Open Access Library Journal
2026, Volume 13, e14739
ISSN Online: 2333-9721
ISSN Print: 2333-9705

Preliminary Success in Hormone-Induced Breeding of *Wallago attu* by Stripping in Bangladesh

Md. Shariful Islam[1], Md. Amirul Islam[1], Md. Shariful Islam[2,3]

[1]Riverine Station, Bangladesh Fisheries Research Institute, Chandpur, Bangladesh
[2]Headquarter, Bangladesh Fisheries Research Institute, Mymensingh, Bangladesh
[3]SAARC Agriculture Centre (SAC), BARC Complex, Dhaka, Bangladesh
Email: msislam.bfri@gmail.com, amirulbfribs74@gmail.com, bausharif@gmail.com

How to cite this paper: Islam, Md.S., Islam, Md.A. and Islam, Md.S. (2026) Preliminary Success in Hormone-Induced Breeding of *Wallago attu* by Stripping in Bangladesh. *Open Access Library Journal*, **13**: e14739.
https://doi.org/10.4236/oalib.1114739

Received: December 11, 2025
Accepted: February 2, 2026
Published: February 5, 2026

Copyright © 2026 by author(s) and Open Access Library Inc.
This work is licensed under the Creative Commons Attribution International License (CC BY 4.0).
http://creativecommons.org/licenses/by/4.0/

Open Access

Abstract

Boal fish or Indian major catfish are generally available in large river, swamps and freshwater lakes but now-a-days those natural habitats are severely degraded. This decreasing rate of Boal fish can be reduced through natural restoration, and breeding practices should be increased. This is the first attempt to breeding Boal fish through hormone-induced breeding by stripping in Bangladesh. The ovulation and fertilization rate was found 90% - 95% and 75% - 85%. Unfortunately, after the gastrula stage, embryogenesis success can be affected by various factors like water quality and handling of larvae. This encouraging finding of preliminary success will motivate researcher to work on brood management, improvement and/or perfection of induced breeding techniques, larval food and rearing, and mass seed production.

Subject Areas

Aquaculture, Fisheries & Fish Science

Keywords

Fish Breeding, Induced Breeding, Helicopter Catfish, Domestication, Conservation

1. Introduction

The Indian major catfish, *Walllago attu*, Boal, belongs to the family Siluridae, is one of the world's largest freshwater fish and is considered a massive ferocotic catfish, which is why it is also known as the freshwater shark [1]. Talwar and

Jhingran [2] and Mirza [3] described the distribution of *W. attu*. It is commonly found in Bangladesh, Pakistan, Nepal, India and Indonesia [4] [5]. Overfishing in many areas has resulted in large-scale population declines [6] [7], and the species at present has been classified as "vulnerable" on the Red Data List of threatened species by the International Union for Conservation of Nature (IUCN) [8]. Kumar *et al*. [9] demonstrated that *W. attu* is in a threatened condition and is a commercially essential fish through length–weight relationships (LWRs) and a condition factor. Those studies also revealed and suggested the existence of different environmental conditions that affect the LWR and conditions of the fish. Boal or Helicopter catfish are a type of freshwater fish that grow quickly and are in high demand as food fish because of their excellent nutritional value both locally and internationally [10]. Large rivers, swamps, and freshwater lakes are the native habitats of Boal fish. People catch this fish drastically from nature, and that's threatened. In addition to this indiscriminate harvest from natural habitats and for several environmental reasons, the abundance of Boal fish in nature is decreasing daily [11]. There is no alternative supply of seeds from artificial sources to conserve the natural biodiversity and increase the production of this fish. Few studies have focused on the biology, conservation and management of Boal. However, no attempt has been made by any sector in Bangladesh to develop the induced breeding and seed production of this commercially popular species. However, different scientists have successfully bred this fish in India [12] and Indonesia [13]. As no attempt has been made in the artificial breeding and fry production of *W. attu* and considering the fishery and aquaculture importance of the species, the Bangladesh Fisheries Research Institute has been conducting research on its breeding in hatchery conditions. This is the first scientific report on the success of hormone-induced stripping breeding of *W. attu* in Bangladesh.

2. Materials & Methods

The study was performed between months of June to August, 2025 at the Riverine Station of the Bangladesh Fisheries Research Institute (BFRI), Chandpur, Bangladesh.

2.1. Domestication of Fish

Live Boal fish were collected from the Dhakatia River of Chandpur District. The average size of those fish was 1 - 2 kg. Fisherman catch those catfish from a special fishing process locally called "Jag/Katha" fishing. Close to the bank of the river is surrounded by large bamboo poles or tree branches, and tree branches or thick twigs are then thrown into the surrounding area [14].

2.2. Maturity and Fecundity of Boal Fish

The maturity of the Boal fish was examined externally, and their fecundity was identified through dissection. The ovaries of female fishes were collected and preserved in 5% formalin. The weight (g) and status of the gonads were recorded.

Moreover, three pieces of ovary weighing 1 g each from the anterior, middle and posterior portions of the ovary were taken and examined for the number of ova present to determine the fecundity.

2.3. Animal Euthanasia of Boal Fish

Anaesthetic overdose was used to humanely euthanize boal fish at the end of the experiment. Fish were immersed in a solution of tricaine methanesulfonate (MS-222), buffered to neutral pH, at a concentration recommended by institutional animal care guidelines. Standard laboratory instruments, including anaesthetic tanks, digital weighing balances, measuring boards, pH meters, and aeration systems, were used during the procedure. Fish are placed and left in a 250 - 500 mg/L buffered MS-222 solution for a minimum of 10 minutes after cessation of opercular movement (anesthesia to respiratory arrest) prior to removal and decapitation (indicate equipment used) to ensure euthanasia.

2.4. Induced Hormone Treatment and Prespawing Activity (Matting)

Selected male and female broodstock were randomly collected and acclimatized in a rectangular tank to avoid the stress of netting or handling for 12 h. Pituitary hormones were subsequently induced in female fish at a dosage of 3 mg/kg body weight as the 1st dose for females. At 6 h after the 1st dose, female fish were injected with the same hormone at a dosage of 12 mg/kg body weight as the 2nd dose, and at that time, males were induced with a dosage of 3 mg/kg body weight. Hormone was injected into deep muscle near the dorsal fin (Figure 1).

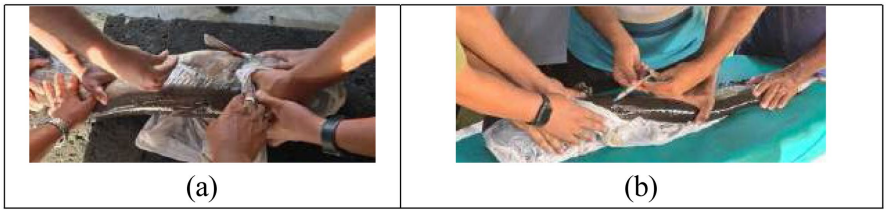

Figure 1. Hormone injection in male and female Boal fish.

Both male and female fish were subsequently released in a large circular tank for pairing and mating. The spawning behavior of the injected fish was closely observed visually.

2.5. Spawning and Hatching

The spawning behavior of the injected fish was closely observed visually. Eight hours after the 2nd dose, both female and male fishes were removed from circular tank. To determine ovulation success, females from which no egg emerged were considered fully ovulated. If any egg emerged, the spent females were dissected, and those retained in the abdomen were counted. The number of unreleased eggs was used to calculate the number of eggs released. The eggs and milt were subse-

quently mixed well for 3 - 5 mins, after which the eggs were washed with water (Figure 2).

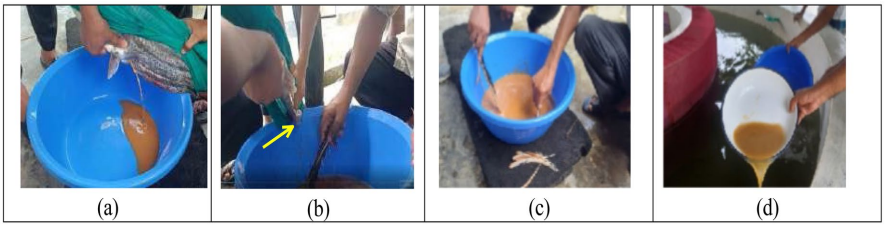

Figure 2. Breeding of Boal fish. (a) Stripping of female fish; (b) Stripping of male fish; (c) Mixing of eggs and sperm; (d) Release of eggs in a circular tank.

After washing, the eggs were released into a circular tank with gentle water flow. After every hour, the eggs were examined under a microscope, and different development stages were examined. The fertilized eggs were examined for the percentage of fertilization after the formation of blastula, measured and placed in hatching jars with water circulation.

3. Results and Discussion

3.1 Domestication of Fish

After two months during the daytime in winter, fishers set their nets and enclose the area, and the fish are caught. This is called Jag/Katha fishing. After these live Boal fish were collected, they were carried to a station pond and reared in high-protein commercial feed. Additionally, tilapia is available in this pond, and they also produce fry. This is consumed by the Boal fish. The health and maturity of these fish were monitored periodically. This study of wild fish domesticated under new environmental conditions revealed altered growth, phenotypic and physiological conditions, gonadal maturation, and reproductive performance, similar to previous studies [15]-[17].

3.2. Maturity and Fecundity of Boal Fish

Mature female fish were identified on the basis of external characteristics such as a bulging soft abdomen, oval reddish urogenital, and brighter body color, whereas mature male fish were identified on the basis of a slightly pointed genital papilla. A similar study was reported by Gupta *et al.* [12]. In male and female Boal fish, mature eggs were detected in the ovary, and milt was also detected in the testis (Figure 3).

In the present study, the absolute fecundity of *W. attu* ranged from 35,000 - 45,000 per kg body weight, which is similar to the findings of Prasad and Desai [18]. They reported that the fecundity of *W. attu* ranged from 16,565 - 29,883 per kg body weight. A similar study was also reported by Absolom [19]. The GSI value in July was 5.32. A similar study reported by Prasad and Desai [20] reported that the GSI of *W. attu* was 4.56 in July.

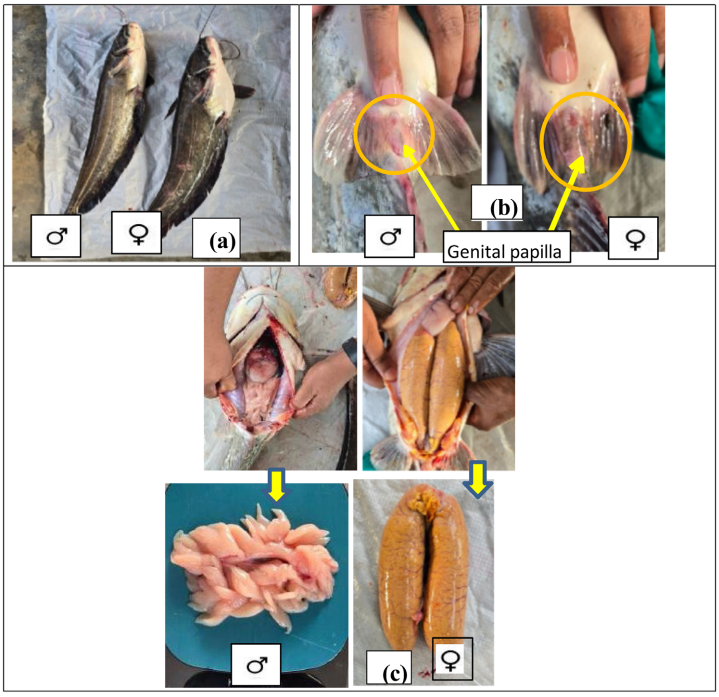

Figure 3. Male and female Boal fish identification; (a) Morphology of Boal fish; (b) Genital papilla of male and female Boal fish; (c) Testis and ovary with egg.

3.3. Induced Hormone Treatment and Prespawing Activity (Matting)

Pairing was observed in a tank. During the induced breeding of *W. attu*, "matting behavior" refers to the courtship and mating rituals that occur, which are stimulated by hormonal injections (Figure 4). This behavior is essential for successful reproduction in captivity.

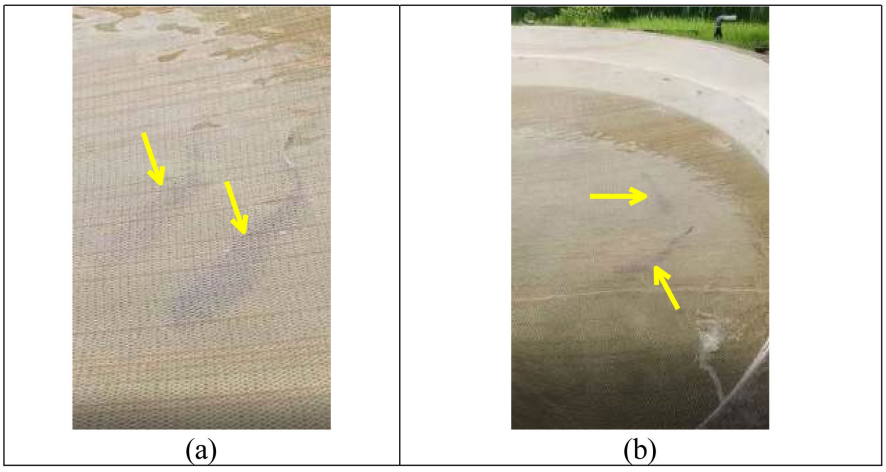

Figure 4. Pairing in a circular tank.

3.4. Spawning and Hatching

The ovulation rate was 90% - 95%. A similar study was performed by Alam *et al*.

[21] with *Liza parsia* fish. The fertilization rate ranged from 75% - 85%. Similar findings were reported by Gupta *et al*. [12].

3.5. Embryonic Development

Embryonic development was observed and is shown in Figure 5. Additionally, the present study revealed low survival rates of larvae from the embryonic stage, with impaired cell division observed in the gastrula and organogenesis stages. After fertilization, the embryos progressed through typical teleost developmental stages, beginning with the single-cell zygote and advancing to morula, blastula, gastrula and early organogenesis. Timing of these transitions showed minor deviations, likely reflecting broodstock health and environmental factors. Previous research shows that water temperature is a crucial environmental factor affecting embryogenesis [22] [23]. High water temperatures may disrupt enzyme processes for hatching, which leads to hardening of the chorion and prevents the eggs from hatching [24] [25]. It is therefore necessary to prepare and handle the parent carefully to obtain good-quality eggs; in this way, embryogenesis can take place optimally and produce good-quality larvae that grow and develop normally. Thus, it was predicted that water temperature would be one of the stress factors involved in the low growth performance of *W. attu*. However, water may not be as clean as needed. This may be the cause of hampered cell division.

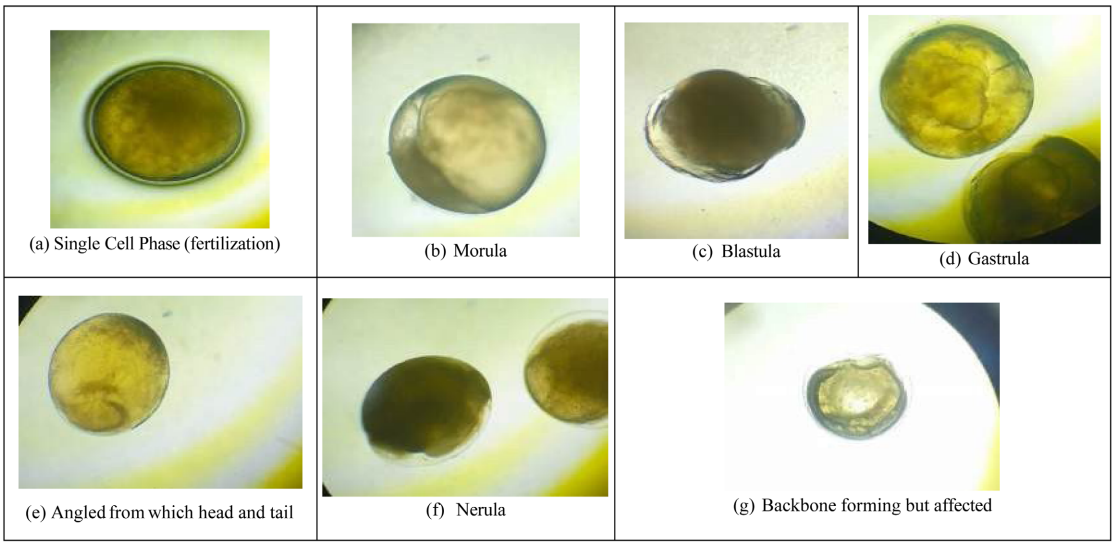

Figure 5. Embryo development of stripped *W. attu* from fertilized egg; (a) Single-cell formation (fertilization), (b) Morula (2.15 h), (c) Blastula (3.05 h), (d) Gastula (8.30 h), (e) angled from the head and tail (11 h), (f) Nerula (12.15 h), (g) Backbone-forming but affected (13 h).

The present study revealed development stages quite similar to those reported by Prakoso *et al*. [13]. Figure 6 shows the findings of their development stage.

The affected egg is shown in Figure 7. The developmental events also do not seem to follow any regular or uniform time intervals from one stage to the other in the present study, and the same was reported by Ahmad [26].

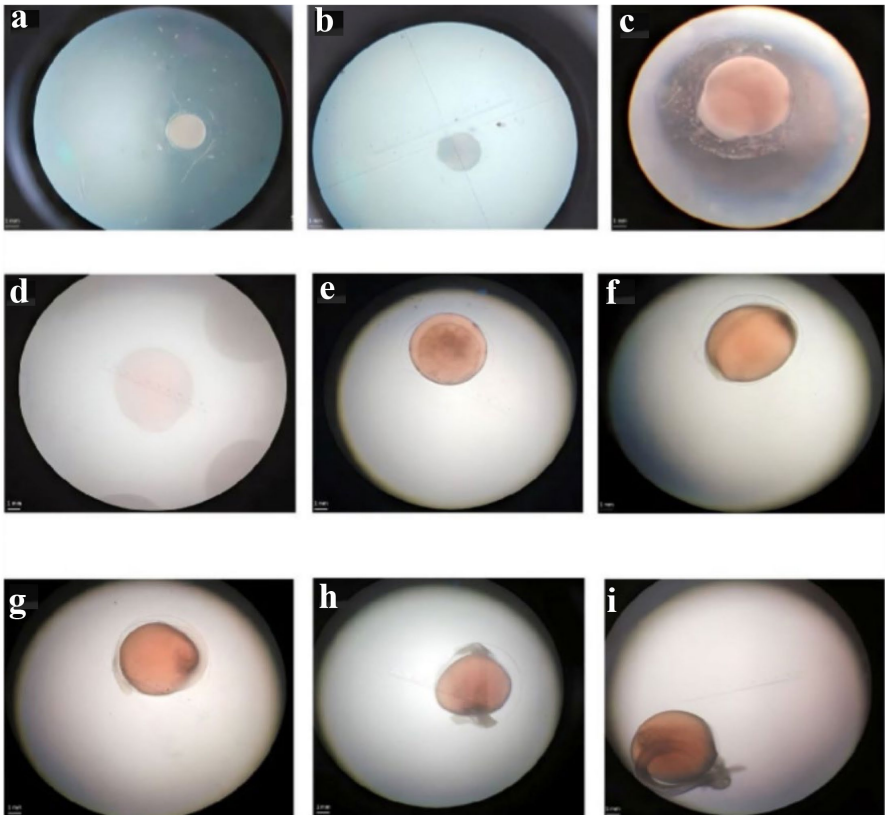

Figure 6. Embryo development of striped wallago catfish *Wallago leerii* from fertilized egg to larval hatching (a) Single-cell phase (fertilization); (b) Morula (2 h:23 min); (c) Blastula (3 h); (d) Gastrula (9 h:48 min); (e) Angled form, which would be the head and tail (10 h:9 min); (f) Neurula (11 h:34 min); (g) Backbone forming (17 h:19 min); (h) Arting of embryo movement (21 h:28 min); (i) Hatched larvae (26 h:23 min) (Source: Figure from Prakoso *et al*., [13]).

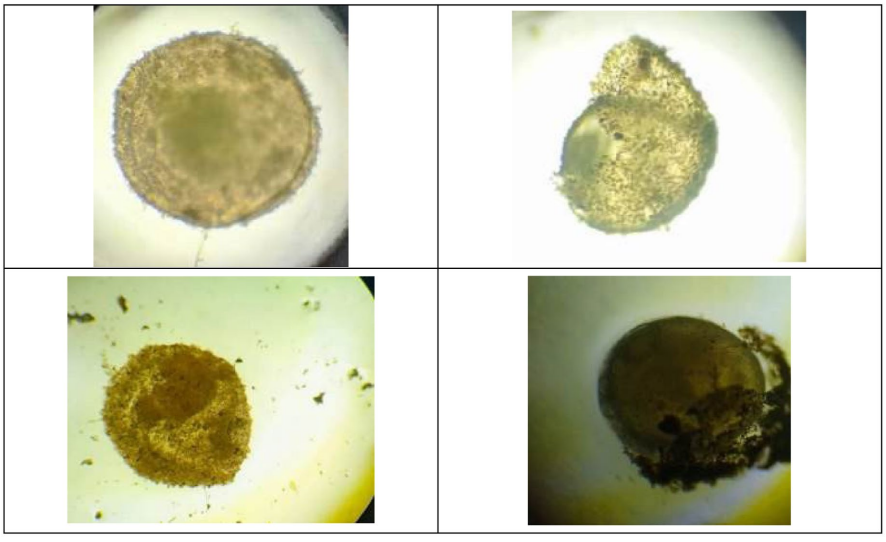

Figure 7. Observation of affected eggs under a microscope.

The results of this study reveal that hormone-induced breeding of *W. attu* in

captive conditions is possible and could lead to a new era in the country for aquaculture and conservation of this commercially important catfish species. On the basis of the present encouraging findings, further research should be conducted on the efficacy of different hormones at different doses and on the impact of water quality management on the breeding performance of *W. attu* for the development of complete technology for the breeding and seed production of this fish. Further research is needed for brood management, improvement and/or perfection of induced breeding techniques, larval food and rearing, and mass seed production.

Acknowledgements

All authors are much indebted to the editor and two anonymous referees for useful comments.

Data Availability Statement

All data are available on request from the authors.

Consent of Publication

All authors and their helping hand (identifiable in some images) have given their consent of publication.

Conflicts of Interest

The authors declare no conflict of interest.

References

[1] Stone, R. (2007) The Last of the Leviathans. *Science*, **316**, 1684-1688. https://doi.org/10.1126/science.316.5832.1684

[2] Talwar, P.K. and Jhingran, A.G. (1991) Inland Fishes of the India and Adjacent Countries. AA Balkema, 541 p.

[3] Mirza, M.R. (2003) Checklist of Freshwater Fishes of Pakistan. *Pakistan Journal of Zoology*, **3**, 1-30.

[4] Giri, S.S., Sahoo, S.K., Sahu, B.B., Sahu, A.K., Mohanty, S.N., Mukhopadhyay, P.K., *et al.* (2002) Larval Survival and Growth in *Wallago attu* (Bloch and Schneider): Effects of Light, Photoperiod and Feeding Regimes. *Aquaculture*, **213**, 151-161. https://doi.org/10.1016/s0044-8486(02)00012-1

[5] Parvez, M.T., Mohsin, A.B.M., Arnob, S.S., Lucas, M.C., Chaki, N., Khan, M.A.G., *et al.* (2022) Fish Diversity Decline in the Lower Gangetic Plains: A Victim of Multiple Stressors. *Biodiversity and Conservation*, **32**, 341-362. https://doi.org/10.1007/s10531-022-02505-7

[6] Patra, M.K., Acharjee, S.K. and Chakraborty, S.K. (2005) Conservation Categories of Siluroid Fishes in North-East Sundarbans, India. *Biodiversity and Conservation*, **14**, 1863-1876. https://doi.org/10.1007/s10531-004-1041-0

[7] Montaña, C.G., Choudhary, S.K., Dey, S. and Winemiller, K.O. (2011) Compositional Trends of Fisheries in the River Ganges, India. *Fisheries Management and Ecology*, **18**, 282-296. https://doi.org/10.1111/j.1365-2400.2010.00782.x

[8] Ng, H.H., de Alwis Goonatilake, S., Fernado, M., *et al.* (2019) *Wallago attu* (Errata

Version Published in 2020). The IUCN Red List of Threatened Species 2019: e.T166468A174784999.

[9] Kumar, R., Yadav, S.S. and Truipathi, M. (2014) Studies on Length-Weight Relationship for Seven Commercially Important Freshwater Fish Species of Gomti River Lucknow (U.P.) India. *International Journal of Fisheries and Aquatic Research*, **1**, 1-3.

[10] Tripathi, S.D. (1996) Present Status of Breeding and Culture of Catfishes in South Asia. *Aquatic Living Resources*, **9**, 219-228. https://doi.org/10.1051/alr:1996056

[11] Hoque, M.M., Rahaman, M.A., Bosu, A., *et al.* (2020) Length-Weight Relationships of *Wallago attu* from the River of Dakatia (Tributary of Meghna), Chandpur, Bangladesh. *Bangladesh Journal of Fisheries Research*, **19**, 59-66.

[12] Gupta, S.D., Reddy, P.V.G.K., Natarajan, E., Sar, U.K., Sahoo, S.K., Rath, S.C., *et al.* (1992) On the Second Breeding and Some Aspects of Culture of *Wallago attu* (Schneider). *Journal of Aquaculture*, **2**, 1-6. https://doi.org/10.61885/joa.v2.1992.156

[13] Prakoso, V.A., Arifin, O.Z., Cahyanti, W., Kurniawan, K., Irawan, D., Putri, F.P., *et al.* (2023) Evaluation of Hormonal Treatments on Bioreproductive and Physiological Parameters of Striped Wallago Catfish *Wallago leerii* during Domestication. *Aquaculture International*, **32**, 1801-1815. https://doi.org/10.1007/s10499-023-01244-y

[14] Rashid, S. (2005) Common Property Rights and Indigenous Fishing Knowledge in the Inland Openwater Fisheries of Bangladesh: The Case of the Koibortta Fishing Community of Kishoregonj. Ph.D. Thesis, Curtin University of Technology, 244 p.

[15] Liao, I.C. and Huang, Y.S. (2000) Methodological Approach Used for the Domestication of Potential Candidates for Aquaculture: Recent Advances in Mediterranean Aquaculture Finfish Species Diversification. *Proceedings of the Seminar of the CIHEAM Network on Technology of Aquaculture in the Mediterranean* (*TECAM*), **47**, 97-107.

[16] Solberg, M.F., Skaala, Ø., Nilsen, F. and Glover, K.A. (2013) Does Domestication Cause Changes in Growth Reaction Norms? A Study of Farmed, Wild and Hybrid Atlantic Salmon Families Exposed to Environmental Stress. *PLOS ONE*, **8**, e54469. https://doi.org/10.1371/journal.pone.0054469

[17] Solberg, M.F., Robertsen, G., Sundt-Hansen, L.E., Hindar, K. and Glover, K.A. (2020) Domestication Leads to Increased Predation Susceptibility. *Scientific Reports*, **10**, Article No. 1929. https://doi.org/10.1038/s41598-020-58661-9

[18] Prasad, H. and Desai, A. (2020) Fecundity, Spawning and Ova Diameter of the *Wallago attu* from Bhadar Reservoir of Gujarat, India. *Journal of Entomology and Zoology Studies*, **8**, 540-542.

[19] Absalom, K.V., Anpe, J.A., Igoche, L.E. and Okunsebor, S.A. (2017) Fecundity and Egg Size of *Clarias gariepinus* in Pandam Lake, Quan-Pan L.G.A. Plateau State, Nigeria. *IOSR Journal of Agriculture and Veterinary Science*, **10**, 19-22. https://doi.org/10.9790/2380-1004021922

[20] Prasad, H. and Desai, A. (2021) Gastro (Gsi) and Gonado Somatic Index (Gasi) of the *Wallago attu* from Bhadar Reservoir of Gujarat, India. *Journal of Natural Resource and Development*, **16**, 123-126.

[21] Alam, M.J., Begum, M., Pal, H.K., *et al.* (2008) Preliminary Success on Hormone Induced Captive Breeding of *Goldspot mullet*, *Liza parsia* (Ham.). *Bangladesh Journal of Fisheries Research*, **12**, 151-156.

[22] Pankhurst, N.W. and Munday, P.L. (2011) Effects of Climate Change on Fish Reproduction and Early Life History Stages. *Marine and Freshwater Research*, **62**, 1015-

1026. https://doi.org/10.1071/mf10269

[23] Tseng, M.C., Yang, D.H. and Yen, T.B. (2017) Comparative Study on Hatching Rate, Survival Rate, and Feminization of *Onychostoma barbatulum* (Pellegrin, 1908) at Different Temperatures and Examining Sex Change by Gonad and Karyotype Analyses. *Zoological Studies*, **56**, e16.

[24] Bidwell, C.A., Larry Chrisman, C. and Libey, G.S. (1985) Polyploidy Induced by Heat Shock in Channel Catfish. *Aquaculture*, **51**, 25-32. https://doi.org/10.1016/0044-8486(85)90237-6

[25] Nwosu, B.F.M. and Holzlohner, S. (2000) Influence of Temperature on Egg Hatching, Growth and Survival of Larvae of *Heterobranchus longifilis* Val. 1840 (Teleostei: Clariidae). *Journal of Applied Ichthyology*, **16**, 20-23. https://doi.org/10.1046/j.1439-0426.2000.00144.x

[26] Ahmad, N. (1944) On the Spawning Habits and Development of the So-Called Freshwaters Shark, *Wallago attu* (Bloch and Schneider). *Proceedings of the National Academy of Sciences*, *India*, **10**, 193-199.