



-RESEARCH ARTICLE-

Length-Weight and Length-Length Relationships of the Fourlined Terapon *Pelates quadrilineatus* (Bloch, 1790) in the North-Eastern Mediterranean Sea, Turkey

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Abstract

This study investigates length–weight relationships (LWR) and length–length relationships (LLRs) of three length measurements (TL, FL, SL) for the Mediterranean population of the Indo-Pacific fourlined terapon, *Pelates quadrilineatus*. A total of 134 specimens were collected, and LWR for females, males and both sexes, were calculated as $W = 0.0037TL^{3.5094}$, $W = 0.0057TL^{3.3378}$ and $W = 0.0046TL^{3.4249}$ respectively. The length-length regressions were significant ($P < 0.001$) for all species, with all r^2 values greater than 0.930.

Keywords:

Length-weight relationship, length-length relationship, *Pelates quadrilineatus*, Iskenderun Bay, Turkey

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Introduction

The opening of the Suez Canal in November 1869 connected the tropical Red Sea with the eastern Mediterranean, known for its primarily temperate fauna, dramatically affecting both marine commerce worldwide and the biodiversity of the Mediterranean (Gewing et al., 2014).

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To date number of reported species is increasing with each passing day with the introduce of alien fish species which are migrating from Atlantic and the Red Sea by way of the Suez Canal. The number of lessepsian species has increased especially during the last decade in Turkish marine waters (Dogdu et al., 2016; Gurlek et al., 2016a,b). Especially, physical conditions in the eastern Mediterranean are changing over the last decades (Turan et al., 2016).

The fourlined terapon, *Pelates quadrilineatus* (Bloch, 1790) is a coastal species, often found in brackishwaters; common in estuaries bottoms at depths ranging from 0 m to 20 m (Golani et al., 2016; Froese & Pauly, 2017).

Length-weight data are useful and standard results of fish sampling programs. These data are essential for a wide number of studies, for example estimating growth rates, age structure and other aspect of fish population dynamics (Kolher et. al., 1995; Morato et. al., 2001). Also relationships between different types of lengths (length–length relationships), for which some information seems to be available for Mediterranean species, are also very important for comparative growth studies (Moutopoulos & Stergiou, 2002).

Up to date, four lined terapon biology has not been studied along coasts of the Mediterranean. In the present study, we first reported length-weight relationships (LWRs) and some length-length relationships (LLRs) for the four lined terapon from Iskenderun Bay (NE Mediterranean, Turkey).

Materials and Methods

The fourlined terapon *P. quadrilineatus* specimens were collected at depths of 24 m by commercial trawler from Iskenderun Bay between October 2013 and April 2014. Fish samples were immediately transported to the laboratory in the Department of Marine Sciences, University of Iskenderun Technical, Iskenderun, Turkey.

Total length (TL) was measured to the nearest 0.1 cm using digital slide calipers and total body weight (W) was measured using an electronic balance with 0.01 g accuracy. Each species lengths were categorized from the smallest to the largest to determine the existing ranges. The isometric ($b = 3$) or allometric growth relationship between total length (TL, cm) and total body Weight (W, g) was described for these fishes growing with their bodies becoming heavier using a plotted power function; $W = aTL^b$ in which a is the power function coefficient (the regression intercept) and b the exponent (the regression slope).

Results and Discussion

A total of 134 (71 female and 63 male) specimens were collected and measured. Their total maximum length and total weight were 18.0 cm, 79.77 gr respectively. Generally, males are bigger and heavier than females. Our calculations show that growth for female, for male and for combined sexes individuals showed positive allometry (Table 1). The b value of *P. quadrilineatus* in the northeastern Mediterranean coast of Turkey has been shown to range from 3.424 to 3.509. Conversions among length measurements are given in Table 2. The length-length regressions were significant ($P < 0.001$) for all species, with all r^2 values greater than 0.930.

Table 1. Length-weight relationships for *P. quadrilineatus* from Iskenderun Bay (NE. Mediterranean, Turkey).

Sex	n	Total length(TL)		Weight (g)		W=aTL ^b			
		TL _{min}	TL _{max}	W _{min}	W _{max}	a	b	SE(b)	r ²
Male	63	10.50	18.00	16.27	79.77	0.0057	3.337	0.142	0.901
Female	71	11.00	17.00	16.75	69.27	0.0037	3.509	0.115	0.931
Male+Female	134	10.50	18.00	16.27	79.77	0.0046	3.424	0.090	0.916

For this species, the data were not representative for all months. Thus these estimated parameters should be considered to represent only a particular season or time of the year. According to Bagenal & Tesch (1978) the parameters of b generally do not vary significantly through the year, unlike parameter a which may vary seasonally, daily and between habitats.

Table 2. Length-length relationships and correlation coefficients for *Pelates quadrilineatus* from the Iskenderun Bay (NE Mediterranean, Turkey)

Sex	n	Equation	a	b	SE (b)	r ²
Male	63	TL = a + bSL	-1.124	0.933	0.032	0.965
		SL = a + bFL	1.910	0.960	0.038	0.956
		FL = a + bTL	0.448	1.007	0.028	0.977
Female	71	TL = a + bSL	-1.187	0.931	0.042	0.937
		SL = a + bFL	1.619	0.960	0.040	0.939
		FL = a + bTL	0.243	1.029	0.025	0.980
Male+Female	134	TL = a + bSL	-1.112	0.928	0.027	0.950
		SL = a + bFL	2.258	0.931	0.027	0.948
		FL = a + bTL	0.338	1.019	0.019	0.978

There are very scarce LWRs studies for *P. quadrilineatus*. Total length-weight relationship equation was found to be $W=0.01340TL^{2.958}$ by Taskavak & Bilecenoglu (2001). The result of our study for combined sex is differ from these values. These differences may be correlated sample method, number of specimen, area/season effect and length ranges of the specimen caught.

Consequently, the present study was a contribution to our knowledge of length-weight, length-length relationships and of *P. quadrilineatus* from Iskenderun Bay (NE. Mediterranean, Turkey).

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