Relationship between otolith and total lengths of flounder (*Pleuronectes Flesus Luscus* Pallas, 1811) collected in Eastern Black Sea Coasts of Turkey

Türkiye'nin Doğu Karadeniz kıyılarından toplanan pisi balığı (*Pleuronectes flesus luscus* Pallas, 1811)' nın otolit ve total boyları arasındaki ilişki

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Abstract

The present study aims to investigate the relationship between otolith length and total length for flounder (*Pleuronectes flesus luscus* Pallas, 1811) collected from the Eastern Black Sea coast of Turkey. 315 females and 275 males, totally 590 flounder were examined during the study. The ages of the 590 flounders ranged between I-VI years. The calculated otolith-total length relationships for females, males and combined sexes were as follows, respectively:

$y = 7.472 + 4.0186 x$ (r= 0.7528), $y = 9.308 + 2.816 x$ (r= 0.6854), $y = 0.5376 - 5.3923 x$ (r= 0.8787).

The relationship between otolith length and total length was significantly different between females and males (P<0.01).

Key words: Eastern Black Sea, flounder (*Pleuronectes flesus luscus*), otolith length, total length.

Introduction

The relationship between otolith and total lengths of a fish is useful for two reasons (Echeverria, 1987).

- Fish size can be estimated from otolith lengths measured from otoliths encountered in predator stomachs, in core samples, archeological sites, etc.

- The length of a fish can be verified when the age determined from the otolith lies outside expected value.

Otoliths have often been used for age determination of marine fish and sometimes for freshwater fish (Nordeng, 1961). According to Jonsson (1976), for the population studies, otoliths are superior to scales both for age determination and estimating fish length.
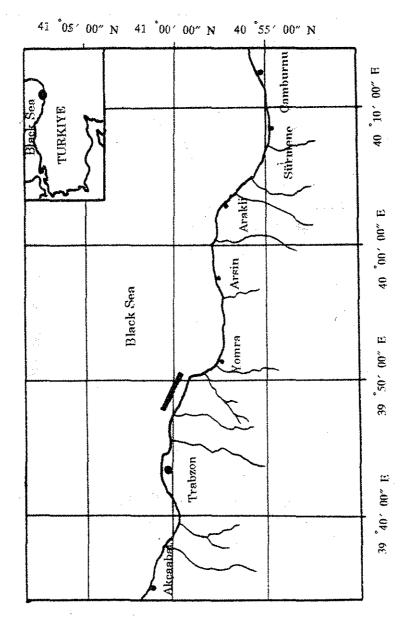
The otolith/total length relationship is useful in predator-prey and archeological studies if fish size can be extrapolated from otolith length. Otoliths are often the only part of a prey fish remaining in a predator's gut (Ainley, Anderson and Kelly, 1981; Treacy and Crawford, 1981) or at cooking sites of archeological middens (Fitch, 1972). Fish lengths could be estimated from otoliths found as remains of prey or in coastal archeological excavations (Fitch and Brownell, 1968).
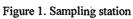
In this paper, we report the results of our investigation of the relationship between otolith length and total length for flounder.

Materials and Methods

Samples of flounder were collected from the sampling stations located along the continental shelf area of the Eastern Black Sea coast of Turkey (Figure 1). The sampling was performed by using bottom-trawl. A total of 590 specimens (315 females, 275 males) were captured during the period from January to December in 1995.

After the catch was taken on board, mud and organic and inorganic matter were washed out carefully by seawater and then sorted for flounder. After that, fish samples were brought to the laboratory and the total lengths and weights were measured to the nearest 1.00 mm and 0.1g. Sagittal otoliths were removed from each fish and measured through the anterior-posterior (Figure 2) with a micrometric binocular and milimetric scale. Linear regression (Ricker, 1973) were run on total length versus otolith length for 590 fish and student-t test was also used to test for significant differences in the relationship of otolith length to total length between the sexes at P=0.01 level.
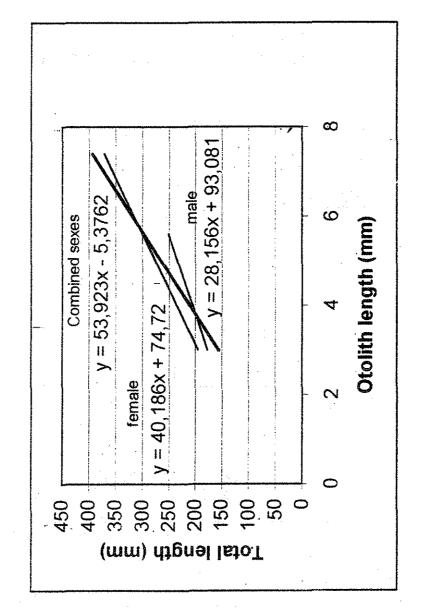
Figure 1. Sampling station

Figure 2. Regression equation for tested organisms

Results and Discussion

The mean total (TL) and otolith length (OL) in mm with the minimum (min) and maximum (max) lengths, the standard deviation for females and males of the different age groups of flounder are given in Table 1.

Regression equation for females, males and combined sexes (female+male) are (Figure 2):

$y=40.186x+74.72$ (r=0.7528)

$y=28.156x+93.081$ (r=0.6854)

$y=53.923x-5.376$ (r=0.8787)

where x= otolith length, y= total length and r= correlation coefficient,

The relationship between otolith length and total length is significantly different between females and males (P<0.01).

Cihangir and Kaya (1988) indicated that there was no difference between female and male sexes of whiting, cought the central Black Sea of Turkish coast. It is possible that the difference between flounder and whiting is due to these relationships are species-specific (Echeverria, 1987).

In food-habit studies, otoliths are often found but the sex and length of the fish are omitted. These results may be used to estimate total length from an otolith length. If the otoliths are from fish of unknown sex, the regression statistics for the combined sexes can be used to estimate fish length. If the otoliths are from fish of known sex, the regression statistics for the appropriate sex can be used to estimate fish length.

				OL (mm)					TL (mm)		
Age	Sex	N	min	max	mean	SD	min	max	mean	SD
I	F	3 24	3.0	3.5	3.33	0.327	162	278	190.3	2.801
	M	27	3.0	4.2	3.55	0.289	145	205	176.1	1.128
	F+M		3.0	4.2	3.53	0.327	145	278	177.7	1.391
II	F	13	3.7	5.4	4.57	0.464	191	265	228.9	2.014
	M	187	3.0	5.2	4.17	0.308	180	238	209.922	1.031
	F+M	200	3.0	5.4	4.19	0.333	180	265	11.1	1.208
III	F	92	4.0	6.2	4.97	0.391	226	326	266.3	1.859
	M	60	3.8	5.6	4.41	0.401	197	272	226.1	1.404
	F+M	152	3.8	6.2	4.75	0.480	197	326	250.4	2.599
IV	F	176	4.0	6.1	5.30	0.416	247	350	292.2	1.952
	M	4	5.0	5.5	5.33	0.236	235	249	238.5	0.699
	F+M	180	4.0	6.1	5.30	0.412	235	350	291.0	2.089
V	F	27	4.2	6.8	5.60	0.579	261	365	328.8	2.429
VI	F	4	6.5	7.4	6.98	0.403	350	375	364.7	1.056

Table 1. The total length and otolith length of different age groups of flounder samples

(N: number of samples, SD: standard deviation).

Özet

Bu çalışmada, Türkiye'nin Doğu Karadeniz kıyılarından toplanan pisi balığı (*Pleuronectes flesus luscus* Pallas, 1811)'nın otolit boyu ile total boyu arasındaki ilişki incelenmiştir. Araştırma süresince, 315 dişi, 275 erkek olmak üzere toplam 590 pisi balığı incelenmiş olup, yaşları I-VI arasında değişmektedir. Hesaplanan otolit-total boy ilişkileri dişi, erkek ve her iki cinsiyet için aşağıdaki gibidir:

y=40.186x+74.72 (r=0.7528)

y=28.156x+93.081 (r=0.6854)

y=53.923x-5.376 (r=0.8787)

Otolit boyu ve total boy arasındaki ilişki dişi ve erkek bireyler arasında önemli derecede farklıdır (P<0.01).

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