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New snake records for the island of Nosy Be, northwest Madagascar: *Mimophis mahfalensis* (Grandidier, 1867) and *Pseudoxyrhopus quinquelineatus* (Günther, 1881)

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Endemic to Madagascar, the lamprophiid snakes *Mimophis mahfalensis* and *Pseudoxyrhopus quinquelineatus* are known from varied locations and habitat types throughout mainland Madagascar. These species were newly encountered during a recent biodiversity study carried out by Frontier staff and volunteers on the island of Nosy Be (13º20'S and 47º15'E) between April 2011 and January 2012. Located in the northwest, Nosy Be is the largest offshore island of Madagascar, situated in the bay of Ampasindava which is approximately 8 km from the mainland (Ambanja region) and it is thought that the islands were probably linked as recently as 8000 years ago, before sea level rose at the end of the last glacial period (Andreone et al., 2003).

Previous studies for the island of Nosy Be revealed a total of 61 reptile and 20 amphibian species, with 81% of these found species being recorded in the Réserve Naturelle Intégrale (RNI) de Lokobe (Andreone et al., 2003). RNI Lokobe is a 740 ha Strict Nature Reserve (13º25'S and 48º20'E) and is one of the largest relatively undisturbed patch of Sambirano type primary forest. Lokobe and small patches of bordering secondary forests are the only remaining forests on Nosy Be, the majority of the island is used for cultivation purposes (Andreone et al., 2003).

Few surveys have actually been performed in Malagasy secondary forests and cultivated landscapes and a large percentage of previous studies have been carried out within protected areas and National Parks indicating that they have high levels of species biodiversity and endemism (Raxworthy and Nussbaum, 1994). Those surveys conducted in secondary forests and cultivated landscapes show that species distributions differ greatly between primary forests and cleared areas (Scott et al., 2006). This is especially significant for lizards, indicating a 50% drop in species richness with disturbance. With fewer species being recorded in anthropogenic habitats, this study concentrated on assessing the biodiversity of these secondary habitats outwith the primary forest of RNI Lokobe to assess whether species richness is affected by forest clearance (S. Marrocoli et al., Unpublished). For this project, six survey sites with varying levels of disturbance were chosen (Figure 1 and Table 1). These sites were located between the local village of Ambalahonko (in the commune of Antafondro) and RNI Lokobe. During this study, the two previously unrecorded species, *Mimophis mahfalensis* (Fig. 2) and *Pseudoxyrhopus quinquelineatus* (Fig. 3) were encountered on the offshore island. Although both species are known from habitats throughout mainland Madagascar, neither had been sighted on Nosy Be during herpetological surveys in the last decades (Andreone et al., 2003). These two new snake sightings extend the currently existing species list for the island. *Mimophis mahfalensis* was encountered frequently during the surveys and was recorded in all but one site (Site 1). Favouring highly anthropogenic habitats this species was abundant in sites 4, 5, and 6 and seen rarely in sites 2 and 3 (Figure 1). Known only to this island in the form of two museum specimens which had been collected in the 19th century, its occurrence had not previously been confirmed. These sightings confirm that *M. mahfalensis* is indeed present and locally abundant on the island of Nosy Be and thus affirms predictions of its presence expressed previously (Andreone et al., 2003).

Pseudoxyrhopus quinquelineatus on the other hand was encountered on only one occasion, in a secondary forest habitat (site 1) (Figure 1). This individual was captured in a pitfall overnight and was found hidden under the leaf litter. Sighted throughout Madagascar, this species is known to a variety of forest habitats including coastal dry forests, arid spiny forests and mid

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Table 1. Site location and description of survey sites. Time since clearance given by local land users (Marrocoli et al. unpublished).

Site ref.	Longitude	Latitude	Time since clearance	Use
1	48.33489562	13.41105569	Never been cleared	Some wood extraction and guided tourism
2	48.33704967	13.40818777	30 years	Wood extraction
3	48.34198135	13.4036328	18 years	Vanilla and pineapple cultivation
4	48.34229814	13.40251597	10 years	Abandoned land reverting to forest, approx 10 years old
5	48.34317875	13.3996345	0 years - currently under use	Ylang-Ylang and banana cultivation
6	48.3460673	13.3996345	1 year – currently under use	Pineapple cultivation

altitude rainforests (Glaw and Vences, 2007), but has never previously been recorded on Nosy Be. The closest known location in which this species has been recorded is the Montagne des Français National Park in the north. The presence of this species on the island is surprising, now adding the Sambirano region to its distribution range. Furthemore *P. quinquelineatus* was recorded in a secondary forest habitat (Site 1), considering the proximity of this site to RNI Lokobe and that the species has a preference for forest habitats, could indeed be an indicator for its presence within the RNI. However further studies are recommended to confirm this.

Malagasy herpetofauna is extremely diverse with a high level of endemism, 91 % in reptiles (Raxworthy, 2003), 99% in amphibians (Glaw and Vences, 2003). However little is known about species distribution and abundance. The findings presented here promote the importance of further studies on Malagasy herpetofauna in order to get more complete and accurate species distribution data. Since neither of the two species found by us were recorded in the RNI de Lokobe, our findings highlight that research should not only be confined to nature reserves, unprotected areas are as equally important in supporting animal communities.

Figure 2. *Mimophis mahfalensis* found on the Island of Nosy Be, Madagascar. Photo: F.McLellan

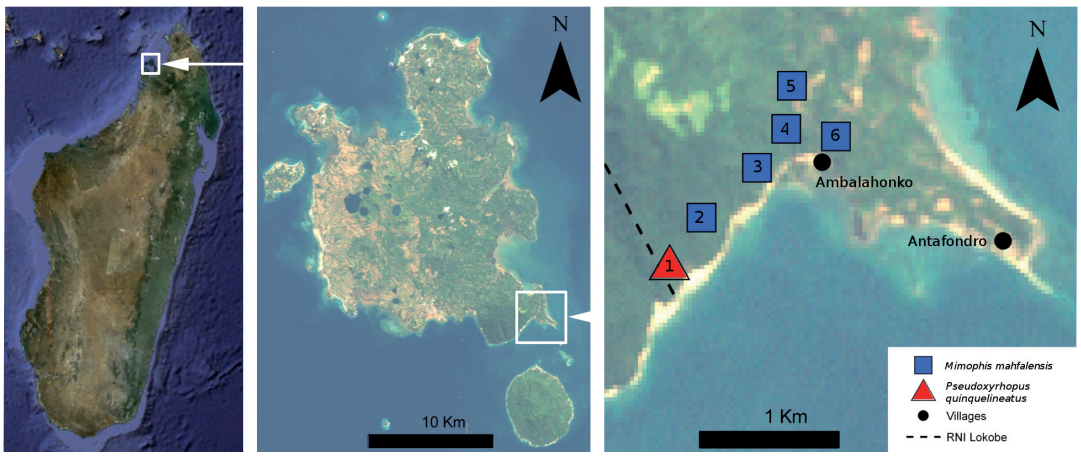

Figure 1. Map of Nosy Be showing surveyed sites and species locations.

Figure 3. A single specimen of *Pseudoxyrhopus quinquelineatus* found on Nosy Be, Madagascar. Photo: F.McLellan

Management and conservation of both natural and anthropogenic habitats is required in order to sustain species diversity.

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