Sahonagasy.org: A Web Platform Implementing Information Management and Citizen-Science for the Conservation of Malagasy Amphibians

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Numerous activities related to amphibian conservation in Madagascar have been recently implemented, and this process was accompanied and managed by the IUCN SSC Amphibian Specialist Group. Among the projects is the establishment of the ACSAM Initiative (A Conservation Strategy for the Amphibians of Madagascar) and the launch of the national official action plan, the Sahonagasy Action Plan (SAP) *(1)*. These projects were successful in identifying and prioritizing areas of thematic interest for the amphibian conservation, improving the awareness among Malagasy decision makers on the need for effective conservation measures and leading to the launch of official chytrid prevention plan *(2)*.

One of the most important points highlighted by the SAP (notably reported in chapter two of the published action plan) was the need for improved exchange of information and coordination of research activities *(3)*. Because specialists of Malagasy amphibians are scattered over various continents, this coordination was thought to be best achieved using an appropriate online-infrastructure. In fact, the free availability of information to all participants and members of the ASG-Madagascar (an informal group not yet structured as a standard society network) is a crucial prerequisite for achieving a wide and concerted participation in the planned actions. For instance, real-time updated taxonomic and distributional information is important to decide on priority areas for rapid assessments, and access to literature is necessary to evaluate the relevance of observations and improve capacity building in Madagascar.

In addition, an increasing number of volunteers, in particular ecotourists, is roaming around in Madagascar. Their photographs (of animals or of peculiar behaviors) and other kinds of observations may provide useful information on the distribution and life history traits of Malagasy amphibians and reptiles, and these contributions are expected to augment with increasing numbers of people interested in visiting the spectacular nature of Madagascar and often specifically targeting the herpetofauna *(4)*. The authors as well as other amphibian specialists regularly receive photographs of Malagasy frogs with precise distributional information with requests for identification. Even if in many cases these photos are from common species in well surveyed areas, sometimes they do constitute new distribution records. Even records of common species can over time provide an important basis to assess seasonal activity patterns and contribute to long-term monitoring of possible declines. It is thus important to systematically record such original citizen-science information *(5)*.

Fig. 1: Welcome page of the Sahonagasy.org web site and the logo of the HerpetoGasy BioBlitz project.

With the aim of providing such a platform for the sharing of original observations and improving coordination of research and conservation activities on Malagasy amphibians, we built a web site named Sahonagasy.org (www.sahonagasy.org). Here we provide some relevant information about this web site and how its relatively simple modules can contribute to these goals.

Structure of the website

The Sahonagasy (from the Malagasy, *sahona* = frog, *gasy* = Malagasy) web site was originally built and launched in 2007 as a portal of contacts for the ACSAM Initiative. After that, and thanks to a funding of the BIOPAT foundation, it was significantly improved and ameliorated, with augmented number of pages and sections.

The site is linked with the Facebook page of "A Conservation Strategy for the Amphibians of Madagascar" page. With this Facebook interface, we hope to assure a wider audience and increase the contact possibilities.

The welcome page of Sahonagasy.org shortly presents the goals of the website and the ACSAM Initiative (Fig. 1), including features such as a song on the peculiar tomato frog *Dyscophus antongili,* written by the environmentalist and traditional singer A. Sarovy.

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In the "ACSAM" page we found a series of downloadable awareness documents, including the Sahonagasy Action Plan *(1),* some popular booklets *(6)* and posters on the frogs, snakes, lizards and chameleons of Ranomafana National Park (by P.S. Gehring, M. Pabijan, M. Rakotoarijaona and R. D. Randrianiaina, prepared and printed in only small numbers in 2010).

The "literature" page provides a list of over 1,600 publications on the Malagasy herpetofauna, including historical and key contributions back to the 19th Century. Because herpetological research very often combines research on amphibians and reptiles, also the available bibliography of reptiles has been included. The references include links to PDFs and scans of literature already available. Papers older than 40 years and thus free of copyright are freely available for all, while downloading newer articles requires a password. Especially for Malagasy students access to historical literature is still limited. Although on a more comprehensive level such literature is being scanned and increasingly becomes publically available through the Biodiversity Heritage Library (http://www.biodiversitylibrary.org) and even by Google Books, such massive databases are often difficult to search *(7),* whereas the Sahonagasy database concentrates most of the relevant papers at a single site and thus allows a time-efficient access to students and researchers preparing scientific papers, or M.Sc. or Ph.D. theses, on the Malagasy herpetofauna.

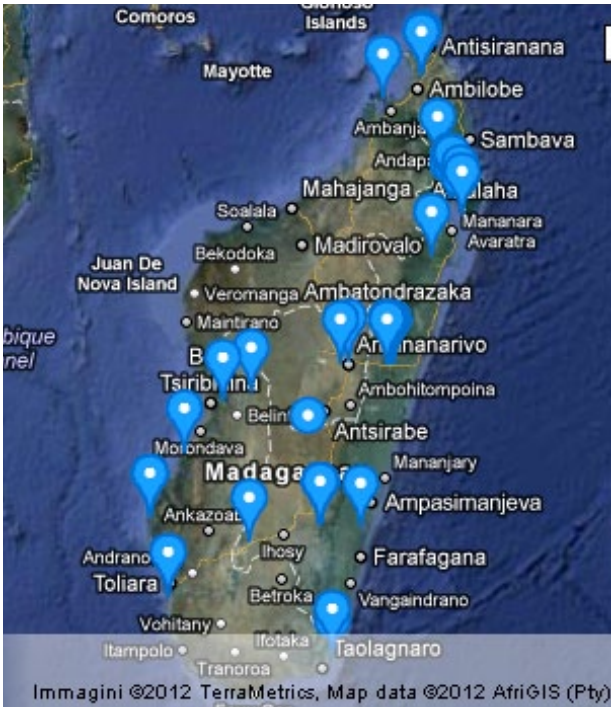

Fig. 2: Map of Madagascar built with Google Earth and implemented with the sites of observations of the amphibians of Madagascar through the HerpetoGasy BioBlitz project.

The "Conservation Projects" page provides information on the ongoing projects, which are as follows: captive breeding *(8),* a project launched to protect the last urban populations of Tomato frog (*Dyscophus antongili*), *Mantella aurantiaca* (*9*), *Mantella cowani* (*10*), threatened amphibians of the Ankaratra Massif and disease screening. These sections present basic information of the above-mentioned projects, including objectives and achieved results. They are particularly helpful for people interested in collaboration and to provide advice the stakeholders.

Since its launch, the web site has received a steadily increasing number of visits, to around 500 visits per month currently.

The HerpetoGasy BioBlitz

The HerpetoGasy BioBlitz (http://www.sahonagasy.org/herpetogasy-bioblitz) is a citizen-science effort to harness amateur observations of reptiles and amphibians to enhance our understanding of the distribution and conservation status of Madagascar's unique fauna. The project represents a regional node of the Global Amphibian BioBlitz (http://www.inaturalist.org/projects/global-amphibian-bioblitz) and the Global Reptile BioBlitz (http://www.inaturalist.org/projects/global-reptile-bioblitz) efforts presented by the IUCN SSC Amphibian and Reptile Specialist Groups and powered by iNaturalist.org (Figs. 2 and 3).

Most importantly, and as major component for interactive information management, a platform for participation of all volunteers in the distributional mapping for Malagasy amphibians. This platform also includes, from the beginning, the possibility of entering data on reptiles.

The HerpetoGasy BioBlitz further allows uploading photographs stored on other media, such as Facebook and Flickr, as well as photographs uploaded via the iNaturalist iPhone and Android apps. The shared photo enables the identification of each observation to be independently verified by iNaturalist community members and the BioBlitz curators.

By integrating distribution maps from the IUCN Red List assessments, the HerpetoGasy BioBlitz identifies out-of-range observations and therefore serves to assemble preliminary information to assess the status and distribution of amphibians and reptiles. For species not yet assessed or mapped, these observations are also valuable as they serve as a foundation for assessing the rarity and distribution of a species.

Another interesting feature provided by the interface HerpetoGasy BioBlitz is that the distribution data compiled from distribution maps and observations provide a sort of field-guide to each geographic locality or protected area within Madagascar which can be used as education tools. For example, this is the field guide to the 38 amphibians thought to occur in the Betampona Strict Nature Reserve: LINK. The following feature compares an observation of *Guibemantis* with the five members of the genus thought to occur in Toamasina, Madagascar: LINK. To date 277 species, representing about half of Madagascar's herpetofauna, have been recorded through the contribution of 1127 observations.

The Blog

A blog section has recently been created to allow people to provide their original observations and reports directly from the field. Blog entries can be submitted through the web site, or automatically by email. The aim of the blog is also to allow providing opinions and information of interest for the herpetologists working in Madagascar. We particularly welcome reports by students, researchers and tourists who have visited remote and unusual regions of Madagascar and can provide real-time information of the state of roads and bridges, suitable local guides, precise access trails and similar; such information can be very valuable for future researchers and ecotourists planning to visit such areas.

Future implementations and the use of social networks

We plan to implement the website via a direct connection with the

Fig. 3: Example of a contribution to the BioBlitz identified as *Guibemantis bicalcaratus*.

researchers working in Madagascar. A contact with the Réseau de la Biodiversité de Madagascar database (REBIOMA, http://www.rebioma.net) will ensure that all verified distributional information becomes automatically available to conservation planning based on the REBIOMA data.

At the same time, we plan to make available unpublished reports provided to the management authorities in Madagascar. This will help ameliorating the information about the areas visited by scientists and tourists. Important extensions could also be the inclusion, in PDF format, of unpublished M.Sc. and Ph.D. theses of Malagasy students and researchers focusing on the amphibian fauna, and fact sheets on all Malagasy amphibians, with distribution maps and photographs. The latter goal is ambitious, especially given the ongoing taxonomic progress with many new species being described every year, but could be achieved in a preliminary way by linking the web site to amphibiaweb.org.

In the meanwhile, it is also worth pointing out that the future of awareness increase and education may pass through an adequate use of web resources. Not only web sites and portals as here summarized, but also through the reasoned utilization of social networks. The advertising of the Sahongasy.org and ACSAM projects through Facebook has been particularly efficient and allowed to implement the friendships up to 709 persons (data available on 9th May 2012). The possibility of sharing photographs, videos, web-articles and rapid opinions has been particularly positive and ensured a better coordination.

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