Menba Su Ürünleri Fakültesi Dergisi
Menba Journal of Fisheries Faculty
ISSN: 2147-2254

Araştırma/Research Article

Length-Weight Relationships for Alien Fish Species Caught by Demersal Trammel Nets in the Gulf of Antalya (NE Mediterranean Sea, Turkey)

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Geliş Tarihi:15/05/2013 Kabul Tarihi:31/12/2013

Abstract: In this study, length-weight relationships were estimated for nine alien fish species in the Gulf of Antalya, namely, *Equulites klunzingeri*, *Lagocephalus sp.*, *Pempheris vanicolensis*, *Pomadasys incisus*, *Siganus luridus*, *Siganus rivulatus*, *Sillago sihama*, *Upeneus moluccensis*, *Upeneus pori*. A total of 293 specimens were sampled by demersal trammel nets at depths of less than 10 meters. The values of the *b* ranged from 2.627 to 3.479

Keywords: Length-weight relationships, alien fish species, the Gulf of Antalya

Antalya Körfezi'nde (Kuzeydoğu Akdeniz, Türkiye) Fanyalı Uzatma Ağları ile Yakalanan Yabancı Balık Türlerinin Boy-Ağırlık İlişkisi

Özet: Bu çalışmada Antalya Körfezi'ndeki dokuz yabancı balık türünün (*Equulites klunzingeri*, *Lagocephalus sp.*, *Pempheris vanicolensis*, *Pomadasys incisus*, *Siganus luridus*, *Siganus rivulatus*, *Sillago sihama*, *Upeneus moluccensis* ve *Upeneus pori*) boy-ağırlık ilişkisi hesaplanmıştır. Fanyalı uzatma ağları ile 10 metreden daha sığ sularda gerçekleştirilen örneklemelerde toplam 293 birey yakalanmıştır. *b* değeri 2.627 ile 3.479 arasında değişmektedir.

Anahtar Kelimeler: Boy-ağırlık ilişkisi, yabancı balık türleri, Antalya Körfezi.

Introduction

The study area was the Gulf of Antalya, which is located on the north-eastern Levantine Basin. After the Suez Canal was completed in 1869, many alien species introduced in Mediterranean Sea. One hundred and forty nine alien fish species were reported in the Mediterranean Sea (Zenetos et al., 2010) therewithal forty nine of them were reported from Turkish coastal waters (Bilecenoglu 2010). The length-weight relationship (LWR) is important in fishery assessment (Garcia et al., 1998) and usually expressed by the equation $W=aL^b$. In case of b value of 3 defines increase in weight is isometric. When the value of b is other than 3, weight increase is allometric (Morey et al. 2003).
The present study determined the length-weight relationships of nine alien fish species caught by trammel nets in the Gulf of Antalya.

Material and Methods

The data of this study were obtained during the period from May 2005 to April 2006. The sampling gear, demersal trammel nets had 22 mm (bar length) inner panel mesh sizes, 110 mm outer panel mesh sizes and E=0.5. The geographical coordinates of 36 fishing trials vary between N 36°49' E 31°09' - N 36°49' E 31°12'. All fishes were preserved in ice and measured immediately in the laboratory. Fishes were weighed on a digital balance and total length was measured to the 0.1 cm using a measuring board.
The relationships between length and weight of fishes estimated by the equation $W=aL^b$. The linear regression analysis was employed on log-transformed data and the parameters a (intercept) and *b* (slope) were estimated by the equation $\log(W) = \log(a) + b \log(L)$.

Results

A total of 293 specimens belong to nine fish species were sampled by demersal trammel nets at depths of less than 10 meters. The parameters a and b, determination coefficient (r^2) for nine alien fish species given in Table 1.
The r^2 values ranged from 0.843 to 0.986 and *b* values ranged from 2.627 (for *Sillago sihama*) to 3.479 (for *Lagocephalus sp.*). The mean value of *b* was 3.034 (S.D.= 0,247) and 50% of the values ranged between 2.881 and 3.177 (Figure 1).

Table 1. Descriptive statistics and length-weight relationship parameters for nine alien fish species of the Gulf of Antalya (NE Mediterranean, Turkey)

		Length (cm)		Parameters			*a* $CL_{95\%}$		*b* $CL_{95\%}$	
Species	N	Min	Max	r^2	*a*	*b*	Lower boundary	Upper boundary	Lower boundary	Upper boundary
Equulites klunzingeri	7	6.4	10.0	0.965	0.0138	2.88	0.0030	0.0635	2.16	3.60
Lagocephalus sp.	10	10.5	37.0	0.986	0.0029	3.48	0.0010	0.0079	3.14	3.81
Pempheris vanicolensis	5	14.5	15.6	-	0.0135*	3.00	-	-	-	-
Pomadasys incisus	23	12.6	18.2	0.958	0.0063	3.26	0.0027	0.0148	2.95	3.58
Siganus luridus	30	12.1	21.8	0.933	0.0169	2.96	0.0073	0.0390	2.66	3.27
Siganus rivulatus	109	8.5	26.0	0.954	0.0161	2.88	0.0114	0.0228	2.76	3.00
Sillago sihama	27	14.5	23.0	0.843	0.0211	2.63	0.0055	0.0804	2.16	3.09
Upeneus moluccensis	59	9.2	17.8	0.901	0.0096	3.04	0.0048	0.0192	2.77	3.30
Upeneus pori	23	7.0	17.5	0.984	0.0065	3.18	0.0043	0.0098	2.99	3.36

N: sample size, Min: minimum, Max: maximum, r^2: determination coefficient, a: intercept of the relationship, b: slop of the relationship, CI: confidence intervals, Species are listed in alphabetical order.
*: the parameter a was estimated by setting b = 3.0 (according to Borges et al., 2003).

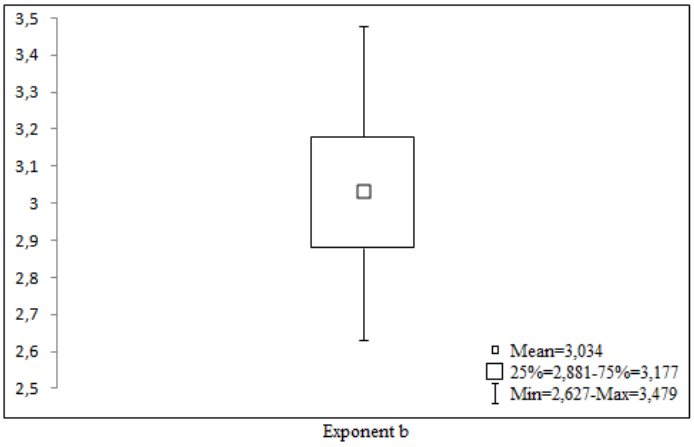

Figure 1. Box-Whiskers plots of the exponent *b* of length-weight relationships for 9 alien fish species.

Discussion

The length-weight relationship in fishes may vary according to season, habitat, sex, gonad maturity, diet and preservation techniques (Tesch 1968). Growth types were found different for *Siganus rivulatus* and *Upeneus moluccensis* by different researchers. These species which have the highest

abundance in this study are two of commercially important alien fish species for small scale fisheries in the Gulf of Antalya. Negative allometric growth was determined for *Siganus rivulatus* as in the studies performed by Gokce et al. (2010) and Erguden et al. (2009) in Iskenderun Bay. Nevertheless, Ceyhan et al. (2009) found isometric growth for *S.rivulatus* in Gokova Bay. In this study *U.moluccensis* showed isometric growth as studies conducted in Mersin and Iskenderun Bay by Ismen (2005) and Taskavak and Bilecenoglu (2001). Negative allometric growth was found by Ceyhan et al. (2009), while positive allometric growth was determined by Gokce et al. (2010), Erguden et al. (2009), Sangun et al. (2007) and Cicek et al. (2006) for the same species.

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