

# *Papéis Avulsos de Zoologia*

ISSN 0031-1049

PAPÉIS AVULSOS ZOOL., S. PAULO, 34 (29) : 403-413

26-IV-1982

## A NEW *GYMNODACTYLUS* FROM MINAS GERAIS, BRASIL, WITH REMARKS ON THE GENUS, ON THE AREA AND ON MONTANE ENDEMISMS IN BRASIL (SAURIA, GEKKONIDAE)

P. E. VANZOLINI

*Gymnodactylus guttulatus*, sp. n., from Guinda, state of Minas Gerais (18° 15'S, 43°41'W), altitude 1320-1360m, differs from its congeners *G. darwini* and *G. geckoides* mainly in the shape and arrangement of the dorsal tubercles, in the scutellation of the tibia and color pattern. *G. geckoides darwini* is restored to full species status and the need is pointed out for a review of the *G. geckoides-g. amarali* complex. Comments are made on the mechanisms possibly involved in the speciation of *guttulatus*, which may be a "stranded" relict of a drier and cooler period.

### INTRODUCTION

During the last year the personnel of this Museum's section of Reptiles has had the privilege of accompanying in the field Dr. Nanuza Luiza Menezes, of the Department of Botany (Institute of Biosciences) of our university. She is a leading authority on Velloziaceae of the mountains of eastern Brasil, and has taken our collectors to some extremely interesting localities, signally enriching our herpetological collections. During two recent trips, Miguel Treffaut Rodrigues, a graduate student in the section of Reptiles, collected some lizards which I describe as a new species.

### *Gymnodactylus guttulatus*, sp. n.

Holotype: MZUSP 56372, Guinda, MG, 13.xii.1980, M. Rodrigues field number 80.1981, a male, body length 33 mm, tail 46 mm.

Paratypes: MZUSP 56370, same data as the holotype, field 80.1979 a male, skin damaged, body length 46 mm, tail broken. MZUSP 56371, same data as the holotype, field 80.1980, a female, body length 35 mm, tail 47 mm. MZUSP 55527, Guinda, MG, 1320 m, 2.v.80, M. Rodrigues field 80.0692, a juvenile male, body length 27 mm, tail 40 mm MZUSP 55528, same data as 55527, field 80.0691, a female, body length 31 mm, tail broken.

Note: Only one specimen (56370) was sexed by dissection. The others were sexed by inspection of the base of the tail and, principally, by inference from the color pattern.

#### DIAGNOSIS

Dorsal tubercles conical, blunt, scattered, poorly aligned in front, a little better organized on the hind part of the trunk. Tibial region with tubercles similar to the dorsal ones. A small but distinct hypothenar tubercle. Tips of digits with slightly raised scales. Male with numerous small light spots on the back; female with broad indistinct transverse bands darker than the grayish-brown ground color.

#### DESCRIPTION

A member of the genus *Gymnodactylus* as defined by Vanzolini (1968): Hands and feet pentadactyl; digits free, with no dilations, with simple central lamellae; distal phalanges of digits raised over the basal ones; claw between two scales, the ventral one notched; pupil vertical, straight; dorsal lepidosis heterogeneous, with granules and tubercles.

Head distinct from body. Snout moderately pointed. Trunk and members gracile. Toes elongate. Tail longer than the body.

Rostral moderate, little swollen, with a shorter or longer cleft behind; bordered and slightly indented on each side by the supranasal scale, on the middle a very small granule. Top of the snout, to the level of the front of the orbit, covered with round, prominent, juxtaposed granules, grading rapidly into smaller ones on top of the head. Parietal and occipital regions with scattered enlarged round granules, similar in shape and size to those of the snout, but much more prominent, practically tubercular.

Nostril lateral, between the rostral, a produced corner of the first labial, two postnasal scales and one much swollen supranasal. Loreal granules decreasing in size downwards. Mouth ending in an upward curl parallel to the eye. A small supraciliary flap, composed of small scales or enlarged granules, flat, forming a serrated edge. Five differentiated, subequal upper labials, reaching the level of the middle of the eye. Ear opening small, without projecting scales. Tympanum deeply sunken.

Symphysial large, fan-shaped, its truncated hind edge bordered, and in some cases a little scalloped, by one to five scales of varying size. Five lower labials decreasing in length and width towards the back, reaching a little beyond the upper labials. On each side, between the first lower labial and the symphysial, a large polygonal scale, its posterior edge more or less aligned with that of the symphysial. Gulars minute, grading into the ventrals on the neck. A few enlarged scales along the lower labials, the anteriormost largest.

Back and flanks covered with minute granules, as small as or perhaps even smaller than those on the head. On each side six or seven extremely irregular and scattered rows of blunt conical tubercles. These are smaller, less dense and less well arranged in front, and form short segments of regular rows behind midbody. A maximum of 20 to 28 tubercles can be counted near the midline from the level of the posterior edge of the thigh to the parietal region.

Ventral scales rounded, flat, imbricate, about 32 to 35 on the midline between the level of the posterior edge of the arm and that of the anterior edge of the thigh. There is no anal flap: the slit is straight, bordered in front by four or five rows of granules.

Dorsal aspect of forelimb covered with imbricate scales about as large as the ventrals. Under surface of arm granular, of forearm with small scales, all smooth; wrist granular. Palmar surface granular; a small but distinct round, flat hypothenar tubercle, on the left hand of the holotype substituted by a patch of three enlarged scales. Fingers in the following order of increasing length: I, II-V, III-IV. The distal phalanges are raised over the basal ones, those of fingers II, III and IV sharply so. The ventral lamellae on the basal phalanges are large and swollen, the proximal one of the pollex practically tubercular. Seven proximal and seven distal lamellae under the fourth finger. The claw is short, ankylosed between the last lamella and a curved, prominent dorsal scale. The dorsal and lateral scales on the tip of the fingers are small and slightly raised, giving the whole a berry-like shape.

Anterior and ventral surfaces of thigh with scales similar to those of the arm; top and back granular. Upper aspect of tibia granular, with tubercles similar to those on the trunk, only a little smaller. Dorsal surface of foot covered to a variable extent with scales on the outer half, with granules on the inner one. Plantar surface granular, with enlarged scales on both edges, in continuity with the ventral lamellae. Toe lengths in the following order: I, II, III-V, IV. The distal phalanges are sharply raised over the basal ones; the proximal lamellae are large, the distal ones small, frequently comminuted; seven plus seven or eight under the fourth toe. The tip of the toes is similar to that of the fingers.

Intact tail above covered with flat granules, and showing a series of 6-7 transverse rows of procumbent flat tubercle-like but short scales, proximally separated by three or four granules between rows, becoming farther apart distally. Behind the last row the dorsal granules grow into flat, irregular, sub-imbricate scales. Ventrally the base of the tail is covered with large, flat, smooth scales, which along 8-9 irregular rows grow into broad plaques; these occupy all the ventral surface and are flanked by flat, irregular scales, that grade into the dorsals.

There are two types of color pattern, that I think are due to sex dimorphism. The large male sexed by dissection, MZUSP 56370, holotype and paratype 55527, a juvenile, are grayish-brown (in alcohol), with a purplish tinge, abundantly sprinkled from snout to sacrum with small white dots (thence "guttulatus"). The white spots cover whole tubercles or granules, the latter at times in clumps of five or six. In the largest specimen many of the white spots are surrounded by a dark halo, forming an indistinct ocellated pattern, which is not quite evident in the smaller specimens supposed to be males. The base of the tail shows dorsally narrow, little distinct whitish cross-bands, coinciding with the transverse rows of enlarged scales. Ventrally it is dark bluish gray, with lighter smudges. The light bands grow wider and more definite distally, until the distal half of the tail is boldly ringed with black and stark white annuli, the former eight to nine, the latter four to five scales wide.

The two paratypes thought to be females show a few lighter gray spots, especially on the flanks, and a fair sprinkling of deep purple tubercles. Besides, the ground color shows, between the nape and the tail, three broad indistinct transverse dark bands.

In the remainder of the color pattern all the specimens agree. The sutures on the top of the snout and on the side of the head are lighter than the scales and granules and show numerous heavy melanophores. The dorsal aspect of the limbs is indistinctly barred, some individual scales being two-colored, the light areas showing many melanophores. The ventral parts are plumbeous gray.

## DISCUSSION

The forms of *Gymnodactylus*

In 1953 I revised the Brazilian forms of *Gymnodactylus*, and arrived at the conclusion that one single species was present, *G. geckoides*, with three subspecies: *darwinii* (Gray, 1845) in the Atlantic forest, *geckoides* Spix, 1825, in the caatingas, and *amarali* Barbour, 1925 in the cerrados. This arrangement has been generally accepted, but better materials and changed theoretical perspectives have now led me to a different position.

In those days there was a tendency to consider closely related allopatric, and especially parapatric, forms almost automatically as subspecies; I ranked *darwinii* as a race of *geckoides* in the absence of intergrades. Presently available data on distribution indicate that it is much more probable that *darwinii* is a distinct species. The past years of collecting have produced no intermediate specimens, although 60 examples of *darwinii* (17 localities) and 341 of *geckoides* (10 localities) have been collected between 1953 and 1980. The specimens so obtained have always had the ecology — forest or open — originally implied in my 1953 paper. The geographical relationships may be best seen in map 1.

The new materials have rather reinforced the differences found in 1953 between Atlantic Forest *darwinii* and open formations *geckoides-amarali*; it continues to be very easy to tell them apart. The most distinctive characters are the number of tubercles on a paramedian row and the color pattern.

*G. geckoides* has fewer than 50 tubercles, counted between the level of the posterior margin of the thigh and the point on the nape where the row vanishes. In *darwinii* the count is always above 60 tubercles.

*G. darwinii* has a distinct nuchal collar, dark, usually light-bordered; this is lacking in *geckoides*. The dorsum of *darwinii* shows fine black marblings; that of *geckoides* varies from unicolored to distinctly ocellated, but shows no marblings.

The matter of the relationships between *g. geckoides* and *g. amarali* is more complicated. The scheme (cerrado vs. caatinga) proposed in 1953 may turn out to be either an oversimplification or, conversely, unnecessary splitting. We have now good series from the caatingas, but still lack enough materials from the cerrados for a meaningful analysis.

The position of *guttulatus*

The change in rank of *darwinii* and the doubts about the status of *amarali* have no actual import in what concerns *guttulatus*. The other forms, whatever their status, are much closer to each other than to the new species. The main differences are:

Both *geckoides* and *darwinii* have serried dorsal rows of tubercles with sharp keels. The tubercles of *guttulatus* are conical, blunt, sparse and disarranged.

The dorsal aspect of the tibia of *guttulatus* shows distinct tubercles, very similar to the dorsal ones. In *geckoides* the proximal two thirds of the tibia are covered with slightly raised scales, the distal third with granules; in *darwinii* the whole area shows closely packed raised scales, some of them erect and keeled, practically tubercular.

An interesting character is the presence of a definite hypothelar tubercle in *guttulatus*; this is also found, but much less marked, in the shape of a slightly enlarged scale, in the other forms.

Finally, the color patterns, both of the male (guttular) and of the female (indistinct broad cross bars) are very characteristic. The pattern of *darwinii* is very distinct; that of *g. geckoides* also; *g. amarali*, however, is usually ocellated. The presence of sexual dimorphism is in itself an important character.

#### GEOGRAPHY AND ECOLOGY

The type, and so far only locality of *guttulatus*, Guinda (18° 15'S, 43° 41'W), is on the geologically complex range of Precambrian mountains of which Derby (1906) said:

"The name Serra do Espinhaço ("Backbone Range") was introduced into geographical literature in 1822 by the founder of Brazilian geology, Wilhelm von Eschwege, as a comprehensive term for the various orographic units that form a great watershed between the rivers flowing directly to the Atlantic and those that discharge first into the Uruguay, Paraná and São Francisco. By modern usage, and in fact by the subsequent usage of Eschwege himself, the name has, however, been practically limited to the section of this watershed corresponding to the São Francisco basin, the greater part of that corresponding to the Paraná basin being known as the Serra da Mantiqueira, while the remainder of this section and the one corresponding to the Uruguay basin are considered as forming parts of the Serra do Mar range. As thus limited the name, though robbed of much of its pristine importance and appropriateness, is applied to a well-marked orographic feature distinguished by special topographic, geologic and tectonic characteristics."

Brazilian geographers (e.g., Domingues, 1963) divide the range into four major segments, longitudinally arranged. Guinda, the type locality of *G. guttulatus*, sits on the northern end of the southernmost segment, a region well known for its diamond-bearing beds. Pflug (1965, a basic geological study, recently updated, for our area, by Schöll & Fogaça, 1979; a general review from the regional viewpoint in Renger, 1979) describes succinctly the main types of landscape found on the Espinhaço. Guinda is on an area characterized by plateaus ("paisagem de planaltos"), where the margins of the range are abrupt; the plateaus, predominantly quartzitic, at 1200 m and more, are gently rolling, and support dissected peaks and short ridges of younger and harder quartzites that may reach a height of 2100 m.

Nimer (1972) describes succinctly the climate of the Espinhaço plateaus as "mild mesothermal semi-humid", i.e., with: mean annual temperature 18°-19° C; mean of the warmest month less than 22°, of the coldest between 10° and 15°, with mean minimum between 6° and 8°, 5 to 20 days of frost per year; annual rainfall relatively high (1,600 mm and more), but with a well defined dry season lasting for 4 months (May to August).

The relations of the Espinhaço range with the morphoclimatic domains of Brasil are complex. The southern end is practically a wall between the core of the cerrados and the semi-deciduous forest that continues inland the Atlantic forest proper. At about 15°S the range sits on the middle of a complex transition belt. Northward, to about 11°S, it deeply bisects the southern lobe of the caatingas (Ab'Saber, 1977; Map 2). However, at all latitudes topography is the main factor in determining the vegetation. In the general Guinda area we have cerrado on the lowlands and on the lower slopes, with some gallery forest, and forest in suitable valleys, much of it, of course, at present reduced to second growth. On the plateaus are found very characteristic plant formations, the "campos rupestres". This is a broad term (and

one for which no English translation has been devised yet) encompassing several montane open formations that occur at heights of 900 m and more, on mild slopes or level surfaces with much exposed, often strongly diaclased rock, and little soil or regolith. In spite of broad physiognomic resemblances, the floras differ considerably among mountain ranges. On the Espinhaço the vegetation comprises grasses, but principally herbs, shrubs and small trees of the families Velloziaceae, Eriocaulaceae, Melastomataceae, Xiridaceae, and of some characteristic genera of the Compositae (Joly, 1970; Magalhães, 1956, 1966; Sendulsky & Burman, 1978). A large number of forms are endemic, and many have quite limited ranges. Magalhães (1956) has specific data on the flora of this very area.

All specimens of the new lizard were caught under rock chips in campo rupestre above 1300 m. The collector's field notes are explicit as to the vegetation: Velloziaceae, Melastomataceae, Eriocaulaceae, the bamboo-like grass *Aulonemia effusa*, and scattered ground bromeliads; definitely no signs of cerrado.

## HISTORY

We have in *Gymnodactylus* two widely different patterns of speciation. On one side we have *geckoides* and *darwinii*, closely related morphologically and inhabiting adjacent areas of sub-continental size and in sharp ecological contrast. On the other side we have *guttulatus*, congeneric with but not very similar to them, and limited (so far) to a specialized montane environment. It seems obvious that more than one round of speciation, and more than one mechanism are involved. I shall confine myself in this paper to some comments on *guttulatus*.

A number of montane endemic forms have been described from the Espinhaço. In the field of herpetology we have fourteen species of frogs (Bokermann, 1956, 1964, 1967, 1967a; Bokermann & Sazima, 1973, 1973a, 1978; Sazima & Bokermann, 1978); it is certain that others await description. Three species of lizards were also described: *Heterodactylus lundii* Reinhardt & Luetken, 1861; *Placosoma cipoense* Cunha, 1966; and *Tropidurus nanuzae* Rodrigues, 1981. A fourth species, *Anotosaura brachylepis* Dixon, 1974, initially thought to be also endemic, was later found in a very disturbed environment at a much lower altitude, 500 to 600 meters (Vanzolini & Ramos, 1977). In fact until we know much more about the fauna of the cerrados, and of the belts between cerrados and caatingas, there will always be a measure of risk in this use of "endemic"; even so the number of forms limited to the higher levels of the Espinhaço is impressive and undoubtedly has a biogeographic meaning.

The use of the word "montane" in Brasil also deserves comment. The altitudes involved are quite moderate, seldom exceeding 1,400 m; however, the ecological peculiarities of such plant formations as the campos rupestres at 1,000 m make the concept a very real one.

Vanzolini & Ramos (1977) have discussed the problems presented by some Brazilian montane distributions. These may be either the result of speciation in situ, or relictual distributions from a previous colder and drier climatic episode. According to the latter hypothesis, the campos rupestres would function as depositories of forms ill adapted to the recent moist and warm peak that allowed continuity between the hylaea and the Atlantic forest. The fact that such forms are being incapable of, or at least very slow in recolonizing the present open formations has led Vanzolini & Ramos (1977) to consider them as "stranded" in marginal situations. *G. guttulatus* seems to

conform to this pattern, but a reliable argument must be based on a comparison of the distributions of the relatives of a larger number of species of lizards from this and from unconnected but similar mountain ranges.

#### ACKNOWLEDGMENTS

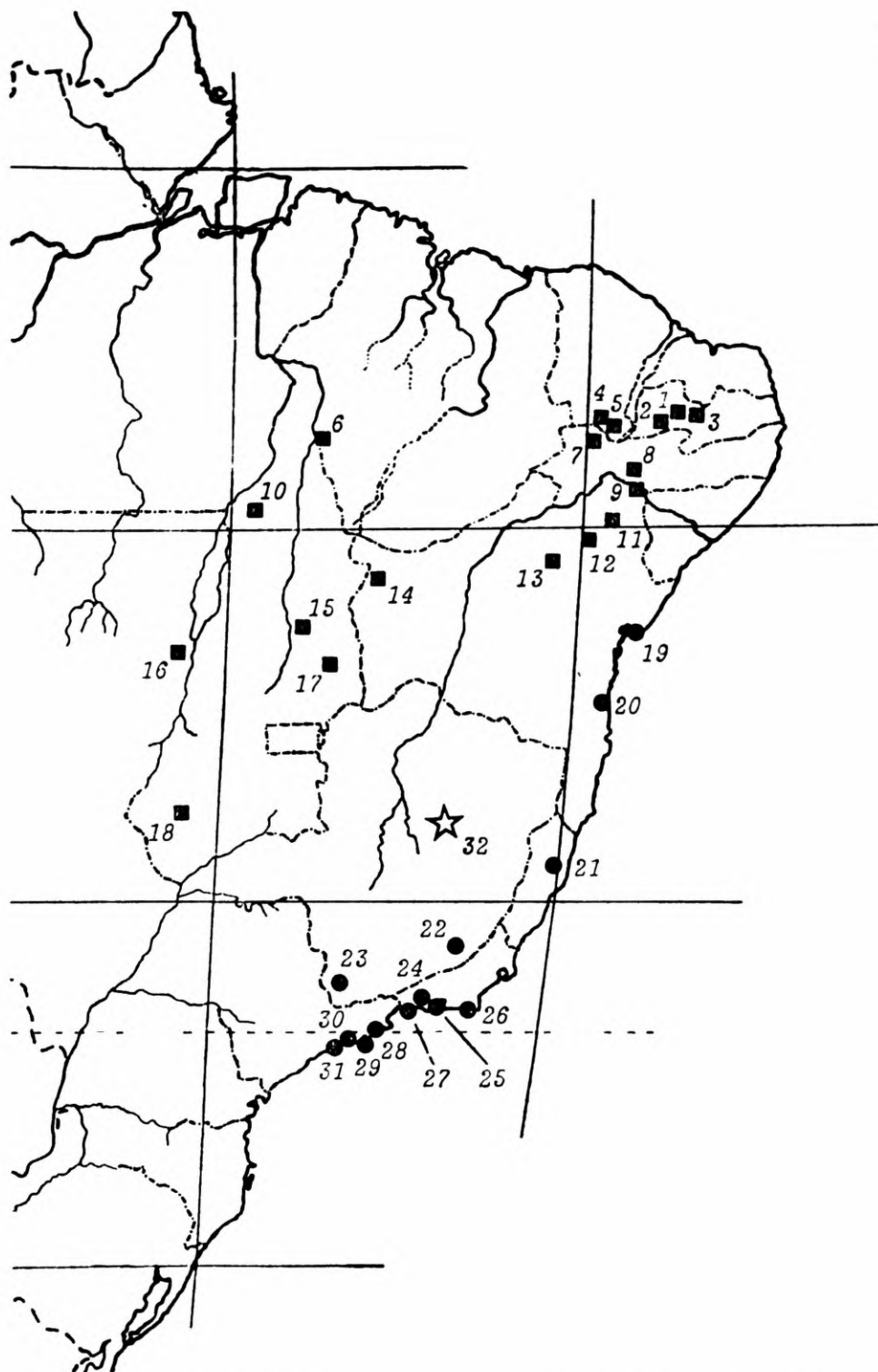
Thanks are due to Nanuza Luiza Menezes for continued support in the field and for orientation in botanical matters. Setembrino Petri (Institute of Geosciences, University of São Paulo) has helped with the geological literature. Ernest E. Williams (Museum of Comparative Zoology) and W. Ronald Heyer (U.S. National Museum) criticized the manuscript. The drawing is by Cirton Genaro.

#### REFERENCES

- Ab'Saber, A. N., 1977. Os domínios morfoclimáticos na América do Sul. Primeira aproximação. *Geomorfologia* (Inst. Geogr. Univ. S. Paulo) 52: 21 p., map.
- Bokermann, W. C. A., 1956. Sobre uma nova espécie de *Hyla* do estado de Minas Gerais, Brasil (Amphibia, Salientia, Hylidae). *Papéis Avulsos Dep. Zool., S. Paulo*, 12 (18):357-362.
- Bokermann, W. C. A., 1964. Dos nuevas especies de *Hyla* de Minas Gerais y notas sobre *Hyla alvarengai* Bok. (Amphibia, Salientia, Hylidae). *Neotropica* 10 (32):67-76.
- Bokermann, W. C. A., 1967. Três novas espécies de "Physalaemus" do sudeste brasileiro (Amphibia, Leptodactylidae). *Rev. Brasil. Biol.* 27 (2):135-143.
- Bokermann, W. C. A., 1967a. Notas sobre *Hyla duartei* B. Lutz (Anura, Hylidae). *An. Acad. Brasil. Ci.* 39 (3-4):437-440.
- Bokermann, W. C. A., & I. Sazima, 1973. Anfíbios da Serra do Cipó, Minas Gerais, Brasil. 1 — Espécies novas de "Hyla" (Anura, Hylidae). *Rev. Brasil. Biol.* 33 (3):329-336.
- Bokermann, W. C. A. & I. Sazima, 1973a. Anfíbios da Serra do Cipó, Minas Gerais, Brasil. 1: Duas espécies novas de *Hyla* (Anura, Hylidae). *Rev. Brasil. Biol.* 33 (4):521-528.
- Bokermann, W. C. A. & I. Sazima, 1978. Anfíbios da Serra do Cipó, Minas Gerais, Brasil. 4: Descrição de *Phyllomedusa jandaia* sp. n. (Anura, Hylidae). *Rev. Brasil. Biol.* 38 (4):927-930.
- Cunha, O. R., 1966. Sobre uma nova espécie de lagarto do estado de Minas Gerais *Placosoma cipoense* sp. n. (Lacertilia, Teiidae). *Bol. Mus. Paraense Emílio Goeldi (N.S.) Zool.* 61: 9.
- Derby, O. A., 1906 The Serra do Espinhaço, Brazil. *J. Geol.* 14:374-401.
- Dixon, J. R., 1974. Systematic review of the lizard genus *Anotosaura* (Teiidae). *Herpetologica* 30 (1):13-18.

- Domingues, A. J. P., 1963. O relêvo, p. 13-40, in L. M. C. Bernardes (coord.), Grande Região Leste (O Planalto). Rio de Janeiro: Inst. Brasil. Geogr. Estat. (Enciclopédia dos Municípios Brasileiros, vol. 8).
- Joly, A. B., 1970. Conheça a vegetação brasileira. São Paulo: Editora da Universidade de S. Paulo; Polígono. xvi + 165 p.
- Magalhães, G. M., 1956. Contribuição para o conhecimento da flora dos campos alpinos de Minas Gerais — 1953-1954. Anais V Reunião Anual Sociedade Botânica do Brasil, Porto Alegre 1954: 227-304.
- Magalhães, G. M., 1966. Sobre os cerrados de Minas Gerais. An. Acad. Brasil. Ci. 38 (Supl.):59-69.
- Nimer, E., 1972. Climatologia da região sudeste do Brasil. Rev. Brasil. Geogr. 34 (1):3-48.
- Pflug, R., 1965. A geologia da parte meridional da Serra do Espinhaço e áreas adjacentes. Bol. Dep. Nac. Prod. Miner. 226: 55 p.
- Reinhardt, J. & C. Lütken, 1861. Bidrag til Kundskab om Brasiliens Padder og Krybdyr. Første Afdeling, Padderne og Öglerne. Vid. Medl. Nat. For. Copenhagen 1861: 143-242, pls.
- Renger, F. E., 1979. Evolução dos conceitos geológicos da Serra do Espinhaço. Núcleo de Minas Gerais, Soc. Brasil. Geol., Bol. 1:9-27. (Atas I. Simpósio Geol. Minas Gerais, Diamantina 1979 — Geologia do Espinhaço).
- Rodrigues, M. T., 1980. Uma nova espécie de *Tropidurus* do Brasil (Sauria, Iguanidae). Papéis Avulsos Zool., S. Paulo, 34 (13): 145-149.
- Sazima, I. & W. C. A. Bokermann, 1978. Cinco novas espécies de *Leptodactylus* do centro e sudeste brasileiro (Amphibia, Anura, Leptodactylidae). Rev. Brasil. Biol. 38 (4):899-912.
- Schöll, W. U. & A. C. C. Fogaça, 1979. Estratigrafia da Serra do Espinhaço na região de Diamantina (M.G.). Núcleo de Minas Gerais, Soc. Brasil. Geol., Bol. 1:55-73. (Atas I Simpósio Geol. Minas Gerais, Diamantina, 1979 Geologia do Espinhaço).
- Sendulsky, T. & A. G. Burman, 1978. *Paspalum* species of the Serra do Cipó (I): a contribution to the study of the Brazilian Poaceae. Rev. Brasil. Bot. 1:1-15 (errata ibidem 1 (2): s/p.).
- Vanzolini, P. E., 1953. Sobre a diferenciação geográfica de *Gymnodactylus geckoides* (Sauria, Gekkonidae). Papéis Avulsos Dept. Zool., S. Paulo, 11 (14):225-262.
- Vanzolini, P. E., 1968. Lagartos brasileiros da família Gekkonidae (Sauria). Arq. Zool., S. Paulo 17 (1):1-84.
- Vanzolini, P. E. & A. M. M. Ramos, 1977. A new species of *Colobodactylus*, with notes on the distribution of a group of stranded microteiid lizards (Sauria, Teiidae). Papéis Avulsos Zool., S. Paulo 31 (3):19-47.

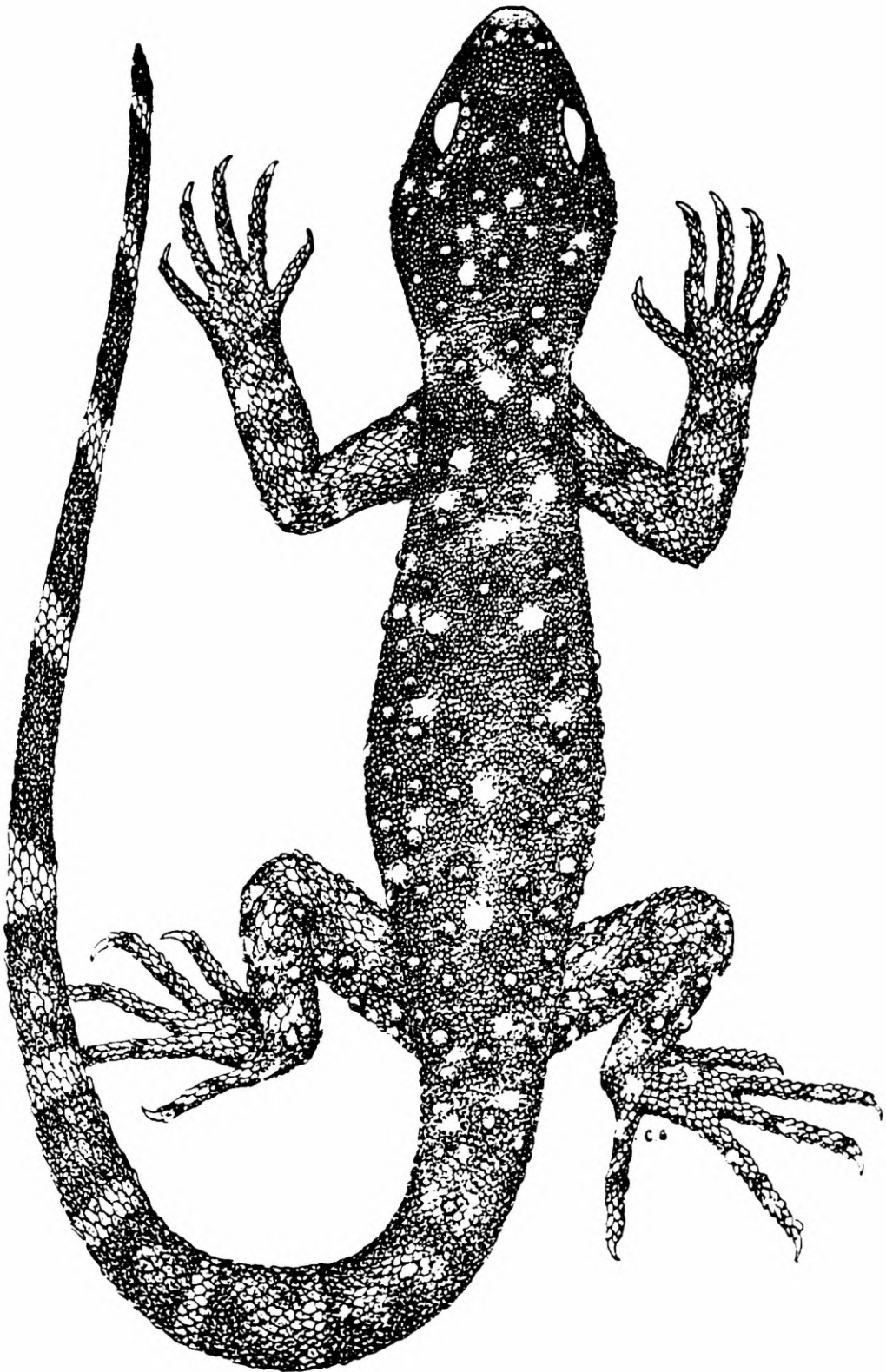




Map 1. Distribution of *Gymnodactylus*. Squares, *G. geckoides*: 1, São José de Espinharas. 2, Santa Luzia. 3, Piancó. 4, Santana do Cariri. 5, Arajara. 6, Carolina. 7, Exu. 8, Carnaubeira. 9, Paulo Afonso. 10, Piau. 11, Canudos. 12, Senhor do Bonfim. 13, Catinga do Moura. 14, Rio Branco. 15, Barra do Rio São Domingos. 16, São Domingos, Rio das Mortes. 17, Cana Brava. 18, Rio Verde. Circles, *G. darwini*: 19, Salvador. 20, Ilheus. 21, Rio Doce at Linhares. 22, Sereno. 23, Francisco Sá. 24, Austin. 25, Rio de Janeiro; Itaguaí. 26, Cabo Frio. 27, Angra dos Reis. 28, Ubatuba. 29, Caraguatatuba, São Sebastião; Ilha de São Sebastião; Ilha Vitória; Ilha dos Búzios. 30, Praia de Boracela. 31, Praia de São Lourenço; Bertloga. Star, *G. guttulatus*: 32, Guinda.



Map 2. Guinda, the type-locality of *G. guttulatus* in the context of the relevant morpho-climatic domains.



*Gymnodactylus guttulatus*, sp. n., MZUSP 55527, paratype.

