

**LENGTH-WEIGHT RELATIONSHIP AND GROWTH OF THE STRIPED SEABREAM *LITHOGNATHUS MORMYRUS* (LINNAEUS, 1758) FROM AL HANEAH FISH LANDING SITE, MEDITERRANEAN SEA, EASTERN LIBYA**

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**ABSTRACT:** Length-weight relationship and growth characteristics of the striped Seabream *Lithognathus mormyrus* (Linnaeus, 1758) was established using 164 fish collected from Al-Haneah (eastern Libya, Mediterranean Sea) artisanal catch during March to October 2015. The power relationship between total weight ( $W$  in gm) and total length ( $L$  in cm) for *L. mormyrus* was highly isometric:  $W = 0.0132L^{3.0008}$  ( $R^2 = 0.8291$ ). The length based von Bertalanffy equation of the order:  $L_t = L_{\infty} (1 - \exp(-K(t - t_0)))$  was  $L_t = 30.465 (1 - \exp(-0.159(t + 2.5435)))$ . The weight based equation was  $W_t = 374.2523 (1 - \exp(-0.159(t + 2.5435)))^{3.0008}$ . The growth index was low:  $\phi = 2.169$ .

**KEYWORDS:** Striped Seabream, Sand Steenbras, *Lithognathus Mormyrus*, Length-Weight Relationship, Von Bertalanffy Growth Equation, Mediterranean Sea, Libya

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## INTRODUCTION

*L. mormyrus*, Family: Sparidae, is a medium size fish demersal on sandy bottoms of subtropical littoral waters of the eastern Atlantic Ocean, the Mediterranean sea, the Red sea and the southwestern Indian Ocean. It feeds on worms, mollusks, small crustaceans and detritus. It is protandrous hermaphrodite and breeds in summer (Russell *et. al.*, 2014).

In Libya the fish is present along the whole coast and is common in the artisanal catch (Khamis, 2008).

The objective of the present work was to establish length- weight relationship and growth characteristics of this fish based on specimens obtained from Al-Haneah, eastern Libya Mediterranean Sea.

## Procedure

One hundred sixty four *L. mormyrus* fish were collected from Al-Haneah (32° 50' N, 21° 31' E) artisanal catch during March to October 2015. Total lengths and corresponding total weights were obtained in mm and 0.0 gm for each fish. About 10 scales were removed from the pectoral region of 82 fish chosen randomly, cleaned thoroughly with running water and 20% H<sub>2</sub>O<sub>2</sub> and mounted on glass slides. The annuli were counted under the microscope.

The length-weight relationship was derived from Ricker, 1975, equation:  $W = aL^b$

W: total fish weight (g), L: total fish length (cm),

“a”: the intercept, and “b”: the slope

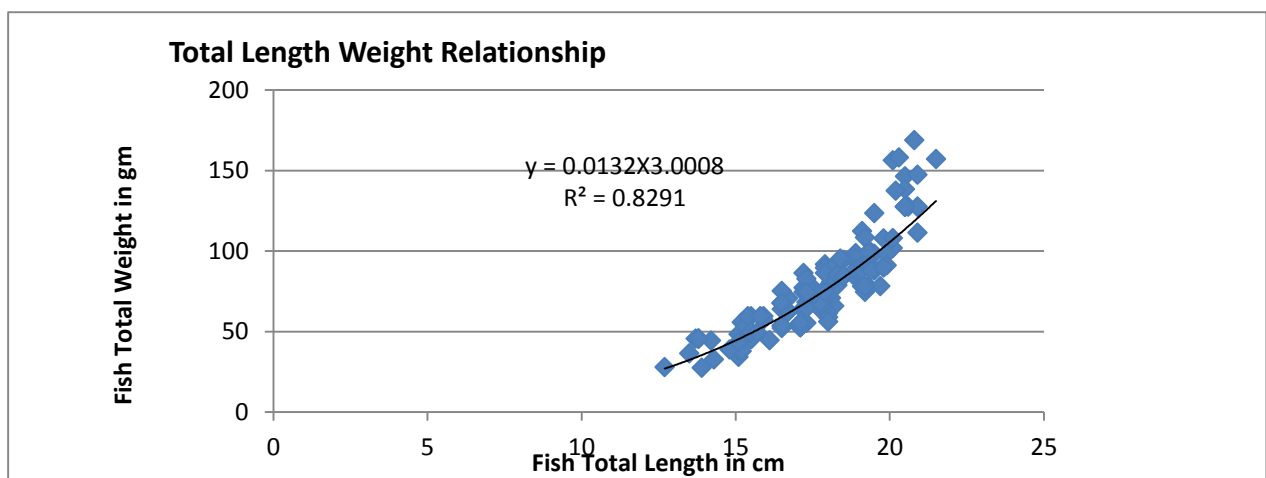
The von Bertalanffy parameters (K) and ( $L_{\infty}$ ) were estimated according to Ford-Walford (Sparre and Venema, 1992) and ( $t_0$ ) according to von Bertalanffy, 1934.

## RESULTS

### The length – weight relationship

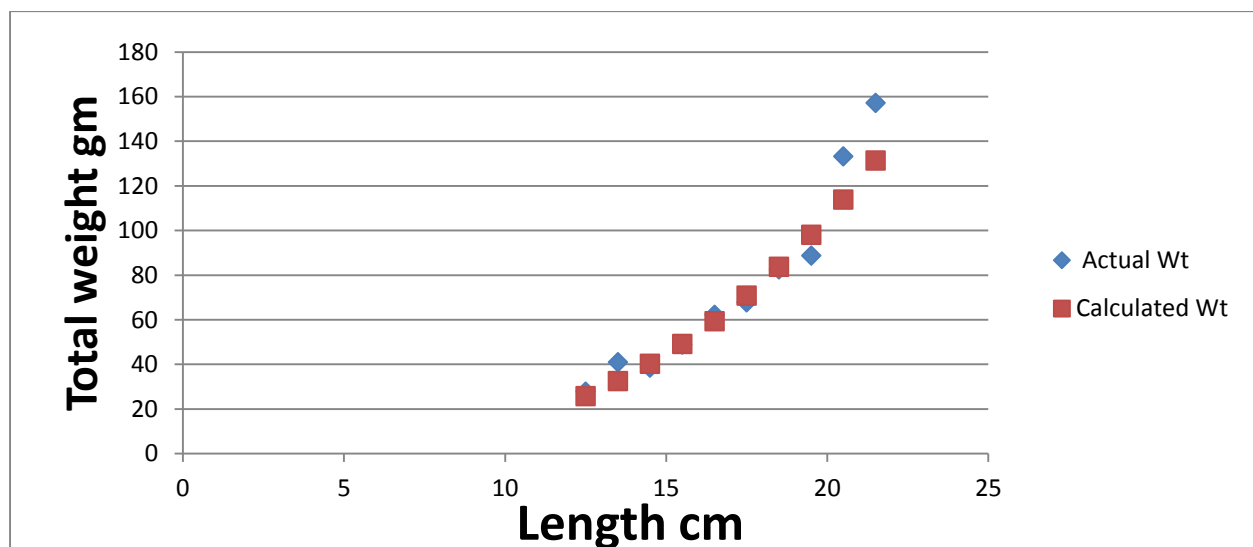
The power relationship between total weight (W in gm) and total length (L in cm) for *L. mormyrus* was highly isometric (Figure 1):

$$W = 0.0132L^{3.000} \quad R^2 = 0.8291 \quad n = 164$$



**Figure 1. The relationship between length and weight derived from 164 *L. mormyrus* collected from Al-Haneah coast during March to October 2015.**

Comparison between actual and calculated weight-at-length derived from the above equation is shown in figure 2. The fit between the actual and the calculated was good.



**Figure 2. Comparison between actual and calculated weight-at-length derived from the above equation.**

### The growth: Estimation of the von Bertalanffy parameters

#### i- Aging

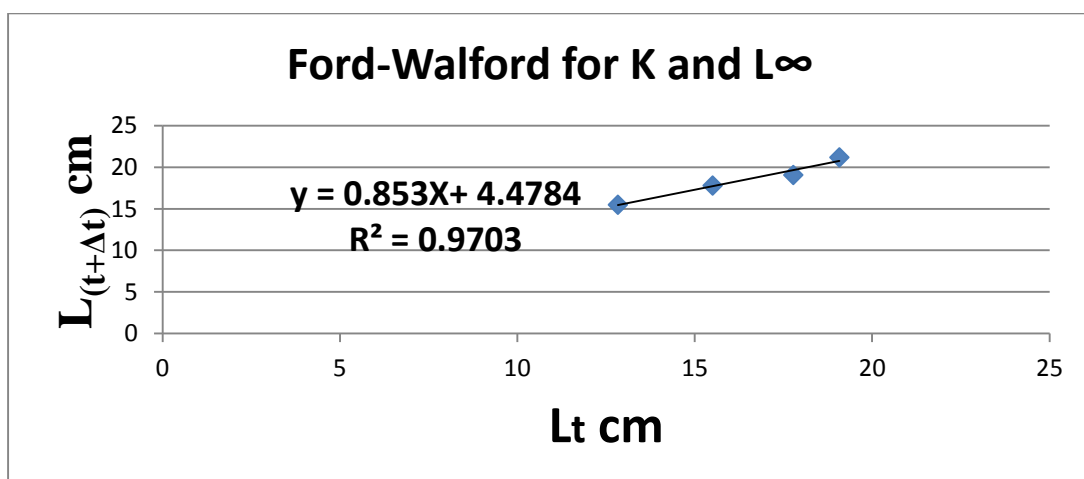
Length ( $L_t$ ) at age ( $t$ ) derived from reading the annuli is shown in table 1.

#### ii- Estimation of ( $K$ ) and ( $L_\infty$ ):

( $K$ ) and ( $L_\infty$ ) were estimated according to Ford-Walford (Sparre and Venema, 1992). A table (table 1) of age, length of fish at age  $t$  ( $L_t$ ) and length of fish at next age  $L_{(t+\Delta t)}$  was prepared. Then the plot of ( $L_t$ ) vs.  $L_{(t+\Delta t)}$  was made to calculate ( $K$ ) and ( $L_\infty$ ), (figure 3).

**Table (1) . Age in years, Length of fish at age ( $L_t$ ) and Length of fish at next age  $L_{(t+\Delta t)}$ .**

<b>t (years)</b>	<b><math>L_t</math> (cm)</b> <b>(x)</b>	<b><math>L_{(t+\Delta t)}</math>(cm)</b> <b>(y)</b>
1	12.833	15.5
2	15.5	17.776
3	17.776	19.077
4	19.077	21.167
5	21.167	



**Figure (3). Estimation of ( $K$ ) and ( $L_\infty$ ) according to Ford-walford (Sparre and Venema, 1992). The plot of  $L_t$  vs.  $L_{(t+\Delta t)}$  for *L. mormyrus*.**

$$y = 0.853X + 4.4784 \quad R^2 = 0.9703$$

$$K = - (1/\Delta t) \text{Ln} (b) = - (1/1) \text{Ln} (0.853) = 0.159 \text{ year}^{-1}$$

$$L_{\infty} = a / (1-b) = 4.4784 / (1- 0.853) = 30.465 \text{ cm}$$

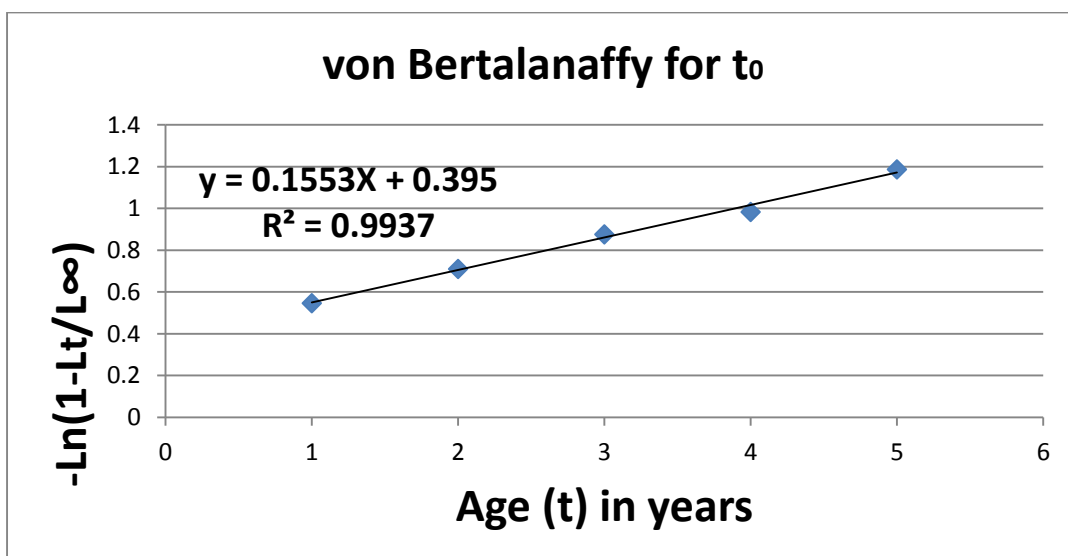
**iii- Estimation of (t<sub>0</sub>)**

The von Bertalanffy parameter (t<sub>0</sub>) was estimated according to von Bertalanffy, 1934. A table of age (t), L<sub>t</sub> and - Ln (1 - L<sub>t</sub>/L<sub>∞</sub>) was prepared (table 2). Then a plot of (t) vs. - Ln (1 - L<sub>t</sub>/L<sub>∞</sub>) was made to obtain t<sub>0</sub> (Figure 5).

**Table (2) . Estimation of t<sub>0</sub> according to von Bertalanffy, 1934.**

Age (t) (X)	L <sub>t</sub>	- LN(1-L <sub>t</sub> / L <sub>∞</sub> ) (Y)
1	12.833	0.5469
2	15.5	0.7109
3	17.776	0.8758
4	19.077	0.984
5	21.167	1.1868

**Figure (5) . Estimation of t<sub>0</sub> according to von Bertalanffy, 1934. The plot of (t) vs. - Ln (1 -L<sub>t</sub>/L<sub>∞</sub>).**



$$y = 0.1553X + 0.395 \quad R^2=0.9937$$

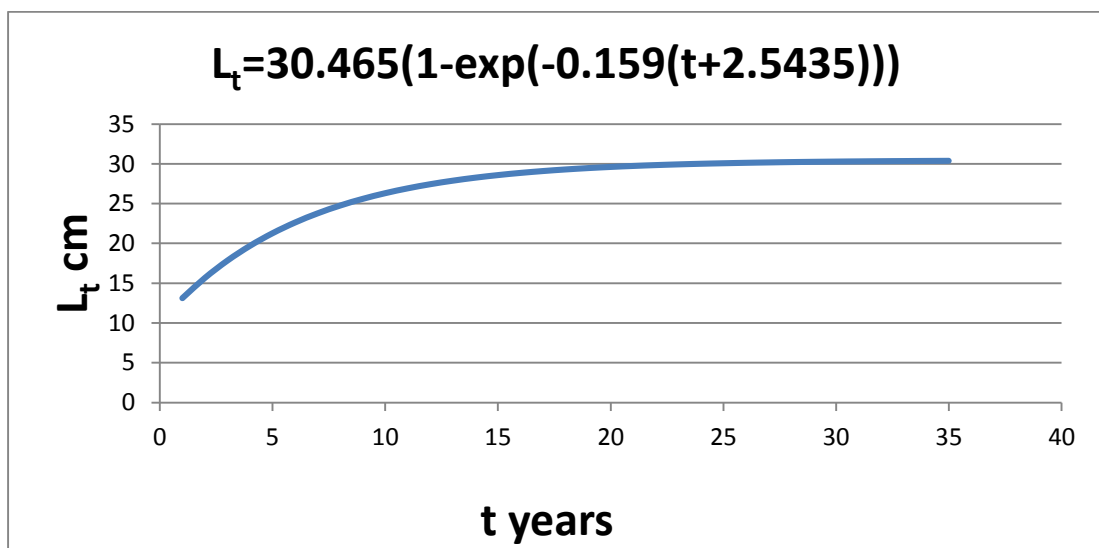
$$t_0 = -a/b = -2.5435$$

The established von Bertalanffy equation for *L. mormyrus*:

$$L_t = L_\infty (1 - \exp(-K(t - t_0)))$$

$$L_t = 30.465 (1 - \exp(-0.159(t + 2.5435)))$$

The plot of the equation is shown in Figure 6.



**Figure (6).** The plot of fish lengths ( $L_t$ ) at different ages ( $t$ ) calculated from the above equation.

A comparison between the actual length-at-age obtained in the present study and that calculated from the obtained von Bertalanffy equation is shown in Table 3

**Table (3).** Comparison between actual  $L_t$  obtained in the present study and  $L_t$  calculated from the von Bertalanffy equation

Age (t)	$L_t$ actual	$L_t$ calculated
1	<b>12.833</b>	13.122
2	<b>15.5</b>	15.672
3	<b>17.776</b>	17.847
4	19.077	19.701

5	21.167	21.284
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### The weight based von Bertalanffy growth equation:

Combining the length based von Bertalanffy growth equation:

$$L_t = 30.465 (1 - \exp(-0.159 (t + 2.5435)))$$

with the length-weight relationship:  $W = 0.0132L^{3.0008}$  gave the weight based von Bertalanffy equation as:

$$W_t = 374.2523 (1 - \exp(-0.159 (t + 2.5435)))^{3.0008}$$

The plot of fish weights ( $W_t$ ) at different ages ( $t$ ) calculated from the above equation is shown in figure 7.

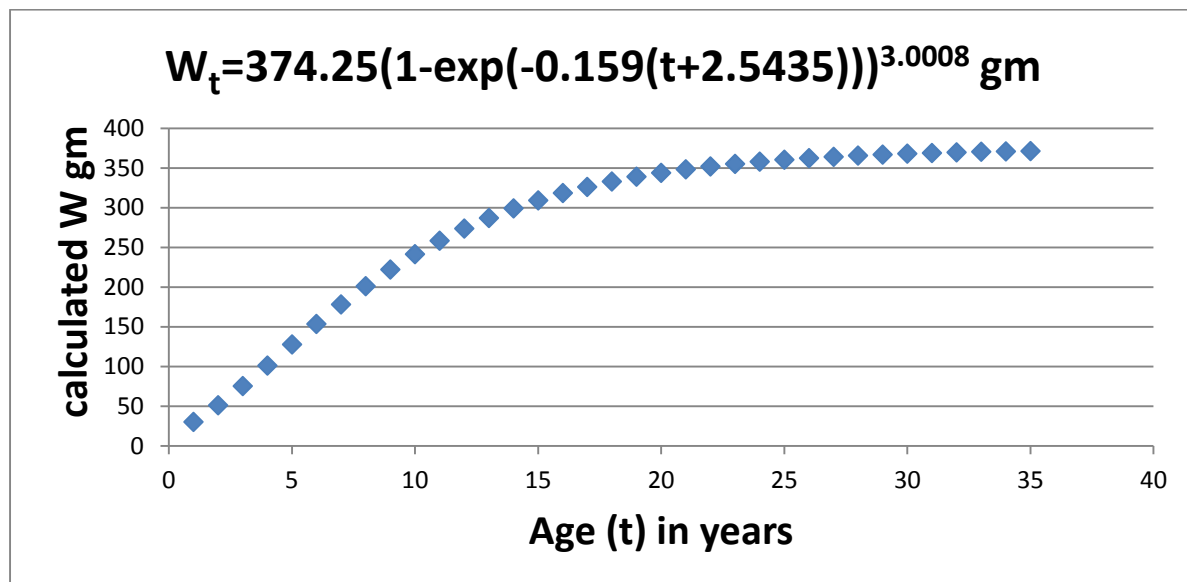


Figure (7). Graphic presentation of the weight based von Bertalanffy growth equation.

### Discussion

The length-weight relationship obtained in the present study reflects highly isometric growth ( $b=3.0008$ ). The following is a summary of the “b” value (between two brackets) obtained by various authors for the same species:

- Suau, 1970, in eastern Spain (3.43);
- Kraljevic« *et al.*, 1995 in the northern Adriatic (3.05) and in the middle Adriatic (2.69);
- Kraljevic« *et al.*, 1996, in the northern Adriatic for males (3.02) and females (3.06);
- Lorenzo *et al.*, 2002, off in the Canary Islands (2.91);
- Santos *et al.*, 2002, in the Algarve coast (3.020);
- Turkmen and Akyurt, 2003, in Iskenderun Bay (3.046);
- Turkmen and Ihsan, 2003, in Üskenderun Bay for males (3.042) and females (3.069);
- Morey *et al.*, 2003, off Balearic Islands and in the Iberian coast (3.0327);

- Kallianiotis *et al.*, 2005, in the coastal waters of the Thracian Sea for immature individuals (3.242) and for mature males, females and intersexual (2.960);
  - Verdiell-Cubedo *et al.*, 2006, in western Mediterranean Sea (3.285);
  - Mariani, 2006, in Fagliano Lagoon (2.85) and in Caprolace Lagoon (3.04);
  - Gokce *et al.*, 2007, in the Northern Eagean (3.10);
  - Matić-Skoko *et al.*, 2007, in eastern Adriatic Sea (3.141);
  - Emre *et al.*, 2010, in the Beymelek Lagoon (Turkey) for both males and females (3.1599 and 3.2187 respectively).
- **In the present study, eastern Mediterranean Sea (3.0008)**

The von Bertalanffy growth parameters of *L. mormyrus* established in various studies including the present one is listed below for comparison:

Location	Authority	$L_{\infty}$ cm	$K$ year <sup>-1</sup>	$t_0$ cm
eastern Spain	Suau, 1970	33.27	0.27	-0.057
northern Adriatic	Kraljevic« <i>et al.</i> ,1995	37.3	0.262	-0.39
middle Adriatic		36.2	0.297	-0.08
western Istrian	Kraljević <i>et al.</i> , 1996	40.05	0.196	-0.945
central-East Atlantic	Lorenzo <i>et al.</i> , 2002		0.88	
central-East Atlantic	Pajuelo <i>et al.</i> , 2002	42.7	0.19	1.46
Üskenderun Bay (males)	Turkmen and Akyurt, 2003	26.55	0.20	-1.81
(females)		32.6	0.13	-2.12
Thracian Sea	Kallianiotis <i>et al.</i> 2005	30.94	0.21	-0.996
south Portugal	Monteiro <i>et al.</i> , 2010	35.30	0.264	-0.809
Beymelek Lagoon (males)	Emre <i>et al.</i> , 2010	28.3	0.456	-1.859
(females)		28.1	0.466	-1.982
(male, female, and immature)		31.5	0.319	-2.201
Canakkale Strait	Ayyildiz <i>et al.</i> , 2014	growth rate=0.325 mm d <sup>-1</sup>		
<b>Present study: Eastern Mediterranean Sea</b>	<b>Ali <i>et al.</i>, 2016</b>	<b>30.465</b>	<b>-0.159</b>	<b>-2.543</b>

## REFERENCES

- Ayyildiz, H.; Ozcan Ozen and Aytac Altin. 2014. Growth, mortality and hatch-date distributions of striped sea bream *Lithognathus mormyrus* inhabiting the Canakkale Strait, Turkey. Journal of the Marine Biological Association of the UK 01/2014; 94(3):607-613. DOI:10.1017/S0025315413001847.
- Bertalanffy, L. von, (1934). Untersuchungen über die Gesetzlichkeit des Wachstums. I. Allgemeine Grundlagen der Theorie; mathematische und physiologische Gesetzlichkeiten des Wachstums bei Wassertieren. Arch. Entwicklungsmech., 131:613-652.).
- Emre, Y.; İsmet BALIK2; Cetin SUMER; D. Aytuğ OSKAY and H. Ozgur YEŞİLCİMEN. 2010. Age, growth, length-weight relationship and reproduction of the striped seabream

- (*Lithognathus mormyrus* L., 1758) (Sparidae) in the Beymelek Lagoon (Antalya, Turkey). Turk J Zool 34 (2010) 93-100 c TUBİTAK doi:10.3906/zoo-0808-13.
- Gokce, G., Aydın, İ. and Metin, C. 2007. Length-weight relationships of 7 fish species from the North Aegean Sea, Turkey. International Journal of Natural and Engineering Sciences 1: 51-52.
- Kallianiotis, A.; Michele Torre and Anna Argyri. 2005. Age, growth, mortality, reproduction and feeding habits of the striped seabream, *Lithognathus mormyrus* (Pisces: Sparidae) in the coastal waters of the Thracian Sea, Greece. Scientia Marina, Vol 69, No 3, 391-404. (2005). doi:10.3989/scimar.2005.69n3391.
- Khamis, E. 2008 The analysis of the catch trawling net along Ben Gghazi, M. sc, Thesis. Coast Fac. of. Nat. Res. and Envi, Omar El Mukhtar University PP89.
- Kraljević, M. Dulčić, J. Cetinić, P. and Pallaoro, A. 1996. Age, growth and mortality of the striped sea bream, *Lithognathus mormyrus* L., in the northern Adriatic. Fisheries Research, 28: Issue. 4361-370.
- Kraljević, M. Dulčić, J. Pallaoro, A. Cetinić, P. and Jug-Dujaković, J. 1995. Sexual maturation, age and growth of striped sea bream, *Lithognathus mormyrus* L., on the eastern coast of the Adriatic Sea. J. Appl. Ichthyol. 11: 1-8.
- Linnaeus, 1758. "*Lithognathus mormyrus* - Linnaeus, 1758". In FishBase. Retrieved 2015-05-24.
- Lorenzo, J.M.; Pajuelo, J.G.; Méndez-Villamil, M.; Coca, J.; Ramos, A.G., 2002. Age, growth, reproduction and mortality of the striped sea bream, *Lithognathus mormyrus* (Pisces, Sparidae), off the Canary Islands (Central-East Atlantic). J. Appl. Ichthyol. 18(3), 204-209.
- Mariani, S. 2006. Life-history- and ecosystem-driven variation in composition and residence pattern of seabream species (Perciformes: Sparidae) in two Mediterranean coastal lagoons. Marine Pollution Bulletin 53: 121-127.
- Matić-Skoko, S.; Josipa Ferri; Miro Kraljević and Jakov Dulčić. 2007. Growth of juvenile striped seabream, *Lithognathus mormyrus* (Teleostei: Sparidae) in the Adriatic Sea. Institute of Oceanography and Fisheries; Meštrovićevo Šet. 63, P.O.Box. 500, 21000 Split, Croatia. Fax: +385 21 358 650.
- Monteiro, P., Luis Bentes, Rui Coelho, Carla Correia, Karim Erzini, Pedro G. Lino, Joaquim Ribeiro and Jorge M. S. Gonçalves. 2010. Age and growth, mortality and reproduction of the striped sea bream, *Lithognathus mormyrus* Linnaeus 1758, from the south coast of Portugal (Algarve). Marine Biology Research Volume 6, Issue 1, 2010, pages 53-65.
- Morey, G., Moranta, J., Massutí, E., Grau, A., Linde, M., Riera, F. and Morelas-Nin, B. 2003. Weight-length relationships of littoral to lower slope fishes from the western Mediterranean. Fisheries Research 62: 89-96.
- Munro, J.L. and Pauly, D. 1983. A simple method for comparing growth of fishes and invertebrates. ICLARM Fish byte 1: 5-6.
- Pajuelo, J.P.; Lorenzo, J.M.; Mendez, M.; Coca, J.; Ramos, A.G., 2002. Determination of age and growth of the striped seabream *Lithognathus mormyrus* (Sparidae) in the Canarian archipelago by otolith readings and back calculation. Sci. Mar. 66 (1), 27-32.
- Ricker, W.E. 1975. Computation and interpretation of biological statistics of fish populations, Bull. Fish. Res. Board Can. 191:203-233.
- Russell, B., Carpenter, K.E., Pollard, D., Mann, B.Q. & Buxton, C.D. 2014. *Lithognathus mormyrus*. The IUCN Red List of Threatened Species 2014: e.T170160A1284573.<http://dx.doi.org/10.2305/IUCN.UK.2014-3.RLTS.T170160A1284573.en> . Downloaded on 02 October 2015.



- Santos, M.N., Gaspar, M.B., Vasconcelos, P. and Monteiro, C.C. 2002. Weight-length relationship for 50 selected fish species of the Algarve coast (Southern Portugal). *Fisheries Research* 59: 289- 295.
- SPARRE, P. & S.C. VENEMA. 1992. Introduction to tropical fish stock assessment. Part 1- Manual, FAO, Fish. Tech. Pap. 306/1. Rome, FAO 376 pp.
- Suau, P., 1970 Contribución al estudio de la biología de *Lithognathus* (=Pagellus) *mormyrus* L. (Peces espáridos). *Inv. Pesq.* 34, 237-265.
- Turkmen, M. Ihsan AKYURT. (2003). Growth Characteristics, Sex Inversion and Mortality Rates of Striped Sea Bream, *Lithognathus mormyrus* L., in Üskenderun Bay. *Turk J Zool* 27 (2003) 323-329.
- Verdiell-Cubedo, D.; F. J. Oliva-Paterna and M. Torralva. 2006. Length-weight relationships for 22 fish species of the Mar Menor coastal lagoon (western Mediterranean Sea). *Journal of Applied Ichthyology*. Volume 22, Issue 4, pages 293–294, August 2006. DOI: 10.1111/j.1439-0426.2006.00738.x