



## Length-Weight relationship of *Liza aurata* (Risso, 1810), along the southern Caspian sea

Huseyn Khayyami, Abdolali Movahedinia, Hossein Zolgharnein, Negin Salamat

### Abstract

The length-weight relationship was derived for the golden grey mullet, *Liza aurata* (Risso, 1810), from Guilan, Mazandaran and Golestan in southern Caspian Sea. A total of 90 adult individuals of the *L. aurata* were collected by beach seine and preserved in 4% formalin. Total length and weight ranged from 29.6 to 57.4 (cm) and 165.3 to 1285.4 (g) respectively. The Length-weight (LWR) was determined according to the power regression model. The relationship between total length and weight was described in *L. aurata* in Guilan  $W = 0.009L^{2.9219}$  ( $R^2 = 0.9821$ ), in Mazandaran  $W = 0.0081L^{2.942}$  ( $R^2 = 0.9884$ ) and in Golestan  $W = 0.0072L^{2.9701}$  ( $R^2 = 0.9616$ ).

**Keywords:** Mugilidae, growth, regression, Fish morphology, Ichthyology.

### 1. Introduction

The study of length-weight relationship (LWR) of fish is important in fisheries biology and population dynamics where many stock assessment models require the use of LWR parameters [1]. At length and weight of fish is among the important morphometric characters, they can be used for the purpose of taxonomy and ultimately in fish stock assessment [2]. The actual relationship between length and weight may depart from the cubic value 3 and this may be due environmental condition in which the animal lives and also due to the physiological condition of the animal [3]. Weight-length relationships (WLR) are used for estimating the weight corresponding to a given length of fish [4], based on the assumption that heavier fish of a given length are in better condition [5]. The golden grey mullet, *Liza aurata* (Risso, 1810), is a mugilid species which adults are neritic usually in schools, entering lagoons and lower estuaries [6]. Golden grey mullet habits in eastern Atlantic, Mediterranean, Black sea and during the years 1930–1934, scientists from the former Soviet Union introduced different mullet species, including the golden mullet (*L. aurata*), from the Black Sea to the Caspian Sea. The introduction of the *L. aurata* was successful and it is currently of high economic importance [7-9]. Golden grey mullet is reported from the southeast Caspian Sea, southwest Caspian Sea and south-central Caspian Sea [10-13]. In the catch composition in the southern Caspian Sea, the golden grey mullet, *L. aurata*, predominated in the years 1995–2009, accounting for 76–98% of the catch [14]. There are numerous studies on the age, growth, habitat, pollution, reproduction and Length weight relation of golden grey mullet in Caspian sea [14-16], but this is first study on length weight relation of this species in Guilan, Mazandaran and Golestan. The aim of the present study was undertaken to elucidate the length-weight relationship of *L. aurata* along the southern Caspian Sea from Guilan, Mazandaran and Golestan.

### 2. Material and method

A total of 90 adult individuals of the *Liza aurata* (Risso, 1810) were collected from the southern Caspian Sea, Iran in February 2014, that comprising 30 individuals from Guilan (37°29'N, 49°26'E), 30 individuals from Mazandaran (36°36'N, 52°10'E) and 30 individuals from Golestan (36°56'N, 53°59'E)(Fig 1). The specimens caught by beach seine and preserved in 4% formalin and sent to the marine biology laboratory of Khorramshahr University of Marine Science and Technology.

ISSN: 2347-5129

IJFAS 2014; 2(1): 248-252

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www.fisheriesjournal.com

Received: 20-07-2014

Accepted: 15-08-2014

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For each specimen, total length (TL) was measured to the nearest 0.01 (cm) and whole body wet weight was measured the nearest 0.1 (g) [17]. The length-weight relationship was estimated by using following equation:

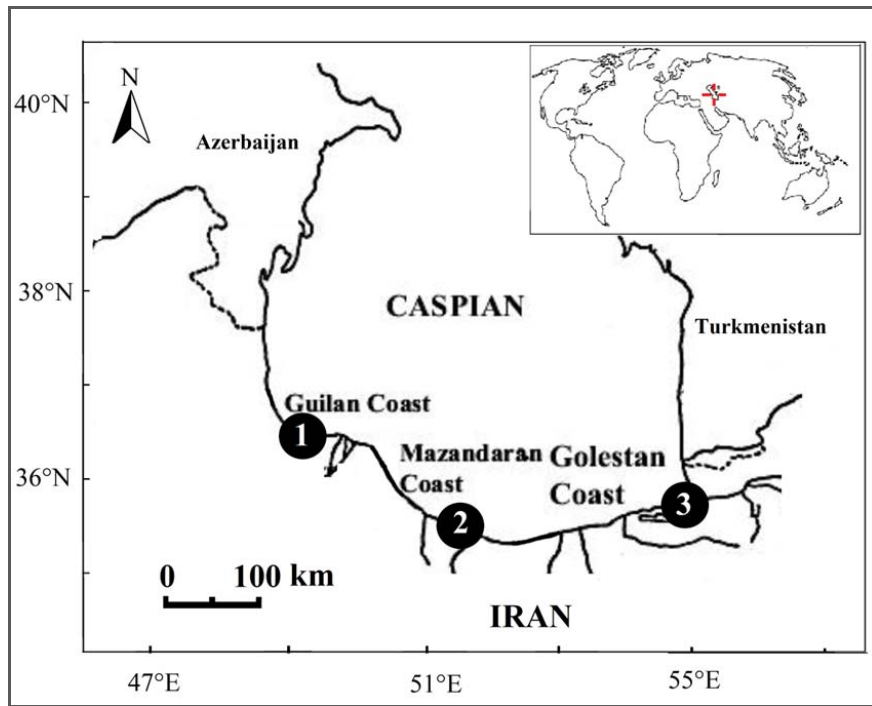
$$W = aL^b$$

Where W is the whole body weight (g), (L) is the total length (cm), (a) is the intercept of the regression and (b) is the

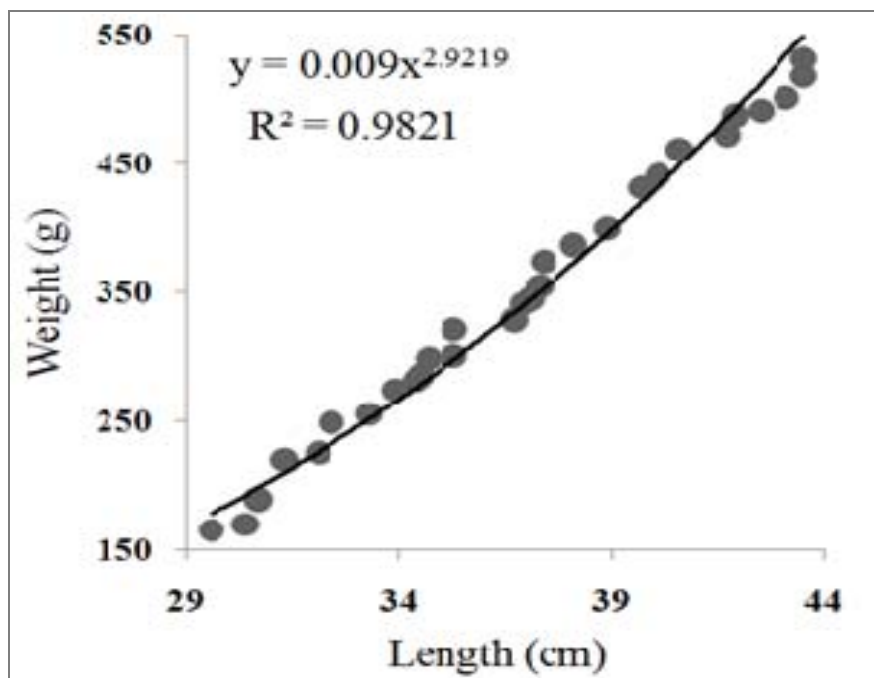
regression coefficient (slope) [18]. The parameters (a) and (b) of the length-weight relationship was estimated by the least-squares method based on logarithms [19]:

$$\text{Log}(W) = \text{log}(a) + b \text{ log}(L)$$

Statistical analyses were performed using the SPSS version 21 software package and Excel 2007.



**Fig 1:** The map of southern Caspian Sea showing the location of fishing regions (1- Guilan, 2- Mazandaran and 3- Golestan) for *Liza aurata* (Risso, 1810), along the southern Caspian Sea



**Fig 2:** Length-weight relationship of *Liza aurata* (Risso, 1810) from Guilan coast in the southern Caspian Sea

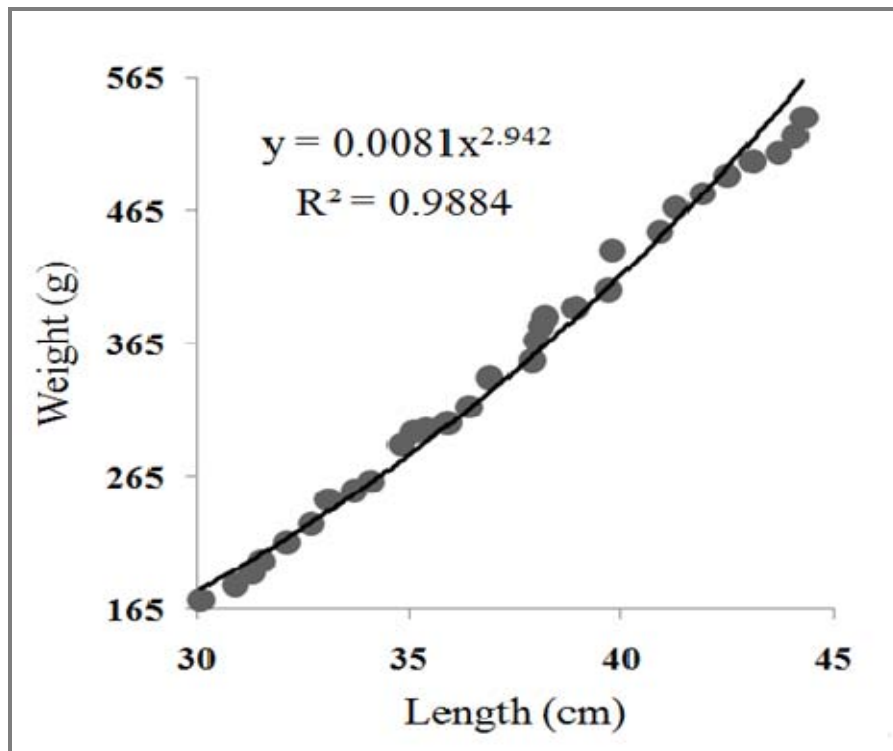


Fig 3: Length-weight relationship of *Liza aurata* (Risso, 1810) from Mazandaran coast in the southern Caspian Sea

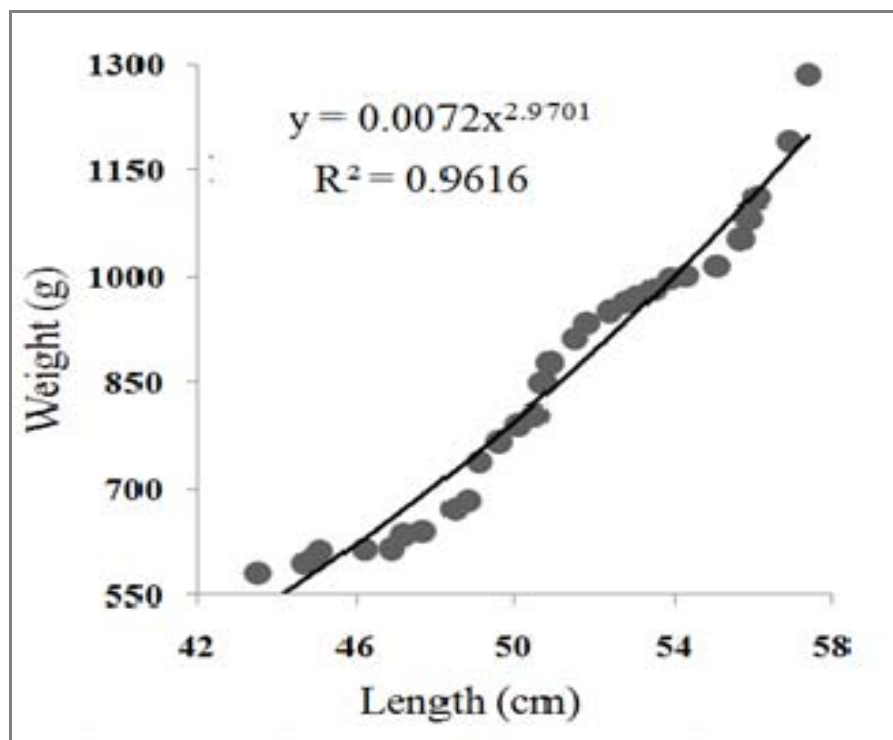


Fig 4: Length-weight relationship of *Liza aurata* (Risso, 1810) from Golestan coast in the southern Caspian Sea

### 3. Result

Overall 90 fish were collected and total length (cm) and weight (g) measured. The sample size, the minimum, maximum and mean length and weight ( $\pm$ STD) of *Liza aurata* (Risso, 1810), from Guilan, Mazandaran and Golestan, along the southern Caspian Sea are presented in Table 1. The minimum, maximum and mean length of *L. aurata* in Guilan

was 29.6, 43.5 and  $42.6 \pm .61$  (cm) and minimum, maximum and mean weight was 165.3, 531.2 and  $342.9 \pm 111.1$  (g) respectively (Table 1). The minimum, maximum and mean length of *L. aurata* in Mazandaran was 30.1, 44.3 and  $42.7 \pm .51$  (cm) and minimum, maximum and mean weight was 172.7, 535.1 and  $348.9 \pm 112.3$  (g) respectively (Table 1). The minimum, maximum and mean length of *L. aurata* in Golestan

was 43.5, 57.4 and  $38.5 \pm 1.31$  (cm) and minimum, maximum and mean weight was 580.6, 1285.4 and  $850.9 \pm 199.1$  (g) respectively (Table 1). Relationship between length-weight on *L. aurata*, from Guilan, Mazandaran and Golestan, along the southern Caspian Sea are presented in Figure 2, 3, 4 and Table

2. The relationship between total length and weight was described in *L. aurata* in Guilan  $W = 0.009L^{2.9219}$  ( $R^2 = 0.9821$ ), in Mazandaran  $W = 0.0081L^{2.942}$  ( $R^2 = 0.9884$ ) and in Golestan  $W = 0.0072L^{2.9701}$  ( $R^2 = 0.9616$ ) (Figure 2, 3 and 4) and (Table 2).

**Table 1:** Length characteristics (cm) and weight characteristics (g) of *Liza aurata* (Risso, 1810), from Guilan, Mazandaran and Golestan, along the southern Caspian Sea

	Guilan			Mazandaran			Golestan		
	Min	Max	Mean $\pm$ STD	Min	Max	Mean $\pm$ STD	Min	Max	Mean $\pm$ STD
<b>Length</b>	29.6	43.5	$42.6 \pm .61$	30.1	44.3	$42.7 \pm .51$	43.5	57.4	$38.5 \pm 1.31$
<b>Weight</b>	165.3	531.2	$342.9 \pm 111.1$	172.7	535.1	$348.9 \pm 112.3$	580.6	1285.4	$850.9 \pm 199.1$

**Table 2:** Regression parameters of Length-weight relationship for *Liza aurata* (Risso, 1810), from Guilan, Mazandaran and Golestan, along the southern Caspian Sea

	n	a	B	R <sup>2</sup>
<b>Guilan</b>	30	0.009	2.9219	0.9821
<b>Mazandaran</b>	30	0.0081	2.942	0.9884
<b>Golestan</b>	30	0.0072	2.9701	0.9616

#### 4. Discussion

In equation of the length-weight relationship ( $W = aL^b$ ), the parameters (a, b) are important in stock assessment studies when  $b = 3$ , an increase in weight is isometric. When the value of b is other than 3, weight increase is allometric (positive if  $b > 3$ , negative if  $b < 3$ ) [20]. The parameter b for *Liza aurata* (Risso, 1810), along the southern Caspian Sea was close to 3 (Table 2), which we determined an allometric increase for weight. This result is confirmed by some studies which have estimated length-weight relationship of this fish in Izmir Bay in Aegean Sea from turkey, Lake Bardawil from Egypt, Adriatic Sea in Croatia and in many studies [21-23]. The parameters of the fish, LWRs are affected by a series of factors including, season, habitat, diet, health, temperature, salinity, food availability [4, 17, 24]. Thereupon *L. aurata* has an isometric and satisfactory growth because of rather well condition of Caspian Sea for it.

#### 5. Conclusion

The obtained results contribute to the knowledge about the length-weight of *Liza aurata* (Risso, 1810) from Guilan, Mazandaran and Golestan in southern Caspian Sea showing isometric and satisfactory growth because of rather well condition of Caspian Sea for this species.

#### 6. Acknowledgement

We would like to express our sincere thanks to Dr. Varamesh, Dr. Ghahri, Dr. Hedayati and Mr. Aghaei for their helps in specimen collection.

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