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Arijit Chakraborty
[1] Nature Environment & Wildlife Society, 10, Chowringhee Terrace, Kolkata, West Bengal, India.
[2] Aquaculture Laboratory, Department of Zoology, the University of Burdwan, Golapbag, Bardhaman, West Bengal, India

Sujan Das
Nature Environment & Wildlife Society, 10, Chowringhee Terrace, Kolkata, West Bengal, India.

Indrojit Sarkar
Nature Environment & Wildlife Society, 10, Chowringhee Terrace, Kolkata, West Bengal, India.

Ajanta Dey
Nature Environment & Wildlife Society, 10, Chowringhee Terrace, Kolkata, West Bengal, India.

Milon Sinha
Nature Environment & Wildlife Society, 10, Chowringhee Terrace, Kolkata, West Bengal, India.

Corresponding Author:
Milon Sinha
Nature Environment & Wildlife Society, 10, Chowringhee Terrace, Kolkata, West Bengal, India.

Seed production of endangered Indian Magur, *Clarias magur* (Hamilton, 1822) in low cost model with community participation

Arijit Chakraborty, Sujan Das, Indrojit Sarkar, Ajanta Dey and Milon Sinha

Abstract
Captive breeding of Indian Magur has been standardized in the last decade. But, low-cost farmers-friendly model is yet to be standardized. One such on-farm trial was carried out at community level with necessary refinement of the existing technology where 5056 numbers of 1 inch Magur seeds were produced successfully in 29 days with 91.9% survival in the month of July, 2018 from one pair brood with 94% fertilization rate and 97.5% hatching rate. The result showed the model can be up-scaled. This paper deals with the detail of that model.

Keywords: Breeding, Magur, Larval rearing, Low-cost, Community

1. Introduction
Indian Magur (*Clarias magur*), is an IUCN evaluated endangered high valued catfish native to India, Nepal, Bhutan and Bangladesh [1]. It has high consumer preference in India and Bangladesh due to its inviting taste and medical diet value for having easily digestible protein, iron and low fat [1]. Therefore, fish farmers consider it as a choice species for diversification of their culture practice in eastern India, especially, in West Bengal as it fetches significant return to them. But, availability of Magur seeds in desired hours of stocking in desired quantity stands as a constraint to propagation of culture of this species as natural seeds of Magur have been sharply declining due to ecological imbalance in their natural breeding ground, low lying paddy field, caused by indiscriminate use of chemical fertilizer and chemical pesticides. Induced breeding of the species in captivity is therefore the only possible way to mitigate the problem. Few models have been developed for captive breeding of Magur but all these have a sizeable amount of cost involvement. Success in induced breeding and larval rearing of similar catfish *Clarias batrachus* in laboratory and well equipped farm level was achieved earlier [2-9] but labor-intensive low-cost farmers'-friendly model for production of small quantity seeds is yet to be standardized for rural small scale fish farmers. In endeavor to do the same, one model was developed refining the existing technology for an on-farm trial at Takipara Fishermen Co-operative Society (FCS), Balagarh, Hooghly, West Bengal, India, involving fishers' community with an aim to augment their alternative livelihood through Magur seed production in captivity in the context of their impacted livelihood caused by fishing ban due to declaring this zone of Hooghly river a Hilsa sanctuary as a part of Hilsa conservation strategy. Thus, this on-farm trial was a conservation linked livelihood development programme indirectly conserving Hilsa and directly conserving Magur, another threatened species, capacitating the resource-poor community and thereby creating a model for community based conservation linked livelihood practice using local resources.

2. Materials and Methods
Induced breeding of *Clarias magur* was performed using one pair of wild caught matured male and female fish weighing 110gm and 150 gm, respectively during July, 2018 at Takipara village in Balagarh Block, Hooghly District, West Bengal, India (Lat. $23^0\ 2^{/}\ 31^{//}$ N and Long. $88^0\ 26^{/}22^{//}$E) involving fishers community of this village following the standardized protocol of Mahapatra *et al.* [2] which they used for similar cat fish *Clarias batrachus* breeding. Female Magur was administered hormone (a combination of GnRH-A + Domperidone) @ 2ml/Kg body weight. Male Magur was administered no hormone. After the latency period when the

female brood fish was found ready for stripping anaesthesia was done using 2-Phenoxyethanol @ 0.2 ml/L of water. The male brood fish was also anesthetised in the same way before the orchiectomy. The orchiectomy of the male fish was done first and both lobes of testes were cut into pieces with a fine scissor and kept on a piece of nylon net placed on a small glass bowl containing 2 ml normal saline (0.9%) in order to extract milt drops by squeezing. The milt suspension is prepared by mixing the milt drops and saline thoroughly using a sterilized glass dropper. Then stripping of the female fish was done following dry stripping method. The water present on the body surface of the fish was soaked using a soft towel to avoid mixing of water with the eggs during stripping and before mixing of eggs with milt suspension. Female fish was hold with soft towel keeping the vent downward and gentle pressure was applied vertically downward with fingers for releasing eggs on a plastic tray. Immediately the milt suspension was mixed with eggs for fertilization. Then freshwater was added to activate the sperms. Incubation of fertilized eggs was done following the modified technology of Sinha *et al.* [8]. Fertilized eggs were spread over a soft net tray made with iron frame and net of 2 mm mesh size immersed in the flow-through glass aquarium having dimension of 60 cm x 30 cm x 30 cm where the water depth was maintained at 15 cm level (Fig. 1). The water used for egg fertilization and hatching was collected from a nearby tube-well and kept previously in a separate tank with provision of aeration using an aerator. The flow-through system (Fig. 1) was maintained by using siphon system from 200 L capacity plastic drum kept on wooden bench beside the incubation system with the help of polythene pipes of 6 mm diameter maintaining water flow rate of 0.8 L/min. The plastic drum was refilled manually in regular interval of 4 hours with the water which was stored previously in a separate tank with provision of aeration as mentioned earlier. Resultant hatchlings were kept in this flow-through system for five days. Then they were transferred into three bigger aquariums having dimension of 90 cm x 45 cm x 30 cm at a stocking density of 20 nos/L water. 100% water exchange was done and fecal matter was removed by siphoning twice a day. The feeding management was done following methodology described by Sinha *et al.* [8]. From the 4th day of post-hatch exogenous feeding with mixed zoo-plankton collected from ponds of the FCS was started. It was continued up to 7th day of post-hatch. From the 8th day finely chopped tubifex was supplemented with the zooplankton. From the 13th day feeding of whole tubifex was started which continued up to 28th day. Vit-C was added every day following Sinha *et al.* [8] and Dhara and Saha [10] into the aquariums @ 5mg/L of water after every water change. From the 4th day to 29th day continuous aeration was done in the rearing glass tanks with the help of an air-pump. Sponge filter were integrated with these aeration pipes. On the 29th day the produced fry were released in a grow-out pond of area 12 decimal having an average water height of 3 ft. The water quality parameters viz., pH, dissolved oxygen (DO) and total hardness were recorded during egg fertilization and egg incubation and also during larval rearing on daily basis. Water quality parameters such as hardness was analysed following the methods of APHA [11] and pH and DO were analysed using pH tester (model no. HI98107), Hanna instruments and portable Dissolved Oxygen meter (model no. HI9146), Hanna instruments, respectively.

a b

Fig 1: The low cost flow-through system developed for small scale farmers for egg incubation of *Clarias magur* (a - the flow-through system; b - the incubation tank with fertilized eggs)

3. Results and Discussion

After a latency period of 18 hrs the female fish was found ready for stripping in the present trial reestablishing the findings of the earlier workers [2, 12]. Approximately, 6,000 eggs were obtained during stripping. The fertilization rate was observed 94%. Approximately 5,500 larvae hatched out with a hatching rate of 97.5%. The fecundity of the female brood found in present trial was about 40,000 nos/kg body weight which was slightly lower than the findings of Das [12] but much higher than that of the findings of Sinha *et al.* [8]. The hatching rate observed in the present study was found to be similar with the finding of Sinha *et al.* [8] following their standardized modified technique for hatching. The hatchlings came out after 31 hrs of fertilization and congregated in the corners of the hatching tank. The incubation period of fertilized eggs for hatching found in this study was relatively higher than the findings of the others [2, 10, 12] possibly due to sudden temperature drop caused by rain at the late night. Commencement of air breathing was observed from 13th day of hatching and completed on 16th day of hatching when all the larvae start their aerial respiration. On the 29th day numbers of the produced fry were counted before releasing in the pond amounted 5056 in number with a survival rate of 91.9%. The high fry survival was ensured in this trial following the larval feeding technology standardized by Dhara and Saha [10] and Sinha *et al.* [8] and water quality management described by Sinha *et al.* [8]. The water quality parameters recorded during egg fertilization, egg incubation and larval rearing are furnished in the Table 1. The water quality parameters remained in favorable range due to sufficient water exchange and timely removal fecal matter. The 29th day old fry attained an average size of 3 cm/180 mg during this experiment. Photos of the hatchlings, 3-day old, 7-day old, 15-day old larvae and 21-day old and 29-day old fry are presented in Fig 2.

Table 1: Water quality parameters recorded during egg fertilization, egg incubation and larval rearing of *Clarias magur*

Parameter	Egg fertilization and incubation	Larval rearing
pH	7.6-7.8	7.6-7.8
DO (ppm)	6.52-6.74	6.88-7.46
Total hardness (ppm)	190	188-192

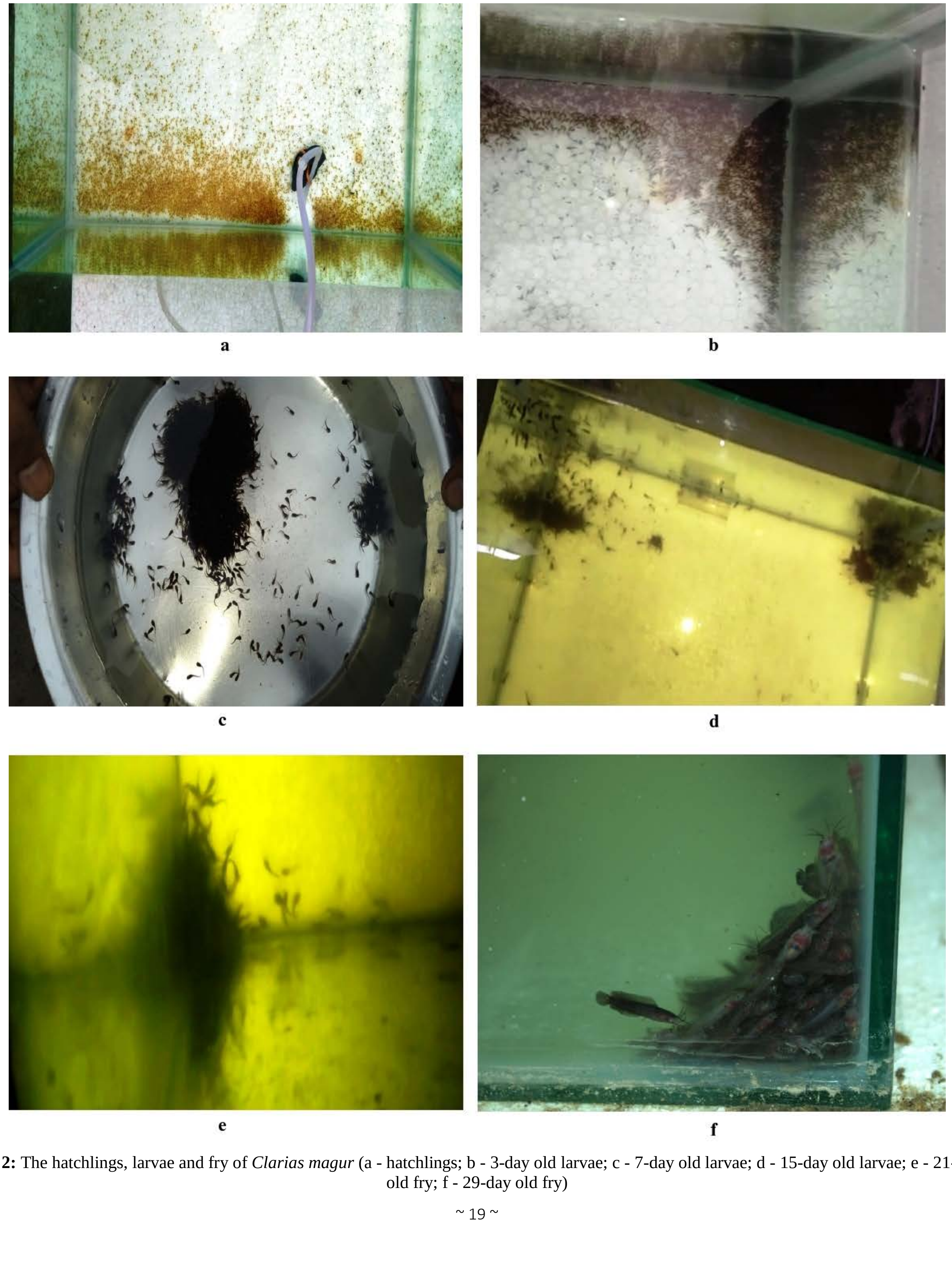

Fig 2: The hatchlings, larvae and fry of *Clarias magur* (a - hatchlings; b - 3-day old larvae; c - 7-day old larvae; d - 15-day old larvae; e - 21-day old fry; f - 29-day old fry)

4. Conclusion

The model came out with a significant techno-economic viability and can be up-scaled as a low-cost farmers'-friendly model. This type of extension research in aquaculture field is very much important for the developing countries like India, where rural fishermen communities will be benefitted by the production of high valued fish as a result of the transfer and implementation of the standardized aquaculture technique modified as per the area specific need and thereby contributing towards the increase in national fish production.

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