241 EGYPTIAN JOURNAL OF AQUATIC RESEARCH ISSN 1110-0354
VOL. 30, (B), 2004: 241-254

REPRODUCTIVE BIOLOGY OF *BOOPS BOOPS* (FAMILY SPARIDAE) IN THE MEDITERRANEAN ENVIRONMENT

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Key wards: *Reproductive biology, Sparidae, Boops boops, Mediterranean Sea.*

ABSTRACT

Monthly analysis of the maturity stages distribution revealed that Boop boops has a long spawning season extending from January to May. The peak value of gonadosomatic index was attained in February for both males and females. Length at first sexual maturity is 12 cm and 13 cm for males and females respectively. The analysis of ova diameter for the species understudy revealed that there are 3 egg batches in the ripe ovary of Boops boops, the first batch includes the immature small and transparent eggs, the second batch includes the vitelline eggs while the third batch includes the yolky and ripe eggs. The relation between the absolute fecundity and the relative fecundity against total length and gutted weight was highly expressive with mean gutted weight for both relative and absolute fecundity then with mean total length.

INTRODUCTION

Family Sparidae includes a large variety of species, commercially known as porgies or breams and most of them are highly valued as food fish. It is the most dominant teleost family observed in commercial landings from Alexandria coast (Ezzat *et al*., 1993). *Boops boops* is the most abundant species in the local markets at Alexandria nearly all the year round where Abdel-Rahman (2003), clarified that *Boops boops* dominated the sparid catch throughout the whole year where in Winter, it constituted 17.5% of sparid catch and 31% in Spring while in Summer it constituted 31.8% and 25% of the landed sparid catch in Autumn.

Several authors were interested in studying *Boops boops* throughout the whole world, where Anato and Katari (1986) studied the feeding and reproduction of *Boops boops* in Tunisian waters. Livadas (1988) studied growth and maturity of *Boops boop*s in Cyprus waters. Hassan (1990) undertook a study on *Boops boops* and *Sarpa salpa* from Alexandria waters especially as regards to their growth, feeding and reproduction as well as their fishery statistics. Ezzat *et al*. (1991) studied the sex reversal in *Boops boops* from the Mediterranean waters. Gordo (1995) studied the sexual maturity of *Boops boops* from the Portuguese coast. Osman (2000) made a comparative study of the feeding and its relation to reproduction for 3 sparid fishes namely *Boops boops*, *Pagrus pagrus* and *Pagellus erythrinus*. Abdel-Rahman (2003) studied the population dynamics of *boops boops*.

The aim of the study is to investigate and give a detailed study of the reproductive biology of *Boops boops*. Such a study of the biology of the fish is in fact very useful in order to improve their fisheries and improve the production of the spawners in the spawning grounds and during the spawning

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season, which is very important for the proper management as well as understanding and predicting the annual changes occurs in the population.

MATERIAL AND METHODS

The samples used in the present work were captured alive, three times a month from the Mediterranean coast near Kayet Bey castle at Anfoushy region, Alexandria. Some samples were obtained from the commercial catch of Anfoushy markets.

462 specimens of *Boops boops*, ranging in length from 10.6 cm to 20.8 cm and ranging in weight from 14.87 gm to 97.68 gm, were collected during the period from August 2001 to July 2002. The fish were transported to the laboratory in aerated aquarium. The date of capture, total length and standard length to the nearest mm were recorded. Also total weight and gutted weight to the nearest gm were recorded. Directly after recording of length and weight, the fish were dissected to determine sex and maturity stage. The gonads were removed, weighted to the nearest 0.01 gm and thoroughly examined. The shape, size and color of the gonads were recorded.

The length at first sexual maturity was studied according to Pitt (1970). Gonadosomatic index was calculated as percentage of the gonads.

To study the egg diameter in the fully matured ovaries, a known portion by weight was preserved in 4 % formaline for one day from a ripe ovary " free from ovarian wall ". These portions were then taken and generally spread in small petri dish, and the diameter of all eggs were measured by using eye piece micrometer and then the measurement were converted into mm. A relationship was drawn between the egg diameters in mm against the percentage frequency.

The weight method was used in studying fecundity, to minimize error due to sampling technique (May, 1967). The number of eggs in the weighted sample (0.1gm) were counted and then the total number of eggs in the ovaries were estimated by using the following formula:

Absolute fecundity (F) =Weight of ovary X number of eggs in the sample / weight of sample.

Also the relative fecundity will be calculated for each of length and weight according to the following equation:

Relative fecundity (F_r) = absolute fecundity / Total length (cm) or gutted weight (gm).

Estimation of mathematical equations that represent the relation between absolute fecundity or relative fecundity on one side and total length (cm) or gutted weight (gm) on the other side was done.

RESULTS

1- Maturity stages

In the present study, we adopted a scale for maturity stages of *Boops boops* taking into account the generalized scales used by Zaki *et al*. (1986) as follows:

Stage I (Thread):

The gonads are filamentous, transparent and occupy a very small proportion of the body cavity. Sex is difficult to be determined by the naked eyes. This stage was observed mainly in fish of total length less than 13 cm in females and less than 12 cm in males.

Stage II (Immature stage):

The differentiation between male and female could be easily determined. The ovaries are thin, almost cylindrical with tapering ends and occupy one–fourth of the body cavity. The tests are thin, flattened, semi-transparent and often bordered by fat. The length of testes is also about one-fourth of the body cavity.

Stage III (Maturation stage):

Ovaries were increased in size, yellowish in colour and occupy about one-third of the body cavity. In the male, testes increased in length and width in compirision with immature stages. The testes also occupy about one- third of the body cavity but they were whitish in colour.

Stage IV (Nearly ripe stage):

Obvious enlargement in the gonad size was clear. The ovaries were yellowish in colour, occupy about two-thirds of the body cavity, invaded with blood vessels. Oocytes can be easily detected by the naked eyes inside the ovary. Testes increased in thickness and occupy about two-thirds of the body cavity, their colour was creamy-white.

Stage V (Ripe stage):

Both ovaries and testes reached their maximum development and occupy almost the entire length of the body cavity. The ovaries are stretched, typically orange-yellow in colour. The oocytes are large and the belly of the female looks swollen, a slight press could evacuate eggs from the belly. Testes are white in colour. Milt could by easily extruded also by a slight press on the belly.

Stage VI (spawning stage):

The discharge of a considerable amount of sexual products during the spawning process causes a decrease in the weight of the ovaries and testes. Both gonads become slightly flaccid and flabby due to the spawning process. The discharge of a considerable amount of oocytes and milt during the course of spawning causes a decrease in the weight of the gonads. After which the gonads increase again in the weight but to a little extent than before, after the ripening of another generation of sexual products and so on, until the end of the spawning season.

Stage VII (spent stage):

The ovaries are highly reduced in size, about one-third of the body cavity, reddish yellow in colour, shrunken, collapsed and may contain remains of unspawned eggs. The testes are also reduced in size to about one-third of the body cavity, Whitish Grey in colour and residual of spermatozoa may appear as white areas.

2-Length at first sexual maturity

From fig (1), it is noticed that the males and females of *Boops boops* smaller than 11 cm, are all sexually immature fishes.

At 12cm total length, the percentage of 40 % of male fish are sexually mature. This percentage of maturity in males will fluctuate until it reach it's maximum at total length of 21 cm.

According to female *Boops boops*, the results showed that at 13cm total length, the percentage of sexually mature fish was 51.43%. This percentage will increase until it reaches its maximum at total length 18 cm in females.

All *Boops boops*, either male or female larger than 17 cm will be in mature case. (Fig 1).

3-Monthly distribution of maturity stages

The monthly distribution of different maturity stages in males and females of *Boops boops* through the period from August 2001 to July 2002 are represented graphically in fig (2). The fish of thread-like stage (stage one) are excluded.

The immature males were presented during the months from June until December with 78.9 % and 18.2 % as maximum and minimum values respectively during months June and December (Fig 2A). While the immature females were present during the months from June until January with 92% and 2.2% as maximum and minimum values respectively (Fig 2B).

The mature males appear during the period from June until January with its maximum value during November (66.7%) then it decrease due to the appearance of the nearly ripe stage (fig 2A). While the mature females appear during the period from June until February with its maximum value also during November (73.3%) then it decreases due to the appearance of nearly ripe stage and beginning of spawning season (fig 2B).

The nearly ripe stage in both males and females reach its maximum value during December and reach its minimum during April while the ripe stage is in its maximum at January recording 28.6% for male and 24.4 for female (Fig 2).

It was noticed that the spawning stage (stage six) extends from January to May, with its maximum peak for both males and females during January and February respectively, while the spent stage occur

during March, April and May for both males and females (Fig 2).

4-Gonadosomatic index

The monthly variation in the GSI values of both sexually matured male and female are shown, in table (1). During the period from November to January, the weight of the testes and the GSI increases gradually with an average that varies during the pre-spawning period. The GSI value reaches its peak during February, March and April respectively, i.e. during the spawning months then it decrease gradually during the following month from May until October with minimum value recorded during June (Table 1A)

During December, the value of GSI increases due to the increase in the weight of the ovary. The GSI value reaches its highest value during February then it begin to decrease during the following months due to the discharge of the ova until it reaches its minimum value during July (Table 1B).

5- Egg diameter analysis

The frequency distribution of egg diameter *Boops boops* was studied in the present work during the period from December to May and the results are represented figure (3). The frequency distribution of eggs diameter in the ripe ovary is divided into three batches. The first batch includes the eggs diameters ranged from 0.085 mm to less than 0.255 mm. This batch represents the immature eggs which are very small, transparent with polygonal shape. This batch is considered as the oocyte stock and it was represented throughout the whole year period. The second batch includes the vitelline eggs with a considerable degree of cytoplasmic growth and yolk formation. Their diameters ranged from 0.255 mm to less than 0.51 mm.

The third batch includes the more advanced ova, which are yolky and ripe transparent. The diameters of the ova of this batch ranged from 0.51 mm to 0.68 mm.

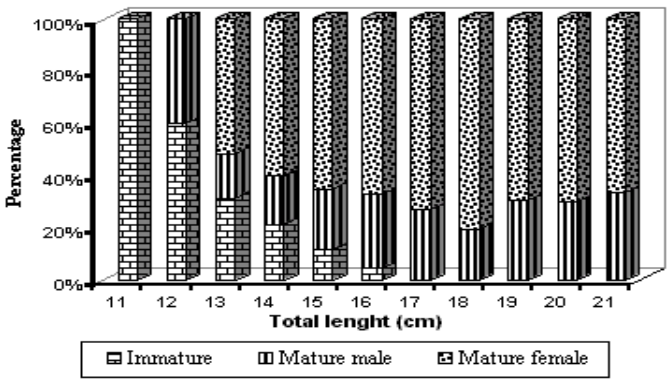

Fig (1): Lenght at first sexual maturity of male and female Boops boops collected from the Mediterranean Sea during the period from August 2001 to July 2002

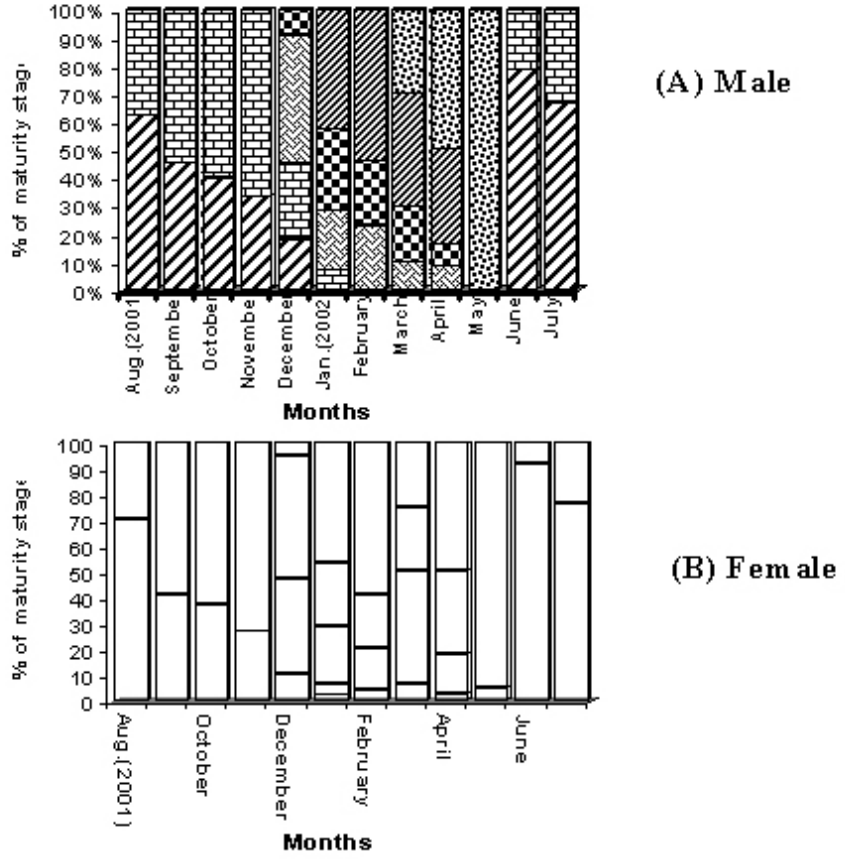

Fig (2): Monthly distribution of maturity stages of (A) male and (B) female *Boops boops* collected from the Mediterranean Sea during the period from August 2001 to July 2002.

During December, The majority of the eggs are within the first and the second batches. At the end of December, two new batches of larger egg diameter started to appear with a relatively small percent, 3 % for egg diameter 0.51mm and 2 % for 0.595mm. The mean GSI value increased to 1.22 (fig 3A).

During January, The ovary represented multiple size batches oocytes. The GSI values through this month reached 5.91 as maximum values with average value about 2.48 ± 1.70. The egg diameters of these samples ranged from 0.085mm to 0.68mm. The highest mode occurs in diameter 0.34 and 0.595 mm where they recorded 26 % and 24 % respectively (fig 3B).

During February, the frequency distribution of egg diameter in the ovary of *Boops boops* extend from 0.085 mm to 0.68

mm with highest percentage in diameters 0.51

mm as shown in fig (3C). During this month, the GSI reached its maximum value (7.17) throughout the annual reproductive cycle of the fish. The frequency distribution of the ova diameter was shifted towards the higher values of the egg diameter. The discharge process during the month, was accompanied by a decrease in the GSI value during late February, to reach 0.81 (Fig 3C).

During March, due to the continuation of discharge of the ripe ova, the percent frequency of the largest egg diameter is elevated during this month, due to the completion of ripening process in the other egg diameters. The egg diameters extend from 0.085mm to 0.68mm, with the highest percentage of egg diameters 0.34mm and 0.595mm (Fig 3D).

During April, the frequency distribution of egg diameters extend from 0.085 mm to 0.68 mm, with the highest mode occur in diameter 0.255 mm. Through this month, a great amount of ripe ova were spawned, the frequency of the ripe ova with diameter 0.68 mm in the ovary had decreased to reach 4.4%. Due to the spawning process and discharge of the ripe ova, the GSI decreased to a lower value compared to the previous months, especially at the end of April, which recorded 0.34 (Fig 3E).

During May, The frequency distribution of egg diameters ranged from 0.085 mm to 0.425 mm and the highest percentage occur in diameter 0.255 mm. It is clear that only immature eggs predominates, specially those of 0.17 mm and 0.255 mm which constitute 27 % and 32 % of the total egg count of the ovary respectively. Thus, the frequency distribution curve is completely shifted towards the left direction with the end of the spawning season (Fig 3F).

The frequency distribution of egg diameter for the fish under study through six months, from December to May, indicated that the fish discharge its ripe ova in batches during the spawning period and withdraw from the egg stock to undergo a continuous maturation process successfully.

Moreover, the presence of more than two modes of egg size, indicate fractional spawning character and a long spawning season extend from early January to late April.

6- Fecundity

A- Analysis of fecundity-length relationship

There are considerable variations in fecundity at any length group, the regression equation can be written as: Fa = -61688 + 5037 L

Where Fa is the absolute fecundity and L is the mean total length in cm.

This equation is used to calculate the individual regression fecundity at each length group of *Boops boops*. The observed and calculated absolute fecundity related to each length group is represented in table (2). The interpretation of different lengths in this equation indicates 0.9 correlation coefficient.

The relative fecundity against total length was estimated. Its equation can be expressed as follows: Fr = -2656 + 233.82L

Where Fr is the relative fecundity and L is the total length in cm.

The correlation coefficient of estimated values for the relative fecundity is found to be 0.85. The observed and calculated relative fecundity related to each length group is represented in table (2).

Table (1): Monthly variaton of GSI for male (1A) and female (1B) *Boops boops* collected from Mediterrenean Sea during the period from August 2001 to July 2002

Table (1A)

Month	No. of fish	GSI Male		
		Min.	Max.	Mean ± SD
Aug.(2001)	8	0.04	0.51	0.31 ± 0.15
Sep.	11	0.03	0.35	0.16 ± 0.1
Oct.	4	0.27	0.41	0.34 ± 0.06
Nov	3	0.24	0.39	0.30 ± 0.08
Dec.	11	0.17	1.11	0.57 ± 0.31
Jan.(2002)	14	0.04	2.13	0.93 ± 0.71
Feb.	5	0.13	3.35	1.56 ± 0.18
Mar.	1	_	1.47	1.47 ± 0.00
Apr.	12	0.7	2.01	1.31 ± 0.44
May.	17	0.03	0.32	0.12 ± 0.09
Jun.	19	0.03	0.36	0.11 ± 0.1
Jul.	12	0.05	0.31	0.22 ± 0.07

Table (1B)

Month	No. of fish	GSI Female		
		Min.	Max.	Mean ± SD
Aug.(2001)	17	0.15	0.53	0.33 ± 0.01
Sep.	34	0.09	0.49	0.31 ± 0.09
Oct.	8	0.27	0.41	0.35 ± 0.04
Nov	15	0.2	0.5	0.36 ± 0.1
Dec.	19	0.4	1.55	0.94 ± 0.27
Jan.(2002)	45	0.5	5.91	2.48 ± 1.7
Feb.	49	0.47	7.17	3.12 ± 1.68
Mar.	16	0.53	5.27	2.52 ± 1.34
Apr.	44	0.27	4.83	1.49 ± 1.22
May.	20	0.03	3.32	0.46 ± 0.68
Jun.	25	0.05	0.41	0.26 ± 0.08
Jul.	17	0.09	0.39	0.21 ± 0.08

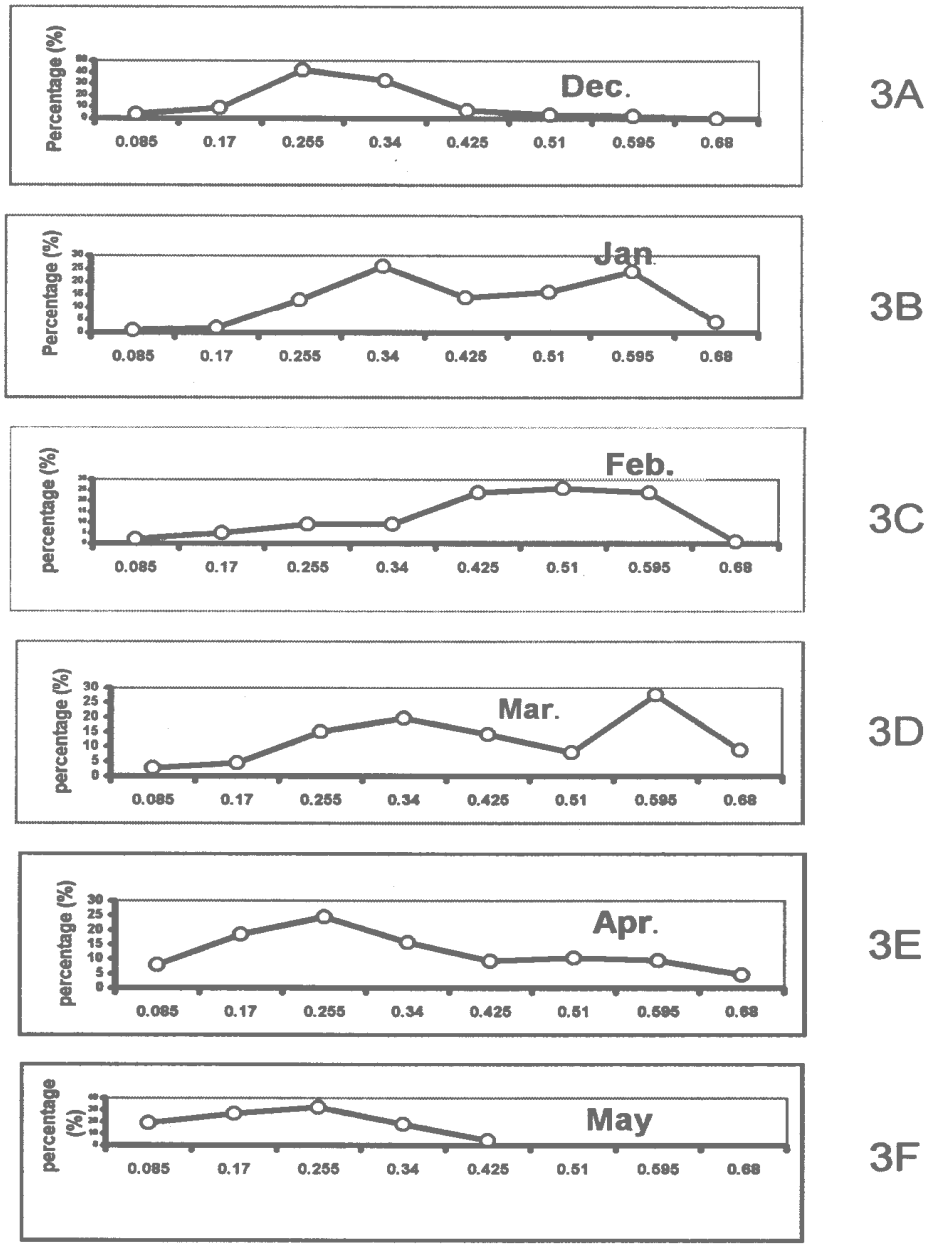

Fig (3): frequency distribution of egg diameters in ***Boops boops***

B-Analysis of fecundity-weight relationship

The average absolute fecundity related to each mean gutted weight is shown in table (3), the regression equation can be expressed as follows: Fa = -12398 + 730.33W , Where Fa is the absolute fecundity and W is the mean gutted weight in grams with a correlation coefficient equal 0.98.

This shows a strong satisfactory agreement of both observed and calculated absolute fecundity for mean total gutted weight from 19.7 gm to 79.7 gm.

The observed and calculated relative fecundity related to mean gutted weight were also shown in table (3), the equation is as follows: Fr = 96.754 + 6.773W

Where Fr is the relative fecundity and W is the gutted weight in grams with a correlation coefficient equal 0.95.

Table (2): Total lenght-fecundity relationship of *Boops boops* collected during the period from August 2001 to July 2002.

Total length interval (Cm)	Mean total length (Cm)	No. of fish	Observed abslute fecundity			Mean calculated abslute fecundity	Observed relative fecundity			Mean calculated relative fecundity
			Min.	Max.	Mean ± SD		Min.	Max.	Mean ± SD	
12 -12.9	12.5	2	1296	6942	4119 ± 3992.32	1274.5	103.68	538.14	320.91 ± 307.21	266.75
13 -13.9	13.5	2	5317.2	5448.6	5382.9 ± 92.91	6311.5	382.53	394.83	388.68 ± 8.698	500.57
14 -14.9	14.5	3	2392.2	26896.2	15117.8 ± 12279.43	11348.5	166.125	1817.31	1020.54 ± 827.1	734.39
15 -15.9	15.5	2	6451.2	10230	8340.6 ± 2672.02	16385.5	430.08	664.29	547.19 ± 165.61	968.21
16 -16.9	16.5	4	7875	33966	20026.75 ± 11582.6	21422.5	483.13	2009.82	1205.94 ± 675.6	1202.03
17 -17.9	17.5	2	24581.7	53070.5	38826.1 ± 20144.62	26459.5	1437.53	2981.49	2204.51 ± 1098.82	1435.85
18 -18.9	18.5	2	12530.7	31057.9	19892.47 ± 9831.85	31496.5	696.15	1643.28	1068.14 ± 505.19	1669.67
19 -19.9	19.5	2	25160.4	33971.4	29565.9 ± 6230.32	36533.5	1324.23	1724.44	1524.34 ± 282.99	1903.49
20 -20.9	20.5	1	51528	51528	51528 ± 0.00	41570.5	2538.33	2538.33	2538.33 ± 0.00	2137.31

Table (3): Gutted weight-fecundity relationship of *Boops boops* collected during the period from August 2001 to July 2002.

Gutted weight intervals (gm)	Mean gutted weight (gm)	No. of fish	Observed abslute fecundity			Mean calculated abslute fecundity	Observed relative fecundity			Mean calculated relative fecundity
			Min.	Max	Mean ± SD		Min.	Max.	Mean ± SD	
15 - 24.4	19.7	2	1296	6942	4119 ± 3992.32	1989.5	66.7	312.84	189.77 ± 174.05	230.18
25 - 34.4	29.7	6	2392.2	26896.2	10428.4 ± 9319.67	9292.8	92.33	796.45	333.5433 ± 262.16	297.9
35 - 44.4	39.7	3	10230	24560	16165.33 ± 7474.86	16596.1	294.13	613.23	426.3 ± 166.45	365.64
45 - 54.4	49.7	4	7875	33966	19738.35 ± 11812.05	23899.4	176.73	645.01	385.91 ± 218.1	433.37
55 - 64.4	59.7	4	16088.8	53070.5	31344.42 ± 15738.26	31202.7	271.13	888.21	515.38 ± 267.09	501.1
65 - 74.4	69.7	1	33971.4	33971.4	33971.4 ± 0.00	38506	504.33	504.33	504.33 ± 0.00	568.83
75 - 84.4	79.7	1	51528	51528	51528 ± 0.00	45809.3	678.36	678.36	678.36 ± 0.00	636.56

DISCUSSION

In *Boops boops*, maturity stages, length at first sexual maturity, monthly distribution of maturity stages, gonadosomatic index, egg diameter and fecundity were discussed here in order to clarify the actual mode of reproduction.

Zaki *et al.* (1986) identified 7 maturity stages of *Clarias lazera*. These are thread, immature, mature, nearly ripe, ripe, spawning and spent. similar scale was used by El-Borahy (1997) and El-Greisy (2000) for *Rhabdosargus haffara* and *Diplodus sargus* (family Sparidae) respectively.

These results are in agreement with our results, which identified the maturity stages of *Boops boops* into 7 maturity stages. While Hassan (1990) identified 6 developmental stages of *Boops boops* and *Boops salpa*, these stages are immature, rest, mature, nearly ripe, running (full ripe) and spent stage.

In the present study, *Boops boops* smaller than 11 cm are all sexually immature. However, male *Boops boops* reach its sexual maturity at 12 cm while female at 13 cm. In many fish species, males attain their sexual maturity at sizes earlier than females (Lagler *et al*. 1962). Hassan (1990) reported that males *Boops boops* become sexually mature at length ranged from 11 to 13 cm and from 10 to 13 cm for females.

The same idea about the relation between the length and the sexual maturity was observed in many fish species as reported by Abdalla (1996) for *Diplodus vulgaris*; El-Borahy (1997) for *Rhabdosargus haffara*; Abou-Shabana (1998) for *diplodus cervinus hottentotus*; EL- Greisy (2000) for *Diplodus sargus*; In the present study, the monthly distribution of the different sexual maturity stages for *Boops boops* revealed that this species has a long breeding season extending from early

January to early May, with maximum peaks during January and February. From June to September, the specimens studied for *Boops boops* were all localized in the first III stages (thread, immature and mature). In December, stage IV (nearly ripe) and stage V (ripe) started to appear. In January and February, the majority of the fish were in the spawning stage (stage VI). The last stage (spent) were observed in months March, April and May, where in May most of the fish were in spent stage.

It was observed that the number of spawning female *Boops boops* was always greater than that of males and the spawning process proceeds in females than in males.

Moneium (1978) in Libanon mention that the spawning season of *Boops boops* extend from February to April while Girardin (1981) in the Gulf of Lion (France) after studying the spawning season of *Boops boops* reported that it is in the period from March to June. Anato and Ktari (1983), in their study of this species in Tunisian coasts found that the spawning period started from January and ends in June. Hassan (1990), study this species in the Egyptian water and determine that spawning season start in February and end in April.

These results showed that the present results in this work are within the limits for the spawning season given by other authors. However, the onset of the sexual maturity varies within the same species under different ecological conditions. Kashiwagi *et al*., (1987) reported that the differences in the spawning season may reflect different temperature regimes or feeding dominance among the areas.

In the present study, the monthly distribution of gonadosomatic index values indicated that its values were elevated from January to March i.e. during the breeding season. The maximum values were attained in February for both sexes. It was 3.12 ± 1.68 for females and 1.56 ± 0.18 for males. During March, the gonadosomatic index values decreased due to the discharge of sexual products during the spawning season. A sharp decrease in the gonadosomatic index values for males and females were observed in April and May due to the discharge of most ova and sperms. This decrease continued until it reached its lowest value in June and July in males and females respectively. These results coincide to a great extent with finding of Hassan (1990).

However, the gonadosomatic index values of the females throughout the year is greater than that of the males. This is due to the fact that eggs, as the end product of ovogenesis in the females are much heavier than the spermatozoa, which represent the end product of spermatogenesis of males. This observation was noticed by many authors such as El-Maghraby *et al.* (1982) for two sparid fishes namely *Diplodus sargus* and *Diplodus vulgaris*; Assem (1992) for *Oblada melanura*; and Litaay *et al*. (2003) for *Haliotis rubra*.

Ova diameter investigation in the present study indicated that the maximum size of ripe ova was 0.68 mm in diameter, which was observed from January to April i.e. winter months. It was noticed that in February, the fish attain its highest GSI value throughout the whole year (3.12 ± 1.68). The egg size is probably related to the amount of food that females can metabolize, assimilate and store in each egg (Neophitou, 1988). Ware (1975) pointed out that egg size was remarkably constant for a given marine fish species in a given geographical area.

The use of size-frequency analysis of oocytes revealed three oocyte groups in the ovary of *Boops boops*. This indicates that the mature fish discharges its ova in batches during prolonged spawning period i.e. they are fractional spawners. The fractional and prolonged spawning season are characteristic features of the tropical and subtropical fish species (Niklosky, 1963).

Zaki *et al*. (1995) stated that the analysis of ova diameter for *Oblada melanura* revealed that there were nine diameter groups of ova in different samples. Allam

(1996) pointed that ripe ovaries of *Trachinotus ovatus* contained three modes of oocytes (primary, intermediate and most advanced oocytes). Oocytes of both intermediate and most advanced oocytes are spawned during one spawning season. Massut and Nin (1997) pointed that the size distribution of oocytes with at least two groups of oocytes in the ovaries suggests that *Coryphaena hippurus* is a multiple spawner with an extended spawning season in the study area.

The present study showed that there is a good agreement between the observed and the calculated values of both absolute and relative fecundity. This observation indicates the fitness of the equations that expressed the relations between absolute and relative fecundity and the mean total length as well as the mean gutted weight of the fish.

However, the present results shows that the values of correlation coefficient between the absolute fecundity and the relative fecundity in relation with the mean total length were 0.9 and 0.85 respectively.

While, on the other hand, the values of correlation coefficient between absolute fecundity and the relative fecundity in relation with mean gutted weight is 0.98 and 0.95 respectively. These results indicate that the weight is closely related to fecundity than length in *Boops boops*.

Our results coincide with that of Hassan (1990) who worked on the same species. He concluded that the mean observed absolute fecundity ranges from 5185 to 52208 eggs for total lengths ranging from 13 to 22 cm and that the relative fecundity varied between 399 to 2373 egg per cm. While the observed absolute fecundity ranges from 5185 to 52208 eggs for mean total gutted weight 18 to 89.4 gm and the corresponding observed relative fecundity ranged from 288 to 584 egg per gm.

The results of the present study followed the same trend like those of Zaki *et al*., (1995) for *Oblada melanura;* Abou Shabana (1998) for *Diplodus cirvenus hottentotus*; El-Greisy (2000) for Diplodus sargus; El-Ghamdy (2001) for *Acanthopagrus bifasciatus* and Zaki *et al*., (2004) for *Diplodus vulgaris*.

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