BIOLOGICAL STUDIES ON SUDANESE INLAND FISHES

I Lates Niloticus

BY

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INTRODUCTION

Like any other living organisms fishes are affected by certain physical factors which limit their-distribution. Of these variable factors, mountains, thick forests, arid deserts, streches of water, as well as temperature, chemical properties of water, salinity, currents etc. are among the conditions which limit the wanderings of many fishes. Extensive journeys are undertaken by fishes from one place to another distant locolity. Spawning or feeding migrations might take place regularly at certain seasons of the year (Norman, 1958).

When studying population or individual species in relation to environmental factors, it is necessary to take into consideration the nature of the life cycle of the fish (Sverdrug *et al*, 1955). By this mean the understanding of the biological activities and the maintained race are made possible. The knowledge of reproduction, and the recognition of feeding and growing give the investigator valuable means for the interpretation of population fluctuations. The understanding of the methods and routes of distribution are thus traced. For this reason, a study of the growth, mainly length and age relationship as well the survival rates are caried out on some Nile fishes.

METHOD

Fish were collected from Jebel Aulia reservoir 45 kilometers south of Khartoum. Studies here were based on observations on the catch of the experiments from October through March. The catch of the fishermen fishing in the reservoir could not be examined due to the fact that fishermen avoid the inspection of their fish.

Three seine nets of nylon twine were used. Twine was about 1.5—1.8mm thick. This was found to be strong enough to catch fish of different sizes available in the dam reservior. Mesh sizes of these nets were 8—10 cms. Each net was about 80 meters long and 30 meters deep. Tarrour (which is like cork of low specific gravity) was used as a buoy which is fixed to the sisal rope on the upper edges of the net. To the bottom of the net lead sheets were fixed to the rope, which act as sinkers. Five fishermen set the nets in the late afternoon which are inspected early next morning. When fishing for small fish, nets with smaller mesh size which sometimes were as small as 2 cm were used.

In this work the fish were investigated and by means of studies in their length distribution as well as age distribution. The length distribution of fish was studied in order to investigate the abundance of year classes, growth and mortality rates. Age distribution of fish was investigated. Coptured fish were sampled and their ages were determined from their scales. From these a length-age key was obtained. When this was combined with the length distribution, the age distribution of captured fish was given. The number of fish belonging to each age group per a unit weight were obtained form the length-age key and the length-weight relationship. Thus the length-weight relationships of investigated fish were studied. Such studies were not carried out before on any of the Sudanese fishes.

Length Distribution

The length distribution of fish populations is determined by abundance of year classes, growth and mortality. Growth tends to increase the fish length, while death of large fishes decreases the mean length of the population. Baranov (1918) was the first to estimate the survival rate of fish populations by the knowledge of length distribution and growth of fish populations. Petersen (1892) introduced the method of length frequency for age determination in which a succession of modes may be treated as belonging to successive year classes. The length frequencies analyses has been recently widely applied by the use of (probability paper) to help the separation of the age groups (Cassie 1954).

Thus, it is possible to estimate two imortant parameters of fish populations from their length distribution viz growth and mortality. However, it is difficult to obtain representative pictures of the length distribution of fish populations because of the selectivity of the gear used for sampling which may be overcomed by the use of different gears with different specifications.

In this chapter, length distribution *i.e.* length frequency of *Lates niloticus*, was studied..

Captured fish ranged from about 250-560 mm (Table 3 Fig. 1). The length distribution obtained from Table 3 was not smooth. However the length distribution was smoothed by combining length intervals which gave the frequencies shown in Table 1.

TABLE 1.—LENGTH FREQUENCY OF *Lates niloticus*.

Length in mm.	Frequency (No. of fish)
255	6
270	25
290	27
310	28
330	57
350	70
370	66
390	173
410	313
430	208
450	168
470	62
490	67
510	35
530	21
550	19

The length distribution is shown in Fig. 1 which has 3 modes at 350, 410 and 490 mm. These modal lengths represent age groups X, X + 1 and X + 2 respectively, as follows :

Age in years	X	X+1	X+2
Fish length in mm	350	410	490

From the scale readings (see chapter on age length key) age group X was foud to be equivalent to age group II. Thus, age group I is missing.

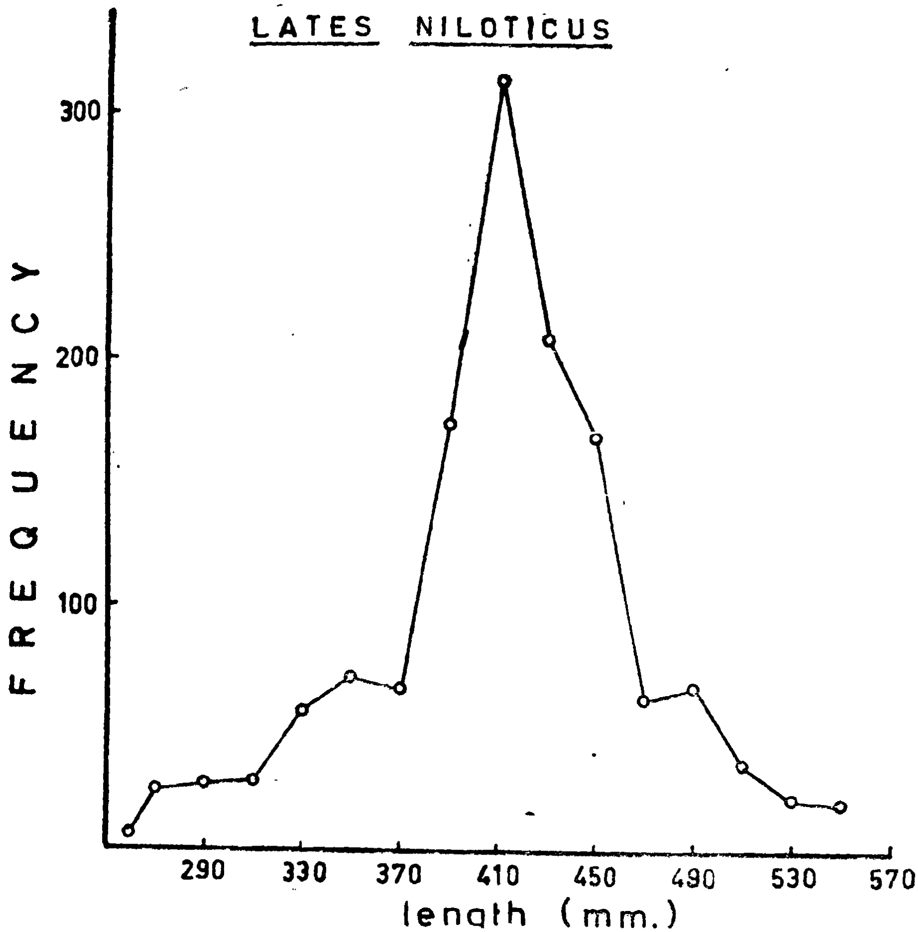


Fig 1 — Length. diotrilution of *Lates niloticus*

Instantaneous total mortality

The other factor which affects length distribution is mortality. The instantaneous total mortality is the natural logarithm (with signe changed) of the survival rate. Thus denoting survival rate by S and instantaneous total mortality by i, then.

$$S = e^{-i}$$

$$\therefore \quad \text{Log}_e\, S = -\, i$$

where $\log_e$ is the natural logarithm

The instantaneous total martality will be estimated from length frequency by Baranov method (1918). Thus, two curves will be obtained :

1) a curve of mean length of age groups against age and the slope of which represents.

$$dl/dt = K$$

Where dl represents increment of growth in length and dt represents the corresponding increment of age, or dl/dt represents the growth in length per unit age (K).

2) a curve between the logarithm of frequency against length, the slope of which is

$$d\ (\log_e f)\ /\ dl$$

where $\log_e$ is the natureal logarithm, f is the frequency after the fish become fully represented in the catch

$$i.e.\quad d\ (\log_e f)\ /\ dl$$

signifies the instantaneous total mortality per unit length

This sleope may be denoted by i′ and represents the rate of decrease of $\log_e$ frequency per unit length.

The instantaneous total mortality per unit age is equal to the instantaneous total mortality per unit length multiplied by the rate of increase in length per unit age.

Then the instantaneous total mortality denoted by i is

$$i = -i' K$$

In this study $\log_e$ will be replaced by $\log_{10}$ and in this case the instantaneous total mortality becomes

$$i = -2.303\ i' K$$

Thus, i estimate here represents the mean value.

Figure 2b show $d(\log_{10} f)/dl$ for *Lates niloticus,* where the length of 410 mm is considered as the length where fish become fully represented and and after which the declination of frequency is due to mortality (Table 2). The curve shows an acceptable straight line with

$$i' = -0.0095 \text{ (Fig. 2 b)}$$

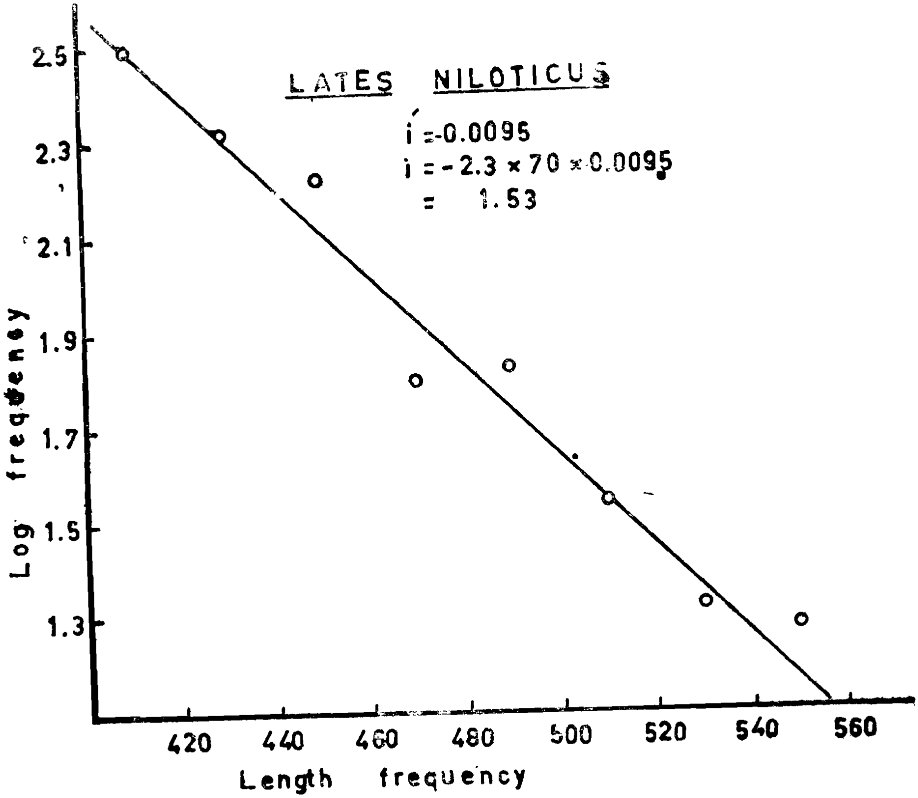


TABLE 2.—LENGTH, FREQUENCY AND LOG FREQUENCY OF *Lates niloticus.*

Length in mm.	Frequency (No. of fish)	Logo frequency
410	313	2.4955
430	208	2.3181
450	168	2.2253
470	62	1.7924
490	67	1.8261
510	35	1.5441
530	21	1.3222
550	19	1.2788

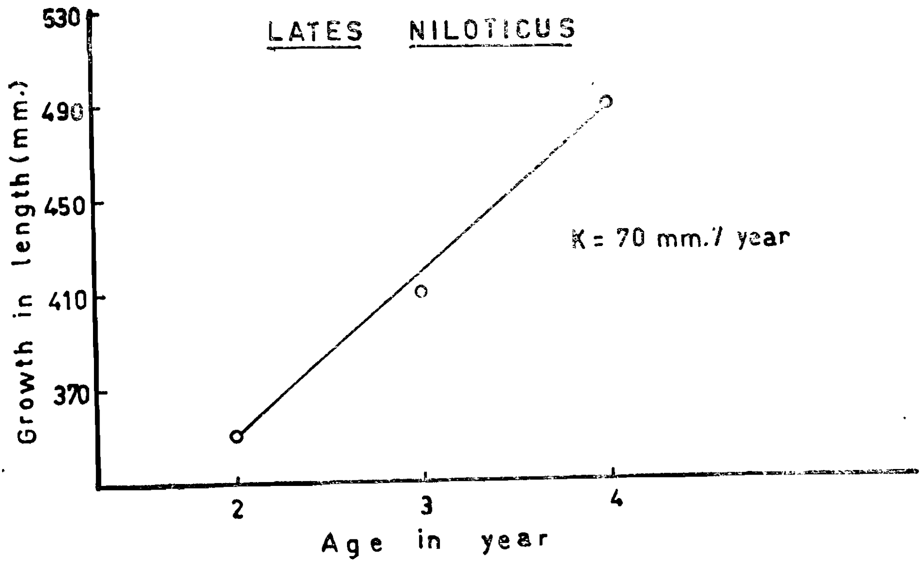


Figure 2 a shows the relation between growth and age which is an acceptable linear relationship with a slope equals 70 mm per year. This may simply be evaluated as follows :

$$K = \frac{490 - 350}{4 - 2} = \frac{140}{2} = 70$$

$$\therefore \quad i = -2.30 \times 70 \times - 0.0095$$

$$\approx 1.531$$

$$\therefore \quad S = e^{-I} = e^{-1.531} \approx 0.217$$

That is, the survival rate S $\approx$ 0.217

i.e. about 22% of *Lates niloticus* survive per year after 3 years of age.

In Sudan *Lates niloticus* is considered as the first meat Nile fish. It has a tasteful non-bony flesh. This is why it has been attracted by fishermen who sell Nile perch for a higher price. Thus, one of the factors which increased the rate of mortality is attributed to the pressure exerted on this fish by fishermen.

Another point which is worth mentioning is the absence of large Nile perch in our experimental catch, while some were observed among the commercial catch in Khartoum market. The high rate of mortality among fish more than 3 years old decreases the chance for *Lates niloticus*

Denoting the fish weight at a given length in the age-length key by the specific weigth, the specific weight distribution was obtained and it was possible to obtain the weight as well as number of fish belonging to the different age groups per one kilogram weight.

From the pervious procedure it becomes clear that it is importan to study the length-weight relationship.

a) Length Weight-Relationship :

The length weight relationship is commonly expressed as, $W = aL^b$ as shown by Hile (1941), Beckman (1948), Carlander (1953) and Sigler (1958).

where W refers to fish weight

L refers to fish length

a & b are parameters i.e. constants

Le Cren (1951) concluded that no single power equation of the type shown previously could adequately describe the length-weight relationship in perch. Rafail (1971) showed by a statistical analysis that length-weight data of *Serranus alexandrinus* Cuv. & Vale can obey a number of power equations to a number of sub-divisions of the length range from 18 cm tō 52 cm.

In this study the power equation is transformed to a simple straight line by logarithmic transformations

i.e. $\text{Log } W = \log a + b \log L$

Where log refers to logarithms to the base 10.

As "a" is a constant, then log a is similarly a constant. Denoting "loga" by "A" then the above equation becomes.

$$\text{Log } W = A + b \log L$$

which is a simple straight line.

To study the length-weight relationship of the investigated fishes a scatter diagram between log L and log W is first inspected to find if the length-weight relationship can be described by a single or a number of equations describing a number of sub-divisions of the length range as shown by figure number 4.

If the scatter diagram shows a single straight line, then the equation is fitted by the least square method. If the scatter diagram shows a number of straight lines, then the equation of each one was fitted by the least squares.

Denoting log W by Y and log L by X, the ralationship betomes.

$$Y = A + bX$$

The least square estimate of b is the following :

$$\hat{b} = \frac{\Sigma XY - (\Sigma X)(\Sigma Y)/n}{\Sigma X^2 - (\Sigma X)^2/n}$$

Where n refers to the number of observations, and

$$A = \bar{Y} - \hat{b}\,\bar{X}$$

Where $\bar{Y}$ is the mean of Y-values, and $\bar{X}$ is the mean of X-values.

One thousand two hundred and forty five specimens of *Lates nilotiucs* were examined in order to determine the length-weight relationship. Their length ranged from 255 to about 555 mm.

The weight of the specimens examined ranged between about 160 gms to about 3400 gms. The scatter diagram between log W against log L can not be described by a single equation (Fig. 4). Thus, there were four sub-division. The four equations were as follows :

Length range	Equation
1. 255 — 315 mm	$\log W = -15.6057 + 7.4079 \log L$ $W = 2.479 \times 10^{-16} L^{7.4079}$
2. 325 — 385 mm	$\log W = -5.3139 + 3.2620 \log L$ $W = 4.854 \times 10^{-6} L^{3.262}$
3. 395 — 445 mm	$\log W = +0.4008 + 1.0446 \log L$ $W = 2.517 \times L^{1.0446}$
4. 455 — 555 mm	$\log W = -5.9760 + 3.4648 \log L$ $W = 1.057 \times 10^{-6} L^{3.4648}$

TABLE 3.—LENGTH WEIGHT RELATIONSHIP OF *Lates niloticus*.

Length in mn L	Frequency	Mean weight in gms (Empircal) W	log L	log W	Calculated log W	Calculated W	Calculated W without sub-divisions (Pooled)
255	6	160	2.4065	2.2041	2.2214	166.5	283.7
265	12	220	2.4232	2.3424	2.3451	221.4	321.5
275	13	280	2.4393	2.4472	2.4644	291.4	362.4
285	9	422	2.4548	2.6253	2.5792	379.5	406.9
295	18	530	2.4698	2.7243	6.6904	490.2	455.2
305	12	611	2.4843	2.7860	2.7978	627.7	507.2
315	16	742	2.4983	2.8704	2.9015	797.0	563.1
325	36	725	2.5119	2.8603	2.8800	758.7	623.3
335	21	880	2.5250	2.9445	2.9228	837.1	687.4
345	17	890	2.5378	2.9494	2.9645	921.6	756.3
355	53	1100	2.5502	3.0414	3.0050	1012.0	829.6
365	48	1050	2.5623	3.0212	3.0444	1108.0	908.0
375	18	1240	2.5740	3.0934	3.0826	1210.0	991.0
385	93	1286	2.5855	3.1093	3.1201	1318.0	1080.0

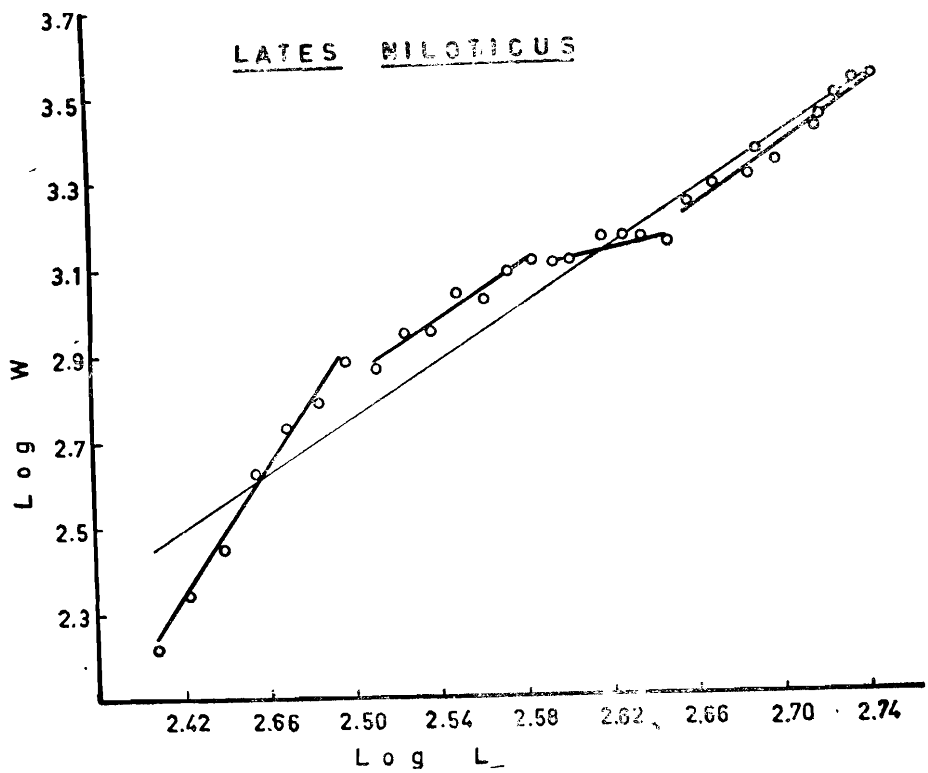
TABLE 3.—(*Cont.*)

Length in mn L	Frequency	Mean weight in gms (Empirical) W	log L	log W	Calculated log W	Calculated W	Calculated W without sub-divisions (Pooled)
395	80	1260	2.5966	3.1004	3.1132	1298	1173
405	107	1300	2.6075	3.1139	2.1246	1332	1273
415	206	1464	2.6180	3.1656	3.1356	1367	1376
425	110	1435	2.6284	3.1568	3.1465	1402	1488
435	98	1430	2.6385	3.1553	3.1570	1435	1604
445	150	1420	2.6484	3.1523	3.1674	1470	1727
455	18	1723	2.6580	3.2362	3.2335	1712	1856
465	41	1815	2.6675	3.2589	3.2664	1847	1992
475	21	2130	2.6767	3.3284	3.2983	1987	2133
485	37	2140	2.6857	3.3304	3.3294	2135	2282
495	30	2307	2.6946	3.3630	3.3603	2293	2439
505	12	2212	2.7033	3.3448	3.3904	2457	2602
515	23	2600	2.7118	3.4180	3.4199	2629	2773
525	18	2740	2.7202	3.4378	3.4490	2812	2952
535	3	3125	2.7284	3.4949	3.4774	3002	3138
545	7	3320	2.7364	3.5211	3.5051	3200	3332
555	12	3400	2.7443	3.5315	3.5325	3409	3534

Pooling all data and fitting a single equation (Fig 4) gave the following equation :

Length range	Equation
255 — 555 mm	$\log W = -5.3504 + 3.2426 \log L$ $W = 4.463 \times 10^{-6} L^{3.2426}$

The previous table shows weights calculated according to the single equation and those calculated according to the four equations fitted to the four sub-divisions. The table shows that sub-dividing the range provided far more better fitted equations because in such a case the theoretical weights are much closer to emperical values.



The differences between the four equations show a change in the morphology of the fish during its growth. Thus in the range from 255 - 315 mm, as the fish grows it becomes thicker than other stages because W in nearly proportonal to the fish length raised to the 7th power. While in the third range i.e. 395 - 445 mm the fish weight is more less proportional to fish length because the exponent in this case is

$$1.044 = 1.0$$

i.e. as the fish grows the cross sectional area does not more or less increase or thickness of the fish is not increaseing.

Martin (1949) related sharp breaks in relative growth lines for several species of fish to ossification and maturity. Hiatt (1947) showed that *Chanos chanos* of approximately 100 mm in body length undergoes a sharp break in relative growth of gut length. It seems therefore that there is considerable body of information on morphological changes with growth in fishes.

Pooling of data provides an estimate of the exponent (b) which is about 3 i.e. a value accepted by authors who dealt with length-weight relationship in fishes (Clark, 1928; kesteven, 1947 and Qasim, 1947).

b— Age-Length Key :

The age compostion or distribution can be estimated by direct sampling. However, it is more precisely estimated by direct sampling for length together with age length keys based on relatively small samples. This combination allows the estimation of age distribution more precisely with a small sample size than with direct sampling.

Thus, this method has merits especially for this study because of the large number of important species in the catch and the unavailability of enough specialists for scale readings.

As fishes were sampled in the period from October to March, then it is expected that the growth is diminished in this period which is the coldest time of the year. The cessation of growth in winter is confirmed by the presence of annulus rings which are used for the identification of age of fish. Adopting the convention that the end of the growth season coincides with the end of a calendar year, then fishes having ages of 1+, 2+, 3+...etc. as identified by scale readings will be considered as 2, 3, 4 ... etc. respectively.

TABLE 4.—AGE-LENGTH KEY OF *Lates niloticus*

Length in mm	Number and percentage of fish belonging to age groups						Total
	I		II		III		
	No.	%	No.	%	No.	%	
255	7	100 0					7
265	6	100 0					6
275	3	100.0					3
285	2	100 0					2
295	2	100.0					2
305	2	100.0					2
315	1	7.7	12	92.3			13
325	1	5.9	16	94.1			17
335	1	5.9	16	94 1			17
345	1	7.7	12	92.3			13
355	2	11.8	15	88.2			17
365	2	7.7	18	69.2	6	23.1	26
375			6	35.3	11	64.7	17
385			6	28.6	15	71.4	21
395			6	54.5	5	45.5	11
405			4	44 4	5	55.6	9
415					6	100.0	6
425					1	100.0	1
435					1	100 0	1
445					0	100.0	0
455					2	100.0	2
465					1	100.0	1
475					1	100 0	1
485					2	100 0	2
495					2	100.0	2
505					1	100.0	1
Total	30		111		59		200

Scales of two hundred specimens of *Lates niloticus* were studied. These were found to belong to 3 age groups (Table 4). Their lengths ranged from 255 - 505 mm. Age group I ranged from 255 - 365 mm with a mode at 255 mm. The mean was found to be 291. Range 315 - 355 mm was mixture of age I and II. Length 365 mm was found to contain fish of age groups I, II and III. Sixty nine per cent of these belonged to age group II. Age group II ranging from 375 - 405 mm. was mixed with age group III. Age group III which ranged from 365 - 505 mm and not show any mixiture with any other age group from length 415 mm or more.

According to the scale readings, the number of fish belonging to each age group with their length ranges are shown in Table 5.

TABLE 5.—LENGTH RANGES OF THE DIFFERENT AGE GROUPS OF *Lates niloticus*

Age group	Number	Length in mm		
		Intervals	Mean	Increment
1	30	255 — 365	291	—
2	111	315 — 405	350	59
3	59	365 — 505	403	53
Total	200			

More than 50% of the number studied were found to belong to age group II. Their length ranged from 315 - 405 mm with an average of 350 mm. This was 60 mm more than the average length of fish belonging to age group I. The number of fish belonging to group III were almost double the number of fish belonging to age group I.

Growth was estimated from length distribution curves and was estimated as follows :

Age in years	X	X + 1	X + 2
Fish length in mm. . . .	350	410	490

From the scale readings age group X can be assigned to age group II. Age groups X + 1 and X + 2 are equivalent to are groups III and IV respectively. Thus growth estimated from length distribution should read as follows :

Age in years	2	3	4
Fish length in mm	350	410	490

Thus estimates from length distribution agree with those from scale readings

C— Growth Rates :

The study of growth rates of fishes is of special importance for both fisheries studies and fisheries mangagement. So, the growth rates will be investigated as estimates derived here by length frequencies studies and by scale readings. A comparsion will be made so as to obtain reliable estimates of the growth rates of the studied fish.

Scale readings were very valuable because it determined the age of the fish, while the length frequency provides the sequence of the age groups. Again, scale reading could detect groups not detected by length frequency studies.

Data concerning growth of fish in weight has been derived from the growth in length by using the length-weight relationship which has been investigated in a previous chapter and given in table 6.

TABLE 6.– GORWTH ESTIMATES OF *Lates niloticus*

Age	Growth estimated by		Accepted estimates mm.	Weight in gms
	Length freque-ncy mm.	Scale readnigs mm.		
1	—	291	290	431
2	350	350	350	966
3	410	403	410	1350
4	490	—	490	2214

At age 3. growth derived by the length frequency is taken as the accepted one, because it is very well defined and showed the best defined mode in the length distribution (Fig. 1). Mean lengths estimated by scales were smaller at age group III which is attributed to the selection of smaller fish belonging to this class aged by scales as is demonstrated by the length frequency of aged Fish (Table 4) where the smaller fishes occurred in much larger numbres.

Considerable gain in weight is shown from age 3 to age 4.

d— Age Distribution

Changes in the abundance and distribution of an organism in time as well as space are important items for study. Such changes affect the species, length and age composition. Information on catches from fish stocks are important because they are sources of data. The catches may be obtained from experiments of fishery or from fishermen. In these studies the data were collected by experimental fishing with the hope that they represent to a better extent the fish populations actually present

As far as the age distribution is concerned, Edser (1908) was the first to note that catches of Northern sea place (*Pleuronectes platessa*) grouped into size classes of equal breadth, the logarithms of the frequency of occurrence of fish in each class form a curve with an ascending left limb, a dome shaped upper portion and a descending right limb which was more or less a straight line through its entire length. This was soon recognized as a convenient method of representing catches graphically. Heincke (1913) plotted a number of curves of this type and computed mortality rates with information on rate of growth. Baranov (1918) gave the name catch curve to the graph of log frequency against size. The same kind of plotting is useful when length is substituted by age. Thus, recent authors plot log frequency aganist age directly and the name catch curve has been applied to this kind of graph (Ricker 1948, 1958).

Thus, it is clear that the age distribution, apart from giving a picture of the age structure of the population it is used to compute the mortality rate. Again the mortality rate explains species, length and age distribution. If a fish is subjected to a high rate of mortality, it will be relatively less represented than the fish with a small mortality rate if recruitment is of the same level.

From the scale readings, *Lates niloticus* captured were found to belong to age group I — III. These studies were carried out on 200 specimens, whereas investigations on corresponding lentghs were done on 1245 individuals. At 255 mm of length,scales of 7 individuals were studied (see chapter on age length key). All 7 individuals were found to belong to age group I. Actually length range 255 — 305 mm belonged entirely to age group I. Thus, the number of fish in this range were put in age group I.

At 315 - 355 mm. fish were a mixture of age group I and II, whereas at 365 mm, the three age groups were observed. From scale readings, only one fish was observed in lengths 315, 325, 335 and 345 mm. each belonging to age group I while the corresponding age group II fish were 12, 16, 16, and 12. These constituted 92.3%, 94.1%, 94.1% and 92.3% of the studied fish. Thus, at 315 mm, 7.7 and 92.3% of the measured fish were assigned to age groups I and II respectively (Table 4).

At 365 mm., 7.7, 69.2 and 23.1% fish were included under age group I, II and III respectively. Fish lengths ranging from 405 - 505 mm were assigned to age group III (Tables 4 and 7).

Summing up the number of fish belonging to age groups I-III we get the following age distribution :

Age group	I	II	III	Total
Frepuency	86	241	955	1282
Ratio	6.7	18.8	74.5	100

Age distribution shown in the above table indicates the relation between the age groups in number. Table 7 shows the corresponding weights of each length. Thus length frequency is transformed to weight frequency from which the total weight of each age group was calculated. This is shown in this following table :

Age group	I	II	III	Total
Weight in gms	42459	251999	1426112	1720570
Gws weight per kilcgram	24.7	146.5	828.8	1000

The ratio of the weight of age group I, II and III was equivalent to 24.7, 146.5 and 828.8 respectively. That is, per a kilogram weight of the *catch of Lates nilotieus* there were about 24.7, 164.5 and 828.8 gms of age groups I, II and III respectively.

The number of fish belonging to each group per a kilogram is calculated to give the following :

Age group	Number of fish per kilogram
I	0.0005812 × 86 ≈ 0 0499
II	0 0005812 × 241 ≈ 0.1398
III	0 0005812 × 955 ≈ 0.5539

Thus in each kilogram weight of fish there were 0.0499, 0.1398 and 0.5539 fish belonging to age groups I, II and III respectively.

The study of age distribution of *Lates niloticus* shows that age group

The study of age distribution *Lates niloticus* shows that age group III is the most important of the three age groups studies. When the number of is fish is studied, age group III forms about 75% of the catch. When the weight is considered, this group forms more than 80% of the total weight.

Lates niloticus (Nile perch) which attains big sizes of 150 kilograms seams to show a slow growth when young. When age group I and II are considered, they form only 25% of the catch. As far as the weight of these two groups is concerned they from less than 20% of the catch. Thus, age groups I and II do not form a significant percentage of neither the number or the weight of the catch. This is probably due to the small size they attain at these stages.

TABLE 7.—AGE DISTRIBUTION OF *Lates niloticus* SHOWING THE RELATION BETWEEN THE AGE GROUPS IN NUMBER AND WEIGHT.

Length in mm	Number	Weight	Number of fish in each group		
			I	II	III
255	6	166 5	6.0		
265	12	221.4	12.0		
275	13	291.4	13.0		
285	9	379.5	9.0		
295	18	490.2	18.0		
305	12	627.7	12.0		
315	16	797.0	1.2	14.8	
325	36	758.7	2.1	33.9	
335	21	837.1	1.2	19.8	
345	17	921.5	1.3	15.7	
355	53	1012.0	6.3	46.7	
365	48	1108.0	3.7	33.2	11.1
375	18	1210 0	0.0	6 4	11.6
385	93	1318.0	0.0	26.6	66.4
395	80	1298.0		43.6	36.4
405	107	1332.0			107.0
415	206	1367.0			206.0
425	110	1402.0			110.0
435	98	1435.0			98.0
445	150	1470.0			150.0
455	18	1712.0			18.0
465	41	1847 0			41.0
475	21	1987.0			21.0
485	37	2135.0			37.0
495	30	2293.0			30.0
505	12	2457.0			12.0
Total . .	1282				
Sum of number of fish in each group			86	241	955
Sum of weight of each group .			42459	251999	1426112
Sum of the total weight . . .			1720570		

DISCUSSION

The length distribution of *Lates niloticus* L. has been used to estimate growth and mortality.

Length distribution of the studied fish were smoothed by combining length intervals which gave different modes. Each modal length represents an age group which has been evaluated by scale readings.

Mortality and survival rates were evaluated from length frequency. About 22% of *Lates niloticus* were found to survive per year after 3 years of age.

From these data an age length key was obtained. The age length key was combined with the length distribution to give the number of fish belonging to each age group. The number of fish belonging to each age group per a unit weight i.e. per 1000 gms, were investigated. These were obtained from the age length key and length-weight relationship.

The use of length-weight relationship has been discussed by many investigators who emphasized its importance (Beckman, 1948; Le Cren, 1951 .. etc.). The formulae used to express the length-weight relationship are expressed in the text.

Rafail (1971) showed that the length-weight data of *Serranus alexandrinus* can obey a number of power equations to a number of su-divisions. In our studies the length-weight relationship of *Lates nilotieus* was described by a number of equations describing a number of sub-visions of the length ranges shown on figure 4. *Lates* niloticus was described by four equations.

Investigations on age distribution of *Lates niloticus* showed that age group III only forms about 75% of the catch by number and 80% of the catch by weight. Thus, age groups I and II form a small percentage of the catch when both number and weight are concerned.

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