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Age and growth of elephant-snout fish *Mormyrus kannume* (Forsskål, 1775) (Family: Mormyridae) from Lake Nasser, Egypt

Mahmoud M. S. Farrag[1*], Alaa M. Younis[2,3] , Rokaya M. Abdel-megaly[4] , Khaled Y. AbouelFadl[5]

[1] Zoology Department, Faculty of Science, Al-Azhar University (Assiut Branch), Assiut, Egypt
[2] Department of Chemistry, College of Science, Qassim University, Buraidah, 51452, Saudi Arabia
[3] Aquatic Environment Department, Faculty of Fish Resources, Suez University, Suez, 43518, Egypt.
[4] Fisheries Department, Faculty of Fish Resources, Suez University.
[5] Faculty of Fish and Fisheries Technology, Aswan University

[*]**Corresponding Author:** m_mahrousfarrag@yahoo.com; mahmoudfarrag42@azhar.edu.eg

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ABSTRACT

The elephant-snout fish *Mormyrus kannume* is one of the known interesting fish in the most interesting man-made lake in Egypt (Lake Nasser). Due to the global conservatory objectives and lake management, this species won scientific and commercial interest as there were no sufficient or recent studies on this species. The present work aimed to study the growth pattern of the elephant-snout fish (*M. kannume*) from Lake Nasser, Egypt via length-weight relationship, condition factor, growth in age and growth parameters. A total of 645 specimens were monthly collected from the commercial landing sites (Aswan, Garf Hussein and Abu Simbel harbours) from November 2017 to December 2018. The investigations illustarted a wide range of length from 15.3 to 77.5 cm (TL), with an average of 36.3±7.0 cm and a total weight (W) ranging from 25.2 to 2882.5 g, with an average of 360.3±278.6. The length-weight relationship showed negative allometric growth for males, females, and combined sexes. The absolute condition (Kc) showed a higher value during February (0.74±0.06) for males and during April (0.72±0.06), May (0.72±0.09) and July (0.72±0.06) for females. For C. sexes, the highest value was recorded during February (0.72±0.06). The lower Kc was during August for males, females and C. sex. In general, the conditions were located under "1" along the year and recorded an annual average of 0.68±0.072, 0.69±0.70 and 0.68±0.075 for males, females and C. sexes respectively. By using opercula reading, the life span/ growth rings of *M. kannume* were calculated as ten years with a mean length of 17.3, 26.64, 35.11, 42.98, 49.56, 55.91, 61.5, 65.82, 69.66 and 72.54 cm TL, for each age groups from one to ten respectively. The von Bertalanffy growth constants were computed as L_∞= 89.91 cm TL, K = 0.16 year^{-1}, and t_o = −0.91. The growth performance index (ϕ) was 3.11 and the longevity of age (t max) was 18.56 years. In spite of the presence of negative allometric growth combined with the lower value of conditions than "1" which may be affected by food and spawning, the others such as aging, growth performance, and age longevity have reflected a satisfied growth pattern in this lake and are valuable for creating a monitoring and management system for *M. kannume*in Lake Nasser recommending its conservation with require to more studies

INTRODUCTION

Mormyrids are endemic in African Rivers and are represented by about 208 species belonging to 18 genera (**Gosse, 1984** and **Chapman & Hulen, 2001).** Twenty species are related to genus *Mormyrus*, only 4 of them are present in the Nile of Egypt **(Bishai and Khalil, 1997**). The elephant-snout fish, *Mormyrus kannume* is the only species found downstream in the Nile after the High Dam construction, Aswan, Egypt in 1969 (**Mekkawy and Hassan, 2012**). It is widely distributed in Africa; it is found in Uganda, Nigeria, Blue Nile and Lake Victoria, Lake Kyoga, Lake Albert, Lakes Edwards and George, Tana River, Athi River and Northern Guaso Nyiro River (**Scott, 1974; Bishai & Khalil, 1997** and **Fawole, 2002**); and more frequently in Lake Nubia where the largest specimen had reached 130 cm in length **(Latif, 1974).** In Egypt, *M. kannume* is known as Anomah Umm Baouez and found in little quantity in the commercial catch (**Bishai and Khalil, 1997; Khallaf and Authman, 2010, 2012**). By the time, the Lake Nasser has been received an attention from different authorities for conservation and management of the commercial and non-commercial species (**Mekkawy, 1998; El-Haweet *et al.*, 2008; El-Far *et al.*, 2020; Jawad *et al.*, 2021; Farrag *et al.*, 2022a, b).** The elephant-snout fish in Lake Nasser has been received some attentions due to the absence of sufficient data or studies in the lake except little old works in the lake **(El-Etreby, 1985** and **Aly, 1993)** or it has been mentioned in the recent one **(El-Far *et al.*, 2020).** While, there are some studies in the River Nile **(Soliman, 1994; Ahmed, 2007; Khallaf and Authman, 2010**; **Ragheb, 2016)**. The recent calls of countries and authorities towards the attention with the biodiversity and sustainable development, the elephant-snout fish has been included among specied needs to monitoring in the field and fish markets.

Growth data can be used to assess the status of a fishery and determine how fisheries have responded or will respond to exploitation (**Zhu *et al.*, 2009; Flinn and Midway 2021**). Growth parameter estimates can be used to compare different populations (or stocks) over time as a tool to evaluate density-dependence or prey-availability **(Farrg *et al.*, 2018; Mehana *et al.*, 2018; Lauerburg *et al.*, 2018; Khan and Khan 2020; AbouelFadl and Farrag, 2021; Flinn and Midway 2021**). Age estimation within a stock is an essential resource in the effective management of commercial species, with the estimation of size at the onset of sexual maturity, which is particularly important in understanding the reproductive strategy and fitness of a species for reproductive output (**McQuaid *et al.*, 2006; Farrg *et al.*, 2018; Mehana *et al.*, 2018**; **Lolas and Vafidis 2021**). It is possible to determine the age of fishes with reasonable accuracy by reading the growth rings in hard parts (scale, otolith, opercular bone, vertebra and cross-section of dorsal or pectoral spine and fin rays). *M. kannume* is covered with a smooth shiny skin and lack scales. So that, the opercula and other hard structures will be effective for age determination. Opercula are often used in age determination and fisheries studies (**Campana 2001** and **Panfili *et al.*, 2002**), because they are easily identifiable bones and easy removed without difficulties.

Length–weight relationships of fishes are among the most important biological parameters in combination with population and environmental parameters as it provides certain information for conservation of natural populations and fishery management (**Hossain *et al.*, 2013; Farrg *et al.*, 2018; Mehana *et al.*, 2018** and **Karuppiah *et al.*, 2021)** and also plays a vital role in morphological comparison of different populations (**Gonçalves *et al.*, 1997** and **Kodeeswaran *et al.*, 2020**). The condition factor is the index used to understand maturity, the survival, health status, and reproduction of fish (**Le Cren, 1951; Hossain, 2010;**

Ahmed *et al.*, 2012), it indicates the quality of a water body and the overall fitness of a population residence in a specific ecosystem **(Tsoumani *et al.*, 2006; Sabbir *et al.*, 2020**). Due to the insufficient and updated data regarded to *Mormyrus kannume* in Lake Nasser, Egypt; the present study aimed to support the information on its age and growth pattern to be an important addition required in management and conservation of the lake Nasser, Egypt.

MATERIALS AND METHODS

Lake Nasser is located at the border of Egypt and Sudan between latitudes 21.8°N to 24.0°N and longitudes 31.3°E to 33.1°E **(Fig. 1)**. A total of 645 specimens of *M. kannume* **(Fig. 2)** were monthly collected from the commercial landing sites (Aswan, Garf Hussein and Abu Simbel harbours) during the period from November 2017 to December 2018.

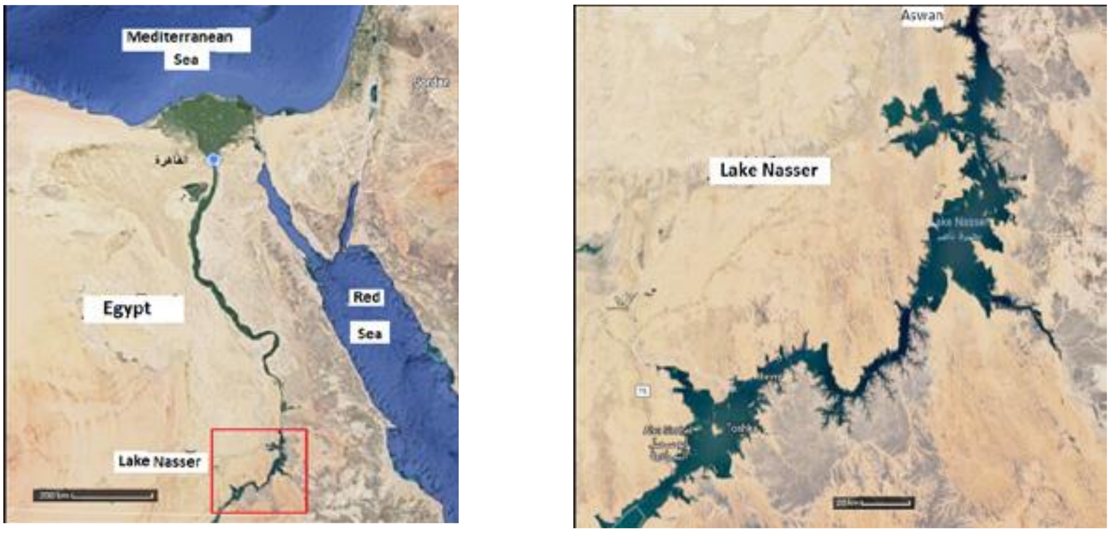

Fig. 1. The location of Lake Nasser, Egypt.

Fig. 2. *Mormyrus kannume* from Lake Nasser, Egypt

The total length (TL) of each specimen was measured to the nearest 0.1 cm and the total weight (TW) was weighed to the nearest 0.1 g, then it dissected for sex determination. The length-weight relationship via total length (L) and total weight (W) was estimated using the formula **(Le Cren, 1951)**: $\mathbf{W = aL^b}$, where a is the intercept, and b is the slope of the relationship. The slope b was used to describe the three types of fish growth in length. If b = 3, the growth is isometric; if b < 3, it is negative allometric; and if b > 3, it is positive allometric **(Froese, 2006)**. The absolute condition factor was calculated according to **Bagenal and Tesch (1978): $\mathbf{Kc = 100 * W/L^3}$**.

For age determination, 645 opercula of *M. kannume* were investigated, they were removed, cleaned/ boiled to remove the extra of tissue and examined under the microscope **(Fig. 3)**.The opercula were used here as it is easy to be removed, easier than otolith and vertebrae particulary in large specimens and more clear. Moreover, the elephant-snout fish are covered with a smooth shiny skin and lack scales. The present opercula is a triangle-shaped bone that is posterior to the eye and mouth joined to the fish via a balland socket hinge. This hinge enables the operculum to easily open and close. The removing and examination of opercula were applied according to protocol of **Davies *et al*. (2015**). The annual growt rings. The opaque band is counted as one annulus (one year old). The determined ages and growth were applied for combined sexes as there were no obvious differences between males and females during length- weight relationships and conditions. So, the following growth parameters and population structurs will be calculated for all population.

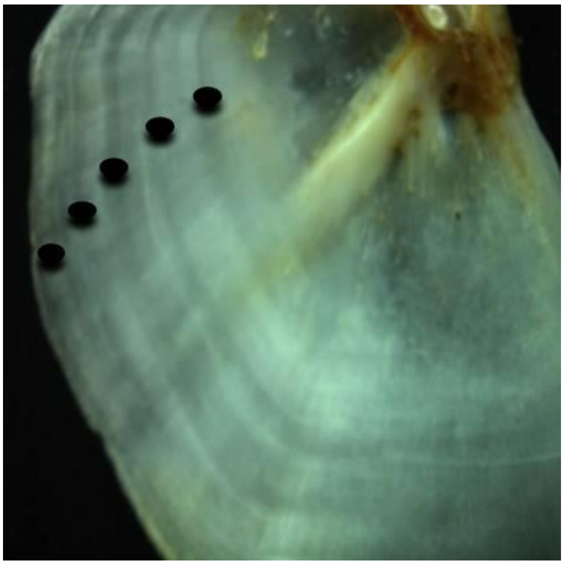

Fig. 3. Operculum of *M. kannume* (45 cm TL; 5 years old) from Lake Nasser, Egypt.

The theoretical growth of *M. kannume* was described using the **von Bertalanffy (1938)** growth model. The length-at-age data of *M. kannume* from opercula reading was fitted by using non-linear least-squares conducted through FiSAT II software **(Gayanillo *et al.,* 1993)**. To estimate the von Bertalanffy growth parameters (L_∞, K, and t_o), the von Bertalanffy equation: $\mathbf{L_t = L_\infty [1 - e^{-K(t - t_o)}]}$ was considered where L_t is the length at age t, L_∞ is the asymptotic length of fish, K is the growth coefficient, and t_o is the age at which the length is theoretically zero.

The growth performance index was computed to compare the von Bertalanffy growth according to the formula of **Pauly and Munro (1984)** as follows: $\boldsymbol{\phi = \log K + 2\log L_\infty}$. The longevity of age ($t_{max}$) was estimated using **Pauly**'s equation **(1980)** as: $\mathbf{t_{max} = 3/K + t_o}$, where k is the growth coefficient in the von Bertalanffy growth equation. The simple calculations such as means and standard deviations were applied by Microsoft excel programme, and SPSS at level of significance (=0.05). While other fisheries sttistics and outputs were applied by using fisheries programme as FiSAT II as mentioned above.

RESULTS

1. *Length-weight relationship and Condition factor.*

The investigated specimens were ranged from 15.3-77.5 cm in total length (TL), and from 25.2 to 2882.5 g as total weight (g). The length- weight relationships for males, females and combined sexes of *M. kannume* were estimated as the following equations: $W = 0.0078TL^{2.9531}$ (n= 292, r^2= 0.9374), $W = 0.0079TL^{2.9553}$ (n= 345, r^2= 0.9527) and $W = 0.0081TL^{2.9453}$ (n= 645, r^2= 0.9565), respectively **(Table 1** and **Fig. 4)**. The results showed that, the exponent "b" of the length- weight relationship ranged between 2.9453 and 2.9583. The correlation of determination (r^2) values ranged between 0.9374 and 0.9565. The values of exponent "b" of the length weight relationship for males, females and C. sexes of *M. kannume* are less than the hypothetical value (H_0=3) and indicate a negative allometric mode of growth **(Table 1)**.From the table, it was noticed that the exponent "b" for males (2.953) and females (2.955) were very closed.

Table 1. Length-weight relationship of *M. kannume* during (2017-2018), Lake Nasser, Egypt.

Sex	n	TL (cm)			Total weight (g)			a	b	r^2
		Min	Max	Mean ± SD	Min	Max	Mean ± SD			
Males	292	24.0	77.5	37.6±6.4	86.7	2882.5	386.2±270.6	0.0078	2.9531	0.9374
Females	345	24.0	75.0	35.7±6.9	80.7	2717.8	345.8±283.2	0.0177	2.9553	0.9527
Unsexed	5	15.3	22.3	17.8±2.1	25.2	76.3	40.5±15.8	-	-	-
C. sexes	645	15.3	77.5	36.3±7.0	25.2	2882.5	360.3±278.6	0.0081	2.9453	0.9565

SD: standard deviation, n: number of fish, a: intercept; b: slope, r^2: correlation coefficient.

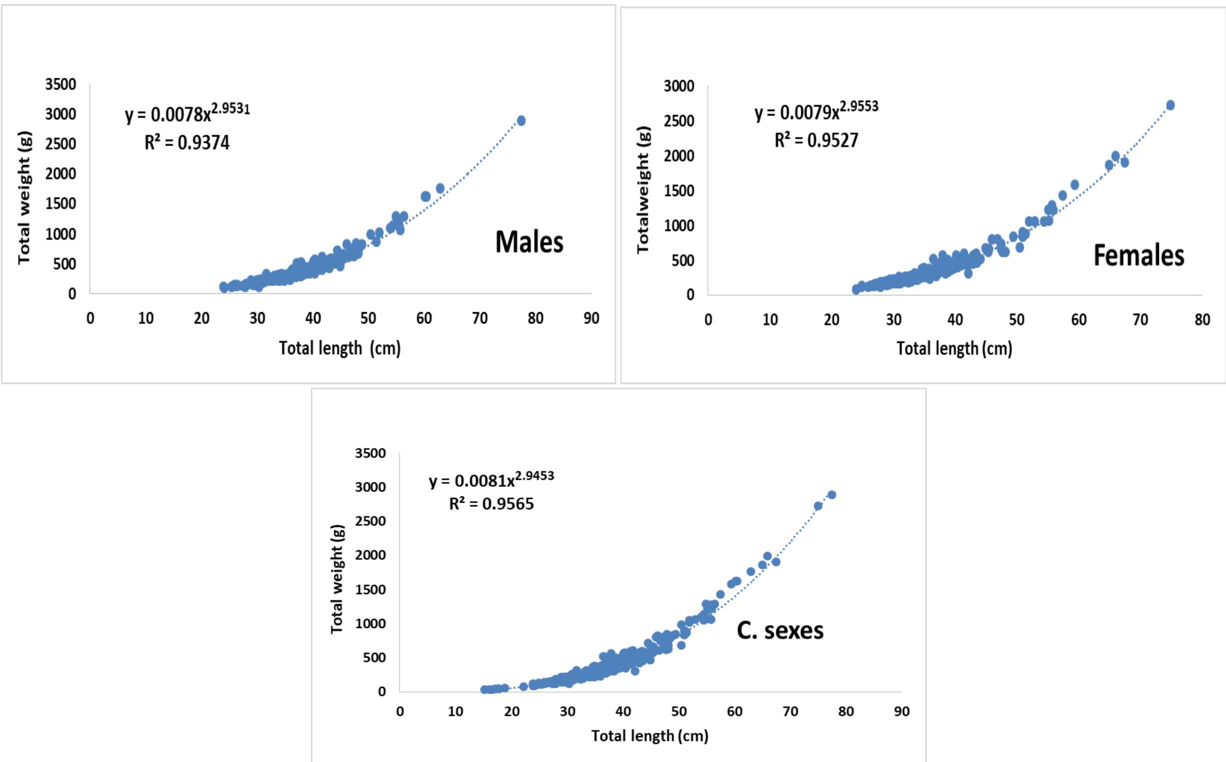

Fig. 4. Length-weight relationship for males, females and C. sexes of *M. kannume* during (2017-2018) from Lake Nasser, Egypt.

The monthly cycle in absolute condition factor (Kc) is represented in Fig. (5). It shows higher value during February (0.74±0.06) for males and during April (0.72±0.06), May (0.72±0.09) and July (0.72±0.06) for females. For C. sexes, the highest value was recorded during February (0.72±0.06). On the opposite trende, the lower Kc values were found to be during August for males, females and C. sexes, recoded the values (0.61±0.06, 0.62±0.06, 0.62±0.06) respectively. In general, the conditions were located under "1" along the year for males, femals and C. sexes, where the highest value doesnot exceeds 0.74±0.06. The annual average of absolute conditions were 0.68±0.072, 0.69±0.70 and 0.68±0.075 for males, females and C. sexes respectively.

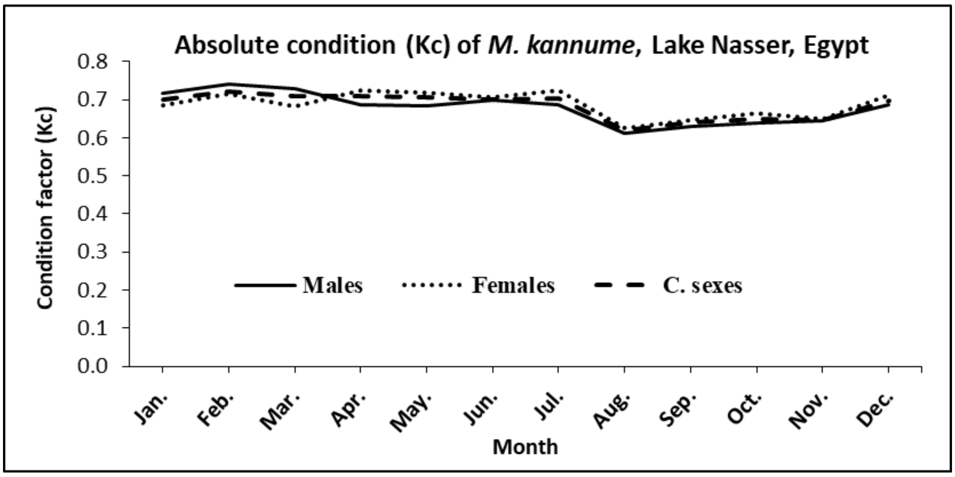

Fig. 5. Monthly variations in absolute condition factor (Kc) for males, females and C. sexes of *M. kannume* during (2017-2018) from Lake Nasser, Egypt.

2. *Age determination*

According to 645 opercula of *M. kannume,* the maximum life span was calculated as ten years with mean lengths of 17.3, 26.64, 35.11, 42.98, 49.56, 55.91, 61.5, 65.82, 69.66 and 72.54 cm for the age groups from one to ten, respectively. The determined age and growth were applied for combined sexes as there were no obvious differences between males and females during length- weight relationships and conditions. Mean lengths and increment for each age group of *M. kannume* was represented in **Table (2)**. The growth in length and annual increment were represented in **Fig. (6**).

Table 2. Mean lengths and increment at each age group of *M. kannume* during (2017-2018) from Lake Nasser, Egypt estimated by operculum reading.

Age group	No. of Fish	Length range		Average Length	±SD	Increment
		Min.	Max.			
I	8	15.3	22.3	17.3	1.29	17.3
II	30	21.7	28.5	26.64	3.33	9.34
III	508	29.4	41.9	35.11	0.77	8.47
IV	34	42	45	42.98	3.23	7.87
V	45	43.6	55.2	49.56	0.78	6.58
VI	6	55.3	57.5	55.91	1.83	6.35
VII	4	56.5	60.5	61.5	1.89	5.59
VIII	4	63	67.5	65.82	0.78	4.32
IX	2	69.1	70.2	69.66	3.14	3.84
X	4	70.4	77.5	72.54	3.14	2.88

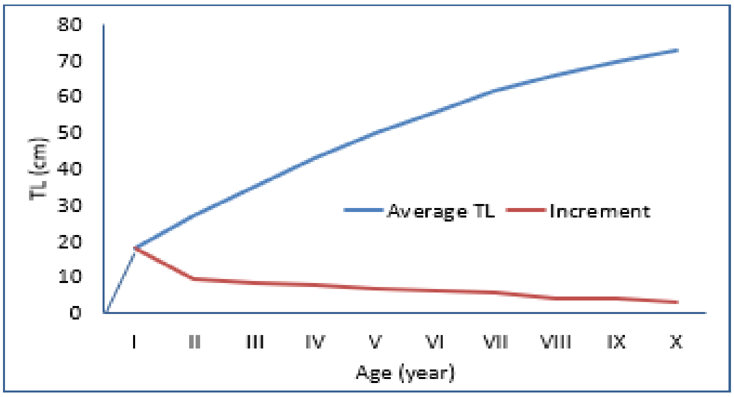

Fig. 6. Growth in lengths and annual increment of *M. kannume* during (2017-2018) from Lake Nasser, Egypt based on operculum reading.

3. Growth parameters.

The growth parameters of von Bertalanffy were fitted to length-at-age data using non-linear least-squares, which revealed that L_∞= 89.91 cm (SE = 5.046 and C.V. = 0.0561), K= 0.16 $year^{-1}$ (SE = 0.0186 and C.V. = 0.1142) and t_o= -0.19 year. The von Bertalanffy equation was rewritten as: $L_t = 89.91[1 - e^{-0.16(t + 0.19)}]$. The growth curve was represented in **Fig. (7)**. Length-weight relationship equations were applied to calculate the expected maximum growth in weight (W_∞**)** which estimated as 4622.2 g. The von Bertalanffy equation representing these growth parameters was: W_t= 4622.2 $[1\text{-}e^{-0.16(t+0.19s)}]^{2.9453}$. The growth performance (ϕ) was 3.22 and potential longevity (t_{max}) was 18.56 years.

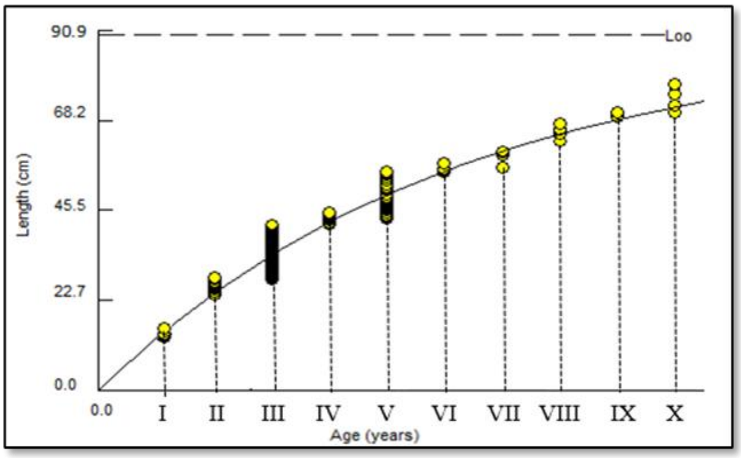

Fig. 7. Growth curve estimated from length-at-age data of *M. kannume* during (2017-2018) from Lake Nasser, Egypt.

DISCUSSION

The present study introduces an required scientific addition on the negliged species in the important lake in Egypt. The elephantfish in lake Nasser was studied via some aspects that needed for management and conservation as the current goals of all countries for biodiversity and sustanaible developments. The length–weight relationship in fish is affected by many factors such as season, habitat, maturity, sex, diet and annual variations in environmental conditions **(Hossain *et al.*, 2013; Karuppiah *et al.*, 2021)**. Fish can attain either isometric or allometric growth **(Gayanilo and Pauly 1997; Sarkar *et al.*, 2013)**. Isometric growth (b= 3) indicates that both length and weight of the fish are increasing at the same rate. Allometric growth can be either positive or negative. Positive allometric (b>3) implies that the fish becomes stouter or heavier its length increases, while at the negative allometric (b<3), the fish becomes slender or lighter as its length increases (**Gayanilo and Pauly 1997; Zafar *et al.*, 2003; Ogunola *et al.*, 2018; Famoofo and Abdul 2020)**.

In the present study, the analysis of length- weight relationships for males, females and C. sexes of *M. kannume* ranged between 2.945 and 2.955 and are significantly (p<0.05) less than the hypothetical value (H0=3) and indicate a negative allometric mode of growth. This observation agrees with that reported previously by **Soliman (1994)** for the same population of *M. kannume*, from Nile at Sohag, Egypt; while it differed those reported from Bahr Shebeen Nilotic Canal **(Khallaf and Authman, 2010)**, Damietta branch, Egypt **(Ragheb, 2016)** and Upper Victoria Nile **(Bassa *et al.*, 2018)**. The present finding also agrees with the negative allometric growth (used standard length) reported by **El-Etreby (1985)** in Lake Nasser, Egypt; **Aly (1993)** in High Dam reservoir, Egypt and **Ahmed (2007)** in Nile at Assiut, Egypt **(Table, 3)**. These variations in the growth pattern of *M. kannume* between the present results in Lake Nasser and other different regions of the Nile are possibly due to several factors, including seasonal influences, habitat type, sex, gonad development, health, preservation procedures, food availability, and the varying ranges of observed lengths of captured specimens **(Bagenal & Tesch 1978; Froese, 2006** and **Soykan *et al.*, 2020)**. Others have stated that the exponent "b" of the length–total weight relationship was influenced by gear selectivity and craft operation; fishing location, seasonality of fishery, sex, maturity stages and feeding habitat **(Kipling, 1962; Matos *et al.*, 2019; Kannan *et al.*, 2021)**.

In fisheries science, the condition factor is used to compare the fatness or wellbeing of fish **(Ahmed *et al.*, 2012; Famoofo and Abdul, 2020)**. The condition factor of 1.0 or greater indicates the good condition of fish while less than 1.0 shows bad condition **(Abobi, 2015; Ogunola *et al.*, 2018).** In the present study, the highest values were recorded during February for males and during April, May and July for females which are the months of spawning where the most population possesses ripe testes and ovaries. It is worthy that, the condition factors of *M. kannume* from lake Nasser were generally less than “1.0” and lower than those reported by different authors (Table 3), this may indicates the the unusuall condition expected for species from such good quality lake in comparing with other poor ares bad condition of fish, this result agrees with **Khallaf and Authman (2010)** in Bahr Shebeen Nilotic Canal. The condition of *M. kannume* from the River Nile at Sohag, Egypt **(Soliman, 1994)**, in High Dam reservoir **(Aly, 1993)** and in Nile at Assiut, Egypt **(Ahmed, 2007)** is better than the condition of *M. kannume* in Lake Nasser in the present study. These differences in conditions from different regions might be attributed to influencing by season, sex, food organism consumed by fish, age of fish, amount of fat reserved **(Bagenal and Tesch 1978; Anene, 2005; Edah *et al.*, 2010; Muchlisin *et al.*, 2017; Jisr *et al.*, 2018).** Moreover, the decrease in conditions may due to use of total wight instead of gutted weight to avoid any bias due to ripe gonads weight and food intensity as supported by **Farrag (2010)**

The life span of *M. kannume* from Lake Nasser was determined by opercula and reached to 10 years at 72.54 cm TL, with mean lengths of 17.3, 26.64, 35.11, 42.98, 49.56, 55.91, 61.5, 65.82, 69.66 and 72.54 cm for the age groups from one to ten, respectively. The rapid growth in the first year of life was reported, then the rate of growth slows down. The maximum recorded age was different from different locations (Table 3), it reached 10 years at 71.50 cm SL from Lake Nasser **(El-Etreby, 1985)**, 8 years at 45.95 cm SL from Bahr Shebeen Nilotic Canal, Egypt **(Khallaf and Authman, 2010)**, 7 years at 61.99 cm SL from the High Dam reservoir **(Aly, 1993)**, 6 years at 41.99 cm SL in the Nile at Assiut **(Ahmed, 2007)**, 5 years at 36.45 cm SL in Damietta branch of Nile **(Ragheb, 2016)** and 10 years at 72.54 cm TL in the present study from the Lake Nasser, Egypt . The table illustrated that the present study from lake Nasser and that by El-Etreby (1985) gave the higher life span than those reported in othe areas.This might due to the higher length range used for samples from lake Nasser. However, the higher length range combined with higher life span indicated that lake Nasser is still in good status at least for present species which usually not included as targets for several fishermen.

Table 3. Lif span of *M. kannume* per year from different regions using different methods (V=5; X=10; VI=6; VII=7; VIII=8)

Author	Location	a	b	r2	Kc	Length range (cm)	Age (year)	Methods
El-Etreby (1985)	Lake Nasser, Egypt	0.037	2.655	----	---	19.88-76	X	------
Aly (1993)	High Dam reservoir, Egypt	0.013	2.938	0.992	1.07	15.8-64.07	VII	-----
Soliman (1994)	Nile at Sohag, Egypt	0.012	2.934	0.998	0.97	--------	----	-----
Ahmed (2007)	Nile at Assiut, Egypt	0.020	2.802	0.960	0.99	18 - 48 (SL)	VI	Vertebrae
Khallaf and Authman (2010)	Bahr Shebeen Nilotic Canal	0.0070	3.033	0.998	0.70	15-57	VIII (♂) VII (♀)	Vertebrae
Khallaf and Authman (2012)	Nile Delta Canal, Egypt.	----	-----			29-53	VII	Vertebrae
Mekkawy and Hassan (2012)	Nile, Egypt	----	-----			16-47	VI	Vertebrae
Ragheb (2016)	Damietta branch of Nile, Egypt	0.0060	3.063	0.997	0.76	14-43	V	Vertebrae
Bassa *et al*. (2018)	Upper Victoria Nile	0.0001	3.000	0.938	1.06	------	---	-----
Present study	Lake Nasser, Egypt	0.0078 0.0079 0.0081	2.9531 2.9553 2.9453	0.9374 0.9527 0.9565	0.68 (♂) 0.69 (♀) 0.68 (C.sex)	15.3-77.5	X	Operculum

The von Bertalanffy growth parameters were estimated and compared with those of other authors from different localities **(Table 4)**. The present growth parameter (L∞) of *M.*

kannume was estimated as 89.91 cm which is greater than that obtained by **Ahmed (2007)** in Nile at Assiut, Egypt ($L\infty$ = 67.94 cm), **Khallaf and Authman (2010)** in Bahr Shebeen Nilotic Canal ($L\infty$= 77.91 cm), **Ragheb (2016)** in Damietta branch of Nile Egypt ($L\infty$= 80.65 cm) and **Bassa *et al.* (2018)** in Upper Victoria Nile ($L\infty$= 73.50 cm) but it was less than those reported by **El-Etreby (1985)** from Lake Nasser, Egypt ($L\infty$= 156.26 cm) and **Aly (1993)** from High Dam reservoir, Egypt ($L\infty$ = 96.10 cm).

The present growth coefficient (K) was 0.16 which is higher than those reported for the same fish in Lake Nasser, Egypt **(El-Etreby, 1985)**, High Dam reservoir, Egypt **(Aly, 1993)**, Nile at Assiut, Egypt **(Ahmed, 2007)**, Bahr Shebeen Nilotic Canal **(Khallaf and Authman 2010)**, Damietta branch of Nile, Egypt **(Ragheb, 2016)** and Upper Victoria Nile **(Bassa *et al.*, 2018)** indicating that the growth rate of *M. kannume* in Lake Nasser (present study) is faster than that *M. kannume* in above mentioned regions. This was attributed to that, the Lake Nasser has good water quality and relative nutrient abundance, providing good conditions for its fishes **(El Far *et al.*, 2018** and **Abdellatif *et al.*, 2021)**. The fluctuation in growth parameters for *M. kannume* from different areas, and even from the same area, were observed in other fishes and that can be due to food composition and availability and environmental conditions, especially prevailing temperatures **(Bruton, 1990)**, or may attributed to difference in length range, the method used to evaluate asympotitic length, number of specimens and growth in length in relation to specifity to age groups which play a role in growth parameters investigation **(Farrg *et al.*, 2015).**

Table 4. Growth parameters, maximum age, length- weight relationship and condition factor of *M. kannume* in different regions.

Author	Location	K	L_∞	t_0	t_{max}	W_∞	Ø
El-Etreby (1985)	Lake Nasser, Egypt	0.061	156.26	-1.137	48.04	24927	3.17
Aly (1993)	High Dam reservoir, Egypt	0.147	96.10	0.029	20.44	8482	3.130
Soliman (1994)	Nile at Sohag, Egypt	----	-----	----	----	-----	-----
Ahmed (2007)	Nile at Assiut, Egypt	0.148	67.94	-0.836	19.43	2683	2.830
Khallaf and Authman (2010)	Bahr Shebeen Nilotic Canal	0.129	77.91	-0.909	22.35	6050	2.80
Ragheb (2016)	Damietta branch of Nile, Egypt	0.141	80.65	-0.271	21.01	4151	2.96
Bassa *et al.* (2018)	Upper Victoria Nile	0.140	73.50	-0.026	21.40	4200	2.88
Present study	Lake Nasser, Egypt	0.160	89.91	-0.190	18.56	4622.2	3.11

Growth performance indices used to compare the fish species from different localities and/or other species in the same area **(Pauly and Munro, 1984)**. By comparing the present results with those in previous studies **(Table 4)**, it was concluded that the Lake Nasser fishing ground showed the better growth performance for *M. kannume* growth than those reported by **Ahmed (2007)** from the River Nile at Assiut, **Khallaf and Authman, (2010)** fromBahr Shebeen Nilotic Canal, **Ragheb, (2016)** from Damietta branch of Nile, Egypt and from Upper

Victoria Nile **(Bassa *et al.*, 2018).** This criterion may be confirmed by the presence of present Longevity (t max) as smaller than those obtained by above montioned authors for the same species from other areas**.** However, it was slightly lower than those reported previously from Lake Nasser, Egypt **(El-Etreby, 1985)** and High Dam reservoir, Egypt **(Aly, 1993)**, this decrease is not obvious but recommends the need to continous monitoring. Generally, it indicated that the lake Nasser and extended closed regions still have good growth performance better than other areas.

CONCLUSION

Inspite of the presence of negative allometric growth combined with lower value of conditions than “1” which may affected by food and spawning, the others such as aging, growth performance and age longivity have reflected satisfied growth pattern of *M. kannume* from Lake Nasser, Egypt and are valuable for creating a monitoring and management system for this species in Lake Nasser recommending its conservation with require to more studies.

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