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An observation on the amazing self healing capacity of catfish Magur (*Clarias batrachus*)

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Abstract
The recommended technology for the artificial breeding of *Magur* (*Clarias batrachus*), requires sacrificing the male for collection of testis, stripping of the female and then dry fertilization with the sperm solution of the male. This process leads to mortality of the male unless special care is taken during dissection. The present communication includes observation on amazing self-healing capacity of dissected male *Magur* through tissue regeneration and its recovery after removal of testis, upon careful handling and minimum physical injury. This is the first report of its kind for this species.

Keywords: *Magur* (*Clarias batrachus*), stripping, dry fertilization, mortality, tissue regeneration.

1. Introduction
The ability of certain animals such as urodele amphibians and teleost fish to regenerate damaged tissues or lost organ of the body is a phenomenon that has puzzled scientists and philosophers for many years. While humans do not have similar capability to regenerate or reconstruct lost a body part, conceptual understanding of the natural mechanism of regeneration in such animals will pave the way for developing novel regenerative medical strategies for treatment of traumatic injuries in people. The present communication includes an amazing observation on the self-healing capacity of a catfish *Clarias batrachus* through regeneration of lost tissue.
The Asian catfish or walking catfish, *Clarias batrachus*, popularly known as ‘Magur’ in Assam is one of the most important native food fish species. Traditionally, this fish is used for therapeutic purpose in curing anaemic patients as well as for recovering patients after child delivery and chicken pox. Having a specialized organ for breathing atmospheric oxygen, this species has the capacity to remain alive for many hours out of water. This air breathing capacity of the fish helps traders to market the fish alive and hence fetch higher market prices in comparison to carps and other commercially important food fishes. In Assam the market price of the species is as high as Rs. 300-Rs 500 per kg during different seasons of the year. Although the fish is in high demand, the culture of the species has not been geared up due to non-availability of seed. In order to popularize the culture and breeding of *Magur*, the seed production of *Magur* through artificial breeding has been carried out at the Fisheries Research Centre, Assam Agricultural University, Jorhat, under the Mega Seed Project, funded by ICAR, since 2006. However, there is an inherent problem with this technology for which the farmers exhibit reluctance for adoption of same.
The technology of artificial breeding of *magur* which is in vogue (Annon 2005) requires stripping of the female and dry fertilization with the sperm solution of the male, for which the males are to be sacrificed. The females are administered with hormone and kept overnight, whereas the males are not subjected to hormone administration. For preparing the sperm solution, mature males are dissected to take out the testis. The collected testes are macerated with the help of a tissue homogenizer with physiological or normal saline (0.9% NaCl in distilled water) to prepare the sperm suspension. In the process of dissection, the males do not survive and are not in marketable condition which is why this technique is questionable whether it is economically and ecologically viable (Fig. 1-3). In the Fisheries Research Centre, Every year around 20-22 breeding operations are carried out, for which considerable number of male *Magurs* are to be sacrificed annually, which apparently have tremendous impact on the brood stock population in subsequent years.

Fig 1: The usual process of dissection of male *Magur* for removing the testes

Fig 2: Dissection of male Magur

Fig 3: Removal of testis

2. Materials and Methods

Keeping in view, the gradual decline in the number of *Magur* population, a trial on refinement of *Magur* breeding technology under Mega Seed Project was conducted at the Fisheries Research Centre during 2011-13, with some variations from the recommended technology which includes the probability of keeping the males alive after dissection. For achieving this, the mature males used for breeding were handled with care and dissection of the male was done with minimum physical injury to the fish. While dissecting, the scissors were inserted carefully through the vent and cut straight to about 4 cm in a more or less straight line to make it a slit like opening. Proper care was taken not to pierce the heart and to avoid damage to other blood vessels, surrounding muscle and organs. The developed testes were removed carefully using forceps though the slit like opening. Utmost care was taken to ensure minimum injury to the internal organs. After removal of the testes, the opening is tapped gently with fingers and then the fish was kept undisturbed in FRP tanks in about 20 cm depth of water for 40 days. Observation of behaviour of the fish, mortality, secondary infection, healing, duration of survival etc. along with water quality parameters were recorded.

3. Results and Discussion

It was observed that around 90% of the fishes remained alive. More surprisingly, it was observed that without any stitching or without any medication, the slit in the abdomen started healing after 4-5 days. No abnormal behaviour was observed in the fish during these days, while the wound gradually healed up. In the beginning of the process a thin membrane was observed covering the wound, which became thicker as the days went by and finally the slit was joined. Within 30-35 days, the process of self-healing was completed and the cut mark almost vanished, (Fig: 4-7). This amazing observation revealed that the fish has an astonishing capacity of self-healing through regeneration of damaged tissue. There may be some special component in this species which is responsible for this unique process of self-healing.

Fig 4: 7 days after dissection.

Fig 5: 13 days after dissection.

Fig 6: 30 days after dissection

Fig 7: 41 days after dissection

A review of literature revealed that in animals with regenerative ability, protective layers of tissue cover the site of injury and the cells underneath transform into progenitor or stem cells forming a growth zone termed as blastema. The blastema then generates the new cells of various kinds as per requirement by interacting with the epithelium of the wound [1]. Such regeneration process of limbs and heart in zebra fish has been reported recently by Anna Jazwinska and her team at the University of Fribourg, Switzerland. According to them, a protein known as Transforming Growth Factor beta (TGF-β) was responsible for signalling during the process of regeneration of heart in zebra fish. However, in case of fin regeneration in zebra fish, two different signalling molecules are responsible for the creation of progenitor cells, viz. Activin-βA and the insulin growth factor (IGF2b). While another report in the Regenerative Medicine News, published online, revealed that a protein called 'fgf' plays a major role in remarkable self-healing ability in fish. (Mowarh University's Australian Regenerative Medicine Institute (ARMI) -by Yona Goldsmith and Peter Curie). Understanding the genetic programming and signalling the mechanism for the formation of blastema and transformation of cells in the blastema into a pool of progenitor cells is fundamental for establishing such ability in humans.

4. Conclusion

While further studies are required to identify the component responsible for the self-healing capacity of *Magur,* and analyze its potential application for human benefit, the present findings can be regarded as a remarkable advantage for farmers performing the artificial breeding of *Magur*, as the dissected male fishes can be restocked after healing and can be used for fattening or marketing. Further studies on the fattening of the male *Magur* after revival, observation on regeneration of testicular tissue as well as identification of the responsible component of the self-healing process are being conducted at the Centre. This is the first report on remarkable self-healing capacity of this fish species *Clarias batrachus*.

5. References

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