

## New observations of Blanc's dwarf gecko (*Lygodactylus blancae* Pasteur, 1995) from the central highlands of Madagascar

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**Abstract.** The dwarf gecko *Lygodactylus blancae* is so far only known from a single locality in the central highlands of Madagascar. A survey of the holotype collection locality and 11 other sites was conducted during March and April 2009. *Lygodactylus blancae* was found in ten sites near Ampefy but was absent from the towns of Miarinarivo and Soavinandriana. Based on 184 observations, the species was encountered most frequently on the lower trunks of *Ficus* spp. trees, on the walls of buildings and on large boulders. It used a variety of other plants, including both exotic and native species. Its extent of occurrence was calculated as 72 km<sup>2</sup> but based on its elevation range (950 m to 1350 m) and abundance in heavily modified habitat, it probably occurs in other sites within the region. *Lygodactylus blancae* is a sit and wait forager that makes short bursts to attack small invertebrate prey. Based on current evidence, there are no major threats impacting this species, but it does have a restricted geographical range. Extended surveys elsewhere in the Malagasy highlands are needed to fully understand the distribution of this species and are justified because this is one of only 11 gecko species to receive strict protection under Malagasy law.

**Keywords.** Ampefy, foraging, Gekkonidae, highlands, Malagasy.

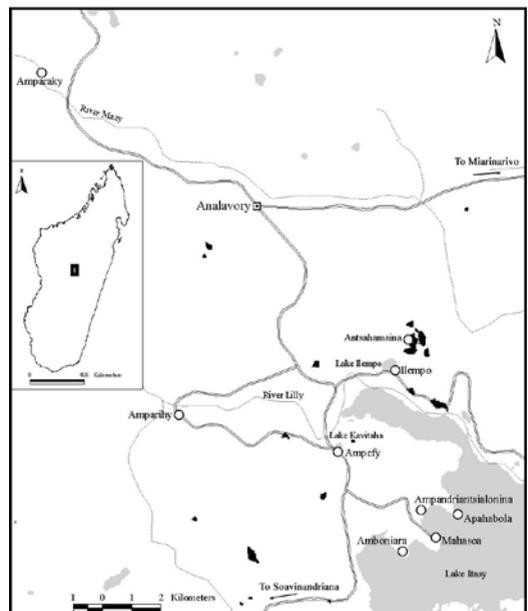
### Introduction

Madagascar's reptile fauna is highly diverse and 92% of the approximately 363 species described are endemic to the island (Glaw and Vences, 2007). Despite this high diversity, and significant efforts by herpetological survey teams, new species continue to be discovered (Raxworthy & Nussbaum, 2006; Glaw et al. 2009; Puente et al. 2009). Some of the reptile species of Madagascar are widespread, occur in a range of native and anthropogenic habitats and are consequently of little concern to conservationists (Boumans et al. 2007). Many other species, however, are restricted to relatively small areas of habitat and are often endemic to a single locality. These species tend to attract the attention of conservationists because of their high risk of extinction.

Before limited conservation resources are allocated to restricted range species it is important to verify that the distribution is genuine and not an artefact of biased, or insufficient, survey effort. Numerous Malagasy geckos have restricted ranges and many *Phelsuma*, *Lygodactylus*, and *Paroedura* species are only reliably

known from single sites. *Lygodactylus* lizards occur in a range of different habitat types and 11 species have a restricted distribution range or endemic to a single locality (Glaw and Vences, 2007; Puente et al. 2009).

*Lygodactylus blancae* Pasteur, 1995, is included in the *L. verticillatus* group, and is thought to be endemic to its type locality at Ampefy in the western central highlands



**Figure 1.** Localisation of study sites: road (double line), river (single line), exotic forest plantation (dark) and lake (grey).

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**Table 1.** Summary information about the twelve study sites surveyed for reptiles in the central highlands of Madagascar. \* indicates sites for which rapid surveys only were completed (see text for more details). Numbers in parentheses are for cross-referencing with Table 2.

Site	Coordinates	Altitude a.s.l. (m)	Habitat description
Ampefy (1)	S19° 02'33,50" E046°44'13,00"	1226-1230	Buildings, rocks and trees
Amboniara (2)	S19° 04'24,20" E046°45'31,60"	1254-1291	Rocks, shrubs, savanna, and agriculture land
Ampandriantsialonina (3)	S19° 03'37,40" E046°45'48,38"	1220-1260	Buildings and trees
Mahasoa (4)	S19° 04'06,70" E046°46'16,00"	1232-1237	Rocks and agriculture land
Apahabola (5)	S19° 03'42,50" E046°46'32,30"	1226-1236	Rocks, shrub and savanna
Amparihy (6)	S19° 01'54,00" E046°41'03,40"	1101-1180	Buildings and trees
Ilempo (7)	S19° 00'35,96" E046°45'38,02"	1240-1294	Buildings, agriculture and trees
Antsamaina (8)	S19°00'59,2'' E046°45'20,2''	1322-1440	Rocks and trees
Amparaky (9)	S18°55'35,90" E046°38'26,90"	950-961	Buildings, rocks and trees
Analavory (10)*	S18° 58' 13,9'' E046° 43'12,6''	1175	Buildings and trees
Miarinarivo (11)*	S18° 56' 56,0'' E046° 54' 26,4''	1300	Buildings and trees
Soavinandriana (12)*	S19°10'23,7" E046°44'32,06"	1288	Buildings and trees

of Madagascar (Glaw and Vences, 2007, Puente et al. 2009). Pasteur (1995) found individuals on small trees near Lake Itasy and only a few specimens are known; information on its distribution range and natural habitat around the Lake Itasy is therefore lacking (Glaw and Vences, 2007). In this study we sought to determine whether this species is genuinely restricted to a tiny area of habitat or whether it is more widespread and tolerant of disturbance and anthropogenic habitats.

## Materials and Methods

The study sites were located approximately 120 km west of the capital Antananarivo, in the Miarinarivo and Soavinandriana Districts, Itasy Region. We visited twelve sites, including the type locality at Ampefy (Figure 1), from March, 25<sup>th</sup> to April, 2<sup>nd</sup> 2009. The geographic coordinates, altitude and habitat characteristic of each site are given in Table 1.

A team of three people searched sites in nine localities that had standing trees, exposed rocks and low vegetation for between 90 and 300 minutes (Table 1). At three other sites, rapid surveys by two people in suitable habitats were conducted for between 10 and 20 minutes (Table 1). Animals were captured by hand and identified using Glaw and Vences (1996, 2007) and Puente et al. (2009). Adults were sexed as males based on the presence of femoral pores. Some females had a visible protuberance in the lower neck. Voucher specimens were collected and deposited in the Department of Animal Biology at the University of Antananarivo.

The coordinates (latitude and longitude) of each locality and

animal location were collected using a Global Positioning System (GPS) *Etrex High Sensitivity*, and were projected in MapSource (Version 6.0, 1999-2004). Altitudes were collected with an electronic altimeter Venture (Oregon Scientific, Oregon, USA). The extent of occurrence and the area of occupancy were calculated based on the Guidelines for Using the IUCN Red List Categories and Criteria (Version 7.0) prepared by the Standards and Petitions Working Group (IUCN, 2008), and using the extension Animal Movement software SA v2.04 (Hooge and Eichenlaub, 1997) with ArcView GIS (version 3.3, 1992-2002). The area of occupancy was obtained by projection of each individual location in grids of 2 x 2 km<sup>2</sup>.

To determine the foraging mode, individual geckos were observed by eye using the focal animal technique for at least 20 minutes. Observations were recorded by a team consisting of, two observers and two scribes. The behaviour of the gecko was classified as either "stationary" or "active" and the time when the behavior changed from "stationary" to "active" was recorded and vice versa. The movement per minute (MPM) and the percentage of time for moving (PTM) were calculated (Huey and Pianka, 1981). The times spent for a social activity or when the animals disappeared was excluded to the analysis.

## Results

*Lygodactylus blancae* was the only *Lygodactylus* species observed during the survey and was found in ten different localities around Ampefy, but was not detected in two more distant sites (Soavinandriana and Miarinarivo) to the south and east, respectively.



**Figure 2.** Female *Lygodactylus blancae* on the wall of a house at night.

An additional six species of reptiles were recorded during the survey (Table 2). The elevational range of *L. blancae* during the survey was between 950 m and 1350 m asl. The highest number of *L. blancae* were found at elevations between 1200 m and 1350 m, but the species was absent from sites with suitable trees and rocks between 1350 m and 1450 m elevation. The minimum convex polygon around *L. blancae* localities (equivalent to the extent of occurrence) is 73 km<sup>2</sup>. The surface area occupied by the species, during the survey based on its presence in 12 x 4 km<sup>2</sup> grids, was 48 km<sup>2</sup>.

The species was found in heavily disturbed anthropogenic areas. It used a variety of habitats during the day which can be broadly described as either open rocky areas with shrubs, or villages with gardens.

Most of the 184 observations were from *Ficus* spp. (Moraceae) trees (27%), structures associated with buildings (exterior-facing walls, gates and roofs; 20%) and exposed large boulders (10%). Other plant species from which there was more than a single observation included *Cactus* sp. (Cactaceae), *Dracaena* sp. (Asparagaceae), *Eugenia jambolana* (Myrtaceae), *Hazunta* sp. (Apocynaceae), *Ligustrum* sp. (Oleaceae), *Persea gratissima* (Lauraceae) and *Mangifera indica* (Anacardiaceae). There were additional records of individuals from eight plants (including *Pinus* sp. (Pinaceae), *Psidium guyava* (Myrtaceae) and *Trema orientalis* (Cannabaceae) whilst *L. blancae* was not found using nine trees of five species, including *Eucalyptus* sp. (Myrtaceae) and *Litchi chinensis*



**Figure 3.** Female (R) and male (L) *Lygodactylus blancae* on a tree trunk.

**Table 2.** Species list of reptiles encountered at Ampefy, in the central highlands of Madagascar. UADBA numbers refer to voucher specimens deposited at the University of Antananarivo.

Family	Species	UADBA No. and locations
Gekkonidae	<i>Lygodactylus blancae</i>	UADBA 49643, 49653, 49666, 49668, 49699 (from Ampefy); 49644, 49658, 49659, 49660, 49683 (from Amboniara); 49650, 49657, 49669, 49671, 49672 (from Apahabola); 49640, 49652, 49655, 49680, 49689 (from Ampandriantsialonina); 49638, 49648, 49677, 49685, 49690 (from Ilembo); 49642, 49646, 49649, 49691, 49702 (from Amparihy); 49645, 49661, 49664, 49679, (from Analavory); 49656, 49675, 49678, 49681, 49686 (from Amparaky)
Gekkonidae	<i>Phelsuma lineata</i>	UADBA 49631, 49641, 49647, 49662 (from Apahabola); 49639, 49665, 49667 (from Mahasoia), 49637 (from Amparaky)
Scincidae	<i>Trachylepis gravenhorstii</i>	No specimens, observed only in Apahabola.
Chamaeleonidae	<i>Furcifer oustaleti</i>	No specimens, observed only in Ampefy Village
Colubridae	<i>Mimophis mahfalensis</i>	UADBA 49651 (from Apahabola)

### (Sapindaceae).

In total, 148 individuals of the 184 observed (80%) were captured, including 53 adult males, 58 adult females, 19 sub-adult/juveniles and 18 recently hatched. None of the adult females that we inspected appeared to have well-developed eggs in their body cavity. Two hatched eggs were found underneath a large square rock that had been cut for construction. The egg shells appeared clean and freshly broken, with no visible signs of weathering, giving us the impression that they had hatched recently.

The foraging of seven geckos was observed for between 3.01 to 25.80 minutes each. Means values of MPM and PTM were  $1.5 \pm 0.22$  and  $8.5 \pm 3.56$  respectively, and within the published range of those for sit-and-wait foragers (Huey and Pianka, 1981). *Lygodactylus blancae* typically moved short distances before stopping and remaining motionless in wait for passing prey. On sighting a suitable food item the gecko rushed quickly to make the prey capture. It was observed feeding on small dipterans.

## Discussion

This survey found nine new localities for *L. blancae* and confirmed its continued presence at the type locality. The species uses a variety of habitat types but most individuals were observed on exposed rock boulders, buildings or large trees in disturbed areas near to freshwater wetlands. It was observed using both native and introduced tree species. There

were no sightings of this species on *Eucalyptus*, and it is possible that previous records on this tree from Ampefy (Glaw and Vences 2007) were based on a wrong identification of tree species. There were frequent sightings of *L. blancae* using the walls and roofs of buildings and this species appears to be well adapted to survival in human-modified environments. It is one of only five *Lygodactylus* that frequently uses both trees and rocks for foraging and basking (Glaw and Vences 2007; Puente et al. 2009).

The upper limit of the elevational range of this species was 1350 m in this study and although it was absent from putatively suitable areas above this altitude, additional surveys are required to better understand the full extent of its range. Given the new distributional records and the use of buildings and exotic plants this species may be significantly more widespread and is unlikely to be of major conservation concern.

The survey period appeared to correspond with the end of the reproductive period as there was little evidence of pregnancy or egg-laying. Such seasonality may be associated with the high elevations as continuous or weakly seasonal reproduction seems to be more common in other species like *L. verticillatus* (Vences et al. 2004). Local people reported that they see most *L. blancae* during October and that eggs are visible in January and February (Razafimanantsoa and Rasolomalala, pers. comm.).

Based on the criteria proposed by Huey and Pianka (1981), PTM (< 30) and MPM (< 1-2) values for *L. blancae* correspond to a “sit-and-wait” foraging mode. Although this species is a sit and wait predator, each time interval spent sitting and waiting is rather short. Its high MPM and low PTM are similar to those of *Mabuya margaritifera* (Scincidae; Wymann and Whiting, 2002) and reflect the use of “short spurts” (frequent movements of short length).

*Lygodactylus blancae* is one of 11 strictly protected gecko species in Madagascar. This classification effectively prohibits all form of collection, except for scientific purposes. There is currently no evidence of high collection pressure on *L. blancae* or any other *Lygodactylus* species. Although there are few threats acting on this species, its small extent of occurrence is a cause for concern, and additional surveys, and taxonomic investigations, at other sites in the highlands are needed to develop a better understanding of the ecological requirements of this species.

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