

# Length-weight relationship of eight decapod crustaceans of the Sığacık Bay, Aegean Sea coast of Turkey

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## Abstract

The parameters of the length-weight relationship of the form  $W = aL^b$  are presented for 8 species of crustaceans caught along the Sığacık Bay, Aegean Sea coast of Turkey. Samples from commercial trawlers were taken during September 2005 to July 2006. The 'b' value ranged between 0.568 and 3.156.

**Keywords:** Length-weight relationship, Decapoda, deep-water, Sığacık Bay, Aegean Sea, Turkey

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## Sığacık Körfezi'ndeki (Ege Denizi, Türkiye) sekiz dekapod krustaseninin boy-ağırlık ilişkisi

### Özet

$W = aL^b$  deki boy-ağırlık ilişkisi parametreleri Sığacık Körfezi'nden (Ege Denizi, Türkiye) yakalanan 8 krustase türü için sunulmaktadır. Örnekler, Eylül 2005 - Temmuz 2006 tarihleri arasında ticari trolden alınmıştır. "b" değeri 0.568 ila 3.156 arasında değişim göstermiştir.

**Anahtar Kelimeler:** Boy-ağırlık ilişkisi, Dekapod, Derin su, Sığacık Körfezi, Ege Denizi, Türkiye

### Introduction

The length-weight relationship (LWR) is an important factor in the biological study of fishes and their stock assessments. Length-width and length-weight relationships are often used to calculate the standing stock biomass or condition indices, and in addition are used in the analysis of ontogenetic changes and several other aspects of fish or crustacean population dynamics (Lagler 1968). The most frequently used dimensions among a variety of body measurements in penaeid shrimps (and other crustaceans) are carapace length, body length, total length, body width, and wet weight

(Sukumaran and Neelakantan 1997; Primavera et al. 1998).

The previously available data on the decapod fauna found in the deep waters of the Sığacık Bay was presented by Özcan and Katağan (2009), who reported 21 decapod species (7 Natantia, 2 Macrura Reprantia, 2 Anomura, 10 Brachyura). There are limited studies on the LWR of the deep water decapod species from the Aegean sea (Vafidis et al. 2004; Tosunoğlu et al. 2007; Koçak et al. 2008; Vafidis et al. 2008).

The present study aimed to determine the equations that best expressed the relationship of

wet weight (WW) to cephalothorax width (CW), carapace length (CL) and total length for each species of deep water decapods.

### Materials and Methods

The samples were collected at depths from 200-600 m off the Sığacık Bay (38°05'N 26°35'E to 37°59'N 26°54'E), Aegean Sea, during six commercial trawler surveys from September 2005 to July 2006 (Fig. 1). The trawler was equipped with 20 mm mesh size net at the cod-end. Hauling lasted about one hour at

a towing speed of approximately 1.5 knots. A total of 6 trawler hauls were carried out during the surveys. Decapod species were fixed in 4 % formaldehyde and were weighed in the laboratory with a digital weight and measured with a digital caliper. The carapace length and width and sexes were determined. The length-weight relationships of all collected samples were determined by the expression  $W=aL^b$ , where  $W$  is the derived weight (g),  $L$  is the total length (mm), carapace length (mm) or width (mm) and  $a$  and  $b$  of the parameters of equation.

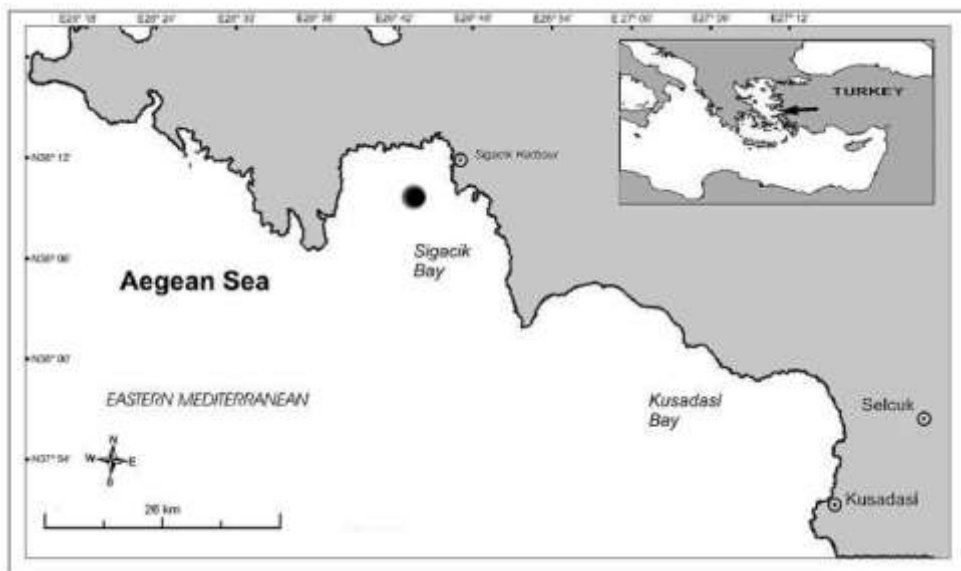


Figure 1. Map of study area.

The parameters  $a$  and  $b$  of the length-weight relationships were estimated by the linear regression method. Equations expressing the length-weight relationships of deep water decapod species were calculated.

The species were identified according to the studies of Zariquiey Álvarez (1968), Ingle (1993), Noël (1992) and Falciai and Minervini (1996). Nomenclature of the species follows Marine species (2009).

### Results and Discussion

In this preliminary study, the length-weight relationship of deep water decapod species from

Sığacık Bay were determined. The parameters of the length-weight relationship estimated for 8 species belonging to 7 families comprising a total of 263 individuals are presented in Table 1. Two species (*Nephrops norvegicus* and *Parapenaeus longirostris*) are considered commercial important species and 6 species are taken as non-target or discrad species. The number of specimens, total length, carapace length and carapace width ranges (minimum and maximum), parameters of length-weight relationships ( $a$  and  $b$ ), 95% confidence intervals of  $b$  and the coefficient of determination ( $r^2$ ) are given in Table 1. Cases of

**Table 1.** Regression equations for 8 crustacean species from Sığacık Bay. n: sample size, min: minimum, max: maximum, a: intercept of the relationship, b: slope of the relationship  $W=aL^b$ ,  $r^2$ : coefficient of determination

Species	Carapace length (mm)		Carapace width (mm)		Weight (g)		n	a	b	$r^2$
	Min	Max	Min	Max	Min	Max				
<i>Solenocera membranacea</i> (Risso, 1816)	35.19	66.33			0.85	3.09	20	0.000	<b>2.294</b>	0.729
<i>Plesionika heterocarpus</i> (Costa, 1871)	32.63	92.07			1.00	4.07	74	0.191	<b>0.568</b>	0.207
<i>Parapenaeus longirostris</i> (Lucas, 1846)	31,7	109.09			0,57	2,42	17	0.000	<b>2.046</b>	0.888
<i>Chlorotocus crassicornis</i> (Costa, 1871)	43.59	61.91			0,51	1,63	28	0.000	2.156	0.509
<i>Aegaeon lacazei</i> (Gourret, 1887)	36	50.2			0,55	1,45	16	0.000	2.439	0.588
	14,7	37.1			1.001	8,37	74	0.062	<b>1.189</b>	0.288
<i>Macropipus tuberculatus</i> (Roux, 1830)			12,6	26,5	1.001	8,37	74	0.003	<b>2.287</b>	0.541
<i>Nephrops norvegicus</i> (Linnaeus, 1758)	48.2	120.3			1,87	35,32	26	9E-06	<b>3.156</b>	0.912
<i>Munida rutllanti</i> Zariquiey-Alvarez, 1952	18	20,6			1,63	2,00	8	0.017	<b>1.579</b>	0.756

Cases of allometric growth are indicated with bold of exponent b.

allometric growth are indicated with bold of exponent *b*. The estimated values of *b* ranged between 0.568 (*Plesionika heterocarpus*) and 3.156 (*N. norvegicus*) (Table 1).

The *b* values indicate that *Munida rutllanti* specimens show negative allometric growth in both sexes (t-test,  $P < 0.05$ ). Length-weight relationship parameters of *M. rutllanti* were calculated as  $W = 2.1623 TL - 4.018$  for males, and  $W = 2.7417 TL - 5.083$  for females, respectively (Koçak et al. 2008). The length-weight relationship of *P. longirostris* was determined as  $W = 0.0031 \times TL^{3.108}$ ,  $r^2 = 0.98$  for total length and  $W = 0.546 \times CL^{2.743}$ ,  $r^2 = 0.97$  for carapace length (Tosunoğlu et al. 2008).

Length-weight relationships were negatively allometric for males of studied pandalids (*Plesionika martia*; *Plesionika antigai*; *P. heterocarpus* and *Chlorotocus crassicornis*). In contrast, females showed an isometric pattern, apart from *P. heterocarpus* for which the pattern was negatively allometric (Vafidis et al. 2008).

In this study, *Solenocera membranacea*, *P. heterocarpus*, *P. longirostris*, *Macropipus tuberculatus* and *M. rutllanti* negative allometric, *N. norvegicus* positive allometric, *C. crassicornis* and *Aegaeon lacazei* showed the isometric growth.

In conclusion this study has been on deep water decapod species from Sığacık Bay. Commercial and uncommercial LWR of 8 decapod species may be useful in the biological study of deep water decapod species.

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