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Age, growth and mortalities of the redbelly tilapia *Tilapia zillii* in Bardawil lagoon, North Sinai, Egypt.

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Abstract

The age, growth and mortalities of the redbelly tilapia *Tilapia zillii* in Bardawil lagoon were studied using 1772 specimens ranging from 8 to21.3cm Total length (TL)and 10 to 165 g total weight, They were collected from May to December, 2015.The relationship between length and weight estimated as $W = 0.0189L^{2.99}$. Age determined by using scales' reading technique for 312 individuals samples and the longevity of this species was found to be 5years. Growth in length and weight at the end of each year was recorded. The growth parameters of the von Bertalanffy equation were calculated as $L\infty=26.01$, $K=0.25yr^{-1}$, $t_0= -1.37yr^{-1}$ Total, natural and fishing mortality rates were 0.48 yr^{-1}, 0.30 yr^{-1} and 0.18 yr^{-1}, respectively.Maximum ages of combined sexes was 5 years. The current exploitation rate (E = 0.37) indicates that the stock of the redbelly tilapia in Bardawil lagoon was lower exploited.The length at first capture Lc was estimated at 14.4 cm. this show that the exploitation of low tilapia in Bardawil lagoon. The letter recommended should be banned fishing at least in length from 14 cm to give opportunity even once hatchery. As it should catch this fish ban sexually mature during the period from July to August, where hatched season in Bardawil lagoon.

Key words: age, growth, estimation of mortalities, *Tilapia zillii*, Bardawil lagoon, Egypt.s

Introduction

The Bardawil lagoon is one of the most important lagoons in Egypt as it produce economic species such as, sea bream, sea bass, solea and mullets. In last year, The red belly, *T. zillii* was recorded in production of Bardawil lagoon .Thus in near future this species may be becoming more dangerous in the lagoon where it is reproduction rapidly .

T. zillii is economically and ecologically important as food fish, for aquaculture, commercial aquarium trade, weed control and recreational fishery in its native range and in many countries it has been introduced **Mehanna, 2004**. *T. zillii* was found to live and reproduce in Quarun Lake (Egypt) in salinities between 10-26 ppt **El-Zarka*et al.*, 1970** in the Red Sea salinity = 42.7 ppt **Bayoumi, 1969** and in Bardawil Lagoon salinity = 41-45 ppt **Chervinski, 1972**. In the Bardawil Lagoon , this species is non-target of fisherman, and undesirable species this work aimed to determine the biological data of assessing the status of this species to cantonal as fish resource and determine the statue fishing in Bardawil lagoon.

Materials and Methods

STUDY REGION

The study was carried out in the Bardawil lagoon (Fig. 1).The lagoon covers an area of 693 km2, in an arid area in the northern part of Sinai Peninsula, Egypt. It is separated from the Mediterranean Sea by a long narrow sandbar that varies in width between 100 m and 1 km. The lagoon communicates with the Mediterranean Sea water by two artificial inlets and one natural narrow channels. The lagoon is considered as a natural depression with a depth of 0.5-3 m.

Fig. (1) Map of the northern side of Egypt showing he location of Bardawil lagoon .

SAMPLING

Monthly random samples of *T. zillii* (1772 individuals) were collected from the different landing sites of the Bardawil lagoon, North Sinai. The sampling period lasted during the fishing season from May to December, 2015. Total length to the nearest centimeter and total weight to the nearest 0.1 gram were recorded for 1772 specimens. To determine the age, scales were taken for (312) individual behind the tip of the pectoral fin below the literal line **Paul, 1968**. The scales were stored in envelopes and drosal .

In the laboratory, the scales were cleaned and stored dry in envelopes for the subsequent study. Later on, scales were soaked overnight in 10% ammonia solution. 5-7 scales were placed between two glass slides, and examined by a projector with 33 x magnifications. On the clearest scale from each

batch, the total scales radius as well as the radius of each annulus were measured to the nearest 0.01 cm.

Data Analysis

The back-calculated total length at the end of each year was determined from scale measurements using **Lea's, 1920** equation as $L_n = L (S_n/S)$, where: L_n equals length of fish at age (n), L equals the fish length at capture, S_n equals the scale radius at annulus n and S equals total scale radius. The relationship between length and weight was described by the potential equation ($W = a*L^b$, **Ricker, 1975**, where W is the total weight (g), and L is the total length (cm), a and b are constants. The calculated weight at the end of each year was estimated by applying length-weight equation. The von Bertalanffy growth equation (VBGE): $L_t = L_\infty (1- e^{-k(t - t_0)}$was used to describe growth in size, where L_t is the length at age t, $L_\infty$the asymptotic length, K is the body growth coefficient and t_0 is the hypothetical age at which a fish would have zero length. The values of L_∞ and K were estimated by plotting $L_t$vs L_{t+1} using the **Ford, 1933 – Walford, 1946**, while $t_0$was estimated by **Gulland and Holt, 1959**. For comparison of the growth parameters with previous studies, the growth performance index was calculated from the equation of **Munro and Pauly, 1983** as (Φ')= Ln K + 2Ln L_∞.The total mortality coefficient was obtained by using the following methods Estimation of Z from age composition data based on catch curve analysis **Ricker, 1975**. The instantaneous rate of natural mortality (M) was obtained by **Ursin, 1967** formula as $M = W^{-1/3}$ where W is the mean weight of the whole sample. The fishing mortality (F) was estimated by subtracting the value of natural mortality from the total mortality as F = Z –M, while the exploitation rate E = F/Z. The length at first capture L_{c50} was estimated as the point on the X-axis corresponding to the 50% point on the Y-axis. W_∞ the theoretical maximum weight calculated by the conversion of L_∞ by applying length – weight relationship. K and to are the constants of the Von Bertalanffy equation, and n = the constant of the length – weight relationship.M is natural mortality.

Results and discussion

Age and growth

Scales reading for 321 individuals showed five age classes of *T. zillii* in Bardawil lagoon during the fishing season 2015. Age groups and growth in length (average back – calculation lengths) were identified for *T. zillii* as 7.7, 11.5, 15.1, 17.2 and 19.1cm for 1st, 2nd, 3rd, 4th and 5thyears respectively. The growth rate of *T. zillii* is particularly high during the first year of life, in this study. After the first year, the annual growth rate drops rapidly. This result is un comparable to that estimated by **Hadi, 2008** where he found that, the Back – calculated length at the end of different years of *T. zillii* in Umhfein Lake (Libya) was 11.38, 15.32, 17.48 and 20.35cm at ages 1st, 2nd, 3rd and 4th respectively. **Abd-Alla and Talaat, 2000** recorded the back-calculated length as 6.74, 10.42, 13.24, 15.35 and 17.06 cm at ages 1st, 2nd, 3rd, 4th and 5th respectively for the species in Edku lake. The observed total length ranged from 8 to 21.3 cm and the observed total weight varied from 10 to 165 g. The length weight relationship (Fig. 2) was described by the power equation as: $W = 0.0189*L^{2.99}$(R^2 = 0.95). The differences in length-weight relationship of *T. zillii* in different rejoins might be interpreted as being due to differences in growth and morphometry between regions and it is a practical index of the condition of fish, and varies over the year according to factors such as food availability, feeding rate, gonad development and spawning period **Bagenal and Tech, 1978.**

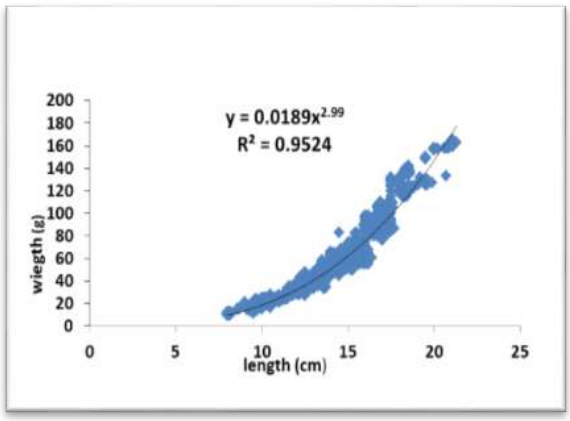

Fig.(2): Length – weight relationship of *T. zillii* in Bardawil lagoon.

Growth parameters of von Bertalanffy were calculated as L_∞=26.01, K=0.25yr^{-1}, t_0= -1.37yr^{-1} and the obtained equation was $L_t = 26.01 (1 - e^{-0.25(t+1.37)})$. The growth parameters and life span in our results were lower than that obtained by**Mahmoud *et al.*, 2014** in Nozha Hydrodrome for the same species (L_∞=33.38cm, K=0.203 yr^{-1} and t_0= -0.346 yr^{-1}) who estimated a lifespan of about 6 yr. The lower value of L∞ may be due to the disappeared of the oldest fish at rebutted of the growth over fishing. The value of growth performance index (Φ') was calculated as (2.2). is higher than that estimated for the same species in Borollus lake (φ =2.09) **Sangak, 2010.**Constant of growth parameters for *T. zillii* in Bardawil lagoon were summarized in **Table (1).**

Table 1. Summary of the estimated growth parameters constants of *Tilapia zillii* in different localities.

Author	Location	L∞	W∞	K	t_0	$Ø_L$
El-Haweet, 1991	Burullos Lake	25.3	324	0.231	-0.91	2.17
Philips, 2004	Nozha Hydrodrome	26.98	356.8	0.306	-0.12	2.35
Mehanna, 2004	Wadi El-Raiyan Lake	33.5	0.5	-	-	2.74
Soliman, 2005	Edku Lake	20.51	184.2	0.291	-0.14	2.09
El-Sawy, 2006	Edku Lake	18.23	131.6	0.42	-0.32	2.14
Mahmoud and Mazrouh, 2008	River Nile	16.5	87	0.5	-0.15	2.13
Adeyemi *et al*., 2009	Gbedikere Lake	34.52	-	0.44	-0.22	-
Sangak, 2010	Burullos Lake	24.8	310.1	0.197	-0.86	2.09
Mahmoud *et al*., 2014	Nozha Hydrodrome	33.38	713.4	0.203	-0.35	2.35
Present study, 2015	Bardawil lagoon	26.01	314.6	0.25	-1.37	2.2

Mortalities and exploitation rate

Total mortality (Z) from length-converted catch curves was estimated as 0.48 yr^{-1} (Fig. 3) while natural mortality (M) was estimated as 0.30 $yr^{-1}$and the fishing mortality rate (F) was 0.18 $year^{-1}$. From these results, the exploitation rate (E = 0.37) shows un exploited stock according to **Gulland, 1971**, who suggested that the optimum exploitation rate for any fish stock is about 0.5 at F=M and more recently, **Pauly, 1987** proposed a lower optimum F that equal to 0.4 M. **Patterson, 1992** reported that an exploitation rate of about 0.4 is safe for the stock.

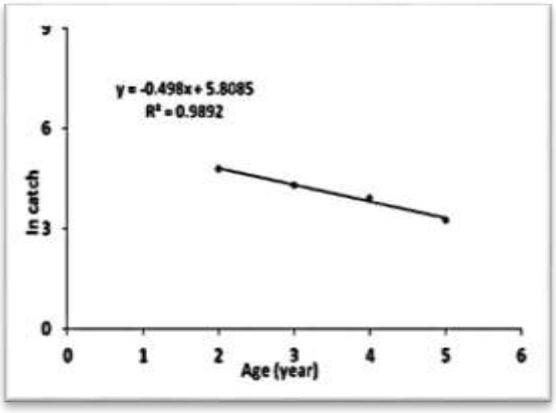

Fig. (3) Z from catch curve based on age composition data of combined sexes of *T. zillii* collected from Bardawil lagoon, 2015.

Length at first capture *(Lc)*

The length at first capture (The length at which 50% of fishes retained bythe gear is the mean selection length, Lc) was estimated to be 14. 4 cm recorded to less than the length of first maturity where it is un acceptable species in the Bardawil lagoon attire lower spawning biomass (fig 4).

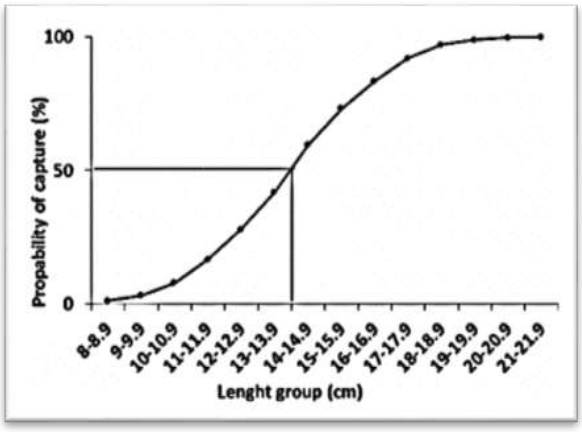

Fig. (4) L_{C50}= 14.4 cm of combined sexes of *T. zillii* collected from Bardawil lagoon, 2015.

Conclusion

- *Tilapia zillii* in the Bardawil lagoon showed slightly negative allometric, slightly growth rate during of study period.
- For the management purpose, the current length at first capture recorded to 14.4 cm.
- Exploitation rate ≈ 37 % indicating that, the stock of *T. zillii* is low exploited this it should be ranged to higher than 50% .

Recommendation

1. The completion of studies on T. zillii to
- Estimate the biomass per recruit
- estimated the yield per recruit
- Des it represent a danger to catch in the Bardawil lagoon (Compete mullets food)

2. Fishing efforts should be reduced during the spawning season (Julie and August) of T. zillii.

References

Abd-Allah, A. and Talaat KM, 2000. Growth and dynamics of Tilapias in Edku Lake, Egypt. Bulletin of National Institute of Oceanography and Fisheries World J. Fish Marine Sci., 1(1): 20-28.

Adeyemi, S. O.; Bankole, N. O.; Adikwu, I. A. and Akombu, P. M., 2009. Age, growth and

mortality of some commercially important fish species in Gbedikere Lake, Kogi State Nigeria. International Journal of Lakes and Rivers, 2(1): 63 – 69.

Bayoumi, A.R., 1969. Notes on the occurrence of *Tilapia zillii* (Pisces) in Suez Bay. Mar.Biol., 4: 255-256.

Begenal, T. B. and Tesch, F. W., 1978. Age and growth In:T.Bagena, editor, methods for assessment of fish production in fresh waters . IBp handbook No.3 (3rded) Black well scientific publications, oxford. pp 101-136(chapter 5).

Chervinski, J., 1972. Occurrence of *Tilapia zillii* (Gervais) (Pisces, Cichlidae) in the Bardawil lagoon in northern Sinai. Bamidgeh, 24(2): 49-50

El-Haweet, A. A., 1991. Biological studies of some *Cichlid* species in Lake Borollus. M.Sc., Fac. Sci. , Alex. Univ. Egypt.

El-Sawy, W.M.T., 2006. Some biological Aspects of Dominant Fish Population in Lake Edku in Relation to Prevailing Environmental Conditions. M.Sc. thesis, Faculty Sci., Zagazig Univ. Egypt.

El-Zarka, S.; El-Maghraby, A.M. and Abdel Amid, Kh., 1970. Studies on the distribution, growth and abundance of migrating fry and juvenile mullet in Brackish coastal lake (Edku) in the United Arab Republic. Stud. Rev. gen. Fish. Coun. Medit., 46: l-19.

Ford, E., 1933. An account of the herring investigation conducted at Plymouth. J. Mar. Biol. Ass. U.K., 19: 305 – 384.

Gulland, J. A. and S. L. Holt., 1959. Estimation of growth parameters for data at unequal time intervals. J. cons. Perm. Int. Explor. Mer., 25 (1) 47 – 49.

Gulland, J. A., 1969. Manual of method for fish stock assessment par, 1 fish population analysis FAO Man. Fish Sci., 4: 154.

Gulland, J. A., 1971. The fish resources of the Ocean. West Byfleet, Surrey, Fishing News (Books), Ltd... For FAO: 255pp.

Hadi. A. A., 2008 Some Observation on the Age and Growth of *Tilapia zillii* (Gervais, 1848)in Umhfein Lake (Libya).BiologyDepartment, Faculty of Science, Omar El-Mukhtar University, Tobruk, Libya. Benghazi University PressJournal of Science and Its ApplicationsVol. 2, No. 1, pp 12-21.

Lee. R. M., 1920. A review of the methods of age and growth determination in fishes by means of scales. Fish. Invest. Min. Agr. Fish. Sen 2, 4(2): 1-32.

Mahmoud Hatem H., EzzatAltaf A., T. El-Sayed Ali b, Abeer El Samman., 2014. Fisheries management of cichlid fishes in NozhaHydrodrome, Alexandria, Egypt. National Institute of Oceanography and Fisheries Egyptian Journal of Aquatic Research.

Mahmoud, H. H. and Mazrouh, M. M., 2008. Biology and fisheries management of Tilapia species in Rosetta branch of the Nile River, Egypt. Egypt. J Aquat. Res., 30: 272- 285.

Mehanna S.F., 2004. Population dynamics of two cichlids, *Oreochromis aureus and Tilapia zillii*, from Wadi El-Raiyan Lakes. Egypt. Agri. Marine Sci. 9(1):9-16.

Munro, J. L. and Pauly, D., 1983. A simple method for comparing growth of fishes and invertebrates. ICLARM Fishbyte, 1 (1): 5–6.

Patterson, K., 1992. Fisheries for small pelagic species: an empirical approach to management targets. Rev. Fish Biol. Fish., 2 (4): 321–338.

Paul, L. J., 1968. Early scale growth characteristics of the New Zealand, *Sparus aurata*(Forster), with reference to selection of a scale sampling site. N.Z.J Marine and Fresh water Res., 2:273-29.

Pauly, D., 1987. Areview of the ELEFAN syste for analysis of length frequency data in fish and aquatic in vertebrates. ICLARMC onf.Proa,13:7

Philips A.E., 2004: Biological studies on the main Cichlid fishes of the Nozha Hydrodrome, Alexandria, Egypt. Ph.D. Thesis, Fac. Sci., Zagazig Univ., Egypt.

Ricker, W. E., 1975. Computation and interpretation of biological statistics of fish populations. Bulletin Fisheries Research Board of Canada, 191: 1 –382.

Sangak, Y.K., 2010. Distribution and abundance of fishes with special reference to Tilapia species in Lake Burullos. Phd. Thesis. Fac. Of Sci., Zagazig Univ., Egypt.

Soliman T.B.H., 2005. Efficiency and selectivity of fishing gears and methods in Lake Edku and their effects on the stock of fish populations. M.Sc. Thesis, Fac. of Sci., Al-Azhar Univ., p. 356.

Ursin, E., 1967. A mathematical model of some aspects of fish growth, respiration and mortality. J. Fish. Res. Bd. Can., 24: 2355-2453.

Walford, L. A., 1946. A new graphic method of describing the growth of animals. Mar. Biol. Bull., 90 (2): 141 – 147.

العمر ، النمو والوفيات للبلطي الاخضر في بحيرة البردويل بشمال سيناء ، مصر.

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اجريت هذه الدراسة علي 1772 عينة يتراوح الطول الكلي لها من8 الي 21.3 سم ووزن من10 الي 165 جرام و جمعت من شهر مايو حتي شهر ديسمبر لموسم صيد 2015 . وتم تقدير علي العلاقة بين الطول والوزن وكانت .$W = 0.0189L^{2.99}$ واستخدم 312 عينة لدراسة العمر عن طريق القشور وكانت الاعمار تصل حتي خمس سنوات واستخدمت معادلة فون بترلانفي لقياس معدلات النمو وكانت علي النحو التالي $L_\infty=26.01$, $K=0.25yr^{-1}$, $t_0= -1.37yr^{-1}$ وكذلك كانت نتائج النفوق الكلي والنفوق الطبيعي والنفوق بالصيد علي النحو التالي 0.48 yr^{-1}, 0.30 yr^{-1} and 0.18 yr^{-1} يعلي الترتيب كذلك ووجد ان اقصي طول للأسماك الذكور والاناث معا كان خمس سنوات ومعدل الاستغلال للمصيد كان (E = 0.37) وهذا يعني ان استغلال البلطي الاخضر منخفض في منخفض البردويل وقد اوضحت الرسالة انه يجب منع صيد الاسماك الاقل في الطول من 14سم وذلك لإعطائها فرصة للتفريخ ولو مرة واحده علي الاقل وانه يجب حظر صيد الاسماك الناضجة خلال الفترة من يوليو ال اغسطس حيث موسم تفريخ هذه الاسماك في البحيرة.