Series 1 – Economic Pillar: Agriculture and Livestock

Enhancing Sustainability in African Catfish Seed Supply for Improved Production in Kenya

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Key Messages

Farmed catfish production is low due to poor survival of fry (larvae) reducing seed availability, forcing search for seeds from natural sources

Increases exploitation pressure on natural populations, exposes fishermen to health risks

Careful choice and management of catfish brood stock and improved husbandry could increase survival of fry and seed availability for farmers.

Context

African catfish, *Clarias Gariepinus*, is an important farmed food fish species in Kenya. It is also used as live bait to catch Nile perch in Lake Victoria using longline hooks and so increases food and nutrition security, income and national development. The daily demand of 3 million live bait samples required by fishermen on the Kenyan side of Lake Victoria is largely unmet by hatchery and fish farms. This is mainly because of inadequate supply of quality seeds for use by farmers to stock their ponds (Rasowo et al., 2007) and for fishermen in Lake Victoria to use as live bait for Nile perch. Limited availability and supply of farm-raised catfish seeds are due to poor survival of catfish fry (Sulem et al., 2006), with farmers losing up to 99.8 per cent of the seed material (Hogendoorn, 1980) mainly due to use of poor quality brood stock of unknown ancestry (Barasa et al., 2014) and poor husbandry practices by farmers (Musa et al., 2012; Barasa et al., 2017). This occasions low annual average production of farmed catfish.

Consequently, fish farmers and bait traders collect catfish seeds from natural habitats. This is environmentally unfriendly and increases exploitation pressure on seeds from the natural habitats to health risks. Additionally, the quality of catfishnatural populations of catfish, and exposes fishermen collecting catfish collected from the natural habitats is not assured, requisite numbers are not met in a reasonable time, and the practice constitutes a loss of income by catfish hatchery operators and farmers as well.

In contrast, artificial propagation of catfish at hatcheries reduces exploitation pres-sure on natural populations of indigenous fish species of the Lake Victoria basin (Kaufman and Ochumba, 1993), generates income and livelihood oppor-tunities for farmers (Barasa et al., 2017; Mkumbo and Mlaponi, 2007) as well as guarantees quality and adequate numbers of seeds.

Identification and isolation of high-quality catfish brood stock for use at hatcheries in artificial propagation in combination with improved husbandry for resultant fry could be a suitable strategy to increase the availability of farm-raised catfish seeds to support expanded aquaculture in Kenya. To maintain the quality of such brood stock, nuclei hatcheries should be developed, to manage this stock. Such hatcheries will be charged with artificial propagation of catfish larvae for sale to farmers, who should consistently maintain best management practices on their farms.

Mature African catfish, Clarias Gariepinus, *from a farm in Kenya (Photo: Author)*

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Approach and Results

The culture of C. gariepinus in Kenya is poorly organized, with the sourcing of seeds from the natural (wild) aquatic habitats whose quality is not known, or from farmer-owned nearby hatcheries whose stocks are of mixed origin, poorly maintained, and suffer poor genetic quality that deprives the stocks of vigour to grow and survive. Similarly, farmers hardly practice good catfish husbandry on their farms, further reducing the quality or vigour of the fish. This inevitably leads to cannibalism among the batch of catfish fry or larvae, increasing mortality among the fry hatched in a batch resulting in low annual farmed production of catfish in Kenya.

In a recent study, the high genetic quality of catfish was found to correlate with higher fitness (Barasa, 2018). For instance, catfish from Lakes Victoria and Turkana had higher genetic quality than those from Lake Baringo (Barasa et al., 2017). The Lake Victoria catfish showed higher fertility as a fitness characteristic than Lake Baringo catfish. Therefore, farmers will benefit from using populations of higher genetic quality as a source of broodstock, as this is likely to increase survival of fry, and so achieve sustainability in seed production and availability.

Also, the relationship between mean relative fertility and the expected Heterozygosity (a measure of genetic variability) of Clarias gariepinus populations from Lakes Victoria, Baringo and Kanyaboli were investigated (see Fig. 1). The Lake Victoria populations had higher genetic quality (higher heterozygosity) and higher fertility than Lake Baringo populations. High heterozygosity means lots of genetic variability. Low heterozygosity means little genetic variability that can be attributed to forces such as inbreeding.

Policy Recommendations

Short-Term

- Ensure proper husbandry practices in the rearing of catfish on farms and hatcheries.
- Avoid movement of catfish brood stock and seeds across drainage basins

Medium-Term

- Establish and maintain nuclei hatcheries to manage multiplication and distribution of quality catfish seed
- Certify the established nuclei hatcheries to ensure best practices are used in seed multiplication.

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References

Barasa, J. E. (2018). Genetic diversity, Population structure and influence on life-history traits. PhD thesis, University of Eldoret, October 2018. 214 pages.

Barasa, J. E., Abila, R., Grobler, J. P., Dangasuk, O. G., Njahira, M. N. and Kaunda-Arara, B. (2014) Genetic diversity and gene flow in African catfish, Clarias gariepinus (Burchell 1822) from Lakes Victoria and Kanyaboli. African Journal of Aquatic Science, 39(3): 287-293.

Barasa, J. E., Mdyogolo, S., Abila, R., Grobler, J. P., Skilton, R. A., Bindeman, H., Njahira, M. N., Chemoiwa, E. J., Otto G. D., Kaunda-Arara B and Verheyen, E. (2017). Genetic diversity and population structure of the African catfish, Clarias gariepinus (Burchell 1822) in Kenya: implication for conservation and aquaculture. Belgian Journal of Zoology, 142 (2): 105-127.

Hogendoorn, H. (1980) Controlled propagation of the African catfish, Clarias lazera. III. Feeding and growth of fry. Aquaculture, 21: 233-241.

Kaufman, L. and Ochumba, P. (1993). Evolutionary and conservation biology of cichlid fishes as revealed by faunal remnants in the Northern Lake Victoria. Conservation Biology, 7 (3): 719-730.

Mkumbo, O. C. and Mlaponi, E. (2007). Impact of the baited hook fishery on the recovering endemic fish species in Lake Victoria. Aquatic Ecosystem Health and Management, 10 (4): 458-466.

Musa, S. M., Aura, C. M., Ngugi, C. C. and Kundu, R. (2012). The effect of three different feed types on growth performance and survival of Clarias gariepinus fry reared in a hatchery. ISRN Zoology, 2012: 1-6.

Rasowo, J., Oyoo, E. O. and Ngugi, C. C. (2007). Effects of formaldehyde, sodium chloride, potassium permanganate, and hydrogen peroxide on hatch rate of African catfish, Clarias gariepinus, eggs. Aquaculture, 269: 271-277.

Sulem, Y. S., Tomedi, E. T., Mounchili, S., Tekeng, S. and Brummet, R. S. (2006). Survival of Clarias gariepinus fry in earthen ponds: effects of composts and leaks. Aquaculture, 260 (1-4): 139-144.

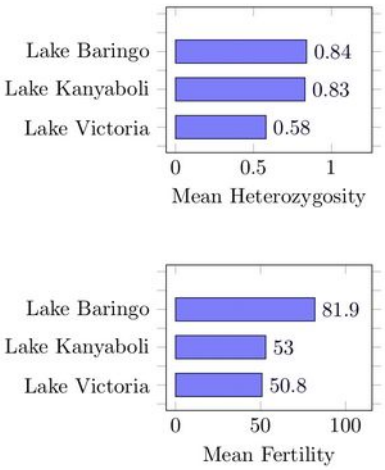

Figure 1: Comparison of mean relative fertility and the expected heterozygosity (a measure of genetic variability) of Clarias Gariepinus *populations*

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