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## Investigation of the Selectivity of Monofilament Gill Nets Used in Carp Fishing (*Cyprinus carpio* L., 1758) in Lake Beyşehir

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**Abstract:** In this study, the selectivity of monofilament gill nets used for fishing carp in Lake Beyşehir was studied.

Monofilament gill nets with mesh sizes of 7, 8, 13 and 14 cm were used in experimental fishing between October 1994 and May 1996.

From the results, the common selection factor of monofilament gill nets was calculated as 2.922.

**Key Words:** Carp, gill net, selectivity, Lake Beyşehir.

### Beyşehir Gölü'nde Sazan Balığı (*Cyprinus carpio* L., 1758) Avcılığında Kullanılan Monofilament Sade Uzatma Ağlarının Seçiciliklerinin Araştırılması

**Özet:** Bu çalışmada, Beyşehir Gölü'nde sazan balığı avcılığında kullanılan monofilament sade ağların seçicilikleri araştırılmıştır.

Bu amaçla, Ekim 1994–Mayıs 1996 tarihleri arasında 7, 8, 13 ve 14 cm göz uzunluğunda monofilament sade ağlar ile avcılık denemeleri yapılmıştır.

Araştırma sonuçlarına göre, sazan balığı avcılığında, monofilament sade ağların ortak seçicilik faktörleri 2.922 bulunmuştur.

**Anahtar Sözcükler:** Sazan, sade uzatma ağı, seçicilik, Beyşehir Gölü.

### Introduction

Fishing with gill and trammel nets is very important in Turkey. Gill and trammel nets are used for fishing carp (*Cyprinus carpio* L., 1758), which are widely distributed in most of the inland waters of Turkey. Only multifilament trammel nets were used until the 1990s but now monofilament gill nets are also in use.

For this reason, the selectivity of monofilament gill nets used for fishing carp in Lake Beyşehir was studied.

### Materials and Methods

This study was carried out in three regions of Lake Beyşehir from October 1994 to May 1996. The regions were the area around Mada Island and the shores of the villages of Kurucaova and Gölkaşı. Samples were collected with gill nets having mesh sizes (stretched mesh) of 7, 8, 13 and 14 cm, and the length of each gill net was 100 m. The nets were set at the bottom after noon and hauled the following day before noon. After hauling, the catch was removed from each net separately and all the fish

were measured to the nearest 0.1 cm in terms of fork length.

In calculating the selectivity parameters and selection curves of the gill nets, the indirect method proposed by Holt (1) was used. This method allows the estimation of selectivity parameters by comparing the catches in terms of quantity according to two different mesh sizes,  $m_a$  and  $m_b$ , for the same length class,  $L$ . In the estimation of the selectivity parameters this method was followed (1, 2, 3, 4):

The natural logarithms of the number caught per length group,  $C_a$  and  $C_b$ , by two slightly different mesh sizes,  $m_a$  and  $m_b$ , are linearly related to the fish lengths  $y = \ln(C_b/C_a)$ ,  $x = L$

$$\ln(C_b/C_a) = a + bL$$

Where  $L$  is the mid-point of the length class and  $a$  and  $b$  are the intercept and slope of linear regression, respectively.

The optimum lengths ( $Lm_a$  and  $Lm_b$ ) for mesh sizes  $m_a$  and  $m_b$ , the selection factor ( $sf$ ) and the standard

deviation (*sd*) are then estimated from the relationships,

$$Lm_a = -2 [ am_a/b (m_a+m_b) ] \quad Lm_b = -2 [ am_b/b (m_a+m_b) ] = Lm_a \cdot m_b/m_a$$

and

$$sf = -2a/b (m_a+m_b) \quad sd = \{-2a (m_a+m_b)/b(m_a+m_b)\}^{1/2}$$

The probability of capture for the length groups was calculated for  $m_a$  ( $S(Lm_a)$ ) and  $m_b$  ( $S(Lm_b)$ ) from the relationships and the selection curves were drawn,

$$S(Lm_a) = \exp [ -(L-Lm_a)^2 / (2sd^2) ]$$

$$S(Lm_b) = \exp [ -(L-Lm_b)^2 / (2sd^2) ]$$

The common selectivity factor was calculated with the following formula because the number of meshes used was more than two,

$$SF = -2 \sum [ (a_i/b_i) (m_i+m_{i+1}) ] / \sum [ (m_i+m_{i+1})^2 ]$$

for  $i = 1$  to  $n-1$

The common standard deviation (SD) was calculated as the mean value of the individual estimates for each consecutive pair of mesh sizes,

$$SD = \{ 1/(n-1) \sum [ 2a_i (m_{i+1} - m_i) ] / [ b_i^2 (m_i+m_{i+1}) ] \}^{1/2}$$

The optimum length for mesh size  $m$  was determined from the relationship,

$$Lm = SF \cdot m$$

The probability of capture ( $P$ ) for a given length  $L$  in a gill net having a mesh size  $m$  was determined from the following equation:

$$P = \exp [ -(L-Lm)^2 / (2SD^2) ]$$

### Results

The number of fish caught according to mesh size and length group is shown in Table 1. The length interval class was 1 cm for the 7 and 8 cm mesh sizes and 2 cm for the 13 and 14 cm mesh sizes. This was due to the fact that the selection range of the 13 and 14 cm mesh sizes gill nets was much larger than that of the 7 and 8 cm mesh. Selectivity parameters were calculated from the length frequency distributions (Table 2).

The optimum lengths were calculated as 18.07, 20.66, 39.33 and 42.35 cm for the 7, 8, 13 and 14 cm

mesh sizes, respectively. The common selection factor and common standard deviation were calculated as 2.922 and 1.481, respectively.

It was observed that the selection range of the gill nets increased gradually with increasing mesh size. This is shown in Figure 1.

Table 1. The number of fish caught with gill nets of 4 different mesh sizes ( $L$  is the mid-point of the length classes and the values between broken lines were used to estimate the selectivity parameters).

$L$	7 cm	8 cm	$L$	13 cm	14 cm
14	1		27	1	
15	5		29	1	
16	10	1	31	1	
17	18	2	33	1	
18	26	7	35	3	1
19	23	12	37	11	2
20	11	18	39	28	7
21	4	31	41	16	21
22	1	11	43	8	34
23		7	45	2	14
24		3	47		3
25		1	49	1	3
26			51		1
27			53		1
Total	99	93	Total	73	87

### Discussion

In fishing management, the selectivity features of gill nets should be well known. For this reason, the selectivity of monofilament gill nets used for fishing carp in Lake Beyşehir was studied.

In the present study, the selection factor values were calculated as 2.583 and 3.027 for 7–8 cm and 13–14 cm mesh sizes, respectively. The common selection factor value of four gill nets was found to be 2.922.

The fishing circular for carp fishing prohibits the catching of fish smaller than 30 cm in total length (5). It is usually accepted that a total length of 30 cm in carp

Mesh sizes		Parameters						
$m_a$	$m_b$	$a$	$b$	$r^2$	$Lm_a$	$Lm_b$	$sd$	$sf$
7	8	-21.74	1.122	0.984	18.07	20.66	1.517	2.583
13	14	-28.93	0.708	0.995	39.33	42.35	42.35	3.027

Table 2. The parameters of regression and selectivity.

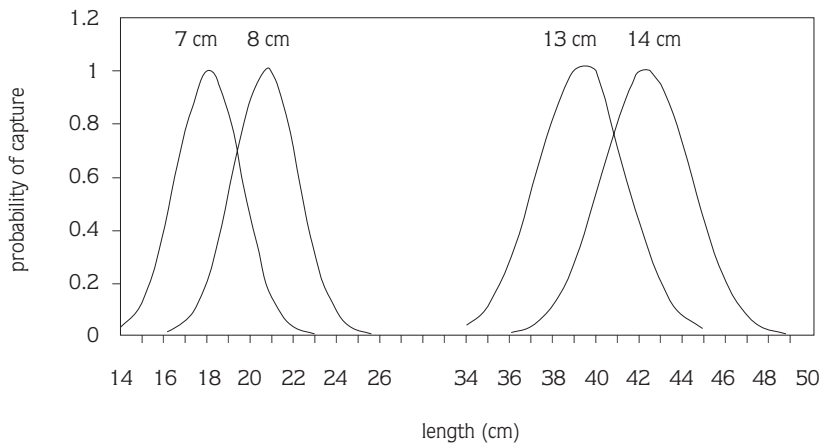


Figure 1. Selection curves for 7, 8, 13 and 14 cm mesh sizes.

corresponds to an average fork length of 28 cm. According to the results of this study, carp with a fork length of 28 cm are usually caught with monofilament gill nets of 9.6 cm mesh size.

The results of the study show that fishing carp with monofilament gill nets smaller than a mesh size of 10 cm should be avoided.

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