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# General Reproductive Biology of Bunnei (*Barbus sharpeyi* Gunther, 1874) in Al Huwaizah Marsh, Basra-Iraq

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**Abstract**

Some biological aspects of Bunnei (*Barbus sharpeyi*) spawners were studied to develop successful induced spawning of this species. The population parameters namely length, weight and sex ratio were determined an inland spawning stock Bunnei in the water system of Al Huwaizah Marsh. This migration started with small size fish which were mostly males, followed by a big rush of bigger size length group which were mostly females. The fecundity was increased directly with the size of fish. Gonado Somatic Index (GSI) and maturity stage indicated that spawning time was during March and April.

*Key words: Barbus sharpeyi*, Fecundity, spawning migration, Bunnei, Marshes, Basra

## Introduction

*Barbus sharpeyi* (Cyprinidae), which is locally known as Bunnei, is one of the most important fishes in the Tigris-Euphrates Basin. It is one of 300 Barbus species in the world (Boulenger, 1965). This species has been identified as endangered species in the Iraqi Marshlands after the drying crime during 1991-2003 (UNEP, 2001). Before the drying of the Marshlands the species had the highest production in the catch of the Iraqi inland fisheries (about 5000 t), which was one quarter of the freshwater catch (Al Daham, 1977). During 2003 when the Iraqi Marshlands restoration program began, it was decided to enhance the natural population of Bunnei by induced spawning and restocking of the fingerlings in the selected sites. As a part of that, recommendation reproductive biology of the species was studied to ensure successful induced spawning.

Few studies were conducted on the biology of Bunnei, e.g. Al Hamed (1966) and Al Jerian (1974) on the age and growth. Al Hamed (1972) studied the fecundity of this species in Al Sennia marsh, while Al Hakeim (1976) worked on the morphology and size at the first maturity. Yesier (1988) investigated the relation between the body and gonad biochemical composition with the maturation stage. Jasim (1988) studied the general biology of this species in Al Hammar Marsh. Part of this work (the fecundity) was published by Al Daham and Jasim (1993). In Iran, Marammazei and Al Mukhtar (2000) found that Bunnei spawn in Shadighan Marsh (Khuzestan province) during March, and that it is a phytophil spawner (spawn on aquatic plants). Neikpeyi (1994) found that Bunnei spawned between March to April in the branches of Al Karkha River flowing to Al Adhaim marshes, the Eastern side of Al Hwaizah marsh. Mohammadi and Marammazei (2000) found that Bunnei comprise the highest percent of Cyprinid fishes in Shadighan Marsh, which is one of the most important spawning area of this species in Iran.

This study aims at investigating the reproductive status of Bunnei during spawning migration to develop successfully induced spawning for the enhancement of the fisheries of this species in the marshes.

## Materials and Methods

Samples of Bunnei *B. sharpeyi* brooders were obtained from Al Dessam Marsh, a part of Al Hwaizah Marsh, south of Iraq (Figure 1) during the period of October 2004 to April 2005. Around 260 fish were collected from this site by using gill nets of different mesh size. This area is the only area where Bunnei was found in sufficient numbers after the reflooding of the marshes. The run of Bunnei in the sampling area comes from the Eastern side of Al Hwaizah marsh, i.e. from the Iranian side.

In the laboratory the following parameters were taken for each individual fish: total length to the nearest millimeter, total weight to the nearest 0.1 g, sex and gonad weight (Nielsen and David, 1983). The length-weight relationship was calculated as exponential formula by using Excel program. Ripe ovaries were placed in Gilson's fluid (modified by Simpson, 1958) for fecundity estimation, containers were periodically shaken to help in releasing the oocytes and dissolving the tissues. Fluid containing free eggs then filtered in Buchner funnel, washed with water, filtered again, transferred to a previously weighted Petri dish and kept exposed. The weight of the washed eggs was taken every five minutes; when weight became constant, four sub-samples of fixed

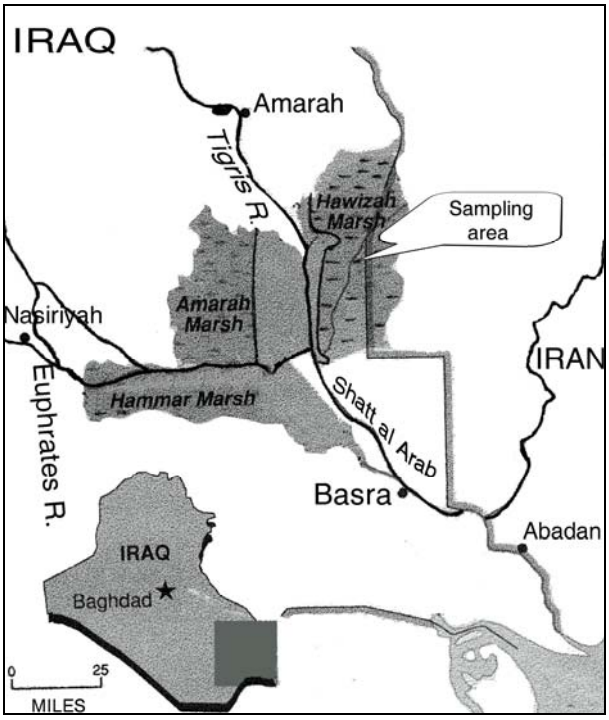


**Figure 1.** The collection site in Al Hwaizha Marsh.

weight (0.01g) were taken and number of eggs in each sub-sample was counted under microscope. The mean number of eggs of these four sub-samples was determined (Ahmed *et al*., 1984). Fecundity was then calculated using the following equation:

Absolute fecundity (F) = (mean number of eggs in samples/ Weight of sample) x weight of eggs at sampling time

Relative fecundity or number of eggs per gram of body weight was also calculated (Bagenal, 1978). To trace the changes in fish condition, the relative condition factor (Kn) was calculated using the following equation:

$$Kn = w/w^{\wedge}$$

where w = observed weight, $w^{\wedge}$ = calculated weight from length-weight relationship

Gonadosomatic index (GSI) was calculated as a percentage of body weight.

For maturity stages, we used the morphological characteristics of the gonads to determine the maturity stage (Ahmed *et al.,* 1984).

## Results

Monthly length and weight distribution of Bunnei brooders obtained during the study was shown in Table 1. The average weight of the fishes was increased from 555.8 g in October to 1061 g in April. The mean length was also increased from 34.8 cm in October to 43.3 cm in April.

The overall length-weight relationship for all Bunnei spawners collected in this area and time was (Figure 2):

$$W = 0.00007\ L^{2.7097}$$

The monthly length-weight relationship (Table 2) showed that there were big differences in the exponential (b) of the relationship. It was higher than 3.0 in January (3.27) and lower than that of February (1.93). It was found that the weight of fish with similar length was higher before and after March in which the relative condition factor (Kn) reached its minimum values (Table 2). The relative condition factor showed an increase from October until January.

Only four maturity stages were found in this study, which were related with the spawning season and spawning migration. The characteristics of these stages are given in Table 3, while the occurrence of maturity stages during months and distribution of spawners are presented in Table 4. All the fish were in developing stage Π during October, while ripe stage appeared during January. Running fishes were found during February in 25%, and 30% in March. One fourth of the fish were at spent stage during March and half of them in April.

The fluctuation in sex ratio during months (Table 4) showed that the spawning migration started by a rush of males. The males were abundant during October and December. After that the percentage of

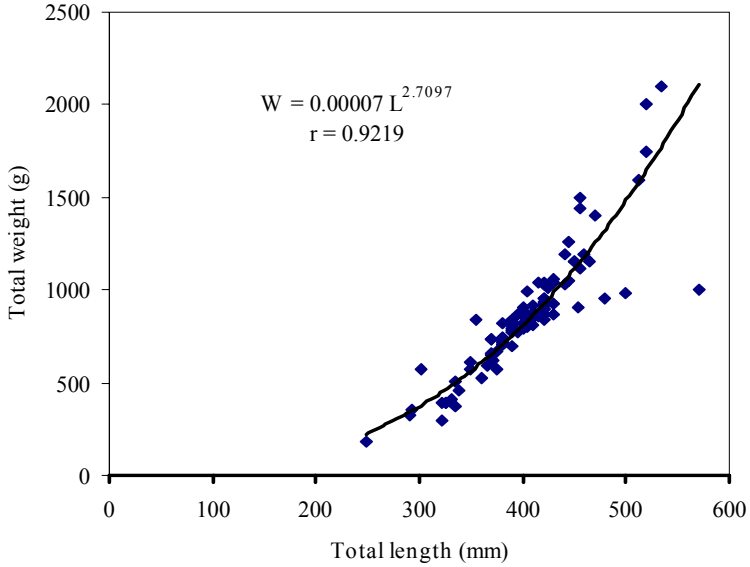


**Figure 2.** Length-weigh relationship of Bunnei brooders from Al Hwaizha Marsh (W =Weight, L = Length).

**Table 1.** Length and weight distribution of Bunnei brooders

| Months | N | Length (cm) | | Weight (g) | |
|---|---|---|---|---|---|
| | | Range | Average | Range | average |
| October | 50 | 51.2-24.8 | 34.8 ±4.9 | 183.4-1590.3 | 555.8 ±20.1 |
| November | 30 | 26.1-49.2 | 40.2 ±3.1 | 244.1-1000 | 689.2 ±15.1 |
| December | 30 | 37.5- 46.0 | 39.8 ±2.6 | 363.6-1150.6 | 753 ±26.1 |
| January | 36 | 39 – 44.5 | 40.8 ±1.80 | 694.5 - 1255 | 875 ±5.1 |
| February | 86 | 35 – 53.5 | 42.8 ±5.0 | 615 - 2100 | 947.8 ±24.5 |
| March | 38 | 33.5 – 52.0 | 40.5 ±4.7 | 505 – 2000 | 997 ±4.1 |
| April | 20 | 41.5 - 45 | 43.3 ±1.30 | 868 - 1191 | 1061 ±12.0 |

**Table 2.** Monthly length-weight relationship parameters, factor of determination ($R^2$) and mean Relative condition factor (Kn)

| Months | A | B | $R^2$ | KN |
|---|---|---|---|---|
| October | 0.0005 | 2.52 | 0.82 | 0.952±0.16 |
| November | 0.0007 | 2.61 | 0.88 | 0.97±0.18 |
| December | 0.0003 | 2.46 | 0.81 | 1.07±0.08 |
| January | 0.000002 | 3.27 | 0.80 | 1.25±0.87 |
| February | 0.0082 | 1.93 | 0.65 | 1.005±0.159 |
| March | 0.00002 | 2.9 | 0.73 | 0.91±0.24 |
| April | 0.0051 | 2.01 | 0.81 | 1.003±0.059 |

**Table 3.** Morphometric characteristics of the ovary and testes in different maturity stages (Ahmed *et al*., 1984)

| Stage | Characteristic | |
|---|---|---|
| | Male | Female |
| Developing II | Firm, yellowish white, one third of length of body cavity | Half to one third body cavity, not translucent, ova visible to naked eye, grey |
| Ripe | Firm, flattened, yellowish white, two third of body cavity | Two third of body cavity, firm, orange, lobed, ova transparent, thin membrane |
| Running | Firm, flattened, white, two third body cavity, milt run from vent on slight pressure | Filing body cavity, orange, ova large transparent run from vent on slight pressure |
| Partial Spent | Flattened, pinkish white, wrinkled, edge transparent, two third body cavity | Speckled in appearance, dull yellow, transparent and partially opaque ova |

female increased rapidly, 1:1.29 during February. The overturn in ratio of male: female started in February. It become close to 1:1 during January and February. In April the males disappeared.

Monthly fluctuations in Gonado Somatic Index (GSI) are presented in Table 5. The Average GSI for females increased from December to March and decreased during April, while for males, it reached maximum values in February, and started to decrease after that.

The fecundity values of Bunnei spawner showed that the fecundity increases with the size of fish and GSI (Table 6).

## Discussion

Generally there was an increase in mean length and weight toward the spawning season. This increase could be explained as a phenomenon of Bunnei spawning migration which started with small size fish which were mostly males. Al Hakeim (1976) stated that the males of Bunnei are smaller than females, while Jasim (1988) found that the males were in mostly size group of 210-234 mm and the females' occurrence increased in the bigger size groups. He also found that the spawning migration started with small size fish. The increase in body weight could also be related with the increase in gonad size closer to spawning season, which could be seen in higher GSI. Just before the spawning months. Jasim (1988) found that the exponential of the length-weight relationship was 3.12 for female and 3.22 for male, which means that the female was heavier than males in the same length group. This result is somewhat similar to our results for all the fish. The monthly changes in length-weight parameters were different from 3.0, which might reflect the effect of maturity stages and the deviation of body shape from the cubic formula because of the increase in body depth due to the increase in gonad size. The decline in condition

**Table 4.** The Occurrence (%) of maturity stages and sex ratio of Bunnei brooders during months

| Months | Developing Π (%) | Ripe (%) | Running (%) | Partial pent (%) | Sex Ratio Male: Female |
|---|---|---|---|---|---|
| October | 100 | - | - | - | 5.66:1 |
| November | 100 | - | - | - | 4:1 |
| December | 90 | 10 | - | - | 2:1 |
| January | 35 | 65 | - | - | 1.25:1 |
| February | - | 75 | 25 | 25 | 1:1.29 |
| March | - | 45 | 30 | 50 | 1:1.8 |
| April | - | 50 | - | | 0:10 |

**Table 5.** The Gonadosomatic index (GSI) of Bunnei brooders during October-April in Al Huwaizah marsh

| | Gonad weight range (g) | | Gonad weight average (g) | | GSI range | | GSI average | |
|---|---|---|---|---|---|---|---|---|
| | ♂ | ♀ | ♂ | ♀ | ♂ | ♀ | ♂ | ♀ |
| October | 1.6-9.23 | 58.9-103 | 3.6±0.92 | 75±5.1 | 1.2-1.7 | 4-13.0 | 1.0 | 7.8±2.1 |
| November | 7.5-13.2 | 60.1-190 | 8.1±2.1 | 77.1±5.0 | 1.0-1.5 | 6-12.6 | 1.1 | 7.9±1.9 |
| December | 9.7-17.1 | 53-105 | 11.2±2.1 | 75.7±9.1 | 1-1.9 | 5-13.1 | 1.2 | 8.2±2.8 |
| January | 7.3-24.7 | 59.9-180 | 11.4±4.1 | 78.4±6.6 | 1.1-3.2 | 5.9-14..5 | 2.0 | 12.2±2.6 |
| February | 12-20.3 | 94-281 | 17..9±3.5 | 180±7 | 2.3-4.1 | 11.6-18.7 | 1.8 | 14.64±3.6 |
| March | 12.9-22.4 | 60-284 | 12.9±2.2 | 151.3±98 | 1.4-2.5 | 5.2-20.5 | 1.5 | 14.94±4.9 |
| April | - | 55-100 | - | 109±6.8 | - | 8-14.2 | - | 13.94±3.2 |

**Table 6.** Absolute and relative fecundity of Bunnei brooders from Al Huwaizah marsh

| Total Length (cm) | Total Weight (g) | Gonad weight (g) | GSI | Fecundity | |
|---|---|---|---|---|---|
| | | | | Absolute | Relative |
| 44 | 1191 | 229 | 19.2 | 100760 | 84.6 |
| 43 | 866 | 100 | 11.5 | 4000 | 40.6 |
| 37 | 651 | 76.5 | 11.7 | 121635 | 186.8 |
| 42 | 1034 | 96 | 9.2 | 65280 | 63.1 |
| 42 | 1031 | 181 | 17.5 | 91224 | 88.48 |
| 52 | 2000 | 284 | 14.1 | 236160 | 118.08 |
| 46 | 1196 | 169 | 14.1 | 152120 | 127.19 |
| 42 | 919 | 158 | 17.1 | 123400 | 134.26 |
| 52 | 1750 | 276.8 | 15.8 | 89840 | 51.33 |

factor during March could be explained with spawning season (Jasim, 1988; Marammazei and Al Mukhtar, 2000; Neikpeyi, 1994). Ahmed *et al.* (1984) stated that the spawning process cause a big reduction in the condition of the brooders.

The sex ratio in this study assures that the spawning migration of Bunnei in the water system of Tigris-Euphrates marshes was started by the presence of males in big numbers followed by a big rush of females. During the spawning period, the sex ratio was close to 1:1. The sex ratio in other studies was differed greatly than that of present one (Jasim, 1988; Al Hakeim, 1976). This could be related to the over fishing during the spawning season.

The characteristics of the maturity stages were similar to that described by Jasim (1988), but he found spent stage during late April, which has not coincided with our findings. This could be related to the geographical and ecological differences between the stocks of Bunnei in Al Hammar and Al Hwaiza marsh. In conclusion, findings of present study can be used for place and timing of broodfish collection for successful induced spawning and restocking. The results of gonad development stages, GSI and sex ratio indicate that the spawning season of Bunnei in Al Dessam marsh (Al Huwaizah marsh) started in March and prolonged until April.

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