

Original Article

Length-weight relationship, condition factor, and length at first capture of *Chelon auratus* (Risso, 1810) golden grey mullet in Bardawil lagoon, North Sinai.

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ABSTRACT: Some biological aspects such as length-weight relationship, condition factor, and length at first capture were studied for golden grey mullet *Chelon auratus* in the Bardawil lagoon during the fishing season 2020- 2021. *Chelon auratus* lengths ranged between 14.5–33.8 cm, and total weight ranged between 27 – 237.20 gm. The total length - total weight relationship was estimated as $TW = 0.0257 TL^{2.652}$, $TW = 0.0344 TL^{2.5296}$, and $TW = 0.0239 TL^{2.652}$ for both sexes combined, males and females respectively; with (b) value >3. The highest condition factor was observed in October for both sexes, but by size group, it was found 24-24.9 cm for males also 16-16.9 and 22-22.9 cm for females have the highest condition factor. The length at first capture were found $L_c = 19.20$ and 20 cm for females and males, respectively. The objective of this study is to determine the current biological status of this species in the Bardawil lagoon.

Key words: *Chelon auratus*, biological aspects, Bardawil lagoon, Length weight relationship.

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1. INTRODUCTION

Bardawil lagoon is a shallow hyper saline lagoon located in the middle of the Mediterranean coast of Sinai. The approximate length is 75 km, and the maximum width is 19 km. The surface area is about 595 km². The lagoon is extremely shallow, and the water depth never exceeds 3 m. A long sandbar, 1 km wide maximum, separates the lagoon from the adjacent

Mediterranean (Fouda, 1985). Family Mugilidae is a common commercial resource of Egyptian waters distributed from the Eastern coastal at Rafah to western at El-Salloum, and through the northern Egyptian lakes. Golden grey mullet locally named “Dhabana”, is a mugilid fish of marketing value for fisheries, especially in north Sinai waters.

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It is distributed in vast coastlines as in northeastern Atlantic waters and Mediterranean and Black seas. *Chelon auratus* stocks need to regulate, monitoring and management to continuously for fisheries sustainability. This research is focused on its biological characteristics.

2. MATERIALS AND METHODS

2.1. Sampling

During six months from October 2020 to March 2021, totally 478 specimens from Golden grey mullet *C. auratus* were collected monthly from local markets.

2.2. Measurements

The Total weight (TW) measured nearest to 0.01 gm and total length (TL) nearest to 0.1 cm. Total lengths of *C. auratus* measured was ranged between 14.5 to 33.8 cm for females and between 15.5 to 27 cm for males, also, total weights were ranged between 27 – 237.20 gm for females and between 32.3 – 148.06 gm for males. The relationship between length and weight was described by the potential equation as $W = a \cdot L^b$ (Ricker, 1975), where (W) is proportional to a certain power (b) of the total body length (L). (a) & (b) are constants whose values were estimated by the least square methods.

The relative condition factor (Kn) was computed by using Le Cren (1951) formula and adopted by (Pope and Kruse, 2006): as: $Kn = W/W^*$ or $Kn = W/a(TL)^b$

Where, Kn: is the relative coefficient of condition. W: is the observed weight in gm. and, W*: is the calculated weight in gm.

The length at first capture (Lc), was determined from the accumulated catch curve as described in Pauly (1984).

3. RESULTS AND DISCUSSION

3.1. Length weight relationship

Length weight relationship was measured for 232 males and 246 females' samples by using Le Cren (1951) equation as weight on length to determine the relation: $W = a \cdot L^b$

Where, the constants a, and b of this equation was 0.0257 and 2.6271 respectively for both males and females. Also, it was 0.0344 and 2.5296 respectively for males and 0.0239 and 2.652 respectively for females. The coefficient (b) as a slope of this regression line was significantly less than (3) this means that the total weight of this species shown negative allometric growth with its total length which $b < 3$ for both sexes (Fig.: 1).

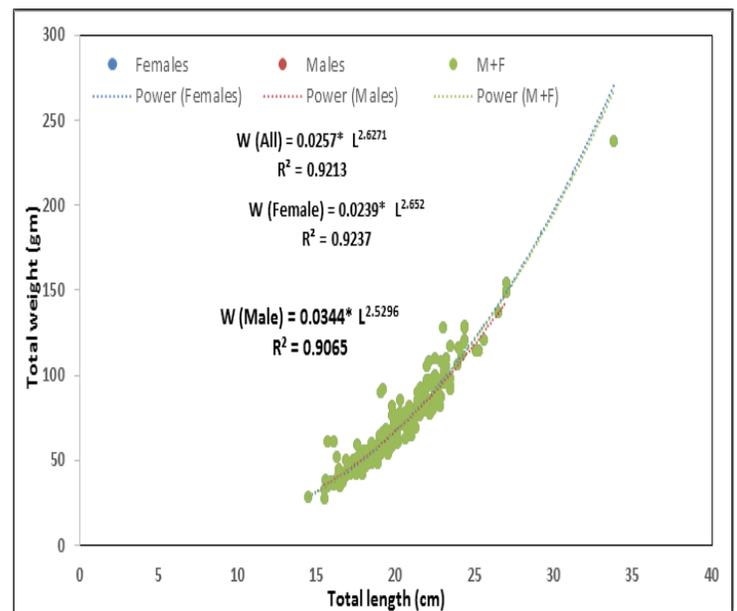


Figure 1. Total length total weight relationship of *Chelon auratus* males and females from Bardawil lagoon.

Fishes' length weight relationship is likely affected by some factors such as: habitat, sex, season, gonad maturity, health, diet, stomach fullness, preservation techniques and length variability of specimens. The present length weight relationship equation is $TW = 0.0257 TL^{2.652}$ for both sexes, $TW = 0.0344 TL^{2.5296}$ for males, and $TW = 0.0239 TL^{2.652}$ for females. These results are agreed with Campillo, 1992 which b (slope)= 2.49 and 2.62 for females and males also Dulcic & Glamuzina, 2006 which found b (slope)= 2.7 for both sexes. The isometric growth of golden grey mullet *Chelon auratus* was observed by Mehanna, 2006 which found

length weight relationship equation is $TW = 0.0086 TL^{2.9356}$ for both sexes, also same result observed by Djabali et al. 1993 and Koutrakis & Tsikliras 2003. The positive allometric growth was observed by Moutopoulos *et al.*, 2013 which found $b = 3.26$, Verdiell-Cubedo *et al.*, 2006 on Mar Menor Lagoon which found $b = 3.19$.

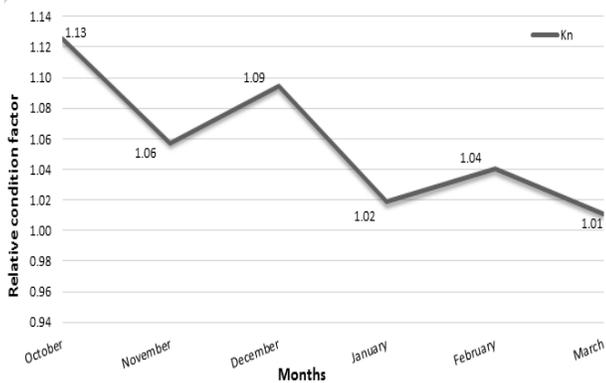
3.2. Condition factor (Kn)

This qualitative measure usually based on a visual assessment of the fish, taking into account the general shape of the fish, its length and weight, and its appearance Al-Beak (2015).

During six months from October to March golden grey mullet males and females show fluctuations in its body condition as seasonal variation in temperature (Fig. 2), where it was at highest values (Kn= 1.13) at the end of the summer then it decreases by the end of winter (Kn= 1.01).

The relative condition factor of *C. auratus* males and females was studied separately by size group, where it was at maximum value (Kn= 1.10) at size group 24-24.9 cm for males, but it was at minimum value (kn= 0.96) at size group 17-17.9 cm. Also, it was at maximum value (Kn= 1.06 and 1.04) at size group 16-16.9 and 22-22.9 cm for females, but it was at minimum value (kn= 0.96) at size group 15-15.9 and 26-26.9cm.

Figure 2. Relative condition factor “Kn” of *Chelon auratus* males and females from Bardawil lagoon for 6 months.



The condition factor values depend on season, habitat, age, and sex (Hotos et al., 2000) so are difficult to compare. However, the condition factor of mullet from adjacent estuaries of the Black Sea mostly ranged between 0.7 and 1.1 Bilgin et al. (2006), which similar to current study. By other hand, in the Golden Horn Estuary, Turkey, Kesiktaş (2020) found most condition factor values of *C. auratus* ranged between 1.0 and 1.5 (lowest 0.68). The higher condition factor found in the Sea of Marmara may be related to the high nutrient capacity of the Golden Horn estuary (Albayrak et al., 2010).

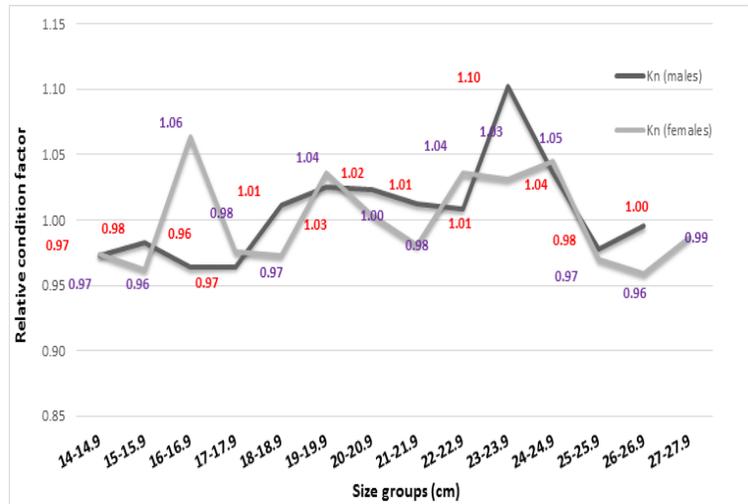


Figure 3. Relative condition factor “Kn” of *Chelon auratus* males and females from Bardawil lagoon by size group.

3.3. Length at first capture (Lc)

The size at 50% captured for golden grey mullet was estimated at TL= 19.20 and 20 cm for females and males respectively (Fig. 3 and 4). The smallest length recorded in the catch Lr was 14.5 and 15.5 cm for females and males, respectively. These results are greater than previous values of *C. auratus* on Bardawil lagoon done by Mehanna (2006) which found the length at first capture of golden grey mullet was (Lc= 16.92 cm), these results were reflected the good management of this important fisheries resource.

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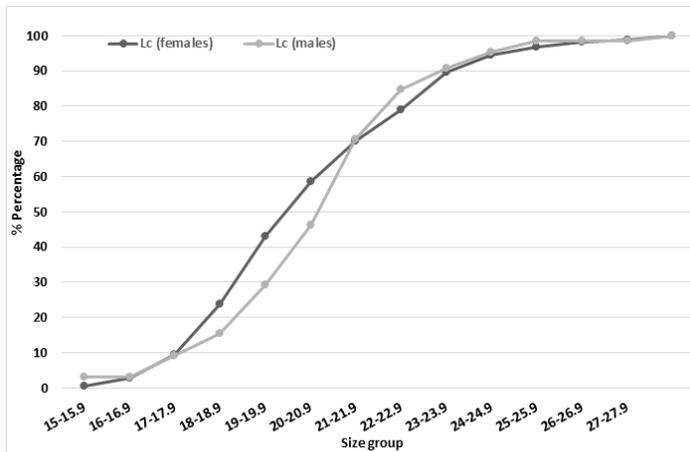


Figure 4. Length at first capture “Lc” of *Chelon auratus* males and females from Bardawil lagoon by size group.

4. CONCLUSION

This study revealed some biological aspects of golden grey mullet in Bardawil lagoon and compare these results with previous research to assess the current management tools in this important fisheries resource.

REFERENCE

AL-Beak, A. M. A. 2015. Biological studies on white sea bream *Diplodus Sargus* in the eastern Mediterranean fisheries. Theses, M.Sc., Fac. Environ. Agr. Sci., Suez Canal Uni.

Bilgin, S., R. Bircan, Ç. Sümer, S. Özdemir, E.Ş. A.k.O. Çelik, & B. Bayraklı. 2006. Population features and reproduction biology of golden grey mullet *Liza aurata* (Risso, 1810) (Pisces: Mugilidae), in the Middle Black Sea (Sinop-Samsun regions). *Sci & Eng. J. Firat Uni.*, 18, 49–62.

Campillo A. 1992. Les pêcheries françaises de Méditerranée: synthèse des connaissances. Institut Francais de Recherche pour l'Exploitation de la Mer, France. 206 pp.

Djabali, F., Mehailia, A., Koudil, M. & Brahmi. B. 1993. Empirical equations for the estimation of natural mortality in Mediterranean teleosts. *Naga ICLARM Q* 16, 35–37.

Dulcic, J. & Glamuzina, B. 2006. Length-weight relationships for selected fish species

from three eastern Adriatic estuarine systems (Croatia). *J. Appl. Ichthyol.*, 22, 254–256.

Fouda, M. M. 1985. Ecology of Bardawil Lagoon, Northern coast of Sinai Peninsula, Egypt. Report submitted to British Petroleum, Cairo.

Hotos, G.N., Avramidou, D. & Ondrias, I. 2000. Reproduction biology of *Liza aurata* (Risso, 1810) (PiscesMugilidae) in the lagoon of Klisova (Messolonghi, W. Greece). *Fish. Res.*, 47, 57–67.

Kesiktaş, M., Yemişken, E., Yildiz, T. & Eryilmaz, L. 2020. Age, growth and reproduction of the golden grey mullet, *Chelon auratus* (Risso, 1810) in the Golden Horn Estuary, Istanbul. *J. the Mar. Biol. Assoc. of the United Kingdom* 1–7.

Koutrakis, E.T. & Tsikliras, A.C. 2003. Length-weight relationships of fishes from three northern Aegean estuarine systems (Greece). *J. Appl. Ichthyol.* 19, 258–260.

Le Cren, E. D. 1951. The length – weight relationship and seasonal cycle in gonadal weight and condition in perch (*Perca fluviatilis*). *J. Ani. Ecol.* 20: 201-219.

Mehanna, S. F. 2006. Fisheries management of the thinlip grey mullet *liza ramada* and golden grey mullet *liza aurata* from lake bardawil, Egypt. *Egypt. J. Aqua. Biol. & Fish.*, 10 (2) 33-53.

Moutopoulos D.K., Ramfos, A. Mouka, A. & Katselis, G. 2013. Length-weight relations of 34 fish species caught by small-scale fishery in Korinthiakos Gulf (Central Greece). *Acta Ichthyologica et Piscatoria* 43, 57–64.

Pauly, D. 1984. Fish population dynamics in tropical water: a manual for use with programmable calculators. ICLARM. Stud. Rev. 8. 325 p. Int. Center for Living Aqua. Res. Manag., Manila, Philippines.

Pope, K.L. & Kruse, C.G. 2006. Condition. In: Brown, M.L., Guy, C.S. (Eds.), *Analysis and Interpretation of Freshwater Fisheries Data*. Amer. Fish. Soc., Bethesda, Maryland.

Ricker, W. E. 1975. Computation and interpretation of biological statistics of fish populations. *J. Fish. Res. Board Can.*, 191:1–367.

Verdiell-Cubedo D., Oliva-Paterna, F.J. & Torralba, M. 2006. Length-weight relationships for 22 fish species of the Mar Menor coastal lagoon (western Mediterranean Sea). *J. Appl. Ichthyol.* 22, 293–294.