New Action Plan
*Mantella cowanii* 2021-2025

Report from the workshop
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New Information
To provide new information to update this report of the workshop for the action plan, or correct any errors, e-mail: Gerardo Garcia, g.garcia@chesterzoo.org

Mantella cowanii New Action Plan Workshop Report
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**ACRONYMS AND ABBREVIATIONS**

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<thead>
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<th>ACSAM</th>
<th>A Conservation Strategy for the Amphibians of Madagascar</th>
<th>IUCN SSC ASG</th>
<th>Madagascar Amphibian Specialist Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bd</td>
<td><em>Batrachochytrium dendrobatidis</em></td>
<td>MATE</td>
<td>Man and the Environment / L’Homme et l’Environnement</td>
</tr>
<tr>
<td>BIODEV</td>
<td>BIODEV International Environment consultancy agency</td>
<td>MEDD</td>
<td>Ministère de l’Environnement et du Développement Durable</td>
</tr>
<tr>
<td>CEPF</td>
<td>Critical Ecosystem Partnership Fund</td>
<td>MV</td>
<td>Madagasikara Voakajy</td>
</tr>
<tr>
<td>CI</td>
<td>Conservation International</td>
<td>MISA</td>
<td>Association Miaro ny Sahona</td>
</tr>
<tr>
<td>CISCO</td>
<td>Circonscription Scolaire</td>
<td>Mitsinjo</td>
<td>Association Mitsinjo</td>
</tr>
<tr>
<td>DREED</td>
<td>Direction Régional de l’Environnement et du Développement Durable</td>
<td>VOI</td>
<td>Vondron'Olona Ifotony / Community Association</td>
</tr>
<tr>
<td>IGA</td>
<td>Income Generating Activity</td>
<td>WCMC</td>
<td>World Conservation Monitoring Centre</td>
</tr>
<tr>
<td>IUCN</td>
<td>The International Union for Conservation of Nature</td>
<td>ZAP</td>
<td>Zone d’Administration Pédagogique</td>
</tr>
</tbody>
</table>

**GLOSSARY**

**Anthropogenic:** Caused by humans or their activities.

**Bd:** *Batrachochytrium dendrobatidis.* A microscopic disease-causing fungus affecting amphibians worldwide, contributing to population declines and extinctions.

**Candidate (species):** A species identified (i.e., thanks to morphological and/or genetic analysis), but not yet formally described.

**Climate change:** Significant changes in global temperature, precipitation, wind patterns and other measures over several decades or longer due to human activities.

**Dina:** A set of local customs and social norms for managing natural resource use.

**Endemic:** An animal/plant whose distribution is restricted to a certain geographic area.

**Fomisame:** Fohisokina Miaro ny Sahonamena, the local community group managing the Fohisokina / Vohisokina site

**Habitat:** The place or environment where a plant or animal naturally or normally lives.

**Hybrid:** An animal or plant derived from the mating of two different species.

**Savannah:** Open grasslands, usually with scattered bushes or trees

**Pet trade:** The trade of wild animals for human pleasure or companionship.

**Syntopy:** The joint occurrence of two species in the same habitat at the same time.

**Sympatry:** Term used to describe populations, varieties, or species that occur in the same place at the same time.

**Tavy:** Slash-and-burn-agriculture, one of the main causes of deforestation in Madagascar.
SUMMARY

The Harlequin mantella, *Mantella cowanii*, is likely one of the most threatened Malagasy amphibians. This striking iconic *Mantella* species has a very scattered range, and none of its known populations is currently included in any protected area. Until 2003 has been collected unsustainably for the pet-trade. Studies on *M. cowanii* were began in 1995 by BIODEV International, confirming the restricted distribution of this frog. The results of this study led to the inclusion of this species in Appendix II of CITES and ultimately a total suspension of export of live wild specimens from Madagascar applied in 2003. Further field studies in the early 2000s confirmed that collection for the pet trade still posed an important threat to the species, along with habitat loss and degradation primarily caused by land conversion to slash-and-burn agriculture (the so-called tavy). Furthermore, erosion of genetic identity by hybridisation with *M. baroni* at a site close to Antoetra (where the two species occur syntopically) was also confirmed. All these data led to the identification of *M. cowanii* as a species in need of immediate conservation and classification. This workshop and consequent new action plan summarises the current state of knowledge of the *Mantella cowanii* population status, its taxonomy and ecology, and of the threats facing it, and describes the institutional framework for conservation management in Madagascar. It lists the key stakeholders in the action plan, and the vision, goals, objectives, and activities. Each activity has a responsible institution(s), an approximate costing, a time, frame and key risks and opportunities in achieving it.

The strategic mission is “Ensure the conservation of *Mantella cowanii* in its natural habitat through the transmission of knowledge for a sustainable development in respect of the environment”.

ACKNOWLEDGEMENTS

The authors would like to thank the following for their help in enabling and producing this document and the new action plan for *Mantella cowanii*.
In Madagascar we are grateful to many people who assisted us during the implementation of actions oriented towards the conservation of the amphibians of Madagascar. To the involved ministries for having, for their administrative support and assistance in organising and hosting the workshop in Ambositra and supported the scheduled conservation actions.
Outside Madagascar our thanks to Jade Newton-Youens for sharing her unpublished data and information during the studies in Madagascar.
Special thanks to Chester Zoo and the Critical Ecosystem Partnership Fund (CEPF) funding the workshop allowing all participants to contribute in this project.
THE NEW ACTION PLAN 2021-2025

Justification

With 365 described species and at least other 200 candidate new species of frogs (Vietes et al., 2009; Perl et al, 2014) Madagascar is one of the countries with the highest amphibian diversity, containing close to 7% of global amphibians. All the species (excepting three introduced ones) are exclusive to Madagascar and several are microendemic, with small, sometime extremely small, areas. Habitat destruction and degradation are currently the major threats to the unique frog diversity of Madagascar, together with climate change, emerging diseases and invasive species (Andreone, 2008; Andreone et al., 2005, 2008; Stuart et al., 2004).

To find a strategy to fight this multiple threats, two workshops entitled “A Conservation Strategy for the Amphibians of Madagascar” (ACSAM) were held in Madagascar in 2006 (Antananarivo) and in 2014 (Ranomafana). The aim of these workshops was to implement the global Amphibian Conservation Action Plan (ACAP) on a regional scale, with the aim to conserve the amphibian fauna of Madagascar (Andreone, 2008; Andreone et al., 2016). These workshops led to the development of the “Vision Sahonagasy” (“sahona” in Malagasy means “frog”, while “gasy” is a contraction of “Malagasy”) for the conservation of Madagascan amphibians, implemented through the Sahonagasy Action Plans in 2008 and 2016 (Andreone & Randriamahazo, 2008) Andreone et al., 2016).

Some species of frogs are also worth of particular attention, since they are known by people and amphibian conservation. Beside the well-known golden mantella (Mantella aurantiaca), tomato frog (Dyscophus antongilii) and the harlequin mantella (M. cowanii) deserves particular attention. This wonderful species, characterized by a sharp black and red colouration, is currently only known from a small number of scattered localities in the Haut Plateau of Madagascar.

This action plan aims to sets out the “Vision Sahonagasy” at a species-specific level, bringing together historic and ongoing research on M. cowanii as well as the experience of experts to develop a comprehensive assessment of the conservation status and threats faced by this species. By doing this, the action plan aims to mitigate the threats faced by M. cowanii and assure its future survival.
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In December 2018 a two-day workshop (4th to 6th) was hosted in Ambositra which aimed to develop the New Action Plan for *Mantella cowanii*. The species is found in high altitude forests and grassland savannas, and is most active during the rainy season. Threats include exploitation for the international pet trade as well as deforestation, which has left its habitat fragmented and, in some areas, completely lost. *Mantella cowanii* is classified as Endangered by the IUCN and planning is needed to support further conservation actions.

The meeting was established under the umbrella of the Action Plan Sahonagasy 2016-2020, the Ministère de l’Environnement et du Développement Durable and in conjunction with the IUCN Amphibian Specialist Group for Madagascar. The focus of this workshop was centralised on four main themes; *in situ* conservation, *ex situ* conservation strategies, research and funding.

The two-day action planning workshop was attended by representatives of 18 organisations and associations, with a total of 30 participants. The action planning involved different stakeholders including individuals from Malagasy government, local communities and international organisations interested in developing and supporting conservation actions for *Mantella cowanii* in Madagascar.

The workshop began with a first session composed of nine presentations related to the four core themes, updating the work that has been done to date with the species. This was followed by a general discussion which led to a group activity identifying the threats for the species. With the threats identified between groups, they then set out to bring solutions to them. The participants continued working in small groups and on plenary activities identifying the Vision, Objectives and Actions for the species. Once these actions were determined the exercise was finalised by identifying the partners involved, an actions prioritisation exercise and an estimation of budget. The last part of the workshop presented a summary of the outcomes during a press conference with the national media.
RESULTS

This document and the Action Plan resulting from this workshop are the outcome of this collaboration and the following review by the participants.

The first outcomes of the workshop were the identification of the threats of the species which hasn’t much changed from the previous action plan.

Threats

**Habitat fragmentation**

The distribution of *Mantella cowanii* is highly fragmented, with most populations isolated from all the others. Such isolation increases extinction risk through inbreeding, genetic drift and reducing adaptive potential. Habitat change and degradation of corridors connecting populations poses potential risks through increasing the isolation of the different populations.

**Habitat loss and degradation**

A small number of *Mantella cowanii* populations occur in primary montane forest habitats (e.g. Antsirankambiaty) (Conservation International team and partners, pers. comm.). These populations are at risk from habitat degradation through illegal logging, harvesting, and
habitat loss as a result of conversion to agriculture, typically carried out by slash-and-burn techniques (locally known as *tavy*).

The majority of *Mantella cowanii* populations occur in montane savannah habitats which are believed to be of anthropogenic nature (e.g. Antoetra) (Andreone et al., 2007). As such, these populations have likely already experienced population declines as a result of habitat conversion. These populations are not at risk of habitat loss from deforestation but remain vulnerable to habitat alterations. Such populations occupy microhabitats within the savannah with very specific environmental conditions (e.g. bare rock hillsides with percolating water). Any minor alteration to these microhabitats (e.g. pollution, anthropogenic development, invasive plant species, etc...) could be enough to promote local extinction of *M. cowanii* at these sites.

**Climate change**

Warming caused by climate change can cause an upslope elevational shifts in suitable microclimates for herpetofauna (Raxworthy et al., 2008). This can lead to the loss of suitable habitat from protected areas or even the disappearance of suitable microclimates from a region. Species most at risk are small-ranged montane endemics, such as *M. cowanii*. *M. cowanii* at Vohisokina are only active in the early mornings and evenings, retreating to refugia in the middle of the day due to high temperatures (Newton-Younes, unpubl.). Any further increases in temperatures can have a strong impact on *M. cowanii* populations survival.

**Diseases**

Infectious diseases have emerged as a major cause of amphibian decline worldwide (Lips 2016). Chytridiomycosis is a fungal disease caused by the chytrid fungus *Batrachochytrium dendrobatidis* (Bd), known to have cause catastrophic population declines in many places (Skerratt et al., 2007). First large scale screening of Bd in Madagascar (Weldon et al., 2008) and 2012 (Vredenburg et al., 2012) found no evidence for Bd in Malagasy amphibians, however screening of specimens exported to the USA in 2012 identified the presence of Bd in Madagascar. This finding was later confirmed by the analyses of multiple samples collected across the entire country from 2005-2014 where Bd has been identified in multiple places, including in the 2014 survey of the *Mantella cowanii* population at Soamazaka (Bletz et al., 2015). Further research is needed to explore the patterns of presence, prevalence and virulence Bd in Madagascar.

**Hybridisation**

*Mantella cowanii* has been found to hybridise with the *M. baroni* (classified as Least Concern by the IUCN Red List - IUCN SSC Amphibian Specialist Group, 2016) in the locality where the two species are known to occur in syntopy (Farimazava) (Chiari et al., 2005). Here, up to 10% of the *M. cowanii* population was found to be of hybrid origin (Chiari et al., 2005; Rabemananjara et al., 2007). Potential range shift of *M. baroni* into higher elevations stimulated by climate change (Raxworthy et al., 2008) poses *M. cowanii* at higher risk of hybridization.

**Collecting**

*Mantella cowanii* has been collected unsustainably for the pet trade since at least the late 1980s. Research on *M. cowanii* led to a total suspension of export of live wild specimens from Madagascar applied in 2003, confirmed as a zero export quota in 2005 (United Nations
Further field studies of *Mantella cowanii* in the early 2000s identified that illegal collection for the pet trade still pose a threat to the species. Data on WCMC website indicated that Madagascar exported 3642 individuals of *M. cowanii* between 1998 and 2004. The maximum was in 2002 with 1520 individuals.
Mission and high priority objectives

“To ensure the conservation of Mantella cowanii in its natural habitat through the transmission of knowledge for sustainable development in respect of the environment”.

The development of the Mantella cowanii action plan links to a number of components and priorities of ACSAM 2 to secure the future for the amphibians of Madagascar. This will, most importantly, help Malagasy organisations and researchers to build capacity in country, and to connect with the local communities.

The objectives identified in the workshop to be achieved by 2025 are:

- Habitat protection and management of Mantella cowanii populations
- Conduct scientific studies of all populations of Mantella cowanii
- Local development program
- Environmental awareness
- Training, sharing information and long-term sustainability of activities

Whilst all of the objectives listed above are needed to address all of the threats facing Mantella cowanii, it was recognized that the from the five objectives are some of overriding importance in attempting to recover the species and accordingly contain the highest priority actions.

Protection and management of M. cowanii populations.
By 2025 it is intended to have clarified definition of the boundaries of protection to develop a habitat management plan. This should include different alternatives to control and safe from wildfires the land. For this approach is necessary to identify their landowners and discuss potential transfers of management for these species’ areas (e.g. DINA, VOI, etc). Protecting key areas, ensuring no losses of valuable M. cowanii habitat and enhancement of key areas to mitigate the anticipated effects of climate change is vital to develop the complete network of protected populations.

Field research to acquire a better understanding of the distribution and conservation status of all the populations of M. cowanii.
The complete distribution, genetic health between the last relict populations and status of them is urgent to generate effective conservation actions. The ecological and population studies are required to determine the specific needs for each population to be sustainable in the long term. From relatively recent studies has been highlighted the urgency to develop a safety net population which can support biological studies of the species. To produce frogs for release, captive breeding facilities will be established in and outside Madagascar.

Local development program.
The work to protect the species and habitat goes in parallel with the investment and support of the local communities. Socio-economic studies to identify the needs and infrastructures (e.g. development of IGAs).
**Promote environmental awareness.**
A complete programme of re-valorisation of the *M. cowanii* areas raising awareness of the environmental values and the importance of the species as a flagship species will be a direct objective focused on the local communities. This programme will also focus on building in country capacity to work in this species and disseminate the experience protecting this species to apply in other areas of Madagascar.

**Sustainability of all activities (funding and coordination).**
Identify local, regional and international funding sources for project activities under the plan becomes an immediate objective to secure the recovery of the species. As the actions are happening will be a programme of monitoring, evaluation leased by a specific coordinator for the New Action Plan.

**Sharing of information and training among stakeholders.**
A national committee with external advisors will be set up to regularly monitor the New Action Plan and secure the involvement of all the partners, communication and support between the different activities.
### OBJECTIVES AND ACTIVITIES

#### OBJECTIVE 1: HABITAT PROTECTION AND MANAGEMENT

<table>
<thead>
<tr>
<th>Project and Activities</th>
<th>Priority</th>
<th>Agencies responsible</th>
<th>Partners</th>
<th>Cost (MGA)</th>
<th>Timescale</th>
<th>Indicators</th>
<th>Risks</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1 Identify the specific conservation features for each of the known localities with <em>Mantella cowanii</em>.</td>
<td>LOW</td>
<td>PARTNERS FOR EACH SITE, MV</td>
<td>ALL PARTNERS</td>
<td>&lt;25M</td>
<td>Year 1 to 2</td>
<td>List of options adopted for each site.</td>
<td>Needs a specific and site-oriented approach.</td>
<td>Adaptation to each site.</td>
</tr>
<tr>
<td>1.2 Identify landowners for each of the localities where <em>Mantella cowanii</em> is present and collaborate with Property Department.</td>
<td>HIGH</td>
<td>MUNICIPALITY</td>
<td>MUNICIPALITY, DOMAINE SERVICE</td>
<td>&lt;25M</td>
<td>Year 1 to 2</td>
<td>Number of management models.</td>
<td>Long process &amp; needs a person coordinating.</td>
<td>Definition of study and protection area.</td>
</tr>
<tr>
<td>1.3 Apply and adapt the Management Plan for the areas of presence/influence to the species localities (purchase, rental, partnership VOI...).</td>
<td>MEDIUM</td>
<td>PARTNERS FOR EACH SITE</td>
<td>ALL PARTNERS</td>
<td>&lt;25M</td>
<td>Year 1 to 2</td>
<td>Number of management models.</td>
<td>Long process &amp; needs a person coordinating.</td>
<td>Adapt models to single needs.</td>
</tr>
<tr>
<td>1.4 Development a Management Plan for the areas of presence or influence of the populations of <em>Mantella cowanii</em>.</td>
<td>MEDIUM</td>
<td>VOI, DREED</td>
<td>PARTNERS, MUNICIPALITY, DISTRICTS</td>
<td>&lt;25M</td>
<td>Year 1 to 2</td>
<td>Finalisation of the MP.</td>
<td>Perceived as a copy of the New Action Plan.</td>
<td>Define objectives.</td>
</tr>
<tr>
<td>1.5 Continue the development of local community forest groups.</td>
<td>MEDIUM</td>
<td>DREED</td>
<td>PARTNERS, MUNICIPALITY, DISTRICTS</td>
<td>&lt;25M</td>
<td>Year 1 to 2</td>
<td>Number of VOI.</td>
<td>Coordination needed and time-consuming.</td>
<td>Assure management.</td>
</tr>
<tr>
<td>1.6</td>
<td>Development and enforcement procedures using local customs and social norms (DINA) to protect the known sites for Mantella cowanii.</td>
<td>MEDIUM</td>
<td>DREEN</td>
<td>PARTNERS, MUNICIPALITY, DISTRICTS, COURT, VOI</td>
<td>&lt;25M</td>
<td>Year 1 to 2</td>
<td>Number of DINA homologues.</td>
<td>Difficulties to assure its application.</td>
</tr>
<tr>
<td>1.7</td>
<td>Formalize the transfer of management of all the sites.</td>
<td>MEDIUM</td>
<td>VOI, DREEN</td>
<td>ALL PARTNERS</td>
<td>&lt;25M</td>
<td>Year 2 to 3</td>
<td>Number of transfers.</td>
<td>Long process &amp; needs a person coordinating.</td>
</tr>
<tr>
<td>1.8</td>
<td>Define the boundaries of the protection and conservation actions for each of the localities.</td>
<td>HIGH</td>
<td>VOI</td>
<td>DREEN, MUNICIPALITY, FKT, PARTNERS</td>
<td>&lt;75M</td>
<td>Year 2 to 5</td>
<td>Number of fully identified sites.</td>
<td>Long process &amp; needs a person coordinating.</td>
</tr>
<tr>
<td>1.9</td>
<td>Controlled access in all sites.</td>
<td>MEDIUM</td>
<td>VOI</td>
<td>DREEN, MUNICIPALITY</td>
<td>&lt;25M</td>
<td>Year 2 to 5</td>
<td>Number of regularized sites.</td>
<td>Difficulty to assure a control.</td>
</tr>
<tr>
<td>1.1</td>
<td>Develop legal protection for all sites where Mantella cowanii is present.</td>
<td>HIGH</td>
<td>PARTNERS</td>
<td>DREEN, REGION, VOI</td>
<td>&gt;75M</td>
<td>Year 3 to 5</td>
<td>Number of protected sites.</td>
<td>Difficulties to assure its application.</td>
</tr>
<tr>
<td>1.1</td>
<td>Monitoring and execute a programme of forest control in all localities.</td>
<td>MEDIUM</td>
<td>DREEN</td>
<td>VOI</td>
<td>&lt;75M</td>
<td>5 years</td>
<td>Number of checks performed.</td>
<td>Needed people's participation.</td>
</tr>
<tr>
<td>1.1</td>
<td>Establish firebreaks around sites and maintain them.</td>
<td>HIGH</td>
<td>VOI</td>
<td>DREEN, MUNICIPALITY</td>
<td>&gt;75M</td>
<td>5 years</td>
<td>Length compared to surface.</td>
<td>Manutention needed.</td>
</tr>
<tr>
<td>1.1</td>
<td>Specific study for each site to restore and reforest the area of presence of Mantella cowanii.</td>
<td>LOW</td>
<td>VOI, PARTNERS FOR EACH SITE</td>
<td>DREEN</td>
<td>&gt;75M</td>
<td>Year 3 to 5</td>
<td>Surface restored / reforested.</td>
<td>Difficult of perennisation.</td>
</tr>
</tbody>
</table>
### OBJECTIVE 2: SCIENTIFIC RESEARCH

<table>
<thead>
<tr>
<th>Project and Activities</th>
<th>Priority</th>
<th>Agencies responsible</th>
<th>Partners</th>
<th>Cost</th>
<th>Timescale</th>
<th>Indicators</th>
<th>Risks</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>2.1 Determine the fully distribution of <em>M. cowanii</em>.</td>
<td>HIGH</td>
<td>ASG /MISA</td>
<td>ALL PARTNERS, CHESTER ZOO</td>
<td>&gt;75M</td>
<td>Year 1 to 3</td>
<td>Number of sites visited with presence/absence.</td>
<td>Associated with insecurity.</td>
<td>Assure a better understanding of species distribution.</td>
</tr>
<tr>
<td>2.2 Genetic mapping of all populations of <em>M. cowanii</em>.</td>
<td>HIGH</td>
<td>ASG /MISA</td>
<td>ALL PARTNERS, CHESTER ZOO</td>
<td>&lt;75M</td>
<td>Year 1 to 3</td>
<td>Number of samples collected.</td>
<td>Difficulties in obtaining research permits and need to get funds.</td>
<td>Good definition of the species differentiation.</td>
</tr>
<tr>
<td>2.3 Develop ecological studies for each of the known populations.</td>
<td>MEDIUM</td>
<td>ASG /MISA</td>
<td>CHESTER ZOO, MV</td>
<td>&gt;75M</td>
<td>5 years</td>
<td>Number of populations studied.</td>
<td>Quite a long and time investing process.</td>
<td>Good definition of the species ecological requirements.</td>
</tr>
<tr>
<td>2.4 Estimate population size and status of the known populations and develop a population monitoring programme.</td>
<td>HIGH</td>
<td>ASG /MISA</td>
<td>CHESTER ZOO, MV</td>
<td>&gt;75M</td>
<td>5 years</td>
<td>Number of populations studied.</td>
<td>Difficulty of being put in practice due to ingent human and time investment.</td>
<td>Comparison of populations.</td>
</tr>
<tr>
<td>2.5 Feasibility study of establishing an <em>ex situ</em> safety net population.</td>
<td>HIGH</td>
<td>CHESTER ZOO</td>
<td>MITSINJO, ASG, MV</td>
<td>&lt;25M</td>
<td>Year 1</td>
<td>List of populations kept and bred.</td>
<td>Enough specimens to start the breeding programme. Availability of facilities, staff and funds for the programme.</td>
<td>The need to move on with captive breeding.</td>
</tr>
</tbody>
</table>
## OBJECTIVE 3: LOCAL DEVELOPMENT

<table>
<thead>
<tr>
<th>Project and Activities</th>
<th>Priority</th>
<th>Agencies responsible</th>
<th>Partners</th>
<th>Cost</th>
<th>Timescale</th>
<th>Indicators</th>
<th>Risks</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.1 Develop alternative income generating activities (IGA) specific for each locality where the species in present.</td>
<td>HIGH</td>
<td>PARTNERS FOR EACH SITE</td>
<td>DREED, REGION, VOI</td>
<td>&lt;25M</td>
<td>Year 1 to 2</td>
<td>Number of AGR identified.</td>
<td>Considerable time dedicated to work out these IGAs.</td>
<td>Involvement of local community.</td>
</tr>
<tr>
<td>3.2 Establish the identified alternative income generating activities (IGA) specific for each locality where the species in present.</td>
<td>MEDIUM</td>
<td>PARTNERS FOR EACH SITE</td>
<td>DREED, REGION, VOI</td>
<td>&lt;25M</td>
<td>5 years</td>
<td>Number of plans developed.</td>
<td>Considerable time dedicated to work out these IGAs.</td>
<td>Involvement of local community.</td>
</tr>
</tbody>
</table>
### OBJECTIVE 4: ENVIRONMENTAL AWARENESS

<table>
<thead>
<tr>
<th>Project and Activities</th>
<th>Priority</th>
<th>Agencies responsible</th>
<th>Partners</th>
<th>Cost</th>
<th>Timescale</th>
<th>Indicators</th>
<th>Risks</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>4.1 Development and dissemination of education and awareness tools for the communities.</td>
<td>MEDIUM</td>
<td>PARTNERS FOR EACH SITE</td>
<td>CHESTER ZOO</td>
<td>&lt;25M</td>
<td>Creation year 1; Diffusion 5 years</td>
<td>Number of tools developed and shared.</td>
<td>Need people specifically dedicated to this project.</td>
<td>Knowledge dissemination via unconventional ways.</td>
</tr>
<tr>
<td>4.2 Establishment of a global awareness campaign with Day of <em>M. cowanii</em> in all the communities.</td>
<td>HIGH</td>
<td>ASG / MISA</td>
<td>CHESTER ZOO</td>
<td>&lt;75M</td>
<td>5 years</td>
<td>Number of events organised, participants and visitors.</td>
<td>Better to associate with amphibian day.</td>
<td>Involve local community.</td>
</tr>
<tr>
<td>4.3 Develop network communication between the different interpretation centres and community kiosks.</td>
<td>MEDIUM</td>
<td>PARTNERS FOR EACH SITE</td>
<td>CHESTER ZOO</td>
<td>&lt;25M</td>
<td>5 years</td>
<td>Number of materials distributed.</td>
<td>Local community is required.</td>
<td>Involve local community.</td>
</tr>
<tr>
<td>4.4 Educational school visits related with the conservation of <em>M. cowanii</em> and its habitat.</td>
<td>MEDIUM</td>
<td>PARTNERS FOR EACH SITE</td>
<td>CISCO, ZAP</td>
<td>&lt;25M</td>
<td>5 years</td>
<td>Number of schools visited.</td>
<td>Local community is required.</td>
<td>Involve local community.</td>
</tr>
<tr>
<td>OBJECTIVE 5: TRAINING, SHARING INFORMATION AND LONG-TERM SUSTAINABILITY</td>
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<tr>
<th>Project and Activities</th>
<th>Priority</th>
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<th>Partners</th>
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<th>Timescale</th>
<th>Indicators</th>
<th>Risks</th>
<th>Opportunities</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1 Development of a strategic plan for fundraising the activities of the New Action Plan.</td>
<td>HIGH</td>
<td>ASG /MISA</td>
<td>CHESTER ZOO</td>
<td>&lt;25M</td>
<td>5 years</td>
<td>Number of grant proposals submitted and succeeded.</td>
<td>Difficulty of duly following this by the concerned entities.</td>
<td>Assure economic independence.</td>
</tr>
<tr>
<td>5.2 Program monitoring and evaluation of all activities.</td>
<td>HIGH</td>
<td>ASG /MISA</td>
<td>MV, CHESTER ZOO, CPSG</td>
<td>&gt;75M</td>
<td>5 years</td>
<td>Follow up reports.</td>
<td>Difficult to implement and follow.</td>
<td>Requires strong coordination.</td>
</tr>
<tr>
<td>5.3 Establish a coordinator for all the New Action Plan.</td>
<td>HIGH</td>
<td>ASG /MISA / MATE</td>
<td>CHESTER ZOO</td>
<td>&gt;75M</td>
<td>Year 1</td>
<td>Coordinator in place by end of Year 1.</td>
<td>Difficulty to identify an available experienced person in country.</td>
<td>Need to assure funds for coordinator.</td>
</tr>
<tr>
<td>5.4 Identify and coordinate training needs for all the partners and stakeholders.</td>
<td>MEDIUM</td>
<td>ASG / MISA</td>
<td>ASG / MISA</td>
<td>&lt;25M</td>
<td>5 years</td>
<td>List of training needs.</td>
<td>Difficult to implement and follow.</td>
<td>Requires strong coordination.</td>
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<tr>
<td>5.5</td>
<td>Establish the training agenda for the New Action Plan (identify trainers, creation of tools, training sessions, evaluations and retraining).</td>
<td>MEDIUM</td>
<td>ASG / MISA</td>
<td>ALL PARTNERS</td>
<td>&gt;75M</td>
<td>5 years</td>
<td>Number of programmes and training activities.</td>
<td>Difficult to implement and follow.</td>
</tr>
<tr>
<td>5.6</td>
<td>Create a national committee for the monitoring of the New Action Plan.</td>
<td>LOW</td>
<td>ASG /MISA</td>
<td>CHESTER ZOO</td>
<td>&lt;25M</td>
<td>5 years</td>
<td>Annual follow up reports.</td>
<td>Requires strong coordination.</td>
</tr>
</tbody>
</table>
REFERENCES


amphibian chytrid fungus *Batrachochytrium dendrobatidis*. Herpetology Notes, 5(November), 507–517. https://doi.org/10.1016/j.foodchem.2008.08.017