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RELATIONSHIPS BETWEEN THE BROOD STOCKS AGE, SIZES (WEIGHT AND LENGTH) AND FIRST FISH MATURATION FOR BOTH MALES AND FEMALES OF EUROPEAN SEA BASS, *Dicentrarchus labrax* (L.).

Abd El-Hakim, N. F.*; M. S. Hussein*and A. A. H. Shahen **

*** Faculty of Agriculture, Al-Azhar University, Nasr City, Cairo, Egypt.**

**** The General Authority for Fish Resources Development , Nasr City, Cairo, Egypt.**

ABSTRACT

The objectives of this study aimed to evaluate the relationships between the brood stocks age, sizes (weight and length) and first fish maturation for both males and females of European sea bass *Dicentrarchus labrax* (L.).

The present study was carried out in the Marine Fish Hatchery belonging to the General Authority for Fish Resources Development (GAFRD), Ministry of Agriculture and Land Reclamation, ARE. The hatchery located at the 21th km western of Alexandria at the road from Alexandrian to Matruh governorate. The study was performed during May 2001 to December 2004. For this experiment a total number of 300 of developed sea bass juveniles aging three months were involved. Averages of sea bass weights and lengths at the experimental start were 7.8 ± 2.6g and 4.5 ± 1.2cm, respectively. The present study aimed to determine the age, weight and length of sea bass*(D. labrax*L.)at first sexual maturity.

The obtained results are summarized in the following:

1. The first mature males (13.7 % of the fish sample) were detected at 12months, while in females it was detected at 15 months of age (3.3 % of the sample).
2. Percent of mature males and females in the sample increased in almost linear manner with each advance in age to become fully mature in the sample at 36 months of age with a total weight range of 678.9 to 995.8 g for males and 853.6 to 1142.3 g for females.
3. Age appeared significant effects on body weights and lengths in both male and female sea bass where both measurements increased with each advance in age.
4. Starting with the age of 12 months, percent of mature males and females in the sample increased with each advance in age to reach 100% maturation at 36 months of age.
5. The correlation coefficients calculated between age and each of total body weight, body total length and percent of maturation were significant.

The study clearly indicated that the first mature males (13.7 % the sample) were detected at 12 months of age with the average of total weight between 109.6-150g, and the average of total length between 18.4-21cm, while in females it was detected at 15 months (3.3 % of the sample) and the average of total weight was 291.2 g, and the average of total length was 33.6cm. The complete sexual maturity of female occurred at 36 months of age at body weight ranging from 678.9 to 995.8g and, which the total length was 38.2 to 60.6.4cm, in males at the same age and average body weights ranging from 853.6to 1142.3 g with the total length was 43.2 to 68.5cm. The sea bass male and female fish reached 100% maturation with a sex ratio to 1:1.1 for female and male, respectively.

Keywords: Brood stocks age, sizes ,first fish maturation , European sea bass , *Dicentrarchus labrax* (L.).

INTRODUCTION

The European sea bass *(Dicentrarchus labrax* L.) is an important cultured species in the Mediterranean region. The European sea bass is a marine aquaculture species of major economic interest in Europe but it is recognised that the skewed sex-ratio in favour of males observed under culture conditions, and their early maturation compared to females still represent important drawbacks for commercial production (Zanuy *et al.*, 2001). Although significant contributions have already been made in this field, much work is still concerned with sex control methods in this species (Pavlidis et al., 2000; Zanuy *et al*., 2001and Koumoundourous *et al.*, 2003). Genetic and physiological approaches generally require the set-up of mid-term or long-term studies and considerable amount of work in sexing juveniles or adult fish. Sexually mature sea bass can be recognised macroscopically by their gonads according to the classification of Barnabé (1976). The demand and high value of this species led to farm cultivate this fish under extensive condition in Egypt. Aquaculture production reached 80 161 tonnes in 2005 (FEAP, 2006), with Greece producing 35 000 tonnes, followed by Turkey (20 900 t), Italy (9,800 t), Spain (6 130 t), and France (4 300 t).

The successful large-scale cultivation of this species for human consumption demands when the resource be easily renewable. It is clearly disadvantageous to cultivate marine finfishes when the supply of young cannot easily be replenished; yet, the history of aquaculture has been dogged by just this problem.There are two solutions to this problem: the first is eminently practical and has been the historical answer to collect fry from natural resources. Yet, the difficulties inherent in this method are many, for it is time consuming, requires considerable skill and experience and relies utterly on the productivity of the natural spawning grounds. The second solution is more direct: learn how to make the brood stock marine finfishes reproduce in captive. A primary requirement as far as brood stock management and good farming practice are concerned is an ability to control fully the sexual maturation and spawning of the marine finfishes species under cultivation. Without this control farmers have to rely on collections of wild brood stock, larvae or fry in order to complete the cycle of production. European sea bass, *D.labrax,* like many other teleosts inhabiting temperate latitudes, used seasonal pattern of changing day length modulated by temperate to synchronize their spawning,So that they occur at the most favorable time of the year for survival of offspring (Barnabé,1990). During the first year of life the gonads of european sea bass remain undifferentiated, with sexual differentiation occurring some time after this event (Robin and Brusle, 1983). However, Blazquez *et al.* (1995) suggested that sex differentiation in captive sea bass may occur at an earlier age of 9 months. They added that, a sensitive period for alteration of ovarian or testicular configuration by steroids hormone administration has been identified between 126 and 226 days post hatching. As regards to sex ratio, Barnabé (1990) reported that a high proportion of males (70-90%) has been observed in

several Mediterranean hatcheries, also the possible environmental and or social factors resulting in such unequal sex ratio are not known.

Eggs are produced all year around using adequate temperature and photoperiod. Sea bass spawn naturally in tanks and buoyant eggs are collected at the water outlet of the spawning tanks. In captivity, first sexual maturation occurs in 1-2 years-old males and in 3-5 years-old females. A generation interval of 2 years can be obtained in controlled rearing conditions but in practice it is longer and ranges between 4 and 6 years. Eggs and sperm can be collected by a gentle pressure on the flanks of anaesthetized fish. Hormonal stimulation of ovulation by LHRH-a or GnRH-a is needed to collect eggs (Zanuy *et al*.2001). Sperm can be frozen with several types of protocols.

Determination of body length and age at first sexual maturity is the most important parameters to serve as basis for reproduction management of sea bass. Rafail (1971) estimated the length and age at maturity for European sea bass *(D.labrax),* and showed that the ripe males of this fish first appeared in catch at 19.5 cm body length and 2 years of age, while ripe females sexual onset appeared at 25 cm, in length and 3 years of age. Brusle and Roblin (1989), reported that under culture conditions, puberty in European sea bass males is reached near the second year of life, depending more on the body size attained on the age of animal. They added that, in contrast, puberty in females usually occurs 2years later and these differences in reproduction strategy resulted in a relatively higher growth performance in females than males. The same authors showed also that in captivity, under natural photoperiod and temperature, 2years old immature female sea bass, attain 0.5±0.04 Kg in weight and 33.7±0.06 cm, in length, compared with 0.3±0.02 Kg and 28.5±0.6 cm for spermating males of the same age. They also added that during the third year of life, the differences in weight and size between males and females are not as pronounced as in previous year, probably as a result of the maturity of females. They concluded that these facts favour the development of techniques for the monosex (all females) culture of sea bass.

In Egyptian coast of Mediterranean, Wassef and El-Emary (1989) found that onset of spawning of females sea bass occurred at 20cm in length (2years) and 29 cm (4 years) for females. Bou Ain (1977) gave a comparison of length at first maturation of sea bass in some countries on areas of the world.Caporiccio and Connes (1977), Mayer *et al,* (1988) Zohar (1989), Zohar *et al.* (1989) and Barnabé (1994) described the cellular types in the gonads and their changes during the sexual cycle in European sea bass *D.Labrax*. They reported that in sea bass, as in other teleost, gonadal maturation involves many months of preparation, where on the later stages of growth and gamete release are but brief interludes in the development process, i, e. vilellogenesis starts in October and lasts *4-5* months, whereas spawning time in the Mediterranean is restricted to a month in the winter.Alvarino *et al.* (1992) studied the pattern of sea bass oocyte development after experimental ovarian stimulation. They reported that sea bass show group synchronous oocyte development and have ovaries which contain more-than one group of developing oocytes. Thus, the sea bass in

culture is a multiple spawner, confirming previous observation of Mayer *et al.* (1990) for wild stocks.

The present study was performed during 3 years from May 2001 to December 2004 and aimed to determine the relationships between the brood stocks age and sizes (weight and length) and the first fish maturation for both males and females of European sea bass *(Dicentmrchus labrax)* at first sexual maturity .

MATERIALS AND METHODS

The present study was conducted in Marine Finfishes Hatchery located at the 21 Km. west of Alexanderia. Matruh governorates. The hatchery belongs to the General Authority for Fish Resources Development (GAFRD), Ministry of Agriculture and Land Reclamation, ARE. The present experiment was performed during 3 years from May 2001 to December 2004 and aims to determine the relationships between the brood stocks age, sizes (weight and length) and first fish maturation for both males and females of European sea bass *(Dicentmrchus labrax)* at first sexual maturity .

Experimental Fish

A total number of 300 sea bass *(Dicentrarchus labrax)* developed juveniles (males and females) were used in this experiment (which were produced from the mating of parent stock of the hatchery) aging three months (average initial weight of 7.8 ±1.34 g and an average initial length of 4.5 ±1.09 cm) at experimental start to determine fish age , weight and length at first fish sexual maturity.

Experimental Diets

During this experiment , the experimental sea bass *(Dicentrarchus labrax)* developed juveniles (mixed sexes) were daily fed during the first period, from 3 to 9 months of age on minced tilapias flesh at a rate of 12% of the fish biomass. Whereas from 9 to 12 months of age (2^{nd} period) the experimental diet contained minced tilapias flesh at daily rate of 10% of biomass (Table 1). During the period 3 from 12 to 15 months, experimental sea bass *(Dicentrarchus labrax)* developed juvenilesperiod from 12-15 month of age were fed on dry pelleted food(47.6% crude protein) at a daily rate of 8% of biomass, and period 4 from 15- 24 months of age fed the same test diet but at a daily rate of 6% of total fish biomass.Period 5 from the 24 to 36 months of age the experimental fish were fed on the same diet, but at a daily rate of 3 % of fish biomass (Tables 1 and 2).

Table (1): Experimental periods (lasted for 5 consecutive periods)and feeding regeme

Period	Age	Feed and rate for feeding
Period. 1	From 3-9 month	Minced tilapia -12%
Period .2	From 9- 12 month	Minced tilapia -10%
Period. 3	From 12-15month	Dry food-8%
Period.4	From 15-24 month	Dry food-6%
Period. 5	Form 24-36 month	Dry food-3%

Table (2): Ingredient and proximate composition of the experimental test diet used in feeding sea bass from 12-36 months of age.

Ingredient	%
Fish meal (FM)*	68
Rice bran (RB)	11
Yellow corn flour(YC)	10
Soybean meal **	3
Cotton seed meal (decorticated)	4
Cod liver oil***	2
Mineral +Vitamins mixture****	2
Total	100
Proximate analysis (%) :	
Dry matter (DM)	88.4
Crude Protein (CP)	47.6
Total lipids (TL)	17.2
Ash	19.5
Crude Fiber(CF)	1.9
NFE[1]	13.8
Gross energy (GE) (kcal/lOOg D.M)[2]	434.3

*** Source from Brazil**
**** Solvent extracted**
***** Cod live oil product by Iceland**
****** Each gram of vitamin premix contains (NRC, 1993), 20.000IUvit. A2000 IU vit. D3, 400 vit. E, 20 mg Niacin, 4.5 mg riboflavin, 3mg pyridoxine, o.o!3 mg vit. B12, 100 mg chorine chloride and 2 mg vit K.Each gram of minerals contains 0.83 Ca, 0.63P, 0.78 Na, 0.018 Mn , 0.011 Zn and 0.001 Cu .The Mixture was prepared by mixing 35parts of dicalcium phosphate, 3 parts of mineral premix and 2 part of common salt.**
[1] Calculated by differences
[2]Growth energy was calculated using values of 5.65 , 4.1 and 9.45 Kcal/g protein , carbohydrate and lipid ,respectively (Jobling, 1983) .

Fish rearing facilities

In the present experiment, sea bass *(Dicentrarchus labrax}* developed juveniles (mixed sexes) , were stocked in a circular concrete tank with a total sea water volume of 50 m^3 till termination of the experiment, i.e three years after start. This water of the experimental tanks was changed completely (daily rate of 100 %) and the tanks were supplied with continuous air through a blower of 15 hp. capacity which provided 15 m^3 air per second.In this experiment, all fish were monthly transferred to another clean tank with the same specification to avoid infection with bacteria or parasites.

Sea water supply system:

Sea water was drawn directly from an intake point in the shore by subs and well point (150 u.m slots, 3pipes PVC, 3m length). Sea water was pumped by 4 kW polypropylene centrifuge pump to three concrete reservoirs of 60m^3 capacity, 11m diameter x 1.5m depth. The reservoir was used as a setting to the coarser suspended particles before the water was filtered. Water was pumped from reservoir to two constant head tanks (5m^3 capacity) to distribute for maturation and spawning tanks, and pumped to larval tanks.

Drainage system and air supply system:

All the tank facilities were provided with two drainage system, one for cleaning water and other to remove water used in experimental larval

rearing.The air supply system consists of three air blowers work alternating at 24-hour interval. The air distribution network was constructed of PVC pipes and control valves.

Measurements and records

Age of both males and females sea bass was recorded. Total weight and total length of each individual fish were recorded to the nearst 0.1 g and 1 mm, respectively. Both weight and length of the experimental fish were recorded every 3 months till the end of the third year after experiment start. Age at sexual first maturity was determined by inserting a plastic canula in the urino-genital openning to collect the eggs from the females, while semen was collected from males by stripping on the abdominal area towards tial fin.The collected eggs were examined under a light microscope to measure egg diameter (microne) and the diameter of the oil globuler. Age at first maturation for male and female fish was further recorded

Water quality parameters

Physical and chemical water parameters in experimental tanks were determined according to Boyd (1990). Water temperature in ^{o}C was daily recorded in all experimental tanks using a simple thermometer. Water pH was measured in the present experiment every week using a digital PH meter(model up Hep). Dissolved oxygen (mg 0_2 / L) was monitored within all experimental tanks every week using a digital 0_2 meter(YSI model MP57).Water salinity was determined in all experimental tanks al the periods previously mentioned in the experiment using a refractometer(model U-81150-20).Ammonia(mg NH_4-N/L)was determined using colormeter(Model HAC).

Analytical feed methods :

Feed ingredients and experimental diets were analyzed for proximate composition according to AOAC(1990). Gross energy was estimated using values of 4.15Kcal/g carbohydrate, 9.4 Kcal/g lipid and 5.5 Kcal/g protein as reported by (Jobling, 1983) .

Growth performance data

Fish were counted and batch - weighed at stocking and at harvest. Mortality was monitored daily and survival was defined as the fraction of the stocked fish that were harvested.Average initial(Wi)and final fish body weight(W_1) were calculated . Rearing time (t) was defined as the period from the first to the last day that the fish were fed .

Statistical analysis

All data were analyzed statistically using SAS(2005) program. Duncans multiple range test {1955) was carried out to test the significance among treatments means ($P<0.05$).

RESULTS AND DISCUSSION

Results of Table (3) illustrate the effect of age ,weight and length of sea bass on maturation percentage. At 3 months of age , averages of body weight(BW) of sea bass was found to be 7.8 ± 2.6 g with an average length of 4.5 ± 1.2 cm. At 6 months of age average body weight and body length increased. During ages 9; 12; 15; 18; 21; 24 and 36 months of age body

weight of sea bass increased significantly(P<0.05) almost in a linear manner with each advance in fish age.

Body length(BL) behaved almost in a similar manner as body weight, thus it increased significantly (P<0.05) with each advance in ages 21 and 24 months. Results of Table 3 and Fig.(1) indicate that sea bass (male and female), average of BW at the experimental start (3months of age) was 7.8 ± 2.6 g and it increased in order with each advance in age to reach 913.9 ± 92.5 g at 36 months, increased its BW by 906.I folds during the period from the third to the 36 months of age in both sexs. Results of Table (3) and Fig. (1) revealed that during the ages 3 to 36 months of age BW showed a highly significant correlation (P<0.05) r = 0.94.Also results of the same Table and the Fig. (2) show that the age revealed a positive significant (P<O.05) correlation with fish BL (r = 0.91).Results illustrated in Table (3) and Fig. (3) declared that maturation percentage is highly dependent on age of sea bass with significant (P<0.05) correlation coefficient(r = 0.69).

Table (3). Effect of age, body weight and total length on percentage maturation of sea bass in experimental tanks , (mean values ± SE,) in period during May 2001 to December 2004.

Variable / Age Month	Weight (g)	Length (cm)	% Mature
3	$7.8^{h} \pm 2.6$	$4.5^{h} \pm 1.2$	$0^{e} \pm 0$
6	$21.6^{h} \pm 5.1$	$9.2^{g} \pm 1.9$	$0^{e} \pm 0$
9	$56.4^{g} \pm 15.17$	$13.8^{f} \pm 2.1$	$0^{e} \pm 0$
12	$110.3^{f} \pm 32.14$	$18.6^{e} \pm 1.9$	$13.7^{de} \pm 0.35$
15	$208.25^{e} \pm 48.6$	$26.6^{d} \pm 4.7$	$26.6^{cd} \pm 0.44$
18	$241.3^{d} \pm 44.04$	$36.5^{C} \pm 6.6$	$29.4^{c} \pm 0.46$
21	$311.9^{C} \pm 63.8$	$41.2^{b} \pm 7.9$	$41.1^{c} \pm 0.49$
24	$346.8^{b} \pm 66.05$	$41.8^{b} \pm 5.4$	$65.5^{b} \pm 0.48$
36	$913.9^{a} \pm 92.5$	$51.3^{a} \pm 7.5$	$100^{a} \pm 0.00$
L.S.D.	24.3 sig.***	2.4 sig.***	0.15 sig. ***

Values in the same column with different superscripts are significantly different at P < 0.05

As presented in Table (3) and Fig.(4) results revealed that maturation percent of both sea bass males and females correlated significantly (P<0.05) with fish weight(r = 0.68) .

Concerning the relationship between fish length (male and female sea bass) results of Table (3) and Fig .(5) revealed that percent of maturation is significantly (P<0.05) dependent on fish length (r = 0.65) .From results of Table (3) and Fig (5), it was noticed that both weight and length of sea bass (males + females) are correlated highly (P<0.05) with a correlation coefficient of (r = 0.85.)

Regarding results of Table (4), results revealed that at age 3, 6 and 9 months after hatch no maturation was observed. At 12 months of age, only 13.7 % (males only) showed maturation with length range of 18.4 - 21cm and weight range of 109.6 - 150.0 g. At 15 months of age, 3.3 % females and 23.3 % of males reached maturation with an average length of 33.6 cm and weight of 291.2 g. for females and 20.1- 27 cm and 145.2- 217.4 g for males, respectively. At 18 months of age, 8.8 % and 20.5 % of the remain ding

females and males showed maturation in the sample. At 21 months of age, 14.7 % and 26.4 % of females and males reached maturity in the sample examined. Furthermore at 24 months of age, 27.5 and 38 % of females and males reached maturity in the tested sample, respectively. At the age 36 months, 100 % of fish were mature. In general results of Table (4) show that male of sea bass mature earlier than their female and the maturation percent increased with each advance in age to reach complete maturation (100 %) at 36 months of age. At 36 months, the ratio between matured females to males was determined to be 1:1.1.

Results illustrated in Tables 3 and 4 are closely in accordance with those reported by Wassef and El-Emary (1989), they reported that the first appearance of mature sea bass in wild was recorded at 17 cm length group representing 14.3 % of the males examined. He added that this percent incased in the successive length group 22 cm. i.e male sea bass attain their first sexual maturity with a length ranging between 17and 22cm. The same author reported also that females sea bass attain their first sexual maturity at length ranging between 26 and 32 cm. which is in complete agreement with results obtained in the present study (Tables 3 and 4).

Table (4): Effect of age, weight and total length on maturation development of sea bass *D. labrax* in experimental tanks in period during May 2001 to December 2004(mean values± SE)

Age month	Fish No.	Total length (cm)	Total weight (g)	Mature fish		Female		Male	
				No.	%	No.	%	No.	%
3	29	4.5	7.8	-	0		0		0
6	33	9.5	21.6	-	0		0		0
9	31	13.8	56.4	-	0		0		0
12	29	18.6	110.3	4	13.7	-	0	4	13.7
length rang	-	-	-	-				18.4-21	-
weight rang	-	-	-	-				109.6-150	
15	30	26.6	208.25	8	26.6	1	3.3	7	23.3
length rang				-		33.6		20.1-27	
weight rang						291.2		145.2-217.4	
18	34	36.5	241.3	10	29.3	3	8.8	7	20.5
length rang						43.3-48.2		31.4-41.3	
weight rang						278.6-330.1		198.1-267.4	
21	34	41.2	311.9	14	41.1	*5*	14.7	9	26.4
length rang weight rang						40.3-60.4 331.6-443.4		33.4-58.3 241.3-439.8	
24	29	41.8	346.8	19	65.5	8	27.5	11	38
Length rang weight rang						41.7-54.3 344.1-497.4		34.8-49.4 272.5-463.2	
36	36	51.3	913.9	36	100	17	47.2	19	52.8
length rang						43.2-68.5		38.2-60.6	
weight rang						853.6-1142.3		678.9-995.8	

Values in the same column with different superscripts are significantly different at P < 0.05

In general, results of the present study may lead us to conclude that length at first maturity is 18.4-21cm for males and 24-36cm for females of Egyptian sea bass. Also results of the present study are in accordance with the findings of Wassef and El-Emary (1989),who reported that sea bass males attain first maturation at length range 17 -22 cm and females23-32 cm. Fish bigger than 22 cm for males and 32 cm for females were all sexually mature. In this connection, Abdo (1996) reported that females of sea bass smaller then 25 cm in length were all immature, while all males smaller than 17 cm were immature which is in complete agreement with the results of the present study (Table 4). The same author showed that the mature individuals appear with small percentage (12.6%) in females at 25 cm and inmales at 17 cm. The percentage of mature individuals increased with the successive increase in length to reach 66.67 % at 21 cm and 30 cm length for males and female, respectively. She added that at length 31 cm the mature female increased and sexually mature individuals were about 71.43 % at length 22 cm, i.e. all males larger than 23 cm in length were sexually mature. In this connection, Brusle and Roblin (1989) and Blazquez *et al.* (1995) recorded that males of sea bass. *D. labrax* reached maturity at two years of age. On the other hand, females reach maturity at 3 years. In England, bass reach maturity at 4 - 6 years of age (35 - 40 cm.) and may continue to spawn for to 20 years Abdo (1996). Mayer *et al.,* (1990) has also observed similar observation. Mediterranean sea bass first reach maturity at smaller size and lower age than Atlantic bass (Barnabé, 1990 and Blazquez *et al.,* 1995).

Concerning the effect of lighting regime, on maturation of male sea bass Rodriguez *et al,* (2001) exposed groups of 4-month-old sea bass over three consecutive years to a natural photoperiod (40 N)(NP), constant long photoperiod (15L:9D) explain and 18-month-expanded photoperiod (the natural light cycle extended to 18 months) (EX), under natural conditions of temperature (12.0 - 26.3^{o} C). They found that during the differentiation period, a significant increase in number of precocious males was found in the LO (26.8%) and explain (17.7 %) groups compared to controls (5.3%) ($P < 0.05$).During the first reproductive season (20-25months of age), gonad size (GSI) in both the explain (0.82 ± 0.16%) and the explain (0.28 ± 0.07 %) groups was significantly lower than controls (1.28 ± 0.41 %). The same authors showed also that (he percentage of spermiating males during the first reproductive period was lower in explain (< 60 %) and explain(<35 %)group compared to controls (> 80 %). They added that at the second reproductive period (32-37 months of age), gonadal maturation was advanced in EX group, whereas a significant delay was observed in LO group with respect to control. Spermiation in EX group was advanced with respect to control group. During the second reproductive period, percentage of spermiating males was significantly higher in EX group (~ 80 %) than in LO group (< 50 %) LO and EX groups displayed enhanced growth (655.52 ± 37.21 g and 376.40 ± 6.33 mm; 510.44 ± 25.80 g and 350.14 ± 5.27mm, respectively) compared to controls (459.93 ± 21.20 g and 343.62 ± 4.82 mm). They concluded that there is a significant beneficial effect of constant long and expanded photoperiod on reducing sea bass gonadal development and enhancing growth at the age of commercialisation.

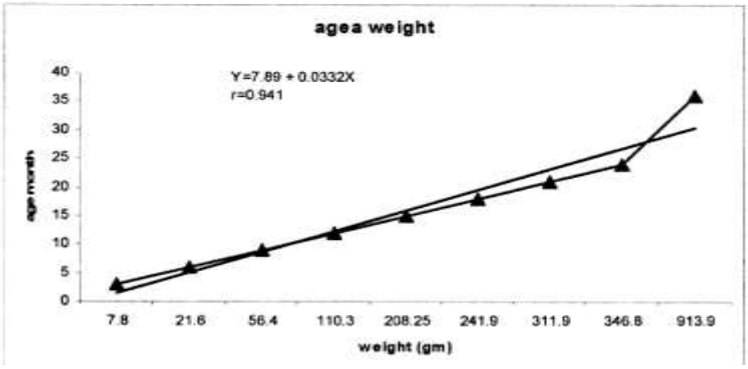

Fig (1). The relation between weight (g) and age (months) of sea bass *D. labrax*

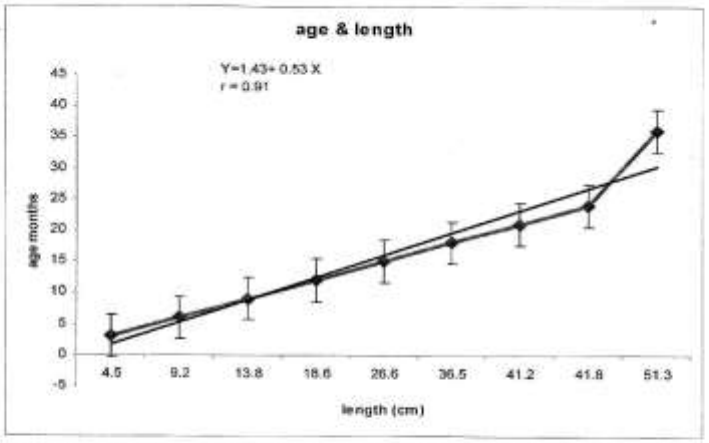

Fig (6). The relation between length (cm) and age (months) of sea bass *D.labrax*

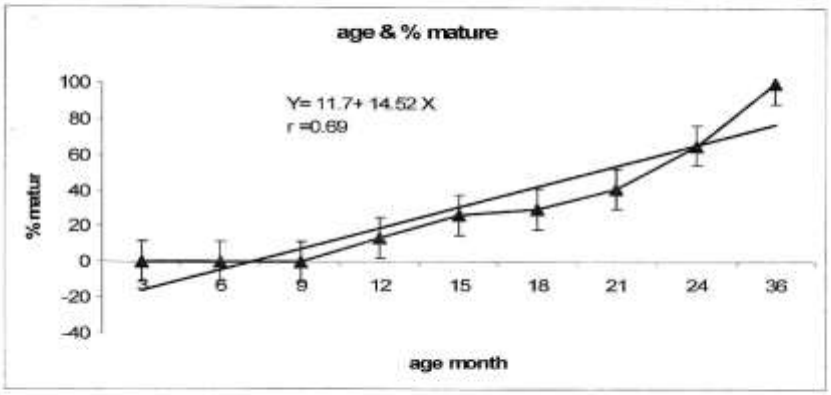

Fig (7). The relation between percentage of maturity and age (months) of sea bass *D.labrax*

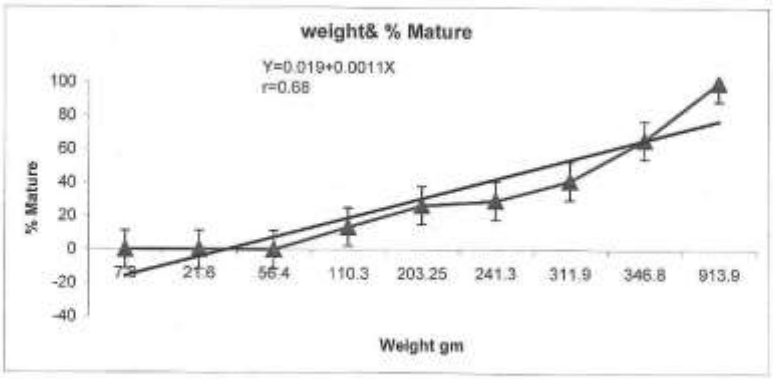

Fig (8). The relation between weight (gm) and percentage of maturity at sea bass *D.labrax*

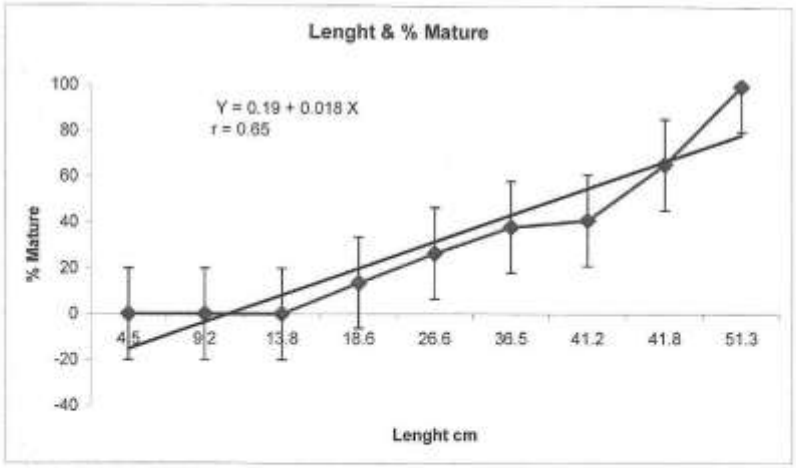

Fig (9). The relation between length (cm) and percentage of maturity on sea bass *D.labrax*

Physico-chemical characteristics of experimental tanks water :

Results of Table(5) show the physico-chemical characteristcs of experimental tanks water during 36 successive months from May 2001 to December 2004 during this experiment.Water quality parameters including water temperature(^{0}C),dissolved oxygen (DO) , pH , ammonia (NH_3 –N) and salinity (ppt‰) were measured throughout the experiment . All water quality parameters were within the permissible levels for sea bass aquaculture. The chemical equilibrium between undissociated ammonia and total ammonia is a function of salinity, temperature and, to a large extent, pH (Miller *et al*., 1990; Soderberg and Meade, 1991 and Boyd, 1990). For equal initial concentration values of total ammonia, a pH variation from 7 to 8 leads to a 10-fold increase in the formation of the toxic fraction (Lloyd, 1992).

Table (5): Physical and chemical water parameters in experimental tanks .

Parameters	Minimum	Maximum	Mean ± SE
Water temperature (^{0}C)	14.4	29.4	21.9 ± 7.4
Dissolved oxygen (DO), mg/l	6.1	6.5	6.3 ± 0.21
pH	7.4	8.0	7.7 ± 0.30
Ammonia (NH_4 –N) mg/l	0.033	0.061	0.047 ± 0.014
Salinity (‰)	30.2	35.4	32.8 ± 2.6

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العلاقات بين عمر وحجم (وزن وطول) مخزون ذكور واناث سمك القاروص عند بدء النضج الجنسي

نبيل فهمي عبد الحكيم*، محسن صالح حسين* و أحمد عبد الحميد حسن شاهين **

*** قسم الإنتاج الحيواني-كلية الزراعة - جامعة الأزهر - مدينة نصر - القاهرة**

**** الهيئة العامة لتنمية الثروة السمكية - مدينة نصر - القاهرة**

أجريت هذه الدراسة في المفرخ البحري التابع للهيئة العامة لتنمية الثروة السمكية، التابعة لوزارة الزراعة واستصلاح الأراضي، وهو يقع في محافظة الإسكندرية على الحدود الغربية عند الكيلو 21 غرب مدينة الإسكندرية على طريق الإسكندرية مطروح، وقامت هذه الدراسة على مدار 3 سنوات من الفترة 2001 إلى 2004. واستهدفت هذه الدراسة الوزن والطول والعمر لأسماك القاروص عند أول النضج الجنسي، وفي هذه التجربة استخدم عدد 300 إصباعية من القاروص، وكان عمرها عند بداية التجربة ثلاثة شهور، وكان متوسط طول ووزن أصبعيات أسماك القاروص وقت بداية التجربة 4.5 ± 1.2 جم و 2.6 g ± 7.8سم، على التوالي

وكانت النتائج كما يلي:

1-كان أول نضج للذكور عند عمر 12 شهراً 13.7% ، بينما كانت الإناث الناضجة3.3% عند عمر 15 شهراً في العينة

2-زادت النسبة المئوية لنضج كلاً من الذكور والإناث في العينة بأسلوب خطي على التوالي مع تقدم العمر إلى 36 شهراً زاد الوزن فيما يتراوح بين 673.9 إلى 995.8جم في الذكورو853.6 إلى 1142.3جم في الإناث على التوالي.

3-ازداد كل من الوزن والطول الكلي للذكور والإناث معنويا كلما تقدم العمر، وبداية من العمر 12 شهراً زادت النسبة المئوية لنضج كلاً من الذكور والإناث في العينة مع تقدم العمر حتى وصلت إلى 100% عند عمر 36 شهراً.

4- معاملات الإرتباط بين العمر وكلاً من الوزن و الطول الكلي و النسبة المئوية للنضج كانت معنوية.

قام بتحكيم البحث

أ.د / عبد الحميد محمد عبد الحميد	**كلية الزراعة – جامعة المنصورة**
أ.د / محمد عبد الحميد الدناصورى	**كلية الزراعة – جامعة قناة السويس**