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Gillnet Selectivity for Bogue *Bopps boops* Caught by Drive-in Fishing Method from Northern Eagean Sea, Turkey

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Abstract: This study was carried out in six different stations in the Northern Aegean Sea between February-May 2008. In the study, the three different fishing nets which were intensively being used by the region fishermen, the net height of which was 105 meshes and the mesh sizes of which were 44, 46 and 50 mm. In the operations performed with the drive-in fishing method, 5867 and 740 kg fish pertaining to the total 30 species were caught and 4791 were got from bogue being the target species. This value composes of approximately 82% of the total catching. SELECT method was used to fit gill net selectivity curves. Log normal model gave the best fit for the bogue selection. It was observed that modal length and spread values increased as far as the net mesh grew. It was determined that the length groups of bogue individuals we got in our study were quite above the first reproduction length. For this reason, it was seen that the gillnets used in the region did not create fishing pressure over the population.

Key words: Gillnet selectivity, Bogue, select method, drive-in fishing method, Northern Aegean Sea

INTRODUCTION

The Northern Aegean, which is under the effect of zooplankton rich waters coming from the Black Sea, where intensive migrations are lived and coastal fishing activities are made effectively, has an important place for fishery (Kocatas, 1992). In the region which has big contribution to economy through coastal fishery, there are 1034 fishing boats registered in the Çanakkale (TUIK, 2006). Fishing is realized with these boats and gillnets (and trammel nets), long line, beam trol, angling. Especially with gillnets being one of passive fishing gear, fish having high economic value are caught in boats of less specialities (Hubert, 1996).

For sustainable fishery, selectivity of the target species is very important in the point of getting maximum product and protecting young individuals (Gulland, 1983; Wileman *et al*., 1996). Thanks to the use of fishing gear in scientific studies, the determination of the length distributions of caught species has importance with regard to knowing the stock. Gillnets are mostly used fishing tools in this direction (Clark, 1960; Hamley, 1975). It is known that selectivity of gillnets can be arranged with their mesh size and that they are a fishing tool having high selectivity (Holt, 1963; Hamley, 1975; Petrakis and Stergiou, 1995). Selectivity of gillnets vary on the size and shape of fish, the mesh size, thickness of twine, fishing net material, colour, hanging ratio and fishing method (Holt, 1963; Hamley, 1975; Santos *et al*., 1998; Hovgard *et al*., 1999).

Nevertheless fishing with gillnets is quite common in the region, drive-in fishing method is a very preferred catching method. Many different nets can be used with this method and so commercial fish can be caught in short time and effectively. In this catching method the target species are especially bogue *Boops boops*, chub mackerel *Scomber japonicus*, common two-banded seabream *Diplodus vulgaris*, white sea-bream *Diplodus sargus*, saddled seabream *Oblada melanura* and porgy *Dentex dentex*.

Bogue pertains to Sparidae family and is a demersal and semi pelagic species. This species continuing its life generally in coastal region can take place in the bottom structures being sandy, muddy, rocky or sea grass. It shows prevalence in the West Atlantis in Mexico coasts and in the Caribbean Sea and in the East Atlantis from Norway until Angola Islands and also in the Mediterranean Sea, Marmara Sea and Black Sea (Bauchot and Hureau, 1986). Although this species which comes to water surface especially in the nights and lives in schools is met in the depths until 300 m, it is seen usually in the depths being shallower than 150 m (Bauchot and Hureau, 1986; Sanches, 1992). Bogue being a commercial species can find place for itself both in

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domestic and foreign market. According to Turkish Statistical Instituite's data, in Turkey in 2007, 3851 ton catching of it was made and the great part of this catching has been realized in the Aegean Sea (TUIK, 2007).

Although many studies were made about selectivity of gillnets (Petrakis and Stergiou, 1995; Santos *et al*., 1998; Hovgard *et al*., 1999; dos Santos *et al*., 2003; Fonseca *et al*., 2005; Karakulak and Erk, 2008), selectivity in gillnets in two spreads of bogue having commercial importance was studied but they were caught as by-catch in these studies (Stergiou and Erzini, 2002; Karakulak and Erk, 2008). There is no any study made by taking bogue as target. So in the study, which had the quality of being the first, we made, to determine selectivity and catching composition of fishing nets which were being used commonly in bogue catching by fishers in the North Aegean Sea and had 44, 46 and 50 mm mesh sizes was aimed.

MATERIALS AND METHODS

This study was realized in six different stations in the Northern Aegean (Fig. 1) between February-May 2008. In the study the three different fishing nets which were intensively being used by the region fishers, the net height of which was 105 meshes and the mesh sizes of which were 44, 46 and 50 mm. The operations were made with drive-in fishing method (von Brandt, 1984) after the sunset. After the operation, the weights of fish were taken on the scales having 1g sensitivity and the Total Lengths (TL) of them were measured with millimetric measurement board. Classification of fish species was made according to Whitehead *et al*. (1986) and Mater and Çoker (2004).

In the calculation of selectivity parameters, SELECT method which was developed by Millar (1992), Millar and Holst (1997) and Millar and Fryer (1999) was used. In the calculation of selectivity parameters, GILLNET computer program was used as well (CONSTANT, 1998).

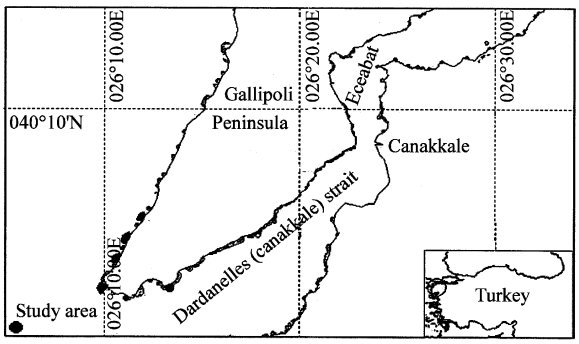

Fig. 1: Study area

RESULTS

In the operations realized, 5867 and 740 kg fish pertaining to the total 30 species were caught and 4791 were got from bogue being the target species. This value composes of 82% of the total catching. When bogue catching was compared according to the nets, the most catching was made as 1703 with the net having 46 mm mesh size (Table 1).

When looked at the length-frequency distributions, the most capturing was observed in 21.5-23 cm length intervals in fishing net having 44 mm mesh size, in 21.5-24 cm length intervals in fishing net having 46 mm mesh size and in 22-24.5 length intervals in fishing net having 50 mm mesh size (Fig. 2).

SELECT method was used to fit gill net selectivity curves. Log normal model gave the best fit for the bogue selection (Table 2).

It was observed that modal length and spread values elevated as far as the net mesh grew (Table 3 and Fig. 3).

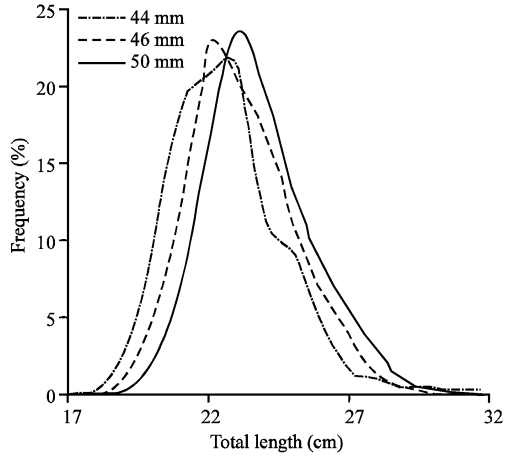

Fig. 2: Length-frequency values of bogue caught by the different gill nets

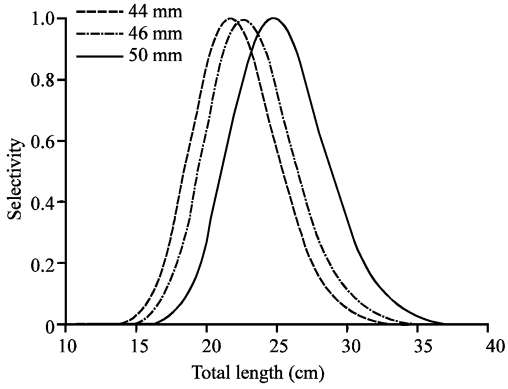

Fig. 3: Selectivity curves of gill net for the bogue

Table 1: Total number and weight of species caught by the different gill nets

	22 mm		23 mm		25 mm		
Species	N	W	N	W	N	W	Total W
Boops boops	1399	167.809	1703	213.369	1689	233.855	615.033
Pomatamus saltatrix	52	5.499	51	7.095	57	7.982	20.576
Serranus scriba	5	0.36	-	-	1	0.115	0.475
Microchirus sp.	2	0.218	-	-	-	-	0.218
Sciaena umbra	-	-	2	0.177	-	-	0.177
Pagrus pagrus	-	-	1	0.102	-	-	0.102
Phycis blennoides	-	-	1	0.118	1	0.31	0.428
Engraulis encrasicolus	1	0.04	-	-	-	-	0.04
Diplodus annularis	10	1.019	28	3.512	35	5.032	9.563
Scorpaena sp.	5	0.518	2	0.253	5	0.771	1.542
Trachurus trachurus	11	1.189	6	0.827	31	4.115	6.166
Trachurus mediterraneus	11	1.336	28	3.431	2	0.268	5.035
Spicara maena	4	0.37	6	0.631	3	0.573	1.574
Pagellus erythrinus	3	0.283	1	0.145	-	-	0.428
Diplodus vulgaris	2	0.272	62	6.511	86	11.733	18.516
Scliorhinus canicula	2	0.254	1	0.058	-	-	0.312
Scomber japonicus	6	0.638	7	0.453	19	2.708	3.799
Pagellus bogaraveo	-	-	1	0.132	7	1.003	1.135
Oblada melanura	93	12.859	90	10.841	49	5.926	29.626
Sarda sarda	1	0.11	1	0.17	3	0.395	0.675
Sarpa salpa	-	-	-	-	3	0.339	0.339
Mullus surmuletus	-	-	1	0.142	3	0.345	0.487
Sardinella aurita	96	9.382	127	13.917	34	3,79	27.089
Trachinus sp.	-	-	-	-	1	0.078	0.078
Scomber scombrus	-	-	1	0.089	1	0.171	0.26
Pagellus acerne	3	0.316	5	0.485	1	0.079	0.88
Sepia sp.	-	-	-	-	1	0.121	0.121
Symphodus sp.	-	-	-	-	1	0.055	0.055
Sphyraena barracuda	-	-	-	-	1	0.267	0.267
Spondyliosoma cantharus	1	0.098	1	0.114	-	-	0.212
Total	1707	199.093	2126	258.676	2034	272.358	739.654

Table 2: The SELECT model parameters for bogue

Species	Model	Equal fishing powers parameters	Model deviance	p-value	Fishing power mesh size parameters	Model deviance	p-value	df
B. boops	Normal scale	(k1,k2) = (0.48505, 0.06920)	121.28	0.0000	(k1,k2) = (0.49479, 0.06855)	121.63	0.0000	36
	Normal location	(k, s) = (0.48148, 3.09459)	110.36	0.0000	(k, s) = (0.49042, 3.12389)	110.01	0.0000	36
	Log normal	(m, s) = (3.07018, 0.13293)	100.69	0.0000	(m, s) = (3.08785, 0.13293)	100.69	0.0000	36
	Gamma	(k, a) = (0.00889, 55.26631)	105.75	0.0000	(k, a) = (0.00889, 56.26631)	105.75	0.0000	36
	Bi-modal	No fit	No fit					

Table 3: Model length and spread values for the best fitting model of gill net selectivity model curves

		44 mm		46 mm		48 mm	
Species	Model	M. Lenght	Spread	M. Lenght	Spread	M. Lenght	Spread
Bogue	Log Normal	21,55	2,95	22,52	3,08	24,48	3,35

DISCUSSION

To not catch fish being under the first reproduction length has great importance for sustainable fishery. Catching those being under the first reproduction length will make pressure on population stock and so will cause the population to become smaller and to vanish in time. In a study made in the Southern Portugal, the first reproduction length of bogue was determined as 15.22 cm (Monteiro *et al*., 2006). El Agamy *et al*. (2004), in a study they made in the Southeast Mediterranean, reported that the first reproduction length of bogue was totally 12 cm in females and 13 cm in males (El Agamy *et al*., 2004). In the studies made in the Western Mediterranean, it was determined that the reproduction length was 13 cm. It was seen that except those caught randomly, the length distribution of bogue caught with gillnets was quite higher than this value.

Karakulak and Erk (2008), for the bogue, calculated the modal lengths as 15.28, 17.19, 19.10 and 21.01 cm, respectively in the study they made with the nets having 32, 36, 40, 44 mm mesh sizes and reported that the nets having 36, 40, 44 mm mesh sizes were harmless to the stock. In the study made, the modal length for 44 mm mesh size was found 20.36 mm. It is considered that the reason of this is sourced from thicknesses of the used

twine and the method difference. In another study made, the tests were made with monofilament gillnets having 44 and 48 mm mesh sizes and the modal length for bogue was reported as 22.94 and 25.02 cm, respectively. In the study we made it is predicted that the reason of that modal length of the net having 44 mm mesh size was lower was due to the net manufacturing material.

In the studies made in the Mediterranean Sea and North Atlantic, it was given that the first reproduction length of bogue was between 12-15 cm (El Agamy *et al*., 2004; Monterio *et al*., 2006). The length groups of fish we got in our study were determined quite above the first reproduction length.

CONCLUSION

So, it can be said that the gillnets used by fishers in bogue catching in the region do not form any fishing pressure on the species. However, there is need in seasonal studies to be able to discuss if the net mesh size creates fishing pressure on a fish species. There isn't any arrangement in administrational base in this subject in Turkey. Measures must be taken for the control of the net mesh size in the point of a sustainable fishery.

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