

# The calls of the frogs of M a d a g a s c a r

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## The calls of the frogs of Madagascar

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Species on cover: *Boophis occidentalis*

Species on back and on CDs: *Boophis erythrodactylus*



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## *The calls of the frogs of Madagascar*

This booklet provides information on the authors, localities, dates and temperature conditions of the recordings present on the three CDs, and on the natural history and calling behaviour of the frog species recorded. More detailed data on the species can be found in an updated version of the "Fieldguide to the Amphibians and Reptiles of Madagascar" by F. Glaw and M. Vences that will be published in 2006 (see [www.mvences.de](http://www.mvences.de) for further information).

The CD contains two types of recordings: (1) Calls of a particular species, for which we usually selected recordings of single specimens, with highest recording quality available, and most typical calls. The terms "call" or "calls" generally refer to advertisement calls. If release calls or distress calls are reproduced, it is explicitly mentioned. (2) Soundscapes were selected to give a general impression of the varieties of sounds in Madagascan rainforests. Many of them are mixed choruses of several species, sometimes the recorded species could not be reliably identified, and some soundscapes include vocalizations of other Madagascan animals. Temperature data refer to air temperature unless otherwise stated.

Except when otherwise indicated the species recordings included have only been lightly processed digitally, preserving both the temporal and spectral characteristics of the calls. When filtering was applied it was used to eliminate background noise, after checking that filtering did not interfere with the spectral characteristics of the call. The frequency limits and characteristics of the parametric filters (highpass, lowpass, and bandpass) are explicitly stated in the text. Filtering software used was Spectral Filter (SoundFront FX for SoundMaker, [www.Riccisoft.com](http://www.Riccisoft.com)). All recordings from a given species are included in the same CD *Track* unless advertisement calls from different populations are clearly different. When more than one recording was selected within a track, these are separated by 0.75 seconds of silence and organized in subsequent *Cuts* which are addressed individually in the written comments. Soundscapes may have been modified more intensely to improve the aesthetic value of the audition (cutting or filtering noisy sections etc.) but tracks have never been mixed: all the choruses heard are natural. Original unedited recordings and additional recordings not selected for the sound guide are deposited in the Animal Sound Library of the Museo Nacional de Ciencias Naturales (CSIC), Madrid, Spain: Fonoteca Zoológica ([www.FonoZoo.com](http://www.FonoZoo.com)).

The listing of species, within each subgroup (genus, subgenus, species group) follows roughly an alphabetical order, but closely related species are usually listed after one another, even if this disrupts alphabetical listing.

The CDs contain the calls of a considerable number of species that are still undescribed or unidentified. These are marked with "sp.", followed either by a characteristic feature in quotation marks, e.g. "Fast Call", and/or followed by the name of the described species to which they bear most morphological or bioacoustic affinities (e.g., "aff. *betsileanus*"). Several groups are in need of thorough revision, and our distinction of probably undescribed species (e.g., in *Stumpffia*) need to be seen merely as hypotheses in need of confirmation. Furthermore, we use the addition "cf.", especially in the Soundscapes, to mark specimens and calls that we assign with some confidence to a particular species, but being aware that confirmation is required.

Generic classification of mantellid species follows a recent proposal by Glaw & Vences (in press) that probably will be published subsequent to this sound guide



MANTELLIDAE: Laliostominae

Genus *Aglyptodactylus*

These medium-sized frogs are typical explosive pond breeders. After heavy rainfalls, males gather around temporary or permanent ponds and emit their loud advertisement calls, mostly at night but also during the day at the peak of the reproductive "explosion", usually at the edge of the pond on the ground. Males of *Aglyptodactylus* are often characterized by a conspicuous yellow colour that disappears after the reproductive period. Eggs are deposited directly into the water where the tadpoles develop.

CD1. Track 1. *Aglyptodactylus laiteps* Glaw, Vences & Böhme, 1998

*Cut 1.* Calls of isolated male recorded by JG at Kirindy. *Cut 2.* Chorus recorded by JG at Kirindy, January 2001. *Cut 3.* Chorus recorded by FG on 21 January 1995 at Kirindy, 25°C.

CD1. Track 2. *Aglyptodactylus madagascariensis* (Duméril, 1853)

Populations currently considered as *A. madagascariensis* belong to various, partly undescribed species. We here consider the mid-altitude populations from eastern Madagascar as representing this species. Calls recorded by FG and MV at Andasibe on 8 February 2000, 19:10 h, at 22.6°C.

CD1. Track 3. *Aglyptodactylus securifer* Glaw, Vences & Böhme, 1998

This species occurs in western and north-western Madagascar, but the differentiation within its range needs to be assessed. *Cut 1.* Calls of a captive male recorded by JG at Kirindy on 14 December 1999, 20:00 h, 27°C. *Cut 2.* Calls recorded by FG at Ankarana Special Reserve, Campement des Anglais, on 13 February 2003.

CD1. Track 4. *Aglyptodactylus* sp. "South"

This is a genetically differentiated, probably distinct species from south-eastern Madagascar. Calls were recorded by FG at Andohahela National Park, 250 m altitude, on 31 January 2004, 19:30 h, at 24.0°C.

Genus *Laliostoma*

This genus contains a single species widespread over western Madagascar. *Laliostoma* breed in stagnant water, similar to *Aglyptodactylus*. Males emit loud advertisement calls from the ground at pond edges at night.

CD1. Track 5. *Laliostoma labrasum* (Cope, 1868)

*Cut 1.* Calls recorded by FG and MV on 23-27 January 1994 at Toliara. *Cut 2.* Calls recorded by FG on 21 January 1995 at Kirindy, ca. 25°C.

## MANTELLIDAE: Boophinae

Genus *Boophis*

This genus contains a radiation of largely arboreal frogs. One subgroup (the *B. tephraeomystax* group) contains species breeding in stagnant water. Several species of this group occur in western Madagascar. The remaining species are specialized stream breeders, occurring mostly in Madagascar's rainforests and montane habitats. Some of these species can be more terrestrial, calling from the ground at the edge of water bodies, but most species call perched on the vegetation around water. All *Boophis* deposit their eggs directly in the water where their tadpoles develop.

*Boophis tephraeomystax* group**CD1. Track 6.** *Boophis tephraeomystax* (Duméril, 1853)

Males call perched on low vegetation or from the ground around stagnant water, usually outside forests, in eastern and northern Madagascar. *Cut 1*. Isolated male recorded by FG on 11 January 1992 at Andasibe, 23°C. *Cut 2*. Chorus recorded by JER and MV on 2 November 2001 at Nosy Be, 27°C. Filtered: highpass 800 Hz. The trill notes included in the second cut are rarely heard in this species, but regularly in *B. doulioti* (see below).

**CD1. Track 7.** *Boophis doulioti* (Angel, 1934)

A medium-sized brown pond-breeding species closely related to *B. tephraeomystax*. Mainly in western Madagascar. Calls are loud, irregular and include frequent trill notes. Emitted from low vegetation or the ground around stagnant waters. *Cuts 1-2*. Isolated calls and chorus recorded by RBS at Ampijoroa (*Cut 1* is a single call isolated from *Cut 2*). *Cut 3*. Calls including trill notes recorded by FG and MV on 28 January 1994, 21:30 h, near Ranohira (Isalo National Park), filtered: highpass 600 Hz, 23.4°C.

**CD1. Track 8.** *Boophis xerophilus* Glaw & Vences, 1997

A medium-sized pond-breeding treefrog occurring in dry forests of western Madagascar. Calls from the ground or low vegetation around stagnant waters. *Cut 1*. Isolated calls. *Cut 2* With background calls of *Laliostoma labrosum*. Both recorded by FG on 21 January 1995 at Kirindy, ca. 25°C.

**CD1. Track 9.** *Boophis guibei* (McCarthy, 1978)

A pond-breeding medium-sized frog. Explosive breeder. Males were observed calling during the day but probably they mostly call at night after heavy rains, partly submerged, deep within vegetation in the pond. *Cut 1*. Isolated calls. *Cut 2*. Mixed chorus with loud *Aglyptodactylus madagascariensis*. *Cut 1* and *Cut 2* recorded by MV and IDR on 26 January 2004, during the day, near Mahariha forest, Ranomafana National Park. *Cut 3*. Male release calls, recorded by FG on 14 January 1992 at Andasibe, 21.5°C.

**CD1. Track 10.** *Boophis idae* (Steindachner, 1867)

A medium-sized pond-breeding frog from the eastern rainforests of Madagascar. The vocalizations include two distinct note types, a pulsed unharmonious call and a harmonious trill. Calls from low vegetation in and around ponds. Recorded by FG on 17 January 1995, 23:20 h, at Andasibe, 22°C.

## CD 1

### **CD1. Track 11.** *Boophis lichenoides* Vallan, Glaw, Andreone & Cadle, 1998

A conspicuous medium-sized species with dermal flaps on the lateral sides of the legs. Breeds in stagnant water. *Cuts 1-3* & *4*. Recorded by FA at Menamelona (Masosala Peninsula), on 18 December 1999, 20:45 h, 20°C. See also soundscapes CD1; Tracks 91-92. *Cuts 4* & *5*. Recorded by FA on 15 December 1996 at Tsararano Forest, Campsite 2 (Andatony Anivo), 19:30 h, 20°C, filtered: lowpass 2800 Hz.

### **CD1. Track 12.** *Boophis opisthodon* (Boulenger, 1888)

A large pond-breeding species from low altitudes along Madagascar's east coast. Specimens call from 2-3 m in the vegetation around or near to stagnant waters. Recorded by MV on 5 February 2004, 21:00 h, between Ifanadiana and Tolongoina.

### **CD1. Track 13.** *Boophis pauliani* (Guibé, 1953)

A small and secretive pond-breeding rainforest species. Advertisement calls unknown. Release calls recorded by FG on 14 January 1992 at Andasibe, 21.5°C.

### *Boophis albilabris* group

### **CD1. Track 14.** *Boophis albilabris* (Boulenger, 1888)

This large treefrog forms choruses of sometimes many individuals that call from slow-moving parts of rainforest streams, or puddles next to these streams. Specimens call from the ground. *Cut 1*. Advertisement calls, recorded by FG on 22 February 1995, 21:00 h, at Anjanaharibe Sud Special Reserve, 24°C. *Cut 2*. Female release call, recorded by FG on 8 March 1994 at Benavony, 23.5°C. *Cut 3* male release call, recorded by FG on 4 March 1995 at Andapa, 23-24°C.

### **CD1. Track 15.** *Boophis occidentalis* Glaw & Vences, 1994

A medium-sized to large treefrog from western Madagascar, closely related to *B. albilabris*. Breeding choruses aggregate after heavy rains in and next to streams, although the species is otherwise arboreal. Specimens from Berara where calls were recorded may belong to an undescribed species; calls from the type locality Isalo National Park are unknown. *Cut 1*. Isolated advertisement calls. *Cuts 2-5*. Chorus. All recorded by MV, FA and JER on 20 February 2000 at Berara forest, Sahamalaza Peninsula, 24.3°C.

### *Boophis luteus* group

### **CD1. Track 16.** *Boophis andohahela* Andreone, Nincheri & Piazza, 1995

A green treefrog from south-eastern Madagascar. Males emit their trill calls from the vegetation along streams, perched 1-2 m high in the vegetation. *Cut 1*. Recorded by FG and MV on 26 January 2005, 20 h, at Andohahela National Park, ca. 1600 m altitude, 17.6°C. *Cut 2*. Recorded by MV on 9 February 2004, 18:20 h, at Vevembe, 23°C.

### **CD1. Track 17.** *Boophis andreonei* Glaw & Vences, 1994

This medium-sized green treefrog calls from the vegetation along streams in rainforest. The call reminds an insect and is similar to that of *B. anjanaharibeensis*. *Cut 1*. Recorded by FG on 1 February 2003, 18:45 h, at Manongarivo Special Reserve, 25.8°C. *Cut 2*. Recorded by FG and MV on 8 March 1994 at Benavony (type locality), 25-26°C, filtered: highpass 2500 Hz.

**CD1. Track 18.** *Boophis anjanaharibeensis* Andreone, 1996

A medium-sized green treefrog emitting its insect-like long pulsed calls from 2-3 m height perched in trees along streams in rainforest. Recorded by FG and MV on 14 February 2005 at Marojejy National Park, near the campsite called "Camp Mantella". *Cut 1.* Recording filtered: bandpass 2500-4000 Hz. *Cut 2.* Same recording unfiltered.

**CD1. Track 19.** *Boophis elenae* Andreone, 1993

A medium-sized green treefrog that calls 2-4 m high perched in the vegetation along rainforest streams. Recorded by MV and IDR on 24 January 2004 at Maharira forest, Ranomafana National Park, 18.4°C.

**CD1. Track 20.** *Boophis engluenderi* Glaw & Vences, 1994

A medium-sized green treefrog calling 2-3 m above the ground, perched in the vegetation along rainforest streams. Recorded by FG on 29 March 1994, 18:00 h, at Marojejy National Park, 23.4°C.

**CD1. Track 21.** *Boophis jaegeri* Glaw & Vences, 1992

A small to medium-sized green treefrog that calls 2-3 m high, perched in the vegetation along streams in north-western rainforests or forest remnants. Insect-like trill calls. *Cut 1.* Single calls recorded by FG on 7 February 1992, 20:00 h, at the type locality (Andoany on Nosy Be), 25°C. *Cuts 2 & 3.* Chorus and single calls recorded by MV and FA, February 2000, at Berara (background: *Cophyla berara*). *Cut 4.* Male release calls recorded by FG and MV on 2 April 1991 at Nosy Be.

**CD1. Track 22.** *Boophis luteus* (Boulenger, 1882)

A medium-sized green treefrog with a very characteristic loud call that reminds the sound of a police car and is often heard along streams in and outside forest at mid-altitudes in eastern Madagascar. *Cut 1.* Starting notes of advertisement calls, recorded by FG on 14 January 1995 at Andasibe, 22.1°C. *Cut 2.* Advertisement call (regular series of notes), recorded by FG and MV, February 1991, at Andasibe. *Cut 3.* Advertisement calls. Recorded by FG on 1 January 1992, at Pic St Louis, Tolagnaro, 23°C. *Cut 4.* Release calls recorded by FG and MV in 1994, at Andasibe.

**CD1. Track 23.** *Boophis septentrionalis* Glaw & Vences, 1994

A medium-sized green treefrog calling 2-4 m above the ground, perched in the vegetation along streams in rainforest or rainforest remnants. The call is similar to that of *B. luteus* but with an unmelodious starting phase. Recorded by FG on 14 March 1994 at Montagne d'Ambre National Park, ca. 21°C. *Cut 1.* More melodious part of the call. Recording filtered high pass 2000 Hz. *Cut 2.* Starting phase of the call. Recording filtered: highpass 300 Hz.

**CD1. Track 24.** *Boophis* sp. aff. *elenae*

A medium sized green treefrog, calling 2-4 m high, perched in the vegetation along streams in or near rainforest. *Cut 1.* Recorded by MV and IDR on 28 January 2004, 21 h, near Vohiparara, Ranomafana National Park, 20-21°C. *Cut 2.* Recorded by FG on 1 March 1996, 17:40 h, at Ranomafana (specimen in collecting bag).

*Boophis albipunctatus* group**CD1. Track 25.** *Boophis albipunctatus* Glaw & Thiesmeier, 1993

A medium-sized green treefrog that calls high (3-4 m above ground) from the vegetation along streams. Typically a regular

## CD 1

series of click notes (call type I), sometimes a series of note groups at the end of a call (call type II). *Cut 1* and *Cut 2* reproduce the two call types. Both recorded by FG on 30 December 1991 at the type locality at Nahampoana, 25°C.

### **CD1. Track 26.** *Boophis sibilans* Glaw & Thiesmeier, 1993

A medium-sized green treefrog that emits two call types: a regular series of unpulsed whistling notes (as opposed to *B. sp. aff. sibilans*, see below), and a second call type with relatively fast repetition of whistles at the end of the call. Calling from 2-4 m height in the vegetation along rainforest streams. *Cut 1*. Call type I recorded by FG and MV on 1 January 1994, 20:30 h, at Andasibe (background: *Boophis luteus*). *Cut 2*. Call type I recorded by FG on 16 January 1995, 19:30 h, at Andasibe, 23°C. *Cut 3*. Call type II recorded by FG on 30 January 1996, 20:55 h, at Andasibe, 21.3°C.

### **CD1. Track 27.** *Boophis sp. aff. sibilans*

A medium-sized green treefrog extremely similar in appearance to *B. sibilans*, but with partly more pulsed notes in advertisement calls and a substantial genetic differentiation. *Cut 1*. Call type I, recorded by FG on 4 March 1996 at Vohiparaha. *Cut 2*. Call type I, recorded by FG on 1 February 1995 at Andasibe, 22°C. *Cut 3*. Call type II, recorded by FG on 1 March 1996, 18:15 h, at Ranomafana National Park.

### **CD1. Track 28.** *Boophis ankaratra* Andreone, 1993

This small to medium-sized green treefrog is common in the Malagasy highlands where at least some trees border clean streams. It calls from 1-3 m perched in the vegetation. Recorded by FG and MV on 1 February 1994, 21:20 h, at Manjakatempo, 18°C.

### **CD1. Track 29.** *Boophis sp. aff. ankaratra* "fast"

This form from Andohahela National Park in south-eastern Madagascar belongs to the *B. ankaratra* complex and is characterized by a fast note repetition rate, reminding *B. schubocae*. Specimens were sitting in the low vegetation (1-2 m high) along a stream. Whether low- and high-altitude recordings refer to the same species remains to be verified. *Cut 1*. Calls recorded by MV and FG on 26 January 2005, at Andohahela National Park, 1600 m altitude, ca. 20 h, 17.6°C (background: *Boophis andohahela*). *Cut 2*. Calls recorded by FG on 3 February 2004, 21:08 h, at Andohahela National Park, low altitude, 23.2°C.

### **CD1. Track 30.** *Boophis sp. aff. ankaratra* "slow"

This species from Andohahela National Park in south-eastern Madagascar belongs to the *B. ankaratra* complex and is characterized by a slow note repetition rate. Specimens called perched on low vegetation (1-2 m high) along a stream, syntopic with *Boophis sp. aff. ankaratra* "fast". *Cut 1*. Recorded by MV and FG on 26 January 2005, at Andohahela National Park, 1600 m altitude, ca. 20 h, 17.6°C. Filtered: bandpass 2000-3500 Hz. *Cut 2*. Same recording unfiltered.

### **CD1. Track 31.** *Boophis schubocae* Glaw & Vences, 2002

A species related to *B. ankaratra* but differing by shorter notes that sound more melodious. *Cuts 1 & 2*. Advertisement calls recorded by FG on 1 March 1996 at Ranomafana National Park, 23°C.

### *Boophis rappiodes* group

### **CD1. Track 32.** *Boophis bottae* Vences & Glaw, 2002

A small green treefrog, similar to *B. rappiodes*. Has several note types and calls 1-2 m above ground perched in the vegetation

along usually relatively large streams. Recorded by FG on 9 February 1996, 18:00 h, at Andasibe, 23.0°C.

**CD1. Track 33.** *Boophis rappiodes* (Ahl, 1928)

A small green treefrog that calls 1-3 m above ground, perched in the vegetation along rainforest streams. Morphologically similar to *B. hottaie* but with simpler calls usually consisting of isolated calls of two or three clicks. Recorded by FG and MV on 8 February 2000, 19:10 h, at Andasibe, 22.6°C.

**CD1. Track 34.** *Boophis erythroductylus* (Guibé, 1953)

A small green treefrog with conspicuous red dotting. Calls from 2-3 m in the vegetation along large, fast-flowing streams. The calls are not very intense. *Cuts 1-4*. Recorded by FG and MV at Mandraka on 21 January 1994. *Cut 5*. Possibly release calls. Recorded by RBS in 1972-73, in captivity from specimens collected at Mandraka.

**CD1. Track 35.** *Boophis tasymena* Vences & Glaw, 2002

A small green treefrog with red dotting, similar to *B. erythroductylus*. Calls from vegetation along rainforest streams. *Cuts 1-3* all recorded by FG on 4 February 1996, 19:30 h, at Andasibe, 24.0°C.

**CD1. Track 36.** *Boophis viridis* Blommers-Schlösser, 1979

A medium-sized green treefrog, calling 1-2 m above ground, perched in the vegetation along or near slow-moving streams in rainforest. Calls are relatively irregular and composed of different call types as reproduced in cuts 1-2 vs. 3-4. *Cuts 1-5*. Recorded by FG on 28 December 1994 at Andasibe.

**CD1. Track 37.** *Boophis* sp. aff. *rappiodes*

This species from north-eastern Madagascar reminds *B. rappiodes* in colour but may not be closely related to it. At Marojejy National Park specimens were calling from 2-3 m high in the vegetation along a stream. *Cuts 1 & 2*. Calls recorded by MV and FG on 16 February 2005, 19:20 h, at the campsite "Camp Simpona", Marojejy National Park, 21.5°C. Both cuts filtered; bandpass 4000-6500 Hz.

*Boophis mandraka* group

**CD1. Track 38.** *Boophis liami* Vallan, Vences & Glaw, 2003

A small green treefrog of the *B. mandraka* group, calling 2-3 m above ground perched in the vegetation along rainforest streams. *Cuts 1 & 2*. Advertisement calls recorded by MV on 10 April 2001, 18:30 h, at Vohidrazana, ca. 20°C. *Cut 3*. Advertisement call recorded by FG on 23 March 1995, ca. 18 h, at Vohidrazana.

**CD1. Track 39.** *Boophis mandraka* Blommers-Schlösser, 1979

A small green treefrog. Short melodious notes are emitted relatively irregularly along large, fast-flowing streams near or in rainforest, perched 2-3 m high on the vegetation. Calls can be heard over relatively wide distances. Recorded by FG and MV on 8 February 2000, 19:30 h, at Mandraka, 18.4°C. *Cut 1*. Two advertisement calls, filtered: highpass 3500 Hz (extracted from cut 2). *Cut 2*. Unfiltered longer recording.

**CD1. Track 40.** *Boophis sambirano* Vences & Glaw, 2005

A small green treefrog from north-western Madagascar. Calls near or along fast-flowing streams in the rainforest, perched 2-4 m high on the vegetation. Regular but slow series of chirping notes. Recorded by FG and MV on 1 February 2003, 18:45 h, at Manongarivo Special Reserve, 25.8°C.

**CD1. Track 41.** *Boophis solomaso* Vallan, Vences & Glaw, 2003

A recently described species. Emits high-pitched whistles, interrupted by shorter clicks, from vegetation along streams. Recorded by DV on 10 February 1997, 20:55 h, at Vohidrazana (Analambalaotra), 19°C.

*Boophis majori* group**CD1. Track 42.** *Boophis blommersae* Glaw & Vences, 1994

A small brown treefrog from northern Madagascar. Usually many specimens emit their loud and rather irregular calls from 1-3 m high in the vegetation along rainforest streams, and single calling specimens are difficult to localize. *Cuts 1-3*. Recorded by FG on 14 March 1994 at Montagne d'Ambre National Park, 21.2°C. All cuts filtered: highpass 200 Hz.

**CD1. Track 43.** *Boophis feonnyala* Glaw, Vences, Andreone & Vallan, 2001

A small brown treefrog, calling from the vegetation along swamps with slow-moving water. *Cuts 1 & 2*. Advertisement calls recorded by FG on 20 March 1995, 18:00 h, near Andasibe, 23.4°C.

**CD1. Track 44.** *Boophis haematopus* Glaw, Vences, Andreone & Vallan, 2001

A small brownish treefrog that calls from the vegetation along streams, known only from south-eastern Madagascar. The call is similar to that of *B. pyrrhus*. Recorded by FG on 30 December 1991 at Nahampoana, ca. 23°C.

**CD1. Track 45.** *Boophis pyrrhus* Glaw, Vences, Andreone & Vallan, 2001

A small brown treefrog that calls 1-2 m high in the vegetation, close to or along usually slow-moving streams at low and mid-altitude rainforests. Calls are similar to those of *B. haematopus*, and somewhat similar to those of *Guibemantis liber* which have a less "metallic" sound. Recorded by FG on 30 January 1996, 19:30 h, at Andasibe, ca. 22°C.

**CD1. Track 46.** *Boophis majori* (Boulenger, 1896)

A small brown treefrog, calling 2-3 m high in the vegetation along rainforest streams. Often forms local choruses in short portions of streams. *Cut 1*. Isolated advertisement call recorded by FG and MV on 16 January 1994 at Andringitra National Park (near Ambalamarina), 19°C. *Cut 2*. Chorus recorded by MV and IDR on 24 January 2004 at ca. 21 h at Maharira forest, Ranomafana National Park, 18.4°C (background with *Spinomantis peraccae* and *Boophis reticulatus*). Second cut filtered: highpass 500 Hz.

**CD1. Track 47.** *Boophis marojezensis* Glaw & Vences, 1994

We here refer all populations of small brown treefrogs with series of high-pitched whistling notes to this species. These calls are emitted from 1-4 m high in the vegetation along rainforest streams. *Cut 1*. Recorded by MV in 2001 at Vohidrazana. *Cut 2*. Recorded by MV and FA on 3 February 2001 at Antsahamanara campsite, Manarikoba forest, Tsaratanana Strict Nature Reserve, 24°C.

**CD1. Track 48.** *Boophis* cf. *marojezensis* Glaw & Vences, 1994

As opposed to the calls reported in Track 47, some specimens considered to belong to the species *Boophis marojezensis* from north-eastern Madagascar appear to be slightly larger and have a different call. The type locality of *B. marojezensis* is in the north-east, indicating that there is a need of taxonomic revision. Recorded by FA at Ambanjana, Masoala, 22°C.

**CD1. Track 49.** *Boophis miniatus* (Mocquard, 1902)

A small brown treefrog from south-eastern Madagascar that calls from the vegetation along streams in or near forest. Recorded by FG on 1 January 1992 at Pic St. Louis near Tolagnaro, 23°C. Filtered: bandpass 1000-5300 Hz.

**CD1. Track 50.** *Boophis picturatus* Glaw, Vences, Andreone & Vallan, 2001

A small brown treefrog that calls 1-2 m high in the vegetation above and along rainforest streams. *Cut 1*. Isolated advertisement call. *Cut 2*. Longer recording of single note calls followed by multi-note call. Both recorded by FG on 11 February 1995, 18:30 h, at An'Ala, 21.5°C.

**CD1. Track 51.** *Boophis vittatus* Glaw, Vences, Andreone & Vallan, 2001

A small brownish treefrog, calling 1-3 m high, perched on the vegetation along rainforest streams. The typical call is a series of very high-pitched short notes. At the end of the call, a trill-like series of notes may be emitted. *Cut 1*. Advertisement calls recorded by MV and FA on 4 February 2001 at Antsahamanara, Manarikoba forest, Tsaratanana Strict Nature Reserve, 21-22°C. *Cuts 2 & 3*. Advertisement calls recorded by FG on 1 March 1995, 20:30 h, at the type locality at Marojejy National Park, 22°C (cut 3 reproduces the trills at the end of a call).

*Boophis microtympanum* group**CD1. Track 52.** *Boophis laurenti* Guibé, 1947

A conspicuously spotted medium-sized montane frog, occurring at elevations above the tree line and therefore more terrestrial than other *Boophis*. Its taxonomic relationship with *B. microtympanum* is still to be clarified. Recorded by FG and MV on 18 January 1994, 20:00 h, at Cuvette Boby, Andringitra National Park, ca. 15°C. Filtered: highpass 400 Hz.

**CD1. Track 53.** *Boophis microtympanum* (Boettger, 1881)

A small to medium sized green treefrog with brown pattern, occurring in highland and montane areas, often above the treeline and therefore of relatively terrestrial habits. Calls can be emitted from vegetation along streams and be very intense, or by submerged specimens in the stream, then being less intense and difficult to locate. Recorded by MV and FA on 21 January 2003, 20:15 h, at Antoetra, 20.5-21°C, from specimens calling in the low vegetation along a stream. Recording filtered: highpass 1200 Hz.

**CD1. Track 54.** *Boophis* sp. aff. *microtympanum*

This form from low-altitudes in the Andringitra National Park area is very similar in morphology and calls to *B. microtympanum* but has a uniform colour. Recorded by FG and MV on 20 January 1994, 20:00 h, near Ambalamarina, Andringitra, 18-18.5°C, from specimens calling outside of the water.

## CD 1

### **CD1. Track 55.** *Boophis rhodoscelis* (Boulenger, 1882)

A small treefrog from the Malagasy highlands. Calls from low positions (<1 m) within dense vegetation along slow-moving streams and swamps. Call is of remarkably low intensity. Recorded by MV and IDR on 28 January 2004, 21:00 h, at a site called Ranomafanakeley, near Vohiparara, Ranomafana National Park, ca. 21°C.

### **CD1. Track 56.** *Boophis* sp. aff. *rhodoscelis* (Ambohitantely)

This species is similar to *B. rhodoscelis* in morphology and colouration but differs bioacoustically. Specimens were calling from ca. 1 m height in the vegetation along a large swamp with gently running water. Calls were recorded by MV on 18 January 2005, after 22:00 h, at Ambohitantely Special Reserve, about 18°C.

### **CD1. Tracks 57.** *Boophis* sp. aff. *rhodoscelis* (Ranomafana)

This medium-sized brown treefrog was observed calling 1-2 m high in the vegetation along a large stream close to the edge of the rainforest. *Cuts 1-3*. Three call types were recorded which apparently were all emitted by the same species. However, more data is necessary to ascertain the call complexity of this frog species and its relationships to *B. rhodoscelis* and *B. miniatius*. Recorded by MV and IDR on 28 January 2004, 21 h, near Vohiparara, Ranomafana National Park, 20-21°C.

### *Boophis goudoti* group

### **CD1. Track 58.** *Boophis goudoti* Tschudi, 1838

A large frog occurring in mid- to high-altitude rainforests as well as in treeless highland habitats. More terrestrial than other *Boophis*. Males call from the ground near slow-moving parts or side ponds of streams. Only recordings of vocalizations of males (*Cut 1*) and females (*Cut 2*) that may represent release calls are available. Recorded by RBS in captivity.

### **CD1. Track 59.** *Boophis periegetes* Cadle, 1995

This large species, described from Ranomafana National Park and morphologically similar to *B. goudoti*, has large skin glands. These were also present in specimens from Andohahela National Park of which these whistled calls were recorded. However, at Ranomafana National Park a further similar species with dermal excrescences and a different call was found (reproduced in the following track, see below). This complex of frogs is in need of revision. Further taxonomic work is necessary to ascertain which of the two species is in fact *B. periegetes* and which is an undescribed species. Males were observed calling from ca. 2 m high in the vegetation along a forest stream. Although the calls were discernible from some distance, they were not conspicuously loud. Calls were recorded by MV and FG on 27 January 2005 at Andohahela National Park, ca. 1600 m altitude, ca. 18°C. *Cut 1* is a section of *Cut 2* filtered: bandpass 700-2000 Hz.

### **CD1. Track 60.** *Boophis* sp. aff. *periegetes*

A large frog with horny dermal excrescences in breeding males, similar in appearance to *B. periegetes* and *B. goudoti*. Calling males were observed in slow-moving canals connecting rice fields close to rainforest. They were emitting their croaking calls sitting on the ground in very shallow water. Recorded by MV and IDR on 29 January 2004, 19:00 h, near Vohiparara, Ranomafana National Park, 20.5°C. Filtered: highpass 400 Hz.

### **CD1. Track 61.** *Boophis brachycheir* (Boettger, 1882)

The identity of this species, a medium-sized to large treefrog, is in need of revision. We here assign calls heard at various

low- to mid-altitude localities in north-western Madagascar to this species, as well as a distress call from Montagne d'Ambre National Park. Specimens were observed calling 1-2 m high, perched in the vegetation along rainforest streams. *Cut 1*. Advertisement calls recorded by FG and MV on 2 February 2003, 18:45-20:45 h, at Manongarivo Special Reserve, 22°C. *Cut 2*. Distress calls recorded by FG on 14 March 1994, 17:30 h, at Montagne d'Ambre National Park, 21.2°C.

**CD1. Track 62.** *Boophis* sp. aff. *brachychir*

This species occurs sympatrically with the morphologically similar *B. brachychir* at Manongarivo Special Reserve and probably other localities in north-western Madagascar but has a very different call. Calls from vegetation along streams. *Cut 1*. Whistling call followed by two click notes. *Cut 2*. Isolated click notes. Both cuts recorded by FG and MV on 1 February 2003, 21 h, at Manongarivo Special Reserve, 24.5°C.

**CD1. Track 63.** *Boophis madagascariensis* (Peters, 1874)

A large treefrog calling in slow-moving stretches or side puddles of streams, in or near rainforest, from the ground or low in vegetation (0-1 m). Calls highly complex and irregularly composed of different types of notes. *Cut 1*. Calls recorded by MV on 5 February 2004, 21:00 h, between Ifanadiana and Tolongoina. *Cut 2*. Calls recorded by FG on 3 February 1996, 18:30 h, at An'Ala, 22.8°C. *Cut 3*. Release calls of a male specimen from northern Madagascar which in fact may belong to a distinct, yet undescribed species or to *B. brachychir*, recorded by FG on 14 March 1994 at Montagne d'Ambre National Park, 21°C.

**CD1. Track 64.** *Boophis boehmei* Glaw & Vences, 1992

This relatively common small treefrog emits its irregular calls from the vegetation, 1-2 m high, along rainforest streams. Several other species (see below) may be distinct from typical *B. boehmei*. Recorded by MV on 7 December 2001, 19 h, at Andasibe (small water reservoir), 24.8°C.

**CD1. Track 65.** *Boophis* sp. aff. *boehmei*

Several populations assigned to *B. boehmei* from south-eastern Madagascar turned out to be genetically distinct from the typical population in Andasibe. Also the calls of these populations seem to differ slightly, but a more in-depth study is necessary to understand this species complex. *Cuts 1 & 2*. Recorded at Andringitra National Park, near Ambalamarina by FG and MV on 16 January 1994, 19°C. Calls filtered: bandpass 1700-3000 Hz.

**CD1. Track 66.** *Boophis* sp. aff. *boehmei*

Also this recording belongs to a representative of the *B. boehmei* complex of uncertain identity. Recorded by FG on 1 March 1996, 18:15 h, at Ranomafana National Park.

**CD1. Track 67.** *Boophis burgeri* Glaw & Vences, 1994

A medium-sized brown treefrog that calls 1-2 m high, perched in the vegetation along rainforest streams. Recorded by MV on 7 December 2001, 19 h, at Andasibe (small water reservoir), 24.8°C (background: *B. boehmei*).

**CD1. Track 68.** *Boophis* sp. "axelmeyceri"

This medium-sized treefrog from northern Madagascar is an species close to *B. burgeri* and *B. rufioculis* that currently is in the process of description (Vences et al. in press). Calls are emitted from the vegetation 2-3 m high along rainforest streams. Two note types. Recorded by MV and FA on 3 February 2001 at Antsahamanara Campsite, Manarikoba forest, Tsaratanana

## CD 1

Strict Nature Reserve, 24°C. *Cut 1*. Filtered: highpass 500 Hz. *Cuts 2 & 3*. Filtered: bandpass 1200-3500 Hz. *Cut 4*. Second note type, not filtered.

### **CD1. Track 69.** *Boophis reticulatus* Blommers-Schlösser, 1979

A medium-sized brownish treefrog that calls in the vegetation along rainforest brooks. Two note types. *Cut 1*. Longer, rather isolated notes. *Cut 2*. Rapid series of short notes. *Cut 3*. Notes of both types. Recorded by FG on 21 March 1995, after 18:34 h, at An'Ala, 20.2-21.9°C.

### **CD1. Track 70.** *Boophis rufiocolis* Glaw & Vences, 1997

A medium-sized brown treefrog that calls from the vegetation along rainforest streams. Two note types, a long note emitted isolated, a short one usually emitted in series. *Cut 1*. Calls with three isolated notes of first note type, recorded by FG on 3 February 1996, 18:30 h, at An'Ala, 22°C. *Cuts 2-3*. Calls with mainly short series of short notes of second note type, recorded by FG on 11 February 1995, 19:00-19:20 h, at An'Ala, 21.5°C.

## MANTELLIDAE: Mantellinae

This subfamily contains the species previously included in the genera *Mantella* and *Mantidactylus*. Due to the large variation in morphology and reproductive biology, the genus *Mantidactylus* has recently been subdivided in a number of separate genera in a publication by F. Glaw and M. Vences, currently in press. Mantellines are characterized by a special mating behaviour without amplexus, and their eggs are deposited outside of the water.

### **Genus *Blommersia***

This genus contains a number of small frog species which mostly call from the vegetation a few centimeters to 1 m above swamps in and outside of forest. Eggs are generally deposited on leaves above water, tadpoles complete metamorphosis mostly in the swamps and ponds. Activity is nocturnal or diurnal.

### **CD1. Track 71.** *Blommersia grandisonae* (Guibé, 1974)

The only known *Blommersia* that breeds in slow-moving parts and side-pools of streams in the forest as opposed to the rest of the species that breed in non-flowing water and often at forest edges or outside of forest. Calls are not very intense, and usually no large choruses are formed. *Cut 1*. Recorded by FG on 19 February 1994, 18:30 h, at Ankeniheny, 21°C. *Cuts 2 & 3*. Recorded by FG on 1 February 1995 at Andasibe, 23.8°C.

### **CD1. Track 72.** *Blommersia blommersae* (Guibé, 1975)

This species can form large and loud choruses in swamps in and near mid-altitude rainforests. *Cut 1*. Calls recorded by FG on 19 February 1994, 18:30 h, at Ankeniheny, 21°C. *Cut 2*. Calls recorded by FG on 27 February 2005, 20:15 h, near Andasibe, 21.4°C.

**CD1. Track 73. *Blommersia sarotra*** (Glaw & Vences, 2002)

A species emitting its calls from low positions, usually hidden in dense vegetation next to or above small, shallow stagnant waters. Recorded by FG on 1 February 1995 at Andasibe, 22°C. Some calls of *Gephyromantis boulengeri* can be heard in the background.

**CD1. Track 74. *Blommersia kely*** (Glaw & Vences, 1994)

A species that is closely related to *M. sarotra* but occurs at higher altitudes. Calls are often emitted during the day. Recorded by MV and FG on 11 February 2000 at Ambatolampy, 23.2°C.

**CD1. Track 75. *Blommersia* sp. aff. *sarotra/kely***

Species from higher altitudes in the Ranomafana area are genetically differentiated both from *Blommersia sarotra* and *B. kely*, but clearly belong to the same species complex. *Cut 1*. Calls recorded by FG on 28 February 1996, 18:10 h, at Vohiparara. Filtered: highpass 1500 Hz. *Cut 2*. Calls recorded by MV and FG on 24 January 2003, 8:10 h, along the road Vohiparara-Fianarantsoa.

**CD1. Track 76. *Blommersia domerguei*** (Guibé, 1974)

A mid- to high-altitude species, calling from low vegetation in shallow swamps, both during the day and at night. Recorded by FG and MV on 15 January 1994 at Andringitra National Park, 19°C.

**CD1. Track 77. *Blommersia wittei*** (Guibé, 1974)

A relatively large species compared to other *Blommersia*, widespread over much of northern and western Madagascar. Calls during the day and at night from low and higher positions in the vegetation along and in swamps. Populations previously assigned to this species from the east coast belong to other species (see below). Populations from western Madagascar (e.g., Isalo National Park) are genetically differentiated and may be a different species as well. Calls from some sites sound more “metallic” than from other localities. *Cut 1*. Recorded by MV on 20 March 2000 at Sambava, 24.7°C. *Cuts 2 & 3*. Recorded by FG on 7 February 1992, 20:00 h, north of Andoany, Nosy Be, 25°C. *Cut 4*. Recorded by FG and MV on 29 January 1994 at Isalo National Park, 21.5°C.

**CD1. Track 78. *Blommersia* sp. aff. *wittei*** (Toamasina)

A species morphologically and ecologically similar to *Blommersia wittei* but genetically closer to *B. blommersae*. *Cuts 1-3*. Recorded by MV on 23 February 2004 north of Toamasina, 25.2°C. *Cut 3*. Sporadic calls with same recording dates, and with a background of calls of *Mantidactylus* sp. aff. *bersileanus*. *Cut 3*. Filtered: highpass 1000 Hz.

**CD1. Track 79. *Blommersia* sp. aff. *wittei*** (Maroantsetra)

This species is close to the previous one from localities further south, but differs by morphological features and a rather relevant genetic differentiation. Recorded by MV on 24 February 2004, 21:00 h, at Maroantsetra, 25.7°C.

**CD1. Track 80. *Blommersia* sp. aff. *wittei*** (Nosy Boraha)

This is a further east coast species of unclarified relationships, superficially close in morphology and habits to *B. wittei*. Recorded by FG and MV on 4-9 March 1991 at Nosy Boraha.

## CD 1

### Genus *Guibemantis*

This is a genus of arboreal frogs that contains two well-defined subgroups. The medium-sized to large species of the subgenus *Guibemantis* call at night from the vegetation around ponds and swamps, and deposit their eggs on leaves above these stagnant waters where the tadpoles complete metamorphosis. In the second subgenus, *Pandanusicola*, this same reproductive biology is found in one species, *Guibemantis liber*, but the remaining species, as far as known, breed in leaf axils of *Pandanus* plants, where they lay the eggs and where their tadpoles develop. Their calling is very secretive and takes place at least partly during the day.

#### Subgenus *Guibemantis*

##### **CD1. Track 81.** *Guibemantis depressiceps* (Boulenger, 1882)

A medium-sized species from mid-altitude rainforests. *Cut 1.* Calls filtered: bandpass 500-2800 Hz. *Cut 2.* Same as previous cut but unfiltered. *Cut 3.* Longer recording of several males. All cuts recorded by FG on 1 April 1995 at Andasibe, 19-20°C. The loud background of the recording is made up by the frequency modulated calls of *Boophis luteus*.

##### **CD1. Track 82.** *Guibemantis timidus* (Vences & Glaw, 2005)

This recently described species is distributed along the East Coast of Madagascar at low altitudes. Its calling is relatively secretive, and the calls are short and only emitted after long and irregular intervals. *Cuts 1-3.* Isolated calls recorded by MV on 31 January 2004 along the road Ifanadiana-Tolongoina, 26-28°C. *Cut 4.* Recording by FG and MV on 4-9 March 1991 at Nosy Boraha.

##### **CD1. Track 83.** *Guibemantis tornieri* (Ahl, 1928)

A mid-altitude species which emits loud and distinct calls. *Cuts 1-2.* Isolated calls recorded by FG and MV on 27 February 1994, 20:15 h, at Andasibe, 21.4°C. *Cut 3.* Longer recording of several specimens, recorded by FG and MV in February 1991 at Andasibe. Background composed by *Guibemantis liber* and *Plethodontohyla mihanika*.

#### Subgenus *Pandanusicola*

##### **CD1. Track 84.** *Guibemantis bicalcaratus* (Boettger, 1913)

This is a typical *Pandanus*-breeding frog, and its taxonomy is in need of revision. Calls reported here were recorded by RBS in captivity from specimens from Fenoarivo at the east coast, not far from the type locality Nosy Boraha. *Cut 1.* Isolated call, filtered: highpass 500 Hz. *Cut 2.* Unfiltered calls.

##### **CD1. Track 85.** *Guibemantis* sp. aff. *bicalcaratus*

These recordings from a mid-altitude locality were emitted from a *Pandanus*-dwelling species morphologically assignable to *G. bicalcaratus*, but are very different from the previous track, indicating specific distinctness. Recorded by MV on 15 February 2004, 16:10 h, at Besariaka (south of Moramanga), 21°C.

##### **CD1. Track 86.** *Guibemantis liber* (Peracca, 1893) (Mandraka)

This species is genetically related to the *Pandanus*-breeding *Pandanusicola* but has a more generalized biology, similar to

the subgenus *Guibemantis*. Calls of this widespread species from different populations differ substantially. *Cuts 1-2*. Recorded by FG and MV on 8 February 2000, 19:45 h, at Mandraka 18.4°C. *Cut 1*. Isolated calls. *Cut 2*. Chorus. *Cuts 3-4*. Recorded by FG on 4 February 1996, 19:30 h, at Andasibe, 24.0°C. *Cut 3*. Isolated calls. *Cut 4*. Chorus.

**CD1. Track 87.** *Guibemantis liber* (Peracca, 1893) (Montagne d'Ambre)

Specimens of *G. liber* from Montagne d'Ambre National Park in northern Madagascar show some genetic differentiation to those from the eastern rainforests, and in addition their calls have several structural differences. Recorded by FG on 14 March 1994, 17:30 h, at Montagne d'Ambre National Park, 21.2°C.

**CD1. Track 88.** *Guibemantis* sp. aff. *liber* (Vevebe)

This species morphologically resembles *Guibemantis pulcher*, but appears to be more closely related to *G. liber*. Specimens were observed calling from perches in low vegetation (ca. 1 m) above the water in a large flooded swamp, next to but not on *Pandanus* plants. *Cuts 1-3*. Recorded by MV on 9 February 2004, 18:20 h, at Vevembe forest, 23°C. *Cut 2*. Filtered: highpass 1500 Hz. *Cut 4*. Recorded by FA in a swamp next to Mangevo/Bevava, a mid-altitude rainforest next to Ranomafana National Park, on 9 February 2004, 19:30 h, 19-20°C.

#### SOUNDSCAPES

**CD1. Track 89.** Recorded by FA at Masoala, Camp 3, on 6 December 1998, 21°C. Among the species that can be heard are *Gephyromantis luteus* and *G. redimitus*. *Boophis* cf. "*axelmeyeri*", as well as probable calls of a *Boophis* species reminding *B. sibilans*.

**CD1. Track 90.** Recorded by FA at Masoala on 17 December 1999, 19-20°C. Most calls in this stream chorus are from *Boophis marojezensis*.

**CD1. Track 91.** Chorus of *Boophis lichenoides* and *Blommersia grandisonae*, with insects in the background, recorded by FA at Menamelona (Masoala), at 11:08 h in the morning of 18 December 1999, air 24°C, water 20°C.

**CD1. Track 92.** *Boophis lichenoides*, recorded at close range by FA at Menamelona (Masoala), on 18 December 1999, 20:45 h, 20°C.

**CD1. Track 93.** Chorus of *Gephyromantis luteus*, recorded by FA at Masoala, Camp 3, on 6 December 1998, 21°C.

**CD1. Track 94.** Stream chorus with *Boophis* cf. *englaenderi*, *Boophis* cf. *madaqascariensis*, *Mantidactylus* cf. *betsileamus*, recorded by FA at Menamelona (Masoala), on 18 December 1999, 20:45 h, 20°C.

**CD1. Track 95.** Chorus of *Boophis viridis*, *Boophis* cf. *septentrionalis*, and *Gephyromantis redimitus*. Recorded by FA at lamy Camp 1, on 1 December 1999 at 20:00 h, 21°C.

**CD1. Track 96.** Chorus of *Boophis marojezensis*, *Gephyromantis redimitus*, and in the foreground, an unidentified species probably of the *Boophis luteus* group. Recorded by FA at Melamalona (Masoala), on 12 December 1999 at 18:27 h, ca. 20°C.

## CD 1

**CD1. Track 97.** A specimen of *Gephyromantis tschenki*, with *Boophis* sp. aff. *sibilans* and other frogs in the background. Recorded by FA at Ranomafana National Park, on 16 December 1991, 21:10 h, ca. 20°C.

**CD1. Track 98.** Chorus of *Boophis tephraeomystax*, with *Heterixalus betsileo* in the background. Recorded by FA at Ranomafana, 18 December 1991, 22:00 h.

**CD1. Track 99.** Stream chorus composed of *Spinomantis aglavei*, *Boophis elenae*, *B. majori* and *B. madagascariensis*. Recorded by FA at Ranomafana National Park, December 1991.



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## CD 2

### Genus *Gephyromantis*

This genus includes more than thirty species, all of which have, as far as known, rather specialized breeding biology. For several of them, direct development is probable, especially for the small diurnal species of the subgenus *Gephyromantis* where it has been confirmed by direct observation in *G. eiselti*. Several of the larger species call close to rainforest streams, but tadpoles have not been described. *Phylacomantis* have free-swimming tadpoles with special carnivorous specializations.

Undescribed subgenus 1 (Glaw & Vences in press)

**CD2. Track 1.** *Gephyromantis ambohitra* (Vences & Glaw, 2001)

A medium-sized rainforest frog, calling at night from 0.5-1.5 m high on leaves in the vegetation, about 5-10 m from streams. *Cut 1.* Isolated call recorded by MV and FG on 3 February 2003, 19:00 h, 23.0°C, at Manongarivo Special Reserve (Camp 1). *Cut 2.* Calls recorded by FG on 17 February 2003 at Montagne d'Ambre National Park (near Gite d'Etape), 21°C (a second male in the background, acoustically interacting by spacing its calls in the intervals of the male in the foreground).

**CD2. Track 2.** *Gephyromantis* sp. aff. *ambohitra*

This species from the Marojejy massif in north-eastern Madagascar is morphologically close to *Guibemantis asper* but clearly differs by calls, which are more similar to *G. ambohitra*. Specimens were calling along a rainforest brook, perched on leaves about 50 cm high. Recorded by MV and FG on 16 February 2005, at night, at a campsite called "Camp Simpona", Marojejy National Park, about 21°C.

**CD2. Track 3.** *Gephyromantis asper* (Boulenger, 1882)

A comparatively small species, emitting its loud calls at night from 1-2 m high on leaves and branches in the forest, not concentrated along water, sometimes forming choruses. *Cut 1*. Recorded by FG on 18-21 February 1994 at Ankeniheny. *Cuts 2 & 3*. Recorded by FG and MV on 8 February 2000, 19:45 h, at Mandraka, 18.4°C.

**CD2. Track 4.** *Gephyromantis cornutus* (Glaw & Vences, 1992)

A medium sized species from central eastern rainforests, calling perched 1-1.5 m high on leaves, about 10 m or more from streams. *Cut 1*. Recorded by FG on 21 March 1995 at An'Ala, 20.2°C. *Cut 2*. Recorded by FG and MV in February 1991 at Andasibe, ca. 18°C.

**CD2. Track 5.** *Gephyromantis tschenki* (Glaw & Vences, 2001)

A species very similar to *G. cornutus*, but with a slightly bilobed (versus single) subgular vocal sac, known from the Ranomafana region. Recorded by FG on 1 March 1996, 18:15 h, at Ranomafana National Park.

**CD2. Track 6.** *Gephyromantis redimitus* (Boulenger, 1889)

A large species mainly from low-altitude sites in eastern and north-eastern Madagascar. Males call perched 1-2 m high in the vegetation, usually not far from streams in rainforest. Recorded by FG on 3 February 1996, 18:30 h, at An'Ala, 22.8°C (background: *Boophis boehmei*).

**CD2. Track 7.** *Gephyromantis moseri* (Glaw & Vences, 2002)

A relatively small species from eastern and northeastern rainforests. Recorded by FG on 18 December 1994, 19:20 h, at the type locality near Andasibe, 20°C. In the background, calls of *Gephyromantis cornutus* and *Platypelis tuberifera* can be heard.

**CD2. Track 8.** *Gephyromantis schilfi* (Glaw & Vences, 2000)

A relatively small species from Marojejy National Park in north-eastern Madagascar. Calls from the vegetation, not concentrated along streams. Recorded by FG on 28 February 1995, 11:30 h, at the type locality in the Marojejy National Park, near Camp Simpona, 22.5°C.

**CD2. Track 9.** *Gephyromantis tandroka* (Glaw & Vences, 2001)

A species sympatric with *G. schilfi* at higher altitudes of Marojejy National Park. Calls along brooks, up to 20 m from the water, about 1-2 m in the vegetation. Recorded by MV and FG on 16 February 2005 at Marojejy National Park, Camp Simpona, ca. 21°C. In the background, some calls of *Mantidactylus klemmeri* and *Platypelis* sp. can be heard.

**CD2. Track 10.** *Gephyromantis salegy* (Andreone, Aprea, Vences & Odierna, 2003)

A relatively large species from north-eastern Madagascar. Recorded by FA at Ambolokopatrika, Campsite 2, on 17 December 1997, 19:12 h, 21°C. Filtered: highpass 1000 Hz. In the background, calls of *Gephyromantis luteus* can be heard.

**CD2. Track 11.** *Gephyromantis granulatus* (Boettger, 1881)

A common species in north-eastern and north-western Madagascar, usually occurring at low altitudes. Males call from 1-2 m in the vegetation and can be locally very common and syntopic with *G. leucomaculatus* which has rather similar calls. Depending on the specimen's motivation, note repetition rate can be quite variable as reflected in the recordings reported

## CD 2

here. *Cut 1*. Recorded by FG on 22 January 1992, 18:30 h, at the type locality Nosy Be, 26°C. Filtered: bandpass 300-7000 Hz. *Cut 2*. Recorded by MV in February 2001 at Andampy campsite, Manarikoba forest, Tsaratanana Strict Nature Reserve, 25-26°C. Filtered: highpass 1000 Hz. *Cut 3*. Recorded by FG on 4 March 1995, 21:20 h, near Andapa, 23-24°C.

### **CD2. Track 12.** *Gephyromantis leucomaculatus* (Guibé, 1975)

A medium-sized species from low-altitude sites in eastern and north-eastern Madagascar. Calls from 1-4 m high in the vegetation including trees. Probably more than one species are subsumed under this name. Recorded by FG on 22 February 1995 at Marojejy National Park.

### **CD2. Track 13.** *Gephyromantis zavona* (Vences, Andreone, Glaw & Randrianirina, 2003)

A species very similar to *G. granulatus*, occurring sympatrically with that species at Tsaratanana and Manongarivo. Calls from a perch height of 1-2 m in the vegetation, along streams in forest. *Cut 1*. Recorded by MV and FA on 3 February 2001, at Antsahamamara campsite, Manarikoba forest, Tsaratanana Strict Nature Reserve (type locality), 24°C. Filtered: highpass 900 Hz. *Cut 2*. Recorded by MV and FG on 3 February 2003, 19:00 h, at Campsite 1, Manongarivo Special Reserve, 23°C.

### **CD2. Track 14.** *Gephyromantis luteus* (Methuen & Hewitt, 1913)

A medium-sized species, common in low-altitude rainforests along the northern east coast of Madagascar. The loud and distinct calls are quite characteristic, and are emitted from perches 1-2 m high on leaves. *Cut 1*. Recorded on 27 March 1994, ca. 18 h, 22.2°C. *Cut 2*. Recorded on 29 March 1994, 23.4°C. Both recorded by FG at Marojejy National Park.

### **CD2. Track 15.** *Gephyromantis sculpturatus* (Ahl, 1929)

This species is morphologically very similar to *G. luteus* and also the genetic differentiation between the two species is low. However, the loud and characteristic calls are usually more strongly pulsed. *Cuts 1 & 2*. Recorded by FG on 20 February 1994, 19:30 h, at Ankeniheny, 21.6°C. *Cut 3*. Recorded by FG on 12 January 1992 at Andasibe, 23°C.

### **CD2. Track 16.** *Gephyromantis plicifer* (Boulenger, 1882)

A large species, morphologically similar to the previous two species. Occurs syntopically with *G. sculpturatus* at Ranomafana National Park. *Cut 1*. Recorded by FG on 23 January 2003, 20:15 h, at Ranomafana National Park, 21.5°C. *Cut 2*. Recorded by FG on 1 March 1996, 18:15 h, at Ranomafana National Park. In *Cut 2* the calls of *G. plicifer* alternate with those of *G. tschenki*.

### Subgenus *Gephyromantis*

Representatives of this subgenus are small, largely diurnal species, and in many Malagasy rainforests their loud and distinct calls are the main acoustic pattern during the day, at least in the rainy season. They call during the day from the ground or from low vegetation, but sometimes also at night, then usually from more elevated positions in the vegetation.

### **CD2. Track 17.** *Gephyromantis blanci* Guibé, 1974

A species from south-eastern Madagascar. *Cuts 1 & 2*. Recorded by FG and MV on 16 January 1994, 10:00 h, at Andringitra National Park, in a forest near Ambalarina, 19°C. *Cuts 3 & 4*. Recorded by FG on 28 February 1996, 18:10 h, at Vohiparana.

**CD2. Track 18.** *Gephyromantis* sp. aff. *blanci*

This is an undescribed species from high elevations on Mount Maharira, Ranomafana National Park, where it calls from the low vegetation during the day. *Cuts 1 & 2*. Recorded by MV and IDR on 25 January 2004, 16-17 h, at this locality.

**CD2. Track 19.** *Gephyromantis boulengeri* Methuen, 1920

A species mainly from lowlands and mid-altitudes along the east coast. *Cuts 1 & 2*. Recorded by MV on 31 January 2004, from along the road Ifanadiana-Tolongoina, 26-28°C. *Cuts 3 & 4*. Recorded by FG on 18-19 February 1994, ca. 18:30 h, at Ankeniheny 23.5°C. Calls from Ankeniheny appear to have a faster note repetition rate, but the taxonomy of this species is not sufficiently studied.

**CD2. Track 20.** *Gephyromantis leucocephalus* Angel, 1930

A species from extreme south-eastern Madagascar. *Cut 1*. Recorded by FG on 30 December 1991 at Nahampoana. *Cut 2*. Recorded by FG on 1 January 1992 on Pic St. Louis near Tolagnaro, 23°C.

**CD2. Track 21.** *Gephyromantis decaryi* Angel, 1930

Known from south-eastern Madagascar. *Cuts 1 & 2*. Recorded by FG on 4 March 1996, 16:20 h, at Vohiparara.

**CD2. Track 22.** *Gephyromantis eiselti* Guibé, 1975

A small species from central-eastern Madagascar, other records are probably due to misidentifications. Can be commonly heard in the Andasibe region. Recorded by FG on 10 February 1996, 12:00 h, at Mantadia National Park.

**CD2. Track 23.** *Gephyromantis thelenseae* (Glaw & Vences, 1994)

A species sympatric with *G. eiselti* and morphologically virtually indistinguishable, but the call is very different. Recorded by FG on 28 February 1994, 11:00 h, near Andasibe, 23.6°C.

**CD2. Track 24.** *Gephyromantis enki* (Glaw & Vences, 2002)

An additional species which is morphologically similar to *G. eiselti* from the Ranomafana region where it is very commonly heard. Recorded by MV and IDR on 24 January 2004, around 17 h, at Maharira forest, Ranomafana National Park, 18.4°C.

**CD2. Track 25.** *Gephyromantis klemmeri* Guibé, 1974

The only species of this subgenus from northern Madagascar, only known from the Marojejy National Park. This species may belong to a different lineage within the genus *Gephyromantis*. Their low intensity calls are emitted from hidden positions on the ground, often in small caves among tree roots, during the day and also at night. *Cuts 1-3*. Recorded by FG on 26-27 February 1995, 7:40 h, at Marojejy National Park, near Camp Simpona, 23.1°C. *Cuts 2 & 3*. Filtered: highpass 2000 Hz.

**CD2. Track 26.** *Gephyromantis* sp. aff. *klemmeri*

The calls of this species appear to be different from those of typical *G. klemmeri* from the type locality Marojejy. Their taxonomic status needs further study. Recorded by FA at Ambolokopatrika, Camp 2, on 6 December 1997, 20:01 h, 22-23°C.

## CD 2

### Subgenus *Laurentomantis*

These are small nocturnal rainforest frogs that often call independent from water - only *G. striatus* and *G. ventrimaculatus* are known to call close to streams. The calls are secretive and of low intensity, emitted from low positions (maximum 1-1.5 m but often much lower) in the vegetation.

#### **CD2. Track 27. *Gephyromantis horridus* (Boettger, 1880)**

Calls were recorded by RJ and GS on 17 February 1997 at Manarikoba forest, Tsaratanana Strict Nature Reserve, 17.5°C. In the background, calls of *Spinomantis* sp. aff. *peraccae* and *Boophis* sp. "axelmeyeri" can be heard.

#### **CD2. Track 28. *Gephyromantis malagasius* (Methuen & Hewitt, 1913)**

Relationships among low- and mid-altitude populations of this species need to be clarified. The mid-altitude populations of which the call is reproduced here may represent an undescribed species. Recorded by FG on 18 February 1994 at Ankeniheny, 23.5°C.

#### **CD2. Track 29. *Gephyromantis striatus* (Vences, Glaw, Andreone, Jesu & Schimmenti, 2002)**

A species close to *G. malagasius* from north-eastern Madagascar. Recorded by FG on 22 February 1995, 19:00 h, at Marojejy National Park, 25.0°C. The recording is of two specimens that emit alternating calls.

#### **CD2. Track 30. *Gephyromantis ventrimaculatus* (Angel, 1935)**

Vohiparara. In the background, calls of *Spinomantis aglavei* can be heard.

### Subgenus *Phylacomantis*

#### **CD2. Track 31. *Gephyromantis corvus* (Glaw & Vences, 1994)**

A medium-sized frog from western Madagascar that calls from the ground and from low vegetation along brooks, during the day and in the early evening. Recorded by FG and MV on 29 January 1994 at Isalo National Park, 21.5°C. Filtered: bandpass 4500-6500 Hz.

#### **CD2. Track 32. *Gephyromantis pseudoasper* (Guibé, 1974)**

A species from northern Madagascar, morphologically similar to *G. corvus*. Very typical, loud calls are emitted during the day and sometimes at night from isolated positions on the ground or in the vegetation, apparently sometimes high in trees. More distinct choruses and call series sometimes early in the morning. *Cut 1*. Recorded by FG on 16 February 1992, ca. 20:00 h, at Benavony, 26°C. *Cut 2*. Recorded by FG on 8 March 1994, 5:30 h, at Benavony, 23.5°C. *Cut 3*. Recorded by MV and FG on 2 February 2003, 18:45-20:45 h, at Manongarivo Special Reserve, Campsite 0, 22°C (recording includes one call of *Spinomantis massorum* after second call of *G. pseudoasper*).

### Undescribed subgenus 2 (Glaw & Vences in press)

Small-sized frogs from north-eastern Madagascar that are found along streams, usually with large mossy stones and boulders. *M. webbi* is known to guard eggs deposited on rocks overhanging the streams, but no tadpoles have been found so far. Calls are usually emitted during the day. All three species were observed sympatrically at the same site near Andranofotsy.

**CD2. Track 33, *Gephyromantis rivicola*** (Vences, Glaw & Andreone, 1997)

Calls were emitted during the day from rocks and the ground at hidden positions in an area where large boulders formed caves near a small stream in rainforest. Recorded by MV on 16 December 2001 near Andranofotsy, 25.4°C. In the background, some calls of *Gephyromantis silvanus* can be heard.

**CD2. Track 34, *Gephyromantis silvanus*** (Vences, Glaw & Andreone, 1997)

Calls were emitted in the late afternoon from within cave-like formations between large boulders, close to a small rainforest stream. Calling specimens were very secretive but could be observed at one occasion. Recorded by MV on 16 December 2001 near Andranofotsy, 25.4°C. *Cut 1.* Isolated male. *Cut 2.* Interactions between several males.

**CD2. Track 35, *Gephyromantis webbi*** (Grandison, 1953)

Calls from mossy stones along rainforest streams during the day. *Cut 1.* Isolated call recorded by MV on 16 December 2001 near Andranofotsy, 25.4°C. *Cut 2.* Chorus recorded by FG and MV on 12-17 March 1991 at the type locality Nosy Mangabe Special Reserve, 23°C.

### Genus *Mantella*

Small, colourful (often aposematic) frogs characterized by the presence of alkaloid skin toxins. They are mostly active during the day, but rarely also call at night. The calls are series of short, often melodious click-notes, emitted from the ground, not particularly loud but in some cases detectable over reasonable distances.

**CD2. Track 36, *Mantella aurantiaca*** Mocquard, 1900

Calls from swamp forest, often near or in retreats among roots of *Pandanus* plants. Recorded by MV on 9 December 2001, 11 h, at Torotorofotsy, 23.0°C.

**CD2. Track 37, *Mantella crocea*** Pintak & Böhme, 1990

Ecology similar to the related *M. aurantiaca*. Recorded by FG from a captive specimen.

**CD2. Track 38, *Mantella milotympanum*** Staniszewski, 1996

Closely related to and possibly conspecific with *M. crocea*. Calling behaviour like *M. aurantiaca*. Recorded by MV on 22 December 2001, 7:45 h, near Fierenana, 22.4°C.

**CD2. Track 39, *Mantella pulchra*** Parker, 1925

Recorded by FA at An'Ala, at a site of close sympatry with *Mantella baroni*, on 5 January 1992, 21°C.

**CD2. Track 40, *Mantella baroni*** Boulenger, 1888

A species typically calling along rainforest streams. *Cut 1.* Recorded by FG on 19 February 1994, 10:00 h, at Ankeniheny, 25.5°C. *Cut 2.* Recorded by FG at Mantadia National Park on 11 February 1996.

## CD 2

### CD2. Track 41. *Mantella cowani* Boulenger, 1882

A species closely related to *M. baroni*, occurring at higher altitudes along streams in forest or in largely deforested regions. Male calling from a hole in the ground, recorded by FA at Vohisokina, Antoetra region, campsite 2, 25 January 2003, 7:50 h, ca. 13-15°C.

### CD2. Track 42. *Mantella haraldmeieri* Busse, 1981

A relatively cryptically coloured *Mantella* species, that lives along small rainforest streams in south-eastern Madagascar. Recorded by FG on 29 February 1992 at Nahampoana.

### CD2. Track 43. *Mantella nigricans* Guibé, 1978

A species living along rainforest streams in north-eastern Madagascar. Recorded by FG on 27 February 1995, 7:40 h, at Marojejy National Park, near Camp Marojejia, 23.1°C.

### CD2. Track 44. *Mantella bernhardi* Vences, Glaw, Peyricras, Böhme & Busse, 1994

A species from low-altitude swamp forests in south-eastern Madagascar. *Cut 1*. Calls from captive specimens, collected in the Tolongoina region, recorded by FG and MV on 1 January 1994. *Cut 2*. Recorded by MV from specimens collected in Manombo in 2004. *Cut 3*. Recorded by FA on 15 February 2004, 10:30 h, at Ambohimandrozo, near Tolongoina, 23°C.

### CD2. Track 45. *Mantella ebenau* (Boettger, 1880)

This name subsumes *Mantella* populations from north-eastern and north-western Madagascar previously considered as *M. betsileo*. Specimens call in swamps and along streams, often outside of primary forest. Recorded by FG on 19 January 1992, 10:50 h, at Nosy Be. *Cut 1*. Calls of a single male, 27°C. *Cuts 2 & 3*. Chorus, 32°C.

### CD2. Track 46. *Mantella betsileo* (Grandidier, 1872)

Populations of western and southern Madagascar previously considered as an undescribed species close to *M. betsileo* are here considered to actually represent typical *M. betsileo*. Recorded by FG on 5-8 January 1995 at Kirindy, 28°C. *Cut 1*. Filtered bandpass 3500-6000 Hz. *Cut 2*. Same recording unfiltered. *Cut 3*. Recorded by FG and MV on 25 January 2005, 8:40 h, north of Tranomaro, 25.8°C (this southern population represented in cut 3 may indeed be yet another species of this complex).

### CD2. Track 47. *Mantella expectata* Busse & Böhme, 1992

A species from the dry Isalo region in central-southern Madagascar. It lives along small streams in open areas, or next to canyons and crevices, becoming particularly active during summer storms. Recorded by FA at Mahalazo, Isalo Massif, on 22 November 2004, 24°C. Filtered: bandpass 2500-6000 Hz.

### CD2. Track 48. *Mantella laevigata* Methuen & Hewitt, 1913

The only *Mantella* species with partly arboreal habits, breeding in treeholes. Known from low-altitude localities in north-eastern Madagascar. Recorded by FG on 28 March 1994, 7:10 h, at Marojejy National Park.

### CD2. Track 49. *Mantella viridis* Pintak & Böhme, 1988

A species from rather dry habitats in the extreme north of Madagascar. Recorded on 7 January 2005 at Duvumbato, Analamanga, by VM.

### Genus *Spinomantis*

The genus *Spinomantis* contains one relatively well-defined group of medium-sized arboreal frogs with loud calls, often of conspicuous metallic or explosive acoustic appearance, and often characterized by dermal spines and flaps on the limbs. These species deposit their eggs on leaves above rainforest streams, where the tadpoles complete their metamorphosis. They call strictly at night from high perches, usually 2 m or higher, in the vegetation. A second group of species seems to be mainly distributed in south-eastern Madagascar, often at relatively high altitudes, and comprises an array of distinct, largely terrestrial frogs of different sizes that live along streams. Of this second group, calls are known for *S. brunae*, *S. berini*, *S. guibei*, and probably *S. elegans*.

**CD2. Track 50. *Spinomantis aglavei*** (Methuen & Hewitt, 1913)

The largest arboreal *Spinomantis*. Calls very characteristic and loud, consisting of a longer pulsed note type and a series of short metallic notes. *Cut 1*. Calls recorded by FG on 20 February 1994, 19:30 h, at Ankeniheny, 21.6°C. *Cuts 2 & 3*. Calls recorded by FG on 27 February 1996, 18:10 h, at Vohiparara.

**CD2. Track 51. *Spinomantis fimbriatus*** (Glaw & Vences, 1994)

A medium-sized arboreal *Spinomantis*. Two note types, similar to those of *S. aglavei*. *Cut 1*. Pulsed note followed by a series of short "metallic" notes, recorded by FG on 26-27 February 1995 at Marojejy National Park, near Camp Marojejia, 21.7°C. *Cut 2*. Pulsed note, recorded by FG and MV on 1 January 1994, 20:30 h, at Andasibe. *Cut 3*. Pulsed note, recording details as cut 1.

**CD2. Track 52. *Spinomantis massorum*** (Glaw & Vences, 1994)

A species from north-western Madagascar. Short notes with two or three clicks, less loud and conspicuous than other arboreal *Spinomantis*. *Cuts 1 & 2*. Recorded by FG and MV on 4 February 2003, 19:00 h, at Manongarivo Special Reserve, Campsite 1, 22.5°C. *Cut 3*. Recorded by FG on 8 March 1994 at the type locality Benavony, 25–26°C.

**CD2. Track 53. *Spinomantis phantasticus*** (Glaw & Vences, 1997)

This species emits typically series of double click notes. *Cuts 1 & 2*. Recorded by FG on 11 February 1995, 18:10 h, at An'Ala, 21°C. *Cut 2* with calls of *Gephyromantis redimitus* in the background.

**CD2. Track 54. *Spinomantis peraccae*** (Boulenger, 1896)

A very loud arboreal species emitting explosive notes in the early evening, and longer series of such notes later at night. *Cut 1*. Call recorded by FG on 20 February 1994, 19:30 h, at Ankeniheny, 21.6°C. *Cut 2*. Calls recorded FG on 27 February 1996, 18:10 h, at Vohiparara. *Cut 3*. Calls recorded by MV and IDR on 24 January 2004, about 19 h, in Maharira forest, Ranomafana National Park, 18.4°C.

**CD2. Track 55. *Spinomantis* sp. aff. *peraccae***

This species from north-western Madagascar emits series of a few metallic notes, and may be specifically distinct from *M. peraccae*. *Cuts 1-3*. Recorded by MV and FA in February 2001 at Antsahamanara Campsite, Manarikoba forest, Tsaratanana Strict Nature Reserve. 20.5°C.

## CD 2

**CD2. Track 56.** *Spinomantis brunae* (Andreone, Glaw, Vences & Vallan, 1998)

A rather small species secretively calling from small caves between boulders along rainforest streams. Recorded by FA on 17 November 1994 at Andohahela National Park, between Eminiminy and Isaka-Ivondro, about 22°C.

**CD2. Tracks 57.** *Spinomantis bertini* (Guibé, 1947)

A small species that calls during the day from hidden positions along rainforest streams. Calls are not intense. Recorded by MV and FG on 28 January 2005, at Andohahela National Park, high altitude.

**CD2. Track 58.** *Spinomantis* aff. *bertini*

Calls attributed to this species from Mount Maharira, Ranomafana National Park (specimens not seen calling), recorded by MV and IDR on 25 January 2004, 16-17 h. This population has a strong differentiation in calls and DNA sequences to the ones from Andohahela National Park. *Cut 1.* Filtered section of cut 2 (bandpass 3000-6000 Hz). *Cut 2.* Unfiltered complete recording.

**CD2. Track 59.** *Spinomantis elegans* (Guibé, 1974)

A large montane species. Not seen calling, but low-intensity calls recorded from granitic caves between boulders at one montane site agree with rough call descriptions (reminding dripping of water) published by other researchers. Recorded by FG and MV in 1994, ca. 20 h, at Cuvette Boby, Andringitra National Park, 15°C. *Cut 1.* Filtered recording; bandpass 1000-3000 Hz. *Cut 2.* Unfiltered recording.

**CD2. Track 60.** *Spinomantis guibei* (Blommers-Schlösser, 1991)

A species probably endemic to south-eastern Madagascar. Calls during the day from hidden positions along rainforest streams. Recorded by MV and FG on 28 January 2005.

### Genus *Mantidactylus*

The genus *Mantidactylus* in the strict sense used here contains a group of largely semiaquatic stream-breeding mantellid frogs. In most cases they call from terrestrial positions close to running water.

#### Subgenus *Brygoomantis*

This is probably one of the taxonomically least understood groups of mantellid frogs. Bioacoustic and genetic evidence points to the existence of a vast number of yet undescribed species. These frogs usually call at night, sometimes during the day, from the ground at the edge of streams, or in shallow water, sometimes also from swamps with very slow-flowing, almost stagnant water. *Brygoomantis* calls are not intense and are usually not heard from the distance.

**CD2. Track 61.** *Mantidactylus alutus* (Peracca, 1893)

A relatively small species from the central highlands. *Cut 1.* Calls recorded by MV on 21 January 2003, 17:30 h, near Antoetra, 20.5-21°C. *Cut 2.* Calls recorded by FG and MV on 1 January 1994, 18:20 h, at Manjakatempo, 18°C. *Cuts 3-5.* Calls recorded by RBS in captivity, from specimens collected at Manjakatempo.

**CD2. Track 62.** *Mantidactylus betsileanus* (Boulenger, 1882)

This name refers to a large and diverse species complex. Calls here regarded as typical *M. betsileanus* calls, following the definition published in 1979 by R. Blommers-Schlösser, were recorded by FG and MV on 29 January 1994 at Mandraka, 23–24°C. *Cut 1*. Typical and complete calls of an undisturbed specimen. *Cut 2*. Calls of a specimen that might have been disturbed by the recording or less motivated, and therefore has less regular sounds with initial “starting problems” (possibly due to an interaction with other males).

**CD2. Track 63.** *Mantidactylus* sp. aff. *betsileanus* “slow” (Andasibe)

This species has clearly slower calls than typical *M. betsileanus*. *Cuts 1 & 2*. Recorded by FG on 20 March 1995, 18 h, near Andasibe, 23.4°C.

**CD2. Track 64.** *Mantidactylus* sp. aff. *betsileanus* “very slow” (Andasibe-Ranomafana)

At Ranomafana National Park we often heard these very slow and long-lasting calls, emitted by *M. betsileanus*-like specimens, and we assume that some calls recorded near Andasibe also belong to this species or a close relative. *Cut 1*. Recorded by MV and IDR on 24 January 2004, ca. 19 h, at Maharira forest, Ranomafana National Park, 18.4°C (background: *Boophis picturatus* and *B. reticulatus*). *Cut 2*. Recorded by FG on 17 December 1994 at Andasibe, ca. 20°C.

**CD2. Track 65.** *Mantidactylus* sp. aff. *betsileanus* (Maroantsetra)

This species from a low-elevation site at the east coast reminds in its calls the typical *M. betsileanus* but is genetically highly distinct. Recorded by MV on 24 February 2004, 21:00 h, at Maroantsetra, 24.1°C.

**CD2. Track 66.** *Mantidactylus* sp. aff. *betsileanus* (Toamasina)

This species is genetically related to the previous form from Maroantsetra, but shows substantial genetic differentiation. Recorded by MV on 23 February 2004, a few km north of Toamasina, 25.2°C. *Cut 1*. Isolated call (foreground) and response of another male (background). *Cut 2*. Filtered: high pass 950 Hz.

**CD2. Track 67.** *Mantidactylus* sp. aff. *ulcerosus* (East Coast)

These calls may belong to the same species as the previous ones, having been emitted from possibly unmotivated specimens. The calling specimens have been assigned to *M. ulcerosus*, but that species apparently does not occur on the Malagasy east coast and furthermore has clearly different calls. *Cuts 1 & 2*. Recorded by RBS in captivity from specimens collected at Fenoarivo. Both cuts filtered: bandpass 500–6000 Hz.

**CD2. Track 68.** *Mantidactylus* sp. aff. *betsileanus* (Tolagnaro)

Calls of specimens from southern Madagascar remind typical *M. betsileanus*, but are specimens clearly differentiated genetically. *Cut 1*. Recorded by FG and MV in February 1991 near Tolagnaro. *Cut 2*. Recorded by FG on 1 January 1992 at Pic St. Louis, near Tolagnaro, 23°C. Filtered: bandpass 1000–1500 Hz. *Cut 3*. Same recording as cut 2 but unfiltered.

**CD2. Track 69.** *Mantidactylus* sp. aff. *betsileanus* (Andranofotsy)

Although morphologically similar to *M. betsileanus*, the calls of this species are very different, and it also shows an important genetic divergence. Recorded by MV on 16 December 2001 near Andranofotsy, 25.4°C.

## CD 2

### **CD2. Track 70.** *Mantidactylus* sp. aff. *betsileanus* (Tsaratanana)

The distinct irregular calls of this species, morphologically similar to *M. betsileanus*, are different from all other calls of this complex. However, it is not definitively clear whether the calls, from a single specimen, may be in part artefactual because of low motivation (compare with the differences between cuts 1 vs. 2 of *Mantidactylus betsileanus* from Mandraka). Recorded by MV in 2001 at Andampy Campsite, Manarikoba forest, Tsaratanana Strict Nature Reserve, 25-26°C. Cuts 1 & 2 are different sections of a single recording session.

### **CD2. Track 71.** *Mantidactylus tricinctus* (Guibé, 1947)

This species is among the smallest in the subgenus. Recorded by FG on 3 February 1996, 12:00 h, at An'Ala, 26.9°C.

### **CD2. Track 72.** *Mantidactylus* sp. aff. *biporus* (Andranofotsy)

Specimens identifiable as *Mantidactylus biporus* form a further complex containing a large number of species, but recordings are only available from two localities. This east coast form was recorded by MV on 16 December 2001 near Andranofotsy, 25.4°C.

### **CD2. Track 73.** *Mantidactylus* sp. aff. *biporus* (Tsaratanana)

This tiny species has only a rather superficial resemblance to *M. biporus*. Cuts 1-3. Different calls from same recording session. Recorded by MV and FA on 4 February 2001 at Antsahamanara Campsite, Manarikoba forest, Tsaratanana Strict Nature Reserve, 20°C. All cuts filtered: highpass 1500 Hz.

### **CD2. Track 74.** *Mantidactylus ulcerosus* (Boettger, 1880)

A species from north-western Madagascar. Cut 1. Recorded by FG on 10 February 1992, 19:00 h, at the type locality Nosy Be (background: *Cophyla phyllodactyla*). Cuts 2-3. Recorded by MV on 24 February 2001 at Ankarafantsika National Park, 28°C. Cut 4. Distress calls recorded by FG and MV in April 1991 at Nosy Be.

### **CD2. Track 75.** *Mantidactylus bellsi* Mocquard, 1895

This species from northern Madagascar is genetically close to *M. ulcerosus* but has a different advertisement call, consisting usually of single notes only. Cuts 1 & 2. Both recorded by MV and FG on 17 March 2000, 20:00 h, at Montagne d'Ambre National Park (entrance of park), 21.6°C.

### **CD2. Track 76.** *Mantidactylus* sp. aff. *ulcerosus* (Isalo National Park)

This species is externally similar to *M. ulcerosus* but differs by its advertisement call. Recorded by FG and MV on 28 January 1994, 21:30 h, at Isalo National Park (near Ranohira), 23.4°C.

### **CD2. Track 77.** *Mantidactylus bourgati* Guibé, 1974

The whole *Mantidactylus curtus* species complex, including *M. bourgati* from Andringitra National Park, has a very secretive calling behaviour. The calls reproduced here were recorded by FG and MV on 16 January 1994, 10:00 h, at Andringitra National Park, close to Ambalamarina, 19°C, but the calling specimens could not be seen, and the attribution to *M. bourgati* is tentative. Filtered: bandpass 700-2000 Hz.

**CD2. Track 78. *Mantidactylus* sp. aff. *curtus*** (Andohahela National Park)

This species from high altitude at Andohahela National Park in south-eastern Madagascar has only a superficial resemblance to *M. curtus*, and is characterized by a rather short snout. The calls are typically very short. Recorded by MV and FG on 27 January 2005 at Andohahela National Park, 17.6°C. Calling specimens were not seen and attribution is therefore not completely certain although likely in this case.

**Subgenus *Chonomantis***

These are small to medium-sized frogs, well-defined by the derived funnel-shaped mouthparts of their tadpoles. Most *Chonomantis* call during the day along rainforest streams and sometimes form typical choruses that run like waves of sound along the stream.

**CD2. Track 79. *Mantidactylus albofrenatus*** (Müller, 1892)

A small species from central-eastern Madagascar. *Cuts 1 & 2*. Both recorded by FG on 12 February 1995, 13:30 h, at An'Ala.

**CD2. Track 80. *Mantidactylus brevipalmatus*** Ahl, 1929

A medium-sized montane species, occurring along streams, often above the tree line. *Cut 1*. Calls recorded by MV and FA on 21 January 2003, 18 h, near Antoetra, 18.9°C. *Cut 2*. Distress call, recorded by FG on 13 March 1992.

**CD2. Track 81. *Mantidactylus delormei*** Angel, 1938

This species is very similar in all respects to *M. brevipalmatus*. It occurs further to the south-east, and seems to be more strictly an inhabitant of montane forest, not typically occurring in unforested areas. *Cut 1*. Call recorded by MV and IDR on 24 January 2004, about 17 h, at Maharira forest, Ranomafana National Park, 18.4°C. Filtered: bandpass 500-4000 Hz. *Cut 2*. Call recorded by FG and MV on 16 January 1994, 10:00 h, at Andringitra National Park, in a forest close to Ambalamarina, 19°C.

**CD2. Track 82. *Mantidactylus charloteae*** Vences & Glaw, 2004

This low-altitude species from the east coast is probably composed of various species and needs further taxonomic work. Recorded by RBS in captivity, from specimens collected near Foulpointe. Filtered: bandpass 1000-6000 Hz.

**CD2. Track 83. *Mantidactylus melanopleura*** (Mocquard, 1901)

A relatively common and widespread species. *Cuts 1 & 2*. Calls recorded by FG on 11 February 1995, 17 h, at An'Ala, 22°C. Both cuts filtered: highpass 650 Hz.

**CD2. Track 84. *Mantidactylus opiparis*** (Peracca, 1893)

A common and widespread species, previously often confused with *M. melanopleura*, but with longer note duration in calls. *Cuts 1 & 2*. Recorded by FG on 3 February 1996, 12:00 h, at An'Ala, 26.9°C.

**CD2. Tracks 85. *Mantidactylus zipperi*** Vences & Glaw, 2004

A small and relatively secretive species. Recorded by FG on 12 February 1995, 13:30 h, at An'Ala. *Cuts 1 & 2*. Advertisement calls. *Cut 3*. Second call type (possibly release or alarm call).

## CD 2

### CD2. Track 86. *Mantidactylus* sp. aff. *zipperi*

We report here calls from a second population that are quite distinct and may represent an additional, undescribed species. *Cuts 1 & 2*. Recorded by FG on 7 April 1995, 16:30 h, at Ambohitantely Special Reserve, 22°C.

### CD2. Track 87. *Mantidactylus* sp. aff. *charlotteae*

The identity of this species is in need of revision, but the calls appear to be different from typical *M. charlotteae* calls. Recorded by FA at Masoala, Camp 3, on 10 December 1998, 21:02 h, 21°C.

### Subgenus *Hylobatrachus*

### CD2. Track 88. *Mantidactylus lugubris* (Duméril, 1853)

This species is usually found on boulders in streams, often near cascades. There is strong evidence indicating that a large number of cryptic species are subsumed under this taxon. Calls were heard at night from relatively high positions in the vegetation along streams. *Cuts 1-3*. Recorded by FA on 10 February 1997 at Ifanadiana, 21°C. *Cut 4*. Recorded by FG on 14 January 1995 at Andasibe, 22.1°C.

### Undescribed subgenus 3 (Glaw & Vences in press)

### CD2. Track 89. *Mantidactylus argenteus* Methuen, 1920

This species is exceptional in the genus *Mantidactylus* because it leads a partly arboreal life. Calls are emitted during the day from the vegetation along streams. Recorded by FG on 11 February 1995 at An'Ala, 13 h, 25°C.

### Subgenus *Ochthomantis*

These are medium-sized to large stream-dwelling frogs of very secretive calling behaviour. So far, calls were usually heard at dusk from the ground or low in the vegetation, near to running water. Only few species are known, but evidence exists for many additional cryptic species.

### CD2. Track 90. *Mantidactylus* aff. *femoralis* ("catalai")

*Cuts 1-3*. Calls recorded by FG on 4 January 1992, 18:30 h, at Nahampoana, 24-26°C.

### CD2. Track 91. *Mantidactylus ambreensis* Mocquard, 1895

*Cuts 1-3*. Recorded by FG on 15 March 1994, 17:00 h, at Montagne d'Ambre National Park, 21°C.

### CD2. Tracks 92-93. *Mantidactylus* sp. aff. *femoralis* (Ranomafana-Vevembe)

Two recordings from south-eastern Madagascar are here supposed to possibly belong to conspecific specimens. They were recorded from specimens sitting on the ground. **Track 92**. *Cuts 1-4*. Recorded by MV on 19 January 2004, 21:30 h, at Ranomafana National Park, 23°C. **Track 93**. *Cuts 1-3*. Recorded by MV on 9 February 2004, 18:20 h, at Vevembe, 23°C.

CD2. Track 94. *Mantidactylus majori* Boulenger, 1896.

Recorded by FA in 1995, 15:20 h, at Ambohimana near Tolongoina, ca. 22°C. Calls probably belonging to *Gephyromantis decaryi* are heard in the background.

Subgenus *Mantidactylus*

This subgenus comprises the largest mantellid frogs.

CD2. Track 95. *Mantidactylus grandidieri* Mocquard, 1895

Similar to the following one, this is a large species which appears to call rather rarely. The only sounds recorded for this species are these distress calls. Recorded by FG and MV in February 1991 at Nahampoana near Tolagnaro.

CD2. Track 96. *Mantidactylus guttulatus* (Boulenger, 1881)

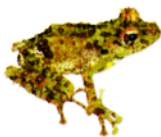
This very large species and its close relatives are common in eastern and northern Madagascar, but have very rarely been heard calling. Calling specimens are very shy and difficult to observe. They call from the ground near streams, or from the shallow water, and emit their guttural sounds at irregular intervals. Compared to the size of the specimens, the sounds are not particularly loud. *Cuts 1-3*. Recorded by MV and FA on 7 February 2001 at Antsahamanana campsite, Manarikoba forest, Tsaratanana Sirict Nature Reserve, ca. 20°C.

#### SOUNDSCAPES

CD2. Track 97. Chorus under the rain with *Gephyromantis redimitus*, *G. luteus* and several unidentified *Boophis* species. Recorded by FA at Masoala, base camp, on 5 December 1998, 22°C.

CD2. Track 98. *Blommersia grandisonae*, two males observed in an open water pool in a tree hole, with probable bioacoustic territorial interactions. Recorded by FA at Camp 3, Masoala, on 9 December 1998, 21:40 h, 23°C. Two *cuts* of the same recording sequence (long silent interval between two consecutive calls omitted).

CD2. Track 99. *Cut 1*. Interaction between two males of *Mantella laevigata*, possibly territorial calls. Recorded by FA at Menamalona (Masoala), on 16 December 1999, 12:42 h, 24°C. *Cut 2*. Chorus of *Mantella nigricans* and of two unidentified mantelline species. Recorded by FA at Menamalona (Masoala), on 17 December 1999, 13:16 h, 22-23°C. *Cut 3*. *Mantidactylus brevipalmatus* in a stream. Calls recorded by FA at Vohisokina (Antoetra) on 26 January 2003, 17:14 h, 21°C.





## HYPEROLIIDAE

This family, in Madagascar, is represented by the endemic genus *Heterixalus*, which is related to the genus *Tachynnemis* from the Seychelles. Other hyperoliids occur in Africa. *Heterixalus* are species typical of open, unforested areas or forest edges. They breed in stagnant waters, usually permanent ponds, rice fields or swamps, and are distributed all over Madagascar. Some species complexes with similar calls, such as *H. madagascariensis* / *H. boettgeri* / *H. albaguttatus*, and *H. tricolor* / *H. variabilis* / *H. andrakata* may in fact represent single species with regional subspecies or colour variation. Specimens call at night from the vegetation up to 1-2 m above the water, often also from grass tufts or other vegetation just above the water line, and dive when disturbed. Calls are loud and conspicuous in some species, such as *H. betsileo*, *H. rutenbergi*, and the *H. tricolor* complex, but less intense in others, such as *H. punctatus* and the *H. madagascariensis* complex.

**CD3. Track 1. *Heterixalus albaguttatus* (Boulenger, 1882)**

Recorded by FG on 1 March 1996, 18:15 h, at Ranomafana village. *Cut 1.* Call type I. *Cut 2.* Call types II (probably territorial call) and I.

**CD3. Track 2. *Heterixalus boettgeri* (Mocquard, 1902)**

*Cuts 1-3.* Calls recorded by FG on 28 December 1991 at Tolagnaro, ca. 24°C. The last call in cut 3 includes a second call type (probably territorial call).

**CD3. Track 3. *Heterixalus madagascariensis* (Dumeril & Bihron, 1841)**

*Cut 1.* Recorded by MV on 20 March 2000 at Sambava, 24.7°C. *Cut 2.* Recorded by RBS in captivity, including call type II (probably territorial call).

**CD3. Track 4. *Heterixalus andrakata* Glaw & Vences, 1991**

*Cut 1.* Recorded by FG on 18 February 1995, 17:40 h, south of Sambava, 29°C. *Cut 2.* Recorded by FG and MV on 16 March 2000, near Montagne des Français, 25.4°C.

**CD3. Track 5. *Heterixalus tricolor* (Boettger, 1881)**

Recorded by FG and MV in April 1991 at the type locality Nosy Be.

**CD3. Track 6. *Heterixalus* "variabilis" (Ahl, 1930)**

Recorded by FA at Ambanja on 24 February 2000, 21:00 h. The recording includes one call of *Heterixalus luteostriatus* in the background. Filtered: bandpass 2000-8000 Hz.

**CD3. Track 7. *Heterixalus betsileo* (Grandidier, 1872)**

*Cut 1.* Recorded by FG on 29 February 1996, 21:30 h, at Ranomafana village, 22.0°C (single specimen, with background of *Boophis tephraeomystax*). *Cut 2.* Recorded by FG and MV on 1 January 1994, 21:20 h, at Manjakatempo, 18°C (chorus of several specimens). *Cut 3.* Long territorial calls of two fighting males, recorded by FG and MV on 11 February 2000 at Manjakatempo, 16°C.

**CD3. Track 8. *Heterixalus carbonei* Vences, Glaw, Jesu & Schimmenti, 2000**

*Cuts 1-3.* Recorded by RJ and GS on 28 January 1995 at the type locality, Tsingy de Bemaraha. *Cut 1.* Isolated calls. *Cut 2.* Chorus. *Cut 3.* Isolated calls, with probably *Blommersia* cf. *wittei* in the background. *Cut 4.* Recorded by FG on 15 March 1994 at Montagne d'Ambre National Park, ca. 20°C: single specimen, with calls of *Guibemantis liber* in background. *Cuts 5 & 6.* Recorded by FG on 17 February 2003 at Montagne d'Ambre National Park, 23°C: probably territorial calls.

**CD3. Track 9. *Heterixalus luteostriatus* (Andersson, 1910)**

*Cuts 1 & 2.* Recorded by FG and MV on 28 January 1994, 21:30 h, near Ranohira, Isalo National Park, 23.4°C. This species furthermore also has a long second note type which can be heard between the two calls in cut 2, which sounds similar to the call emitted by the species of the *H. madagascariensis* complex.

**CD3. Track 10. *Heterixalus punctatus* Glaw & Vences, 1994**

*Cuts 1 & 2.* Recorded by FG on 28 December 1994 at the type locality Andasibe. *Cut 1.* Isolated call extracted from cut 2. *Cut 2.* Chorus. *Cut 3.* Recorded by MV on 20 March 2000 at Sambava, 24.7°C (background: *Heterixalus andrakata*).

**CD3. Track 11. *Heterixalus rutenbergi* (Boettger, 1881)**

Recorded by MV on 17 January 2005, ca. 20 h, at Ambohitantely Special Reserve, about 20°C. Filtered: highpass 800 Hz.

**RANIDAE**

This family is represented in Madagascar by the introduced *Hoplobatrachus tigerinus*, of which calls from Malagasy populations have so far not been recorded, and the species *Ptychadena mascareniensis* which is also thought to occur in Africa. However, African populations are genetically different and have, as far as known, at least partly different calls. It is likely that *P. mascareniensis* is indeed native to Madagascar. Here it is the most widespread frog, occurring from the coast to over 2000 m altitude, in all sorts of stagnant water bodies outside of the forest.

**CD3. Track 12. *Ptychadena mascareniensis* (Duméril & Bibron, 1841)**

There are different call types. Bursts of longer, pulsed calls are emitted, often in choruses, during the day, whereas at night and especially in the early morning, more regular series of short notes are emitted. *Cuts 1 & 2.* Typical day calls, recorded by RBS in captivity. *Cuts 3 & 4.* Single calls and a large chorus of the night-early morning calls, recorded by MV on 22 December 2001, 4:00 h, at Fierenana, 20.0°C. *Cut 4.* Filtered: highpass 350 Hz.

## MICROHYLIDAE: Scaphiophryinae

Genus *Paradoxophyla*

The only genus specialized to breeding in stagnant waters that is restricted to eastern rainforests. Small species that calls at night from hidden positions at the border of small, often temporary waters where the tadpoles (of the typical microhylid type) complete metamorphosis. Calls are loud and of melodious appearance from the distance, more pulsed and insect-like from nearby.

**CD3. Track 13.** *Paradoxophyla palmata* (Guibé, 1974)

*Cuts 1 & 2.* Recorded by MV on 21 January 2003, 21:30 h, at Ranomafana village (Station Thermale), 19°C. *Cut 3.* Recorded by FG at Andasibe, on 16 December 1994, 20:00 h, 19°C.

Genus *Scaphiophryne*

This genus comprises a number of medium-sized stout frogs that are typical pond explosive breeders. Breeding usually takes place during a few days only, following heavy rains. They usually call at night, but occasionally, in the peak of the breeding period, calls are also emitted during the day, from stagnant, often temporary water bodies. The calls are very loud and choruses can be heard over wide distances. *Scaphiophryne* can be found in the highlands (*S. madagascariensis*), in eastern forests (*S. boribory*, *S. marmorata*, *S. spinosa*), and in dry western Madagascar. Three species (*S. brevis*, *S. calcarata*, and *S. sp. aff. calcarata*) are restricted to the west and south and differ phylogenetically and in advertisement calls from the other species which form one monophyletic group and, as far as known, have very similar advertisement calls. Calling specimens sit on the ground around ponds, or float with their large subgular vocal sacs inflated, on the water surface. Eggs are deposited in the water, the tadpoles, of special morphology intermediate between the microhylid and ranoid type, complete their metamorphosis in the ponds.

**CD3. Track 14.** *Scaphiophryne brevis* (Boulenger, 1896)

*Cut 1.* Recorded by FG on 21 January 1995 at Kirindy, 25°C. *Cut 2.* Recorded by FG and MV on 25 January 2005, 19:30 h, at Esomony, 24.9°C.

**CD3. Track 15.** *Scaphiophryne* sp. aff. *calcarata* (Tolagnaro)

*Cuts 1 & 2.* Recorded by MV on 25 December 2001, 19:30 h, at the base of Pic St. Louis near Tolagnaro, 27°C. *Cut 1.* Some isolated calls (loud calls of *Boophis doulioti* can also be heard). Filtered: bandpass 2500-4000 Hz. *Cut 2.* Chorus (not filtered).

**CD3. Track 16.** *Scaphiophryne* sp. aff. *calcarata* (Kirindy)

This species from Kirindy differs genetically and by having much shorter notes in advertisement calls than the *S. calcarata* populations in southern Madagascar, and needs further taxonomic study. *Cut 1.* One individual (under heavy rain). *Cut 2.* Chorus. Both cuts recorded by FG on 21 January 1995 at Kirindy, 25°C.

**CD3. Track 17.** *Scaphiophryne boribory* Vences, Raxworthy, Nussbaum & Glaw, 2003

This is the largest *Scaphiophryne* species, known only from the Fierenana region in central-eastern Madagascar. The calls reproduced here were recorded by PK from captive specimens in a terrarium, and therefore are sound distorted (strong echo).

**CD3. Track 18. *Scaphiophryne gottlebei* Busse & Böhme, 1992**

This is a very peculiar *Scaphiophryne*, living mainly in deep canyons and crevices of the Isalo Massif, central-southern Madagascar. It has an explosive breeding, and in that occasion the males emit trilling calls from the water. *Cuts 1 & 2*. Recorded by FA at Isalo Massif, Zahavola, 22 November 2004, 21°C. *Cut 1*. Filtered: bandpass 600-2500 Hz. *Cut 2*. Same recording unfiltered.

**CD3. Track 19. *Scaphiophryne madagascariensis* (Boulenger, 1882)**

Recorded by FG and MV on 11 February 2000 at Manjakatempo, 16°C. Filtered: bandpass 500-2500 Hz.

**CD3. Track 20. *Scaphiophryne spinosa* Steindachner, 1882**

*Cut 1*. Recorded by FG and KG in captivity; the identification of the recorded specimen has not been assessed with complete reliability. *Cut 2*. Recorded by FA in 1992 within the Ranomafana rainforest (next to Ambatolahy village). Some males called from a small swamp in the afternoon at ca. 17:30. ca.23°C.

**CD3. Track 21. *Scaphiophryne menabensis* Glos, Glaw & Vences, 2005**

*Cuts 1 & 2*. Recorded by JG on 5 February 2002, 2:00 h, at Kirindy, ca. 25°C. The typical trill calls of *Scaphiophryne* are heard rather in the background, with a loud chorus of other frog species (*Boophis doulioti*, *Aglyptodactylus*) in the foreground.

**MICROHYLIDAE: *Dyscophinae*****Genus *Dyscophus***

Medium-sized (*D. insularis*) to large frogs with tadpoles of the typical microhylid type. They emit their characteristic, not very loud calls from the ground at the edge of temporary and permanent ponds and swamps, sometimes floating on the water surface. *D. antongilii* and *D. guineti* are very similar in morphology, colour, calls and genetic markers, and may be conspecific.

**CD3. Track 22. *Dyscophus antongilii* Grandidier, 1877**

*Cut 1*. Calls recorded by FG and MV on 11 March 1991 in Maroantsetra. *Cut 2*. Release calls recorded at Maroantsetra by FA, 25 June 1995, 13:20 h, ca. 25°C.

**CD3. Track 23. *Dyscophus guineti* (Grandidier, 1875)**

Recorded by FG on 10 July 1997 in captivity, 20.5°C. Call is slightly distorted because specimen was calling from inside a terrarium (echo).

**CD3. Track 24. *Dyscophus insularis* Grandidier, 1872**

Advertisement calls recorded by FG on 21 January 1995 at Kirindy, 25°C. *Cut 1*. Section of cut 2, filtered: lowpass 3500 Hz. *Cut 2*. Unfiltered recording, in which *Dyscophus* calls are mixed with those of *Scaphiophryne* sp. aff. *calcarata*. *Cut 3*. Release calls recorded by FG in January 1995 from a specimen collected in Kirindy, 28°C.

## MICROHYLIDAE: Cophylinae

Cophylines are a species-rich monophyletic radiation restricted to Madagascar. They are well-defined by their reproductive biology, because as far as known all species have non-feeding tadpoles that develop either in water-filled tree-holes, or in terrestrial jelly or foam nests. The Cophylinae include terrestrial, fossorial as well as arboreal genera. Most cophylines have very simple and unstructured calls, in which a single, mostly melodious note type is repeated after regular intervals. Only rarely are these notes arranged in series (*Plethodontohyla* sp. from Nosy Mangabe Special Reserve, or *Anodontohyla* sp. from Ranomafana National Park), or are the notes of a pulsed or noisy structure (*Stumpffia psologlossa*, *Platypelis grandis*).

Genus *Plethodontohyla*

A genus of largely fossorial frogs, containing a number of partly arboreal species (of those included here, this applies to *P. notosticta*, *P. mihanika* and partly *P. inguinialis*).

**CD3. Track 25.** *Plethodontohyla inguinialis* Boulenger, 1882

A large species that is largely terrestrial but seems to reproduce in tree holes at moderate height. Recorded by DV on 16 January 1997, 19:50 h, at An'Ala, 21°C. The specimen was calling from a dry tree-hole, far from water. *Cut 1*. Section of cut 2. filtered: bandpass 600-2000 Hz. *Cut 2*. Unfiltered recording

**CD3. Track 26.** *Plethodontohyla mihanika* Vences, Raxworthy, Nussbaum & Glaw, 2003

Specimens call from vertical tree trunks at night, about 2-4 m high. Recorded by FG on 14 January 1995, 19:25 h, at Andasibe, 24.5°C.

**CD3. Track 27.** *Plethodontohyla notosticta* (Günther, 1877)

Arboreal species that breeds in treeholes, and probably also calls from the treeholes or from positions on tree trunks. Heard only at night. Recorded by FG and MV on 19 March 1991 at Voloina. *Cut 1*. Filtered recording: bandpass 800-1200 Hz. *Cut 2*. Unfiltered recording.

**CD3. Track 28.** *Plethodontohyla alluaudi* (Mocquard, 1901)

Single calls emitted with rather long intervals from burrows in the forest floor, heard during the day immediately after strong rainfalls. *Cuts 1 & 2*. Calls from the same calling individual (collected voucher specimen). *Cuts 3 & 4*. Calls from another male. Most of the intervals between calls have been omitted. All recorded by MV on 21 February 2004, 15:20 h, at Torotorofotsy, 19.1°C.

**CD3. Track 29.** *Plethodontohyla coronata* Vences & Glaw, 2003

A relatively small species, calling from the forest floor, at night and sometimes also during the day. *Cuts 1 & 2*. Recorded by FG on 19 February 1994, 18:30 h, at Ankeniheny, 23.5°C.

**CD3. Track 30.** *Plethodontohyla minuta* (Guibé, 1975)

The smallest *Plethodontohyla*, known only from high elevations of the Marojejy Massif. Specimens call at night from low perches (up to 1 m high) in the vegetation. Recorded by MV and FG on 17 February 2005, about 21 h, at Marojejy National Park, above Campsite Simpona, below 20°C.

**CD3. Track 31. *Plethodontohyla* sp. (Nosy Mangabe)**

A small species calling at night from the forest floor, sometimes hidden in burrows. Recorded by FG and MV on 13 March 1991 at Nosy Mangabe Special Reserve. *Cuts 1 & 2*. Filtered recording: highpass 1400 Hz. *Cuts 3 & 4*. Unfiltered recordings.

**CD3. Track 32. *Plethodontohyla ocellata* Noble & Parker, 1926**

A medium-sized terrestrial species. Advertisement calls unknown, one specimen emitted faint release calls when caught, recorded by FG and MV on 13 March 1991 at Nosy Mangabe Special Reserve.

**Genus *Rhombophryne*****CD3. Track 33. *Rhombophryne testudo* Boettger, 1880**

A medium-sized very stout and fossorial species. The typical calls are emitted during the day or at night, often after rainfall, from burrows in the forest floor. Recorded by FG in January or February 1992 at the type locality, Nosy Be. Filtered: highpass 175 Hz.

**Genus *Stumpffia***

The genus *Stumpffia* contains a large number of terrestrial frog species, ranging from small to extremely miniaturized in size. One species (*S. pygmaea*) is known to deposit its eggs in foam nests in the leaf litter, where the non-feeding tadpoles develop. The high-pitched calls are often emitted during the day, but also at night. During the day, they often form dense soundscapes, especially in forests of northern Madagascar where the diversity and apparently also population density of *Stumpffia* is highest. Calls are emitted from the ground, sometimes from hidden positions in the leaf litter. Considering the small size of the specimens, calls are usually surprisingly loud and can be heard over considerable distance.

The genus contains a large number of undescribed species and is in need of revision. We here report calls from various sites and populations, not all of which necessarily correspond to distinct species. Several species with different calls can occur sympatrically; for example, at Marojejy National Park there are at least six species of *Stumpffia*.

**CD3. Track 34. *Stumpffia helenae* Vallan, 2000**

Recorded by MV on 17 January 2005, ca. 20 h. at Ambohitantely Special Reserve. Specimens were found calling on the ground as all other *Stumpffia*, but similar calls were also heard from tree ferns, at heights of about 3 m above the ground.

**CD3. Track 35. *Stumpffia psologlossa* Boettger, 1881**

Recorded by FG in February 1992 at the type locality, Nosy Be.

**CD3. Track 36. *Stumpffia pygmaea* Vences & Glaw, 1991**

Recorded by FG and MV in March or April 1991 at the type locality, Nosy Be. *Cut 1*. Filtered: bandpass 5000-6500 Hz. *Cut 2*. Unfiltered recording.

**CD3. Track 37. *Stumpffia tetradactyla* Vences & Glaw, 1991**

*Cut 1*. Recorded by FG and MV on 4-9 March 1991 at Nosy Boraha, type locality. Filtered: highpass 3000 Hz. Further calls of specimens that possibly belong to this species (*Cut 2*) were recorded by FG on 4 January 1992 in an eucalypt forest near

### CD 3

Nahampoana, ca. 26°C, and (Cut 3) by MV from captive specimens from Manombo, on 5 February 2004, 8:00 h, 25.8°C.  
Filtered: highpass 3000 Hz.

**CD3. Track 38.** *Stumpffia tridactyla* Guibé, 1975

*Cut 1.* Recorded by MV and FG on 16 February 2005, in the late afternoon, at the type locality Marojejy National Park, near Camp Simpona, 21.5°C. Filtered: highpass 5500 Hz. *Cut 2.* Recorded by FG on 9 January 1992 at Andasibe. Filtered: highpass 2000 Hz. *Cut 3.* Recorded by MV and IDR on 26 January 2004, 8:45 h, at Maharira forest, Ranomafana National Park, 24.5°C.

**CD3. Track 39.** *Stumpffia roseifemoralis* Guibé, 1974

Calls from a specimen tentatively attributed to *S. roseifemoralis*, recorded by FG and MV on 19 March 1991, at Voloina.

**CD3. Track 40.** *Stumpffia gimmeli* Glaw & Vences, 1992

Recorded by FG on 16 February 1992, ca 18:00 h, at Benavony, 26°C.

**CD3. Track 41.** *Stumpffia* sp. (Manongarivo)

*Cut 1.* Recorded by FG and MV on 2 February 2003, about 19 h, at Manongarivo Special Reserve, Campsite 0, 22°C. Filtered: highpass 1000 Hz. *Cut 2.* Recorded by FG and MV on 3 February 2003, 19:00 h, at Manongarivo Special Reserve, Campsite 1, 23°C.

**CD3. Track 42.** *Stumpffia* sp. (Sambava A)

Recorded by FG on 18 February 1995, 17:40 h, south of Sambava, 29°C (with a chorus of *Cophyla* in the background).

**CD3. Track 43.** *Stumpffia* sp. (Sambava B)

Recorded by FG on 18 February 1995, 17:40 h, south of Sambava, 29°C.

**CD3. Track 44.** *Stumpffia* sp. (Andapa)

Recorded by FG on 19 February 1995, 22:00 h, near Andapa.

**CD3. Track 45.** *Stumpffia* sp. (Tsaratana)

Recorded by MV on 2 February 2001, at Andampy Campsite, Manarikoba forest, Tsaratana Strict Nature Reserve, 25.0°C. Filtered: bandpass 4800-5700 Hz.

**CD3. Track 46.** *Stumpffia* sp. "Very Fast" (Marojejy National Park)

Recorded by FG on 29 March 1994, 18:00 h, at Marojejy National Park, 23.4°C.

**CD3. Track 47.** *Stumpffia* sp. "Fast" (Marojejy National Park low altitude)

Recorded by FG on 27 March 1994, 16:00 h, at Marojejy National Park, 25.3°C.

**CD3. Track 48.** *Stumpffia* sp. "Slow" (Marojejy National Park low altitude)

Recorded by FG on 27 March 1994, 16:00 h, at Marojejy National Park, 25.3°C.

**CD3, Track 49.** *Stumpffia* sp. "Slow" (Marojejy National Park high altitude)  
Recorded by MV and FG on 16 February 2005, 19:20 h, at Marojejy National Park, near Camp Simpona, 21.5°C.

**CD3, Track 50.** *Stumpffia* sp. (Ambre)  
Recorded by FG on 18 March 2000, 16:00 h, at Montagne d'Ambre National Park, Les Rousettes, 21.7°C.

**CD3, Track 51.** *Stumpffia* sp. (Nahampoana)  
Recorded by FG on 30 December 1991, during the day, at Nahampoana, ca. 26°C.

**CD3, Track 52.** *Stumpffia* sp. (Andasibe)  
Calls probably emitted by males of this species, characterized by conspicuous red colour on the belly, were recorded by FG on 20 March 1995, 18 h, near Andasibe, 23.4°C.

**CD3, Track 53.** *Stumpffia* sp. (Ranomafana)  
This undescribed species from Ranomafana has some ventral red colour as well. Calls were recorded by MV on 15 January 2003, 22:45 h, at Ranomafana village.

#### Genus *Platypelis*

This genus contains arboreal, usually tree hole breeding cophylines, ranging from very large (*P. grandis*) to small in size (e.g., *P. occultans*, *P. tetra*). Calls are emitted at night from positions in the trees, often from horizontal leaves, but sometimes also from branches, vertical tree trunks or from within tree holes (probably *P. grandis*).

**CD3, Track 54.** *Platypelis barbouri* Noble, 1940  
A small tree-hole breeding species. Calls from leaves, about 1-1.5 m high. Recorded by FG on 10 January 1992, after dusk, at Andasibe.

**CD3, Track 55.** *Platypelis cowanii* Boulenger, 1882  
A very poorly known species. Specimens morphologically agreeing with the original description were observed and recorded by FG and MV on 19 March 1991, at Voloina, but they may not be conspecific with *P. cowanii*. Filtered recording: bandpass 3500-5500 Hz.

**CD3, Track 56.** *Platypelis grandis* (Boulenger, 1889)  
This very large species emits short and loud calls which do not resemble typical cophyline vocalizations. Recorded by FG on 16 January 2003, 20:45 h, at Ranomafana National Park, 23.0°C. *Cut 1*. Isolated call. *Cut 2*. Two consecutive calls with long intercall interval.

**CD3, Track 57.** *Platypelis milloti* Guibé, 1950  
This species calls from *Ravenala* traveller's palms, 2-4 m high, and is likely to breed in the leaf axils of *Ravenala*. Recorded by FG on 11 February 1992, 20:10 h, at Lokobe Strict Nature Reserve, Nosy Be, 26°C. Filtered: highpass 500 Hz (background: *Cophyla phyllodactyla*).

## CD 3

**CD3. Track 58.** *Platypelis occultans* Glaw & Vences, 1992

A small species that calls from leaves and often is found in or close to bamboo. This species may indeed be more closely related to *Cophyla* than to other species of *Platypelis*. *Cut 1*. Recorded by FG on 11 February 1992 at Nosy Be, 26°C. In the background, calls of *Cophyla phyllodactyla* are heard, which calls at a lower frequency and with a higher note repetition rate. Another recording (*Cut 2*) documents calls from Marojejy National Park that are also attributed to *P. occultans*, recorded by FG on 22 February 1995, 19:00, 25.0°C.

**CD3. Track 59.** *Platypelis* sp. aff. *occultans*

Recorded by FG and MV on 19 March 1991 at Voloina. Initially attributed to *P. occultans*, the call of this species differs substantially from *P. occultans*.

**CD3. Track 60.** *Platypelis pollicaris* Boulenger, 1888

A species calling from leaves 1.5-2 m high in mid-altitude rainforest. Recorded by FG on 14 January 1995 at Andasibe, 22.1°C.

**CD3. Track 61.** *Platypelis tetra* Andreone, Fenolio & Walvoord, 2003

This is a small *Platypelis* calling from *Pandanus* plants, with a remarkably fast call. Calls were recorded by FA on 5 February 1996 between 18:30 and 19:00 h, at Anjanaharibe Sud Special Reserve, Analabe Valley, campsite W2, 18.0-18.5°C. They consisted of an almost endless fast series of chirping metallic notes.

**CD3. Track 62.** *Platypelis tuberifera* (Methuen, 1920)

A *Platypelis* specialized to live and probably reproduce in leaf axils of *Pandanus* plants. Recorded by FG on 12 January 1992 at Andasibe, 23.0°C.

**CD3. Track 63.** *Platypelis* sp. (Marojejy, low altitude)

Recorded by FG on 24 February 1995, 20:00 h, at Marojejy National Park, 26.0°C.

**CD3. Track 64.** *Platypelis* sp. (Marojejy, high altitude)

This is a small undescribed species from higher altitudes at Marojejy National Park which has yellow colour on the ventral parts. Calls 1-2 m high on leaves in forest. Recorded by MV and FG on 15 February 2005, 19:20 h, at Marojejy National Park, Camp Simpona, 21.1°C.

**CD3. Track 65.** *Platypelis* sp. (Vevenbe)

Recorded by MV on 9 February 2004, 18:20 h, at Vevenbe, 21°C. The calling specimens could not be captured. *Cut 1*. Section of cut 2 filtered: bandpass 2300-2800 Hz. *Cut 2*. Unfiltered recording.

**CD3. Track 66.** *Platypelis* sp. (Antsirasira)

Recorded by MV and FA on 31 January 2001 at Antsirasira, 26°C. The calling specimen could not be captured.

### Genus *Cophyla*

*Cophyla* are arboreal microhylids which are morphologically similar to *Platypelis*, but appear to be a phylogenetically distinct clade. They call at night from leaves 1-3 m high, and their non-feeding tadpoles develop in tree holes or water-filled bamboo.

**CD3. Track 67.** *Cophyla berara* Vences, Andreone & Glaw, 2005  
Recorded by MV and FA on 19 February 2000 at Berara forest, 23.5°C.

**CD3. Track 68.** *Cophyla phyllodactyla* Boettger, 1880  
*Cut 1.* Recorded by FG on 11 February 1992 at the type locality Nosy Be, 26°C. Filtered: highpass 1000 Hz. *Cut 2.* Recorded by FG and MV on 3 February 2003, 19:00 h, at Manongarivo Special Reserve, Campsite 1, 23°C.

**CD3. Track 69.** *Cophyla* sp. (Sambava)  
Two recordings of this form differ from those of typical *C. phyllodactyla*, which may indicate specific distinctness. *Cut 1.* Recorded by FG on 18 February 1995, 17:40 h, south of Sambava, 29°C. *Cut 2.* Recorded by FG and MV on 23 March 1991 near Sambava.

### Genus *Anodonthyla*

A genus of mostly arboreal frogs (except for the montane species *A. montana*), with non-feeding tadpoles developing in tree holes. These frogs usually call at night from vertical tree trunks.

**CD3. Track 70.** *Anodonthyla boulengeri* Müller, 1892  
This small and widespread form may be a complex of several species, but recordings from various localities so far showed no distinct differences. The call reproduced here was recorded by FG on 24 January 2003, 19:15 h, near Kianjavato.

**CD3. Track 71.** *Anodonthyla moramora* Glaw & Vences, 2005  
This species is similar to *A. boulengeri*, but is smaller and has a much slower call repetition rate. Recorded by FG on 20 January 2003, 16:30 h, near Vohiparara.

**CD3. Track 72.** *Anodonthyla nigrigularis* Glaw & Vences, 1992  
A species similar to *A. boulengeri*, but with slower call repetition rate and often with a blackish colour on the throat. Recorded by FG on 1 January 1992 at Pic St. Louis near Tolagnaro, 23°C

**CD3. Track 73.** *Anodonthyla* sp. aff. *nigrigularis*  
This species from Ambohitantely Special Reserve in central eastern Madagascar is similar to *A. nigrigularis* in having a blackish throat, but slightly differs in calls. Recorded by MV on 17 January 2005, about 20 h, at Ambohitantely Special Reserve.

**CD3. Track 74.** *Anodonthyla* sp. (Ranomafana)  
This undescribed species is exceptional because it arranges its notes into series. Recorded by FG on 18 January 2003, 21:00 h, at Ranomafana National Park, 20.6°C. *Cut 1.* Isolated call. *Cut 2.* Two consecutive calls and intercall interval.

## CD 3

### SOUNDSCAPES

**CD3. Track 75.** *Anodonthyla boulengeri*, advertisement calls with a storm in the background. Recorded by FG on 30 January 1996, 17:45 h, at Andasibe, 22.5°C.

**CD3. Track 76.** Chorus of *Heterixalus betsileo*. Recorded by FA at Ankaratra, on 1 February 1993, 19:00 h.

**CD3. Track 77.** Chorus of *Heterixalus tricolor* and other frogs recorded by JG at Kirindy.

**CD3. Track 78.** Chorus of *Heterixalus punctatus* and *Guibemantis timidus*. Recorded by FA on 14 June 1995 at Nosy Boraha, 24°C.

**CD3. Track 79.** Soundscape with *Platypelis tuberifera* in the foreground. Recorded by FA at Tsararano, Camp 1, on 3 December 1996, 18:59 h, 21°C.

**CD3. Track 80.** Soundscape with two unidentified cophyline microhylids and loud insects. The high-pitched call in the foreground is from a small *Platypelis*, calling from a tree hole about 1.5 m high. Recorded by FA at Ambolokopatrika, on 4 December 1997, ca. 20-21°C.

**CD3. Track 81.** Chorus of *Mantella baroni*. Recorded by FA at Ranomafana National Park on 22 December 1991, during a sunny morning (9:30 h).

**CD3. Track 82.** Intensively calling specimens of *Boophis reticulatus*. Recorded by FA at Ranomafana National Park, in August 1992.

**CD3. Track 83.** Unidentified species of *Boophis*, possibly *B. sp. aff. sibilans* Recorded by FA at Ifanadiana on 20 August 1992, 19:35 h, 19°C.

**CD3. Track 84.** Mixed chorus, with *Boophis sp. aff. rappiodes* and *Spinomantis* spp. Recorded by FA at Anjanaharibe Sud Special Reserve, Camp 1, on 27 January 1996, 18:45 h, ca. 22°C.

**CD3. Track 85.** Calls of *Boophis sp. aff. elenae*. Recorded by FA at Ifanadiana, on 20 August 1992, 18°C.

**CD3. Track 86.** Chorus of *Boophis doulioti*, *Laliostoma labrosus* and *Blommersia wittei*. Recorded by FA at Ampijoroa (Ankarafantsika National Park) on 22 January 1993, ca. 24°C.

**CD3. Track 87.** Chorus of various frogs, among them *Gephyromantis luteus* and *Platypelis tuberifera*, and an unidentified *Gephyromantis* (possibly *G. moseri*) in the foreground. Recorded by FA on 4 December 1996 at Tsararano, Camp 1, 20:00 h, ca 21°C.

**CD3. Track 88.** Calls of *Boophis luteus*. Recorded by FA on 11 February 1993 at Ifanadiana. 23°C.

**CD3. Track 89.** Chorus of *Guibemantis liber* and *Gephyromantis tschenki*. Recorded by FA on 11 February 1993 at Ifanadiana, 20:00 h, 22°C.

**CD3. Track 90.** *Cut 1.* Chorus of *Guibemantis liber*, *Blommersia blommersae*, and a third unidentified frog. Recorded by FA on 11 February at Ifanadiana, 21:00 h, 21-22°C. *Cut 2.* Chorus of unidentified frogs. Recorded by FA on 19 June 1995, 19:10 h, at Kalalao forest, Nosy Boraha, 23°C.

**CD3. Track 91.** Chorus of *Gephyromantis enki*, *Mantidactylus melanopleura* and *Mantidactylus majori*. Calls recorded by FA at Vohiparara Forest (Ranomafana National Park ) in December 1991.

**CD3. Track 92.** Chorus including *Gephyromantis redimitus*, *G. luteus* and an unidentified frog (possibly a *Boophis*) with melodious sounds in the foreground. Recorded by FA on 16 June 1995 at Kalalao forest (Nosy Boraha), 17:45 h, ca. 24°C.

**CD3. Track 93.** A night in Nosy Boraha including calls of *Guibemantis timidus* recorded by FA on 17 June 1995, 18:15 h, 23°C.

**CD3. Track 94.** Calls of *Gephyromantis luteus*. Recorded by FA on 16 June 1995 at Nosy Boraha. 17:45 h, ca. 24°C.

**CD3. Track 95.** Mixed chorus with *Boophis cf. brachychir* in foreground. Recorded by FA at Tsararano, Camp 1, on 3 December 1996, 20:14 h, ca. 24°C.

**CD3. Track 96.** Mixed chorus with *Gephyromantis luteus*, and an unidentified *Gephyromantis* (possibly *G. cf. moseri*) in the foreground. Recorded by FA at Tsararano, Camp 1, on 3 December 1996, 20:14 h, ca. 21°C.

#### Other nocturnal sounds

**CD3. Track 97.** Distress calls of the gecko *Uroplatus henkeli*. The specimen emitted the loud cry with its mouth wide open, while being handled to be photographed. *Cut 1.* Recorded by FA on 19 February 2000 at Sahamalaza, 18:59 h, ca 21°C. *Cut 2.* Recorded by FG at Nosy Be, January or February 1992.

**CD3. Track 98.** The calls of *Eulemur fulvus* Recorded by RBS at Ampijoroa.

**CD3. Track 99.** Soundscape of two troops of indris (large lemurs, *Indri indri*). First a troop howls in the distance, then a second troop in the vicinity responds with their howling. One of the most magical soundscapes on earth. Recorded by FG on 24 February 1994 at Andasibe.





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