Tr. J. of Zoology
23 (1999) 179-183

Investigation of the Selectivity of Multifilament and Monofilament Gill Nets on Pike perch *(Stizostedion lucioperca* (L., 1758)) Fishing in Lake Beyşehir

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Received: 13.08.1997

Abstract: In this study, carried out in Lake Beyşehir, the selectivity of multifilament and monofilament gill nets used for pike perch fishing were investigated.

Multifilament gill nets with 5 differenet mesh sizes and monofilament gill nets with 6 different mesh sizes were used during experimental fishing from October 1994 ve May 1996.

According to the results, the common selection factor of multifilament gill nets was calculated to be 4.67 and 4.70 for monofilament gill nets.

Key Words: Pike perch, multifilament, monofilament, gill net, selectivity.

Beyşehir Gölü'nde Sudak Balığı *(Stizostedion lucioperca (L. 1758))* Avcılığında Kullanılan Multifilament ve Monofilament Sade Uzatma Ağlarının Seçiciliklerinin Araştırılması

Özet: Beyşehir Gölü'nde yapılan bu çalışmada, sudak balığı avcılığında kullanılan multifilament ve monofilament sade ağların seçicilikleri araştırılmıştır.

Bu amaçla gölde, Ekim 1994–Mayıs 1996 tarihleri arasında 5 farklı göz uzunluğundaki multifilament ve 6 farklı göz uzunluğundaki monofilament sade ağlar ile sudak balığı avcılık denemeleri yapılmıştır.

Araştırma sonuçlarına göre, multifilament ağların ortak seçicilik faktörleri 4.67 bulunurken, monofilament ağların ortak seçicilik faktörleri 4.70 bulunmuştur.

Anahtar Sözcükler: Sudak, multifilament, monofilament, sade ağ, seçicilik.

Introduction

Pike perch has been introduced into many lakes, dams and reservoirs since the 1950's. This species was introduced into Lake Beyşehir in 1978 and 1980. There were 8 native fish species in Lake Beyşehir when pike perch was introduced. But currently, there are only three. Pike perch is a predator species, so the capture of this species must be thoroughly investigted. In Turkey, pike perch were caught only with multifilament gill nets until the 1990's. But now, this species is generally caught with monofilament gill nets. In this study, the selectivity features of multifilament and monofilament gill nets on pike perch fishing were investigated in Lake Beyşehir. The results will be useful for the management of freshwater fisheries.

Materials and Methods

Samples were collected between October 1994 and May 1996 with multifilament gill nets with mesh sizes of 3.4, 4, 5, 6 and 7 cm, and 3.6, 4, 4.4, 5, 6 and 7 cm mesh monofilament gill nets. The length of each net was 100 m and the hanging ratio 0.50. All nets were set at the bottom for a certain area in the after noon and hauled the following day before noon. After hauling, the catch was removed seperately from each net and the fork length of each fish was measured to the nearest 0.1 cm.

In calculating the selectivity parameters and selection curves of the nets, the indirect method proposed by Holt (1) was used. The method for the estimation of the selectivity parameters was as follows (1–4);

Step 1:

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 fish lengths; $y=\ln(C_b/C_a)$, $x=L$

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

Where L is the fish length, a and b are the intercept and slope of the linear regression, respectively.

Step 2:

The optimum lengths (Lm_a and Lm_b) for mesh sizes m_a and m_b and the selection factor (sf) and the standard deviation (sd) were then estimated from the relationships,

$$Lm_a = -2\,[am_a/b\,(m_a+m_b)]$$

$$Lm_b = -2\,[am_b/b\,(m_a+m_b)] = Lm_a.m_b/m_a$$

and

$$sf = -2a/b\,(m_a+m_b)$$

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

Step 3:

Probability of capture for length groups was calculated for m_a (S (Lm_a)) and m_b (S (Lm_b)) from the relationships and selection curves drawn;

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

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

Step 4:

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

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

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,

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

Step 5:

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

$$Lm = SF\,.\,m$$

Step 6:

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

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

Results

The length–frequency distribution of pike perch caught are given in Table 1.

The selectivity parameters were calculated from the length–frequency distributions and the results are shown in Table 2.

The selection features of the nets and the optimum lengths of the fish caught in monofilament gill nets were found to be larger than those of the fish caught in multifilament gill nets (Table 2). In addition, the common selection factor of multifilament and monofilament gill nets were calculated to be 4.67 and 4.70, respectively.

In general, the selection range of gill nets increased with increasing mesh size in both of the net groups. This is shown in the selection curves in Figures 1 and 2.

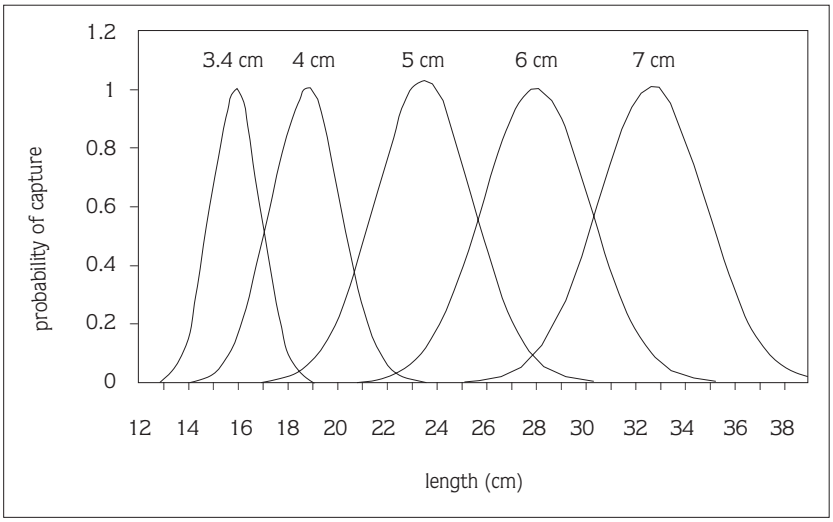

Figure 1. The selection curves of multifilament gill nets.

Table 1. The number of fish caught with multifilamet and monofilament gill nets with different mesh sizes (*L* is the fish length and the values between the broken lines were used for estimating the selectivity parameters).

	Multifilament gill nets					Monofilament gill nets					
L	3.4	4	5	6	7	3.6	4	4.4	5	6	7
12	1										
13	6					1					
14	51	2				3					
15	230	5				28					
16	358	21				161	6				
17	96	100				101	36				
18	7	120	1			30	71	6			
19		41	1			1	47	9			
20		14	2				10	16	2		
21		10	6				3	24	2		
22		8	10				1	38	16	2	
23		3	26					19	50	4	
24		1	32	4				11	59	4	
25			27	11				4	85	11	
26			19	19					24	13	
27			11	30	2				7	17	1
28			6	21	4				8	11	1
29			1	14	6				7	9	3
30				9	8				0	5	5
31				4	12				1	3	9
32				2	19				1	2	24
33					7					1	23
34					2						13
35					1						8
36											7
37											
38											2
Total	749	325	142	114	61	325	174	127	26	82	96

Table 2. The selectivity parameters of multifilament and monofilament gill nets with different mesh sizes (mu: multifilament, mo: monofilament).

Net groups	m_a	m_b	*a*	*b*	r^2	Lm_a	Lm_b	*sd*	*sf*
Mu	3.4	4	–48.25	2.838	0.999	15.61	18.37	0.985	4.59
	4	5	–29.74	1.381	0.996	19.13	23.92	1.861	4.79
	5	6	–26.37	1.014	0.998	23.62	28.34	2.157	4.73
	6	7	–28.82	0.965	0.996	27.54	32.13	2.180	4.59
Mo	3.6	4	–36.44	2.075	0.998	16.63	18.47	0.943	4.62
	4	4.4	–31.49	1.594	0.993	18.80	20.68	1.085	4.70
	4.4	5	–28.11	1.247	0.986	21.09	23.96	1.518	4.80
	5	6	–38.71	1.466	0.999	24.00	28.80	1.809	4.80
	6	7	–32.64	1.090	0.993	27.61	32.22	2.054	4.61

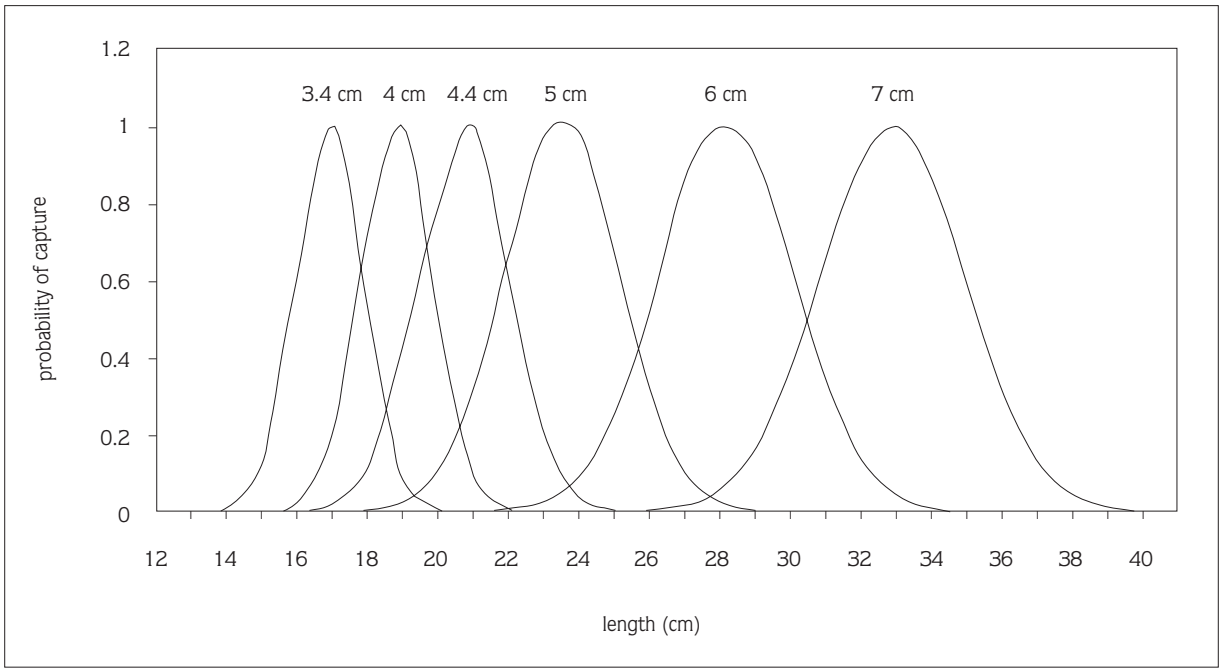

Figure 2. The selection curves of monofilament gill nets.

Discussion

Optimum catch lengths and selection factors for the same mesh sizes of monofilament gill nets were found to be larger than for multifilament gill nets.

Especially the selection factor is a very important constant for fishing. In this study, the values of the common selection factors of multifilament and monofilament gill nets were determined to be 4.67 and 4.70, respectively. Kuşat (4) calculated the common selection factors of multifilament and monofilament gill nets to be 4.61 and 5.02 in pike perch fishing in Lake Eğirdir.

The elasticity and flexibility of the net twine affect the selectivity. In general an increased elasticity should result in the capture of a large average size of fish and a wider selection range (5).

Hamley (6) reported that monofilament nylon nets selected larger fish than multifilament nets did, while other authors found no difference or found differences for some species. In contrast, Machiels et al. (7) found that the average lengths of pike perch and bream caught in multifilament gill nets were larger than those caught in monofilament gill nets.

Fishing for pike perch smaller than 26 cm in total length is prohibited. It can be accepted that a total length of 26 cm for pike perch is equal to the average size of 25 cm fork length. The resulst of this study showed that the most pike perch of 25 cm fork length can be caught with multifilament and monofilament gill nets of 5.3 cm (*m=lm.SF*) mesh size. Therefore, the minimum mesh size of gill nets must be bigger than 5.8 cm so as not to catch individuals smaller than 25 cm.

But during our experiments we saw that pike perch, smaller than 25 cm had been caught by fishermen using gill nets of 3.6–4 cm mesh sizes. This situation is very important for the future of lake fishing. Fishing with gill nets smaller than 5.8 cm mesh size must be prevented.

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