



Vietnamese Crocodile Lizard

(*Shinisaurus crocodilurus vietnamensis*)



Vietnamese crocodile lizard (*Shinisaurus crocodilurus vietnamensis*) at Cologne Zoo's conservation breeding facility. Phot. T. Ziegler



General Introduction

Vietnam belongs to the global hotspots of biodiversity and is a megadiverse country. Discoveries of new species are regularly reported from it. The Endangered Vietnamese crocodile lizard is endemic to northeastern Vietnam and facing a series of direct threats to its survival.

Biology

Shinisaurus crocodilurus, discovered by Ahl in 1930 from China, is the sole living representative of the family Shinisauridae. The split from one of its closest relatives, the monitor lizards, more than 100 million years ago, makes it a living fossil. For more than 70 years, this species was only known to inhabit China. However, subsequent field surveys since 2003 have found that the species also occurs in Vietnam, where three subpopulations have been discovered so far. Recently, the Vietnamese population has been described as a distinct conservation unit at the subspecies level based on its divergent morphological characters, different ecological adaptations and genetic divergence compared to other populations from China.

The crocodile lizard is a semi-aquatic reptile, which spends most of its time in shallow stream water or on tree branches near streams. Its food includes insects, worms, and other invertebrates. It hunts for food by sitting and waiting until prey comes along. The lizard looks colourful with a mixture of green, brown, red, orange and yellow and is about 40-46 cm long. Several rows of bony scales run on its back and muscular tail, resembling those of a crocodile, forming the most remarkable feature of the species and also where its name originated from. Adult females are smaller and less colourful than adult males, particularly during the breeding season. The species is also known for its territorial behaviors, e.g., scaring intruders by performing push-ups and moving its head around.



The Vietnamese subspecies is characterised by a relatively longer and more pointed snout compared to its Chinese counterpart. However, there is no detected difference in terms of coloration between Vietnamese and Chinese populations. Chinese crocodile lizards occupy evergreen broadleaf and bamboo forests in limestone habitat, while the Vietnamese taxon only occurs in evergreen broadleaf forests or mixed with bamboos in granitic habitats. Crocodile lizards from Vietnam start to hibernate at significantly higher temperatures compared to those from China, probably because the winter in China is colder. Unlike Chinese crocodile lizards, individuals from Vietnam are found in much higher perches and rarely rest on rocks.

In contrast to most other reptiles, the species give birth to live offspring (viz. being viviparous) because embryos develop inside the body of the mother. In general, females mature and can begin to reproduce by the age of three. Each female delivers 2-12 developed offspring in spring.

Status

Recent studies revealed that the Chinese populations of the Crocodile Lizard decreased from 6000 in 1978 to 950 individuals in 2008. Although the species was first recorded from Vietnam in 2003, the populations have been imperiled by hunting activities, coal mining, deforestation, and tourist activities. The species was first recorded in the international trade in 1982 and between 1984 and 1986, it was estimated that more than 3,000 individuals were illegally exported from Guangxi Autonomous Region in China. In Vietnam, numerous individuals were observed on sale for pet trade at the tourist sites in the early 2000s. In recent years, the species has become increasingly popular in international and local trade, especially individuals from Vietnam because they are more colourful.

This species is facing an extremely high risk of extinction. It is listed as Endangered in the IUCN Red List and in Appendix I of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES),



meaning it is prohibited from trade in any forms. The population in Vietnam has been estimated at fewer than 150 adults, that is distinctly lower than published threshold sizes of several thousand individuals required for the long-term persistence of a species.

Conservation action

To act following the One Plan Approach, ex situ activities have been implemented years ago in both Vietnam and Europe. Breeding has already taken place in IEBR's Melinh Station for Biodiversity, and in Cologne Zoo, Germany, an extensive breeding facility was built for housing confiscated and genetically screened individuals from Vietnam. At Cologne Zoo, successful breeding up to F2 has already taken place and bred individuals from there have been forwarded to other zoos, where they have already bred (recently in Ostrava). If above stated population estimates for Vietnam were right, so far already more than 20 % of the globally known population has been reproduced in Europe (with $n = 30$ offspring alone at Cologne Zoo). Thus basic steps have already been done, now it is important to extend the conservation breeding program / network to reinforce with the aforementioned generated offspring, the very small and declining natural subpopulations. Environmental DNA and field surveys are also needed to confirm their microhabitats so that future releases of held individuals can be performed properly. Habitats at key sites, especially in Yen Tu, where it has been shown to be resilient to future climate change, will need to be secured by mitigating harmful activities, such as mining, logging, and infrastructure development. Finally, poaching to supply the international trade needs to be stopped to save the remaining population in the country.

Campaign objectives

To effectively implement appropriate conservation measures together with the partners, including the Institute of Ecology and Biological Resources (IEBR), the



Central Institute for Natural Resources and Environmental Studies (CRES), and protected areas within the species range (such as Tay Yen Tu Nature Reserve, Yen Tu Nature Reserve, Dong Son – Ky Thuong), the EAZA Vietnam campaign will foster (as the species already is nationally and internationally protected, focus should be now on habitat and populations conservation / restoration):

- Work with different stakeholders and protected areas within the species range to mitigate direct threats and secure key habitat for the species;
- Conduct additional field surveys to locate other subpopulations in Vietnam;
- Continued genetic screening;
- Continued habitat/threat assessment and population monitoring;
- Identify suitable sites for releasing bred animals;
- Support conservation breeding populations in European and Vietnamese facilities and to extend the conservation breeding network;
- Support of restocking actions, as plans by Ministry of Natural Resources and Environment, through repatriation of offspring from Europe;
- Build a small ranger station in Quang Ninh, plus a tourist site and provide patrolling equipment;
- Awareness activities such as 12-16 signboards;
- Further option: work towards Hai Ha at border with China becoming a new reserve in future.



Vietnamese crocodile lizard (*Shinisaurus crocodilurus vietnamensis*) with freshly born young at Cologne Zoo's conservation breeding facility. Phot. T. Ziegler



Together for conservation - Vietnamese crocodile lizard (*Shinisaurus crocodilurus vietnamensis*) comic "Shini" with young generation. Drawing. C. Niggemann, Cologne Zoo