

## Reproductive Cycle of Khishni Fish, *Liza abu* in Tigris River (Southern Baghdad)

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### Abstract

This study was conducted to investigate the reproductive cycle of Khishni fish, *Liza abu* in Tigris River (Southern Baghdad). A total of 439 male and 524 female khishni were captured for two years and the capturing was weekly, immediately dissected for general biological parameters. Six reproductive stages have been distinguished for both male and female and were termed as; resting, maturing, early pre spawning, advance pre spawning, spawning and post spawning. Male GSI ranged between 0.27 to 9.74 in Sep. to Mar., and for female it was 0.94 to 13.35 in October to April respectively. Spawning occurred in the periods of May to July when temperatures reach 24.7 – 28.9°C. The study concluded that, Khishni fish, *L. abu* in Tigris River have complete reproductive cycle (six stages for both male and female) and spawning take place for three months in the periods of May to July when temperatures significantly raised to 24.7 – 28.9°C.

**Key Words:** Khishni Fish, *L. abu*, Reproductive Cycle, Stages and Spawning.

### دورة التكاثر لاسماك الخشني *Liza abu* في نهر دجلة ( جنوب بغداد )

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### الخلاصة

اجريت الدراسة لاجل التعرف على دورة التكاثر لاسماك الخشني *Liza abu* في نهر دجلة (جنوب بغداد) . اصطيد 439 ذكر و 524 انثى لمدة سنتين والاصطياد كان اسبوعيا، شرحت الاسماك مباشرة واخذت القياسات البيولوجية. حددت ست مراحل للتكاثر للذكور والاناث سميت: الراحة، النضج، ما قبل السرة المبكرة، ما قبل السرة المتقدمة، السرة، وما بعد السرة. تراوحت دالة المناسل للذكور بين 0.27- 9.74 في ايلول الى اذار وكانت للاناث بين 0.94-13.35 في تشرين الاول الى نيسان على التوالي. حدث السرة في الفترة بين ايار الى تموز عندما وصلت درجة حرارة الماء الى 24.7- 28.9 م° . خلصت الدراسة الى ان اسماك الخشني في نهر دجلة لها دورة تكاثر كاملة تقع في ست مراحل لكلا الجنسين ، وان السرة يحدث في ثلاثة اشهر هي ايار- تموز عندما ترتفع درجة حرارة ماء النهر معنويا الى 24.7- 28.9 م° .

**الكلمات المفتاحية:** اسماك الخشني، *Liza abu*، دورة التكاثر، مراحل وسرة.

## Introduction

Khishni fish (*L. abu*) is one of the more abundant Mugilidae fish presented in the catches of inland water in Iraq, it was considered as trash fish in the rearing ponds of cyprinidae family, but, fortunately was consumed as human diet in Iraq and appears in markets as regular food. Khishni fish, *L. abu* inhabits wide range of aquatic systems like; Tigris, Euphrates, Asia Rivers and their branches, marshes, lakes, and canals (Kuru, 1979; Sevik and Bozkurt, 1997; Yalcin, 2004; Elp and Kaya, 2014), also it was distributed in estuaries and marine environments (Nasir and Naama, 1988). The reproductive cycle of *L. abu* and description of stages was poorly studied and there are only one study on their artificial propagation and embryo development (dahham, *et al.*, 2003). Khishni fish reach the maturation at the end of their first year of life in Iraq and turkey (Al-Yamour, *et al.*, 1988 and Unlu, *et al.*, 2000). However, when fish comes to reproduce, some phenotypic, structural, and histological changes will undergo with the advance of reproductive stages (Horvath, 1986 and Sutharshiny, *et al.*, 2013). On the other hand, Aquatic systems continuously alter their physico- chemical properties due to human bean activities and climate changes which stimulate fishes to display suitable alternative strategy in the reproductive development and behaviors. The aim of this study is to investigate the reproductive biology (number and description of reproductive stages for Khishni fish male and female) and demonstrate the relationship with water temperature of Tigris River (Southern Baghdad).

## Materials and Methods

439 male and 524 female khishni fish, *L. abu* were caught in Tigris River (Alzaafarana/ 20 Km Southern Baghdad) for two years (Jan./ 2014 to Dec./ 2015) using fixed gill and sieve nets (25 – 32 mm mesh size) and the capturing was weekly fish were transferred immediately to the laboratory, then, total length (cm), body and gonad weights (gm) and age (year) were recorded. After dissecting, sex were determined and gonads described visually or with the aid of macroscopic lens, stages of developments were determined by following gonads color, shape, lobules, occupying the lumen, adhered to the dorsal lumen, presents of veins and ovum and milt secretion under light squeezing of the abdomen (Albiaty, 2000). Sexual maturity was determined when yolked egg and sperm were macroscopically presents in the gonads (Nikolsky, 1963). Gonad Somatic Index (GSI %) was calculated by the equation:

$$GSI\% = \frac{\text{gonad weight}(gm)}{\text{body weight}(gm)} \times 100$$

Temperatures of the water were recorded directly from the river every weekly. Data were statistically analyzed by SPSS soft ware (SPSS, 2001) and significant differences were assessed at  $p < 0.05$ .

## Results and Discussion

Some biological parameters of Khishni fish, *L. abu* were presented in Table 1. All studied male and female *L. abu* were reaches sexual maturity in 1<sup>st</sup> and 2<sup>nd</sup> years respectively, smallest mature male were 29.50 gm in weight, 13.30 cm in length and 1<sup>+</sup> year age,.

Table (1) Means of Some Biological Parameters of Khishni Fish, *L. abu* Captured in Tigris River (Southern Baghdad ).

Months	No. Catches Male/ Female	Age (years) Male/ Female	Total length ( cm) Male/ Female	Total weight (gm) Male/ Female
Jan	64/ 70	1 <sup>+</sup> / 2 <sup>+</sup>	17.01/ 18.87	63.21/ 66.31
Feb	35/ 41	2 <sup>+</sup> / 3 <sup>+</sup>	17.48/ 15.90	43.48/ 45.87
Mar	27/ 22	2 <sup>+</sup> / 3 <sup>+</sup>	15.72/ 17.96	40.85/ 55.04
Apr	22/ 24	2 <sup>+</sup> / 2 <sup>+</sup>	15.82/ 15.56	46.64/ 43.01
May	22/ 29	3 <sup>+</sup> / 3 <sup>+</sup>	16.86/ 15.63	48.90/ 47.86
Jun	23/ 35	1 <sup>+</sup> / 3 <sup>+</sup>	16.06/ 17.85	43.31/ 49.61
Jul	24/ 32	3 <sup>+</sup> / 3 <sup>+</sup>	18.73/ 17.98	61.79/ 51.05
Aug	21/ 38	3 <sup>+</sup> / 2 <sup>+</sup>	15.53/ 16.91	39.81/ 53.29
Sep	66/ 75	3 <sup>+</sup> / 3 <sup>+</sup>	16.85/ 20.11	58.97/ 90.07
Oct	17/ 24	3 <sup>+</sup> / 3 <sup>+</sup>	20.84/ 19.90	83.18/ 76.26
Nov	86/ 96	3 <sup>+</sup> / 3 <sup>+</sup>	18.76/ 19.71	72.81/ 91.89
Dec	32/ 38	3 <sup>+</sup> / 3 <sup>+</sup>	17.73/ 18.41	57.81/ 53.61

corresponding values for female were 37.0 gm, 13.5 cm and 2<sup>+</sup> respectively which have been seen in March and have yolked egg and sperm. In Tigris River (Turkey), Unlu, *et al.*, (2000) reported that *L. abu* matured at the end of the first year of life, while (Sahinoz, *et al.*, 2011) thought that it was at the fourth years of life in Ataturk Dam Lake. However, it seems that under un-running stable water systems (Lakes, Ponds), Khishni fish may alter their reproductive behaviors and strategy to keep successful reproduction and survive. Percentage of males appeared in total catches was lower than females (45.58% vs. 54.42% ) may indicate high feeding activity in female due to the high requirements of reproductive behaviors rather than the differentiations within fish species, population and years (Nikolsky, 1963). There are different ratios in sexes, Elp and Kaya ( 2014) recorded 1: 0.94 in the favor of male in Devegecidi Dam Lake (Turkey) which confirmed by Al-Shawi and Wahab (2008), in contrast, (Khalaf, *et al.*, 1986) reported it to be in the favor of females.

Reproductive cycle of *L. abu* were studied for two consecutive years and six stages were distinguished for both male and female and termed as; resting, maturing, early pre spawning, advanced pre spawning, spawning and post spawning (Table 2). ( Manssor, *et al.*, 2009) distinguished six stages for male but seven for female, (Sahinoz, *et al.*, 2011) in the histological study reported also six stages. However, there are many factors which play roles in determining reproductive stages like the procedures, descriptive accuracy, aquatic system, the situation of the study and habitat (Bhatti and Al-daham, 1978; Ahmed, *et al.*, 1984; Chelemaal, *et al.*, 2009; Rahemo and Al-Shatter, 2012). Some of the more frequented and differential traits of *L.abu* reproductive stages in Tigris River were summarized in (Table 3). There were a steadily advance in gonad morphology and structure within a year indicating that *L. abu* has a single reproductive cycle per year and was in agreement with the finding of (Manssor, *et al.*, 2009). The variations in gonads relate to the shape, volume, weight, and coloration (Nakaghi, *et al.*, 2003).

Table (2) Description of Reproductive Stages of Khishni Fish, *L.abu* in Tigris River (Southern Baghdad).

Stage	Male/ Testis	Female/ Ovary
<b>1 Resting</b>	Very small threat adhered at the dorsal abdominal vertebrates, white to pink color (Aug - Nov).	Small threat hanged from the upper abdominal cavity, ovum was not eyed seen, white – transparent color (Aug - Nov).
<b>2 Maturing</b>	Thin pipe structure, smooth and opaque, pink color (Nov – Jan).	Pipe structure, small ovum was difficultly seen, off-white color (Nov – Jan).
<b>3 Early pre Spawning</b>	Thick pipe structure, occupied one third of body cavity, visional blood vessels, pink - milky color (Jan – Feb).	Cylindrical shape, occupied one third of body cavity, scattered ovum seen easily, yellowish – white color, (Jan – Feb).
<b>4 Advance pre Spawning</b>	Cylindrical lobule shape, occupied two third of body cavity, milky color (Feb – Apr).	Large cylinder, large dense ovum, occupied most of the body cavity, orange color (Feb - Apr).
<b>5 Spawning</b>	Swollen cylindrical shape, soft appearance, easily milt dropped when squeezed, grayish color (May – Jun).	Swollen cylinder, separate ovum was exit under light pressure, orange – gray color (May - Jun).
<b>6 Post Spawning</b>	Empty flaccid sacs, bloody clots, pink – opaque color (May - Jul).	Empty flaccid sacs, many ovum clotted with blood, pink color, (May - Jul).

Table (3) Differentiation and More Frequency Appearance Traits of Testis and Ovary of Khishni Fish, *L. abu* in Tigris River (Southern Baghdad).

Stage	Male/ Testis	Female/ Ovary
<b>1 Resting</b>	Very small threat, white – pink color.	Small threat hanged from the upper abdominal cavity
<b>2 Maturing</b>	Thin pipe, pink color.	Small ovum was difficultly seen.
<b>3 Early pre Spawning</b>	Thick pipe, pink – milky color.	Scattered ovum easily seen.
<b>4 Advance pre Spawning</b>	Cylindrical lobule shape.	Occupied most of the body cavity, orange color.
<b>5 Spawning</b>	Swollen cylindrical shape, easily milt dropped.	Separate ovum was exit under light pressure.
<b>6 Post Spawning</b>	Empty flaccid sacs, bloody clots.	Empty flaccid sacs, many ova clotted with blood.

Table (4) showed the monthly variation of GSI and maturation stages in relation with temperatures. For male, GSI ranged between 0.27 to 9.74 in Sep. to Mar. respectively, and for female it was 0.94 to 13.35 in Oct. to

Apr. respectively, and spawning occurred in the periods of May to July when temperatures of the water reaches 24.7 – 28.9°C and sex ratio (male: female) was 0.65:1 to 0.75:1.

Table (4) Monthly Variations of GSI% and Maturation Stages for Khishni Fish, *Labu* in Tigris River (Southern Baghdad) and it's Relation with Water Temperatures.

Month	Water Temperature (C°)	Sex	GSI% Mean $\pm$ S.E.M	Maturation Stages	Sex Ratio Male: Female
January	15.4 f	Male	5.87 $\pm$ 1.43 b	2 – 3	0.91 : 1
		Female	5.48 $\pm$ 2.41 c	2 – 3	
February	17.1 e	Male	9.16 $\pm$ 2.06 a	3 – 4	0.85 : 1
		Female	9.64 $\pm$ 3.44 b	3 – 4	
March	19.2 d	Male	9.74 $\pm$ 2.21 a	4	1.22 : 1
		Female	11.94 $\pm$ 1.40 a	4	
April	19.5 d	Male	9.60 $\pm$ 2.24 a	4	0.91 : 1
		Female	13.35 $\pm$ 2.84 a	4	
May	24.7 b	Male	1.64 $\pm$ 0.98 d	5 – 6	0.75 : 1
		Female	4.93 $\pm$ 1.17 cd	5 – 6	
June	27.8 a	Male	1.99 $\pm$ 0.10 d	5 – 6	0.65 : 1
		Female	3.21 $\pm$ 0.91 de	5 – 6	
July	28.9 a	Male	1.98 $\pm$ 0.14 d	6	0.75 : 1
		Female	3.35 $\pm$ 0.68 d	6	
August	28.4 a	Male	0.72 $\pm$ 0.31 de	1	0.55 : 1
		Female	2.26 $\pm$ 0.51 ef	1	
September	24.2 b	Male	0.27 $\pm$ 0.07 e	1	0.88 : 1
		Female	1.19 $\pm$ 0.17 f	1	
October	22.5 c	Male	0.60 $\pm$ 0.27 de	1	0.70 : 1
		Female	0.94 $\pm$ 0.54 f	1	
November	15.5 f	Male	1.74 $\pm$ 0.63 d	1 - 2	0.89 : 1
		Female	1.05 $\pm$ 0.46 f	1 - 2	
December	17.9 e	Male	4.46 $\pm$ 1.35 c	2	0.84 : 1
		Female	3.98 $\pm$ 1.10 d	2	

Different letter for the same gender indicates significant differences ( $p \leq 0.05$ ) between months.

Very close synchronization between stages of male and female have been seen, while GSI showed higher percentages for female in comparison with male. Al-Shawi and Wahab (2008) reported that spawning period elongated from March to May with maximum GSI of 7.77 and 11.14 for male and female respectively during February, also, (Epler, *et al.*, 2001) revealed that spawning occurs in May in Tharthar and Habbaniya Lakes in Iraq and maximum GSI were 7.9 % and 12.33% for male and female respectively, the variations in the results of this study could be due to the differences in the habitats and temperatures of the water. *L.abu* spawn when temperatures of the water significantly ( $p \leq 0.05$ ) raised to reach 24.7°C and continued till 28.9°C, the same trend was previously seen for Cyprinid fish (Kattan fish, *Barbus xanthopterus* and Shabbot fish, *Barbus grypus*) by Albiaty (2000) and Himri fish, *B. luteus* by Yousif (1983); Al Hazzaa and Hussein (2003) with a significant monthly variations. The study concluded that, Khishni fish, *L.abu* in Tigris River (Southern Baghdad) have complete reproductive cycle with six stages for both male and female, and spawning takes place for three months in the periods of May to July when the temperatures of the water raised to 24.7 – 28.9 °C.

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