

New records and updated distribution of the ant-like jumping spider genus *Zuniga* Peckham & Peckham, 1892 (Salticidae: Salticinae: Sarindini) in the Neotropics

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Abstract: Based on a comprehensive literature review and the examination of specimens deposited in museum collections the Neotropical ant-like jumping spider genus *Zuniga* Peckham & Peckham, 1892 is reported from Argentina, Colombia and Mexico for the first time, and new records are presented for Brazil. A distribution map including new and previously published records of *Zuniga* is included.

Key words: Amycoida, America, Andes, faunistics

Introduction

The vast majority of known species, about 80%, are invertebrates (Cardoso *et al.*, 2011a). There are about 5845 described species of jumping spiders, 12.7% of all spider species (World Spider Catalog, 2015), more than the known mammal species of the world (Wilson & Reeder, 2015; IUCN, 2015). The actual number of jumping spiders is probably much greater, considering the fact that only about 27% of the total species of spiders may be known (Coddington & Levi, 1991). Two obstacles to the conservation of invertebrates are the well-known Linnean shortfall (most species are undescribed) and the Wallacean shortfall (the distribution of described species is mostly unknown) (Bini *et al.*, 2006; Cardoso *et al.*, 2011b). It is important to note that the diversity and distribution of Neotropical jumping spiders is still poorly known.

This paper updates the known distribution of the ant-like spider genus *Zuniga* Peckham & Peckham, 1892. This genus is represented by two accepted species, both Neotropical (Galiano, 1964a; World Spider Catalog, 2015). The type species *Z. laeta* is only known from the type specimens. *Z. magna* has a wide distribution, and has been described repeatedly under other names. New specimens were identified based on the descriptions of Galiano (1964a), who published a comprehensive revision of *Zuniga* and other ant-like genera in a series of papers (Galiano, 1964b, 1964c, 1965, 1966a, 1966b, 1967, 1969a, 1969b, 1971a, 1971b, 1971c, 1972, 1974, 1975, 1986).

Materials and methods

Specimens that were examined are deposited in the following institutions: Arachnological collection of the Fundação Zoobotânica do Rio Grande do Sul, Museu de Ciências Naturais, Porto Alegre, Brazil (FZB), Arachnological collection of the Instituto de Ciencias Naturales, Universidad Nacional de Colombia, Bogotá, Colombia (ICN-Ar); Arachnological collection of the Museo Argentino de Ciencias Naturales,

Buenos Aires, Argentina (MACN); and Arachnological collection of the Museu de Ciências e Tecnologia, Pontificia Universidade Católica, Porto Alegre, Brazil (MCTP). Species are listed in alphabetical order. The photographs of specimens were taken with a digital camera, the Nikon Coolpix L14.

Abbreviations used in the text and figures are: BMNH= British Museum of Natural History, London, England; MCZ= Museum of Comparative Zoology, Invertebrate Zoology (Harvard University), Cambridge, United States of America; MNHN= Muséum National d'Histoire Naturelle de Paris, France; MNRJ= Museu Nacional do Rio de Janeiro, Universidad Federal de Rio de Janeiro, Brazil; OC=length of the ocular quadrangle; SMNK= Staatliches Museum für Naturkunde Karlsruhe, Germany.

The information in square brackets was added to complement label data. Records without coordinates in the label were approximated to locations via the gazetteers GeoLocator™ (<http://tools.freeside.sk/geolocator/geolocator.html>) and GeoNames™ (<http://www.geonames.org/>). The map was prepared in the Geographic Information System QGIS “Lyon” (version 2.12.2, <http://www.qgis.org/es/site/>). Raster files from NaturalEarth™ (<http://www.naturalearthdata.com/>), and shapefiles of the Biogeographical regionalization of the Neotropical region (Morrone 2014) by Löwenberg-Neto (2014) were used to perform the distributional map and analysis of the group. Specimens from Mexico were examined from pictures deposited in the Cyberdiversity of Araneomorphae from Mexico web project of the Álvaro-Padilla Laboratory (2014).

A total of 27 museum specimens belonging to the two species of the genus were examined, as follows: two males, two male immatures, and 14 females of *Z. laeta* (Peckham & Peckham, 1892) and six males and three females of *Z. magna* Peckham & Peckham, 1892.

Taxonomy

Zuniga Peckham & Peckham, 1892

Simprulloides Mello-Leitão, 1933: 85, type species: *Simprulloides xanthurus* Mello-Leitão, 1933.
Arindas Mello-Leitão, 1933: 88, type species: *Arindas ornatus* Mello-Leitão, 1933.

Note. For additional taxonomic information and diagnosis, see Galiano (1964a).

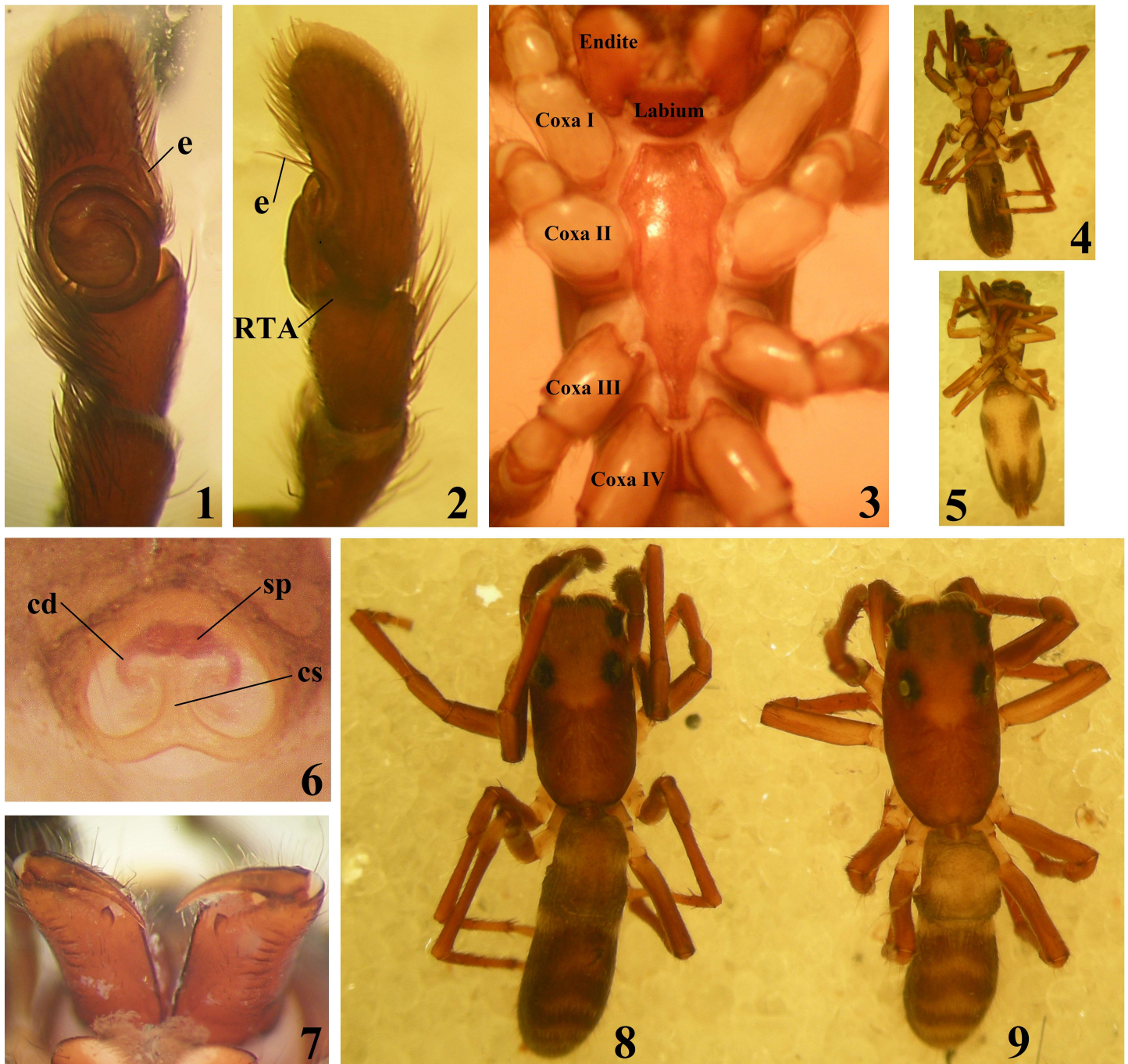
Zuniga laeta (Peckham & Peckham, 1892)

Figs. 1-9

Sarinda laeta Peckham & Peckham, 1892: 41, pl. 3, fig 6 (male holotype from Brazil, Rio de Janeiro, deposited in MCZ 21766, not examined). Simon, 1901: 506-507, figs. 600-603. Petrunkevitch, 1911: 702. Mello-Leitão, 1933: 74-75. Bonnet, 1958: 3931. Jackowska & Prószyński, 1975: 42, fig. 4a (*S. lateata*, lapsus, gives a diagrammatic illustration of the female copulatory organ).

Zuniga severa Peckham & Peckham, 1892: 44, pl. 3, fig. 7 (female holotype from Brazil, Minas, Caraça [Minas Gerais, Serra do Caraça], deposited in MCZ 23045, not examined). Simon, 1901: 519-522. Petrunkevitch, 1911: 718. Petrunkevitch, 1928: 195. Mello-Leitão, 1933: 69-70. Bonnet, 1959: 4997. Synonymized by Galiano (1964a: 70).

Zuniga laeta Galiano, 1964a: 70, pl. 1, figs. 1-7, pl. 2, 16, 18-19, pl. 3, figs. 24-25 (redescribed and transferred to the genus *Zuniga*). World Spider Catalog, 2015.



Figures 1-9. *Zuniga laeta*, male and female from Brazil, Paraná, Pinhais, Serra da Farinha Seca (except where noted). **1**, Left male palp, retroventral view. **2**, Same, retrolateral view. **3**, Sternum, particularly long, female from Brazil, Rio Grande do Sul, Montenegro. **4**, Male, ventral view. **5**, Female, ventral view. **6**, Epygyne, dorsal view. **7**, Male chelicerae, ventral view. **8**, Male, habitus. **9**, Female, habitus. Abbreviations: cd=copulatory duct, cs=chitinous septum, e=embolus, RTA=retrolateral tibial apophysis of the male palp, sp=spermatheca.

Material examined. Argentina, Jujuy, Lagunas de Yala, [24.109115°S, 65.479295°W], [1950 m], 30 Nov 1981, 5♀ E. Maury (MACN). Brazil, Paraná, Pinhais, Serra da Farinha Seca, [25.399088°S, 48.933476°W], [1012 m], 15 to 20 Sep 1995, 2♂, 5♀, Equipe Lab. Aracnologia A.A. Lise (MCTP 7674). Rio Grande do Sul, Montenegro, [29.690439°S, 51.469257°W], [179 m], 6 Oct 1977, 2♂ immatures, A.A. Lise Leg (FZB 6789); Torres, Parque Estadual de Itapeva, [29.360484°S, 49.758137°W], [7 m], 10 to 14 Jan 2005, 1♀, R. Ott Leg (FZB 38464). Santa Catarina, Florianopolis, Canavieiras, [27.432575°S, 48.464497°W], [7 m], Jan 1949, no collector (MACN). Colombia, Boyacá, Santuario de Flora & Fauna Iguaque, [5.666114°N, 73.455448°W],

2800 m, 4 Nov 1997, 1♀, F. Fernández (ICN-Ar 6782). Magdalena, Santa Marta, Minca, Hacienda La Victoria, Sector Jabalí Alto, Quebrada Jabalí [11.02°N, 73.93°W], 1293 m, Jul 2015, 1♀, W. Galvis, (ICN-Ar 5932).

Diagnosis. Somatically the species can be differentiated from *Z. magna* by its dorsal eye field occupying 41-42% of the total length of the prosoma (Figs. 8-9), two promarginal and one retromarginal teeth (Fig. 7), prosoma with slightly marked radiating prosomal grooves and abdomen coloration with a mixture of white-brown transverse stripes, and with two-four longitudinal, ventral brown marks (Figs. 4-5, 8-9). Males can be distinguished by the slender and not dilated femur of the palp, with the embolus rotated ventrally (Figs. 1-2). Females can be separated from those of *Z. magna* by the epigyne, with smaller pits, a chitinous septum that does not reach the height of the spermathecae on the anterior side of the epigyne (Fig. 6), and copulatory ducts that are shorter and not convoluted. For more diagnostic characters see Galiano (1964a: 70). Although the sternum of the species as described is wider and shorter than that of *Z. magna* (see Galiano, 1964a: 71, fig 5), here I present a specimen with a narrower sternum (Fig. 3).

Distribution. Colombia (Boyacá, Magdalena), Brazil (Minas Gerais, Rio de Janeiro, Paraná, Santa Catarina, Rio Grande do Sul) and Argentina (Jujuy) (Fig. 19). This includes new northernmost, southernmost and altitudinal records for the species, and new genus records from Argentina and Colombia. In Brazil this includes new records from the southern states of Paraná and Santa Catarina, and Rio Grande do Sul, after Buckup *et al.* (2010). The known altitudinal range is 7-2800 m.

These are the first records of this species since its original description (Galiano, 1964a). In Colombia, the species was collected beating vegetation in a grassland near an intervened high Andean wet forest, and near to a road in a highly conserved Andean wet forest at the Sierra Nevada de Santa Marta (Fig. 17). There is an unconfirmed record of the species from Brazil, Amazonas, Humaitá, Humaitá (SMNK 2901) listed by Heiko Meztner (Meztner, 2015; Fig. 19).

***Zuniga magna* Peckham & Peckham, 1892**

Figs. 10-16

Zuniga magna Peckham & Peckham, 1892: 43, pl. 4, fig 1a-c (male holotype from Amazonas, Pebas [probably Peru, Loreto, Pebas in the Amazonian region, not described in that paper, and described by Galiano, 1964a: 75] and female allotype from Brazil, Santarem, both deposited in MCZ 21960, not examined). Simon, 1901a: 519-521, figs. 620-622. Petrunkevitch, 1911: 718. Mello-Leitão, 1933: 69-70. Galiano, 1964a: 75-78, pl. 1, figs 8-15, pl. 2, figs 17, 20-21, pl. 3, figs. 22-23 (redescribed the species). Galiano, 1965: 310. Galiano, 1981: 15. Bodner, 2002: 73. Alvarez-Padilla Laboratory, 2014. World Spider Catalog, 2015.

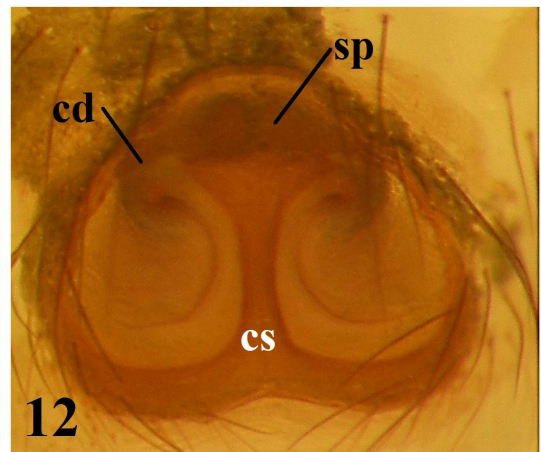
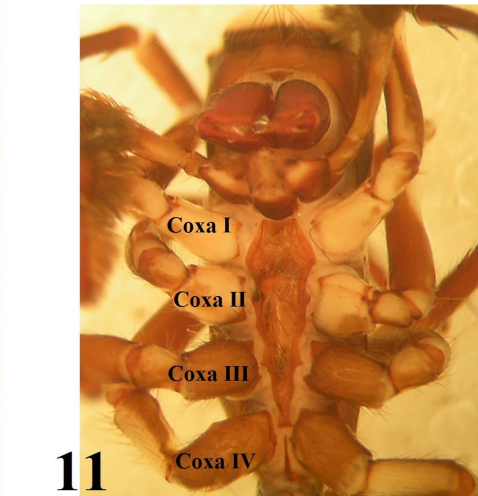
Sarinda formosa Banks, 1929: 73, pl. 1, fig 6 (male holotype from Panamá, Barro Colorado Island, deposited in MCZ 25730, not examined). Chickering, 1946: 447-449, fig 413-415 (transferred to the genus *Zuniga*). Jackowska & Prószyński, 1975: 42, fig 4b (gives a diagrammatic illustration of the female copulatory organ). Synonymized by Galiano (1964a: 75).

Zuniga melzeri Mello-Leitão, 1933: 69, 71-72, pl. 3, fig 10 (female holotype from Brazil, São Paulo, Morro [Mato] do Governo, deposited in MNRJ 14066, not examined). Synonymized by Galiano (1964a: 75).

Simprulloides xanthurus Mello-Leitão, 1933: 85, pl. 2, fig 14 (juvenile holotype from Brazil, Paraná, Rio Negro, deposited in MNRJ 14080, not examined). Synonymized by Galiano (1981: 15).

Arindas ornatus Mello-Leitão, 1933: 88-89, pl. 3, fig 15 (male holotype from Brazil, Paraná, Rio Negro, deposited in MNRJ 14061, not examined). Synonymized by Galiano (1964a: 75).

Sarinda elongata Mello-Leitão, 1940: 189, fig 30 (male holotype from British Guiana, Moraballi Creek, Essequeibo River, deposited in BMNH 2936, not examined). Synonymized by Galiano (1965: 310).



Figures 10-12. *Zuniga magna*, female from Brazil, Amazonas, São Gabriel da Cachoeira. **10**, Female, habitus. **11**, Same, sternum. **12**, Same, epygyne, dorsal view. Abbreviations: cd=copulatory duct, cs=chitinous septum, sp=spermatheca.

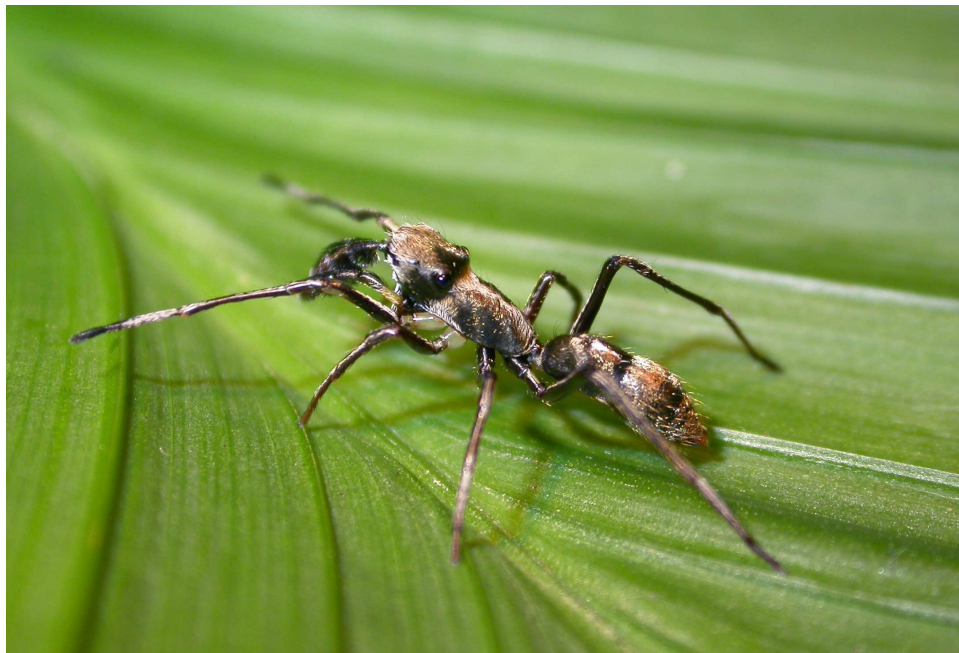


Figure 13. *Zuniga magna*, female from Costa Rica, Heredia Province, Sarapiquí Canton, Puerto Viejo de Sarapiquí, La Selva Protected Zone, La Selva Biological Station. Photo: Lisa Taylor, by courtesy.



Figures 14-16. *Zuniga magna*, male from Colombia, Valle del Cauca, Buenaventura, Bajo Calima. **14**, Male, habitus. **15**, Same, left palp, ventral view. **16**, Same, retrolateral view. Abbreviations: e=embolus, RTA=retrolateral tibial apophysis of the male palp.



Figures 17-18. Ecosystems where the two species of *Zuniga* were found in Colombia. **17**, *Z. laeta*, highland wet forest at Hacienda La Victoria, Minca, Santa Marta, Sierra Nevada de Santa Marta, Magdalena, Colombia. **18**, *Z. magna*, lowland Chocóan wet forest, Chocó, Colombia. Photos by the author.

Material examined. Argentina, Misiones, Oberá, [27.488324°S, 55.12204°W], [323 m], Nov 1986, 1♀, Galiano, Gonzales Miranda (MACN). Brazil, Amazonas, São Gabriel da Cachoeira, [0.240277°N, 68.032222°W], [86 m], 28 Sep 1990, 1♀, A.A. Lise (MCTP 1170). Bahía, Camacau, Fazenda Matiapa, [15.415788°S, 39.49449°W], [194 m], 16 Oct 1978, 1♂, J. S. Santos (FZB 11257); Mucurí, Fazenda Escalvoda, [18.077326°S, 39.561188°W], [2 m], 14 Sep 1979, 1♂, A.C. Niella (FZB 11203); Mucurí, Fazenda Paissandú, [18.077326°S, 39.561188°W], [2 m], 15 Apr 1979, 1♂, A.C. Niella (FZB 11385); Uruçuca, Fazenda Almada, [14.596458°S, 39.286179°W], [95 m], 26 Nov 1977, 1♂, 1♀, J. S. Santos (FZB 10279, 11330). Espirito Santo, Linhares, Suoretama, [19.378523°S, 40.00989°W], [20 m], Oct 1962, 1♂, A.

Martínez (MACN). Colombia, Valle del Cauca, Buenaventura, Bajo Calima, [3.998055°N, 76.969444°W], 25 m, 18 Jun 1982, 1♂, no collector (ICN-Ar 7068).

Diagnosis. Somatically the species can be differentiated from *Z. laeta* by the dorsal eye field occupying 34-38% of the total length of the prosoma (Figs. 10, 14), with distinct radiating prosomal grooves and a brown prosoma and abdomen (in alcohol and in life), with an “inverted-V” white mark above the abdominal constriction (Figs. 10, 13-14). Males can distinguished by the short and distally dilated femur of the palp, with embolus directed forward (Figs. 15-16). Females can be distinguished from those of *Z. laeta* by their epigyne, with larger rounded pits (Fig. 12), and the chitinous septum reaching the height of the spermathecae on the anterior side, and copulatory ducts longer and convoluted. For more diagnostic characters see Galiano (1964a: 70). The specimen shown here has a slender sternum (Fig. 11).

Distribution. Mexico (San Luis Potosí), Costa Rica (Heredia), Panama (Canal Zone Biological Area, Barro Colorado Island), British Guiana (Cuyuni-Mazaruni region), Colombia (Valle del Cauca), Brazil (Amazonas, Bahía, Espirito Santo, São Paulo, Paraná), Peru (Loreto), and Argentina (Misiones) (Fig. 19). This includes new northernmost and southernmost records for the species, and new genus records for Argentina (Misiones Province, after Rubio, 2014) and Colombia. In Brazil, this includes new records from the Amazonas, Bahía and Espirito Santo states. The known altitudinal range is 0-800 m. Mexican records of the species are based on the high-definition diagnostic images of the Alvarez-Padilla Laboratory (2014).

This species has been collected in a conserved low-land Chocoan wet forest in Colombia (Fig. 18), beating vegetation in a second-growth clearing forest in Costa Rica (Bodner, 2002), and a 25-35 year old remnant tropical forest in México (Alvarez-Padilla Laboratory, 2014). There are some unconfirmed records of the species from Peru, Junín (MCZ 25866) and Costa Rica, Guanacaste (MCZ 25666) identified by M.E. Galiano and G. Bodner in the MCZ on-line catalogue, respectively (Fig. 19).

Discussion

The genus *Zuniga* has a strictly Neotropical distribution, with its northern record in the Xilitla municipality of San Luis Potosí state, México, in the Veracruz province (Mesoamerican dominion), and its southern record in the Montenegro municipality of Rio Grande do Sul state, Brazil (Figs. 19-20). Both records are located very close to province or subregion convergences. In the north this represents the transition between the Veracruz province and the Mexican transition zone. In the south this is situated between the Parana Forest province (Parana dominion) and the Pampean province (Chacoan dominion).

Each of the two species of *Zuniga* has a different distribution. The scarce or rare *Z. laeta* has been reported mainly toward the southern hemisphere, in the Chacoan subregion, with some other disjunctive records close to transitional zones, curiously at high altitudinal locations. In the northwestern and southwestern localities, the species is recorded close to the South American transition zone, dominated by open vegetation areas. On the other hand its eastern localities are associated with middle forested areas of the Brazilian Atlantic region. In the southwest this species was collected in the last southern remnants of the Yungas province (Yungas forests; after Rubio, 2015).

Is important to point out that the record of *Z. laeta* in the Pampean province (Chacoan subregion) could be due to a failure in the accuracy of the georeferenced data, because the remaining records are all in the Parana dominion. The unconfirmed record by Metzner (see above) could represent the only Amazonian record of for this species, in the Madeira province (Fig. 20).

The more widespread *Z. magna* also has a disjoint distribution, with its southern range near that of *Z. laeta*, although it has not been found at the same locations (Figs. 19-20). In its northern records, it is found mainly in forested zones between Amazonian, Guianan and Chocoan regions, up to the Guatuso-Talamanca province. A final northern record is in the Veracruz province (Mesoamerican dominion) in Xilitla, San Luis Potosí, México, very close to the Mexican transition zone. The record of this species in the Xingu-Tapajós province (Southeastern Amazonian dominion) could be due to a failure in the accuracy of the georeferenced data. The unconfirmed records by Galiano (see above), could represent the only South Brazilian dominion record of the species, in the Ucayali province.

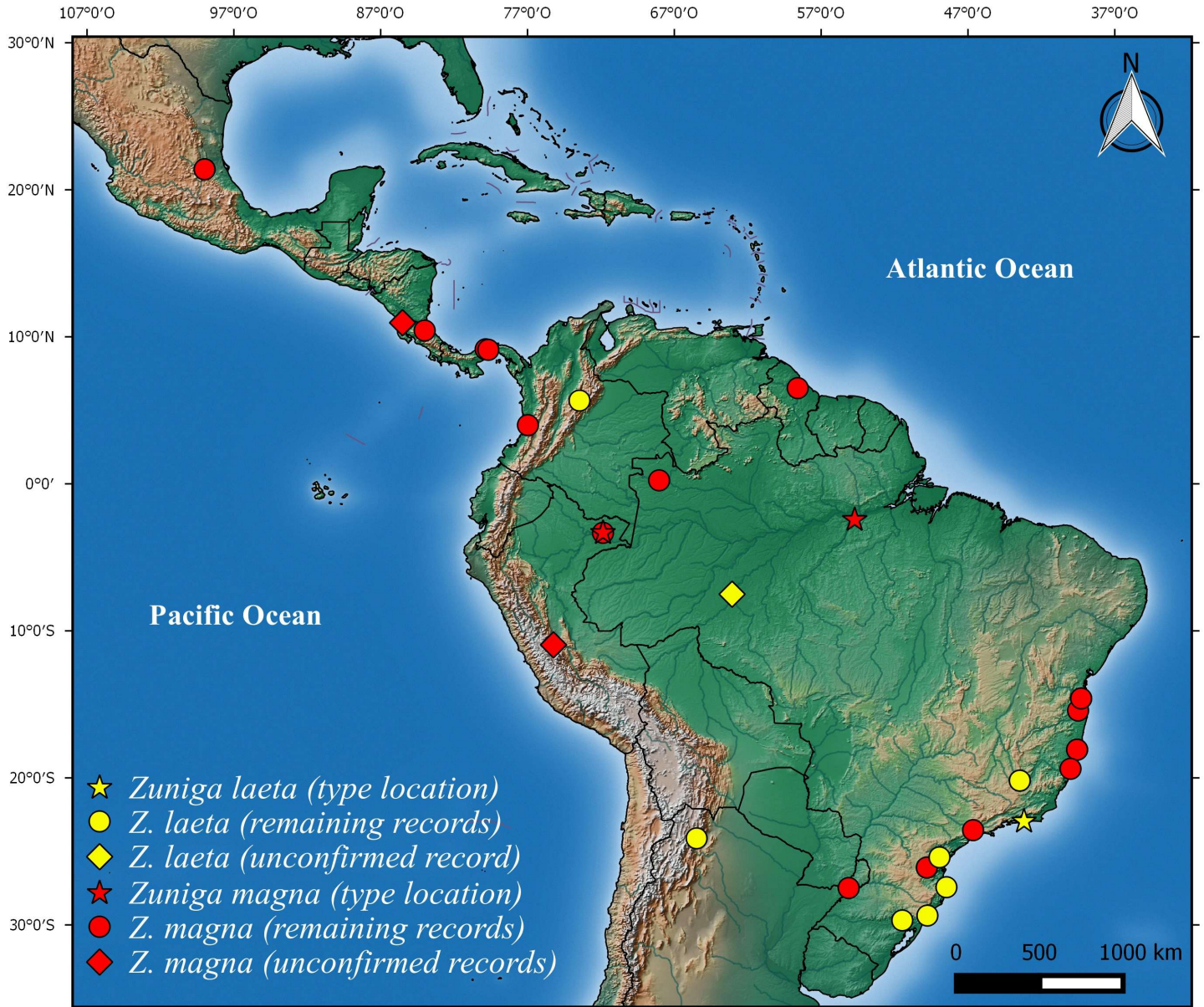


Figure 19. Known distribution of the genus *Zuniga* in the Americas.

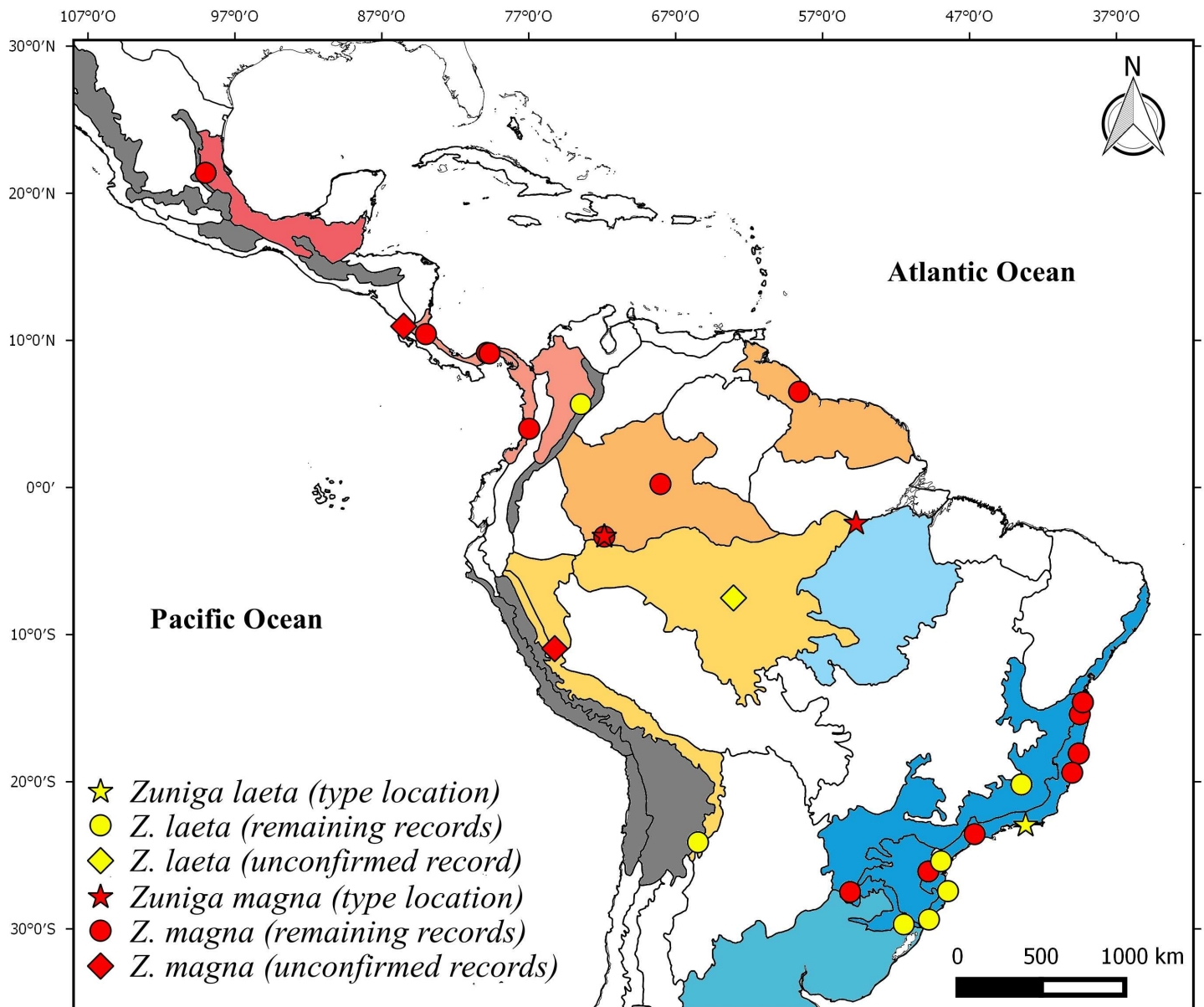


Figure 20. Known distribution of the genus *Zuniga* Peckham & Peckham in the Americas, relative to the Neotropical regionalization scheme of Morrone (2014). This only shows the provinces where *Zuniga* has been found. The gray color represent the American transition zones.

Importance of collections

Biological collections, as reservoirs of knowledge of animal distribution, are of utmost importance for its consequent conservation. This was particularly important for the very rare *Z. laeta* that has been registered in collections for many years (1940-2000), but not reported in publications. In regions such as the southern Brazilian territory these collections were the product of many years of field work by the FZB and MCTP institutions (see Buckup *et al.* 2010). The same applies to collections in the northeastern Argentinian portion of Misiones (in MACN, see Rubio, 2014). These collections and the institutions that maintain them are of great importance with respect to the knowledge needed for conservation of biota, particularly in regions like the Neotropics where high biodiversity coexists with high anthropogenic pressure to transform the environment. It is a duty of the local governments and people to conserve,

maintain and promote research in these academic campuses, not only for the conservation of the biota, but for the direct benefit of local society (Araújo & Williams, 2000; Cotterill, 1995; Fattorini et al. 2012; Funk et al. 1999; Kozłowski, 2008; Ponder et al. 2001; Pyke & Ehrlich, 2010; Suarez & Tsutsui, 2004).

Acknowledgments

I wish to express my warmest thanks to Eduardo Flórez-D. (ICN-Ar), Arno Antonio Lise (MCTP), Ricardo Ott (FZB), and Cristina Scioscia and Martín Ramírez (MACN) for permitting the revision of the material deposited in their collections. I thank Ingi Agnarsson (University of Vermont), Alexander Sabogal (Universidad Nacional de Colombia) and the CARBIO team for their invitation to collect in the northern Caribbean coast of Colombia, for the CARBIO project. I thank Jonathan Campos and Jennifer Krause (Porto Alegre), and Mario Drozler and Marisa Cabrera (Buenos Aires) for opening their homes to me, and for help, support and friendship in their cities. I thank Maria Rita Poeta (MCTP) and Luis Piacentini (MACN) for their support and friendship in the laboratory. I thank the Alvaro-Padilla Lab (Universidad Nacional Autónoma de México) and Lisa Taylor (University of Florida) for permitting the use of their photographs and information. I also thank David Hill, for his disposition and comments in the final version of the manuscript.

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