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**Some aspects of the Reproductive Biology of the Piper Gurnard *Trigla Lyra* (Linnaeus, 1758) in Dernah Coast – Eastern Libya**

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**Abstract**

The reproductive biology of 354 specimens of *Trigla lyra* (Family: Triglidae) collected from catches by gill and trammel nets on Dernah coast (Eastern Libya) in the Mediterranean Sea was studied. There were monthly variations in sex ratio between females (174 fish = 49.2%) and males (180 fish = 50.8%). Sex ratio was (1: 0.97) for males to females respectively. The breeding season extends from January to March. Oocyte diameters increase from August ( $89 \pm 5.23 \mu\text{m}$ ), until March ( $542 \pm 23.13 \mu\text{m}$ ). The average absolute fecundity ranged from  $651 \pm 75.8$  to  $9218 \pm 779.4$  for fish with the total length ranging from 19.3 to 32.9 cm, during the period from August till March, whereas relative fecundity ranged from  $22.3 \pm 3.2$  to  $303.9 \pm 32.7$  cm.

Key- Words: Triglidae, *Trigla lyra*, Reproductive biology, Mediterranean Sea, Eastern Libya.

**Introduction**

Family Triglidae includes bottom fish dwellers occurring over sand, muddy sand or gravel at depth from 56 to 200m, but it is more common between 50 and 100m (Tsimenides *et al.*, 1992). The piper gurnard *Trigla lyra* is one of the fishes in family Triglidae is one the most popular Triglid fish species in the eastern Mediterranean region and the Atlantic coast (Richards, 1968 & Baron, 1985), the fish had been characterized by high appreciated flesh and good market perspectives. Although the piper gurnard found in a wide variety of locations that range from the North Sea to Madeira, its status is considered and ranged (Bauchot, 1987). The available literature showed that, few works have been published on the biology of Triglid fishes in eastern Mediterranean Sea (Awad, 1972; Papaconstantinou *et al.*, 1992; Tsimenides *et al.*, 1992; Abdallah, 2002 and Ahamed, 2012). The piper gurnard is reaching a maximum length of 60 cm, but usually the length of most individuals is 20 to 35 cm (Papaconstantinou, 1981). The species is similar to all gurnards, it has a large head covered by protective bony plates, and the lower three rays of the pectoral fin are separated and fleshy (Golani *et al.*, 2006). The piper gurnard is usually found on sand and mud bottoms (Banon *et al.*, 2010), feeds on shrimps and crabs (Gaertner *et al.*, 2005).

It is very common in Eastern Atlantic, north of British Isles and North Sea to Walvis Bay, Namibia, including Madeira and the Mediterranean excluding the Black Sea (Richards and Saksena, 1990). This species is caught with bottom trawls but also with long lines and band lines (Lewis and Yerger, 1976). Although the piper gurnard is very common in the eastern Libyan coast, there is no known record on its reproductive biology in this region. Therefore, the study, appear to be the first to provide information on the reproductive biology of *Trigla lyra* (family Triglidae) in the Libyan eastern coast.

**Material and Methods**

Monthly samples of *Trigla lyra* were collected during the period from

April (2013) to March (2014) by trawler net from Dernah coast which is located along the eastern most stretch of the Libyan coast line on the Mediterranean Sea ( $32^{\circ} 39' 26'' \text{N} - 23^{\circ} 00' 37'' \text{E}$ ) (Fig. 1).

A total of 354 specimens of *Trigla lyra* were used 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:

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

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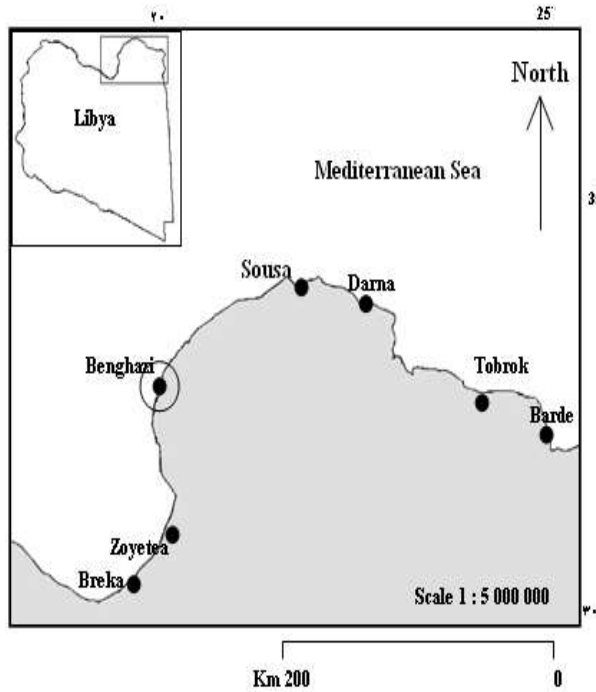


Figure 1: Derna coast, on the Mediterranean Sea, eastern Libya.

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.

The data were tested for normality using a Kolmogorov–Smirnov test. A paired t-test was used to compare the number of males and females among months.

**Results and Discussion**

**Sex ratio**

Generally, there is a tendency for more males (180 fish, 50.8%) than females (174 fish, 49.2%) of the collected population. Overall sex ratio was 1: 0.97 for males to females (Table 1). The sex ratio was not constant throughout different months. The numbers of males exceeded females in all months except in the period from September till November (pre spawning season) and from January till March (spawning season). However, there was no significant difference in the number of males and females among months (paired t-test,  $t_{12} = 0.24 P = 0.818$ ).

Such indices were expressed as the monthly averages and plotted against months. 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, then they were measured under the microscope

Table 1: Monthly variations in sex ratio of *Trigla lyra* from Derna coast.

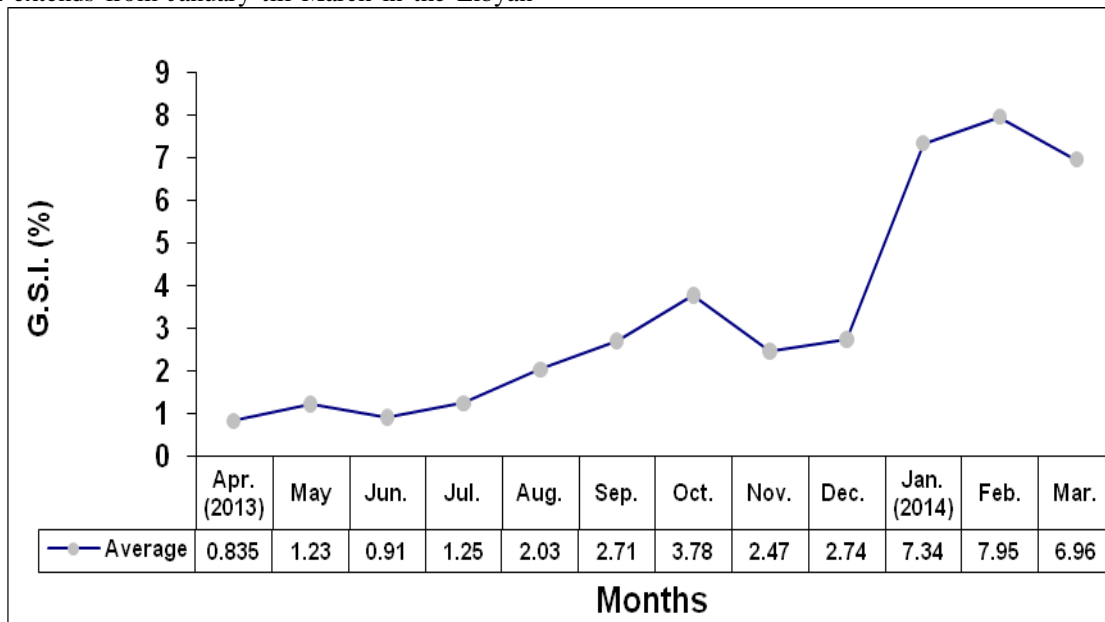
Months	No. of fish	Males		Females		Sex ratio
		No.	%	No.	%	
Apr.(2013)	51	35	68.6	16	31.4	1 : 0.46
May	27	16	59.3	11	40.7	1 :0.69
Jun.	27	15	55.6	12	44.4	1 :0.80
Jul.	32	17	53.1	15	46.9	1 : 0.88
Aug.	27	16	59.3	11	40.7	1 : 0.69
Sep.	17	5	29.4	12	70.6	1 :2.40
Oct.	18	7	38.9	11	61.1	1 : 1.57

Nov.	28	12	42.9	16	57.1	1 :1.33
Dec.	33	17	51.5	16	48.5	1 : 0.94
Jan. (2014)	30	11	36.7	19	63.3	1 : 1.73
Feb.	23	9	39.1	14	60.9	1 :1.56
Mar.	41	20	48.8	21	51.2	1 : 1.05
<b>Total</b>	<b>354</b>	<b>180</b>	<b>50.8</b>	<b>174</b>	<b>49.2</b>	<b>1 : 0.97</b>

**Gonado-somatic indices (G.S.I.)**

The monthly changes in G.S.I. are represented in Fig. (2). *Trigla lyra* showed a definite breeding season, which extends from January till March in the Libyan

eastern coast. The average G.S.I. increased from April (0.84) till December (2.74), then increased sharply in January (7.34), February (7.95) and March (6.96) (Fig. 2).



**Figure 2: Monthly variations in the average gonado-somatic indices of *Trigla lyra* from Derna coast**

**Oocyte diameter**

The recorded average oocyte diameters of *Trigla lyra*, during the whole period of the study are represented in Table (2). The smallest average oocyte diameter was recorded in August (89±5.23µ), then gradually increased in November (317±49.30µ) and December (413±43.83µ), and this increase continued in the following months, reaching (547±24.08µ) in January and reached the maximum value in February, with an average of (548±25.33 µ). The egg diameter in fish samples was very minute and difficult to measure in the period from April till July.

**Fecundity**

Two terms are applied in fish fecundity studies; the absolute fecundity which is the total number of mature eggs in the ovary and the relative fecundity which is the number of eggs per unit length or weight of the fish (Nikolsky, 1963). Ovaries of 72 *Trigla lyra* were examined. The smallest mature female had a total body length of 19.3cm and body weight of 45.4 g. Its ovary weight was 1.04 g. (2.29% of the body weight), with absolute fecundity of 532 ripe eggs. The largest female had a total body length of 32.9cm and body weight of 288.9 gm, whereas its ovary weight was 19.2g and its absolute fecundity was 8397 ripe eggs. The relationship between the body length and absolute fecundity of *Trigla lyra* is given in Table (3). The average absolute fecundity ranged was from 651±75.8

to  $9218 \pm 779.4$  for fish with the total length ranging from 19.3 to 32.9 cm, during the period from August till March, whereas relative fecundity ranged from  $22.3 \pm 3.2$  to  $303.9 \pm 32.7$  cm.

**Table 2: Monthly variations in egg diameters ( $\mu$ ) of *Trigla lyra* from Dernah coast**

Months	Number of fish	Egg-Diameters ( $\mu$ )		
		Minimum	Maximum	Average
Apr.(2013)	A	A	A	A
May	A	A	A	A
Jun.	A	A	A	A
Jul.	A	A	A	A
Aug.	7	82	98	$89 \pm 5.23$
Sep.	6	101	143	$124 \pm 15.53$
Oct.	5	211	299	$252 \pm 44.31$
Nov.	11	211	390	$317 \pm 49.30$
Dec.	7	389	498	$413 \pm 43.83$
Jan. (2014)	8	518	569	$547 \pm 24.08$
Feb.	13	517	598	$548 \pm 25.33$
Mar.	15	517	599	$542 \pm 23.13$
Average				$462 \pm 312$

A = The egg diameter were very minute and difficult to measure

**Table 3: The absolute and relative fecundity of *Trigla lyra* from Dernah coast during the period from April 2013 till March 2014**

Months	Range of total length	No.	Absolute Fecundity			Relative Fecundity F/T.L. (cm)
			Minimum	Maximum	Average	
Aug.(2013)	19.3 - 32.7	7	532	733	651 ± 75.8	22.3±3.2
Sep.	22.4 - 32.4	6	898	990	958 ± 45.9	32.3±3.7
Oct.	19.5 - 32.1	5	1122	1289	1247 ± 79.5	44.9±7.2
Nov.	19.9 - 32.3	11	1398	2666	2375 ± 589.2	77.2±15.2
Dec.	29.3 - 32.9	7	3234	6255	4398±1060.3	138.2±35.8
Jan. (2014)	32.1 - 32.5	8	6121	8388	7354±858.2	226.8±25.9
Feb.	29.1 - 32.9	13	8397	10712	9638±851.9	312.6±34.1
Mar.	29.1 - 32.8	15	7787	10715	9218±779.4	303.9±32.7
<b>Average</b>					<b>5497±3724.2</b>	<b>178.2±121.3</b>

Triglid fishes inhabit tropical and temperate coastal water, and are found near the shore in shallow inlets and bays less often at moderate depths (Tsimenides *et al.*, 1992). *Trigla lyra* is the largest and oldest of the European gurnards after *Trigla lucerna*, reaching a maximum length of 60 cm and 7 years (Baron, 1985). It is usually found on sand and mud bottoms from 5-30m depth (Banon *et al.*, 2010). In the current study, the overall sex ratio was 1: 0.97 for males and females of *Trigla lyra* and these results are nearly similar with sex ratio of other species of family Triglidae in the Mediterranean Sea (Gaertner *et al.*, 2005 and Ahamed, 2012). In the present work, the sex ratio was not constant throughout months, during the breeding season of each species number of female usually higher than number of males (Oren, 1975). In spawning season, the number of females of *Trigla lyra* exceeded males since the males might migrate for spawning elsewhere before females, comparable result was found by Aamed, (2012) who studied sex ratio of related species *Trigla lucerna* in Benghazi coast, eastern Libya. Same result has been also obtained for other fish species such as mullet species (Mohammad, 1982 and El-Mor, 1993). The ripe females were heavier than

male's during the spawning season, thus, the females get caught in the gear in large numbers, resulting in an unbalanced sex ratio (Awad, 1972). In the present study, the males and females of *Trigla lyra* showed a definite breeding season, which extends from January till March, with maximal G.S.I. of 7.34, 7.95 and 6.96 in January, February and March 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 January till April (Baron, 1985), and then from December till March in the Eastern Ionian Sea (Mytilineou,*et al.*, 2005), and from January to March in Benghazi coast, eastern Libya (Ahamed, 2012). The time of spawning season in the present study coincided with the appearance of the juveniles and fry of the fish in the Mediterranean Sea (El-Mor, 2002). In the current work, the increase in the oocyte diameters of *Trigla Lyra* was evident in August ( $89 \pm 5.23 \mu\text{m}$ ), until

March ( $542 \pm 23.13 \mu\text{m}$ ). However, In April till July, all fish samples were immature and the egg diameters were very minute and difficult to measure. These results coincide with those recorded by Ahamed (2012) who stated that the egg diameters reached  $465 \mu$ ,  $480 \mu$  and  $498 \mu$  in spawning season (January to March) of *Trigla lucerna*. 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). Ahamed (2012) found that the absolute fecundity ranged from 678 to 10047 with an average of 5010 ripe eggs/fish and with an average relative fecundity of 254 ripe eggs/cm. for *Trigla lucerna* in Benghazi coast, eastern Libya, these results similar to those of the data of present study which stated that, the average absolute fecundity ranged was from  $651 \pm 75.8$  to  $9218 \pm 779.4$  for fish with the total length ranging from 19.3 to 32.9 cm, during the period from August till March, whereas relative fecundity ranged from  $22.3 \pm 3.2$  to  $303.9 \pm 32.7$  cm.

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