

## CHARACTERIZATION AND FARMERS' PERCEPTION ON AQUATIC FAUNA PREDATION IN MADAGASCAR SMALL-SCALE FRY HATCHERIES

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, common carp fry (*Cyprinus carpio*, L.) are produced in rice fields or ponds of small-scale hatcheries. These hatcheries suffer from small yield production despite the high fecundity of common 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. For the latter hypothesis, a characterization of the aquatic fauna, their trophic interactions and farmers' perception was provided. Most of small-scale hatcheries in Madagascar are located in the countryside, without a setup to avoid the introduction of invertebrates and other aquatic fauna, such as tadpoles and other fish species, through flying, crawling or through the water supply. In the hatchery, they compete for food or act as predators, therefore threatening fry production.

Insects were collected in 16 hatcheries in 2019. Their frequency and density were measured and life cycles studied in order to assess the risk displayed by each taxa. Farmers' perception of the risk displayed by each taxa was then evaluated through surveys with a total of 42 respondents. Lastly, characterization of the food web relationships was jointly performed in an experiment assessing the first hypothesis on feed availability through carbon and nitrogen natural stable isotopes.

The results showed that the dominant group are *Amphibian* larvae (tadpoles), *Notonecta* (backswimmer), *Odonata* larvae (dragonfly larvae), *Coleoptera* adult/larvae (diving beetle), and *Gambusia* (mosquitofish). According to farmers, the most troublesome group are diving beetle larvae, dragon fly larvae and *Nepa* (water scorpion) due to their predation behaviour on fish larvae and fry as well as backswimmers by predation on fish eggs and during larval stage. Tadpoles are not considered as predators but as a highly competitive group for natural productivity and fry feed. The marbled crayfish (*Procambarus virginalis*) is also considered as a pest by some hatcheries given their burrowing behaviour resulting in water leakage of ponds. Farmers' perception was in general in accordance with literature with respect to aquatic fauna behaviour and life cycles. However, depending on the species, tadpoles may also be considered as predators as suggested by the stable isotopes analysis. Aquatic fauna identified in Madagascar small-scale hatcheries are also commonly found in waterbodies of other tropical countries. An exception is the marbled crayfish which is present in Madagascar but not yet in other tropical areas. Thus, the current study helped to identify the main groups of aquatic pests to be targeted in order to improve common carp fry production in Madagascar. Several methods are already adopted by farmers to suppress troublesome aquatic pests but none seems to yield a satisfactory result yet. However, the use of larvae protection such as happa nets is a sustainable method, avoiding ecological negative impacts on insects' populations. Further research is needed to characterize tadpole species and trophic behaviour.