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STUDIES ON MUGIL SEHELI AND M. CAPITO IN LAKE TIMSAH.

II. REPRODUCTION.

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ABSTRACT

Mugil seheli and **Mugil capito** in Lake Timsah start sexual maturation early within age group I, and are exclusively mature in the next year. Based on egg diameter, gonad index, monthly magnitude of mature fish, the spawning season extends from October to January with the peak in December and January for **M. seheli** and extends from October to January with the peak in November/December in **M. capito**. The fecundity averaged 261 thousand for the former and 981 thousand for the latter. Largest eggs measured about 475 µ in **M. seheli** and 630 µ in **M. capito**. For the whole year, the males were the fewest in the catch during the spawning period.

INTRODUCTION

The interest in the studies of the Suez Canal started since a long time and was mainly concerned with the distribution and the migration of fishes through the Canal (Tiller 1902, Tortonese 1948, Steintiz.. et al 1972 .. etc.). The biology of fish in this area is far from being known. In other areas of Egypt, the biology of mullets has been the subject of some studies (El-Zarka and El-Sedfy 1967, El-Maghraby .. et al 1973, Fayek 1973.. etc.). The present work is a part of the program directed to the biology of mugilids in Lake Timsah and deals with reproduction of **Mugil seheli** and **M. capito.**

MATERIAL AND METHODS

Random fish samples were collected from the commercial catch of Lake Timsah along the different months of 1980. Total length, total weight and gutted weight, stage of maturity and weight of gonad were recorded. The maturity stages were also recorded according to the differentitation of the five stages given by Hjort, 1910. Gonads were preserved after dissection in 10% formalin, dated and labelled with all the necessary data for subsequent examination. The gonad index was calcualted as the percentage of gonad weight to the total fish weight. For studying the fecundity, only the ovaries of stages IV and V were adopted. Egg counts were based on the gravimetric method. The number of fish samples adopted for the different items analysed is the following.

Topic	Number of fishes			
	Mugil seheli		Mugil capito	
	♂	♀	♂	♀
1- First Sexual Maturity	157	760	161	405
2- Gonad Index	200	663	206	495
3- Egg Diameter		655		483
4- Fecundity		169		148
5- Sex Ratio	840		699	

RESULTS

A. First Sexual Maturity

In **Mugil Seheli,** the smallest mature male was 10.2 cm and the smallest mature female was 11.4 cm in total length. A clear picture can be drawn from Fig. 1 a. Thus, all males longer than 14 cm are sexually mature while all females longer than 15 cm are so. Furthermore, some males or females start their sexual maturity in the first year of life (74% of males and 37 % of females). All males of age group II are mature while only 65% of females exhibited this condition. Common female maturation is shown in age group III, Fig.1 b. Thus, on the basis of the data available, 50% maturation prevails at 13 cm for male and 14 cm. T.L. for female (Fig. 1 c).

On the other hand, in **M. capito,** the smallest ripe male was 14.8 cm while the smallest ripe female was 17.5 cm. The extent of maturation with length is clearly shown in Fig.2, thus, all males larger than 22 cm and females larger than 24 cm are sexually mature. Concerning the relation between maturity and age, about 17% of females and 68% of males of age group I were found mature. All males of age group II were found mature as compared with only 76% for females of this age group. All females of age group III or older were found mature, Fig.2 b. Lastly, the 50% maturation corresponds to about 20 cm. T.L. for female and 18 cm T.L. for male, Fig.2 c.

B. Maturity Stages of Gonads

(a) **Mugil seheli** (Fig.3)

In the male, the immature testes belonging to stages I and II were common in June, July and August, then their frequency decreased in September

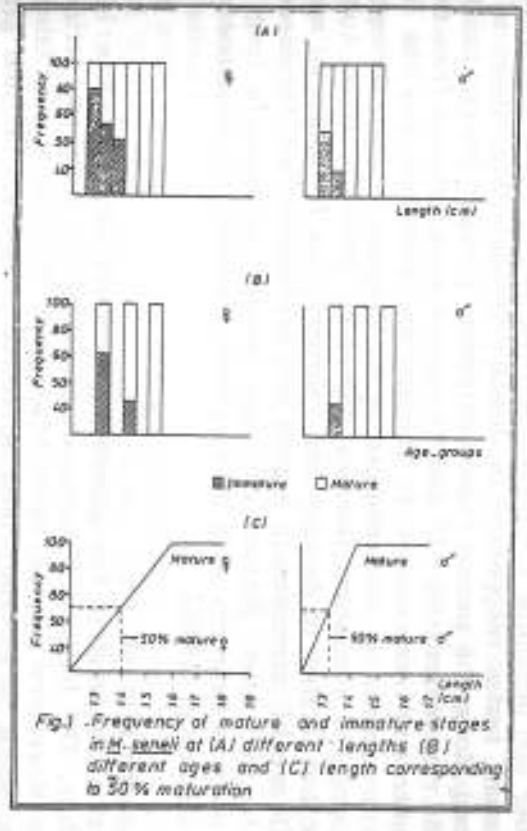

Fig.1 .Frequency of mature and immature stages in *M. seheli* at (A) different lengths (B) different ages and (C) length corresponding to 50% maturation

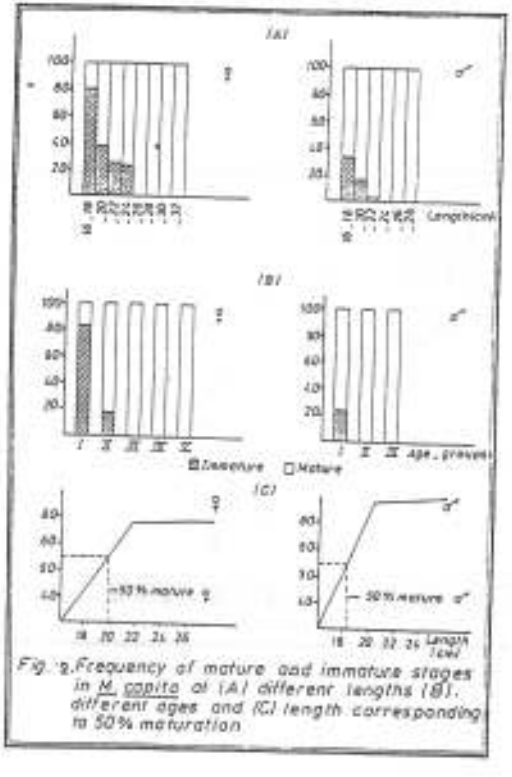

Fig. 2. Frequency of mature and immature stages in *M. capito* at (A) different lengths (B) different ages and (C) length corresponding to 50% maturation

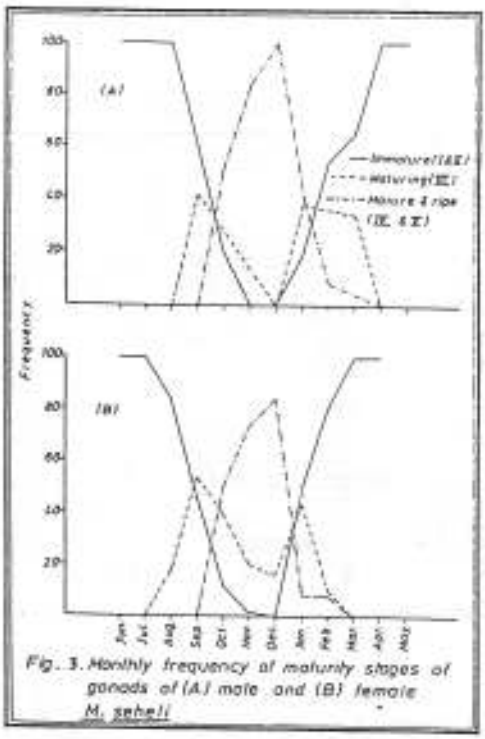

Fig. 3. Monthly frequency of maturity stages of gonads of (A) male and (B) female *M. seheli*

and October and becoming completely wanting in November and December. The immature testes reappeared in January through May. Males of stage III appeared along the period from September through March. Lastly, the mature and ripe males (stage IV and V) become more common from October to December and less common in January and February. For the female, the immature condition was recorded in all samples in June through May, the frequency of immature females decreased gradually from August to December and further to January and February. The frequency of maturing females (Stage III) increased in August and September, but decreased from October to December. Mature and ripe females appeared a long period from October to February with its maximum frequency in November (about 84%) and December (100%).

(b) **Mugil capito** (Fig. 4)

Concerning the males, the gonads are collectively immature in April through July. The frequency decreased progressively along the period from August to November and increased afterwards from December (about 6%) to March (about 94%). The maturing testes (Stage III) become gradually fewer from August (about 20%) to October (about 3%) and increased in December and January (16%), then decreasing to 12% in February and 6% in March. The mature/ripe testes appeared in October-February period and their frequency was 87, 89, 72, 58 and 17% in these months respectively.

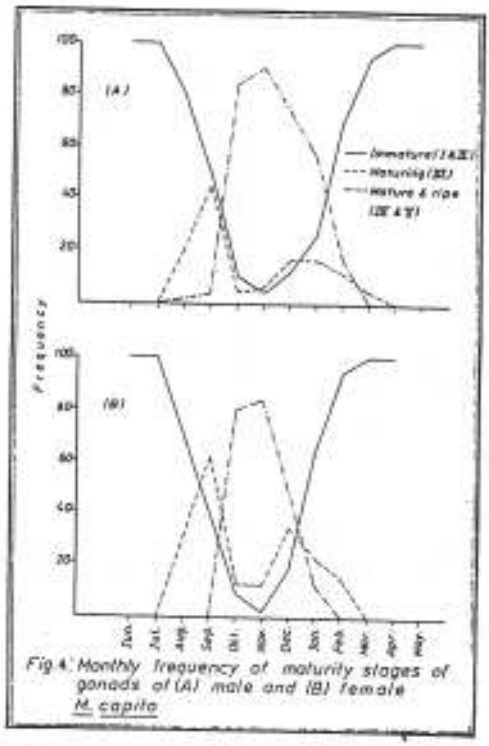

Fig 4. Monthly frequency of maturity stages of gonads of (A) male and (B) female *M. capito*

On the other hand, the ovaries were exclusively immature from March to July. The frequency of immature females decreased from August (38%) to November (5%), but increased afterwards to 85% in February. Females of Stages III formed 30% in August, 62% in September, becoming fewer in October/ November (11-14%), but the frequency increased to 34% in December, decreasing to 25-21% in January/February period. The mature/ripe females were the commonest in October (79%) and November (83%), becoming fewer in December (about 48%) and January (about 11%).

C. Gonad Index

(a) Mugil seheli (Fig.5 a)

For the male, the average G.I. did not vary greatly along the period from June (0.01 %) to September (0.11 %) and it was less than 0.2%. This average increased to 1.12-1.16% in October-November and further to 1.5% in December.

The G.I. started declining afterwards and averaged 1.2% in January, 0.94% in February and 0.42% in March. In April-May period, the average G.I. was 0.02. The maximal values recorded were 0.5, 3.5, 4.4, 1.7, 2.1, 1.9 and 0.7% along the successive months from September to March.

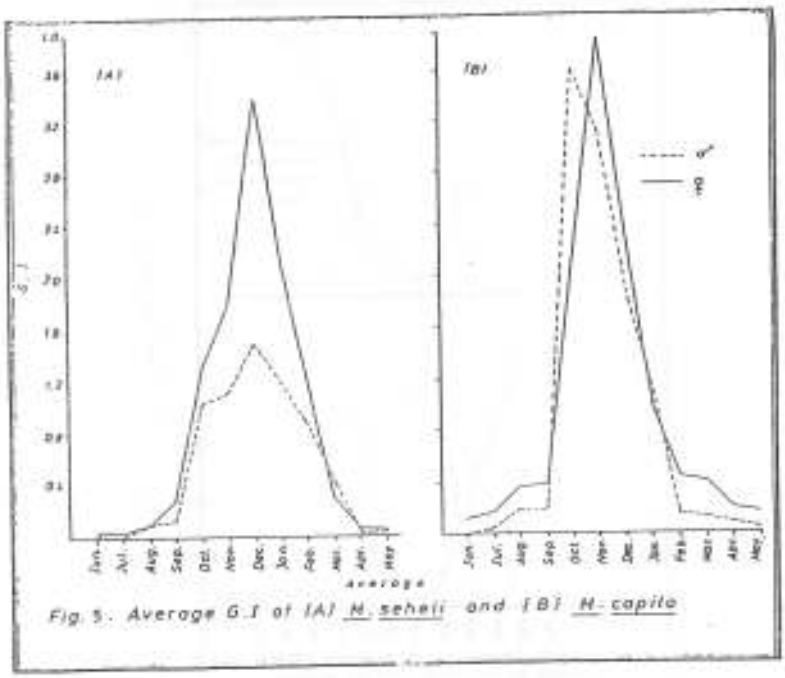

Fig. 5. Average G.I of (A) *H. sehali* and (B) *H. capito*

On the other hand, the average G.I. of the female ranged from 0.05-0.07% along the April-July period, but it increased to 0.17% in August and further to 0.29% in September. A considerable continuous increase prevailed from October to November and further to December as the average G.I. was calculated as 1.32, 1.81 and 3.42% respectively. Afterwards followed a progressive decrease as the average G.I. was 2.34% in January, 1.23% in February and 0.30% in March. The maxima were recorded as 0.61, 4.9, 7.6, 11.9, 9.7, 5.7 and 0.5% along the successive months from September to March respectively

As to the frequency of fish with different G.I. (Fig. 6), all males have small testes, not more than 2% in G.I. along the period from January to September within the fish samples examined. This appeared in 88-89% of males in November/December. In addition, males with 2-4% G.I. appeared in October, November and December comprised 18,9 and 11%. In turn, males with higher G.I. (4%) appeared in November with only 3%.

For the female, the ovaries exclusively had G.I. < 2% in March-September period. This category formed 80, 74, 40, 61 and 83% along the sucessive months of October-February respectively. The frequency of the next category (2-4% G.I.) was 16, 25, 26, 29 and 17% while that of the third category was 4, 5, 19, 7 and 1 % along the above successive months respectively.

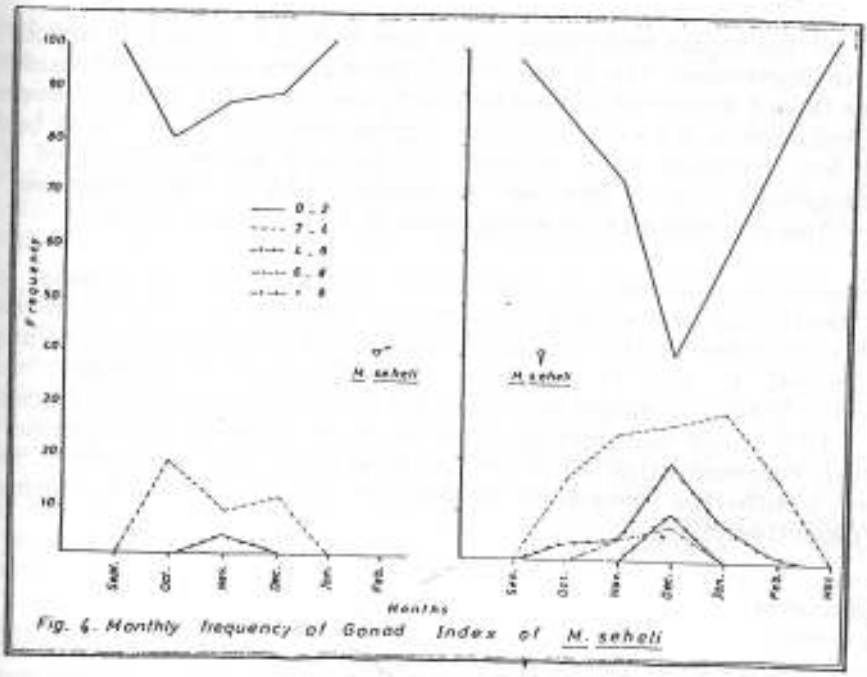

Fig. 4. Monthly frequency of Gonad Index of M. seheli

Females with ovaries 6-8% appeared in November and December with frequency 5-6%, while heavier ovaries > 8% were recorded in December with only 9% frequency.

(b) **Mugil capito** (Fig. 5b)

For the male, the average G.I. was only 0.04% in July and 0.2% in August and September. This variable increased to 3.6% in October, but decreased to 3.1% in November, 1.9% in December and 1.0% in January. Along the period from February to May, the average G.I. range was 0.05 - 0.15%. The maximum G.I. varied from 0.05 to 0.3% from February to August, increasing to 1.1% in September, 6.2% in October and 5.4 - 5.7% in November/January period.

The average G.I. of the female showed a comparable annual pattern to that of male as the values were generally low along February - September period (0.16 - 0.44%). Numerically, this average increased from 0.13 in June to 0.38% in September, then followed an abrupt increase to 2.16% in October and further in November (4.26%). A considerable decline prevailed in December (2.29%) and further to January (0.92%). Average G.I. afterwards decreased gradually from 0.44% in February to 0.16% in May. In turn, the maximal values were 0.34 - 0.77% along the period from April to September and were 8.1, 15.6, 10.8, 8.8 and 1.1% along the successive months from October to February.

In turn, all the males had gonad index less than 2% along the period from February to September. The frequency of these males decreased considerably in October (about 30%), but afterwards increased to about 39% in November, 68% in December and 85% in January. Males with G.I. of 2 - 4 % became gradually less frequent from October to January period. Males of 4 - 6 % G.I. comprised 33% in October/ November, 17% in December and 10% in January. Heavier testest (>76%) appeared in 9% of males, Fig.7.

For females,the smallest ovaries (2-4%) prevailed in all females along February-September period. The frequency of females of 2-4% G.I. decreased from 37% in October to 11.0% in December, while those of next G.I. range(4-6%) comprised 4, 20, 10 and 5% from October to January months respectively. 6-8% G.I. range was recorded only in November and December, while 8 - 10% range was distinguished along October-January period with the highest representation of 6-7% in November and December. During these two months.The frequency of heavier ovaries(>10% G.I.) formed 14 and 2% respectively, Fig.7.

D. Egg-Diameter

(a) **Mugil seheli**

As shown in Fig. 8, the average diameter was 44-53 μ along the period from June to August, increasing only to 61 μ in September. October showed

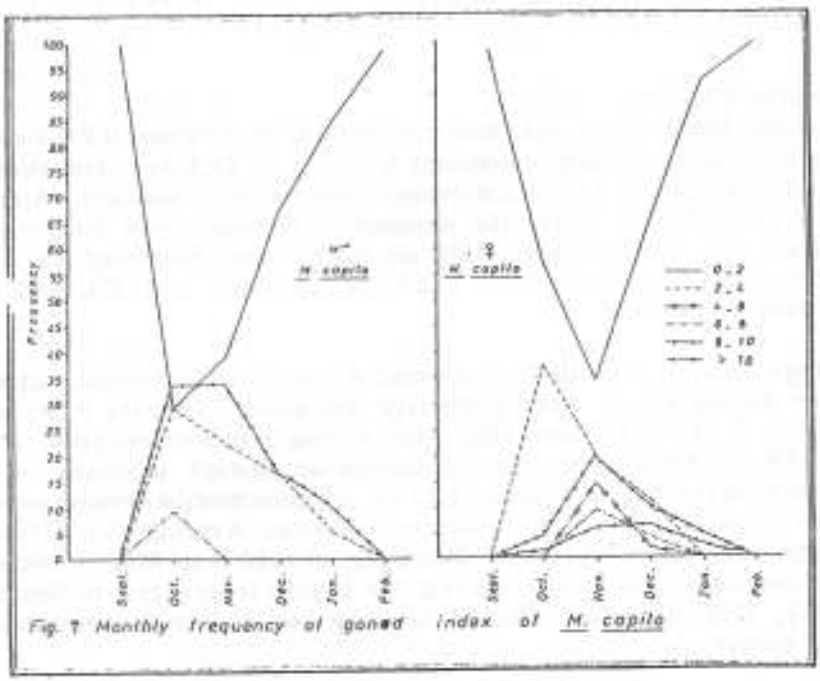

Fig. 7 Monthly frequency of gonad index of M. capito

an abrupt development of the size of the eggs which averaged 225 μ in diameter. Thence, followed an increase to 306 μ in November and further to 383 μ in December which had the absolute annual maximum. A marked decrease took place in January, February and March as their average egg diameter was about 190, 135 and 65 μ respectively. In April and May, this average diameter was 35-39 μ. In turn, the maximum diameter recorded was 51-82 μ for March-September period, 390 μ in October, 440 μ in November, 475 u in December and 460 μ in January.

(b) **Mugil capito** (Fig. 8)

The average egg diameter of oldest eggs increased only from 49 μ in June to 74 μ in September. The tempo of growth was much higher in October and November as their averages were 250 and 411 μ respectively. Afterwards followed a decrease to 290 μ in December. Thence, followed a much wider difference in January whose average was calculated as 101 μ. Along February through May, the average egg diameter changed from 53 μ to 73 u. In addition, the maximum diameters were 45-98 μ along February - September period, increasing to 425 μ in October, 580 μ in November and further to 630 μ in December, but afterwards followed a decline to 400 μ in January.

E. Fecundity

Generally, fecundity is defined as the total number of ripe eggs produced by female in a spawning season or in a year and two terms are generally applied, viz, the absolute fecundity which is defined as the total number of eggs in the ovary and the relative fecundity which is the number of eggs

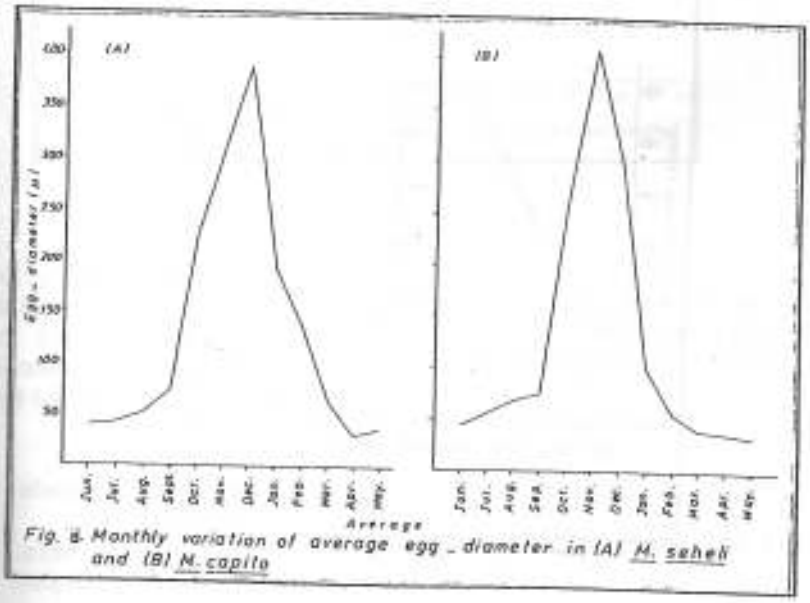

Fig. 8. Monthly variation of average egg - diameter in (A) *M. seheli* and (B) *M. capito*

per unit length or weight of fish. In the present work, the analysis of the fecundity of **Mugil spp.** was based on counting the yolk oldest eggs in the ovary.

(a) Fecundity Versus Length

In **Mugil seheli,** the fecundity characteristics, within the limits of females examined are the following

i) The absolute fecundity increased from 109 thousand to 199 thousand with growth in length from 13.5 to 18.5 cm, Fig. 9 a. The relation between the two variables, absolute fecundity (F) and total length (L) is described by the equation

$$\text{Log } F = 29.434 + 1.848 \text{ Log } L.$$

Thus, the calculated absolute fecundity varied from 108 thousand for 13.5 cm to 193 thousand for 18.5 cm.

ii) The relation between relative fecundity (R.F.) or number of eggs per 1 cm length is also curvilinear, Fig. 9b and described by the following equation

$$\text{Log } F = 2.929 + 0.859 \text{ Log } L.$$

The empirical R.F. increased from 8074 to 10456 as compared with calculated R.F. from 7 940 to 10 408 on growth in total length from 13.5 to 18.5 cm.

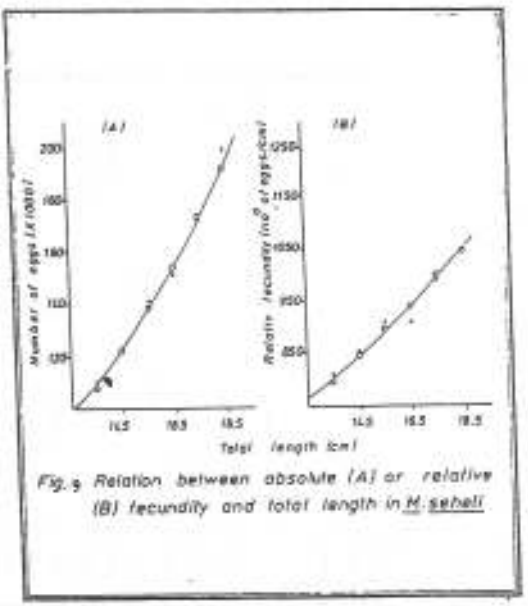

Fig. 9 Relation between absolute (A) or relative (B) fecundity and total length in M. seheli

On the other hand, in **M. capito,** the following calculations were attained

The absolute fecundity, Fig. 10a increased from about 68 thousand to 450 thousand with growth in length from 18 to 34 cm. The relation is described by the following equation

$$\text{Log } F = 0.379 + 3.525 \text{ Log } L.$$

The calculated fecundity varied from 64 thousand to 599 thousand for the above length range.

The relation between R.F. and total length is described by the equation

$$\text{Log } F = 0.3376 + 2.526 \text{ Log } L.$$

The empirical R.F. increased from 3 777 to 16 470 as compared with calculated R.F. from 3 224 to 16 o73 with growth in length from 18 cm to 34 cm, Fig. 10b.

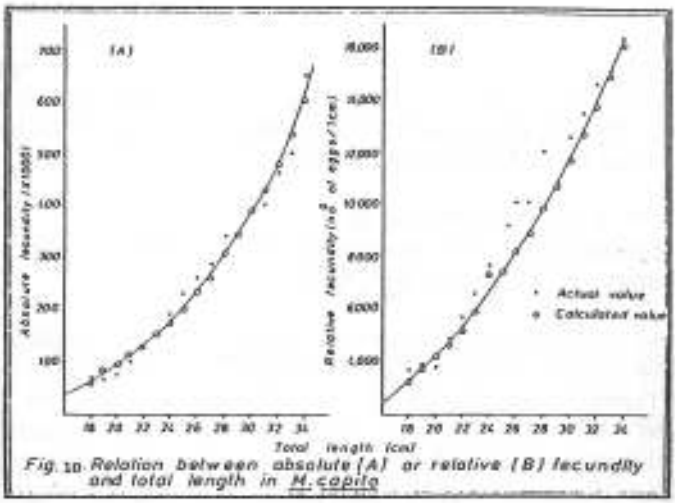

Fig. 10. Relation between absolute (A) or relative (B) fecundity and total length in *M. capito*

Fecundity Versus Weight

The relation between absolute fecundity and weight of **M. seheli** is curvilinear, Fig. 11. Generally, the fecundity increased from 113.4 thousand to 206 thousand on growth from 35 to 75 gm in weight. The relation is represented by the equation

$$\text{Log } F = 4.009 + 0.6696 \text{ Log } W,$$

where F = absolute fecundity in thousands and W = weight in grams.

The calculated absolute fecundity,thus, increased from 110.4 thousand for 35 gm weight to 183.9 thousand for 75 gm weight.

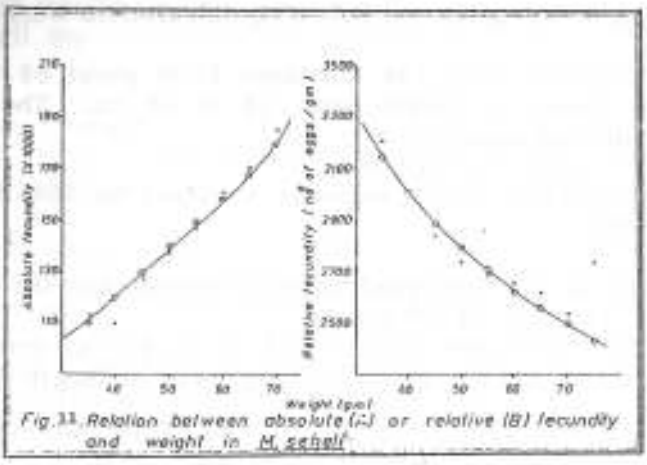

Fig.11 Relation between absolute (A) or relative (B) fecundity and weight in *M. seheli*

The relative fecundity (R.F.) calculated as the number of eggs per gm body weight decreases with growth in weight and ranged empirically from 3228 to 2746 from the smallest to the heaviest fish. The relation between the two variables is explained by the equation

$$\text{Log } F = 4.006 - 0.329 \text{ Log } W$$

(F = relative fecundity). The calculated R.F. varied from 3147 eggs for 35 gm to 2449 eggs for 75 gm weight, Fig. 11b.

On the other hand, the absolute fecundity range of **Mugil capito** is variable in females of the same weight. This results in interference between fecundities of different females of different weights. On the whole, the difference between the minimal and maximal absolute fecundities tends to become wider on growth of fish. In other words, while the range of A.F. was recorded as 17.3 thousand to 106.6 thousand for 75 gm. weight, it varied from 1086.4 thousand to 1218.9 thousand for 475 gm. weight. On the whole, the average A.F. increased with growth in weight and ranged from 60.8 thousand to 1150.5 thousand on growth in weight from 75 gm. to 475 gm., Fig. 12a. The relation between actual A.F. and weight is described by the equation

$$\text{Log } F = 1.6205 + 1.658 \text{ Log } W.$$

The calculated A.F. ranged from 53.6 thousand for 75 gm. weight to 1144.1 thousand for 475 gm. weight.

In **Mugil capito,** the relative fecundity, on the contrary to **M. seheli,** progressively increased with growth in weight. The actual R.F. increased from 800 eggs for 75 g to 2530 eggs for 475 g weight and the relation between the two variables is described by the equation

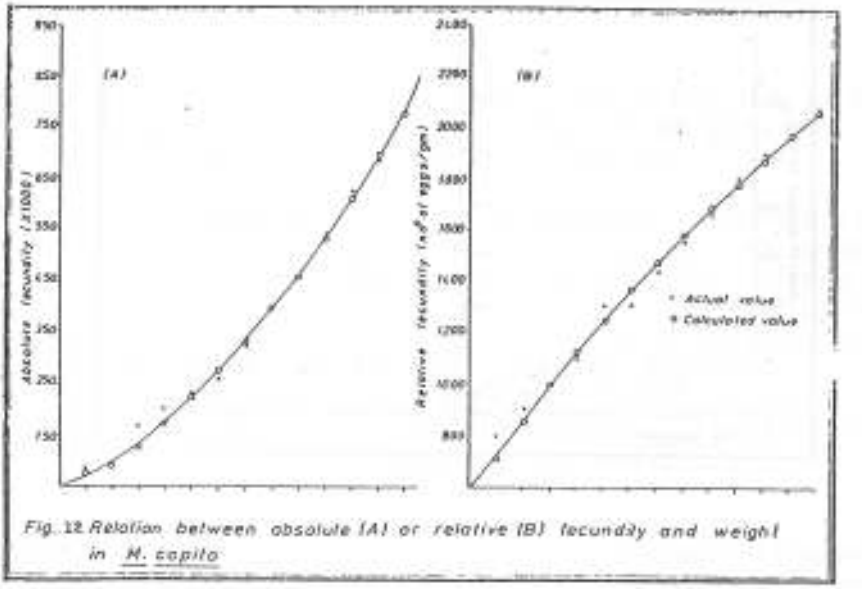

Fig. 12 Relation between absolute (A) or relative (B) fecundity and weight in *M. capito*

$$\text{Log } F = 1.6207 + 0.659 \text{ Log } W.$$

The calculated R.F. increased from 718 to 2488 eggs with growth in weight from 75 gm to 475 gm, Fig. 12b.

(c) Fecundity Versus Age

The fecundity of **M. seheli** and **M. capito** increases progressively as the fish become older, Fig. 13. In the successive age groups, there is interference in egg production. For example, in **M. seheli,** the ranges of number of eggs were about 72 thousand to 191 thousand for age group I and from 80 thousand to 263 thousand for age group II. Similarly, in **M. capito,** the ranges were 68.4-444 thousand and 201-674 thousand for the above two age groups respectively. On the whole, the maximum number of eggs was counted as 260 thousand for age group IV in **M. seheli** and 981 thousand for age group V in **M. capito.** The average number of eggs was about 133, 154, 178 and 194 thousand for the successive age groups I to IV respectively in **M. seheli.** For **M. capito,** this average was 177, 325, 500, 690 and 805 thousand for age group I - V respectively.

F. Sex Ratio

The frequency of males and females among the landings was examined for **M. seheli** and **M. capito,** along four quarters of the year, Fig. 14. In both species, the ratio betwen males and females was the lowest in the last quarter of the year, in other wards, in the spawning period. Numerically, the percentage of males was 20, 13, 24 and 29% in **M. seheli** and 36, 21, 30 and 24% in **M. capito** in July - September, October - December, January - March and April - June periods respectively.

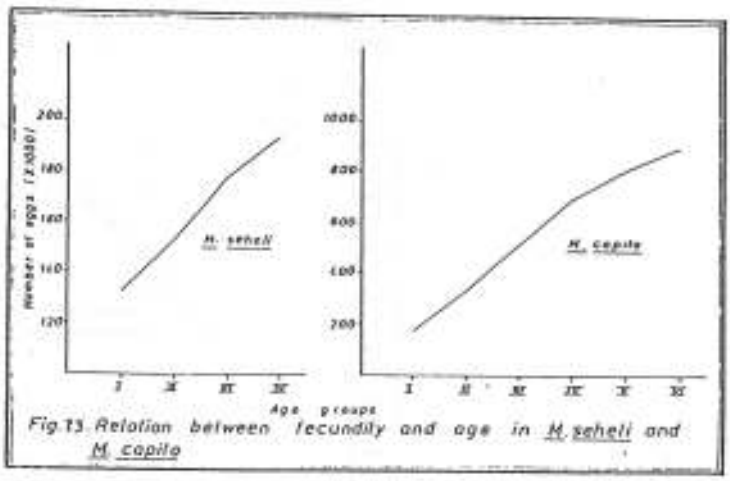

Fig 13 Relation between fecundity and age in M. sahelI and M. capito

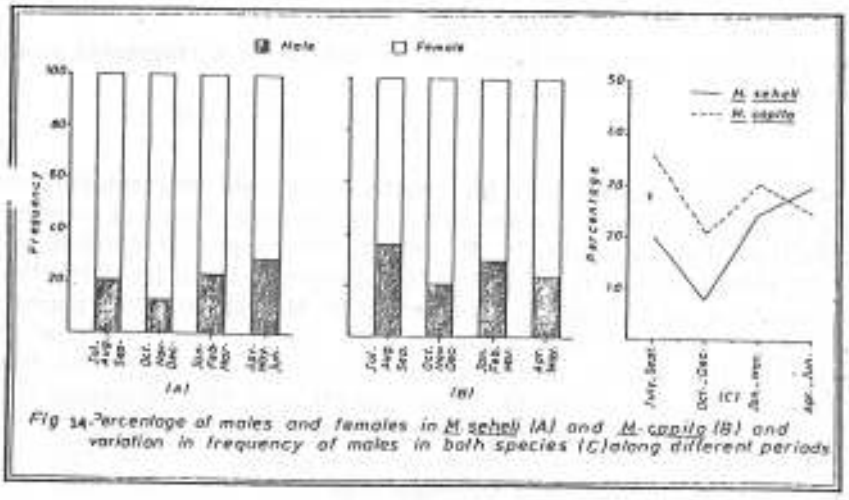

Fig 14 Percentage of males and females in M. sahelI (A) and M. capito (B) and variation in frequency of males in both species (C) along different periods

DISCUSSION

The presnet work is a part of the program directed to the study of **Mugil seheli** and **M. capito** in Lake Timsah and deals with the reproduction on the basis of the morphological characteristics of the gonads.

As to the onset of sexual maturation, in **M. seheli,** the minimum length of ripe males was 10.2 cm while that of females was 11.4 cm or within age group I. Concerning **M. capito,** El-Maghraby et al (1973) found that the minimum size of ripe males in Lake Borollus was 130 mm T.L., while that of female was 170 mm T.L. and that sexual maturation starts in the second year of life. In Lake Manzalah, **M. capito** reaches sexual maturity at the end of the first year, for the male, and at the end of the second year for female (Fayek 1973). In the present study, males start their sexual maturity at 148 mm T.L. and the females at 175 mm T.L. or in the first year of life in both sexes as in **M. seheli.**

It is generally observed that the gonads grow larger towards the spawning season. In the present work, the maturity stages of the gonads of **M. seheli** and **M. capito** were examined according to Hjort's description. In the former species, towards the spawning season, the immature tests of stages I and II generally become fewer from June to October, disappear in November and December and becoming more frequent afterwards. Mature and ripe testes of stage IV and V appeared in October through February with the peak prevailed in November (84%) and December (100%), followed by October (53%) and January (43%). In the female, these two stages appeared also along the same period with the peak in December (84%) and November (77%) followed by October (49%) while January and February showed very low representation (8-9%) of the two stages. For **M. capito,** the mature/ripe ovaries appeared in October-February period with a frequency of 79, 84, 48 and 12% for the different months respectively, denoting the spawning peak in October and November. However, the mature/ripe testes were distinguished along September-February period and with the highest frequency in October (87%), November (89%) and December (72%) followed by January (58%). Dealing with **M. capito** in Lake Borollos, El-Maghraby et al (1973) also found that the mature males are more frequent than mature females along November-January period.

The gonad index "maturity index" is another way for comparing the periodic changes in gonadal development (Latif, 1966, Latif and Rashid, 1972... etc). In **M. seheli** and **M. capito,** the gonad index (G.I.) was computed as percentage weight of gonad to that of the body. In **M. seheli,** the male's average G.I. was 1.12, 1.16, 1.5 and 1.2% in October, November, December and January respectively, while the maximal G.I. was the highest in October (3.5%) and November (4.3%), followed by December (1.7%) and January (2.1%). For female, the average G.I. was the highest in December (3.4%) and January (2.3%), followed by November (1.8%). The maximal values showed also the relation and recorded as 11.9, 9.7 and 7.6% in these three

months respectively. In turn, for **M. capito**, the male's peak of the average G.I. appeared in October (3.6%) and November (3.1%) but December had lower values (1.9%). The maximal G.I. varied from 6.2% in October to 5.4% in January. For females, the average G.I. was 4.3% in November, 2.3% in December and 2.2% in October. In the first two month, the maximal G.I. was 15.6% and 10.8% respectively and less in October and January (8.1-8.8%).

In addition, the analysis of the diameters of the ovarian eggs throws light on the peculiarity of fish spawning period. Measurements of the egg size showed that it increases progressively from June or May onwards and attains the largest size in November and December in **M. capito** and **M. seheli** respectively. During the spawning months, the eggs of the oldest generation are of varying diameters in the different ovaries and the difference was the widest in December and January. This conclusion coincides with the presence of ovaries at different maturity stages and different gonad index. The mean egg diameter decreases from November through May in **M. capito** and from December through April in **M. seheli.** On the whole, the largest eggs measured 630 μ and 475 μ in diameter in these two species respectively.

In turn, the absolute and relative fecundity represents a common item in studying of fish reproduction. In **M. seheli** and **M. capito,** the fecundity shows a wide range for a given length or age, but in general, the average fecundity has a curvilinear relationship with length and weight and increases proportionally with age. Thus in **M. seheli,** the fecundity-length relation is described by the equations

$$\text{Log F (absolute)} = 2.9434 + 1.848 \text{ Log L (Absolute fecundity)}$$

and

$$\text{Log F (relative)} = 2.929 + 0.859 \text{ Log L (Relative F).}$$

The fecundity-weight relation is described by the equations

$$\text{Log F} = 4.009 + 0.6696 \text{ Log W (Absolute F)}$$

and

$$\text{Log F} = 4.006 - 0.329 \text{ Log W (Relative F)}$$

Also, the number of eggs increased from 133 thousand for age group I to 195 thousand for age group IV in **M. seheli.** Generally speaking, the variation in fecundity between fishes of the same age group is greater than the variation between fishes of the same weight or length. This is mostly due to the wide length or weight - range for the different age group.

Within the limits of fish samples examined **M. capito** is more fecund

in Lake Timsah than in either Lake Borollus or Lake Manzalah.

The calculated values according to the formula $F = C\ L^n$ are the following

Area	Equation	Authors
Lake Borollus	Log F = - 1.9351 + 2.9414 Log L	Hashem et al (1973)
Lake Manzalah	Log F = - 1.7603 + 2.806 Log L	Fayk (1973)
Lake Timsah	Log F = 0.379 + 3.525 Log L	Present work

The same difference can be visulaized on comparing the relative fecundity, as shown in the following table for some selected lengths

Relative Fecundity (No. of eggs / cm. T.L.) of
M. capito in different Egyptian Lakes.

T.L. (cm)	L. Edku	L. Borollus	L. Manzalah	L. Timsah
18	3055	2851		3777
19	3514	3080	3184	3789
22	4181	4108	5373	5727
24	4500	4829	5600	7708
26	5000	5744	6192	10461
29		7136	8120	11751
32		8512		14625
34		9318		16470

In addition, the fecundity - weight relation also reflects the difference between different Egyptian water masses, as seen from the following table

Area	Equation	Authors
L. Borollus	Log F = 2.6462 + 1.1577 Log W	Hashem et al (1973)
L. Manzalah	Log F = - 0.3634 + 1.2541 Log W	Fayek (1973)
L. Timsah	Log F = 1.6205 + 1.658 Log W	Present data

Concerning age-fecundity relation, the number of eggs of **M. capito** of Lake Timsah increases with age and ranged from 177 thousand for age group I to 940 thousand for age group IV. In conclusion, the higher fecundity of **M. capito** in Lake Timsah than in other areas can be attributed to the fact that the former area receives fresh-water via Ismailia Canal, resulting in higher productivity in some localities of the Lake.

Furthermore, for **M. seheli** and **M. capito,** the females outnumbered males which comprised 13-29 % and 21-36 % among the catches of the two species respectively. The males were the fewest during the spawning period, and probably this may be due to the fact that some males may accompany the migratory ripe females. On the contrary, Hashem et al (1973) recorded the males of **M. capito** are dominant in February and November in Lake Borollus. This may be due to the scarcity of the females remaining in the lake due to the migratory nature for spawning outside the lake in November. Besides, the males may return to the Lake earlier than the females.

SUMMARY

1- In both **Mugil seheli and M. capito,** the males start sexual maturation earlier than females. Members of age group I may be mature or immature while those of age group II are exclusively mature.

2- Mature/ripe females showed the highest frequency in December and November followed by October in **M. seheli.** For **M. capito,** these females were the commonest in November and October, followed by December.

3- In **M. seheli,** for males, ranges of average G.I. were 1.12-1.5 % from October to January and maximum G.I. was 1.7-4.35 % from October to February. For females, average G.I. ranges were 1.8-3.42 % and maximum 7.6-11.9 % from November to January. In **M. capito,** the male's average G.I. was 3.6 % in October and 3.1 % in November as compared with maxima of 6.2 and 5.6 % in the two months respectively. Female's G.I. was the

highest in November whence the average was 4.3 % followed by about 2.2-2.3 % in October and December while the maximum values were 8.1, 15.6, 10.8 and 8.8 for the successive months from October to January respectively.

4- **M. seheli** has a long spawning period extending from October to February with the peak in December and January. The spawning period of **M. capito** extends from October to January with the peak in November and December.

5-a) Egg production varies within females at any particular length, weight and age of fish. The relation between length or weight and fecundity is curvilinear.

b) Fecundity ranged from 192 thousand for age group I to 261 thousand for age group IV in **M. seheli.** In **M. capiro,** the range was from 445 thousand for age group I to 981 thousand for age group V.

c) The fecundity of **M. capito** in Lake Timsah is higher than in other Egyptian waters, viz, Lake Borollus and Lake Manzalah.

6- Average diameter of largest eggs was 306 μ in November, 383 μ in December and 189 μ in January, while maximum diameter was 442, 474 and 460 μ in these months respectively, in **M. seheli.** In **M. capito,** the average diameter was 410 μ in November and 290 μ in December while maximum values were 590 and 630 μ in these two months respectively.

7- The frequency of males of **Mugil spp.** among the fish landings was the lowest during the spawning period.

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