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Boophis pyrrhus. Photo by: Jörn Köhler

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Urban Amphibians and the Challenges They Face

The Harlequin Mantella *Mantella cowanii* in Antoetra Region, High Plateau of Madagascar: New Steps in Conservation

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Fig. 1. Fohisokina (or Vohisokina) Massif, selected habitat of *Mantella cowanii* in the Antoetra region, with view of the artificial lake where carp are bred for local consumption.

Since 2008, the conservation program of the Harlequin mantella (*Mantella cowanii*) in Fohisokina site (or Vohisokina), located in the Antoetra Region (Fig. 1), is moving on and scheduled activities are currently shared with the local association "Fohisokina Miaro ny Sahonamena" (= "Fohisokina protects the red frog," abbreviated FOMISAME) to get a better protection of the site following the species action plan (*1*). Positive results are now evident and actions need to be continued and reinforced.

Population monitoring

One of us (M. A.) is carrying out her PhD thesis at the University of Antananarivo. The study concerns several aspects the ecology, distribution and population abundance of *M. cowanii* in Fohisokina. The used technique consists of catching the encountered individuals by quadrat sampling. The survey is usually carried out in the early morning (h. 05:00-09:00) before the temperature rises too much, and when frogs are more active. Each individual is photographed and recognized by checking its belly pattern (Fig. 2). In 2012 the total number of captured individuals of *M. cowanii* was 191 within a 2,500 m^2 surface. The consequent estimation is around 750 individuals per hectare. This number suggests a positive evolution of the population when compared to data at the beginning of the conservation activities in 2008, when only 40 individuals were counted. Furthermore, regular ecological citizen-based surveys carried out by trained guides of FOMISAME were done every day in the warm-rainy season (October-April). This activity also supported the program on the patrol against illicit activities (i.e., gold mining extraction) within Fohisokina. Twice a year a session of the chytrid monitoring action is also being done (*2*).

Fig. 2: Belly pattern of *Mantella cowanii*, used to recognize the individuals.

Fig. 3: School construction under progress.

Communication and public awareness

A booklet narrating the history of Fohisokina was published in 2011 by ASG and FOMISAME with the financial help of Conservation International Madagascar (*3*). It has been developed to increase the knowledge and the importance of the Fohisokina area to people. This handbook has been distributed to schools around Fohisokina and now it is used as a manual (book) in the Ivato municipality. In addition, footage was realized in 2012 with the help of CI, reporting the chronicles of the conservation program on *M. cowanii* with the participation of the local population in Fohisokina. A school building is currently under construction in the Ampadirana village around Fohisokina (Fig. 3). This construction is funded by the NGO, Man and The Environment.

Plant nursery and water quality

Fifteen hundred essential oil plants belonging to the species *Ravensara madagascariensis* were planted around the core site. The aim of this plantation was to improve the livelihood of local populations and mitigate the impact of climate change caused by bushfires. Moreover, the native

Haroungana madagascariensis was planted and cultivated in the buffer zone, close to the core of *M. cowanii* site.

The water sources from Fohisokina supplies an artificial 1-hectare fishpond (carp) realized in 2009 (Fig. 5). This was done as a measure of compensation and to generate revenue. In 2013 the local community has begun to profit from the first production of carp through conservation of the water services.

The water quality is another aspect related to *M. cowanii* conservation. A study to help better understand the hydrographic watershed quality in Fohisokina was completed in February 2013 by a student from Antananarivo University. The objective was to get physico-chemical indications of the pollution level according to potability and drinking water legislation of Madagascar. Fohisokina has five permanent sources for which the main physico-chemical factors were analyzed, as well as quantitative hydrological factors (i.e., temperature, depth, river bed and flow speed).

This fieldwork suggests the water in Fohisokina has good physico-chemical qualities upstream according to Malagasy legislation drinking standards, but still needs microbiological analyzes to understand whether it is potable. The source surface is still covered by plants and mosses, herbs and forest relicts. In contrast, the downstream water is progressively bad due to the degradation of the environment by bushfire and erosion during the rainy season; this increases the turbidity of the water and contamination.

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Fig. 4: First carp production from Fohisokina fishpond.