOS, 2013) were caught. These nets are not suitable to determine the species composition of marine fish community in the specific conditions of the Gulf of Trieste because they are selective for a limited set of fish species and sizes. On the other hand, the Adriatic type nets also caught considerable amount of pelagic, larger and rare species, which results in better estimate of fish community structure in terms of species and length distribution. (Figures 1 and 2)
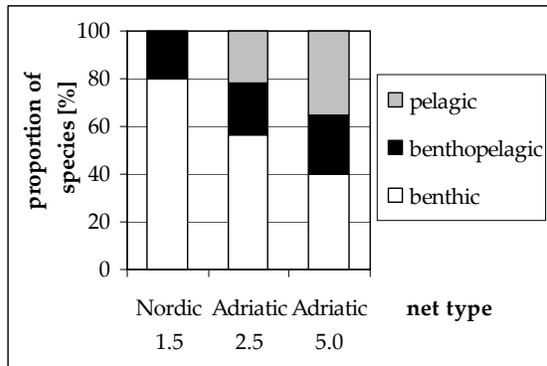

Figure 1: Proportion of demersal and pelagic fish species in the catch from the three net types.
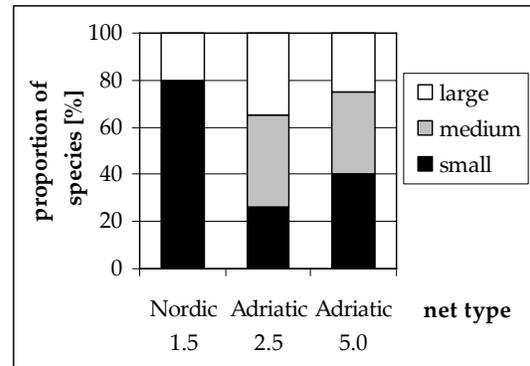
Figure 2: Proportion of caught species from the three size classes for the three net types.

With the exception of mean BPUE the Adriatic 2.5 nets preformed best in all other mean CPUE comparisons against both the other net types. The Nordic 1.5 nets scored the worst, beating only the Adriatic 5.0 nets in terms of mean NPUE. The only difference between the Adriatic type nets is in the net height, so if the fish were uniformly distributed in the water column, we would expect the CPUE to be equal for both the Adriatic type nets. However, the CPUE relationship indicates that there was a corridor in the water column where most of the fish were caught and that its upper limit was around 2.5 m above the bottom. Additional comparison sampling is advised to determine the optimum height of the Adriatic sampling nets so that the best cost-benefit ratio would be achieved.

Overall, our survey proves that the Nordic 1.5 type nets are not suitable for fish community research in the specific conditions of homogenous flat muddy bottom habitat. They underperformed in all the comparative analyses against the Adriatic type nets. On the other hand, we failed to confirm significant differences between both of the Adriatic net types in almost all of the comparisons. Finally, the Adriatic nets proved to be effective in determining the fish community structure in the specific conditions of our survey. A comparison with the list of species from the Fisheries Resources Monitoring Programme (BIOS, 2013) indicates the potential of the Adriatic type nets to reach a representative sample of species with only a small increase in sampling effort and a stratified sampling strategy. Our results give a good starting point for focusing future research effort by raising specific questions and indicating difficulties encountered during the survey.

References

Appelberg, M., Holmqvist M. and Forsgren, G. 2003. An alternative strategy for coastal fish monitoring in the Baltic Sea. ICES Annual Science Conference, Tallinn, Estonia, 24-27 September, 13 pp.

Marčeta, B. Editor. 2012. BIOS database. Ljubljana: Fisheries Research Institute of Slovenia. 1995 – [accessed 2013 Jan].

Neuman, E., Sandström O. and Thoresson, O. 1997. Guidelines for coastal fish monitoring. National Board of Fisheries, Institute of Coastal Research. May, 1997. 45 pp.

SIST EN 14757:2005 Water quality - Sampling of fish with multi-mesh gillnets. ICS 13.060.70; 65.150: 34 pp.