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Research Application Summary

Reproductive biology and cryopreservation of milt of *Alestes baremoze* (Joannis, 1835) of Lake Albert, Uganda

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Abstract

This study is designed to generate knowledge relevant to the domestication, breeding, production and propagation of *Alestes baremoze* fish species in captivity through artificial spawning and *in vitro* fertilization. The study aims at broadening the scope of cultured fish in Uganda which currently is limited to two major species; the Nile tilapia (*O. niloticus*) and the African catfish (*C. gariepinus*). Successful cryopreservation of *A. baremoze* milt and recovery of the male genome for *in vitro fertilization* will be a starting point for conservation of this fish species. The next step following successful cryopreservation will be to recommend to policy makers the establishment of gene banks in anticipation for future restocking of the depleted fisheries resources. Further, this study will act as an initial step to future studies involving hybridization experiments and/or employing recent biotechnological advances in chromosome engineering and transgenesis.

Key words: African catfish, *Alestes baremoze*, artificial spawning, Uganda

Résumé

Cette étude est conçue pour produire de la connaissance concernant la domestication, l'élevage, la production et la propagation des espèces de poissons *Alestes baremoze* en captivité par reproduction artificielle et par fertilisation in vitro. L'étude vise à élargir la portée du poisson élevé en Ouganda qui actuellement n'est limitée qu'à deux espèces principales : le tilapia du Nil (*O. niloticus*) et le poisson moustachu Africain (*C. gariepinus*). La cryopréservation réussie du sperme de l'espèce *A. baremoze* et le rétablissement du génome mâle pour la fertilisation in vitro seront un point de départ pour la conservation de cette espèce de poisson. La prochaine étape poursuivant la cryopréservation réussie sera de recommander aux décideurs politiques l'établissement des banques du gène afin d'anticiper le futur réapprovisionnement des ressources

de pêche épuisées. De plus, cette étude apparaitra comme une étape initiale aux futures études concernant les expériences d'hybridation et/ou utilisant des avancées biotechnologiques récentes dans la technologie et la transgénèse de chromosomes.

Mots clés: Poisson moustachu Africain, *Alestes baremoze*, reproduction artificielle, Ouganda

Background

Alestes baremoze (Joannis, 1835), also known as *Angara (Ngara),* is a highly prized fish which forms part of the special dish of the Bagungu community, Bakobya, Banyoro, Acholi, Alur and other West Nile tribes of Uganda. Unprocessed fresh fish fetches approximately US$ 5.0 at landing sites and US$ 7.5 in urban centres including the city of Kampala. The fish is also of great interest to sport fishing tourists of the Murchison Falls National Park. Although this fish has great commercial and tourist significance, its aquaculture potential remains untapped. This is despite reports that its catch levels (Proude, 1984; Nambooze, 2008) and mean length (Worthington, 1929; Namulemo, 2009) have immensely declined.

The decline in *A. baremoze* fish catches and the drop in the mean length of these catches are most probably due to increased fishing pressure from a growing human population, the harmful effects of the predatory native *Lates niloticus* (Nile perch) and the possibility of emigration by *A. baremoze* to the protected parts of the Victoria Nile within the Murchison Falls National Park. Faced with the declining fish species diversity and reduced fish catches in L. Albert, the fishing communities have resorted to poaching in the park at the risk of being shot and killed. There is need, therefore, to devise strategies for aquaculture and/or conservation of *A. baremoze* in the wild. This study, which is looking at the reproductive biology and cryopreservation of milt of *A. baremoze,* is designed to contribute towards the development of these strategies. Through evaluation of various extenders and cryoprotectants, this study will lead to the establishment of cryopreservation protocols for *A. baremoze* semen thus facilitating the establishment of gene banks.

Literature Summary

In Uganda, *A. baremoze* is found in Lake Albert and in the Nile River. Lake Albert is now facing multiple environmental changes including declining fish species diversity, hyper-eutrophication, hypoxia, and reduced fish catches (Campbell *et al.*, 2005). The number of fish types has reduced to 40 (Namulemo *et al.*, 2009) from 46 species recorded by Greenwood (1964). Since there is

no indication in literature that Greenwood probably misrepresented sub-species as true and distinct species, it is postulated that some species have become extinct. *A. baremoze* catch figures have dropped to less than 0.1% (Nambooze, 2008), a worrying figure from 75-85% as reported by Proude (1984).

Figure 1. *Alestes baremoze* (Larsen, J.H) .

The mean length for *A. baremoze* has also dropped by 50% (Worthington, 1929; Namulemo *et al.*, 2009). This decline is probably due to increased fishing pressure and/or the predatory effects of the *L. niloticus*.

Study Description

A longitudinal study will be carried out in the delta regions of two inflowing rivers of L. Albert; Waki and the Victoria Nile, that are located approximately 40 km apart. Two study sites shall be selected, one in the Waki delta region near Butiaba port (01°50'N 31°20'E) and the other within the Victoria Nile delta (2°14'N 31°26'E) at Wanseko.

The first phase of the study will involve sampling for *A. baremoze* in its natural environment in order to establish the current biological and environmental benchmarks for culture and possible future propagation. The second phase will involve production of cryopreserved semen, artificial breeding experiments and, evaluation of fertility and hatching rates at an aquaculture facility in Uganda.

Research Application

By the end of this study, the temporal breeding patterns of *A. baremoze* and abiotic factors that can be attributed to *A. baremoze's* breeding activity will be determined. Further, a non-lethal approach to prediction of spawning activity and cryopreservation protocols for *A. baremoze* milt will be established.

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