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# Length-weight relationships for five Lessepsian fish species from the coast of Benghazi, Libya (southern Mediterranean)

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**To cite this article:**

Houssein Elbaraasi. Length-Weight Relationships for Five Lessepsian Fish Species from the Coast of Benghazi, Libya (Southern Mediterranean). *Agriculture, Forestry and Fisheries*. Vol. 3, No. 3, 2014, pp. 178-180. doi: 10.11648/j.aff.20140303.16

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**Abstract:** This paper provides length–weight relationships estimated for 5 Lessepsian fish species (four families), economically important to the local community, of the coast of Benghazi-Libya; namely: *Fistularia Commersonii*, *Saurida undosquamis*, *Siganus luridus*, *Siganus rivulatus* and *Scomberomorus commerson*. The regressions for all species were found to be significant. This study presents the first estimation of length-weight relationship for some Lessepsian inhabiting coastal area of the southern Mediterranean Sea.

**Keywords:** Length – Weight Relationship, Lessepsian Fish, Benghazi, Libya

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## 1. Introduction

The opening of Suez Canal in 1869 connected the Red Sea to the Mediterranean and allowed the introduction of numerous Indo-Pacific species into the Mediterranean, termed Lessepsian species [1-3]. About 80 Lessepsian fish species were documented in the Mediterranean so far [4-10], 18 of them were recorded, already, from the Libyan coasts [11].

The coast of Benghazi, which located in the eastern part of Libya, is one of the most important fishery grounds of the Libyan coast on the southern Mediterranean. Furthermore, a variety of bony fishes was surveyed by reference [12] in Benghazi coast to include 201 species. Accordingly, this part of Libyan coast seems to be an important spawning ground for several fish species that need to be discovered and studied indeed [13].

Length–weight relationships have been used extensively in fisheries Biology to provide information on the conditions of fish stock [14]; these parameters are also required to calculate growth rates, length and age structures and other biological characteristics of fish population dynamics [15]. Furthermore, Length-weight relationships are useful for comparing life history and morphological aspects of populations inhabiting different regions [16-17].

Despite the utility of length-weight relationship in fisheries science and the importance of the coast of Benghazi for Libyan fisheries, information about the length-weight

relationships of fish species in Libya is scarce and incomplete. The present study presents the first estimates of the length-weight relationships for five Lessepsian fish species of the families Fistularidae, Synodontidae, Siganidae and Scombridae for the Libyan coast.

## 2. Material and Methods

Samples of *Fistularia Commersonii*, *Saurida undosquamis*, *Siganus luridus*, *Siganus rivulatus* and *Scomberomorus commerson* were collected using, trammel nets and commercial bottom trawl, separately, at depths ranges from 5 to 70 m from the coast off Benghazi, Libya (Figure 1), between August 2010 and October 2013. In the Laboratory specimens were weighted with a digital balance to an accuracy of 0.01g and measured to 0.1 cm total length. Fish species were identified according to references [18 and 19]. The scientific name for each species was checked according to reference [20].

The relationship between weight and total length,  $W = aL^b$  [21] was converted into the logarithmic expression:  $\ln W = \ln a + b \ln L$ . Parameters  $a$  and  $b$  were calculated by least squares regression [22], as was the coefficient of determination ( $r^2$ ). The  $b$  value for each species was tested by t-test to verify if significantly different from 3 [23].

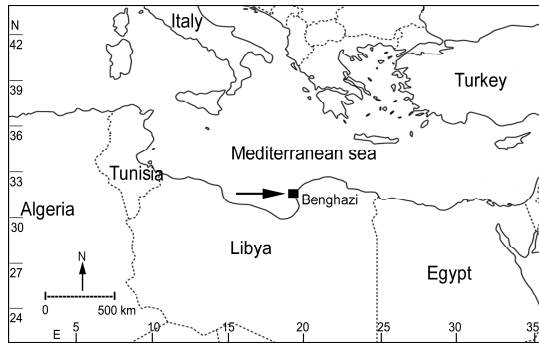


Fig 1. Sampling location off Benghazi, Libya in the Mediterranean Sea.

Table 1. Length-weight relationship parameters for the studied fish species.

Family	Species	n	Length range (cm)	Weight range (g)	a	b	r <sup>2</sup>
Fistularidae	<i>Fistularia commersonii</i>	190	21.2-115.1	5.1-1181	0.0013	3.32	0.98
Synodontidae	<i>Saurida undosquamis</i>	288	9.3-35.1	5.71-315.1	0.0053	2.91	0.89
Siganidae	<i>Siganus luridus</i>	380	13.4-16.5	21.2-57.2	0.014	2.95	0.93
	<i>Siganus rivulatus</i>	310	12.5-18.1	20.1-58.1	0.018	2.81	0.91
Scombridae	<i>Scomberomorus commerson</i>	99	23.4-140.0	120-10221	0.011	2.91	0.88

The sample size ranged from 99 individuals for *Scomberomorus commerson* to 380 for *Siganus luridus*.

The  $r^2$  values ranged from 0.88 for *Scomberomorus commerson* to 0.98 for *Fistularia Commersonii*.

All regression values were found to be highly significant ( $P < 0.05$ ).

Values of exponent  $b$  provide information on fish growth indicating the type of growth; isometric ( $b=3.0$ ), positive allometric ( $b>3.0$ ) or negative allometric ( $b<3.0$ ). In the present study, the  $b$  values ranged from 2.81 for *Siganus rivulatus* to 3.32 for *Fistularia Commersonii*. None of the studied specimens showed isometric growth ( $b=3.0$ ). However, one specimen showed positive allometric growth: *Fistularia Commersonii* ( $b=3.32$ ). The other four specimens showed negative allometric growth: *Saurida undosquamis*, *Siganus luridus*, *Siganus rivulatus* and *Scomberomorus commerson* (Table 1).

The length-weight relationship in fish is affected by a number of factors including gonad maturity, sex, diet, stomach fullness, health, and preservation techniques as well as season and habitat [24], none of which were taken into consideration in the present study. Furthermore, data recorded in this study were not representative for all months within a year. However, the  $b$  parameters generally do not vary significantly throughout the year, unlike parameter  $a$  which may vary seasonally, daily and between habitats [14, 16].

The length-weight relationships calculated in the current study were similar to those of species from other research work [20]. Despite the small sample sizes and narrow size ranges for some species studied, these data represent an important background data for fisheries in the Libyan coast. Furthermore, species studied in this paper included a wide range of body shapes and life history dynamics; this diversity in body size and shape was reflected in the

### 3. Results and Discussion

A total of 1267 individual fish length and weight observations were recorded for the 5 fish species analyzed in this study. The estimated parameters and length characteristics of the length-weight relationship are given in Table 1.

estimated parameters. Most of Lessepsian fish species adapted rapidly to the new environment of the Mediterranean to establish new populations. Furthermore, the new established populations become an economically important for local community. Yet, in most cases, they become an invasive dangerous species to the Mediterranean ichthyofauna profile. Therefore, more studies must focus on the fisheries management, population's growth, and feeding habits of the invasive fish species.

To the best of my knowledge, there is no information on length-weight relationships of the Lessepsian species presented here on the Libyan coast. Consequently the present study is a preliminary reference on these species (*F. Commersonii*, *S. undosquamis*, *S. luridus*, *S. rivulatus* and *S. commerson*) in the southern Mediterranean Sea.

### Acknowledgments

I am grateful to the World Marine Fisheries Ltd. for their help in providing samples.

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