



Research Article

Fecundity and Gonadal Periodicity of Snakehead, *Channa striata* from River Indus, Near Jamshoro, Sindh, Pakistan

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Abstract | Fecundity and gonadal periodicity of *Channa striata* from River Indus, near Jamshoro, Sindh, Pakistan was examined from 240 samples (120 for each sex) during October 2020 to September 2021. The experimental fish was procured from the commercial catch of local fisher community. The investigations were based on estimation of fecundity and its relationship with other body parameters, variation in egg size and calculation of gonadosomatic index. The results of fecundity estimation were based on 10 mature female fish ranging in size 30.4 to 43 cm and from 235.0 to 765.0 g in length and weight respectively. The lowest egg production (2193) was noted from small sized and highest was recorded (11830 eggs) from large fish. Egg production ability was noted ideally co-related by weight of ovary in relation to length and weight of fish. Egg size measurement reveals that the ova was noted to be increased in size during August to October (0.95 to 1.2 mm), after extrusion, there were no gonads during November to January and again start developing from February 0.1 to 1.2 mm that indicated that fish breeds onetime in year having peak during October. GSI values also showed similar trend of increasing the size of gonads from 0.2 to 2.0 and from 0.5 to 5.5 in both sexes. Lastly, it was decided that egg production capacity (fecundity) showed strong association with ovary weight in *Channa striata* from River Indus near Jamshoro as compared with other parameters.

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Keywords | Fecundity, Ova measurements, Gonadosomatic index, River Indus and *Channa striata*, Gonadal periodicity



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Introduction

The snakehead *Channa striata* (Bloch) is an air-breathing fish locally called as Shakur, Sol and

commonly as Stripe Murrells is widely distributed in Asia and Africa (Narejo et al., 2015). It is commercially important, high-prized, carnivorous, fast growing and hardy fish could be reared with other cultured

species of genus *Channa* in number of other countries like Philippines, Thailand, Vietnam, India, Cambodia, Malaysia and China (Azadi and Siddique, 1986). It also contains high concentration of amino acids and fatty acids and regarded as best tool for wound healing and suitable for the patients of osteoarthritis, due to its numerous therapeutic worth in different countries like Singapore, Thailand, China and number of other countries around the globe shows distinct attention to this fish (Mia, 1984). Availability of this fish from natural resources has been reduced every day due to the indiscriminate use of pesticides. The attempts are very meager to culture this fish in open water in Pakistan (Narejo *et al.*, 2015). Unfortunately, no work had yet been done for the fry rearing and induced breeding practices of *Channa striata* in Pakistan (Narejo *et al.*, 2018). It is therefore important to establish the induced breeding technology to ensure sufficient production of seeds of this important fish. So, it was felt necessary to supply basic knowledge on its gonadal periodicity and egg production potential from River Indus near Jamshoro.

Materials and Methods

Sample collection

Experimental fish was procured from commercial catch of fisher community from river resides near Jamshoro. Total 240 samples during October 2020 to September 2021 ranging in size from 30.4 to 43 cm and from 235.0 to 765.0 g for both length and weight. The observed samples were then transferred from field to laboratory Department F.W. Biology, U/ Sindh, Jamshoro fixed with 5% formaldehyde in bags.

Laboratory studies

Collected fish then individually sexed and measured their length and weight. Length was measured by measuring tape (cm accuracy), and weight was documented by numerical balance (SF-400). Determination of sex of the sampled fish their gonad condition of individual fish was enumerated and detached from body cavity, weighted on automatic balance, after that shifted to vial containing 5% formaldehyde for further analysis.

Estimation of egg production (fecundity)

Egg production ability (fecundity) in the present course of investigations was based on 10 gravid females between 30.4 to 43.0 cm and 235g to 765g

of both length and weight. The 01 g was taken from anterior, middle and posterior region of the ovary. The egg found in 01 g were counted and multiply with the weight of both ovaries, the fecundity was described in this way. Estimation of egg was calculated by following formulae.

$$F = N \times \text{weight of gonad} / \text{weight of 01 g}$$

Where; F= termed as fecundity of fish; N= ova found in 01 g

Body parameters such as length, weight of gonad and weight of fish were contrived with the fecundity and their relationship was calculated by the methods of least squares proposed by LeCren (1951).

Gonadal periodicity

For the gonadal periodicity study 10 fish of both the sexes (10 males and 10 females) of *Channa striata* of dissimilar lengths were obtained by the support of fishermen of Indus River, adjacent to Jamshoro starting from October 2020 to September 2021.

Calculation of gonadosomatic index (%GSI)

Calculation of gonadosomatic index (GSI) was made separately for male and female through the study period stating from October 2020–September 2021 through formulae cited below:

$$\text{Weight of ovary/testis} / \text{weight of fish} \times 100.$$

Dimension of egg size

For the enumeration of dimension of egg size from each ovary 100 eggs were taken into account by using binocular microscope already attached with ocular micrometer as proposed by Narejo *et al.* (2002).

Results and Discussion

Estimation of fecundity

Estimation of fecundity was based upon 10 mature fish size ranging from 30.4–43 cm and 235–765 g for both length and weight. Range of fecundity of the experimental fish in investigation was deviated from 2193 to 11830 eggs. The highest fecundity (11830) eggs were recorded from fish size 4.03 cm and lowest fecundity (2193) eggs from fish size 30.4 cm (Table 1). The fecundity values were contrived with their respective factors of the body such as length of fish, weight of fish and weight of gonad. It was noted that

fecundity showed solid association to gonad weight of *Channa striata* from River Indus near Jamshoro as compared to other parameters. The resulted co-relation co-efficient equation and regression analysis value ($r=$) are shown below.

$\log F = -1.2 + 0.8 \log GW$ ($r = 0.99$) fecundity versus gonad weight relationship

$\log F = -1.6 + 1.9 \log L$ ($r = 0.90$) fecundity versus total length relationship

$\log F = -1.4 + 1.6 \log BW$ ($r = 0.89$) fecundity versus body weight

As may be noted from above equations and regression values ($r = 0.99$) for fecundity versus gonad weight relationship showed the fecundity displayed very solid association to weight of gonad as compared to length and weight of experimental fish.

Table 1: Showing data on total length, total weight, gonad weight, and fecundity of *Channa striata* from River Indus near Jamshoro.

S. No.	Length of fish (cm)	Weight of fish (g)	Gonad weight (g)	Fecundity in thousands
1.	30.4	235	7	2193
2.	34.5	279	8	3786
3.	36.4	486	23	5774
4.	35.6	435	25	6700
5.	40	560	28	8134
6.	37.8	533	29	9633
7.	40.3	573	39	10481
8.	41.5	565	38	10151
9.	43	765	44	11830
10.	43	609	40	11010

Measurement of egg

Egg size of *Channa striata* in fish under study noted to be deviated from (0.1 to 1.2 mm) as recorded from the ovaries of fish. The egg size was start developing from August to October (0.95 to 1.2 mm) with one peak during October (Table 2). This specified that *Channa striata* spawns on one occasion throughout the year in the month of October.

Calculation of gonadosomatic index

The gonadosomatic index values of experimental fish were calculated for 12 months starting from October 2020 to September 2021 for male and female. The GSI values also showed similar trend of increasing the size of gonads from 0.2 to 2.0 and from 0.5 to

5.5 for both sexes (Table 2). Values of both egg size measurement (0.95 to 1.2 mm) and gonadosomatic index (2.0 and 5.5) indicated that *Channa strata* spawns one time in the year during October.

Table 2: Month-wise variation of the gonadosomatic index and egg size in *Channa striata* from River Indus near Jamshoro.

S. No.	Months	% GSI in Male	% GSI in Female	Egg size (mm)
1	January	0.00	0.00	0.00
2	February	0.2	0.5	0.1
3	March	0.4	0.8	0.2
4	April	0.5	1.0	0.4
5	May	0.7	1.2	0.66
6	June	0.9	1.5	0.88
7	July	1.1	2.0	0.92
8	August	1.5	3.9	0.95
9	September	1.8	4.8	1.0
10	October	2.0	5.5	1.2
11	November	0.00	0.00	0.00
12	December	0.00	0.00	0.00

Conclusions and Recommendations

Present investigations on the fecundity and gonadal periodicity in *Channa striata* from River Indus near Jamshoro was determined in order to supply production potential and spawning season of this commercially important fish. The assessment of fecundity in the studies was ranging from 2193-11830 eggs from the fish of 30.4 to 43.0 cm and from 235.0 to 765 g in length and weight respectively. Earlier Azadi and Siddique (1986) reported fecundity of *Channa striata* ranging from 3100 to 12100 eggs from fish of size 33.4 to 52.9 cm and from 460.0 to 1220.0 g respectively from India and Marimuthu and Haniffa (2007) 3050 to 12110 eggs from Bangladesh. Similarly, Kilambi (1996) suggests the range 2997 to 11811 eggs in *C. striata* from Sri Lanka. Narejo et al. (2015) reported fecundity of *C. striata* ranged between 3000 to 12000 eggs from coastal district Badin, Sindh Pakistan. The assessment of fecundity in *C. striata* and their ranges given by above authors are similar and in agreement with the observed during studies. The fecundity values were plotted versus different body parts and noted that fecundity found to be closely associated ($r = 0.99$) and directly proportionate with the gonad weight of the fish as compared to total length and body weight during

present investigations. Numerous authors like (Azadi and Siddique, 1986; Kilambi, 1996; Marimuthu and Haniffa, 2007; Narejo *et al.*, 2015) commented that fecundity bear strong relationship with gonad weight which supports the finding of present investigations. The egg size measurement in the studies was ranged from (0.95 to 1.2 mm) found to be increased from August to October with peak (1.2 mm) in the month of October and the similar increasing trend was also noted in the gonadosomatic index values for male and female (1.5-2.0 and 3.9 to 5.5, respectively) with highest in the month October that suggests the fish has single spawning season that last from August to October with one peak during the month of October. More or less alike information has been published by earlier authors like (Azadi and Siddique, 1986; Marimuthu and Haniffa, 2007; Narejo *et al.*, 2015) in *Channa striata* from elsewhere. Similar observation was also published by various workers in different fish species like Narejo *et al.* (2006) in *Gudusia chapra*, Mastoi *et al.* (2008) in *Labeo calbasu*, Chandio *et al.* (2016) in *Notopterus notopterus*, Bakht *et al.* (2020) in *Cyprinus carpio*, Thebo *et al.* (2022) in *Ompok pabda*, reported alike information related to the findings.

Finally, it was concluded that the estimation of fecundity in the present investigations was ranged between 2193 to 11830 eggs and the experimental fish *Channa striata* from River, near Jamshoro found to be spawn once in a year during the month of October.

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Novelty Statement

This research showed that the estimation of fecundity ranged between 2193 to 11830 eggs and the experimental fish *Channa striata* from River, near Jamshoro found to be spawn once in a year during the month of October.

Author's Contribution

Shabana Parveen: Performed the experiment and prepared initial draft of the manuscript.

Naeem Tariq Narejo: Designed and conceived the idea of this experiment.

Ayaz Hussain Qadri and Ghulam Dastagir: Data analysis.

Muhammad Hanif Chandio: Searched literature, manuscript reviewed, composed the document with data acquisition.

Pervaiz Khan and Saddar Faheem: Collected fish and eggs samples for the research.

Naveed Ahmad Abro: Helped in the relevant literature.

Ghulam Abbas: Searched literature, manuscript reviewed, data analysis.

Shahnaz Rashid: Helped in composing, formatting and updating bibliography.

Conflict of interest

The authors have declared no conflict of interest.

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