A herpetological assessment of the littoral forests of Sainte Luce (southeastern Madagascar): Using genetic tools to ascertain the true identities of the area's amphibians and reptiles.

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INTRODUCTION

Sainte Luce represents one of the last examples of intact southern littoral forest in Madagascar, an island renowned for its incredible species richness and biodiversity. Madagascar is currently home to 313 described species of amphibian and 439 described species of reptiles. Although these figures are impressive, it must be also recognised that these figures do not constitute final richness counts, with both groups known to contain a large number of undescribed 'candidate' species. Total estimates for the number of amphibians present on the island is often cited as being nearer to 500 species, with similar estimates offered for the reptiles. The astonishing herpetological diversity seen on Madagascar is given further significance when levels of endemism are considered; with 99% of amphibians being found nowhere else on Earth and likewise over 97% endemicity is observable in the Squamata.

Unfortunately, Madagascar is now almost as renowned for its disturbing levels of deforestation and habitat degradation as it is its biological wealth, both of which are considered key drivers of species extinction. Madagascar can perhaps now be viewed as the most salient global example of the crisis facing the world's tropical forests and biodiversity. Therefore it is crucial that we work towards compiling a complete species inventory for this biodiversity hotspot so that practical conservation can be implemented and before it becomes too late. Two of the Sainte Luce forest fragments, S8 and S9, (**Fig.1.**) have recently been granted partial pseudo-protected status, however the species richness reported here is representative of the wider Sainte Luce area.

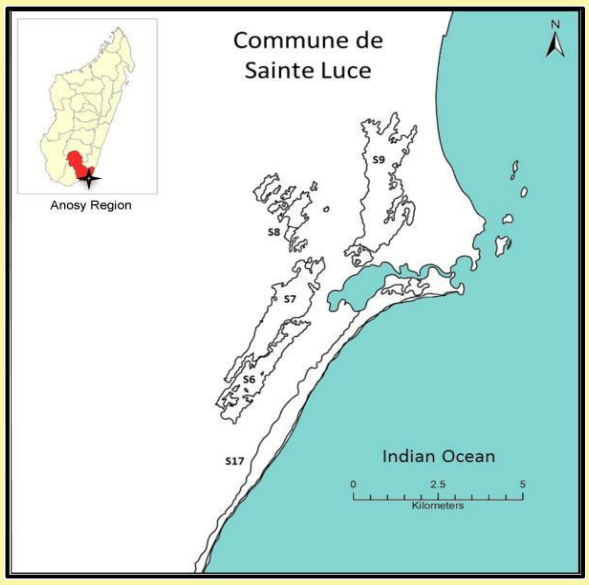
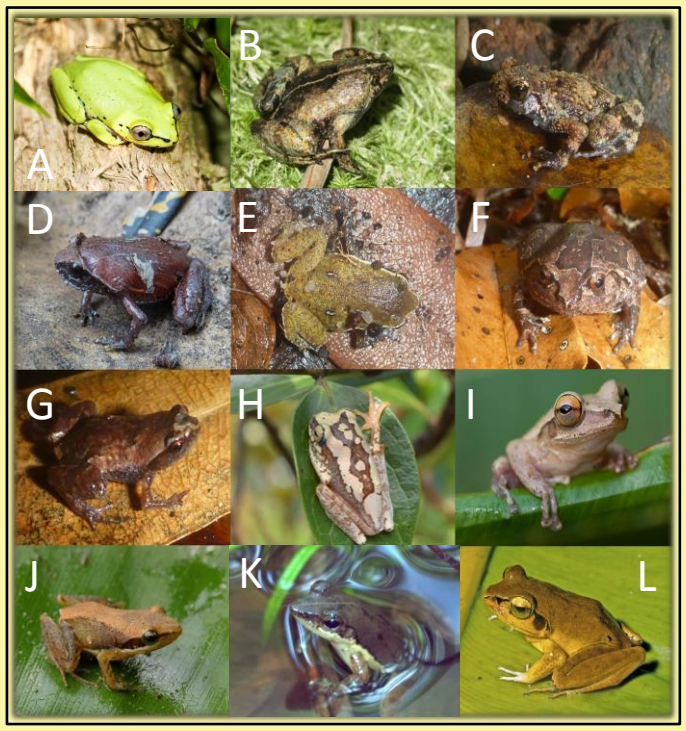


Fig. 1 – Map showing Sainte Luce relative to Madagascar.



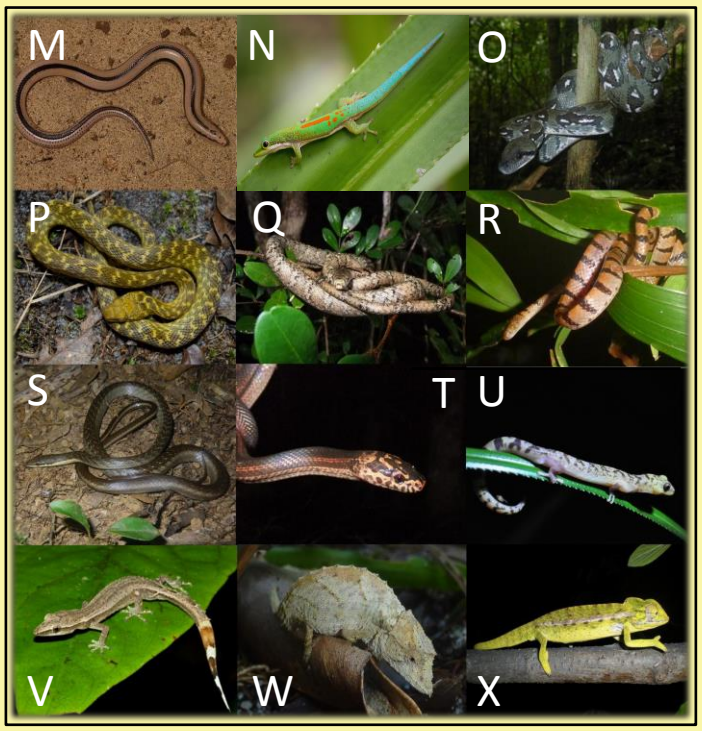


Fig.2: (**A**) *Heterixalus boettgeri*, (**B**) *Paradoxophyla palmata*, (**C**) *Anodonthyla nigrigularis*, (**D**) *Plethodontohyla bipunctata*, (**E**) *Plethodontohyla notosticta*, (**F**) *Plethodontohyla alluaudi*, (**G**) *Stumpffia spp.*, (**H**) *Boophis picturatus*, (**I**) *Boophis opisthodon*, (**J**) *Blommersia blommersae*, (**K**) *Mantidactylus sp. aff. majori*, (**L**) *Aglyptodactylus inguinalis*, (**M**) *Androngo trivittatus*, (**N**) *Phelsuma antanosy*, (**O**) *Sanzinia madascariensis*, (**P**) *Madagascarophis meridionalis*, (**Q**) *Micropisthodon orchaeus*, (**R**) *Lycodryas gaimardi*, (**S**) *Itychyphus goudoti*, (**T**) *Pseudoxyrophus sp. aff. microps*, (**U**) *Matoatoa spannringi*, (**V**) *Ebenavia inunguis*, (**W**) *Palleon nasus*, (**X**) *Furcifer lateralis*.

MATERIALS and METHODS

Sainte Luce has been subject to two previous short herpetological studies (2006 & 2012), but has never been subject to a comprehensive genetic study. Between September 2014 and October 2015 a serious attempt was made to examine and collect tissue samples from the entire herpetological community of Sainte Luce, using a variety of innovative methods extended across each of the fragments that constitutes the Commune de Sainte Luce (**Fig. 1**). Samples were collected in the form of toes clippings in amphibians (4th toe on back foot) and tail tips for all members of the Squamata. Sampling was conducted as part of a long term assessment of the herpetological community but also included opportunistic sampling. Both morphological and genetic markers (16s, COI, ND1, ND2 and ND4) have been employed to assess community composition, in order to categorically reveal the true identities of the amphibian and reptiles species present in Sainte Luce.

RESULTS and DISCUSSION

In the Sainte Luce area we have identified and can confirm the presence of 20 species of amphibian and 46 species belonging to the Squamata (excluding marine turtles) (**Fig.2**). Of the amphibians, 12 species belong to the large endemic family the Mantellidae, 6 are microhylids, and the families Hyperolidae and Ptycadenidae are each represented by a single species. Among the squamates the familial composition is as follows: Lamprophiidae snakes (18), Boidae (2), Geckos (10), Chamaeleonidae (4), Scincidae (7), Gerrhosauridae (2), one Opluridae and one Crocodylidae. Interestlingly, several taxa contain candidate new species and whose descriptions are currently being worked on. We also provided a novel set of gene sequences for all markers in order to bridge the current gap in knowledge that exists in and around the study area. The project advances the case for Sainte Luce to be formally recognised as a protected area and encourages more serious discussion about the long term survival of its forests, human and wildlife communities.

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