Paper ID E82

Gametogenesis in Captive Stinging Catfish (*Heteropneustes fossilis*) During Spawning Season

Samiron Kumer Saha, Md. Haider Ali and Harunur Rashid*

Department of Fisheries Management, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh
Corresponding *e*-mail: rashid@bau.edu.bd

Abstract

The high priced and important aquaculture species stinging catfish (*Heteropneustes fossilis*) were reared in cement cistern to study the gametogenesis process during its breeding season. Sampling was done during the breeding season of this fish starting from early March till early June 2014. Gonado-somatic index value for male was found highest (0.847) in early June and lowest (0.169) in early March, and for female it was highest (14.457) in early June and lowest (4.286) in early March. Histological study of ovary revealed that pre-mature (PM) and mature (M) oocytes were found prominent from early May to early June with an occurrence of M stage oocytes highest in early June. Again histology of testes indicated that spermatids (SPT) were in high abundance during early April to early May. During early June spermatozoa (SPZ) were prominently visible. The occurrence of M oocytes in ovary and SPZ germ cells in testicular lumen in highest proportion in early June indicates that the peak breeding season of captive stinging catfish starts in early June.

INTRODUCTION

Stinging catfish *(Heteropneustes fossilis)* is one of the very popular and highly palatable freshwater fish species in Bangladesh. *H. fossilis* has high economic importance and of great demand because of medicinal value (Talwar and Jhingran, 1991). This fish is recommended for the patients after recovery from malaria because of its invigorating qualities (Bhuuiyan, 1964) The stinging catfish belongs to the family Heteropneustidae under the order Siluriformes (locally called *shing*, *shinghi*) is primarily a fish of ponds, ditches, beels, swamps and marshes but sometimes found in muddy rivers (Jha and Rayamajhi, 2010; Froese and Pauly, 2012). Because of its fast growth, tolerance to high stocking density and high market value, *H. fossilis* is considered as an ideal fish species for aquaculture (Dehadadrai et al., 1985). This fish does not breed in captivity but easily breed in the natural freshwater habitats (Kohil and Goswami, 1987). Due to its high demand in aquaculture, induced breeding is being practiced in commercial hatcheries. Brood is very important item in hatcheries for induced breeding to produce quality fry and fingerlings but in natural sources brood fishes are not available. Most hatchery owners collect brood fishes from different aqua farms where fishes are being cultured in captive condition up to breeding. Therefore, it is very important to study the gametogenesis of this fish which can provide information to the hatchery owners for better brood fish management and to identify the perfect breeding season of stinging fish. Considering all these facts the present study was conducted to identify ovarian and testicular maturity stages in *H. fossilis* during its breeding season and to determine the peak breeding season in captivity.

MATERIALS AND METHODS

The present study was conducted at Backyard hatchery complex, Faculty of Fisheries, Bangladesh Agricultural University, Mymensigh from October 2013 to June 2014.

A. Collection and rearing of experimental fish

1200 fingerlings of stinging catfish (*H. fossilis*) were collected from Sharnalata Agro Fisheries Ltd having average size 6.31 cm and 2.39 gm., Radhakanai, Fulbaria, Mymensingh. They were brought to the study site in poly bag with oxygen and were stocked in three cement cisterns (average size 52.62ft^3). The fish were reared from October 2013 to June 2014 with regular commercial *shing* diet (Prot-39%, Carbo-40%, Cal-2%, Moist-11%, Fat-8%, M. energy-3400 kcal/kg). About 90% of water was exchanged every alternate day by fresh underground water. Unutilized feedstuff and faecal wastes were cleaned using siphoning.

B. Sampling, processing and histology of gonads

Sampling of gonad were done monthly starting from early March to early June 2014 to study gonado-somatic index (GSI) and maturity stages of ovaries and testes. Totally four sampling have been done in four months. In each sampling, 6 male and 6 female were collected randomly from. The total weight (gm) of individual fishes were recorded. The fishes were then sacrificed and collected gonads. Total weights of gonad were measured by electric balance. Sampled gonads were preserved in vials at 10% formalin and dehydration with graded alcohol series (series of Ethanol having 70%, 80%, 90%, 95%, 100% and 100% in distilled water). Totally 48 fish gonads sample (24 male and 24 female) were studied for histology. The gonad samples were processed using routine histology protocol (Paraffin method), sectioned in microtome machine, stained using Haematoxylin -Eosin series and finally observed under microscope (OLYMPUS CX4) at 10x/0.25 and 40x/0.65 magnification to identify stages of oocyes and testicular germ cells. Pictures were taken by digital camera (MAGNUS).

RESULTS

A. GSI (Gonado-Somatic Index)

GSI values for male ranged from 0.169 to 0.847 with highest (0.847) value during early June and lowest in early March (0.169; Fig. 1). On the other hand female GSI values ranged from 4.286 to 14.457 with highest (14.457) during early June and lowest in early March (4.286; Fig. 2).

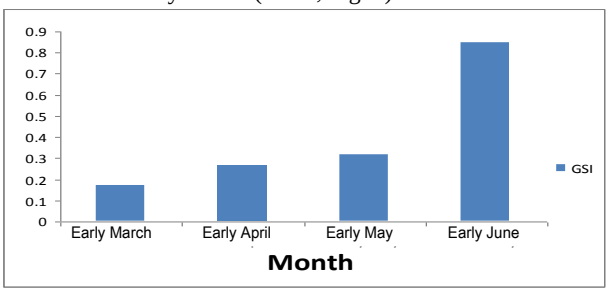

Fig. 1: Monthly mean GSI value of male *H. fossilis*.

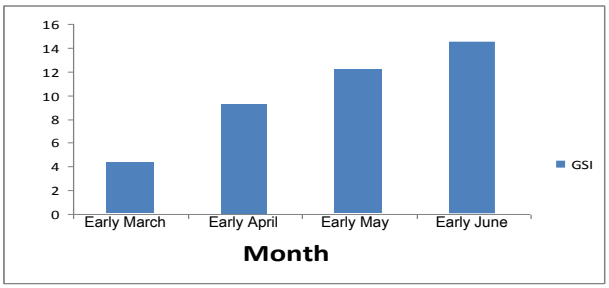

Fig. 2: Monthly mean GSI value of female *H. fossilis*.

B. Gametogenesis

Totally 48 fish gonads (24 male and 24 female) were studied for histology

i. Oogenesis

In early March ovaries were abundant with underdeveloped oocytes (UO), early perinucleolar oocytes (EPNO) and late perinucleola oocytes (LPNO). However, early yolk granule

(EYG) oocytes were also present but were few in abundance (Fig. 3). In Early April ovary contained EPNO, LPNO, late yolk granule (LYG), PM and M oocytes (Fig. 4). Early May samples were mostly abundant with EYG, LYG and PM stage oocytes (Fig. 5). In early June ovary samples were dominated with PM and M oocytes (Fig. 6).

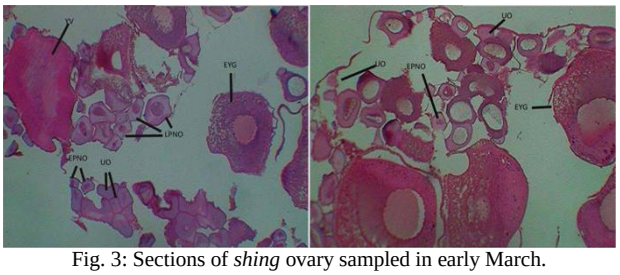

Fig. 3: Sections of *shing* ovary sampled in early March. (at 10x/0.25 and at 40x/0.65)

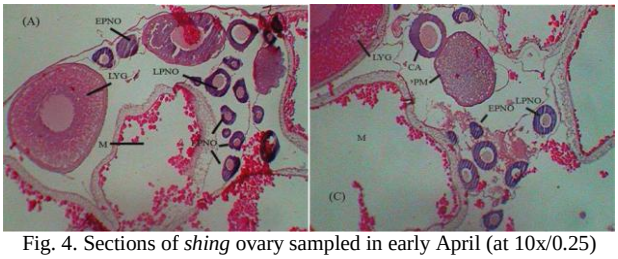

Fig. 4. Sections of *shing* ovary sampled in early April (at 10x/0.25)

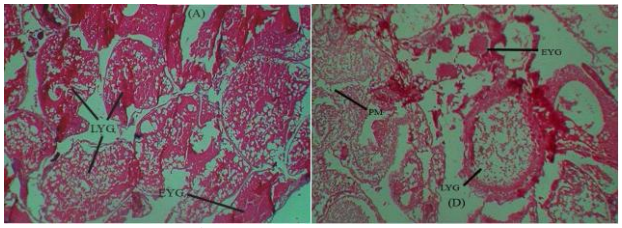

Fig. 5. Sections of ovaries sampled in early May (at 40x/0.65)

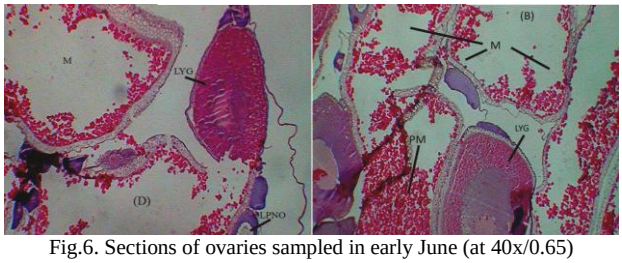

Fig.6. Sections of ovaries sampled in early June (at 40x/0.65)

ii. Spermatogenesis

During March-April spermatocytes cell (SPC) were present in testes but testicular lumens were mostly filled with spermatids (SPT; Fig. 7 and 8). On the other hand May-June samples were abundant with SPT and spermatozoa (SPZ; Fig. 9 and 10).

DICUSSION

Month wise mean GSI values of both male and female *H. fossilis* were highest in early June and lowest in early March. Highest value of GSI in early June is indicative of start of peak breeding season in June. Comparison among GSI values of other months indicates that spawning season sets from early April. Faruk (1995) described that four catfish species viz. *Mystus cavasius, M. vittatus, H. fossilis,* and *Clarias batrachus* breeds from June and July in Bangladesh. Akter et.al., (2012) studied the GSI of P. pangasius and found highest in July and lowest in September.

Month wise histological observation of ovary showed the PM and M stages were observed at the most advanced stage of maturity during May–June with an increasing abundance in early June. Barua *et al*. (1986) studied some aspects of reproductive biology in *C. batrachus,* a close relative of *H. fossilis*, and stated that the fish has a single spawning season in a year that persists from May to July.

Histology of *H. fossilis* testes revealed that SPT and SPZ stages were full in testicular lumen during May - June. Motin *et al*. (2013) observed large amount of SPT, SPZ and small amount of SPC in testes of *O. pabo* sampled from April to June. Testes were full of SPZ in June samples, indicating peak breeding season of *O. pabo*.

GSI and histological study of gonads in *H. fossilis* are in agreement with each other and are supported by similar results from other catfish species of Bangladesh. Together, GSI and histology data of gonads clearly indicate that *H. fossilis* in captivity breeds during April – June with a peak starting in early June.

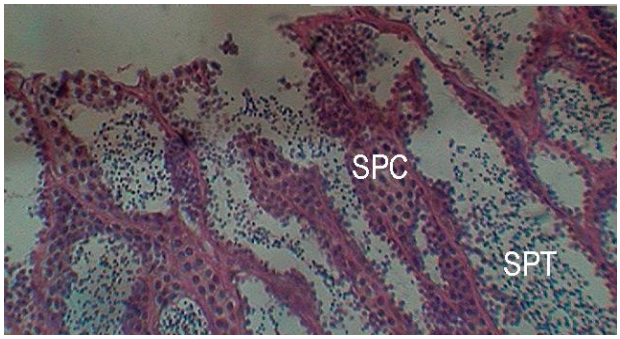

Fig. 7. Sections of testes sampled in early March (at 40×/0.65)

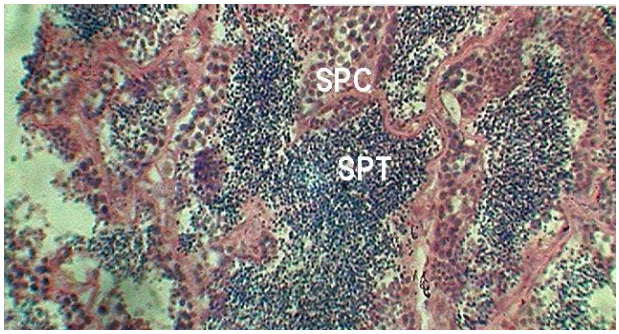

Fig. 8. Sections of testes sampled in early April (at 40×/0.65).

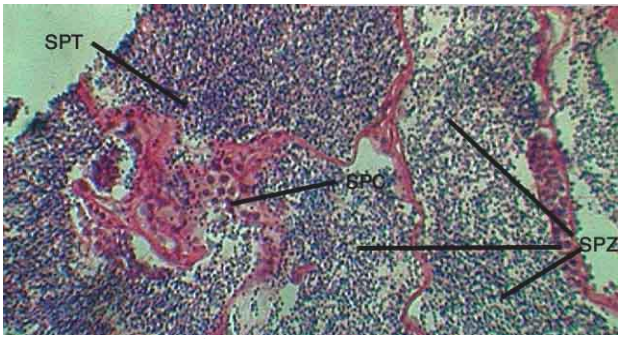

Fig. 9. Sections of testes sampled in early May (at 40×/0.65).

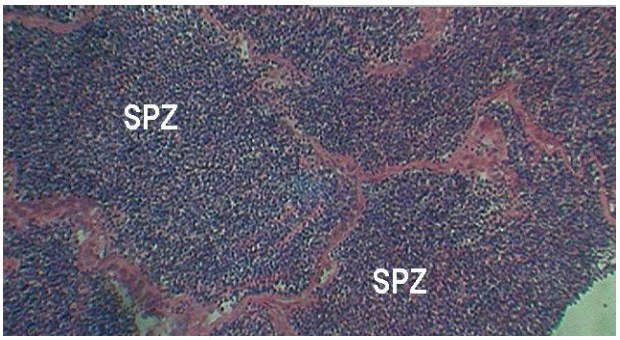

Fig. 10. Sections of testes sampled in early June (at 40×/0.65).

CONCLUSION

In Bangladesh, aquaculture of *H. fossilis* is growing day by day. Hatchery managers are using the captive broods for induced breeding and fry production. Therefore, the findings of this study, done during the breeding season of this fish, have

provided information on gametogenesis in captive *H. fossilis* useful for hatchery managers and breeders

REFERENCES

[1] Akter, S., Nima, A., Alam, A.K.M.S., Rashid, H. and Ahmed, G.U. 2012. Histological Study of Gametogenesis in captive pangasius catfish Pangasisu pangasius. Book of Abstract. BFRF 5th Fisheries Conference and Research Fair. Dhaka, Bangladesh. pp 5

[2] Barua, G., Islamand, M. M. and Mollah, M. F. A. 1986. Some aspects of reproductive biology of *Clarias batrachus* (Linneaus) with notes on some climatological parameters. *Bangladesh J. Fish.*, 9 (1-2): 23-31.

[3] Bhuiyan, A.L. 1964. Fishes of Dacca. Asiatic Society of Pakistan. Dacca. 148 pp.

[4] Dehadrai, P.V., Yusuf, K.M and Das, R.K, 1985. Package of practices for increasing production of air breathing fishes, p. 1-4. Aquaculture Extension Mannual, Information and Extension Division of CIFRI (ICAR), India. New Series. No.3.

[5] Faruq, M. A. 1995. Studies on the fecundity of *Heteropneustes fossilis*, *Clarias batrachus*, *Mystus cavasius* and *Mystus vittatus*. M. S. Thesis. Department Aquaculture and Management, Bangladesh Agricultural University, Mymensingh. 66 pp.

[6] Froese, R. and Pauly, D. (Eds). 2012. Fishbase 2012. World Wide Web electronic publication. Available at www.fishbase.org.

[7] Jha, B.R. and Rayamajhi, A. 2010. *Heteropneustes fossilis* In: IUCN 2013. IUCN Red List of Threatened Species. Version 2013.1. www.iucnredlist.org.

[8] Kohil, M.P.S and Goswami, U.C. 1987. Spawning behaviour of a freshwater air breathing Indian catfish (Bloch). Matsya 12: 180-183.

[9] Motin, M.A., M.R.U. Sarkar, M. Maya, M.J, Alam, Z.P. Sukhan and H. Rashid. 2013. Histological study of gametogenesis in endangered pabo catfish (*Ompok pabo*) from the Sylhet basin in the North-East Bangladesh. *Proceedings of 4th the International Conference on Environmental Aspects of Bangladesh*, Fukuoka, Japan. pp 109-112.

[10] Talwar, P.K. and A. G. Jhingran. 1991. Inland Fishes of India and Adjacent Countries. Vol. 1 & 2. Oxford & IBH Publishing Co. Pvt. Ltd. New Delhi, India: 689-690.