

SIZE SELECTIVITY OF SORTING GRID FOR COMMON PANDORA (*PAGELLUS ERYTHRINUS* (LINNAEUS, 1758)) IN THE GULF OF ANTALYA, EASTERN MEDITERRANEAN

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Abstract

Size selectivity of sorting grid was studied for Common pandora in the Gulf of Antalya. Trawling's were carried out in October - December 2012, with a traditional bottom trawl net (600 mesh around the mouth). The fish totally retained in upper codend (catches) and bottom codend (escapes) were used to estimate the selectivity. Selectivity data analyzed as covered cod-end method by means of a logit function of Maximum Likelihood Method. The Kolmogorov – Smirnov test (KS – test) was applied in order to determine the difference between size groups of escapes and catches codends. The percentages of the total catch in terms of weight were 56% retained and 44% escaped. Mean L_{50} value of common pandora was calculated as 14.47 ± 0.27 cm. Total weight of common pandora caught in hauls was 29.937 kg. The results confirm that using sorting grid fixed mesh codend gave higher L_{50} value than size selectivity studies with different mesh size and shapes.

Key words: sorting grid, size selectivity, Common pandora, Antalya gulf, Eastern Mediterranean.

INTRODUCTION

The common pandora, *Pagellus erythrinus* (Linnaeus, 1758), is a member of family Sparidae and an important commercial food fish in the Mediterranean region. It is distributed in waters of the continental shelf of the northeastern and central-eastern Atlantic Ocean, from Norway to Guinea-Bissau including the Mediterranean Sea and the Madeira, Canary and Cape Verde Islands (Coelho et al., 2010). This species is caught with bottom trawls, beach seines, on line gear, traps (Canary Islands), trammel nets, gill nets, bottom long lines and hand lines (Russell, 2014). The minimum landing size for this species is 15 cm in Turkey and in the Mediterranean (Özbilgin et al., 2012). It can grow up to 60 cm but its usual length in catches is 10 to 30 cm (Bauchot and Hureau, 1986). During the MEDITS expedition, the range was from 4 to 27 cm (average value 14.72 cm) (Vrgoč, 2000), in the same area. Generally, longer fish were caught in deeper water (Adriamed, 2010).

According to FAO statistics, the global production of *P. erythrinus* was 15.000

tonnes/per year in 1963 - 1968. After that date, it was subsequently decreased significantly since 1987 to 2007 to about 4.500 tonnes per year. (Coelho et al., 2010)

Improved selectivity can be achieved in different ways, by modifying the gear design and/or operation and by using alternative fishing gears. In trawls mesh size and by inserting filtering grids in front of codend is a well-known measure to regulate the size of captured organisms. Successful separation of targets and non-targets species can also be achieved by using grid devices (Valdermarsen, 2005).

Gulf of Antalya is predominantly overfished by vessel from Iskenderun and Mersin. Most of commercially fish species live at a depth of 30-200 m. *Mullus barbatus barbatus* Linnaeus, 1758 (Red mullet), *Mullus surmuletus* Linnaeus, 1758 (Surmullet), *Upeneus moluccensis* (Bleeker, 1885) (Goldband goatfish), *Saurida undosquamis* (Richardson, 1848) (Brushtooth lizardfish), *Boops boops* (Linnaeus, 1758) (Bogue), *Pagellus erythrinus* Linnaeus, 1758 (Common pandora), *Spicara flexuosa* (Linnaeus, 1758) (Picarel), are main

demersal commercially important species of Mediterranean coast of Turkey.

This is first selectivity study for Common pandora by using horizontal bar spacing from the eastern Mediterranean Sea. Although, there are many selectivity studies carried out by using different shape (diamond, square, hexagonal) and sizes (40, 44, 50 mm) of codends in the Mediterranean coast of Turkey (Ferretti and Frogli, 1975; Kınıkarıslan, 1976; Livadas, 1988; Jukic and Piccinetti, 1988; Gurbet, 1992; Stergiou et al., 1994; Gurbet et al., 1997; Lök et al., 1997; Tokaç and Tosunođlu, 1997; Tosunođlu et al., 1997; Tokaç et al., 1998; Tosunođlu, 2000; Akyol et al., 2000; Kınacıgil et al., 2001; Fiorentini and Leonori, 2002; Özbilgin and Tosunođlu, 2003; Tosunođlu et al., 2003), there are no selectivity study by using sorting grid in the Mediterranean coast of Turkey.

In this study, size selectivity of sorting grid for common pandora in the gulf of Antalya, eastern Mediterranean.

MATERIALS AND METHODS

A total of 14 hauls were conducted in the Gulf of Antalya (northeastern Mediterranean Sea), at depths of 30 – 200 m (Figure 1), with a traditional bottom trawl net (600 mesh around the mouth).

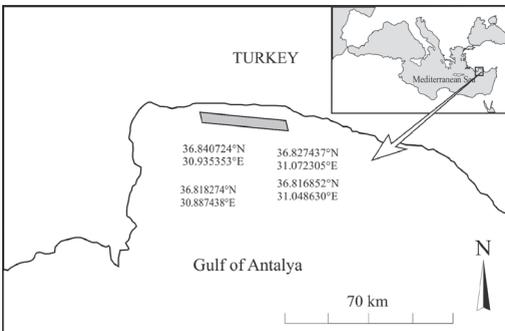


Figure 1. Study area for selectivity study conducted in bottom trawl fishery

The towing speed varied between 2 and 3 knots. The mean effective towing duration was 106 min (range 90 – 120 min). The research vessel (R/V Akdeniz Su) has a length overall of 26.5 m and 2 x 450 HP engines. Sorting grid was attached aft belly of the net. After each

haul, fishes caught from both codends were sorted by species and were separately weighed. The fish totally retained in front of the grid and collected upper codend (catches), and bottom codend (escapes) were used to estimate the selectivity (Figure 2, 3). All taxa were determined to the species level whenever possible and the respective weights recorded from the codends. All individuals (without using sub-samples) were immediately weighed (total wet weight) to the nearest 0.1 g and measured to the nearest cm in the laboratory of the research vessel.

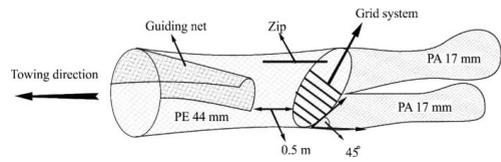


Figure 2. General view of the sorting grid and codends



Figure 3. Sorting grid fixed bottom trawl net used in the study

Selectivity curves of the individual hauls were obtained by fitting the logit function: $r(l) = \exp(v_1 + v_2l) / [1 + \exp(v_1 + v_2l)]$ by means of the maximum likelihood method as given in Wileman et al. (1996), where the parameters v_1 and v_2 are the intercept and slope of the linear logistic function, respectively. The mean selectivity curves were estimated from the individual hauls which were fitted taking into account the between haul variation. The Kolmogorov – Smirnov test ($K - S$ test) was applied in order to determine the difference

between size groups of escapes and catches codends (Aydn et al., 2007).

RESULTS AND DISCUSSIONS

Selectivity of sorting grid for commercial fish species was studied in the gulf Antalya. The present study is first selectivity study by using horizontal grid bars for Common pandora in the gulf of Antalya, Turkey. Total 14 hauling were carried out during the trials and a total weight of 29.937 kg Common pandora was caught (Table 1).

Table 1. Weights, numbers, and percentages of total numbers of common pandora retained in codends

Species	Amount
Common Pandora	
Weight in catches codend (kg)	19.087 (67%)
Weight in escapes codend (kg)	9.442 (33%)
Number in catches	358 (56%)
Number in escapes	279 (44%)

Table 1 shows the weight and number of the investigated species. Other species usually present in the catch were *Solea solea* (Linnaeus, 1758), *Chelidonichthys lucerna* (Linnaeus, 1758), *Trachurus mediterraneus* (Steindachner, 1868), *Trachurus picturatus* (Bowdich, 1825), *Pagrus pagrus* (Linnaeus, 1758), *Nemipterus randalli* (Russell, 1986), *Merluccius merluccius* (Linnaeus, 1758), *Citharus linguatula* (Linnaeus, 1758), *Chelidonichthys lastoviza* (Bonnaterre, 1788), *Spicara flexuosa* (Linnaeus, 1758), *Boops boops* (Linnaeus, 1758), *Serranus hepatus* (Linnaeus, 1758), *Serranus cabrilla* (Linnaeus, 1758), *Diplodus annularis* (Linnaeus, 1758), *Dentex maroccanus* (Valenciennes, 1830), *Pagrus caeruleostictus* (Valenciennes, 1830), *Sillago sihama* (Forsskal, 1775), *Trichiurus lepturus* (Linnaeus, 1758), *Bothus podas* (Delaroche, 1809) and *Zeus faber* (Linnaeus, 1758) from the Gulf of Antalya.

Kolmogorov - Smirnov test showed that differences between length groups of catches codend and escapes codend for common pandora wasn't significant ($K - S$ test, $D: 0.1875; P = 0.912$) ($p > 0.05$).

Selectivity parameters of Common pandora

The total number of 637 are taken to be evaluated for common pandora and 358 (56%) of these were retained on the catches codend; 279 (44%) of these were retained on the escapes codend. While fish size groups retained on the catches codend were ranging 11 – 22 cm, escapes codend groups were 7 – 19 cm (Figure 4). L_{25} , L_{50} , L_{75} selection ranges and selection factor are calculated for common pandora. The results were found as $L_{50} = 14.5 \pm 0.27$ cm, $SR = 2.9$, $SF = 4.14$ (Table 2).

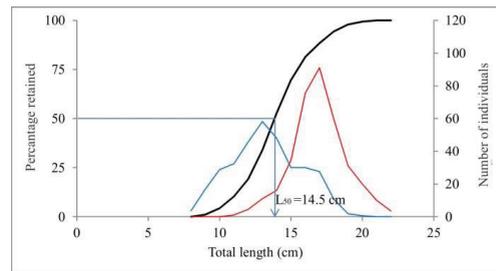


Figure 4. Selectivity curves and length distribution (red line: catches; green line: escapes) of common pandora

Table 2. Selectivity parameters of sorting grid system for common pandora . L_{25} , 25% retention length; L_{50} , 50% retention length; L_{75} , 75% retention length; SR, selection range; SF, Selection factor; v_1 and v_2 , regression parameters, SE, standard errors; SFM, size at first maturity; MLS, minimum landing size

Catches	358
<MLS	41 (11%)
≥MLS	317 (89%)
Escapes	279
<MLS	210 (75%)
≥MLS	69 (25%)
SR	2.9 cm
SF	4.14
L_{25}	13.03 cm
$L_{50} \pm SE$	14.5 ± 0.27 cm
L_{75}	15.92 cm
$v_1 \pm SE$	10.9 ± 0.27 cm
$v_2 \pm SE$	-0.76 ± 0.03 cm
MLS/SFM	15 cm

There were found three selectivity studies for common pandora by using different size and material of mesh codends in the Mediterranean coast of Turkey and 4 studies in Atlantic (Table

3). Tokaç et al. (1995) was calculated L_{50} value as 10.07 cm (by using 20 mm codend) and 13.27 cm (24 mm codend) in Aegean Sea. Özbilgin and Tosunoğlu (2003) were estimated as 10.50 cm (by using 22 mm codend) in same research area. Both studies the hooped covered codend method were used. Çiçek (2015) was estimated L_{50} value as 7 cm by using the covered cod-end technique in Karataş, coast of Adana.

Table 3. Selectivity parameters of common pandora selectivity studies conducted in Atlantic and Mediterranean Sea

References	Mesh/Grid size (mm)	L_{50} (cm)	SF	Locality
Tokaç et al., 1995	40	10.8	-	Mediterranean Sea
	36	12.4	-	
	44	13.8	-	
Özbilgin and Tosunoğlu, 2003	22	10.5	-	
Çiçek, 2015	22	7.20	3.18	
Present Study	35	14.5	4.14	
Levi et. al., 1971	40	11.8	0.89	
Vrgoč, 1995	40	11.30	-	
	40	11.8	0.89	
Jukić and Piccinetti, 1987	41	11.8	0.89	
	51	12.2	0.95	
	55	16.4	0.90	
	65	20.5	0.91	
Joksimovic, 1999	13.5*	7.60	-	
	16.1*	8.68	-	
	17.5*	10.82	-	
	22*	15.00	-	
	35*	15.26	-	

* knot to knot.

The L_{50} that we determined was 14.47 cm for a net with sorting grid fixed 35 mm codend mesh size in the gulf of Antalya, intermediary between three previously reported values in the Mediterranean Sea. Possible reasons for these differences include the location of the research (different seas), differences in net materials, and different hang-in ratios (Tosunoğlu and Tokaç, 1997; Tokaç et al., 2004). Besides these, the differences between L_{50} sizes may be occurred fishing the populations of different size groups in localities or a lesser intensive

fishing pressure on this species may have occurred in the gulf of Antalya.

It is clear that third studies by using hooped and covered codend methods gave lower L_{50} size than present study by using sorting grid bar fixed 35 mm codends. According to Sarda et al. (2004) and Aydın, (2008); size selectivity studies made with sorting grids are more successful than size selectivity studies with different mesh size and shapes.

Generally, it is waiting that number of fish individuals larger than MLS retained in the escapes codend would be expected low, in the size selectivity studies. A total of 41 (11%) individuals of common pandora larger than L_{50} size were retained in catches codend. It is considered that some materials having very large size such as pet bottles, garbage bags, twigs, tires, and very large fishes such as stingrays and groupers may have blocked the selectivity grids during the hauls and individuals smaller than L_{50} couldn't pass the bar and changed the direction and retained in catches codend.

CONCLUSIONS

In order to improving the size selectivity of trawl nets, square mesh codend and fixed sorting grid bar together may give better results for size selectivity of immature individuals and discard species.

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