SELECTIVITY IN A MEDITERRANEAN BOTTOM TRAWL FISHERY: IS THE COUNCIL REGULATION (EC) Nº1967/2006 ENOUGH FOR FULFILLING THE LANDING OBLIGATION?

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Abstract
This study aimed at comparing catches and size composition, both from landings and discards, obtained by three different mesh types in the codend of bottom trawlers in the western Mediterranean. Information was obtained under commercial conditions in the Balearic Islands. Our results suggested that the two recently implemented meshes do not have an equivalent selectivity but, in general, both are more selective than the traditional mesh. Although the benefits of this management measure are demonstrated, with a clear reduction of discards in some of the strata, they are not enough for improving the exploitation pattern of many species and thus, additional measures should be implemented.

Keywords: Fisheries, Demersal, Monitoring, Balearic Islands, Coastal management

Discarding, returning unwanted catches to the sea, has adverse ecological impacts in marine ecosystems, even posing in risk the sustainability of current fisheries [1]. One of the objectives of the new Common Fisheries Policy is doing away with discarding through the obligation to land all the catches of those species with minimum sizes (landing obligation). The improvement of bottom trawl selectivity is one of the key points for reducing discards and improving the exploitation pattern of species, which cannot only be achieved by a simple reduction in the current fishing mortality [2]. The Council Regulation (EC) Nº1967/2006 concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean, established a change of the mesh type in the bottom trawl codend, from the traditional 40 mm diamond mesh (40D) to a 40 mm square mesh (40S). This measure also established the exemption of using 50 mm diamond mesh (50D) if its selectivity is equivalent to or higher than that of 40S. Although most fleet adopted this, the scientific information on selectivity of 50D in the western Mediterranean is almost nil.

The objective of this study was to compare catches and size composition, landings and discards, obtained by the three mesh types under commercial conditions. The specific objectives were: i) to analyze if the selectivity of the 40S and 50D are equivalent, and compare them to the 40D and ii) to assess the usefulness of the new meshes for the landing obligation. Data were obtained from the monitoring of the bottom trawl fleet (2009-2013) in the Balearic Islands, where bottom trawlers operate along a wide bathymetric range (50-800 m), from the shallow shelf to the middle slope, in four different fishing tactics. Data were analyzed using several univariate and multivariate techniques.

At community level, no differences were detected in the species composition with the three mesh types, but significant differences were detected in the biomass indices in the shallow shelf and middle slope, including a clear reduction of discards mainly with the 40S (Figure 1).

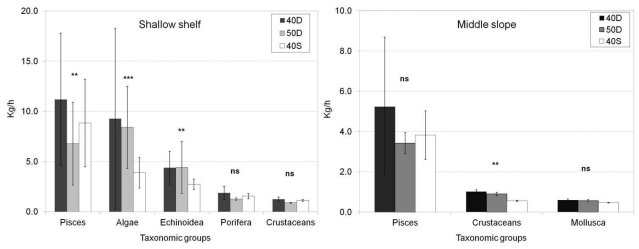

Fig. 1. Yields of standardized biomass for the main taxonomic groups of the discarded fraction for the shallow shelf and for the middle slope. 40D: 40 mm diamond mesh; 50D: 50 mm diamond mesh; 40S: 40 mm square mesh; ns: not significant; *: p<0.05; **: p<0.01; ***: p<0.001.

Significant differences were also found in the abundance and biomass indices for some species, although they species did not respond similarly to the mesh change and their performance can be related to other factors, such as their population dynamics or morphological issues. Differences in size composition by mesh type have also been detected for some species, as well as a decrease in the abundance of undersized and immature individuals caught with the recently implemented meshes (Table 1). However, the most selective mesh type is the 40S, followed by the 50D, while the 40D is the less selective. According to that, the current exemption of using 50 mm diamond mesh codend is not fully justified.

Although this study reflects the potential benefits of these management measures, with a reduction of the discarded catches and an improvement of the exploitation pattern, this improvement does not affect equally to them all. For most of the target species, a large part of the catches is still under their length at first maturity and, for some, even under their minimum conservation reference size (Table 1). In this sense, this management measure would barely help to the landing obligation enforcement for species such as *Merluccius merluccius*, and is still not enough for ensuring an improvement of the exploitation pattern of many species. Thus, additional measures should be implemented.

Tab. 1. Percentage of the abundance (Ab%) of individuals under Minimum Conservation Reference Size (MCRS) and under length at first maturity (L_{50mat}) related to total catch. 40D: 40 mm diamond mesh; 50D: 50 mm diamond mesh; 40S: 40 mm square mesh. Fish: total length, cm; crustaceans: carapace length, mm; cephalopods: mantle length, cm.

Species	MLS	Ab % <MCRS			L_{50mat}	Ab % <L_{50mat}		
		40D	50D	40S		40D	50D	40S
M. surmuletus	11	1.9	0.6	0.7	15♂; 17♀	52.5	53.9	39.5
S. smaris	11	3.7	4.1	0.7	15.3♀	24.3	45.2	10.4
M. merluccius	20	55.0	31.8	66.6	32	97.8	97.0	98.3
N. norvegicus	20	0.0	0.2	0.0	30	17.9	21.1	10.2
L. boscii	15	42.4	60.5	81.4	11♂; 14♀	33.1	56.8	70.6
L. vulgaris	-	-	-	-	16♂; 19♀	96.4	94.9	97.7
S. canicula	-	-	-	-	43♀; 44♂	93.9	93.7	95.1
O. vulgaris	-	-	-	-	8♂	52.1	54.8	56.8
G. melastomus	-	-	-	-	44♂; 49♀	99.9	99.5	100
A. antennatus	-	-	-	-	19♂; 25♀	25.4	25.7	25.7
P. blennoides	-	-	-	-	19♂; 20♀	86.2	76.5	64.8

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