SELECTIVITY OF TWO DIAMOND MESH SIZE COD-ENDS IN THE TRAWL FISHERY OF THE NORTHERN TYRRHENIAN SEA (WESTERN MEDITERRANEAN)

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Abstract

Experimental fishing trials were carried out to compare the size selectivity of the 40 mm stretched diamond mesh size cod-end, commonly used in the Italian waters, and the 60 mm stretched diamond mesh size cod-end. In total, 24 tows were carried out in summer 2003 and spring 2004 between 20 and 350 m depth. Selection curves were estimated through the covered cod-end method. The experimental net was more selective for most of the commercial species, showing a reduction of the percentage of retained fraction and a consistent increase of the L_{50} retention length.

Keywords : Demersal, Fisheries, Tyrrhenian Sea.

Introduction

Mediterranean trawling is typically multi-species. In addition to the target species, an important contribution to the commercial value of the catch is provided by the accessory species; most of the marketed species are of small size, as many cephalopods and crustaceans. This implies the use of gears with reduced selectivity, especially in the case of trawling. A previous study in the same area showed the high multi-specificity of the commercial landing and the importance of discards in trawl activity [1]. In the context of the reform of the EU Common Fisheries Policy, in 2003 the Commission proposed a regulation concerning management measures for the sustainable exploitation of fishery resources in the Mediterranean Sea based on the Community action plan for the conservation and sustainable exploitation of fishery resources in the Mediterranean Sea (COM(2002) 535 final of 9 October 2002). The proposal introduces technical measures to improve the selectivity of the current 40 mm mesh size for towed nets by increasing the minimum mesh size to 60 mm. The aim of the present study was to compare the selectivity parameters of the 40 mm commercial diamond mesh cod-end and of an experimental 60 mm mesh cod-end.

Materials and methods

The study was performed in the northern Tyrrhenian Sea (western Mediterranean). Two trawl nets were used: a commercial net, provided with nominal 40 mm diamond mesh cod-end, and an experimental net, provided with a 60 mm diamond mesh cod-end.

Experimental trials have been carried out onboard of a demersal fishing vessel in summer 2003 and spring 2004, at depths ranging from 20 to 350 m. The nets were enclosed in an enveloping small mesh cover to trap the escaping fish. In order to maintain a good flow of water and to avoid the masking effect, the cover was held from the cod-end by means of two hoops placed outside the cover.

For each net, six 1-hour experimental hauls were carried out every season for a total of 12 hauls. The selection curve for each net, commercial and experimental, was estimated through the covered cod-end method [4]. The selectivity of the net was estimated by comparing the catches at length in the cod-end with those in the cover. Estimation of the 50% retention length (L_{50}), of the selection factor (SF) and of the selection range (SR) were done by fitting the experimental data to a logistic curve using the SELECT statistical package (Trawl function package for R) [2, 3]. Due to the small number of specimens collected in most individual hauls, it was necessary to merge the survey data. The retained fraction R in the cod-end was estimated by the following equation:

$R = [(N_{cod-end}/N_{total}] \times 100$, where $N_{cod-end}$ was the number of specimens in the cod-end and N_{total} the total number of specimens caught (cod-end plus cover cod-end).

Results and discussion

The species richness of the catches was not affected by the use of a larger mesh size in the cod-end. During the experimental trials, 142 species were caught, belonging to four major taxa: teleosts (88), crustaceans (28), cephalopods (20) and elasmobranchs (6). Table 1 shows the number of species caught in each survey, according to the major taxa.

The experimental net showed higher selectivity for most of the commercial species (Tab. 2), with a consistent decrease of the percentage of retained fraction. For almost all species, the L_{50} estimated from the 60 mm cod-end mesh size was higher than the L_{50} obtained from the 40 mm cod-end mesh size; in addition, the L_{50} from the 60 mm mesh was higher than the minimum landing size established by the EU regulation for the Mediterranean.

Tab. 1. Number of species caught in each survey.

Taxonomic group	Commercial cod-end 40 mm mesh size				Experimental cod-end 60 mm mesh size			
	Summer		Spring		Summer		Spring	
	cod-end	cover cod-end	cod-end	cover cod-end	cod-end	cover cod-end	cod-end	cover cod-end
Teleosts	52	36	50	39	43	43	53	48
Crustaceans	14	13	14	22	4	10	13	19
Cephalopds	14	10	13	11	10	10	13	9
Elasmobranchs	2	1	3	1	2	0	5	1

Tab. 2. Selectivity parameters.

specie	COMMERCIAL NET D40					EXPERIMENTAL NET D60				
	N_{total}	R	L_{50}	SR	SF	N_{total}	R	L_{50}	SR	SF
Argentina sphyraena	183	69.4	11.31	4.23	2.83	539	8.9	23.12	9.95	5.78
Arnoglossus laterna	66	10.6	12.63	4.21	3.16	214	10.7	10.58	2.49	2.65
Chlorophthalmus agassizi	223	4.0				3209	6.1			
Galeus melastomus	34	67.6				97	30.9			
Helicolenus d. dactylopterus	309	74.4	6.73	1.96	1.68	478	23.0	10.31	3.17	2.58
Lepidopus caudatus	1555	96.5				256	25.0			
Lepidorhombus boscii	61	98.4				95	72.0			
Lepidotrigla cavillone	73	95.9				85	69.4			
Merluccius merluccius	6976	76.5	9.17	2.56	2.29	5769	21.6	18.10	10.62	4.53
Micromesistius poutassou	818	14.7				1792	5.9			
Mullus barbatus	15122	16.5				5695	1.9	16.63	3.01	2.77
Phycis blennoides	160	33.8	11.95	3.17	2.99	308	21.1	17.23	5.38	4.31
Spicara smaris	1238	0.7				1358	12.6			
Trachurus m. mediterraneus	190	62.1				153	58.2			
Trachurus trachurus	485	52.2	10.28	3.04	2.57	494	26.1	19.83	10.52	4.96
Trisopterus minutus capelanus	903	56.1	10.94	4.54	2.74	747	25.5	16.13	5.14	4.03
	N_{total}	R	L_{50}	SR	SF	N_{total}	R	L_{50}	SR	SF
Eledone cirrhosa	267	85.8	4.60	3.62	1.15	297	60.6	5.45	3.01	1.36
Illex coindetii	1071	92.1	4.10	2.00	1.00	548	48.0	7.92	3.93	1.32
	N_{total}	R	L_{50}	SR	SF	N_{total}	R	L_{50}	SR	SF
Parapenaeus longirostris	1714	95.1	12.98	5.32	3.25	1625	52.9	22.25	11.96	5.56

These results encourage further investigations on alternative methods, such as selection grids, square mesh panels, separator trawls, etc., to increase the escape of small sized fish.

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