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Unlocking Potentials of African Lungfish to Improve Nutrition and Livelihoods in Uganda

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Domestication research preserves wild populations



AquaFish researchers examine a lungfish on-site in Uganda (Photo courtesy of John Walakira).

The African lungfish (*Protopterus aethiopicus*) is an indigenous, air-breathing, freshwater fish that is endemic to the great lakes region of Kenya, Uganda, Democratic Republic of the Congo, Rwanda, and Tanzania. As a food fish, lungfish has high nutritional value and a desirable flesh quality that is preferred by many local people in Uganda and throughout East Africa.

Due to high demand, natural lungfish stocks are declining from overexploitation. Environmental degradation and the large-scale conversion of wetlands to agricultural land have imposed additional pressures on natural lungfish populations. Traditionally, fish farmers have collected young lungfish from the wild and raised them in small ponds. This practice is not environmentally sustainable and has resulted in low fish yields. Therefore, the development of sustainable lungfish aquaculture will help ensure a more reliable supply, better economic gains, and more efficient use of Uganda's natural resources.

Several earlier attempts to domesticate lungfish have been made, but have been met with little success. Further, attempts at captive breeding have not been well documented. Lungfish domestication is complex and requires an understanding of physiological and other characteristics that are not yet well understood, including spawning season, reproductive hormone profiles, egg quality and maturation, fecundity, size at sexual maturity, sex plasticity, and expected sex ratios of offspring.

In collaboration with the National Fisheries Resources Research Institute (NAFIRRI) under the National Agriculture Research Organization (NARO) in Uganda, the AquaFish Innovation Lab has been working to develop culture technologies that will guide lungfish domestication in the East Africa region. Initial attempts to raise wild-caught lungfish fingerlings (~10g) revealed that they accept sinking pellets. This feeding method increased fish growth and survival rates increased to about 60%. These promising results provided key insights, considering that previous lungfish producers achieved survival rates of less than 15%.

The AquaFish IL team of scientists from NAFIRRI, Biosciences eastern and central Africa – International Livestock Research Institute (BeCA-

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ILRI) in Kenya, Auburn University, North Carolina State University, and Oregon State University in the US have generated information that will inform lungfish breeders and conservationists. Reproductive studies have indicated that lungfish have an asynchronous female organ that ovulates 200-500 oocytes per spawn with seasonal peaks associated with rainfall periods. Studies investigating breeding methods showed that wild caught and ripe lungfish broodstocks are able to spawn in captivity if subjected to the synthetic hormones, human chorionic gonadotropin (HCG) and luteinizing hormone-releasing hormone (LHRH); and fertilized eggs will hatch optimally at 27-30 °C. Rearing and growth studies determined larvae weaned to artificial and live diets on the 16th day post hatch were most successful when the digestive system is fully developed. This study also found that if graded to the same size, lungfish fry grow well on a protein-rich (>45%) commercial diet.

This novel research has built up the knowledge base for sustaining lungfish populations in Uganda and has provided a foundation for lungfish culture in East Africa. The development of sustainable lungfish aquaculture practices will contribute to national food security, reduce fishing pressures on wild lungfish populations, and economically empower fishing communities and fish traders (especially women) who derive livelihoods from aquaculture products. Furthermore, information generated from this work will inform policies that will conserve lungfish biodiversity in East Africa.