بسم الله الرحمن الرحيم

Sudan University of Science and Technology

College of Graduate Studies

Some fisheries biological aspects for two Fish Species in Khashm El. Girba Reservoir

بعض جوانب بيولوجية المصائد لنوعين من أسماك خزان خشم القربة

Athesis Submitted in Partial Fulfillment of theRequirements for the Degree of Master in Science for fish Technology

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بسم الله الرحمن الرحيم

قَالَ تَعَالَىٰ:

﴿ يَسْـَٔلُونَكَ مَاذَآ أُحِلَّ لَهُمْۖ قُلۡ أُحِلَّ لَكُمُ ٱلطَّيِّبَٰتُ وَمَا عَلَّمۡتُم مِّنَ ٱلۡجَوَارِحِ مُكَلِّبِينَ تُعَلِّمُونَهُنَّ مِمَّا عَلَّمَكُمُ ٱللَّهُۖ فَكُلُواْ مِمَّآ أَمۡسَكۡنَ عَلَيۡكُمۡ وَٱذۡكُرُواْ ٱسۡمَ ٱللَّهِ عَلَيۡهِۖ وَٱتَّقُواْ ٱللَّهَۚ إِنَّ ٱللَّهَ سَرِيعُ ٱلۡحِسَابِ ٤ ﴾

صدق الله العظيم

سورة المائدة: الآية ٤

Dedication

I am dedicate this research to:

My Father,,,

My Mother,,,

All Fisheries in Sudan…

Acknowledgement

Firstly, thanks for almight Allah whom his help this study could not have been done, a lot of respect to my supervisor **Dr. Ahmed Elaabid** for his constant support, valuable guidance and encouragement during the preparation of this study.

I would like to thank the staff (of Fisheries Research Station center- in Khashm El Girba) for their help.

In the last I would like to thank my family and friends.

Abstract

The data used in This study was collected from Khashum El Girba during the period (November 2016 to December 2017) to show the variation in the total landings for major fish species, to estimate the length - weight relationships *O. niloticus* and *L. niloticus* with the condition factor and to indicate the spawning seasons of *O. niloticus* and *L. niloticus* depending on the (b) values from the length - weight Relationships .

The Total landings during study period show the highest landings during (Feb – May _ August) and the lowest landing during (November and December)

The length –weight Relationship for (*oreochromis* and *labeo niloticus*) were estimated and they were ($w=1.399L^{2.959}$) and ($w=1.567L^{2.9}$) respectively. The condition factor were calculated) k=3.7 in *O. niloticus* – k=2.9 in *L. niloticus*) also they shows a significant difference less than $p>0.05$ that means all the above depended variable are affected by the species of the fish. The highest values for (b) values were found to be during (April _September and November) for *O. niloticus* and during (March and December) for *L. niloticus* this indicated that spawning season for two species are during (May) (November).

المستخلص

البيانات المستخدمة فى هذه الدراسة جمعت من خشم القربة في الفتـــرة مـــن (نـــوفمبر 2016 إلـــى ديسمبر2017) لمعرفة الاختلاف فى الإنزال الكلى لمعظم الأسماك الموجودة في خشم القربة بالإضـــافة الى معرفة العلاقة بين الطول و الوزن فى(البلطى والدبس) ومعرفة مواسم التوالد لها اعتمادا على قيمـــة (b) من علاقة الطول بالوزن.

الإنزال الكلى خلال فترة الدراسة أن أعلاه في (فبراير ومـــايو. و اغســـطس) أدنـــاه فـــي (نـــوفمبر وديسمبر).

العلاقة بين الطول والوزن في البلطي والدبس تـــم تقـــديرها بالعلاقـــة(($w=1.399L^{2.959}$) للبلطـــي ($w=1.567L^{2.9}$) للدبس وتم حساب معامل الحالة.

أوضحت الدراسة أيضا ان هناك فروق معنوية باحتمالية اقل من 0.05.

وهذا يعنى أن الاختلاف يتأثر بأنواع الأسماك .أعلى قيمة للـــ (b) في أبريل وسبتمبر ونوفمبر للبلطـــي وفى مارس وديسمبر للدبس وهذه إشارة لمواسم التوالد الأسماك (في الفترة من مايو – إلى نوفمبر).

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Chapter One
Introduction

1. Introduction

1.1 Overview:

Fisheries rank first among the most important resources of food security programmers in the world, with at least 20.000 known species (Thurman and Webber 1984).

Fish can contribute much cheaper and better of animal protein which was regarded ancient time as excellent relatively cheap and available source of animal protein currently, over 5000 species of fin fish are used by human as sources of protein (ICLARM 1997 Ibrahim 1979).

In Sudan the total sustainable production amount estimated to be about 114.100 tones, year and human consumption is estimated at only 1.4 kg, year (Meske, 1985).

To overall percentage contribution from the Atbara river to the Nile water was estimated at 13%, but ranges from 22% during the flood season to nil (Roska 1976), (Ahmed 1978_Ibrahim 1984). However, the river – annual variations in discharges are large and range from 4 to 20 billion per year (El Moghraby *et al.*, 1993), and both before and after the building of the dam, a great length of the downstream portion of the river dries out completely for several months each year, normally from December to July (El moghraby *et al*,.1993).

The fishing gears used are gillnets for pelagic species and long lines for bottom shallow water. Beach seining is used in shallow waters to catch cichlids and characids. At the onset of the flood season "normally in July", when drift wood and debris washed in to the lake tend to damage the gill nets, meshed wire traps are used (King, . 1995).

Fisheries management and research often require the use of biometric relationships in order to transform data collected in the field into appropriate indices (Ecoutin and Albaret, 2005).

The length-weight relationship study is an approach that is widely applied in fisheries management as it provides information on stock condition (Bagenal and Tesch 1978). This relationship is used by fishery researchers and to compare the average associated parameters between fish groups spatially or temporally.

Length-weight relationship (LWR) of fishes are important in fisheries and fish biology because they allow estimation of the average weight of the fish of a given length group by establishing a mathematical relation between them (Sarkar *et al*., 2008 and Mir *et al*., 2012).

Objectives:

General objectives:-

- To show the variation in the total landings for the species in Khashm El Girba during (2016-2017).

- To provide baseline data of L-W Relationship for some species in Khashm El girba

Specific objectives of the present study

- To compare (a-b) L-W Relationship parameters for *O.nilotcus* and *L.nilotcus*
- Indicate spawning season of major species in Khashm El Gibran reservoir by using the values of (b).

Chapter Two
Literature Review

2. Literature Review

2.1 Importance of major fish species:

The cichlids and cyprinids *O. Niloticus* and *L. niloticus* are among the most important fishes of the reservoir.

Tilapia is common name for 70 species of perch-like fish (family Cichlidae) native to the fresh water of tropical Africa (Trewaves, 1983 Stiasany, 1991). *Labeo niloticus* is bottom mud sifter with a well- developed buco- pharyngeal filtering apparatus (Yousif, 1972).

2.2 The Total landings

Are defined as the catch that landed at any landing site and usually composed of many species found in fishing ground.

2.3 Length-Weight Relationship:

Weights are as good as length measurements but they are not used routinely because they are time-consuming to collect and liable to large inaccuracies. However, it is essential to establish length-weight relationships for all species because at some stage in stock assessments lengths of fish have to be converted to weights of fish (Khallaf *et al*., 2003). It is useful to have seasonal length-weight relationships for both whole and gutted fish; this is particularly useful for whole fish whose weight may be much greater during the spawning season than during the non-spawning season (Wallace *et al* .,1994; Blackhart *et al* .,2006).

Because most outlets for purse-seine-caught fish are bulk handled, it is possible to get catch information in two ways. The catch, as estimated by the skipper or mate, can be obtained by interview, together with other relevant information data of the length and weight of the fish have commonly been analyzed to yield biological information. The length weight relationship (LWR) is very important for proper exploitation and management of the population of fish species. LWR has a number of important application in fish stock assessment (Hajjej *et al*., 2010), to obtain the relationship between total length and other body weight are also very much essential for stabilizing the taxonomic characters of the species stated that LWR provides valuable information on the habitat where the fish lives while stressed the importance of LWR in modeling aquatic ecosystems (EL _ Moghraby M.I.,1993).

The length – weight parameters of the same species may be different in the population because of feeding, reproduction activities and fishing (Gutierre 2 Estrada *et al* 2000, Ritcher *et al.*, 2000). Therefore, data on functional LWR of fish species is important for fish stock assessment and parameter and can be used for length – weight conversion.At the same time the relationship of length – weight estimates condition factor (K) of the fish species and fish biomass through the length frequency (Wallace et al., 1994; Blackhart *et al*., 2006).. In fisheries science the condition factor used in order to compare the "condition" "fatness" or wellbeing of fish – it's based on the hypothesis that heavier fish of a particular length are in a better physiology condition. Condition factor is also a useful index for monitoring of feeding intensity age, and growth rates in fish. It is strongly in flounced by both biotic and abiotic environmental condition and can be used as an index to assess the states of the aquatic ecosystem in which fish live.(Egbal . 2011)

The estimation of fish condition factor assuming that a heavier fish a given length in a better condition can in tended by LWR . The objective of the present study was to provide baseline data on length– weight relationship for two major species "*oreochromis niloticus*" (cichlidae) and *labeo niloticus.* (Cyprinidae).

The (b) value indicates whether the growth is Isometric growth, or allomitric growth. Isometric growth is associated with no change of body shape as an organism grows. Negative allometric growth implies the fish becomes more stander as it increase in weight while positive allometric growth implies the fish becomes relatively stouter or deeper – bodies it weight relationship (LWR) Knowledge of LWR allows, in a given geographic zone, the estimation of the average weight at given length (Ferreira *et al*. 2008) Moreover, this tool may provide important information comparison between species and populations (King 1996, Gongalues *et al*, 1997) and life history comparisons between regions (Weatherly and Gill 1987). In all fish sampling programs the length and weight data are standard. The (LWR) helps to clarify the functional relations between the growth and the environmental condition which allow forecasting the variation of the population dynamics under different environmental scenarios (Gutierrez- Estrada *et al* 2000, Ritcher *et al*, 2000).

2.4 The Condition Factor:

Condition factor compares the well-being of a fish, and is based on the hypothesis that heavier fish of a given length are in a better condition (Bagenal and Tesch, 1978, and Abowei and George, 2009). Condition factor has been used as an index of growth and feeding intensity (Fagade, 1979, and Abowei *et al*., 2009). It decreases with increase in length (Abowei, 2010). The condition factor of fish can be affected by a number of factors such as stress, sex, season, availability of feeds, and other water quality parameters (Khallaf *et al*., 2003)

The condition factor (K) reflects, through its variations, information on the physiological state of the fish in relation to its welfare when condition factor value is higher it means that the fish has attained a better condition. (Abowei 2009; Ighwela *et al*. 2011)

2.5 Spawning Season:

Some species exhibit a different ring structure after the onset of spawning. In. These post-spawning zones can be identified, counted and the otoliths used to provide data on the number of times each fish has spawned, in addition to giving the age (Rollefsen, 1933) .

As in maturity stage estimations the simplest case is that of total spawners . Seasonal changes in temperature, rain fall, day length, chlorophyll concentration and water level often corresponded with changes in the annual spawning cycle.

Oreochromis. niloticus produces very few ova that are mouth- breed after fertilization whereas *L. niloticus* compensates losses by high fecundity (Ahmed 1978, Babiker and Ibrahim 1979). *L. niloticus* probably spawns once every year but ore. Niloticus may breed more than once annually (Lowe 1956, Zarka *et al.*, 1970, Ibrahim 1979).

During the spawning season, oocyte development is a continuous process involving all stages of oocyte, with a new spawning batch maturing every week to days in peak spawning months (Hunter And Leong, 1981)

Environmental manipulation to induce Ovulation and spawning in fish has been reviewed by Lam (1983) and Munro, 1987).

Spawning season determination:

- Histological examination of gonads usually are suitable to determine the precise duration of the spawning period.
- The spawning season, can be defined by observing the mean monthly variation in the gonad somatic index (Peterson, M.S., W.T. **J.L. McDonald, 2004)**.
- Using spawning potential rations or indirectly by using the steepness of the spawner recruit relationship.
- By incidence of post-ovulatory follicles the remnants of ovulated follicles (Zaria El 1970).
- The simplest way to indicate the spawning season is by the value of (b) in the W-L relationship .

Chapter Three
MATERIALS AND METHODS

3. Materials and Methods

3.1 Study Area:

Khashm El Girba reservoir located in the arid desert landscape of Eastern Sudan. Was erected a cross the river Atbara, tributary to the Nile, in 1964 to provide irrigation water and hydroelectric power to the Khashm El Girba Agricultural scheme. But is the one with the strongest seasonality and extreme flow regime .The sources are close to the blue, and Lake Tana in Ethiopia (Roska 1976). From Ethiopia the Atbara River flows through and crosses the border to the Sudanese territory some 100 upstream of the Khashm el Girba Dam. Downstream it joins the main Nile about 320 north of the confluence of the blue and white Niles.

The fish samples were obtained from the Khashm el Girba is located in an arid zone at the eastern Sudan and less at 14° 55 “35”N and 35° 53‘20’E

It was constructed across at Atbara River in 1964, mainly to provide irrigation from the population displaced by the rising water of Lake Nubia “the southern part of the high dam reservoir on the Nile River. Fisheries conservation in the Dam – reservoir has special problem, because each year it in flushed to remove silt and debris, as a result of which these fish population suffer great lessees ever year. This is through mass mortality due to the high speed of correct and the blockage of gills by silt in addition to carry over part of the population downstream (Ibrahim 1984).

3.2 Sampling of Fish:

A total of 734 fish samples belonging to families cichildae, were sampling randomly from the sampling station the Khashm el Girba. (Hajralhmam, Moswada, Gargof, Sharfa, Turat Halfa), were shown in between November 2016 to July 2017.

The Fisher folks operation in this reservoir deploy surface and bottom set gill nets using various mash size ranging from 5 – 7.3 – 8.8 – 10 and 12 cm.

The length (cm) of each fish was taken from the tip of the snout “mouth closed” to extended tip of the caudal fin using a measuring board.

The length measurements were taken using a measuring board as follows:

The total length (TL) was the greatest length of the fish from its anterior end the tail fin.

The standard length (SL) was measured from the tip of the snout closed to the hidden base of the median tail fin rays.

Body weight was measured to the nearest gram using Electronic balance "KRUTPS type 875".

3.3 Data Analysis:

3.3.1 Total landings for the species of the study from Khashm El girba during (2016-2017).

The total landings were calculated for many species that landed in khasum El Girba. And they were plotted all around the period of study to show the variation among them.

3.3.2 Length - weight Relationship & and condition factor;-

Following Santos *et al*. (2002), a power curve (Equation I) was filed to the L-W data.

$$W = aL^b. \ .... (1)$$

This equation can also be expressed in its logarithmic from (Equation2);

$$\text{Log } w = \log a + b \log l. \ .... (2). \text{ (Zar, 1984)}$$

Where;

W = total weight (g),

L = the total length (mm)

a= the intercept (initial growth coefficient or condition factor),

b = slope (growth coefficient, I., fish relative growth rate).

In equation (1), a = weight

x = length *b unit, and is a dimensionless constant (Xiao 1998).

Parameters a and b of the l-w relation were estimated by linear regression analysis (least -squares methods).

Measures were log- transformed in order to eliminate any effect of “scale, to keep relation linear and their variation comparable. The degree of association between variables (L and W) were assessed by the coefficient of determination (R^2).

Statistical significant is expressed by the slope b of the linear regression equation. In the relations between different type of variables (size and weight), the l-w relationship reflects an isometric growth when b=3, where the relative growth of both variables is perfectly identical (Mayra 1970).

The relationship of length - weight was calculated using the formula.

Variation in the length- weight relationship “represented by b ≡ growth coefficient) and condition factor “represented k” of individual fish living in Khashm El-Girba reservoir were described throughout November 2016 – to December 2017.

$K = (\frac{w}{(L)^{3*100}})$. (Pauly, 1983)

Where:

K= Condition factor

W = weight in gram

L = total length

Relationship of weight from length for each L. niloticus and O.niloticus “Table 1” compare a and b≡ constant – b= regression co-efficient “Tudorancea - 1988”.

Condition factor (k) has been widely used by the fisheries profession. Carlander (1950) identified k as a sensitive measure of change and differences in body form.

Condition factor assumes isometric growth (b=3, fish slope does not change with growth and is calculated as the ratio between the observed weight and an expected weight dependent of the fish length .

The constant a, b in the power curve relationship Table

$$y = a + bx$$

y =Weight

x =Length

a, b = constant

$$a = 0.05$$

$$b = 2.8$$

Length to the Labeo niloticus between “8– 44 cm and weight limit between “5 - 705”g.

From oreochermis niloticus length limit between “7 – 32 cm” and weight limit between “7 – 56 g”.

Condition factor of the fish ranged from (1.46 to 3.19). The values were found to be significantly different between months. Anova – p< 0.05”.

The values wavering were relatively between November 2016– to December 2017 through the graph can knowledge the season of breed “graph 1”.

3.4 Spawning Seasons:

The highest values of (b) during the study period for each species is taken as/ indication for the spawning season of the species

Chapter Four

Results

4. Results

4.1 Total landings for the species in khashm El girba and disterbution during (2016-2017).

The total landings during the study from period are presented in the figures below.

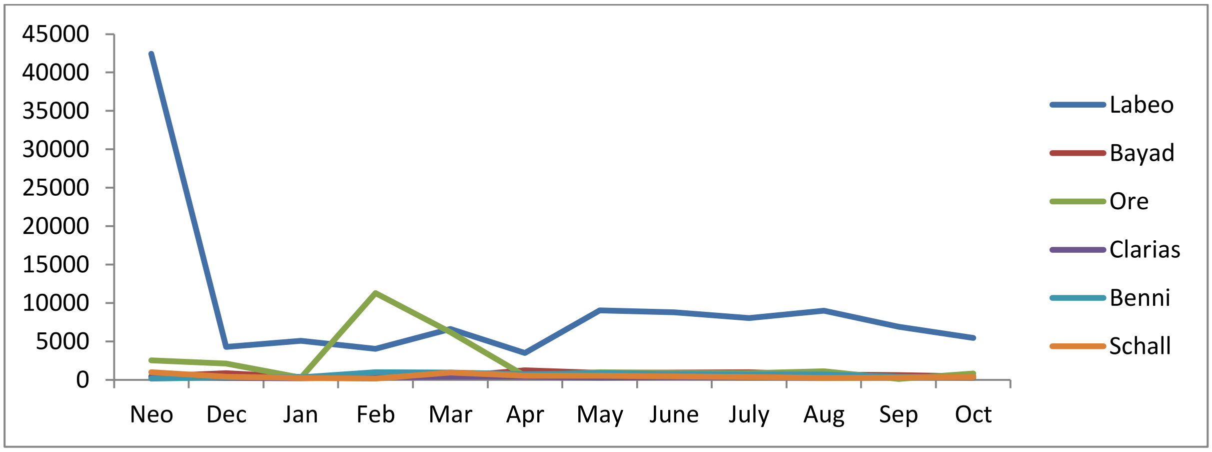


Figure (4-1): the variation in the total landings for the species for (*labeo, bayad, ore., Clarias, benni, schall*).

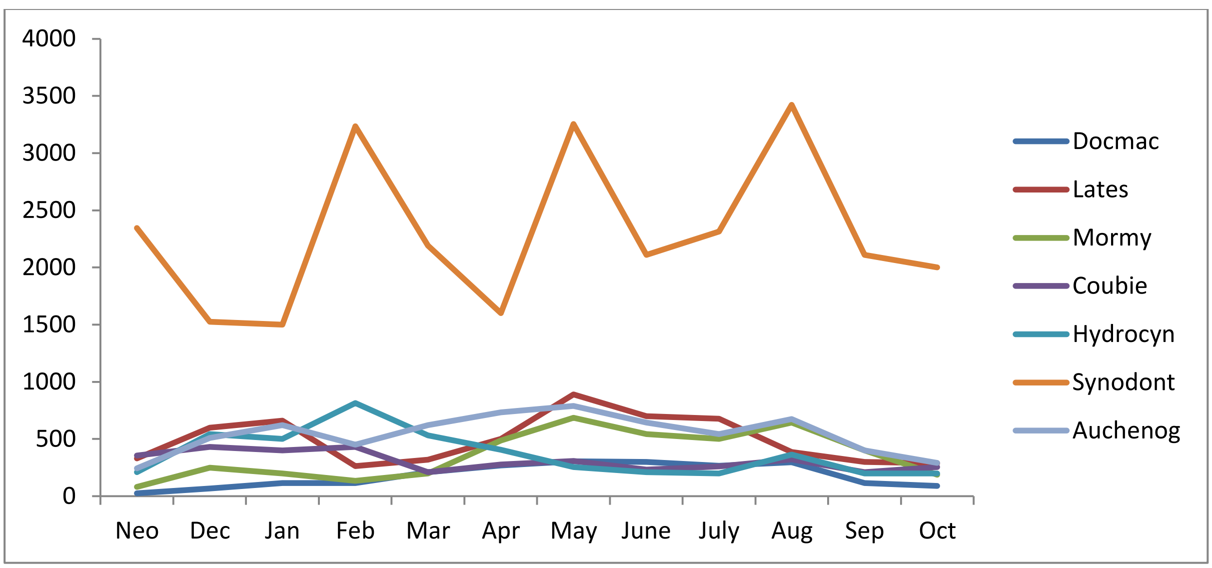


Figure (4-2): the variation in the total landings for the species for (*Docmac, lates, Mormy, Coubie, Hydrocyn, Synodont and Auchenog*)

4.2 Distribution of length through year for *O.niloticus* and *L. niloticus*

Table (4-1):Length Frequency of from weight through year for *Oreochromis niloticus* (length)

Length limit	Frequency
7 - 12	17
12 - 17	18
17 - 22	319
22 - 27	61
27 - 32	2

Table (4-2): Length Frequency of from weight through year for *Oreochromis niloticus* (weight)

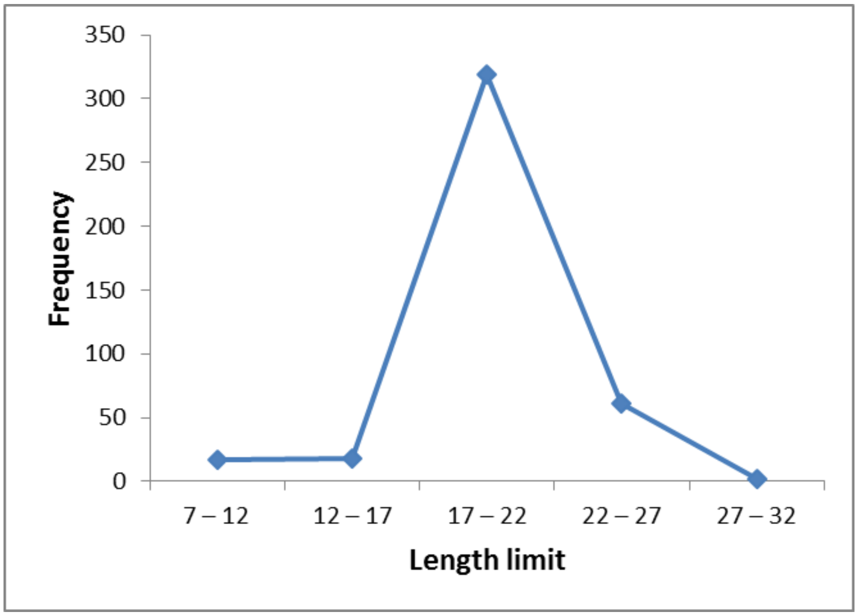
Weight limit	Frequency
7 - 14	22
14 - 21	15
21 - 28	45
28 - 35	102
35 - 42	82
42 - 49	49
49 - 56	80

Table (4-3): length Frequency from weight through year for *Lebeo niloticus* (length limit)

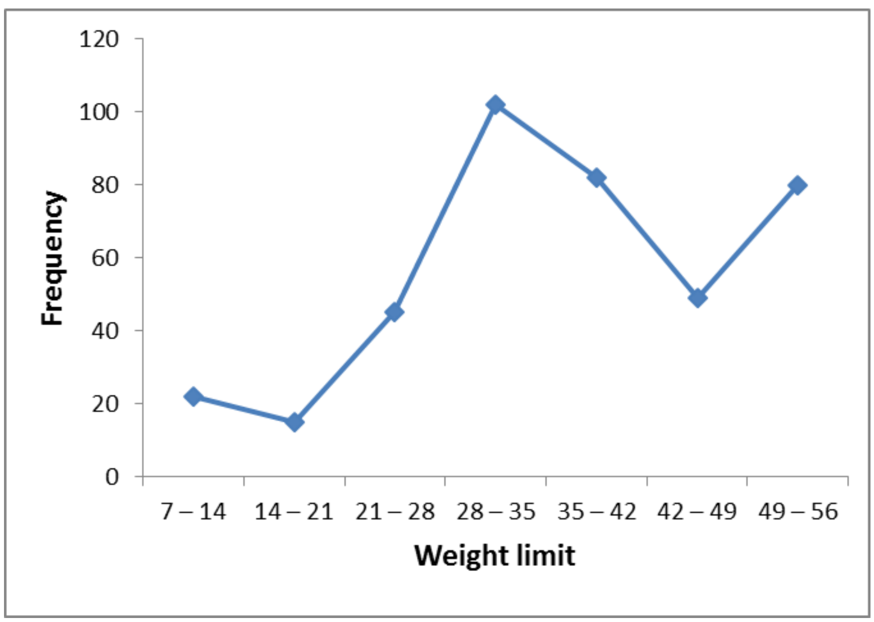
Length limit	Range	Frequency
8 – 12	10	14
12 – 16	14	130
16 – 20	18	68
20 – 24	22	15
24 – 28	26	48
28 – 32	30	59
32 – 36	34	31
36 – 40	38	7
40 – 44	42	3

Table (4-4): Length Frequency from weight through year for *Lebeo niloticus* (weight limit)

Weight limit	Frequency
5 – 55	124
55 – 105	42
105 – 155	38
155 – 205	39
205 – 255	37
255 – 305	27
305 – 355	20
355 – 405	12
405 – 455	12
455 – 505	16
505 – 555	3
555 – 605	2
605 – 655	1
655 – 705	2



Figure(4-3) Length Frequency of from weight through year for *Oreochromis niloticus* (length)



Figure(4-4). Length Frequency of from weight through year for *Oreochromis niloticus* (weight)

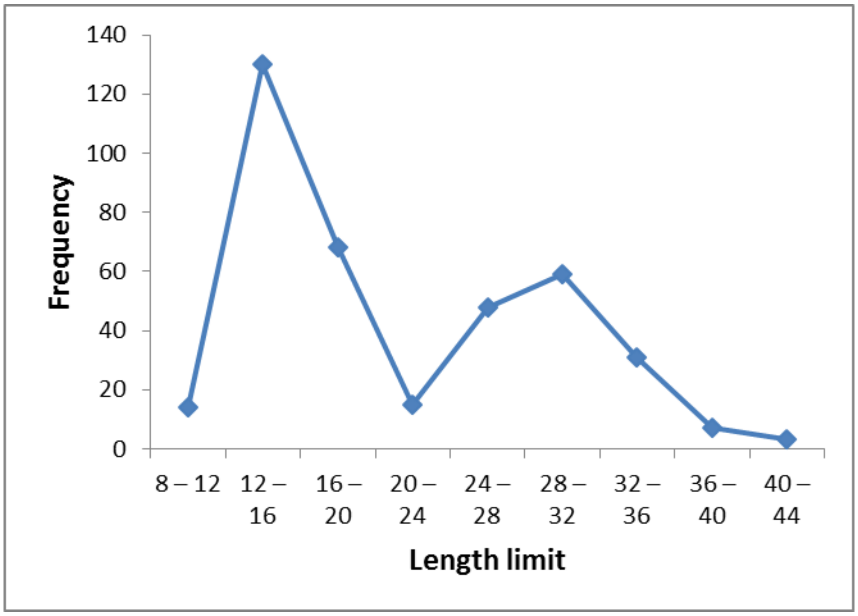


Figure (4-5) Length Frequency from weight through year for *Lebeo niloticus* (length limit)

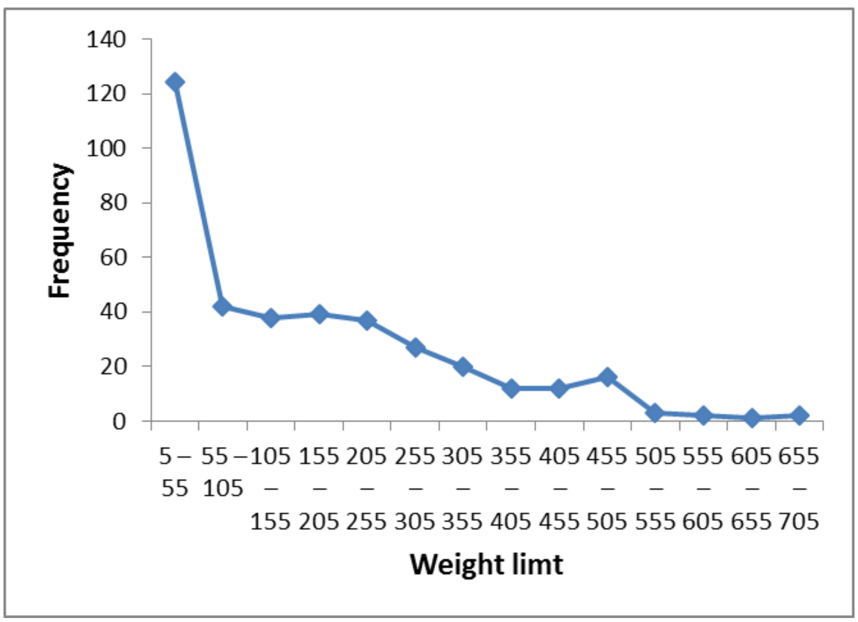


Figure (4-6)Length Frequency from weight through year for *Lebeo niloticus* (weight limit)

4. 3 Length- weight Relationship of Related statistic in Kashamel girba Reservoir:-

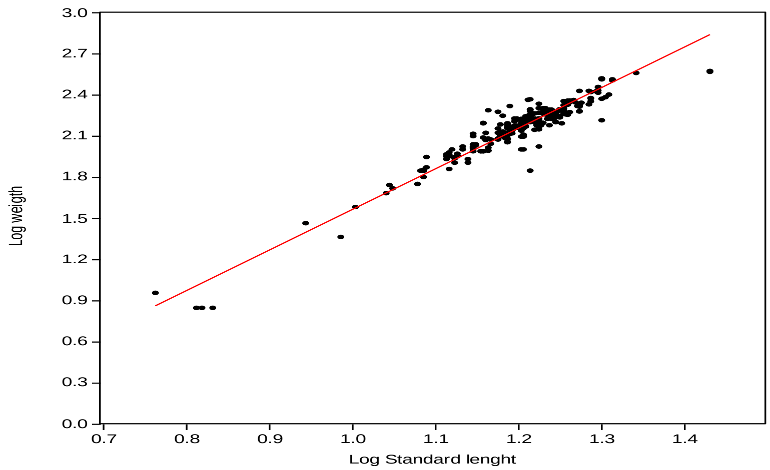


Fig. (4-7): length-weight relationship of overall of *O. niloticus*.

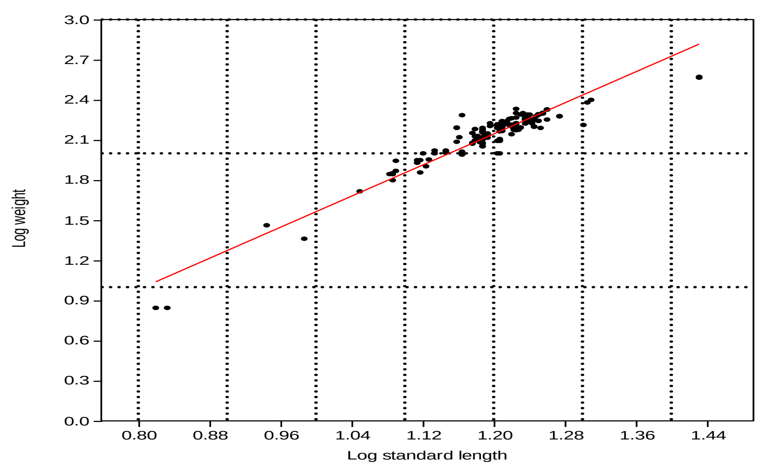


Fig. (4-8): length-weight relationship of female of *O. niloticus.*

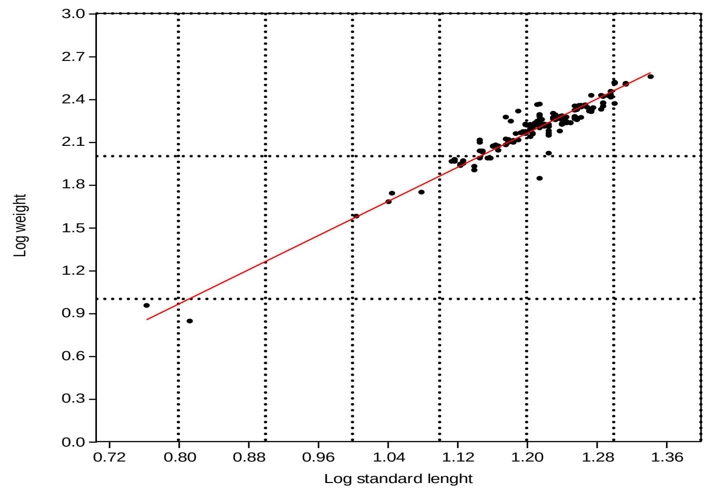


Fig. (4-9): length-weight relationship of male of *O. niloticus.*

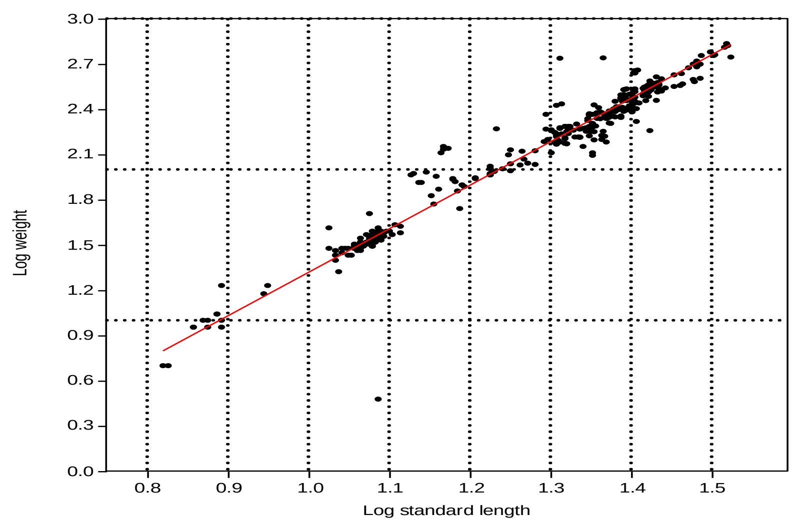


Fig. (4-10): length-weight relationship of overall of *L. niloticus*.

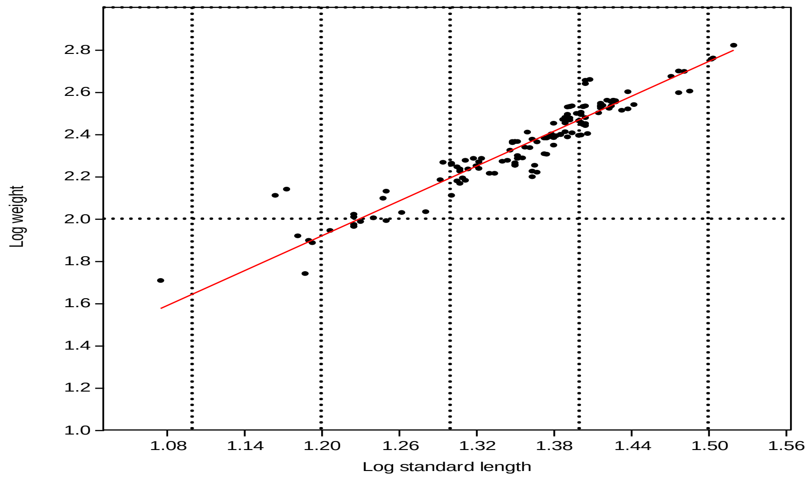


Fig. (4-11): length-weight relationship of female of *L. niloticus.*

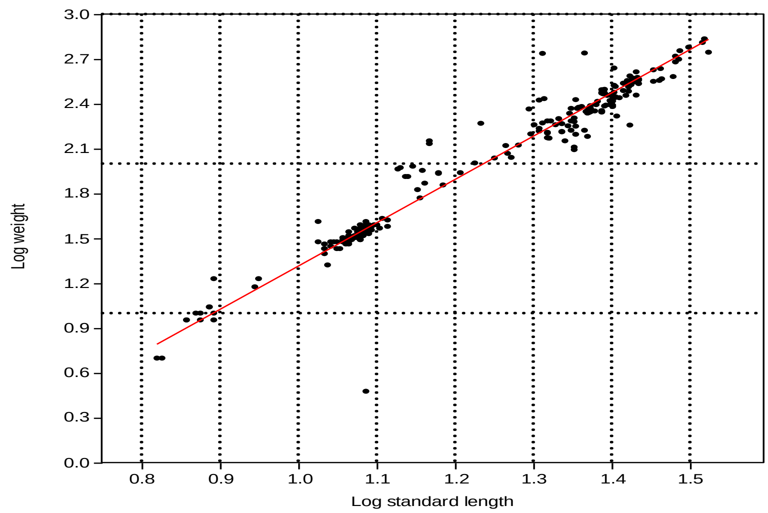


Fig. (4-12): length-weight relationship of male of *L. niloticus.*

Table (4-5): Association between weight and length of male and female of *O. niloticus.*

Specimens	Equation model	*r*	r^2
Overall	Log Y= - 1.399 + 2.959 Log X	0.95201	0.90633
Female	Log Y= - 1.341 + 2.905 Log X	0.94322	0.88996
Male	Log Y= - 1.429 + 2.990 Log X	0.9608	0.92313

Table (4-6): Association between weight and length of male and female of *L. niloticus*.

Specimens	Equation model	*r*	r^2
Overall	Log Y= - 1.567 + 2.885 Log X	0.97408	0.94883
Female	Log Y= - 1.384 + 2.752 Log X	0.9469	0.89662
Male	Log Y= - 1.581 + 2.895 Log X	0.9725	0.9458

Table (4-7): Condition factor of *O. niloticus.*

Months	Overall	Female	Male
Dec – 2015	3.715 ± 0.170	3.395 ± 0.728	3.826 ± 0.016
Jan – 2016	3.322 ± 0.510	3.192 ± 0.566	3.497 ± 0.536
Feb – 2016	3.562 ± 0.270	3.670 ± 0.286	3.574 ± 0.224
March – 2016	3.378 ± 0.482	3.292 ± 0.568	3.478 ± 0.245
Apr – 2016	3.525 ± 0.295	3.511± 0.289	3.616 ± 0.277
May – 2016	3.454 ± 0.448	3.459 ± 0.449	3.591 ± 0.474
Jun – 2016	3.449 ± 0.324	3.447 ± 0.376	3.662 ± 0.227
Jul – 2016	3.453 ± 0.340	3.479 ± 0.345	3.666 ± 0.274
Aug – 2016	0.0	1.0	1.0
Sep – 2016	3.414 ± 0.564	3.601 ± 0.721	3.757 ± 0.189
Oct – 2016	3.617 ± 0.343	3.704 ± 0.345	3.707 ± 0.209
Nov – 2016	3.487 ± 0.766	3.809 ± 0.129	3.566 ± 0.279

Table (4-8): Minimum, Maximum and average of condition factor of *O. niloticus.*

	Overall	Female	Male
Min	1.111 ± 0.416	1.870 ± 0.249	1.632 ± 0.324
Max	4.113 ± 0.416	4.001 ± 0.249	3.992 ±0.321
average	3.460 ± 0.416	3.466 ± 0.428	3.611 ± 0.321

Table (4-9): Condition factor of *L. niloticus*.

Months	Overall	Female	Male
Dec - 2015	2.666 ± 0.390	0.00 ± 0.00	2.654 ± 0.385
Jan – 2016	2.751 ± 0.169	1.898 ± 0.107	2.803 ± 0.000
Feb – 2016	2.602 ± 0.379	1.815 ± 0.262	2.509 ± 0.408
Mar – 2016	2.783 ± 0.416	1.992 ± 0.260	2.549 ± 0.437
Apr – 2016	2.723 ± 0.407	1.889 ± 0.295	2.665 ± 0.440
May – 2016	2.668 ± 0.431	1.868 ± 0.296	2.586 ± 0.473
Jun – 2016	2.577 ± 0.355	1.797 ±0.278	2.511 ± 0.458
Jul – 2016	2.785 ± 0.457	2.234 ± 0.693	2.624 ± 0.524
Aug – 2016	0.0	0.0	0.0
Sep – 2016	2.528 ± 0.000	1.749 ± 0.000	0.000 0.000±
Oct – 2016	2.658 ± 0.186	0.000 ±0.000	2.588 ± 0.182
Nov - 2016	2.929 ± 0.489	2.002 ± 0.327	2.871 ± 0.514

Table (4-10): Minimum, Maximum and average of condition factor of *L. niloticus.*

	Overall	Female	Male
Min	1.420 ± 0.393	1.282 ± 0.359	1.370 ± 0.414
Max	3.993 ± 0.393	3.869 ± 0.359	3.984 ± 0.414
average	2.707 ± 0.393	1.923 ± 0.359	2.625 ± 0.414

Table (4-11)b value monthly of *O. niloticus.*

Months	Overall	Female	Male
Dec. 2015	2.586	0	0
Jan. 2016	3.276	3.469	3.287
Feb. 2016	2.698	2.547	3.191
Mar. 2016	2.570	2.290	3.185
Apr. 2016	3.014	3.376	2.838
May 2016	2.717	2.085	4.068
Jun. 2016	2.890	2.444	2.959
Jul. 2016	2.876	2.458	2.971
Aug. 2016	0.000	0.000	0.000
Sep. 2016	3.670	3.393	3.055
Oct. 2016	3.299	3.194	3.113
Nov. 2016	3.805	2.887	3.437

Table (4-12) b value monthly of *L.niloticus.*

Months	Overall	Female	Male
Dec. 2015	3.067	0.000	3.068
Jan. 2016	3.140	3.547	0.000
Feb. 2016	2.742	2.619	2.730
Mar. 2016	3.281	3.043	3.364
Apr. 2016	2.741	2.828	3.229
May 2016	2.970	2.897	3.228
Jun. 2016	2.852	2.921	2.736
Jul. 2016	2.258	2.284	2.554
Aug. 2016	0.000	0.000	0.000
Sep. 2016	0.000	0.000	0.000
Oct. 2016	2.687	0.000	2.687
Nov. 2016	2.734	3.116	2.702

The length-weight distribution of the two species fish collected from the Roseires reservoir were analysed in this study. The species, length-weight relationship parameters a and b, 95% confidence interval for b and correlation coefficient (r) are presented in table (5) and table (6), while number of specimens, min-max length, min- max weight and condition factor of fish species are presented in Table (7)(8)(9) and(10). The estimated value of allometry coefficient (b) ranged between (2.9) for *O.niloticus* and (2.8) for *L. niloticus* . The values of correlation coefficient (r) varied from 0.952 in *O. nilotcus* to (0.974) in *L.nilotcus* . The highest condition factor (K) (3.7 -0.170)and lowest condition factor (K) (3.3 -0.482) in *O.niloticus*. while the highest of (K) (2.9 -0.489) and lowest of (K) (2.5 - 0.000) was recorded in *L.niloticus.*

The highest b value is (3.805) in *O.niloticus*. (table 11) and highest b Value is (3.281) in *L.niloticus.* (table 12).

Chapter Five

Discussion

5. Discussion

The study explain the relationship in the length – weight in *O. niloticus* female is very strong more than male. In two sex there found relationship between L and W “Significant” that means either increase in length also increase the weight from two sex in all samples. the difference between the sexes are significant at the reservoir $p<0.05$ show “Table (5)(6)”.

Length –weight relationship parameters (a & b) are useful in fisheries sciences in many ways: to estimate a weight of individual fish from its length- to calculate conditions indices, to compare life history and morphology of populations belonging to difference regions (Petrkis, 1995) And to study ontogenetic allometric changes (Teixera and Mello, 2006).

Relationship of fishes are important in fisheries biology because they allow the estimation of the average weight of fish of a given length group by in establishing mathematical relation between the two.

When the b-value is less than 3, the fish has a negative allometric growth but when it is greater than 3, it has a positive allometric growth and when it is equal to 3, the fish has isometric growth (Khairenzam and Norma Rashid, 2002).

Similarly when b is far less or greater than 3, growth in the fish is allometric i.e. the fish becomes thinner with increases in length (King R. P., ICLARA, 1996).

When means that there was a high correlation between the total length and total weight (Marioghae I E .1982). This means that as the length of fish increase the weight increase in the same proportion.

Coefficient of determination was also high (R^2 =0.0.923 in O.niloticus, L.niloticus= 0.945) Which indicated that the model used for the analysis fits the data (Andem A B., *et al* 2013) .

L. niloticus during this study have showed negative allowmetic growth pattern indicated by the growth coefficient (b= 2.8) (Egbal *et al*., 2011).

The calculated condition factor (k) was (*O.nilotcus* =3.7, *labeo* =2.9) indicated that the two fish species in this study was in a good condition ($k > 1$) (Barnham C., and Baxter, 1998). K value of the rest of species were >1 showing their perfect condition whereas, its value <1 reflects that the well being of the fish is not in a good condition (Manorama & Ramanujam 2014). In the present study, the condition factors revealed that of the fish species had their K values more than one, indicating that the well being of fishes are good in the Kahshm AlGebra reservoir .

Length -weight Relationship in *O. niloticus* (relation was highly significant anova, p<0.05.with explained variances of more than 95% .

The total length versus standard length thehigt correlation (*O.niloticus*=0.952---*labeo*=0.974).

The values of coefficient relationship measurement in table (5) and (6) related to total length over standard length the high correlation .

The result of the present study showed that the growth of the species in the reservoir was allomitric growth. This means that the fishes do not growth. This means that the fishes do not growth symmetrically (Tesh, 1968) or the fish becomes thinner with increase in length (King R.P.,1996).

The values in length – weight relationships determine the growth pattern of the fish species. When b is equal to 3 or close to 3, growth in the fish is said to be isometric i.e. fish becomes more robust with increasing length (Bagenal and Tesch, 1978). Similarly when b is far or greater than 3, growth in the fish becomes is allometric i.e. the fish becomes thinner with increase in length (King, 1996). The Cichlids (*Oreochromis niloticus*) in the present study has b value was found between _3.7___ and ___5___ belongs to the fish family cyprinidae and had a b. value range of between _2.9_____ and __5____.

(Dan – Kishiya, A.S.) The body length – scale radius relationship change seasonally (Reay, 1972) assessment (Pauly, 1993).

Tilapia (*Oreochromis niloticus*) (Linnaeus, 1758) is native to Africa, ranging from the upper Nile River south to the equator and west to the Atlantic cost (Trewavas 1983).

The species is favored among aqua culturists due to its ability to tolerate a wide range of environmental conditions, fast growth, successful reproductive strategies, and ability to feed at different trophic levels. These same traits allow them to be an extremely successful invasive species in subtrophic and temperate environments (Peterson *et al*. 2005).

One the fallacies that fostered the successful introduction of Nile tilpia and other tailpipe Cichlids in to temperate environments of the United States (Fuler *et al*. 1999, Rico and Schofield, 2011).

Survive cold winter temperatures; therefore, concert over escape from an aquaculture facilities cold winter temperature; therefore, concern over escape from aquaculture facilities was fishes of the genus *Labeo* consist of at least 80 species, which comprises about 16% of the African cyprinid ichthyofauna (Reid, 1985). Most *Labeo* spp are important throughout the African continent, contributing significantly to various fisheries (Delaney *et al*., 2007). Where they serve as food fishes, thus supporting the fishing industry (Corbet *et al*, 1961).

The length weight distribution of two species collected from the khashm el. Girba reservoir were analyzed in this study the species, length – weight relationship parameters and 95% confidence interval for b, correlation – the estimated value of allometry coefficient (b) = 2.8, the fish grow isometric ally resulting in ideal shape of fish experiences a negative allometric growth lebeonilotics and orechromis respectively suffered from this pattern of grow following the positive allometric pattern. The weight of fish increased when they utilize the food items that are available for growth and energy (kamaruddin et al ,2012 offemet al 2007).

The oreochromisniloticus respectively from the reservoir ha positive Allomitric growth (Egbal ,*et al*., .2011).

According to the sign of the slope $(y = 0.05 + 2.8 \times x^b)$ indicate that where is (+) relationship between the variable (weight – length) when X increase by I unit y increase by 2.8. As the values of b increase, the size of fish also increases because the fish usually grows proportionately in all direction.

However, the changes in fish weight in general are actually greater than the changes in its length. The 95% confidence interval of b for all the fish species ranged from 2.5 to 5 the length – weight distributions of fishes from khashm el. Girba reservoir showed considerably large variation in fish sizes indicating that the samplings with gillnet were carried out efficiently. Selection of mesh size of nets also contributed to the minimum – maximum length of fish caught (12 – 93 cm) hence the weight ranged from 25 to 2100 g. the size fish captured ranged from the smallest to the biggest and from.

Young to adult stags with differences in their growth rates.

The length-weight distributions of fishes from Roseires reservoir showed considerably large variations in fish sizes indicating that the samplings with gill nets were carried out efficiently. The size of the fish captured ranged from the smallest to the biggest and from young to adult fferences in their growth rates (Fafioye *et al*., 2005). The slopes (b) of the fish L-W regression lines from the reservoir fell within 3.7 and 2.9 This is similar to the observations of previous studies of Tiago *et al*., (2017). Differences in b value can be attributed to the combination of one or more factors such as: number of specimens, gonadmaturity, sex, health, habitat, seasonal effect etc. (Wootton 1991). Values of the exponent 'b' provide information on fish growth. When b = 3, the fish grows isometrically resulting in ideal shape of fish such was not observed for all fish sampling in this study. When the value of b is less than 3.0, the fish experiences a negative allometric growth and positive allometricgrowth when the value of b is greater than 3.0 (Froese 2006). In this study, the regression trend indicate that, all fish species exhibited negative allometric growth pattern($b<3$) in *L.niloticus* , and positive allomtric growth $b>3$ in *O.niloticus*. Many factors could contribute to the differences of growth of fish such as differences of habitat, fish activities, food habits and seasonal growth rates (Lowe, 1987 & Mizuno, 1982.). Other factors such as temperature, trophic level and food availability in the community were also important. The correlation coefficient (r) for length-weight relationships is high for all fish species which indicates that the length increases with increase in weight of the fish. This is in agreement with previous studies on different fish species from various water bodies, (Fagade, 1983; Layèyè, 2006; Ayoade and Ikulala, 2007 & Egbal *et al*.,2011). The condition factor (K) reflects, through its variations, information on the physiological state of the fish in relation to its welfare. From a nutritional point of view, there is the accumulation of fat and gonad development (Le Cren, 1951). From a reproductive point of view, the highest K values are reached in some species (Angelescu *et al*., 1958).The condition factor value estimated in this study compared to previous work showed that it's close to the values reported by Abowei, 2010, Mousavi-Sabet *et al*., 2013 and Seiyaboh *et* *al*.,2016, these results were almost same as our study. K value of the rest of species were >1 showing their perfect condition whereas, its value <1 reflects that the well being of the fish is not in a good condition (Manorama & Ramanujam 2014).Therefore, there would be need for more studies on the relationships and condition factors of some fish species in the reservoir.

The condition factor (k) reflects, through its variation in *L.niloticus*– and *O.niloticus* information on wlfare. From a nutritional point of view, there is the accumulations of far and ganad development the condition factor of *O.nilotics* (3.7) and L.nilotics (2.9).

That Khashm el. Gibra reservoir has been flushed annually, because it faces serious siltation problem, which is very critical in the sense that the reservoir is losing storage capacity at an average rate of 40 million$m^3/year$. In this process complete drainage of the reservoir occurs within approximately nine hours when the dam gates are fully opened. During the flashing process massive mortality of fish occur, the process is detrimental factor which affects various fish population as considerable amount of fish was last in the reservoir. For this reason suggests that the condition of khashm el. Girba reservoir in comparison to fresh water bodies may by unfavorable to fishes in the reservoir.

Fisheries conservation in the Dam – reservoir has aspecial problem, because each year it is flushed to remove silt and debris, as result of which the fish population suffers great losses due the high speed of current and the blockage of gills by silt in addition to carrying over part of the population downstream.(El-Moghraby A. I., Mishrigi S.Y. and Kheir H. (1993)

5.5 The spawning season of fishes in Kasham El-girba reservoir:-

Oreochromis niloticus two spawn season first in Jan to mar the second season in November to September.(Balarin 1979).

However, annual periodicity of *O. niloticus* reproduction was more likely influenced by the ephemerides cycle.

The spawning season of *O. niloticus* is influenced by latitude (reviews by Lowe- Mc Connell 1958, Zohar 1982, Trewavas 1982).

Influence of rainfall on tilapia reproduction is also well documented , although its role is often difficult to isolate from that of flooding (Lowe - M c Connell 1958 , 1959 , Steward 1988) . The regulation of photoperiod on fish reproduction is well established in temperate regions, whereas it is often neglected in tropical and sub – equatorial regions because its relative constancy . Congeneric species of fish often hybrididize in nature (Hubbs , 1955 and Schwartz , 1972) .

Nine tilapia reach sexual maturity between 5 and 10 months when they reach a total length of 9 – 15 cm , The spawning stage was recorded from April to November for female and to October for male .

- *Lebeo* – has two spawn season first in March to May.

Conclusion and Rrecommendations

Conclusion:

In conclusion the present studies found that each species of fish inhabiting the khashm el. Girbareservoir had different length and weight relationship due to factor such as differences in length and body weight, differences in food availability in lotic and lentic environments and other environmental condition (build up the dam the and decrease in fish quantity) more of the fish and variation in the spawn season in most species of the fish and vibration through year the lowest level of abundance occurred in summer “February to Junel the numbers of fish caught started to increase gradually from about m id – July and reached a peak in May and October, and in early November in the reservoir.

The most frequency of length to weigh through year for orechromism nilloticus in range (7 – 32) generally the frequency of length is lower in large weight.

Recommendations:

The study recommended the following:

More biological study should be done at Kasham El-Girba reservoir.

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