



International Journal of Fisheries and Aquatic Studies

ISSN: 2347-5129

(ICV-Poland) Impact Value: 5.62

(GIF) Impact Factor: 0.549

IJFAS 2016; 4(5): 666-669

© 2016 IJFAS

www.fisheriesjournal.com

Received: 29-07-2016

Accepted: 30-08-2016

Saleha Jasmine

Department of Fisheries, Faculty
of Agriculture, University of
Rajshahi, Rajshahi, Bangladesh

Mahbub Ara Molina

Department of Fisheries, Faculty
of Agriculture, University of
Rajshahi, Rajshahi, Bangladesh

Reproductive biology of *Mystus vittatus* (Bloch, 1794) in the Padma River, Bangladesh

Saleha Jasmine and Mahbub Ara Molina

Abstract

The aim of this study is to present the reproductive biology of *Mystus vittatus* including- sex ratio, gonadal maturation, spawning season and fecundity from the Padma River, Bangladesh. Fish samples were collected using different types of traditional fishing gears i.e., cast net, square lift net and gill net during June 2010 to May 2012. For each individual total length was measured to the nearest 0.1 cm using digital slide calipers and whole body weight and gonadal weight were taken using an electronic balance with 0.01 g accuracy. During the study, total 2875 specimens of *M. vittatus* were collected where, 48.66% were males and 51.34% were females and the overall sex ratio was recorded as 1:1.05 (male: female). A total of 350 gravid female fishes were studied to determine different stages of ovaries and a total of 8 stages of ovaries were examined. Based on percentages of gravid females and monthly variations of gonadosomatic index (GSI), the spawning season was ranged from March to September and peak spawning season was June for *M. vittatus* in the Padma River. During the study fecundity for *M. vittatus* varied from 6023 to 29800 with a mean value of 14751 ± 7539 . The results of this study would be an effective tool for fishery managers, biologists, and conservationists to initiate appropriate management strategies and regulations for the sustainable management of this species in the Padma River and surrounding ecosystems.

Keywords: *Mystus vittatus*, sex ratio, maturation stages, spawning period, fecundity

1. Introduction

The striped dwarf catfish, *Mystus vittatus* (Bloch, 1794) belongs to the family Bagridae. This fish species is found in Bangladesh, India, Malaysia, Myanmar, Pakistan, Sri-Lanka and Thailand^[1]. It is commonly known as tengra in Bangladesh and India, baung in Malaysia, muller in Pakistan and pla-kayeng in Thailand^[1]. This fish serve as a major source of animal protein and macronutrients in the diet of people^[2,3]. It is an important target species for small-scale fishers^[4]. But the untamed population of this species is waning due to reckless fishing, habitat destruction and other ecological changes to their environment^[5-7].

Reproduction is very important for their survivability^[8-10]. The reproductive biology of fish involves sexual maturity, ovarian maturation, spawning season, mating, spawning and fecundity^[11]. Reproduction is influenced by several factors such as differentiations in genetic combination, day light, temperature, turbidity, depth of water and availability of food^[12,13].

Various studies on morphometric relationships^[14-16], conditions and first maturity^[17,18] for many threatened species from Bangladesh are well documented. But there is no study on reproductive biology for *M. vittatus*. Therefore, the aim of this study is to present the reproductive biology of *M. vittatus* from the Padma River of Bangladesh for sustainable management strategies.

2. Materials and methods

2.1 Study site

This present study was conducted in the Padma River (Lat. 24°22'; Long. 88°35') northwestern Bangladesh. This river is considered an important feeding and spawning ground for freshwater fish species of northwestern Bangladesh^[19,20].

2.2 Sampling and laboratory analysis

The samples were collected from the commercial fishers in different locations (Charghat; 24°15' N, 88°44' E; Saheb bazar; 24°20' N, 88°34' E and Godagari; 24°26' N, 88°19' E) of

Correspondence

Saleha Jasmine

Department of Fisheries, Faculty
of Agriculture, University of
Rajshahi, Rajshahi, Bangladesh

the Padma River in Rajshahi region during June 2010 to May 2012, using different types of traditional fishing gears i. e., cast net (mesh size 1.5 – 2.0 cm), square lift net (mesh size ~1.5) and gill net (mesh size 1.8 – 2.2 cm). The collected samples were instantly iced in site, and then preserved in 10% alcohol solution for further study in the laboratory. Fish were sexed by microscopic observation of gonad. For each individual total length (TL) was measured to the nearest 0.1 cm using slide calipers and whole body weight (BW), gonadal weight (GW) were taken by an electronic balance with the accuracy of 0.01 g. Maturation stages of ovary were confirmed by visual assessment of color, texture, shape and size of gonads.

On the basis of monthly variations of gravid female and gonadosomatic index (GSI) the spawning season was determined. The GSI was deliberated by the following method-

$$GSI (\%) = \frac{100 \times GW}{BW}$$

Where,

GW = weight of gonad
 BW = body weight

For fecundity estimation at first whole ovary weight was measured. Then three sub-samples were taken from three different position of the ovary. Then total number of eggs was counted from each sub-sample. The number of eggs from each sub-sample was estimated by the following equation of [21]

$$F_1 = \frac{\text{Gonadweight} \times \text{number of egg sin the sub-sample}}{\text{sub-sample weight}}$$

Afterward, by adding the mean number of eggs of three sub-samples (F₁, F₂ and F₃), the individual fecundity was

calculated using the following formula:

$$Fe = \frac{F_1 + F_2 + F_3}{3}$$

2.3 Statistical analysis

For statistical analyses Graph Pad Prism 6.5 software were used. All statistical analyses were considered significant at level 5% (p < 0.05).

4. Results

During the study total 2875 specimens of *M. vittatus* were collected from the Padma River, where 48.66% were males and 51.34% were females. The overall sex ratio did not differ statistically from the expected 1:1 ratio (p > 0.05). Monthly variations of sex ratio of *M. vittatus* indicated that female was highest in all the month except November-December (Figure 1). A total of 350 gravid female fishes were studied to determine the different stages of ovaries. During the study a total of 8 stages (immature-I, Immature-II, Immature-III, Maturing-I, Maturing-II, Mature, Ripe, and Spent) were examined and shown in Figure 2.

Maximum gravid female was in the month of March to September, also the GSI was highest in the same period. Therefore, spawning season varied from March-September and peak was June for *M. vittatus* in the Padma River (Figure 3 and 4). The mean value of GSI was highest (23.16±0.25) in the month of June and lowest (3.06±0.10) in December (Figure 4). During the present study total 350 gravid female was used for the estimation of fecundity. Here, it was observed that the fecundity varied from 6023 to 29800. However, the smallest gravid female (total length 7.8 cm and body weight 6.57 g) produced 6023 eggs and the largest female (total length 12.6 cm and body weight 22.08 g) had 30800 eggs. The mean fecundity was 14751 ± 7539.

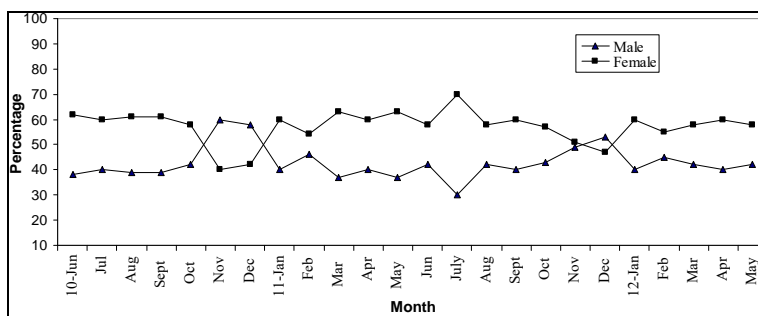


Fig 1: Monthly variations of sex ratio for *Mystus vittatus* in the Padma River, Bangladesh

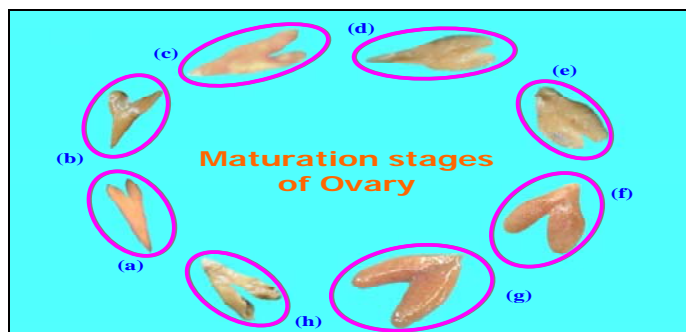


Fig 2: Maturation stages of ovary of female *Mystus vittatus* (a) Immature-I (b) Immature-II (c) Immature-III (d) Maturing-I (e) Maturing-II (f) Mature (g) Ripe (h) Spent, in the Padma River, Bangladesh

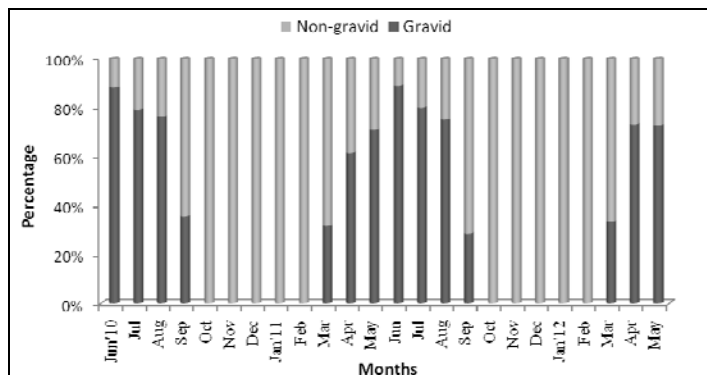


Fig 3: Monthly variations of gravid female (in percentage) of *Mystus vittatus* in the Padma River, Bangladesh

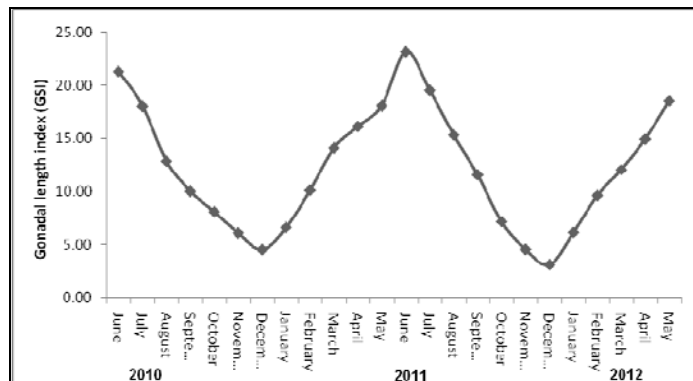


Fig 4: Showing the monthly changes of mean Gonado somatic index (GSI) of female *Mystus vittatus* in the Padma River, Bangladesh.

5. Discussion

For most of the species expected sex ratio is 1:1, but strong bias may be found for some prawn populations [22]. In our study, out of 2875 individuals of *M. vittatus*, 1399 were males and 1476 were females and the sex ratio was 1:1.05 (male: female). Our finding is similar with [23], who has reported female dominance over male.

In the present study spawning season starts from March and continue to September and peak spawning season was June for *M. vittatus* in the Padma River, while [24] have reported June-September as the breeding season in Aligarh. But [25] have reported April to August as the breeding season for *M. vittatus* in Mathabhanga River of Bangladesh. The changes in spawning season may vary due to climatic conditions especially rainfall [26, 27].

In the present work the fecundity of *M. vittatus* varied from 6023 to 29800. According to [28] the fecundity ranged from 2534 to 60746 for *M. vittatus*. Also [29], estimated the fecundity for the same species as 18210-44620. The fecundity of fishes may vary due to body size and water quality parameters [25, 30] which were no studied in the present work.

6. Conclusion

The present study describes the reproductive biology of *M. vittatus* including sex ratio, gonadal maturation, spawning season and fecundity from the Padma River. The results of this study would be an effective tool for fishery managers, biologists, and conservationists to initiate proactive management strategies and regulations for the sustainable management of the remaining stocks of this species in the Padma River and surrounding ecosystems.

7. References

1. Froese R, Pauly D. (Eds.), FishBase 2016: World Wide Web electronic publication. Available at, 2016. <http://www.fishbase.org> (accessed on 10 March 2016).
2. Ahmed GU, Khatun T, Hossain MB, Shamsuddin M. Health condition of a farmed Tilapia in earthen ponds, northern Bangladesh. *J Biol Sci.* 2012; 12(5):287-293.
3. Hossain MY, Leunda PM, Ohtomi J, Ahmed ZF, Oscoz J, Miranda R. Biological aspects of the Ganges River sprat *Corica soborna* (Clupeidae) in the Mathabhanga River (SW Bangladesh). *Cybiuim.* 2008; 32(3):241-246.
4. Shafi M, Quddus MAA. *Bangladesher Matshya Sampad* (in Bengali), Bangla Academy, Dhaka, 1982, 1-444.
5. Hossen MA, Hossain MY, Yahya K, Pramanik MNU. Threatened Fishes of the World: *Labeo bata* (Hamilton, 1822) (Cypriniformes: Cyprinidae). *Croat J Fish.* 2015; 73(2):89-91.
6. Hossain MY, Hossen MA, Ahmed ZF, Yahya K, Rahman MM, Ahmed F *et al.* Threatened Fishes of the World: *Botia dario* (Hamilton, 1822) (Cypriniformes: Cobitidae). *Croat J Fish.* 2015a; 73(2):86-88.
7. Hossain MY, Hossen MA, Pramanik MNU, Ahmed ZF, Yahya K, Rahman MM *et al.* Threatened Fishes of the World: *Anabas testudineus* (Bloch, 1792) (Perciformes: Anabantidae). *Croatian J Fish.* 2015b; 73(3):128-131.
8. Carbonell A, Grau A, Lauronce V, Gómez C. Ovary development of the red shrimp, *Aristeus antennatus* (Risso, 1816) from the northwestern Mediterranean Sea. *Crustaceana.* 2006; 79(6):727-743.
9. Hossain MY, Ohtomi J. Reproductive biology of the southern rough shrimp *Trachysalambria curvirostris* (Penaecidae) in Kagoshima Bay, southern Japan. *Journal of Crustacean Biology.* 2008; 28(4):607-612.

10. Hossain MY. Length-weight, length-length relationships and condition factor of three Schibid catfishes from the Padma River, Northwestern Bangladesh. *Asin Sci J.* 2010; 23:329-339.
11. Tracey SR, Lyle J, Haddon M. Reproductive biology and per-recruit analyses of striped trumpeter (*Latris lineata*) from Tasmania, Australia: Implications for management. *Fisheries research.* 2007; 84(3):358-367.
12. Waterman TH. The physiology of Crustacea. New York. Academic press, 1961, 1(2).
13. Hossain MY, Hossen MA, Pramanik MNU, Nawer F, Ahmed ZF, Yahya K *et al.* Threatened Fishes of the World *Labeo calbasu* (Hamilton, 1822) (Cypriniformes: Cyprinidae). *Croat J Fish.* 2015c; 73(3):134-136.
14. Hossain MY, Rahman MM, Fulanda B, Jewel MAS, Ahamed F, Ohtomi J. Length-weight and length-length relationships of five threatened fish species from the Jamuna (Brahmaputra River tributary) River, northern Bangladesh. *J Appl Ichthyol.* 2012a; 28(2):275-277.
15. Hossain MY, Sayed SRM, Rahman MM, Ali MM, Hossen MA, Elgorban AM *et al.* Length-weight relationships of nine fish species from the Tetulia River, southern Bangladesh. *J Appl Ichthyol.* 2015d; 31(5):967-969.
16. Hossain MY, Naser SMA, Bahkali AH, Yahya K, Hossen MA, Elgorban AM *et al.* Life history traits of the flying barb *Esomus danricus* (Cyprinidae) in the Ganges River, Northwestern Bangladesh. *Pak J Zool.* 2016a; 48(2):399-408.
17. Hossain MY, Rahman MM, Abdallah EM, Relationships between body size, weight, condition and fecundity of the threatened fish *Puntius ticto* (Hamilton, 1822) in the Ganges River, Northwestern Bangladesh. *Sains Malays.* 2012b; 41(7):803-814.
18. Hossain MY, Hossen MA, Pramanik MNU, Yahya K, Bahkali AH, Elgorban AM. Length-weight relationships of *Dermogenys pusilla* Kuhl & van Hasselt, 1823 (Zenarchopteridae) and *Labeo bata* (Hamilton, 1822) (Cyprinidae) from the Ganges River (NW Bangladesh). *J. Appl. Ichthyol.* 2016b. DOI: 10.1111/jai.13070.
19. Jones T, Phillips B, Williams CE, Pittock J. Managing Rivers Wisely: Lessons from WWF's Work for Integrated River Basin Management. WWF (World Wildlife Fund) International: Gland, Switzerland, 2003.
20. Hossain MY, Rahman MM, Miranda R, Leunda PM, Oscoz J, Jewel MAS *et al.* Size at first sexual maturity, fecundity, length-weight and length-length relationships of *Puntius sophore* (Cyprinidae) in Bangladeshi waters. *J Appl Ichthyol.* 2012c; 28(5):818-822.
21. Yeldan H, Avsar D. A preliminary study on the reproduction of the rabbit fish *Siganus rivulatus* (forsskal, 1775) in northeastern Mediterranean. *Turk J Zool.* 2000; 24(2):173-182.
22. Hossain MY, Ohtomi J, Ahmed J, Jasmine S, Vadas RL Jr. Life-history traits of the Monsoon River prawn *Macrobrachium malcolmsonii* (Milne-Edwards, 1844) (Palaemonidae) in the Ganges (Padma) River, northwestern Bangladesh. *J Freshwater Ecol.* 2012d; 27(1):131-142.
23. Bhatt VS. Studies on the biology of some freshwater fishes. Part V. *Mystus vittatus* (Bloch). *J Bombay Nat Hist Soc.* 1971; 68:556-572.
24. Qasim SZ, Qayyum A. Spawning frequencies and breeding seasons of some freshwater fishes with special reference to those occurring in the plains of Northern India. *Indian Journal of Fisheries.* 1961; 8(1):24-43.
25. Hossain MY, Ahmed ZF, Leunda PM, Jasmine S, Oscoz J, Miranda R. Condition, length-weight and length relationships of the Asian striped catfish *Mystus vittatus* (Bloch, 1794) (Siluriformes: Bagridae) in the Mathabhanga River, Southwestern Bangladesh. *J Appl Ichthyol.* 2006; 22(4):304-307.
26. Prabhu MS. Maturation of intra-ovarian eggs and spawning periodicities in some fishes. *Indian Journal of Fisheries.* 1956; 3(1):59-90.
27. Hossain MY, Ahmed ZF, Islam ABMS, Jasmine S, Ohtomi J. Gonadosomatic index-based size at first sexual maturity and fecundity indices of the Indian River shad *Gudusia chapra* (Clupeidae) in the Ganges River (NW Bangladesh). *J Appl Ichthyol.* 2010; 26(4):550-553.
28. Hoque MA, Hossain MA. Sexual maturity and fecundity of the freshwater catfish *Mystus vittatus* (Bloch). *Univ J Zool Rajshahi Univ.* 1993; 12:9-13.
29. Islam SS, Shah MS, Rahi ML. Study of fecundity and induced breeding of *Mystus vittatus*. *Bangladesh J Zool.* 2011; 39(2):205-212.
30. Rao TA, Sharma SV. Reproductive biology of *Mystus vittatus* (Bloch) (Bagridae: Siluriformes) from Guntur, Andhra Pradesh. *Hydrobiologia.* 1984; 119(1):21-26.