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Case study results

1.5 - Bottom trawl crustacean fisheries in Sicily, Italy

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SUMMARY

The crustacean trawl fishery in the Sicilian Channel is targeting deep waters shrimps. In this area the unwanted catches ranges between 25 and 40% of the total catch. Experiments with professional and research vessel bottom trawlers are ongoing to evaluate the effectiveness of sorting grid separators in the crustacean fisheries. A comparison between the catches retained by an experimental trawl-net with grid (JTED) and without grid (control) was conducted to assess the potential reduction of juveniles/unwanted catches in deep water rose shrimp fisheries. Statistical analysis highlighted significant differences among the three length frequency distribution, 1-escaped-2-retained in the cod-end (hauls with grids) and 3-retained in the cod-end (control, hauls without grids) for unwanted catches (p-value < 0.05). The use of grids demonstrated a potential reduction of unwanted catches up to 30 % . Sorting grids could represent a fundamental device for the reduction in the unwanted catch of juveniles of commercial species during deep water crustacean fisheries.

CASE STUDY RESULTS

Type of intervention

"Grids" – Juveniles and Trash Excluder Device (JTED)

Aim of the experiment

Assess the efficency of technological devices to reduce the capture of unwanted species in bottom trawling. In this regard has been experimented a type of grid, named JTED (Juvenile and Trash Excluder Device), to limit the catch of deep water rose shrimp, Parapenaeus longirostris (DPS) and European hake Merluccius merluccius (HKE) juveniles in deep water crustacean fisheries.

Main activities carried out

In the Strait of Sicily deep water crustacean fisheries is the most important for amount of volume and value of landing. Among the target crustaceans, DPS represents the most abundant being the HKE the main commercial by-catch. In this area the unwanted catches of deep water rose shrimp fishery ranged between 25 and 40% of the total catch with a huge amount of DPS and HKE juveniles (Milisenda et al., 2017). The aim of the experiment is the improvement of selectivity in crustacean fisheries by the adoption of sorting grids. The technical device adopted in the experiment was based on the configuration (opportunely adapted for our fisheries) proposed by Bahamon et al. (2007). In particular an interchangeable system was projected to adapt, on a fixed frame, three grids with different selectivity (Grid 1, Steel & Net, mesh size 40 mm square; Grid 2, Steel, space among the bars 2 cm; Grid 3, Steel, space among the bars 2.5 cm). The sampling design consisted in repeated hauls (with grid and without grid) using a local commercial fishing vessel. Forty-eight trawl hauls were carried out

on consecutive days over the same geographical coordinates during November 2015. In September 2017 a new survey was conducted with the same vessel for a total of further 42 hauls. Tow time was limited to 1 h and towing speed was 2.7 – 3.0 knots. DPS and HKE catches were categorized as (1) escaped by grids (2) retained in the cod-end during the hauls with grids and (3) retained in the cod-end during the hauls without grids (control). All specimens were measured and the statistical differences among the different length frequencies distributions (1-escaped by grids; 2-retained in the cod-end during the hauls with grids; 3-retained in the cod-end during the hauls without grids, namely control) were tested by means of General Additive Model (GAM).

Bahamon, N., Sardà, F., Suuronen, P. (2007). Selectivity of flexible size-sorting grid in Mediterranean multispecies trawl fishery. Fisheries Science, 73(6), 1231-1240.
Milisenda G., Vitale S., Massi D., Enea M., Gancitano V., Giusto G. B., Badalucco C., Gristina M., Garofalo G., Fiorentino F. (2017). Discard composition associated with the deep water rose shrimp fisheries (Parapenaeus longirostris, Lucas 1846) in the south-central Mediterranean Sea. Mediterranean Marine Science, 18(1), 53.

Main results

The experiment demonstrated in situ sorting ability of the device and its potential to reduce DPS and HKE juveniles catches in deep water crustacean fisheries.
Concerning DPS the best device was the grid 1, able to reduce the catch of juveniles up to 31 % with statistical differences among the three length frequencies distribution: 1-escaped-2-retained in the cod-end (hauls with grids), 3-retained in the cod-end (control, hauls without grids) (p-value < 0.05).
Concerning HKE the best device was the grid 1, able to reduce the catch of juveniles up to 20 % with statistical differences among the three length frequencies distribution: 1-escaped-2-retained in the cod-end (hauls with grids), 3-retained in the cod-end (control, hauls without grids) (p-value < 0.05).
The efficiency of the adopted sorting device was affected by oceanographic conditions and benthic communities.

Discussion of the results

In the Mediterranean, the poor selectivity of trawlers is a challenging problem for the reduction of unwanted catches. Studies conducted over the past decade have shown that the selectivity of fishing gear can be improved through the use of technological solutions allowing trawl nets to capture certain species and in certain sizes (e.g. Kennelly 2007; Lucchetti 2008). The technical solutions tested in the case-study 1.5 represented a first attempt to reduce the impact of bottom trawl on deep water rose shrimp. The experiment demonstrated the potential capability of sorting grids in order to reduce DPS and HKE juveniles' catches. Comparing the catches with grid and without grid (control) obtained with the experimental trawl-net our results showed a reduction in the amount of undersize DPS and HKE up to 31% and 20%, respectively. Although the results obtained seemed encouraging, it is necessary to collect a further amount of data in order to obtain a progressive improvement of the device performance. For example, the high heterogeneity recorded among the hauls in terms of abundances, size structures, community assemblages, and substrates influenced the efficiency of the device in reducing unwanted catch.
The collaboration with fishermen is considered as a main step for the improvement of

the technical solutions tested as well as to assure a bilateral technological transfer between enterprises and scientific community. In this context a multi-actor approach was performed with the aim to bring positive changes in the current fisheries practice. This approach have an important social implications because it could provide the possibility to characterize the problem and propose shared solutions. The opportunity to discuss about socio-economic impact of some management measures, like the implementation of a “fishery management plans” (regionalization), represents a unique opportunity for the future co-management of marine resources.

Kennelly SJ (ed) (2007) Bycatch Reduction in the World’s Fisheries, Reviews: Methods and Technologies in Fish Biology and Fisheries Vol. 7. Springer, The Netherlands, p 288.
Lucchetti, A. (2008). Comparison of diamond- and square-mesh codends in the hake (Merluccius merluccius L. 1758) trawl fishery of the Adriatic Sea (central Mediterranean). Scientia Marina 72 (3), 451–460.

How practical is it for a fisherman to implement this improvement, technically and financially?

The addition of sorting grids to standard bottom trawl net seems a relatively cheap solution; regarding the technical implementation it requires the acquisition of an adequate practise.

Is there sufficient evidence to support wider adoption of the method/technology?

The experiment has shown that the addition of sorting grids to the bottom trawl net can reduce the impact on unwanted catches. However their adoption in commercial fisheries needs further data with the aim to define a specific grid efficient for each peculiar condition (e.g. assemblage characteristic, substrata typology).

CONCLUSION

Potentially the improvement of sorting grids could represent a fundamental device for the reduction in the catch of juveniles in deep water rose shrimp fisheries.

ADDITIONAL RELEVANT RESOURCES OR LINKS

EU Common Fisheries Policy (CFP) Reform: https://ec.europa.eu/fisheries/cfp_en
International Guidelines on Bycatch Management and Reduction of Discards: http://www.fao.org/fishery/nems/40157/en

The MINOUW Consortium

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