

## Two Unknown Arboreal Frogs (genus *Platypelis*) Described from the Rainforests of Northeastern Madagascar (Microhylidae: Cophylinae)

FRANCO ANDREONE<sup>1\*</sup>, DANTÉ B. FENOLIO<sup>2</sup>, AND MARK E. WALVOORD<sup>2</sup>

<sup>1</sup> Museo Regionale di Scienze Naturali, Sezione di Zoologia, Via G. Giolitti, 36, I-10123 Torino, ITALY

<sup>2</sup> University of Oklahoma, Department of Zoology, 730 Van Vleet Oval, Richards Hall, Norman, Oklahoma, USA

**Abstract:** Two new arboreal microhylid frogs are described from the rainforests of northeastern Madagascar. *Platypelis tetra* is a very small frog, reaching about 20 mm SVL, and inhabits phytotelms in screw *Pandanus* pines. It was found in some low and mid-altitude rainforests, such as Anjanaharibe-Sud, Besariaka, Tsararano, and Masoala Peninsula. This species diverges from the other *Platypelis* by its small size and colouration, with a series of whitish spots on the back, of which four are more evident. Furthermore, its advertisement call is composed by a long series of discrete notes at about 3.5–4 KHz of frequency, and a repetition rate of about 3.0 notes/s. The second species, *Platypelis mavomavo*, reaches a larger size (about 30 mm SVL), and is characterized by a yellowish colouration of the ventral surface, and a dorsal surface with a network of dark spots on a beige-yellow background. It is currently known from Anjanaharibe-Sud and Ambolokopatrika, around the Andapa water-basin, but is expected to have a wider distribution.

**Key words:** Amphibia; Anura; Microhylidae; *Platypelis*; New species; Madagascar

### INTRODUCTION

Madagascar is well known for its biodiversity and high endemism (Glaw and Vences, 1994). Amphibians are no exception with more than 210 endemic species (Andreone and Luiselli, 2003) and many others still in wait for description. Like other vertebrates of Madagascar (e.g., fish and mammals, see Benstead et al., 2000; Yoder et al., 2003), the frogs of

this landmass belong to a few families, of which they represent an offshoot radiation. According to recent studies (Vences and Glaw, 2001) they are included in four families: Ranidae, Mantellidae, Microhylidae, and Hyperoliidae. Of these, the microhylids are still the most enigmatic clade, and their phylogenetic and taxonomic relations are largely unstudied. Of the three recognized Malagasy subfamilies (Dyscophinae, Scaphiophryninae, and Cophylinae), the cophylines account for a high number of species inhabiting rainforests and secondary altitude savannahs (Andreone, 1999). Indeed, little is known of their ecology and distribution

\* Corresponding author. Tel: +39-011-4320-7310; Fax: +39-011-4323-331.  
E-mail address: f.andreone@libero.it

except that they are specialized to a variety of microhabitats: e.g., the enigmatic *Rhombophryne testudo* and some *Plethodontohyla* species (such as *P. ocellata*, *P. alluaudi*, and *P. serratopalpebrosa*) are fossorial or terrestrial, the small *Stumpffia* are adapted to leaf-litter, and most of the *Anodonthyla*, *Platypelis*, *Cophyla*, and some *Plethodontohyla* are arboreal or semiarboreal. The conditions and evolutionary pressures that led to such a dramatic ecological radiation in these frogs are unknown. Further, whether an ecologically specialised group is indeed monophyletic is the subject of a separate work (Andreone et al., in press).

One reason for the lack of knowledge about cophyline microhylids is that they often lead a cryptic life, which makes their study difficult. In fact, many taxa are known from a few specimens and are only occasionally re-discovered (e.g., *Plethodontohyla coudreau*; Andreone, in press a). This was confirmed by our own experience: during field surveys we often found specimens that could be grouped with one another representing the same ecological and morphological cluster, but were difficult to assign to any known taxon. This leads us to the idea that, especially in microhylids, many more species await description, and it is not an exaggeration to affirm that most likely the final number of species will stabilize around the double that currently known. Many of these specimens still await description and will be the object of further contributions, using both traditional (e.g., morphological analysis and comparisons of museum samples), and other methods (e.g., acoustics, karyology, DNA). While it is important to collect ecological and natural history information on unknown species, the discovery and rapid description of new frogs from Madagascar is important for two reasons: (1) it accelerates the cataloguing of the whole Malagasy batrachofauna, providing powerful tools to draw biogeographic relationships for conservation actions (see Andreone and Luiselli, 2003), and (2) it helps clarify the taxonomy and phylogeny of this subfamily in a region where

deforestation outpaces description. Written records and museum specimens might become all we have for future studies of the most sensitive species, which are rapidly vanishing.

The present paper is just a step in this direction and deals with the description of two new *Platypelis* that we found in northeastern Madagascar. One of these frogs is a *Pandanus*-specialized *Platypelis*, while the second is an arboreal generalist. They are sufficiently divergent from all known *Platypelis*, in both morphology and bioacoustics, to warrant description here.

#### MATERIALS AND METHODS

We searched for frogs during the night with the help of flashlights. Vocalizing males were located by following calls at sunset or during rainfall. One species described here is a microhabitat specialist, living within phytotelmata of screw-pines, *Pandanus* sp., and we spent daytime hours searching the leaf axils of these plants. After capture and photography of live colouration, specimens were sacrificed after anaesthesia in chlorobutanol, fixed in 4% formalin or 90% ethanol, and preserved in 70% ethanol. They are currently deposited in the Museo Regionale di Scienze Naturali, Torino (MRSN).

Measurements follow standard methods, using digital callipers or the dissecting microscope's micrometer (to the nearest 0.1 mm): SVL (snout-vent length), HW (head width), HL (head length, from the maxillary commissure to the snout tip), ED (horizontal eye diameter), END (eye-nostril distance), NSD (nostril-snout tip distance), NND (inter-narial distance), TD (horizontal tympanum diameter), HAL (hand length, from the carpal-metacarpal articulations to the tip of the longest finger), FORL (forelimb length, from the axilla to the tip of the longest finger), HIL (hindlimb length, from the cloaca to the tip of the longest toe), FOL (foot length, from the tarsal-metatarsal articulations to the tip of the longest toe), FOTL (foot length including tarsus, from the tibiotarsal articulation to the

tip of the longest toe), TIBL (tibia length).

When available, type specimens and/or other representative specimens of presumably related taxa from zoological collections were examined, as well as the original descriptions and subsequent works (e.g., Blommers-Schlösser and Blanc, 1991; Glaw and Vences, 1994). The advertisement calls were recorded with a SONY TC-D3 tape recorder with external microphone and analyzed with a VOXYS 3.1 sound system (Andreone et al., 2003). The proposed common names for the new species are provided in the authors' original languages (Italian and English) and in Malagasy.

*Platypelis tetra* sp. nov.

Four-spotted tree cophyline frog (English), cofilino degli alberi dalle quattro macchie (Italian), sahonkely anatihazo misy tebok'efatra (Malagasy).

Figs. 1–3

*Type series*

**Holotype:** MRSN A2174, adult male, Campsite W2, Anjanaharibe-Sud Massif, Analabe Valley, Befandriana Fivondronana, Mahajanga Faritany (Majunga Province), 14°46'S, 49°26'E, 1,250 m asl, collected by F. Andreone, H. Randriamahazo, and J. E. Randrianirina, 5 February 1996. **Paratypes:** MRSN A2171–2173, three adult females, same data as the holotype; MRSN A1952–1953, an adult male and an adult female, Tsararano Forest, Andatony Anivo, Andapa Fivondronana, Antsiranana Faritany (Diégo Suarez Province), 14°54.8'S, 49°42.6'E, 600 m asl, collected by F. Andreone and J. E. Randrianirina, 5 and 10 December 1996; MRSN A2175, one juvenile, Besariaka Forest, Andapa Fivondronana, Antsiranana Faritany (Diégo Suarez Province), between 14°49'S–14°50'S, 49°35'E–49°36'E, about 700 m asl, collected by J. E. Randrianirina, 1 May 1996; MRSN A646.1–4, three adult males and one juvenile, Masomihenjina Forest, Masoala Peninsula, Maroantsetra Fivondronana, Toamasina Faritany (Tamatave Province), 15°25'S, 49°46'E, collected by R. Nincheri, 24 July 1993; MRSN A2161,

A2164–2165, one juvenile and two adult males, Ambohidroina Forest, Masoala Peninsula, Mahalevona Fivondronana, Toamasina Faritany (Tamatave Province), 15°26.00'S, 49°57.56'E, 840 m asl, collected by J. E. Randrianirina, 26 January 2002; MRSN A2166, one juvenile, same date and collector, 28 January 2002; MRSN A2167, an adult male, same date and collector, 29 January 2002; MRSN A2169, one juvenile, same date and collector, 30 January 2002; MRSN A2170,



FIG. 1. *Platypelis tetra*. Holotype (male, MRSN A2174) from Analabe Valley, Anjanaharibe-Sud, western slope, NE Madagascar.

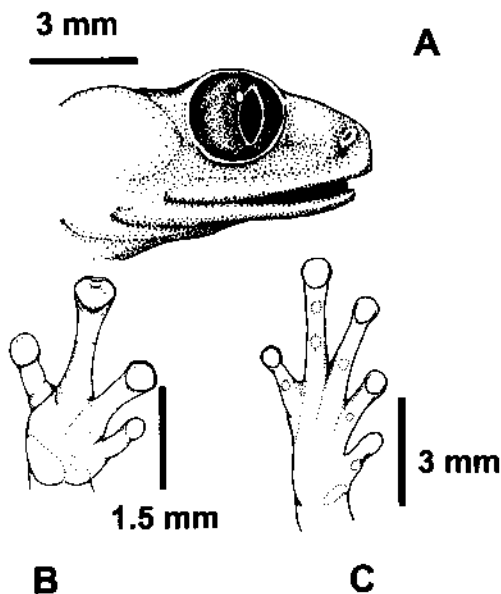


FIG. 2. Particular of the head (A), hand (B), and foot (C) of the holotype of *Platypelis tetra* (male, MRSN A2174).

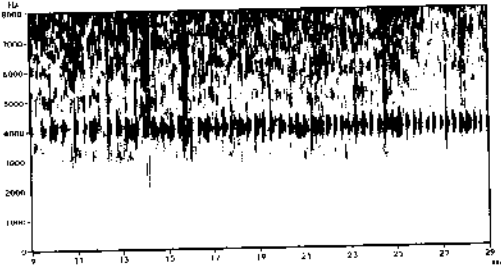


FIG. 3. Sonagram of part of a call (two notes out of a longer note series) of *Platypelis tetra*, recorded at Anjanaharibe-Sud, NE Madagascar. Recording temperature: 18C.

same date and collector, 9 February 2002.

### Diagnosis

An arboreal *Platypelis* characterized by the following combination of characters: small adult body size, canthus rostralis indistinct, toe and finger pads more circular than ovoid and moderate in size; hands and feet without webbing, tarso-metatarsal articulation reaching the eye, dorsal surface smooth, dorsal colour shading from brown to tan, sometimes with irregular markings and at least four oblong white spots on the dorsal surface.

### Description

The SVL in the examined males ranged from 15.7 to 18.2 mm. In the females from 17.5 to 19.4 mm. Other measurements of the type series are given in Table I. Head as long as wide; HW 32–41% of SVL; HL 31–41% SVL; snout short, slightly protruding beyond margin of lip; rounded and blunt in dorsal view and in profile; END less than ED; END 20–26% of HL; eye moderate in size; ED 28–36% of HL. Top of head flat; cranial crests absent; canthus rostralis indistinct; internarial area not depressed; nostril more circular than ovoid; protruding laterally. Weak supratympanic fold usually visible, tympanum round, TD 34–67% of ED. Choanae small, round, separated, partially obscured by palatal shelf of maxillary arch. Vomerine teeth present and posterior to choanae. Tongue trapezoid in shape with rounded edges, widest

at the free margin, no groove or notch, free behind for about two thirds of its length. Pupil horizontal. Vocal sac moderate in size, single, and in gular position. Skin on dorsum of head, body, belly, and limbs smooth. Fingers moderate in length bearing circular, moderately sized discs compared with phalanges; disc on first digit smaller than others:  $1 < 2 < 4 < 3$ ; subarticular tubercles faint, circular, not elevated; supernumerary tubercles absent; palmar tubercle semi-distinct, not elevated. No webbing between fingers. Feet with semi-distinct supernumerary tubercles; vestiges of metatarsal tubercle; no other distinct tubercles. Small pads on toes, circular in shape. No webbing between toes. Toe length:  $1 < 2 < 5 < 3 < 4$ .

### Coloration

After five-seven years of preservation in ethanol, all the specimens still show contrasting colouration. Dorsum of head, body, and limbs are brown or tan with vague darker markings, and legs have irregular tan spots. Four bigger dorsal whitish spots are present on the back (two just behind the head, and two other on the sacral bone). Other smaller scattered light points are also present on the back and superior parts of legs in some individuals. In some cases the four main spots form a sort of hourglass figure on the dorsum. Flanks with a brown dorsolateral band beginning posterior to the eye, passing through the union of the arms with the body and down each flank, ending at the groin; brown bar is edged above and below by a thin cream line. The anterior surface of the arm with a brown line extending from the union of the arms with the body and terminating at or before the elbow. Iris brownish shading to copper, with peripheral fine spots and dark shadings. Ventral surface grey to creamish with a few brown flecks, sometimes forming dark spots.

### Variation

The paratypes come from Anjanaharibe, Besariaka, Tsararano, and Masoala, spanning therefore about 200 km. These specimens agree with the holotype in colouration. The

TABLE 1. Morphometric measurements (in mm) of type specimens of *Platypelis tetra* sp. nov. and *P. mavomavo* sp. nov. M=male, F=female, J=juvenile, holotype marked with an asterisk. For abbreviations see the text.

Museum number	Provenience	Sex	SVL	HW	HL	ED	END	NSD	NND	TD	HAL	FORL	FOL	TIBL
<i>Platypelis tetra</i>														
MRSN A2174*	Anjanaharibe-Sud	M	17.5	6.4	6.2	2.0	1.3	1.6	2.0	0.8	3.2	5.9	6.0	17.5
MRSN A2172	Anjanaharibe-Sud	M	18.2	6.5	6.3	2.2	1.4	1.6	2.1	1.2	3.4	6.5	5.4	18.2
MRSN A1952	Tsararano	M	16.5	5.9	5.8	1.9	1.3	1.5	2.0	0.9	2.8	6.6	4.5	16.5
MRSN A646.1	Masomihenjina	M	15.8	5.5	5.7	1.9	1.4	1.4	2.0	0.9	3.1	6.4	5.3	15.8
MRSN A646.2	Masomihenjina	M	15.7	6.2	6.1	2.1	1.2	1.4	2.0	1.0	3.4	6.4	5.2	15.7
MRSN A646.3	Masomihenjina	M	16.2	5.2	5.8	1.8	1.5	1.5	2.1	1.1	2.8	5.9	4.6	16.2
MRSN A2164	Ambohidroina	M	18.2	6.2	6.3	2.2	1.5	1.7	2.0	0.9	3.4	6.6	5.4	18.2
MRSN A2165	Ambohidroina	M	18.2	6.8	6.3	1.8	1.4	1.9	2.2	1.2	3.7	7.3	5.7	18.2
MRSN A2167	Ambohidroina	M	15.9	5.7	5.5	1.7	1.4	1.5	2.2	1.1	2.9	6.5	4.5	15.9
MRSN A2170	Ambohidroina	M	16.6	5.9	5.7	2.0	1.4	1.7	2.1	1.0	2.8	6.7	5.5	16.6
MRSN A2173	Anjanaharibe-Sud	F	19.4	6.8	7.1	2.3	1.5	1.6	2.1	0.8	3.8	6.3	5.9	19.4
MRSN A2171	Anjanaharibe-Sud	F	18.9	6.9	6.4	2.3	1.5	1.9	2.2	1.2	4.1	7.6	5.7	18.9
MRSN A1953	Tsararano	F	17.5	5.8	6.3	2.0	1.3	1.8	2.1	1.0	2.8	6.8	5.1	17.5
MRSN A2175	Besariaka	J	13.1	5.3	5.3	1.9	1.1	1.3	1.8	1.0	2.9	6.5	4.9	13.1
MRSN A646.4	Masomihenjina	J	11.5	4.5	4.7	1.5	1.1	1.3	1.7	0.7	2.1	4.1	3.9	11.5
MRSN A2161	Ambohidroina	J	14.3	5.2	5.4	1.9	1.3	1.3	1.7	0.7	3.1	6.5	4.3	14.7
MRSN A2166	Ambohidroina	J	14.9	5.3	5.5	2.0	1.4	1.3	1.8	0.7	3.2	6.4	4.3	14.9
MRSN A2169	Ambohidroina	J	14.9	5.2	6.1	1.8	1.2	1.5	1.8	0.8	3.2	6.0	4.2	14.9
<i>Platypelis mavomavo</i>														
MRSN A2435*	Ambolokopatrika	M	26.5	9.3	9.7	4.1	2.5	2.1	3.0	1.7	8.1	18.8	12.4	26.5
MRSN A2432	Ambolokopatrika	M	28.6	11.3	9.6	3.6	2.5	2.4	2.7	1.7	8.6	20.7	12.6	28.6
MRSN A2434	Ambolokopatrika	M	24.4	8.4	8.5	2.9	2.5	2.1	2.6	2.1	8.8	17.5	10.7	24.4
MRSN A2431	Ambolokopatrika	F	27.9	9.9	9.7	4.0	2.4	2.6	3.2	1.8	8.5	18.3	12.8	27.9
MRSN A2433	Ambolokopatrika	F	26.8	9.4	8.8	3.4	2.0	2.4	3.6	1.6	8.1	19.4	11.7	26.8

individuals from Masomihenjina (Masoala) show a paler dorsal colouration, and a contrasted lateral band. Colouration in life was basically similar to that described for preserved animals, although much more vivid.

#### Etymology

The word "tetra" is derived from the Greek "tetras" means "four" and is attributed to the fact that most specimens show four lighter spots on the back. This name is used as a noun with the same meaning.

#### Natural history and distribution

The holotype and some of the paratypes were collected at Anjanaharibe-Sud, western slope (Analabe Forest), Campsite W2 (around 1200 m asl), where the habitat is comprised of a mid-high altitude transitional rainforest with tall trees and abundant lichens, mosses, and ferns (Raxworthy et al., 1998; Andreone et al., 2000). The specimens were found within a plant of the genus *Pandanus*. A single specimen was found at Besariaka Forest. This forest at about 60 km south of Andapa is rather degraded, especially in areas far from streams, due to cattle, cutting of trees by