Zootaxa 0000 (0): 000–000
http://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

http://doi.org/10.11646/zootaxa.0000.0.0
http://zoobank.org/urn:lsid:zoobank.org:pub:00000000-0000-0000-0000-00000000000

On the distribution of the genus *Teius* Merrem, 1820 (Reptilia: Squamata: Teiidae)

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Abstract

The green lizard genus *Teius* is composed by three species: *Teius teyou*, *T. oculatus*, and *T. suquiensis* and is distributed in South America, east of Andes. *Teius teyou* and *T. oculatus* have wide parapatric distributions with contact zones. *Teius suquiensis* is present in a small range along a sympatric area of the former species. In this work we analyze the distribution of the three species of *Teius* across its whole geographic range, examining its relationships with climatic parameters. We based our analysis on specimens in collections and literature records. Our analysis shows that the genus *Teius* is distributed from central Bolivia southwards to north of Río Negro Province in northern Patagonia, Argentina. *Teius teyou* reaches the northernmost range limit of the genus whereas *T. oculatus* occupies the southernmost limit. *Teius oculatus* is related to open and moist environments whereas *T. teyou* is more adapted to xeric and forested areas. *Teius suquiensis* is present in xerophytic areas of Dry Chaco and Espinal. Climatic factors in the distribution of the distribution of the two widespread species show marked differences and seasonality.

Key words: climate, deforestation, ecoregions, habitat loss, South America, sympatry

Introduction

The South American lizard genus *Teius* Merrem, 1820 currently includes three species: *Teius teyou* (as *Lacerta teyou*) Daudin, 1802; *T. oculatus* (as *Ameiva oculata*) D'Orbigny & Bibron, 1837; and *T. suquiensis* Avila & Martori, 1991. *Teius* belongs to the Teiinae subfamily (Estes *et al*. 1988), and as many other members of the subfamily, individuals of *Teius* have a bright green coloration, a long tail with autotomy, are extremely agile and exceptional runners (Cei 1993; Avila 2002; Carreira *et al*. 2005).

The three species of *Teius* have an eastern-Andean distribution. Avila (2002) studied the chorology of the genus, showing that the bisexual species (*Teius oculatus* and *T. teyou*) have wide distributions, whereas the parthenogenetic *T. suquiensis* is restricted to a narrow contact zone between the bisexual species, in the provinces of Córdoba, San Luis, and Santa Fe (Avila & Martori 1991; Avila 2002), being sympatric with either one of the sexual species or even with both of them (Guerreiro *et al*. 1998; Avila 2002; Cabrera & Monguillot 2007).

An important fact of *Teius* is that these lizards have wide trophic ranges, they feed opportunistically on the available prey that varies depending on the season (Acosta *et al*. 1991; Avila *et al*. 1992; Cappellari *et al*. 2007). Even when these lizards consume mainly insects, they are omnivorous animals eating also fruits and therefore being considered a seed disperser in the Dry Chaco (Varela & Bucher 2001). All these dietary traits plus the fact that they can tolerate rather well anthropogenic alterations, make these lizards the most common reptiles within its chorological range.

Avila (2002) published a detailed revision of the distribution of the genus and found a sympatric diagonal gradient between *Teius oculatus* and *T. teyou*, highlighting areas where even the three species seem to be sympatric.

Knowledge of the biodiversity distribution is not only important for conservation but also to understand the

Accepted by S. Carranza: 19 May 2016; published: ?? Month 2016

different species distribution patterns facing the growing and rapid process of habitat loss. In this work we analyzed the distribution of the genus *Teius* across its whole geographic range, and discuss the chorology as well as its relationships with climatic parameters.

Method

Our work is based on an exhaustive revision of scientific collections and web resources including Species Link (http://splink.cria.org.br/) from Brazil, and VertNet (http://vertnet.org/index.php) from the USA. Additionally, we conducted fieldwork in different areas of the distribution of the genus that resulted on the addition of new distributional data for species of this genus. Acronyms used in the text follow Sabaj Pérez (2014) except CHC-L (Colección Herpetológica de Corrientes – Lagartijas, actualmente UNNEC) and CZPLT (Colección Zoológica Para La Tierra, San Pedro, Paraguay). Bibliographic records were obtained from Acosta & Murúa (1998), Álvarez *et al*. (1995), Briguera *et al*. (2005), Carreira *et al*. (2005), Céspedez *et al*. (2001), Dirksen & de la Riva (1999), Etchepare *et al*. (2013), Gallardo (1966; 1969), Gallardo *et al*. (1985), Guerreiro *et al*. (1998; 2005), Halloy *et al*. (2007), Hellmich (1960), Kacoliris *et al*. (2006), Leynaud & Bucher (2005), Lions *et al*. (1997), Lopez & Prado (2008), Mertens (1929), Padial *et al*. (2003), Pelegrin & Bucher (2015), Peracca (1897), Pérez *et al*. (2011), Scrocchi *et al*. (2010), Souza *et al*. (2010), Winck *et al*. (2011), and Zaracho *et al*. (2014).

We generated distribution maps with DIVA-GIS 7.5 and ArcMap 10.3, and we used ecoregional maps from http://maps.tnc.org/gis_data.html based on Olson *et al*. (2001).

We obtained climatic information from WorldClim (Global Climate Data) based on Hijmans *et al*. (2005). For high resolution elevation maps we used SRTM30 (30 seconds resolution) datasets taken from Consortium for Spatial Information (CGIAR-CSI) available on http://www.diva-gis.org/gdata (Jarvis *et al*. 2008).

We plotted the records of *Teius* on elevation and ecoregional maps using ArcMap 10.3, and precipitation and temperature maps using DIVA-GIS 7.5. To visualize sympatric areas, we conducted a richness analysis using grids of 0.5 square degrees, and simple "Point to grid procedure".

Results

We analyzed 2001 specimens (915 *T. oculatus*, 302, *T. suquiensis* and 784 *T. teyou*) from 1071 localities (Appendix 1), including all the type specimens of the three species.

Our analysis shows that the genus *Teius* is distributed from central Bolivia southwards to north of Río Negro Province in northern Patagonia, Argentina; occupying an area in the center and north of the southern cone of South America, east of Andes (Fig. 1). The whole distribution extends from high elevation areas in the "pre-cordillera" (up to 2587 masl, San Francisco, Tarija Province, Bolivia; Dirksen & De la Riva 1999) to the Atlantic coast (near sea level).

Teius oculatus reaches the southernmost range limit of the genus (Fig. 1). The latitudinal range extends from 24º04'12"S (Reserva Natural del Bosque Mbaracayú, Canindeyú, Paraguay; MNHNP 10860) to 40º54'03"S (Río Negro Province, Argentina; Scrocchi *et al*. 2010) southwards; and from 51º01'19"W (Viamão, Rio Grande do Sul, Brazil; MCP 4657) to 68º28'15"W (San Rafael, Mendoza, Argentina; several specimens at the MHN SR H listed in Appendix 1) of longitude west. These and other localities mentioned in the text, are shown in Figure 2. The southern limit, south of the Colorado River still needs effective confirmation with voucher specimens; only observations of a few specimens in the area between the Colorado and Negro rivers are available. This species is present in eastern Paraguay, northeastern, eastern and central Argentina, Uruguay, and Rio Grande do Sul State in Brazil.

The ecoregional distribution of *Teius oculatus* is related to Low Monte, Espinal, Pampas, Parana Flooded Savanna, Uruguayan Savanna, Southern Cone Mesopotamian Savanna, and Humid Chaco (Fig. 3). Furthermore it is present in the southeastern edge of the Dry Chaco, and there are some records of this species in the Araucaria Moist Forest (one record from Mormaço, Rio Grande do Sul, MCP 17718) and Alto Paraná Atlantic Forest. Nevertheless, it is important to note that even when this species is present in this ecoregion, it is not associated with the forest. For example, a detailed observation at Tuparendi (Fig. 4A) in Rio Grande do Sul (Brazil; 27º45'23"S, 54º28'54"W) or Campo Viera (Fig. 4B) in Misiones (Argentina; 27º19'41"S, 55º03'36"W) reveals that those areas

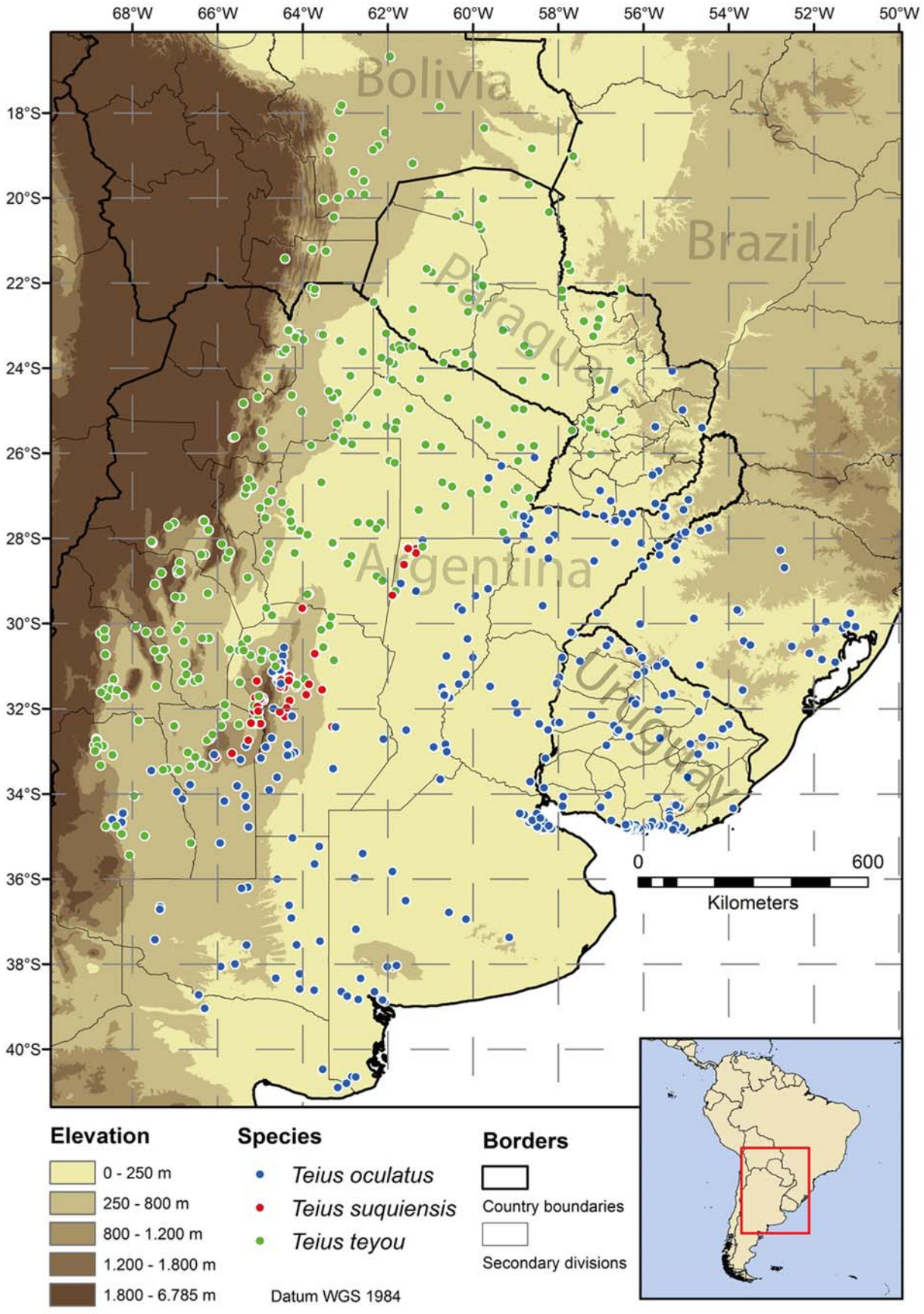

FIGURE 1. Geographic distribution of the genus *Teius*.

FIGURE 2. Important localities mentioned in the text.

actually lack forest, and most of the area is covered by grasslands or crop fields. We performed a field survey at San Rafael National Park (Itapúa, Paraguay; 26º30'42"S, 55º47'20"W), and we found that even when the study area has two main biomes (forest and grassland, Fig. 4C) *T. oculatus* is only present in the grasslands (Fig. 4D). Given that *Teius oculatus* shows tolerance for modified environments it can be found in natural or introduced grasslands; nevertheless, when the degrading impact is too high, *T. oculatus* is absent. For example, in a field survey at Itakyry (Alto Paraná, Paraguay; 24º58'59"S, 55º04'58"W) (Fig. 4E) we found this species in shrub-lands with some degree of anthropogenic perturbations (Fig. 4F), but absent in crop fields. In the southwestern limits of its distribution, in areas were vegetation is typical of Monte (eastern Mendoza, southwestern San Luis and western La Pampa), *Teius oculatus* is found in dry and shrubby environments that are commonly occupied by *T. teyou*. This entire region is part of the Atuel and Salado Chadileuvu rivers drainage, a southern portion of the Desaguadero

basin, which became drier when water use increased for agricultural and human consumption around Jachal, San Juan, Mendoza and San Rafael cities. Some chronicles mention the advance of the "jarilla" (*Larrea* spp.) on grasslands areas, but there is no scientific information about the effect of the lack of water on the landscape and biodiversity. Probably populations of *T. oculatus* are relicts of a more westernmost distributions of this genus in central Argentina. Present population density seems to be low, but in the last 10 years we were able to collected several specimens and observe its presence along roads of western La Pampa and southern San Luis, extending its known southwestern distribution at least 100-200 km SW from previous records. *Teius oculatus* is not the only "pampasic" (Gallardo 1966) species in this region, *Liolaemus wiegmannii* is in periurban areas surrounding San Juan, Mendoza and San Rafael-General Alvear cities in San Juan and Mendoza provinces (Avila et al. 1998; Corbalan and Debandi 2008), and some other species of vertebrates presently only found in eastern Argentina were registered several years ago (e.g. *Synbranchus marmoratus*, Murúa and Acosta 2007).

The altitudinal range of *T. oculatus* varies from near sea level in coastal areas of Uruguay and Buenos Aires (Argentina) to 1292 masl in central Argentina in "Sierras de Córdoba", Córdoba, Argentina (2 km E of Characato, CM 72486) (Fig. 1). The climatic conditions in the distribution area of this species ranges from a minimum mean temperature of -1.1ºC (July) in Mendoza (Argentina), to a maximum mean temperature of 35.8ºC (January) in Santa Fe (Argentina) (Fig. 5). Most of the locality records of this species are in areas with an annual mean temperature ranging from 14 to 23ºC (Fig. 6). With respect to rainfalls, *T. oculatus* is distributed in areas with values from 200 to 1800 mm/yr (Fig. 7). Figure 5 shows that some areas of Uruguay and southern Brazil where *T. oculatus* is present, hold almost equal levels of precipitation along the year; while towards the west of its distribution, during the dry season values of rainfalls can be less than 10 mm/month between June and August (Locality 5, Fig. 5).

Teius suquiensis is present in two relatively small areas, one in the northeastern corner of Santa Fe Province, and another in central and western Córdoba Province, following the "Sierras" and reaching the northeastern area of San Luis Province (Fig. 1). The range extends from 28º14'20"S (Estancia El Nochero, Santa Fe, Argentina; several specimens at the CENAI listed in Appendix 1) to 33º07'59"S (La Florida, San Luis, Argentina; Guerreiro *et al*. 1998) southwards, and from 61º20'24"W (45 km NE of Villa Minetti, Santa Fe, Argentina; MACN 4176) to 66º01'59"W (La Florida, San Luis, Argentina; Guerreiro *et al*. 1998). This species is present in the southernmost edge of Humid Chaco, being more abundant in Dry Chaco and Espinal (Fig. 8). The northeastern areas of its distribution are lowlands (from 68 to 74 masl), while the populations that inhabit the surroundings of "Sierras de Córdoba" have an altitudinal range from 210 to 1210 masl. This species is present in areas with a temperature range from 0.1ºC (July) in San Luis (Argentina) to a maximum of 35.8ºC (January) in Santa Fe (Argentina) (Fig. 5). The annual mean temperature in areas where *T. suquiensis* is present ranges from 14 to 20ºC in the southwestern population (Córdoba and San Luis provinces) and from 20 to 23ºC in the northeastern population (Santa Fe Province) (Fig. 6). The annual rainfall range is between 400 and 1000 mm/yr (Fig. 7) with records of less than 10 mm/month in the dry season (June-August) to maximum peaks of more than 100 mm/month in the rainy season (October-March) (Fig. 5).

Teius teyou, the most boreal species of the genus (Fig. 1), is present from 16º40'08"S (Los Troncos, Santa Cruz Province, Bolivia; Hellmich 1960) to 35º26'09"S (Prov. Route 179, 9.2 km N of intersections with Routes 179 and 190, Mendoza, Argentina; LJAMM-CNP 5036) in the south, and the longitudinal range goes from 56º17'59"W (Laguna Blanca, San Pedro, Paraguay; several specimens at the CZPLT listed in Appendix 1) to 68º53'42"W (El Challao, Mendoza, Argentina; IBAUNC 147 and 849). This species is present from south-central Bolivia through the western portion of Paraguay (west of Paraguay River), with some records in the eastern portion of the country, and in the western border of the Brazilian State of Paraná, to central western Argentina, reaching the Precordillera de los Andes (Fig. 1).

The ecoregional affinities of *T. teyou* correspond mainly to xeric environments in Chiquitano Dry Forest, Dry Chaco, Southern Andean Yungas, Humid Chaco, Low as well as High Monte, and Espinal. Furthermore, there are some records in Pantanal, Cerrado, and Paraná Flooded Savanna, but only marginally near the border with the Humid Chaco (Fig. 9). In Paraguay the species has a single record in the Alto Paraná Atlantic Forest (Fig. 9).

Teius teyou is the species that has the broadest vertical range, being present from lowlands in the Chaco (approx. between 50 and 100 masl) to 2595 masl in San Francisco (Tarija, Bolivia, in Yungas ecoregion). Additional records above 1000 masl include several along the western edge of its distribution. The majority of the distributional range of *T. teyou* is in areas with an annual mean temperature of 20 to 26ºC, with some records of 14

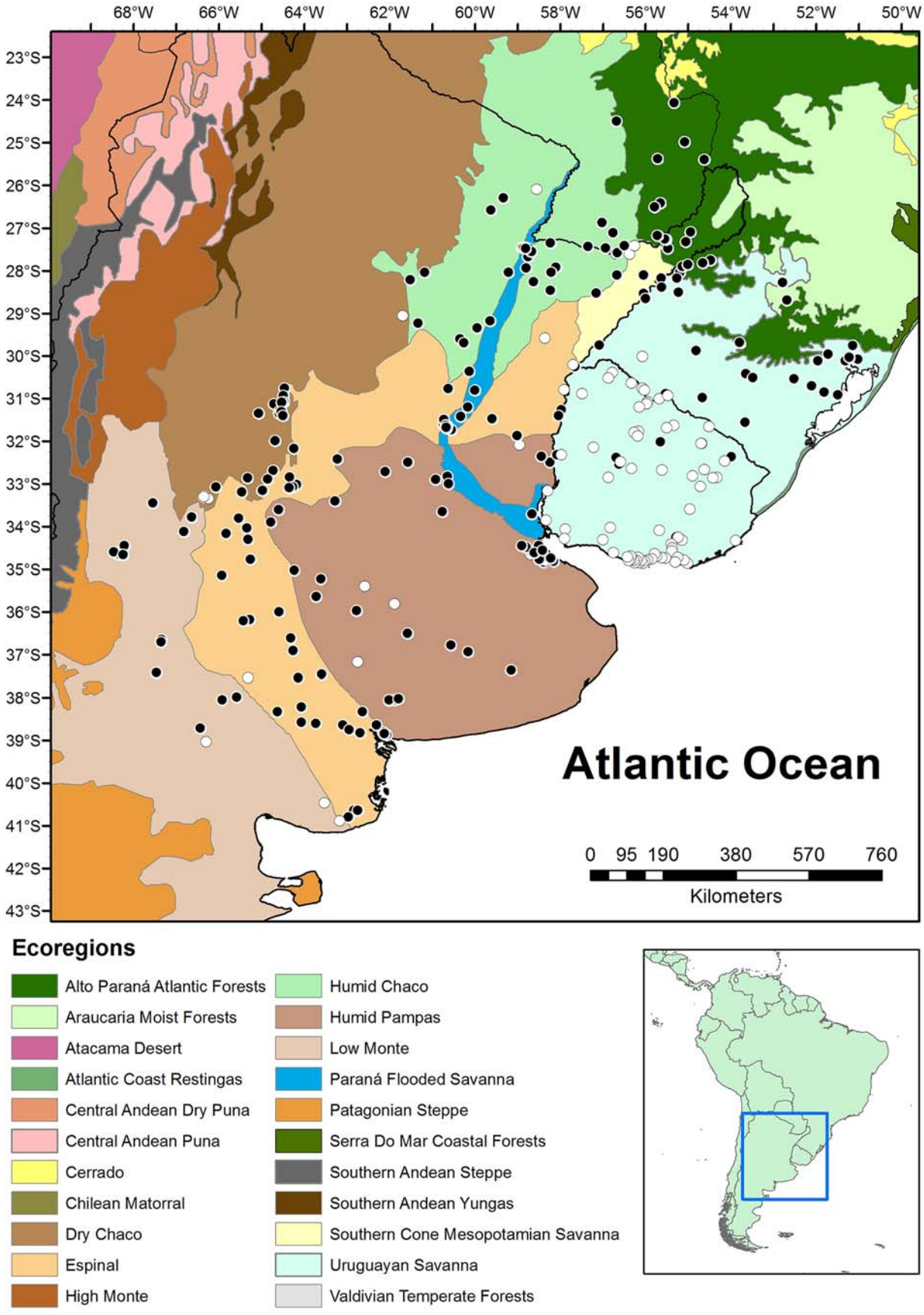

FIGURE 3. Ecoregional map for *Teius oculatus*. Black symbols: collection records, white symbols: literature records.

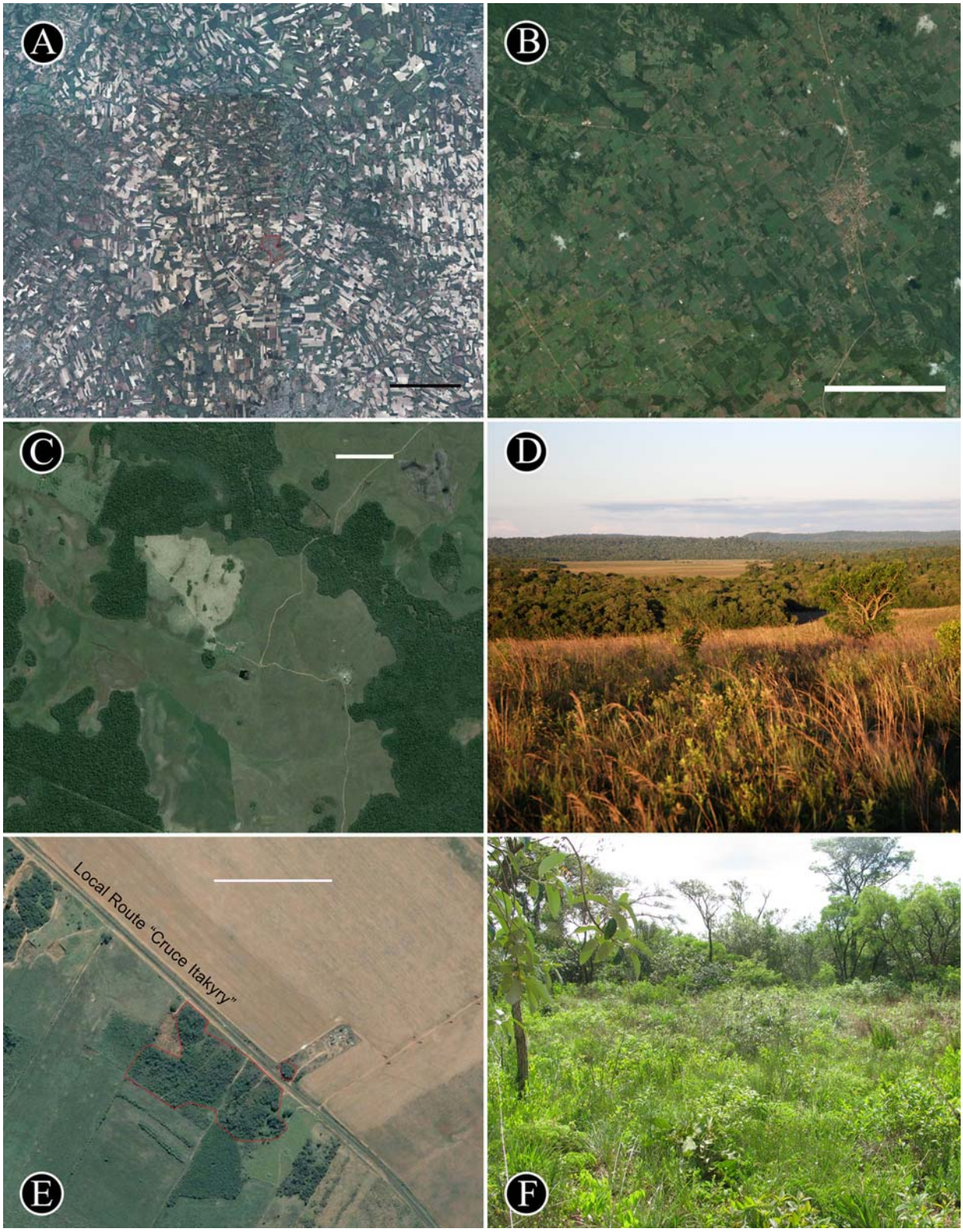

FIGURE 4. Satellite images of: A—Tuparendi, Rio Grande do Sul, Brazil (city marked with a red polygon), black bar 5 km (Date of image 6-XI-2013). B—Campo Viera, Misiones Argentina, white bar 4 km (Date of image 9-III-2014). C—Kangüery at San Rafael National Park, Itapúa, Paraguay, white bar 500 m (Date of image 29-VIII-2006); two major biomes are visible: forest (dark green) and grasslands (light green). D—Landscape photography showing the typical habitat for *Teius oculatus* in Kangüery (natural grasslands), mixed with patches of forest. E—Vicinities of Itakyry, Alto Paraná, Paraguay, white bar 250 m (Date of image 1-VIII-2006); areas where *Teius oculatus* was found during fieldwork delineated in a red polygon. F—Photography of modified shrubs at Itakyry, typical environment of *T. oculatus* (no presence was recorded in culture fields or around houses).

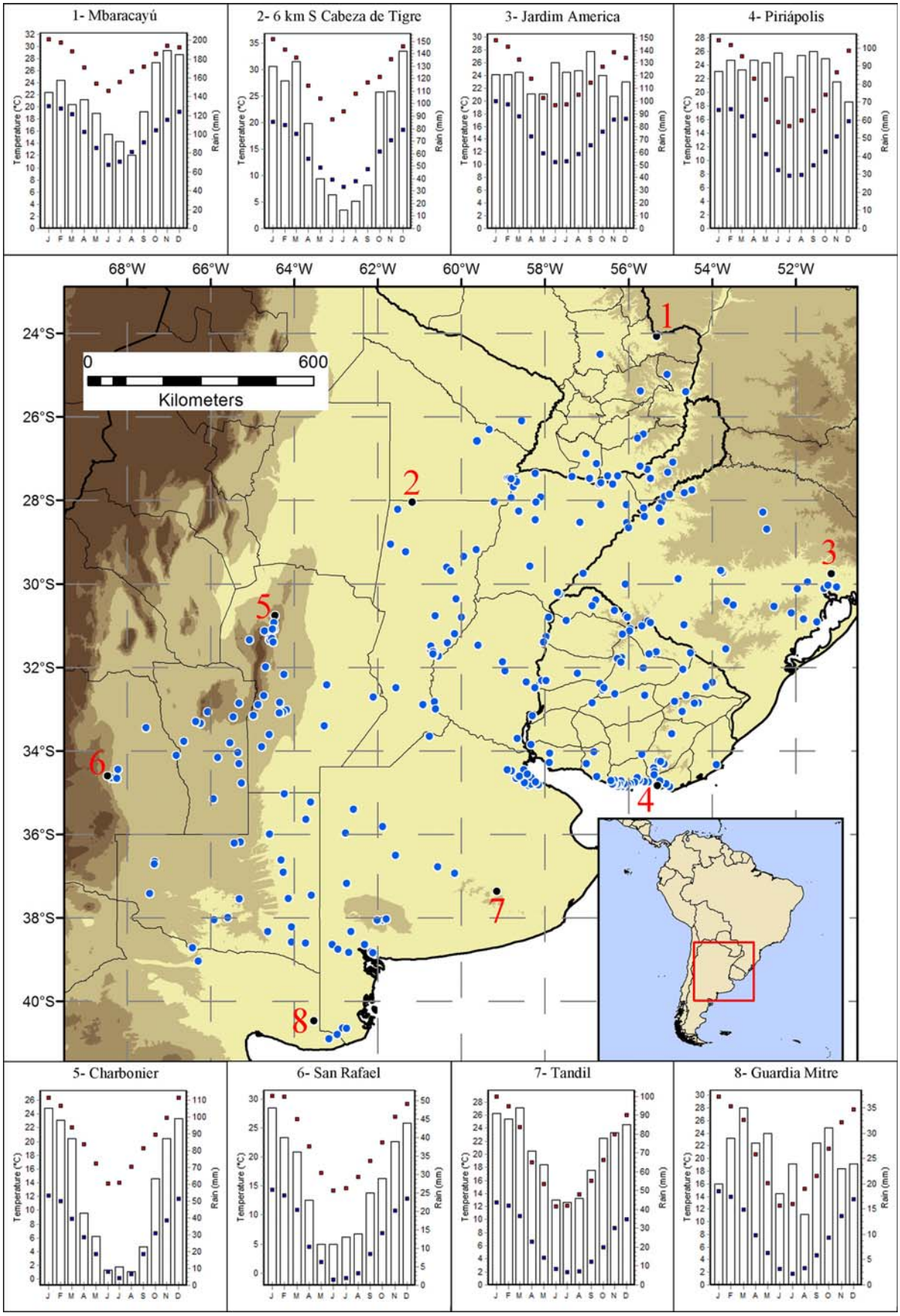

FIGURE 5. Climatic conditions (temperature and precipitation) in some localities of *Teius oculatus*. Temperature graphed with squares (minimum blue, maximum red) and rainfalls with vertical bars.

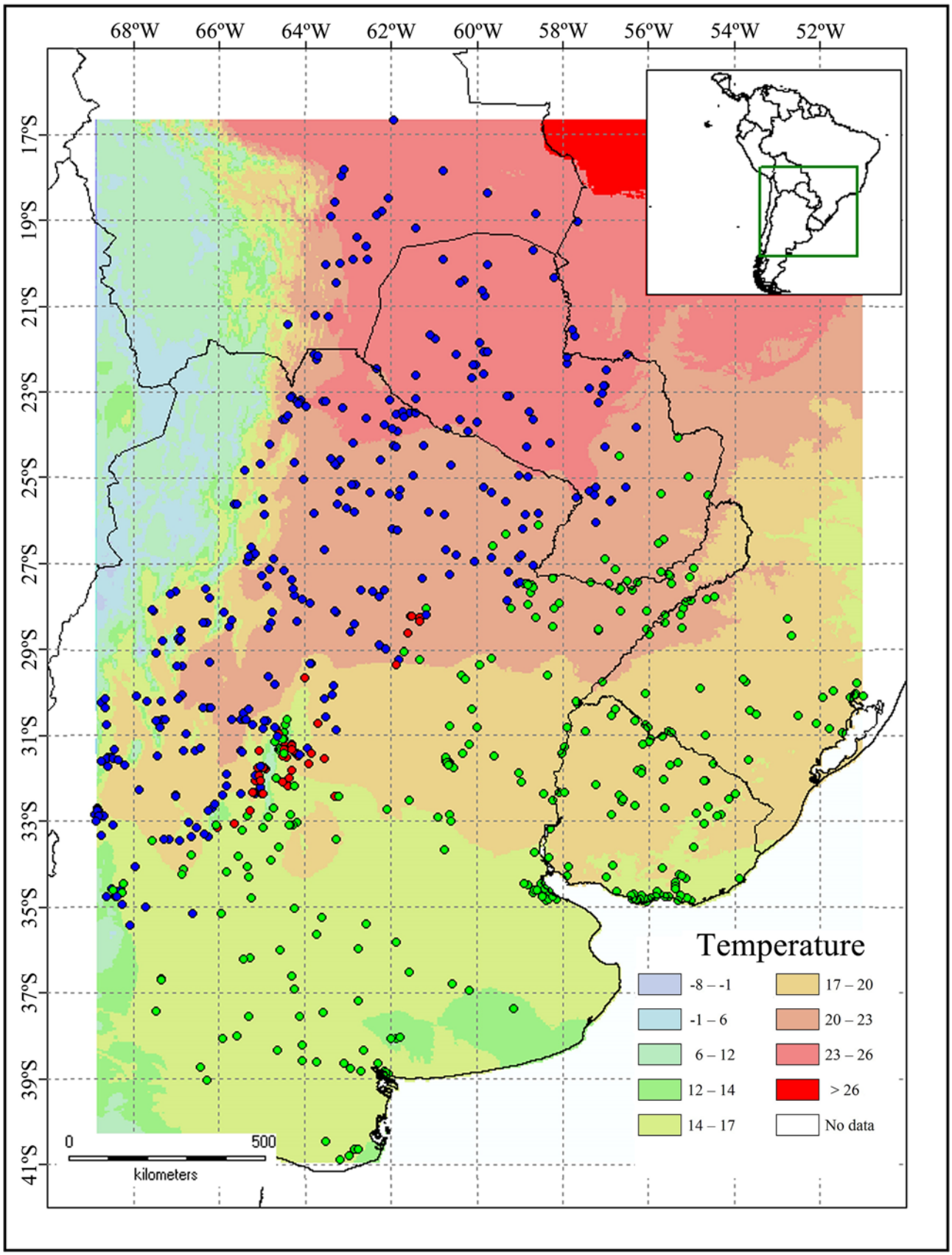

FIGURE 6. Annual mean temperature in the distribution range of *Teius* (blue: *T. teyou*, red: *T. suquiensis*, and green: *T. oculatus*). Temperature in ºC.

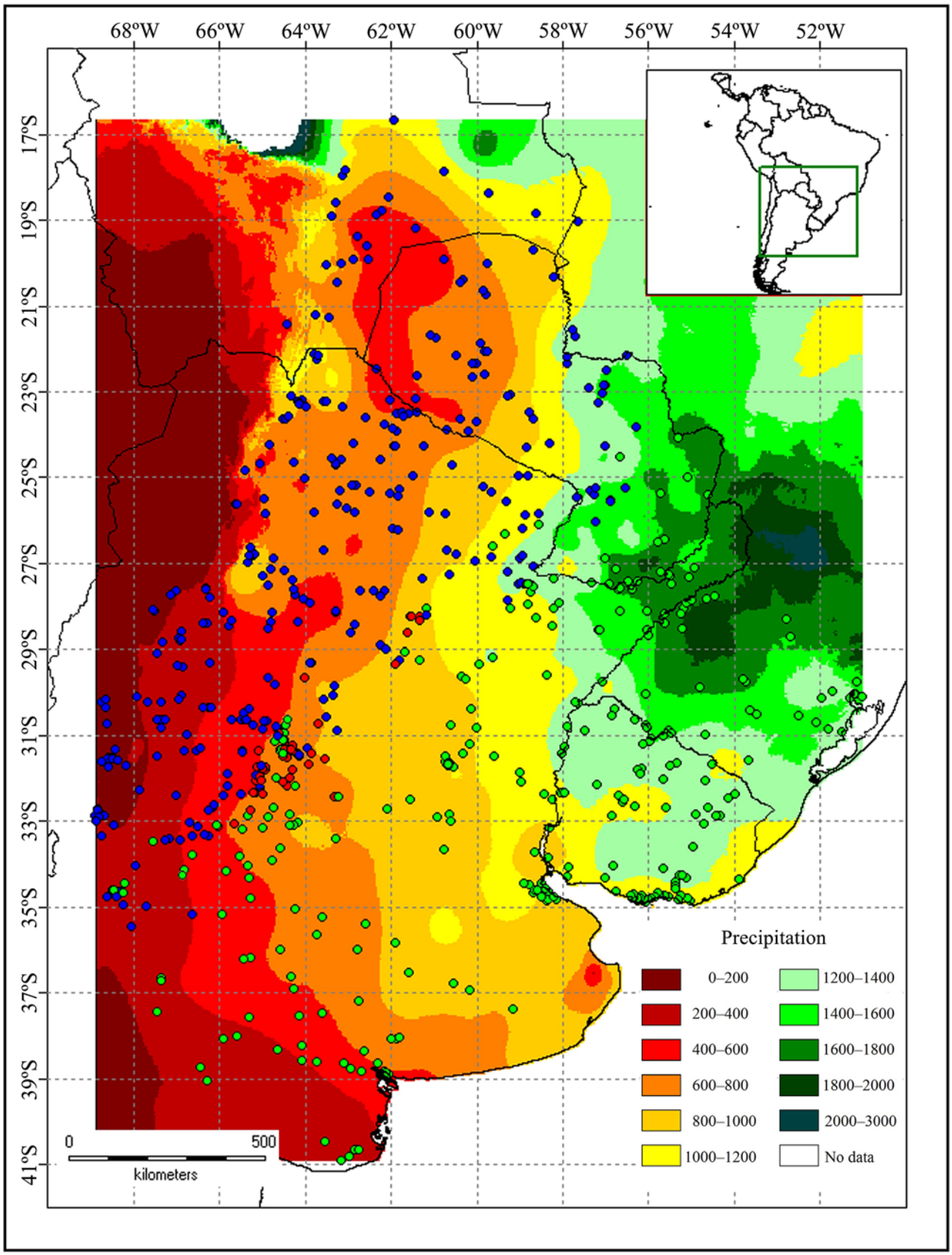

FIGURE 7. Annual precipitation in the distribution range of *Teius* (blue: *T. teyou*, red: *T. suquiensis*, and green: *T. oculatus*). Precipitation in mm per year.

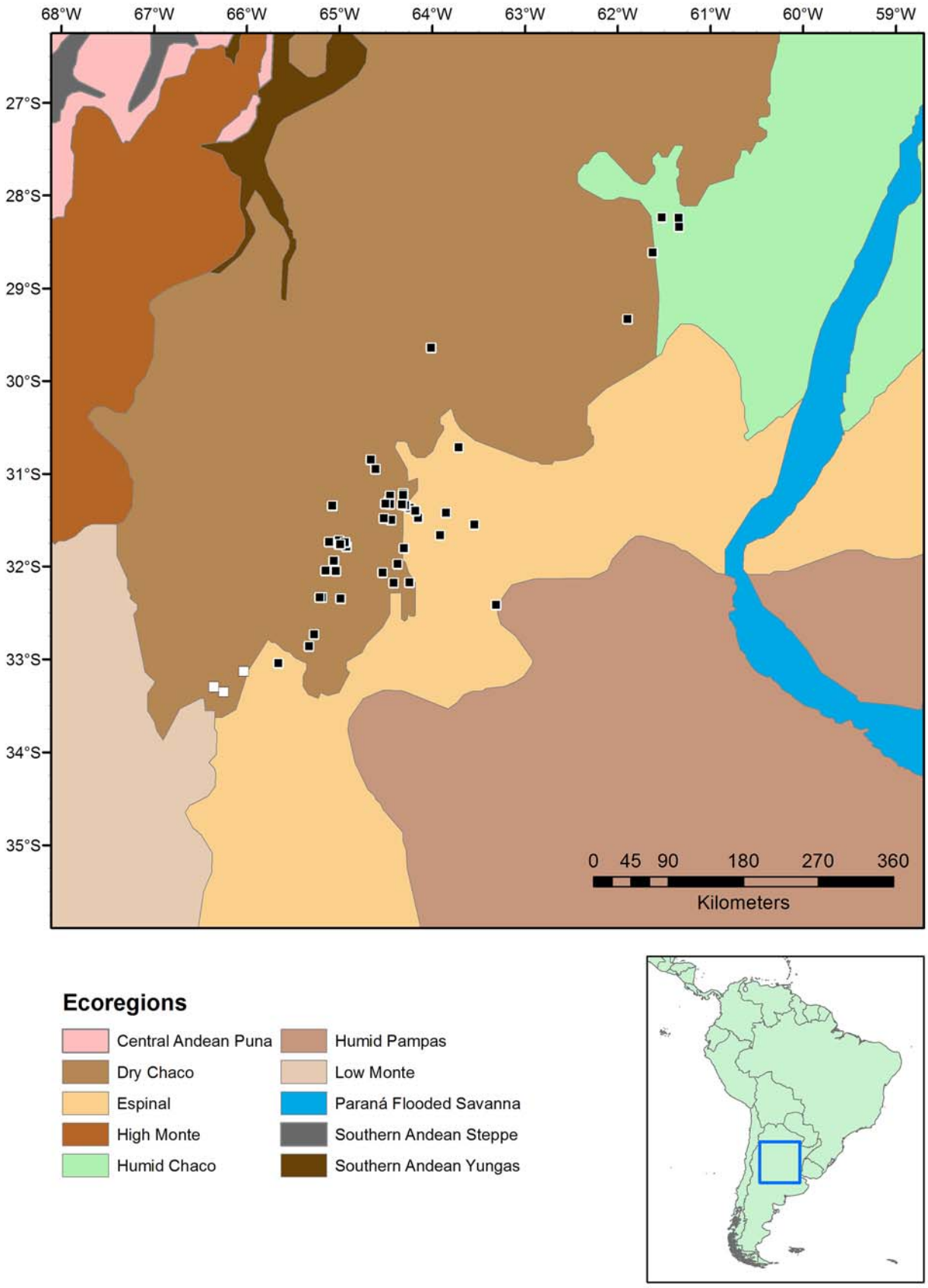

FIGURE 8. Ecoregional map for *Teius suquiensis*. Black symbols: collection records, white symbols: literature records.

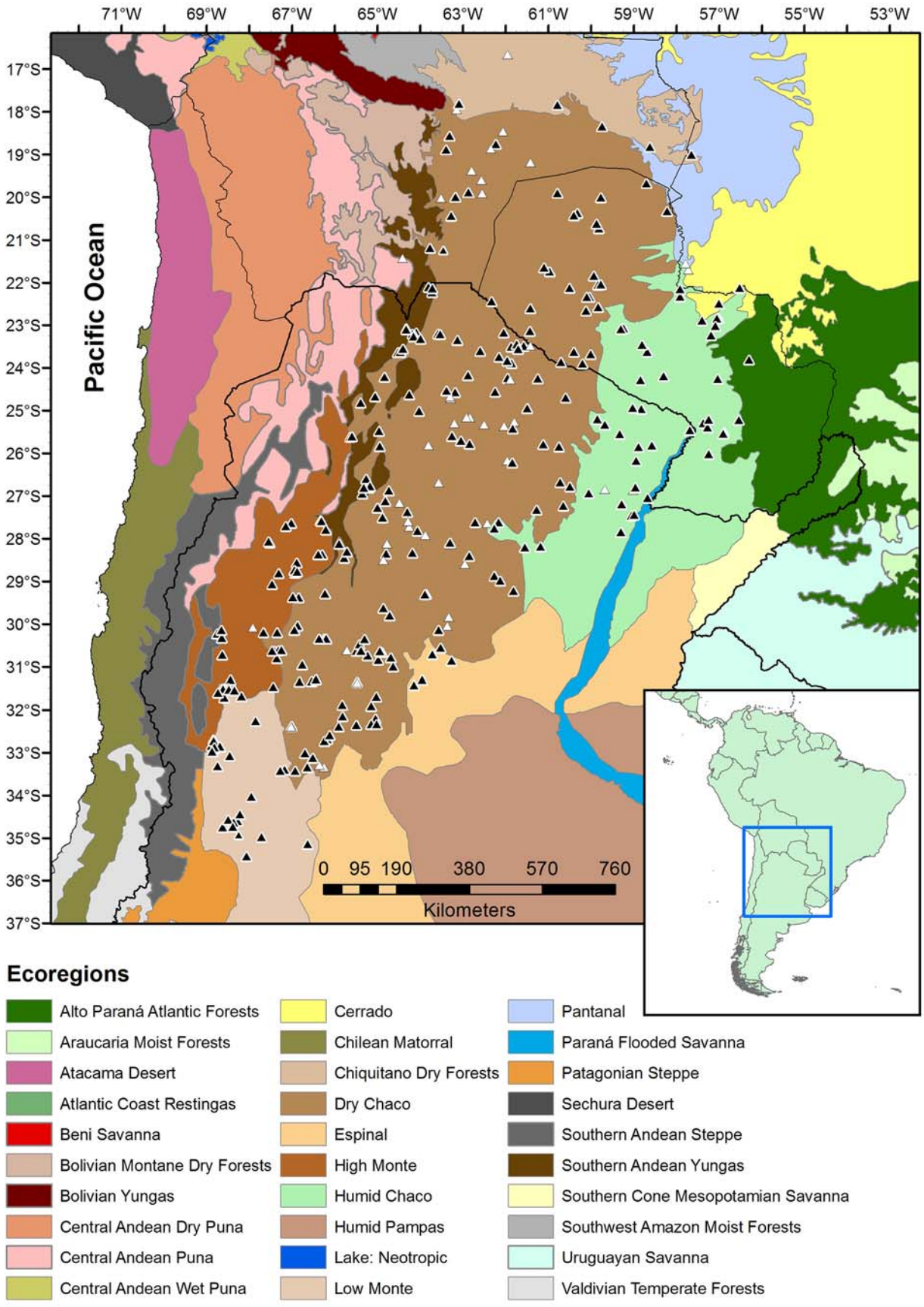

FIGURE 9. Ecoregional map for *Teius teyou*. Black symbols: collection records, white symbols: literature records.

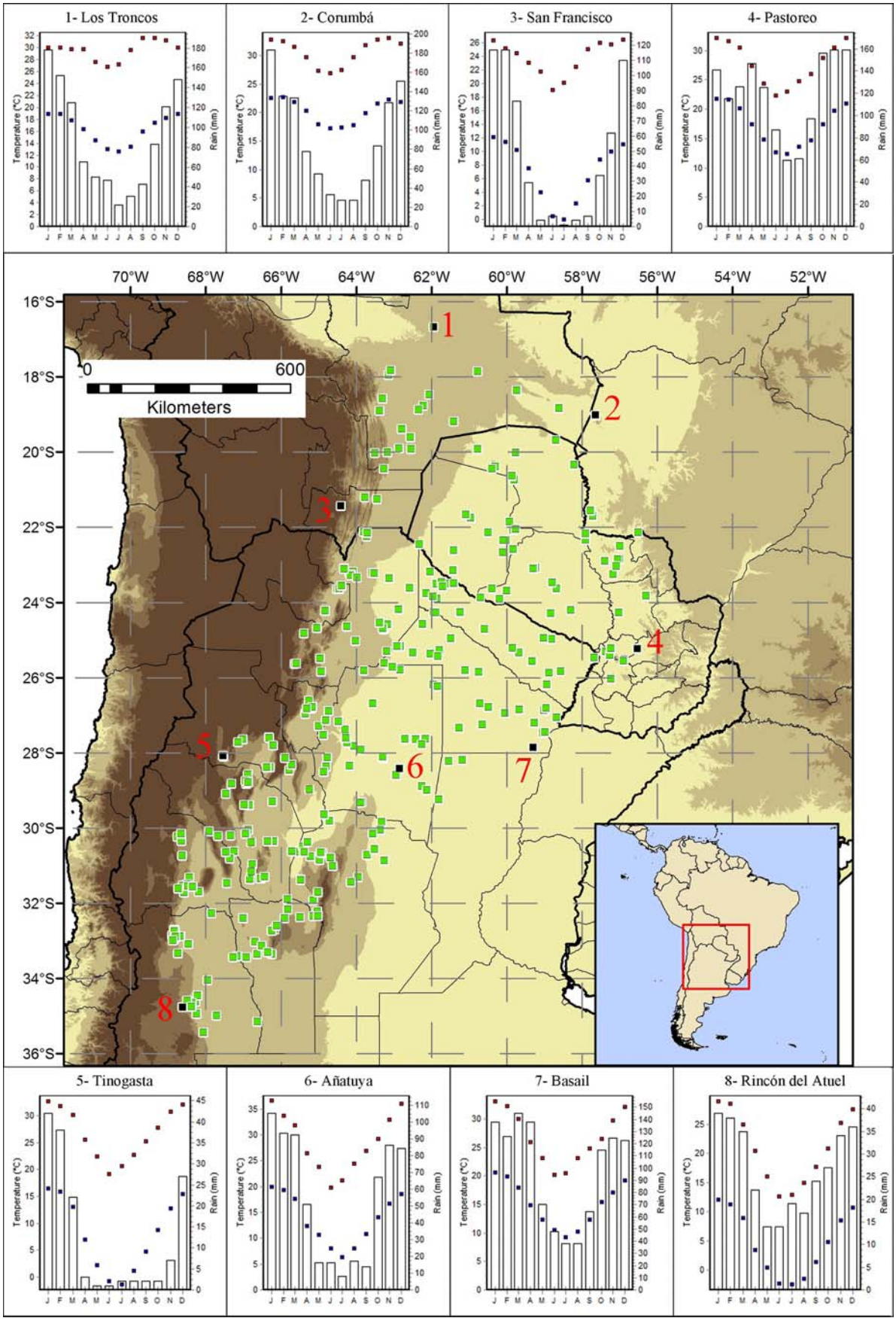

FIGURE 10. Climatic conditions (temperature and precipitation) in some localities of *Teius teyou*. Temperature graphed with squares (minimum blue, maximum red) and rainfalls with vertical bars.

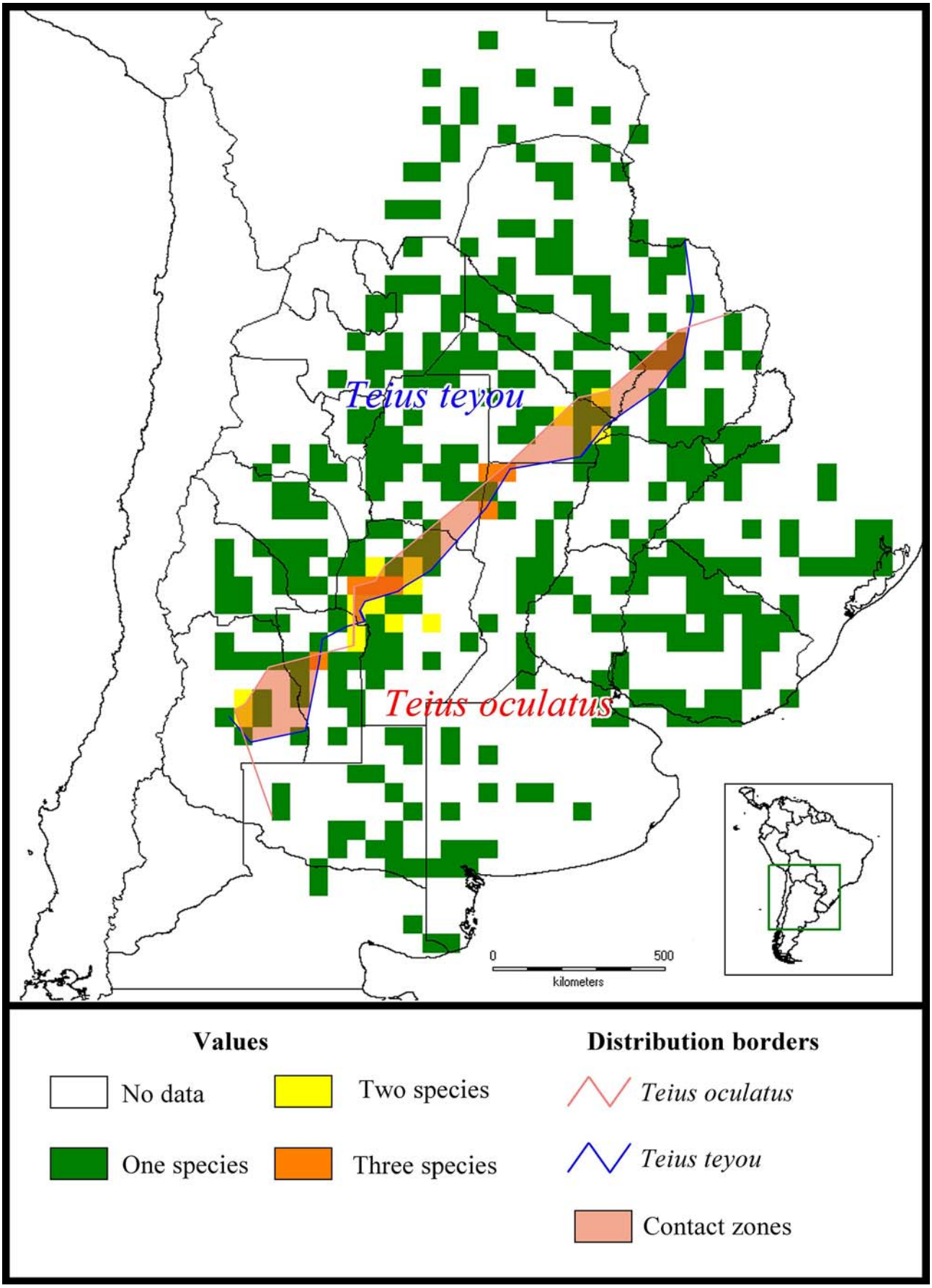

FIGURE 11. Richness map showing areas of sympatry among two or the three species of *Teius*.

FIGURE 12. Chronological change of the study site "Itakyry" (also shown in Fig. 3E). Dates of images from left to right: 13-IV-2003 / 1-VIII-2006 / 14-XI-2014. Note that suitable habitat for *Teius oculatus* is shrub lands (darker green).

FIGURE 13. Landscape at Laguna Blanca, being the only white sand environment where *Teius teyou* is present.

to 20ºC in the southern portion of its range (Fig. 6). The coldest record for the species was -2.6ºC (July) in Rincón del Atuel, Mendoza (Argentina), and the warmest was 36.6ºC (January) in Añatuya, Santiago del Estero (Argentina) (Fig. 10). The precipitation across its distribution fluctuates between less than 200 mm/yr to 1400-1600 mm/yr (Fig. 7). *Teius teyou* is distributed in areas with a very marked seasonality of dry and humid periods; the lowest precipitation rate is close to zero in the western portion of its distribution (near the Andes, Fig. 10).

Most of the distributions of the two sexual species show high levels of parapatry with some contact zones, where they are in sympatry (Fig. 11) but they were never found in syntopy. The three species of the genus are found in sympatry in some areas of northwestern Santa Fe, west of Córdoba, center of San Luis and central Mendoza in Argentina (Fig. 11). Contact areas between *T. oculatus* and *T. teyous* also include a fringe from Paraguay southwestwards to southeastern Chaco Province in Argentina (Fig. 11).

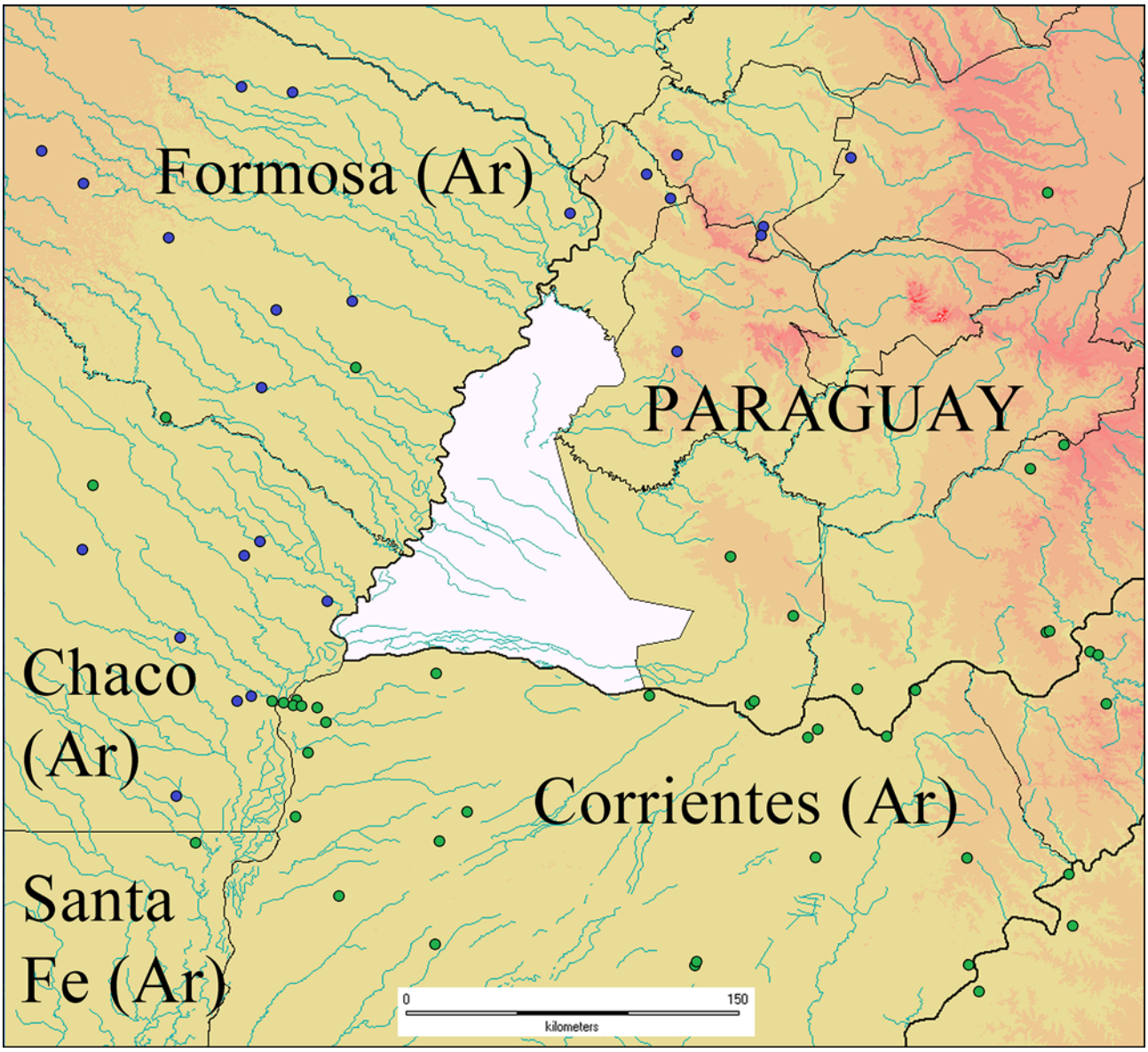

FIGURE 14. Map of southern Paraguay and northeastern Argentina (Ar), the Paraguayan Department of Ñeembucú (in blank) may be an area of potential sympatry according to known records of *Teius oculatus* (green dots) and *T. teyou* (blue dots), but there is no available information.

Discussion

In this review we present the northernmost locality record for *Teius oculatus* that corresponds to Canindeyú Department (Paraguay) (Fig. 1), with which we extend ca. 395 km northeast the previous known limit in Formosa, Argentina (Avila 2002). The southernmost record for this species is in Río Negro Province, being a record based on Scrocchi *et al*. (2010), but the records provided by these authors are based on probably unvouchered data from previous publications. Gallardo (1966) cited *T. teyou* for "northern Patagonia", but southern limits of this species are very distant from this area and probably his observations were based on specimens of *T. oculatus*. Avila (2002) considers the Río Negro River as the southern limit for the species, and indicates that previous records from Chubut Province most probably are mistakes.

Teius oculatus has a preference for open environments, being grasslands and shrubs its main habitat. Avila (2002) recorded the species in Pampas, Chaco, Monte, and Espinal. Even when *T. oculatus* is recorded in the Alto Paraná Atlantic Forest (also recorded by Avila 2002 as Paranaense province), it is important to note that the species

is not related to forests, but to grasslands or modified areas in the ecoregion (Fig. 4). Avila (2002) already stated that the species is well adapted to moderately disturbed environments, but its populations disappear when the anthropogenic impact is high (urban modifications, crop fields). Based on our field records, we present solid evidence that populations of *T. oculatus* are being affected by land modification (Fig. 11). Additionally, modifications in habitat structure are not the only factor affecting the persistence of the lizards. Habitat transformation into crop fields is usually followed by the use of chemicals, which inhibit the growth of herbs and also exterminate invertebrates' populations that are the main food source for *Teius*. In addition to this indirect effect on the lizard's survivorship (by absence of dietary source or by secondary poisoning), it is also known that some chemicals *per se* are harmful for lizards (Henle 1988; McIlroy 1992; Weir *et al*. 2010). More studies are needed in order to assess the specific effect of herbicides and pesticides on *Teius* populations.

The distribution of *Teius suquiensis* is limited to two spots (Avila 2002), the southern area is wider and associated with valleys between Sierras de San Luis and Sierras Grandes de Córdoba, and it extends eastern of the last one; the northern area is in the lowlands of Santa Fe Province (Fig. 1). Avila (2002) suggested that most probably populations from these two areas could be connected. Later Cabrera & Monguillot (2007) registered this species in El Cercado (Córdoba), north of the Sierras' populations, but further sampling is needed in order to assess the level of connectivity between these areas. The southern population of *T. suquiensis* inhabits Espinal and Dry Chaco (Chaco Serrano according to Avila 2002), whereas the northern population is on a small area between both Humid and Dry Chaco. Although this species is more frequently found near the water (rivers or streams), Guerreiro *et al*. (1998) found it in a xeric environment.

For *Teius teyou* we extend the previous known distribution (Avila 2002) 60 km southwards in Mendoza Province (Argentina). The eastern limit is the record from Laguna Blanca (San Pedro, Paraguay, Fig. 2), not far from the previous records from Bella Vista (Amambay Department) and Piribebuy (Paraguarí Department) (Aquino *et al*. 1996). In Brazil, this species is marginal, being recorded only in Corumbá and Porto Murtinho (Mato Grosso do Sul State) (Gans 1960; Souza *et al*. 2010). Hellmich (1960) published the northernmost record for *T. teyou* in Bolivia, but posterior works carried out in this country lack of information about ecoregional affinities (Dirksen & De la Riva 1999; Padial *et al*. 2003), but we found *T. teyou* associated to the Chiquitano forest. The presence of this species in Chaco and Monte was already mentioned by Avila (2002). One of the Paraguayan records came from Reserva Natural Laguna Blanca (San Pedro, Paraguay) (Fig. 9). The actual ecoregional affinities of Laguna Blanca is a mix of Cerrado with patches of Atlantic Forest and elements of Humid Chaco, with vegetation implanted in white sand soils (Smith *et al*. 2012; 2014) (Fig. 13). Avila (2002) states that some populations of *T. teyou* in its western distribution range reach up to 2000 masl, but the highest record for this species is the record of Peracca (1897) mentioned also by Dirksen & De la Riva (1999) for San Francisco (Tarija, Bolivia) at 2595 masl.

Teius teyou has more distributional records than the other two species, which although may be indicative of higher densities, no extensive ecological studies have been performed on the three species of this genus. It is possible that an apparent less shy behavior of this species, allows finding it more often on roads or uncovered areas, foraging longer distances away from shelters.

The two sexual species of the genus follow a parapatric NE-SW distribution (Avila 2002) with several areas where both species occur in sympatry. Similar patterns are also observed in other reptiles' taxa such as *Tropidurus spinulosus* with *T. torquatus*, *Boa constrictor amarali* with *B. c. occidentalis*, *Epicrates alvarezi* with *E. crassus*, *Chironius maculoventrus* with *C. quadricarinatus*, and *Oxyrhopus rhombifer rhombifer* with *O. r. inaequifasciatus* among others. Avila (2002) defined three main areas of sympatry for Argentina, being the northeastern area the one near the border of Paraguay. In Figure 14 it is possible to observe the absence of information from the Ñeembucu Department in Paraguay, which could be key to understand the sympatry pattern in that area. Also, it would be advisable to collect more information in other contact zones to understand the degree of sympatry between species and its relationship with the parthenogenetic species. According to Cano *et al*. (2015) the two sexual species inhabit in syntopy in the Chaco (Pilcomayo National Park) in Argentina. A genetic study must be carried out in order to study the origin of parthenogenesis and *T. suquiensis* in some areas of sympatry of the two sexual species in Central Argentina.

Teius lizards support rather well environmental alterations and modifications when the impact is not too high (Avila 2002); Cabrera & Monguillot (2007) stated that the area where *T. suquiensis* is distributed receives a high anthropogenic pressure. In fact, the anthropogenic impact probably affects almost all of the distribution of the

genus. Eva *et al*. (2004) showed an extreme modification in the ecoregions of Pampas and Espinal, and currently the deforestation is also threatening the Chaco (Caballero *et al*. 2014).

Climatic conditions of areas where both sexual species of *Teius* are distributed seem to be different. The northern and western distribution of the genus is occupied by *T. teyou*, where the climate is xeric, and lays in some neotropical xerophytic areas where precipitation in the driest moths can be around zero (Fig. 10) near the Andes. On the other hand, some areas of the distribution of *T. oculatus* have no differentiation among dry and humid months, thus it is not possible to discriminate between dry and humid seasons (Fig. 5). These areas mainly correspond to the Atlantic coast, being the farthest regions of the contact zones with *T. teyou*. Nevertheless, most of the climatic factors of the areas of both species have a marked seasonality in dry and humid months. Cappellari *et al.* (2007) analyzed the diet of *T. oculatus* along a period of three years but did not mention if diet may be influenced by temperature or rainfall; but Acosta *et al*. (1991) did find differences in trophic ecology between different seasons.

Finally, the climate analyses of the distribution of *Teius* can illustrate some scenarios about its evolutionary history. It is well known that *Teius* and *Dicrodon* correspond to the oldest divergences within the phylogeny of Teiinae (Reeder *et al*. 2002; Giugliano *et al*. 2007; Harvey *et al*. 2012). Additionally, Harvey *et al*. (2012) showed morphological evidence to argue that *Dicrodon* may be intermediate between *Teius* and the rest of the Teiinae. *Dicrodon* inhabits xeric environments in Peru (Lehr *et al*. 2002; Venegas 2005), similar to *Teius teyou* (in most of its distributional range), whereas *T. oculatus* tends to inhabit moister areas in the Atlantic coast. It is possible that the common ancestor of *Dicrodon* and *Teius* was most related to xeric environments, and dispersal and further divergence leading to *Teius oculatus* could have been in response to an adaptive process for moist environments. Detailed genetic and past climate niche reconstruction analyses are needed to test this hypothesis.

Acknowledgments

We thank Nelson Pérez, Daniel Espínola, Rosario Gabaglio, Ana María Macedo, Karina Atkinson, and Jean-Paul Brouard, and Goli Stroessner for hospitality and Cristian Pérez, Nelson Silva, Pastor Pérez, Enrique Bragayrac, Hugo Cabral, Jorge A. Céspedez, Gloria Céspedes, Marcela Ferreira, Irene Gauto, Celeste Gauto, Pamela Marchi, Monica Kozykariski, Martha Motte, Sixto Fernández, Sergio Ríos, Lía Romero, Humberto Sánchez, María E. Tedesco and Víctor Zaracho for help during fieldwork; Sebastian Lotzkat for instructions on GIS management; Irene Gauto for the photography in Figure 3D; Santiago Carreira for providing data. We also thank Martha Motte (MNHNP), Nicolas Vidal (MNHN), Alan Resetar (FMNH), Jonathan Losos (MCZ), Jimmy McGuire (MVZ), Darrel Frost (AMNH), Jack W. Sites, Jr. (BYU), Jose Padial (CM), Karina Atkinson (CZPLT), and Kevin de Queiroz (USNM) who allowed us examine specimens in their care. PC thanks Consejo Nacional de Ciencia y Tecnología, through the program PRONII (Paraguay) for financial support for fieldwork activities, GNB Bank and Fundación Moisés Bertoni for a fieldwork grant through the program "*Becas para la Conservación*" in Mbaracayú Natural Reserve; and to Idea Wild for providing field equipment. Recent collections in Paraguay were made with the collection permit from SEAM Nº 009/2014. LJA and MM thank the following institutions for funds for field trips and collection support: CONICET, ANPCYT and Brigham Young University.

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APPENDIX 1

Teius oculatus

ARGENTINA: Buenos Aires: Bahía Blanca (3) (LJAMM-CNP 447-8, MLP 215); Barreto (1) (MLP 424); Berazategui (1) (CENAI 813); Buenos Aires (1) (MACN 5266); Burzaco (1) (MACN 1683); Capital Federal (5) (MLP 213, MACN 1663, 2085, 2604, MNHN 2656); Carmen de Patagones (1) (MACN 5391); 20 km N Carmen de Patagones (1) (MVZ 127352); Chasicó (2) (MLP 213, 791); Ezpeleta (2) (CENAI 853, 1425); General Lavalle (2) (MACN 3243, 3247); Laguna de Chasico (1) (LJAMM-CNP 6915); Los Talas (1) (MLP 217); Médanos (3) (MVZ 127349-51); Olivos (1) (MACN 1440); Pilar (1) (MACN 971); Pirovano (2) (MACN 2306, 3755); Punta Alta (1) (LJAMM-CNP 8520); Querandí (1) (MACN 2844); Saenz Peña (1) (MACN 3220); San Blas (1) (MLP 223); San Isidro (1) (MACN 3413); Sierra de la Ventana (4) (MACN 32565-6, 32833, 32840); Sierras Bayas (1) (MACN 5003); Sierras de Tandil (1) (MACN 2471); Trenquelauquen (1) (MLP 5592); Villa Ventana (1) (MACN 32810). Chaco: Barranqueras (1) (MACN 3058); Cierco Petizo (1) (FML 89); Colonia Las Mercedes (1) (CHC L 131); Resistencia (1) (CM 72486); 25 km S Santa Sylvina (1) (MACN 4735). Córdoba: Achiras (43) (LJAMM-CNP8489-93, FML 20405-9, UNRC-ZV 1204, 1206-7, 1211-2, 1266-9, 1270-1, 1273, 1275, 1376, 1658-60, 1664-6, 1891-5, 2216, 3432-4, 3987, 4006, 4223, 4478); Achiras, Balneario Municipal (2) (LJAMM-CNP 16506-7); Almafuerte (29) (UNRC-ZV 491-2, 495-6, 498-500, 575, 577-8, 634-5, 695-7, 700-3, 705, 707, 721-3, 725, 728, 730, 732, 1336); Alpa Corral (5) (FML 10461-3, 20453, UNRC-ZV 1361); Atos Pampa (2) (FML 20448-9); Baigorria (1) (FML 20437); 8 km E Charboniel (1) (FML 20447); Chucul (1) (FML 20458); Chucul, Arroyo (2) (FML 20433 UNRC-ZV 2213); Copacabana (2) (LJAMM-CNP 17043, 17056); Coronel Moldes (1) (FML 20457); Laboulaye (2) (CENAI 584-585); La Carlota (1) (MACN 4928); La Falda (5) (MHN SR H 41, 43, 58, 184, 280); Laguna Oscura (7) (FML 10467-71, 20455-6); La Puerta (1) (LACM 131313); Las Higuieras (25) (FML 10436-7, 10293-304, 10427-35, 20435, UNRC-ZV 520); Leones (1) (MACN 2040); Mina Clavero (2) (MLP 1722-3); Piedras Grandes (2) (FML 20452, 20454); Río Cuarto (132) (LJAMM-CNP 5001, 8494, 8498, FML 10267-92, 10310-2, 10318-33, 10335-9, 10341-9, 10352-4, 20445, 20450-1, 20712, UNRC-ZV 89, 93, 96, 104, 109, 112-3, 117, 130, 135, 138-44, 436-7, 548-52, 791-2, 794, 796, 799, 801-4, 806, 810-20, 831, 833, 836, 922-4, 926-7, 962-4, 966-7, 2178, 2364, 2366, 2468); Tanti (18) (LJAMM-CNP 8499, FML 10440-1, 10446-52, 10454, 10458, 20436, 20687-8, UNRC-ZV 50, 2429, MVZ 127312-5); 2 km E Tuclame (1) (LACM 131321); Villa del Lago (1) (FML 10453); Villa El Chacay (8) (FML 10438-9, 10459-60, 10465-6, UNRC-ZV 2033-4); Villa María (2) (FML 20353, 20355); 10 km W Washington (5) (FML 20723, UNRC-ZV 2156-9). Corrientes: Colonia Galarza (1) (CHC L 71); Corrientes (4) (LJAMM-CNP 8488, MHN SR H 203, MLP 437, UNRC-ZV 1811); Concepción (1) (MACN 3379); El Sombrerito (1) (MACN 4858); Empedrado (2) (CHC L 180-1); Estación Biológica Corrientes (1) (FML 20434); Iberá (1) (MLP 5454); Isla Apipé Grande (1) (FML 222); Itá Ibaté (1) (CHC L 82); Ituzaingó (2) (CHC L 395, UNNEC 389); Laguna Brava (1) (CHC L 135); Las Marias (1) (CHC L 176); Manantiales (1) (MACN 3284); Mburucuyá (1) (CHC L 395); Monte Caseros (1) (MACN 3220); Ombú Chico (4) (UNNEC 547-50); General Belgrano (1) (CHC L 139); Saladas (4) (CHC L 307-9, MACN 3559); Santo Tomé (1) (CHC L 177); Santa Tecla (1) (UNNEC 887); Yacareí (2) (CHC L 151-2). Entre Ríos: Alcaraz (1) (CENAI 357); Ayui (2) (CENAI 918-9); Concepción del Uruguay (4) (MACN 4450, 4618, 25177-8); Concordia (1) (MACN 859); Paraná (1) (MACN 282); Paranacito (12) (CENAI 589, 642, 797, 640-1, 904, 1245-8, 4225, 5185); Villaguay (1) (MACN 933). Formosa: El Colorado (1) (CHC-L 293). La Pampa: Almacén El 52 (3) (RVP 72-4); Cerro Centinela (2) (RVP 110-1); Conelo (2) (MACN 914, 1048); Cuchillo Có (1) (RVP 20); Estancia Arco Iris (1) (RVP 43); General Campos (1) (IADIZA-CH 234); General Pico MACN (4) (1034, 1044, 1083, 32808); Gobernador Duval (1) (LJAMM-CNP 4493); Guatraché (1) (RVP 71); Intendente Alvear (1) (MACN 5309); La Adela, 45.5 km N (1) (LJAMM-CNP 6024); La Adela, 87.8 km N (1) (LJAMM-CNP 6026); Lihué Calel (2) (MACN 31376, 5212); Loventué (1)

(MACN 1310); Parque Luro (1) (RVP 63); 17 km SE Puelén (1) (LJAMM-CNP 8433); Realicó (7) (FML 10444-6, 10455-7, 10464); Ruta Provincial 107, 10.1 km N Ruta Nacional 152 (1) (LJAMM-CNP 14692); Santa Rosa (1) (RVP 62); Victorica (2) (USNM 60398, 63951). Mendoza: Cuadro Nacional (24) (FML 20438-40, MHN SR H 705, 709, 809, 814, UNRC-ZV 54-5, 86, 122, 124, 145-55); La Paz (1) (MACN 1587); Lavalle (1) (IADIZA-CH 5); Mendoza (2) (MNHN 334, 1997); Isla Diamante (3) (MHN SR H 865-6, UNRC-ZV 1908); Rincón del Atuel (2) (MHN SR H 15, 717); Las Horquetas, 10.6 km W (1) (LJAMM-CNP 5730); Las Horquetas, 22 km W (1) (LJAMM-CNP 17202); San Rafael (20) (LJAMM-CNP 8497, FML 20441, MHN SR H 247, 287-8, 398, 400, 491, 493, 524-5, 637-8, 641-2, 799, 982, 1040, 1101, 1284). Misiones: Azara (11) (MCP 3092-101, 4216); Bompland (2) (MLP 212, 214); Campo Vieira (1) (MLP 811); Cuña Pirú (1) (MLP 2199); Cuña Pirú, Arroyo (2) (MLP 2197-8); San Ignacio (2) (MACN 1582, 1614). San Luis: Beazley, 4 km SW (1) (LJAMM-CNP 5772); Buena Esperanza, 50 km N (2) (LJAMM-CNP 16508, 16532); Buena Esperanza, 82.5 km N (1) (LJAMM-CNP 3126); Buena Galia, 37.7 km N (1) (LJAMM-CNP 14806); Cerro Centinela (1) (LJAMM-CNP 4198); 7 km N Naschel (1) (FML 20442); El Morro (1) (MACN 2324); Estancia El Centenario (1) (MLP 5307, 5588); Las Isletas (1) (MACN 212); Unión (1) (IBAUNC 440). Santa Fe: Alto Verde (1) (MHN SR H 226); Cayasta (1) (FML 2677); Cerrito (1) (MHN SR H 77); Colastine Sur (3) (MHN SR H 35, 278-9); Colonia Mascias (1) (MACN 1643); Florencia (1) (FML 20714); Gregoria Perez de Denis (36) (CENAI 397, 403-4, 431, 439, 441, 443, 447, 450-1, 456, 461, 474-5, 477, 479, 481, 488-9, 492-3, 500, 503-4, 506-7, 509, 513, 517, 526, 532, 536-7, 544, 563, 567); La Brava (1) (MACN 4676); Las Rosas (1) (MACN 4745); Piquete (1) (MHN SR H 185); 5 km de Reconquista (1) (IBAUNC 260); Reserva Ecológica El Pozo (1) (MHN SR H 236); Roldán (1) (MACN 4911); Rosario (2) (FML 860, UNRC-ZV 2926); San Justo (1) (MHN SR H 221); Santa Fe (6) (MHN SR H 3, 8-9, 74, 127, 185); Santa Rosa de Calchines (1) (CENAI 799); Santo Tomé (1) (MHN SR H 181); Tostado (1) (MACN 1845). BRAZIL: Rio Grande do Sul: Arambare (9) (MCP 4494, 4559-61, 4617, 4664, 5037-9); Butia (1) (MCP 6931); Caçapava do Sul (1) (MCP 10022); Cacequi (1) (CM 928); Camaqua (1) (MCP 5040); Candiota (3) (MCP 11398, 11863, 19148); Carazinho (3) (MCP 3510-2); Dom Feliciano (170) (MCP 7840, 12508-14, 12606-12, 12823-51, 13191-203, 13320-7, 13485-96, 13822-33, 14353-68, 14370-83, 14604-17, 15896-922, 18319-27, 18391); Dom Pedrito (4) (MCP 18592-4, 18702); Encruzilhada do Sul (7) (MCP 2661, 7864, 7880, 7964-6, 8973); Garruchos (1) (MCP 3054); Guaiba (3) (MCP 1257, 6928-9); Mormaço (1) (MCP 17718); Pirapo (1) (MCP 3060); Porto Alegre (19) (CAS 87096, MCP 289-90, 352-8, 1052, 1231, 1553, 4871, 5361, 12078, 12083, 14842, TNHC 20991); Porto Lucena (2) (MCP 11689-90); Porto Xavier (1) (MCP 3313); Santana do Livramento (1) (MCP 3733); Santa Maria (17) (MCZ 126774-6, 126778, 126780, 43351-9, 126773, 126777, 126779); Santo Antonio das Missoes (1) (MCP 3085); Santo Cristo (1) (MCP 11667); São Borja (3) (MCP 13273-5); São Francisco de Assis (2) (MCP 18887-8); São Jeronimo (23) (MCP 14459, 15335, 15649-51, 15780-3, 15874-5, 15968, 16203-5, 17753-5, 17886-9, 18658); São Leopoldo (1) (MCP 2368); São Nicolau (1) (MCP3546); Turarendi (2) (MCP 11595, 11603); Uruguaiana (8) (8760-1, 11892-7); Viamão (2) (MCP 4657, 6930). PARAGUAY: Alto Paraná: Itaipú Reserves (1) (Mai 52); Itakyry (5) (MNHNP 11802-6). Caaguazú: J.E. Estigarribia (11) (PCn 32-42). Canindeyú: Reserva Natural del Bosque Mbaracayú (1) (MNHNP 10860). Itapúa: El Tirol (1) (USNM 253543); Isla Talavera (2) (UNNEC 871-2); Parque Nacional San Rafael (4) (MNHNP 9221, 11822, 11836, 11838). Misiones: San Ignacio (1) (MNHNP 2761); Santiago (1) (MNHNP 2762). San Pedro: Colonia Primavera (3) (NHMUK 1956.1.3.21, 1960.1.2.64-5). URUGUAY: Artigas: Arroyo de la Invernada (1) (MCP 14870). Canelones: Carrasco (3) (CM 57073-5); Solymar (1) (IBAUNC 136). Cerro Largo: Melo, 20 km E (2) (Field number: SC 407-8). Lavalleja: Cerro Arequita (1) (CM 58332). Río Negro: Tres Árboles (1) (SC s/n, tissue sample at SMF). San José: Sierra Mahoma (1) (IBAUNC 162). Montevideo: Montevideo (5) (MNHN 567, 2655, 8387, USNM 60413, 65575). Tacuarembó: Estación “Francia” (1) (CM 57076); Estancia La Loma (1) (CM 55379).

Teius suquiensis

ARGENTINA: Córdoba: Arroyo Los Algarrobos, 1 km E (1) (LJAMM-CNP 8238); Almafuerte (25) (UNRC-ZV 493-4, 497, 573, 581, 631-3, 636, 693-4, 698-9, 704, 706, 724, 726-7, 729, 731, 1332-35, 1337); Bialet Massé (71) (FML 02537, LACM 131299-309, UNRC-ZV 38-41, 44-49, 57, 119-124, 126-128, 345-366, 480-489, 534-5, 557, 570-2, 574); Cabana (1) (MACN 4658); Cañada de Luque (1) (LACM 131312); Capilla del Monte (2) (UNRC-ZV 2085-6); Cienaga de Allende (1) (CENAI 284); Córdoba (3) (LACM 131324, MVZ 127329, UNRC-ZV 590); Cosquín (1) (UNRC-ZV 579); Despeñaderos (12) (UNRC-ZV 708-715, 717-720); Embalse Rio Tercero (1) (UNRC-ZV 2018); Estancia El Cercado, 12 km E of Pozo Nuevo (3) (UNRC-ZV 484-5, 488); Falda del Carmen (1) (UNRC-ZV 716); La Carolina, 2 km SE of Villa Warcalde (14) (MVZ 127353, 127355-7, 127361-3, 127373, 127381, 127383, 127388, 127393, 127910, 128175); Mina Clavero (11) (UNRC-ZV 606-611, 613-617); Montecristo (1) (UNRC-ZV 1646); Niña Paula (2) (UNRC-ZV 1754-5); Nono (2) (UNRC-ZV 3201-2); Nono, 2 km W (6) (LJAMM-CNP 13982-4, 12995-7); Pintos Arriba (1) (UNRC-ZV 1364); Rio Segundo (1) (LACM 131310); San Agustín (2) (UNRC-ZV 782-3); San Antonio de Arredondo (11) (UNRC-ZV 505, 516-524, 526); San Roque (2) (MLP 1186, UNRC-ZV 788); Santa Rosa de Calamuchita (1) (UNRC-ZV 4128); Taninga (1) (UNRC-ZV 1632); Tanti (47) (UNRC-ZV 371, 374, 376, 378-81, 387-90, 414, 425, 444, 453-56, 462, 475, 477, 529, 540-1, 563-4, 591-94, 599, 601-2, 776, 984, 986-9, 991-999); Unquillo (1) (MACN 2299); Villa del Rosario (2) (UNRC-ZV 1363, 1756); Villa Las Rosas (4) (UNRC-ZV 1422, 1443, 1453, 2730); Villa Maria (1) (UNRC-ZV 4258); Villa Warcalde (17) (MVZ 127316-7, 127319-21, 127330-2, 127338-41, 127345, UNRC-ZV 586-9); Yacanto (5) (UNRC-ZV 1434-7, 2733). San Luis: Ayacucho (1) (UNRC-ZV 2729); Chacabuco (3) (UNRC-ZV 664-6); Coronel Pringles (1) (LJAMM-CNP 5729); Junin (2) (UNRC-ZV 1431, 1433). Santa Fe: Gregoria Perez de Denis, 20 km E (2) (UNRC-ZV 3546-7); Villa Minetti (1) (UNRC-ZV 4257); Villa Minetti, 45 km (1) (UNRC-ZV 4176); Gregoria Perez de Denis (Estancia El Nochero) (35) (CENAI 342, 399, 433-4, 438, 445, 448, 454, 458, 460, 462, 466, 469, 472-3, 480, 482-5, 490, 497, 527, 529, 538, 551-2, 554, 557, 560-1, 565, 572-4); Tostado (1) (MACN 1845).

Teius teyou

ARGENTINA: Catamarca: Andalgalá (3) (CM 70192, 70204, UNRC-ZV 2145); Andalgalá, 19 km S (1) (CM 70203); Belen (2) (FMNH 10684, 10873); Campo del Breal (1) (FML 1627); Catamarca, 1 km N (1) (MVZ 127298); Crossing National Route 60 and Local Route 46, Km 35 (1) (UNRC-ZV 2123); Icaño, 6.3 km W (1) (LJAMM-CNP 3166); Pomancillo (1) (MACN 1713); Puesto Rio Blanco (1) (FML 1614); Rio Poman (12) (CM 70190-1, 70195, 70197-8, 70200-2, 70205, 70209-10, 70213); Londres (1) (LJAMM-CNP 4246); Tinogasta (1) (MACN 3211). Chaco: Avia Terai (2) (CHC L 182-3); Basail (2) (UNRC-ZV 1150-1); Colonia Las Mercedes (9) (CHC L 25-33); Comandante Frías (3) (CHC L 2100, 103, FML 12014); Florida Grande (3) (CHC L 80-1, FML 2015); General Pinedo (1) (MACN 1923); Las Palmas (1) (CHC L 312); Loro Hablador (4) (MLP 2224, 2547, 5154-5); Machagai (2) (CHC L 164-5); Makallé (3) (MLP 1812, CHC L 178-9); Nueva Pompeya (6) (CHC L 14-6, 58-60); Presidencia Roque Saenz Peña (3) (LJAMM-CNP 186-7, UNRC-ZV 1503); Resistencia (6) (IBAUNC 259, MACN 5394, 5481, 29820-1, 29824); Selvas del Rio de Oro (3) (CHC L 281, 310-1); Taco Pozo (3) (CHC L 212-4). Córdoba: Cañada de Luque (2) (LACM 131311, 131325); Chancaní (3) (UNRC-ZV 1767, 3504-5); Colonia Tirolesa (1) (MVZ 127382); El Brete (3) (UNRC-ZV 1192-4); Guanaco Muerto (8) (UNRC-ZV 1679-86, 2017); La Paz (1) (MACN 1659); La Posta (16) (UNRC-ZV 1859-61, 1863-76); La Batea (3) (MLP 271-3); La Puerta (3) (LACM 131314-6); Lucio V. Mansilla (4) (FML 2679, 2681, UNRC-ZV 2091, 3021); Media Naranja (2) (UNRC-ZV 1608-9); Piedra Pintada (1) (UNRC-ZV 1142); San Marcos Sierra (4) (UNRC-ZV 2081-3, 2719); San Jose de Las Salinas (1) (MVZ 127270); Sebastián Elcano (4) (CHC L 154-7); Serrezuela (1) (UNRC-ZV 1191); Serrezuela, 11 km W (2) (LACM 131328-9); Serrezuela, 2 km E (1) (LACM 131327); Totoralejos (1) (MVZ 127311); Tristan Navarja (1) (MVZ 127368); Tuclame, 2 km E (6) (LACM 131312-3, 131317-20); Villa Cura Brochero (1) (MLP 1265); Villa de Soto (4) (LACM 131330-2, 134448). Formosa: Comandante Fontana (3) (MACN 712, 2298, CHC L 467); El Bagual Ecological Reserve (3) (TCWC 69344, 70229, 70250); El Mistolar (1) (TCWC 70318); El Quebracho (2) (UNRC-ZV 477-8); El Tayí (1) (CHC L 269); Estancia Don Theo (1) (CHC L 372); Gran Guardia (2) (MACN 2828, IBAUNC 77); Ibarreta (3) (CHC L 161-3); Ingeniero Guillermo Juarez (1) (CHC L 466); Ingeniero Guillermo Juarez, 13.2 km W (2) (LJAMM-CNP 12098-9); La Rinconada (3) (CHC L 483, 486-7); Laguna Yema (2) (CHC L 477, FML 1716); Las Lomitas (6) (CHC L 17, 19, 132-3, 174, FML 2181); Los Pocitos (1) (CHC L 455); Misión Franciscana Tacaaglé (1) (FML 1717); Palmar Largo (9) (LJAMM-CNP 8486-7, MHN SR H 202, UNRC-ZV 807-10, CHC L 433-4); Palo Santo (1) (CHC L 469); Paraje Urbana Vieja General Belgrano (11) (CHC L 20-4, 76, 85-9); Pozo de Maza (1) (CHC L 412); Teniente General Fraga (2) (CHC L 420-1). Jujuy: Estancia Yuto (1) (IBAUNC 80); Ingenio La Esperanza (1) (FML 789); Yuto (8) (FML 255, 443, 473, MVZ 127277-81). La Rioja: Aimogasta (2) (MACN 1488, 2233); Anillaco (6) (CM 147859, 147896, LJAMM-CNP 700, 736-7, 1143); Anillaco, 6 km E (1) (LJAMM-CNP 501); Antinaco (2) (FML 1735-6); Chamical, 11 km E (2) (CM 70206-7); Chamical, 19 km E (3) (CM 70193, 70196, 70212); Chamical, 5 km W (1) (CM 70198); Chamical, 5 km W (7) (CM 70214-20); Chamical, 6 km E (3) (CM 70194, 70208, 70211); Chepes, 18 km E (4) (LJAMM-CNP 5733-6); Chepes, 23 km W (1) (LJAMM-CNP 13985); Chepes, 5 km E (1) (MVZ 127297); Chilecito, 12 km N (1) (LJAMM-CNP 698); Ilisca, 4.2 km N (1) (LJAMM-CNP 735); La Rioja (1) (IBAUNC 477); Los Molinos (16) (LJAMM-CNP 1978, 2012-5, 2025-6, 2039-40, 2060-1, 2103, 2193, 2234, 2252, 8578); Los Sauces (1) (MACN 2554); Paganzo, 7 km W (1) (LJAMM-CNP 2257); Patquía (4) (MACN 1181, 1293, 4663, 9510); Patquia, 33 km S (1) (LJAMM-CNP 17143); San Antonio (1) (LJAMM-CNP 17203); Villa Union (1) (LJAMM-CNP 4167). Mendoza: Carrizal (1) (MVZ 180775); Chacras de Coria (2) (IBAUNC 1098, 1137); Cuadro Nacional (1) (MHN SR H 709); Desaguadero, 0.5 km W (3) (MVZ 127299-301); El Challao (2) (IBAUNC 147, 849); Estacion Capdevila, 2 km S (1) (MVZ 127269); Estacion Capdevila, 4 km NW (5) (MVZ 127226, 127261-2, 127265, 128176); Estacion Capdevila, 7 km NW (1) (MVZ 127259); Estacion Pampita (1) (IBAUNC 1039); Finca El Sauce (1) (IBAUNC 1331); General Alvear (1) (MLP 826); General San Martín (1) (MLP 825); Godoy Cruz (2) (IBAUNC 325, 481); Guaymallen (1) (IBAUNC 243); Hornito del Grinco (1) (FML 2260); La Mora, 18 km E (1) (LJAMM-CNP 3144); Lavalle (1) (IADIZA-CH 52); Medanos de Picardo (1) (MVZ 127348); Mendoza (6) (IADIZA-CH 16, 79, 152, MCZ 14916, MLP 432, MVZ 127268); Reserva Ñacuñan (7) (IADIZA-CH 53-4, 61, 78, 92, IBAUNC 1114, 1170); Rincón del Atuel (16) (LJAMM-CNP 8495-6, MHN SR H 97-9, UNRC-ZV 1820-5, 1906-7, 2175, 2177, 2493); Route 179, 9.2 km N from crossroad of Routes 179 and 190 (1) (LJAMM-CNP 5036); San Rafael (13) (LJAMM-CNP 8500, MHN SR H 399, 490, 562, 1085, 1269, UNRC-ZV 56, 1820-5). Salta: Aguaray (1) (MACN 6075); Alemania, 3 km S (3) (LJAMM-CNP 17119-21); Cierva Muerta (1) (FML 92); El Carmen, 10 km W (3) (LJAMM-CNP 12057-8, 12060); El Duraznito (1) (MACN 35520); Embarcacion (9) (FML 518, 2470, LACM 73993-5, 73997-4000); Hickmann (4) (FML 34, 251, 290, 1718); La Población (1) (FML 311); La Quena (2) (FML 02471-2); Los Blancos (1) (MLP MLP 5420); Los Colorados (1) (FML 2710); Metán (1) (MACN 2892); Morillo (3) (MLP 1528-9, 2170); Obraje Salta Forestal (1) (FML 1111); Pluma de Pato, 3 km W (1) (LJAMM-CNP 12100); Puesto Vialidad Salta, 7.1 km W (2) (LJAMM-CNP 12043-4); Quebrada de Acambuco (1) (FML 874); Quebrada de las Conchas (1) (LJAMM-CNP 11807); Rio Bermejo (1) (MACN 4335); Rio Blanco (1) (FML 590); Rio del Valle (1) (FML 1119); San Ramón de la Nueva Orán (1) (MACN 8506); Talapampa, 8.6 km SW (1) (LJAMM-CNP 11806); Tobantirendá (1) (FML 205); Urundel (36) (MACN 2202, 9925-59). San Juan: Aguango (2) (IMCN-UNSJ 63, 164); Astio, 20 km N (1) (LJAMM-CNP 8585); Baños del Salado (1) (IMCN-UNSJ 230); Estacion ferroviaria Adan Quiroga (1) (LJAMM-CNP 3142); La Rinconada (1) (MACN 4349); Los Baldecitos (1) (LJAMM-CNP 12488); Marayes, 15 km W (1) (IBAUNC 1293); Medanos río San antonio (1) (IMCN-UNSJ 64); Pie de Palo, 5 km SE (1) (MVZ 127271); Punta del Agua, 32.8 Km W (1) (LJAMM-CNP 4060); San Agustin del Valle Fertil (1) (IBAUNC 1147); San Jose de Jachal, 3 km NW (3) (MVZ 127273-5); San Juan (6) (IMCN-UNSJ 70, 85, 249-50, 268, 462); Valle Maradona (1) (IMCN-UNSJ 281); Villa los Olivos (1) (IMCN-UNSJ 442); Villa Mercedes (1) (MACN 1449). San Luis: Alto Pencoso (8) (MLP 435-6, 406, 408, 429, 431, 433-4); Balde, 1 km W (4) (MVZ 127302-5); El Caldén (2) (UNRC-ZV 72-3); La Aguada (1) (MACN 396); La Chañarienta (1) (MACN 34225); La Higuerita (1) (UNRC-ZV 1877);

Merlo (2) (UNRC-ZV 1430, 1432); Quines (4) (LJAMM-CNP 1990-3); Rio Amieva (1) (JMC-DC 60); San Francisco del Monte de Oro (1) (MACN 396); San Francisco del Monte de Oro, 11 km S (1) (MVZ 127306); San Gerónimo (1) (MACN 30315); Santa Rosa del Conlara (1) (UNRC-ZV 1505); Sierra de las Quijadas (2) (4152-5). Santa Fe: Estancia El Nochero (49) (CENAI 364, 396, 401, 416, 418, 420-2, 430, 432, 436-7, 442, 444, 449, 452, 455, 457, 463-4, 467-8, 470-1, 478, 486, 491, 494-6, 498, 502, 5, 8, 511, 514, 518, 528, 530-1, 534, 539, 541, 543, 546-7, 549, 553, 558); Santa Sylvina, 40 km S (1) (MACN 4735); Tostado (1) (MACN 287). Santiago del Estero: Añatuya (2) (FML 2676, MLP 1108); Bandera (4) (CENAI 333-4, 365, 520); Beltrán (4) (MLP410, 439-41); Caspi Corral (1) (FML 02261); Dique El Frontal (1) (FML 1209); Girardet (1) (MLP 816); Guardia Escolta (1) (CENAI 327); Huyamampa (1) (FML 294); Matará (1) (MACN 4999); Monte Quemado (3) (CHC L 184, FML 1751, 1896); Pampa de los Guanacos (1) (MACN 4999); San Juan, 3.5 km W (1) (LJAMM-CNP 12128); Santiago del Estero (1) (MHN SR H 50); Tintina (1) (MHN SR H 190); Urutaú (3) (CHC L 198-200); Villa La Punta (1) (FML 2632); Villa Ojo de Agua (1) (LJAMM-CNP 12127); Villa San Martín, 5 km S (1) (MACN 5083). Tucumán: Laguna Carimayo (1) (FML 165); Las Cejas (1) (FML 7091); Los Puestos (1) (FML 504); Rio Sali (13) (FML 461, MVZ 127282-92, IBAUNC 79); Rio Tapia (1) (FML 2606); San Miguel de Tucumán (3) (FML 1058, IBAUNC 78, MLP 428); Tacanas (3) (MACN 2675, MCZ 66990-1); Yerba Buena (1) (FML 1237). BOLIVIA: Santa Cruz de la Sierra: Boyuibi (2) (LACM 37678-9); Carandaiti, 30 km SE (1) (LACM 37680); Curuyuqui (2) (USNM 336159,336202); El Carmen (2) (CM 35887-8); Abapó Norte (4) (MACN 19102-5); Rio Seco (7) (MACN 19005-11); Robore (1) (CM 35889); San Antonio de Parapetí (1) (MACN 33045); San Jose de Chiquitos (2) (MCZ 39981-2); Santa Cruz de la Sierra (1) (MACN 9270); Turenda (1) (MACN 4495). Tarija:Capirenda (1) (LACM 37677); Villamontes (31) (KU 136375-95, 136397-8, 136400, 136402-7, 136409). BRAZIL: Mato Grosso do Sul: Corumbá: (6) (CM 35879-84). PARAGUAY: Alto Paraguay: Agua Dulce (1) (MNHNP 2739); Cerro León (8) (CM 109160-1, MNHNP 2755-60); Colonia Potrerito (1) (MNHNP 9282); Estancia Punto Alto (1) (MNHNP 10165); Madrejón, 45 km S (1) (USNM 342486); Mayor Pablo Lagerenza (1) (MNHNP 7231); Parque Nacional Defensores del Chaco (1) (MNHNP 7232); Puerto Casado (1) (UMMZ 94089). Amambay: Bella Vista, 2 km W (1) (MNHNP 2743). Boquerón: Campo Loro (1) (MNHNP 10654); Comunidad Ayoreo Jesudi (2) (MNHNP 10727, 11112); Comunidad Ayoreo Tunucojai (1) (MNHNP 10655); Estación Experimental Chaco Central (1) (MNHNP 9994); Estancia Casilda (1) (MACN 1795); Estancia Guayhú (1) (MACN 1769); Estancia Jabalí (1) (MNHNP 8068); Estancia La Gama (2) (MNHNP 8075, 11031); Filadelfia (11) (CM 94219, 94224, MNHNP 2734-8, 2740-1, USNM 341970-1); Neuland (4) (MNHNP 8047, 8069, 8072-3); Pedro P. Peña (6) (MNHNP 4021, 4030, 4022-3, 4029, 8077); Route IX Km 517 (3) (MNHNP 7082, 7301, 7662); Teniente Ochoa (5) (UCS 5729-31, USNM 341974-5); Villa Hayes (2) (USNM 341974-5). Central: Lago Ypacaraí (1) (USNM 341972). Concepción: Asentamiento San Ramón (4) (MNHNP 11816-9); Estancia Kumaré (3) (MNHNP 11815, 11820-1); Loreto (1) (MNHNP 9848); Río Apa (1) (MZUT 958); Paso Barreto (2) (MNHNP 8373, 9847); Rancho Z (7) (CM 142497-9, 142535, MNHNP 7648-9, 7653); San Lázaro (1) (MNHNP 2742). Cordillera: Piraretá (1) (USNM 341973); Quinta Las Andreas (1) (Field number: PCS 215). Paraguarí: Caapucú, 22 km N (1) (MNHNP 10018). Presidente Hayes: Agroganadera Solito (8) (MNHNP 11807-14); Estancia Juan de Salazar (27) (MNHNP 3403, 3608-15, 4204, 4222, 4318-9, UCS 5727-8, 6976-86, USNM 341976); Estancia La Golondrina (2) (CM 109252, MNHNP 328); Estancia La Victoria (1) (MNHNP 4321); Estancia Santa María (4) (CM 142617-20); Estancia Tinfunqué (4) (CM 94018, 94150-1, 94158); Estancia Toro Mocho (1) (MNHNP 10628); Fortín Teniente Coronel Miguel A. Ramos (1) (MNHNP 10770); Pozo Colorado (2) (MNHNP 9725, MVZ 110970). San Pedro: Laguna Blanca (8) (CZPLT 86, 105, 288, 289, 319, 429, 436, 469).