Annals Of Agric. Sc., Moshtohor,
Vol. 41(4):1479-1491, (2003)

SOME FACTORS AFFECTING ON PROPEGATION OF BLACK CARP, *MYLOPHARYNGODON PICEUS* UNDER THE EGYPTIAN CONDITIONS

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ABSTRACT

The present study was conducted at Fowa and Abbassa fish hatcheries to study the effect of hatchery year and female body weight of black carp *(Mylopharyngodon piceus)*on reproductive performance under the Egyptian conditions.

At each hatchery, a total number of 12 females were divided to three weight groups available, 5-6; 6.5 – 7.5 and 8-9kg. Also, a total number of 8 males (for each hatchery) were selected randomly from the parent stock for female insemination during the period from February 1999 to June 2000.

The obtained results show that, Fowa hatchery indicated the best results compared with Abbassa hatchery for all the studied reproductive performance. Black carp females gave the best reproductive performance during the first season (1999) compared with the second season (2000) with significant differences for egg production/fish, egg production/kg of female body weight, absolute and relative fecundity and larvae number/kg of female body weight.

The heavier females produced the higher egg production/fish, absolute fecundity, number of egg/g of egg, hatchability percentage, larvae number/fish, larvae number/kg of fish body weight and fry number/fish. Also, the heavier females produced the lower means of fry number/kg of female body weight and viability percentage (after 10 days of hatching).

INTRODUCTION

Black carp (*Mylopharyngodon piceus*) is a large and fast growing cyprinidae, native to the southern regions of China. Black carp mature at the age of 7 to 9 years in subtropics (e.g. Egypt) which is 3 to 5 years earlier than in China. Mature fish require water and special food prior to artificial, hormonally induced reproduction.

In nature, Juvenile and adult black carp feed exclusively on molluscs; thus it has a great potential as a biological control of nuiance snails and bivalves. In preliminary experiments carried out in aquaria, black carp yearling of 20-50g easily shifted from artificial pelletized food to its natural diet of *Bulinus sp.*

Since the black carp is an effective mollusc predator, it can be considered for biocontrol of mollusc, that serve as intermediate host for human parasites (e.g. Schistosoma), or parasites relevant to fish culture, such as the yellow and white grubs in channel catfish farming.

Introduction of exotic species is becoming increasingly, regulated by governmental authorities to prevent biological and ecological contamination of the environment. Evaluating the introduction of an exotic fish, as the black carp in an "ecologically save manner" can involve several options for reproductive manipulation. These include gynogenesis followed by hormonal sex-inversion, or the production of sterile triploids (Rothbard et al., 1996).

The aim of the present study is to investigate the effect of some factors affecting success of reproduction of black carp such as hatchery, year and female body weight under the Egyptian environmental conditions during the period from February 1999 to June 2000.

MATERIALS AND METHODS

This experiment was conducted at Fowa Fish Hatchery, Kafr El-Sheakh Governorate (Middle delta) and Abbassa fish Hatchery at Sharkia Governorate (East delta) belonging to General Authority for fish Resources and Development, Ministry of Agriculture, Egypt.

A total number of 12 Females as parent stock of black carp *(Mylopharyngodon Piceus)* representing three weight groups (4 each) were stocked in three earthen ponds (40×25m) in each hatchery (one pond for each weight group). All females used in this experiment aged 3 years at the start of the experiment. In each weight group, females were individually weighed and tagged using silver nitrate to follow their reproductive performance.

At the start of spawning experiments, females were divided into three weight groups, 5-6kg; 6.5-7.5kg and 8-9 kg for groups 1, 2 and 3, respectively. A total number of 8 males aged 3 years, were selected randomly from the male parent stock which stoked in two earthen ponds of total area of 1000m^2 (40× 25m) in order to use them for females insemination of the females. Males and females ponds were completely dewatered, dried, weeded and exposed to sun for two weeks. After that ponds were limed at a rate of 200kg/feddan in order to avoid the presence of any foreign fish which could present in the ponds. After 5 days of liming, cow dung was applied as an organic fertilizer at the bottom of the ponds at a rate of 400kg/feddan, pond were filled with water to a level of 20cm depth. After three days, water level was increased to 40 cm.

Granular urea (46.5%N) fertilizer was applied at a rate of 10kg/feddan, then water level was increased in ponds again to the level of 60 cm. Also, 30kg/feddan superphosphate (15% phosphor) was dissolved in water and splashed over the water surface of each pond and water level was then increased to one meter. The preparation of ponds continued 3 weeks and finished 10 days before the start of the experiment. The analysis of water used in the earthen ponds as well as in the hatcheries are given in table (1). During the experimental period, cow dung, 10 kg/feddan of urea (46.5%) and 30 kg/feddan superphosphate (15%) were applied bi-

weekly to fertilize the experimental ponds according to the reading of secchi-disck and the status of plankton bloom.

During December to march fish received no supplementary feeding due to the low temperature during these months. From March to August experimental fish were fed on a ration containing 39% crude protein at a rate of 5% of the total biomass. Composition of supplementary feed presented in table (2). Hatching of fertile eggs as well as collection of eggs and melt were carried out according to the method described by Woynarorich and Horvath (1980). Averages of egg production spawned per female was determined to the nearest gram. Number of eggs in one gram egg weight was determined by weighting one gram of eggs then all eggs presented in this gram weight were counted using a binocular. Weight of eggs in gram per kg live body weight was calculated by dividing the weight of eggs spawned per female on its live weight. The absolute and relative fecundity were determined according to Bhujel (2000) as Follows:

Absolute fecundity = Total weight of eggs per female (g)×number of eggs in one gram

Relative fecundity = Absolute Fecundity / Body weight (g)

Fertilizability was determined by counting the number of fertile eggs in a sample as a percentage of the total number in the same sample. Samples for fertilizability determination were taken 10 hours after incubation of eggs in Zoug jars.

Percentage of hatchability was determined as follows:

Hatchability=[fry number per female×100]/Total number of fertilized eggs spawned/female

Table (1): Water quality for Al Kaddaba and Al-Ismailya canals

Water Parameter	Al-Kaddaba canal (Fowa)	Al-Ismailya canal (Abbassa)
pH	8.2	7.8
Total Salinity %	2	0.6
Total alkalinity (ppm)	240	155
Conductivity	418	350
Total hardness (ppm)	80	112
Phosphate (mg/l)	1.04	0.23
Nitrate (ppm)	1.4	0.20
Sulphate (ppm)	43	20
Ferrous (ppm)	0.02	0.1
Cupper (ppm)	0.16	0.6
Manganese (ppm)	-	Traces

Table (2): Composition of fish ration during the period from March to October.

Ingredients	%
Fish meal (60% protein)	15
Poultry slaughter house wastes	20
Decorticated cotton seed meal	15
Soy-bean meal (48% protein)	15
Rice brane	30
Wheat brane	5
Total	100
Gross energy/kg	2500
Protein	39
Fat	6.1
Fibers	6.4

The statistical analysis of data was carried out by applying the computer program SAS (1996) by adopting the following model:

$X_{ijkl} = \mu + L_i + Y_j + B_k + (LY)_{ij} + (LB)_{ik} + (YB)_{jk} + (LYB)_{ijk} + e_{ijkl}$

Where:

X_{ijklm} = The l^{th} observation for the k^{th} body weight and J^{th} year and ith hatchery location; μ = Overall mean; L_i = The effect of i^{th} hatchery location ; Y^j = The effect of j^{th} year ; B_k = the effect of k^{th} body weight; $(LY)_{ij}$=The effect of interaction between i^{th} hatchery location and j^{th} year; $(LK)_{ik}$=The effect of the interaction between i^{th} hatchery location and k^{th} body; $(YB)_{jk}$ = The effect of the interaction between j^{th} year and k^{th} and k^{th} weight; $(LYB)_{ijk}$=The effect of interaction between i-th hatchery location j-th year and K^{th} body weight; e_{ijkl} = random error.

RESULTS AND DISCUSSION

Total egg production/female (g) and egg weight (g) /per Kg of body weight.

As described in table (3) the averages of egg production (g)/ female (EPF) were 602.29 and 636.04 g and the averages of egg production/kg of female body weight (EPK) were 84.28 and 87.78 g for the two hatcheries located at Abbassa and Fowa, respectively. These results indicate that EPF and EPK for Fowa hatchery were higher than that obtained in Abbassa hatchery but the differences were not significant.

With regard to year effect regardless of hatchery location, table (3) show that EPF were 648.54 and 589.79 g; EPK were 90.07 and 82.00 g for the two years 1999 and 2000, respectively and the differences between the two years were significant. These results may be due to the environmental condition especially temperature (during spawning season) which changed from year to another and also to the abundance of natural food available to fish which related to the changes in the environmental conditions. Some indications have been found that low dissolved oxygen occurring at dawn in green water systems, has negative impacts on seed quantity (Bevis, 1994).

Kausch (1975) showed that spawning of black carp dependent on temperature. The optimum temperature for spawning of black carp is 22-28ºC and spawning was not observed at water temperature below 17ºC (NACA, 1989).

With regard to the effect of female body weight on EPF irrespective of hatchery location and year it is observed that EPF increased gradually as body weight increased. EPF for the three weight groups 5-6, 6.5 to 7.5 and 8-9 kg were 323.75, 717.81 and 815.94 g, respectively. These results are in accordance with those obtained by Rana (1986 and 1988). Some authors found that, the egg number produced by a fish was more related either to body weight (Mostafa, 1988 and Rana 1988) or to the body length (De Silva 1986 and Rana, 1986).

As shown in table (3) EPK increased from 59.84 to 103.03 g as body weight increased from 5-6 to 6.5- 7.5 kg and then decreased from 103.03 to 95.23 g as body weight increased from 6.5 –7.5 to 8-9 kg. These results indicate that, the best EPK was recorded with the second size group (6.5-7.5 kg) of female compared with first and third size groups (5-6 and 8-9 kg), respectively. These results are in agreement with those found by Mostafa (1988). He found that, averages weight of eggs production/kg. of live weight increased from 158 to 200 and 227 g as body weight of common carp increased from 3, 4 and 5 kg respectively then decreased gradually to 198, 195 and 173 as body weight increased from 6, 7 and 8 kg, respectively.

Absolute and relative fecundity:

Results presented in table (3) showed that average absolute fecundity as affected by hatchery location were 566,728 and 598,633 , respectively and the differences were not significant and the same trend was also observed for relative fecundity, where it averaged 78.22 and 82.60 for the two hatcheries, Abbassa and Fowa, respectively.

Concerning the effect of year on the absolute and relative fecundity, the present results showed that the absolute fecundity were 610,216 and 555,146 and the relative fecundity were 84.71 and 76.11 for the two studied years, 1999 and 2000, respectively, and the year had a significant effect on both absolute and relative fecundity where the first year of study, 1999 had a higher means of absolute and relative fecundity compared with the second year, 2000. The significant effect of year on absolute and relative fecundity may be attributed to the changes of environmental condition among both years such as temperature, light and the availability of natural food.

Results presented in table (3) showed that absolute fecundity gradually increased as the female body weight increased. These results are in agreement with the findings of Hussein (1986) who concluded that, the absolute fecundity of black carp showed an increase with the increase in fish size and the weight of ovaries. Also (Mostafa, 1988) with common carp revealed that, absolute fecundity were 331,686, 432,830, 390,739 and 560,311 for females with body weights averaged 2.77, 3.25, 3.59 and 4.13 kg, respectively. Rana (1988) and Bhujel (2000) indicated that absolute fecundity is related to body weight while De Silva (1986) and Rana (1986) found that, absolute fecundity is related to body length.

ISSN 1110-0419
Annals Of Agric. Sc., Moshtohor,
Vol. 41(4):1479-1491, (2003)

Table (3): Least squares means and standard error for some factors affecting on egg weight(g)/fish and egg weight (g)/kg of fish body weight.

Variable	No.	Egg weight(g)/fish	Egg weight (g)/kg of fish body weight.	Absolute fecundity	Relative fecundity	Hatchability percentage	Number of eggs/g of egg
Location (L)							
Abbassa (L1)	24	602.29±17.50 a	84.28±2.03 a	566,728±16,625 a	78.22±1.67 a	65.24±1.13 a	940.54±0.83 a
Fowa (L2)	24	636.04±17.50 a	87.78±2.03 a	598,633±16,625 a	82.60±1.67 a	66.02±1.13 a	940.79±0.83 a
Year (Y)							
1999 (Y1)	24	648.54±17.50 a	90.07±2.03 a	610,216±16,625 a	84.71±1.67 a	64.80±1.13 a	940.50±0.83 a
2000 (Y2)	24	589.79±17.50 b	82.00±2.03 b	555,146±16,625 b	76.11±1.67 b	66.46±1.13 a	940.83±0.83 a
Body weight (BW)							
5-6 kg (BW1)	16	323.75±21.44 c	59.84±2.49 c	304,109±20,362 c	54.64±2.05 c	49.76±1.38 c	939.63±1.02 a
6.5-7.5 kg (BW2)	16	717.81±21.44 b	103.03±2.49a	675,109±20,362 b	96.89±2.05 a	58.44±1.38 b	940.38±1.02 a
8-9 kg (BW3)	16	815.94±21.44 a	95.23±2.49 b	768,629±20,362 a	89.70±2.05 b	88.69±1.38 a	942.00±1.02 a

Table (3): Cont.

Variable	No.	Larvae number/fish	Larvae number/kg	Fry number/fish	Fry number/kg	Viability % (10 days after hatching).
Location (L)						
Abbassa (L1)	24	335,210±11,820 a	47,460±1,320 b	258,040±12,340 b	37,060±1,360 b	78.44±1.51 b
Fowa (L2)	24	367,080±11,820 a	51,800±1,320 a	311,290±12,340 a	44,220±1,360 a	85.57±1.51 a
Year (Y)						
1999 (Y1)	24	364,060±11,820 a	51,800±1,320 a	291,040±12,340 a	41,730±1,360 a	80.40±1.51 a
2000 (Y2)	24	337,500±11,820 a	47,450±1,320 b	278,290±12,340 a	39,560±1,360 a	83.61±1.51 a
Body weight (BW)						
5-6 kg (BW1)	16	269,060±14,480 c	48,320±1,620 a	234,130±15,110 b	42,020±1,660 a	86.92±1.85 a
6.5-7.5 kg (BW2)	16	336,560±14,480 b	48,260±1,620 a	289,750±15,110 a	41,530±1,660 a	85.77±1.85 a
8-9 kg (BW3)	16	447,810±14,480 a	52,300±1,620 a	330,130±15,110 a	38,390±1,660 a	73.32±1.85 b

+ Means with the same letter in each column are not significantly different.

Annals Of Agric. Sc., Moshtohor,
Vol. 41(4):1479-1491, (2003)

With regard to the effect of body weight on the relative fecundity, table (3) show that, the relative fecundity increased from 54.64 to 96.89 as body weight increased from 5-6 to 6.5 –7.5 kg and then decreased to 89.70 when body weight increased to 8-9 kg. Results of Mostafa (1988) indicated also that, relative fecundity increased from 127 to 157 and 180 for common carp female weight 3, 4 and 5 kg then decreased to 158 to 134 and 124 for females weight 6, 7 and 8 kg respectively and these differences were significant ($P<0.05$).

Number of eggs in one gram:

Table (3) show that, there were no significant effect of hatchery, year and female body weight on the average the number of eggs in gram.

These results indicate that average eggs number in one gram of egg showed a slight increase as females body weight increased and all females of different groups may be produce eggs with equal degree of ripeness. Hussein (1986) and Mostafa (1988) observed a slight decrease in the average number of eggs in one gram as females body weight increased.

Hatchability percentage:

Averages of hatchability percentages as affected by hatchery location were 65.24 and 66.02% for the two hatchery locations Abbassa and Fowa, respectively and reached to 64.80 and 66.46% for the two years studied 1999 and 2000 respectively, and the differences in hatchability attributed to hatchery location and year were not significant (table3).

Averages of hatchability percentages as affected by weight of black carp females were 49.76, 58.44 and 88.69% for the weight groups, 5-6, 6.5 – 7.5 and 8-9 kg, respectively. These results show that, hatchability increased with each increase in body weight and these results are partially agreement with those obtained by Mostafa (1988) with common carp. He found that hatchability percentage of female common carp increased from 82 to 90 and 95% for weight groups 3, 4 and 5 kg, respectively but the hatchability percentage decreased from 95 to 94, 90 and 90% for the weight groups 5, 6 , 7 and 8 kg respectively.

Larvae number per female and Larvae number per kg of female body weight:

Averages of larvae number/female as affected by hatchery location and year were 335,210 and 367,080 for Abbassa and Fowa and 364,060 and 337,500 larvae for the two years 1999 and 2000, respectively, and these averages were not significantly different. Also, the averages larvae number produced by females weighed 5-6, 6.5 – 7.5 and 8-9 kg were 269,060 ; 336,560 and 447,810 for the three body weight groups, respectively (table 3).

Regarding to the effect of female body weight on the average larvae number produced it was noticed that as female body weight increased, the average larvae number per female increased and this scientifically logic because the absolute fecundity increases with each increase in body weight. These results could be

explained by the fact that heavier females produce more big eggs with higher degree of ripeness than those of lighter body weights, thus results of fertilizabilty and larvae hatched were higher in heavier females compared with the lighter ones. The present results are in agreement with those obtained by Mostafa (1988).

Larvae number per one kg of female was significantly affected by hatchery location where these averages reached to 47,460 and 51,800 for Abbassa and Fowa hatcheries, respectively. Also, larvae number per one kg of female body weight as affected by year were 51,800 and 47,450 for the two years 1999 and 2000, respectively.

The increase in body weight from 5-6 kg to 6.5–7.5 and 8-9 kg had non significant effect on the average larvae number per kg of female body weight.

Fry number per fish and fry number per kg of female body weight:

The averages fry number per fish as affected by hatchery location were 258,040 and 311,290 fry/fish for the two hatcheries, Abbassa and Fowa respectively, and the differences between these averages were significant and this indicat that, fry number produced per fish in Fowa hatchery was better than those of Abbassa hatchery. Fry number per fish were 291,040 and 278,290 for the two years studied 1999 and 2000 respectively with insignificant differences in averages of fry number/fish attributed to year effect and the opposite results were observed with the effect of body weight on fry number/fish whereas fry number produced by females increased with each increase in female body weight.

As shown in table (3) the averages fry number/kg were 37,060 and 44,220 for the two hatchery locations, Abbassa and Fowa, respectively and the difference was significant. Fry number/kg were 41,730 and 39,560 for the two years 1999 and 2000, respectively and the differences in fry number/kg of female body weight attributed to female body weight were not significant.

Fry viability percentage (10 days after hatching):

As described in table (3) the average of fry viability were 78.44 and 85.57% for the two hatchery locations, Abbassa and Fowa, respectively whereas averages fry viability were 80.40 and 83.61% for the two years 1999 and 2000, respectively and the differences between these means attributed to year effect were not significant.

With regard to the effect of body weight on fry viability table (3) show that, fry viability decreased from 86.92 to 85.77 and 73.32% as female body weight increased from 5-6 to 6.5-7.5 and 8-9 kg, respectively and the differences between these means were significant.

Correlation coefficients between body weight and some reproductive traits of black carp:

Correlation coefficients between reproductive traits of black carp are presented in table (4). As shown in this table female body weight is positively correlated with each of egg production/ fish (0.91), egg production/kg of fish body weight (0.70), absolute fecundity (0.91) relative fecundity (0.71), egg number/gm of egg (33); larvae number per fish (0.87); larvae number/kg (35); fry number per fish

(0.68) and negatively correlated with hatchability percentage (-0.65) fry viability 10 days after hatching and these correlation coefficient were significant.

The obtained correlation between body weight and the different reproductive traits outlined above indicates that as the female body weight increased, most of the studied reproductive traits, egg weight per fish, egg weight/kg, absolute and relative fecundity, egg number for one gm egg, larvae number/fish larvae number/kg, and fry number /fish, will be significantly increased. But the fry number/kg and fry viability (after 10 days from hatching) will be decreased. Gisbert et al., (2000) working on siberia sturgeon (*Acipenser baeri*) found that the correlation coefficient between egg size and body weight was 0.88 and this estimate is higher than that found in the present study between body weight and egg number per one gram egg.

As shown in table (4) there are positive and highly significant ($P<0.001$) correlations between egg production/fish and each of egg weight/kg (0.92), absolute fecundity (0.99), relative fecundity (0.94), larvae number per fish (0.83) and fry number per fish (0.73). Also there was a significant ($P<0.01$) correlation between egg production/fish and larvae/kg (0.41). The negative correlations were observed between egg production/fish and each of hatchability percentage (- 0.83) and fry viability (- 0.31). Correlation coefficients between egg production/fish and other reproductive traits outlined above indicated that as egg production/fish increased, egg weight per kg, absolute and relative fecundity, larvae number per fish, larvae number per kg fry number per fish will be increased but hatchability and fry viability will be significantly decreased.

It worths to mention that, there are a positive and significant correlation between egg production/kg of female body weight and each of absolute fecundity (0.92) relative fecundity (0.98) larvae number per fish (0.67) larvae number/kg (0.39) and fry number/fish (0.65). The negative correlations were obtained between egg weight/kg and each of hatchability (- 0.86) and viability (- 0.14).

Absolute fecundity positively correlated with each of relative fecundity (0.94), larvae number/fish (0.83) larvae number/kg (0.41), and fry number/fish (0.73) and there were negative and significant correlations between each of hatchability (- 0.83) and fry viability (- 0.31). Relative fecundity was positively correlated with each larvae number per fish (0.68), larvae number per kg of female body weight (0.39) and fry number per fish (0.65) and these correlation coefficients were significant ($P<0.01$ and 0.001). On the other hand there was a significantly ($P<0.001$) negative correlation coefficient between relative fecundity and hatchability. The negative correlation between relative fecundity and hatchability percentage may be referred to the decrease in the percentage of ripen egg as relative fecundity increased.

Table (4) indicates that, average number of eggs in one gm show a positive and significant correlation with each of larvae number fish (0.40), larvae number/kg of female body weight (0.34); fry number fish (0.44) and fry number/kg (0.29) and negatively correlated with hatchability (-0.82).

ISSN 1110-0419
Annals Of Agric. Sc., Moshtohor,
Vol. 41(4):1479-1491, (2003)

Table (4) : Correlation coefficient between body weight and some reproductive traits of black carp.

	Body weight	Egg weight/fish	Egg weight/kg	Absolute fecundity	Relative fecundity	Egg no./gm of egg	Larvae no. /fish	Larvae no/kg	Hatchability %	Fry no. /fish	Fry no. /kg
Egg weight/fish	0.91***										
Egg weight/kg	0.70***	0.92***									
Absolute fecundity	0.91***	0.99***	0.92***								
Relative fecundity	0.71***	0.94***	0.98***	0.94***							
Egg no./gm of egg	0.33*	0.27	0.18	0.28	0.20						
Larvae no. /fish	0.87***	0.83***	0.67***	0.83***	0.68***	0.40**					
Larvae no/kg	0.35**	0.41**	0.39**	0.41**	0.39**	0.34**	0.67***				
Hatchability%	-0.65***	-0.83***	-0.86***	-0.83***	-0.88***	-0.82***	-0.40**	-0.07			
Fry no. /fish	0.68***	0.73***	0.65***	0.73***	0.65***	0.44***	0.86***	0.75***	-0.34*		
Fry no. /kg	-0.04	0.11	0.21	0.12	0.20	0.29*	0.35*	0.72***	0.19	0.70***	
Viability%	-0.46***	-0.31*	-0.14	-0.31*	-0.17	0.02	-0.36**	-0.09	0.21	0.15	0.61***

* P<0.05 ** P<0.01 *** P<0.001

Annals Of Agric. Sc., Moshtohor,
Vol. 41(4):1479-1491, (2003)

The same table show also that larvae number/fish was positively correlated with each of larvae number/kg (0.67), fry number/fish (0.86) and fry number/kg (0.35) and these correlation coefficients were significant. The negative correlation coefficients observed between larvae number/fish and each of hatchability (- 0.40) and viability (- 0.36). Correlation coefficients between larvae number/kg and each of fry number/fish (0.75) and fry number/kg (0.72) were positive and significant ($p<0.001$) but there was a negative and significant correlation (-0.34) between hatchability percentage and fry number/fish. The correlation coefficients between fry number/fish and fry number/kg was positive (0.70) and significant ($p<0.001$) and fry number/kg was positively correlated with fry viability (0.61).

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بعض العوامل المؤثرة على تفريخ أسماك المبروك الأسود تحت الظروف المصرية

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** الهيئة العامة لتنمية الثروه السمكية – وزارة الزراعة

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أجريت هذه الدراسة فى مفرخى فوه والعباسه لدراسة تأثير المفرخ والسنة بالإضافة إلى وزن جسم الإناث على الأداء التناسلى لأسماك المبروك الأسود تحت الظروف المصرية.

وقد أستخدمت ١٢ أنثى من إناث المبروك الأسود فى كل مفرخ وقسمت هذه الإناث إلى ثلاث مجموعات حسب الوزن حيث كان متوسط وزن المجموعه الأولى ٥–٦ كجم والثانية ٥ر٦–٥ر٧ كجم أما المجموعة الثالثة فكان متوسط الوزن فيها ٨–٩ كجم. كذلك تم إختيار ٨ ذكور فى كل مفرخ وذلك لإستخدامها فى التفريخ. وقد أجريت الدراسة لمدة موسمين متتاليين فى الفترة من فبراير ١٩٩٩ وحتى يونيو ٢٠٠٠ ويمكن تلخيص أهم النتائج المتحصل عليها فيما يلى:

أعطت الإناث التى تم تفريخها فى مفرخ فوه نتائج أفضل من تلك التى تم الحصول عليها فى مفرخ العباسه وذلك فى معظم الصفات التناسلية التى تمت دراستها و خاصةً صفة عدد اليرقات الناتجة لكل وحده (كجم) من وزن الجسم وكذلك نسبة الحيوية فى الزريعة (بعد مرور ١٠ أيام من الفقس) حيث كانت الفروق معنوية وفى مصلحة مفرخ فوه.

كان الأداء التناسلى لإناث المبروك الأسود فى الموسم الأول ١٩٩٩ أفضل من الموسم التالى ٢٠٠٠ وكانت الفروق فى متوسط بعض الصفات مثل وزن البيض الناتج لكل أنثى وكذلك وزن البيض لكل وحده (كجم) من وزن الجسم وعدد البيض لكل أنثى وعدد البيض الناتج لكل وحده (جم) من وزن الجسم وكذلك عدد اليرقات الناتجه لكل وحده (كجم) من وزن الجسم والراجعة لتاثير الموسم كانت فروقاً معنويه.

أعطت إناث المبروك الأسود الأكبر وزناً متوسطات أكبر لبعض الصفات مثل وزن البيض الناتج لكل أنثى وعدد البيض لكل أنثى وعدد البيض النتاج لكل جرام من وزن البيض ونسبة الفقس وعدد اليرقات الناتجه لكل أنثى وكذلك عدد اليرقات لكل وحده (كجم) من وزن الجسم وكانت افروق فى متوسطات هذه الصفات والراجعة لتاثير وزن جسم الأنثى فروقاً معنويه. كما أعطت إناث المبروك الأسود الأصغر وزناً متوسطات أقل لبعض الصفات مثل عدد الزريعة الناتجة لكل وحده (كجم) من وزن الجسم وكذلك نسبة الحيوية فى الزريعة (بعد مرور ١٠ أيام من الفقس) حيث كانت الفروق معنوية.