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# The calls of *Plethodontohyla inguinalis* from eastern Madagascar

(Amphibia, Microhylidae)

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A specimen of the frog species *Plethodontohyla inguinalis* Boulenger, 1882 was identified as the emitter of unknown calls recorded at the rainforest of An'Ala in central eastern Madagascar. The calls remind the barking of a dog and consist of single melodious notes, repeated after regular intervals and at a fundamental frequency of 400-600 Hz. The specimen was found in a tree hole at a height of about 50 cm, indicating some degree of climbing behaviour in this species.

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## Introduction

Bioacoustic studies have proven to be an important tool in anuran taxonomy. In the anuran fauna of Madagascar, a large number of cryptic species have been discovered and identified by analysis of their calls (Glaw & Vences 2000), and most recent species descriptions heavily rely on bioacoustics (e.g. Vallan et al. 2003).

The genus *Plethodontohyla* contains species with tadpoles developing in subterranean jelly nests or in waterfilled tree holes. The latter reproductive mode is known from three species that are also characterized by expanded terminal discs of fingers and toes (Cadle 1996, Vences et al. 2003): *Plethodontohyla inguinalis* Boulenger, 1882, *P. mihanika* Vences, Raxworthy, Nussbaum & Glaw, 2003, and *Plethodontohyla notosticta* (Günther, 1877). In this paper we describe the advertisement calls of the largest of these species, *Plethodontohyla inguinalis*.

## Materials and Methods

Calls were recorded using a portable tape recorder with external microphone in the field. They were digitized on a PC using the software Cooledit 96 (Syntrillium Corp.), with a sampling rate of 32 kHz. For visual representation of the sonagram, the following settings were used: Hanning Window (resolution 512 bands) with linear energy plot (0.8 % scaling). Because of a relatively high degree of noise (calls of other frogs and of insects) at higher frequencies, we eliminated frequencies above 1500 Hz (using an FFT filter) before using the oscillogram for temporal measurements and as graphical representation of the relative amplitude of the call. Temporal call parameters are given in milliseconds (ms), as range, followed by mean  $\pm$  standard deviation, and number of analyzed units in parentheses.

## Results and Discussion

The calls were recorded on 16 January 1997, on a cloudy evening at 19:50 h, in slightly disturbed primary rainforest at An'Ala (18°55'S/48°29'E,



Fig. 1. Adult male of *Plethodontohyla inguinalis* from An' Ala, central-eastern Madagascar, observed and photographed on 16 January 1997.

890 m above sea level), central eastern Madagascar. Calls of a single specimen were heard and noticed already from a distance of about 100 m. After carefully approaching the site of the vocalizations, the first author found a specimen of *Plethodontohyla inguinalis* (snout-vent length 91 mm) in a tree-hole (not water filled), about 50 cm high in a tree of about 60 cm trunk perimeter. No water body was seen in about 10 m surrounding of the tree.

The observed specimen (Fig. 1) was not collected, but could unambiguously be determined as *Plethodontohyla inguinalis* by its large size and the expanded terminal of fingers and toes which constitutes a unique combination of characters among Malagasy frogs.

The specimen could not be directly observed calling, but we consider the assignation of the calls to *Plethodontohyla inguinalis* as highly probable because (a) an adult male (Fig. 1) was found in a treehole exactly at the position from which the calls were heard, (b) the calling site was not next to an open water body, while most other Malagasy frogs call next to water, (c) the call was very different from all other calls known from central eastern Madagascar, (d) the general call structure (regularly repeated single melodious notes) is typical for

cophylines and (e) the low frequency of the call agrees with the large size of this species.

The call, recorded at 21 °C air temperature, sounded like the barking of a small dog. It consisted of a single melodious note that was repeated regularly, with a note repetition rate of 0.9 per second. The sonagram (Fig. 2) shows that each note consists of a fundamental frequency band and one harmonic, the harmonic representing the dominant frequency. In both, the frequency increases from the beginning of the note, and then decreases again towards the end. Fundamental frequency is between 400-600 Hz, dominant frequency is between 800-1300 Hz. Note duration is 133-191 ms ( $148 \pm 18$  ms,  $n=10$ ), interval between notes is 848-1151 ms ( $1004 \pm 85$  ms,  $n=10$ ).

These data provide the first evidence that the call of *P. inguinalis* is similar to that of other cophylines in being regularly repeated melodious notes. Specimens of *P. inguinalis* so far were usually found during the day on the ground, where they are known to feed on large invertebrates such as scorpions (Lourenço et al. 1997). Despite their enlarged terminal disks of fingers and toes, they have not been found climbing so far. Our observations demonstrate that this species is able to climb, but also

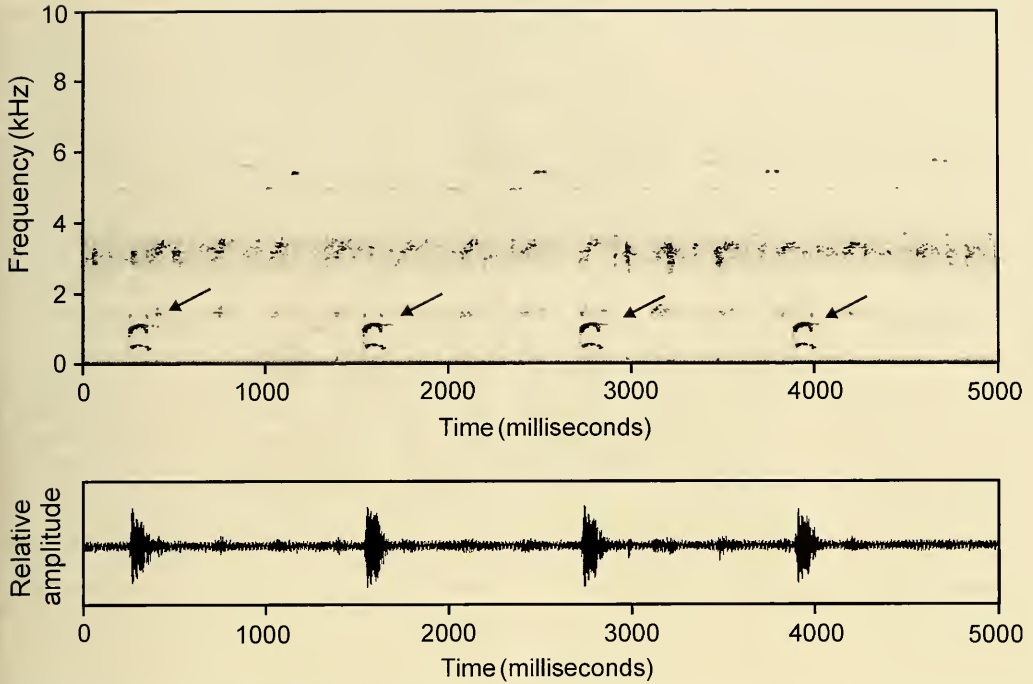


Fig. 2. Sonogram and oscillogram of the advertisement call of *Plethodontohyla inguinalis*, recorded at An'Ala, central-eastern Madagascar, at 21 °C air temperature. Four notes are shown (marked with arrows).

indicate that it might prefer tree holes at lower heights than the other climbing *Plethodontohyla* with expanded finger disks (*P. notosticta* and *P. mihanika*; Vences et al. 2004), confirming the observations of Cadle (1996: p. 380) who found the large eggs of *P. inguinalis* in tree holes, often close to the ground. Eggs probably belonging to this species were regurgitated by a male of the snake *Liopholidophis rhadinæa* (Cadle 1996).

Whether this species uses water filled tree holes for reproduction, or the larvae develop in some kind of nest in a dry tree hole, cannot be assessed without further observations.

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