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Using a modified Nordmøre grid for by-catch reduction in the Portuguese crustacean-trawl fishery

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Abstract

By-catch and discards are a common problem to all fisheries. Recent studies of the Portuguese crustacean-trawl fishery show that discards average 70% of the total catch. This situation poses a threat not only to the management of target and commercial fish by-catch species stocks, but also in terms of the ecosystem impact of the discarded species whose survival is generally low.

Previous attempts to address this problem by using oblique separator mesh panels associated with square-mesh windows, or square-mesh windows alone, provided encouraging results, but these are unlikely to have commercial applicability at present. Therefore, we tested the efficiency of a modified Nordmøre grid in excluding some of the most captured non-commercial by-catch species, such as the blue whiting, *Micromesistius poutassou*, and the boarfish, *Capros aper*, evaluating simultaneously the losses of the crustacean target species (rose shrimp, *Parapenaeus longirostris*, Norway lobster, *Nephrops norvegicus* and red shrimp, *Aristeus antennatus*) and commercially valuable fish by-catch. A total of 41 valid hauls were carried out during 2001, and 15 in 2002 on board the R/V "Noruega". Results from both years varied considerably, with higher by-catch exclusion rates, in weight, registered in the second survey (73–74 and 48–63% for blue whiting and boarfish, respectively). The corresponding percentage reduction for target species was 8–15% for the Norway lobster, 4–9% for rose shrimp and 7–10% for red shrimp. The level of exclusion of the non-commercial by-catch is encouraging, although short-term loss of Norway lobster, where the escapees comprised larger individuals, raises some concern with regards to fishers' acceptance of mandatory use of grids.

Keywords: Trawl selectivity; Sorting grids; By-catch reduction; *Nephrops norvegicus*; *Parapenaeus longirostris*; *Aristeus antennatus*; *Micromesistius poutassou*; *Capros aper*; Portuguese waters

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1. Introduction

Vessels operating in the crustacean-trawl fishery off the coast of Algarve (south Portugal), target Norway lobster, *Nephrops norvegicus*, rose shrimp, *Parapenaeus longirostris*, and red shrimp, *Aristeus antennatus*, using a minimum codend mesh size of 55 mm. From 1984 to 1993, the Norway lobster dominated the landings, while from 1994 onwards there was a shift to the rose shrimp and red shrimp as the stock of Norway lobster declined. Like in most crustacean-trawl fisheries throughout the world, there is also a substantial capture of by-catch in addition to the targeted species. Some of the by-catch is retained and sold, including high value species such as the European hake, *Merluccius merluccius*, and the monkfish, *Lophius* spp., that contribute to a significant proportion of the total revenues of this fishery. However, a large subset comprising a miscellaneous collection of fish, crustaceans and cephalopods is discarded at sea.

An average of 70% of the total catch weight per haul was discarded in this fishery in 1995–1996 (Borges et al., 2001), while in subsequent years a lower figure of about 38% was reported by Monteiro et al. (2001). The blue whiting, *Micromesistius poutassou*, was found to be the most abundant discard in the latter study. Often, a certain proportion of discards corresponds to undersized individuals of commercially valuable species that form the basis of other fisheries. For these species the practice of discarding is viewed as a contribution to growth overfishing of stocks, causing conflicts among different *métiers* and between fishers and fisheries management authorities.

In a considerable number of crustacean-trawl fisheries, the concern raised by the mortality of large quantities of by-catch and undersized target species has been addressed via the assessment of alterations to existing commercial trawls, designed to improve both size and species-selectivity. These alterations typically have involved changes in the size and shape of the codend meshes and/or the use of different types of devices, commonly referred to as by-catch reducing devices (BRDs) (review, Broadhurst, 2000). Although different types of BRDs have been successfully testedworldwide and commercially adopted in some fisheries, e.g., in Argentina, Australia, Canada, Iceland, Mexico, Norway, USA (Anon., 1996, 1998), there is often considerable resistance from the industry to their enforced use. Some of the factors that have been shown to limit acceptance of modifications include: failure to operate efficiently over a range of commercial conditions (Christian and Harrington, 1987), undesirable effects on gear performance and handling (Oravetz and Grant, 1986), complex designs and high costs (Watson, 1989; Mounsey et al., 1995; Robins and McGilvray, 1999) and unacceptable losses of commercially valuable by-catch or of target species (Hanna and Jones, 2000).

The improvement in codend selectivity of crustacean trawls has been previously addressed by INIAP/IPIMAR (Portuguese Institute for Agriculture and Fisheries Research). A considerable amount of information was gathered regarding how the most important species react both to an increase in codend mesh size and changes in mesh configuration (Campos et al., 2002, 2003). The results obtained in these studies support the idea that an increase in codend mesh size from the current 55 mm, as well as a change in mesh configuration from 55 mm diamond to 55 mm square mesh, would allow the exclusion of a high proportion of undersized individuals, together with non-commercial by-catch, but always at the expense of losing an important fraction of commercial-sized shrimp. Experiments using separator mesh panels (Campos and Fonseca, 2004) and square-mesh windows inserted in the upper belly or in the top of the codend (Fonseca et al., 1998) were also carried out on board research vessels, and therefore the validation of the results under commercial conditions is still needed. However, while the sorting panels had a complex design and rigging, losses of rose shrimp above the minimum landing size (MLS) were registered when using the square-mesh windows alone. Hence, both the latter devices are likely to raise objections from fishers.

As a consequence, it was decided to pursue a different approach based on the use of a modified Nordmøre grid, as these types of BRDs have proven successful in a number of crustacean fisheries (without excessive loss of target species), and their use is now mandatory in several fisheries in the North Atlantic (Anon., 1996, 1998).