
SOME ASPECTS OF THE REPRODUCTIVE BIOLOGY OF THE SADDLED SEA BREAM *OBLADA MELANURA* (LINNAEUS, 1758) IN BENGHAZI COAST – EASTERN LIBYA

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ABSTRACT

The reproductive biology of 400 specimens of *Oblada melanura* (Family: Sparidae) collected by gill and trammel nets in Benghazi coast, Eastern Libya, Mediterranean Sea from artisanal fishing was studied. There were monthly variations in sex ratio between females (242 fish = 60.5%) and males (158 fish = 39.5%). Sex ratio was (1: 1.53) for males to females respectively. Length at first maturity, L_{50} , for *O. melanura* was found to be 17.5 cm for males and 18.6 for females. The breeding season extends from March to June. Oocyte diameters increase from January ($345 \pm 27.4 \mu\text{m}$), until the maximum value in June ($1112 \pm 487.8 \mu\text{m}$). The average absolute fecundity ranged was from 22278 ± 181.8 to 366780 ± 611.1 for fish with the average total length ranging from 16.5 to 32.4 cm, whereas relative fecundity ranged from 1350.2 eggs/cm to 11320.4 eggs/cm.

Key Words: Sparidae, *Oblada melanura*, Reproductive Biology.

INTRODUCTION

Sparid fishes inhabit tropical and temperate coastal water. Fish individuals are swimming near the shore in shallow inlet and bays at moderate depth. Family Sparidae comprise about 22 genera in four subfamilies containing 41 species (Bauchot and Smith, 1983). Fourteen species were recorded in the Libyan coast, such as *Diplodus annularis*, *Pagrus pagrus*, *Dentex dentex*, *Diplodus vulgaris*, *Lithognathus mormyrus*, *Oblada melanura*, *Sarpa salpa* and *Boops boops* (Al-Hassan and El-Silini, 1999).

The saddled bream *Oblada melanura* (Linnaeus, 1758) is common throughout the Mediterranean and eastern Atlantic, inhabiting littoral waters above rocky bottoms and Posidonia beds, up to 30 m depth (Bauchot and Hureau, 1986). Family Sparidae was studied by various authors as: Erzini et al., (2001), Morato (2001), Morato et al., (2003), Abd Elbarr (2004) and Heemstra & Heemstra (2004). While few authors studied *O. melanura* such as: Zaki et al., (1995) who studied the reproductive biology. Pallaoro et al., (1998) studied some biological parameters of this species, while the feeding habits were studied by Pallaoro et al.,

(2003). The target species feed almost exclusively on crustaceans and zooplanktonic animals, which they graze from the substrata when juveniles, but when become adults they feed mainly on vegetable matter as algae and hydrophytes (Froese and Pauly, 2009). In spite of the wide distribution and commercial importance of *O. melanura*; information on their biology and ecology in the Libyan waters is limited. The present study aims to shed some light on the basic information required for fisheries management and aquaculture of such fish species especially their sex ratio, first sexual maturity, spawning season, egg diameter and fecundity of *Oblada melanura* inhabiting Benghazi coast on eastern Libyan Mediterranean Sea.

MATERIAL AND METHODS.

Monthly samples of *Oblada melanura* were collected during the period from January to December 2015 by using gill and trammel nets from artisanal fishing in Benghazi fishing harbor $32^{\circ}36'$ N and $20^{\circ}03'$ E on the Mediterranean (Fig. 1). A total of 400 specimens of *O. melanura* were sampled for studying the reproductive biology of the fish. Each fish was wet weighed in grams and its

total length was measured in cm, then it was dissected to determine sex then the gonads were removed and wet weighed to the nearest mg. The monthly Gonado-somatic indices (G.S.I.) was calculated according to the following formula:

$$\text{G.S.I.} = \frac{\text{wet weight of gonad (g)}}{\text{wet weight of fish (g)}} \times 100 \text{ (Buxton, 1989).}$$

Such indices were expressed as the monthly averages and plotted against months. Length at First Maturity (L_{50}) at which 50% of individuals were mature, was obtained by plotting the percentage mature fish in each length class of the whole population versus length. From the curve, L_{50} was the length corresponding to 50% mature. Oocytes diameters were measured to the nearest 0.01 mm by using an eyepiece micrometer. Oocytes were separated from the ovarian tissue and put in saline solution (0.9% NaCl) for 24 hours and then they were measured under the microscope at 40 X, then 20 oocytes were taken randomly and their diameters were measured. The average oocyte diameters for mature specimens were calculated. Fecundity was estimated by counting all ripe eggs found in the female ovary just prior to spawning season. Fish ovary was put in a small divided Petri- dish; ova were separated from the ovarian tissue with the aid of a dissecting needle, and all ripe ova were counted under a binocular microscope.

RESULTS

Sex ratio

Generally, there is a tendency for more females (242 fish, 60.5%) than males (158 fish, 39.5%) of the collected population. Overall sex ratio was 1: 1.53 for males to females (Table 1). The sex ratio was not constant throughout different months. The numbers of females exceeded males in all months especially during the spawning season.

Gonado-Somatic Indices (G.S.I.)

The monthly changes in G.S.I. are represented in Fig. (3). *Oblada melanura* showed a definite breeding season, which extends from March till June in the Libyan eastern coast. In males the average G.S.I. increased from January (4.44) and February (5.28), then increased sharply in March (9.66), April (11.17), May (12.66) and June (14.87). In females the average G.S.I. increased from January (6.12) and February (7.08), then increased sharply in March (13.92), April (19.77), May (21.16) and June (21.90) (Fig. 4).

Length at first maturity (L_{50})

Length at first maturity L_{50} is the length at which half the population is mature and the other half is not. For *O. melanura* L_{50} was found to be 17.5 cm for males and 18.6 cm for females (Figs. 5&6).

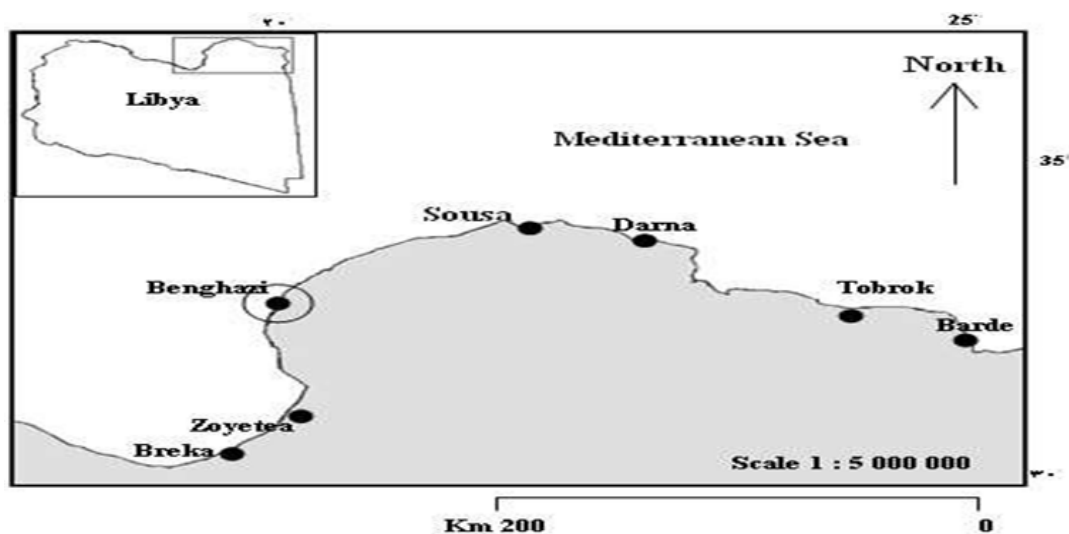


Figure 1: Map showing Benghazi coast, on the Mediterranean Sea, eastern Libya.

Table (1). Monthly variations in sex ratio of *Oblada melanura* in Benghazi Coast, eastern Libya during the period from January till December 2015.

Months	No. of fish	Males		Females		Sex ratio
		No.	%	No.	%	
Jan. (2015)	26	12	46.2	14	53.8	1 : 1.17
Feb.	38	15	39.5	23	60.5	1 : 1.53
Mar.	54	20	37.0	34	63.0	1 : 1.70
Apr.	50	21	42.0	29	58.0	1 : 1.38
May	39	12	30.8	27	69.2	1 : 2.25
Jun.	33	13	39.4	20	60.6	1 : 1.54
Jul.	32	13	40.6	19	59.4	1 : 1.46
Aug.	19	7	36.8	12	63.2	1 : 1.71
Sep.	27	10	37.0	17	63.0	1 : 1.70
Oct.	33	13	39.4	20	60.6	1 : 1.54
Nov.	26	12	46.2	14	53.8	1 : 1.17
Dec.	23	10	43.5	13	56.5	1 : 1.30
Total	400	158	39.5	242	60.5	1 : 1.53

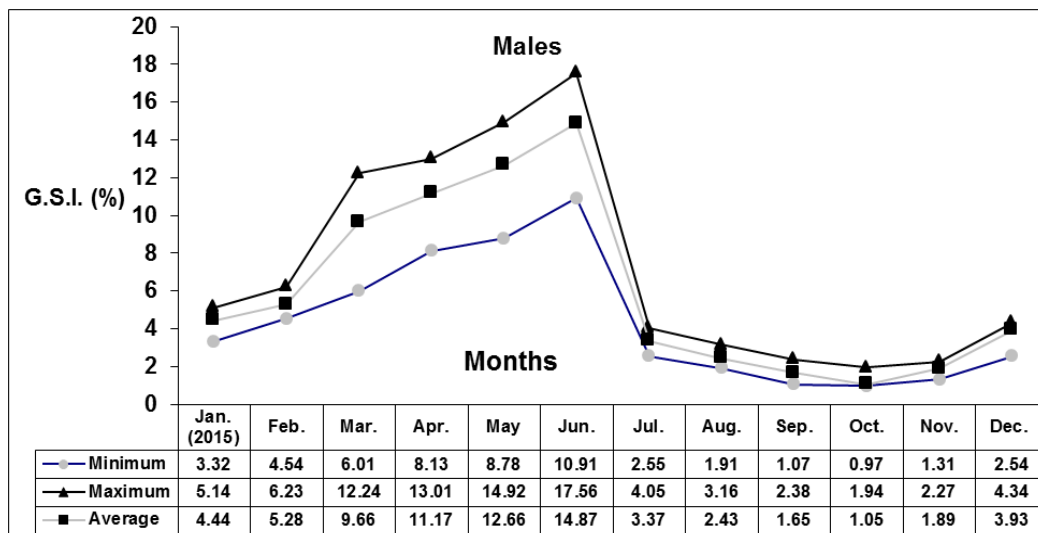


Figure (3). Monthly variations in the gonado-somatic indices for males *Oblada melanura* in Benghazi coast, eastern Libya during the period from January till December 2015.

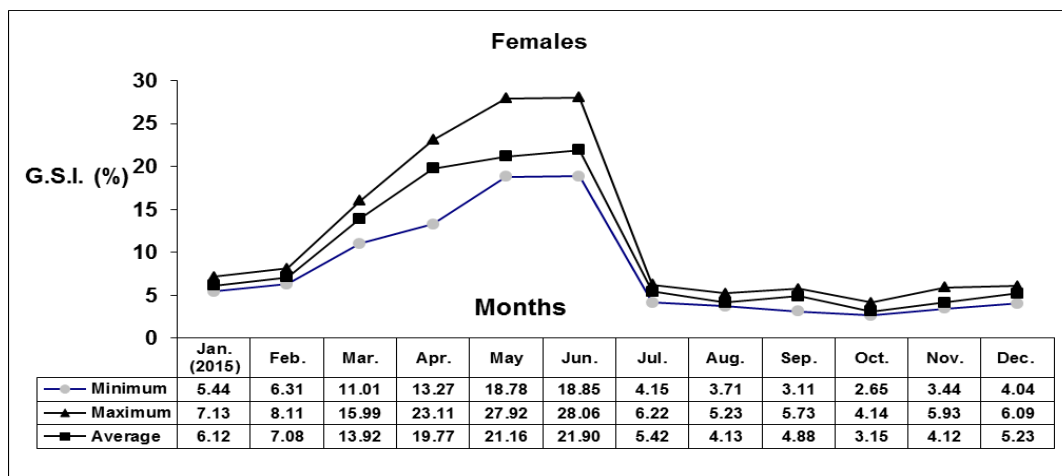


Figure (4). Monthly variations in the gonado-somatic indices for females *Oblada melanura* in Benghazi coast, eastern Libya during the period from January till December 2015.

The Oocyte Diameter

The average oocyte diameter for 144 female's *O. melanura* was represented in table 2. In January was $345 \pm 27.4 \mu$, then increased in February ($391 \pm 48.5 \mu$) and increased sharply in March ($845 \pm 118.3 \mu$), April ($916 \pm 208.9 \mu$), May (1019 ± 422.1), then the egg diameters recorded the maximum in June (1112 ± 487.8). In July spent females have egg diameters 744 ± 258.2 . During the period from August till December the oocytes were either

not present or too very small to be measured.

Absolute and relative fecundity

The absolute fecundity increased with increasing fish length from 22278 ± 181.8 egg per fish at the average total fish length of 16.5 cm to 366780 ± 611.1 egg per fish at the average total length of 32.4cm. The same trend was observed for the relative fecundity. It ranged from 1350.2 eggs per centimeter to 11320.4 eggs per centimeter (table, 3).

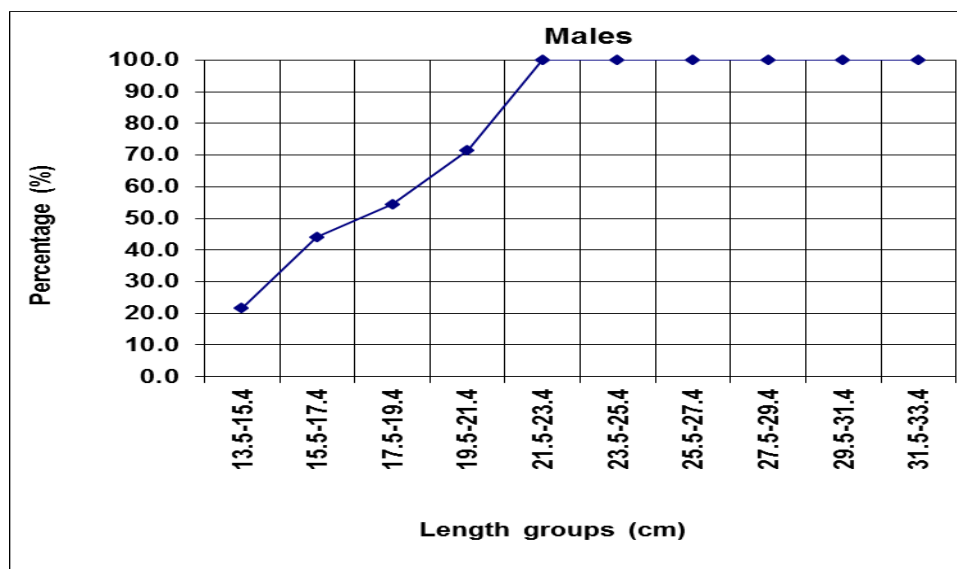


Figure (5). Length at first maturity for males *Oblada melanura* in Benghazi coast, eastern Libya during the period from January till December 2015.

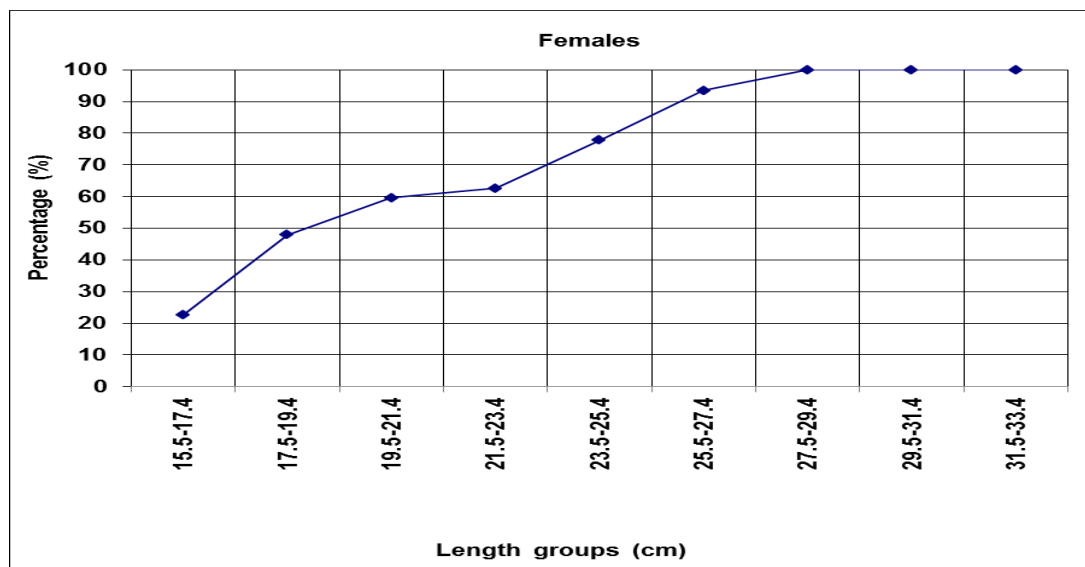


Figure (6). Length at first maturity for females *Oblada melanura* in Benghazi coast, eastern Libya during the period from January till December 2015.

Table (2). Monthly variations of oocyte diameters of females *Oblada melanura* in Benghazi coast, eastern Libya during the period from January till December 2015.

<u>Months</u>	<u>Number of fish</u>	<u>Egg-Diameters (μ)</u>		
		<u>Minimum</u>	<u>Maximum</u>	<u>Average</u>
<u>Jan. (2015)</u>	<u>5</u>	<u>311</u>	<u>381</u>	<u>345\pm 27.4</u>
<u>Feb.</u>	<u>11</u>	<u>374</u>	<u>411</u>	<u>391\pm 48.5</u>
<u>Mar.</u>	<u>20</u>	<u>733</u>	<u>914</u>	<u>845\pm 118.3</u>
<u>Apr.</u>	<u>17</u>	<u>759</u>	<u>1013</u>	<u>916\pm 208.9</u>
<u>May</u>	<u>19</u>	<u>814</u>	<u>1232</u>	<u>1019\pm422.1</u>
<u>Jun.</u>	<u>9</u>	<u>822</u>	<u>1290</u>	<u>1112\pm 487.8</u>
<u>Jul.</u>	<u>9</u>	<u>629</u>	<u>811</u>	<u>744\pm 258.2</u>
<u>Aug.</u>	<u>4</u>	<u>M</u>	<u>M</u>	<u>M</u>
<u>Sep.</u>	<u>3</u>	<u>M</u>	<u>M</u>	<u>M</u>
<u>Oct.</u>	<u>20</u>	<u>M</u>	<u>M</u>	<u>M</u>
<u>Nov.</u>	<u>14</u>	<u>M</u>	<u>M</u>	<u>M</u>
<u>Dec.</u>	<u>13</u>	<u>M</u>	<u>M</u>	<u>M</u>
<u>Average</u>	<u>144</u>			<u>839\pm347.5</u>

M = The egg diameters were very minute and difficult to measure

Table 3: The average absolute and relative fecundity of *Oblada melanura* in Benghazi coast, eastern Libya during the period from January till December 2015.

<u>Total length (cm)</u>			<u>Average absolute fecundity</u>	<u>Relative fecundity F/T.L. (cm)</u>
<u>Length groups (cm)</u>	<u>Average</u>	<u>No.</u>		
<u>15.5 - 17.4</u>	<u>16.5</u>	<u>6</u>	<u>22278 \pm 181.8</u>	<u>1350.2</u>
<u>17.5 - 19.4</u>	<u>18.6</u>	<u>11</u>	<u>35102\pm 225.3</u>	<u>1887.2</u>
<u>19.5 - 21.4</u>	<u>20.4</u>	<u>24</u>	<u>43321 \pm 311.5</u>	<u>2123.6</u>
<u>21.5 - 23.4</u>	<u>22.5</u>	<u>20</u>	<u>74578 \pm 414.7</u>	<u>3314.6</u>
<u>23.5 - 25.4</u>	<u>24.7</u>	<u>19</u>	<u>112245 \pm 488.8</u>	<u>4544.3</u>
<u>25.5 - 27.4</u>	<u>26.7</u>	<u>21</u>	<u>178654\pm 471.3</u>	<u>6691.2</u>
<u>27.5 - 29.4</u>	<u>28.4</u>	<u>12</u>	<u>222413\pm513.2</u>	<u>7831.4</u>
<u>29.5 - 31.4</u>	<u>30.5</u>	<u>13</u>	<u>287487 \pm 541.7</u>	<u>9425.8</u>
<u>31.5 - 33.4</u>	<u>32.4</u>	<u>14</u>	<u>366780 \pm611.1</u>	<u>11320.4</u>

DISCUSSION

The saddled bream *Oblada melanura* is common throughout the Mediterranean and eastern Atlantic, inhabiting littoral waters above rocky bottoms and Posidonia beds, up to 30 m depth and it can grow to a maximum length of about 36.6 cm (Akyolo and Saglam, 2014). In the present study, the overall sex ratio was 1: 1.53 for males and females of *Oblada melanura* and these results are nearly similar with sex ratio of other species of family Sparidae in the Mediterranean Sea (Mounie *et al.*, 2007 and Sabor and Lahlh, 2017). In the present work, the numbers of females exceeded males in all months especially during the spawning season since the males might migrate for spawning elsewhere, generally of each fish species number of female usually higher than number of males (Oren, 1975). The same result has been also obtained for other fish species such as mullet species (El-Mor, 1993). The ripe females were heavier than males during the spawning season, thus, the females get caught in the gear in large numbers, resulting in an unbalanced sex ratio (Cavallaro *et al.*, 1985). In the present study, the males and females of *Oblada melanura* showed a definite breeding season, which extends from March till June, with maximal G.S.I. of 9.66 for ♂, 13.92 for ♀; 11.17♂, 19.77♀; 12.66♂, 21.16♀; and 14.87♂, 21.90♀ in March, April, May and June respectively. The increase of G.S.I. during the breeding season is mainly due to the deposition of large amounts of proteins and lipids in the developing eggs and spermatozoa. A part of these materials comes directly from ingested food but a major proportion comes from the reserve of food deposits, during the active season, in organs such as liver, muscles and fat bodies (Larson, 1974). The spawning season of the target species consistent with that in other sites on the Mediterranean Sea which extends from March till July (Sabor and Lahlh, 2017 in Tartous, Syria), and from February till June in the Eastern Adriatic Sea (Pallaora, *et al.*, 1998), from April to July in Mediterranean coasts of Egypt (Zaki *et al.*, 1995). The time of spawning season in the present study coincided with the

appearance of the juveniles and fry of the fish in the eastern Libyan Mediterranean Sea (Ekwelha, 2008). In the current study the length at first maturity L_{50} was found to be 17.5 cm for males and 18.6 for females these results nearly coincide with the results of Sabor and Lahlh, 2017 for the same species in Tartous, Syria. The average oocyte diameter for 144 female's *O. melanura* in the present study increased sharply in March ($845 \pm 118.3 \mu$), April ($916 \pm 208.9 \mu$) and May (1019 ± 422.1) and then the egg diameters recorded the maximum in June (1112 ± 487.8). These results nearly similarly with those recorded by Sabor and Lahlh, (2017) who stated that the egg diameters for the same species in Tartous, Syria reached 811 μ , 934 μ , 1011 μ , 1233 μ and 1253 μ in spawning season (March to July). The number of eggs produced by females varies greatly according to species, size, age, region, period and techniques used, thus a considerable variability has been shown in different populations (Oren, 1975). Mouine *et al.*, (2007) found that the absolute fecundity for *Oblada melanura* in eastern Adriatic ranged from 27000 to 400000 eggs per fish at the average total fish length of 15.5 – 36.4 cm, these results nearly similar to those of the data of present study which stated that, the average absolute fecundity ranged from 22278 ± 181.8 to 366780 ± 611.1 eggs per fish at the average total length of 16.5-32.4cm.

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بعض جوانب بيولوجيا التكاثر لسمكة اوبلادا ملينيورا (الكحلة)

في ساحل بنغازى - شرق ليبيا

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تم دراسة عدد ٤٠٠ عينة من اسماك الكحلة من عائلة المورجانيات في ساحل بنغازى - شرق ليبيا قد تم تجميعها بواسطة الشباك الاحادية والثلاثية الطبقات من المصيد التقليدى في ميناء بنغازى شرق ليبيا. ودراسة الشق الجنسى للسمكة وجد انه تم تجميع ٢٤٢ انثى بنسبة ٦٠,٥٪ وعدد ١٥٨ سمكة ذكر بنسبة ٣٩,٥٪ بنسبة شق جنسى عام ١ : ١,٥٣ للذكور والاناث.

والسمكة محل الدراسة وجد انها لها بداية نضج جنسى عند $L_{50} = 17,5$ سم للذكور و $18,6$ سم للاناث والدراسة اثبتت ان للسمكة موسم تكاثر محدد يمتد من مارس وحتى يونيو . والسمكة لها قطر بيوض سجل $27,4 \pm 345$ ميكرومتر في شهر يناير تزداد هذه القيمة في الشهور التالية وصولا لموسم التكاثر والتي تصل فيها السمكة لاقصى قيمه $487,8 \pm 1112$ ميكرومتر في يونيو.

والسمكة سجلت خصوبة مطلقة تتراوح بين $181,8 \pm 22278$ الى $611,1 \pm 366780$ بويضة للاسماك ذات متوسط طول يتراوح بين $16,5$ سم الى $32,4$ سم اما الخصوبة النسبية فكانت تتراوح بين $1350,2$ الى $11320,4$ بويضة لكل سم.