

**Variation in *Amapasaurus tetradactylus***  
**(Reptilia: Squamata: Gymnophthalmidae), a rare Guiana lizard**  
*Variação em *Amapasaurus tetradactylus**  
*(Reptilia: Squamata: Gymnophthalmidae), um lagarto raro das Guianas*

Teresa Cristina Sauer de Avila-Pires<sup>I</sup>, Jucivaldo Dias Lima<sup>II</sup>, Marinus Steven Hoogmoed<sup>I</sup>,  
Janaína Reis Ferreira Lima<sup>II</sup>, Wáldima Alves da Rocha<sup>III</sup>

<sup>I</sup>Museu Paraense Emílio Goeldi/MCTI. Belém, Pará, Brasil

<sup>II</sup>Instituto de Pesquisas Científicas e Tecnológicas do Estado do Amapá. Macapá, Amapá, Brasil

<sup>III</sup>Universidade Federal do Piauí. Canto do Buriti, Piauí, Brasil

**Abstract:** The Guiana region is one of the better-preserved parts of Amazonia, but its fauna is still incompletely known. *Amapasaurus tetradactylus* was described in 1970, on the basis of two specimens from the upper Maracá river basin, Amapá, Brazil. Only between 2004-2006, during a series of expeditions in Amapá, new material of this species was obtained, and in 2008 it was collected also in northern Pará (at present it is also recorded from French Guiana). A total of 37 specimens, from six localities in Brazilian Guiana, is here examined, giving an idea of variation in scale characters and of its habitat. Present data makes it likely that the species is an endemic to the eastern part of the Guiana Shield, possibly in its central-southern portion.

**Keywords:** Amazonia. Guiana Region. Distribution. Morphological/geographical variation.

**Resumo:** A área das Guianas é uma das mais bem preservadas na Amazônia, porém sua fauna não é ainda completamente conhecida. *Amapasaurus tetradactylus* foi descrito em 1970, com base em dois exemplares da bacia do alto rio Maracá, Amapá, Brasil. Somente entre 2004-2006, durante uma série de expedições no Amapá, novo material dessa espécie foi obtido, e em 2008 a espécie foi coletada também no norte do Pará (atualmente é registrada também para a Guiana Francesa). Registramos aqui um total de 37 exemplares, de seis localidades na Guiana brasileira, dando uma ideia da variação nos caracteres de escutelação e sobre o habitat da espécie. Os dados atuais parecem indicar que a espécie é endêmica da parte leste do Escudo das Guianas, possivelmente em sua porção centro-sul.

**Palavras-chave:** Amazônia. Região das Guianas. Distribuição. Variação morfológica/geográfica.

---

AVILA-PIRES, T. C. S., J. D. LIMA, M. S. HOOGMOED, J. R. F. LIMA & W. A. ROCHA, 2013. Variation in *Amapasaurus tetradactylus* (Reptilia: Squamata: Gymnophthalmidae), a rare Guiana lizard. **Boletim do Museu Paraense Emílio Goeldi. Ciências Naturais** 8(3): 419-429.

Autor para correspondência: Teresa Cristina Sauer de Avila-Pires. Museu Paraense Emílio Goeldi/MCTI. Av. Perimetral, 1901 – Terra Firme. Belém, PA, Brasil. Caixa Postal 399. CEP 66017-970 (avilapires@museu-goeldi.br).

Recebido em 09/09/2013

Aprovado em 12/12/2013

Responsabilidade editorial: Philippe J. R. Kok



## INTRODUCTION

The Guiana part of Amazonia harbors large, well-preserved areas of rainforest. Even though studies of this complex environment began some centuries ago, its fauna is still relatively poorly known. Discovery of new species is not uncommon (e.g., Kok, 2011; Sturaro & Avila-Pires, 2011), and understanding of the hidden molecular diversity within species is only beginning (e.g., Fouquet *et al.*, 2012). Knowledge on the diversity of a region, at all levels, is fundamental for the development of conservation policies. We here provide data on an apparently rare (or at least elusive), small lizard of the Guiana region.

Cunha (1970) described *Amapasaurus tetradactylus* (Figure 1) on the basis of two specimens from the upper Maracá river basin, Amapá, Brazil. The species was described in a new genus, mainly due to the presence of four fingers and a frontonasal divided into several scales. Apart from these characters, lepidosis was similar to that of *Leposoma*, suggested by Cunha (1970) to be its closest relative. For more than 30 years these were the only two specimens known, and they were reported by Avila-Pires (1995) to be in poor condition, especially the paratype. Between 2004-2006, however, during a series of expeditions more specimens were collected in three distinct localities in Amapá (Lima, 2008), to which a fourth locality was recently (September 2012) added. In 2008 specimens were collected for the first time in the state of Pará, in two of seven localities studied north of the Amazon (Avila-Pires *et al.*, 2010). Dewynter & Surugue (2012) reported the species from southern French Guiana, extending its distribution further north (Figure 2).

A total of 37 specimens, from six localities in Brazilian Guiana, is now available, apart from the types, and we here analyze variation in scale characters, as well as what can be added in terms of ecological data about this species.

## MATERIALS AND METHODS

Specimens examined are deposited in Museu Paraense Emílio Goeldi (MPEG) or in the Instituto de Pesquisas Científicas e Tecnológicas do Amapá (IEPA). They represent 31 out of the 37 newly collected specimens, all from Brazil.

MPEG 25099 (from Óbidos) was not included in the study of variation because it was not available because of hemipenial studies elsewhere. Five specimens (four males, one female; IEPA 1870-1874) were obtained after the manuscript had been closed and were not used for morphometrics, but the collecting locality was inserted in the map.

Among the material examined 28 are from Amapá: IEPA 253-254, municipality of Laranjal do Jari, Reserva de Desenvolvimento Sustentável do Rio Iratapuru; IEPA 317-336, municipality of Pedra Branca do Amapari, Reserva de Desenvolvimento Sustentável do Rio Iratapuru; IEPA 507, municipality of Serra do Navio, Parque Nacional Montanhas do Tumucumaque; IEPA 1870-1874, municipality of Mazagão, Floresta Estadual do Amapá. Eight specimens are from Pará: MPEG 25098, MPEG 25100, MPEG 25101, MPEG 27751-27754, municipality of Óbidos, Floresta Estadual do Trombetas; MPEG 27370, municipality of Oriximiná, Estação Ecológica Grão-Pará, Serra do Acaraí.

Field data of specimens from Amapá were obtained by JDL, JRFL and Rafael Cabral dos Santos; of specimens from Pará by TCSAP, MSH and WAR. Snout-vent length (SVL), tail length (specimens from Pará) and weight were measured in the field, prior to fixation. Scale counts were made under a stereomicroscope and follow Avila-Pires (1995). Mean and standard deviation of paired characters were calculated on the basis of counts on each side separately, but frequency distributions shown in graphs consider counts on both sides. In order to estimate geographic variation we make comparisons between specimens from Amapá, which encompasses the easternmost localities, and Pará (western localities).

## RESULTS

### GENERAL DESCRIPTION AND OBSERVED VARIATION

Specimens (14 males, 12 females, five of unidentified gender) in the sample ranged from 23 mm SVL, weighing 0.3 g, to 36 mm SVL, 0.6 g (Figure 3). Three specimens from Pará had intact tails that were 1.6-1.7 times SVL.



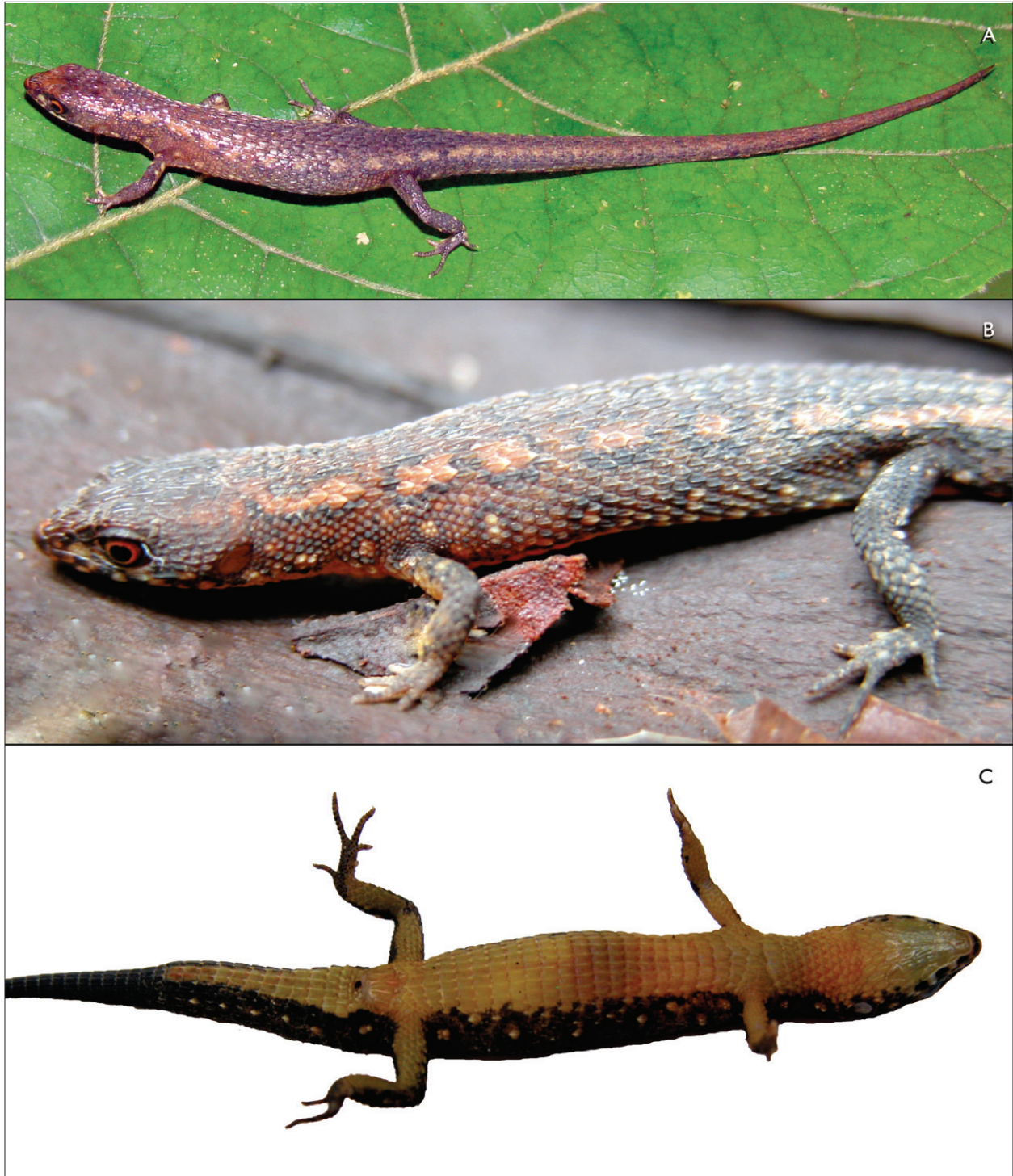


Figure 1. *Amasaurus tetradactylus*: A) a male in life from Floresta Estadual do Amapá, Amapá (IEPA 1873, photo by Rafael Cabral dos Santos); B) a male in life, SVL 28 mm, from Floresta Estadual do Trombetas, Pará (MPEG 27752, photo by Marinus S. Hoogmoed); C) MPEG 27752 in ventral view.



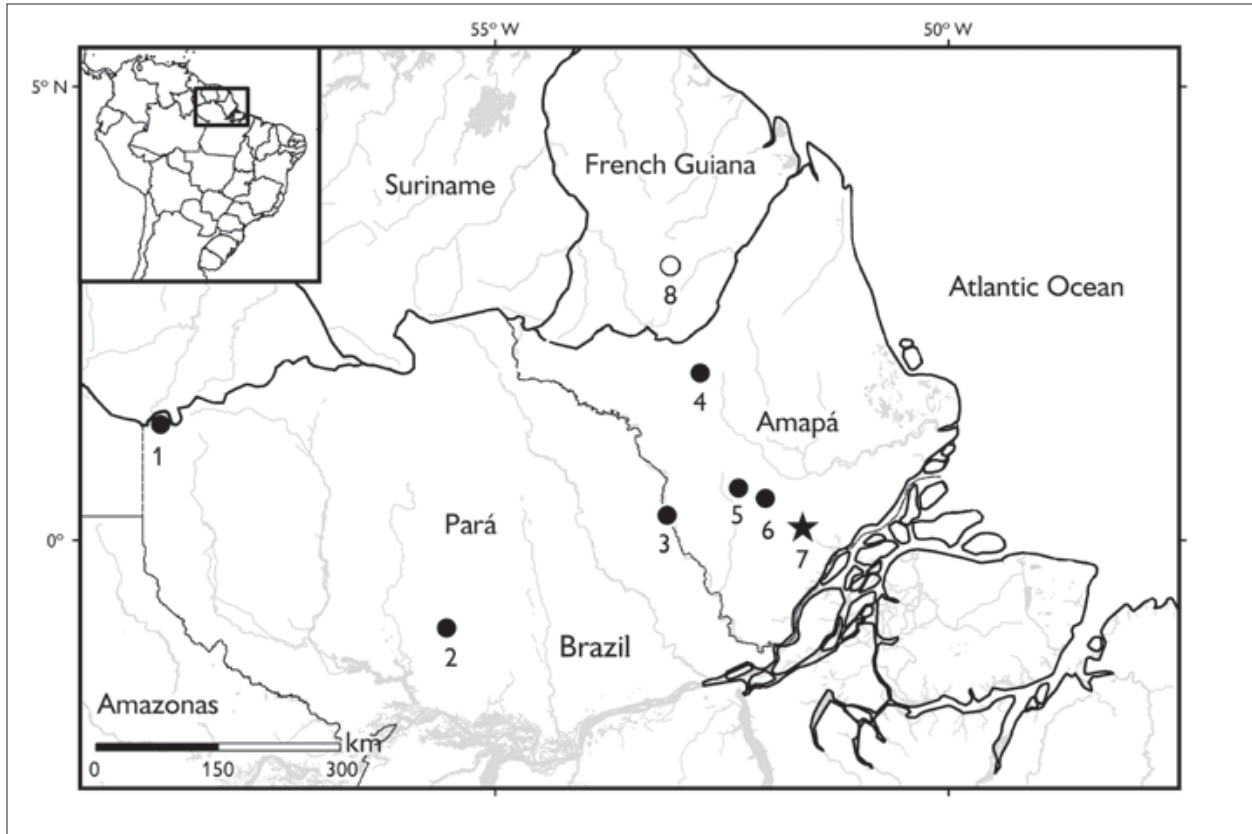


Figure 2. Locality records of *Amapasaurus tetradactylus*. Inset shows position of depicted area within South America (rivers and other water bodies in gray). Star = type-locality; closed circles = material examined; open circle = data from Dewynter & Surugue (2012). 1 - Pará, Oriximiná, Estação Ecológica Grão-Pará, Serra do Acaraí; 2 - Pará, Óbidos, Floresta Estadual do Trombetas; 3 - Amapá, Laranjal do Jari, Reserva de Desenvolvimento Sustentável do Rio Iratapuru; 4 - Amapá, Serra do Navio, Parque Nacional Montanhas do Tumucumaque; 5 - Amapá, Pedra Branca do Amapari, Reserva de Desenvolvimento Sustentável do Rio Iratapuru; 6 - Amapá, Mazagão, Floresta Estadual do Amapá; 7 - Amapá, Igarapé Camaipi, affluent of upper Maracá river (type-locality) – all in Brazil; 8 - French Guiana, Mount Itoupé, Amazonian National Park of French Guiana.

All specimens have the following dorsal head scales, most of which exhibit small pits close to their margins (Figure 4A): rostral, frontonasal divided into 3-6 scales (Figures 5, 6A), paired prefrontals (left prefrontal divided in IEPA 254; Figure 5G), frontal, paired frontoparietals, and a group of one interparietal bordered by one parietal on each side forming a rounded posterior margin. Anterior supraocular single or consisting of up to four additional smaller scales (Figure 6B), followed by three other supraoculars (Figure 7). Four to six supraciliaries (Figure 6C), partially separated from supraoculars by 1-5 scales (Figure 6D); with one exception (IEPA 319), there is always

contact between anterior supraciliaries and supraoculars, while posteriorly they may or not be in contact.

Sides of head (Figure 4D) with a divided nasal, loreal separated from supralabials by a larger frenocular in contact with nasal, 4-8 suboculars (Figure 6E), lower eyelid with a semitransparent disc divided into 2-4 scales (Figure 6F), 5-7 supralabials (Figure 6G), 4-5 to centre of eye, and several hexagonal, keeled temporals.

On ventral surface of head (Figure 4B), mental is followed by a single, large postmental and usually three pairs (Figures 8A-8D) of chinshields (two pairs in IEPA 317 [Figure 8E], second and third partially

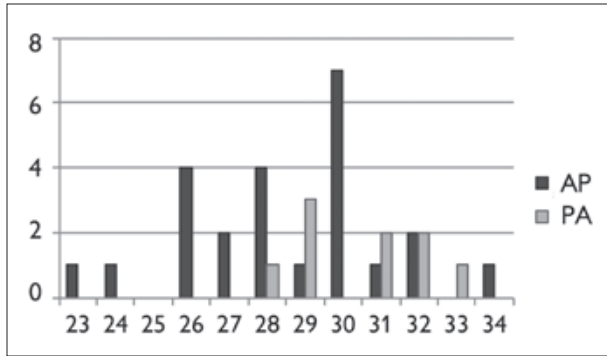


Figure 3. Distribution of SVL (mm) in the studied sample of *Amapasaurus tetradactylus*, separately for specimens from Amapá (AP) and Pará (PA).

fused on left side in IEPA 507 [Figure 8F]), of which the anterior pair in medial contact (separated by an azygous medial scale in MPEG 27751 [Figure 8D]), the second pair in medial contact (Figures 8A, 8D, 8F) or separated by small scales (Figures 8B-8C, 8E), and both in contact with infralabials. Some specimens have both pairs in medial contact, with a small scale in the corner between the two pairs (Figure 8A). Third pair varies from relatively small to large and it is always separated medially and from the infralabials. Posteriorly scales are irregularly polygonal to hexagonal, broadly keeled; they may be completely or partially separated by small scales from the gular region. Usually three infralabials (four on one side in IEPA 253), the contact between second and third below centre of eye. Gulars in 8-11

transverse rows (Figures 4B, 6H), of which the collar is composed by 7-10 scales (Figure 6I). Gular fold distinct.

Nape with rhomboid to pentagonal, imbricate, keeled scales (Figure 4A). They grade into the dorsals, which are larger, mostly hexagonal, imbricate, keeled and mucronate (Figure 4E); 30-36 ( $32.6 \pm 1.2$ ) scales along a mid-dorsal line between interparietal and posterior margin of hind limbs (Figure 9A). Scales on flanks smaller than those on back and they may be more rounded. Scales on back and flanks in transverse rows, but with some discontinuities between those on flanks and back, and middorsally. Scales on chest rhomboid, imbricate, keeled; scales on belly squarish to pentagonal, imbricate, keeled and mucronate, in transverse and longitudinal rows (Figure 4F); in 8 (80.6%), 9 (3.2%), or 10 (9.7%) longitudinal rows (plus two specimens in which either eight or ten rows could be considered; Figure 9B); in 21-25 ( $22.5 \pm 0.8$ ) transverse rows between collar and preloacal plate (Figure 9C). Scales around midbody 25-29 ( $26.8 \pm 1.1$ ) (Figure 9D). Preloacal plate formed by one mid-anterior scale and five posterior ones, all keeled, imbricate (Figure 4C). Males with two preloacal pores at each side (four in total), females with one (two in total), while femoral pores are absent in both sexes. Four fingers,  $II < V < III < IV$ , and five toes,  $I < II < V < III < IV$ , with 7-10 (7-9,  $8.2 \pm 0.6$ , on right side; 7-10,  $8.5 \pm 0.7$ , on left side) lamellae under fourth finger (Figures 4G, 9E), 9-13 (9-13,  $11.2 \pm 0.8$ , on right side; 10-12,  $11.1 \pm 0.6$ , on left side) under

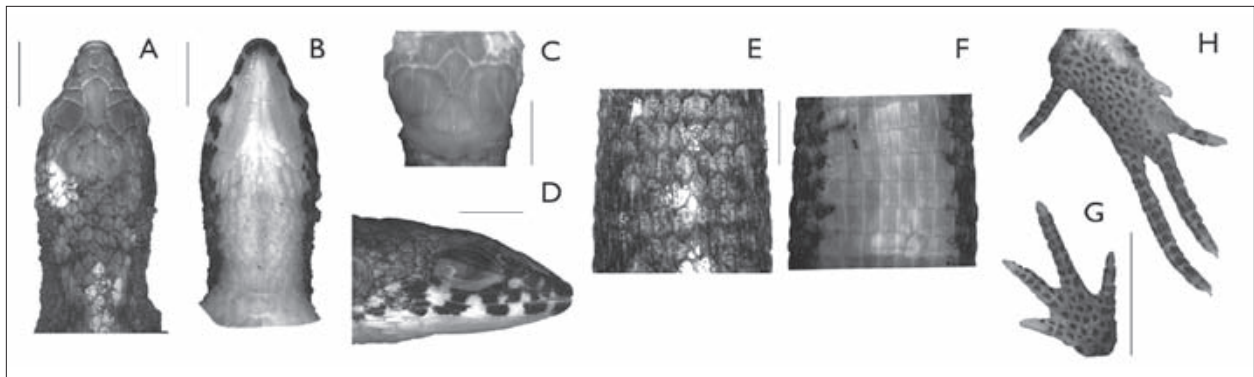


Figure 4. *Amapasaurus tetradactylus*, IEPA 329, female: A) dorsal view of head; B) ventral view of head; C) preloacal plate; D) lateral view of head; E) dorsal scales; F) ventral scales; G) ventral view of hand; H) ventral view of foot. Scale: 2 mm.

fourth toe (Figures 4H, 9F). Dorsal surface of tail with scales similar to dorsals, scales on the underside similar to ventrals but narrower, keels forming 2-4 longitudinal ridges along the tail; scales arranged in transverse rows all around the tail.

*Amapasaurus tetradactylus* is mostly brown dorsally, cream or yellow ventrally. None of the males had an orange venter as found in males of *Leposoma*. A series of cream blotches, outlined by dark brown, are present dorsolaterally, with smaller spots on neck and the lower part of flanks. Up to 11 blotches may be present, but some may be fused, forming a continuous line; blotches may be rounded or

more irregular, and the dark brown outline more or less complete. Spots on sides are distinctly smaller, up to 13 on each side but usually less, with much variation in number, form, and how far back they reach. Descriptions of colour in life, all from specimens from Pará (by MSH) – MPEG 25099 (male, SVL 29 mm): Back brown, series of orange-brown dorsolateral spots, lateral line of white ocelli. Belly and chin yellow. Iris orange-brown. MPEG 25100 (male, SVL 29 mm): underside yellow, centre of throat white. MPEG 25101 (female, SVL 33 mm): back dark brown. Dorsolateral band indicated by light brown spots. Series of white ocelli at

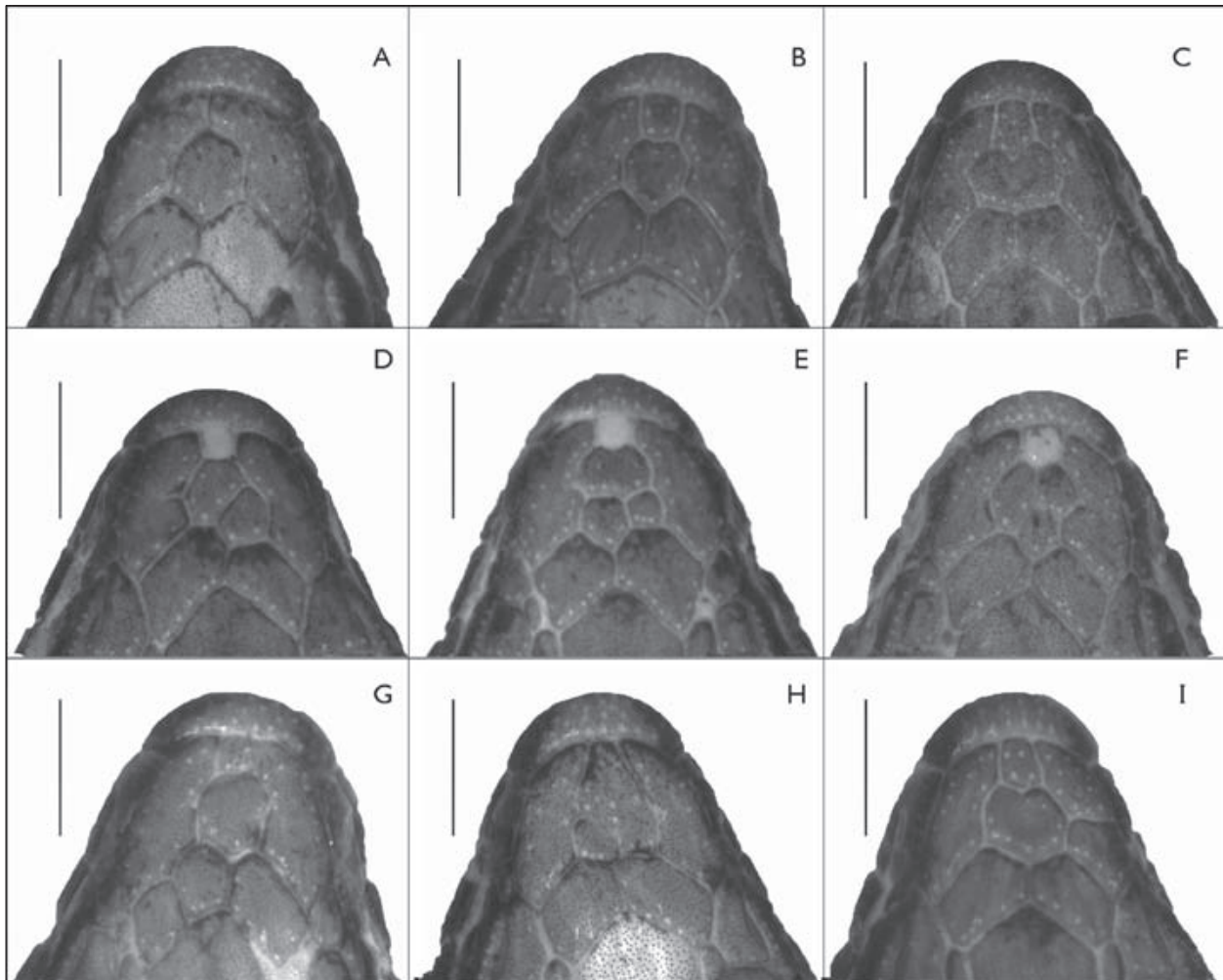


Figure 5. Variation in frontonasal-prefrontal scales in *Amapasaurus tetradactylus*: A) IEPA 324; B) IEPA 320; C) MPEG 27751; D) MPEG 25100; E) MPEG 27754; F) IEPA 326; G) IEPA 254; H) IEPA 331; I) IEPA 336. Scale: 1 mm.

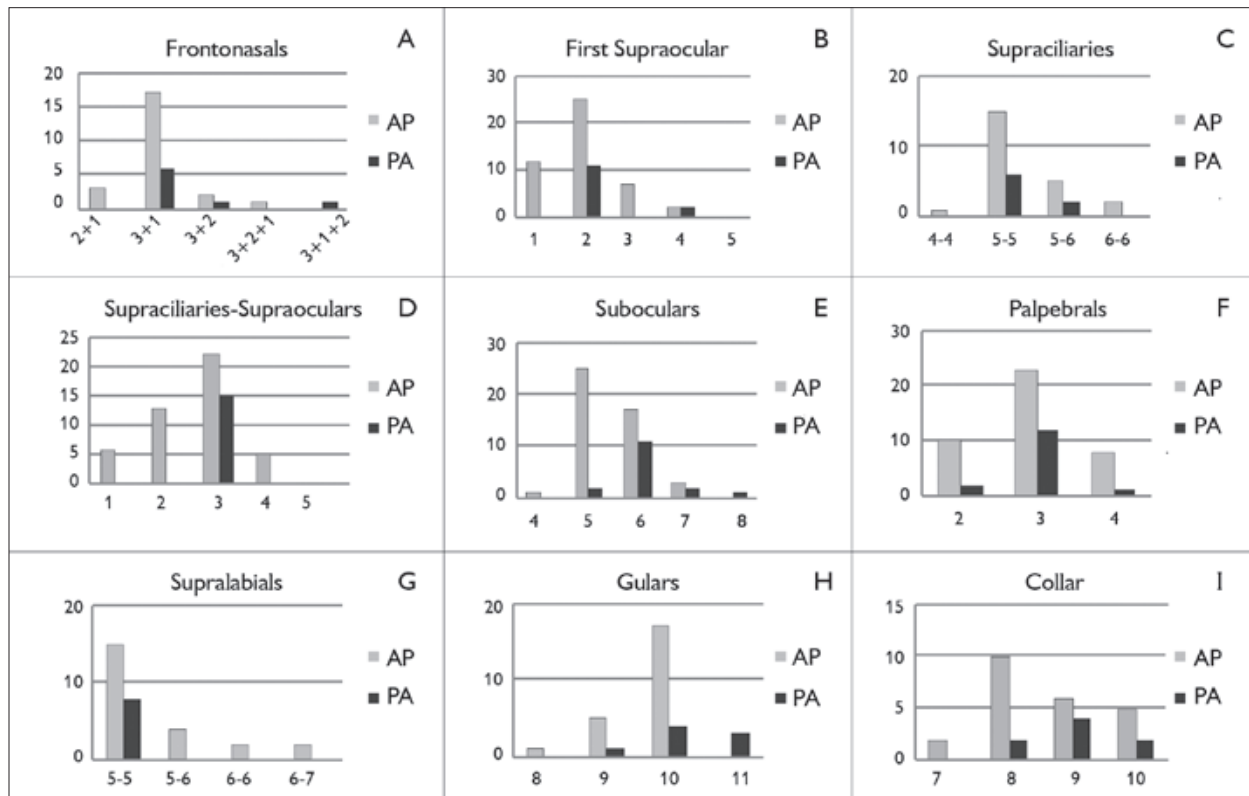


Figure 6. Frequency distribution of (A) number of frontonasals (anterior-[median]-posterior), (B) divisions in the first supraocular (both sides), (C) supraciliaries (side 1 – side 2), (D) scales between supraciliaries and supraoculars (both sides), (E) number of suboculars (both sides), (F) palpebrals (both sides), (G) supralabials, (H) transverse rows of gulars, and (I) number of scales forming the collar, in *Amapasaurus tetradactylus*, separately for specimens from Amapá (AP) and Pará (PA).

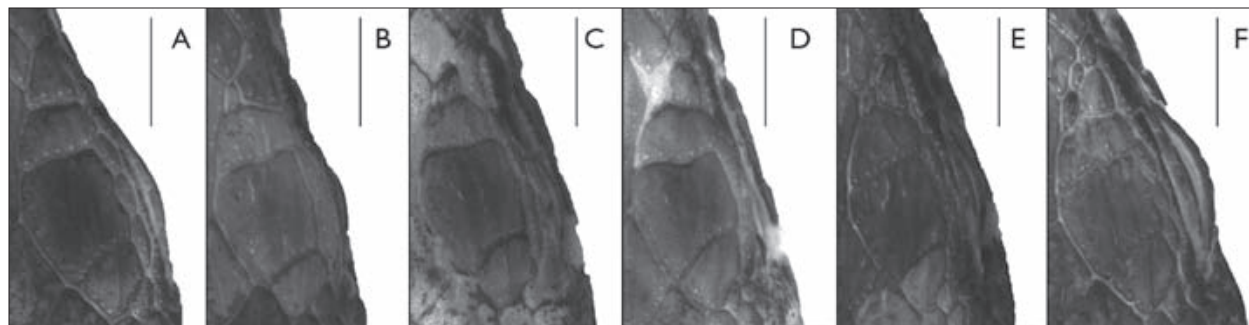


Figure 7. Variation in supraoculars in *Amapasaurus tetradactylus*: A) MPEG 25100; B) IEPA 320; C) IEPA 324; D) IEPA 254; E) IEPA 335; F) MPEG 25101. Scale: 1 mm.

lower part of flanks. Chin, throat and belly yellow. MPEG 27752 (male, SVL 28 mm): back brown with dorsolateral spots and lines on base of tail orange brown. Eyes reddish. Belly dark yellow (Figures 1B-1C). MPEG 27754 (female,

SVL 31 mm): back brown, flanks brown. Distinct dorsolateral series of light spots. Series of white ocelli on lower part of flanks, continuing on tail. Iris golden. Throat and belly yellow. Underside of tail dirty white.

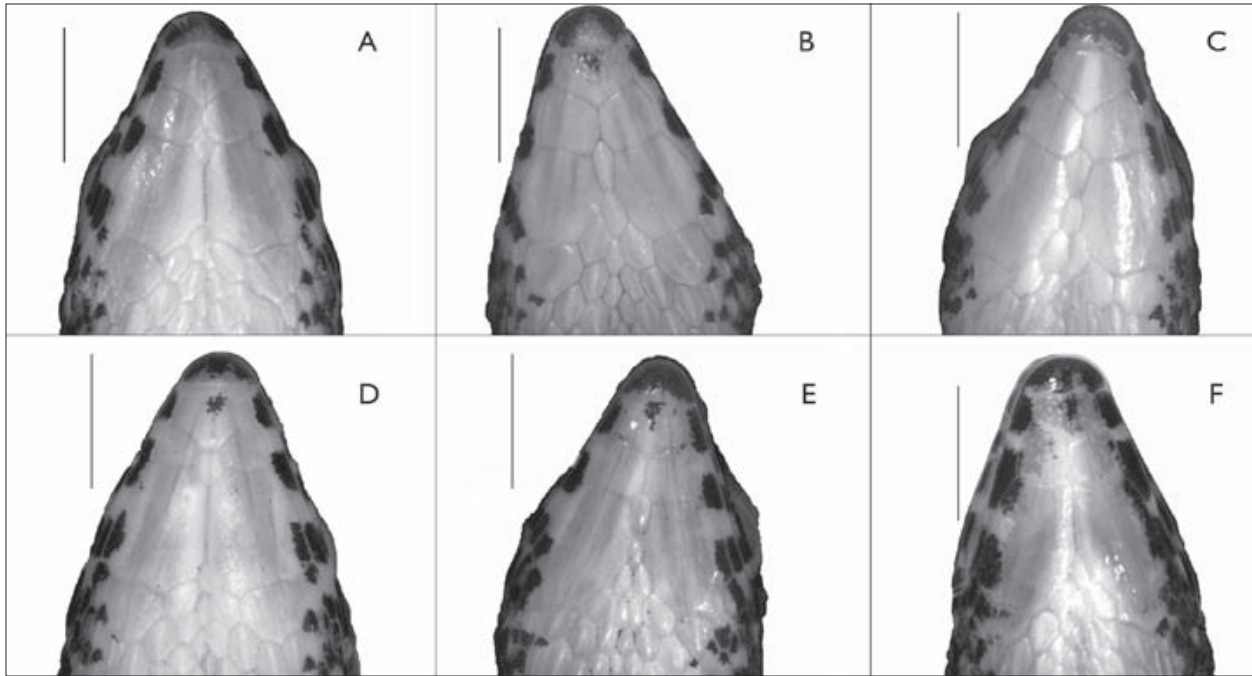


Figure 8. Variation of scales under the head in *Amapasaurus tetradactylus*: A) MPEG 25100; B) IEPA 254; C) IEPA 328; D) MPEG 27751; E) IEPA 317; F) IEPA 507. Scale: 2 mm.

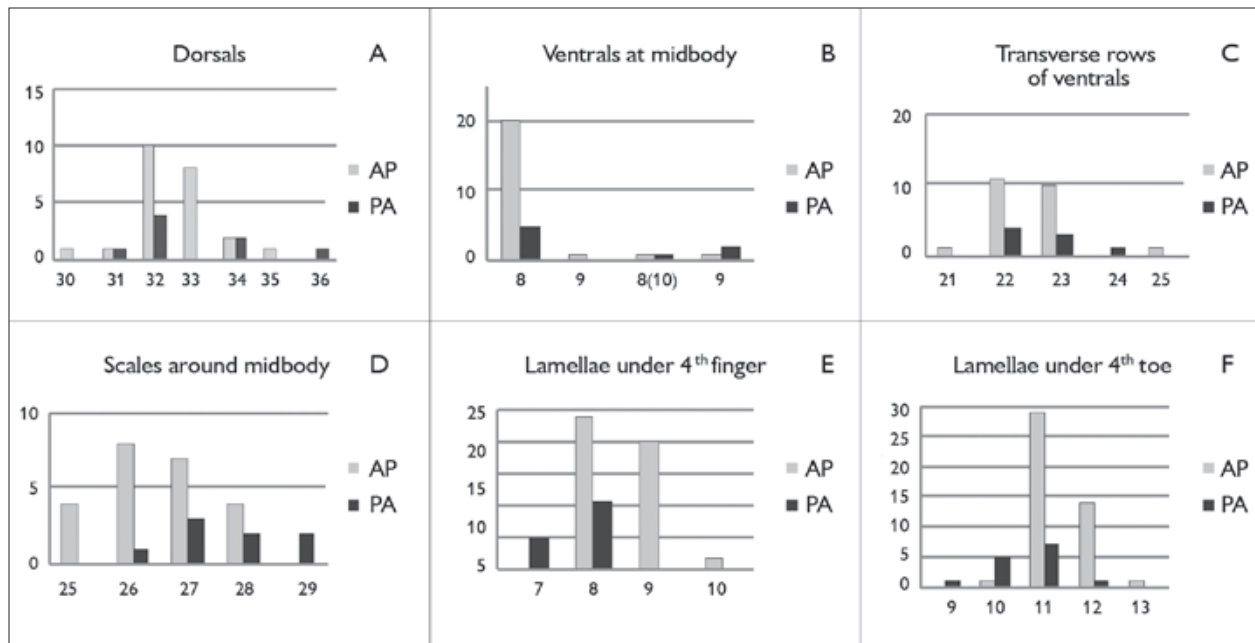


Figure 9. Variation in scale counts in *A. tetradactylus*, separately for specimens from Amapá (AP) and Pará (PA). A) Dorsals along a mid-dorsal line between interparietal and posterior margin of hind limbs; B) longitudinal rows of ventrals (counted at midbody); C) transverse rows of ventrals between collar and preloacal plate; D) scales around midbody; E) lamellae under fourth finger (both sides); F) lamellae under fourth toe (both sides).



## DISTRIBUTION AND HABITAT

Known from Amapá and Pará, Brazil, north of the Amazon River, and from southern French Guiana. Specimens from Amapá were collected in four localities – in the municipalities of Laranjal do Jari (two specimens) and Pedra Branca do Amapari (21 specimens), both within the limits of the ‘Reserva de Desenvolvimento Sustentável (RDS) do rio Iratapuru’; in the municipality of Serra do Navio (one specimen), in the ‘Parque Nacional Montanhas do Tumucumaque’ (Lima, 2008); and in the municipality of Mazagão (five specimens), in the ‘Floresta Estadual (FLOTA) do Amapá’. In Pará, *Amapasaurus tetradactylus* was found in two localities – municipality of Óbidos, within the ‘Floresta Estadual (FLOTA) Trombetas’ (eight specimens) and a single specimen in the municipality of Oriximiná, in the Acarai (or Acari) Mountains, northern part of ‘Estação Ecológica (ESEC) Grão-Pará’ (Avila-Pires *et al.*, 2010; Figure 2). All were in the leaf litter of well-drained (‘terra firme’) rainforest, although the forest where the only specimen (IEPA 507) from Serra do Navio was found showed signs of influence of the Anacuí river (with tallest trees about 20-25 m high, vines, and dense undergrowth), which ran parallel to the trail used, but at least 500 m away from it. Leaf litter depth in most places in Amapá varied between 15-30 cm (but see below for an exception). Most specimens (32 out of 37) fell in pitfall traps. In RDS do Rio Iratapuru, 12 specimens were collected in a single pitfall, in one day (eight in the central bucket of a Y-shaped pitfall), during the dry season (July 31, 2005), in a place with a humid, thick layer of leaf litter (c. 50-60 cm) at the base of a hill. This seems to indicate high activity and local abundance.

In the field the species is easily confused with sympatric species of *Leposoma*. At a first glance the most distinctive character is the dorsolateral line of cream blotches in *A. tetradactylus*. Adult males differ in the color of the belly-yellow in *A. tetradactylus*, orange in *L. guianense*.

## DISCUSSION

Our data show that the divided frontonasal, which together with the presence of only four fingers on the hand make *Amapasaurus tetradactylus* so distinct, occurs in all specimens and follows a rather regular arrangement, even though there is some variation in the number of scales that substitute the single or double frontonasal of most gymnophthalmids. These characters make the species easily recognizable, while other features of lepidosis, size and habitat are quite similar to those in species of *Leposoma*. Cunha (1970) already supposed that *Amapasaurus* and *Leposoma* were most likely closely related. The similarity between these two genera is strengthened now that Rodrigues *et al.* (2013) described a species of *Leposoma*, *L. sinepollex* Rodrigues, Teixeira, Recoder, Dal Vechio, Damasceno & Pellegrino, 2013, with only four fingers. However, even considering the possibility of *Amapasaurus* being derived from *Leposoma*, morphology would include it in the *L. parietale* group, of Amazonian distribution, while *L. sinepollex* is part of the *L. scincoides* group, present only in the Atlantic Forest. Thus, even in this case two independent origins for the reduction of the pollex would have to be considered, as pointed out by Rodrigues *et al.* (2013).

Most characters did not show variation when specimens from Amapá and Pará were compared. A few characters, however, showed some tendency to differ between the two groups, e.g. scales around midbody, transverse rows of gulars and lamellae under fourth finger. Number of specimens available and geographic representation are still insufficient for a good understanding of geographic variation in the species, and these results should be seen as no more than an indication. Differences between populations due to geographic distance are expected to occur and it is important to take them into consideration in conservation policies.

*Amapasaurus tetradactylus* seems to be endemic to the eastern portion of the Guiana Shield, south of the divide (Brazil-Guyana+Suriname border), except in the

easternmost part, where it reaches northward at least to the Massif Central Guyanais, in French Guiana. Another possibility is that its northern limit coincides with a faunal break observed by Fouquet *et al.* (2012) in 12 amphibian lineages (within species), that crosses the region in a SE-NW direction, from Amapá to Suriname, passing through French Guiana. At least three of the species examined by these authors (*Adenomera heyeri*, *Allobates femoralis* and *Rhinella 'margaritifera'*) showed independent lineages in the central portion of the Guiana Shield south of this break. The northeastern distribution limit of *Atelopus hoogmoedi* seems also to follow this break zone (Noonan & Gaucher, 2005).

In all cases mentioned above, the area of occurrence includes parts of Suriname and Guyana, where *A. tetradactylus* has not yet been found. Reasonably good inventories of lizards were made in many parts of Suriname between 1968 and 1990 (Hoogmoed, 1973, 1985; Hoogmoed, personal observation), although sampling has been minimal in southwestern and southeastern Suriname. Recently some RAPs have been made in areas in southern Suriname (Ouboter *et al.*, 2011; Nielsen *et al.*, 2012, 2013). In Guyana inventories of lizards have been few and far between. The largest inventory effort seems to have been that in Iwokrama forest (Donnelly *et al.*, 2004), but other inventories were made in southern (Señaris *et al.*, 2008), northwestern (Reynolds & MacCulloch, 2012), and central western Guyana (MacCulloch & Reynolds, 2012). Considering the apparent difficulty in collecting this species, however, and considering that many of these inventories did not use pitfall traps (none in Suriname, nor in southern Guyana), presence of *A. tetradactylus*, especially in the southern part of these countries, cannot be ruled out. For instance, the species was collected in Brazil in the Acarai Mountains, a few hundred meters from the Brazil-Guyana border, making the presence of the species on the Guyana side of the border very likely. All evidence therefore indicates that *A. tetradactylus* is endemic to the eastern part of the Guiana Shield, possibly in its southern portion.

## ACKNOWLEDGEMENTS

Expeditions to FLOTA Trombetas and Acarai Mountains were part of 'Calha Norte project', a joint effort of Secretaria do Meio Ambiente do Estado do Pará (SEMA-PA), Conservação Internacional (CI-Brasil) and Museu Paraense Emílio Goeldi, with logistic support of Rio Tinto mining company (collection permit SEMA-PA 001/2008). M. A. Ribeiro Jr. joined the herp team in Acarai Mountains. Expeditions in Amapá between 2004-2006 were part of the 'Rapid Biological Inventories in the Tumucumaque Mountains National Park, Amapá, Brazil', a partnership between IEPA, CI-Brasil, the Brazilian Institute for Environment (IBAMA), and SEMA-AP (collection permits SEMA-AP 075/2004 and 006/2012). Personnel from FLOTA Amapá and Instituto Estadual de Floresta do Estado do Amapá (IEF) made possible the trip to this UC. M. Sturaro elaborated the map and helped with the photos of preserved specimens, which were made with a stereomicroscope of 'Rede de Museus' project/CNPq. T. C. S. Avila-Pires thanks Conselho Nacional de Desenvolvimento Científico e Tecnológico/CNPq for a research fellowship (Process 304199/2010-9).

## REFERENCES

- AVILA-PIRES, T. C. S., 1995. Lizards of Brazilian Amazonia (Reptilia: Squamata). **Zoologische Verhandelingen** 299: 1-706.
- AVILA-PIRES, T. C. S., M. S. HOOGMOED & W. A. ROCHA, 2010. Notes on the Vertebrates of northern Pará, Brazil: a forgotten part of the Guianan Region, I. Herpetofauna. **Boletim do Museu Paraense Emílio Goeldi. Ciências Naturais** 5(1): 13-112.
- CUNHA, O. R., 1970. Lacertílios da Amazônia. IV. Um novo gênero e espécie de lagarto do Território Federal do Amapá (Lacertilia-Teiidae). **Boletim do Museu Paraense Emílio Goeldi, nova série Zoologia** 74: 1-8.
- DEWYNTER, M. & N. SURUGUE, 2012. First record of *Amapasaurus tetradactylus* Cunha, 1970 (Squamata: Gymnophthalmidae) in French Guiana. **Check List** 8(4): 815-816.
- DONNELLY, M. A., M. H. CHEN & G. G. WATKINS, 2004. Sampling amphibians and reptiles in the Iwokrama Forest ecosystem. **Proceedings of the Academy of Natural Sciences of Philadelphia** 154: 55-69.



- FOUQUET, A., B. P. NOONAN, M. T. RODRIGUES, N. PECH, A. GILLES & N. J. GEMMELL, 2012. Multiple Quaternary refugia in the eastern Guiana Shield revealed by comparative phylogeography of 12 frog species. **Systematic Biology** 61(3): 461-489.
- HOOGMOED, M. S., 1973. **Notes on the herpetofauna of Surinam IV**: the lizards and amphisbaenians of Surinam: 1-419. Dr. W. Junk, The Hague.
- HOOGMOED, M. S., 1985. *Coleodactylus septentrionalis* Vanzolini, a lizard new for the Surinamese fauna (Sauria: Gekkonidae). Notes on the Herpetofauna of Suriname X. **Zoologische Mededelingen** 59(20): 229-238.
- KOK, P. J. R., 2011. A new species of the genus *Gonatodes* Fitzinger, 1843 (Reptilia: Sphaerodactylidae) from central Guyana, northern South America. **Zootaxa** 3018: 1-12.
- LIMA, J. D., 2008. A herpetofauna do Parque Nacional Montanhas do Tumucumaque, Amapá, Brasil, Expedições I a V. In: E. BERNARD (Ed.): Inventários Biológicos Rápidos no Parque Nacional Montanhas do Tumucumaque, Amapá, Brasil. **RAP Bulletin of Biological Assessment** 48: 38-50.
- MACCULLOCH, R. D. & R. P. REYNOLDS, 2012. Amphibians and Reptiles from Paramakatoi and Kato, Guyana. **Check List** 8(2): 207-210.
- NIELSEN, S., R. JAIRAM, P. E. OUBOTER & B. NOONAN, 2012. Preliminary Report-Reptiles and Amphibians. In: **Southeast Suriname RAP Survey**. Grensgebergte and Kasikasima. March 9-29, 2012: 52-54. Conservation International, Paramaribo.
- NIELSEN, S., R. JAIRAM, P. E. OUBOTER & B. NOONAN, 2013. A herpetofaunal survey of the Grensgebergte and Kasikasima regions, Suriname. In: L. E. ALONSO & T. H. LARSEN (Eds.): A rapid biological assessment of the upper Palumeu river watershed (Grensgebergte and Kasikasima) of Southeastern Suriname. **RAP Bulletin of Biological Assessment** 67: 131-144.
- NOONAN, B. P. & P. GAUCHER, 2005. Phylogeography and demography of Guianan harlequin toads (*Ateolopus*): diversification within a refuge. **Molecular Ecology** 14(10): 3017-3031.
- OUBOTER, P. E., R. JAIRAM & C. KASANPAWIRO, 2011. A rapid assessment of the amphibians and reptiles of the Kwamalasamutu region (Kutari/Lower Sipaliwini Rivers), Suriname. In: B. J. O'SHEA, L. E. ALONSO & T. H. LARSEN (Eds.): A rapid biological assessment of the Kwamalasamutu region, Southwestern Suriname. **RAP Bulletin of Biological Assessment** 63: 124-130.
- REYNOLDS, R. P. & R. D. MACCULLOCH, 2012. Preliminary checklist of amphibians and reptiles from Baramita, Guyana. **Check List** 8(2): 211-214.
- RODRIGUES, M. T., M. TEIXEIRA JR., R. S. RECODER, F. DAL VECHIO, R. DAMASCENO & K. C. M. PELLEGRINO, 2013. A new species of *Leposoma* (Squamata: Gymnophthalmidae) with four fingers from the Atlantic Forest central corridor in Bahia, Brazil. **Zootaxa** 3635(4): 459-475.
- SEÑARIS, J. C., C. A. LASSO, G. RIVAS, M. KALAMANDEEN & E. MARAWANARU, 2008. Amphibians and reptiles of the Acarai Mountains, and Sipu, Kamoá and Essequibo rivers in the Konashen COCA, Guyana. In: L. E. ALONSO, J. MCCULLOUGH, P. NASKRECKI, E. ALEXANDER & H. E. WRIGHT (Eds.): A rapid biological assessment of the Konashen Community Owned Conservation Area, Southern Guyana. **RAP Bulletin of Biological Assessment** 51: 55-62.
- STURARO, M. J. & T. C. S. AVILA-PIRES, 2011. Taxonomic revision of the geckos of the *Gonatodes concinnatus* complex (Squamata: Sphaerodactylidae), with description of two new species. **Zootaxa** 2869: 1-36.

