LONG TERM SIZE EVALUATION OF EUROPEAN HAKE IN THE SEA OF MARMARA

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Abstract
Within this study, size data of European hake (*Merluccius merluccius*, Linnaeus,1758) from the Sea of Marmara in 20 years range was evaluated. A total of 5248 specimens were obtained via bottom trawling the from Sea of Marmara during the 2 different time period from 1995 to 1996 on a biannual basis and from 2009 to 2011 on the annual basis. Length-weight relationships and the length frequency distribution of European hake were determined.

Keywords: Fisheries, Stock assessment, Marmara Sea

The aim of this study is to determine the changes in length-weight relationship and the length frequency of European hake over time in the Sea of Marmara. European hake (*Merluccius merluccius*) is distributed Northeast Atlantic to Mediterranean [1]. The Sea of Marmara has 2 permanent water masses, one is the surface layer which constitutes lower salinity water comes from brackish waters of the Black Sea and the other one is bottom layer that is formed of saline Mediterranean waters [2].

Fish samples were collected on a biannual basis from 1995 to 1996 and on the annual basis from 2009 to 2011 with a commercial bottom trawl net at depths between 30 m to 150 meters. Total length (TL) and total body (W) were measured to the nearest 0.1 cm and the nearest 1 g respectively. The relation of total length (TL) to total weight (TW) was determined according to the allometric equation [3]. $W=a \times L^b$, where W is the total weight (g), L is the total length (cm) while a and b constants, *t*-test was applied to determine if the b value was significantly different from the isometric expected value of 3 [4].

A total of 5248 *Merluccius merluccius* specimens were collected ranged from 4.5 cm to 57 cm (1.0 g to 1387 g). Among the examined specimens for their reproductive state 4394 specimens 2071 (%47) were females (TL= 9.3 - 57 cm, TW=6 -1.387 g) and 1719 (%39) males (TL= 8.8 – 41 cm, TW= 5 - 589 g) and 604 (%13) were juvenile (TL= 5 - 22 cm, TW= 2 – 83 g).The sex ratio was calculated 1:1.2 males to females.The minimum and the maximum values of total weight and total length by years shown in Table 1.

Tab. 1. Descriptive statistics for length and weight by years of *Merluccius merluccius*

Years	N	Total Length [cm]		Total Weight [g]	
		Min-Max	Mean	Min-Max	Mean
1995	2049	4.5 - 43.7	17.45 ± 1.69	1 – 820.0	68.23 ± 1.92
1996	2348	7 – 57	21.33 ± 0.13	2 – 1.387	95.90 ± 1.95
2009	351	13.6 - 52	23.73 ± 0.22	27 – 1.180	108.27 ± 4.41
2010	244	5 - 45	18.76 ± 0.58	2 - 632	88.22 ± 6.75
2011	256	8.7 – 41.5	21.04 ± 0.48	5 – 481.0	93.47 ± 6.47

The total length-weight relations were detected $W=0.005x\ L^{3.079}$ ($r^2=0.97$) for females, $W = 0.007x\ L^{2.981}$ ($r^2=0.95$) for males. Length weight relationship parameters presented according to years in Table 2.

Tab. 2. Length–weight relationship parameters of *Merluccius merluccius* over years.

Years	n	*a*	*b*	SE	R^2
1995	2049	0.007	2,99	0,011	0,97
1996	2348	0.005	3,10	0,008	0,98
2009	351	0.007	2,97	0,04	0,93
2010	244	0.025	2,61	0,03	0,97
2011	256	0.010	2,87	0,04	0,94

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