AGE AND GROWTH OF MUGIL CAPITO (C & V.) IN NOZHA HYDRODROME, ALEXANDRIA, A. R. E.

By

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ABSTRACT

Age and growth of *Mugil capito* in Nozha Hydrodrome is studied in detail, in the course of evaluation of the Hydrome as commercial fish farm.

M. capito is found to grow in Nozha Hydrodrome at a higher rate than natural waters. The average size of this fish in the Nozha Hydrodrome was between 300 and 400 mm, The commercial Hydrodrome was between 300 and 400 mm, the commercial fishery depended upon fish of age groups III and IV.

INTRODUCTION

Transplantation of mullet fry to inland waters, started in Egypt since 1921 when Paget transplanted mullets to lake Mariut, in the vicinity of Alexandria. Wimpenny 1932, and Wimpenny and Faouzi 1929, transplanted mullet fry into lake Quaroun upper Egypt. Since that time, mullet fry are annually transplanted from Egyptian Meditterr anean waters to that lake.

The periodicity and morphometric differentiation of mullet fry in Alexandria weters was thouroughly studied by El-Zarka and Fahmy 1965, El-Maghraby and Bishara 1971.

The hydrodrome was originally a part of lake Mariut separated from during the second world war. It has an area of 504 hectares and average depth of about 6 meters.

Water in the hydrodrome is of low chlorosity (O.24 - O.44 gm Cl/L Al-Sayes 1971). The hydrodrome made the subject of various hydrological and fisheries studies, since Jensen and Elster 1960. Since 1965 it is used as a commercial fish farm and mullet fry are annually transplanterd to it .

The object of the present investigation is to study the growth of *M. capito* in the hydrodrome which is a closed body of water, in the course of evaluation of the hydrodrome as commercial fish farm.

MATERIAL AND METHOD

Fish were collected weakly from professional fishermen, in the hydrodrome in the period October 1968 December 1970. Gears used in the fishing operations were mainly trammel nets.

Total length in cm,gutted weight in gm, and sex were recorded for each fish. Age was determined by readings of the scales, taken from the flank region behind the pectoral fin.

Scale examination :

Dameter of scales and growth fields were measured under a sterioscopic microscope to the neasrest micrometer division along a line passing through the focus and bisecting the anterior field.

Age groups were designated by Roman numerals corresponding to the number of annuli. All fish were considered to have passed into the next higher age group on 1st of January.

No great difficulty was encountered in the determination of age of this species. False annuli were not frequent. Regenerated scales were not often present, but these were usually discarded, in age determination.

Body-scale relationship :

The body scale relationship of *M. capito* in the hydrodrome was determined from the average diameter of five scales of each of 1400 fish examined. They covered total lengths between 200 and 450 mm. The graph of mean scale diameter and mean total body lengths is shown in fig. (1). The straight line fitted by

the least squares to the means of scale diameters and lengths of fish, had the following equation: $L = 3.33 + 6.60\ S$

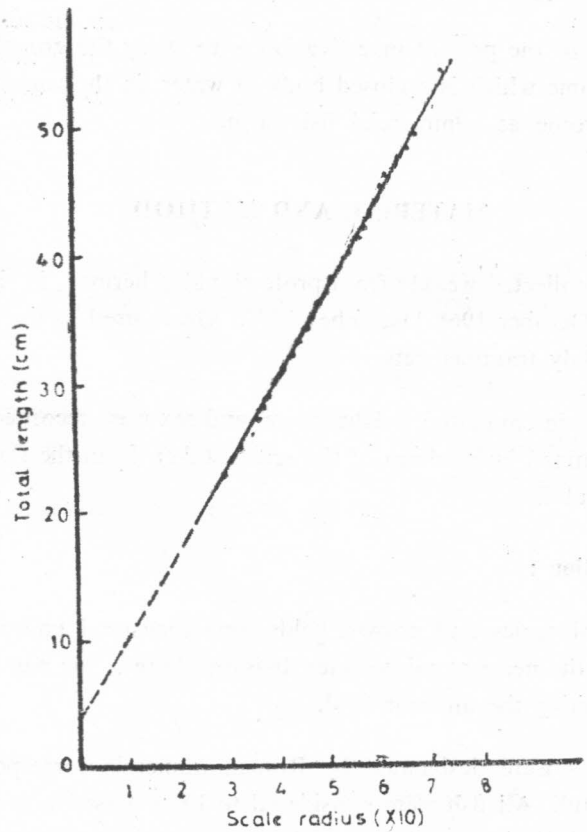

Fig. 1 - Length scale relationship of Mugil capito from the Nozha hydrodrome

In our back calculations we followed the Lee's formula

$$Ln = Sn/S\ (L - a) + a$$

where Ln = calculated length in cm.

L = total length at capture in cm.

S = total scale radius, in micrometer division × 20.

Sn = scale radius at annulus n, in micrometer division X 20.

a = intercept.

Calculated growth in length:

The calculated lengths of males and females in different years of life of *M. capito* in the Nozha hydrodrome are shown in fig. (2). It is clear that the rate of growth of females is higher than the males. The males of certain age are smaller in size than the females of the same age group. It should also be noted that the rate of growth in length in both sexes is lowest during the second year of life. This is the age at which the *M. capito* usually reaches sexual maturity in the hydrodrome.

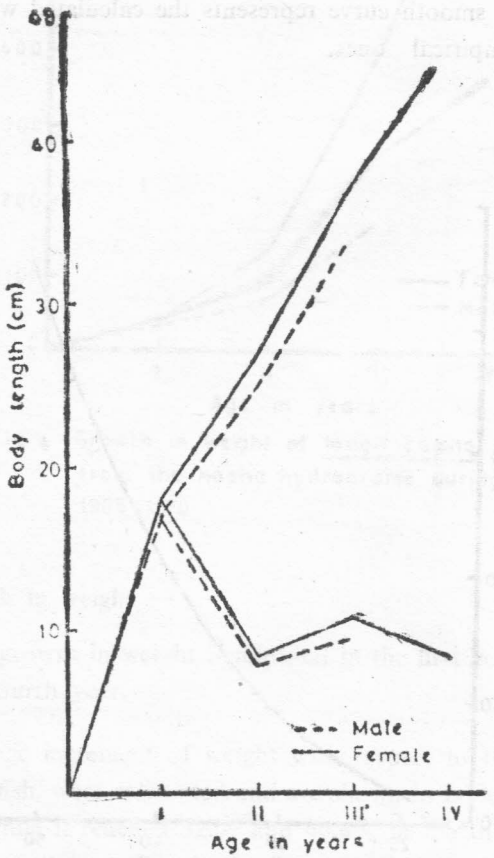

Fig. 2- Growth in length of Mugil capito from the Nozha hydrodrome during 1968-1970

Length weight relationship :

The length weight relationship for *M. capito* reared in the hydrodrome was found to be represented by the following equations.

for the females; $\log W = -2.5426 + 3.2983 \log. L$

for the males; $\log W = -2.2465 + 3.1513 \log. L$

for the sexes combined ; $\log W = -2.2456 + 3.1066 \log. L$

The agreement between calculated and empirical weights is evident from fig. (3), where the smooth curve represents the calculated weights and the dots represent the empirical ones.

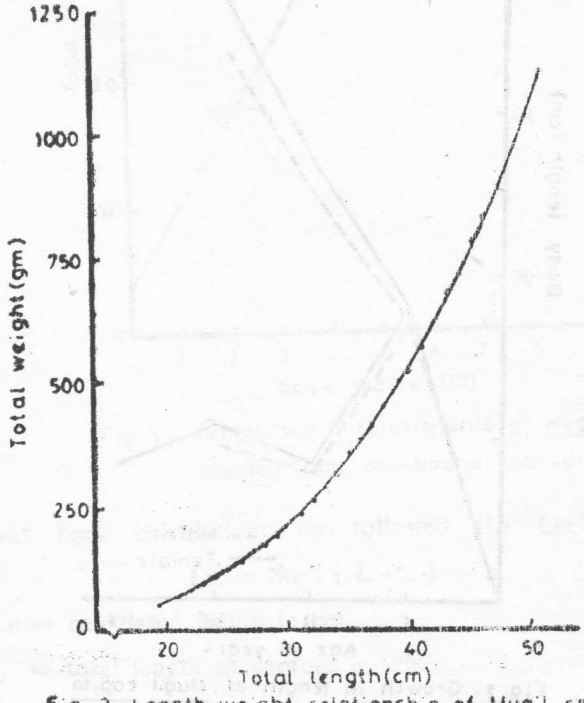

Fig 3- Length weight relationship of Mugil capito from the Nozha hydrodrome during 1968 - 1970

Calculated weights for males and females at the end of each year of life are shown in fig. (4).

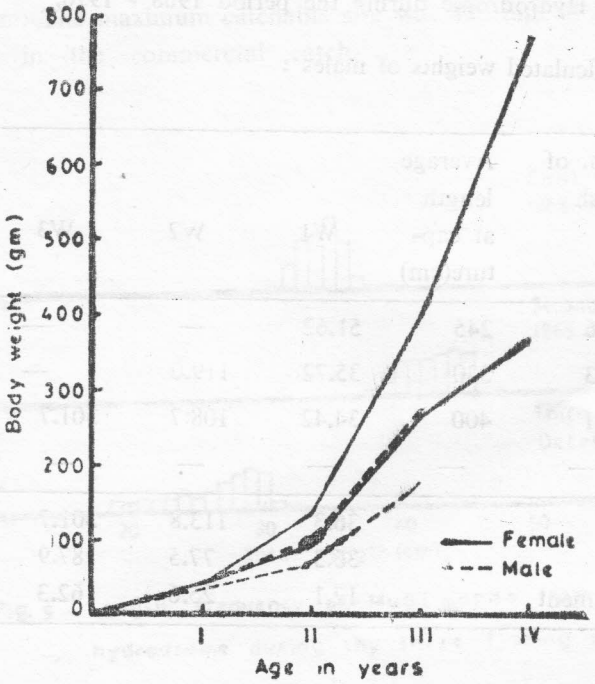

Fig. 4 - Growth in weight of Mugil capito from the Nozha hydrodrome during 1968 - 1970

Calculated growth in weight :

The annual growth in weight is minimal in the first year and is at its highest rate in the fourth year.

The percentage increment of weight with respect to the total weight of a four year female fish, were calculated and are shown in table (1). In the first year this was 6.1%, while it reached 32.09 and 46.4% in the third and fourth years. Thus growth in weight was slow in the first two years and then increases more rapidly in the third and fourth years. In the males, the growth in weight also increases in every year of life. A male fish gains nearly most of its weight in the third year of life.

Table 1. Calculated weights of *M. capito* at the end of each year of life, in the Nozha Hydrodrome during the period 1968 - 1970.

A - Calculated weights of males :

Age Group	No. of Fish	Average length at capture(cm)	W1	W2	W3	W4
I	36	245	51.62	—	—	
II	173	330	35.72	119.0	—	
III	171	400	34.42	108·7	301.7	
IV	—	—	—	—	—	
Grand average			36.3	113.8	301.7	
Increment			36.3	77.5	187.9	
Percentage increment			12.1	25.6	62.3	

B — Calculated weights of females:

I	69	260	51.62	—	—	—
II	271	355	45.87	173.9	—	—
III	285	437	44.33	137.9	401.9	—
IV	9	500	44.33	139.6	408.9	750.4
Grand Average		45.8	155.2	405.4	750.4	750.4
Increment			45.8	109.4	246.9	348.3
Percentage increment			6.1	14.6	32.9	46.4

Length distribution of the commercial catch:

The frequency distribution of different length groups in the commercial catch is shown in fig. (5). The minimum size obtained in the commercial catch was 190 mm. The maximum catchable size was 480 mm in 1969. Bigger sizes were rare in the commercial catch.

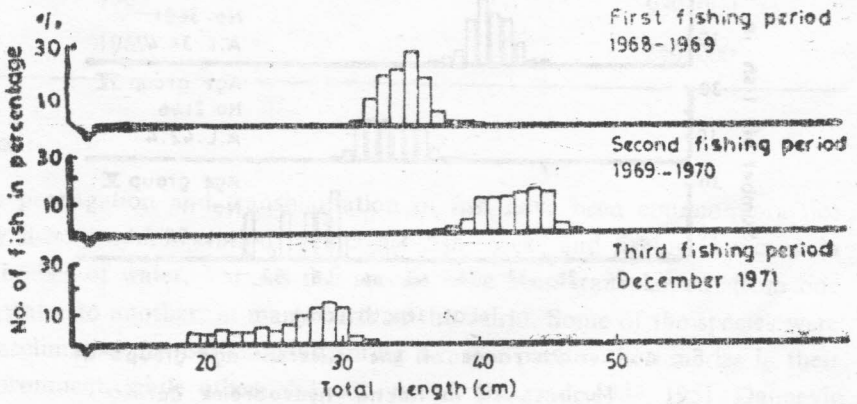

Fig. 5 - Length frequency of Mugil capito from the Nozha hydrodrome during thy three fishing periods

In general, the ordinary size met with in the commercial catch varied between 300 and 400 mm. Fish in the length interval of 300 to 400 mm made up 98.56% of the catch of *M. capito* in the hydrodrome. Fish 400 mm and longer comprised only 0.96% of the commercial catch. The modes of the length distribution were at 350 mm for 1969 and 430 mm for 1970.

Length distribution of the age groups :

The length distribution of 1400 *M. capito* for which ages were determined indicate wide ranges in length for individual age groups. Overlapping exists between fish of age group II, III and IV as shawn in fig (6). Length therefore cannot be taken as a good index of the age of *M. capito*. Fish in the length range 295-324 mm. may belong to age group II or III. This length range comprised about 75.5% of fish of age group III. Length range from 365-394 mm comprised about 37% of fish of age group IV and length range from 465-484 mm comprised about 31.3% of age group V.

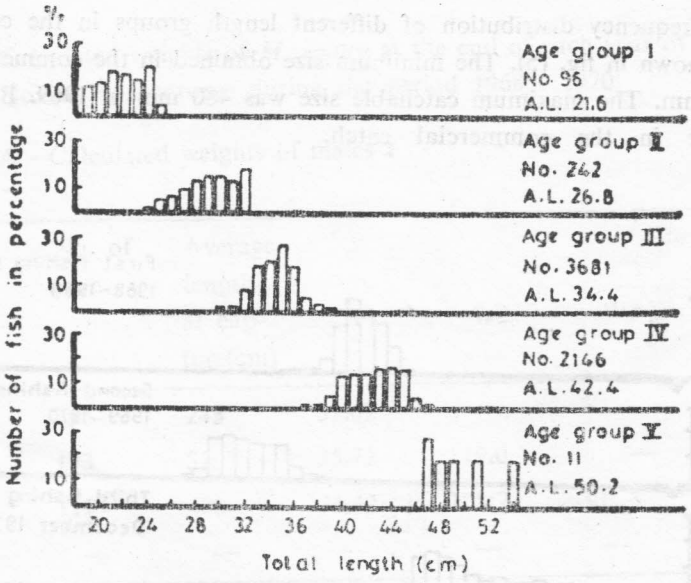

Fig. 6 – Length range of the different age groups of Mugil capito in Nozha hydrodrome during 1968-1970

Age composition of the commercial catch :

The commercial fishery of *M. capito* depended primarily on fish of age group III and IV, which represented 96·3% of the total catch in 1968-1969 and 97.8% of the total catch in 1969-1970. Fish of other age groups represented 3.6% in 1968-1969 and 2% in 1969-1970.

The lack of fish of age groups I and II were attributable to gear selectivity. The small number of fish of older age groups, suggest high mortality in later years, or over exploitation.

The catch of 1968-1969, was dominated by age group II, whie that of 1969-1970 was dominated by age group III. These two age groups belong to the year class 1965. This means that the year class 1965 was dominating the population of *M. capito* in the hydrodrome, during the two fishing periods. This is mainly due to the very high stocking rate with mullet fry in the year 1965, as shown from table (2).

Table 2. The number of mullet fry transplanted in the hydrodrome during the years 1965-1968.

Year	Number of fry transplanted (in thousands)
1965	3 838 000
1966	930 000
1969	240 000

Discussion:-

The propagation and transplantation of fish have been common practice of many fishery administration to increase fish stocks and fishing capacties in specific bodies of water. Various fish species have been transplanted from one body of water to another, in many parts of the world. Some of the species were able to acclimatise themselves, constituting a major part of the fisheries in their new environment, while others did not succed. (Blegrad. 1933, 1951, Dannevig 1951, El Zarka 1963, Nikolsky 1963).

By the word success in acclimitisation we mean that the fish, was able to reproduce in the new habitat, and hence establish a new population in the new environment. Concerning *M. capito*, it is evident, as was mentioned by various authors (Wimpenny and Faouzi 1936, Faouzi 1936, Elster et.al. 1960 and El-Zarka 1963) that this fish is not able to spawn in landlocked water areas.

That is why the hydrodrome is used as a big fish rearing pond, into which the fry is transplanted annually. The rate of growth of *M. capito* in the hydrodrome is compared with those in other waters in the Delta lakes. The rate of growth of this fish species in the hydrodrome is higher than in other bodies of water *(Table* 3 *)*. For the females, the incerment increase in length, in lake Menzala is least during the fourth year of life. In lake Burollos, the rate of growth in length drops during the 3rd year of life. In the Nozha hydrodrome the growth rate decreases in the second year, another decrease is noted in the fourth year. For the males, in Menzala lake, the rate of growth is least during the 2nd year. In lake Burollos it is during the 3rd year that a drop in the rate of growth is noted. In the Nozha hydrodrome this decrease in growth rate occurs in the

Table (3) — Growth in length of *M. capito* in various waters.

Area	Reference	length at the end of each year of life (mm.)											
		I		II		III		IV		V		VI	
		M.	F.	M.	F.	M.	F.	M.	F.	M.	F.	M.	F.
Lake Manzala	Fayek (1973)	131	137	200	216	—	302	—	368	—	—	—	—
				(69)	(79)		(86)		(56)				
Lake Borollus	El-Maghraby	123	129	226	238	299	313	—	—	—	—	—	—
	(1974)			(103)	(109)	(73)	(75)						
Nozha Hydrodrome	Present data	168	181	242	268	332	364	—	445	—	—	—	—
				(74)	(77)	(90)	(96)	(81)					
Mediterranean Sea	Rafail (1968)	18		232		314		377		427		467	
				(214)		(82)		(63)		(50)		(40)	
France	Ezzat (1965)	114.3	111.5	190.2	194.5	263.3	280.1	312.2	325.1	333.0	356.1	375.0	
				(75.9)	(83.0)	(72.1)	(85.6)	(48.9)	(45.0)	(20.8)	(31.0)	(42.0)	
Black Sea	Alexandrova	147.6		287.3		367.1		447.6					
	(1962)			(139.6)		(79.9)		(80.8)					
Arcachon	P. Arne	131		181		210		234		272		(216)	
	(1967)			(50)		(29)		(24)		(38)		(44)	

2nd year. In the Mediterranean the least increment is during the 3nd year. After the fifth year, the rate of linear growth decreases in fish caught from the Mediterranean waters, off lake Edku.

From the above we can see that, for all areas, a drop in the rate of growth is noted in the second or third year of life. This drop is grenerally associated with the onset of sexual maturity. After this drop in length, the *M. capito* of the hydrodrome grows at a higher rate, than in the other two lakes.

If we compare the mean length for each age group in the four regions, we can see that the fish of lake Menzala have the least length for each age group and that the hydrodrome fish attains bigger sizes for each age group.

It is known that the commercial size of this fish in Egypt is about 250 mm total length.This size is reached in the hydrodrome by the end of the second year, while in other waters, the fish needs three years to reach the commercial size.

Table (4) shows the different values for log c and n, for this fish in differnt Egyptian Delta lakes. From this, it is clear that the value of a is highest in the hydrodrome. The rate of putting on weight in the hydrodrome fish is higher than those in lake Burollus, lake Menzala, lake Mariut and in the Mediterranean waters.

Table (4) Comparison between (log c & n) in the length-weight equation for *M. capito* in Different Egyptian Waters.

Region	Author	log c	n
Mediterranean shore	Rafail (1968).	-4.8998	2.9142
Lake Borollus	El-Maghraby, Hashem & El-Sedfy (1973).	-4.4244	2.8071
Lake Manzala	Fayek (1973).	-4.9346	2.9287
Lake Mariut	El-Maghraby & Bishara (1971).	-2.2465	2.8715
Nozha Hydrodrome	Present data.	-2.2456	3.1066

Table (5) is so arranged that the weight of fish of the same length in the hydrodrome and two other Delta lakes (lake Burollus and lake Menzala), could be compared. Weights of *M. capito* in the hydrodrome are always heavier than

those of similar lengths from other lakes, in all size groups, greater than 220 mm. The difference increase from 0.5 gm to 209.7 gm. for lake Menzala. It should be mentioned also that as the fish increases in length the rate of putting on weight by the fish is highest in the Nozha hydrodrome. This advantage in weight of fish of the Nozha hydrodrome clearly shows that the hydrodrome could be considered as an excellent rearing pond for that fish.

Table.(5) Comparison of the calculated Weights of *M. capito* in Nozha-Hydrodrome, Lake Borollus and Lake Manzala.

Total Length (mm.)	Calculated weight of *M. capito* (gm)			Advantage of weight in Hydrodrome over the area (gm)	
	Hydro-drome	Lake Borollus	Lake Manzala	Lake Borollus	Lake Manzala
190	53.3	52.8	54.93	+ 0.5	— 1.6
210	72.8	72.93	73.60	+ 0.1	— 0.8
220	81.1	81.49	84.33	+ 2·6	— 0.2
230	96.5	94.48	96.5	+ 2.0	+ 0.4
240	110.2	100.80	108.8	+ 9.4	+ 1.4
250	125.5	114.8	122.7	+ 10.7	+ 2.8
260	141.4	130.5	137.6	+ 10·9	+ 3.8
270	159.6	148.6	153.7	+ 11.0	+ 5.9
280	177.9	158.5	171.0	+ 21.4	+ 6.9
290	198.4	189.0	189.4	+ 9.4	+ 9.0
300	220.4	192.5	209.2	+ 27.9	+ 11.2
310	244.1	218.8	230.4	+ 25.3	+ 13.7
320	269.3	238.8	252.2	+ 30.5	+ 17.1
330	296.3	242.8	276.6	+ 53.5	+ 19.7
340	325.3	264.0	301.9	+ 61.3	+ 23.4
350	355.8	286.5	328.7	+ 69.3	+ 27.1
360	388.4	310.0	356.9	+ 78.4	+ 31.5
370	422.9	334.7	386.8	+ 88.2	+ 36.1
380	459.4	360.9	418.2	+ 98.5	+ 41.2
390	498.0	388.2	451.3	+ 109.8	+ 46.7
400	538.8	416.9	486.1	+ 121.9	+ 47.3
410	581.8	446.7	522.4	+ 138.1	+ 59.4
420	626.6	477.7	560.4	+ 148.9	+ 66.2
430	674.5	510.6	600.8	+ 163.9	+ 73.7
440	724.6	544.6	642.5	+ 180.0	+ 82.1
450	776.6	579.5	686.1	+ 197.1	+ 90.5
460	876.6	617.0	731.9	+ 259.6	+ 144.7
470	989.0	655.2	779.3	+ 333.8	+ 209.7
510	1147.0	824.3	990.2	+ 322.7	+ 156.8

SUMMARY

This study was caried out to evaluate growth of *M. capito* in the Nozha Hydrodrome. *M. capito* is transported annually among Mugl fry from Egyptian Mediterranean waters to Nozha Hydrodrome.

Age was determined by scale examination. Study of linear growth showed that the females had a highrer growth rate than the males. Growth in weight showed also that the females gain more weight than the males.

The commercial catch, comprises mostly fish of size groups 300-400 mm. Study of length distribution of age groups showed wide ranges in length for individual age groups. Overlapping exist between fish of age groups II, III & IV. The commercial catch depends primarly on fish of age group I & IV. The lack of age groups I & II were attributed to gear selectivity. The small number of older ages, suggests high mortality in those age groups or over-exploition.

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