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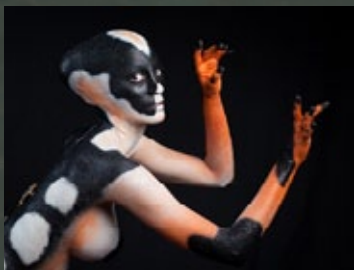
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Rhacophorus rhodopus of Hainan Island, a beautiful treefrog from Indochina that needs intact rainforest to survive. Photo credit: Bosco Chan@KCC.



**Metamorphosis
wins
International
Photo Award**



**New Partnership
between the ASG and
International Society
for the Study and
Conservation of the
Amphibians**

Amphibian Research and Conservation in Vietnam

By Truong Quang Nguyen & Thomas Ziegler

Vietnam has one of the richest amphibian faunas in the world with nearly 200 species being recognized from this country (1-10). However, many amphibian populations and species are facing declines as a result of habitat loss and degradation, over-harvesting for food consumption, traditional medicine and pet trade (11-13). Currently, 32 Vietnamese amphibian species (approximately 16% of the total species number known for Vietnam) are listed in the IUCN Red List (14) at different categories: three species are listed as Endangered, 13 as Vulnerable and 16 as Near Threatened. To counteract the biodiversity decline in tropical forests in Southeast Asia, numerous research and conservation programs have been undertaken in Vietnam during recent decades (15, 16). We herein provide a brief overview about recent amphibian research and conservation efforts in Vietnam.



Rhacophorus robertingeri, a newly described species from central Vietnam. Photo: T.Q. Nguyen.

RESEARCH ACTIVITIES

Since 1998, a series of herpetofaunistic studies has been conducted in different regions of Vietnam with the focus on unexplored forests such as Hoang Lien Mountains in the Northwest; Ngan Son and Bac Son karst formations or Viet Bac and Dong Trieu granitic formations in the Northeast; Truong Son range and Central Highlands (e.g., Kon Tum, Dak Lak, Langbian, Di Linh plateaus); as well as on some offshore islands (e.g., Bai Tu Long, Cat Ba, Con Dao and Phu Quoc). As result of recent herpetological exploration, the knowledge about species richness of amphibians in Vietnam has remarkably increased, from 82 species in 1996 to 181 in 2010, and currently, the species number has reached 194 (1-10, 17). In the past two years, 11 new amphibian species have been described from Vietnam and two new records have been reported from this country as well. In addition, taxonomic reviews have been provided for some groups based on morphological and molecular data, namely *Gracixalus* (3), *Ichthyophis* (8), *Leptolalax* (9), *Rhacophorus* and *Theloderma* (4, 10). Ongoing investigations of the amphibian fauna are being



Ichthyophis nguyenorum, a newly described species from central Vietnam. Photo: T.Q. Nguyen.

carried out in Dien Bien, Son La, Cao Bang, Ha Giang, Thanh Hoa and Lam Dong provinces.

In contrast to the surge of herpetofauna diversity surveys, the research on the natural history of Vietnamese amphibians is still limited. However, information about the specific adaptations (ecology) and population status is crucial for subsequent, suitable conservation measures. In times of the global amphibian crisis, and to be prepared for proper conservation breeding action, necessitated by the hazardous amphibian chytrid fungus (which is responsible for the amphibian disease chytridiomycosis), one of the major interests here is related to the reproductive biology of threatened or poorly known species. Some larval descriptions, larval staging and in part breeding reports of salamanders, bufonids, megophryids, microhylids, ranids and rhacophorids have been recently published (2-4, 9, 10, 18-26). Call descriptions for some species of several anuran groups from Vietnam were also provided, amongst others, by Anderson *et al.*, (27), Ziegler (28), Rowley *et al.*, (3, 6) and Wildenhues *et al.*, (21).

Currently, a comprehensive study on the distribution, population size and ecology of the Vietnamese newt genus *Tylotriton* and salamander genus *Paramesotriton* is taking place in northern Vietnam (e.g., 29).

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Larvae of Vietnam newt *Tylotriton vietnamensis* at the Amphibian Breeding Station in Hanoi. Photo: T. Ziegler.

CONSERVATION ACTIVITIES

An amphibian conservation needs assessment for the species of the Indochina region was held in Hanoi by the Amphibian Ark in March 2012. During this five-day workshop, the conservation status of 65 species from Cambodia, 110 species from Laos and 176 species from Vietnam was evaluated. According to the assessment results, conservation actions for the Vietnamese amphibians include: 80 species of *in situ* conservation, 105 species of *in situ* research, five species of *ex situ* research, 73 species of conservation education and 21 species that do not require any conservation action at this point of time (30).

In order to build up or maintain populations in captivity, the Institute of Ecology and Biological Resources (IEBR), together with the Cologne Zoo, have decided to promote the *ex situ* research and conservation of amphibian species in Vietnam since 2007 (see 31, 32, 33). The first phase has been successfully carried out at the Breeding Station on the outskirts of Hanoi, with already 14 bred amphibian species (34). Some results already have been published as service for other breeding stations / conservation projects / natural history research on tadpoles (21, 25), further data in particular concerning rearing, tadpole morphology and staging of rhacophorids (*Rhacophorus*, *Theloderma*) are currently assessed by Vietnamese and German students of our working group and prepared for subsequent publication. For disease control, selected breeding groups have been tested for the amphibian chytrid fungus *Batrachochytrium dendrobatidis* and since recently also for *Ranavirus*, but fortunately there has been no infection documented in Vietnamese amphibians at the station so far.

However, because of the land re-allocation and the current conditions at the Breeding Station in Hanoi, IEBR and Cologne Zoo are planning to implement the second phase of the *ex situ* research / conservation, but this time combined with *in situ* and education activities at the Me Linh Station for Biodiversity, bordering the famous Tam Dao National Park in Vinh Phuc Province, northern Vietnam. The Me Linh Station was established by the Vietnam Academy of Science and Technology in 1999 with the total area of 170.3 hectares. This station is directly located in forest environment, and therefore, it creates easier conditions for *in situ* conservation and research approaches as well as environmental



(Top left) Herpetological field work of European / Vietnamese working group in the lowland forest of Yen Tu, northern Vietnam. (Top right) Examination of abiotic parameters in the habitat of the endemic *Tylotriton vietnamensis*. (Lower left) One of the amphibian breeding facilities at the IEBR Breeding Station at Hanoi. (Lower right) Rhacophorid tadpoles at the Hanoi Breeding Station. Photo: T. Ziegler.



Cologne Zoo staff constructing indoor amphibian terraria and introducing the Me Linh Station staff into amphibian husbandry management. Photo: T. Ziegler.



The Me Linh Station for Biodiversity, located directly in forested environment. Photo: T. Ziegler.

education. The objectives at Me Linh are to monitor the local biodiversity, to protect the native species and their natural habitat, to rescue confiscated animals, to keep and breed selected threatened / poorly known species, with a special focus on amphibians (including husbandry analogue species, as was decided during the AArk amphibian assessment in March 2012) and finally to provide services for conservation education for visitors and students.

Several initial activities have already been done at the Me Linh Station in May 2010 during a five-day visit of the latter author together with Cologne Zoo staff. This first administrative assistance included amongst others the beginning of the build up of an indoor amphibian facility, the setting of a quarantine station, the building of facilities for Tiger geckos (*Goniurosaurus* spp.) and Vietnamese crocodile lizards (*Shinisaurus crocodilurus*), the improvement and enrichment of a macaque facility, and the improvement of existing as well as construction of new turtle enclosures (35). Further building activities, in particular regarding the indoor amphibian facility and the construction of outdoor amphibian facilities, together with labeling and a keeper training conducted by the Cologne Zoo team on husbandry and captive breeding are planned to take place at the Me Linh Station in spring 2013, but still outstanding funds need to be acquired first. Besides such capacity strengthening aspects we also intend to continue with public awareness such as implementation of school visits and compiling a bilingual brochure, as it was already done by our team for the Yen Tu Nature Reserve, which houses the endemic Vietnam newt *Tylotriton vietnamensis* (see http://www.eaza.net/campaigns/Documents/Brochure_Tay_Yen_Tu_Nature_Reserve_2010.pdf).

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