TABLE 2.—(continue)

Total Length (mm)	Number of Fish	Average Scale Radius (X 10)	L/Sc Ratio	Total length (mm)	Number of Fish	Average Scale Radius (X 10)	L/Sc Ratio
620	5	195.40	3.17	1060	1	394	2.69
630	2	199.50	3.16	1070	2	369	2.90
650	5	225.90	2.88	1080	2	460	2.35
660	1	268	2.46	1080	1	392	2.78
670	1	228	2.94	1100	2	422.2	2.61
680	1	224	3.04	1120	5	433.6	2.58
690	4	231.75	2.98	1140	1	404	2.82
700	1	252.50	2.77	1150	2	471	2.44
710	2	240	2.96	1160	1	440	2.64
720	3	234.5	3.07	1210	1	472	2.56
740	1	248	2.98	1220	3	490.7	2.49
760	3	265.33	2.86	1250	1	502	2.49
770	1	289	2.66	1260	1	524	2.40
780	5	282	2.77	1280	1	478	2.68
800	6	299.6	2.67	1300	1	452	2.88
820	2	324	2.53	1320	1	516	2.56
840	2	316	2.66	1340	4	545	2.46
850	3	354	3.40	1350	2	486	2.78
860	2	304.5	2.82	1370	2	535	2.56
870	1	354	2.46	1400	2	566	2.47
880	2	316	2.78	1420	1	560	2.54
900	5	370.4	2.43	1430	2	481	2.97
910	1	312	2.92	1440	4	509	2.83
920	3	355	2.60	1450	1	540	2.69
930	3	336	2.77	1460	2	536	2.72
950	5	348	2.73	1490	1	540	2.76
960	1	394	2.44	1500	2	567	2.65
970	6	390.7	2.48	1520	1	522	2.91
980	7	365	2.68	1540	1	606	2.54
1000	3	382	6.62	1570	1	542	2.90
1010	3	359.5	2.81	1580	1	532	2.97
1020	1	354	2.88	1600	1	680	2.35
1030	1	356	2.89	1620	3	602	2.69
1040	3	370	2.81	1730	1	670	2.58
1050	2	360	2.92				

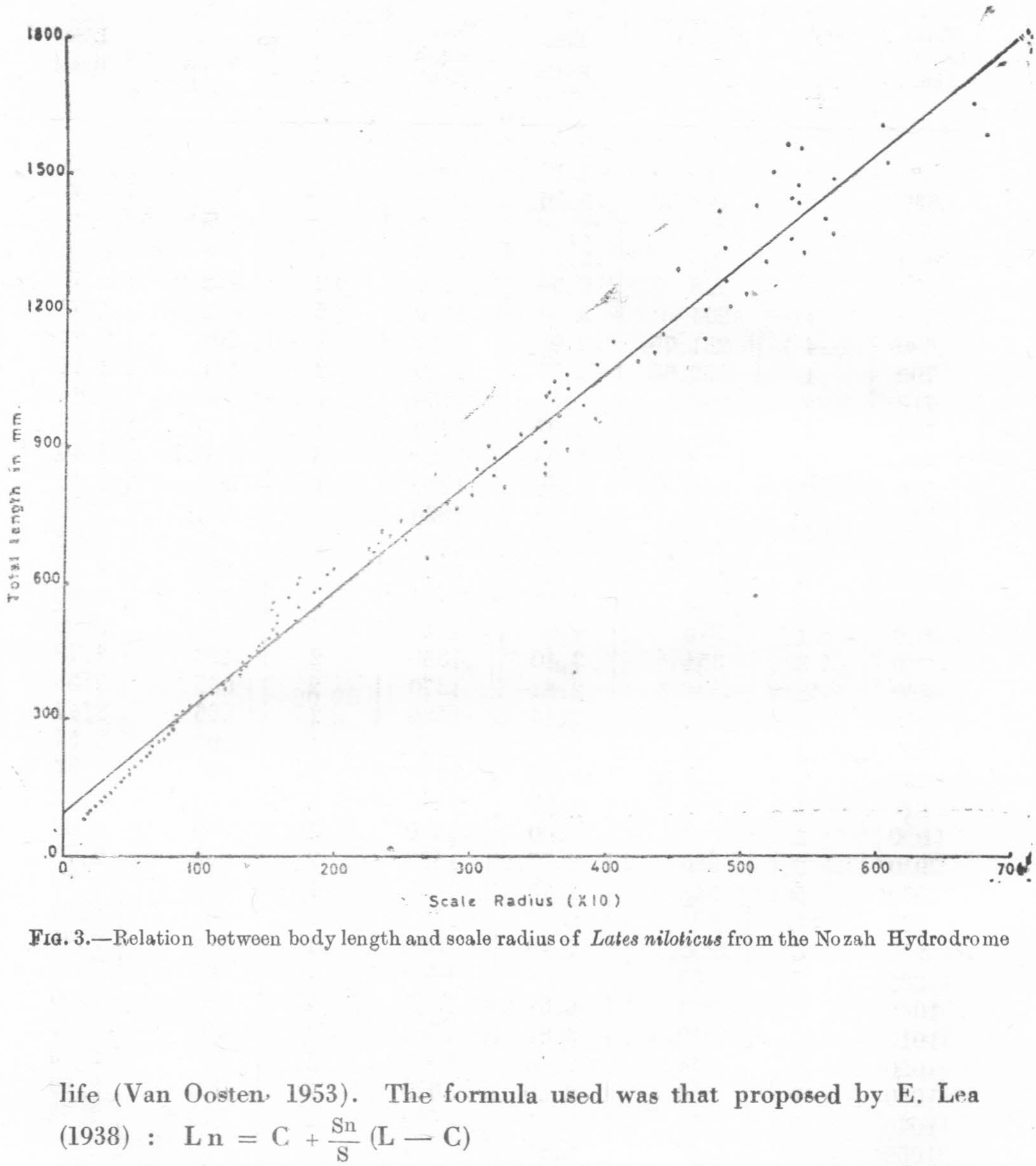

Fig. 3.—Relation between body length and scale radius of *Lates niloticus* from the Nozah Hydrodrome

life (Van Oosten, 1953). The formula used was that proposed by E. Lea (1938) : $Ln = C + \frac{Sn}{S}(L - C)$
where L n is the average length of fish when annulus n was formed, L is the average length of fish at the time of capture, S n is the average distance of the scale radius to annulus n , S is the average distance of the scale radius, and C is the correction factor.

Since the catch in all the years, with the exception of 1964 collection, consisted mostly of young age groups (0, 1 & 11), so the study of the ral-culated growth of *Lates niloticus* will be confined to the average calculated lengths as determined from the combination of the data for all age groups in all the years of collection. Also, the lack of sex records for all the individuals of the hydrodrome collections prevented the determination of possible sex differences in the growth rate of *Lates niloticus*, and so the tabulated data are the growth history of the seres combined.

The average calculated lengths of Table (3) for the different collections of *Lates niloticus* from the Nozha-Hydrodrome in the years 1955, 1956, 1957, 1958, 1961 & 1964 were the grand average calculated legnths. *Lates niloticus* reached an average total length of 232 mm. at the end of the first year of life. This figure obtained by the back calculation coincides with the data obtained for the average empirical total length (230 mm.) of 218 young fish mostly caught at the end of the growing season (October-December) and belonging to age group 0. These figures are also confirmed by that found by Jensen (1957) and Elster & others (1960), who stated that the average calculated length at the completion of the first zone is 195 mm. for low-growing *Lates niloticus* from the trap catch and 231 mm. for fast-growing *Lates niloticus* from the commercial fisheries in November 1954 - March 1955.

For other age groups, Jensem (1957) and Elster & others (1960) reported that a big specimen of *Lates niloticus* (1070 mm. long) was found dead and rotten in February 1955. The scales of this fish had five extremely clear zones and the six was under formation on the margin. This coincides with our results obtained for the average calculated length of age group VI (1079 mm.).

To ensure more representative values, the figures for the average growth increments in length of *Lates niloticus* in the above mentioned different years is represented in Table (4). It is clear, that the rate of growth is high during the first year of life, then the annual increment in length gradually decreases with the increase of age.

For the determaination of the general growth, the grand average calculated lengths (table 3) were compared with the summation of the average annual increments (table 4). It is found that the figures are nearly equal in the earlier years of life, while in the later years, the calculated lengths determined by the successive addition of the average annual increments

of length, is less than that determined by the grand average calculated lengths. These differences become more marked at older years of life. It should be mentioned that the numbers of specimens were so small at higher ages that the presence of only a few individuals of exceptionally slow or rapid growth would have a profound effect on the determination of calculated lengths in the later years of life.

TABLE 3. – Grand average calculated lengths (mm) at the end of each year of life of all age groups of *Lates niloticus* of both sexes taken from the Nozha Hydrodrome in the period 1955–1964.

Age Group	No. of Fish	Average length at capture	Year of Life										
			1	2	3	4	5	6	7	8	9	10	11
I	307	335	229							643	Total No. of Fish		
II	180	480	.26	422									
III	53	697	244	440	611								
IV	20	886	243	442	619	770							
V	30	986	242	419	592	757	907						
VI	16	1108	232	413	586	753	904	1006					
VII	6	1230	255	453	632	797	927	1075	1152				
VIII	11	1322	257	455	625	802	695	1080	1194	1283			
IX	13	1457	253	460	649	843	999	1141	1257	1342	1421		
X	6	1586	242	459	642	838	990	1129	1257	1367	1469	1553	
XI	1	1730	210	434	646	826	987	1137	1269	1187	1289	1570	1652
Grand Average Calculated length			232	429	612	782	937	1079	1222	1327	1439	1555	1652

TABLE 4.—Grand average increments in length (mm) of *Lates niloticus* of both sexes taken from the Nozh-Hydrodrome in the period 1955-1964.

Age Group	No. of Fish	Year of Life 1	2	3	4	5	6	7	8	9	10	11
I	307	229							643 TOTAL No. of Fish			
II	180	226	196									
III	53	244	196	171								
IV	20	243	199	177	151							
V	30	242	177	173	165	150						
VI	16	232	181	173	167	151	102					
VII	6	255	198	179	165	130	148	77				
VIII	11	257	198	170	177	163	115	114	89			
IX	13	253	207	189	194	156	142	116	85	79		
X	6	242	217	183	196	152	139	128	110	102	84	
XI	1	210	224	212	180	161	150	132	118	98	85	82
Grand Average Increment		232	195	175	196	152	125	112	92	87	84	82
Sum of average Increment		232	427	602	771	923	1048	1160	1252	1339	1423	1505

The study of the calculated growth of certain individual age groups can be employed for the collection of 1964 separately to show the annual fluctuation in growth rate (Table 5). It is obvious that the growth rate of the 1964 collection is nearly the same as that calculated from the combination of all the collections in the different years.

The study of annual fluctuations in growth rate of *Lates niloticus* as determined from the analysis of the growth increments of the various year classes are given in Table (6). For example, fishes of age group III had an average growth increment more than the grand average in all their lifes. Also fishes of age group IX had an average increment of growth more than the grand average in the first seven years of life. On the other hand, fishes of age group V had an average increment of growth less than the grand

TABLE 5.—Grand average calculated lengths (mm) at the end of each year of life of all age groups of *Laets niloticus* of both sexes taken from the Nozha Hydrodrome in the year 1964.

Age Group	No. of Fish	Average length at capture	Year of Life										
			1	2	3	4	5	6	7	8	9	10	11
I	—	—	—							123 Total No. of fish			
II	13	530	218	418									
III	21	761	253	466	648								
IV	14	870	244	630	630	788							
V	28	984	242	415	588	754	908						
VI	12	1107	237	418	577	739	890	994					
VIII	6	1230	255	453	632	797	927	1075	1152				
VIII	10	1319	258	460	631	798	925	1071	1185	1276			
IX	12	1459	2524	64	657	842	999	1140	1254	1340	1420		
X	6	1586	242	459	642	838	990	1129	1257	1367	1469	1553	
XI	1	1730	210	434	646	826	987	1137	1269	1387	1485	1570	1652
Grand Average Calculated length			244	440	621	784	935	1078	1218	1325	1439	1555	1652

average throughout the first four years of life. Also fishes of age group VI had an average increment of growth below the grand average throughout the whole life. Old fishes of age group X and XI, with the exception of their first year of life, had an average increament of growth more than the grand average.

TABLE 6.—Grand average increments in length (mm) of *Lates niloticus* of both sexes taken from the Nozh-Hydrodrome in the year 1964.

Age Group	No. of Fish	Year of Life										
		1	2	3	4	5	6	7	8	9	10	11
I	—	—							123 T.No. of Fish			
II	13	218	200									
III	21	253	213	182								
IV	14	244	200	186	155							
V	28	242	173	173	166							
VI	12	237	181	159	162	151	104					
VII	6	255	198	179	165	130	148	77				
VIII	10	258	202	171	167	154	119	114	91			
IX	12	252	212	193	185	157	141	114	86	80		
X	6	242	217	183	196	152	139	128	110	102	84	
XI	1	210	224	212	180	161	150	132	118	98	85	82
Grand Average Increment.		244	178	169	178	152	128	111	94	88	84	82
Sum of average Inecrement.		244	440	618	787	939	1067	1178	1272	1360	1444	1526

To give a clear picture of the grand average calculated lengths at the end of each year of life, the changes in growth rate (increments of length) are represented in percentage to the total sum of increments during the whole life of the fish (Table 7). It is clear that *Lates niloticus* made by far their best growth in length during the first year of life. The growth rate declined sharply in the second year when the increment was less by about 40 mm, than that of the first year. The growth during the third through the eighth years continued to decrease gradually. The growth during the 9th, 10th, and 11th year also continued to decrease but at much slower rate than before.

TABLE 7.—Average calculated length at the end of each year of life, annual increment of growth in length and annual percentage increase in length of *Lates niloticus* from the Nozha Hydrodrome in 1955-1964.

Age Groups	Average calculated length (mm)	Annual Increment (mm)	Annual Increment (%)
I	232	232	15,41
II	429	195	12,96
III	612	175	11,63
IV	782	169	11,23
V	937	152	10,10
VI	1079	125	8,31
VII	1222	112	7,44
VIII	1327	92	6,11
IX	1439	87	5,78
X	1555	84	5,58
XI	1652	82	5,45

The Season's Growth

It is possible to estimate the progress of growth during the season by comparing the "partial-growth" completed at the time of capture with the total growth which the fish would have been completed at the end of the pollowing season. In other words, by comparing the length increment for that part of the growing season preceeding capture with the length increment for the entire season as calculated from samples of the same year class taken in subsequent calender years.

The best information on the increase in length of *Lates niloticus* from the Nozha Hydrodrome during the growing season was supplied by the collections of 1955, 1957 and 1961. The data of O and I age groups were mostly from the collection of 1955, while that of age group II were from the collection of 1961. The data of 1957 collection were sometimes used to fill the gaps in forming Table (8).

Among the best represented age groups (O, I and II) the total growth increment in December was nearly the same as that computed for the period January-March. Therefore, in January, February and March practically no growth takes place. On the other hand, the percentages of partial-growth of *Lates niloticus* captured in different months as shown from Table (8) and Figure (4), indicate that in August the fish had completed about 50 percent of its full-season growth and by reaching November about 95% of full-season growth was completed. It can also be noticed, that for the O-group, the monthly increment of growth gradually increase from June through September, where it reaches its maximum value, then it begins to decrease sharply from October to December. For I and II age groups, the monthly increment of growth was high in September and October while in August it was comparatively lower than in all other months of the growing season. In December, the monthly increment of growth was very low and this was most probably due to the lowering of temperature and the ending of the growing season during this month.

Unfortunately, the April data were lacking from all our collections, but Elster and others (1960) working on other data collected from the Nozha-hydrodrome in 1955, found that in March-April, zone formation was observed very commonly on the margin of the scales of Lates. So it can be concluded that the growing season for *Lates niloticus* in the Nozha Hydrodrome begins in April and ends by December.

TABLE 8.—Comparison of the amount of seasonal growth (Total and monthly increment in mm and %) of certain age groups of *Lates niloticus* from the Nozha Hydrodrome

Age Group		April	May	June	July	August	Sept	October	November	December	January	February	March
O	Number of fish			1	3	12	13	4	4	26	15	6	8
	Total increment (mm)			38	78	120	164	200	226	237	235	232	230
	Total increment (%)			16.0	32.9	50.6	69.2	84.4	95.4	100.0			
	Monthly increment (mm)			38	40	42	44	36	26	11			
	Monthly increment (%)			6.0	16.9	17.7	18.6	15.2	11.0	4.6			
I	Number of fish		1	21	3	5	5	10	41	23	8	7	4
	Total increment (mm)		28	58	84	104	139	172	200	214	214	219	215
	Total increment (%)		13.1	27.1	39.3	48.6	65.0	80.5	93.5	100.0			
	Monthly increment (mm)		28	30	26	20	35	33	28	14			
	Monthly increment (%)		13.1	14.0	12.2	9.3	16.4	15.5	13.1	6.5			
II	Number of fish		11	4	5	3	8	2	1	1	7	9	1
	Total increment (mm)		23	56	78	98	132	165	192	208	207	209	212
	Total increment (%)		11.1	24.1	37.5	47.1	63.4	79.2	92.2	100.0			
	Monthly increment (mm)		23	27	28	20	34	33	27	16			
	Monthly increment (%)		11.1	13.0	13.4	9.6	16.3	15.9	13.0	7.7			

In spite of some uncertainties as to the dates at which the growing season of *Lates niloticus* begins and ends in the Nozha Hydrodome, and inspite of the strong probability of some annual variation in these dates, we can generally conclude that the growing season of that species in this locality is not less than 8 months long.

An interesting question arises, however, concerning the factor or factors that determine the beginning and the end of the growing season. It is well known that changes in the metabolic rate of fishes are most closely connected with changes in the temperature of the surrounding water. In many cases changes in water temperature function as a natural stimulus which determines the start of some biological process such as feiding, breedin, and migration (Nikolsky, 1963).

For *Lates niloticus* in the Nozha Hydrodrome, the time of annulus formation and the progressive increase of growth beyond the last annulus were affected, to a more or less degree, by water temperature. This is quite obvious from Figure (4), which shows the relation between the percentages of partial growth of *Lates niloticus* captured from the Nozha hydrodrome in different months and the water temperature recorded during the year 1956.

For fishes of I and II age groups, the percentange increase of growth was 12.1% in May when the water temperature was 22.4°C. In June and July, as the water temperature rose to 26.7 & 27.6°C the percentage increase of growth was 25.5 & 38.1 respectively. In August, although the water temperature increased to about 29.7°C the fish added only 9.45% of its annual growth. In September, October and November, as the water temperature decreased to 26.2, 23.7 and 20.9°C, the fish gained 16.35, 15.70 and 13.05% of its annual growth respectively. In December the water temperature decreased to about 15.2°C and the fish added only 7.1% of its annual growth, completing the full season's growth.

Consequently, it would appear that temperature is the factor controlling the seasonal course of growth. *Lates niloticus* being very sensitive to low temperature, markedly decrease its feeding activity or may stop feeding completely in the early winter, when the water temperature becomes less than 15°C and continues starvation during the whole winter till the water temprature rises again in the following spring.

Length-Weight Relationship

The study of the general growth in weight of *Lates niloticus* was based on 852 fish ranging from 110 to 1730 mm in total length and including all specimens employed in the investigation of age and growth and also those fish, whose age could not be determined.

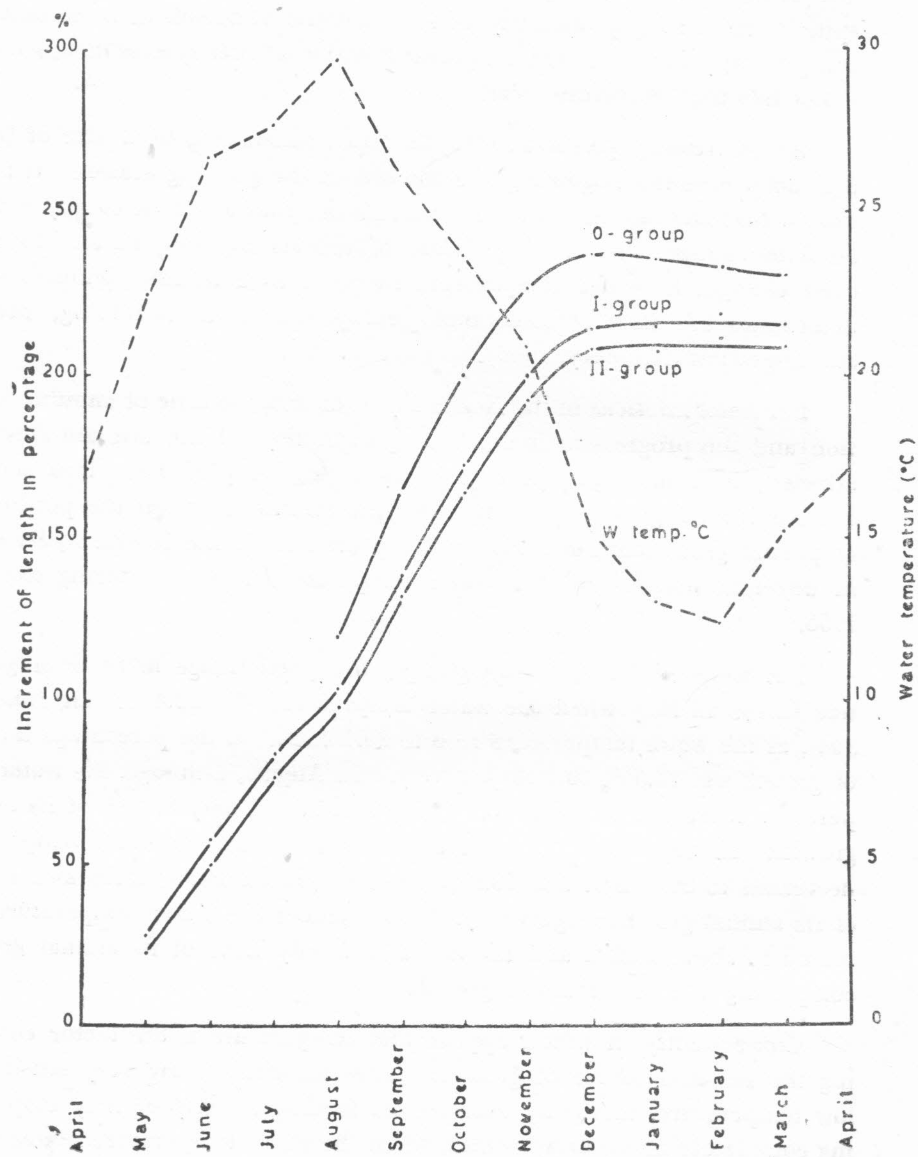

FIG. 4.—Comparison of the amount of seasonal growth (in %) of certain age groups of *Lates niloticus* and its relation to the monthly water temperature of the Nozha Hydrodrome.

Equation of the type $W = c L^n$ is usually the more suitable in the study of length-weight relationship, where c and n are constants, whose values are computed by the logarithms of the total lengths and actual weights (Beckman, 1948). The fitting of the parabolas to the length-weight data yielded the following equation .

$$\log W = -5.1114 + 3.0889 \log L$$

or

$$W = 0.7738 \times 10^{-5} L^{3.0889}$$

where W is the total weight in grams and L is the total length in mm.

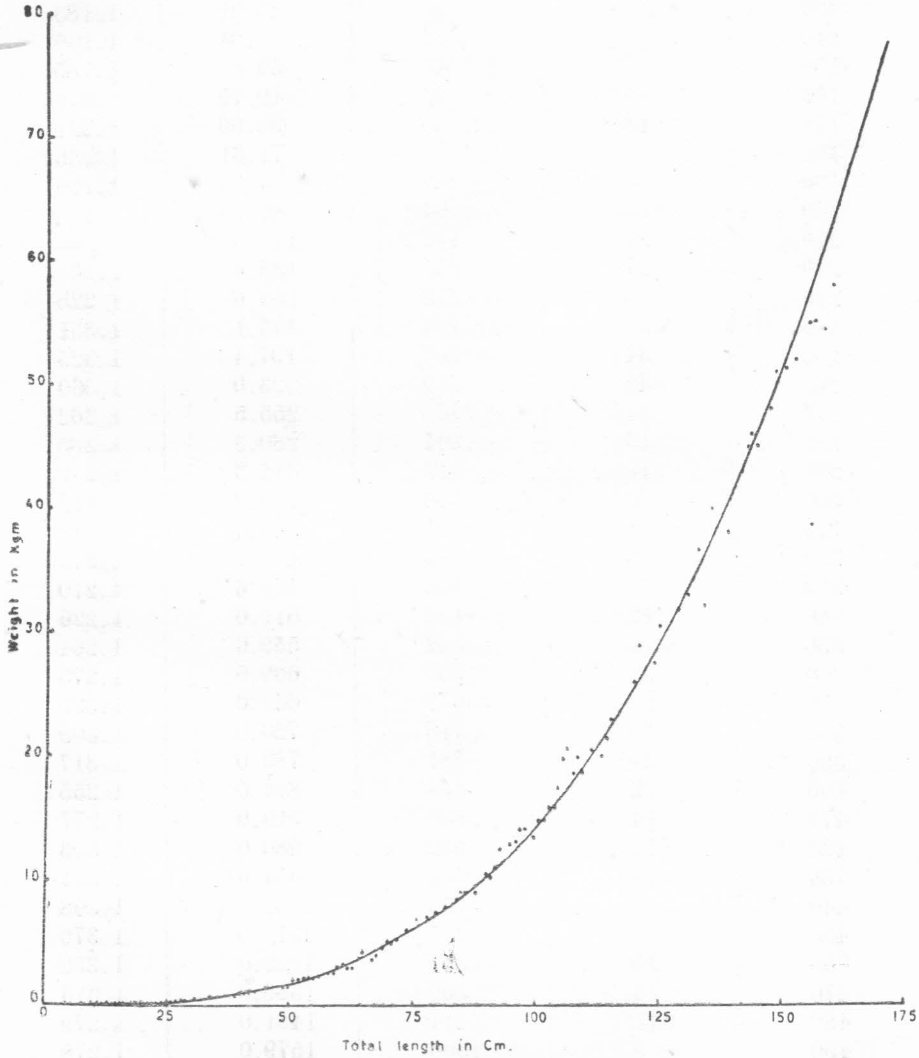

FIG. 5.—Length-weight relationship of *Lates nilotticus*. The smooth curve represents the calculated weights and the dots represent the emperical weights.

TABLE 9.—Length-Weight Relationship and the coefficient of condition of Lates *Lates niloticus* from the Nozha Hydrodrome in 1955–1964.

Total Length (mm)	Number of Fish	Average Empirical Weight (gram)	Calculated Weight (gram)	Coefficient of Condition (k)
110	2	15	15.64	1.127
120	1	20	20.46	1.157
130	2	26	26.01	1.183
140	2	32	32.94	1.166
150	5	40	39.84	1.185
160	6	52	49.75	1.270
170	13	60	59.99	1.221
180	24	72	71.61	1.235
190	24	82	84.56	1.196
200	29	94	99.10	1.175
210	27	112	115.3	1.206
220	17	135	133.0	1.268
230	18	149	152.6	1.225
240	30	184	174.1	1.331
250	34	207	197.4	1.325
260	42	239	223.0	1.360
270	24	268	255.5	1.362
280	15	304	280.3	1.385
290	10	312	312.3	1.279
300	9	354	346.8	1.311
310	11	391	384.0	1.312
320	9	416	433.1	1.270
330	7	435	465.6	1.210
340	12	482	511.0	1.226
350	14	542	559.0	1.264
360	31	595	609.0	1.275
370	23	671	663.0	1.325
380	39	715	720.0	1.303
390	24	781	780.0	1.317
400	22	844	844.0	1.255
410	14	880	910.0	1.277
420	17	1032	980.0	1.393
430	14	1061	1054.0	1.334
440	15	1165	1132.0	1.368
450	13	1257	1213.0	1.379
460	15	1351	1299.0	1.388
470	14	1366	1388.0	1.316
480	11	1414	1481.0	1.279
490	8	1500	1579.0	1.275
500	11	1575	1681.0	1.260

TABLE 9.—(continued)

Total Length (mm)	Numher of Fish	Average Empirical Weight (gram)	Calculated Weight (gram)	Coefficient of Condition (k)
510	6	1690	1786.0	1.470
520	4	2013	1897.0	1.432
530	2	2123	2012.0	1.426
540	3	2119	2131.0	1.346
550	4	2150	2256.0	1.292
560	3	2290	2385.0	1.304
570	5	2410	2520.0	1.301
580	5	2533	2657.0	1.298
590	3	2641	2803.0	1.272
600	3	2900	2885.0	1.343
610	2	3250	3106.0	1.432
620	5	3030	3266.0	1.271
630	2	3000	3430 0	1.200
650	6	4334	3779.0	1.578
670	1	3750	4151.0	1.247
680	1	4000	3344.0	1.272
690	2	4500	4543.0	1.370
700	2	5125	4751.0	1.494
710	2	5000	4966	1.397
720	3	5250	5182	1.407
740	1	6000	5640	1.481
760	4	6875	6003	1.566
780	4	7125	6637	1.501
800	7	7664	7178	1.458
820	2	7875	7745	1.428
840	2	8500	8347	1.434
850	3	9083	8654	1.479
860	2	9000	8974	1.415
880	2	9000	9634	1.321
900	5	10500	10320	1.440
910	1	10250	10680	1.345
920	3	11000	11050	1.397
930	2	12600	11440	1.566
950	5	13000	12200	1.516
960	1	13200	12610	1.492
970	5	14250	13020	1.561
980	7	14357	13420	1.525
1000	4	13625	14300	1.363
1010	3	15000	14740	1.456

TABLE 9.—*cont.*

Total Length (mm)	Number of Fish	Average Empirical Weight (gram)	Calculated Weight (gm)	Coefficient of Condition (k)
1020	1	15000	15200	1.413
1030	1	16000	15660	1.464
1040	2	16000	16140	1.422
1050	1	17500	16630	1.512
1060	1	20000	17120	1.679
1070	2	20750	17620	1.694
1080	2	18750	18110	1.488
1090	1	20000	18650	1.544
1100	2	18750	19200	1.409
1120	4	20500	20290	1.459
1140	1	20000	21430	1.350
1150	2	21500	22020	1.414
1160	1	23000	22520	1.474
1210	1	26000	25760	1.468
1220	2	28916	25430	1.592
1250	1	27500	28480	1.408
1260	1	30500	29200	1.525
1280	1	29000	30650	1.383
1300	1	32000	32150	1.457
1320	1	33000	33710	1.435
1340	3	36625	35310	1.522
1350	2	32167	36130	1.307
1370	2	40000	37830	1.556
1400	1	38000	40420	1.385
1420	1	36000	42240	1.257
1430	2	43000	43150	1.470
1440	3	45000	44110	1.507
1450	1	46000	45060	1.509
1460	2	45000	46040	1.446
1490	1	48000	49040	1.451
1500	2	51000	50020	1.511
1520	2	51250	52100	1.459
1540	1	52000	54250	1.425
1570	1	55000	57590	1.421
1580	1	55000	58750	1.394
1600	1	54500	61050	1.331
1620	2	58000	63450	1.364
1730	1	68000	77690	1.313

TABLE 10.—Average calculated length and weight at the end of each year of life, annual increment of growth and percentage increment in weight of *Lates niloticus* from the Nozha Hydrodrome in 1955–64.

Age Group	Calculated Length (mm)	Calculated wight (gram)	Increment in weight	Percentage of incerement
I	232	157	157	0.23
II	429	1047	890	1.32
III	612	3138	2091	3.10
IV	782	6689	3551	5.27
V	937	11690	5001	7.42
VI	1079	18090	6400	9.50
VII	1222	26610	8520	12.64
VIII	1327	34270	7660	11.37
IX	1439	43980	9710	14.41
X	1555	55900	11920	17.69
XI	1652	67390	11490	17.05

TABLE 11.—Coefficient of Condition for different length-groups of *Lates niloticus* from the Nozha Hydrodrome in 1955—1964.

Length-Group (mm)	No. of Fish	Coeff. of Condition	Length-Group (mm)	No. of Fish	Coeff. of Condition
110 — 200	108	1.203	1010—1100	16	1.500
210 — 300	226	1.311	1110—1200	68	1.436
310 — 400	210	1.287	1210—1300	7	1.489
410 — 500	132	1.334	1310 1400	9	1.457
510 — 600	38	1.352	1410—1500	12	1.466
610 — 700	21	1.397	1510—1600	6	1.415
710 — 800	21	1.475	1610—1700	2	1.364
810 — 900	16	1.427	1710—1800	1	1.313
910 —1000	28	1.488	—	—	—

The value of the exponent ($n = 3.0889$) shows that the weight of *Lates niloticus* in the Nozha Hydrodrome increases to a power greater than the cube of the length and this indicates that the body shape changes rapidly as the fish grow in length.

The general length-weight data of Table (9) are represented graphically in figure (5). The smoith curve represents the calceulated weights, while the dots show the average empirical weights.

Comparison of the actual and calculated weights show that the equation fits the empirical data reasonably well. The greatest difference between the actual and calculated weights are encountered in larger fish and are probably caused by the small number of these fish. Extremely close agreement between actual and computed weights should not be expected since the empirical values were derived from the combination of all available data regardless of sex, state of organs, or month, or year of capture.

To give a clear picture, the values of growth increments in weight for each year of life is given in Table (10) in percentage to the total weight reached by the fish at the end of life span (12 years old). From the figures it is clear that the annual increments of weight of *Lates niloticus* exhibited a general upward trend from the first to the 10th year of life. In only one year of life (the eighth) the increment slightly fal below the previous year and this may be explained by the combination of sexes, beside the small number of fish represented at this age.

The growth increment in weight is very small during the first year of life and continuously increases with increasing age till it reaches its maximum value at the 10th year of life, after which the increment in weight begins to decrease.

The Coefficient of Condition

Because the growth in weight is proportional to the growth in volume, the cub relationship of the length to the weight of a fish is usually used for the purpose of comparing the condition of a species. The equation is in the form :

$$K = \frac{W \times 10^5}{L^3}$$

where W is the weight in grams and L is the length in millimeters. The actual values of the coefficient of condition (K) in Table (9), however, show an irregular variation. These irregularities correspond with the discrepancies between the actual and calculated weights discussed before. But when comparing the coefficient of condition for different length-groups (Table 11), we can generally say that the coefficient of condition was low for the young fish and gradually increased as the length increased to about 800 mm.

The values of K then tended to remain high for fishes up to 1500 mm. length. Thereafter the coefficient tended to decrease with the increase in length. The maximum value of K was attained at lengths 1010-1100 mm.

Other Biological Informations

The growth of fry and the spawning time of Lates niloticus :

Some fry collections were made in the beginning of June, July and August of 1965. The total fry lengths (in mm) and weights (in gram) are given in Table (12). On the 6th of June the youngs of *Lates niloticus* attained a total length of 17-35 mm (average = 28 mm) ond a weight of 0.08-0.53 gm (average = 0.30 gm). On the 7th of July the youngs attained an average total length of 65 mm. and an average weight of 2.7 gm. By the 4th of August the youngs reached a total length of 60-100 mm. (average = 83 mm) and a weight of 3.00-9.00 gm. (average = 6.20 gm).

If growths was rapid before June 6 as between June 6 and July 7, the tabulated data do provide some information that confirm the month of May (specially the first half) as the probably spawning time of *Lates niloticus* in the Nozha Hydrodrome. This does not agree with what had been mentioned by Elster & others (1960). They observed two males (of 49 and 65 cm long and about 2 years old) with running milt, on 30 November 1954 and assumed this as strong indication that *Lates niloticus* spawn in late autumn or winter.

The Survival of Lates niloticus during winter :

It has to be mentioned, that some mortalities are usually observed among *Lates niloticus* and some other Nile fishes in January and February when the water temperature dropped to less than 10°C, specially when this relatively low temperature prolonged for some days. A similar case was found by Koura and El-Bolock (1958) for *Tilapia mossambica* transplanted in Egypt. They recorded great mortalities when the water temperature dropped to less than 14°C for a long period, that always exceeds 10 days. They concluded that this species was not able to acclimatize itself in Egypt due to this relatively low temperature in winter.

TABLE 12.—Comparison of growth (total length in mm and weight in gm) of the fries of *Lates niloticus* from the Nozha Hydrodrome in 1965.

Serial Number	June 6		July 7		August 4	
	length (mm)	weight (gm)	length (mm)	weight (gm)	length (mm)	weight (gm)
1	17	0.08	55	2.0	60	3.0
2	18	0.09	60	2.0	70	4.0
3	24	0.19	80	4.0	80	5.5
4	27	0.20			80	6.0
5	32	0.38			85	7.0
6	32	0.39			90	6.5
7	34	0.52			95	9.0
8	35	0.53			100	8.5
Average. . . .	28	0.30	65	2.7	83	6.2

The death of *Lates niloticus* in winter, was observed many times by fishermen in different places in the northern part of Egypt. This phenomenon was also observed during winter in the Serow fish farm, when the depth of water in the ponds did not exceed 1.0 meter. Consequently in shallow water areas (like the Egyptian Delta lakes), the Nile Perch is not able to withstand the relatively low water temperature of winter and in many cases some mortality takes place. So a winter temperature of 10°C may be considered as a limiting factor in the geographical distribution of *Lates niloticus* into higher latitudes.

The Behaviotr of Lates niloticus :

Elster (1960) and El-Medani (1966) had recorded that crustaceans, water insects and some other invertebrates were very frequent in the food of young *Lates niloticus* and form at least for fishes up to 40 cm. in length (about 2 years old) an import part of the diet. This feeding character makes the fish to be active in obtaining their food and so they are easily caught with the ordinary fishing methods.

By reaching maturity (more than 40 cm in length) the *Lates niloticus* becomes essentially carnivorous, feeding on Tilapia and many other sepcies of fish including their own young, and so the *Lates niloticus* changes its living behaviour. They always keep in deep water, using shelters to hide. Staying quiet in their hidding places, till any fish (victim) passes near by. Suddenly the *Lates niloticus* attacks its prey and return back to its shelter again. This behaviour, beside the large size and strength that Lates attains, makes it very difficult to catch the large Lates by the ordinary fishing gears.

SUMMARY

This study was based on materials obtained from the Nozha Hydrodrome in the period from 1955 to 1964. All *Lates niloticus* (968 specimens) were taken with nets (gill and trammel), as well as seines and wire traps.

Fishes of age groups 0 and I were typically dominant in the commerical catch, while age group II was rare. The partial draining of the Hydrodrome and the extensive fishing carried out in 1964 enabled us to obtain a number of large fishes which were nearly impossible to catch with the ordinarily fishing methods. The largest fish in the collections was a single individual having a total length of 173 cm, a weight of 68 kgm. and aging 12 years(age-group XI).

Ages were determined and individual growth histories were computed from the examination of the scales of 694 fish. Body-scale relationship is shown to be linear and appropriate corrections were made in all calculations. The general growth data showed that the Nile perch made by far the greatest growth in length (232 mm) during the first year of life. The growth increments of the later years exhibited a regular tendency to decrease with increasing age.

The season's growth of *Lates niloticus* in the Nozha Hydrodrome mostly begins in April and ends by December and so the growing season of this species in this locality is not less than 8 months long. The growing season of this fish is mostly affected by water temperature, the decrease of which to about 14°C practically hinders the growth of this tropical species.

Over the length interval (110-1730 mm), the length-weight relationship was described satisfactorily by the equation $W = 0.7738 \times 10^{-5} \times L^{3.0889}$. The agreement between empirical weights and those computed from this equation was reasonably good at lengths represented by far numbers of fish. The actual weights of larger fish were less than the weights computed because of the combination of sexes, beside the smaller number of fish present.

The calculated annual growth in weight increased from 157 grams in the first year of life to a maximum value of about 12 kg. in the 10th year. In the succeeding years the increment decreased consistently to about 11 kg. in the 12th year of life.

The coefficient of condition (k) showed some correlation with the length of the firsh. The value of (k) was low for younger fishes and increased with increasing length till it reached high values at 1000-1500 mm. Thereafter, it decreased with the increase of length.

In the Nozha Hydrodrome the spawning time of *Lates niloticus* as decided from the growth rate of fry was found to take place probably in the month of May.

In the shallow water areas of the Northern part of Egypt, some mortalities of the *Lates niloticus* were observed in January and February when the water temperature decreased to less than 10°C for some days. So the survival (over wintering) of this species is very much affected by low temperatures.

By reaching maturity, the *Lates niloticus* changes its living behaviour. The mature fish keep always quiet in deep water and feed only on fishes. Owing to this special living characters, beside its powerful strength, the large sizes of *Lates niloticus* can not be caught by the ordinary fishing gears.

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