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Amphibian and reptile records from around the Betsiboka delta area in North-Western Madagascar

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Abstract. This study summarises amphibian and reptile records from ad hoc surveys in a series of localities in the North-West of Madagascar, largely centred on the delta of the Betsiboka River. Eleven amphibian and approximately 32 reptile species were found, with taxonomic uncertainties remaining for some of them. Among the most relevant findings, we report on range extensions northwards of *Aglyptodactylus laticeps* (verified by DNA sequencing), and of an enigmatic skink of the *Trachylepis aureopunctata* group, possibly close to *T. dumasi, T. tandrefana,* or *T. volamenaloha*. We furthermore provide anecdotal information on habitat and natural history of several rare and regionally endemic burrowing skinks, i.e., *Voeltzkowia mira, V. yamagishii,* and *Pygomeles petteri.*

Key words: Range extension, *Aglyptodactylus laticeps*, *Trachylepis* sp. aff. *dumasi*, natural history, *Voeltzkowia mira, Pygomeles petteri*.

Introduction

In hyperdiverse tropical faunas of amphibians and reptiles, the biology and population dynamics of the vast majority of species remains poorly known, and information on their spatial occurrence becomes paramount for their conservation. In Madagascar, Red List assessments (Andreone et al., 2005; Jenkins, 2015) and reserve planning (Kremen et al., 2008) are largely relying on the extent of geographical occurrence of species. A proper knowledge of distribution ranges is also crucial for biogeographic inference and analysis of speciation mechanisms (e.g., Goodman & Ganzhorn, 2004; Vences et al., 2009; Brown et al., 2014).

Although the herpetofaunal diversity of Madagascar has been relatively well documented (Glaw & Vences, 2007) and species delimitation has been improved by comprehensive molecular data sets (Vieites et al., 2009; Nagy et al., 2012; Perl et al., 2014), the knowledge of some regions and taxa remains scarce. The dry to subarid regions in the South-West, West and North-West (regions according to Boumans et al. 2007) contain numerous such poorly accessible and poorly explored sites, but at the same time are characterized by high rates of habitat destruction (Waeber et al., 2015).

Herpetofauna survey work in Madagascar has been rather intensive over the past two decades (D'Cruze et al., 2009), and has included numerous sites in the dry habitats of the island (e.g., Raxworthy et al. 1994; Goodman et al., 1997; Ramanamanjato & Rabibisoa, 2002; Raselimanana, 2004, D'Cruze et al., 2007; Bora et al., 2010). A particular increase in knowledge came from the recent comprehensive accounts of Raselimanana (2008).

During recent fieldwork in the North-West of Madagascar we recorded numerous species of amphibians and reptiles from various sites, some of which had not been surveyed so far. Our records were made ad hoc, without standardized survey methodology, and were the result of search efforts conducted in addition to or as part of surveys aimed at finding regionally endemic species of burrowing

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skinks. We here summarize the survey results, including some range extensions, and include observations on the natural history of some poorly known species, in particular the fossorial skinks that were the main target of the fieldwork.

Study sites

Amphibian and reptile surveys were conducted across eight locations largely centred on the delta of the Betsiboka river (Fig. 1). According to the biogeographical zonation of Boumans et al. (2007) and Glaw & Vences (2007), the following sites are all in the North-West and West regions of Madagascar and are mainly characterised by deciduous dry forest. Survey work took place between 7 January 2012 and 4 January 2013 for periods of 1 to 5 days.

1. Plateau of Bongolava (-15.6471, 47.5831, 200 m a.s.l.). Surveyed from 10–14 February 2012. The study site was located about five km west of the village of Marosely, which itself is approximately 15 km south-west of Port Bergé and on the Plateau of Bongolava. The area is characterised by deciduous dry forest and sandy soils (Miralles et al., 2012).

2. Ankarafantsika National Park (-16.31783, 46.81434, 133 m a.s.l.). Surveyed on 7 January 2012 and from 19–20 December 2012. Crossed by the National Road 4 connecting Antananarivo and Mahajanga, Ankarafantsika is located 115 km from the city of Mahajanga and 454 km from Antananarivo. The park is bounded on the east by the river Mahajamba and on the west by the river Betsiboka. Ankarafantsika forest is one of the last remaining dense dry deciduous forests of the West of Madagascar (Waeber et al., 2015) (Fig. 2b). Surveys were conducted on a small trail between the "*campement des chercheurs*" and the *Jardin Botanique* A (JBA) as well as within the JBA itself.

3. Antsanitia (-15.57716, 46.43378, 6 m a.s.l.). Surveyed from 22–23 December 2012. Antsanitia is located 25 km north-east of Mahajanga. The study site was an old cassava plantation partially converted to a place of residence. The area is characterised by sandy soils amidst relictual deciduous dry forest vegetation (Fig. 2a).

4. Boanamary (-15.83102, 46.30732, altitude not recorded). Surveyed on 24 December 2012. The study site was an extended sandy area close to the sea, with a relict mangrove forest.

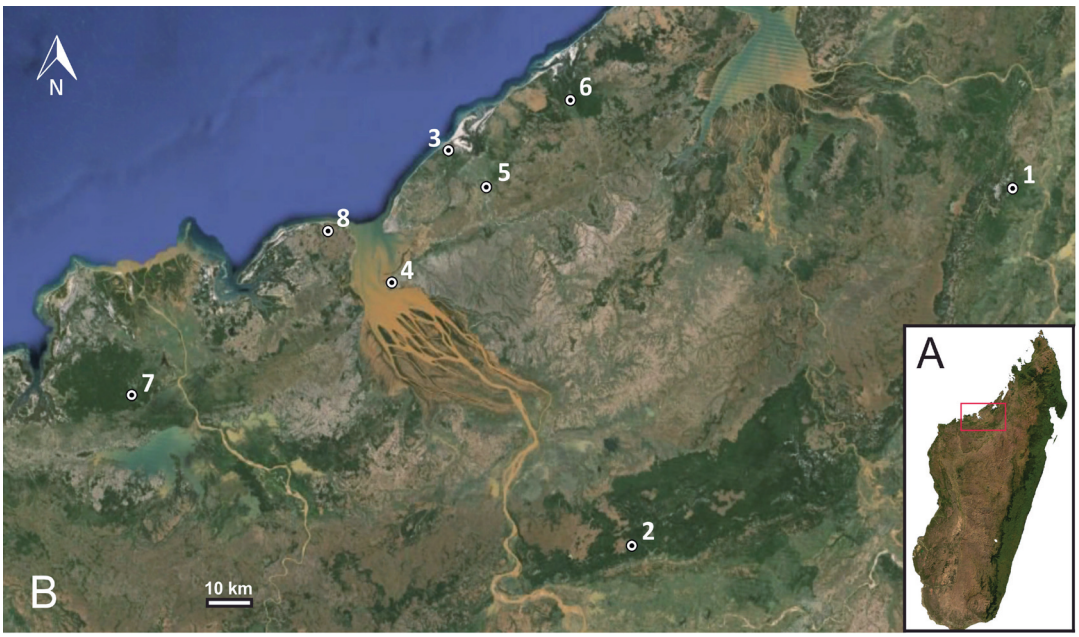

Figure 1. (A) Location of the study area in North-Western Madagascar, and (B) location of study sites: (1) Plateau of Bongolava (2) Ankarafantsika National Park; (3) Antsanitia; (4) Boanamary; (5) Betsako; (6) Mariarano; (7) Mitsinjo; (8) Ankiririka Katsepy. (Modified from Google Earth, 2013).

Figure 2. Surveyed sites around the Betsiboka delta in North-Western Madagascar. (a) Antsanitia (22 December 2012); (b) Ankarafantsika (July 2013); (c) Boanamary (24 December 2012); (d) Mitsinjo (3 January 2013).

Table 1. Summary of amphibian records from surveyed sites in northwestern Madagascar.

	Plateau of Bongolava	Ankarafantsika	Antsanitia	Boanamary	Betsako	Mariarano	Mitsinjo	Ankiririka Katsepy
AMPHIBIA								
Microhylidae								
Dyscophus insularis	+	+					+	
Scaphiophryne sp. aff. *calcarata*	+							
Stumpffia cf. *analamaina*		+						
Mantellidae								
Aglyptodactylus laticeps							+	
Blommersia wittei						+	+	
Boophis doulioti							+	
Laliostoma labrosum	+	+					+	
Mantella betsileo	+						+	
Heterixalus luteostriatus	+						+	
Ptychadenidae								
Ptychadena mascareniensis		+					+	
Dicroglossidae								
Hoplobatrachus tigerinus							+	
Total	**5**	**4**	**0**	**0**	**0**	**1**	**9**	**0**

5. Betsako (-15.65438, 46.51374, 29 m a.s.l). Surveyed on 26 December 2012. The study site was an extended sandy area near the river Mahamavo.

6. Mariarano (-15.49341, 46.69323, altitude not recorded). Surveyed from 27-28 December 2012. Mariarano forest is part of an unprotected forest block in the North-West of Madagascar, about 50 km north-east of Mahajanga. The few remaining patches of deciduous forest are no larger than 800 ha and under intense anthropogenic pressure (Evans et al., 2013).

7. Mitsinjo (-16.04848, 45.79003, 44 m a.s.l). Surveyed from 2-4 January 2013, the study site was located within a newly protected area managed by the organisation Asity Madagascar. Locally known as Analamanitra, the site is part of the larger Tsiombikibo forest in the Mahavavy-Kinkony Wetland Complex. Analamanitra consists of highly fragmented dense dry deciduous forest affected by anthropogenic activities such as lemur and bushpig traps. Several sites were visited during diurnal and nocturnal opportunistic searches.

8. Ankiririka Katsepy (-15.71289, 46.21650, 18 m a.s.l). Surveyed on 4 January 2013. The study site was a very small littoral forest with moderately open canopy and no remaining big trees, situated on a steep north-facing ridge in close proximity to the seashore. A single nocturnal survey was conducted at this field site in heavy rain.

Voucher specimens of several species of amphibians and reptiles were collected and labelled using ZCMV field numbers (Zoological Collection Miguel Vences). Upon completion of their taxonomic study, they will be deposited in the collections of UADBA (Université d'Antananarivo, Departement de Biologie Animale, Madagascar), and ZSM (Zoologische Staatssammlung München, Germany).

From selected species, a fragment of the mitochondrial 16S rRNA gene was sequenced using standard methods (e.g., Vieites et al., 2009) and compared to an existing database of DNA sequences of Malagasy amphibians and reptiles in order to verify species identification. Newly determined DNA sequences were submitted to Genbank (accession numbers KR025899–KR025915).

Results and Discussion

Altogether, a total of 11 amphibian and approximately 32 reptile species (Tables 1, 2) were identified across the eight study sites around the Betsiboka delta area. Most of these were representatives of the typical regional fauna as characterised in previous surveys and monographs (Ramanamanjato & Rabibisoa, 2002; Raselimanana, 2008; Glaw & Vences, 2007). In a few cases the taxonomy of the encountered specimens requires further confirmation. For instance, the miniaturised microhylid frogs of the genus *Stumpffia* occurring in Ankarafantsika, according to our preliminary data (to be published elsewhere), probably belong to the recently described *S. analamaina* (see Klages et al. 2013). *Blommersia* populations from the area have been assigned to *B. wittei* but might instead belong to its sister species, *B.* sp. Ca5 (Vieites et al. 2009; Perl et al. 2013).

Table 2. Summary of reptile records from surveyed sites in North-Western Madagascar.

	Plateau of Bongolava	Ankarafantsika	Antsanitia	Boanamary	Betsako	Mariarano	Mitsinjo	Ankiririka Katsepy
SQUAMATA								
Chamaeleonidae								
Brookesia stumpffi	+							
Brookesia brygooi						+	+	+
Furcifer cf. *oustaleti*	+	+				+	+	+
Furcifer angeli						+	+	
Furcifer rhinoceratus		+						
Opluridae								
Oplurus cf. *cuvieri*		+				+	+	
Gerrhosauridae								
Zonosaurus laticaudatus		+						
Scincidae								
Trachylepis elegans	+	+	+	+	+		+	
Trachylepis sp. aff. *dumasi*							+	
Madascincus polleni	+	+					+	
Voeltzkowia mira			+					
Voeltzkowia mobydick	+							
Voeltzkowia yamagishii		+						
Pygomeles petteri		+						
Gekkonidae								
Phelsuma grandis					+			
Phelsuma mutabilis	+							
Phelsuma madagascariensis		+						
Paroedura stumpffi						+	+	
Paroedura sp.	+							
Lygodactylus tolampyae	+	+				+	+	
Lygodactylus sp.								+
Hemidactylus mercatorius	+	+					+	+
Geckolepis sp.						+	+	
Uroplatus guentheri						+		
Uroplatus ebenaui						+		
Lamprophiidae								
Dromicodryas sp.				+				
Phisalixella variabilis	+							
Madagascarophis colubrinus							+	
Mimophis mahfalensis		+						
Liophidium torquatum		+						
Leioheterodon madagascariensis		+						
Leioheterodon modestus					+			
Typhlopidae								
Typhlopidae sp.	+	+	+		+	+	+	
Total	**11**	**15**	**3**	**2**	**4**	**10**	**13**	**4**

Our records of *Madascincus polleni* probably all are to be assigned to the southern *polleni* clade (*polleni*-S) as defined by Miralles and Vences (2013); this is confirmed by a DNA sequence (accession number KR025911) of a sample from Mitsinjo that is 99% identical to a sequence of *polleni*-S from Ankarafantsika (JQ008005), but we have no sequence available from the Bongolava samples. A taxonomic revision of this complex of species is currently in progress by A. Miralles and co-workers.

In the following we discuss in more detail some of the more remarkable records which represent either range extensions or natural history observations of particularly rare species.

Amphibia: Mantellidae

Aglyptodactylus laticeps Glaw, Vences & Böhme, 1998

Specimens were observed at Mitsinjo, along a 2–3 m wide stream of shallow and slowly running water, punctuated with some almost stagnant sections. Multiple males were found calling at the bank of the stream (details not recorded); calls were emitted intermittently rather than as part of a larger chorus. Some moderate

rain occurred earlier in the night prior to the time of observation.

This record represents a substantial range expansion northwards. The species was described from Kirindy forest in western Madagascar (Glaw et al., 1998), and Raselimanana (2008) recorded it from Bemaraha. We here provide a third reliable locality for the species, confirmed by a DNA sequence of the mitochondrial 16S rRNA gene, suggesting it is more widespread across western Madagascar. Four individuals were collected (ZCMV 14148–14151). DNA sequences of two examined individuals (ZCMV 14148 and 14150; Genbank accession numbers KR025899–KR025900) were identical, and had 98% similarity to sequences of the species from the type locality Kirindy (Genbank accession AY847960).

Mantella betsileo (Grandidier, 1872)

The two analysed specimens from Bongolava (ZCMV 13584 and 13585) presented sequences of 99% identity with *M. betsileo* and only 98% identity with the morphologically cryptic *M. ebenaui* (accessions KR025903–KR025904). Analyses of more variable gene fragments such as cytochrome *b* (e.g., Rabemananjara et al. 2007) will be necessary for a more reliable assignment, but it seems probable that indeed, *Mantella betsileo* occurs as far north as the Bongolava Plateau whereas in the Sambirano region, *M. ebenaui* occurs.

Amphibia: Microhylidae

Dyscophus insularis Grandidier, 1872

In Ankarafantsika, one specimen was found during the day in a small pond. At the Bongolava Plateau site, one active specimen was found on sandy soil bordering a small stream during a nocturnal walk. A 16S DNA sequence was obtained from ZCMV 13589 (Bongolava; accession KR025901).

Scaphiophryne sp. aff. *calcarata*

Two active specimens were found in the same area and substrate as the *Dyscophus insularis* at the Bongolava Plateau during a nocturnal walk. According to molecular data (to be published elsewhere) the Bongolava sample corresponds genetically to specimens from Ankarafantsika. This is one of three lineages currently referred to as *S. calcarata*, but from distinct call differences among the other two lineages (from around Tolagnaro in the South-West, and Kirindy in the West) (Vences et al. 2006) it is probable that they represent distinct species. Despite considerable efforts and repeated fieldwork in the region, we have still not been able to record the calls of the lineage from the North-West.

Squamata: Scincidae

Trachylepis sp. aff. *dumasi*

One specimen of *Trachylepis*, clearly belonging to the *Trachylepis aureopunctata* group, was collected at Mitsinjo (Fig. 3d). The rather uniformly coloured dorsum without stripes or rows of spots, the dark lateral band and the row of white spots below this band most closely match the characteristics of *Trachylepis dumasi*. If this species identification is confirmed, it would indicate a substantial range extension of about 350 km in north-eastern direction, as the northernmost confirmed locality of the species is Antsalova, close to the Tsingy de Bemaraha, from a photograph taken by G. Kuchling (Glaw & Vences 2007; Lima et al., 2013). Alternatively, the specimen might belong to *T. tandrefana* or *T. volamenaloha* in which case it would also represent a substantial range expansion, or it might be an undescribed species of the *T. aureopunctata* group. The 16S sequence of the voucher specimen (ZCMV 14171; accession KR025912) showed a 97% identity both to *T. aureopunctata* (DQ238878) and to *T. dumasi* (DQ238880) but the available sequence library for this gene is rather incomplete for Malagasy *Trachylepis*. In general, this complex of species requires further revision (Lima et al., 2013).

Voeltzkowia mira Boettger, 1893

Among the visited field sites, we found this fossorial skink at Antsanitia only. By digging and carefully overturning the sand substrate, the species was located at the base of vegetation patches in the dune area, interspersed with *Hyphaene* palms (Fig. 2a). Several individuals could be observed around the same patch of vegetation, on sandy soil with leaf litter and roots, during short and concentrated diurnal searching efforts. These findings corroborate the observations of Boettger (1913) of the species at the type locality of Betsako and the wider Mahajanga area. The individuals were located around 15–20 cm deep in the overturned sand volume, likely escaping unfavourable hot conditions during the day in the shaded and humid environment. The discovery of *V. mira* at the former cassava plantation of Antsanitia

Figure 3. Remarkable amphibian and reptile records from the Betsiboka delta area in North-Western Madagascar; (a) *Aglyptodactylus laticeps* from Mitsinjo (4 January 2013); (b) *Scaphiophryne* sp. aff. *calcarata* from Plateau of Bongolava (14 January 2012); (c) *Pygomeles petteri* from Ankarafantsika NP (19 December 2012); (d) *Trachylepis* sp. aff. *dumasi* from Mitsinjo (4 January 2013); (e) *Voeltzkowia mira* from Antsanitia (23 December 2012); (f) *Voeltzkowia yamagishii* from Ankarafantsika NP (19 December 2012).

might additionally indicate a degree of resilience to anthropogenic habitat conversion. Our observations might suggest a high local abundance of the species, but it should be noted that we were unsuccessful in finding the species at the other visited dune areas. A more detailed distribution range is thus pending further observations.

Voeltzkowia yamagishii (Sakata & Hikida, 2003)

Taxonomy of this species here follows Miralles et al. (2015) who proposed to consider the genus *Sirenoscincus* (with species *S. yamagishii* and *S. mobydick*) as synonym of *Voeltzkowia*. The species *V. yamagishii* – which exhibits an uncommon appendicular morphology among squamates in having front limbs only – was found at its type locality, the *Jardin Botanique* A (JBA) in Ankarafantsika National Park (Fig. 2b). Several

individuals were observed just underneath the leaf litter covering the JBA walking trail within several hours following sunset, with respective ground temperatures measuring between 25.4°C and 26.6°C.

Pygomeles petteri Pasteur & Paulian, 1962

This legless species was found in a similar way during the same inventory and time period at Ankarafantsika National Park as described for *V. yamagishii*. One specimen was found during a nocturnal walk along the small trail leading to the JBA site at Ankarafantsika, after sweeping the leaf litter along the sand trail.

Upon exposure, *P. petteri* was easily startled, comparable to the swift movement patterns observed in other sand-dwelling ecomorphs (cf. Miralles et al., 2015). Although the ecology of these fossorial skinks remains poorly known, it seems that these species show crepuscular or nocturnal activity patterns, and likely remain obscured by leaf litter while foraging for small invertebrates.

Lygodactylus tolampyae (Grandidier, 1872)

Two 16S sequences of this small gecko (accessions KR025914–KR025915), obtained from the Bongolava Plateau (ZCMV 13573) and Mitsinjo (ZCMV 14165) were 4–5% different from the available sequences from other sites in western Madagascar, and had a 6.1% uncorrected pairwise p-distance between each other, confirming a strong phylogeographic structure in this widespread species.

Secretive species such as burrowing skinks and microhylid frogs might still include undescribed species from the North-West of Madagascar. Two new species of *Paracontias* are currently under description, and we also expect that populations of *Stumpffia* might persist in isolated fragments and potentially represent undescribed species. It also is likely that new species of geckos occur in Eastern and North-Western Madagascar, with several genetic lineages already identified (e.g., Nagy et al., 2012; Glaw et al., 2014). Besides the need for further field surveys, wherever possible accompanied by DNA barcoding of the encountered species, we also emphasise the importance of observations of life history and natural history. Such data, even if anecdotal, are increasingly being published (e.g., Gardner & Jasper, 2012a,b; Taylor & Gardner, 2014, and herein) and can provide important fundamental knowledge about the ecological requirements of the respective species, and in combination with the availability of more reliable distribution data, facilitate the implementation of effective conservation measures.

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References

Andreone, F., Cadle, J.E., Cox, N., Glaw, F., Nussbaum, R.A., Raxworthy, C.J., Stuart, S.N., Vallan, D., Vences, M. (2005): Species review of amphibian extinction risks in Madagascar: conclusions from the Global Amphibian Assessment. Conservation Biology **19**: 1790-1802.

Bora, P., Randrianantoandro, J.C., Randrianavelona, R., Hantalalaina, E.F., Andriantsimanarilafy, R.R., Rakotondravony, D., Ramilijaona, O.R., Vences, M., Jenkins, R.K.B., Glaw, F., Köhler J. (2010): Amphibians and reptiles of the Tsingy de Bemaraha plateau, western Madagascar: checklist, biogeography and conservation. Herpetological Conservation and Biology **5** (1): 111-125.

Boumans, L., Vieites, D.R., Glaw, F., Vences, M. (2007): Geographical patterns of deep mitochondrial differentiation in widespread Malagasy reptiles. Molecular Phylogenetics and Evolution **45**: 822-839.

Brown, J.L., A. Cameron, A.D., Yoder, A.D., Vences, M. (2014): A necessarily complex model to explain the biogeography of the amphibians and reptiles of Madagascar. Nature Communications **5**: e5046.

D'Cruze, N.C., Henson, D., Olsson, A., Emmett, D.A. (2009): The importance of herpetological survey work in conserving Malagasy biodiversity: Are we doing enough? Herpetological Review **40** (1): 19-25.

D'Cruze, N., Sabel, J., Green, K., Dawson, J., Gardner, C., Robinson, J., Starkie, G., Vences, M., Glaw, F. (2007): The first comprehensive survey of amphibians and reptiles at Montagne des Français, Madagascar. Herpetological Conservation and Biology **2** (2): 87-99.

Evans, B., Rakotondraparany, F., Cole, L., Graham, S., Long, P., Gandola, R. (2013): The carnivores of Mariarano forest, Madagascar: first insights. Small Carnivore Conservation **49**: 15-19.

Gardner, C., Jasper, L. (2012): Cannibalism in *Chalarodon madagascariensis* (Squamata: Iguanidae) from southwest Madagascar. Herpetology Notes **5**: 127-128.

Gardner, C., Jasper, L. (2012b): *Paroedura picta* in southern Madagascar: diet and predation by the introduced *Hemidactylus frenatus*. Herpetology Notes **5**: 457-458.

Gehring, P.S., Ratsoavina, F.M, Vences, M. (2010): Filling the gaps – amphibian and reptile records from lowland rainforests in eastern Madagascar. Salamandra **46**: 214-234.

Glaw, F., Vences, M. (2007): A Field Guide to the Amphibians and Reptiles of Madagascar, third edition. Vences & Glaw Verlag, Köln (Cologne), 496 pp.

Glaw, F., Rösler, H., Ineich, I., Gehring, P.S., Köhler J., Vences, M. (2014): A new species of nocturnal gecko (*Paroedura*) from karstic limestone in northern Madagascar. Zoosystematics and Evolution **90**: 249-259.

Glaw, F., Vences, M., Böhme, W. (1998): Systematic revision of the genus *Aglyptodactylus* Boulenger, 1919 (Amphibia: Ranidae), and analysis of its phylogenetic relationships to other Madagascan ranid genera (*Tomopterna, Boophis, Mantidactylus, and Mantella*). Journal of Zoological Systematics and Evolutionary Research **36**: 17-37.

Goodman, S.M., Ganzhorn, J.U. (2004): Biogeography of lemurs in the humid forests of Madagascar: the role of elevational distribution and rivers. Journal of Biogeography **31**: 47-55.

Goodman, S.M., Ramanamanjato, J.B., Raselimanana, A. (1997): Chapitre 7. Les Amphibiens et les Reptiles, pp. 110-130. In: Inventaire Biologique Foret de Vohibasia et d'Isoky-Vohimena (O. Langrand & S. M. Goodman, eds.). Recherches pour le developpement Série Sciences Biologiques **12,** Antananarivo, 197 pp.

Jenkins, R.K.B., Tognelli, M.F., Bowles, P., Cox, N., Brown, J.L., Chan, L., Andreone, F., Andriamazava, A., Andriantsimanarilafy, R.R., Anjeriniaina, M., Bora, P., Brady, L.D., Hantalalaina, E.F., Glaw, F., Griffiths, R.A., Hilton-Taylor, C., Hoffmann, M., Katariya, V., Rabibisoa, N.H., Rafanomezantsoa, J., Rakotomalala, D., Rakotondravony, H., Rakotondrazafy, N.A., Ralambonirainy, J., Ramanamanjato, J.B., Randriamahazo, H.,. Randrianantoandro, J.C, Randrianasolo, H.H., Randrianirina, J.E., Randrianizahana, H., Raselimanana, A.P., Rasolohery, A., Ratsoavina, F.M., Raxworthy, C.J., Robsomanitrandrasana, E., Rollande, F., Van Dijk, P.P., Yoder, A.D., Vences, M. (2014): Extinction risks and the conservation of Madagascar's reptiles. PLoS ONE **9**: e100173.

Klages, J., Glaw, F., Köhler, J., Müller, J., Hipsley, C.A. Vences, M. (2013): Molecular, morphological and osteological differentiation of a new species of microhylid frog of the genus *Stumpffia* from northwestern Madagascar. Zootaxa **3717**: 280-300.

Kremen, C., Cameron, A., Moilanen, A., Phillips, S.J., Thomas, C. D., Beentje, H., Dransfield, J., Fisher, B.L., Glaw, F., Good, T.C., Harper, G.J., Hijmans, R.J., Lees, D.C., Louis Jr., E., Nussbaum, R.A., Raxworthy, C.J., Razafimpahanana, A., Schatz, G.E., Vences, M., Vieites, D.R., Zjhra, M. L. (2008): Aligning conservation priorities across taxa in Madagascar with high-resolution planning tools. Science **320**: 222-226.

Lima, A., Harris, D.J., Rocha, S., Miralles, A., Glaw, F., Vences, M. (2013): Phylogenetic relationships of *Trachylepis* skink species from Madagascar and the Seychelles (Squamata: Scincidae). Molecular Phylogenetics and Evolution **67**: 615-620.

Miralles, A., Anjeriniaina, M., Hipsley, C.A., Müller, J., Glaw, F., Vences, M. (2012): Variations on a bauplan: description of a new Malagasy "mermaid skink" with flipper-like forelimbs only (Scincidae, *Sirenoscincus* Sakata & Hikida, 2003). Zoosystema **34:** 701-719.

Miralles, A., Hipsley, C. A., Erens, J., Gehara, M., Rakotoarison, A., Glaw, F., Müller, J., Vences, M. (2015): Distinct patterns of desynchronized limb regression in Malagasy scincine lizards (Squamata, Scincidae). PLoS ONE 10: e0126074.

Nagy, Z.T., Sonet, G., Glaw, F., Vences, M., (2012): First large-scale DNA barcoding assessment of reptiles in the biodiversity hotspot of Madagascar, based on newly designed COI primers. PLoS ONE **7**: e34506.

Perl, R.G.B., Nagy, Z.T., Sonet, G., Glaw, F., Wollenberg, K.C. (2014): DNA barcoding Madagascar's amphibian fauna. Amphibia-Reptilia **35**: 197-206.

Rabemananjara, F.C.E., Crottini, A., Chiari, Y., Andreone, F., Glaw, F., Duguet, R., Bora, P., Ravoahangimalala Ramilijaona, O., Vences, M. (2007): Molecular systematics of Malagasy poison frogs in the *Mantella betsileo* and *M. laevigata* species groups. Zootaxa **1501**: 31-44.

Ramanamanjato, J.B., Rabibisoa, N. (2002): Evaluation rapide de la diversité biologique des reptiles et amphibiens de la Réserve Naturelle Intégrale d'Ankarafantsika, pp. 98-103 and 135-138. In: Alonso, L.E., Schulenberg, T.S., Radilofe, S., Missa O. (eds): Une evaluation biologique de la Réserve Naturelle Intégrale d'Ankarafantsika, Madagascar. Bulletin RAP d'évaluation rapide **23,** Conservational International, Washington, DC.

Raselimanana, A.P. (2008): Herpétofaune des forets sèches malgaches. Malagasy Nature **1**: 46-75.

Raselimanana, A.P. (2004): L'herpétofaune de la forêt de Mikea. Dans Inventaire floristique et faunistique de la forêt de Mikea: Paysage écologique et diversité biologique d'une préoccupation majeure pour la conservation, eds. Raselimanana, A.P., Goodman, S.M. Recherches pour le Développement. Séries Sciences biologiques **21**: 37-52.

Raxworthy, C.J., Ramanamanjato, J.B., Raselimanana, A. (1994): Les reptiles et les amphibiens. In: Goodman, S.M., Langrand, O. (eds, 1994): Inventaire Biologique Forêt de Zombitse. Recherches pour le developpement Série Sciences biologiques No Spécial 1994, Antananarivo, pp. 41-57.

Taylor, B., Gardner, C. (2014): Nectar feeding by the day gecko *Phelsuma mutabilis* (Squamata: Gekkonidae) on the mangrove tree *Sonneratia alba* (Lythraceae) in southwest Madagascar. Herpetology Notes **7**: 85-87.

Vences, M. Glaw, F., Marquez, R. (2006, editors): *The Calls of the Frogs of Madagascar*. 3 Audio CD's and booklet, 44 pp. Barcelona, Alosa.

Vences, M., Wollenberg, K.C., Vieites, D.R., Lees, D. C. (2009): Madagascar as a model region of species diversification. Trends in Ecology and Evolution **24**: 456-465.

Vieites, D.R., Wollenberg, K.C., Andreone, F., Köhler, J., Glaw, F., Vences M. (2009): Vast underestimation of Madagascar's biodiversity evidenced by an integrative amphibian inventory. Proceedings of the National Academy of Sciences of the U.S.A **106:** 8267-8272.

Waeber, P.O., Wilmé, L., Ramamonjisoa, B, García, G., Rakotomalala, D., Rabemananjara, Z.H., Kull, C.A., Ganzhorn, J.U., Sorg, J.-P. (2015): Dry forests in Madagascar: neglected and under pressure. International Forestry Review **17**: 127-148.

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