

RESEARCH ARTICLE

Two new species of *Vitalius* (Araneae: Theraphosidae) from the restingas of the states of Rio de Janeiro, Bahia and Sergipe, Brazil

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ABSTRACT. Brazil is the country with the most diverse tarantula (Theraphosidae) fauna, having 215 described species. *Vitalius* Lucas, Silva Júnior & Bertani, 1993 is one of the most diverse and common genera in Southern, Southeastern and Central-West regions of Brazil with ten described species. Individuals of *Vitalius* species are large and widespread in areas of the Brazilian Atlantic Forest. A single species is known to occur in areas of Cerrado vegetation. Herein, two new species are described from areas of restinga, coastal areas typically with low vegetation and sandy soil, in the coast of the states of Rio de Janeiro (*Vitalius restinga* **sp. nov.**), Bahia and Sergipe (*Vitalius sapiranga* **sp. nov.**). Males and females of these two new species have a much longer than wide sternum. Males have a short apical keel in the male palpal bulb. The two species can be distinguished by embolus width, slender in *V. restinga* **sp. nov.** and thicker in *V. sapiranga* **sp. nov.** Females can be distinguished by the spermathecae shape, slender in *V. restinga* **sp. nov.** and broader in *V. sapiranga* **sp. nov.** These are the first known theraphosids endemic to Brazilian Atlantic Coast restingas. Biological data indicate *V. sapiranga* **sp. nov.** and maybe *V. restinga* **sp. nov.** commonly use bromeliads as retreats. It is herein hypothesized they are sister species occupying similar habitats in Brazilian coast, but separated by ca. 1,000 kilometers.

KEY WORDS. Aranha-caranguejeira, bromeliad, *Pachistopelma*, spider, tarantula, taxonomy.

INTRODUCTION

Brazil is home to an important fauna of theraphosids, with 215 described species (World Spider Catalog 2022). Popularly known as aranhas-caranguejeiras in Brazil and tarantulas in English speaking countries, they are the largest spiders and important elements of tropical and subtropical fauna.

The theraphosid genus *Vitalius* Lucas, Silva Júnior & Bertani, 1993 is composed of ten species (World Spider Catalog 2022) distributed on Southern, Southeastern and part of Central-West of Brazil: *V. sorocabae* (Mello-Leitão, 1923) (type species), *V. dubius* (Mello-Leitão, 1923), *V. roseus* (Mello-Leitão, 1923), *V. vellutinus* (Mello-Leitão, 1923), *V. wacketi* (Mello-Leitão, 1923), *V. nondescriptus* (Mello-Leitão, 1926), *V. buecherli* Bertani, 2001, *V. longisternalis* Bertani, 2001, *V. lucasae* Bertani, 2001, and *V. paranaensis* Bertani, 2001. Most species inhabits areas of Brazilian Atlantic Forest, and

a single species is known to occur in Cerrado vegetation. The Brazilian coast has also a typical vegetal formation, the Brazilian Atlantic Coast restinga, characterized by sandy dunes and low vegetation, as shrubs, but also having trees that can reach 15 meters tall further inland (Lacerda et al. 1984, Rocha 1994, Rizzini 1997). The presence of high vegetation is prevented by the sandy and nutrient-impooverished soil having low capability of water retention. However, the presence of bodies of water, which sometimes can be very large, is common. Most of the vegetal species originate from the close Brazilian Atlantic Forest, but, due to the nutrient-impooverished soil near the coastline, cactuses and bromeliads are the dominant plants in this sandy area. Therefore, restingas are a vegetation mosaic (Lacerda et al. 1984, Rocha 1994, Rizzini 1997).

The restingas are found on most of the Brazilian coast, and can be very small to very large, depending on the region topography. Larger restingas have dunes that can be 80–90 m

high (Rizzini 1997). They are found in southern Brazil (Lagoa dos Patos, state of Rio Grande do Sul); Florianópolis, state of Santa Catarina); Southeast (Arraial do Cabo, state of Rio de Janeiro) and in many areas of the Northeast (Lacerda et al. 1984, Rocha 1994, Rizzini 1997).

Restingas are recent formations, originated on the Quaternary or Tertiary period. The plant diversity is high and the endemism of animal and plants is moderate to low. Normally, the fauna and flora of restingas are the same as those of the Brazilian Atlantic Forest, or even the Amazon forest. However, only 2.6% of the plant species of restingas are endemic in the state of Rio de Janeiro, Brazil (Lacerda and Araujo 1987).

Restingas have been suffering anthropic pressure by centuries, mainly due to urban expansion, as many of the larger, more densely populated cities developed in the Brazilian coast (Rocha 1994). As a result of this process, Atlantic Coast restingas have been reduced by more than 90% (Schipper 2023). Therefore, it is very important to better understand the fauna and flora of restingas and the conservation of its endemic biota is crucial.

Herein, two new *Vitalius* species are described from areas of the Brazilian Atlantic coast restingas. These are probably the first two theraphosid species known to be endemic to this ecoregion.

MATERIAL AND METHODS

All measurements are in millimeters and were obtained with a Mitutoyo digital caliper with an error of 0.005 mm, rounded up to two significant digits for large measurements. A Leica LAS Montage and LAS 3D module mounted on a Leica M205C dissecting microscope with a DFC 450 camera attached were used for image capture and measurements of other small structures. Leg and palp measurements were taken from the dorsal view of the left side. Leg spine terminology follows Petrunkevitch (1925) and Bertani (2001). Structures of the left side of the specimens were chosen for descriptions. Male palpal bulb keel terminology follows Bertani (2000). Urticating setae terminology follows Cooke et al. (1972), the position of urticating setae on the dorsum of the spider follows Bertani and Guadanucci (2013). Each of the six abdominal regions had five urticating setae measured.

Abbreviations: (A) apical keel, (ALE) anterior lateral eyes, (AME) anterior median eyes, (d) dorsal, (ITC) inferior tarsal claw, (p) prolateral, (PI) prolateral inferior keel, (PLE) posterior lateral eyes, (PLS) posterior lateral spinnerets,

(PME) posterior median eyes, (PMS) posterior median spinnerets, (PS) prolateral superior keel, (R) retrolateral keel, (SA) subapical keel, (STC) superior tarsal claws, (v) ventral.

Specimens from the following institutions were examined: (IBSP) = Instituto Butantan, São Paulo; (MNRJ) = Museu Nacional do Rio de Janeiro, Rio de Janeiro; (MZUSP) = Museu de Zoologia da Universidade de São Paulo, São Paulo.

Geographic coordinates were obtained with Google Earth™. The center of the municipality was used when the information on the label of the specimens was unavailable and indicated by square brackets. Original coordinates obtained from labels are indicated by rounded brackets. For species distribution, maps were done with SimpleMappr (Shorthouse 2010).

TAXONOMY

Vitalius Lucas, Silva Júnior & Bertani, 1993

Pamphobeteus (in part: *Pamphobeteus sorocabae* Mello-Leitão, 1923: 233; *Pamphobeteus roseus* Mello-Leitão, 1923: 232).

Pterinopelma (in part: *Pterinopelma dubium* Mello-Leitão, 1923: 188; *Pterinopelma vellutinum* Mello-Leitão, 1923: 186, figs 112–113; *Pterinopelma wacketi* Mello-Leitão, 1923: 185, figs 114–115).

Hapalopus (in part: *Hapalopus nondescriptus* Mello-Leitão, 1926: 319, figs 7–8).

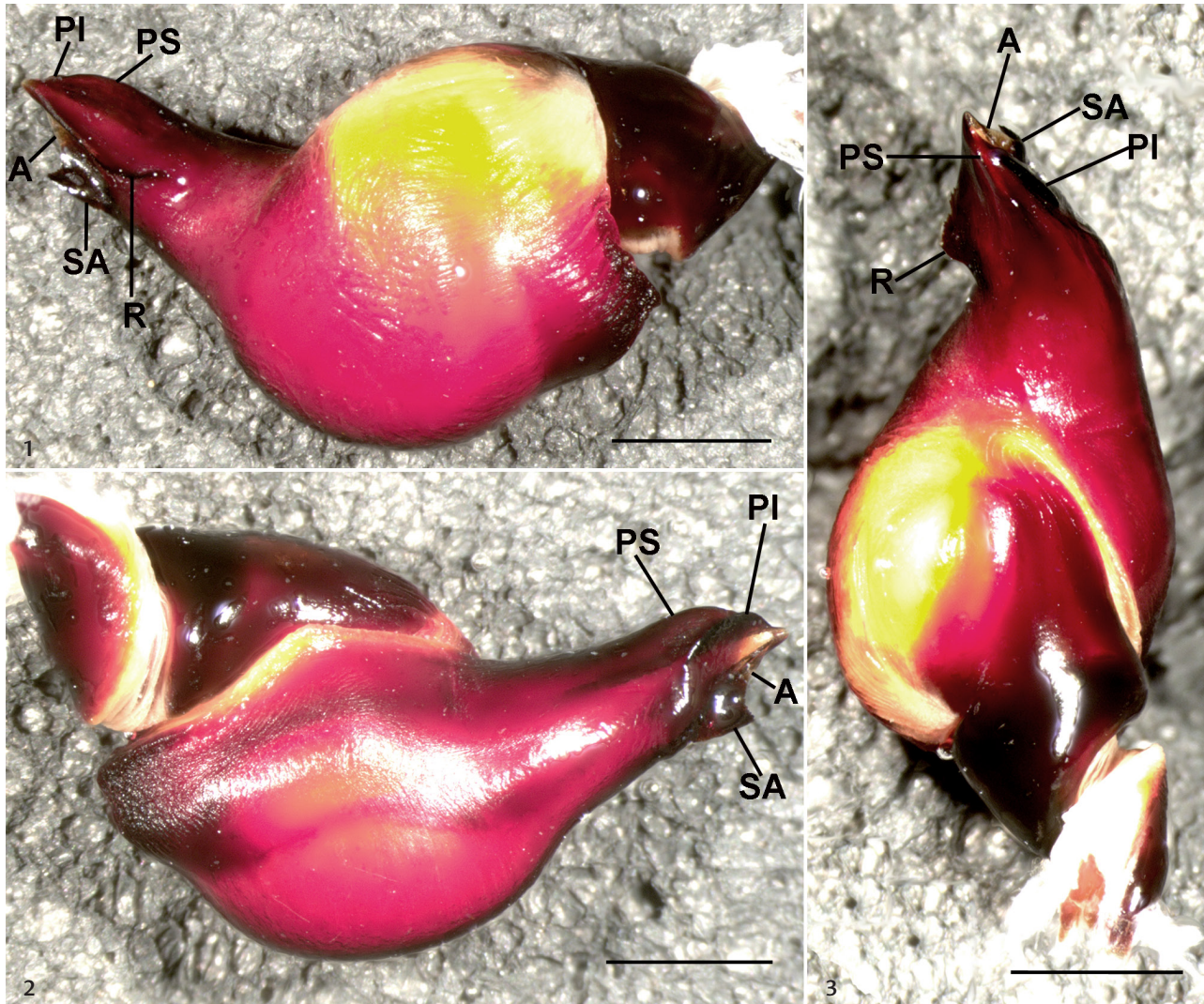
Vitalius sapiranga sp. nov.

Figs 1–23, 42–43

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Diagnosis. Males and females of *Vitalius sapiranga* sp. nov. resemble those of *Vitalius longisternalis* and *V. restinga* sp. nov. by the sternum much longer than wide (Fig. 8). Males differ from those of *V. longisternalis* by the short apical keel (Figs 1–3) and from *V. restinga* sp. nov. by the bulky embolus (Figs 1–3). Females differ from those of *V. longisternalis* and *V. restinga* sp. nov. by the wider spermathecae receptacles (Figs 12–15).

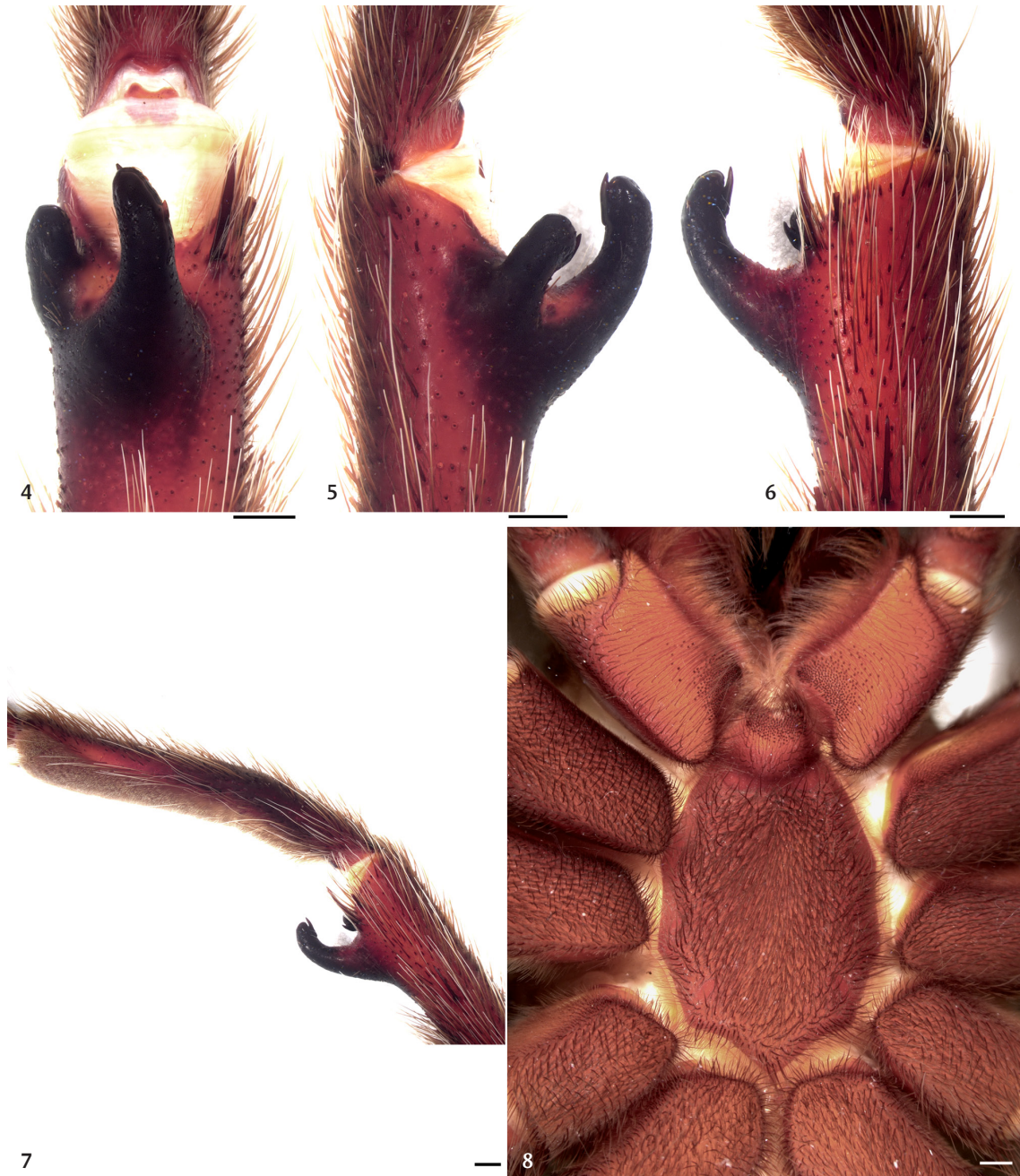
Type material. Holotype male from Brazil, state of Bahia, Mata de São João, Arembepe [12°46'S, 38°11'W], I. Grantsau col. (IBSP 6449, Ref. 11127); paratype female, state of Sergipe, Santa Luzia do Itanhý, Crasto [11°23'S, 37°24'W], A. D. Brescovit et al., November 1996 (IBSP 8534, Ref. 79901); paratypes 2 females, 3 immature males from Brazil state of Sergipe, Santo Amaro das Brotas (Gravatá) [10°48'S, 37°00'W], no collector, 23 March 1978, together with several *Pachistopelma bromelicola* Bertani, 2012 (MZUSP 77912);



Figures 1–3. *Vitalius sapiranga* sp. nov., holotype male, left bulb: (1) retrolateral; (2) prolateral; (3) dorsal. (A) apical keel, (PI) prolateral inferior keel, (PS) prolateral superior keel, (R) retrolateral keel, (SA) subapical keel. Scale bars: 1 mm.

paratype male from Brazil, state of Bahia, Mata de São João, Arembepe [12°46'S, 38°11'W], I. Grantsau col. (IBSP 6449, Ref. 81123); paratype male, same locality and collector (IBSP 6448 Ref. 81123); paratype male, same locality and collector (IBSP 6450, Ref. 81123); paratype male from Brazil, state of Bahia, Mata de São João, Praia do Forte, RPPN Sapiranga [12°34'S, 38°02'W], R. Bertani, C.S. Fukushima and R. H. Nagahama col., 2 October 2007 in bromeliad, matured in captivity (MNRJ 07724); paratype male, same locality, collectors and data, in bromeliad, matured in captivity (MNRJ 07725); paratype female, same locality, collectors and data, in bromeliad with eggsac (MNRJ 07726).

Description. Holotype male. Carapace: 19.65 long, 17.65 wide, chelicerae 9.35. Legs (femur, patella, tibia, metatarsus, tarsus, total): I: 18.86, 9.60, 16.01, 15.18, 8.53, 68.18. II: 17.70, 8.18, 14.23, 14.70, 8.53, 63.34. III: 15.00, 7.80, 12.71, 15.62, 8.14, 59.27. IV: 18.35, 8.03, 15.77, 21.91, 9.04, 73.10. Palp: 11.47, 6.13, 9.35, –, 4.10, 31.05. Midwidths: femora I–IV = 3.50, 3.51, 4.43, 3.68, palp = 2.48; patellae I–IV = 3.45, 3.42, 3.59, 3.36, palp = 2.73; tibiae I–IV = 2.89, 2.81, 2.71, 2.83, palp = 3.11; metatarsi I–IV = 1.91, 1.71, 1.83, 1.74; tarsi I–IV = 1.51, 1.35, 1.42, 1.42, palp = 2.10. Abdomen 16.28 long, 9.00 wide. Spinnerets: PMS, 2.06 long, 0.72 wide, 0.94 apart; PLS, 2.91 basal, 2.52 middle, 3.53 distal; midwidths 1.11, 0.97, 0.69, respectively.



Figures 4–8. *Vitalius sapiranga* sp. nov., holotype male. (4–6) Left leg I tibial apophysis: (4) ventral; (5) prolateral; (6) retrolateral; (7) metatarsus and tibia I, retrolateral; (8) sternum, labium, maxillae and coxae. Scale bars: 1 mm.

Carapace: Length to width 1.11; cephalic area moderately raised, thoracic striae deep. Fovea: deep, straight, 2.81 wide. Carapace covered with short, slender, dense setae, bordered with long setae pointing out. Eyes and eye tubercle: Tubercle 0.77 high, 2.05 long, 2.64 wide. Clypeus

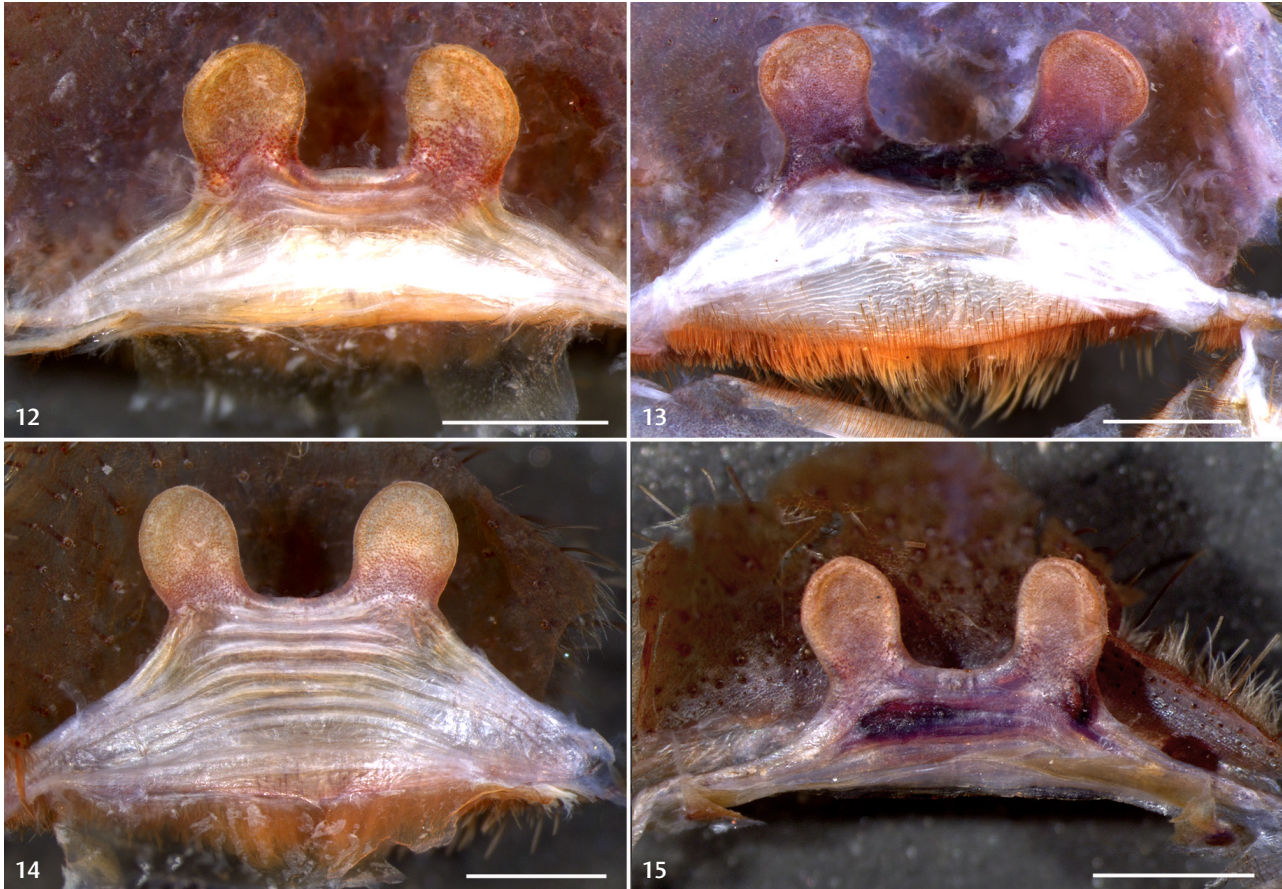
0.40 wide. Anterior row procurved, posterior recurved. Sizes and inter-distances: AME 0.56, ALE 0.72, PME 0.40, PLE 0.58, AME–AME 0.43, AME–ALE 0.27, AME–PME 0.20, ALE–ALE 1.62, ALE–PME 0.44, PME–PME 1.25, PME–PLE 0.21, PLE–PLE 1.92, ALE–PLE 0.36, AME–PLE 0.65. Eye



Figures 9–11. *Vitalius sapiranga* sp. nov., MNRJ 07725, male, left bulb, variation: (9) retrolateral; (10) prolateral; (11) dorsal. (A) apical keel, (PI) prolateral inferior keel, (PS) prolateral superior keel, (R) retrolateral keel, (SA) subapical keel. Scale bars: 1 mm.

group 2.64 wide, 1.32 long. Maxillae: Length 5.40, width 3.69. Cuspules: ca. 212 spread over ventral inner heel. Lyra absent. Labium: 2.16 long, 3.20 wide, with ca. 181 cuspules spaced by ca. one diameter from each other on the anterior third center. Labio-sternal groove deep with two large sigilla (Fig. 8). Chelicerae: Rastellum absent, basal segment with 9 teeth on promargin and ca. 20 denticles on basal area. Sternum: Length 9.39, width 6.57. Posterior angle rounded, not separating coxae IV. Sigilla: first and second pairs rounded; third oval, all ca. one diameter from margin (Fig. 8). Legs: leg formula: IV I II III. Clavate trichobothria: on distal 2/3 of tarsi I–IV. Stridulatory setae: Absent. Scopula: Retrolateral femur IV scopulate. Tarsi I–IV fully scopulate. Metatarsi I–II fully scopulate, III 1/2, IV 1/4 distal

scopulate. Metatarsus IV scopula divided by row of 3–4 setae. Spination: palp: femur p0-0-1, patella p1, tibia v0-1-0, p2-4-2; leg I: femur p0-0-1, patella 0, tibia v2-2-1, p1-0-0, r0-1-1, metatarsus v0-1-1ap; leg II: femur p0-1-1, patella 0, tibia v2-2-4ap, p1-1-1, r0-1-0; metatarsus v1-1-2ap, p2-0-0, r0-1-0; leg III: femur p0-0-1, r0-0-1, patella p1, r1, tibia v1-2-4ap, p1-1-1, r1-1-0, metatarsus v3-3-3ap, p1-1-1, r0-1-1; leg IV: femur r0-0-1, patella 0, tibia v2-2-4(2ap), p0-1-1, r1-1-1, metatarsus v19(3ap), p1-2-1, r1-1-1. Claws: ITC absent from all legs; STC with a single row of 4–7 denticles on all legs. Urticating setae: Abdomen bald. Information from specimen MNRJ 07725. Position, type and length range: MA, I, 0.30–0.42; LA, I, 0.26–0.30; MM, I, 0.63–0.65; LM, I, 0.23–0.29; MP, I, 0.29–0.38; LP, I, 0.32–0.34. Intermediates of types I and III



Figures 12–15. *Vitalius sapiranga* sp. nov., females, spermathecae, dorsal: (12) IBSP 8534; (13) MZUSP 77912; (14) MNRJ 07726; (15) same, exuvium. Scale bars: 1 mm.

on MM region having very small to absent reversed barbed region (Bertani 2001, Bertani and Guadanucci 2013); distribution of urticating setae on abdomen corresponds to fig. 5 in Bertani and Guadanucci (2013). Palp (Figs 1–3). Palpal bulb pyriform, embolus length 1.78, tegulum length 2.45, embolus slightly flattened laterally at distal region, apex short. Prolateral keels present. PS forming embolus edge distally. A present, short. R present, sharp. SA present, well developed. Bifid tibial spur (Figs 4–7) with processes originating from common well-developed base, both roughly straight, retrolateral slightly longer. A large romboid spine at the internal face of prolateral process and another at the internal face of distal retrolateral process. Metatarsus I curved at basal third, when folded touches the retrolateral face of retrolateral tibial process (Fig. 7). Color pattern: Carapace and chelicerae brown. Carapace bordered with scattered light brown long setae, chelicerae with long light brown setae. Legs brown with abundant light brown long

setae, mainly on ventral area. Coxae of legs, sternum, labium and maxillae covered ventrally with light brown setae. Abdomen dorsally and ventrally black with abundant long reddish setae. Femora, patellae, tibiae and metatarsi of legs and palp lacking light stripes. Apex of leg segments with very discrete whitish rings.

Paratype female IBSP 8534. Carapace 18.15 long, 14.97 wide, chelicerae 11.74. Legs (femur, patella, tibia, metatarsus, tarsus, total): I: 12.65, 7.39, 10.60, 8.88, 5.68, 45.20. II: 11.37, 6.82, 9.28, 8.73, 5.22, 41.42. III: 10.27, 5.78, 7.89, 9.46, 6.07, 39.47. IV: 12.41, 6.81, 11.05, 13.77, 5.61, 49.65. Palp: 9.05, 6.07, 7.26, –, 5.71, 28.09. Midwidths: femora I–IV = 2.76, 2.85, 3.40, 3.12, palp = 2.19; patellae I–IV = 3.06, 3.05, 2.80, 2.90, palp = 2.62; tibiae I–IV = 2.57, 2.43, 2.57, 2.76, palp = 2.42; metatarsi I–IV = 2.05, 1.89, 1.85, 1.67; tarsi I–IV = 2.02, 1.98, 1.98, 1.98, palp = 2.01. Abdomen 21.93 long, 17.47 wide. Spinnerets: PMS, 2.58 long, 0.84 wide, 1.63 apart; PLS, 3.97 basal, 3.04 middle, 3.18 distal; midwidths 1.42, 1.32, 1.03, respectively.



Figures 16–19. *Vitalius sapiranga* sp. nov., alive: (16) female (MNRJ 07726); (17) male (MNRJ 07725); (18) female (IBSP 8534); (19) immature from Brazil, state of Sergipe, Santa Luzia do Itanh, Crasto. Photos: Rogério Bertani.

Carapace: Length to width 1.21; cephalic area moderately raised, thoracic striae deep. Fovea: deep, straight, 2.81 wide. Carapace covered with short, slender, dense setae, bordered with long setae pointing out and some longer setae directed to the internal area. Eyes and eye tubercle: Tubercle 0.56 high, 1.88 long, 2.71 wide. Clypeus 0.53 wide. Anterior row procurved, posterior slightly recurved. Sizes and inter-distances: AME 0.57, ALE 0.66, PME 0.41, PLE 0.55, AME–AME 0.39, AME–ALE 0.31, AME–PME 0.18, ALE–ALE 1.70, ALE–PME 0.52, PME–PME 1.24, PME–PLE 0.22, PLE–PLE 2.02, ALE–PLE 0.33, AME–PLE 0.60. Eye group 2.62 wide, 1.24 long. Maxillae: Length 5.08, width 3.75. Cuspules: ca. 317 spread over ventral inner heel. Lyra absent. Labium 2.03 long, 3.51 wide, with 191 cuspules spaced by ca. one diameter from each other on the anterior third center. Labio-sternal groove deep, narrow, with two large sigilla. Chelicerae: Rastellum absent, basal segment with 9 teeth on promargin and 22 denticles on basal area. Sternum: Length

9.17, width 7.01. Posterior angle rounded, not separating coxae IV. Sigilla: first and second pairs rounded; third oval, all pairs ca. one diameter from margin. Legs: formula: IV I II III. Clavate trichobothria: on distal 2/3 of tarsi I–IV. Stridulatory setae: Absent. Scopula: Retrolateral femur IV scopulate. Tarsi I–IV fully scopulate. Metatarsi I–II 4/5, III 1/2, IV 1/4 distal scopulate. Metatarsus IV not divided by row of setae. Spination: palp: femur p0-0-1, patella 0, tibia v0-1-4ap, p0-1-1, leg I: femur p0-0-1, patella 0, tibia v0-1-3ap, metatarsus v0-0-1ap; leg II: femur p0-0-1, patella 0, tibia v1-1-3ap, p1-1-0; metatarsus v1-0-3ap, p1-0-0; leg III: femur 0, patella 0, tibia v1-2-3ap, p1-1-1, r1-1-0, metatarsus v3-2-4ap, p1-1-1, r1-1-0; leg IV: femur 0, patella 0, tibia v0-2-6(4ap), p1-1-1, r1-1-0, metatarsus v20(4ap), p1-1-1, r0-1-1. Claws: ITC absent from all legs; Palp with an unpaired smooth claw, STC with 3–7 denticles on a single row. Urticating setae: Abdomen bald. Information from specimen MNRJ 07726. Position, type and length range: MA, I, 0.20–0.22;



Figures 20–23. *Vitalius sapiranga* sp. nov., habitat: (20) general view of a restinga area in RPPN Sapiranga, Mata de São João, state of Bahia, Brazil; (21) bromeliad in the same area; (22) female with eggsac using the bromeliad as retreat; (23) same, detail. Photos: Rogério Bertani.

LA, I, 0.19–0.21; MM, I, 0.46–0.53; LM, I, 0.24–0.27. MP, I, 0.36–0.43; LP, I, 0.27–0.30. Intermediates of types I and III on MM region having small to absent reversed barbed region (Bertani 2001, Bertani and Guadanucci 2013); distribution of urticating setae on abdomen corresponds to fig. 5 in Bertani and Guadanucci (2013).

Genitalia. Two short spermathecae separated by heavily sclerotized short area, spermathecal stalk slightly narrower than rounded spermathecal bulb (Fig. 12).

Color pattern: As in male.

Distribution. Brazil, known only from restingas in the coast of the states of Sergipe and northeastern Bahia (Figs 42–43).

Etymology. The specific epithet refers to the Sapiranga Private Heritage Reserve (RPPN) in Mata de São João, state of Bahia, a typical area where the species occurs.

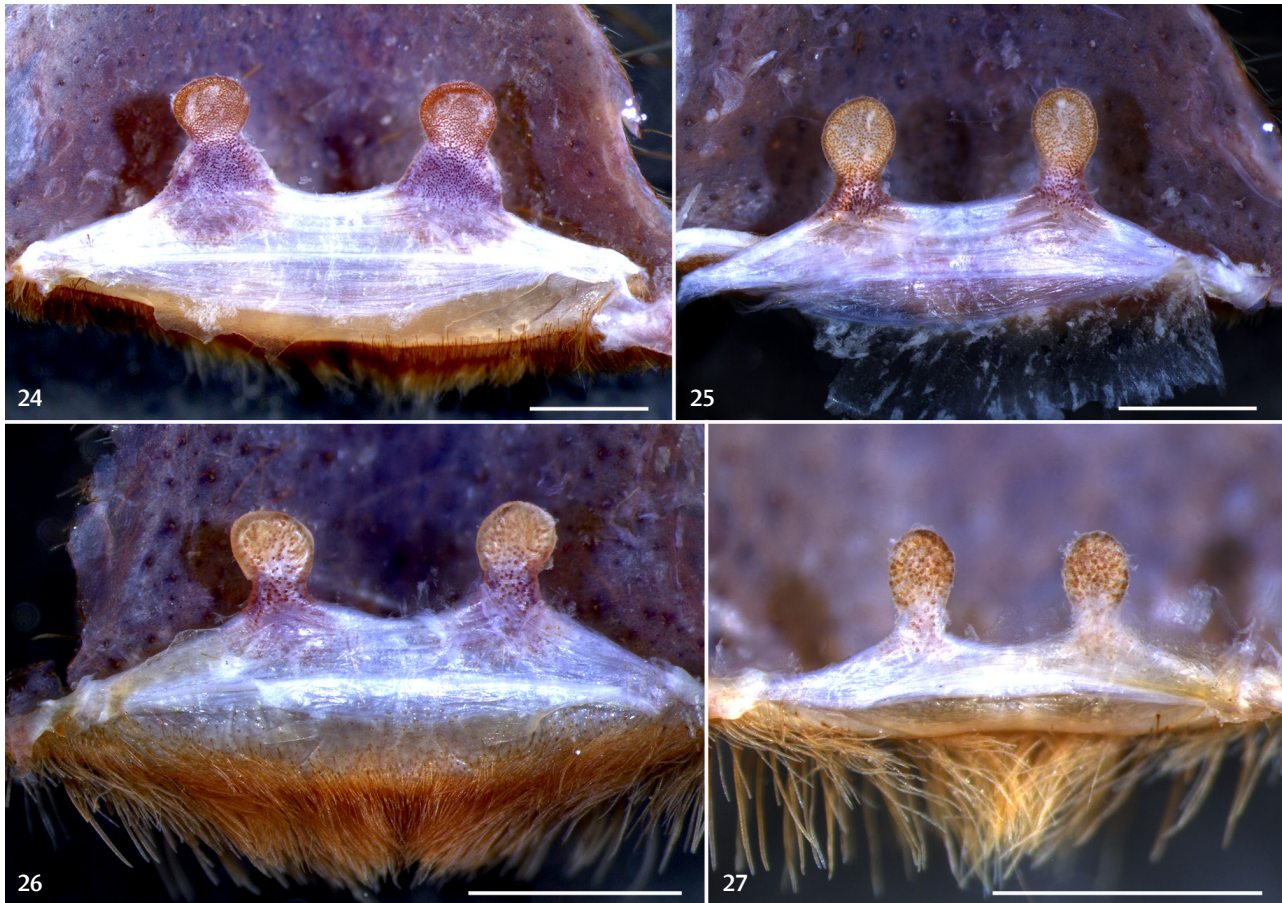
Vitalius restinga sp. nov.

Figs 24–42, 44

<https://zoobank.org/2DC9A1A7-736E-47BD-A09A-AA21612BC860>

Diagnosis. Males and females of *Vitalius restinga* sp. nov. resemble those of *Vitalius longisternalis* and *V. sapiranga* sp. nov. by the sternum much longer than wide (Fig. 35). Males differ from those of *V. longisternalis* by the short apical keel (Figs 28–30) and from *V. sapiranga* sp. nov. by the slender embolus (Figs 28–30). Females differ from those of *V. longisternalis* and *V. sapiranga* sp. nov. by the slender spermathecae receptacles (Figs 24–27). Additionally, males and females of *V. restinga* sp. nov. can be distinguished from those of *V. longisternalis* and *V. sapiranga* sp. nov. by the whitish setae on the retrolateral face of chelicerae.

Type material. Holotype female from Brazil, state of Rio de Janeiro, Arraial do Cabo, Ilha de Cabo Frio [22°59'S,



Figures 24–27. *Vitalius restinga* sp. nov., females, spermathecae, dorsal: (24) holotype (MNRJ 12939); (25) MNRJ 07723; (26) MNRJ 12948; (27) (MNRJ 13735). Scale bars: 1 mm.

41°59'W], R. L. C. Baptista col, 1985, T09 (MNRJ 12939); paratype male from Brazil, state of Rio de Janeiro, Búzios [22°45'S, 41°53'W], J. Batista col. 27 January 2000 (IBSP 8057); paratype male from Brazil, state of Rio de Janeiro, Arraial do Cabo [22°45'S, 41°19'W], Prof. B. Manchal col., 9 March 1980 (MNRJ 13716); paratype female from Brazil, state of Rio de Janeiro, Arraial do Cabo, Ilha de Cabo Frio [22°59'S, 41°59'W], R.L.C. Baptista col., August 1985, T56 (MNRJ 07723); paratype female from Brazil, state of Rio de Janeiro, Macaé, APA SANA, Trilha Peito de Pombo [22°18'S, 42°12'W], A. Chagas Jr. and B. Segal col., 18 August 2002 (MNRJ 12948); paratype female from Brazil, state of Rio de Janeiro, Maricá, Itaipuaçu, km 6 [22°57'S, 42°57'W], no collector, 20 April 1972, in restinga (MNRJ 13551); paratypes female and immature from Brazil, state of Rio de Janeiro, Maricá, Ponta Negra [22°54'S, 42°43'W], Equipe de malacologia e alunos de pós-graduação col., 1–2 June 1977

(MNRJ 13735); paratype female from Brazil, state of Rio de Janeiro, Saquarema [22°53'S, 42°28'W], L. N. Garcia-Neto col., 12 February 1997 (MNRJ 13718); paratype male from Brazil, state of Rio de Janeiro, Praia de Massambaba [22°55'S, 42°2'W], no collector (IBSP 300870, Ref 78336).

Description. Holotype female. Carapace 19.87 long, 16.10 wide, chelicera 11.50. Legs (femur, patella, tibia, metatarsus, tarsus, total): I: 13.63, 8.70, 10.25, 9.60, 6.06, 48.24. II: 12.25, 7.62, 8.92, 8.93, 5.95, 43.67. III: 11.15, 7.38, 8.31, 9.35, 6.16, 42.35. IV: 13.34, 7.82, 11.31, 13.44, 6.85, 52.76. Palp: 10.24, 6.35, 7.62, –, 6.94, 31.15. Midwidths: femora I–IV = 2.76, 3.10, 3.51, 3.17, palp = 2.31; patellae I–IV = 3.15, 3.22, 3.13, 3.24, palp = 2.78; tibiae I–IV = 2.78, 2.60, 2.76, 2.85, palp = 2.57; metatarsi I–IV = 2.30, 2.20, 2.09, 2.01; tarsi I–IV = 2.30, 2.23, 2.09, 2.18, palp = 2.08. Abdomen 22.72 long, 16.70 wide. Spinnerets: PMS, 2.60 long, 1.17 wide, 1.56 apart; PLS, 3.54 basal, 2.78 middle, 3.89 distal; midwidths 1.78, 1.67, 1.14, respectively.



Figures 28–30. *Vitalius restinga* sp. nov., male IBSP 8057, left bulb: (28) retrolateral; (29) prolateral; (30) dorsal. (A) apical keel, (PI) prolateral inferior keel, (PS) prolateral superior keel, (R) retrolateral keel, (SA) subapical keel. Scale bars: 1 mm.

Carapace. Length to width 1.23; cephalic area raised, thoracic striae deep. Fovea: deep, straight, 3.39 wide. Carapace covered with short, slender, dense setae, bordered with long setae pointing out and some long setae pointing to the inner side. Eyes and eye tubercle: Tubercle 0.68 high, 2.25 long, 2.67 wide. Clypeus 0.31 wide. Anterior row procurved, posterior slightly recurved. Sizes and inter-distances: AME 0.66, ALE 0.68, PME 0.48, PLE 0.62, AME–AME 0.38, AME–ALE 0.31, AME–PME 0.19, ALE–ALE 1.72, ALE–PME 0.61, PME–PME 1.35, PME–PLE 0.16, PLE–PLE 1.98, ALE–PLE 0.33, AME–PLE 0.54. Eye group 2.64 wide, 1.43 long. Maxillae: Length 5.41, width 3.80. Cuspules: ca. 319 spread over ventral inner heel. Lyra absent. Labium 2.38 long, 3.89 wide, with

180 cuspules spaced by ca. one diameter from each other on the anterior third center. Labio-sternal groove deep, narrow, with two large sigilla.

Chelicerae. Rastellum absent, basal segment with 13 teeth on promargin and 23 denticles on basal area. Sternum: Length 9.51, width 6.89. Posterior angle rounded, not separating coxae IV. Sigilla: three pairs, ovals, all ca. one diameter from margin. Legs: formula: I = IV II III. Clavate trichobothria: on distal 2/3 of tarsi I–IV. Stridulatory setae: Absent. Scopula: Retrolateral femur IV scopulate. Tarsi I–IV fully scopulate. Metatarsi I–II fully scopulate; III 2/3, IV 2/5 distal scopulate. Metatarsus IV not divided by setae. Spination: palp: femur 0, patella 0, tibia v0-0-5(4ap), p0-1-1, leg I:



Figures 31–35. *Vitalius restinga* sp. nov., male IBSP 8057. (31–33) Left leg I tibial apophysis: (31) ventral; (32) prolateral; (33) retrolateral; (34) metatarsus and tibia I, retrolateral; (35) sternum, labium, maxillae and coxae. Scale bars: 1 mm.

femur 0, patella 0, tibia v0-0-2ap, metatarsus v0-0-1ap; leg II: femur 0, patella 0, tibia v0-0-2ap; metatarsus v0-0-2ap; leg III: femur 0, patella 0, tibia v0-0-2ap, r0-0-1, metatarsus v1-1-7ap, p0-0-1; leg IV: femur 0, patella 0, tibia v0-1-4(3ap), r0-0-1ap, metatarsus v17(4ap), p0-0-1. Claws: ITC absent from all legs; Palp with an unpaired smooth claw, STC with 1–5 denticles on a single row. Urticating setae: Position, type and length

range: MA, I, 0.19–0.20; LA, I, 0.19–0.22; MM, I, 0.32–0.37; LM, I, 0.29–0.33. MP, I, 0.33–0.39; LP, I, 0.33–0.36; distribution of urticating setae on abdomen corresponds to fig. 5 in Bertani and Guadanucci (2013).

Genitalia. (Fig. 24): Two short spermathecae separated by sclerotized short area, spermathecal stalk narrower than rounded spermathecal bulb.



Figures 36–38. *Vitalius restinga* sp. nov., male IBSP 300870, left bulb, variation: (36) retrolateral; (37) prolateral; (38) dorsal. (A) apical keel, (PI) prolateral inferior keel, (PS) prolateral superior keel, (R) retrolateral keel, (SA) subapical keel. Scale bars: 1 mm.

Color pattern. Carapace brown bordered with scattered light brown long setae. Chelicerae brown with abundant whitish short setae. Legs brown with abundant light brown long setae, mainly on ventral area. Labium and maxillae reddish brown. Coxae of legs ventrally and sternum light brown with light brown longer setae. Abdomen dorsally and ventrally brownish with abundant long yellowish setae. Femora, patellae, tibiae and basal third of metatarsi of legs and palp dorsally with very discrete whitish stripes. Apex of leg segments with discrete whitish rings.

Paratype male IBSP 8057. Carapace 17.96 long, 15.33

wide, chelicerae 9.12. Legs (femur, patella, tibia, metatarsus, tarsus, total): I: 15.96, 7.71, 13.08, 13.21, 7.59, 57.55. II: 15.29, 7.30, 11.37, 11.89, 7.17, 53.02. III: 12.77, 7.06, 10.36, 12.12, 6.87, 49.18. IV: 15.56, 7.33, 13.64, 17.63, 7.44, 61.60. Palp: 9.59, 5.50, 8.41, –, 3.92, 27.42. Midwidths: femora I–IV = 3.07, 2.88, 3.39, 2.93, palp = 1.95; patellae I–IV = 2.98, 3.14, 3.08, 3.03, palp = 2.57; tibiae I–IV = 2.59, 2.36, 2.56, 2.70, palp = 2.58; metatarsi I–IV = 1.72, 1.83, 1.75, 1.79; tarsi I–IV = 1.62, 1.54, 1.44, 1.50, palp = 2.07. Abdomen 15.74 long, 9.54 wide. Spinnerets: PMS, 2.27 long, 0.93 wide, 1.11 apart; PLS, 2.79 basal, 2.46 middle, 3.23 distal; midwidths 1.24, 1.15, 0.90, respectively.



Figures 39–41. *Vitalius restinga* sp. nov., alive: (39) male IBSP 8057; (40, 41) female from Brazil, state of Rio de Janeiro, Saquarema, praia de Massambaba, in nature. Photos: (39) Rogério Bertani; (40, 41) Bruna Pozzebon.

Carapace. Length to width 1.17; cephalic area moderately raised, thoracic striae deep. Fovea: deep, straight, 2.20 wide. Carapace covered with short, slender, dense setae, bordered with long setae pointing out. Eyes and eye tubercle: Tubercle 0.86 high, 1.94 long, 2.66 wide. Clypeus 0.14 wide. Anterior row procurved, posterior slightly recurved. Sizes

and inter-distances: AME 0.64, ALE 0.67, PME 0.37, PLE 0.59, AME–AME 0.31, AME–ALE 0.29, AME–PME 0.20, ALE–ALE 1.63, ALE–PME 0.52, PME–PME 1.24, PME–PLE 0.15, PLE–PLE 1.86, ALE–PLE 0.29, AME–PLE 0.54. Eye group 2.62 wide, 1.36 long. Maxillae: Length 4.94, width 2.81. Cuspules: ca. 254 spread over ventral inner heel. Lyra absent (Fig. 35). Labium:

2.27 long, 3.16 wide, with ca. 150 cuspules spaced by less than one diameter from each other on the anterior third center. Labio-sternal groove deep with two large sigilla (Fig. 35).

Chelicerae. Rastellum absent, basal segment with 11 teeth on promargin and 19 denticles on basal area. Sternum: Length 8.12, width 6.26. Posterior angle rounded, not separating coxae IV. Sigilla: three pairs, ovals, all ca. one diameter from margin (Fig. 35). Legs: leg formula: IV I II III. Clavate trichobothria: on distal 2/3 of tarsi I–IV. Stridulatory setae: absent. Scopula: Retrolateral femur IV scopulate. Tarsi I–IV fully scopulate. Metatarsi I–II fully scopulate, III 2/3, IV 2/5 distal scopulate. Metatarsus IV scopula not divided by row of setae. Spination: palp: femur p0-0-1, patella 0, tibia p3-2-1; leg I: femur p0-0-1, patella 0, tibia v0-0-1, metatarsus v0-0-1ap; leg II: femur 0, patella 0, tibia v0-1-4ap; metatarsus v0-0-1ap; leg III: femur 0, patella 0, tibia v1-0-2ap, p0-0-1, r0-0-1, metatarsus v0-2-3ap, p1-0-1, r0-0-1; leg IV: femur 0, patella 0, tibia v1-4-4(3ap), r0-1-0, metatarsus v22(4ap), p0-0-1. Claws: ITC absent from all legs; STC with a single row of 3–6 denticles on all legs.

Urticating hairs: Position, type and length range: MA, I, 0.24–0.28; LA, I, 0.24–0.30; MM, bald; LM, I, 0.27–0.28; MP, I, 0.24–0.30; LP, bald; distribution of urticating setae on abdomen corresponds to fig 5 in Bertani and Guadanucci (2013).

Palp (Figs 28–30). Palpal bulb pyriform, embolus length 2.10, tegulum length 1.24, embolus slightly flattened laterally at distal region, apex short. Prolateral keels present. PS forming embolus edge distally. A present, short. R present, sharp. SA present, weakly developed. Bifid tibial spur with processes originating from common base, both roughly straight, retrolateral longer, with a slight curvature at its distal portion. A romboid spine at the internal face of prolateral process and another at the internal face of distal retrolateral process (Figs 31–34). Metatarsus I with a curvature at its proximal third, when folded touches the retrolateral face of retrolateral process (Fig. 34).

Color pattern. As in female.

Distribution: Brazil, known only from some restingas in the coast of the state of Rio de Janeiro (Figs 42, 44).

Etymology. The specific epithet refers to the restinga, a Brazilian ecoregion, where this species is found.

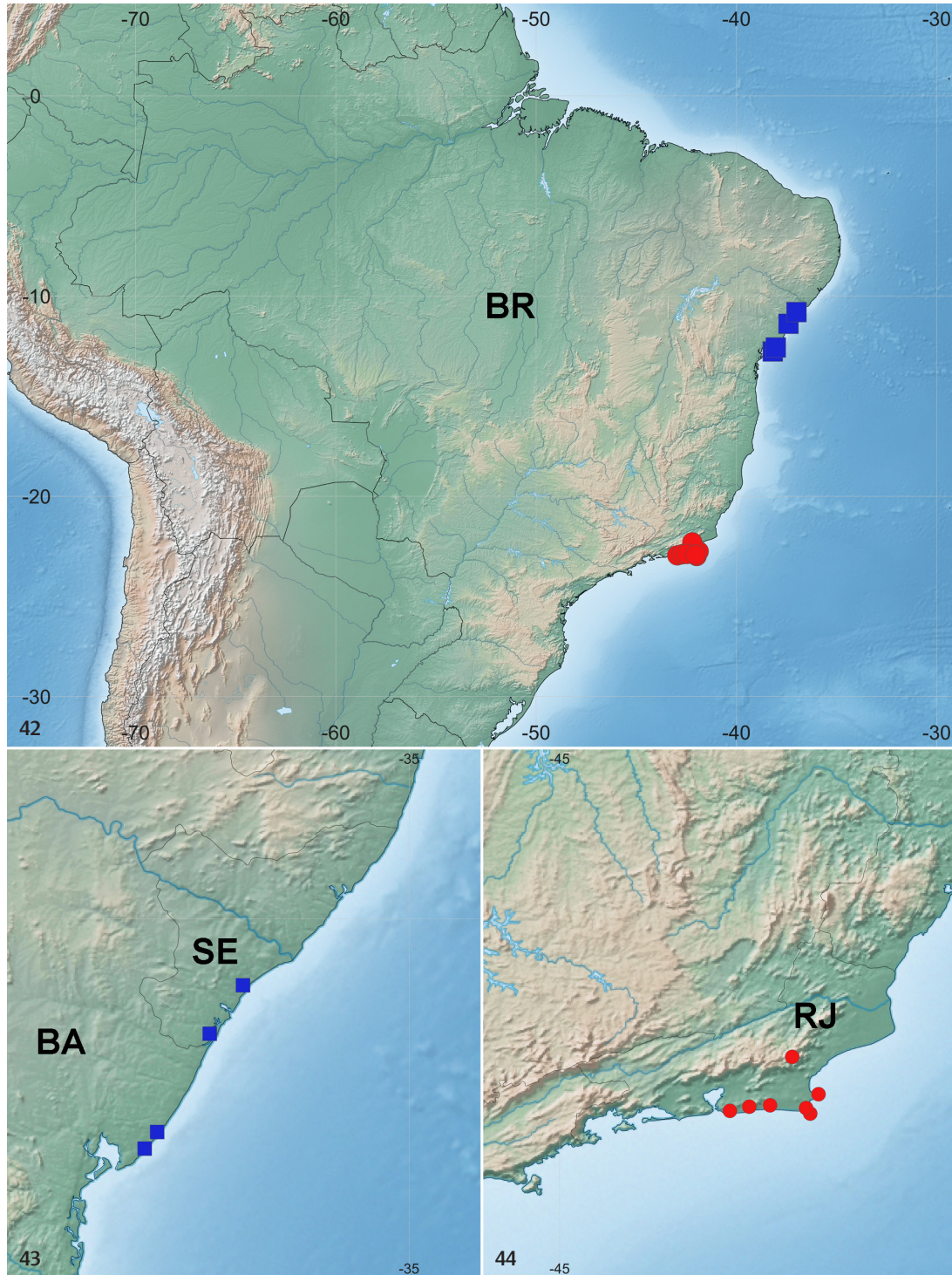
Remarks. Only three males of *V. restinga* sp. nov. were available for study and the male bulbs show an important degree of intraspecific variation (Figs 28–30, 36–38), as in the paratype used in the description the keels are not so developed. I have no doubt, though, they are conspecific, since the three specimens are from close localities and have a much longer than wide sternum and their chelicerae have

whitish setae. I have already seen this type of variation in other *Vitalius* species having underdeveloped keels on the male bulb.

DISCUSSION

Males of the two new species, herein, described have a characteristic male palpal bulb with a set of keels on the embolus shared by four theraphosine genera: *Pterinopelma* Pocock, 1901, *Lasiadora* C.L. Koch, 1850, *Nhandu* Lucas, 1983 and *Vitalius*. To determine which of these genera the new species should belong to was not an easy task. As *Vitalius nondescriptus* (Mello-Leitão, 1926) (see Bertani et al. 2012), both *V. sapiranga* sp. nov. and *V. restinga* sp. nov. have the apical keel short on the male bulb (Figs 1–3, 28–30), contrasting with the remaining *Vitalius* species that have a larger keel (Bertani 2001). A short apical keel is found in *Lasiadora* C. L. Koch, 1850 and *Pterinopelma* Pocock, 1901 species as well, but the new species lack a stridulatory apparatus that is a synapomorphy of *Lasiadora* and the sternum is much longer than wide contrasting with the rounded or slightly longer than wide sternum of *Pterinopelma* species (Bertani et al. 2011, Bertani and Leal 2016). Conversely, the lack of type III urticating setae of females and males having the metatarsus I touching the retrolateral side of the retrolateral tibial spur indicate the species are related with *Vitalius*.

The two new species are the first *Vitalius*, and possibly theraphosid species, endemic to the restinga ecoregion. This is not a friendly habitat for individuals of a family known to build burrows, due to the instability of the sandy soil. Interestingly, the two species were found using terrestrial bromeliads as retreats (Figs 20–23, 40–41). I found three specimens of *V. sapiranga* sp. nov. using bromeliads, including a female with an eggsac. The space between leaves were covered with silk, making a retreat. Other theraphosids known to use bromeliads are two species of the genus *Pachistopelma* Pocock, 1901, that only rarely are found outside them; and, eventually, other aviculariines (Bertani 2012). *Pachistopelma bromelicola* Bertani, 2012 is sympatric with *V. sapiranga* sp. nov. in the northern coast of the state of Bahia and Sergipe (Bertani 2012), sometimes occurring in the same bromeliad cluster (pers. obs.). However, for *Vitalius restinga* sp. nov., distributed on southeastern Brazil, I obtained a single record of the use of bromeliads as a retreat. The use of bromeliads by terrestrial theraphosids living in restinga could be explained by the sandy soil of this ecoregion that makes it difficult to dig stable burrows. A discussion was given in Bertani (2012) concerning the use of bromeliads by aviculariines such as *Pachistopelma* spp.



Figures 42–44. Distribution of *Vitalius sapiranga* sp. nov. and *V. restinga* sp. nov. in Brazil: (42) map of Brazil showing the distribution of both species; (43) Detail of the distribution of *V. sapiranga* sp. nov.; (44) Detail of the distribution of *V. restinga* sp. nov. (Red circle) *V. sapiranga* sp. nov., (Blue square) *V. restinga* sp. nov.; (BA) state of Bahia, Brazil, (BR) Brazil, (RJ) state of Rio de Janeiro, Brazil, (SE) state of Sergipe, Brazil.

Species of *Vitalius* are largely distributed in the Brazilian Atlantic Forest of Southern, Southeastern and part of Central-West of Brazil, normally on medium to higher altitudes (Bertani 2001). A single species, *Vitalius sorocabae* (Mello-Leitão, 1923) lives in areas of Cerrado (a savannah-like biome). Another species, *Vitalius wacketi* (Mello-Leitão, 1923), is found at lower altitudes, on the coast, from the Southern state of Rio de Janeiro to the Southern of Santa Catarina (Bertani 2001). Therefore, the discovery of two *Vitalius* species endemic to Brazilian Atlantic Coast restingas is remarkable. Furthermore, the presence of a short apical keel on the male bulb, shared by both species and also by *V. nondescriptus*, can be seen as a plesiomorphic retention, indicating these three species might be in a basal position relative to other *Vitalius* species in a cladogram. More interesting is that *V. restinga* sp. nov. and *V. sapiranga* sp. nov. share a common trait, the much longer than wide sternum, a feature only found in *V. longisternalis*, species that occur in Brazilian Atlantic Rainforest of the states of Paraná and Santa Catarina in Southern Brazil. But, in *V. longisternalis*, the apical keel of male bulb is longer, indicating the sternum shape would be a parallelism. Therefore, possibly *V. sapiranga* sp. nov. and *V. restinga* sp. nov. are sister species occupying similar habitats in Brazilian coast, but separated by ca. 1,000 km. Probably, their ancestor lived on an ancient sandy area covering the Brazilian coast and most parts of the old area are now covered by Brazilian Atlantic Forest, isolating the two species. Searches for related *Vitalius* species in the restingas of the states of Espírito Santo, Northern Rio de Janeiro and Southern Bahia could be done looking for additional related species in these areas that could strengthen this hypothesis.

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