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# SOME STUDIES ON THE FECUNDITY OF THE NILE CATFISH *Pagrus docmac* (FORSK.)

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## ABSTRACT

Completely ripe female **Bagrus docmac** were collected from June to September from the Nile in the vecinity of Cairo. The highest percentage (38.8%) was caught in July which seems to be the peak of its spawning season.

The fecundity of **Bagrus docmac** increases at a rate more than the cube of length (3.87), and at a rate little more than the unity of the weight (1.15). The relative fecundity is 36. This species attains its first maturity when it reaches its third year of life. The maximum empirical fecundity in relation to age, belongs to age group VI, which is four times higher than that of age group III.

## INTRODUCTION

The Nile catfish **Bagrus docmac**, belonging to the family Bagridae, is one of the important economic species as food in Egypt. It is considered as a first-class edible fish, since it reaches large sizes (95cm.) and its flesh is free of small intermuscular spines. This species is represented in the catch by 7% of the total Nile production. However, only few studies on the various biological aspects of this species have been done, (Pekkola, 1919; Greenwood, 1957; Copley, 1959; Elder, 1960; Bishai, 1970; Latif, 1974 and El Sedfy, 1977).

The aim of this work is to study the fecundity of **Bagrus docmac** in the Egyptian Nile waters as a contribution to its general biological aspects. Such study will add to our knowledge of the life history of **Bagrus docmac** in the Nile. This study is essential when culture of this species comes into consideration especially after depletion from the fisheries.

## MATERIAL AND METHODS

Adult **Bagrus docmac** samples were collected from the Nile in the area extending from opposite to the fish breeding station, Zamalek, Cairo to the Delta Barrages 25 km North. Ripe females were caught from the areas with rocky bottom using suspended sharp unbaited strike hooks. A total

of 457 **Bagrus docmac** females were caught during the period from December, 1984 to November, 1985. However, only 154 females with completely ripe ovaries were used for fecundity studies. Three samples were taken from the anterior middle and posterior parts of each ripe ovary. The samples were kept in Gilson's fluid for about two weeks. The eggs were then filtered by Buchner funnel and suction pump. Egg counting was done using a glass plate divided into small squares under a simple microscope.

In order to test the releability of the sampling method, the standard deviation formula was applied to eight **Bagrus docmac** females of 600 mm standard length. The number of eggs per one gram of total fish weight in each case was estimated as 39, 38, 36, 41, 42, 40, 37 and 37. The average number was 39 (±2), with a percentage deviation of 5.13%. This indicates that the observed variation in fecundity among individuals of the same body length is not due to sampling errors, but primarily to inherent variation in the material.

The stages of gonad maturity were standardized according to the stages of gonads, the portion they occupy in the body cavity, the colour of the eggs in the ovary and the condition of the milt in the testis. The following stages are adopted :

**Stage I:** Immature; there is no grossly visible sexual organs in the body cavity.

**Stage II :** Mature; the gonads are thread like, transperant and can be differeniated into testis or ovary.

**Stage III :** Developing; the gonads begin to swell to occupy nearly half the body cavity, but still translucent. The eggs can be seen by the naked eye.

**Stage IV :** Nearly Ripe; the gonds occupy nearly 2/3 of the body cavity, the ovaries are pale yellow in colour, and the testes are whitish-yellow in colour.

**Stage V :** Ripening; gonads are turgid, filling the whole body cavity, the ovary is yellowish and the testis is almost white milky in colour, the contents can be easily extruded by slight pressure on the dish belly.

**Stage VI :** Spent; the ovary is flassid , reddish black in colour and much reduced in size, the testes are yellowish white in colour, soft, empty and fleshy in its appearance.

In the ripe ovaries of **Bagrus docmac,** two distinct catigories of eggs are found:

(a) Comparatively large ripe eggs (about 90%) yellowish in colour, ranging in diameter from 0.75 to 1.5 mm.

(b) Rather minute transparent pale yellow eggs (about 10%) ranging in diameter from 0.4 to 0.75 mm.

However, only eggs belonging to the first group were used for fecundity studies.

## RESULTS

### Monthly Distribution of Maturity Stages:

The monthly distribution of maturity stages of female **Bagrus docmac** collected in the period from December 1984 to November 1985 are shown in Table 1 and is graphically represented in Fig. 1. The period was chosen to embrace all the maturity stages during and after ~~the breeding season~~ which extends from June to September.

From Table 1, it is clear that **Bagrus docmac** ovaries in the thread like condition are most dominant in January (42%). Developing ovaries (stage III) are found nearly all the year round, the highest percentage being in May (33.6%). Fish with nearly ripe ovaries (stage IV) are collected from April to July with the maximum number in June. Completely ripe **Bagrus docmac** females are available from June to September. The highest percentage (38.8%) of ripe females (Stage V) is observed in July which seems to be the peak of the spawning season of this species. Spent females (Stage VI) are found in July up to October with maximum percentage (60%) in September. **Bagrus docmac** spawns once, and is not a fractional spawner, because nearly about 90% of the eggs are ripe in July, with a diameter ranging from 0.75 to 1.5 mm.

Table (1)
Monthly changes in sexual maturity of Bagrus docmac in the area of investigation during the period from December 1984 to November 1985.

| Month | No. | STATE OF MATURITY | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Thread | | Ripening | | Nearly Ripe | | Ripe | | Spent | |
| | | No. | % | No. | % | No. | % | No. | % | No. | % |
| Decem. | 12 | 12 | 17.1 | | | | | | | | |
| Jan. | 33 | 30 | 42.9 | 3 | 2.5 | | | | | | |
| Feb. | 25 | 20 | 28.6 | 5 | 4.2 | | | | | | |
| March | 19 | 8 | 11.4 | 11 | 9.2 | | | | | | |
| April | 39 | | | 27 | 22.7 | 12 | 18.7 | | | | |
| May | 56 | | | 40 | 33.6 | 16 | 25.0 | | | | |
| June | 93 | | | 18 | 15.1 | 30 | 46.9 | 45 | 29.2 | | |
| July | 76 | | | 7 | 5.9 | 6 | 9.4 | 60 | 38.8 | 3 | 6.0 |
| Aug. | 43 | | | 4 | 3.4 | | | 31 | 20.3 | 8 | 16.0 |
| Sep. | 48 | | | | | | | 18 | 11.7 | 30 | 60.0 |
| Oct. | 13 | | | 4 | 3.4 | | | | | 9 | 18.0 |
| Nov. | -- | | | | | | | | | | |
| Total | 457 | 70 | | 119 | | 64 | | 154 | | 50 | |

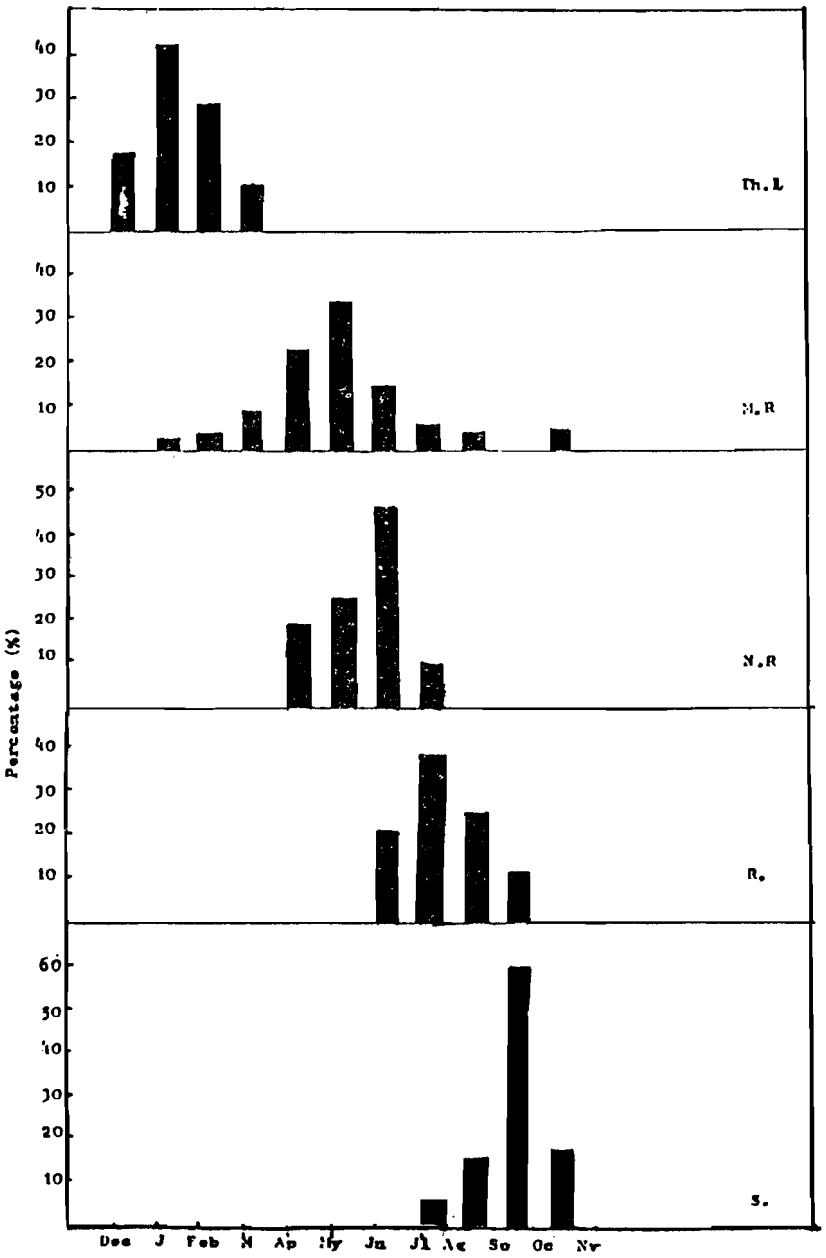


Fig. (1)
Monthly distribution of maturity stages
of **Bagrus docmac.**

## FECUNDITY

**Relation between Fecundity and Length :**

The results of the relation between fecundity and standard length of Bagrus docmac are shown in Table (2). It is clear that there is a proportional increase in fecundity with increase in length. This relation is a curvelinear one and can be expressed as follows:

$$F = aL^n,$$

where, F = number of ripe eggs in the ovaries or the fecundity, L = the standard length in mm. and (a) and (n) are constants calculated by the least square method. Applying this equation, the following formula was obtained:

$$\text{Log } F = -5.8251 + 3.8709 \text{ Log } L,$$

$$\text{or,} \quad F = 1.496 \times 10^{-6} L^{3.8709}$$

This means that the fecundity of Bagrus docmac in the area of investigation increases at a rate more than the cube of the length. The above mentioned equation is a predictable one for fecundity of Bagrus docmac. It is clear also from Table (2) that there is a slight difference between the empirical and calculated fecundity obtained by the F-L equation. The percentage departure of the empirical fecundity from the calculated one varies from 0.07 to 18.37% and the average differences is 6.37%. Thus, in this relation the curve in Fig.(2) fits the empirical dots fairly well.

**Relation between Fecundity and Weight:**

The relation between these two variables of Bagrus docmac shows a linear relation and can be expressed as follows:

$$\text{Log } F = -1.0542 + 1.1459 \text{ Log } W,$$
$$\text{or,} \quad F = 8.827 \times 10^{-2} W^{1.1459}.$$

The results obtained of this relation are shown in Table (2). It is clear that there is a slight difference between the empirical fecundity and calculated one. The average percentage departure of empirical from calculated fecundity is 7.94%, with maximum and minimum values of 19.55 and 0.58%, respectively. This relation is graphically represented in Fig.(3) where the regression line fits the empirical dots well.

**The Relative Fecundity:**

Another relation between egg number and fish weight is the relative fecundity which is defined as the number of eggs (empirical) found in

TABLE (2)

Empirical and calculated number of eggs in the ovaries of Bagrus docmac.

St = Standard length; F/Lequation: fecundity-length; F/W = fecund-weight

| Std. length (mm) | No. of fish | Av.weight (gm) | | Av. No. of eggs | | | Total Emper. No. of eggs | Tot. Cal. No. of eggs | |
|---|---|---|---|---|---|---|---|---|---|
| | | fish | ovary | 1 cm of SL | 1 gm of Ovr. | 1 gm of BW | | by FL eq. | by FW eq. |
| 500 | 5 | 1450 | 43.2 | 794 | 920 | 27 | 39744 | 41928 | 47517 |
| 510 | 8 | 1460 | 44.6 | 844 | 965 | 29 | 43039 | 45425 | 47895 |
| 520 | 8 | 1490 | 48.5 | 903 | 968 | 32 | 46948 | 48783 | 49019 |
| 530 | 4 | 1570 | 51.9 | 961 | 980 | 32 | 50950 | 52528 | 52045 |
| 540 | 6 | 1600 | 57.9 | 1037 | 1000 | 36 | 57935 | 56401 | 53184 |
| 550 | 7 | 1750 | 60.2 | 1096 | 1000 | 34 | 60272 | 60634 | 58932 |
| 560 | 8 | 1825 | 66.6 | 1258 | 1059 | 39 | 70470 | 64999 | 61848 |
| 570 | 8 | 1960 | 70.2 | 1330 | 1080 | 39 | 75816 | 69617 | 67119 |
| 580 | 9 | 2190 | 71.2 | 1463 | 1190 | 39 | 84847 | 74429 | 76202 |
| 590 | 6 | 2250 | 73.5 | 1495 | 1200 | 39 | 88200 | 79504 | 78611 |
| 600 | 8 | 2360 | 76.5 | 1524 | 1195 | 39 | 91417 | 84925 | 83024 |
| 610 | 9 | 2700 | 79.6 | 1579 | 1210 | 36 | 96316 | 90473 | 96882 |
| 620 | 7 | 2850 | 82.6 | 1637 | 1230 | 36 | 101478 | 96383 | 103052 |
| 630 | 3 | 2925 | 85.0 | 1626 | 1205 | 35 | 102425 | 102497 | 106171 |
| 640 | 8 | 3050 | 89.0 | 1720 | 1230 | 36 | 110085 | 108998 | 111393 |
| 650 | 7 | 3290 | 91.8 | 1751 | 1240 | 35 | 113832 | 115706 | 121149 |
| 660 | 8 | 3450 | 94.5 | 1733 | 1210 | 33 | 114345 | 122716 | 128282 |
| 670 | 5 | 3580 | 97.0 | 1745 | 1195 | 33 | 116900 | 130152 | 133849 |
| 680 | 5 | 3770 | 102.4 | 1770 | 1175 | 32 | 120363 | 137792 | 141998 |
| 690 | 5 | 3800 | 108.5 | 1895 | 1204 | 34 | 130733 | 154798 | 143315 |
| 700 | 4 | 3870 | 120.6 | 2019 | 1172 | 37 | 141353 | 154169 | 146343 |
| 710 | 4 | 3985 | 128.0 | 2117 | 1174 | 38 | 150304 | 162929 | 151321 |
| 720 | 3 | 4110 | 138.5 | 2382 | 1238 | 42 | 171510 | 171879 | 156767 |
| 730 | 3 | 4250 | 149.0 | 2468 | 1209 | 42 | 180230 | 181230 | 162923 |
| 740 | 3 | 4950 | 160.0 | 2778 | 1280 | 42 | 205568 | 191111 | 194018 |
| 750 | 3 | 5100 | 180.8 | 2996 | 1222 | 43 | 220942 | 201419 | 200789 |

the ovaries equivelant to the unit fish weight. On this basis, the average relative fecundity of **Bagrus docmac** examined was found to be 36, (Table 2, column 7) and can be simply expressed by the equation: F = 36 W, where F = the number of eggs in the ovary and W = fish weight in grams.

**The Relation between Fecundity and Age:**

**Bagrus docmac** shows complete maturity when it reaches its third year of life. Thus, age group III will be considered as the initial age for fecundity comparison. The relation between fecundity and age of **Bagurs docmac** is shown in Table (3) and graphically represented in Fig. (4). It is found that the empirical fecundity increases with increase of age. The average

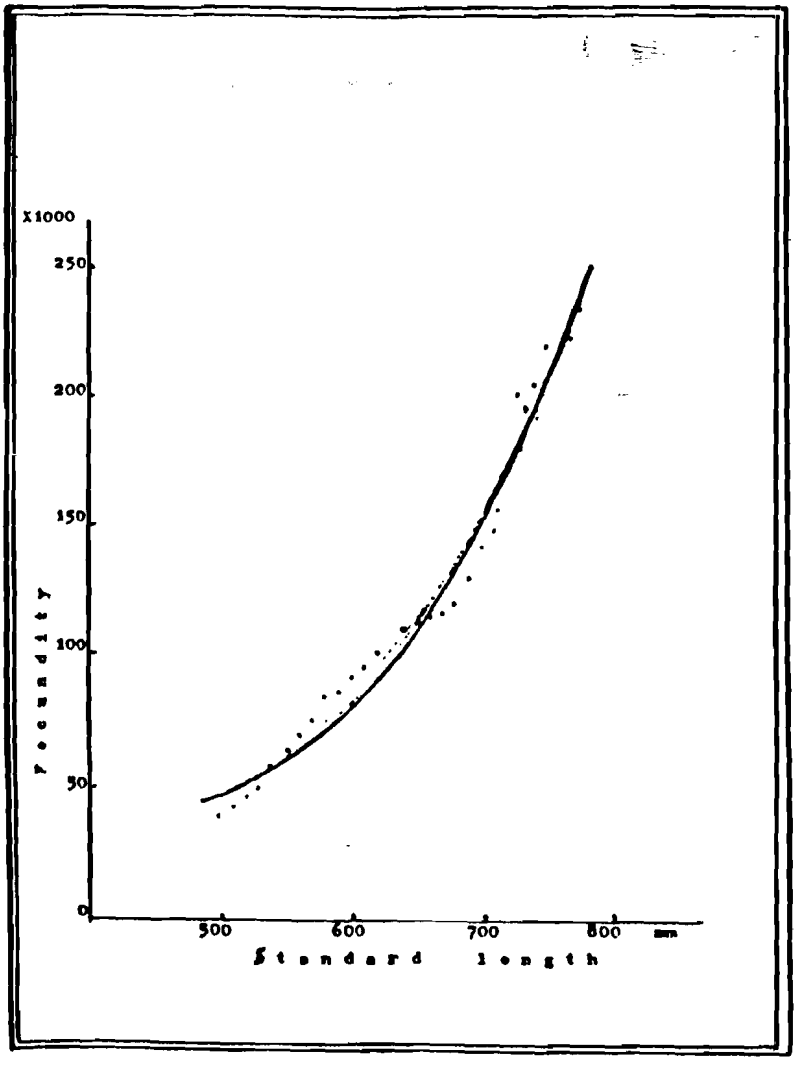


Fig. (2)
Curvilinear relationship between fecundity and standard length of Bagrus bayad.

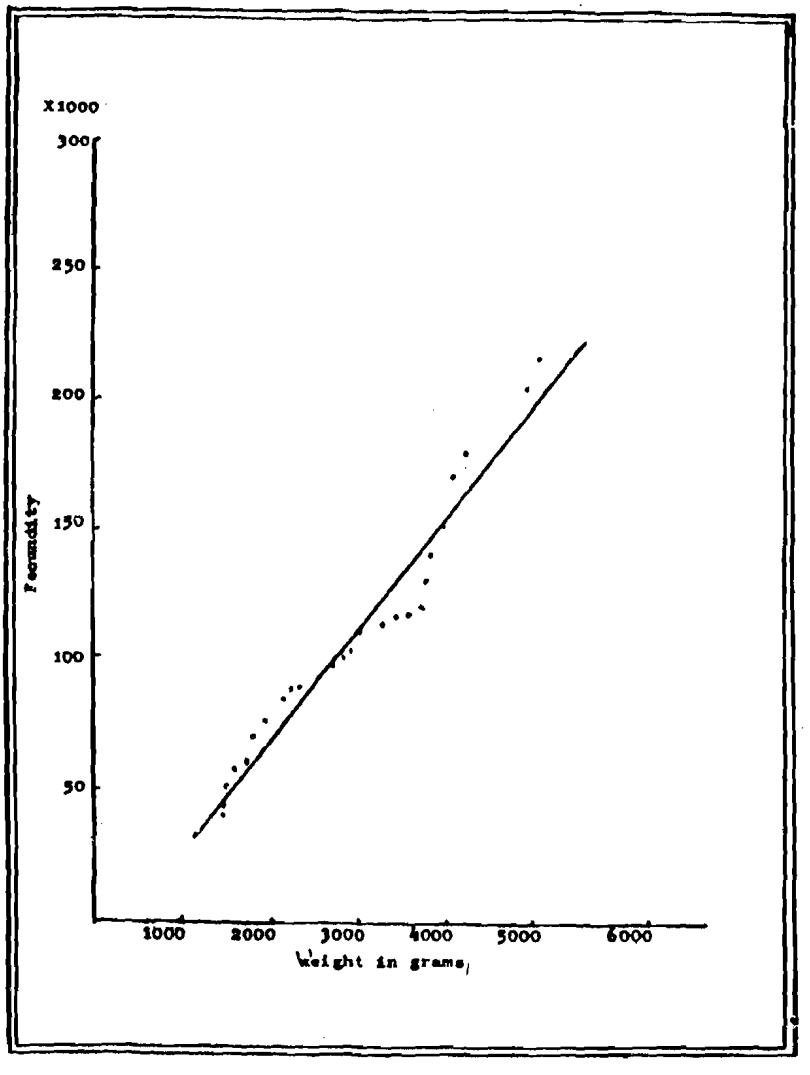


Fig. (3)
The relation between fecundity of Bagrus docmac and fish weight.

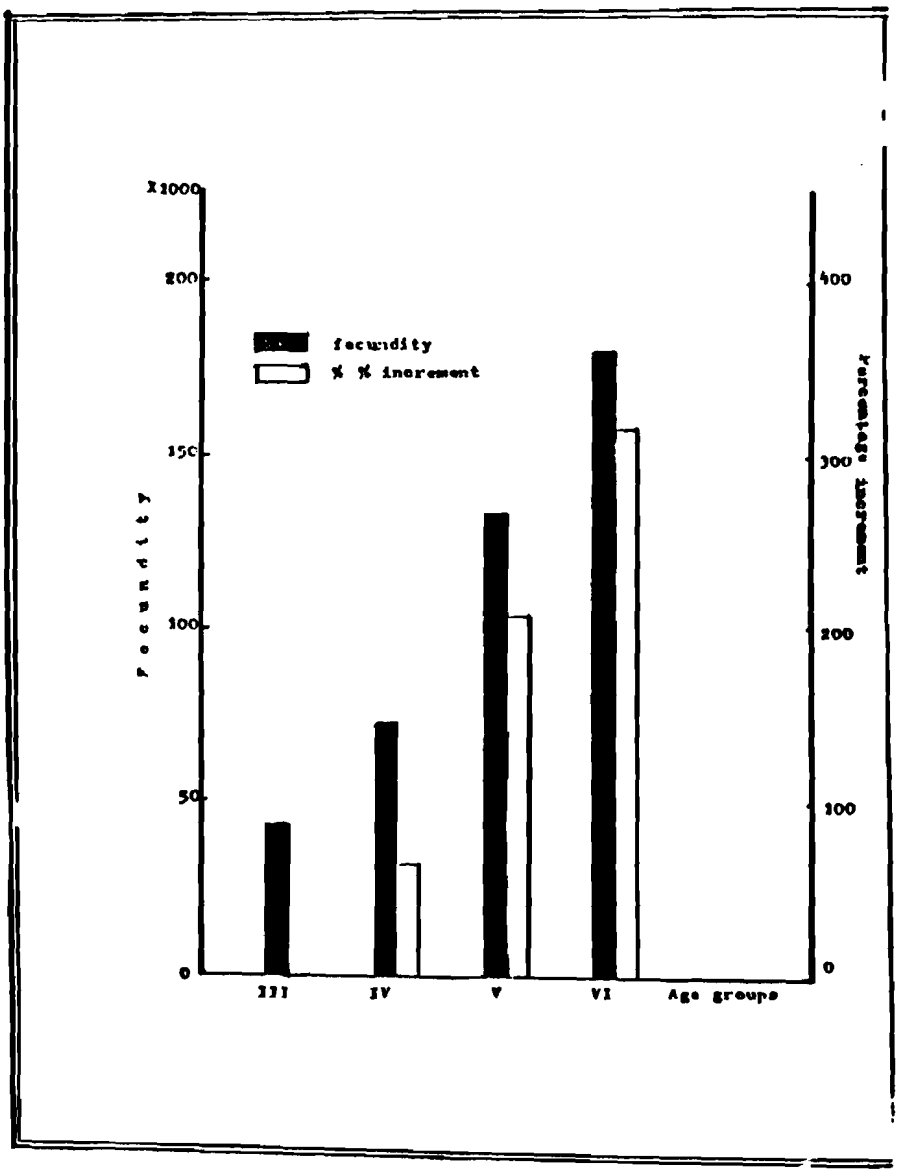


Fig. (4)
The relation between fecundity and age and
the percentage increment.

Table (3)
Emperical fecundity of Bagrus docmac with minimum and maximum number of eggs in different age groups.

| AGE GROUP | EMPERICAL NUMBER OF EGGS | | | TIME OF INCREASE TO AGE III | % INCREASE TO AGE III |
|---|---|---|---|---|---|
| | MINIMUM | MAXIMUM | AVERAGE | | |
| III | 39744 | 46948 | 43346 | --- | --- |
| IV | 43039 | 101475 | 72257 | 1.7 | 66.6 |
| V | 96316 | 171510 | 133913 | 3.1 | 208.9 |
| VI | 141353 | 220942 | 181148 | 4.2 | 317.9 |

empirical fecundity in the fourth year is 3.1 times that of the third one, the percentage increase being 208.9%. The maximium empirical fecundity of Bagrus docmac in relation to the age groups examined belongs to age group VI where the fecundity is 4.2 times that of age group III with a percentage increase 317.9%

## DISCUSSION

Ripe Bagrus docmac females are available from June to September. However, the highest percentage (38.8%) is obtained during July which seems to be the peak of spawning season of this species. This is one month later than what is observed for Bagrus bayad localy, where the spawning peak is in June (El Sedfy, 1977).

Results of typical fecundity investigations have shown that there is a great variability in the number of eggs in fish of the same length, weight and age (Bagenal, 1958). By listing the intensity of correlation between the fecundity (F), Length (L) and weight (W) of Bagrus docmac in the Nile waters, it was found that there is a strong correlation between these variables. The relation is stronger between fecundity and length than between fecundity and weight. The same relation was recorded by El Bolock and El Sedfy (1983) for Clarias lazera, and Botros (1969) for Tilapia nilotica and Tilapia zillii and Bishai (1970) for the same species B. docmac in Sudan. Sugunan and Vinci (1981) recorded an opposite result in case of Rhinomugil corsula. They stated that the number of ova is more related to the weight than to the length.

The study of the relationship between the number of eggs and the length of Bagrus docmac revealed that there is a proportional increase of fecundity with increase in length. This relation can be expressed by the formula $F = 1.4690 \times L^{3.7090}$, which means that the fecundity of Bagrus docmac increases at a rate more than the cube of the length of fish. This exponential

value varies according to fish species. For **Cyprinus carpio,** Dawood (1970), recorded a value of 3.91. According to El Bolock and El Sedfy (1983) **Clarias lazera** fecundity increases at a rate of 2.69.

As for weight, the fecundity of **Bagrus docmac** increases at a comparatively lower rate. The formula expressing this relationship was found to be : $F = 8.8270 \times 10^{-2} W^{1.1459}$ . This is in accordance with the findings of El Maghraby et al (1974) on **Mugil capito** where the fecundity was found to increase at a rate slightly more than the unity of the weight of the fish. In **Clarias lazera** the fecundity increases at a rate of 0.8905 i.e. less than the unity of the fish weight (El Bolock and El Sedfy, 1983). The fecundity-weight relationship of **Bagrus docmac** is a linear one. This agrees with the findings of Botros (1969) on **Tilapia spp.,** Dawood (1970) on **Cyprinus carpio,** Bishai (1970) on **Bagrus Docmac** of the Sudan and El Bolock and El Sedfy, (1983) on **Clarias lazera.**

In **Bagrus docmac** it was found that there is no direct relation between fecundity and age. This agrees with what was found by Bagenal, (1985), Bishai (1970) and Botros (1969). They plotted the relationship between fecundity and age by using the total empirical number of aggs against age directly.

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