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The Fecundity of the whipfin silver-biddy fish, *Gerres filamentosus* (Cuvier, 1829) In The Hurghada Red Sea, Egypt

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Abstract

Fecundity estimates were made on a total of 92 mature fish of whipfin Silver-biddy, *Gerres filamentosus* (Cuvier, 1829) of different lengths and weights, collected during the early June of 2010 to October 2010. Log-Log relationships were calculated between fecundity (either absolute or relative) and fish length, fish weight, ovary length and ovary weight. A linear relationship exists between the individual absolute fecundity and fish length or ovary weight. It was found that, absolute fecundity increased at a rate proportional to the power of 4.31115, 1.41549, 1.89836 and 1.122 of the total length, the body weight, the ovary length and the ovary weight, respectively. While the regression coefficients of the relative fecundity estimations for the total length, the body weight, the ovary length and the ovary weight were 3.31115, 0.41549, 0.89836 and 0.0.122, respectively. The observations of the present study showed that fecundity, either absolute or relative, depended mainly on body length and to a lesser extent on body weight, and ovary length. Therefore, fish length is the best expression for fish fecundity and can be used for the prediction of *Gerres filamentosus* (Cuvier, 1829) production in the Hurghada Red Sea, Egypt.

Keywords: *Gerres filamentosus,* absolute and relative fecundity, Length- Gutted Weight.

1 Introduction

Fishes have a great significance in the life of the mankind, being the most important source of protein and providing certain other useful products. It plays a most important role in the economics of many countries. *Gerres filamentosus* (Cuvier,1829), belonging to the Perciform family Gerreidae are one of the most economic schooling coastal fishes in the north western part of the Red Sea. It is a widely distributed and economically important marine fish which is capable of adapting itself to diverse climatic conditions (ranging from tropical to temperate seas) or over nearly all the world (Kuronuma and Abe, 1972). Also, highly important for both understanding coral reef ecosystems and an efficient use of limited research resources provide guidance for future research on coral reef ecosystems and enhance the potential for assessment and management of future changes ,(Feary,et al. 2013).

Successful exploitation of any fish requires a thorough knowledge of its reproductive biology. Despite the extensive range of this species throughout the Indo-Pacific region, and its economic importance, little has been known about the biology and nutritive value of *Gerres filamentosus*(Cuvier, 1829)(Nikitha and Kuttyamma, 2014). El-Agamy, (1986 and 1988), gave a description of the fecundity and biology of *Gerres oyena* (Froskaal, 1775) in the Qatari waters, Arabian Gulf.

Fecundity is very flexible in marine teleosts. Gillis, *et al*., (1990) studied the gonadosomatic indices with maturation for assessment as approximation of the whole population. As Fecundity has been reported as a function of length, weight and age of some fish species (Nikolsky *et al*.,1973 , AL-Zahaby *et al.*, 1981,1982 &1983 and El-Agamy, 1986). Larson *et al.*, (2012) recognized the length at first reproduction of *Gerres filamentosus* was reported to be 19 cm. where the adults were coastal inhabitants, found on soft bottoms over sandy substrate and juveniles were found in brackish mangrove estuaries for a population in a South African estuary. Accordingly, the present study was undertaken to determine the pattern of the fecundity of *Gerres filamentosus* (Cuvier, 1829) in the Hurghada Red Sea, Egypt, versus length, weight, age and ovary weight.

2 Materials and Methods

A total of 103 mature female fish, (*Gerres filamentosus*, Cuvier,1829) were randomly collected during the period from June 2010 to October 2010, from the catch of fishermen fishing in Hurghada, Egypt. For each fish obtained, total length (to the nearest centimeter) and body weight (to the nearest gram) were recorded.

The paired ovaries from each fish were carefully removed, weighted to the nearest 0.1 g and preserved in 4% formalin solution as modified by Scott, (1968). The shape, size and colour of each ovary were recorded. Three subsamples were usually taken for counting, but in a few cases two additional subsamples were taken when the first three ones showed counts quite different from each other. Each subsample weighted 0.01 gram, in such cases the average of all three counts was used for the fecundity estimate. The subsample was placed in a Petri dish, and the ova were counted following the direct method with the help of a binocular compound microscope X16. The weight method was used to minimize error due to sampling technique (May.1967), the number of the eggs in the weighted sample were counted and estimated. The total eggs in the ovaries were estimated by the formula:

Total Number of ova = Weight of ovary / Weight of subsample X Number of eggs in the subsample

Gonado-somatic Index (G.S.I.) was computed as the percentage weight of the gonads to the total weight of the fish, by the formula:

G.S.I. =Weight of ovary / Weight of fish X 100

All of the ovaries were collected before the eggs were translucent, approximately one month prior to spawning. Thence, at this period there was no possibility of counting eggs that would mature the following year since the average diameter of maturing eggs of the studied year was approximately ‘0.8 mm. whereas that of the immature eggs was less than ‘0.2 mm. Ova diameter measurements were made following the procedure of Clark, (1934) monthly by using a dissecting binocular zoom-stereo-microscope at a magnification (16X) fitted with a calibrated ocular micrometer.

3 Results and Discussion

Egg Diameter:

In the present investigation, the ovary found to be contain different generations of eggs, and their diameter varies in the different periods of the year. Towards the spawning season, the eggs inclined to discharge in the following spawning season progressively increase in size during the pre-spawning period, the different generations were of varying levels of vitellogenesis. Pitt, (1964) and El-Agamy, (1986) mentioned that , in view of the considerable variations reported in gonadal cycle, knowledge about spawning season and fecundity are urgently needed in order to maintain and manage the important fish species.

Three sizes of ova which show that the first size involves ova having diameters less than 0.2 mm. These ova were minute, rounded grey-coloured, yolkless and considered to represent the oocyte stock (recruitment stock) which would develop for spawning in the following or subsequent years. The other two sizes of ova are either yolky opaque-coloured, about 0.3 to 0.8 mm. in diameter or translucent large eggs about 0.9 to 1.0 mm. in diameter. Both of these two sizes were involved in the immediate spawning. Ova –diameter frequency distribution in stage III and stage IV of maturation of *Gerres filamentosus* (Cuvier,1829) in the Hurghada Red Sea during the spawning season(July2010 to October2010) was represented in Fig. (1).

This result of ova –diameter frequency distribution in stage III and stage IV of maturation of *Gerres filamentosus (Cuvier, 1829)* coincided well with that results of El-Agamy ,(1986) for *Gerres oyena*(Forsk.,1775) in Arabian Gulf. Moreover, Sivashanthini ,(2008) recorded macroscopically and microscopically three batches of matured eggs showing that *Gerres filamentosus* from the south east coast of India spawns three successive batches within the same prolonged spawning season. She estimated that the annual fecundity varied from 121,700 to 2,062,278 while batch fecundity varied from 171,596 to 740,844 oocytes and added that the atretic ovarian follicles were observed in October to February.

While, Karjalainen, *et al*., (2016) found that the energy allocation to somatic tissues and eggs prior to spawning served as a proxy for total resource availability to individual females, and its effects on offspring survival and growth. Moreover, they obtained that the energy allocation to eggs per mass was higher in young than in old spawners and the egg size and the relative fecundity differed between them where young females produced more smaller eggs and larvae than old spawners. They added that vendace accommodate strong population fluctuations by their high plasticity in growth and fecundity, which affect their offspring size and consequently their recruitment and productivity, and account for their persistence and resilience in the face of high fishing mortality.

Gonado-somatic Index:

The relation between cyclic changes in the ovary weight and the changes in monthly gonado-somatic index at is represented in Fig.(2). The mean G.S.I. value in July amounted to 13.69 ±0.88 which was about slightly three times of that value in January(5.00 ±0.12). Fig.(3) showed the length-group and gonado-somatic index relationship of investigated species.

Comparative Summary of the intercepts, regression coefficients and correlation coefficient of the various fecundity relationships in different *Gerres sp.* Are summarized in table (1).

It is apparent that the absolute fecundity increases at a rate greater than the fourth power of the total length. The average absolute fecundity of *Gerres filamentosus* (Cuvier, 1829) varied between 25398 and 850251 eggs with change in fish lengths from 17 to 35 centimeters length. On the other hand, there are variable changes in the values of both absolute and relative fecundities in related suitable reference were obvious graphically as in figures (4 -7).

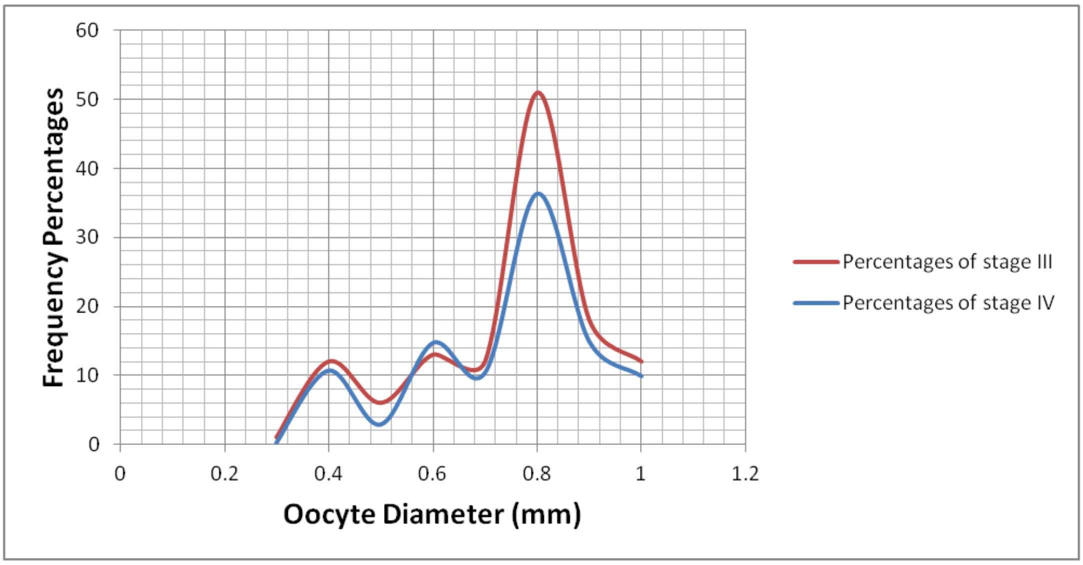

Fig.(1): Ova-Diameter frequency distribution in the mature ovary of two stages (III and IV) of the whipfin silver-biddy, *Gerres filamentosus* (Cuvier,1829) in the Hurghada Red Sea, Egypt.

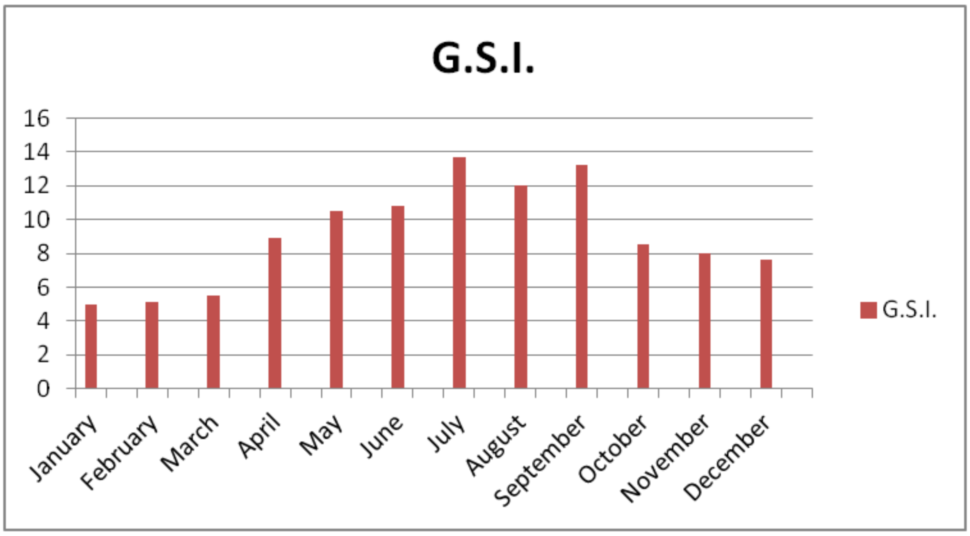

Fig.(2): Monthly changes in the ovaries weight represented by the gonado-somatic index (G.S.I.) for females of *Gerres filamentosus* (Cuvier,1829) in the Hurghada Red Sea.

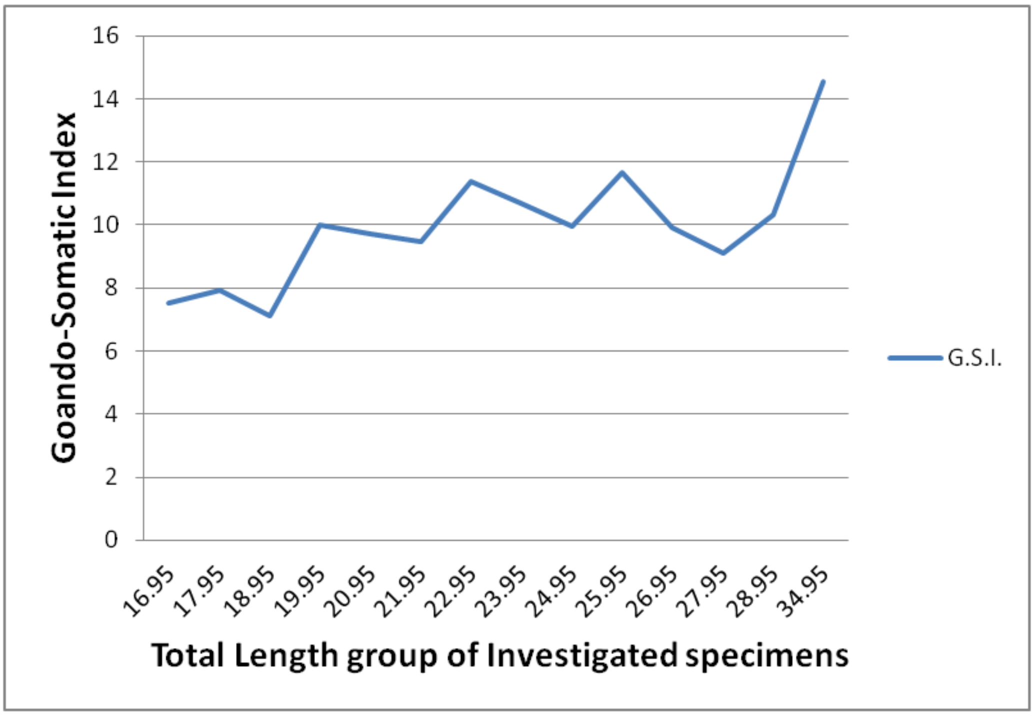

Fig.(3): The length-group and gonado-somatic index relationship of investigated species

Table (1). Comparative Summary of the intercepts, regression coefficients and correlation coefficient of the various fecundity relationships in different *Gerres sp*

Log-fecundity In related to		Intercept(a) Absolute	Realative	Regression Coefficient(b) Absolute	Realative	Correlation Coefficient (r) Absolute	Realative
LogL	El-Agamy (1986)	-2.43	-2.43	5.47	4.47	0.9972	0.9959
LogW	*G.oyena*	1.12	1.12	1.99	0.79	0.9965	0.9829
LogAge	Arabian Gulf	4.12	-2.68	1.78	4.65	0.9758	0.9984
Log Ovary Weight		4.19	4.19	1.08	0.08	0.9927	0.4491
Log L	Present study (2010)	-0.7754	-0.7754	4.311٢	3.311٢	0.9840	0.9733
Log W	*G.filamentosus*	2.0030	2.0030	1.4155	0.4155	0.984٤	0.8537
Log Ov.L.	Red Sea	2.9531	2.9513	1.8984	0.8984	0.8963	0.6593
Log Ov.Wt.		3.78.3	3.7803	1.122	0.122	0.9557	0.2013

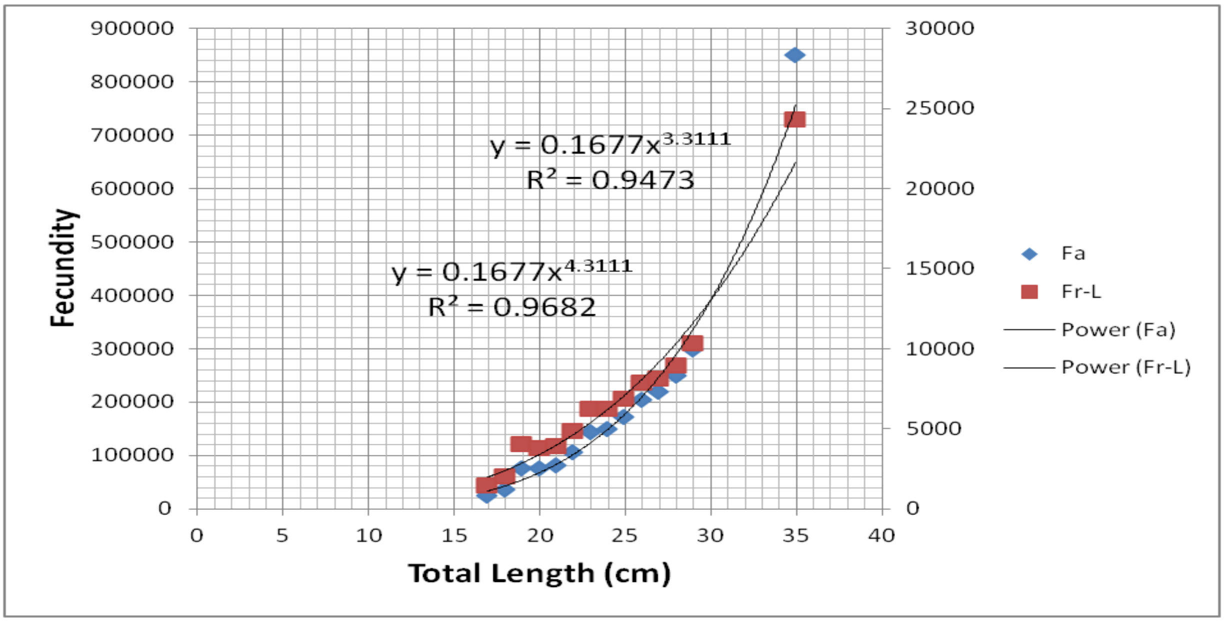

Fig.(4): Relationship between fecundity and total length of *Gerres filamentosus* (Cuvier, 1829) in the Hurghada Red Sea, Egypt.

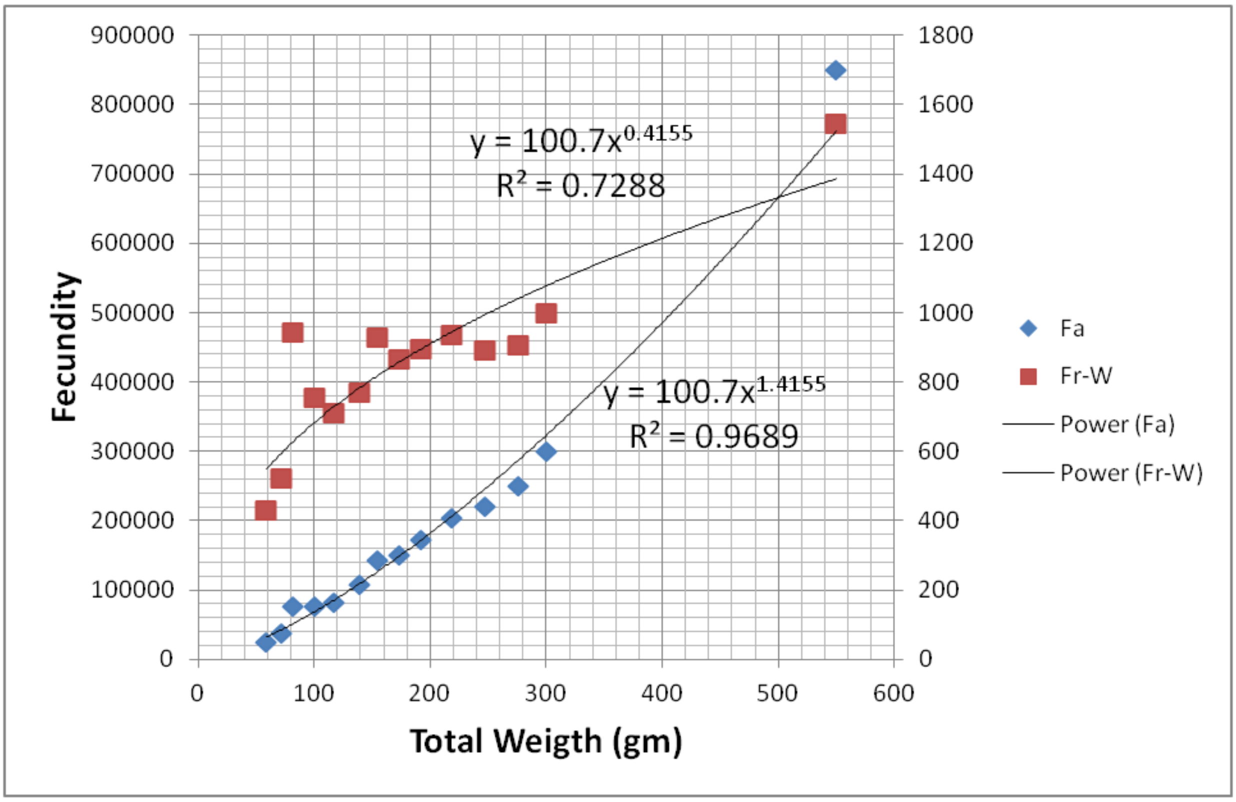

Fig.(5): Relationship between fecundity and total weight of *Gerres filamentosus* (Cuvier, 1829) in the Hurghada Red Sea, Egypt.

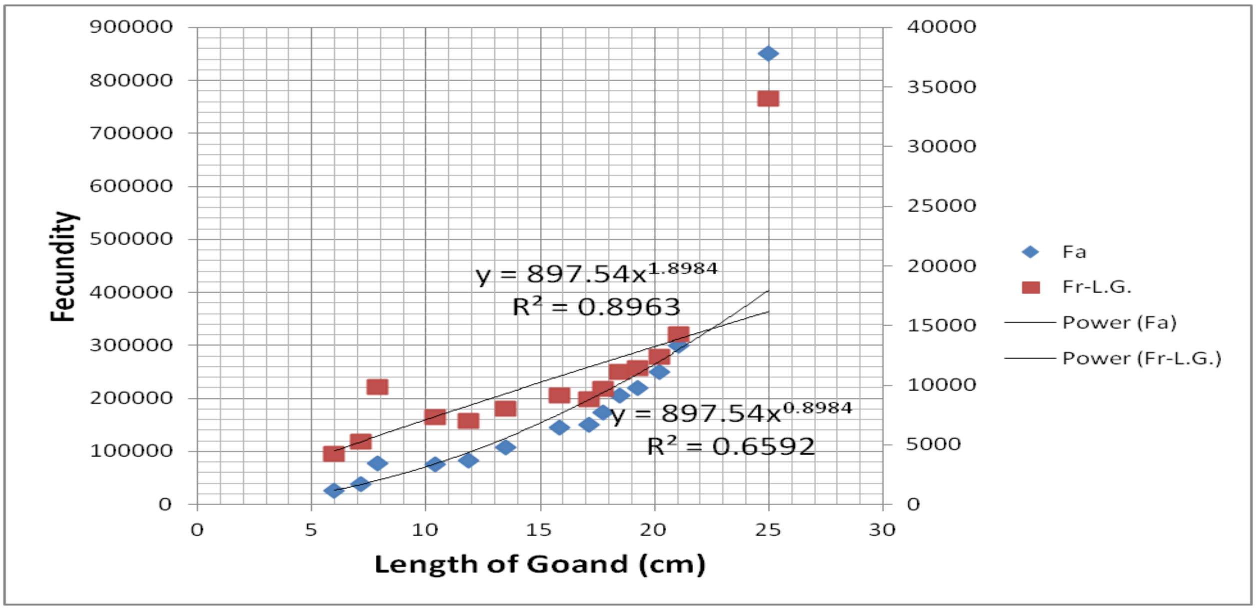

Fig.(6): Relationship between fecundity and ovary length of *Gerres filamentosus* (Cuvier, 1829) in the Hurghada Red Sea, Egypt.

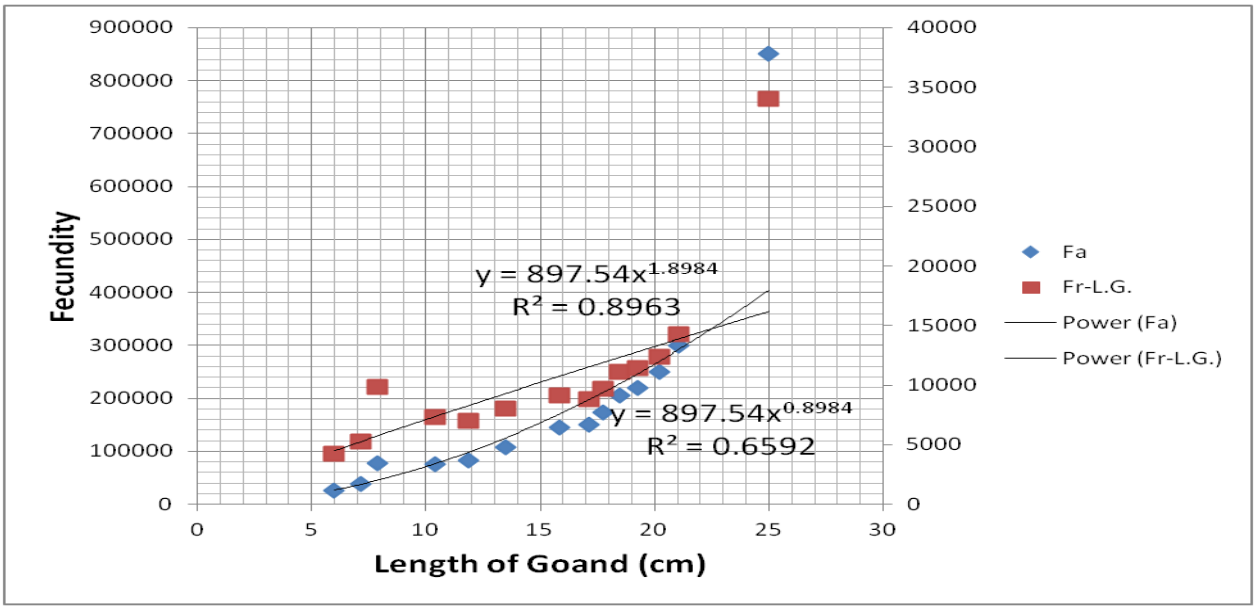

Fig.(7): Relationship between fecundity and ovary weight of *Gerres filamentosus* (Cuvier, 1829) in the Hurghada Red Sea, Egypt.

In the present investigation a curvilinear relationships were obtained for fecundity against total length, total body weight (Total or gutted weight) , ovary length and ovary weight, respectively. It was concluded that, the length of the female Gerres filamentosus (Cuvier, 1829) is the best expression of its absolute fecundity, where the two parameters are statistically more significantly correlated with each other.

The size of the egg varies in the different periods of the year, as it increases towards the spawning season. The minute oocytes (less than 0.2mm.) are not considered in fecundity estimations, as they have a great significance in the following season. Oven (1976) called these oocytes reserve fund eggs. While Macer (1974) called them recruitment stock eggs.

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