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GROWTH, MORTALITY AND YIELD PER RECRUIT OF THE SHRIMP SCAD (*Alepes djedaba*) FROM MEDITERRANEAN COAST OF SINAI EGYPT

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Abstract

Growth, mortality and yield per recruit of the shrimp scad (*Alepes djedaba*)) from Mediterranean coast of Sinai Egypt. 780 specimens (11.1 to 25.3 cm total Length and 15.3 to 172.2 g total weight), were collected from January to December, 2016 (one fishing season). The relationship between length and weight was W= 0.0064*L $^{\mathbf{3.134}}$. The Age groups were 0 to 5 years. Growths in length and weight at the end of each year were calculated as11.87, 15.94, 18.40, 20.40 and 22.37 cm for the 1, II, III, IV, and V year of life respectively and the growth in weight were 14.9 ,37.6 ,58.9 ,81.4 and 108.6 g for the 1, II, III, IV, and V year of life respectively. The growth parameters of von Bertalanffy equation were calculated as ($L\infty$= 26.94 cm, K = 0.2946 year-1 and t0 = -1.0408 year). Growth performance index (φ' = 2.33). Mortality rates were 0.91957 yr−1, 0.43654 yr−1and 0.48303 yr−1 for total, natural and fishing mortality respectively. The currently exploitation rate E = 0.53. The length at first capture (Lc) as 17.0cm, (2.34 year)). The results of age at first capture and the current exploitation rate indicated that the small fish are caught at higher fishing effort level. Since these fish represent a percentage of the total catch in the Mediterranean Sea coast of Sinai and low price of this fish to some extent is an alternative to fish such as sea bream and sea bass, which are very high prices and also there is no previous studies on these fish,

So you should do the following studies on this type of fish to know in the Spawning season and the length at first maturity of these fish and distribution and feed habitat so that fish can be managed catch and work to increase the production of these fish while preserving the stock of fish

INTRODUCTION

The shrimp scad (*Alepes djedaba*) fish is one of the important fish that comes out of the Mediterranean coast of Sinai. It is ranked third in production after sardines and crabs. In 2016, production reached 64.4 tons (4.3%) of total catch in Sinai Coast(source region of fisheries El Arish North Sinai Egypt). The production of the shrimp scad fish (*Alepes djedaba*) in North Sinai was 5 tons in 1989 and increased to 44 tons in 1991, 57 tons in 1996, 105 tons in 1997 and 114 tons in 2004, then production decreased to 64 tons 2016 (GAFRD, 2017).

The shrimp scad (*Alepes djedaba*) is one of five species of fish in the scad genus Alepes, which itself is one of thirty genera in the jack family Carangidae. The Carangidae are Perciform fishes in the suborder Percoidei Zhu *et al.,* 2007.

The shrimp scad (*Alepes djedaba*) is distributed throughout the Indo-Pacific region from South Africa in the west, along the coasts of East Africa, India, Asia, Indonesia, northern Australia, Japan (Iwatsuki and Kimura, 1996) and extending as far east as Hawaii (Carpenter and Volker, 2001). They are also one of the species involved in the Lessepsian migration through the Suez Canal and inhabit the east coast of the Mediterranean Sea around Palestine, Lebanon and Egypt (Taskavak and Bilecenoglu, 2001)and Sea of Marmara (Artüz and Kubanç, 2014). El –Sayed, 2005 found that, length and weight relationship in Shrimp scad, *Alepes djedaba* from Abu Qir Bay was given by an equation log W = -1.9248+ 2.9762 log L (r^2 = 0.9967) for all individuals or W= 0.01189L ^{9762} (r^2 = 0.9967) .

Siwat *et al.,* 2016 recorded that, the length and weight relationship from Semarang waters, Indonesia was computed as Log W = -1.565 + 2.939 * Log SL (r2 = 0.961) for length-weight relationships the value of ‘b’ for *A. djedaba* was 2.939.

Medhat *et al.*, 2014 pointed that shrimp scad, *A. djedaba* lengths ranging from 16.5 cm to 32.4 cm collected from Arabian Gulf off Dammam, Saudi Arabia by longlines.

El –Sayed, 2005 found that, the *Alepes djedaba* grew to 10.38 cm TL in the first year of life, reaching a length of 19.32cm in third year of life. the increment of length was 53.73% in the first year then decreased gradually with age.

Corpuz *et al.*, 1985 found that, the estimated von Bertalanffy growth parameters for *A. djedaba* in Philippine waters were L_∞ = 40 cm, K = 1.2 yr^{-1} and the growth performance index (φ) was 2.54,Reuben *et al.*,1992 in Indian Sea were L_∞ = 32.6 cm, K = 0.61 yr^{-1} and the growth performance index (φ) was 2.81,Medhat *et al.,* 2014 in Arabian Gulf off Dammam, (Saudi Arabia),were L_∞ = 41.71 cm, K = 0.36 yr^{-1} and t_o = - 0.76 yr^{-1} and El –Sayed, 2005 In Abu Qir Bay, Eastern Alexandria, (Egypt),were L_∞ = 33.29 cm, K = 0.2473 yr^{-1} and t_o = - 0.51 yr^{-1}. The growth performance index (φ) was 2.44.

Medhat *et al.,* 2014 estimated that, total mortality coefficient "Z" of *Alepes djedaba* in Arabian Gulf as2.07 $year^{-1}$, but the Natural mortality coefficient "M" which obtained from the mean total length was 0.8$year^{-1}$ and the fishing mortality coefficient "F" was found to be 1.27 $year^{-1}$.Reuben *et al.*,1992 found that in the Indian sea Z was 5.15 year-1. but the Natural mortality from the mean total length was 0.99 $year^{-1}$, and the fishing mortality"F" was found to be 4.16 $year^{-1}$ and El –Sayed, 2005 in Abu Qir Bay, Eastern Alexandria, (Egypt) Z was 1.85 $year^{-1}$, M was found to be 0.62 $year^{-1}$ and the fishing mortality "F" was found to be 1.23 $year^{-1}$.

In Abu Qir Bay, Eastern Alexandria, (Egypt), El –Sayed, 2005 found that, the length at first capture of *Alepes djedaba* ($Lc_{50\%}$ = 13.92 cm) and its corresponding age tc was 1.68 year.

Fig 1. The photo of shrimp scad *Alepes djedaba* in Mediterranean coast of Sinai.

MATERIALS AND METHODS

A total of 870 specimens of the shrimp scad *Alepes djedaba* were collected monthly from Mediterranean coast of Sinai. Total length was measured to the nearest mm and total weight was recorded to the nearest 0.1 g. The relationship between length and weight was described by the potential equation ($W = aL^n$, Ricker, 1975), where W is the total weight (g), and L is the total length (cm), a and b are constants.

Otoliths for 310 samples were removed, cleaned and stored dry in labeled vials. Annual rings on otoliths were counted using an optical system consisting of Nikon Zoom-Stereomicroscope focusing block, Heidenhain's electronic bi-directional read out system VRX 182, under transmitted light. The total radius of the otolith "S" and the distance between the focus of the otolith and the successive annuli were measured to the nearest 0.01 mm. The otolith's measurements from specimens were used to describe the relationship between the total length and the otolith radius. Lengths by age were back-calculated using (Lee's, 1920) equation(Ln=L-a)*Sn/S) + a. The von Bertalanffy models, 1934 and 1949, ($Lt = L\infty (1- e\text{-}k(t – t0)))$ was used to describe growth in size, where Lt is the length at age t, L∞ the asymptotic length, K the body growth coefficient and defines the growth rate towards L∞ and t0 the hypothetical age at which a fish would have zero length. The values of L∞, K and t0 were estimated by plotting Lt vs Lt+1 (Ford, 1933 and Walford, 1946). The growth performance index was calculated by using the phi prime test (φ') = $\log k + 2\log L\infty$ (Munro and Pauly, 1983) which can be used to compare growth rates. Total mortality coefficients were obtained by using methods:_1-Chapman and Robinson (1960): $Z = -\ln S$ and $S = T / (\sum N - 1) + T$ Where T = N1 + 2 N2 + 3 N3 + …..x Nx Notes $\sum N$ = No + N1 + N2 + ………Nx. No is the number of fish in age – group II N1 is the number of fish is age – group III

N2 is the number of fish is age – groupIV Nx is the number of fish in age – group V 2- Beverton and Holt's (1956) Z-equation based on length data $Z=K^*((L\infty-\bar{Lc})/(\bar{Lc}-Lc))$ .Where L_c The length at first capture $L_{\bar{c}}$ Average fish in catches of 50% even bigger fish in the sample. 3-The Powell-Wetherall plot based (Powell (1979), discussed in Wetherall *et al*. (1987)) Z = 1-k. 4-Estimation of Z from A Linearized catch curve based on age composition data (Pauly, 1983). Natural mortality coefficient was estimated by using four methods: 1- Alverson and Carney (1975) $M = 3 * K / [\exp(t_{max} * 0.38 * K) - 1]$, where t_{max} is the age of the oldest fish $T_{max} = 3/k$ 2- Hewitt and Hoenig (2005) expand on the earlier version with a larger data set. The new empirically derived method is the following M=4.22/Tmax.3- Jennings *et al*. 2001 $M=3 / T_{max}$ and 4- Ursin. 1967 M=W′^(-1/3),Fishing mortality F=Z-M. The exploitation rate (E)=F/Z by Gulland, 1971. Length with the highest biomass in an unfished population (L_{opt}), estimated according to Beverton (1992) from the parameters of the von Bertalanffy growth function and natural mortality. $L_{opt} = L\infty \times [3/ (3+M/K)]$ .Estimate of life span (t_{max}) according to Taylor (1958), where it is the approximate maximum age that fish of a given population would reach. $T_{max} = 3/k$. The yield and biomass per recruit (Y/R) was estimated by Gulland (1969) model. $Y/R = F\, e^{-M(tc-tr)}\, W_\infty\, [(1/Z) - (3S/Z + K) + (3S^2/ Z + 2K) - (S^3/ Z + 3K)$.

RESULTS

Length – weight relationship.

The observed total length 870 of The shrimp scad *Alepes djedaba* caught from Mediterranean coast of Sinai from January to December, 2016 ranged from 11.1 to 25.3 cm (fig. 2) and the observed total weight from 15.3 to 148.3 g. The length frequency distribution of *A. djedaba* is given ln figure 2. Fish l. Fish between 14.0 cm and 19.9cm constituted which 84.8%from total catch, followed by the fish larger than 19.9cm 11.4 %. Fish less than 14 cm constituted 3.8% of the total catch.

The length – weight relationship (fig.3) was described by the power equation as: W= 0.0064 L $^{\mathbf{3.134}}$ (r2 = 0.8567).

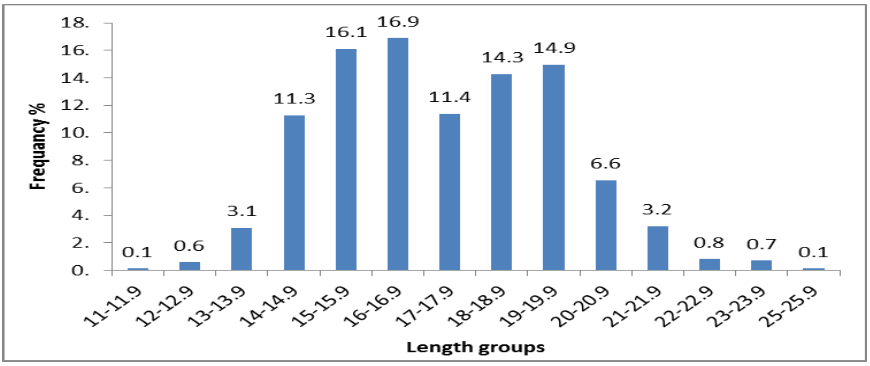

Fig.2. Length frequency distribution of *Alepes djedaba* in Mediterranean coast of Sinai during season 2016.

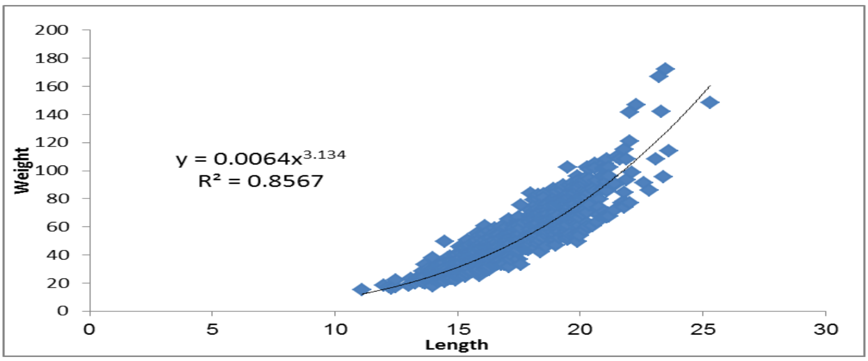

Fig.3. Length weight relationship for *Alepes djedaba* in Mediterranean coast of Sinai during season 2016.

Back – calculation lengths and weight.

The following formula was derived to obtain the back-calculated total length at the end of each year of life: (Ln=L-a)*Sn/S} + a

Ln = (L – 7.5636) Sn / S + 7.5636

Where: Ln is the length at the end of nth year, Sn is the radius of the scale to nth annulus, S is the total radius of the scale, and L is the total length at capture.

The average back – calculation lengths and annual increment of The shrimp scad *Alepes djedaba* (fig. 5) are 11.87, 15.94, 18.4, 20.4 and 22.37 cm for age 1, 2, 3, 4 and 5 years respectively. The highest annual increment occurred during the first year of life, while a noticeable decrease is observed in the second year, reaching its minimal value during the sixth year of life (Fig. 4). Back–calculation weights at the end of each year of life for The shrimp scad *Alepes djedaba* were estimated by applying the length – weight relationship and the results are 14.9,37.6,58.9,81.4 and 108.6 g for age 1, 2, 3, 4 and 5 years respectively and the annual increment of weight given in Fig. (5).

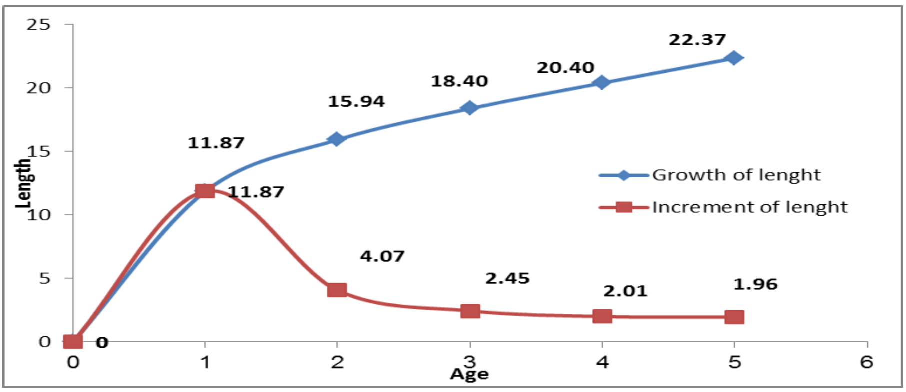

Fig. 4. Back calculation length (TL,cm) at the end of life different years of *Alepes djedaba* in Mediterranean coast of Sinai during season 2016.

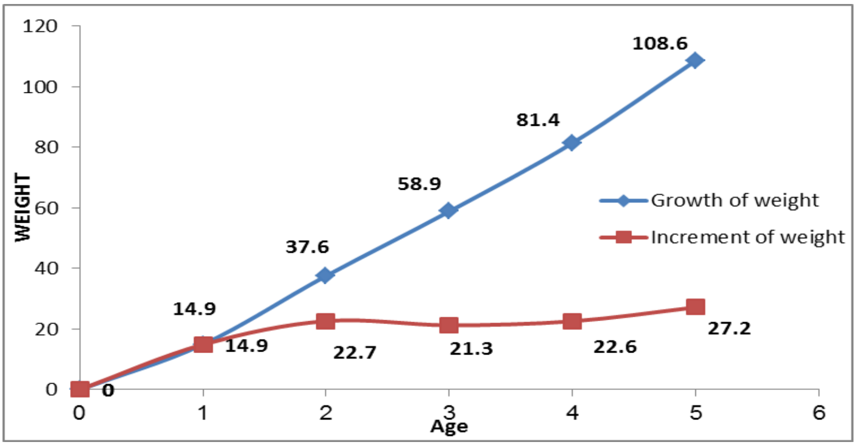

Fig. 5. Back calculation weight (Tw,gm) at the end of life different years of *Alepes djedaba* in Mediterranean coast of Sinai during season 2016.

Growth parameters.

The back-calculated length and according to Ford wel Ford 1933 and the von Bertalanffy growth parameters L∞, K, W∞ and to were estimated 26.94,0.2946,194.51 and – 1.0408 respectively the equations obtained were as follows:

For length $Lt = 26.94(1 - e^{-0.2946\,(t+1.0408)})$

For weight $Wt = 194.51\,(1 - e^{-0.2946\,(t + 1.0408)})^{3.134}$

Growth performance index (Φ).

The growth performance index (Φ and Φ') as defined by were computed for *Alepes djedaba* in Mediterranean coast of Sinai during season 2016 and found to be 2.33 for length and 0.995 for weight

Estimation of L_{opt} , T_{max} and Lc.

Maximum length with the highest biomass of *Alepes djedaba* in Mediterranean coast of Sinai L_{opt} was 18.03 cm, maximum age T_{max} was 10.2 years and length at first capture (Lc) was estimated by the analysis of catch carve by Pauly1984) (Lc= 17.0 cm) (fig 6).

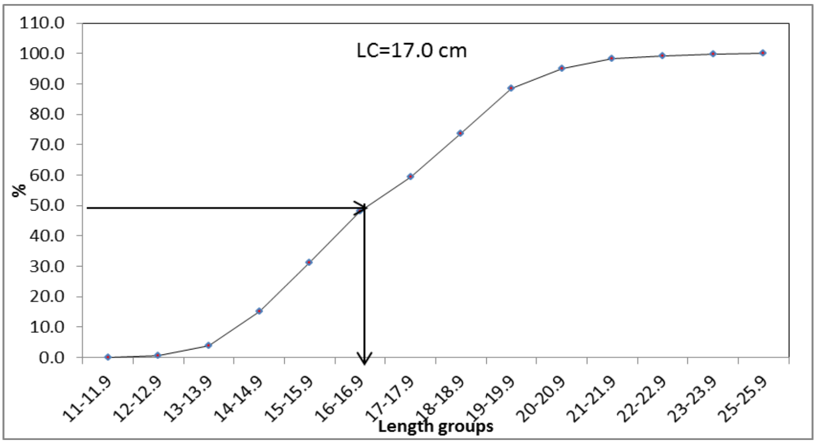

Fig. 6. Length at first capture Lc of *Alepes djedaba* in Mediterranean coast of Sinai during season 2016.

Age composition.

The age distribution of sample ranged from age 0 to v years for *Alepes djedaba* based results of the otolith reading (Figure 7) the age group П was dominant (42.5%) followed by groups Ш (29.2%), IV (14.3%), 0 I (9.3%), 0 (2.7%) and V(2%) respectively (Fig. 7).

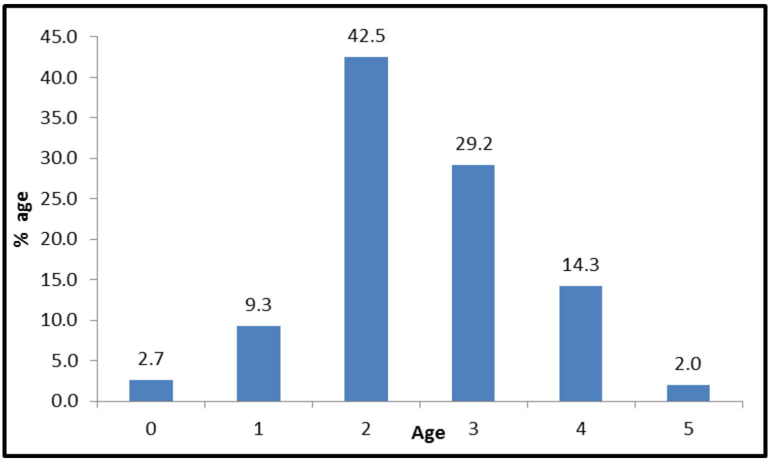

Fig. 7. Age composition distribution *of Alepes djedaba* in Mediterranean coast of Sinai during season 2016.

Mortalities and exploitation rate.

Total mortality Z, natural mortality M, fishing mortality F and Exploitation rate (E) for shrimp scad *Alepes djedaba* were estimated as 0.91957, 0.43654, 0.48303 and 0.52528, respectively.

Yield per recruit (Y/R) and biomass per recruit (B/R).

The yield per recruit (Y/R) and biomass per recruit (B/R) of shrimp scad *Alepes* djedaba in Mediterranean coast of Sinai were found to be 19.5 gm and 24.5gm respectively at the actual fishing mortality 0.48303 and 5.25 respectively . Biomass per recruit was decreased with the increasing of fishing mortality where it maximum Biomass per recruit (108.2 g) at F=0 (Fig.8).

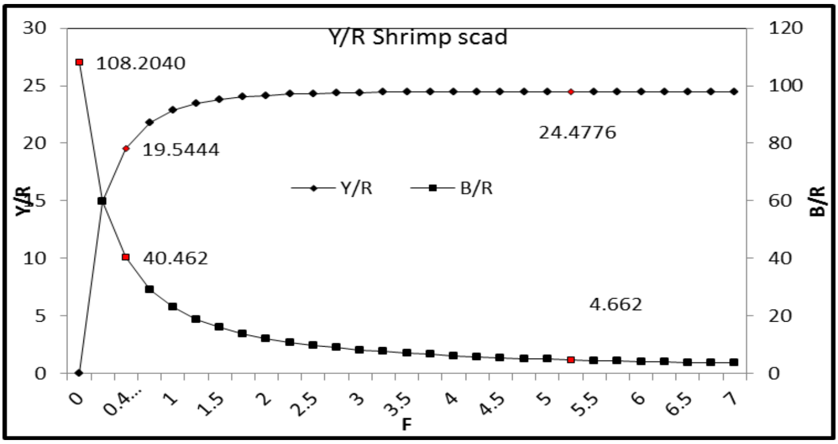

Fig. 8. Yield per recruit and biomass per recruit of *Alepes djedaba* in Mediterranean coast of Sinai during season 2016.

The effect of different values of "tc" in (Y/R) with different values of "F.

The higher values of yield per recruit of *Alepes djedaba* were (21.022 , 21.798 , 23.044 , 24.478 and 23.682) were with Tc = 1,1.5, 2,2.3, and 2.5 can be obtained at fishing mortality 0.75,1.25,2.25,5.25 and 6.75 respectively in Table (1) and fig. (9).

Table 1. The relationship between yield per recruit and fishing mortality *Alepes djedaba* in Mediterranean coast of Sinai with different values of age at first capture Tc..

F	TC=1	TC=1.5	TC=2	TC=2.3471	TC=2.5
0.25	16.653	15.911	15.254	14.906	14.223
0.48	20.146	19.877	19.619	19.544	18.701
0.75	21.022	21.324	21.568	21.827	20.933
1.00	20.996	21.724	22.353	22.867	21.965
1.25	20.740	21.798	22.728	23.446	22.548
1.50	20.429	21.743	22.913	23.793	22.903
1.75	20.123	21.639	23.000	24.011	23.131
2.00	19.840	21.520	23.036	24.155	23.284
2.25	19.586	21.399	23.044	24.252	23.390
2.50	19.360	21.283	23.036	24.319	23.465
2.75	19.159	21.175	23.020	24.367	23.520
3.00	18.981	21.075	22.998	24.400	23.560
3.25	18.821	20.984	22.974	24.425	23.590
3.50	18.678	20.900	22.949	24.442	23.613
3.75	18.550	20.823	22.925	24.454	23.631
4.00	18.434	20.752	22.900	24.463	23.644
4.25	18.329	20.687	22.877	24.469	23.654
4.50	18.233	20.627	22.854	24.473	23.662
4.75	18.146	20.572	22.832	24.476	23.668
5.00	18.066	20.521	22.812	24.477	23.672
5.25	17.992	20.474	22.792	24.478	23.676
5.50	17.924	20.430	22.774	24.477	23.678
5.75	17.861	20.390	22.756	24.477	23.680
6.00	17.803	20.352	22.739	24.475	23.681
6.25	17.749	20.316	22.723	24.474	23.682
6.50	17.699	20.283	22.708	24.472	23.682
6.75	17.652	20.252	22.694	24.470	23.682
7.00	17.608	20.222	22.680	24.468	23.682

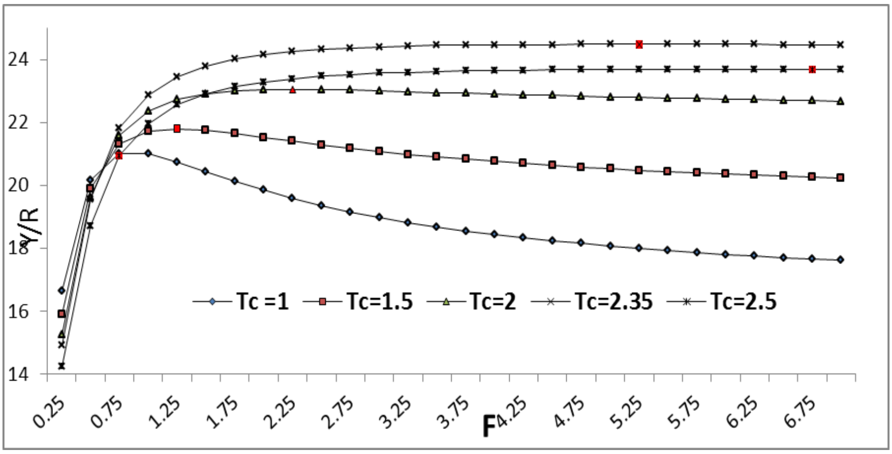

Fig. 9. Yield per recruit with different values of (F and tc) of Alepes djedaba in Mediterranean coast of Sinai during season 2016.

DISCUSSION

Length–weight relationships are important for comparative growth studies Moutopoulos and Stergiou, 2002. Length–weight relationships are also important for (1) calculating the weight of a given individual fish of known length or total weight of fish from length-frequency distribution; (2) estimating age structure, weight growth rate and several other aspects of fish population dynamics; (3) converting growth-in-length equations to growth-in-weight equations for use in stock assessment models; (4) estimating indices of condition of fish in a given geographical area; (5) making between region comparisons of life histories and morphology of certain species Kohler *et al*., 1995; Stergiou and Moutopoulos, 2001.

In present study the length – weight relationship was described by the power equation as W = 0.0064L 3.134 (positive allometric (b>3). In present study value b equal 3.134 this results agreement with Reuben *et al.*, 1992 in Indian sea (b=3.147) and Nasir and Zarrien, 2011 at the Karachi Fish (b=3.084) but the results in the present study were greater than results of many Authors in different regions of the world in Table (2).

Table 2. Summarized the values of (b) for *Alepes djedaba* in various regions.

Authors	The regions	The value of b
Schoeder 1982	Honda bay Philippine	2.67
Kulbiki et al 1993	New Caledonia Lagoon	2.761
Taskavak et al 2001	Estern Mediterranean	2.816
El Sayed,2005	Abu Qir Bay	2.9762
Jaliadi et al 2017	In Aceh Barat Waters	2.8953
Siwat et al 2016	Semarang waters, Indonesia	2.939

The length-w-eight relationship for fish is curvilinear with the length exponent (regression coeffiicient) ranging between 2.5 and 4.0 (Lagler *et al.*, 1977). Bangenal and Tesch (1968) reported that growth is isometric when the length exponent is less than or equal to 3 and allometric when length exponent is greater than 3. Actually, when the b = 3 the relationship is isometric, positive allometric (b>3) or negative allometric (b<3) (Spiegel, 1991). The relationship between body length and weight can be change with many condition factors as season, sex, food, maturity stage and techniques of sampling (Le Cren, 1951).

In the present study, the back-calculated length at the end of life year was calculated by using Lea's formula (1920). The highest annual increment was occurred during the first year of life, while a noticeable decrease is observed in the second year, reaching its minimal value during the fifth year of life,this results agree with El Sayed (2005) in Abu Qir Bay eastern Alexandria Egypt and with Many Authors in different areas . in the present study the increment of length in the first year was 53.06% then decreased gradually with age this results agreement with El Sayed (2005) the increment of *Alepes djedaba*) in Abu Qir Bay eastern Alexandria Egypt of length in the first year was 53.73%. in the present study five age groups were identified, II age group dominated the catch (42.5%), followed by III age group (29.2%), IV age group (14.3%), I age group (9.3%) , 0 age group (2.7%) and V age group (2%).

In present study the Growth parameters were $L\infty$ = 26.94cm, $W\infty$ = 194.51g, K = 0.2946, T0 = -1.0408 this results were lower than for the another regions Table (3).

Table 3. Growth parameters of grey mullet *Alepes djedaba* in different places of the world.

country	L∞	K1/y	to	W∞	source
Philippine waters	40	1.2			Corpuz *et al.*, 1985
Indian sea	32.6	.61			Reuben et al 1992
Abu Qir Bay	33.29	0.2473	-0.51	403.11	El Sayed,2005
Arabian Gulf	41.71	0.36	-0.76		Medhat *et al.*, 2014
Coast of Sinai	26.94	0.2946	-1.0408	194.51	Present study

The growth performance index (φ′) for *Alepes djedaba* was about 2.33. Growth performance index (φ′) is slightly lower comparing with the φ′ values obtained were consistent with (Corpuz *et al.*, 1985) in Philippine waters (φ′=2.54)and Reuben et al 1992 in Indian sea (φ′=2.81) and El Sayed 2005 for the same species in Abu Qir Bay(φ′=2.44). The growth performance index (φ) emerges as an alternative as it has suitable dimensions of cm per year although put on logarithmic base (Munro and Pauly, 1983; Pauly and Munro, 1984). The discovery by Pauly, 1979 that the relation between Log K and Log L∞ is 2 (or 2/3 when W∞ is used instead of L∞) constantly across fish species, turns out to be a consequences of the so called, Beverton and Holt dimensionless life-history inversion Beverton and Holt, 1956; Beverton, 1992; Charnov, 1993, which allows the comparison of growth performance index as represented by Munro and Pauly, 1983) of stocks of the same or different species, be they closely allied species or not. It also represents a potential check for the accuracy of growth parameter estimates. The growth performance index (φ) is equal within species or between closely taxa and between different stocks of the same species (Moreau *et al.*, 1986).

In the present study, the total mortality rate (Z) for *A. djedaba* from Mediterranean coast of Sinai during season 2016 was 0.91957 year^{-1} This rate is lower than those found for the same species in other locations. . Reuben *et al.*, 1992 found that the total mortality Indian sea for *A. djedaba* was 5.15 year^{-1} ,Medhat *et al.*, 2014 found that the total mortality rate (Z) for *A. djedaba* from Arabian Gulf was 2.07 year^{-1}, the mean total mortality of *A. djedaba* from south Asia was 7.2 year^{-1}(Hannesson and Herrick, 2006), Moreover ,the mean total mortality of *A. djedaba* from Abu Qir Bay was 1.85 year^{-1}(El Syed, 2005).

The total mortality coefficient "Z" is defined as the total loss by death (by natural and fishing death) of individuals from a population during a certain time interval. The total mortality coefficient "Z" is composed of two components namely fishing mortality "F" by man and natural mortality "M" by all other causes than fishing (predation, ecological conditions and diseases etc.) The natural mortality is often strongly correlated with life-history parameters such as growth rate and maximum age (Papaconstantinou and Kapiris, 2003). In the present study the annual rates of total mortality coefficient "Z", the natural mortality "M" and the fishing mortality "F" for combined sexes of A. djedaba were estimated to be 0.91957, 0.43654 and 0.48303 respectively. El-Syed, 2005 found that the values of Z, M and F in the Abu Qir Bay , Egypt for *A. djedaba* was "Z" =1.85 , "M" = 0.62and "F" = 1.23 these results are high compared to our results. This difference can be explained by a very high fishing effort and a high natural mortality. Concerning mortality estimates, comparison is difficult because of scarcity of data and the total mortality coefficient is not a species-specific parameter, but an area specific parameter. These results could be explained by a high predation or other natural causes affecting fry and juveniles. Mortality parameters depend on both physiological factors (disease, old age, etc.), environmental factors (temperature, currents ...). According to Christensen and Pauly, 1997 for juveniles, predation mortality is sometimes much higher than fishing mortality. The comparison shows that the mortality estimates differ from author to author and from one region to another, the temperature of the environment and the parameters of the equation of von Bertalanffy are the main sources of variation values of natural mortality (Pauly, 1985).

Exploitation rate is the fraction of an age class that is caught during the life span of a population exposed to fishing pressure, i.e., the number caught versus the total number of individuals dying due to fishing and other reasons.

which allows one to (roughly) assess if a stock is overfished or not, on the assumption that the optimal value of E is about equal to 0.5, the use of $E \approx 0.5$ as optimal value for the exploitation ratio itself resting on the assumption that sustainable yield is optimized when $F \approx M$ (Gulland, 1971). Pauly, 1987 proposed a lower optimum F that equal to 0.4 M, so the values of fishing mortality and exploitation rate were relatively high indicating a high level exploitation. In present study the exploitation rate was 0.525 for combined sexes. El-Sayed, 2005 found that, in the Abu Qir Bay , Egypt. The exploitation rate (E) was 0.66 using value of M and F.

The variation in yield per recruit with changing of age at first capture Tc, this is closely related to the estimation of the optimum mesh size. Yield per recruit of *A. djedaba* was calculated using Tc = 1.0, 1.5, 2.0, 2.3 (current age at first capture) and 2.5 years. The Results indicated that, the maximum yield per recruit will be achieved at Tc = 2.3 year with current exploitation rate (F = 0.48303) in a long time. In addition, with the increasing of fishing mortality F = 5.25 at Tc = 2.3 year, the maximum yield per recruit will be increase. Increasing of effort (F = 0.48303) to F_{max} (F = 5.25) associated with negligible increase in the yield per recruit (24.478-19.544 = 4.934).That meaning of, the increase in fishing effort by 986.9% over production as much as 25.24% only, this is unacceptable biologically .Also, higher yields that obtained by increase in effort cannot be maintained, and they will have to be followed by a period of much lower yield.

RECOMMENDATION

Since this fish represent a percentage of the total catch in the Mediterranean Sea coast of Sinai and the low price of this fish to some extent is an alternative to fish such as sea bream and sea bass, which are very high prices and also there is no previous studies on this fish. Make multiple studies on this type of fish in the Spawning season and the length at first maturity of this fish, distribution and feed habitat so that fish can be managed catch and work to increase the production of this fish while preserving the stock of fish.

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النمو والنفوق والامداد في اسماك الميرا في ساحل البحر المتوسط السيناوى مصر

عطيه على عمر العياط

المعهد القومي لعلوم البحار والمصايد فرع الاسكندريه.

الملخـص العربــى

تمت دراسة النمو والوفيات والامداد على اسماك الميرا (السرفديا) (*Alepes djedaba*) من ساحل البحر المتوسط في سيناء مصر. تم جمع 780 عينة (من 11.1 إلى 25.3 سم من طول كلى ومن 15.3 إلى 172.2 جرام وزن كلى) من يناير إلى ديسمبر 2016 (موسم صيد واحد). كانت العلاقة بين الطول والوزن $W = 0.0064 * L^{3.134}$. كانت الفئات العمرية من صفر إلى خمس سنوات. تم حساب النمو في كل من الطول والوزن في نهاية كل عام و كان الطول 11.87 ، 15.94 ، 18.40 ، 20.40 و 22.37 سم للسنوات الأولى والثانية والثالثة والرابعة والخامسة على التوالي ، وكان النمو في الوزن 14.9 ، 37.6 و 58.9 و 81.4 و 108.6 جرام للسنوات الأولى والثانية والثالثة والرابعة والخامسة من العمر على التوالي. تم حساب معاملات النمو لمعادلة فون بيرتالانفي ($L\infty=26.94$ سم، $K = 0.2946$ و $t0 = -1.0408$). مؤشر أداء النمو ($\varphi' = 2.33$) . كانت معدلات الوفيات 0.91957 ، 0.43654 و 0.48303 لكل من النفوق الكلي والطبيعي والنفوق بالصيد على التوالي. معدل الاستغلال الحالي $E = 0.53$. الطول عند بداية الصيد (Lc) كان 17.0سم ، والعمر عند بداية الصيد 2.34 سنة. وأشارت نتائج العمر عند أول التقاط ومعدل الاستغلال الحالي إلى أن الأسماك الصغيرة يتم صيدها عند مستوى أعلى من جهد الصيد.

بما أن هذه الأسماك تمثل نسبة مئوية من مجموع المصيد في ساحل البحر الأبيض المتوسط في سيناء وانخفاض أسعار هذه الأسماك إلى حد ما هو بديل للأسماك مثل الدنيس والقاروص ، وهذه الاسماك أسعارها مرتفعة للغاية وأيضاً لا يوجد سابقًا دراسات على اسماك السرفديا في مصر، لذا تقترح الدراسة ضرورة اجراء العديد من الدراسات على هذا النوع من الاسماك بالأخص فى سواحل البحر المتوسط المصرية للتعرف على موسم التزاوج والطول عند بداية النضج الجنسي لهذه الاسماك وتوزيع هذه الاسماك و السلوك الغذائي بحيث يمكن إدارة مصيد هذه الاسماك والعمل على زيادة الانتاج من هذه الأسماك مع الحفاظ على المخزون منها.