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BIOLOGICAL STUDIES ON THE NARROW-BARRED SPANISH MACKEREL, *SCOMBEROMORUS COMMERSON* OF EASTERN MEDITERRANEAN (NORTH SINAI COAST) EGYPT DURING 2017

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ABSTRACT

The goal of the present study is to give basic information required for managing Narrow-barred Spanish mackerel, *Scomberomorus commerson* (Lacepéde, 1800) of Eastern Mediterranean (North Sinai Coast) Egypt. 1189 Samples of *S. commerson* (12.0 to 137 cm total Length and 12.2 to 14880 g. total weight), were collected during 2017. The relationship between length and weight was W= 0.0111L 2.8469. Age was determined by otolith where age groups 1 to 5 years. Growths in length and weight at the end of each year were calculated as 36.49, 62.41, 86.15, 101.5 and 114.35 cm for the 1st, 2nd, 3rd, 4th and 5th year of life respectively. The growth parameters of von Bertalanffy equation were calculated as ($L\infty$= 161.67 cm, K = 0.2436 year-1 and t0 = -0.0501 year-1). Growth performance index (φ′ = 3.78). Mortality rates were 0.9536 yr−1, 0.3854 yr−1 and 0.5682 yr−1 for total, natural and fishing mortality respectively. The exploitation rate E = 0.60. The length and age at first capture (Lc) (Tc) was 34.5 cm and 0.9353 year respectively.

In the end, 67.5% of the total fish catch (0 and 1st, 67.5% of age groups) of *Scomberomoruscommerson* is small and this affects the fish stocks of these fish and must be stopped to prevent growth overfishing and exploitation of large size fish (2nd age, and 3rdof age groups) must be regulated to prevent recruitment overfishing. Also the exploitation rate (E) is 6 and is a high rate is high. Therefore, should be reduce the fishing effortto preserve the fish stocks from these fish, or at least should not be increaseing the fishing effort, as we are in the stage of low Yield per recruit also these fish are important in north Sinai as the catch from these fish reached 90 tons per year and their prices are affordable.

INTRODUCTION

Narrow-barred Spanish mackerel, *Scomberomoruscommerson* (Lacepéde, 1800) is a pelagic, highlymigratory fish that usually hunts solitary and oftenswims inshallow water along coastal slopes. It feeds onmainly on schooling fishes such as anchovies, clupeids,carangids, also squids and shrimps. Maximum length is240 cm FL, common length is 120 cm TL, and it reachessexual maturity at 65 cm (Golani*et al*., 2006; Froese and Pauly, 2018). *S. commerson*spreads originally throughoutthe Indo-Pacific from the Red Sea and South Africato Australia and Fiji. It is immigrant to the easternMediterranean Sea via the Suez Canal where it can befound westward to at least Tunisia (Golani *et al*., 2006;Collette *et al*., 2011; Froese and Pauly, 2018).

The Narrow-barred Spanish mackerel, *Scomberomoruscommerson* (Lacepède, 1800) is a member of the family Scombridae (Mackerels, tunas, bonitos), subfamily: Scombridae. It is distributed in the Indo-Pacific from the Red Sea and South Africa tosoutheast Asia, north to China and Japan and south to Australia (Randall, 1995), beingan immigrant to the eastern Mediterranean Sea by way of the Suez Canal (Ben-Tuvia, 1978).

S. commerson occurs from the edge of the continental shelf to shallow coastal waterswhere it is found along drop-offs, gently sloping reefs and lagoon waters from depths of10 to 70 m. (McPherson 1985 and Myers 1991). In north Queensland Australia, smalljuveniles up to 10 cm fork length live in creeks, estuaries and sheltered mud flats duringthe early wet season (McPherson, 1981).Large adults may be solitary, whereasjuveniles and young fish occur in small schools (Collette, 2001).The diet mainlyconsists of small fishes like anchovies, clupeids and carangids, though squids andshrimps are also consumed (Blaber *et al*., 1990). It reaches a maximum size of 240 cmfork length and maximum weight of 70.0 kg (McPherson, 1992).

The narrow-barred Spanish mackerel *S.commerson* is the most commercially important pelagic species in the northern Persian Gulf, where it inhabits shallow coastal waters less than 100mdeep and often associates itself with reefs and shoals (Collette and Nauen, 1983).

Despite the variation in estimates of growth between locations, age-based growth studies of *S. commerson* from Australia, South Africa and Oman all suggest rapid growth in juveniles (Dudley *et al.*, 1992).The maximum age reported from the Arabian Gulf for *S. commerson* is 16.2 years(Grandcourt *et al.*, 2005) and a maximum age of 20 years has been reported by

McIlwain *et al.* (2005) from the Gulf of Oman. These values are of the right ordercompared with that of 17 years for this species in Queensland (Tobin and Mapleston, 2004).Total mortality rate (*Z*) estimates for *S. commerson*may be inherently biased upwardsdue to the differential targeting of younger schooling fish in the region. Estimates of *Z*and the size/age compositions may also have been biased by ontogenetic and/or seasonal migrations (Grandcourt *et al.*, 2005). McPherson and Williams (2002) considered that certain gear types resulted in the larger older fish being proportionatelyhigher on fishing grounds than their representation in catches would suggest. Sizespecific selectivity would explain the small proportion of larger and older fish in the sizeand age frequency distributions. However, the impact of fishing cannot be discounted, especially given the limited regulation and intensity of fisheries targeting *S. Commerson* throughout the region. Particularly given that the high total mortality rate (Z = 0.88 yr-1)derived from the age based catch curve for the southern Arabian Gulf (Grandcourt *et al*., 2005) compares well to the estimates of 0.90 yr-1 and 0.89 yr-1 for females andmales respectively in the waters off Oman (McIlwain *et al*., 2005). The narrow-barred Spanish mackerel (Drak) fish is one of the important fish in the Sinai coast, where its production ranged from 2 tons to 90 tons per year during the period from 1989 to 2017 (GAFRD, 2018) and also these fish are cheap and they are affordable for people as the price per kilo ranges from 40 pounds to 70 pounds.

The narrow-barred Spanish mackerel *S. commerson*are considered the most important fishes in the port of El Arish. where production *S. commerson* arrived about 90 tons. Theses research aims to study the biological and dynamical characteristic of this species to assess the situation of this kind and to provide some information for stock management.

MATERIALS AND METHODS

Monthly, random samples of Narrow-barred Spanish mackerel (*Scomberomoruscommerson*) collected from El Arish port (North Sinai Coast). The samples were collected from January to December 2017. The total length of 1189 individuals of Narrow-barred Spanish mackerel fishfrom the tip of the snout to the end of the caudal fin was measured to nearest centimeter, total weight to the nearest 0.1 gram Fig (1).

Total length and total weight of 1189 specimens of *S. commerson*were recorded monthly during 2017. Length –weight relationship was determined by Le Cren (1951) as W = a *Lb where W = total weight (g), L = total length (cm) and a and b constants. The values of $L\infty$, K and t_0 were estimated by Ford, 1933-Walford method, 1946where growth rate is plotted against the mean length during the corresponding year.

Otoliths for 462 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 as follows: $L_n = (L - a)\ (S_n / S) + a$

Where: L_n equals length of fish at formed of ring n (age at n year), L equals the fish length at capture, S_n equals the otoliths radius at fish length L_n and S is the total radius of scales (a: constant). The calculated weight at the end of each year was estimated by applying length-weight equation.

The growth performance index (ø) was estimated using Pauly and Munro, 1984 formula as ø = Log K + 2 Log $L\propto$.

Fig. 1. Narrow-barred Spanish mackerel (*S.commerson*) samples collected from eastern Mediterranean (North Sinai Coast. 2017.

Total mortality were obtained by using five methods 1- Chapman and Robson, 1960) as $Z= -Ln\ S$) 2- (Beverton and Holt's, 1957based on length data as $Z=K*((L\infty-\bar{Lc})/(\bar{Lc}-Lc))$ Where L_c The length of the fish at 50% of the catch of the catch , $L_{\bar{c}}$ Average fish in catches of 50% even bigger fish in the sample 3- (Beverton and Holt's, 1957 based on length data andas $Z=K*(L\infty-L')/(L'-Lr)$ where $\bar{L}$ is The average length of the sample fish and Lr is the smallest length of the samples and k and $L\infty$ the growth parameter of vonbertlanvy4- Z=-b and The Powell- Wetherall method (Powell, 1979) discussed in (Wetherall *et al.*, 1987) as Z=1-k.

Natural mortality coefficient was estimated by using two methods: 1- (Alverson and Carney, 1975 as $M = 3 * K / [\exp (t_{max} * 0.38 * K) – 1]$ where t_{max} is the maximum age of the fish in the sample. 2- Jensen (1996) as M=1.5k. 3- Lorenzen, 1996 M=3W′^(-.288) 4- Pauly (1980).

$$\log M = [- 0.0066 – 0.279 \log L + 0.6543 \log K + 0.4634 \log T] –$$

Fishing mortality F=Z-M.

The exploitation rate (E) by Gulland, 1971.

E= f/z. Survival rate from age composition data using Ricker, 1975 equation found $S= e^{-Z}$.

Length at first capture (Lc) was calculated from the plot of the probability of capture against size. The method of Gulland, 1969 was used to predict the yield per recruit as follows:

$$Y`/R = F*e^{(M (Tc – Tr))} *W\infty*[(1/Z) –(3S/Z+K)+ (3S^2/Z+ZK) – (S^3/Z+3K)]$$

Where $S = e^{(-k (Tc – t_0))}$. L_∞, K, and $t_0 = t_o = t + 1 / k \ Ln (L\infty - Lt) / L\infty$, Tc is age at first capture, Tr is age at recruitment, W∞ is asymptotic body weight, F is fishing mortality, M is a natural mortality and Z = F+M, is a total mortality.

RESULTS

Body length-otolith radius relationship.

The otolith–total length relationship is almost linear and can be described by the following equation L =45.814s-16.99 (with R2 = 0.9302)

Where S is the otolith radius and L is the total length.

Back-Calculationslength.

The following equation was derived to obtain the back-calculation total length at the end of each year of life: Ln = (L+16.99) (Sn/S)-16.99. Where Ln is the length at the end of n^{th} year, Sn is the radius of the otolith to n^{th} annulus, S is the total radius of the otolith and L is the total length at the capture.

The obtained back-calculation length at the end of each year of life are given in Fig (2). The results found that the highest increment in length for *S. commerson*at the first year of life (36.5 cm) and then declined rapidly thereafter, the back-calculated length of *S. commerson* are 36.5, 62.4, 86.2, 101.5 and 114.3 cm for age 1, 2, 3, 4 and 5 years, respectively. (Fig. 2).

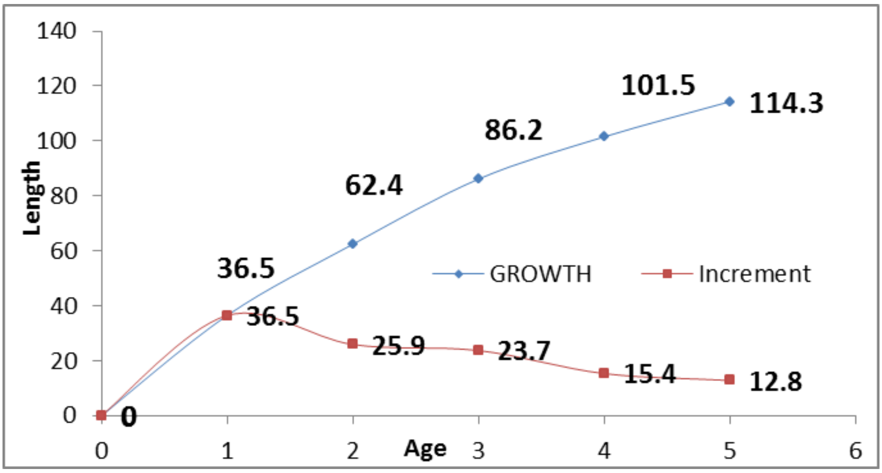

Fig. 2. Growth and annual increment in length (♀♂) of *S. commerson*, 2017.

Length – Weight relationship.

The length–weight relationship curve *S. commerson*in Bardwell lagoon is presented in (Fig. 3), was described by the power equation as

$$W= 0.0111*L^{2.8469}$$

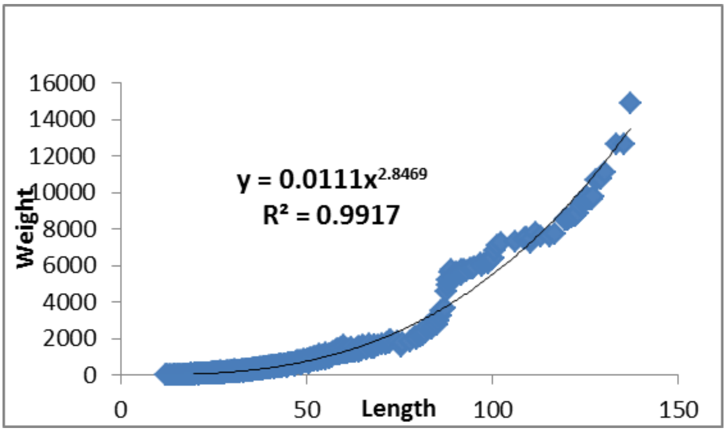

Fig. 3. Length-weight relationship (♀♂) of *S.commerson* collected from Mediterranean coast of Sinai 2017.

Growth in Weight.

From (Fig. 4) it clear that the increase in weight varies from year to year according to the feeding conditions, the condition of the fish, and the sexual maturity of the fish for *S. commerson*. The back-calculated weight of S. commerson were 310.9, 1433.1, 3587.7, 5722.3 and 8032.9 g. for age 1, 2, 3, 4 and 5 years, respectively.

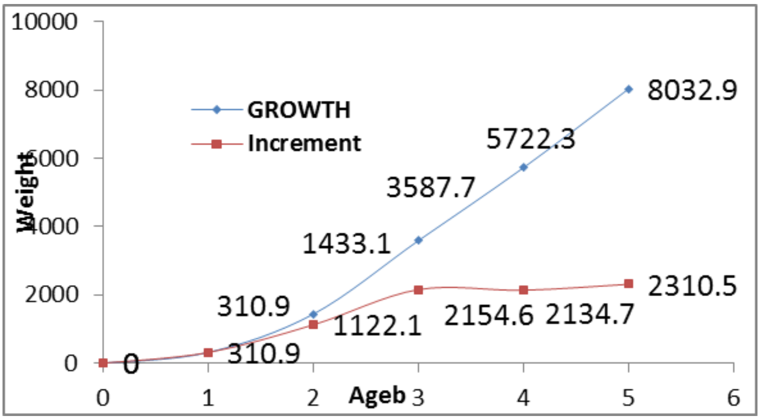

Fig. 4. Back– calculation weight at the end of different years of life (♂♀) of *S. commerson*, 2017.

Growth parameters.

The back-calculated length and according to the plot of Ford wel Ford 1933 the von Bertalanffy growth parameters L_∞, K , t_o and W_∞ were estimated 161.67, 0.2436, -0.0501 and 21529.4 respectively the equations obtained were as follows.

For length $Lt = 161.67 \ (1 - e - 0.2436 \ (t + 0.0501)$

For weight $W_t = 21529.4 \ [(1 - e^{- 0.2436 \ (t + \ 0.0501)})]^{2.8469}$

Growth performance index (Φ).

The growth performance index (Φ and Φ') as defined by were computed for *S. commerson*in the Eastern Mediterranean and found to be 3.78 for length and 1.085 for weight.

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

Maximum length with the highest biomass of *S. commerson*in Bardwell lagoon L_{opt} was 105.8 cm, and maximum age T_{max} was 12.3 years. The length at first capture (The length at which 50% of fishes retained by the gear is the mean selection length, Lc) was estimated to be 34.5 cm (Fig 5).

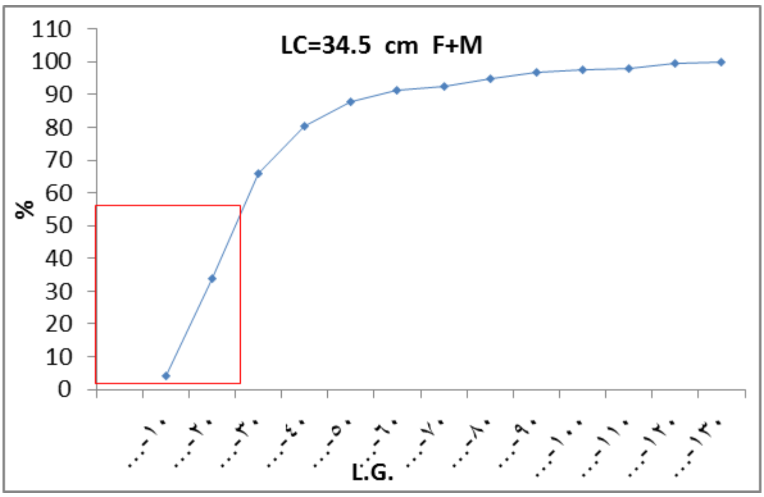

Fig. 5. Length at first capture (L_c)= 19.6 cm of *S. commerson* during 2017.

Age composition.

The age distribution of sample ranged from age 0 to v years for *S. commerson*based results of the otolith reading (Fig. 6) the age group0 was dominant (38.7%) followed by groups I (28.8%), П (14.3%), Ш (9.3%), IV (6.3%) and V (2.6%), respectively. (Fig. 6).

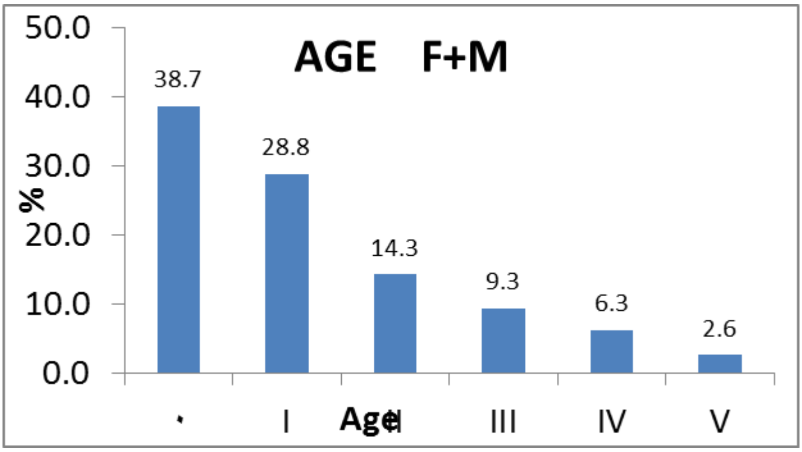

Fig. 6. Age composition of combined sexes of *S. commerson* in Mediterranean coast of Sinai during 2017.

Mortalities and exploitation rate.

Estimation total mortility by five methods and the average results Z= 0.9536 year^{-1} of *S. commerson*in Mediterranean coast of Sinai during 2017 and natural mortality estimated by three methods and the average results M= 0.3854 year^{-1} also fishing mortality estimated by difference between total and natural mortality F= Z-M was 0.5682 year^{-1} and Estimation the exploitation rate (E) was 0.60.

Yield per recruit.

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

The yield per recruit (Y/R) and biomass per recruit (B/R) of *S. commerson*inin Mediterranean coast of Sinai during 2017 were found to be 727.3 g. and 790.2 g respectively at the actual fishing mortality 0.5682 year^{-1} and 0.35 respectively. In this study the maximum Yield per recruit in the pre-current phase of the fishing effort. Where it was 790.2 fishing mortality (F) 0.35 but at the time of the current catch, Yield per recruit was 727.2. Now, there is a decrease in the Yield per recruit of 9.7%, {(790.2-727.2) /790.2*100} with an increase in fishing mortality by 38.4%.(0.5682-0.35)/0.5282*100). Biomass per recruit was decreased with the increasing of fishing mortality where it maximized (6870 g) at F= 0.0 (Fig.7).

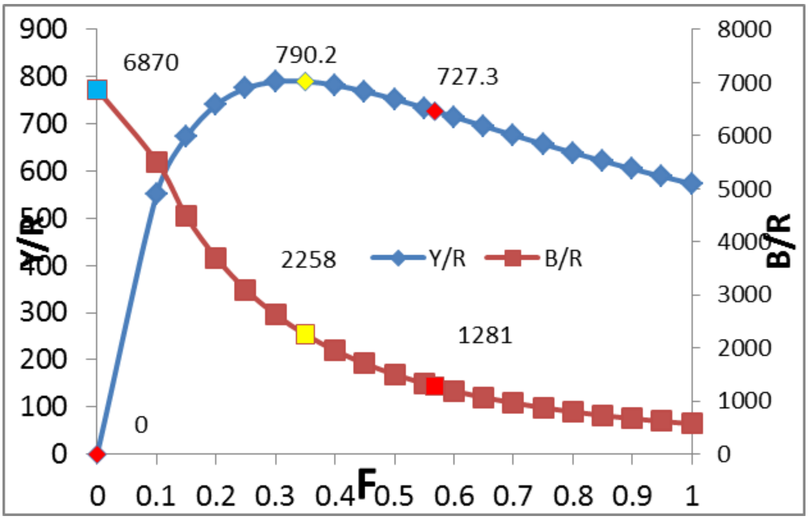

Fig. 7. Yield per recruit (Y/R) and Biomass per recruit (B/R) of *S. commerson* during 2017 a function of different fishing mortality.

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

The yield per recruit of *S.commerson*was calculated using tc = 0.5,0.9(the present age at first capture), 1.0, 1.5, 2.0 and 2.5 in Fig. (8). The results indicated that the maximum yield per recruit increases when the age at first capture increases. The higher values of yield per recruit (705.4, 790.2, 804.8, 911.7, 1016.9 and 1110.5g) atfishing mortality F= 0.25, 0.35, 0.35, 0.45, 0.6 and 0.8 years^{-1}, respectively .

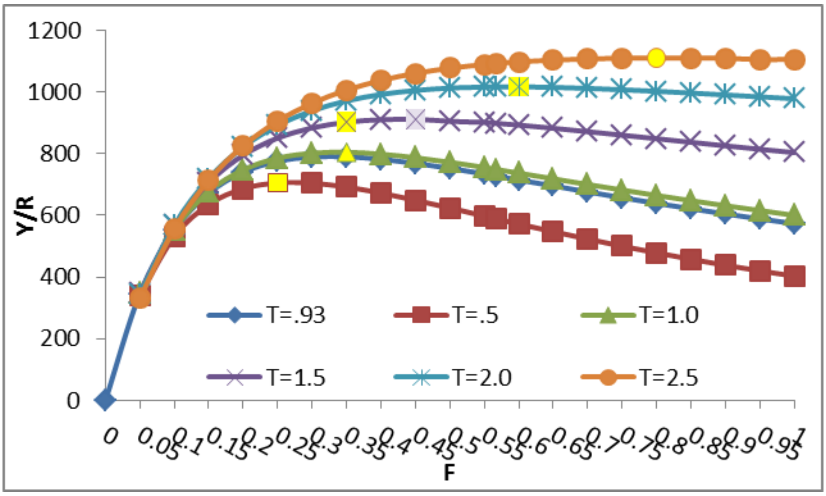

Fig. 8. Yield per recruit (Y/R) of *S. commerson*during 2017 a function of different fishing mortality and age at first capture.

DISCUSSION

Age and growth parameters are the most important study to our understanding of the species biology was enable to control of fishing and the growth studies based on the sum of increments are held to be more descriptive of biological growth potential (El-Zarka, 1961).

Age was determined by means of the interpretation and counting of growth rings on the otoliths (sagitta) of 1189 individuals caught during the spawning season by the commercial fleet and on fisheries research surveys. In present study, the otolithsof, *S. commerson* were used estimate the age and growth characteristics. The sizes for all individual are ranging between 12.0-137 cm in total length and12.2- 1880.0 g weight.

The results of the present study is in conformity with the results of Niamaimandi *et al*. (2015) where it ranged from 17 to 152 cm in commercial catch in the northern Persian Gulf, Stephen *et al*. (2012) where it ranged from 6.2 to 178.0 cm in Western Australia and Grandcourt *et al*. (2005) where it ranged from 21.0 to 135.0 cm in the southern Arabian Gulf.these results may be due to probably due to environmental changes and the small-sized fish were scarcely represented in the whole sample, because of the minimum landing size of 18 cm TL allowed in the Adriatic Sea (Meneghesso *et al*. (2013)also in Egypt the nets of purse seine are narrow and there is no control on the nets.

The age composition of *S.commerson*showed a five age classes. The results revealed that, the percentage occurrence of age groups as 38.7, 28.8, 14.3, 9.3, 6.3 and 2.6% for 0, 1st, 2nd, 3rd, 4th and 5th age respectively. McIlwain *et al*. (2005) studied the distribution of age *S. commerson* found that it stretches for over 20years in the coastal waters of the Sultanate of Oman but ages most presence is the years the first and second and ratios too weak ages of the 7th to20th.

In the present study, the calculated values of 'b' for length and weight of *S. commerson* was 2.8469 for combindsexes. The correlation coefficient was close to one suggesting a good adjustmeent between length and weight of *S. commerson* which were of expected range ($W = 0.0111\ L^{2.8469}$ ($R^2 = 0.9917$). Table (1).

These presented results were equal with results obtained from some regions (Table 3). The b values in fish is species specific and varies with sex, age, seasons, physiological conditions, growth increment and nutritional status of fish, health, habitat, nutrition, environmental conditions (such as temperature and salinity), area, degree of stomach fullness, differences in the length range of the caught specimen, maturity stage and techniques of sampling fishing gear (Le Cren, 1951 and Begenal and Tesch, 1978). In the present study, environmental or habitat factors were not analyzed.

Table 1. Length- weight relationship of *S. commerson* in some regions.

Area	Type of Measurement	a	b	References
Saudi Arabia	TL	0.0056	2.979	Kedidi*et al*., 1993
India	TL	0.0154	2.8138	Pillai*et al*., 1993
Oman	TL	$8.27*10^{-6}$	3.02	AL- Hosnni(1999)
India	TL	0.0096	2.857	Devaraj, 1981
Red Sea	TL	0.0012	2.812	Kedidi and Abushusha, 1987
Mediterranean Sea North Sinai Egypt	TL	0.0111	2.8469	Presented study

In this results, growth parameters of *S.commerson*($L\infty$ = 161.7cm, K = 0.2436year -1 and t_o = -0.0501year-1) were lower than of that for the same species which resulted of the Saudi Arabia by Kedidi *et al*. (1993)where the $L\infty$ and K was 183.6 cm and 0.26 year-1 respectively. In Omani waters by AL-Hosni and Siddeek (1999) mentioned that $L\infty$, K and t_o were 173.6 cm, 0.28 year-1 and -0.86 year-1 respectively. In Oman sea by TaghaviMotage *et al*. (2008) reported that the $L\infty$, K and t_o were 178 cm, 0.28 year-1 and -0.36 year-1 respectively and also Jayabalan *et al*. (2011)in the GCC waters reported that the $L\infty$, K and t_o were 176cm,0.4year-1 and -0.45year-1respectively. On the other hand, these results of *S. commerson*were higher than that recorded by Niamaimandi *et al*. (2015)in the northern Persian Gulf which reported that $L\infty$, and K were 148 cmand, 0.5 year-1 - respectively.In the United Arab Emirate combined sexes wereestimated as K = 0.21 year−1 and $L\infty$ = 138.6 cm (Grandcourt *et al*., 2005). This was attributed to the physiological processes through which individuals pass during their first stages of development.

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 *S. commerson* were estimated to be 0.9536, 0.3854 and 0.5682 respectively.These results agreement with that obtained by (Niamaimandi *et al*., 2015) in the northern Persian Gulf where Z= 0.97 and TaghaviMotage *et al*. (2008)in the GCC waters where Z= 0.95,M= 0.36 F= 0.59. Also these results were lower than that obtained by Mehdi *et al*., 2007) in Coastal Waters of Iran whereZ=1.47 M=0.49and F= .98 and McIlwain *et al*., 2005 in the Sultanate of Oman. where Z =1.321 ,M= 0.443 and F=0.878

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 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 ≈ 0.5 as optimal value for the exploitation ratio itself resting on the assumption that sustainable yield is optimized when F ≈ 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 0.6 for combined sexes. Niamaimandi *et al* (2015) found that, exploitation rate (E) was 0.42 using value of M and F for the northern Persian Gulf.

The yield per recruit (Y/R) and biomass per recruit (B/R) of *S. commerson* in in Mediterranean coast of Sinai during 2017 were found to be 727.3 gm and 790.2 g respectively at the actual fishing mortality 0.5682 year-1 and 0.35 respectively. In this study the maximum Yield per recruit in the pre-current phase of the fishing effort. Where it was 790.2 fishing mortality (F) 0.35 but at the time of the current catch, Yield per recruit was 727.2. Now, there is a decrease in the Yield per recruit of 9.7%,{(790.2-727.2)/790.2*100} with an increase in fishing mortality by 38.4%. (0.5682-0.35) /0.5282*100).

RECOMMENDATION

Most the catch of *S. commerson*of small fish (0 and 1st, 67.5% of age groups) must be stopped to prevent growth overfishing and exploitation of large size fish (2^{nd} age, and 3^{rd} of age groups) must be regulated to prevent recruitment overfishing. Also the exploitation rate (E) is 0.6 and it a high rate.

Therefore, should be reduce the fishing effortto preserve the fish stocks from these fish, or at least should not be increaseing the fishing effort, as we are in the stage of low Yield per recruit.

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دراسات بيولوجية على اسماك الدراك (*S. commerson*) في شرق البحر المتوسط (ساحل شمال سيناء) مصر خلال عام٢٠١٧

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الملخص العربي

الهدف من هذه الدراسة هو تقديم المعلومات الأساسية اللازمة لإدارة اسماك الماكريل الإسباني (*S. commerson*)(دراك) في شرق البحر المتوسط (ساحل شمال سيناء) في مصر. تم جمع ١١٨٩ عينه من (١٢.٠ إلى ١٣٧ سم الطول الكلي و ١٢.٢ إلى ١٤٨٨٠ جم. الوزن الكلي)، خلال عام ٢٠١٧. كانت العلاقة بين الطول والوزن. ($W = 0.0111L^{2.8469}$) تم تحديد العمر بواسطة otolith حيث الفئات العمرية ١ إلى ٥ سنوات. تم حساب النمو في الطول والوزن في نهاية كل عام على أنه(٣٦.٤٩، ٦٢.٤١، ٨٦.١٥، ١٠١.٥، ١١٤.٣٥ سم) للسنة الأولى والثانية والثالثة والرابعة والخامسة من العمر على التوالي. تم حساب قياسات النمو لفون برتلانفىعلى أنها ($L\infty =$ 161.67CM سم، $K = 0.2436Year^{-1}$) و($t0 = -0.0501year^{-1}$). مؤشر أداء النمو ($\varphi' =$ 3.78).وكانت معدلات الوفيات (z= ٠.٩٥٣٦ ، M= ٠.٣٨٥٤ ، F=٠.٥٦٨٢) للوفيات الكلية والطبيعية والنفوق بالصيد على التوالي. معدل الاستغلال .E = 0.60 كان الطول والعمر عند الالتقاط الأول 34.5 (Tc) (Lc) سم و ٠.٩٣٥٣ عامًا على التوالي.

في النهاية، فإن ٦٧.٥٪ من إجمالي الأسماك (٠ ، ١ ، ٦٧.٥٪ من الفئات العمرية) من *S. commerson* صغيرة وهذا يؤثر على المخزون من هذه الأسماك ويجب إيقافه لمنع نمو الصيد الجائر واستغلال الأسماك كبيرة الحجم لمنع التجنيد المفرط. كما أن معدل الاستغلال (E) هو ٠.٦ ، وهو معدل مرتفع. لذلك، ينبغي تقليل جهد الصيد للحفاظ على الأرصدة السمكية من هذه الأسماك، أو على الأقل ألا تزيد من جهد الصيد، لأننا في مرحلة انخفاض الامداد أيضًا، فهذه الأسماك مهمة في شمال سيناء لأن المصيد من وصلت هذه الأسماك ٩٠ طن في السنة وأسعارها معقولة.