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MORE THAN 15 YEARS OF AMPHIBIAN CONSERVATION IN MADAGASCAR UNDER THE FLAG OF IUCN SSC AMPHIBIAN SPECIALIST GROUP

SUMMARY

We report the activities of the IUCN SSC Amphibian Specialist Group in Madagascar and conservation actions and initiatives about amphibians carried out in Madagascar from 2005 to present day.

Key words: Madagascar, Amphibians, Conservation, IUCN

RIASSUNTO

Oltre 15 anni di conservazione degli Anfibi in Madagascar sotto la bandiera dell'IUCN SSC Amphibian Specialist Group. Vengono riportate le attività dell'IUCN SSC Amphibian Specialist Group in Madagascar e le azioni / iniziative di conservazione sugli Anfibi dell'Isola dal 2005 ad oggi.

Parole chiave; Madagascar, Anfibi, Conservazione, IUCN

This contribution is a summary about the conservation activities that have been carried out – and/or still on progress – on the peculiar amphibian fauna of Madagascar, with a particular reference to the actions done under the umbrella of IUCN SSC Amphibian Specialist Group (ASG). For those interested to pick-up more details and other important actors, they can consult the recent paper by Andreone *et al.* (2021). In fact, this large continent-island – as Madagascar is often named – hosts a great number of endemic frogs. Current estimates talk about more than 500 endemic species, with around 380 already described and many others still waiting for a formal description (Vieites *et al.*, 2009). Only two species are non-endemic and introduced, the Asian toad *Dut-*

taphrynus melanostictus and the Tiger frog *Hoplobatrachus tigerinus*. The endemic frogs of Madagascar show a considerable adaptive radiation, and facing a few families (Hyperoliidae, Mantellidae, Microhylidae, and Ptychadenidae) present on its territory, it is remarkable to state their diversity. Great part of the species live in the eastern rainforests of the island, while others show remarkable adaptations to the other peculiar ecosystems, namely the dry deciduous forests of the west and other areas, such as isolated massifs and karst areas, including the sandstone massifs of Isalo and Makay, and Bemaraha.

Seen the taxonomic gap affecting Malagasy frogs, it is logical that a great effort carried out by amphibian researchers was paid to visit new areas and describe new species, with the aim to provide a thorough knowledge to frog diversity present on the island. At the same time, the critical situation of the natural habitats of Madagascar and the incipient deforestation rate, justify why a special attention was recently also paid to the conservation of this peculiar amphibian fauna. So far, the growing interest on the conservation of Madagascar's biodiversity pushed many researchers and conservation organizations to study and propose conservation actions. Logically, the main attractive taxonomic group in Madagascar is still and always represented by lemurs, with more than 100 endemic species which act as touristic attractors. Notwithstanding, in the last 30 years many new research and activities began to valorise the amphibians of Madagascar. This was first boosted by the increase of integrative studies which led to the publications of three field guides by GLAW & VENCES (1992, 1994, 2007), and by an intense vague of growing interest in the conservation of world amphibians. This was also coincident with the ACAP (Amphibian Conservation Action Plan), held in Washington in 2005 (GASCON *et al.*, 2007) and just followed a first interdisciplinary meeting held in Mantasoa (Madagascar) (ANDREONE *et al.*, 2001). In this occasion, one of us (F. Andreone) was approached by two renowned conservationists (Russell A. Mittermeier and Claude Gascon) who charged him to put together a dedicated group and an action plan regarding the conservation of amphibians of Madagascar. Indeed, this was a great opportunity and led to the constitution of the Declining Amphibian Task Force (DAPTF) dedicated to Madagascar, that soon evolved to become the Amphibian Specialist Group Madagascar. The lead of this informal group was first assured by F. Andreone and H.J.A. Randriamahazo, who had already worked together for the study and conservation of Malagasy amphibians. At the same time, the collaboration of the core team with S. Stuart and N. Cox allowed to organize an operative meeting in Gland (Switzerland) for the first assessment of the then known Malagasy fauna. This produced the publication of a first keystone contribution on the conservation of Malagasy amphibians (ANDREONE *et al.*, 2005) where, for the first time, the amphibians of Madagascar were object of an in-depth conservation analysis and a threat assessment.

From this first contribution a collaborative network originated and produced several actions in terms of conservation. Soon after this formalization it was launched the first meeting held in Madagascar dedicated to the conservation of endemic amphibian fauna. The coined name of the meeting was ACSAM, literally "A Conservation Strategy for the Amphibians of Madagascar", and was held in 2006 in the capital Antananarivo. This workshop boosted the cooperation of many national and foreign herpetologists, basically all the researchers who were interested to amphibian biology and conservation. The meeting held several contributions and talks, presenting a great number of news, issues, proposals and study projects declined upon the conservation (ANDREONE, 2008). The meeting, held in one of the most prestigious Antananarivo hotels (Colbert), was the occasion of defining a mission for the ACSAM and the launch of the Sahonagasy Action Plan, "sahonagasy" being a Malagasy neologism, with "sahona" meaning "frog" and "gasy", an equivalent adjective to "Malagasy" (ANDREONE & RANDRIAMAHAZO, 2008). The SAP was one of the first amphibian national action plans in high endemism countries, and was taken as a model for subsequent initiatives in many other amphibian biodiversity hotspots. The workshop also allowed to published a comprehensive amphibian conservation monograph (ANDREONE, 2008) which summarized and oriented the subsequent conservation actions and boosted a real interest in frog conservation. At the same time, the SAP produced a printed version (ANDREONE & RANDRIAMAHAZO, 2008), which is currently considered a keystone for amphibian conservation. The contributions reported within these two books oriented the conservation activities for the following years, which can be considered as a sort of "amphibian decade". The engagement in favour of amphibian conservation was soon recognized with the attribution in 2009 of the Sabin Award for Amphibian Conservation to F. Andreone and H.J.A. Randriamahazo (ANDREONE, 2012).

Conservation actions were translated into several aspects of research, active conservation and awareness (ANDREONE *et al.*, 2013b). Research were conducted from one side on some iconic species, such as the Harlequin mantilla *Mantella cowanii* (ANDREONE & RANDRIANIRINA, 2003); the Tomato frog *Dyscophus antongilii* (TESSA *et al.*, 2008); the False tomato frog *D. guineti* (TESSA *et al.*, 2011); the Rainbow frog *Scaphiophryne gottlebei* (ANDREONE *et al.*, 2013a) and the Green mantella *Mantella viridis* (CROTTINI *et al.*, 2012). At the same time, studies were carried out on some frog communities in protected and unprotected areas (ROSA *et al.*, 2012). A particular collaboration was established with the Madagascar Fauna and Flora Group (MFG), a consortium of zoos that is managing the Ivoloina Park in Toamasina and the Betampona Strict Nature Reserve. Such a collaboration allowed to organize a frog festival, which was held in Marontsetra in 2009 and dedicated to the town iconic from the tomato frog *Dyscophus antongilii* (ANDREONE *et al.*,

2013b). This is one of the most renowned and known frog of Madagascar, and one of the few that is known with a specific and onomatopoetic name by local communities, the "saogongogno", making explicit reference to its advertisement call. Furthermore, the species is present within the Maroantsetra town, inhabiting ponds and draining ditches, and thus being one of the most attractive frogs in Madagascar, being also a regular step for tourists passing to visit the Masoala National Park and visiting Maroantsetra. With MFG many other activities were also carried out, including a multi-year monitoring activity which led to the publication of a specific analysis of the amphibian community evolution in Betampona SNR (DUBOS *et al.*, 2020).

The activity of ASG Madagascar produced also a few more workshops. The first one was dedicated to the chytrid fungus and its prevention and entitled "Disease screening for amphibians. Course for amphibian biologists", and was held at Ivoloina (12th-18th October 2010). In fact, the chytrid fungus *Batrachochytrium dendrobatidis* (Bd) was firstly thought as absent from Madagascar (WELDON *et al.*, 2013). A series of analyses on amphibian communities showed an apparent absence of this emerging pathogen, which caused dramatic declines and extinctions all around the World. Suddenly a screening on amphibians exported for the herpetological pet-trade evidenced some Bd positives (KOLBY, 2014). This was also mirrored by further positives found in the remote Makay Massif. So far, an expedition was immediately organized in this massif in August 2011, and supported with an emergency fund from the Mohamed bin Zayed Species Conservation Fund. This survey revealed a few further positives, that convinced the ASG Madagascar to invest in a regular monitoring program for Bd presence and in the creation of a "Chytrid Emergency Cell" (BLETZ *et al.*, 2012). Despite the fact that a study by LÖTTERS *et al.* (2008) revealed that Madagascar was particularly prone to host the Bd, the number and occurrence of positive cases were always quite scanty and limited. Efforts by M.C. Fisher and colleagues to isolate Bd have so far been rather unsuccessful. Anyhow, taken into consideration that it is always possible that mass mortality cases could occur, and that until present there is not efficient treatment against Bd in the wild, the ASG Madagascar also invested in the formation of captive breeding methods. A dedicated workshop entitled "Amphibian Conservation Husbandry" was held in Andasibe (26th November-2nd December 2012), organized in collaboration with Fikambanana (Association) Mitsinjo, and aimed to teach the modalities of captive breeding and husbandry science with a focus on the Malagasy amphibians (EDMONDS *et al.*, 2012). This was successfully translated in practice with the realization of the Amphibian Breeding Center at Andasibe. This center was financially supported by Sherritt International Co. to sustain the reproduction of the Golden frog *Mantella aurantiaca* as a compensatory measure for the destruction/alteration

of the breeding sites located in the eastern rainforests due to the passage of the pipeline dedicated to the transfer of nickel and cobalt from the Ambatovy mine to the port town of Toamasina. The project was coordinated by Fikambanana Mitsinjo and supervised by ASG Madagascar and was largely successfully, with a large number of individuals and generations produced and subsequently reintroduced in nature. At the same time, a few other species were also kept in captivity and reproduced (RAKOTONANAHARY *et al.*, 2017). The SAP was implemented during the time and in 2014 a second meeting was held to make the point and verify what happened and what was still to be implemented. This new workshop was named ACSAM2 and held in Ranomafana National Park. Again, the meeting saw a great participation of the scientist and conservationist community and produced a great number of communications (ROSA *et al.*, 2014). Similarly, to what happened with the first ACSAM meeting, this new one produced a new Sahonagasy Action Plan (ANDREONE *et al.*, 2016). During the ACSAM2 a particular emphasis was given to the threatening situation due to the discovery that an alien amphibian, the Asian toad *Duttaphrynus melanostictus* was discovered in Madagascar around Toamasina, and was rapidly expanding. This invasion was particularly worrying due to the potential impact due to the presence of this species, affecting the local amphibians (LICATA *et al.*, 2019), and due to the fact that the presence of this species could cause the death of many potential predators, which are not used to the toxins produced by the toad's skin (MARSHALL *et al.*, 2018).

This focused more in detail the critical situation and drew a roadmap for further initiatives. As an important fallout, the core nucleus of the ASG Madagascar together with Durrell Wildlife Conservation Trust put together an important project and proposal entitled "Building a future for Madagascar amphibians", which was supported by Critical Ecosystem Partnership Fund (CEPF) (https://www.cepf.net/grants/grantee-projects/building-future-amphibians-madagascar). This grant extended from November 2015 to June 2019 allowed the possibility to contribute to the capacity building of local people, to the recruitment of two dedicated personnel (T.F. Rakotonanahary and S.H. Ndriantsoa). The project also focused on one critical site, the Ankaratra Massif (around 150 Km from the capital Antananarivo) which is the second highest massif of Madagascar and site of two of the most threatened amphibian species, respectively *Boophis williamsi* and *Mantidactylus pauliani.* Last but not least, the activity of the IUCN SSC Amphibian Specialist Group organized, on several occasions, meeting and educational initiatives with the amphibians as focus group, showing the importance of protecting them as ambassadors of biodiversity. The last event, named "Festival des amphibiens" was organized in on the 3rd May 2019 in Parc Ivoloina, and continued the profitable collaboration with Madagascar Fauna and Flora

Group. Finished the CEPF fund the activities of ASG Madagascar were directed to a reboot of the conservation initiatives. Currently, following a meeting on the conservation of *Mantella cowanii* held in the town of Ambositra in December 2018 a new action plan, the McAP *Mantella cowanii* Action Plan was put together and updated a previous one (RABIBISOA, 2008; ANDREONE *et al.*, 2020). Unluckily, the COVID19 sanitary emergency hit Madagascar too and prevented to start-up a series of initiatives, included this one. In any case, the conservation of this iconic species, that was already one of the first interested by ASG activities (ANDREONE & RANDRIANIRINA, 2003) is scheduled to move on during the breeding season in late 2021, and will see a through collaboration between ASG Madagascar members, Chester Zoo, Madagasikara Voakajy, Fondazione A.R.C.A. and L'Homme et l'Environnement. This summary provides a good example of what the ASG Madagascar will become in the future, most likely an independent and autonomous association (Miaro ny Sahona, MISA) that will contribute to the conservation of one of the most attractive and rich amphibian fauna in the World.

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