



## Pretty in pink: A new treefrog species of the genus *Boophis* from North-Eastern Madagascar

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### Abstract

Treefrogs of the genus *Boophis* comprise the most species-rich genus among all Malagasy frogs. In this paper we describe a new species to be added to this genus from Masoala Peninsula and nearby areas. Related populations have been found in three localities of North-Eastern Madagascar (Tsararano, Marojejy, and Anjanaharibe-Sud), and molecular data indicate that at least the Marojejy population is strongly differentiated. The new species has an attractive pink or reddish colour pattern on a green ground colour. It bears a strong similarity to *Boophis bottae* and *B. rappiodes* in morphological appearance, but is genetically very distinct from these and other members of the *Boophis rappiodes* group. *Boophis ulftunni* **sp. n.** belongs into a separate evolutionary lineage probably related to the *Boophis microtypanum* group, a lineage of highland species from Central Eastern Madagascar which otherwise have very different phenotypes and advertisement calls. We here include *B. ulftunni* in a new phenetic species group, the *Boophis ulftunni* group.

**Key words:** Amphibia, Anura, Mantellidae, *Boophis ulftunni* **sp. n.**, *B. microtypanum* group, *B. rappiodes* group, *B. ulftunni* group, systematics, Madagascar, phylogeny

### Introduction

The genus *Boophis* Tschudi contains a species-rich radiation of Malagasy treefrogs (Blommers-Schlösser and Blanc 1991; Vences *et al.* 2002; Cadle 2003). Taking into account the latest species descriptions, over 50 species are known from Madagascar, and one still undescribed species occurs on the Comoro island of Mayotte (Glaw and Vences 2006; Köhler *et al.* in press). The genus is currently divided in two subgenera, and the nominal subgenus *Boophis* is further divided into eight species groups, several of which probably do not constitute monophyletic units (Glaw and Vences 2006; Glaw *et al.* 2006). Since the works of Blommers-Schlösser (1979), systematic studies have increasingly revealed that *Boophis* contains high numbers of morphologically similar cryptic species (e.g., Glaw *et al.* 2001). This is especially true for a series of small to medium-sized species of predominantly green colour which initially (Blommers-Schlösser 1979) were classified in the *B. luteus* group and the *B. rappiodes* group. A large number of green *Boophis* species have been discovered since, most of them bearing extremely low morphological and chromatic divergence, but exhibiting high bio-acoustic and genetic differences to their congeners.

More recent studies furthermore suggest that different lineages of green *Boophis* exist which may not be closely related. Vences and Glaw (2005) noted that several species related to *Boophis mandraka* Blommers-Schlösser are in fact phylogenetically distant from other species in the *B. rappiodes* group, although all of

these taxa share green ground colour, small size, and as a unique feature among *Boophis*: a transparent ventral skin which allows to observe the inner organs in living specimens. Consequently, a separate *B. mandraka* group was created for these species (Vences and Glaw 2005) and subsequently also the *B. luteus* group was partitioned by creation of a new *B. albipunctatus* group (Glaw and Vences 2006).

Here we describe a new small species of *Boophis* of translucent green ground colour which differs from all described species by morphology, calls and a high differentiation in mitochondrial DNA sequences. Phylogenetic analysis indicates that this remarkably pretty new species does not belong to any of the currently existing species groups of *Boophis* but in fact represents an independent lineage that so far is only known from North-Eastern Madagascar.

## Materials and methods

Calling male frogs and occasionally female specimens were collected at night, euthanized in a chlorobutanol solution, fixed in 90% ethanol or 5% formalin, and preserved in 70% ethanol. Locality information was recorded with GPS receivers. Specimens studied in this paper are deposited in the collections of Museo Regionale di Scienze Naturale in Torino, Italy (MRSN), and in the Zoologische Staatssammlung München, Germany (ZSM) (Table 1).

Morphological measurements (in millimetres) were taken with a digital caliper (precision 0.01 mm) to the nearest 0.1 mm. Used abbreviations are: SVL (snout-vent length), HW (greatest head width), HL (head length), ED (horizontal eye diameter), END (eye-nostril distance), NSD (nostril-snout tip distance), NND (nostril-nostril distance), TD (horizontal tympanum diameter), TL (tibia length), HAL (hand length), FOL (foot length), FOTL (foot length including tarsus), FORL (forelimb length), HIL (hindlimb length), RHL (reaching of tibiotarsal articulation when hindlimb is adpressed along body). Terminology and description scheme follows Glaw and Vences (2002) and Glaw and Vences (1997) for eye colouration. Webbing formulae follow Blommers-Schlösser (1979).

Calls were recorded with different sound recording equipment in the field. They were computer-analyzed using the software CoolEdit (© Syntrillium Corp.). Frequency information was obtained through Fast Fourier Transformation (FFT, width 1024 points); the audiospectrograms were obtained at Hanning window function with 512 bands resolution. Temporal measurements are given as range, with mean  $\pm$  standard deviation in parentheses. Terminology in call descriptions follows Heyer *et al.* (1990) as extended by Köhler (2000).

A molecular phylogeny of three individuals belonging to the type series of *B. ulftunni* (holotype and two paratypes) was constructed using 536 basepairs of the mitochondrial 16S rRNA gene, which has proven to be suitable in anuran species identification (Vences *et al.* 2005). We furthermore added sequence data of representatives of all major species groups of *Boophis* to the dataset to infer phylogenetic relationships of the new species. A sequence of *Aglyptodactylus madagascariensis* was added as outgroup taxon. Newly determined sequences were submitted to GenBank (Accession numbers EU252140–EU252144). Best-fit models of evolution were computed with the software ModelGenerator (Keane *et al.* 2006). Phylogenies were constructed using Maximum Likelihood with the software PhyML (Guindon and Gascuel 2003), and Maximum Parsimony in PAUP\* (V. 4.0.b.10, Swofford 2001), with 500 (ML) and 2000 (MP) bootstrap replicates.

### *Boophis ulftunni* sp. n.

**Holotype.** MRSN A4287, adult male, from the Masoala Peninsula, Menamalona (Campsite 5), Ilampy Corridor, 15°22.87'S, 49°59.27'E, 610–630 m altitude in North-Eastern Madagascar, collected on 1 December 1998 by F. Andreone and J. E. Randrianirina.

**TABLE 1.** Morphometric measurements (in mm) of the holotype, six paratypes, and five additional specimens of *Boophis ulftunni* sp. n. For abbreviations of measured variables see Materials and Methods.

Catalogue number	MRSN A1858	MRSN A2559	MRSN A2560	MRSN A2561	MRSN A2562	MRSN A2572
Fieldnumber	FN6479	-	-	-	RJS 0418	FN 7801
Status	Further material	Paratype	Paratype	Paratype	Paratype	Paratype
Sex	m	f	m	m	m	f
SVL	24.2	32.0	22.6	21.9	22.8	37.1
HW	9.3	11.0	8.4	8.1	8.9	12.1
HL	9.3	11.9	8.4	8.0	8.5	12.8
TD	2.3	2.0	1.7	1.7	1.9	2.8
ED	3.3	3.4	3.4	3.6	3.6	3.9
END	1.9	2.6	1.7	1.5	1.9	3.1
NSD	2.1	2.2	2.0	1.7	2.1	3.1
NND	1.7	3.8	2.4	2.2	2.7	3.6
FORL	14.0	21.5	15.1	16.6	15.4	22.6
HAL	7.5	9.1	7.7	7.6	7.6	10.9
HiL	37.8	53.2	38.6	37.5	40.8	56.5
FOTL	15.4	22.3	16.1	16.3	16.5	25.8
FOL	9.0	13.3	10.0	9.3	10.0	15.3
TL	12.8	17.5	12.5	12.6	13.1	17.7
RHL	-	eye / nostril	snout / nostril	snout / nostril	snout / nostril	eye / nostril

*to be continued.*

Catalogue number	MRSN A4286	MRSN A4287	MRSN A4448	MRSN A4449	MRSN A4450	ZSM 80/2005
Fieldnumber	FAZC 10398	FAZC 10396	-	-	-	FGZC 2879
Status	Paratype	Holotype	Further material	Further material	Further material	Further material
Sex	m	m	f	f	m	m
SVL	24.0	23.0	32.7	34.3	21.8	22.5
HW	7.7	8.3	11.4	12.1	8.1	8.5
HL	7.9	8.2	11.7	12.7	8.5	8.5
TD	1.5	1.4	2.2	2.9	1.8	1.3
ED	3.1	3.5	3.6	4.0	2.9	3.1
END	1.9	2.0	2.6	2.9	1.7	1.6
NSD	2.2	1.8	2.6	2.9	1.8	1.8
NND	2.2	2.4	3.6	4.0	2.4	2.4
FORL	14.1	14.3	22.5	22.8	14.6	16.0
HAL	7.0	7.3	10.0	11.0	6.4	7.4
HiL	34.8	38.9	49.8	57.5	36.0	40.5
FOTL	15.7	16.4	23.6	24.3	14.6	17.6
FOL	9.8	9.4	14.5	15.0	8.7	9.8
TL	12.4	12.9	17.0	18.6	12.5	13.2
RHL	eye / nostril	nostril	nostril	nostril	nostril	beyond snout

**Paratypes.** All paratypes are from North-Eastern Madagascar. MRSN A4286, adult male, from same locality and same collection data as holotype; MRSN A2572, adult female, from the Masoala Peninsula, Andasiny Governera (Campsite 3), Ambatolelama Corridor, 15°18'S, 50°01'E, 610–630 m alt., collected on 5 December 1998 by F. Andreone and J. E. Randrianirina; MRSN A2559–2562, one adult female and three adult males, from the Masoala Peninsula, Ambohitsitondroina (Campsite 6), 15°26.00'S, 49°57.34' E, 1106 m alt., collected on 31 January 2002 by J. E. Randrianirina.

**Further material.** All further material is from North-Eastern Madagascar. MRSN A1858, adult male, from Tsararano Chain, Campsite 2, Andatony Anivo, 14°54.80'S, 49°42.60'E, 600–750 m alt., collected on 15 December 1996 by F. Andreone and J. E. Randrianirina; MRSN A4448–4450, two adult females and one adult male, from the western slope of the Anjanaharibe-Sud Massif, Valley of Analabe River, 14°46.62'S, 49°26.60'E, 1050 m alt., collected on 3 February 1996 by F. Andreone, J. Randriamahazo and J. E. Randrianirina; ZSM 80/2005, adult male from Marojejy National Park, Campsite locally known as Camp Simpona, 14°26.199'S, 49°44.6'E, 1326 m alt., collected on 16 February 2005 by F. Glaw, M. Vences and R.-D. Randrianiaina.

**Diagnosis.** A species assigned to the genus *Boophis* based on the presence of intercalary elements between terminal and subterminal phalanges of fingers and toes (externally verified), absence of femoral glands, presence of (weakly developed) nuptial pads in males, general morphological resemblance to other *Boophis* species, and molecular phylogenetic evidence. All species of *Boophis* in the subgenus *Sahona* and in the *B. albilabris* group, *B. goudoti* group and *B. microtypanum* group have larger body sizes and no translucent green ground colour. Distinguished from species in the *B. majori* group by green translucent (rather than brownish) ground colour, and by an advertisement call consisting of trills (not known from any species of the *B. majori* group except *B. blommersae*). Distinguished from species in the *B. albipunctatus* group and the *B. luteus* group by smaller size (male SVL 22–24 vs. 24–46 mm) and by the presence of distinct reddish-brown to pink spots and patches on the dorsum. Distinguished from species in the *B. mandraka* group and *B. rappiodes* group by non-transparent ventral skin. Although some other species of green *Boophis* have trill calls of similar general structure as *B. ulftunni* (especially *B. erythrodactylus*, *B. andohahela*, *B. jaegeri*), the detailed temporal call parameters of *B. ulftunni* differ from these species.

The molecular analysis reveals that *B. ulftunni* is related to species of the *B. microtypanum* group. *B. ulftunni* strongly differs from all species currently recognised in the *B. microtypanum* group by morphology and by molecular characters (see below).

**Description of the holotype.** Adult male, SVL 23.0 mm (for measurements see Table 1). Body slender; head as long as wide, wider than body; snout rounded in dorsal view, slightly truncate in lateral view, nostrils directed laterally, slightly nearer to tip of snout than to eye; canthus rostralis and loreal region both slightly concave; tympanum distinct, rounded, 40% of eye diameter; supratympanic fold not recognizable; tongue ovoid, distinctly bifid, posteriorly half free; vomerine odontophores distinct; positioned posteromedian to choanae; choanae small, rounded. Arms slender, subarticular tubercles single, round; metacarpal tubercles unrecognizable; fingers with weak webbing; webbing formula 1(2), 2i(1.5), 2e(1.25), 3i(2.5), 3e(1.5), 4(0.75); relative length of fingers 1<2<4<3 (finger 2 shorter than finger 4); finger disks moderately enlarged; small unpigmented nuptial pads faintly recognizable on inner side of first finger. Hindlimbs slender; tibiotarsal articulation reaches nostril when hindlimb is adpressed along body; lateral metatarsalia separated by webbing; inner metatarsal tubercle distinct, no outer metatarsal tubercle; webbing formula between toes 1(0.5), 2i(1.25), 2e(0.5), 3i(1.75), 3e(0.5), 4i(2), 4e(2), 5(0.5); relative length of toes 1<2<5=3<4; toe disks slightly enlarged. Skin on dorsal surfaces and ventrally on throat smooth; ventral skin on belly and around cloacal opening glandular.

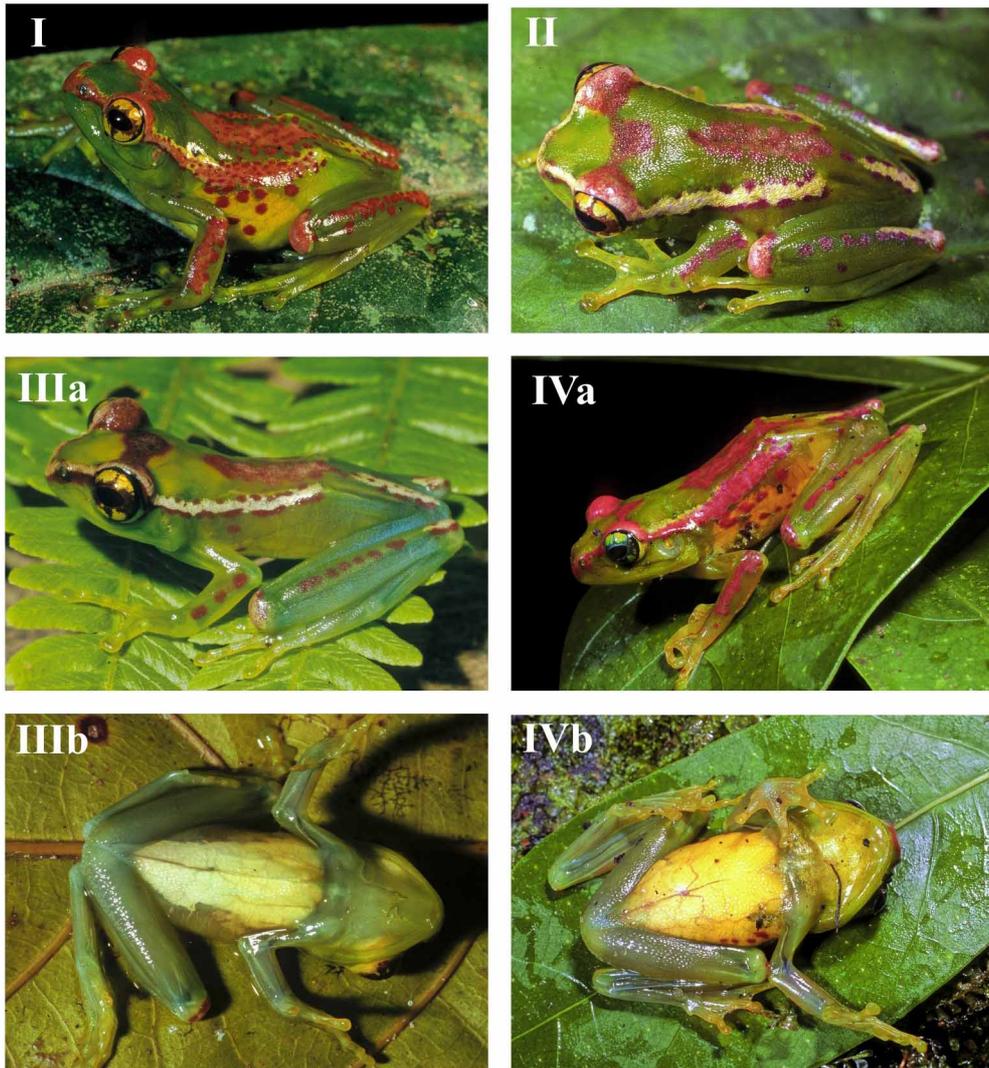
In preservative uniformly cream-white with a thin reddish-brown line reaching from eye to snout tip, supraorbital reddish-brown marks converging into a spot on the head (Figure 1). Colour in life unknown.



**FIGURE 1.** Specimens of *Boophis ulftunni* sp. n. I. male holotype from Masoala (MRSN A4287); II. male paratype from Masoala (MRSN A2562); III. male specimen from Marojejy (ZSM 80/2005); IV. female specimen from Anjanaharibe-Sud (MRSN A4449). Scale represents 10 mm.

**Variation.** The morphological variation of the type specimens is shown in table 1. The specimen from Marojejy (ZSM 80/2005) has the following differences to the holotype: hand webbing formula 1(2), 2i(1.5), 2e(1.25), 3i(2.5), 3e(1.5), 4(1); webbing formula between toes 1(0.5), 2i(1), 2e(0.25), 3i(1.25), 3e(0.25), 4i(1.25), 4e(1.25), 5(0.5); nostrils directed slightly nearer to eye than to tip of snout; dorsolaterally with a thin brownish-pink line that reaches until each nostril, and irregular pink spots on dorsum, arms and thighs.

**Colouration in life** (based on photographs shown in Figure 2): Dorsum translucent green; dorsolaterally with a metallic-cream white line accompanied by pink spots extending to snout tip and converging at the urostyle; supraorbital reddish-brown to pink marks converging into a reddish-brown or pink blotch on the middle of the head (y-shaped); and irregular pink spots and blotches on dorsum, flanks, knees, upper arms and upper thighs which can be accompanied by metallic-cream-white marks. Iris with outer yellow area and inner purple area which irregularly border onto each other. Toes and finger disks uniformly green. The amount of pink colour pattern on head, dorsum and extremities seems to be variable among specimens and populations, and the same accounts for the metallic-white colour elements (Figure 2). In the Marojejy specimen, additional blue hue can be observed on thighs and rear end of dorsum.

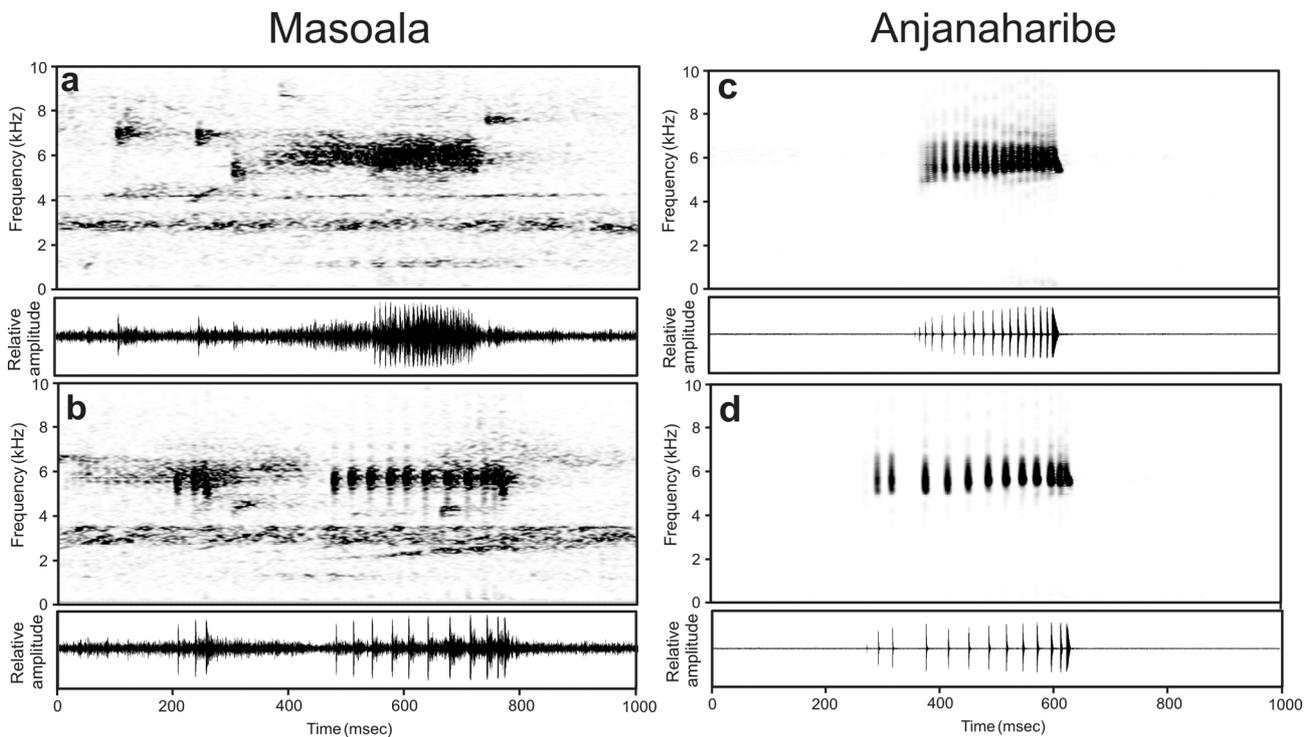


**FIGURE 2.** Life colouration of *B. ulftunni*. The photos show specimens from I, Masoala, II, Tsararano, IIIa, Marojejy (ZSM 80/2005; IIIb, ventral view), and IVa, Anjanaharibe-Sud (IVb, ventral view).

**Vocalization.** The call of *Boophis ulftunni* sp. n. consists of single pulsed notes that can be described as trills and that are repeated after relatively irregular intervals. Each note is a succession of short pulses with considerable variation in interpulse durations. In some of the available recordings (especially in those from Masoala, partly in those from Marojejy), most notes are of noisy appearance and pulses are only weakly discernible in parts of the call (Figure 3a–b), while other notes are clearly pulsed. In other recordings (especially in those from Anjanaharibe-Sud), the pulses are clearly recognizable in all notes (Figure 3c–d). Whether this is due to variation among populations, or due to a different motivational state of specimens, cannot be determined at present. Possibly two note types exist, one with fast and one with slow pulse repetition rate (Figure 3), but these note types are not always clearly distinguishable and their temporal and spectral parameters are therefore merged in the analysis (Table 2). We furthermore note the presence of single or double "click" sounds that can be emitted between calls. No significant frequency modulation could be observed.

**Molecular phylogenetic relationships.** The phylogeny reconstructed from a fragment of the mitochondrial 16S rRNA gene shows *B. ulftunni* as belonging into a distinct evolutionary lineage, sister to *B. microtypanum* (Figure 4). Despite the obvious phenotypical similarities to members of the *B. rappiodes* group such as translucent green colour on dorsum, reddish spots, or a y-shaped pattern on the head, the pairwise genetic dis-

tances between these and *B. ulftunni* are very high (10.7% to *B. rappiodes*). Furthermore, *B. ulftunni* does not bear genetic similarity to the phenotypically similar *B. mandraka* group (genetic distances to *B. mandraka* 14.1–14.9%). The sister relationship of *B. ulftunni* sp. n. with *B. microtypanum* receives relevant support in ML and MP bootstrap analyses. Pairwise genetic distances between *B. ulftunni* sp. n. and *B. microtypanum* are also higher than 10%, which supports the status of *B. ulftunni* as a valid species. Based on more comprehensive phylogenetic analyses including all currently described species of *Boophis* (not shown), *B. ulftunni* is in fact confirmed as related to the *B. microtypanum* group (which in turn is monophyletic, containing the species *B. laurenti*, *B. microtypanum*, *B. rhodoscelis*, and *B. williamsi*), but more extended analyses including more genetic markers have yet to show if these two *Boophis* lineages are in fact sister to each other. The sequenced type specimens of *B. ulftunni* from Masoala (which are genetically identical) furthermore showed considerable genetic variation as compared to the single specimen from Marojejy (pairwise genetic distances 5.0%).



**FIGURE 3.** Sonograms and oscillograms of advertisement calls of *Boophis ulftunni*. (a) and (b) show a fast and a slow pulsed note, respectively, from Masoala (type locality). (c) and (d) show a fast and a slow-pulsed note from Anjanaharibe-Sud. Note that the pulses in the fast Masoala call are poorly recognizable and pulse rate is much faster than in Anjanaharibe. However, this could be due to a higher motivational state in the Masoala specimens which were recorded while calling in a dense chorus, whereas the Anjanaharibe specimen was calling from a smaller and less dense aggregation of individuals. The additional short sounds in (a) and (b) may have at least partly been emitted by *B. ulftunni* as well, but this cannot be ascertained from the available recordings on which also other syntopic frogs can be heard.

**Natural history.** At Marojejy, specimens were heard at night, calling from high perches (2–4 m) in the vegetation along a small stream in rainforest, at an elevation of approximately 1300 m above sea level. Specimens were relatively common but difficult to observe at this site. The sites at Masoala where the species has been found are all typical low- and mid-altitude rainforests, being represented by patches of rather intact pristine or re-grown secondary forest. The individuals were found along forest streams, mainly in areas characterized by dense vegetation. All the Masoala sites lie outside the Parc National de Masoala boundaries, and represent corridors between larger forest nuclei. The habitat in Analabe (Anjanaharibe-Sud Massif) is a patchwork of pristine and altered forest, with most of the unaltered forest occurring on its ridge and steepest slopes.

In the degraded patches, the original vegetation has been replaced by ferns and grasses. The Tsararano Chain lies south of the Andapa Basin, midway between the Anjanaharibe-Sud Massif and the Masoala Peninsula and is formed by several hills (altitude 400–1,269 m). The forest of Tsararano appears to be relatively intact, most likely due to its distance from large villages.

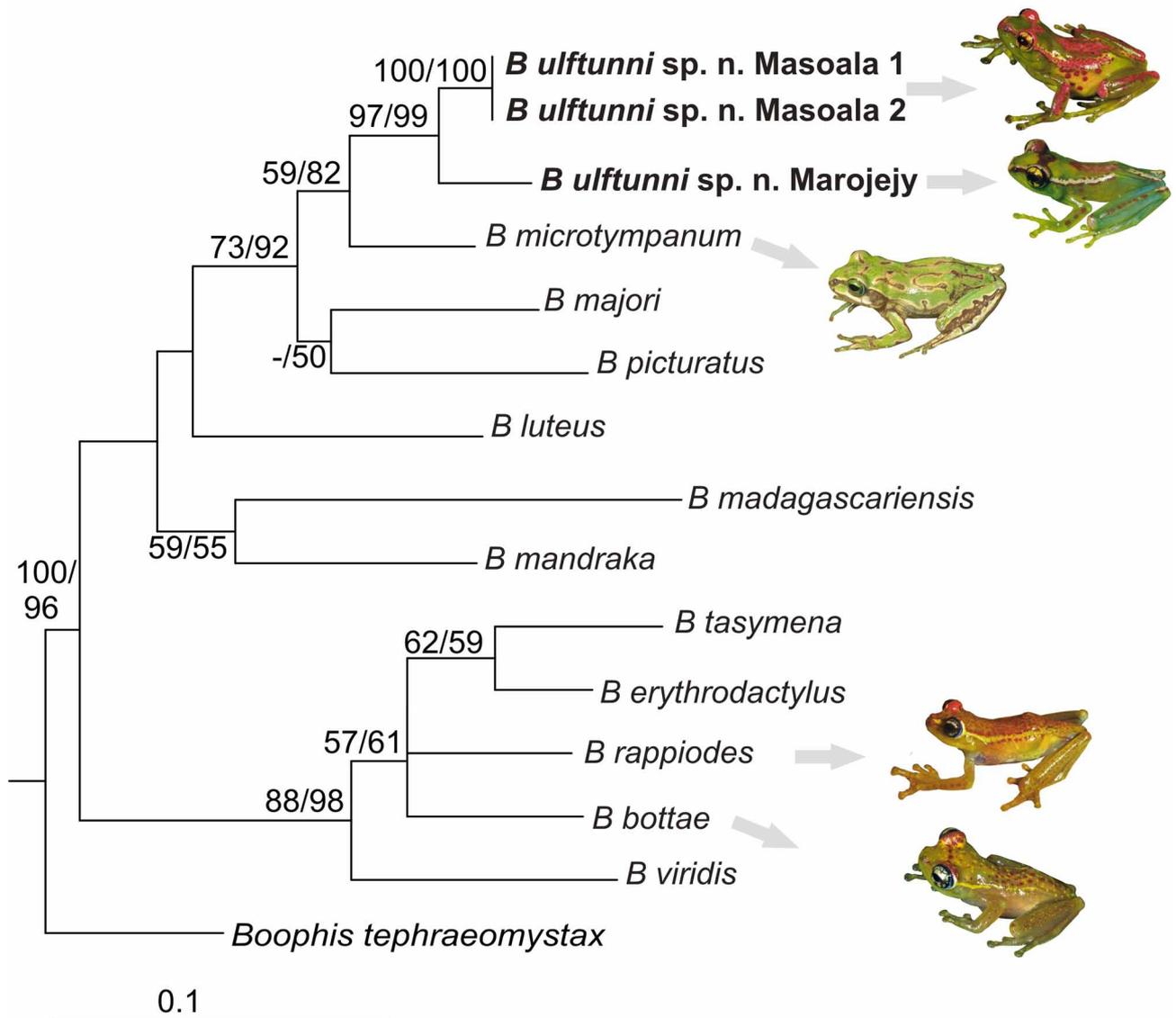
**Etymology.** The specific name is dedicated to Dr. Ulf Walter Tunn in recognition for his support of research and nature conservation through the Biopat initiative.

**TABLE 2.** Bioacoustic characters of *B. ulftunni* sp. n. For each call, pulse- and interpulse duration of 5–10 pulses were measured. Due to high amounts of background noise, these variables could only be analyzed for four notes in the Masoala recording. Temporal variables are given as mean  $\pm$  standard deviation (minimum–maximum).

Call recorded at	Marojejy N = 6	Anjanaharibe-Sud N = 10	Masoala N = 11
Call voucher	ZSM 80/2005	not identified	not identified
Note duration in ms	306 $\pm$ 90 (154–392)	231 $\pm$ 103 (76–421)	339 $\pm$ 142 (188–634)
Inter-note interval duration in ms	765 $\pm$ 167 (593–1035)	2183 $\pm$ 2477 (846–9048)	2604 $\pm$ 3444 (150–12380)
Number of pulses per note	20.8 $\pm$ 10.6 (8–34)	16.5 $\pm$ 11.1 (5–38)	22.2 $\pm$ 8.47 (11–34)
Pulse duration in ms	12.13 $\pm$ 6.65 (5–20)	4.08 $\pm$ 1.45 (1–5.7)	2.4 $\pm$ 0.71 (1.7–3.4)
Inter-pulse interval duration in ms	3.67 $\pm$ 1.37 (2–6)	16.49 $\pm$ 13.46 (3.6–35.6)	12.76 $\pm$ 12 (4–26.5)
Mean pulse rate per second	68.1	71.2	65.5
Dominant frequency in Hz	5247	6000	6413
Fundamental frequency in Hz	4800	4800	5000
Frequency range in Hz	4800–6400 (1600)	4800–8000 (3200)	5000–7000 (2000)

**TABLE 3.** Voucher specimens and Genbank accession numbers of *Boophis* species used in molecular phylogenetic analysis.

Species	Collection No.	Locality	GenBank accession numbers
<i>Boophis majori</i> (Boulenger)	ZMA 20068	Maharira	AY848586
<i>Boophis picturatus</i> Glaw, Vences, Andreone & Vallan	ZSM uncatalogued	An'Ala	EU252140
<i>Boophis microtympaum</i> (Boettger)	ZSM uncatalogued	Ambohitantely	EU252141
<i>Boophis ulftunni</i>	ZSM 80/2005	Marojejy	EU252142
<i>Boophis ulftunni</i>	MRSN A4287	Masoala, Menamalona	EU252143
<i>Boophis ulftunni</i>	MRSN A2572	Masoala, Ambatodelama	EU252144
<i>Boophis luteus</i> (Boulenger)	ZSM 90/2004	Andohahela	AY848482
<i>Boophis madagascariensis</i> (Peters)	uncatalogued	Ranomafana	AY838585
<i>Boophis mandraka</i> Blommers-Schlösser	ZSM 346/2000	Mandraka	AJ315921
<i>Boophis erythroductylus</i> (Guibé)	ZSM 324/2000	Mandraka	AJ314814
<i>Boophis tasymena</i> Vences & Glaw	ZMA 20241	Ranomafana	AY848670
<i>Boophis rappiodes</i> (Ahl)	ZMA 19434	Ranomafana	AY848666
<i>Boophis bottae</i> Vences & Glaw	UADBA 24451	Ranomafana	AY848625
<i>Boophis viridis</i> Blommers-Schlösser	UADBA 24363	Manombo	AY848679
<i>Boophis tephraeomystax</i> (Duméril)	UADBA 24183	Montagne d'Ambre	AY848508
<i>Aglyptodactylus madagascariensis</i> (Duméril)	ZSM 203/2004	Montagne d'Ambre	AY847979



**FIGURE 4.** Maximum-likelihood tree of 13 *Boophis* species including *B. ulftunni* sp. n. Numbers on nodes indicate bootstrap values higher than 50% in MP (first numbers) and ML tree searches (second numbers).

## Discussion

Members of the genus *Boophis* are not easy to be discerned from one another morphologically. The use of bio-acoustic and, increasingly, molecular characters have allowed to identify and describe numerous new *Boophis* species. However, in most cases these species were closely related to other, already known species or species complexes and usually could be unambiguously assigned to existing species groups.

On the contrary, the current paper provides an example for a *Boophis* species with misleading chromatic characters. The presence of pink blotches and translucent green body colouration would have implied to place this species among the members of the *B. rappiodes* group. However, its lack of transparent ventral skin already indicated an unprecedented combination of character states: in fact, so far this is the only *Boophis* with translucent green dorsal ground colour, small size (SVL in males < 25 mm), and with a non-transparent ventral skin. Molecular data unexpectedly show its affiliations with the *B. microtympenum* group, which contains four species from high-elevation habitats in Central Madagascar. This placement, plus the high genetic differentiation to other *Boophis*, indicates that *B. ulftunni* belongs into an independent evolutionary lineage

and we here propose a new species group to accommodate this species. At present *B. ulftunni* is the only known species in this lineage, but we have recently been able to collect additional green *Boophis* species from Ifanadiana in South-Eastern Madagascar, and from Forêt d'Ambre in the far north, which are likely to belong into the *Boophis ulftunni* group as well. Hence, these frogs may in fact represent a moderately diversified tree-frog lineage in Madagascar that has evaded discovery and taxonomic recognition so far.

*Boophis ulftunni* is known from various localities of North-Eastern Madagascar. It was found at three sites on the Masoala Peninsula, and is also known from Tsararano, Anjanaharibe-Sud and Marojejy. The available data indicate significant differentiation among these populations, but unfortunately are insufficient for final conclusions. Identical DNA sequences are available from two specimens from different sites in Masoala, indicating that populations from this area are probably homogeneous. Some call variation was observed among sites (Table 2), but this could also be due to different states of motivation (e.g., calling in choruses as in Masoala and Marojejy, or from rather isolated positions as probably in Anjanaharibe-Sud). Most significant is the strong genetic differentiation in the sole specimen collected from Marojejy. In fact, a pairwise divergence of 5% in the 16S rRNA gene in frogs usually characterizes specimens differentiated at the species level (Vences *et al.* 2005).

The new species has been collected from two protected areas in Madagascar, Marojejy National Park and Anjanaharibe-Sud Special Reserve, and is likely to occur in Masoala National Park. According to current data it can be assumed to be relatively widespread in North-Eastern Madagascar. However, the genetic divergences among populations indicate that more than one species might be currently included in *B. ulftunni*. Using the same rationale and IUCN criteria as applied during the Global Amphibian Assessment for Madagascan amphibians (see Andreone *et al.* 2005) we classify *Boophis ulftunni* as "Data Deficient".

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