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On Atlantic Forest rock outcrops: the first record of *Phyllopezus pollicaris* (Spix, 1825) (Squamata, Phyllodactylidae) in the state of Espírito Santo, southeastern Brazil

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Abstract

We present the first record of *Phyllopezus pollicaris* from the state of Espírito Santo, southeastern Brazil, on the Atlantic Forest rock outcrops of the Pedra do Elefante, an inselberg area located at the municipality of Nova Venécia. We discuss the first state record of the genus *Phyllopezus*, the geographic distribution range of this species, and the records outside the seasonally dry forest biomes, in which the species rarely occurs.

Keywords

Distribution, Gekkota, inselbergs, lizard, rock gecko

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Introduction

The South America native gecko *Phyllopezus pollicaris* (Spix, 1825) has nocturnal, saxicolous, and arboreal habits, and it has widespread distribution, predominantly occurring in the Cerrado and Caatinga domains (Gamble et al. 2012; Werneck et al. 2012; Cacciali et al. 2018). Although rare, records of *P. pollicaris* are known from the Atlantic Forest and Amazonia (Werneck et al. 2012).

Molecular studies have revealed that the nominal taxon *P. pollicaris* is a complex of cryptic lineages, with population genetic structure concordant with the geographic limits of the dry open biomes, represented by the Caatinga, Cerrado, and Chaco (Pennington et al. 2006; Werneck et al. 2012). As a result, populations from the Chaco and from the southern limit of the Cerrado were designated as *P. przewalskii* and *P. heuteri*, respectively, while *P. pollicaris* remains paraphyletic (Werneck et al. 2012; Cacciali et al. 2018). Lineage differentiation in this species shows three major clusters related to historical events happening since the Neogene (Werneck et al. 2012). In the Cerrado, the historical geomorphological

rearrangements of the landscapes in ancient plateaus and young valleys have likely shaped the genetic structure of *P. pollicaris* populations (Werneck et al. 2012). Therefore, the current distribution of the species has been associated with rock outcrops in the Cerrado domain, and possibly also in the Atlantic Forest, for the last 11.5 Ma (Miocene), starting from the initial diversification of the species, according to Werneck et al. (2012). *Phyllopezus pollicaris* occupies a wide range of microhabitats across its distribution, including rocky terrains, either on granitic, gneissic, or quartzite sandstones (Rodrigues 1986; Cei 1993; Vitt 1995; Werneck et al. 2009; Recoder et al. 2012).

Except for *Gymnodactylus darwinii* (Gray, 1845) (Phyllodactylidae) and the African exotic species *Hemidactylus mabouia* (Moreau-de-Jonnès, 1818) (Gekkonidae), no other species of gecko has previously been recorded from the state of Espírito Santo (Costa and Bernils 2018). We present the first state record of the genus *Phyllopezus* and address the occurrence of *Phyllopezus pollicaris* in the Atlantic Forest rock outcrops in Espírito Santo, southeastern Brazil.

Methods

The landscape of southeastern Brazil, particularly that of the state of Espírito Santo, is characterized by the presence of inselbergs, granitic or gneissic rock outcrops abruptly rising within the Atlantic Forest landscape, which varying in area and degrees of connectivity (Safford and Martinelli 2000; de Paula et al. 2020b). In October 2019, we conducted an exploratory survey of the surroundings of the Pedra do Elefante, an inselberg area located in the municipality of Nova Venécia, Espírito Santo. A single specimen of *Phyllopezus pollicaris* was found and collected under the permits of Ministério do Meio Ambiente (MMA/SISBIO #56580) and Instituto Estadual do Meio Ambiente (IEMA #76433846). The voucher is deposited at the Reptile Collection of Museu de Biologia Professor Mello Leitão (MBML), municipality of Santa Teresa, Espírito Santo, Brazil. The geographic coordinates and elevation were taken with a Garmin 64SX GPS receiver, using the WGS84 datum, and an altimeter manually calibrated at the sea level. Morphometric measurements of the specimen were taken with digital calipers to a precision of 0.1 mm. The taxonomic identity of our specimen was confirmed by morphological analysis under a stereomicroscope, and by further comparison with related taxa based on data from the literature (Koslowsky 1895; Müller and Brongersma 1933; Loveridge 1941; Vanzolini 1953; Rodrigues 1986; Koch et al. 2006; Cacciali et al. 2018).

The geographic distribution map was built in ArcMap, and includes the new record and occurrence data of *Phyllopezus pollicaris* and closely related species (*P. przewalskii* and *P. heuteri*) from the literature (totaling 316 records; Appendix, Table A1). We also checked records from *P. pollicaris* deposited in the Museu de Biologia Professor Mello Leitão (MBML), Instituto Nacional da Mata Atlântica, to ensure no other specimen was previously collected in Espírito Santo. This included searching for possible misidentified specimens of *P. pollicaris* among the deposited material of *Hemidactylus mabouia* and *Gymnodactylus darwinii*. A single specimen of *P. pollicaris* from the municipality of Porto Seguro, state of Bahia, northeastern Brazil (MBML 1160), was found among the examined material identified as *H. mabouia*.

Results

***Phyllopezus pollicaris* (Spix, 1825)**

New record (Fig. 1). BRAZIL – **Espírito Santo** • municipality of Nova Venécia; Área de Proteção Ambiental Pedra do Elefante (APAPE); 18°46′08″S, 04027′24″W; 601 m elev.; 17.X.2019; 7 p.m.; Thais H. Condez, Juliane P. Ribeiro, Paulo M. Gonella, Claudio N. Fraga & Dayvid Couto leg.; initially observed at ground level on exposed rock, but collected after hiding among the roots of a bromeliad [*Alcantarea trepida* Versieux & Wand.]; snout–vent length = 58.3 mm, tail length = 63.2 mm, head length = 12.2 mm, head width = 18.6, nares–eye distance = 5.6 mm, interorbital distance = 6.8 mm, internarial distance = 1.8 mm, humerus length = 7.4 mm, forearm length = 8.4 mm, thigh length = 12.4 mm, tibia length = 8.6 mm; 1 ♂, MBML 4763 [field no. TC 524] (Fig. 2).

Identification. The specimen was identified by the combination of the following characters: thin skin with small granular scales and scales modified as equidistant larger tubercles, absence of differentiated scales on the tail, a single series of digital lamellae (not cloven), the two distal phalanges of all fingers narrowed towards the claw, central pair of posmental scales in direct contact, and well-developed pollex (Müller and Brongersma 1933; Loveridge 1941; Vanzolini 1953; Rodrigues 1986; Kock et al. 2009; Cacciali et al. 2018).

Additionally, the specimen can be distinguished from *P. przewalskii* and *P. heuteri* (restricted to Chaco and southern limit of Cerrado; Cacciali et al. 2018) by presenting homogeneous scales at the mouth commissure (presence of 2–3 larger tubercle-shaped scales in *P. heuteri*), one tubercle between eye and ear opening (5–8 in *P. heuteri*), 11 and 12 lamellae under the fourth toe (9–11 in *P. przewalskii*), and presence of three postcloacal tubercles on each side (tubercles not always present in adults of *P. przewalskii*) (Vanzolini 1953; Cacciali et al. 2018).

Discussion

Our finding represents the first record for the genus *Phyllopezus* from the state of Espírito Santo, expanding the known distribution of *P. pollicaris* by 272 km south of the municipality of Porto Seguro [district of Trancoso], Bahia state, and 312 km east of the municipality of Serro,

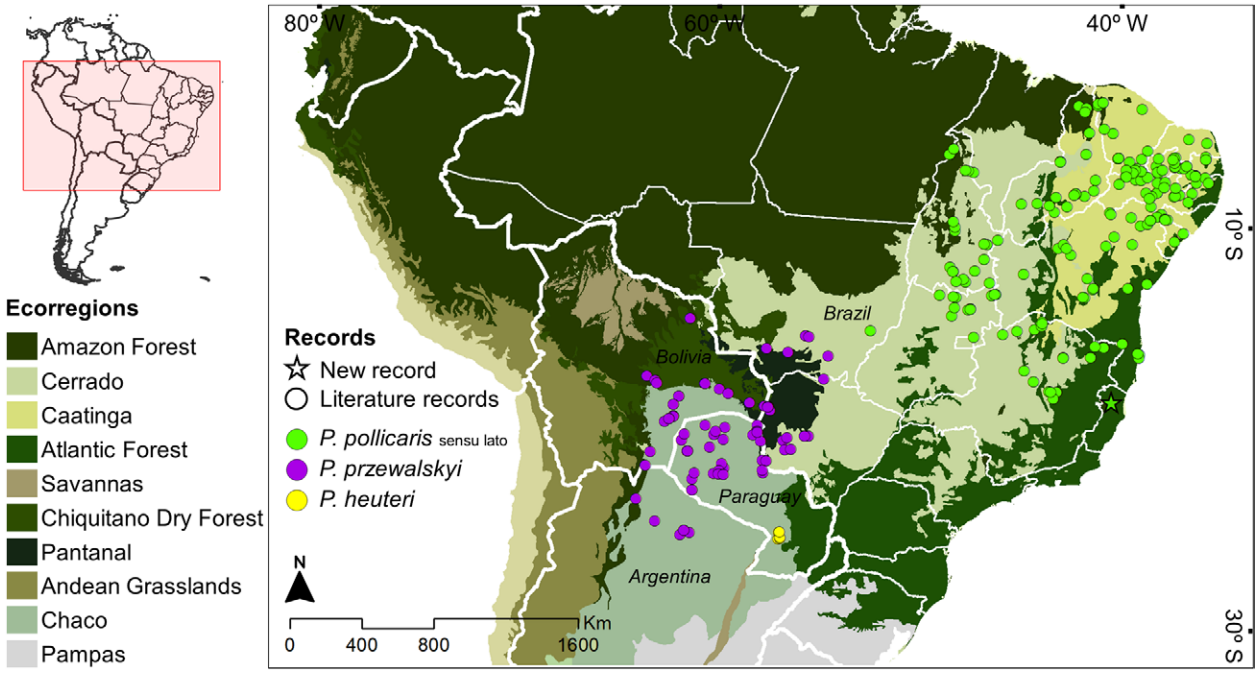

Figure 1. Geographic distribution of the *Phyllopezus pollicaris* and closely related species (*P. przewalskii* and *P. heuteri*): *Phyllopezus pollicaris* sensu lato (green circles), *P. przewalskii* (purple circles) and *P. heuteri* (yellow circles). Green star represents the new record from Área de Proteção Ambiental Pedra do Elefante (APAPE), Nova Venécia, Espírito Santo. Inset map: South America.

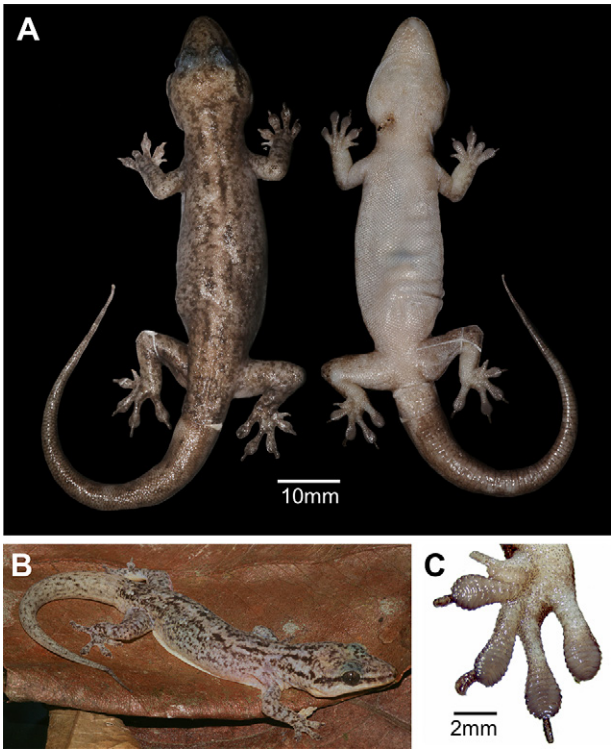

Figure 2. Specimen of *Phyllopezus pollicaris* [MBML 4763] collected in the Área de Proteção Ambiental Pedra do Elefante (APAPE), municipality of Nova Venécia, Espírito Santo. **A.** Dorsal and ventral view of specimen in preservative. **B.** Dorsolateral view of specimen in life. **C.** Detail of the digital lamellae on right toe.

Minas Gerais state (Fig. 1). The site where the specimen was found is within a legally protected area (APAPE) which encompasses several granitic/gneissic inselbergs immersed in a matrix of forest fragments and human-modified landscape. The locality where we found the specimen is characterized as a natural open formation surrounded by montane semideciduous forests (Fig. 3).

This remarkable record of a relatively well-known species on Atlantic Forest rock outcrops reinforces the importance of herpetological surveys in areas with sampling gaps, such as the inselbergs of southeastern Brazil (Almeida et al. 2016). These iselbergs have been neglected in comparison to coastal forests, and they have potential to harbor unknown diversity and endemism (Safford and Martinelli 2000; Porembski 2007). They might act as natural refuges for reptiles in areas where their surrounding landscapes are human-modified (Michael et al. 2008). Not always included in conservation plans, inselbergs are targeted areas for urban expansion and directly threatened by mining activities; they are also very susceptible to fire, biological invasions, and the illegal extraction of ornamental plants (Martinelli 2007).

Neotropical inselbergs are geomorphologically stable and isolated habitats, forming phytophysiognomic "islands", completely distinct of the surrounding landscape in terms of its edaphic and microclimatic characteristics (Porembski 2007; de Paula et al. 2020a, 2020b). The unique environmental conditions of inselbergs, such as the higher air temperature, lower relative air humidity, exposure to wind, and low connectivity with the surroundings, might limit the occurrence of forest-adapted species and favor the occurrence of specialized taxa of open and relatively drier habitats (Porembski 2007). Additionally, the steep slopes and the lack of soil in tropical inselbergs contribute to the rainwater run-off, with water in these high-altitude areas a scarce seasonal resource stored in rock depressions and vegetation

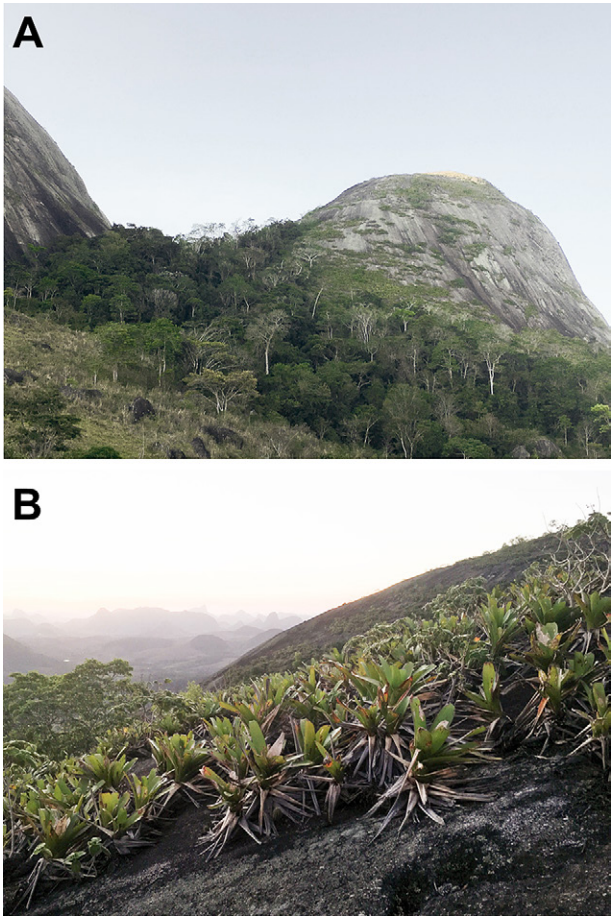

Figure 3. Habitat of *Phyllopezus pollicaris* at the Área de Proteção Ambiental Pedra do Elefante (APAPE), municipality of Nova Venécia, state of Espírito Santo. **A.** External view of the Atlantic Forest inselberg. **B.** Details of the rock outcrop surface where the specimen was found.

(Porembski 2007). In addition to desiccation-tolerant, well-adapted plants, the saxicolous frog *Thoropa miliaris* (Spix, 1824) and the bromeligenous treefrog *Scinax arduous* Peixoto, 2002, are examples of amphibian specialists commonly observed in southeastern Brazilian inselbergs (Teixeira et al. 2006).

Other records of *P. pollicaris* in the Atlantic Forest domain are known for the Brazilian states of Bahia and Minas Gerais (Werneck et al. 2012). The available molecular evidence suggests these populations might constitute distinct candidate species, with representatives associated to the northeastern cluster (Caatinga) and central cluster (Cerrado; Werneck et al. 2012). Further investigation is crucial to include samples from this newly discovered population from Espírito Santo in molecular studies aiming to determine their phylogenetic relationships with the other putative lineages of *P. pollicaris*.

Additionally, the occurrence of *P. pollicaris*—a species with its origin and diversification associated with the South American Dry Diagonal biomes (Werneck et al. 2012)—in the Atlantic Forest rock outcrops of Espírito Santo adds important information for the study of the diversification of this taxon and of the herpetofauna associated with Atlantic Forest inselbergs.

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Authors' Contributions

Conceptualization: THC, JFRT, MJMD. Data curation: THC, JFRT, JPR, MJMD. Formal analysis: THC, MJMD. Investigation: THC, JFRT, JPR, MJMD. Visualization: MJMD. Software: MJMD. Writing – original draft: THC. Writing – review and editing: THC, JFRT, JPR, MJMD.

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Appendix

Table A1. Records of *Phyllopezus pollicaris* and closely related species (*P. przewalskii* and *P. heuteri*). Species: ***P. pol*** = *P. pollicaris* sensu lato; ***P. prz***. = *P. przewalskii* and ***P. heu***. = *P. heuteri* based on literature data. New record is highlighted in bold. Precision: **provided** = coordinates provided in the article; **approximate** = coordinates obtained using Google Earth; **IBGE** = Centroid of the municipality available in www.ibge.gov.br/geociencias/organizacao-do-territorio.

Species	Locality	Latitude	Longitude	Reference	Precision
P. pol.	Brazil: Alagoas: Delmiro Gouveia	−09.444152	−038.017305	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Alagoas: Olho d'Água do Casado	−09.501446	−037.836243	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Alagoas: Piranhas	−09.623559	−037.750393	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Alagoas: Usina Hidrelétrica de Xingó	−09.62361	−037.7983	Dias and Lira-da-Silva 1998	approximate
P. pol.	Brazil: Alagoas: Usina Hidrelétrica de Xingó	−09.40	−037.97	Werneck et al. 2012	provided
P. pol.	Brazil: Alagoas: Xingó	−09.62361	−037.7983	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Alagoado	−19.4833	−041.3500	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Alagoado	−19.4833	−041.3500	Rodrigues et al. 1996	provided
P. pol.	Brazil: Bahia: Alagoado	−11.08	−043.13	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Amargosa	−13.034451	−039.598123	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Barragem de Itaparica	−09.00417	−308.4997	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Buritirama	−10.711791	−043.631381	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Cachoeira	−12.596211	−038.969398	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Campo Formoso	−10.5167	−040.3333	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Carnaíba	−07.80306	−037.7934	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Catinga do Moura	−10.9667	−040.7500	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Contendas do Sincorá	−13.755497	−041.046318	Neri et al. 2012	IBGE
P. pol.	Brazil: Bahia: Coronel João Sá	−10.279395	−037.932964	Ribeiro-Junior 2015	IBGE

Species	Locality	Latitude	Longitude	Reference	Precision
P. pol.	Brazil: Bahia: Curaçá	−08.989032	−039.908081	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Elíseo Medrado	−12.943326	−039.520486	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Estação Biológica de Canudos	−09.95306	−039.0019	Fliladelfo et al. 2017	provided
P. pol.	Brazil: Bahia: Estação Ecológica do Raso da Catarina	−09.88461	−038.6643	Garda et al. 2013	provided
P. pol.	Brazil: Bahia: Feira de Santana	−12.290995	−039.018502	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Formosa do Rio Preto	−10.6699	−046.1519	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Gentio do Ouro	−11.427531	−042.504742	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Gentio do Ouro	−11.110936	−042.720647	Rodrigues et al. 1996	IBGE
P. pol.	Brazil: Bahia: Gentio do Ouro	−11.4289	−042.5058	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Guanambi	−14.225315	−042.778562	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Ibipeba	−11.637526	−042.011248	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Ibiraba	−10.789350	−042.825406	Rodrigues et al. 1996	IBGE
P. pol.	Brazil: Bahia: Ilha do Gado Bravo	−07.58278	−035.7908	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Ilha do Gado Bravo	−10.90	−042.86	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Itatim	−12.709247	−039.703775	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Itiuba	−10.691901	−039.853277	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Jacobina	−11.223472	−040.526649	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Lagoa de Itaparica	−12.8815	−038.6840	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Lauro de Freitas	−12.896718	−038.323462	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Lauro de Freitas	−12.896718	−038.323462	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Manuel Vitorino	−14.176678	−040.258815	Neri et al. 2012	IBGE
P. pol.	Brazil: Bahia: Mata de São João	−12.529971	−038.297299	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Milagres	−07.3000	−038.9333	Ribeiro et al. 2012	provided
P. pol.	Brazil: Bahia: Morro do Chapéu	−11.550126	−041.159097	Neri et al. 2012	IBGE
P. pol.	Brazil: Bahia: Mucugê	−13.15	−041.40	Freitas et al. 2012	provided
P. pol.	Brazil: Bahia: Mucugê	−13.003894	−041.373213	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Mucugê	−13.10	−041.38	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Nordestina	−10.9022	−039.4224	Leite et al. 2019	provided
P. pol.	Brazil: Bahia: Paulo Afonso	−09.403332	−038.218329	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Paulo Afonso	−09.52699	−038.1788	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Pico das Almas	−13.5394	−041.9072	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Porto Seguro	−16.449056	−039.062114	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Porto Seguro	−16.4194	−039.0676	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Potiraguá	−15.8669	−039.9317	Souza-Costa et al. 2020	provided
P. pol.	Brazil: Bahia: Queimadas	−10.976391	−039.626407	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Queimadas	−10.976391	−039.626407	Rodrigues et al. 1996	IBGE
P. pol.	Brazil: Bahia: Raso da Catarina	−09.55361	−039.4889	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Reserva Veracruz Florestal	−16.3458	−039.1453	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Rio de Contas	−13.588608	−041.818791	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Rio de Contas	−13.588608	−041.818791	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Rio de Contas	−13.57	−041.8	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: Salvador	−13.014772	−038.488061	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Salvador	−13.014772	−038.488061	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Santa Terezinha	−12.772852	−039.521140	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Santo Estevão	−12.428893	−039.253190	Freitas 2014	IBGE
P. pol.	Brazil: Bahia: Santo Inácio	−11.110936	−042.720647	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Santo Inácio	−11.10	−042.72	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: São Desidério	−12.360895	−044.974096	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: São Desidério	−12.3683	−044.8661	Werneck et al. 2012	provided
P. pol.	Brazil: Bahia: São Francisco	−06.61928	−038.09710	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Bahia: Serra do Timbó	−13.10	−039.65	Freitas et al. 2019a	provided
P. pol.	Brazil: Bahia: Taquari	−12.6000	−041.6667	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Bahia: Trancoso	−16.5831	−039.0993	Werneck et al. 2012	provided
P. pol.	Brazil: Ceará: Aiuaba	−06.60117	−040.1245	Werneck et al. 2012	provided
P. pol.	Brazil: Ceará: Aluaba	−06.563298	−040.123160	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Arajara	−07.33694	−039.3931	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Barbalha	−07.3500	−039.2833	Ribeiro et al. 2012	provided
P. pol.	Brazil: Ceará: Brejo Santo	−07.55594	−038.8417	Neta et al. 2018	provided
P. pol.	Brazil: Ceará: Caririaçu	−07.09917	−039.2407	Neta et al. 2018	provided
P. pol.	Brazil: Ceará: Colina	−04.15429	−038.9393	Ribeiro-Junior 2015	IBGE

Species	Locality	Latitude	Longitude	Reference	Precision
P. pol.	Brazil: Ceará: Crato	−07.2500	−039.4667	Ribeiro et al. 2012	provided
P. pol.	Brazil: Ceará: Crato	−07.231753	−039.408390	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Crato	−07.23333	−039.40000	Souza et al. 2017	provided
P. pol.	Brazil: Ceará: Crato	−07.23333	−039.40000	Souza et al. 2014	provided
P. pol.	Brazil: Ceará: Estação Ecológica de Aiuaba	−06.6075	−040.1336	Lima et al. 2017	provided
P. pol.	Brazil: Ceará: Estação Ecológica de Aiuaba	−06.6075	−040.1336	Lima et al. 2018	provided
P. pol.	Brazil: Ceará: Farias Brito	−06.7825	−039.5531	Oliveira et al. 2021	provided
P. pol.	Brazil: Ceará: Floresta Nacional do Araripe-Apodi	−07.6533	−039.2646	Muniz et al. 2016	provided
P. pol.	Brazil: Ceará: Ibiapina	−03.936131	−040.893929	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Ibiapina	−03.99153	−041.1144	Werneck et al. 2012	provided
P. pol.	Brazil: Ceará: Icó	−06.24613	−038.6639	Neta et al. 2018	provided
P. pol.	Brazil: Ceará: Jati	−07.68333	−039.00000	Ribeiro et al. 2012	provided
P. pol.	Brazil: Ceará: Lavras da Mangabeira	−06.65623	−038.96390	Neta et al. 2018	provided
P. pol.	Brazil: Ceará: Mauriti	−07.55594	−038.6466	Neta et al. 2018	provided
P. pol.	Brazil: Ceará: Milagres	−07.310428	−038.943157	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Milagres	−07.25361	−038.9764	Werneck et al. 2012	provided
P. pol.	Brazil: Ceará: Parque Nacional de Aiuaba	−06.59947	−040.1224	Costa et al. 2018	provided
P. pol.	Brazil: Ceará: Parque Nacional de Ubajara	−03.84028	−040.89500	Castro et al. 2019	provided
P. pol.	Brazil: Ceará: Pentecoste	−03.796267	−039.267009	Fernandez et al. 2019	IBGE
P. pol.	Brazil: Ceará: Santana do Cariri	−07.1809	−039.738	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Tianguá	−03.722674	−040.991706	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Tianguá	−03.87124	−041.1191	Werneck et al. 2012	provided
P. pol.	Brazil: Ceará: Ubajara	−03.848491	−040.907144	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Ceará: Ubajara	−03.81756	−040.8843	Werneck et al. 2012	provided
P. pol.	Brazil: Ceará: Várzea Alegre	−05.35	−040.3833	Ribeiro et al. 2012	provided
P. pol.	Brazil: Espírito Santo: Nova Venécia	−18.7689	−040.4567	Present study	provided
P. pol.	Brazil: Goiás: Alto Paraíso de Goiás	−14.1362	−047.5191	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Goiás: Alto Paraíso de Goiás	−14.1167	−047.5167	Werneck et al. 2012	provided
P. pol.	Brazil: Goiás: Cana Brava	−13.5031	−048.3615	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Goiás: Formosa	−15.5341	−047.3564	Werneck et al. 2012	provided
P. pol.	Brazil: Goiás: Minaçu	−13.5351	−048.2239	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Goiás: Niquelândia	−14.45	−048.45	Werneck et al. 2012	provided
P. pol.	Brazil: Goiás: Parque Nacional Chapada dos Veadeiros	−14.1631	−047.6193	Domingos et al. 2017	provided
P. pol.	Brazil: Goiás: São Domingos	−13.402	−046.3151	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Goiás: São Domingos	−13.3983	−046.2683	Werneck and Colli 2006	provided
P. pol.	Brazil: Goiás: São Domingos	−13.3983	−046.2683	Werneck et al. 2009	provided
P. pol.	Brazil: Goiás: São Domingos	−13.45	−046.45	Werneck et al. 2012	provided
P. pol.	Brazil: Goiás: Serra da Mesa	−14.05	−048.32	Werneck et al. 2012	provided
P. pol.	Brazil: Maranhão: Carolina	−07.29771	−047.3622	Werneck et al. 2012	provided
P. pol.	Brazil: Maranhão: Estreito	−13.4136	−049.0564	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Maranhão: São Luís	−05.14139	−040.825	Borges-Nojosa and Cascon 2005	provided
P. pol.	Brazil: Mato Grosso: Barra do Garça	−15.2	−052.5	Werneck et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Almenara	−16.05	−040.85	Feio and Caramaschi 2002	provided
P. pol.	Brazil: Minas Gerais: Augusto de Lima	−17.75	−044.3667	Werneck et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Diamantina	−18.2833	−043.2	Righi et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Diamantina	−18.25	−043.6	Werneck et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Extração	−18.2811	−043.5242	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Minas Gerais: Grão Mogol	−16.5665	−042.888	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Minas Gerais: Grão Mogol	−16.55	−042.88	Werneck et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Guaicurus	−17.2012	−044.8217	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Minas Gerais: Itaobim	−16.5595	−041.499	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Minas Gerais: Januária	−15.1544	−044.303	Werneck et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Manga	−14.7559	−043.9368	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Minas Gerais: Manga	−14.8432	−043.9891	Werneck et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Matias Cardoso	−14.8503	−043.9178	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Minas Gerais: Matias Cardoso	−14.9924	−043.9528	Werneck et al. 2012	provided
P. pol.	Brazil: Minas Gerais: Parque Nacional Grande Sertão Veredas	−15.3833	−045.9000	Recoder and Nogueira 2007	provided
P. pol.	Brazil: Minas Gerais: Pedra Azul	−16.0059	−041.2818	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Minas Gerais: Rio Pandeiros	−15.2425	−045.1898	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Minas Gerais: Serro	−18.6055	−043.3866	Werneck et al. 2012	provided

Species	Locality	Latitude	Longitude	Reference	Precision
P. pol.	Brazil: Pará: Santa Isabel do Araguaia	−06.12317	−048.3262	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pará: São Geraldo do Araguaia	−06.39896	−048.5557	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pará: São Geraldo do Araguaia	−06.4000	−048.5333	Werneck et al. 2012	provided
P. pol.	Brazil: Paraíba: Aguiar	−07.00556	−038.2208	Silva et al. 2020	provided
P. pol.	Brazil: Paraíba: Cabaceiras	−07.49067	−036.2843	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Paraíba: Cabaceiras	−07.48	−036.28	Werneck et al. 2012	provided
P. pol.	Brazil: Paraíba: Cabaceiras	−07.48	−036.28	Werneck et al. 2012	provided
P. pol.	Brazil: Paraíba: Cacimba de Dentro	−06.68333	−035.74970	Arzabe et al. 2006	provided
P. pol.	Brazil: Paraíba: Estação Experimental de São João do Cariri	−07.41667	−036.50000	Almeida et al. 2008	provided
P. pol.	Brazil: Paraíba: Itaporanga	−07.30398	−038.1526	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Paraíba: Itaporanga	−07.35336	−038.1494	Werneck et al. 2012	provided
P. pol.	Brazil: Paraíba: Junco do Seridó	−06.99334	−036.7164	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Paraíba: Junco do Seridó	−06.99967	−036.70890	Werneck et al. 2012	provided
P. pol.	Brazil: Paraíba: Parque Estadual da Pedra da Boca	−06.52806	−035.7406	Arzabe et al. 2005	approximate
P. pol.	Brazil: Paraíba: Patos	−07.02449	−037.2769	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Paraíba: Patos	−07.05228	−037.30830	Werneck et al. 2012	provided
P. pol.	Brazil: Paraíba: Piancó	−07.19257	−037.92650	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Paraíba: Salgadinho	−07.10278	−036.84500	Freitas et al. 2013	provided
P. pol.	Brazil: Paraíba: Salgadinho	−07.10278	−036.84500	Freitas et al. 2014	provided
P. pol.	Brazil: Paraíba: Salgadinho	−07.10069	−036.8368	Ragner et al. 2014	provided
P. pol.	Brazil: Paraíba: São José de Espinhares	−06.84418	−037.3251	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pauí: Batalha	−03.98028	−042.0942	Silva et al. 2015	provided
P. pol.	Brazil: Pernambuco: Arcoverde	−08.41833	−037.0586	Freitas et al. 2019b	provided
P. pol.	Brazil: Pernambuco: Belo Jardim	−08.33639	−036.4236	Freitas et al. 2019b	provided
P. pol.	Brazil: Pernambuco: Betânia	−08.31139	−038.1958	Borges-Nojosa and Santos 2005	approximate
P. pol.	Brazil: Pernambuco: Betânia	−08.31194	−038.1958	Werneck et al. 2012	provided
P. pol.	Brazil: Pernambuco: Buíque	−08.5000	−037.3333	Werneck et al. 2012	provided
P. pol.	Brazil: Pernambuco: Caetés	−08.77278	−036.6228	Oliveira et al. 2017	provided
P. pol.	Brazil: Pernambuco: Carnaubeira	−07.83308	−035.6096	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pernambuco: Encruzilhada	−08.32061	−038.7434	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pernambuco: Exu	−07.51631	−039.7227	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pernambuco: Exu	−07.48222	−039.7417	Werneck et al. 2012	provided
P. pol.	Brazil: Pernambuco: Floresta	−08.48082	−038.4719	Borges-Nojosa and Santos 2006	approximate
P. pol.	Brazil: Pernambuco: Floresta do Navio	−08.60083	−038.5678	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Pernambuco: Juazeiro do Norte	−07.2	−039.3	Ribeiro et al. 2012	provided
P. pol.	Brazil: Pernambuco: Ouricuri	−07.88315	−040.0815	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pernambuco: Parque Nacional do Catimbau	−08.51583	−037.3497	Pedrosa et al. 2015	approximate
P. pol.	Brazil: Pernambuco: Parque Nacional do Catimbau	−08.48694	−037.2811	Rodrigues and Santos 2008	provided
P. pol.	Brazil: Pernambuco: Petrolina	−09.39738	−040.50000	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pernambuco: Petrolina	−09.31944	−040.56080	Souza et al. 2013	approximate
P. pol.	Brazil: Pernambuco: Santa Cruz da Baixa Verde	−07.82194	−038.15280	Quirino et al. 2018	provided
P. pol.	Brazil: Pernambuco: Sertânia	−08.07556	−037.26920	Freitas et al. 2019b	provided
P. pol.	Brazil: Pernambuco: Sítio dos Nunes	−08.04953	−037.83340	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Pernambuco: Taquaritinga do Norte	−7.81972	−036.21500	Barbosa et al. 2018	provided
P. pol.	Brazil: Piauí: Capitão Gervásio	−08.48	−041.81	Werneck et al. 2012	provided
P. pol.	Brazil: Piauí: Castelo do Piauí	−05.32222	−041.5525	Werneck et al. 2012	provided
P. pol.	Brazil: Piauí: Estação Ecológica Uruçuí-Una	−08.83333	−044.16670	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Piauí: Floriano	−06.76967	−043.02060	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Piauí: Floriano	−06.76694	−043.026	Werneck et al. 2012	provided
P. pol.	Brazil: Piauí: Parna Serra da Capivara	−08.41667	−042.3333	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Piauí: Parna Serra das Confusões	−08.94806	−043.5761	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Piauí: Parque Nacional da Serra da Capivara	−08.41667	−042.3333	Cavalcanti et al. 2014	approximate
P. pol.	Brazil: Piauí: Parque Nacional da Serra das Confusões	−08.53333	−043.25000	Vechio et al. 2016	provided
P. pol.	Brazil: Piauí: Patos	−07.68076	−041.2523	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Piauí: Paulistana	−08.20	−041.35	Souza et al. 2010a	provided
P. pol.	Brazil: Piauí: Piracuruca	−04.10139	−041.70830	Werneck et al. 2012	provided
P. pol.	Brazil: Piauí: Piripiri	−04.27607	−041.7785	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Piauí: São João do Piauí	−08.34885	−042.2564	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Piauí: São João do Piauí	−08.36005	−042.2517	Werneck et al. 2012	provided
P. pol.	Brazil: Piauí: São Raimundo Nonato	−09.01	−042.69	Werneck et al. 2012	provided

Species	Locality	Latitude	Longitude	Reference	Precision
P. pol.	Brazil: Piauí: Serra das Confusões	−09.27	−043.32	Werneck et al. 2012	provided
P. pol.	Brazil: Piauí: Uruçuí-Uma	−08.88	−044.97	Werneck et al. 2012	provided
P. pol.	Brazil: Piauí: Valença do Piauí	−06.3982	−041.7405	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Rio Grande do Norte: Angicos	−05.66037	−036.60540	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Rio Grande do Norte: Estação Ecológica do Seridó	−06.57672	−037.25580	Andrade et al. 2013	provided
P. pol.	Brazil: Rio Grande do Norte: Estação Ecológica do Seridó	−06.58333	−037.33330	Caldas et al. 2016	provided
P. pol.	Brazil: Rio Grande do Norte: Santa Maria	−05.85306	−035.70110	Jorge et al. 2020	provided
P. pol.	Brazil: Rio Grande do Norte: Serra Negra do Norte	−06.66398	−037.39500	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Sergipe: Areia Branca	−10.7582	−037.31340	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Sergipe: Canindé de São Francisco	−09.6541	−037.78800	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Sergipe: Canindé de São Francisco	−09.64861	−037.7968	Werneck et al. 2012	provided
P. pol.	Brazil: Sergipe: Canindé do São Francisco	−09.68278	−038.51610	Amora et al. 2014	provided
P. pol.	Brazil: Sergipe: Monumento Natural Grota de Angico	−09.68333	−038.51670	Ferreira et al. 2014	provided
P. pol.	Brazil: Sergipe: Monumento Natural Grota do Angico	−09.68333	−038.51670	Silva et al. 2012	provided
P. pol.	Brazil: Sergipe: Poço Redondo	−09.6638	−037.68250	Werneck et al. 2012	provided
P. pol.	Brazil: Sergipe: São Francisco de Assis	−10.3368	−036.8862	Werneck et al. 2012	provided
P. pol.	Brazil: Tocantins: Babaçulândia	−07.20186	−047.75880	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Tocantins: Babaçulândia	−07.20917	−047.62170	Werneck et al. 2012	provided
P. pol.	Brazil: Tocantins: Combinado	−12.8186	−046.5521	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Tocantins: Conceição do Tocantins	−12.2173	−047.2929	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Tocantins: Dianópolis	−11.6252	−046.8204	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Tocantins: Estação Ecológica Serra Geral do Tocantins	−10.9027	−046.6971	Recoder et al. 2011	approximate
P. pol.	Brazil: Tocantins: Estação Ecológica Serra Geral do Tocantins	−10.9027	−046.6971	Recoder et al. 2012	approximate
P. pol.	Brazil: Tocantins: Mateiros	−10.8669	−046.8209	Werneck et al. 2012	provided
P. pol.	Brazil: Tocantins: Palmas	−10.2228	−048.2778	Werneck et al. 2012	provided
P. pol.	Brazil: Tocantins: Paranã	−12.6205	−047.8841	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Tocantins: Paranã	−12.7531	−047.7591	Werneck et al. 2012	provided
P. pol.	Brazil: Tocantins: Peixe	−12.0298	−048.5378	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Tocantins: Peixe	−12.2364	−048.3797	Werneck et al. 2012	provided
P. pol.	Brazil: Tocantins: São Salvador do Tocantins	−12.7474	−048.2321	Ribeiro-Junior 2015	IBGE
P. pol.	Brazil: Tocantins: Usina Hidrelétrica de Lajeado	−10.0067	−048.2842	Werneck et al. 2012	provided
P. pol.	Brazil: Tocantins: Usina Hidrelétrica de Luis Eduardo Magalhães	−09.75611	−048.37310	Ribeiro-Junior 2015	approximate
P. pol.	Brazil: Tocantins: Usina Hidrelétrica de Peixe Angical	−12.2339	−048.3869	Ribeiro-Junior 2015	approximate
P. prz.	Argentina: Chaco: Fuerte Esperanza	−25.1635	−061.8406	Abdala and Moro 1996	approximate
P. prz.	Argentina: Chaco: El Torito	−25.3667	−062.0333	Kacoliris et al. 2006	provided
P. prz.	Argentina: Chaco: Fuerte Esperanza	−25.2667	−061.5667	Kacoliris et al. 2006	provided
P. prz.	Argentina: Chaco: Fuerte Esperanza	−25.1635	−061.8406	Werneck et al. 2012	provided
P. prz.	Argentina: Fuerte Esperança	−25.1635	−061.8406	Ribeiro-Junior 2015	approximate
P. prz.	Argentina: Jujuy: Santa Bárbara	−23.5989	−064.2295	Gallardo 2013	provided
P. prz.	Argentina: Salta: Los Colorados Biological Station	−24.6833	−063.3000	Leynaud and Bucher 2005	provided
P. prz.	Argentina: Santa Cruz: Cerro Colorado	−19.4667	−062.3500	Padial et al. 2003	approximate
P. prz.	Bolivia: Puerto Suarez: Parque Nacional Río Negro	−19.9167	−058.1667	Cacciali et al. 2015	provided
P. prz.	Bolivia: Santa Cruz	−17.8000	−063.1667	Mano-Cuellar et al. 2015	approximate
P. prz.	Bolivia: Santa Cruz: Buena Vista	−17.4500	−063.6667	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Cerro Colorado	−19.4667	−062.35	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Cerro Colorado	−19.4822	−062.3597	Gonzales 1998	provided
P. prz.	Bolivia: Santa Cruz: Cupesí	−18.4667	−062.0667	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Cupesí	−18.4783	−062.0817	Gonzales 1998	provided
P. prz.	Bolivia: Santa Cruz: El Carmen	−18.80	−058.55	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: El Portón	−18.10	−060.05	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Inselberg	−14.5833	−061.5167	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: La Madre	−18.8667	−062.3500	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: La Madre	−18.8742	−062.3586	Gonzales 1998	provided
P. prz.	Bolivia: Santa Cruz: Parque Nacional Amboró	−17.6667	−063.2500	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Puerto Suárez	−18.9667	−057.8000	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: San José de Chiquitos	−17.8333	−060.8000	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: San Ramón	−17.8333	−060.7500	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Santiago	−18.3333	−059.6000	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Tierras Nuevas	−19.7167	−062.8000	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Tierras Nuevas	−19.7167	−062.8000	Gonzales 1998	provided

Species	Locality	Latitude	Longitude	Reference	Precision
P. prz.	Bolivia: Santa Cruz: Yapiroa	−19.6000	−062.5667	Dirksen and De la Riva 1999	provided
P. prz.	Bolivia: Santa Cruz: Yapiroa	−19.6028	−062.5728	Gonzales 1998	provided
P. prz.	Bolivia: Tarija: Serranía Aguarague	−21.9333	−063.7667	Werneck et al. 2012	provided
P. prz.	Bolivia: Tarija: Villa Montes	−21.25	−063.50	Dirksen and De la Riva 1999	provided
P. prz.	Brazil: Mato Grosso: Usina Hidrelétrica de Ponte de Pedra	−17.6086	−054.8278	Silva-Jr et al. 2009	provided
P. prz.	Brazil: Mato Grosso do Sul: Aquidauana	−20.4747	−055.7906	Melo et al. 2021	IBGE
P. prz.	Brazil: Mato Grosso do Sul: Aquidauana	−20.4747	−055.7906	Ribeiro-Junior 2015	IBGE
P. prz.	Brazil: Mato Grosso do Sul: Aquidauana	−20.4614	−055.6194	Werneck et al. 2012	provided
P. prz.	Brazil: Mato Grosso do Sul: Bodoquena	−20.5548	−056.6736	Ribeiro-Junior 2015	IBGE
P. prz.	Brazil: Mato Grosso do Sul: Bodoquena	−20.7014	−056.8807	Werneck et al. 2012	provided
P. prz.	Brazil: Mato Grosso do Sul: Bonito	−21.1243	−056.4929	Ribeiro-Junior 2015	IBGE
P. prz.	Brazil: Mato Grosso do Sul: Bonito	−21.1469	−056.7883	Werneck et al. 2012	provided
P. prz.	Brazil: Mato Grosso do Sul: Corumbá	−18.9984	−057.6310	Albuquerque et al. 2013	provided
P. prz.	Brazil: Mato Grosso do Sul: Corumbá	−19.1803	−057.5381	Ávila and Cunha-avellar 2005	provided
P. prz.	Brazil: Mato Grosso do Sul: Corumbá	−19.0064	−057.6490	Ribeiro-Junior 2015	IBGE
P. prz.	Brazil: Mato Grosso do Sul: Corumbá	−19.0008	−057.6140	Werneck et al. 2012	provided
P. prz.	Brazil: Mato Grosso do Sul: Porto Murtinho	−21.6667	−057.9000	Souza et al. 2010b	provided
P. prz.	Brazil: Mato Grosso do Sul: Porto Murtinho	−21.7069	−057.7125	Werneck et al. 2012	provided
P. prz.	Brazil: Mato Grosso: Barra dos Bugres	−15.4606	−055.7450	Ribeiro-Junior 2015	IBGE
P. prz.	Brazil: Mato Grosso: Chapada dos Guimarães	−15.4606	−055.7450	Ribeiro-Junior 2015	IBGE
P. prz.	Brazil: Mato Grosso: Poconé	−16.2597	−056.6269	Werneck et al. 2012	provided
P. prz.	Brazil: Mato Grosso: Rio Aricá	−15.5000	−055.5833	Ribeiro-Junior 2015	approximate
P. prz.	Brazil: Mato Grosso: Rondonópolis	−16.47	−054.63	Werneck et al. 2012	provided
P. prz.	Brazil: Mato Grosso: Sao Luis de Cáceres	−16.0711	−057.6789	Koslowsky 1895	approximate
P. prz.	Paraguay: Boquerrón: Teniente Agripino Enciso	−21.2106	−061.6571	Werneck et al. 2012	provided
P. prz.	Paraguay: Alto Paraguay: Agua Dulce	−20.0167	−059.7667	Cacciali et al. 2016	provided
P. prz.	Paraguay: Alto Paraguay: Bahia Negra	−20.25	−058.20	Cacciali et al. 2016	provided
P. prz.	Paraguay: Alto Paraguay: Bahía Negra	−20.2281	−058.1703	Motte et al. 2015	provided
P. prz.	Paraguay: Alto Paraguay: Cerro León	−20.3833	−060.3167	Cacciali et al. 2016	provided
P. prz.	Paraguay: Alto Paraguay: Colonia Protrerito	−20.4167	−058.3833	Cacciali et al. 2016	provided
P. prz.	Paraguay: Alto Paraguay: Lagerenza'i	−19.9288	−060.7735	Cabral and Weiler 2014	provided
P. prz.	Paraguay: Alto Paraguay: Madrejón	−20.6333	−059.8667	Cacciali et al. 2016	provided
P. prz.	Paraguay: Alto Paraguay: Misión Nueva Tribu	−20.3833	−060.3167	Cacciali et al. 2016	provided
P. prz.	Paraguay: Alto Paraguay: Parque Nacional Defensores del Chaco	−20.2333	−060.2500	Cacciali et al. 2015	provided
P. prz.	Paraguay: Alto Paraguay: Puerto Leda	−20.7167	−057.9833	Cacciali et al. 2016	provided
P. prz.	Paraguay: Alto Paraguay: Puerto Ramos	−20.2833	−058.1667	Cacciali et al. 2016	provided
P. prz.	Paraguay: Asunción: Fortín Toledo	−22.3333	−060.3500	Werneck et al. 2012	provided
P. prz.	Paraguay: Boquerón: Campo Loro	−22.0667	−059.8333	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Comunidad Ayoreo Jesudi	−21.8500	−059.9333	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Estabelecimiento Ko'e Pyahu	−20.6667	−061.9500	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Estancia Agropil S,A,	−23.1500	−061.4333	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Estancia Iparoma	−22.1833	−060.0667	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Estancia Jabalí	−22.6167	−061.4167	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Estancia La Gama	−23.1500	−061.4333	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Estancia Mbutú Retã	−22.3	−061.3	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Filadelfia	−22.35	−060.10	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Fortín Américo Picco	−21.0167	−060.5333	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Loma Plata	−22.3833	−059.8500	Cacciali et al. 2016	provided
P. prz.	Paraguay: Boquerón: Parque Nacional Médanos del Chaco	−20.3719	−061.8114	Cacciali et al. 2015	approximate
P. prz.	Paraguay: Boquerón: Parque Nacional Teniente Enciso	−21.20	−061.65	Cacciali et al. 2015	provided
P. prz.	Paraguay: Boquerón: Parque Nacional Teniente Enciso	−21.20	−061.65	Cacciali et al. 2016	provided
P. prz.	Paraguay: Concepción: San Lázaro	−22.2956	−057.8749	Cabral and Weiler 2014	provided
P. prz.	Paraguay: Concepción: San Lázaro	−22.1667	−057.9167	Cacciali et al. 2016	provided
P. heu.	Paraguay: Cordillera: Cerro de Tobatí	−25.2797	−057.0925	Cacciali et al. 2018	provided
P. heu.	Paraguay: Cordillera: Cerro Hu	−25.6069	−057.1294	Cacciali et al. 2018	provided
P. heu.	Paraguay: Cordillera: Chololó	−25.5667	−057.0333	Cacciali et al. 2016	provided
P. heu.	Paraguay: Cordillera: Chololó	−25.5138	−057.0400	Cacciali et al. 2018	provided
P. heu.	Paraguay: Cordillera: Tobatí	−25.2500	−057.0667	Cacciali et al. 2016	provided