

## **INCREASING FRY SURVIVAL IN NATURAL FOOD-BASED CARP (*Cyprinus carpio*, L.) HATCHERIES IN MADAGASCAR: AN EXOGENOUS FEED EXPERIMENT**

Jean-Michel Mortillaro\*, Antsa Rafenomanjato, Julie Mandresilahatra, Modestine Raliniaina

ISEM, Univ Montpellier, CNRS, IRD, CIRAD, Montpellier, France  
FOFIFA DRZVP, Rue Farafaty, Ampandrianomby, Antananarivo, Madagascar  
jean-michel.mortillaro@cirad.fr

In Madagascar, fry shortage is one of the major constraints of fish farming development. Large hatcheries fail to sufficiently supply fish growers with fry due to little road development and remoteness of production areas. Thus, farmers mainly rely on small scale hatcheries selling their production in the neighbourhood. After hatching, carp fry are usually reared in rice fields or ponds of 100 – 10 000 m<sup>2</sup> and rely almost completely on natural productivity. However, this system suffers from large mortalities at the larval stage, resulting in the harvest of few thousand marketable carp fry despite the high natural fecundity of female carp. Two hypotheses were made, based on participatory research with farmers, suggesting i) feed shortage and, ii) predation by invertebrates and other aquatic fauna, as the main drivers. Regarding the first hypothesis, it was thus expected that feeding carp fry would significantly increase the survival rates and fish growth.

An on-farm experiment was conducted during two breeding campaigns in which the effect of a soybean and maize flour combination (SM) and commercial fry feed were compared to a control treatment without exogeneous feed inputs. Commercial feed used in the experiment (LFL®, tilapia starter fry feed) consisted of 43% proteins and 6.5% lipids content while the SM feed was estimated to reach a 30% protein content. Fish were fed twice a day by the fish farmer throughout the 45 d of the experiment. Feeding was stopped and postponed in case no fish feeding activity was observed to avoid waste. The three treatments were replicated in a total of 15 small scale hatcheries within the two breeding campaigns, where farmers acted as research technicians for all activities. The experiment was completed by a carbon and nitrogen stable isotopes analysis in order to characterize the food web relationships between carp fry, feeds and the aquatic fauna collected at harvest.

Fry production reached 5±8, 15±16 and 22±19 individuals/m<sup>2</sup> in the control, the SM and commercial fry feed treatments, respectively. Thus, compared to the control treatment, exogenous feed supplement increased fry survival. A difference between SM and the commercial fry feed was not confirmed by statistical analysis probably given high standard deviation. No difference in carp fry size was observed between the three treatments, although a bigger size for the fed fry was expected. However, stable isotopes suggested little contribution of the exogenous feed to the overall food web over the 45 d of experiments. Our study confirmed the opportunity to increase fry survival rate for small scale hatcheries in Madagascar through feed supplementation. However, although exogeneous feed improved fry production, its contribution and assimilation by carp fry is called into question and will require further investigation.