

The reptiles of the Southern Mikea Forest, Madagascar

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ABSTRACT – 59 species of reptiles (37 lizards, 19 snakes and 3 chelonians) are recorded from a site located on the eastern shore of Lake Ranobe in the Southern Mikea forest of southwest Madagascar. This study suggests that this site is particularly diverse as it contains 17% of the 346 species known from Madagascar. Importantly, 92% of these species are endemic to Madagascar and 14% are limited to the dry forests of southwest Madagascar. Five species (*Furcifer labordi*, *Phelsuma standingi*, *Acrantophis dumerili*, *Sanzinia madagascariensis* and *Pyxis arachnoides*) are listed as vulnerable on the 2005 IUCN Red List of Threatened Species. Located near to the city of Tuléar, the area is subject to numerous human-induced environmental problems (e.g. charcoal production, agricultural clearance, zebu grazing, the illegal collection of species) and therefore should be considered a high conservation priority.

THE herpetofauna of Madagascar is extremely species rich and diverse with a high level of endemism (Glaw & Vences, 1994). Despite this fact, detailed surveys focusing on Malagasy reptiles are relatively few in number when compared to other geographical regions. As part of the Frontier-Madagascar Forest Research Programme* the herpetofauna of the Southern Mikea forest was surveyed at a number of sites. This paper intends to provide a comprehensive and accurate survey of a site located on the South Eastern shore of Lake Ranobe in the Southern Mikea forest of southwest Madagascar.

The first intensive herpetological survey work focusing on this site was carried out by Raxworthy (1995) as part of a broader survey of the Toliara region with the intention of 'improving the status of the current research data and potentially facilitating the establishment of new protected areas'. Raxworthy spent a total of 27 days at several camps in various habitat types at the end of the wet season and encountered a total of 66 species of reptiles.

*For a full report of Frontier-Madagascar's Southern Mikea work, see Frontier-Madagascar (in prep.), *The Southern Mikea. A Biodiversity Survey*. Frontier-Madagascar Environmental Research Report XX. Society for Environmental Exploration, UK, and the Institute for Marine Sciences, University of Toliara, Madagascar).

It is the intention of this paper to both highlight and contribute to the existing literature regarding the composition, geographical, ecological and seasonal distribution of the numerous species found in the area surrounding Lake Ranobe. We highlight the herpetological importance of this area and reinforce the need for its inclusion as part of the proposed national park planned for the Mikea Forest eco-region (WWF 2003).

MATERIALS AND METHODS

Fieldwork was carried out by Frontier staff and volunteers over a period of approximately one year with specimens stored at the University of Tuléar and the University of Antananarivo. For identification, specimens were sent to the American Museum of Natural History, New York. Frontier-Madagascar is an arm of the Society for Environmental Exploration, a UK based non-governmental organisation carrying out scientific and socio-economic survey work with a view to making informed conservation decisions. Fieldwork consisted of four sampling periods each lasting approximately nine weeks in length (two wet and two dry seasons) and can be summarized as follows: Wet 1: 14th January-14th March 2003; Dry 1: 13th April-4th June 2003; Wet 2: 13th October-11th December 2003; Dry 2: 4th July-30th August 2004.

Pitfall trapping and active searches were utilised to survey the reptile species. Pitfall traps were dug into the ground at 10 m intervals with drift fences along a transect line measuring 100 m. Daily searches lasting approximately one hour in length were carried out. Investigators searched under stones, amongst dead wood, and on tree trunks both day and night in order to gauge diversity of the full complement of species.

DESCRIPTION OF THE RANOBE AREA

All four periods concentrated on an area adjacent to Ranobe village at a base camp situated on the South Eastern edge of the lake at 23°02'S 043°36'E. Lake Ranobe is a freshwater lake measuring 3 km North-South and 1.5 km East-West at its widest point. The lake is situated approximately 30 km North of Tuléar, the administrative capital of the Toliara region in southwest Madagascar.

Physiography The study site is part of the Southern Mikea, a region of southwest Madagascar that is defined by four major geographic features: to the South the Fiherenana River; to the West the Mozambique Channel; to the North the Manombo River and to the East the Mikoboka Plateau, a tertiary calcareous limestone formation (Du Puy & Moat, 1996). The region is reasonably low lying and flat.

Climate

The Southern Mikea region is located in one of the hottest and most arid parts of Madagascar. Rainfall averages 700 mm with the majority of rain falling between November and March (Goodman & Benstead, 2003). The average annual maximum temperature ranges between 30°C and 33°C with an average minimum temperature ranging between 15°C and 21°C (Goodman & Benstead, 2003).

Vegetation Types

The sandy plains immediately surrounding the study site at Ranobe give rise to two major types of vegetation that can be found throughout the Southern Mikea region: dry spiny forest and gallery forest. In addition to these natural vegetation types there is also a proportion of anthropogenically disturbed habitat.

Spiny Forest

This vegetation type is typified by a dense xerophytic assemblage of succulent and spinescent plants, reaching a maximum height of 8 m (Seddon *et. al.*, 2000). The tree flora includes the endemic family Didiereaceae in addition to coralliform euphorbias and baobabs (e.g. *Andansonia fony*). Included in the lower strata are a wide variety of plants belonging to both the Euphorbiaceae and Leguminoseae families. The level of endemism to Madagascar has been estimated at 61.4% (Phillipson, 1996).

Gallery Forest

Found near to rivers and lakes, this vegetation is more verdant than the spiny forest with a far higher standing biomass. The canopy is dominated by tamarind trees, *Tamarindus indicus*, reaching up to 35 m with an understorey that includes a wide variety of broadleaf trees, epiphytes and lianas. In contrast to the Spiny Forest a moist leaf litter layer is typically present and the level of endemism to Madagascar is much lower at 28.3% (Phillipson, 1996).

Anthropogenically disturbed areas

Lake Ranobe is surrounded by several villages and a swathe of cultivated land running from the foot of the Mikoboka plateau. As a result substantial areas of both Spiny and Gallery Forest have been altered creating a distinct habitat characterized by cultivated and cleared village areas.

Microhabitats

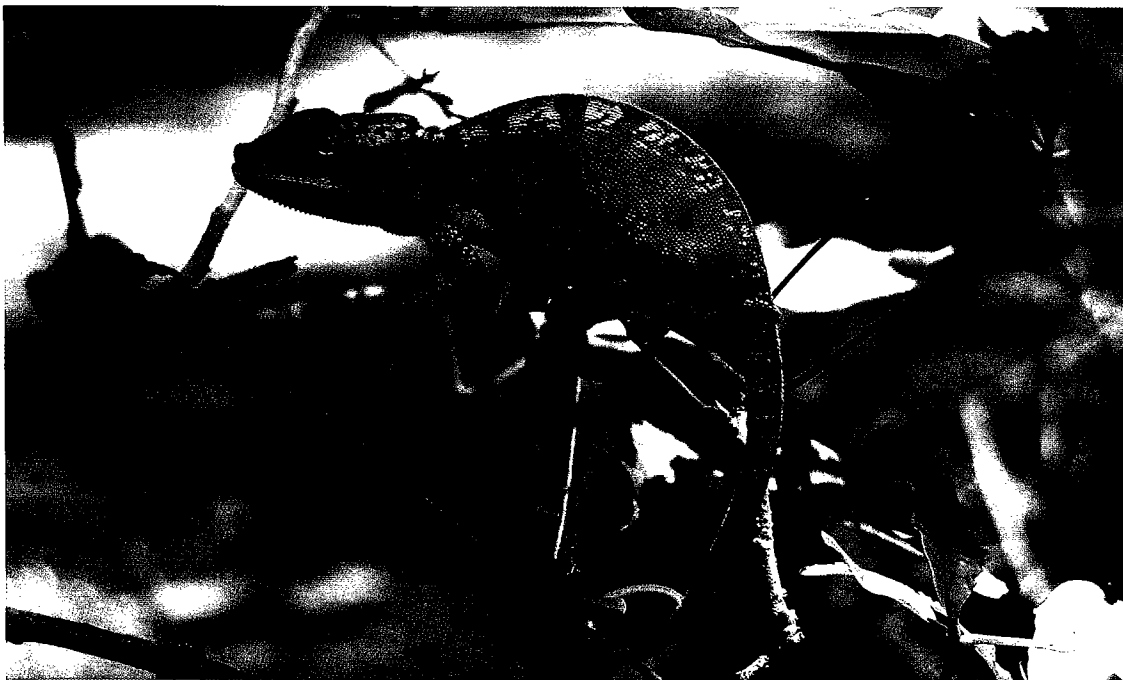
Many microhabitats exist for the species found at this location. The vegetation offers a wide variety of arboreal niches that can be utilized by a large number of different species, such as those belonging to the genus *Furcifer* and *Langaha*. The accompanying shrub layer also provides shelter for terrestrial species such as *Chalarodon madagascariensis*. A layer of leaf litter is present in the gallery forest in which fossorial species such as *Amphiglossus igneocaudatus* occur and the lake provides a large body of water in which chelonians such as *Pelusios castanoides* can be found.

Composition

A total of 59 different species were encountered during this study (Table 1 and Table 2) and it is



Above: *Sanzinia madagascariensis*. Photograph © Neil D'Cruze. Below: *Furcifer labordi*. © Frontier staff.



Species	Primary Habitat	Ecological Distribution	Relative Abundance	Season			
				Wet 1	Dry 1	Wet 2	Dry 2
Chamaeleonidae							
<i>Furcifer antimenae</i>	GF	AB	R	+		+	
<i>Furcifer labordi</i> *	GF	AB	C	+		+	
<i>Furcifer verrucosus</i>	GF	AB	A	+	+	+	
Gekkonidae							
<i>Blaesodactylus sakalava</i>	GF, SF	AB	I	+	+	+	+
<i>Geckolepis typica</i>	GF, SF	AB	I	+	+	+	+
<i>Hemidactylus frenatus</i>	GF	AB	R	+		+	
<i>Hemidactylus mabouia</i>	GF	AB	R		+	+	
<i>Hemidactylus mercatorius</i>	GF	AB	I		+	+	
<i>Lygodactylus tolampyae</i>	GF	AB	I	+	+	+	
<i>Lygodactylus tuberosus</i>	GF	AB	C		+	+	+
<i>Lygodactylus verticillatus</i>	GF	AB	R			+	+
<i>Paroedura androyensis</i>	GF	AB	R			+	+
<i>Paroedura bastardi</i>	SF	AB, T	C	+			+
<i>Paroedura picta</i>	GF	AB, T	R	+	+	+	+
<i>Paroedura vahiny</i>	GF, SF	AB	I	+			
<i>Phelsuma mutabilis</i>	SF	AB	R	+	+	+	+
<i>Phelsuma standingi</i> *	A, SF	T	R		+		+
<i>Phyllodactylus brevipes</i>	SF	AB	I		+	+	
Scincidae							
<i>Amphiglossus andranovahensis</i>	SF	T	C				+
<i>Amphiglossus igneocaudatus</i>	SF	T	R	+	+	+	+
<i>Amphiglossus intermedius</i>	SF	T	I				+
<i>Amphiglossus ornaticeps</i>	GF	T	C	+	+	+	
<i>Mabuya aureopunctata</i>	SF	T	R	+	+	+	+
<i>Mabuya dumasi</i>	SF	T	A			+	
<i>Mabuya elegans</i>	A, GF	T	I	+	+	+	+
<i>Mabuya gravenhorstii</i>	SF	T	I	+	+	+	
<i>Mabuya vato</i>	SF, GF	T	I	+	+		
<i>Pygomeles braconnieri</i>	SF	T	R	+	+	+	+
<i>Voeltzkowia lineata</i>	SF	T	I	+	+		+
<i>Voeltzkowia petiti</i>	GF, SF	T	R			+	+
<i>Voeltzkowia rubrocaudata</i>	SF	T	C			+	+
Gerrhosauridae							
<i>Tracheloptychus madagascariensis</i>	SF	T	C	+	+	+	+
<i>Tracheloptychus petersi</i>	GF	T	R		+	+	+
<i>Zonosaurus karsteni</i>	SF, GF	T	C			+	+
<i>Zonosaurus quadrilineatus</i>	SF	T	A	+	+	+	
Iguanidae							
<i>Chalarodon madagascariensis</i>	SF, GF	T	C	+	+	+	+
<i>Oplurus cyclurus</i>	SF	T	I	+	+	+	+

Table 1. Distribution of the lizard species found in the Ranobe area. Abbreviations include: Primary Habitat- GF = gallery forest, SF = spiny forest, A = anthropogenically disturbed areas; Ecological Distribution- AB = arboreal, T = terrestrial; Relative Abundance- A = abundant, C = common, I = infrequent, R = rare; Seasonal Data- + = present. *Listed as Vulnerable in the 2005 IUCN Red List of Threatened Species.

Species	Primary Habitat	Ecological Distribution	Relative Abundance	Season			
				Wet 1	Dry 1	Wet 2	Dry 2
Boidae							
<i>Acrantophis dumerili</i> *	GF	T	I	+		+	
<i>Sanzinia madagascariensis</i> *	GF	AB, T	R	+	+		
Colubridae							
<i>Dromicodryas bernieri</i>	SF, GF, A	T	I	+	+	+	
<i>Heteroliodon occipitalis</i>	GF	T	R	+	+	+	
<i>Ithyocyphus oursi</i>	GF	AB	I	+	+	+	
<i>Langaha alluaudi</i>	SF	AB	R		+		+
<i>Langaha madagascariensis</i>	GF	AB	I		+		
<i>Leioheterodon geayi</i>	SF	T	I	+		+	
<i>Leioheterodon modestus</i>	GF	T	C	+	+	+	
<i>Liophidium chabaudi</i>	SF	T	I	+	+	+	
<i>Liophidium torquatum</i>	SF	T	R			+	+
<i>Liophidium vaillanti</i>	SF	T	I	+		+	
<i>Lycodryas pseudogranuliceps</i>	SF	T	R	+	+		+
<i>Madagascarophis colubrinus</i>	GF	T	I	+		+	+
<i>Madagascarophis meridionalis</i>	GF	T	I	+	+		+
<i>Madagascarophis ocellatus</i>	SF, GF, A	T	R		+		
<i>Mimophis mahfalensis</i>	SF	T	C	+	+	+	+
Typhlopidae							
<i>Typhlops arenarius</i>	SF	T	I	+		+	
<i>Typhlops decorsei</i>	GF	T	R	+		+	
Testudinidae							
<i>Pyxis arachnoides</i> *	GF, SF	T	R	+		+	
Pelomedusidae							
<i>Pelomedusa subrufa</i>	GF	A	R	+			
<i>Pelusios castanoides</i>	GF	A	I			+	+

now known that the reptile fauna of the Ranobe area consists of at least 37 species of lizard (62.7%), 19 snakes (32.2%) and 3 chelonians (5.1%).

Primary habitat

With regards to primary habitat, 24 (40.7%) species were found solely in Gallery Forest and 23 (39%) were found to occur only in Spiny Forest (Tables 1 and 2). No species were found to occur solely in anthropogenically disturbed areas. Eight species (13.6%) were encountered in both Gallery and Spiny Forest, two (3.4%) in both Gallery Forest and Anthropogenically disturbed areas, one (1.7%) in both Spiny Forest and Anthropogenically disturbed areas and two (3.4%) in all three of the primary habitats.

Ecological Distribution

In terms of vertical positioning within the primary habitat, 36 species (61%) were usually found only in terrestrial situations, 19 (32.2%) were typically

Table 2. Distribution of the snake and chelonian species found in the Ranobe area. Abbreviations include: Primary Habitat- GF = gallery forest, SF = spiny forest, A = anthropogenically disturbed areas; Ecological Distribution- AB = arboreal, T = terrestrial; Relative Abundance- A = abundant, C = common, I = infrequent, R = rare; Seasonal Data- + = present. *Listed as Vulnerable in the 2005 IUCN Red List of Threatened Species.

found only in arboreal situations, and 3 (5.1%) were found in both (Table 1 and Table 2). Two of the chelonians (3.4%) were only found in aquatic situations.

Relative abundance

The 59 species recorded from the area are classified using a system similar to that used by Wilson & McCranie (2004) and can be summarized as follows: Abundant (large numbers encountered on a

regular basis), common (encountered on a regular basis), infrequent (unpredictable, few individuals seen), or rare (rarely seen). These classifications are based on data collected over all four study periods. Three species (5.1%) were abundant, 11 (18.6%) were common, 24 (40.7%) were infrequent and 22 (37.3%) were rare (Table 1 and 2).

Seasonal Variation

As this study was carried out over two wet and dry seasons we are able to present data detailing the seasonal occurrence of species. Of the species encountered, 12 (20.3%) were present during all four of the sample periods. Nine (15.3%) were found only during wet seasons and two (3.4%) were found only during dry seasons (Table 1 and 2).

IMPORTANCE OF THE AREA AS A HERPETOFAUNAL REFUGE

In a similar manner to Raxworthy (1995) and Seddon *et al.* (2000), the data collected in this study can be used to assess the conservation issues regarding the herpetological fauna present in the area surrounding Lake Ranobe in the Southern Mikea Forest. This paper has the additional advantage of intensively documenting the reptile fauna of one specific and previously only briefly studied site, in both wet and dry seasons.

The reptile rich fauna of the Mikea forest is already recognised as one of the more diverse areas of Madagascar, with species numbers comparable to those typical of the Western forests (Seddon *et al.*, 2000). This study shows that the area around Lake Ranobe is strikingly diverse as a total of 59 species were encountered, which is comparable to the total of 66 species previously recorded by Raxworthy (1995) in the whole of the Toliara region. The majority of these species are endemic to Madagascar and eight (*Furcifer antimena*, *Lygodactylus verticillatus*, *Phelsuma standingi*, *Pygomeles braconieri*, *Voeltzkowia petiti*, *Tracheloptychus petersi*, *Zonosaurus quadrilineatus* and *Liophidium chabaudi*) are endemic to the dry forests of southwest Madagascar. Five species encountered during the course of this study (*Furcifer labordi*, *Phelsuma standingi*, *Acrantophis dumerili*, *Sanzinia*

madagascariensis and *Pyxis arachnoides*) are listed as vulnerable on the 2005 IUCN Red List of Threatened Species. On a broader scale, the results of this study indicate that the reptile fauna of this area (representing 0.004% of the total surface area of Madagascar) comprises 17% of the 346 species (Goodman & Benstead, 2003) known from Madagascar and reinforces the notion that the southwest ecoregion is of great herpetological significance.

As has already been stated the Southern Mikea is an area close to the city of Tuléar and thus is subject to numerous human-caused environmental problems. The ever increasing major threats to the integrity of the reptile fauna of this area include charcoal production (during which sites are either selectively logged or cleared of all trees), agricultural clearance, Zebu grazing and the illegal collection of species for the pet trade (e.g. *Phelsuma standingi* and *Pyxis arachnoides*) (Seddon *et al.*, 2000; Raxworthy & Nussbaum, 2001). We reinforce the view that the Southern Mikea should be considered as a high conservation priority (Raxworthy, 1995; Domergue, 1983; Nicoll & Langrand, 1989; WCMC, 1991 and ZICOMA 1999) and support its inclusion as part of the proposed national park planned for the Mikea Forest eco-region (WWF 2003).

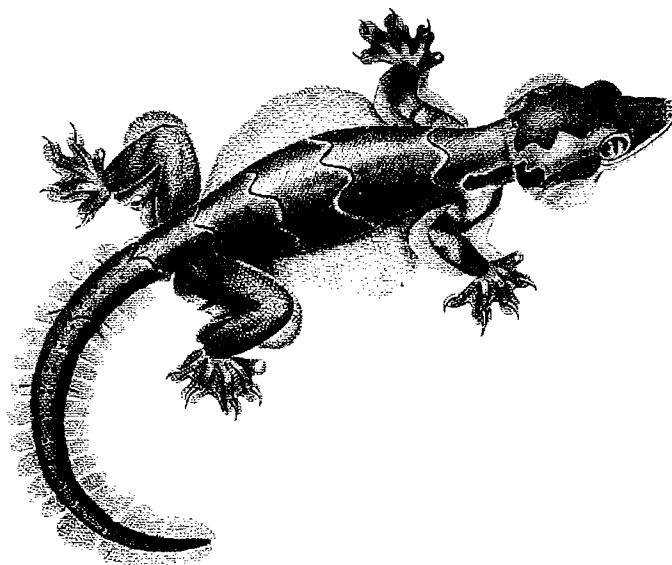
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Platydactylus homalocephalus (= *Ptychozoon kuhli*). From an original lithograph in Duméril, A.M.C., Bibron, G. and Duméril, A. (1854). *Erpétologie Générale ou Histoire Naturelle complète des Reptiles*, plate 29. Reproduction courtesy of the Natural History Museum, London.