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SOME MORPHOMETRIC TRAITS OF *LIZA AURATA* (RISSO, 1810) IN UMM HUFAYN BRACKISH LAGOON, EASTERN LIBYA MEDITERRANEAN SEA COAST

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ABSTRACT: *Eighty Liza aurata fish were collected from the artisanal catch of Umm Hufayn lagoon, eastern Libya, during January/ February 2018 for use in the present study. Values of key morphological parameters (descriptive, morphometric, and meristic) of the fish were established, correlated with each other, and related to fish length (as an indicator of growth and age) by power and linear regressions. The mean length of the fish was 21.331cm corresponding to weight of 89.011g. The established meristic form was: D1, IV; D2, I+ 6-9 (8); A, III, 7-12 (9); P, 12-18 (15); V, I + 4-7 (5); LL, 34-54 (42), numbers between parentheses are modes of counts. Power and linear length-weight relationship were* $Y=0.006X^{3.111}$, $R^2=0.891$ *and* $Y=15.89X-250.1$, $R^2=0.824$, *fish growth is almost isometric; Fulton and Clark condition factors were 0.8498± 0.01486 and 0.6651± 0.01145. These factors did not correlate significantly with fish length, i.e. they did not change significantly during fish growth.*

KEY WORDS: morphometric, *Liza aurata*, Mediterranean, Libya

INTRODUCTION

Systematics is the science of identifying and naming individual living organisms or groups of organisms and assigning them to different taxa based on common phylogenetic attributes using established procedures and conventions. The main tools used in fish identification and classification include habitat, ecological traits, geographic distribution, morphological traits including truss network systems (TNS) and image recognition systems (IRS), behavior, internal anatomy, physiological characters, and molecular traits such as DNA, RNA and protein Sequencing. (Sokal *et al*., 2009). Morphological characters are the morphogenic, morphometric, and meristic traits. Morphogenic (descriptive) traits are the immeasurable, uncountable characters, such as body color and shape, and the shape of the caudal fin. Morphometric traits are derived from the external bodily measurable traits such as fish weight and length, and length of fins, and eye diameter. Meristic traits are countable characters, such as the number of spines and rays of individual fins, and the number of scales on the lateral line (Talwar and Jhingran, 1992). Magnitudes of morphometric parameters change with fish growth and along geographic gradients (Lindsey, 1988), therefore, morphometric parameters are often related to fish total length or total weight by linear, power, and logarithmic equations such as in the length-weight relationship (Le-Cren, 1951; Rejitha and Pillai 2015) and the condition factor (Fulton, 1902; Clark, 1928). Meristic traits, on the other hand, are conservative and do not change with fish growth or geographical gradients; therefore, they are used in deriving meristic forms, which are rough fingerprints of individual fish species. The earliest and easiest methods of fish identification were based on morphological traits (Ihssen *et al*., 1981; Zafar *et al*., 2002; Costa *et al*., 2003; Barriga-Sosa *et al*., 2004; Doherty and McCarthy, 2004; Naesje *et al*., 2004). Even after inventing the modern genetic identification techniques, morphologically based techniques are still the principal foundation for fish taxonomy and systematics and are often used for conformation of genetic analyses. The use of gene sequencing, even though is believed to be more accurate than morphometry, is more difficult and expensive to perform and needs special equipment and technical know-how.

The objective of the present work is to avail baseline information on morphological traits, including length-weight relationship, condition factors, and meristic form of *Liza aurata* (teleost), an important fish in the artisanal catch of Umm Hufayn lagoon and the other similar brackish lagoons typically found scattered along the eastern coast of Libya Mediterranean Sea coast.

Procedures and methods

The Study Site

Um Hufayn is a brackish lagoon (< 11‰.) located within the Gulf of Bomba on the eastern coast of Libya Mediterranean Sea at latitude 32° 33' 13.5" N and longitude at 23° 05' 57.2" E (Fig. 1). It is a 2x1 km cove (Mohamed, 2018) that covers a surface area of about 2 Km^2 with a depth of 0.5 to 3m. It is partly connected to the open sea, but receives freshwater from underground springs and seasonal streams. The lagoon is a principal artisanal fishing ground, an important wetland with high biodiversity, refuge and breeding sites for fish and turtles, and nesting and resting site for resident and migratory sea birds**.**

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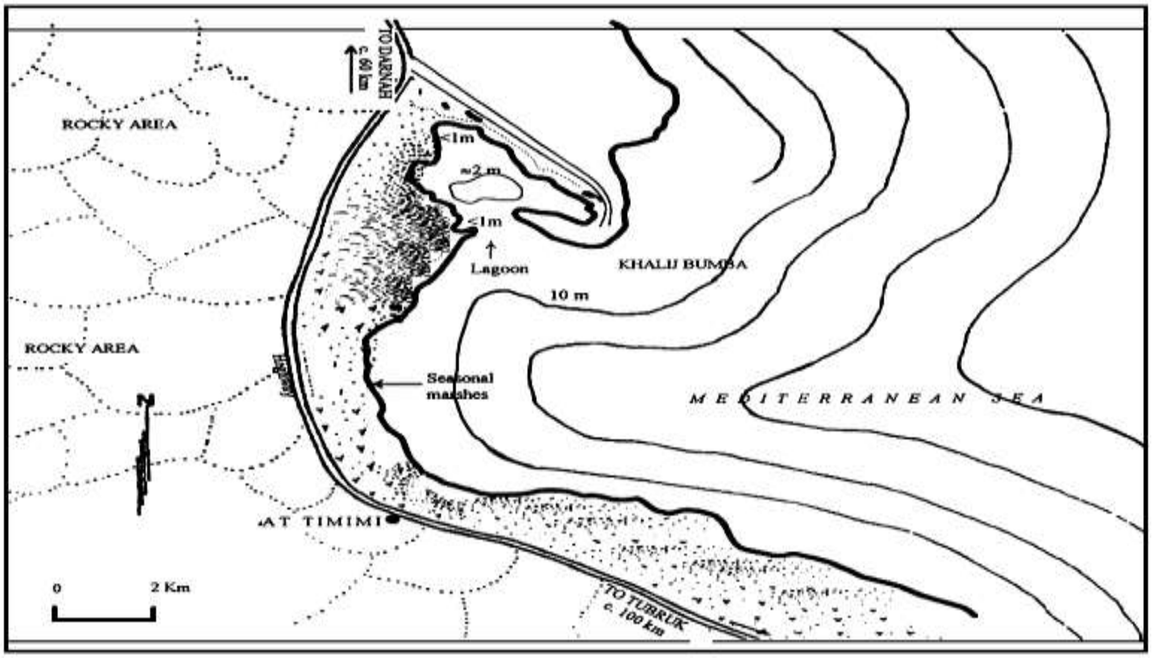

Fig. 1. Um Hufayn lagoon within the Gulf of Bomba, eastern Libyan Mediterranean Sea (Reynolds, *et al*., 1995).

Collection of *L. aurata* samples

Eighty *L. aurata* fish were collected from the artisanal catch of Umm Hufayn lagoon during January/ February 2018 and brought in iceboxes to the Marine Biology Laboratory of Omar Al-Mukhtar University at Albaida for use in establishing morphological characters (morphogenic, morphometric, and the meristic) of *L. aurata*;

The morphological characters established in the present study for *L. aurata*

Morphological characters (morphogenic, meristic, and descriptive characters) established in the present study for *L. aurata* are shown in Table 1 and Fig. 2.

Table 1. Morphological traits established for *L. aurata.*

Morphometric traits (cm)	Meristic traits
1- Total Weight (gm)	1- The first Dorsal fin (D1)
2- Eviscerated weight (gm)	2- The second Dorsal fin (D2)
2- Total Length (TL)	3- The Pectoral fin (P)
3- Fork Length (FL)	4- The Ventral fin (V)
4- Standard Length (SL)	5- The Anal fin (A)
5- Body Depth (BD)	6- The Caudal fin (C)

6- Head Length (HL)	7- Scales on Lateral line (SLL)
7- Pectoral fin Length (P_fL)	8- Scales Above Lateral line (SAL)
8- Dorsal fin Length1 & 2 (D_fL)	9- Scales Below Lateral line (SBL)
9- Pelvic fin Length (P_fL)	10- Gill Rakers Upper (GRU)
10- Anal fin Length (A_fL)	11- Gill Rakers Lower (GRL)
11- Caudal peduncle length (CpL)	12- Strips
12- Caudal peduncle Width (CpW)	**Morphogenic characters**
13- Cauda fin Gape (C_fG)	
14- Predorsal length (PdL)	1- body shape
15- Post anal length (PoL)	2- body color
16- Preanal length (PaL)	3- presence of spots and/or strips
17- Eye Diameter (ED)	4-position & retractability of mouth
18- Preorbital Length (ProL)	5- shape of caudal fin
19- Postorbital Length (PooL)	
20- Mouth Width (MW)	
21- Mouth Gape (MG)	
22- Cheek Length (CL)	

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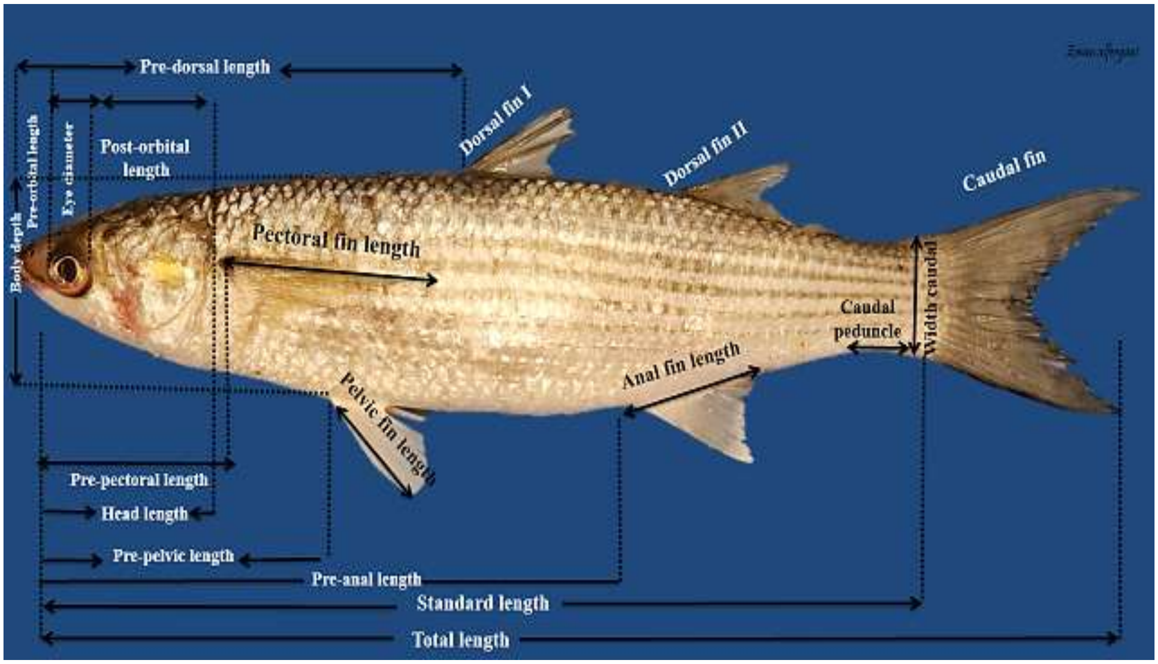

Fig. 2. The morphometric and meristic parameters established in the present study.

Length-weight relationships (LWR)

LWR was calculated for each fish species from the obtained morphometric data according to Le Cren, (1951); Ricker, (1975) as follows:
$W = aL^b$, Where: W = Total fish weight in grams,
L = Total fish Length in centimeters,
"a" and "b" are the constants of the regression line.

Fulton (K_F) and Clark (K_C) condition factors of *L. aurata*

Fulton (K_F) and Clark (K_C) condition factors of *L. aurata* were determined according to Fulton, 1902, and Ricker, 1975, as follows:
$K_F = 100 * W / L^3$; $K_C = 100 * We / L^3$
Where W: total fish Weight in grams; We: eviscerated fish weight in grams
L: total fish Length in centimeters

RESULTS

Size of the studied fish

The total length range of the studied *L. aurata* was 16.9 to 31.2cm corresponding to 39.59 to 316.25g (Table 2). Mean lengths (± SD) of female, male, and mixed female + male fish were 21.746 ± 3.001, 20.894 ± 3.036, and 21.331± 3.010 cm corresponding to mean weights of49.913±57.664, 82.807±47.697, and 89.011±52.724g.

Table 2. Mean lengths and weights (± SD) of males and females *L. aurata*.

Sex	no. of samples	TL (cm)		TW (g)	
		Mean ± SD	Min. – max.	Mean ± SD	Min - Max
F	49	21.746 ± 3.001	18 - 31.2	49.913±57.664	45.44 - 316.25
M	31	20.894 ± 3.036	16.9 - 28.6	82.807±47.697	39.59 - 286.46
F+M	80	21.331± 3.010	16.9 - 31.2	89.011±52.724	39.59 - 316.25

TL: Fish total length; TW: Fish total weight; SD: Standard deviation; n.: number; F: Females; M: Males; F+M: Mixed Females + Males.

The length-weight relationship

Both power and linear regressions describe the length-weight relationship of *L. aurata* very well (Fig. 3). R^2 in both cases was 0.891 and 0.824. The slope, "b" of the power regression was 3.111 indicating near isometric growth (b = 3).

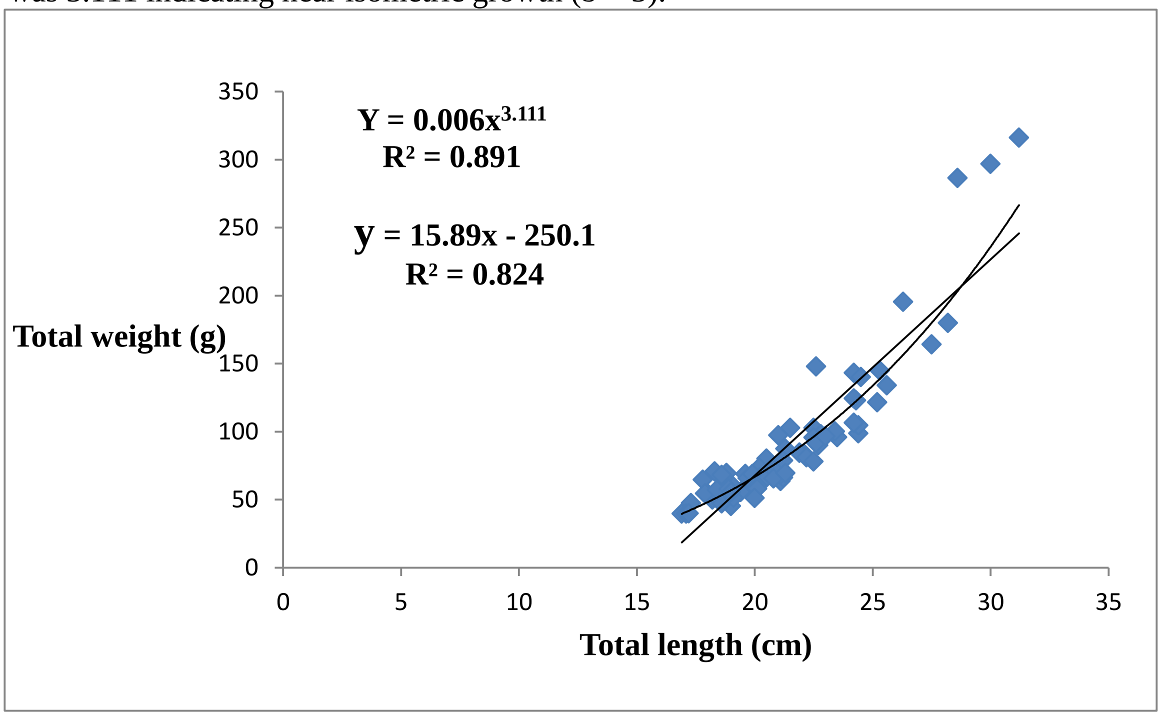

Fig. 3. Total length-total weight linear and power relationship of *Liza aurata*.

Condition factors of *L. aurata*

Values of Fulton (K_F) and Clark (C_F) condition factors were 0.8498 and 0.6651 (Table 3). Correlation of K_F and C_F with fish length was very weak (r = 0.190 and 0.163) and their regressions (Fig. 4) were insignificant indicating that these factors do not change as fish grows.

Table 3. Fulton and Clark condition factors of *L. aurata*.

Condition factors of *L. aurata*		
Statistics	**Fulton**	**Clark**
Mean	0.8498	0.6651
St D	0.13290	0.10242
St Error	0.01486	0.01145
Corr. Fact. vs. TL	0.190	0.16

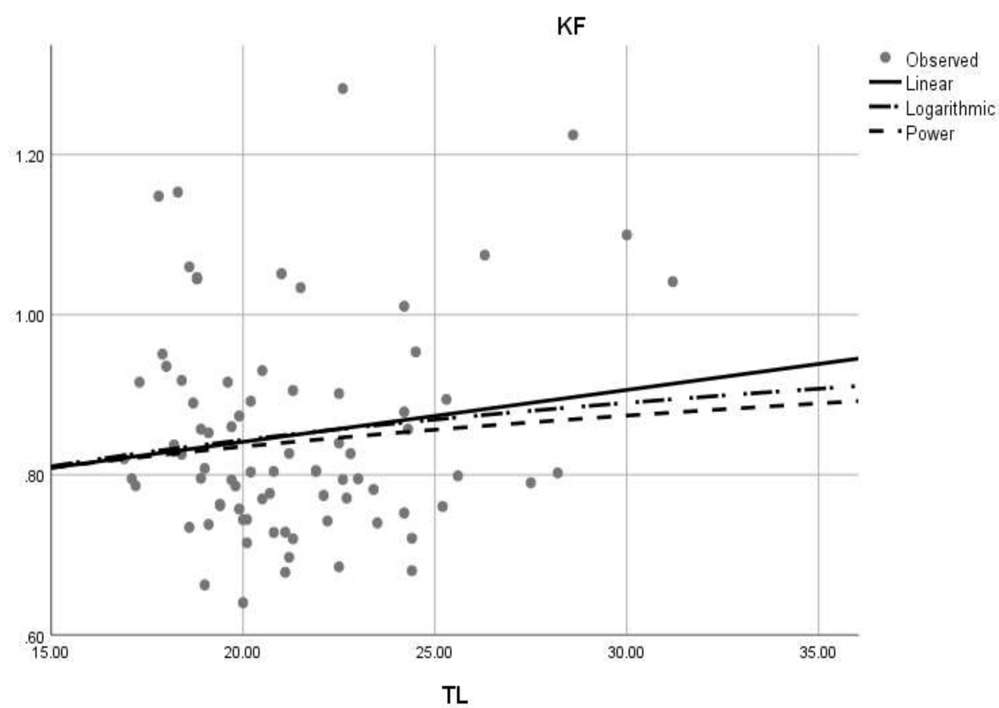

Fig. 4. Linear, logarithmic, and power regression of Fulton condition factor (K_F) on the y axis and total length (TL) on the x-axis. All regressions were weak, insignificant and showed high scatter.

The other morphometric traits of *L. aurata*

Magnitudes of key morphometric parameters and their % ratio from fish length or head length were established (Table 4). Strong and moderate correlations were observed between most of these parameters (Appendix 1); their linear and power regressions with fish length varied from strong to moderate to weak (Table 5). All regressions were positive indicating that individual parameters increased with increases in fish length. The value of R^2 for the linear and the power equations were comparable indicating that both regressions had similar strength in describing the relationship, with a slight preference for the linear ones (have slightly higher R^2 in most parameters). Examples of these regressions are presented graphically in Figs. 5-9.

Table 4. Means ± SE of morphometric parameters of *L. aurata* and their % ratio from the fish total length. Parameters within the head region are related to head length. Weights are in grams, lengths in centimeters.

Morphometric parameters	Mean± SE	%
TW	89.01±5.93	-
TL	21.33±0.34	-
EW	69.75±4.75	-
SL	17.86±0.27	82.81±1.97
BD	3.06±0.09	14.13±1.67
HL	4.24±0.10	19.66±2.75
PFL	3.27±0.05	15.26±1.49
PeFL	2.42±0.04	11.29±1.12
DFL	5.55±0.11	25.69±2.52
AFL	1.71±0.04	7.98±1.18
CPL	3.42±0.06	15.96±1.77
CPW	1.77±0.03	8.24±0.77
CFL	4.85±0.09	22.89±4.57
PDL	9.15±0.14	42.48±1.92
PoOL	6.69±0.66	163.69±154.83
POL	1.00±0.03	23.65±5.042
MG	0.75±0.02	18.052±4.049
MW	1.46±0.04	35.153±8.972
ED	0.98±0.01	24.201±6.620

Table 5. Morphometric parameters of *L. aurata* related to fish total length or head length by linear (L) and power (P) regressions. High R^2 are highlighted green, moderate R^2 yellow.

Morph. parameters	Regression	a	b	R^2	P
SL	L	1.028	0.789	0.974	0.000
	P	1.019	0.936	0.971	0.000
BD	L	1.155	0.198	0.584	0.000
	P	0.080	1.185	0.535	0.000
HL	L	0.107	0.194	0.480	0.000
	P	0.217	0.968	0.362	0.000
PFL	L	0.754	0.118	0.599	0.000
	P	0.353	0.728	0.530	0.000
PeFL	L	0.369	0.097	0.598	0.000
	P	0.205	0.806	0.573	0.000
DFL	L	0.719	0.294	0.772	0.000
	P	0.162	1.152	0.551	0.000
AFL	L	0.106	0.076	0.434	0.000
	P	0.110	0.896	0.376	0.000
CPL	L	0.684	0.129	0.519	0.000
	P	0.359	0.736	0.432	0.000
CPW	L	0.008	0.083	0.688	0.000
	P	0.111	0.904	0.640	0.000
CFG	L	3.833	0.48	0.032	0.110
	P	3.186	0.133	0.010	0.367
PDL	L	0.894	0.387	0.896	0.000
	P	0.613	0.884	0.889	0.000
PoOL	L	3.517	0.149	0.006	0.499
	P	0.603	0.761	0.118	0.002
MG	L	0.081	0.031	0.261	0.000
	P	0.072	0.761	0.170	0.000
MW	L	0.272	0.081	0.625	0.000
	P	0.042	1.154	0.593	0.000
ED	L	0.596	0.018	0.187	0.000
	P	0.328	0.385	0.153	0.000

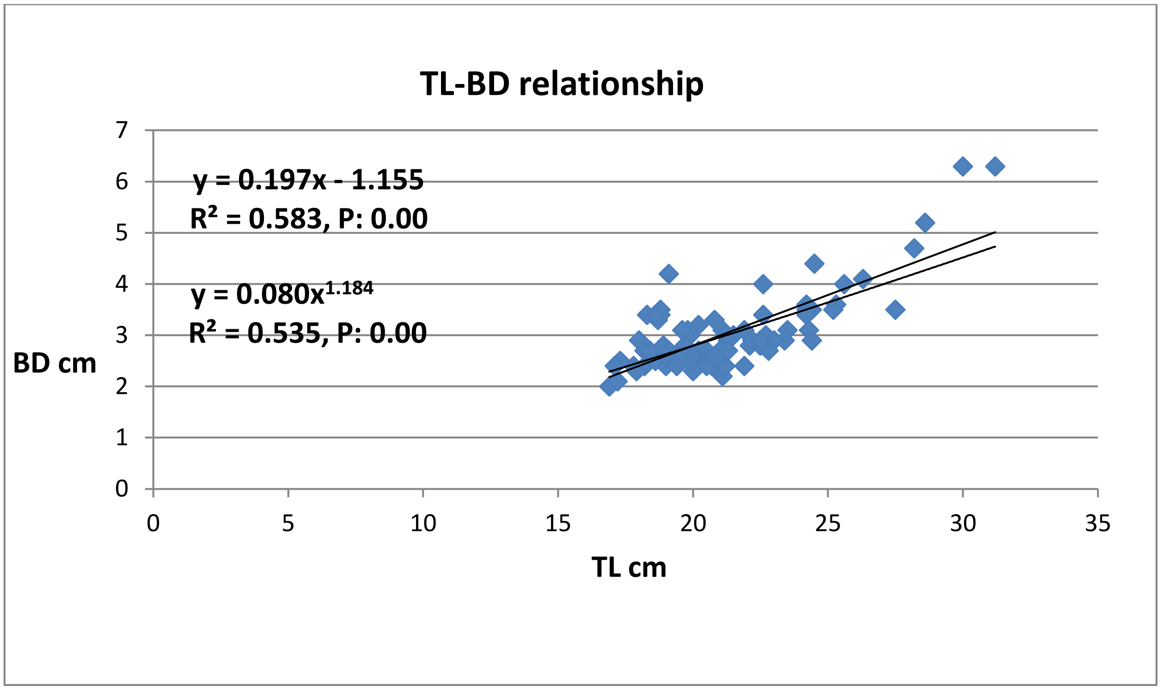

Fig. 5. Total length-body depth relationship of *L. aurata*.

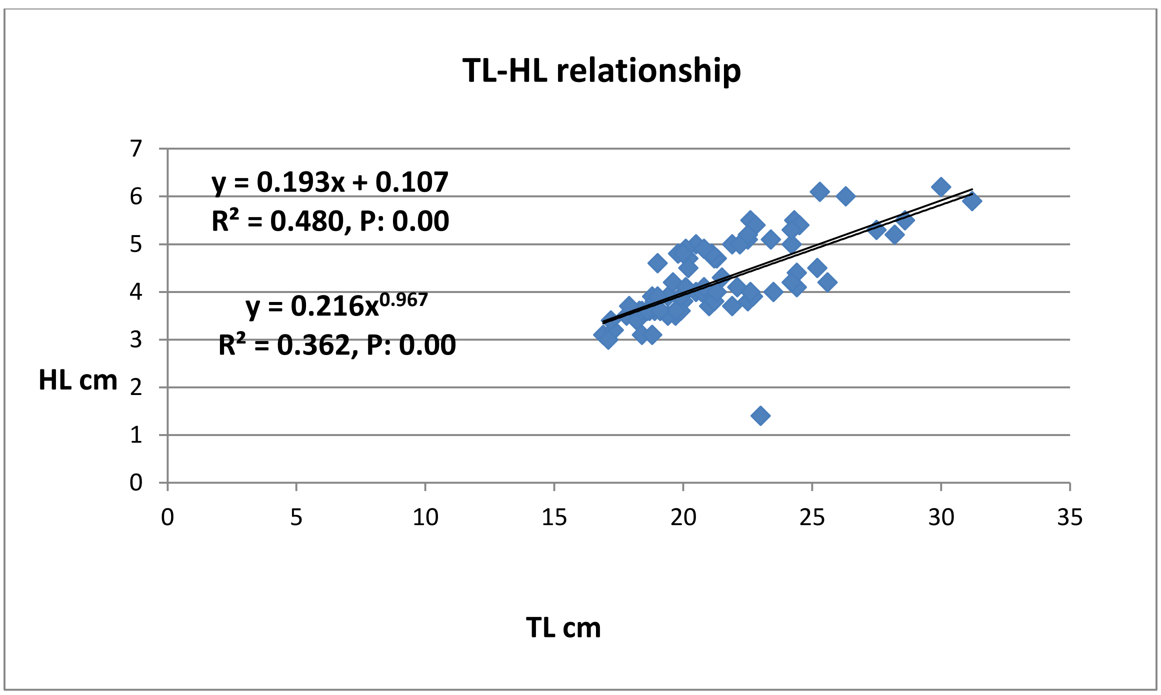

Fig. 6. Total length-head length relationship of *L. aurata*

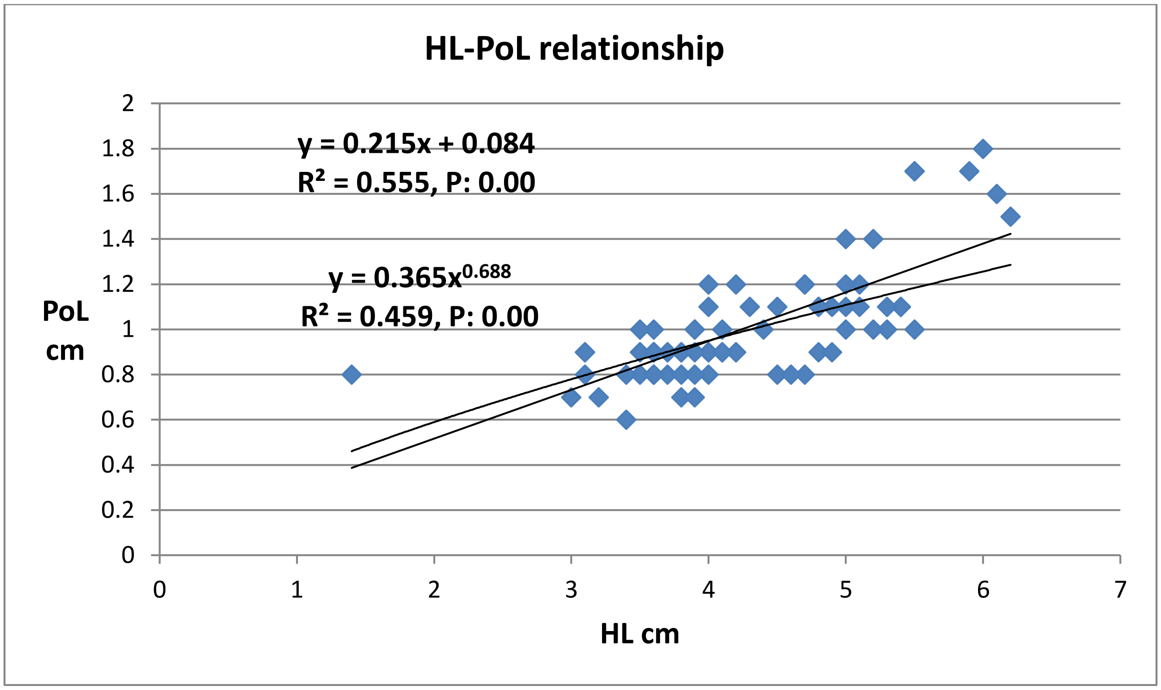

Fig. 7. Total length-post anal length relationship of *L. aurata*.

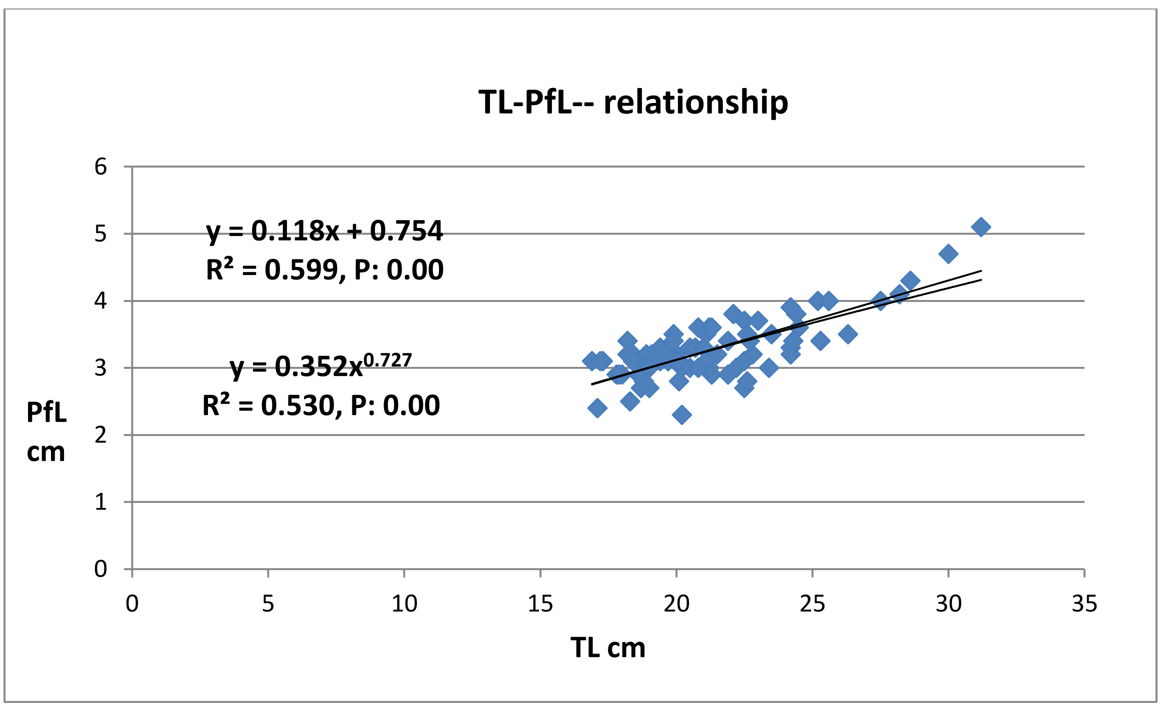

Fig. 8. Total length-pectoral fin Lengths relationship of *L. aurata*

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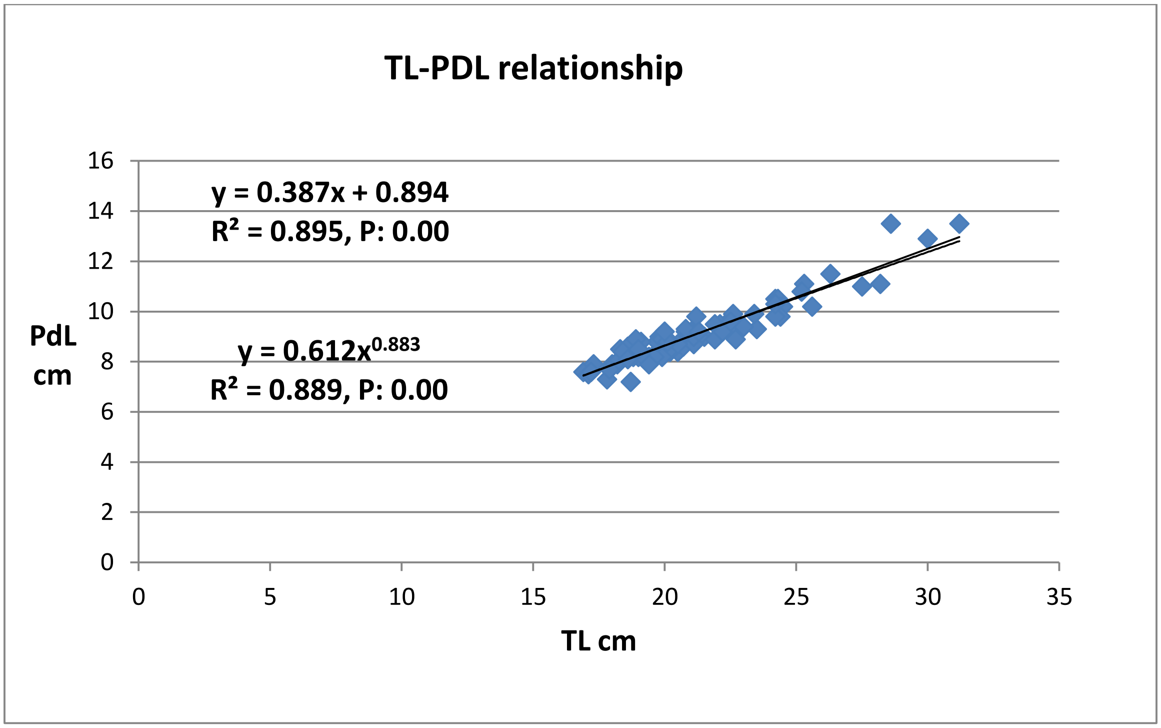

Fig. 9. Total length-predorsal length **fin Lengths relationship of *L. aurata***

Meristic traits of *L. aurata*
Magnitudes of meristic traits of *Liza aurata* are shown in Table 6. Only minimum, maximum, and mode values of the traits are presented because these are the parameters that are used for establishing meristic forms of fish. Means are not used for this purpose. Meristic parameters are conservative and do not correlate with fish length. However, there are two noticeable exceptions: number of scales on lateral line (LL) and number of gill rakers (GR); TL-LL relationship (Fig. 10): Y=0.364X-5.807, R^2: 0.894; Y=2E-05$X^{3.750}$, R^2: 0.846), TL-GR relationship (Fig. 11): Y=3.194X-22.99, R^2: 0.916; Y=0.447$X^{1.505}$, R^2: 0.916).

The following meristic form of *Liza aurata* is based on minimum-maximum values and modes presented below:
D1, IV; D2, I+ 6-9 (8); A, III, 7-12 (9); P, 12-18 (15); V, I + 4-7 (5); LL, 34-54 (42)
D1 and D2 are first and second dorsal fins, A: anal fin, P: pectoral fin, V: ventral fin, LL: scales on lateral line and GR: gill rakers. Roman letters indicate the number of spines and Arabic letters the number of rays.

Table 6. Values of meristic parameters of *Liza aurata* (S: spines, R: rays).

Meristic parameters	Min	Max	Mode
DF S	4	4	4
DF R	0	0	0
DF S2	1	1	1
DF R2	6	9	8
PF S	1	1	1
PF R	4	7	5
PlF S	0	0	0
PlF R	12	18	15
AF S	1	1	1
AF R	7	12	9
CF R	16	24	19
LLon	34	54	42
LLa	32	54	43
LLu	32	56	42

(min: minimum value, max: maximum value, S: number of spines, R; the number of rays

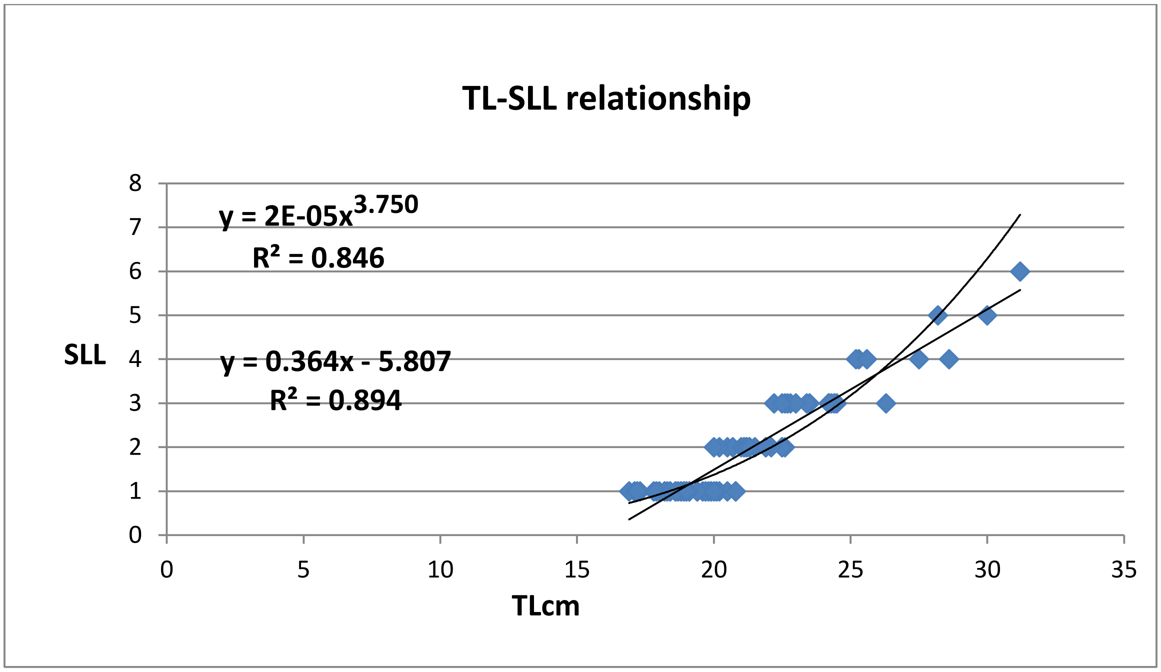

Fig. 10. Total length-number of lateral line scales relationship of *L. aurata*

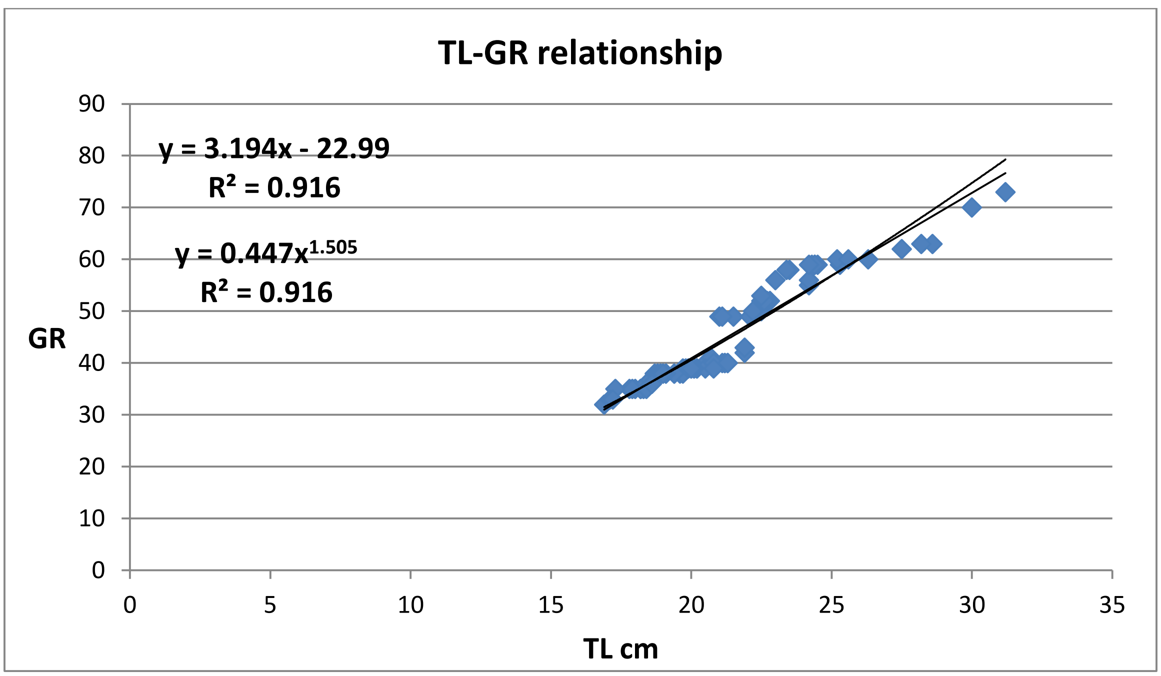

Fig. 9. Total length-number of gill rakers (upper + lower lobes) relationship of *L. aurata*

Discussion

L. aurata of the present study was 21.331cm long and weigh 89.011g on average. Berg (1965) and Thomson (1990) reported that the common length of *L. aurata* is 14-30 cm but

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can reach up to 59 cm. Both linear and power regressions established in the present study described the length-weight relationship of the fish very well, "b" value of the power regression was 3.111 indicating an almost isometric growth. Regression equations of *L. aurata* reported in previous literature was discussed in details in the "Literature review" chapter, "b" is close to isometry (value = 3) in most of the studies, hence agree well with our study. Our Fulton (K_F) and Clark (K_C) condition factors were 0.8498 and 0.6651. Generally, higher values of these factors indicate that the fish is in better health condition, which would mean that environmental conditions are favorable. Bilgin *et al*. (2006) reported Fulton values of 0.865 and 0.803 for males and females of the same species in the Middle Black Sea (Sinop-Samsun Regions). Moradinasab *et al*. (2012) reported that *Liza aurata* in Iranian coastal waters of the Caspian Sea had condition factor values of 1.017 to 1.071. These values were close to the ones established in the present study. However, Mohammed *et al*. (2016) obtained much higher K_F (2.8) and K_C (2.6) values. It is well documented that K_F and K_C are dependent on the degree of fitness, gonad development, the suitability of the environment, feeding condition, stress, sex, age, and season of fish, which explain differences in value reported by different studies.

Means of key morphometric parameters of *L. aurata*, % of these parameters from fish length or head length, their binary correlations (Pearson's correlations), and their linear and power regressions with fish length was established. The ratio of head to fish length is of importance in aquaculture, as fish with the smaller ratio are preferred. This ratio was 19.66±2.75% for *L. aurata* of the present study. All regressions were positive indicating that morphometric parameters increase as fish grows. However, meristic parameters, except the number of scales on the lateral line and the number of gill rakers, do not increase with increases in fish length. Meristic parameters, because they are more conservative, are used in establishing meristic forms of different fish. These forms are thought of as rough fingerprint that differentiates different species. However, intra-species meristic forms though are similar but not identical:

- D1, IV; D2, I+ 6-9 (8); A, III, 7-12 (9); P, 12-18 (15); V, I + 4-7 (5); LL, 34-54 (42) (meristic form of the present study)
- D1, IV; D2, I+8; A, III, 8-9; P, 17; V, I + 5; LL, 40-47 (Golani *et al*. (2006), form for the same fish)

We strongly support Mohammed (2018) who advocated inclusions of modes in meristic forms to account for counting errors, in the past, meristic forms were based on the minimum and maximum counts. The von Bertalanffy growth model.

References

Barriga-Sosa, D. L. A., Jimenez-Badillo M. D. L., Ibanez A. L., Arredondo- Figueroa J. L. 2004. Variability of Tilapias (*Oreochromis*Spp.) introduced in Mexico: morphometric, meristic and genetic characters. J. Appl. Ichthyol., 20: 7-14.

Berg, L. (1965). Freshwater fishes of the U.S.S.R. and adjacent countries. Volume 3, 4th edition. Israel Program for Scientific Translations Ltd, Jerusalem. Russian version published.

Bilgin, S., Recep Bircan, Çetin Sümer, Süleyman Özdemir, E.Şanver Çelik, Orhan Ak, H.Hüseyin Satilmiş and Barış. (2006). Population Features and Reproduction Biology of Golden Grey Mullet Liza Aurata (Risso, 1810) (Pisces: Mugilidae), In the Middle Black Sea (Sinop-Samsun Regions). Fırat Üniv. Fen Ve Müh. Bil. Der. Science and Eng. J of Fırat Univ. 18 (1), 49-62, 2006 18 (1), 49-62.Div. Scot. Rep. 20.

Clark, F. (1928). The weight length relationship of the California sardine (Sardina coarulea) at San-Pedro. Division of Fish and Game of California. Fishery Bulletin No. 12-59.

Costa, J. L, De Almeida P. R, Cost M. J. (2003). A morphometric and meristic investigation of Lusitanian toadfish *Halobatrachusdidactylus* (Bloch and Schneider, 1801): evidence of population fragmentation on the Portuguese coast. Sci. Mar., 67: 219-231.

Doherty D., McCarty T. K. (2004). Morphometric and meristic characteristics analysis of two western Irish populations of Arctic char, *Salvelinusalpinus* (L.). Biology and Environment: Proceedings of the Royal Irish Academy, 104: 75-85.

Fulton, F. (1902). Rate of growth of sea fishes. Scient. Invest fish.

Golani, D, Ozturk, B., and Basusta, N. (2006). The Fishes of the Eastern Mediterranean. Turkish Marine Research Foundation, Istanbul, Turkey. 259 pp.

Ihssen, P. E. Booke, H. E., Casselman, J. M., McGlade, J. M., Payne, N. R., Utter, F.M. (1981). Stock identification: Materials and methods. Can. J. Fish. Aquat. Sci., 38: 1838-1855.

Le Cren, E. D. (1951). The length-weight relationship and seasonal cycle in gonad weight and condition in the perch (Percafluviatilis). J. Animal Ecology. 20: 201-219

Lindsey, C. C. (1988). Factors controlling meristic variation. In Fish physiology, Vol. XI-B (Hoar WS, Randall DJ, eds), pp. 197-274. San Diego, CA: Academic Press

Mohammed, Wafa Idrees (2018). Morphological Study to identify tilapia species (Cichlidae) in Ain Um Hufayan Lagoon, Eastern Libya Coast. Thesis. Marine Biology Branch, Department Of Zoology, Faculty of Science, Omar AL-Mukhtar University, Albaida, Libya.

Mohammed, Amana A.; Lutfi M. A. Musa; Ramadan A. S. Ali; Abdalla N. Elawad and Sayed M. Ali. 2016. The length-weight relationship and condition factor of the thin lip mullet Liza ramada and the flathead grey mullet Mugil cephalus (Mugilidae) fishes from Ain El-Ghazala lagoon, eastern Libya. International Journal of Information Research and Review. Vol. 03, Issue, 06, pp. 2504-2507. June, 2016.

Moradinasab,G.; Hadi Raeisi; Seyed Yousef Paighambari; Rasul Ghorbani, and Zobeydeh Bibak. (2012). Length-Weight relationships, Relative condition factor, and Relative weight of three fish species from beach seine fishing grounds Iranian coastal waters of Caspian Sea. Caspian Journal of Applied Sciences Research, 1(5), pp. 36-40.

Vol.7, No.1, pp.11-27, January 2021

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Naesje, T. F., Vuorinen, J. A., Sandlund, O. T. (2004). Genetic and morphometric differentiation among sympatric spawning stocks of white fish (*Coregonuslavaretus*L.) in Lake Femund, Norway. J. Limnol., 63: 233-243

Rejitha, B. and, Pillai, P. (2015). Estimation of length-weight relationship of six coral reef fishes of order Perciformes from Gulf of Mannar, southeast coast of India. International Journal of Fisheries and Aquatic Studies; 3(1): 305-307.

Reynolds, J. E., Haddoud, D. A., Vallet, F., 1995. Prospects for aquaculture development in Libya, Libfish Field documents No 9. Tripoli / Rome, FAO.

Ricker, W. E. (1975). Interpretation of biological statistics of fish populations, Department of the Environment Fisheries and Marine Service Pacific Biological Station, Nanaimo, B. C. V 9R5 K6, pp. 266.

Sokal M., and A. Oktener, 2009. Biometry of the fishes Barbusplebejus and Barbuscapito from Coruh Basin, Turkey. Rev, Biol Trop, 57: 159-165.

Talwar, P. K., Jhingran A. G. 1992. Inland fishes of India. Rec. Ind. J., 3: 19-24.

Thomson, J. (1990). Karrer, A. Post and L. Saldanha (eds.) Check-list of the fishes of the eastern tropical Atlantic (CLOFETA). JNICT, Lisbon; SEI, Paris; and UNESCO, Paris. Vol. 2. Mugilidae. p. 855-859. In J.C. Quero, J.C. Hureau.

Zafar, M., Nazir, A., Akhtar, N., Naqvi SMHM, Zia-ur-Rehman M. (2002). Studies on meristic counts and morphometric measurements of Mahseer (*Tor putitora*) from a spawning ground of himalayan Foot-hill River korang Islamabad, Pakistan. Pakistan J. Biol. Sci., 5(6): 733- 735.