The Effects of Netting Twine on Discard Rates of Commercial Red Mullet Gillnets in Izmir Bay

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Abstract

In this study, discarded rates of the commercial red mullet (*Mullus barbatus*) gillnets made from different netting twine, monofilament and multifilament were presented. The nets were set near the shore which contains sea grasses (*Posidonia oceanica*) in İzmir Bay. These areas are sensitive habitats. During the fishing trials, totally 32 fish species have been caught, 21 of which were non-marketable. The rates of these non-marketable species are 77.8% and 22.8% in number for monofilament and multifilament gillnets, respectively. Serranidae and Labridae families were dominant in catch composition. The CPUE of the monofilament and multifilament gillnets for weight were calculated as 129.6±5.1 and 36.9±1.3 respectively. As a result, monofilament gillnets caught more non-marketable species than multifilament gillnets ($P<0.05$; $z=0.007$). Because of the high rate of discarded species, it is not advisable to use monofilament gillnets near the shore, which contains sensitive habitats.

Key words: Monofilament, Multifilament, Serranidae, Labridae, Sensitive habitats.

Introduction

In recent decades, discarded species, caught by fishing gear are an important problem as part of commercial fishing activity over the world. There has been significant concern throughout the world over the effects of discarded species of unwanted catches. However, there are few information about discard values and rates of Mediterranean and Black Sea like all over the world (Andrew *et al*., 1995; Kınacıgil *et al*., 1999). The discard value of fishing trials for Mediterranean and Black Sea was estimated as 564613 tons in the period between 1980 and 1990 (Alverson *et al*., 1994). According to FAO discard database accounts, only 24% of 1.5 million tons of nominal catch were reflected on statistics. As a result of that lacking information, only 18,000 tons of discard were determined for this region in 2003 (Kelleher, 2005).

There is an increased interest in small scale fisheries, generally practiced with set gears, and the potential partial replacement of trawl nets by set gears are generally more selective, might be beneficial to fisher's livelihoods (Fabi *et al*., 2002). The red mullet gillnets are very common fishing equipment in artisanal fishery in the Aegean Sea. Red mullet is one of the dominant species of trawl, and beach seine in İzmir Bay (Akyol and Kara, 2003). Trawl fisheries was forbidden in İzmir Bay and also use of beach seines has been prohibited for all Turkish waters except Edremit Bay since year 2000 (Anonymous, 1999). Because of these reasons, trammel nets and gillnets are the only fishing gears which could catch red mullet in İzmir Bay.

The mesh sizes of the gillnets have a large range between 12 mm to 120 mm in the Aegean Sea (Metin *et al*., 1998). Commercial gillnet fishermen generally use mesh size of 36 mm to catch red mullet and set the nets near shore where the depths ranged between 3 and 20 m in İzmir Bay. These areas are called "*apoşi*" by local commercial fishermen, where the sandy and muddy sea floors join with rocky and grassy zone. Not only nursery areas for juveniles, but also evolution and reproduction for mature individuals of many fish species use these zones. As a result, economically valuable species could have been caught by fishing trials in these areas. However, catching of immature individuals and non-marketable species could increase the discard ratio in catch composition. All commercial fishermen want to select the non-marketable species and individuals from their fishing gears (Aydın and Tosunoğlu, 2004); but in multi-species fishery, it is difficult to select economically potential species from fishing ground. Aydın *et al*. (2004) introduce increasing bar spaces of sorting grids in trawl net in order to help reducing discarded species. Gökçe (2004) searched the non-target species rate in prawn trammel nets used in İzmir Bay, and reduced them by using selvedge between the lead line and the net. There are several studies on discard problem of İzmir Bay. Akyol (2003) determined discard rate as 21% of the total catch in beach seines used in Aegean coast of Turkey. Gökçe and Metin (2007) introduced 63.9% of all catch composition in which an equivalence of 46 species was discarded in commercial prawn trammel net used in İzmir Bay.

Lots of species have showed different economic

values from region to region in Turkish waters such as economically potential or non-marketable values. Especially some wrasse species (e.g. *Labrus berglyta*, *Labrus merula*) and also some of the Serranidae species (e.g. *Serranus cabrilla*, *Serranus scriba*) markets. On the other hand, those of which are also discarded generally by Turkish fishermen. Species classified as non-marketable in this study were defined for İzmir Bay. This paper is subjected to determine the discard rates of monofilament and multifilament red mullet gillnets, used in İzmir Bay.

Materials and Methods

Totally, 24 fishing trials were conducted by a commercial fishing vessel, "Barış" (overall length 6 m) between May 2004 and May 2005 in İzmir Bay. The study area was given in Figure 1.

Four pieces of polyamide (PA) gillnets were set on the sea bottom in juxtaposition as recommended by Dutt (1965). Soft bodied red mullet are easily damaged by predators (Aydın and Metin, 2008). Therefore, fishing operations were limited to two hours as commonly practiced by the fishermen.

Catch per unit effort (CPUE) values were calculated using the formulas given by Godøy *et al*. (2003); (a) CPUE values for number (n), (b) CPUE values for weight (g).

$$\text{(a)}\quad CPUE = \frac{\sum number\ of\ species}{\sum number\ of\ nets * \sum fishing\ trials}$$

$$\text{(b)}\quad CPUE = \frac{\sum weight}{\sum number\ of\ nets * \sum fishing\ trials}$$

The significance of difference for captured individuals between monofilament and multifilament gillnets were determined by using Wilcoxon Matched Pairs test (Figures 2, 3). Also this test was applied on five wrasse species having had enough individuals for statistical analysis (*Serranus scriba*, *Serranus*

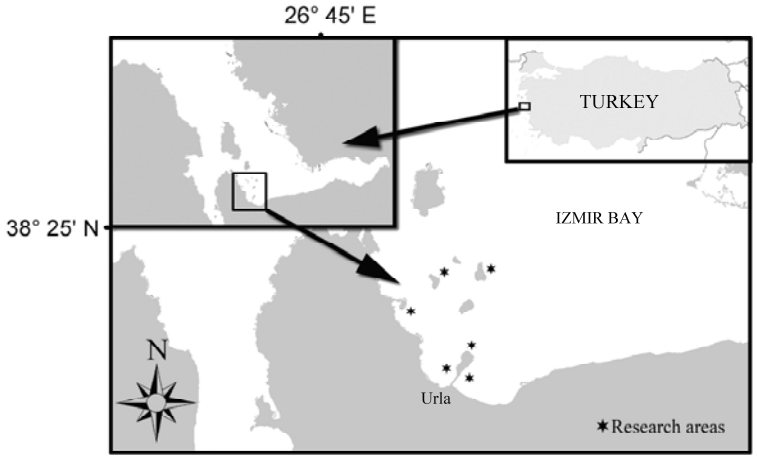

Figure 1. The region, where trials were conducted.

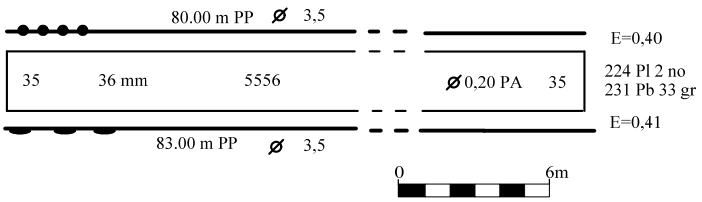

Figure 2. Technical plan of the monofilament gillnet, used in experiments.

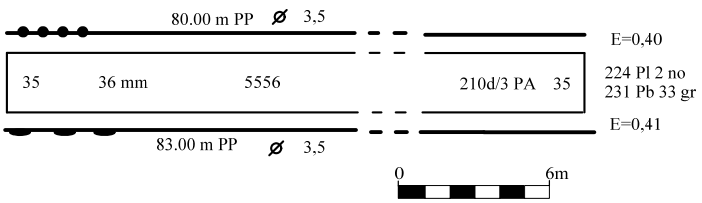

Figure 3. Technical plan of the multifilament gillnet, used in experiments.

cabrilla, *Coris julis, Symphodus mediterraneus, Symphodus tinca*).

Results and Discussion

32 species and 20 families were caught in fishing trials. The number of specimens in monofilament gillnets and multifilament gillnets is 1,989 weighed 73,350 g, and 542 weighed 24,426 g respectively (Table 1). Monofilament gillnets caught 3.67 times more than multifilament gillnets in numbers rate, and 3 times more in weight rate. 1,245 specimens of all data from 11 species weighed as 43,008 g were economically potential and rest of the 1,289 specimens weighed 54,768 g from 21 species were non-marketable.

The monofilament and multifilament gillnets caught 73.2% and 26.8% of all economically potential specimens and weight rates of those changed as 72.1% and 27.9% respectively. On the other hand, 77.8% of the non-marketable specimens were caught by monofilament gillnets. The weight rate of them was 77.3%. The rest of all non-marketable specimens whose rate was registered as 22.2% was caught by multifilament gillnets and weight rate of them were calculated as 22.7% (Table 2).

Catch rates of Serranidae and Labridae families which were dominant in non-marketable species of our study denote similarities with those of Aydın *et al*. (2006). Generally, discard rates of monofilament gillnets were higher than those of multifilament gillnets. Not only for general catch composition, but also dominant discarded species were higher in monofilament gillnets too (Table 3).

Generally, monofilament gillnets caught more specimen than multifilament gillnets ($P<0.05$ $z=0.007$). Only the value of 6 species (*Atherina hepsetus*, *Trachinus draco*, *Uranoscopus scaber*, *Arnoglossus laterna*, *Sepia officinalis*, *Parasentaratus lividus*) were higher in multifilament gillnets. *Sepia officinalis* was the only economically potential species in those of others. Because of being small individuals or few specimens, some of the economically potential species (*Sardina pilchardus*, *Scorpaena scrofa*, *Trachinus draco*, and *Uranoscopus scaber*) were also discarded. Sea urchin (*Paracentrotus lividus*) was one of the discarded species in them. The authors estimate that, because of the spiny skin of sea urchin, multifilament gillnets' netting twine could catch them more than that of

Table 1. Catch composition of the monofilament and multifilament gillnets

Family/	Species	G	Monofilament		Multifilament	
			n	W	n	W
Clupeidae	*Sardina pilchardus*	NM	4	66	0	0
Atherinidae	*Atherina hepsetus*	NM	0	0	2	311
Scorpaenidae	*Scorpaena scrofa*	NM	14	1027	8	562
Triglidae	*Aspitrigla cuculus*	NM	2	61	0	0
Serranidae	*Serranus cabrilla*	NM	56	2130	4	326
	Serranus scriba	NM	86	6122	34	1830
Sparidae	*Diplodus annularis*	EP	480	8360	78	1540
	Diplodus puntazzo	EP	13	170	6	130
	Diplodus sargus	EP	1	243	0	0
	Diplodus vulgaris	EP	2	42	0	0
	Pagellus acarne	EP	2	97	0	0
	Sarpa salpa	EP	62	2200	2	63
Centracanthidae	*Spicara maena*	EP	14	984	6	240
	Spicara smaris	EP	112	3340	6	184
Mullidae	*Mullus barbatus*	EP	98	4644	30	1495
	Mullus surmuletus	EP	196	10070	120	6711
Pomacentridae	*Chromis chromis*	NM	18	455	14	306
Labridae	*Coris julis*	NM	146	7398	30	1434
	Labrus bergylta	NM	4	364	4	270
	Symphodus mediterraneus	NM	564	17478	130	4540
	Symohodus rostratus	NM	10	216	0	0
	Symphodus tinca	NM	60	1776	28	814
Trachinidae	*Trachinus draco*	NM	0	0	2	142
Uranoscopidae	*Uranoscopus scaber*	NM	0	0	2	1004
Scophthalmidae	*Phrynorhombus regius*	NM	2	33	0	0
Bothidae	*Arnoglossus laterna*	NM	0	0	4	90
Muricidae	*Murex brandaris*	NM	6	659	0	0
Cerithiidae	*Cerithium vulgatum*	NM	14	139	2	17
Sepiidae	*Sepia officinalis*	EP	6	864	8	1631
Echidae	*Paracentrotus lividus*	NM	2	200	18	385
Echinasteridae	*Echinaster sepasitus*	NM	1	60	0	0
Holothuriidae	*Holothura tubulosa*	NM	14	4152	4	401

G; group of the species, EP; economically potential species, NM; non-marketable species, n; number of specimen, W; weight

Table 2. CPUE values of the economically potential and non-marketable species for monofilament and multifilament gillnets

	Monofilament		Multifilament		Total	
	n	W (g)	n	W (g)	n	W (g)
Economically potential specimen	988	31012	257	11994	1245	43006
non-marketable specimen	1003	42336	286	12432	1290	54768
CPUE of economically potential specimen	20.5	646	5.3	249.8	12.9	447.9
CPUE of non-marketable specimen	20.8	882	5.9	259	13.4	570.5

n; number of specimen, W; weight of the specimen, CPUE; catch per unit effort.

Table 3. The descriptive statistics and the differences of monofilament and multifilament gillnets for 5 non-marketable wrasse species

	Monofilament			Multifilament			
Species	n	$\bar{x}$	V	n	$\bar{x}$	V	z (95%)
Serranus scriba	86	0.597	0.016	34	0.206	0.086	0.016
Serranus cabrilla	56	0.95	0.031	4	0.06	0.018	0.0309
Symphodus tinca	116	1.297	0.159	28	0.882	0.146	0.021
Symphodus mediterraneus	564	1.226	0.091	130	0.558	0.13	0.0001
Coris julis	146	0.649	0.107	30	0.115	0.03	0.0019

n; number of specimen, $\bar{x}$; average, V; variance, z; results of the wilcoxon matched pairs test between monofilament and multifilament gillnets ($P<0.05$).

monofilament gillnets.

Habitats that contain sea grasses and rocky grounds accommodate several economically potential or discarded species. Some of these species temporally use these areas for a limited period in their life cycle, (for reproduction, and evolution) those of others spend all of their lives in there. Therefore, in red mullet gillnet fishery, it is not advisable to use monofilament near the shore which contains sensitive habitats.

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