

Comparison of Two Different Types of Basket Trap on Fish Catches in İskenderun Bay

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Abstract: The present study aimed to determine the relative catch efficiencies of two different fish traps in İskenderun Bay. Trap model A had an entrance supported by a hoop, whilst the entrance of model B was unsupported. Fieldwork was carried out in Piriçlik-Madenli Bight (İskenderun Bay) between 15 July and 15 November 2001. Forty basket traps were set each day during the 124-day study period. Overall 1242 individuals, 16 species and 11 families of fish and commercial invertebrates were recorded. The total biomass was 317.73 kg. Fishing effort, irrespective of trap models was 0.25% and the highest catch weight was in August, September and October. The amount of by-catch (0.04 kg) and discards (0.07 kg) were quite low.

Key Words: Trap fishing, catch weight, İskenderun bay

İskenderun Körfezi'nde Kullanılan İki Farklı Sepet Modelinin Balık Yakalamaya Etkisi

Özet: Bu çalışmada, İskenderun Körfezi'nde kullanılan iki farklı sepet modelinin av verimine etkisinin belirlenmesi amaçlanmıştır. Çalışmada, A Model Sepet (Girişi Kasnakla Desteklenmiş) ve B Model Sepet (Girişi Kasnakla Desteklenmemiş Silindirik Sepet) modelleri kullanılmıştır. Araştırma, İskenderun Körfezi'nin Piriçlik-Madenli koyunda, 15 Temmuz-15 Kasım 2001 dönemleri arasında yapılmıştır. 124 çalışma günü boyunca her gün 40 sepet denize bırakılmıştır. Çalışma sonunda 11 familyaya ait, 16 tür ve balık ve ekonomik omurgasız tür olmak üzere toplam 1242 adet birey kaydedilmiştir. Toplam canlı kütle 317,73 kg'dır. Sepet modelleri dikkate alınmaksızın avlama çabası % 0,25 ve en yüksek av verimi Ağustos, Eylül ve Ekim aylarında olmuştur. Tüm çalışma için bulunan 0.04 kg hedeflenmeyen türler ve 0,07 kg iskarta miktarları oldukça düşük bulunmuştur.

Anahtar Sözcükler: Sepet avcılığı, av miktarı ve İskenderun körfezi

Introduction

Trawl, long-line and fish traps are the most common fishing techniques used in demersal fisheries. Whereas trawls and long-lines may be difficult to operate on some fishing grounds, demersal traps can be the predominant gear used in such habitats. Furthermore, the increased concern on the impacts of towed gears on seabed habitats has also highlighted the potential benefits of non-towed fishing gears. Therefore, there has been increased research by fisheries scientists on the catch rates of fish traps in recent years.

Gobert (1) studied density-dependent size selectivity in Antillean fish traps and reported that size selection of fish traps not only depended on mesh size, but also location, due to spatial differences in the length frequency of fish. Robichaud et al. (2) and Ferrel and Stewart (3) indicated that selectivity might change with changing mesh size and shape and fish body size. The design and model of fish trap also affects the capture success of Black sea bass (*Centropristis striata*) (4).

The primary fishing gears used in the multispecies demersal fisheries of İskenderun Bay are otter trawl,

long-line and fish traps. A variety of fish traps (rectangular, cylindrical, diamond shape, semispherical and flat traps), with various mesh sizes are used to target various shrimp species, crab and fish.

Fish traps used by local fishermen are generally cylindrical, metal framed, approximately 40-50 cm in height and 65-70 cm in diameter, with an approximate volume of 0.2 m³. They have a single entrance funnel on one side and 30-35 mm mesh size (Figure 1).

The baited traps are usually deployed at 40-50 m depths. Groupers (*Epinephelus aeneus*, *Epinephelus marginatus*), white seabream (*Diplodus sargus*), red porgy (*Pagrus pagrus*), common pandora (*Pagellus erythrinus*), axillary sea bream (*Pagellus acarne*), blennies (Blennidae), greater weever (*Trachinus draco*) and sand steenbras (*Litognathus morrmyrus*) are the main species caught by these traps (5).

Although there were no available data on gear selectivity, catch rates and composition, by-catch and discard rates, overfishing has been attributed to excess fishing effort and, as a consequence, the use of fish traps was banned by the Ministry of Agriculture in 2000 because of the possible negative effects on fish stocks. Therefore, The present study aimed to determine the relative catch efficiencies of two different fish traps in İskenderun Bay.

The objective of the current study was to determine the effect of two different types of basket traps on fish catches in İskenderun Bay.

Materials and Methods

Research was carried out in a station located the Piringlık-Madenli Bight, İskenderun Bay (36°29'N,

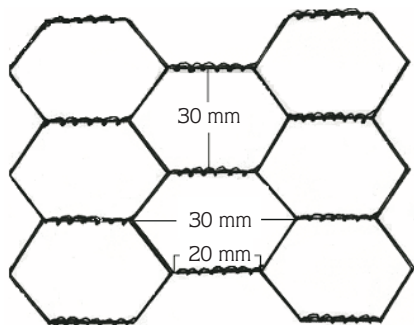


Figure 1. Shape and dimensions of mesh wire covering the traps.

035°51'E; 36°25'N, 035°51'E; 36°34'N, 036°02'E) between 15 July and 15 November 2001. Forty basket traps were set each day by a commercial fishing vessel during the 124-day study period, resulting in a total of 4960 settings in the study area (Figure 2).

The 40 traps were deployed in two sets, each set consisting of 10 type-A (entrance supported by a hoop) and 10 type-B (entrance not supported by a hoop) traps (Figures 3, 4) connected to each other consecutively as a longline.

The distance between traps was 6.5 m 1-1.5 kg of Sardine (*Sardina pilchardus*) was used as bait. Fishing was carried out on a rocky area and at a depth of 35-60 m (Figure 5).

The total length (mm) and wet weight (± 0.01g) of fish were recorded for all catches and an one way ANOVA test was applied using SPSS 12.0 to determine whether there was a significant difference in the catch weight of the two types of trap.

'Catch per Unit Effort' was computed with equation below,

$$\text{Fishing Effort} = \text{Catch Rate} / \text{Number of Traps}$$



Figure 2. Location of experimental fishing.

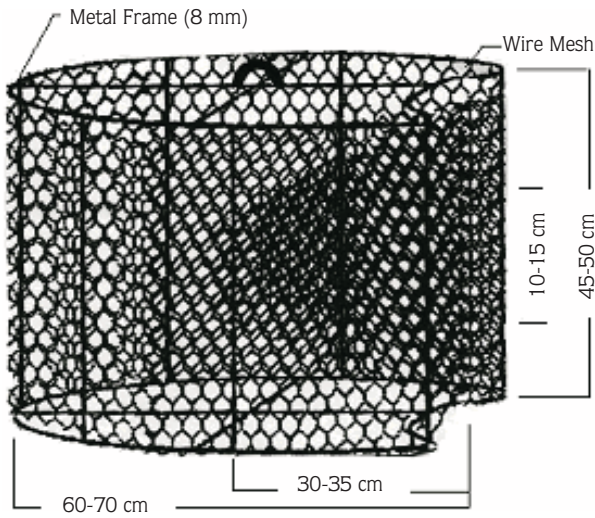


Figure 3. A model fish trap (entrance supported by hoop).

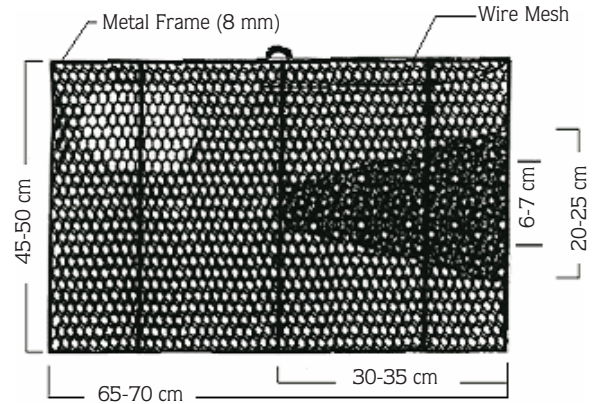


Figure 4. B model fish trap (entrance unsupported by hoop).

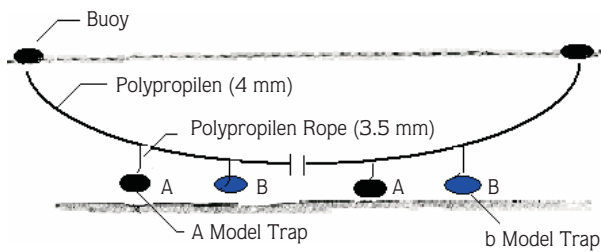


Figure 5. Trap longline used in the study.

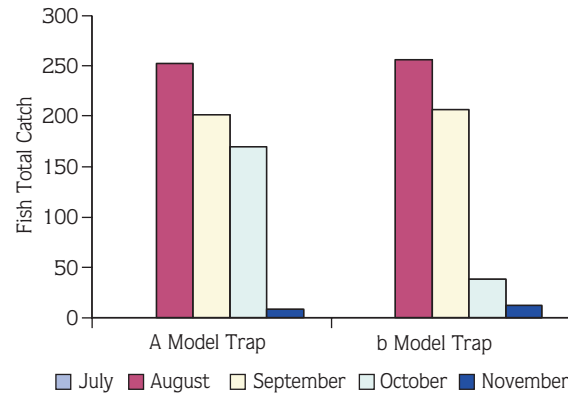


Figure 6. Distributions of fish caught by two types of traps according to months.

Results

A total of 1242 individuals belonging to 16 species and 11 families of fish and commercial invertebrate were caught (Table 1). The total catch weight of these individuals was 317.73 kg. The number of fish, crustaceans and cephalopods were 1178, 51 and 13 respectively. Sea-breems (Sparidae) and Groupers (Serranidae) were the dominant fish species caught.

Although the catch rate and total weight of fish caught by the type-A trap were greater than the type-B trap, these differences were not significant ($P > 0.05$, Table 2).

Nevertheless, significant differences in the catches of the type-A and type-B traps were observed, with the mean length of fish caught by type-A traps higher than type-B traps. Irrespective of the trap models, fishing effort per unit was 0.25% (Table 3).

The highest catch weight in the study was observed in August, September and October (Figure 6).

The result of the current study indicated very low discard rates for both types of trap during the fishing period (Tables 4, 5). Target fish under the minimum legal size were not considered as discard. Discard fish were non-commercial species. The mortality rate of discarded fish was not determined. Target species in trap fishery are *Pamadasys incisus*, *Mycteroperca rubra*, *Epinephelus marginatus*, *Epinephelus aeneus*, *Epinephelus costae*, *Dentex dentex*, *Diplodus vulgaris*, *Sparus aurata*, *Pagrus coeruleostictus*, *Pagellus erythrinus*, and *Octopus sp.* Non-target species (by-catch) in trap fishery are *Balistes carolinensis*, *Alepes djedaba*, *Sargocentron rubrum*, and *Siganus luridus*. Non-commercial (discards) species

Table 1. Number (N), Mean Total length (TL), Standard deviation (SD) and Mean total weight (W) of fish and invertebrates caught by two types of trap.

Species	Model A				Model B				Model A and B			
	N	TL (cm)	SD	W (kg)	N	TL (cm)	SD	W (kg)	N	TL (cm)	SD	W (kg)
<i>Balistes carolinensis</i>	3	19.04	1.32	0.37	3	19.37	0,38	0.44	6	19.20	0.88	0.80
<i>Alepes djedaba</i>	30	20.68	2.24	5.82	13	19.58	3.60	2.34	43	20.35	2.73	8.16
<i>Echeneis naucrates</i>	30	42.37	1.16	10.51	27	42.08	1.31	9.46	57	42.23	1.23	19.97
<i>Pamadasys incisus</i>	34	13.4	2.20	2.98	37	12.89	2.43	3.07	71	13.13	2.32	6.05
<i>Sargocentron rubrum</i>	14	16.14	2.01	1.14	9	15.68	1.31	0.63	23	15.96	1.75	1.77
<i>Gymnothorax unicolor</i>	11	23.36	4.18	0.60	10	21.40	3.86	0.54	21	22.43	4.06	1.14
<i>Siganus luridus</i>	1	15.7	0.00	0.15	-	-	-	-	1	15.7	0.00	0.15
<i>Mycteroperca rubra</i>	10	39.06	7.17	7.88	8	32.95	12.47	4.92	18	36.34	10.05	12.80
<i>Epinephelus marginatus</i>	2	39.65	4.17	1.78	4	36.88	7.27	3.16	6	37.80	6.11	4.94
<i>Epinephelus aeneus</i>	80	32.94	8.85	42.91	67	32.83	7.26	33.02	147	32.89	8.14	75.93
<i>Epinephelus costae</i>	31	32.28	6.21	14.34	26	27.77	7.03	9.00	57	30.22	6.91	23.34
<i>Dentex dentex</i>	1	31.9	0.00	0.50	-	-	-	-	1	31.9	0.00	0.50
<i>Diplodus vulgaris</i>	86	16.18	3.43	10.16	87	16.12	3.80	10.70	173	16.15	3.61	20.86
<i>Sparus aurata</i>	96	19.95	4.17	17.67	105	17.46	4.10	15.83	201	18.65	4.30	45.76
<i>Pagrus coeruleostictus</i>	163	22.31	7.13	46.79	181	20.85	5.91	44.33	344	21.55	6.55	91.12
<i>Pagellus erythrinus</i>	2	17.70	0.42	0.16	7	18.96	1.73	0.83	9	18.68	1.60	0.99
<i>Octopus sp.</i>	10	-	-	11.50	3	-	-	4.20	13	-	-	15.70
<i>Callinectes sapidus</i>	26	-	-	-	25	-	-	-	51	-	-	-
TOTAL	630	-	-	175.26	612	-	-	142.47	1242	-	-	317.73

Table 2. Total number and weight of fish caught by two types of trap.

Trap Model	Catch		Weight	
	Number	%	kg	%
A	630	50.72	187.52	56.83
B	612	49.28	142.47	43.18
Total	1242	100	329.98	100

(Discard) in trap fishery are *Echeneis naucrates*, *Gymnothorax unicolor*, and *Callinectes sapidus*.

There was no significant difference on the amounts of targeted, by-catch and discarded fish between the two trap designs. However, catch weight of model A was significantly higher when weight of fish caught taken into account.

Minimum legal sizes of eight species are not known and data obtained for five of the species were sufficient for evaluation. The major finding is that the number of inappropriate size of fish whose minimum legal sizes known caught by both modal traps was lower than that of the number of appropriate sizes. However, mean lengths of these individuals were higher than minimum legal sizes (Tables 6, 7).

Table 3. Comparison of fish length between minimum legal sizes (cm) and weight (g) according to Turkish Fishery Regulations (7).

Species	Lengths of fish				
	Minimum Legal Size (cm)	N	Min-Max Length (cm)	Mean Length (cm)	Fishing
<i>Balistes carolinensis</i>	-	6	17.52-19.80	19.20	*
<i>Alepes djedaba</i>	-	43	13.50-26.40	20.35	*
<i>Echeneis naucrates</i>	-	57	43.70-42.70	43.70	*
<i>Pamadasys incisus</i>	-	71	9.09-18.60	13.13	*
<i>Sargocentron rubrum</i>	-	23	14.0-21.40	15.96	*
<i>Gymnothorax unicolor</i>	-	21	19.0-27.0	22.43	*
<i>Siganus luridus</i>		1	15.70	15.7	*
<i>Mycteroperca rubra</i>	30	18	13.40-49.90	36.34	I,+
<i>Epinephelus marginatus</i>	40	6	28.60-45.30	37.80	I,-
<i>Epinephelus aeneus</i>	30	147	17.40-61.40	32.89	+
<i>Epinephelus costae</i>	30	57	12.0-49.20	30.22	+
<i>Dentex dentex</i>	20	1	31.90	31.90	I,+
<i>Diplodus vulgaris</i>	15	173	10.10-27.0	16.15	+
<i>Sparus aurata</i>	15	201	9.70-32.0	18.65	+
<i>Pagrus coeruleostictus</i>	15	344	11.0-38.40	21.55	+
<i>Pagellus erythrinus</i>	15	4	16.70-22.0	18.68	I,+
<i>Octopus sp.</i>	1 kg	13	0.45-2.47 kg	1.21 kg	I,+
<i>Charybdis longicollis</i>	-	51	-	-	

(+: appropriate, -: inappropriate, I: insufficient data, *: minimum legal size is unknown)

Table 4. Number (N) and Weight (W) of target, by-catch and discard.

	Model A				Model B				Total			
	N	%	W (kg)	%	N	%	W (kg)	%	N	%	W (kg)	%
Target Fish	515	81.75	156.67	89.39	525	85.78	129.06	90.87	1040	83.74	297.99	90.53
By-catch	48	7.62	7.48	4.27	25	4.09	3.41	2.39	73	5.88	10.88	3.30
Discard	67	10.63	11.11	6.34	62	10.13	10	7.04	129	10.39	21.11	6.41
Total	630	100	175.26	100	612	100	142.47	100	1242	100	317.73	100

Discussion

The results showed that the highest catch occurred between August and October, the time of year when demersal fish are more active along the Mediterranean coast of Turkey (6).

The number of inappropriate size of fish whose minimum legal sizes known caught by both modal traps was lower than that of the number of appropriate sizes. However, mean lengths of these individuals were higher than minimum legal sizes (7).

Table 5. Amount of target fish caught (in weight).

For 1 kg target fish	Model A (kg)	Model B (kg)	Total (kg)
By-catch	0.04	0.03	0.04
Discard	0.07	0.08	0.07

Table 6. Comparison of fish length caught and minimum legal sizes (7).

Species	Model A					Model B			
	Min. Legal Sizes (cm)	N (cm)	Min-Max length (cm)	Mean length	Fishing	N	Min-Max length (cm)	Mean length (cm)	Fishing
<i>Mycteroperca rubra</i>	30	10	24.60-49.90	39.06	I, +	8	13.40-44.70	32.95	I, +
<i>Epinephelus marginatus</i>	40	2	36.70-42.60	39.65	I, -	4	28.60-45.30	36.88	I, -
<i>Epinephelus aeneus</i>	30	80	17.40-61.40	32.94	+	67	17.70-46.50	32.83	+
<i>Epinephelus costae</i>	30	31	18.20-45.20	32.28	+	26	12.0-42.70	27.77	I, -
<i>Dentex dentex</i>	20	1	31.9	31.9	I, +	-	-	-	-
<i>Diplodus vulgaris</i>	15	86	10.2-26.7	16.8	+	87	10.10-27.0	16.12	+
<i>Sparus aurata</i>	15	96	11.3-32.0	19.95	+	105	9.70-31.80	17.46	+
<i>Pagrus coeruleostictus</i>	15	163	11.0-38.40	22.31	+	181	11.0-35.30	20.85	+
<i>Pagellus erythrinus</i>	15	2	17.40-18.0	17.70	I, +	7	16.70-22.0	18.95	I, +
<i>Octopus sp.</i>	1 kg	10	0.45-2.47 kg	1.15	I, +	10	1.20-1.50 kg	1.40 kg	+

(+ : Appropriate , - : Inappropriate , I : Insufficient data)

Table 7. Individual numbers of species under and above Minimum Legal Size (MLS).

Species	Minimum Legal Size (cm)	Model A				Model B				Model A and B			
		Shorter than MLS		Longer than MLS		Shorter than MLS		Longer than MLS		Shorter than MLS		Longer than MLS	
		<	%	>	%	<	%	>	%	<	%	>	%
<i>Mycteroperca rubra</i>	30	1	10	9	90	2	25	6	75	3	16.6	15	83.4
<i>Epinephelus marginatus</i>	40	1	50	1	50	1	25	3	75	1	16.6	5	83.4
<i>Epinephelus aeneus</i>	30	26	32.5	54	67.5	19	28.4	48	71.6	45	30.6	102	68.4
<i>Epinephelus costae</i>	30	10	32.3	21	67.7	12	46.2	14	53.8	22	40	35	60
<i>Dentex dentex</i>	20	-	-	1	100	-	-	-	-	-	-	1	100
<i>Diplodus vulgaris</i>	15	38	44.2	48	55.8	42	48.3	45	51.7	80	46.2	93	53.8
<i>Sparus aurata</i>	15	13	13.5	83	86.5	38	36.2	67	63.8	51	25.4	150	74.6
<i>Pagrus coeruleostictus</i>	15	30	18.4	133	81.6	40	22.1	141	77.9	70	20.4	274	79.6
<i>Pagellus erythrinus</i>	15	-	-	2	100	-	-	7	100	-	-	9	100
<i>Octopus sp.</i>	1 kg	5	50	5	50	-	-	3	100	5	38.5	8	61.5
TOTAL			124		357		154		334		278		691

According to the results of the present study, although differences were not significant, catch rate and total weight of fish caught by the type-A trap were greater than the type-B trap. Burnett et al. (8) stated that fishing power also might vary according to trap models.

Significant differences in the catches of the two types of traps were determined. This is in accordance with Burnett et al. (8) and Ward et al. (9), who reported that trap design, including the entrance, is as important factor affecting the catch weight.

Although traps were soaked, fishing was not effective between 15 July and 7 August 2001, possibly due to the colour of mesh wires. Despite the typical metallic colour at the beginning of the trials, the colour of wires changed

from metallic to brown by 8-9 August. Although we could not find definitive evidence we suggest the colour of wire may affect the fishing effort.

While many of these discarded fish swam away, they may suffer from injury and mortality (e.g. from gas embolisms, stress, handling) prior to release, or from predation (e.g. sea birds and other fish), as indicated by Stewart and Ferrel (3).

In conclusion, the result of the present study indicated that although catch weight of model A was higher when weight of fish caught taken into account, there was no significant difference on the amounts of targeted, by-catch and discarded fish between the two trap designs.

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