

# A new species of *Phasmahyla* Cruz, 1990 (Anura: Hylidae) from the Atlantic Rain Forest of the States of Minas Gerais and Bahia, Brazil

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**Abstract.** A new species of the genus *Phasmahyla* is described from Atlantic Rain Forest fragments at the Fazenda Duas Barras, Municipality of Santa Maria do Salto, northeastern State of Minas Gerais, at the Reserva Particular do Patrimônio Natural (RPPN) Serra do Teimoso, Municipality of Jussari, and at the Fazenda Santa Cruz, Municipality of Arataca, southern State of Bahia, Brazil. The new species is recognized by its medium size for the genus (SVL 33.3 to 38.0 mm in males, 42.8 to 48.6 mm in females); purple drops on flanks and concealed surfaces of forearm, thigh, and digits; male with moderate nuptial pad of minuscule horny asperities on finger I; tympanum distinct only on ventral half; supratympanic fold weakly developed and visible only behind the tympanum; loreal region slightly obtuse; larval oral disc with distinct upper and second lower series of horny teeth; and second lower series of horny teeth slightly shorter than the upper one.

**Keywords:** *Phasmahyla spectabilis* new species, Phyllomedusinae, taxonomy.

## Introduction

The genus *Phasmahyla* Cruz, 1990 is characterized mainly by the absence of vocal sacs, cream iris, and the larval oral disc modified into an anterodorsal funnel-shaped structure (Cruz, 1990), in addition to considerable mitochondrial DNA variation (Faivovich et al., 2005). *Phasmahyla* is associated with mountain streams in the Atlantic Rain Forest fragments and adjacent areas influenced by this domain, and is distributed on the Mountain Ranges of Mar, Mantiqueira, and Espinhaço, in southeastern Brazil (Cruz, 1990; Nascimento et al., 2005). Currently, the genus is composed by four species: *P. guttata* (Lutz, 1924), *P. cochranæ* (Bokermann, 1966),

*P. jandaia* (Bokermann and Sazima, 1978), and *P. exilis* (Cruz, 1980) (Cruz, 1990; Frost, 2007).

Herein, we describe a new species of the genus *Phasmahyla* from northeastern of the State of Minas Gerais and southern of the State of Bahia, Brazil.

## Materials and methods

Examined specimens are housed in the Museu Nacional, Rio de Janeiro, Brazil (MNRJ) and Museu de Ciências Naturais da Pontifícia Universidade Católica de Minas Gerais, Belo Horizonte, Brazil (MCNAM). Abbreviations of the measurements (in millimeters) are: SVL (snout-vent length); HL (head length); HW (head width); IND (internarial distance); END (eye to nostril distance); ED (eye diameter); UEW (upper eyelid width); IOD (interorbital distance); TD (tympanum diameter); THL (thigh length); TL (tibia length); FL (foot length, including the tarsus).

Nomenclature and measurements (in millimeters) of tadpoles follow Altig and McDiarmid (1999), except for the interorbital and internarial distances, which were taken between inner margins of eyes and nostrils, respectively. Tadpoles examined are: MNRJ 47689, Fazenda Duas Barras, Municipality of Santa Maria do Salto, State of Minas Gerais, on 06 January 2004, by L.B. Nascimento, R.N. Feio, C.A.G. Cruz, D.S. Fernandes, D.P.R. Cabral, and M.G. Soares; MNRJ 44971, Reserva Particular do Patrimônio Natural (RPPN) Serra do Teimoso, Municipality of Jussari, State of Bahia, on 22-25 January 2007, by B.V.S. Pimenta and F.C. Falcão; and MNRJ 44990, Fazenda Santa Cruz, Municipality of Arataca, State of Bahia, on 26 January 2007, by B.V.S. Pimenta and F.C. Falcão. The tadpole

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description (MNRJ 47689) is based on three specimens in stage 36 (Gosner, 1960). Measurements of other specimens (stage 30 and 38) are presented. Comparisons of the tadpole of the new species with those of known species were based on literature information from Cruz (1982).

***Phasmahyla spectabilis* sp. nov.**

(figs 1 and 2)

**Holotype.** — MNRJ 43078, adult male (fig. 1), collected at the Fazenda Duas Barras (16°23'S, 40°03'W, elevation 800 m), Municipality of Santa Maria do Salto, State of Minas Gerais, Brazil, on 15th January 2005, by L.B. Nascimento, R.N. Feio, and C.A.G. Cruz.

**Paratypes.** — MNRJ 43079, adult female, collected with the holotype; MNRJ 43080, adult male, collected at the type locality, on 14 to 16 December 2003, by L.B. Nascimento, R.N. Feio, P.L. Ferreira, D.P.R. Cabral, M.G. Soares and C.A.G. Cruz; MNRJ 43076-43077, respectively adult female and adult male, collected at the type locality, on 5 to 10 January 2004, by L.B. Nascimento, R.N. Feio, C.A.G. Cruz, D.S. Fernandes, D.P.R. Cabral, and M.G. Soares; MNRJ 28425, adult female, collected at Reserva Particular do Patrimônio Natural (RPPN) Serra do Teimoso (15°09'S 39°31'W), Municipality of Jussari, State of Bahia, Brazil,

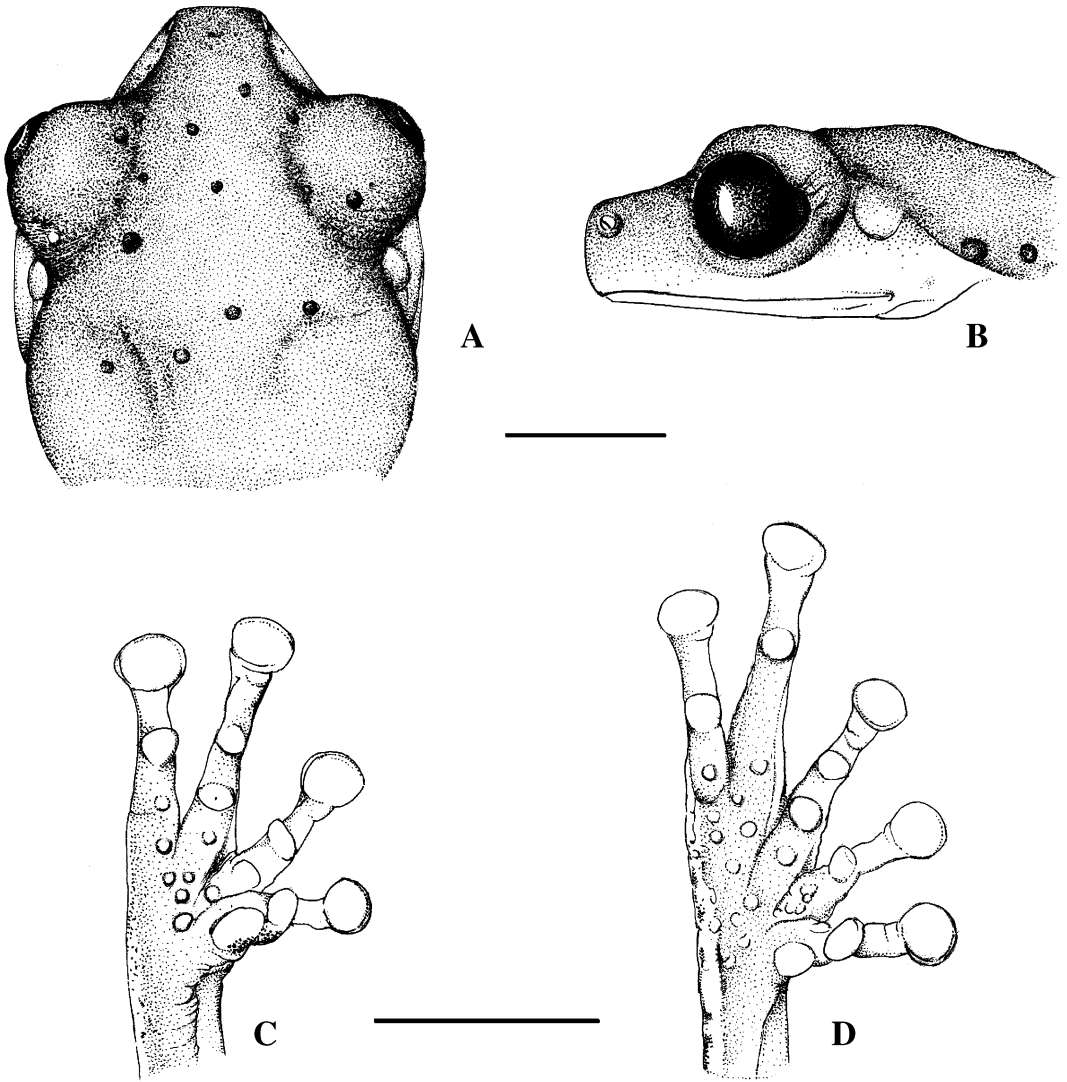
on July 2000, by B.V.S. Pimenta; MNRJ 44981-44982, adults male, collected at Fazenda Santa Cruz (15°16'S 39°31'W), Municipality of Arat-aca, State of Bahia, Brazil, on 26 January 2007, by B.V.S. Pimenta and F.C. Falcão.

**Diagnosis.** — The new species is characterized by: (1) medium size for the genus (SVL 33.3 to 38.0 mm in males, 42.8 to 48.6 mm in females); (2) paratoid glands absent; (3) dorso-lateral glands present; (4) loreal region slightly obtuse; (5) tympanum distinct only on ventral half; (6) supratympanic fold weakly developed and visible only behind the tympanum; (7) male with moderate nuptial pad of minuscule horny asperities on the base of finger I; (8) purple drops on flanks and concealed surfaces of forearm, thigh, and digits; (9) larval oral discs of tadpoles with upper (A-1) and second lower (P-2) series of horny teeth distinct; (10) larval oral discs with P-2 slightly shorter than A-1.

**Comparisons with other species.** — *Phasmahyla spectabilis* is distinguished from *P. guttata* by the forearms slender in males (robust in *P. guttata*), by the calcar appendage broad at the base (narrow in *P. guttata*), fingers medium sized (large in *P. guttata*), moderate nuptial pad of minuscule horny asperities on the



**Figure 1.** *Phasmahyla spectabilis* sp. nov., holotype (MNRJ 34650, SVL 42.6 mm), dorsal and ventral views.



**Figure 2.** *Phasmahyla spectabilis* sp. nov., holotype (MNRJ 34650). A) Dorsal view of head. B) Lateral view of head. C) Hand. D) Foot. Bar equals 5 mm.

base of finger I (large in *P. guttata*), tip of snout smooth (with a granule in *P. guttata*), supratympanic fold weakly developed and visible only behind the tympanum (developed and extending above the tympanum in *P. guttata*), and loreal region slightly obtuse (obtuse in *P. guttata*); *P. spectabilis* differs from *P. cochranae* by the moderate ornamentation with purple drops on flanks and concealed surfaces of forearms, thighs, and digits (conspicuous ornamentation with purple drops on flanks and con-

cealed surfaces of arms, forearms, thighs, tibiae, tarsus, and digits in *P. cochranae*), dorsal surface of forearm delimited by weakly developed ridge (delimited by well developed ridge in *P. cochranae*), tympanum distinct only on ventral half (indistinct in *P. cochranae*), moderate nuptial pad of minuscule horny asperities on the base of finger I (large in *P. cochranae*); *P. spectabilis* is distinguished from *P. jandaia* by the larger size (SVL 28.0 to 33.0 mm for males of *P. jandaia*), supratympanic fold weakly de-

veloped and visible only behind the tympanum (developed and extending above the tympanum in *P. jandaia*), moderate nuptial pad of minuscule horny asperities on the base of finger I (smaller in *P. jandaia*), and calcar appendage developed (weakly developed in *P. jandaia*); and *P. spectabilis* differs from *P. exilis* by the moderate ornamentation with purple drops on flanks and concealed surfaces of forearms, thighs, and digits (reduced and only present on flanks and concealed surfaces of thighs in *P. exilis*), moderate development of the body and limbs (body and limbs very thin in *P. exilis*), tip of snout smooth (with a granule in *P. exilis*), and moderate nuptial pad of minuscule horny asperities on the base of finger I (larger in *P. exilis*).

*Description of the holotype.* — Body slender; head depressed, slightly longer than wide, head length contained about three times in the SVL; snout truncate in dorsal and lateral views (fig. 2A and B); nostrils placed laterally near the tip of snout; canthus rostralis distinct, viewed from above slightly curved; loreal region slightly obtuse and concave; eye large, protuberant, directed anterolaterally, its diameter nearly equal eye to nostril distance and approximately 32% head width; eye to nostril distance nearly equal upper eyelid width; internarial distance 24% head width; interorbital distance 38% head length; tympanum small, only distinct on ventral half, its diameter 16% head length; supratympanic fold weakly developed and visible only behind the tympanum; tongue elongated, free on the posterior half, notched behind; vomerine teeth absent; choanae small, oval, widely separated.

Arms long and slender, external margin of forearms with weak dermal ridges more developed at elbows; hand slender (fig. 2C) with finger lengths  $I < II < IV < III$ , not webbed, with approximately circular, well-developed discs; inner carpal tubercle large, oval, on the base of finger I; outer carpal tubercle absent; subarticular tubercles ovoid, prominent; supranumerary tubercles present, rounded; moderate nuptial

pad of minuscule horny asperities on the base of finger I.

Legs long and slender; thigh length equal to tibia length, the sum of thigh and tibia lengths equal to snout vent length; foot length about two thirds snout vent length; external and internal margins of tibia and external margin of tarsus with granules, more sparse on tibia; calcar appendage present; foot slender (fig. 2D) with toe lengths  $I = II < III < V < IV$ , not webbed, with well-developed discs, approximately circular, about same size of fingers discs; inner metatarsal tubercle small, ovoid; outer metatarsal tubercle absent; subarticular tubercles ovoid, prominent; supranumerary tubercles present, rounded. Dorsal skin coarse with scattered small warts; ventral surface of belly granulated, gular region and ventral surfaces of limbs smooth; region of cloacal opening granulated.

*Color in life.* — Dorsal surfaces of body, forearms, legs, loreal, and tympanic regions light green with white and dark brown scattered warts; upper arms, fingers, and toes orange with small purple drops on fingers IV, toes IV and V; iris cream; flanks, inguinal region, internal and external sides of tibia, and internal side of tarsus orange with sparse purple drops; ventral surfaces whitish; nuptial asperities dark brown. At the night, the green color becomes brownish red.

*Color in preservative.* — Dorsal surfaces of body, forearms, legs, loreal, and tympanic regions purple, with white and dark brown scattered warts; upper arms, fingers, and toes cream with small purple drops on fingers IV, toes IV and V; iris gray; flanks, inguinal region, internal and external sides of tibia, and internal side of tarsus cream with sparse purple drops; ventral surfaces cream; nuptial asperities dark brown.

*Measurements of the holotype.* — SVL 35.4; HL 12.4; HW 11.7; IND 2.8; END 3.4; ED 3.8; UEW 3.2; IOD 4.7; TD 2.0; THL 17.7; TL 17.7; FL 22.1.

**Variation.** — Examined specimens are congruent with respect to the morphological characters and color. The sum of thigh and tibia length varies from 95% to 100% of snout vent length. The external and internal margins of tibia of fe-

**Table 1.** Range, mean, and standard-deviation (SD) of the measurements of *Phasmahyla spectabilis* sp. nov. (n, number of specimens).

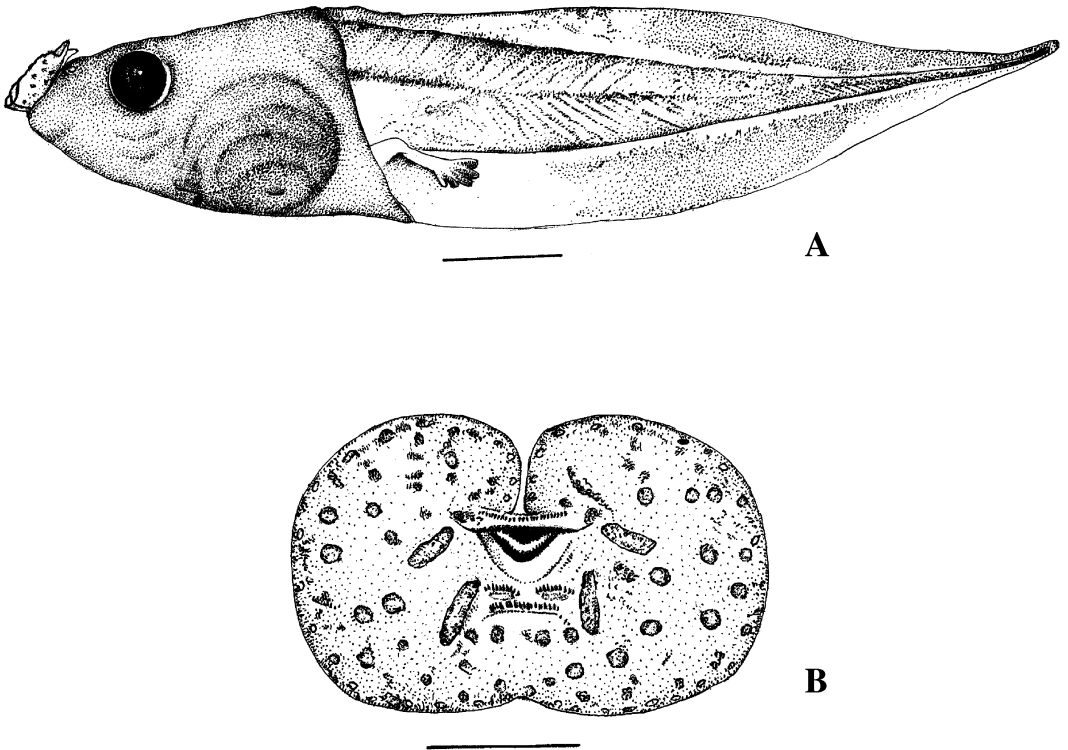
Characters	Males (n = 5)			Females (n = 3)		
	Range	Mean	SD	Range	Mean	SD
SVL	33.3-38.0	35.5	1.67	42.8-48.6	45.6	2.91
HL	12.4-13.1	12.7	0.31	14.8-16.2	15.4	0.71
HW	11.1-13.0	12.2	0.77	14.3-16.6	15.1	1.27
IND	2.2-2.8	2.6	0.26	2.6-3.1	2.9	0.29
END	3.1-3.5	3.3	0.15	3.8-4.0	3.9	0.10
ED	3.7-4.1	3.9	0.16	4.2-5.1	4.7	0.45
UEW	3.0-3.4	3.2	0.17	3.4-3.7	3.5	0.17
IOD	4.2-4.7	4.4	0.19	5.3-5.6	5.4	0.15
TD	1.5-2.1	1.8	0.26	1.9-2.4	2.1	0.25
THL	15.4-19.3	17.3	1.41	20.1-23.2	21.5	1.56
TL	16.5-19.8	18.0	1.21	21.4-23.2	22.2	0.93
FL	21.0-25.0	22.7	1.52	25.7-29.0	27.4	1.65

males have more prominent granules. Variations in measurements are presented in table 1.

**Tadpoles.** — At stage 36, tadpoles total length from 41.6 to 45.0 mm (see measurements, table 2); body elliptical in dorsal view and nearly oval in lateral view (fig. 3A), approximately one third of total length; nostrils dorsolateral,

**Table 2.** Measurements and range (mm) of tadpoles of *Phasmahyla spectabilis* sp. nov. at stages 30, 36, and 38.

	Stage 30 (n = 1)	Stage 36 (n = 3)	Stage 38 (n = 1)
Total length	40.6	41.6-45.0	45.7
Body length	13.4	14.5-14.7	14.5
Body width	6.8	6.3-6.9	6.6
Body height	7.6	7.0-7.9	7.7
Tail height	27.2	27.1-30.4	31.2
Nostril-snout distance	2.3	2.9-2.9	2.0
Eye-nostril distance	1.6	1.4-2.0	1.6
Interorbital distance	4.7	4.9-5.3	5.3
Internarial distance	5.7	5.4-5.6	5.7
Eye diameter	2.7	2.6-2.7	2.7
Oral disc width	5.4	6.1-6.9	5.9



**Figure 3.** *Phasmahyla spectabilis* sp. nov., tadpole on stage 36. A) Lateral view (bar equals 5 mm) and B) Oral disc (bar equals 3 mm).

nearer to the eye than to the tip of snout, with a small dorsal prominence; eyes lateral, diameter shorter than interorbital and internarial distances; spiracle ventral, sinistral, its opening at half of body length and attached to the body wall; anal tube dextral, long, free of the ventral fin, and inclined posteroventrally; tail approximately two thirds of total length, with maximum height at middle of tail length; dorsal and ventral fins originating at the end of body, slightly arched; ventral fin deeper than dorsal fin; tail tip flagelliform, directed dorsally; tail musculature moderately robust; oral disc (fig. 3B) modified into an anterodorsal funnel-shaped structure surrounded by a series of small papillae; dorsal margin with a conspicuous reentrance, deep and narrow, ventral margin slightly indented; surface of oral disc with numerous sparse papillae, larger than the marginal papillae; two large elongate papillae on each side of the horny beak; upper and lower jaw sheaths with serrate margins, upper jaw sheath with a conical projection, lower jaw sheath V-shaped; tooth row formula 1/2(1), teeth rather separated from each other, interrupted row P1 about same length as row A1, row P2 just shorter than row P1.

In preservative, dorsal surface light brown with sparse dark brown dots; ventral surface grayish; tail musculature light brown, more pigmented dorsally and with a dark brown stripe on the first third; tail fins with dispersed light brown pigment, less concentrated on the first third; iris black with dispersed small, unpigmented areas; oral disk light brown with dark brown papillae.

Tadpoles of *P. spectabilis* differ from tadpoles of *P. cochranae* and *P. exilis* by the oral disc having distinct anterior and posterior series of horny teeth (both vestigial in *P. cochranae* and *P. exilis*, Cruz 1982). From *P. guttata* and *P. jandaia*, the tadpoles of *P. spectabilis* differ in that tooth row P2 is slightly shorter than tooth row A1 (P2 as long as A1 in *P. guttata* and *P. jandaia*, Cruz 1982).

*Geographical distribution.* — The new species is known from the Fazenda Duas Barras, Mu-

nicipality of Santa Maria do Salto, northeastern of the State of Minas Gerais, and Reserva Particular do Patrimônio Natural da Serra do Teimoso, Municipality of Jussari, and Fazenda Santa Cruz, Municipality of Arataca, southern of the State of Bahia, Brazil.

*Etymology.* — The specific Latin name *spectabilis* is an adjective related to the beauty, elegance, and conspicuous coloration of the specimens.

*Remarks.* — The paratype MNRJ 28425 was referred by Pimenta & Silvano (2002) as *Phasmahyla exilis*.

## Discussion

The species of the genus *Phasmahyla* are associated with the Atlantic Rain Forest in Brazil, in different mountain ranges: *P. cochranae* is known from the Mar and Mantiqueira Mountain Ranges, in the states of São Paulo, Rio de Janeiro, and Minas Gerais (Bokermann, 1966; Cruz, 1990; Haddad & Sazima, 1992; pers. obs.); *P. exilis* is known from the Mantiqueira Mountain Range, in the State of Espírito Santo (Cruz, 1980, 1990); *P. guttata* has the widest distribution in the genus, ranging from the Mar Mountain Range, at Nova Friburgo, in State of Rio de Janeiro, to Morretes, in the State of Paraná (Bokermann, 1966; Cruz, 1990); *P. jandaia* is restricted to the southern of the Espinhaço Mountain Range, in the State of Minas Gerais (Bokermann and Sazima, 1978; Cruz, 1990; Nascimento et al., 2005).

*Phasmahyla spectabilis* is associated with Atlantic Forest fragments, at the region of Jequitinhonha river basin, northeastern of the State of Minas Gerais and the Una and Cachoeirinha river basins, in southern State of Bahia. The region of Fazenda Duas Barras is one of the last remaining forest fragments of Atlantic Forest in northeastern State of Minas Gerais and is included as a priority area for biodiversity conservation (see Drummond et al., 2005, area 217). Additionally, the region

of Fazenda Duas Barras shelters several anuran species typical of Brazilian Rain Forest (Feio et al., in press). The region of Fazenda Santa Cruz and RPPN Serra do Teimoso are also included as priority area for biodiversity conservation (see MMA, 2000, areas 212 and 214 respectively). Efforts have been made to recognize the region of Fazenda Duas Barras and Fazenda Santa Cruz as protected areas.

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**Appendix – Specimens examined**

*Phasmahyla cochranæ*: São Paulo: MNRJ 4027 (paratype), Estação de Fruticultura, Serra da Bocaina, São José do Barreiro; MNRJ 28021, Parque Estadual Intervales, Ribeirão Grande; Minas Gerais: MNRJ 24839, Parque Estadual do Ibitipoca, Lima Duarte.

*Phasmahyla exilis*: Espírito Santo: MNRJ 41120 (paratype), Santa Teresa; MNRJ 24633, Reserva Biológica de Duas Bocas, Cariacica.

*Phasmahyla guttata*: Rio de Janeiro: MNRJ 27636 and MNRJ 27728, Parque Estadual da Pedra Branca, Rio

de Janeiro; MNRJ 61687-61692, Horto Botânico, Rio de Janeiro; MNRJ 30285, Palmital, Saquarema.

*Phasmahyla jandaia*: Minas Gerais: MNRJ 4104 (paratype), MNRJ 39980-39981, Serra do Cipó, Jaboticatubas; MCNAM 1347, Caeté; MCNAM 3202, Nova Lima; MCNAM 4420, Barão de Cocais; MCNAM 6337, MCNAM 6354, Parque Nacional da Serra do Cipó, Santana do Riacho; MCNAM 7861-7863, Congonhas do Campo.