



# **A proposal for the rapid conservation of the highly endemic and threatened amphibians of Madagascar**

**Edited by Franco Andreone**

## **Foreword**

This proposal follows the Amphibian Conservation Action Planning, held in Washington DC (17-19 September 2005). During this meeting it became soon clear that an important step in the urgent worldwide amphibian conservation concerns the rapid application of tailored programs for the biodiversity hotspots, especially for those where most of the amphibian species diversity occurs. Madagascar is a perfect candidate for such an action, due to the severe threats through habitat destruction to a very diversified frog fauna, with more than 220 described species, 99% of which endemic at the level of genus, and many at the level of family or subfamily.

Therefore, the present report summarises some of the initiatives that are expected to be done in Madagascar, according to the consensus obtained among some of the most prominent specialists on the phylogeny, taxonomy, and conservation of the Madagascan amphibians (see at this purpose the end of the report, with the comments of these scientists).

This report lists some urgent actions to be developed in Madagascar to facilitate the conservation of amphibians. It is likely that coordination, new structures and organisations need to be put in place or implemented, with the final aim to obtain homogeneous and repeatable results. Until now, in fact, several teams acted mainly independently on the field, with a personal schedule and with results that often were difficult to evaluate (and sometimes even to recover). Furthermore, these activities were sometimes based upon small grants, that in most occasions were not sufficient to warrant a long-term continuity of the projects, and of the training activities in the field. It was therefore clear that to achieve a more durable effect on the conservation goals it is necessary to develop a new scientific alliance that fosters a multi-focused program.

After some discussions and exchanges of ideas it soon became clear that a coordination is urgently needed, in order to maximise the efficiency of the work. In fact, one thing that I wish to stress is how this project is a fruit of a joint discussion with the most eminent amphibian specialists from Europe, Madagascar, and USA. We recently met in Bonn for the meeting of the European Herpetological Society, and we soon agreed that a project should be rapidly schematised for Madagascar and for the conservation of its peculiar amphibian (and reptile) fauna.

Then, we put together the main topics, that are here summarised. In a wider acceptance it is also worth to stress how the teamwork that comes out from the project's drawing is complementary in its skills and competencies. As a group we can manage most of the aspects regarding the study and conservation of the herpetofauna of Madagascar. Notwithstanding, it is clear that only with a wider collaboration we could accomplish our final aim, that is to save the amphibians of Madagascar through conservation actions based on thorough research. For this after the presentation of the project I have indicated the list of the main persons potentially involved, with their abilities and field of interest.

To fulfil this project I have also attached some supporting letters, that were written by some of the persons directly involved in the project, or by renewed zoologists that have followed with interest this initiative and expect that is accomplished in the next time.

### ***Aims of the project***

The project has the following primary goals (not necessarily in order of importance):

1. Organise a herpetological workshop in Madagascar to coordinate the persons and organisations that could be involved in the actions.
2. Establish a local coordination and provide conservation agencies in Madagascar with baseline biodiversity data and recommendations for sound conservation planning;
3. Promote Malagasy understanding of herpetology through training of student field assistants, conducting workshops on amphibian (and reptile) identification and curation, depositing identified reference collections in Madagascar, and training some M.Sc. students abroad.
4. Increase public awareness regarding the importance of the amphibian (and reptile) conservation.
5. Conduct intensive inventories and monitoring of amphibians (and reptiles) in a series of localities (for short term and long term surveys). Integrate this new locality data with data already available for predictive mapping of species distribution ranges, which will be used in conservation planning and monitoring.
6. Assist in developing a national herpetological collection in Madagascar.
7. Assist in identifying hot spots for the amphibian diversity and to create new protected areas specifically conceived for the amphibian (and reptile) conservation.
8. Foster a molecular identification system (already partly existing) that allows the large-scale verification of amphibian inventory results by DNA barcoding methods. Help establishing a national tissue collection in Madagascar and capacity building for the development of already existing local molecular facilities.
9. Assess the potential of captive breeding and define priority species for possible captive breeding actions.

### 1. Herpetological workshop in Madagascar

**STATE:** The first step to increase the awareness on the necessity of amphibian conservation and to coordinate the actions will be the realisation of a workshop meeting of amphibian specialists. This will give the possibility to foreign and Malagasy specialists to jointly set out the priorities and details actions to be taken, and to propose a possible organisational structure that the program should take.

**ACTIONS:** To organise a meeting for the prioritisation and coordination of activities and initiatives in conservation of Malagasy amphibians, likely in the period June-October 2006.

### 2. Local coordination and assistance to conservation agencies

**STATE.** Actually there is not a real coordination in Madagascar for the conservation activities on its peculiar amphibians (and reptiles). In the past years an SSC “*Madagascar and Mascarene islands Amphibian and Reptile Specialist Group*”, existed, but did not promote any real conservation action. More recently, the DAPTF (*Declining Amphibian Population Task Force*) was involved in a general action plan on some critically endangered species. The chair of this regional group (F. Andreone) promoted and carried out actions on some of the nine critically threatened species, using, among others, the *seed grants* and the *rapid response funds* obtained by DAPTF, and other funds obtained via *Conservation International* and other agencies. In this context an email list (*MadFauna-Herp*, [www.MadFauna-Herp.yahoogroups.com](http://www.MadFauna-Herp.yahoogroups.com)) was specifically developed to address the more general problems of herpetological conservation in Madagascar. The development of a local and specialised team and reference office is urgently needed, and will have evident advantages, among which the coordination of a series of activities that touch the most important aspects of the amphibian and reptile conservation. There will be, for the first time, a local center specifically devoted to the amphibians (and reptiles). This will become a point of contact for all the herpetologists that will come to Madagascar either for the professional activities (research) or for eco-tourism. Furthermore, it will give assistance to local authorities for any aspect concerning the conservation of the amphibians and reptiles

**ACTIONS:** The development of such an office / coordination team (already in 2006?), with the identification of a responsible for the herpetological activities under (under the IUCN auspices).

### 3. Training of local people

**STATE.** Malagasy guides, biology students, educators, etc. will benefit by receiving training in herpetological inventory and fieldwork techniques for herpetological conservation. Furthermore, because the project implies intensive contacts to villagers (which will be interviewed as to the occurrence of certain species, and which will be employed as guides and porters during the expeditions), and to pet trade collectors and exporters, it will also offer real opportunities of discussions on the relevance of biodiversity conservation, thus increasing the overall awareness. All of the research and conservation

actions taken will take place through intensive collaborations with appropriate Malagasy counterparts or will be led by Malagasy principal investigators or project managers. This will significantly contribute to capacity building in Madagascar.

**ACTIONS:** Training for the several aspects of the projects, including many steps (e.g. in field surveys, in cataloguing and studying preserved specimens, in captive breeding).

#### **4. Increase of public awareness**

**STATE.** It is clear that it is necessary to increase the public awareness regarding the importance of the amphibians and reptiles in the natural environments. The Malagasy people look at these animals as to non-significant and non-edible (excepting for a few species) items, and thus not worth of any special consideration or concern. On the other hand, some species (e.g. chameleons, crocodiles, some snakes) are seen as potential threats, and for this locally persecuted. While it is clearly difficult to make this vision be changed in a few generations, it is likely that some well-defined projects could help in redirecting people's attention, especially in the main towns.

**ACTIONS.** Already by the end of 2005, a sound guide with three Audio-CDs will be published in a joint effort of various researchers, coordinated by M. Vences, F. Glaw and R. Marquez of the Fonoteca Zoológica of the Madrid Natural History Museum. This soundguide will facilitate bioacoustic inventory work as it has been, for example, widely applied for amphibian distribution mapping in South Africa. In 2006 a new field guide (of amphibians and reptiles) will be realised by M. Vences and F. Glaw and other co-authors. This book will be translated into Malagasy language through funding by the World Bank "Local Language Field Guide" program, which was granted in 2004. At the same time a short and user-friendly booklet (20-40 pp. long) on the amphibians of Madagascar will be realised under the coordination of F. Andreone, M. Bungard (The Living Rainforest), and K. Freeman (Madagascar Fauna Group / Betampona) published. Beside the basic biological references there will be a conservation section, which will introduce the meaning of a study project and conservation. Other aspects of the increase of public awareness will involve the realisation of public meetings and specific courses for Malagasy teachers.

#### **5. Field research work**

**STATE.** Most of the activities devoted to the amphibian conservation in Madagascar necessarily pass through the field surveys of little known areas and little known or endangered species. For this reason much attention should be paid to these aspects, and consistent funding must be allocated for this purpose. At the same time it is clear that the field activity should be constantly monitored and priorities re-assessed, in order to ensure the issuing of objective recommendations to be used in a conservation context. For this, the research activity needs to be carried out from one side by internationally recognised teams (that have already sufficient experience), and from the other side by small teams of Malagasy researchers and students.

**ACTIONS.** That the research will be constantly done, with the following priorities:

1) *Predictive mapping of species distribution ranges.* Which are the priority areas for amphibian conservation in Madagascar? To address this question we will develop predictive distribution models for amphibian species from available species locality data. The first models will allow us to define areas which need further exploration (see point 2) or areas where species may occur but were never recorded, that may be critical for discovering new populations of endangered species (see point 3). New locality data will help to improve our models which can be integrated into a global analysis to define biogeographic regions and priority areas for conservation. A first step of this research already started in 2005 by D. Vieites and co-workers.

2) *Research on poorly explored areas.* Survey work needs to be regularly carried out to get a complete overview of species distributions, and on the presence (and consequent description) of new species. Up to now most of the survey work was carried out in protected areas, but even there the permanence of the researchers was limited to a few campsites and a few seasonal periods. Therefore, there is the need to repeat the surveys in already known sites, and to carry out new researches in little known and remote areas. This work should be led by research teams from abroad, with a major implication of local researchers. The local coordination will be crucial to assure that all the data will be comparable and to coordinate the local people (especially students).

3) *Research on threatened and data deficiency species.* This will be carried out on the most endangered species, as following the GAA. It will also become an important tool just to update the GAA database, since the “critically endangered” (CR) and the “endangered” (E) species will be evaluated and likely changed in categorisation. Beside this, a considerable part of the research will be devoted to species that were classified as “data deficient”, and for this worth of further attention. It is not unlikely that great part of the DD species could become CR or E species. Research will include (a) clarifying the distribution area and extent of occupancy by integrating fieldwork and predictive species distribution modelling, (b) field studies on population density and structure, (c) field studies of habitat requirements and natural history, (d) collection of tissue samples for subsequent conservation genetics research.

4) *Long-term monitoring.* Some selected areas will be chosen where to carry out a long-term monitoring of the amphibian fauna. These sites will be identified on the basis of the presence of infrastructures. The study will be done in collaboration with Malagasy research teams, and during a selected team in ideal periods of the year. This will allow gathering data useful to quantify the long-term population trend in a Malagasy forest, and to clarify if there is a fluctuation in the presence of species and abundance. The presence of a regular research activity in some sites will provide the

advantage to have local training and to allow the visit and collaboration of eco-tourists or volunteers interested to the amphibian study.

5) *Systematics and taxonomy.* A major task for local herpetologists will be to develop an autonomous systematic and taxonomic work on preserved collection material. The research will be carried out on the major collections held in Madagascar, with the aim of cataloguing and unifying them (see following point regarding the national herpetological collection).

6) *Assessment of genetic diversity.* The application of molecular techniques is an ongoing need for biodiversity studies, allowing to start a DNA barcoding project in loco and the identification of management units for conservation. As outlined above, the project will take into consideration the possibility to sustain the creation of a central tissue collection in Madagascar, and the establishment of a local biomolecular laboratory.

7) *Analysis on the possible presence of chytridid fungi and on other causes of epidemic declines.* The chytridiomycosis is a fungal pathology known to affect many amphibian populations in tropical and temperate regions. Up to now no data are available on Malagasy populations. It is therefore important to monitor the health of most of the species, which turn out to be potentially highly sensitive. A first step of this research will be started in 2006 by M. Vences and co-workers.

8) *Pet trade analysis.* Most of the coloured *Mantella* species (together with some *Scaphiophryne*, *Dyscophus* and *Heterixalus*) are (or have been) regularly collected for the pet-trade. While for some of the species this collecting activity is potentially dangerous and represents a real threat for the survival of the last populations (e.g., *Mantella cowani*), for many other species a controlled use could be hypothesised. This collecting activity should anyhow base its numbers upon a series of regular evaluation of the situation in the wild. The personnel involved in the monitoring will assure collaboration with national institutions.

## 6. Identifying hotspots for amphibian conservation and developing new protected areas

**STATE.** President M. Ravolamanana's "Durban Vision" will suppose a size increase of the Malagasy protected area network 3-fold over the next several years. The major goal for this strategy is to define priority areas for conservation for different groups, which will be used in reserve design and implementation of the actual reserve area network. To define these areas for amphibians more data are needed, because for many species we do not have a clear idea of their distribution ranges, and also some poorly explored areas can be expected to hold new undiscovered species to account for.

**ACTIONS.** The overlap of species richness and eventually endemism rates will give an interpretation key for defining the new protected areas, based upon the (exclusive or priority) presence of amphibians (and reptiles). We will also identify areas where the critically endangered species occur. This has already been done in part (during the GAA meeting), but need to be extended. In particular, we will propose some protected



spots for *Mantella cowani*, *Boophis williamsi*, *Mantidactylus pauliani*, that up to now occur only outside the protected areas.

#### 7. Assistance in developing a national herpetological collection

**STATE.** Among the major needs for conducting herpetological research is to have a functional public collection of preserved voucher specimens. This is in part already accomplished by the University of Antananarivo, and further collectings are housed in the *Parc Botanique et Zoologique de Tsimbazaza*. Anyhow, these collections suffer from shortages of personnel and material, and cannot warrant for long-term persistence. In the framework of the present proposal it would be envisaged that a national collection is created, by facilitating collaboration between these and other institutions. This will involve the possibility to have a continuous presence of a collection manager and availability of basic materials, such as jars, personal computers, field tags and ethanol for the preservation of the specimens and tissue samples. The presence of a safe and functional Malagasy collection will allow the foreign researcher to visit it, and also to ask for the loan of type specimens as it is the standard for the modern museum institutions, and will allow the local students to be continuously trained. This collection will be digitized and can be integrated into *HerpNET*, which is a network between databases of herpetological collections in natural history museums around the world, making their information freely available on internet.

**ACTIONS.** To discuss with the University of Antananarivo and other agencies to promote the fast development of a national collection. In absence of this consensus we could also think to realise a separate facility where assuring to stock the voucher specimens (following the example made by the California Academy of Sciences for the entomological collections). Initiate communications with *HerpNET* coordinators (C. Spencer and D. Wake, University of California, Berkeley, already started by D. Vieites) to find ways to make their technology available to Malagasy institutions.

#### 8. Capacity building for DNA barcoding

**STATE.** Amphibians are notorious for the large number of cryptic species that are morphologically very hard to distinguish, especially for non-specialised researchers. Amphibians also show large inter-population genetic variation. This trend, verified also in Madagascar, indicates the existence of several independent Evolutionary Significant Units for conservation even within well-established species. As an additional aspect, most amphibians have both aquatic and terrestrial life stages, and research and conservation measures, especially in tropical habitats, has often considered the adult stages only. Understanding tadpole biology, however, is crucial to comprehend the ecological requirements of a species and to issue recommendations for its conservation. In addition, tadpoles can be extremely suitable focal organisms for inventory work as they are more consistently and often more easily collected than adult frogs.

In order to be able to identify tadpoles and immature frogs, molecular tools are the only reliable method available. Most inventories in the past years are unreliable regarding several complexes of morphologically similar, such as the green

treefrogs of the *Boophis luteus* group, or the stream-dwelling *Mantidactylus lugubris* complex which consists of many yet undescribed species. It therefore seems to be highly recommendable to set up a survey system that allows the validation of controversial records by DNA methods, and that sets a seed for the future application of such methods in Madagascar. At present, a basic molecular laboratory has been set up at the Animal Biology department, University of Antananarivo, where basic DNA isolation and PCR is expected to become functional in 2006 or 2007.

**ACTIONS.** To assist Madagascar with establishing a central collection of tissue samples from animals collected in inventory and monitoring works. Tissues can be preserved in ethanol or buffer solutions, which preferable should be stored in a basic -20°C freezer. An open-access management of the collection and clear agreements to avoid conflicts of interest and to address issues of accession of the collection by others than the tissue providers. To develop recommendations for survey work involving the standardized collection of tissue samples for verification of identification, and for conservation genetic purposes. To assist training Malagasy researchers in molecular techniques and DNA barcoding approaches, in order to enable local research institutes to actively participate and apply such techniques. To collaborate with and issue recommendations to global initiatives, especially the Consortium for the Barcode of Life, with the goal of facilitating the development of standardized tools for the screening of genetic diversity of Malagasy amphibians for conservation purposes.

## 9. Developing of breeding, capacity

**STATE.** At some of the institutions collaborating with the present project (e.g., Acquario di Genova, Zurich Zoo, DWPT) we plan to realise “Madagascar sections”, where to breed and exhibit some of the most peculiar amphibian species. Selected species will be chosen for a captive breeding program, that will have the aim to collect information on the life history traits in captivity, and to warrant the survivorship of some of the most endangered species. In particular, the captive rearing of *Mantella cowani* will allow obtaining some captive nuclei. Some specimens there exhibited will be obtained via the captive breeding network, or using confiscated animals. We have yet to discuss whether it is necessary, at least at the present time, to develop an intensive captive breeding program, as established and suggested during the ACAP meeting at Washington. So far, very little is known on the real status of the Malagasy amphibians, and almost nothing is known on the real need to establish an “amphibian survival alliance”. An additional important benefit is to build local capacities for captive breeding, in order to have local people experienced in these methods.

**ACTIONS.** We plan to prepare an experimental captive breeding program. This will be aimed to train the local students to the methods for the captive breeding, especially oriented to the endangered species, which are requested by the trade. Protocols will be drawn to assure a continuing and efficient activity.



## MAIN SPECIALISTS COLLABORATING ON THIS PROJECT

### **Franco Andreone**

Museo Regionale di  
Scienze Naturali, Torino,  
Italy

*Coordinator of the  
proposed project*

He carries out herpetological research in Madagascar since long time, and has conducted field surveys in most of the rainforests and dry forests. He collaborated with most of the main herpetologists active in this field, drawing particular attention to the aspects concerning the conservation of the critically endangered species. In such a sense he carried out survey work on *Mantella cowani*, *Scaphiophryne gottlebei*, *Mantella expectata*, *Mantella viridis*. He also acted as chair of the Declining Amphibian Population Task Force (DAPTF) of IUCN (together with H. Radriamahazo). He described many new species of amphibians and reptiles, mainly in cooperation with other researchers involved in the present project. The collaborative work touched aspects of taxonomy, phylogeny, ecology, and distribution, often done in collaboration with Malagasy scientists. He also produced a categorisation of all the amphibians of Madagascar based upon the use of natural history and distribution data. He led the realisation of a synthetic work about the GAA results for Madagascar. Research has been and is being funded by the Nando Peretti Foundation NPF, the Declining Amphibian Population Task Force DAPTF (Seedgrants and Rapid Response Fund), the Wildlife Conservation Society WCS, Conservation International CI, Madagascar Fauna Group MFG, National Amphibian Conservation Center NACC, Institute Oikos onlus, World Wide Fund for Nature.

### **Frank Glaw**

Zoologische Staatssammlung  
München, Germany

Since 1987 he has conducted intensive field work and herpetological research in all major regions of Madagascar, mostly in cooperation with the colleagues supporting the present project. One focus of his research is taxonomy and systematics resulting in the description of about 75 new species of amphibians (and reptiles) and in the discovery of many still undescribed species. A major method that led to the recognition of the enormous cryptic diversity of Madagascan amphibians was the use of comparative bioacoustics. Together with M. Vences he published 1992 a field guide to the amphibians and reptiles of Madagascar (2nd edition 1994, third edition in preparation). Furthermore his research addressed distribution and biogeography, conservation, natural history, morphology and phylogeny. Research has been funded by the Deutsche Forschungsgemeinschaft (DFG), the Heinrich-Hertz-Stiftung, the Deutscher Akademischer Austauschdienst (DAAD), the Volkswagen Stiftung, and the German Herpetological Society DGHT.

### **Fabio Mattioli**

Acquario di Genova, Area  
Porto Antico, Genova

The Acquario di Genova (Italy) has since June 1998 a section devoted the exhibit of amphibians and reptiles from Madagascar and a whole area of the exhibit rebuilds several habitats of the island. This area has been developed after a series of field surveys and ecological studies since 1995, most of which done in close collaboration with other persons involved in the present project. Such researches yielded to several good results, among which the description of new species, proposal of habitat managements. Actually, there are

some facilities for captive breeding, and the herpetological section has accumulated experience in the breeding protocols. This work has been addressed to produce pools of animals from captive stocks (for example, there is a group of *Mantella aurantiaca* born in captivity at the Zurich Zoo), and to identify techniques to get the best reproductive fitness with the least economic effort. Expertise in this sense will become available to establish an efficient methodical to be applied on some of the most endangered species.

**Olga Ramilijaona**

Université d'Antananarivo,  
Département de Biologie  
Animale, Bp 96, Antananarivo  
101, Madagascar

The staff of the Animal Biology Department at the Antananarivo University has been closely involved in most of the activities formerly held by the members of the team. In particular, M. Vences, F. Glaw and D. Vieites trained several DEA students in the field, and also obtained a PhD for a student who is currently working on the conservation genetics of the species of the genus *Mantella* (F. Rabemanjara). The Acquario di Genova hosted the visit of a professor of the University, who was formed for the captive breeding techniques. F. Andreone trained some students in the field and held lessons at the University. The department is also continuously consulted for all the managing activities, especially for the aspects regarding the collaboration with the CITES authorities. It is clear that all the work that will be done in Madagascar under the auspices of the present project will be done together with the Antananarivo University. In particular, the training of students is a main tenet, together with field research and the development of a national herpetological collection.

**Jasmin E.  
Randrianirina**

Parc Botanique et Zoologique  
de Tsimbazaza, BP 4096,  
Antananarivo 101, Madagascar

He was trained by F. Andreone and the staff of the Acquario di Genova since 1996. He participated to most of the field surveys as a student of Antananarivo University, and then he was recruited by the Parc Botanique et Zoologique de Tsimbazaza. Under this function he was named responsible for the herpetological section, and acted as a curator of the preserved collection there. He also supervised the vivarium at PBZT, and was engaged in several scientific publications. Furthermore, he also realised independent field surveys, namely on some of the most threatened amphibian species. The PBZT is since long-time a historical institution of Madagascar, having always played an important role in the entire captive breeding projects on mammals, birds and herps. It is clear that an important role will also be done for the future implementation of captive breeding facilities and to the expected unification of the preserved collections.

**Denis Vallan**

Museum of Natural History,  
Lucerne, Switzerland

Conservation was since 1993 the goal of his research in Madagascar. For this purpose and for topics concerning taxonomy and systematic cooperation with different colleagues has been carried out. Several studies have been carried out - and are ongoing - about the influence of fragmentation and degradation of habitat on amphibian diversity. The research is focused mainly on two regions in the east and in the highlands of Madagascar. This focus permits to carry out long term studies and to recognize processes that lead to a decline of the anuran diversity. Based on an article published in 2000

one of the study areas has been taken in focus to be valorised economically and be protected. This shows the importance of research and the communication of the results toward the broad public, conservation organisation and the decision-maker like local and national politician. One of the proposed activities is indeed to increase the flow of information toward the public.

### **Miguel Vences**

Institute for Zoology,  
University of Braunschweig,  
Germany

In a long-standing cooperation with most of the colleagues supporting the present project, he has been involved in research on the natural history, evolution and conservation of Malagasy amphibians since 1991. He has intensively collaborated with the University of Antananarivo to foster the understanding of the distribution and genetic differentiation of species of the genera *Mantella* and *Dyscophus*. At present, a Malagasy PhD student is pursuing these studies and has been intensively been trained in molecular techniques. He has further established a near-complete DNA sequence database for Malagasy amphibians that allows the reliable identification of tadpoles and immature frogs by DNA barcoding. This standardized application of molecular techniques helped identifying about one hundred still undescribed species of frogs which challenge the assessment of conservation hotspots based on current taxonomy and allows for a more objective definition of management units for conservation. Further cooperations include the laboratories of A. Meyer (Konstanz University) and the Bill & Berniece Grewcock Center for Conservation and Research at Omaha's Henry Doorly Zoo (Ed Louis Jr.) in aspects of conservation genetics of Malagasy amphibians, as well as the laboratory of D. Tautz (University of Cologne) for the application of DNA barcoding of Malagasy tadpoles. Research has been and is being funded by the Deutsche Forschungsgemeinschaft DFG, the Deutscher Akademischer Austauschdienst DAAD, the Netherlands Research Foundation NWO-WOTRO, the Volkswagen foundation, the BIOPAT foundation, and the German Herpetological Society DGHT.

### **David Vieites**

Museum of Vertebrate Zoology  
and Department of Integrative  
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Sciences Bldg. University of  
California, Berkeley, 94720-  
3160, California, USA

Since 2000 he has been working with amphibians and reptiles of Madagascar, mainly in cooperation with the other researchers that support this project. He is interested in comparative phylogeography and conservation planning of Malagasy herps, being co-author of several papers dealing with these subjects. As part of the conservation planning strategy for Malagasy fauna, he is currently involved in a multitaxonomic cooperation leaded by Professor Claire Kremen (University of California, Berkeley), in which we want to develop ecological niche models for as many species as possible, which will be used for reserve design. New climatic and satellite data, and new methods in niche modelling, allow us to develop potential distribution models and determine the relevant climatic and habitat factors that shape species' distributions. Also, new reserve design algorithms (like Zonation) will be used to prioritize areas for conservation. However, the available models so far for amphibians are done with few locality data points, which derive in huge overpredictions. He wants to use this preliminary data to

planify fieldwork in order to get new locality data for as many species as possible. These data will be used for developing accurate species potential distribution models that can be used for conservation planning.

### **Other potential collaborations**

Many other persons and organisations have collaborated in the past and for certain will collaborate in the future with the realisation of the present project. We here report some of them (together with the expected skills), in order to provide a wider understanding of the potential involvement.

To avoid misunderstandings, we wish to make clear that some of these potential collaborators are here mentioned largely without their knowledge. The list is therefore to be interpreted as a non-exhaustive inventory of colleagues to whom invitations of collaboration will be issued.

**W. Böhme**, Zoologisches Forschungsinstitut und Museum A. Koenig, Bonn: taxonomy, phylogeny, museum implementation.

**Mike Bungard**, The Living Rainforest, UK: captive breeding, education, increase in public awareness.

**J. E. Cadle**, Chicago Zoological Society, Chicago: taxonomy, species distribution, museum implementation.

**A. Carpenter** and **R. Griffiths**, University of East Anglia and DICE, Canterbury: trade of Malagasy amphibians.

**A. Dubois**, **A. Ohler**, National Museum of Natural History, Paris: taxonomy, museum implementation.

**L. Du Preez**, Potchefstroom University, South Africa: parasitology, infectious diseases (chytrid), environmental pollution effects (pesticides)

**K. Freeman**, Madagascar Fauna Group and Betampona reserve, Antananarivo: education, captive breeding, long-term studies, local training.

**S. Furrer** and **N. Lutzmann**, Zurich Zoo: captive breeding.

**G. Garcia**, Durrell Trust: captive breeding.

**F. M. Guarino**, University of Naples: age structure.

**E. Louis Jr.**, Henry Doorly Zoo, Omaha: conservation genetics

**R. Marquez**, National Museum of Natural History, Madrid: bioacoustics.

**A. Meyer**, University of Konstanz: phylogeny, conservation genetics

**R. A. Nussbaum**, University of Michigan, Museum of Zoology: taxonomy and museum implementation.

**G. Odierna** and **G. Aprea**: karyology and taxonomy.

**H. Randriamahazo**, Wildlife Conservation Society: conservation biology, education, survey work.

**A. Raselimanana**, World Wide Fund For Nature: conservation biology, taxonomy.

**C. J. Raxworthy**, American Museum of Natural History: biogeography, conservation biology, taxonomy, and phylogeny.

**S. Stuart** and **N. Cox**, CABS at Conservation International: conservation biology, GIS implementation, red-list updates.

**D. Wake** and **M. Wake**, Berkeley University: museum implementation and training via web resources.



Museum Koenig - Adenauerallee 160 - D-53113 Bonn

To

**CONSERVATION INTERNATIONAL**

**ZFMK**

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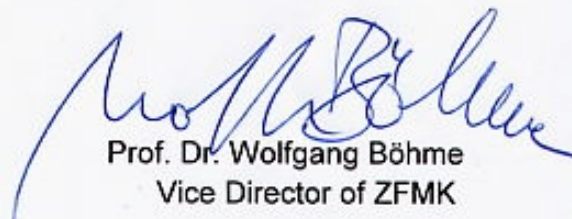
## LETTER OF RECOMMENDATION

With this letter, I want to support the application directed to CONSERVATION INTERNATIONAL by Dr. Franco ANDREONE and coworkers.

The primary goals, as listed in the written application, are all of crucial importance to conserve and save the unique biodiversity of Madagascar a most important part of which are the amphibians. These sensitive vertebrates - due to their dependance from unpolluted water - are not only ideal indicators for the quality of biotopes in general, but are also most heavily affected by habitat pollution and destruction which just on Madagascar with its absolute singular, endemic fauna is proceeding in an extreme speed. Measures for amphibian conservation and their scientific baselines are therefore of highest priority.

Luckily, the team of applicants consists of particularly competent young researchers. All of them have long-standing experience with the amphibian fauna of Madagascar and were important contributors to the knowledge of their diversity themselves. They seem most suitable to me in actually and reliably achieving the goals they have set up.

That is why I most warmly and urgently recommend this application for acceptance.



Prof. Dr. Wolfgang Böhme  
Vice Director of ZFMK



# ZOOLOGISCHE STAATSSAMMLUNG MÜNCHEN



Zoologische Staatssammlung München, Münchhausenstr. 21, D-81247 München

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Dr. Franco Andreone  
Museo Regionale di Scienze Naturali Torino  
Via Giolitti 36  
10123 Torino  
Italy

München, 6 October 2005

Dear Franco,

with more than 220 described species of amphibians and more than 360 described reptiles species, Madagascar harbours a significant part of the world's herpetofauna. Its herpetofauna represents the largest groups of Malagasy vertebrates in terms of species diversity. And this is just the official part of the real diversity: We already know about 100 additional undescribed amphibian species and about 40 undescribed reptile species and many additional species still await their discovery and identification. Furthermore, with levels of endemism between 95 and 100% Madagascar's herpetofauna is almost entirely restricted to a single and poor country that is suffering from rapid deforestation and high growth rates of human populations.

The intention of president Ravalomanana to treble the surface of protected areas within the near future is a great and probably unique chance for nature conservation in Madagascar. An optimal choice of areas that should be included in the future network of protected areas will be crucial not only for the survival of amphibians but for the survival of Madagascar's biodiversity in general. Amphibians and reptiles are perfect model groups to identify priority areas of high diversity and endemism in Madagascar. They are much more species-rich than mammals and fishes, and much better known than any group of invertebrates. Data from intensive surveys in non-protected areas would help decision makers to design a network of protected areas that would protect as much animal and plant species as possible.

I therefore strongly support a collaborative amphibian conservation program. I am very interested in participating this program and willing to provide any support needed. The planned workshop in Madagascar would allow us to determine the priorities for this program and first steps for its realization.

Sincerely yours,

# DEPARTEMENT de SYSTEMATIQUE et EVOLUTION

MUSÉUM NATIONAL d'HISTOIRE NATURELLE

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Annemarie OHLER

Maître de Conférences

e-mail: ohler@mnhn.fr

Paris, le 07/10/2005

FrancoAndreone

Museo Regionale di Scienze Naturali

Torino, Italy

## TO WHOM IT WILL CONCERN

I read the proposal of Franco Andreone for an **Amphibian Conservation Program for Madagascar** with much interest. As a curator of Reptiles and Amphibians of one of the biggest collections in the world, I am quite concerned and engaged in Amphibian Conservation. It seems quite essential to put together our efforts to increase knowledge on the systematics, the biology and ecology of these still so poorly known species in order to have support for conservation politics and education.

Doing studies of biodiversity in tropical Asia I am quite bothered about the state of natural habitats and frog populations. To many species are still only known from a single observation and many new taxa are still expected. Any data on biology and life history of most the species are known. It is just too much for a single person or a single institution to cope with.

A main problem is the availability of collections and knowledge to the governments and researchers of the countries where the highest diversity is observed. Knowledge is stored in the north and work should be done in the south. The close relationship and long-time collaboration of the participants of the program will allow transfer of knowledge and education on a large scale.

I think the choice of Madagascar for such a problem is judicious. The participants of the program have experience with the animals studied and also with the more applied aspects of the program. Due to high endemism and the relative small size of the region chosen one can expect that many different components of the amphibian fauna and many different habitat types will be covered by the study which will lead to high impact of the results.

Finally as the curator of the Paris Museum collections I wish to invite the participants to make use of the specimens and literature as much as necessary. The projects gathers all components and people to lead in good time to significant results. So I give my full support to this project.



Annemarie OHLER



UNIVERSITEIT VAN AMSTERDAM  
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Franco Andreone  
Museo Regionale di Scienze Naturali Torino  
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*Amsterdam, 5 October 2005*

**Letter of support: Amphibian Conservation  
Program for Madagascar**

Dear Franco,

I have enthusiastically read your proposal for a collaborative amphibian conservation program in Madagascar. As you know, I have been intensively working in Madagascar for the last 14 years, and especially in the more recent past have focused on the conservation genetics and DNA barcoding of Malagasy amphibians, besides my research focus on their speciation and biogeography.

Especially in recent times it became more and more apparent that a better coordination of conservation efforts and research on Madagascan amphibians is urgently needed. A very large number of new species have been identified and are being described, but inventory and conservation prioritization still relies on outdated survey data and unreliable identification tools. Species are treated as units for analysis, although our data clearly indicate the existence for management units for conservation also below the species level. And at the same time, forests and forest fragments are disappearing which harbour substantial numbers of locally endemic species or even major endemic lineages of very local distributions.

Considering recent efforts of the Malagasy government to increase the surface of the protected areas of the country, I am convinced that this is the almost perfect momentum to start the conservation program outlined in your proposal. I am highly interested in participating and collaborating in this program, and am willing to provide any help needed.

After my imminent move to a professorship at Braunschweig University, Germany, as of 15th October 2005, I am fully disposed to coordinate the research of my group with the major amphibian conservation goals to be determined in the planned workshop meeting in Madagascar. This planned meeting certainly would be a fundamental and urgently needed first step to determine the priorities for this endeavour and therefore receives my full support.

Sincerely yours,

*Miguel Vences*

# UNIVERSITY OF CALIFORNIA, BERKELEY

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SANTA BARBARA • SANTA CRUZ

Berkeley, October, 5, 2005

Dr. David R. Vieites  
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Dr. Franco Andreone  
Museo Regionale di Scienze Naturali Torino  
Via Giolitti 36  
10123 Torino  
Italy

Dear Franco:

Thank you for inviting me to contribute to this initiative. I think this is the perfect timing to start an integrative project like this. It is clear from many studies dealing with global conservation priorities for different groups of organisms that Madagascar is always on the top of the list. Amphibians are a group of major concern, as global amphibian declines have been reported in different continents and for many species. Madagascar harbors a huge diversity of amphibians with a high degree of endemism, being currently threatened mainly by habitat destruction. This project will provide crucial new data for amphibian conservation planning, bringing together all the specialists on this group.

I think this is a timely opportunity to establish an international team of amphibian biologists working together towards the solution of various issues. Data is urgently needed for many threatened Malagasy species, and defining priority areas for amphibian conservation as well. This project will also provide this data on time to be used in the decision-making process under President Ravolamanana's "Durban Vision". For these reasons you get my full support and collaboration.

I look forward to hearing from you in the near future.

Best wishes

David R. Vieites

A handwritten signature in blue ink, appearing to read "David R. Vieites", with a long horizontal flourish extending to the right.



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SANTA BARBARA • SANTA CRUZ

October 6, 2005

**DAVID B. WAKE**

wakelab@uclink.berkeley.edu  
**MUSEUM OF VERTEBRATE ZOOLOGY**  
**3101 VALLELY LIFE SCIENCES BUILDING,**  
**BERKELEY, CA 94720-3160**

Dr. Franco Andreone  
Museo Regionale di Scienze Naturali Torino  
Torino, Italy

Dear Franco:

I have read the document outlining a comprehensive program focused on the amphibian fauna of Madagascar. Without question the amphibians of Madagascar represent a group that is of very high value for many fundamental biological issues in phylogenetic and evolutionary biology, ecology, and other areas, and of course they should be a primary target for development of conservation strategies. These can only be developed effectively by integrating information from other taxa, as you are proposing.

While I do not work in Madagascar I am entirely supportive of your efforts and will be happy to cooperate with you and other members of your team as I am able and as would be appropriate. At present David Vieites is working in our laboratory as a part of the AmphibiaTree program. A component of this program is the AmphibiaWeb website, which I direct. Information you derive in your study will be directly relevant to the goals of AmphibiaWeb, which include dissemination of information concerning all of the amphibians in the world, with emphasis on issues related to declines and conservation. Furthermore, information that you develop will also be relevant to the goals of the HerpNET program, for which I am a co-Principal Investigator. Our hope is to expand HerpNET from its present focus on North and Middle America to the entire globe, and for this program it is essential to have accurate, geocoded locality information for all specimens. Because you will focus attention on this point and on the utility of these data, the goals of these large studies are high compatible.

With my best wishes and full support for success with this proposal and project.

Sincerely,

David B. Wake  
Professor of the Graduate School in Integrative Biology