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To cite this article: David Gustavo Vera, Igor Berkunsky, Micaela Harkes, Borja Baguette Pereiro, Melisa Celia Jazmín Rolón, Diego Omar Di Pietro & Federico Pablo Kacoliris (08 Apr 2025): Predicting the invasion of the common wall gecko (*Tarentola mauritanica*) in the southern cone of South America, Studies on Neotropical Fauna and Environment, DOI: [10.1080/01650521.2025.2474366](https://doi.org/10.1080/01650521.2025.2474366)

To link to this article: <https://doi.org/10.1080/01650521.2025.2474366>

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Predicting the invasion of the common wall gecko (*Tarentola mauritanica*) in the southern cone of South America

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ABSTRACT

The common wall gecko (*Tarentola mauritanica*) has invaded three regions globally: the Azores and Madeira archipelagos, the subtropical and temperate regions of North America, and the south of South America. The information about the invasion in South America is limited, and records suggest rapid expansion in the continent's south. In this work, we modeled the gecko's distribution in its native range to identify potential invasion sites in the Southern Cone of South America, updating its geographic distribution and assessing their potential threat to native South American geckos. The most contributive variables in the Species Distribution Model included precipitation of the driest quarter, minimum temperature of the coldest month, and temperature seasonality. The habitat suitable for the expansion of geckos in the Southern Cone covers 1,397,558.36 km², with the highest being in the north-central part of Argentina. The species *Homonota taragui*, *Homonota williamsii*, and *Homonota whitii* had the greatest degree of overlap with the suitable habitat of *T. mauritanica*, requiring particular caution against future introductions. This underscores the importance of understanding and mitigating the risks associated with the invasive potential of *T. mauritanica* in the Southern Cone of South America, specially to the endemic and endangered species, living in rocky areas.

ARTICLE HISTORY

Received 22 November 2023
Accepted 21 February 2025

KEYWORDS

Ecological niche model;
invasive gecko; native
geckos; species distribution
model

Introduction

Invasive species were defined by Blackburn et al. (2011) as self-sustaining populations with evidence of spread and the broad-spectrum articles consider a species as invasive based on its spread. The introduction of invasive species into a new ecosystem can lead to changes in its structure and the displacement of native species (Simberloff et al. 2013). Moreover, invasive species are considered one of the main threats to the biodiversity (IUCN 2025) and the cause of significant economic losses (Oerke and Dehne 2004). For example, brown tree snakes (*Boiga irregularis*) have altered island ecosystems, preying on native birds and domestic poultry and causing agricultural losses (Savidge 1987). Additionally, the Burmese python (*Python bivittatus*) has been introduced in Florida, United States, establishing populations that predate native mammals and outcompete native species (Dorcas et al. 2012; Willson and Driscoll 2017). Therefore, forecasting the suitability of new ecosystems for an invasive species is a key

tool for planning management actions in advance (Seuffert and Martín 2021).

Several studies have highlighted the concern about the coexistence of invasive and native reptile species, and assessed the invasiveness of the former through Species Distribution Models (SDMs) (Mothes et al. 2019; Conyers and Roy 2021; Ginal et al. 2022). Indeed, several methods are available for niche modeling; Maxent stands out as a premier choice due to its adeptness in handling presence-only data and its capacity to capture complex relationships between species and their environment (Urbina-Cardona et al. 2019). The superior performance of Maxent often stems from its robust algorithms, which facilitate accurate predictions and provide valuable insights into species distribution dynamics (Elith et al. 2011). SDMs are used to identify suitable habitats, model future climate change scenarios, and determine conservation priority areas (Elith et al. 2010; Brizio et al. 2022). Maxent is also a valuable and widely used tool for predicting the suitable habitat for the invasion of exotic

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 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/01650521.2025.2474366>

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species (Nori et al. 2011; Biganzoli et al. 2013; Fujisaki et al. 2015; Tingley et al. 2016; Rato et al. 2024).

The common wall gecko (*Tarentola mauritanica*) is native to southern Europe, North Africa, and most islands of the Mediterranean Sea (Joger 1984; Rato 2015). Due to its synanthropic habits, this gecko inhabits roofs and walls of houses and buildings and has a high anthropogenic dispersal capacity (Carranza et al. 2000; Vences et al. 2004; Arredondo and Núñez 2014). Populations of the species have been reported as invading three global regions: the Azores and Madeira archipelagos (Azores, Madeira, and Porto Santo islands), the subtropical and temperate regions of North America (USA and Mexico), and the south of South America (Argentina, Bolivia, Chile, and Uruguay; Achaval and Gudynas 1983; Montero et al. 1995; Baldo et al. 2008; Jesus et al. 2008; Barreiros et al. 2010; Arredondo and Núñez 2014; Rato 2015; Huerta-Vera 2016; Ortiz-Medina et al. 2019; Vera et al. 2022). The information about the potential impact of these invasions is scarce; however, *T. mauritanica* has been reported preying on lizards (genera *Podarcis* and *Hemidactylus*), suggesting this gecko invasion could be a threat to native lizards (González de la Vega 1988; Díaz-Vega et al. 2020).

The colonization and expansion of *T. mauritanica* in North America were assessed, where the minimum temperature and the annual rainfall were the most important variables in predicting the potential colonization area of *T. mauritanica* (Fujisaki et al. 2015). Also, Rato et al. (2024) noted that temperature and precipitation variables were the most important in predicting the distribution of *T. mauritanica*. However, the information about the invasion by *T. mauritanica* in South America is limited to several reports (Achaval and Gudynas 1983; Williams 1988; Cabrera and Guerra 2006; Baldo et al. 2008; Arredondo and Núñez 2014; Huerta-Vera 2016; Baguette Pereiro et al. 2019; Díaz-Fernández et al. 2019; Díaz-Vega et al. 2020; Cabrera et al. 2022; Vera et al. 2022). This species was present in Argentina since 1963 in Buenos Aires city, presumably due to the naval traffic and illegal sale of pets (Castello and Gil Rivas 1980; Cabrera et al. 2022). These sparse records suggest a rapid geographical expansion of *T. mauritanica* in the south of the American continent (Díaz-Fernández et al. 2019). Still, there is a lack of updated geographic distribution, and the progress of the *T. mauritanica* invasion is still unknown. Cabrera et al. (2022) note that, taking into account the dispersal capacity of the species and its adaptation to anthropic environments with a generalist and opportunistic diet (including observations of them feeding on other lizards), studies are needed to assess the impact this invasive species may have on native reptile species.

In this work, we modeled the distribution of *T. mauritanica* in its native geographical range (the Mediterranean) and we used this result to identify the potentially suitable sites to be invaded by *T. mauritanica* in the Southern Cone of South America (Argentina, Chile, and Uruguay). We also updated the species' geographic distribution and assessed the potential conflict with the native geckos in the studied area.

Methods

Native distribution and the Southern Cone of South America presence data

We compiled all records of *Tarentola mauritanica* in its native range. We used as record sources those described in two major online databases: Global Biodiversity Information Facility (<https://www.gbif.org>) and iNaturalist (<https://www.inaturalist.org>). We only used records with precise latitude and longitude and plotted the records to make sure all coordinates made sense. We also used only records where the photographs allowed us to identify the species unambiguously. The specimens reported from museums were included, as they have been previously reviewed by the curators. We removed the replicated presence records (i.e. in the same locality) in QGIS software (QGIS.org 2025). To avoid the sample bias caused by the closest presence points (Urbina-Cardona et al. 2019), distance filters were used to remove presence records in clusters with a distance less than 5 km through QGIS software (Fourcade et al. 2014). After this process, we finally used 535 records of *T. mauritanica* from 1267 in its native range.

We compiled all records of *T. mauritanica* in the Southern Cone of South America. We used online databases as record sources (Ecoregistros, Global Biodiversity Information Facility and iNaturalist), specimens from the Herpetological Collection of the Museo de La Plata (MLP; see [Supplementary Online Material](#)) and records that are described in the scientific literature (Baldo et al. 2008; Baguette Pereiro et al. 2019; Díaz-Vega et al. 2020; Cabrera et al. 2022). We also obtained records from 'Reptiles de Tandilia,' a Citizen Science Project (Vera et al. 2021). We filtered the online database records where the photographs allowed us to identify the species unambiguously. Additionally, we added field records from June 2017 to December 2018 from two urban sites (each one with a surface of <500 m²), Buenos Aires City and Vicente López (Buenos Aires Province). A visual encounter survey was carried out twice a week on these sites.

We also added field records from March 2011 to June 2022 from occasional surveys in Buenos Aires City and nearby localities ([Supplementary Online Material](#)). With those records (443 records) we generated an updated geographic distribution map of *T. mauritanica* in the Southern Cone of South America. Then, for modeling purposes, we removed duplicate presence records using QGIS software, obtaining a total of 263 records.

Environmental variables

We chose a combination of 19 bioclimatic and elevation variables from the WorldClim Project in the highest resolution (i.e. 1 km² per cell; Fick and Hijmans 2017). Then, to avoid the collinearity between them, we performed a Pearson correlation test using the caret package in R (Kuhn 2008; R Core Team 2025). Then we selected a subset of non-correlated covariables (i.e. those whose values were below 0.7) and used in SDM: Bio1 (Annual Mean Temperature); Bio4 (Temperature Seasonality); Bio5 (Max Temperature of Warmest Month); Bio6 (Min Temperature of Coldest Month); Bio7 (Temperature Annual Range); Bio10 (Mean Temperature of Warmest Quarter); Bio11 (Mean Temperature of Coldest Quarter); Bio12 (Annual Precipitation); Bio13 (Precipitation of Wettest Month); Bio14 (Precipitation of Driest Month); Bio15: Precipitation Seasonality; Bio16 (Precipitation of Wettest Quarter); and Bio17 (Precipitation of Driest Quarter). The variables were processed and dimensioned to the native area (i.e. the Mediterranean) and the Southern Cone of South America in the R environment (R Core Team 2025).

Native suitable habitat and suitable areas for invasion

Species distribution models were generated with Maxent software version 3.4.4 (Phillips et al. 2006; Phillips and Dudík 2008). Maxent is a presence/background algorithm that uses environmental variables to predict the species' invasiveness (Franklin 2010). Also, compared with other algorithms used in SDM, Maxent performs relatively well (Duan et al. 2014). We used the native distribution of *T. mauritanica* to generate a SDM within its native range and then projected it onto the Southern Cone of South America to identify potentially suitable habitats (hereafter referred to as the PSA model). Using the native range prevents spurious projections (Nori et al. 2011). Additionally, we generated an independent SDM using presence records from the invaded area in the Southern Cone of South

America (hereafter, SCSA). This allows for comparing the environmental characteristics of Mediterranean areas with those of the SCSA. We used a maximum of 10,000 background points, a regularization multiplier of 0.5, hinge, product, linear, and quadratic features. The regularization multiplier value and feature types were chosen after an initial evaluation of model performance through the area under the curve (AUC) values (see Shcheglovitova and Anderson 2013). We converted the models to binary maps through QGIS software using the 10%ile training presence and Maximum training sensitivity plus specificity (MaxSSS) values as a cutoff threshold to obtain the suitable habitat of *T. mauritanica* (Phillips et al. 2006). The first threshold value is frequently used in SDM (Stiels et al. 2011; da Silva et al. 2018; Di Pietro et al. 2018, 2023, 2025; Vera et al. 2023), while the latter is usually recommended for models based on presence-only data (Liu et al. 2013). Those areas whose values were below this threshold were classified as unsuitable habitats.

The models were cross-validated using 10 replicates of the models to evaluate replicate adjustment through the average AUC value for both test (AUCte) and training (AUCtr) data, and to obtain a reliable consensus prediction of the geographic distribution (Dormann 2007; Pearson et al. 2007; Elith et al. 2011). AUC values range from 0.5 to 1, from random to perfect prediction. Also, we calculated null models to validate the distribution models through the nullRandom function of dismo package in R (Hijmans et al. 2023). We obtained the AUC for null models (ten replicates), and then calculated the *p* value through t-test (Sillero et al. 2021). Some studies note that the use of AUC as an evaluation metric is highly controversial (Lobo et al. 2008). Therefore, we included the omission rate to validate the model (Boria et al. 2014). Overfit models have omission rate values higher than the expected for the threshold selected (Shcheglovitova and Anderson 2013). Thus, we estimated the omission rate and expected omission rate values in dismo package in R (R Core team 2025). Then, we created an error matrix composed of points that matched the area of suitable habitat as well as omissions in order to verify if the number of omissions was smaller than the expected (considering $p < 0.05$) through a Chi squared test in R (R Core Team 2025). The matrix considered the binary maps produced with two thresholds (the 10% tile and the MaxSSS) for the native, PSA, and SCSA models.

The relative contribution of each variable in SDM was estimated by calculating the percentage increase of gain during the optimization phase of the model

through Maxent iterations and using the Jackknife method (Phillips et al. 2006).

Potential threat to the native geckos in the Southern Cone of South America

We evaluated the overlapping between native gecko species' ranges and the suitable habitat of *T. mauritanica* in the SCSA as a measure of potential threat to native species. We used only the suitable habitats determined by the 10%ile threshold. We included in this analysis the native geckos with a confirmed presence in the SCSA (Abdala et al. 2012; Ávila et al. 2012; Carreira et al. 2012; Cajade et al. 2013; De Gamboa 2016). Native geckos' ranges were estimated by the extent of occurrence (hereafter, EOO) layers available on the IUCN online page (IUCN 2025). The EOO area of each native gecko species was estimated with these downloaded layers. Then, the pairwise overlap percentage between each EOO of the native species and the suitable habitat of *T. mauritanica* was calculated. Thus, we assume that greater overlap between species pairs implies a higher potential threat to the native gecko species. All maps and overlap analysis were built using QGIS software.

Results

We obtained the native distribution of *Tarentola mauritanica* and the SDM in their native range (Figure 1A), which had very high AUC values in training (0.947) and test (0.942). Also the t-test showed significant differences between the null models and *T. mauritanica* models ($p < 0.05$). The omission rate values were lower than expected and the chi-square test was significant for all cases (Table 1). Hence, according these metrics, the models had high performance. We obtained the suitable habitat of *T. mauritanica* within its native range, encompassing 614,195.62 km² for the 10%ile threshold (Figure 1B). The most contributive variables were precipitation of the driest quarter, minimum temperature of the coldest month, and temperature seasonality (Table 2).

We obtained the SDM for the potential expansion and colonization of *T. mauritanica* in the SCSA (Figure 2A). The highest suitable habitat was in the north-central part of Argentina. In Chile, there is only a low suitable habitat for *T. mauritanica* in the country's center. In Uruguay, there is a mid suitable habitat in the West. The suitable habitat obtained by converting the SDM to a binary map by using the 10% ile threshold covers 1,397,558.36 km² (Figure 2B). Also,

we obtained an updated geographic distribution of the *T. mauritanica* in the SCSA (Figure 2B).

We obtained the overlapping degree from all ten native gecko species with the *T. mauritanica*'s suitable habitat in the SCSA (Figure 3, Table 3). The *T. mauritanica*'s suitable habitat did not overlap the distribution with *Homonota gaudichaudii*, *Phyllodactylus inaequalis*, and *Phyllodactylus gerrhopygus*. The species *Homonota taragui*, *Homonota williamsii*, and *Homonota whitii* had the greatest degree of overlap with the suitable habitat of *T. mauritanica*.

Discussion

In this work, we obtained the potential distribution of *Tarentola mauritanica* in its native range and the sites with suitable habitat in the Southern Cone of South America based on SDM analyses. The potential distribution within the native range largely coincides with its known distribution according to the presence records and the estimated occupied area by Vogrin et al. (2017). Habitat suitability was obtained in the studied area, without considering other factors beyond bioclimatic variables. It is necessary to study in depth how other factors interact with climatic variables, such as the number of introduced individuals and dispersal capacity.

The most contributive variables were precipitation of the driest quarter, minimum temperature of the coldest month, and temperature seasonality. These results agree with previous studies where suitable habitat of *T. mauritanica* is predicted by precipitation, temperatures, and temperature seasonality (Fujisaki et al. 2015; Rato et al. 2024). In the SCSA, the SDM analyses showed a high suitable habitat of *T. mauritanica* in the center-north of Argentina, being the highest near Paraná, Uruguay, and Río de La Plata rivers. East of Argentina, in Uruguay, there is also a high suitable habitat in the west of the country, near Uruguay and Río de la Plata rivers. The climate niche for *T. mauritanica* in its native range is low to moderate precipitation, moderate to high temperatures, and low temperature seasonality (Rato et al. 2024). However, the climate of both regions in Argentina and Uruguay is different from the native niche, being here a temperate and humid climate with wet summers (Carreira et al. 2005; Morello et al. 2012). The climate most similar to the native range of *T. mauritanica* is in Chile (Arad et al. 1997). Models suggested a low suitable habitat in this country, except for the center. Most of the current presence records in Chile match the predicted area. Díaz-Vega et al. (2020) notes that there are already well-

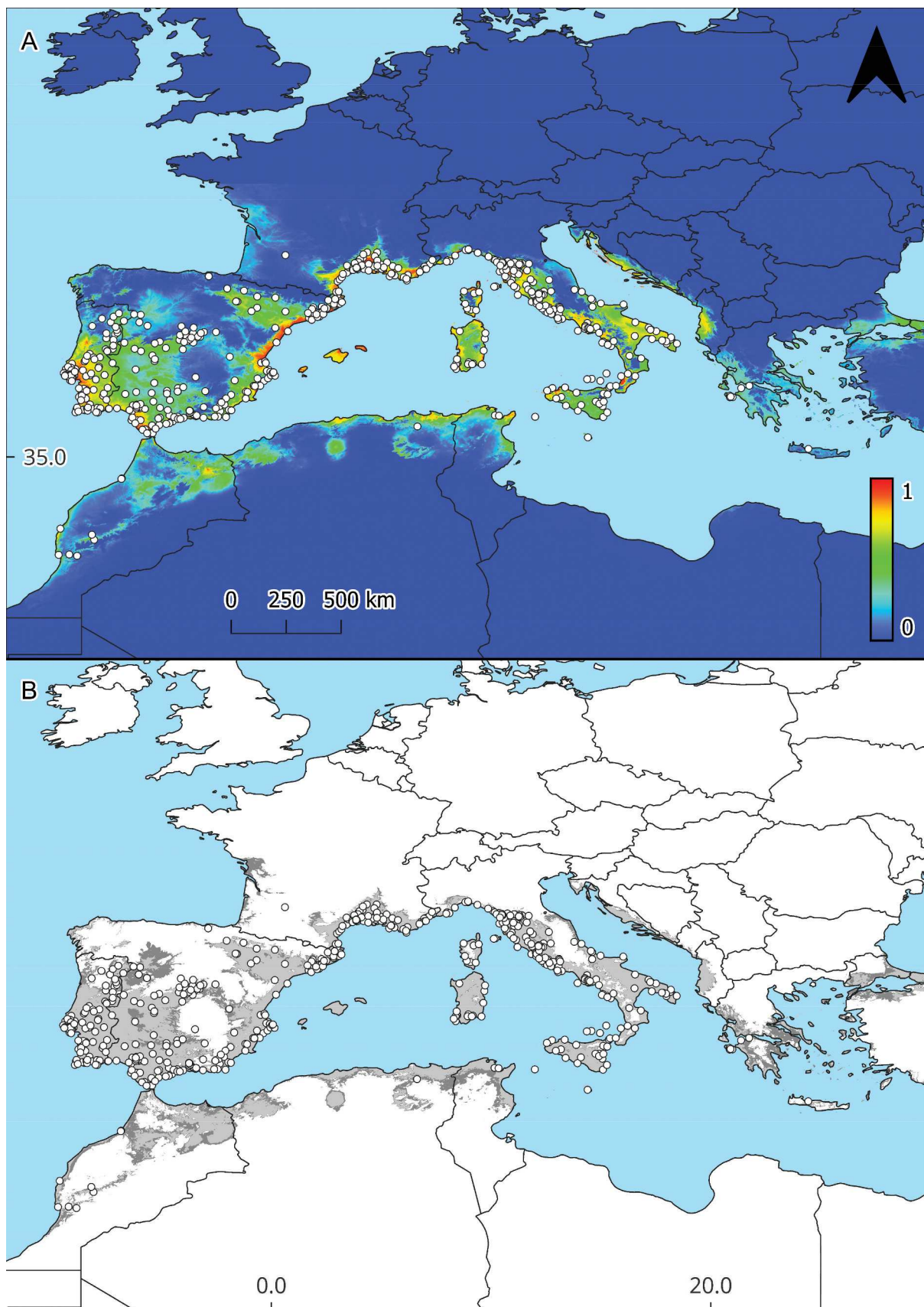


Figure 1. Species distribution model results of *Tarentola mauritanica* in their native region. (A) SDM; white dots: presence records used in the SDM; heat-bar ranges from the best (red) to worst (blue) suitable habitat. (B) Suitable habitat 10%ile threshold (pale gray areas); MaxSSS threshold (dark gray areas); white dots: presence of records in and out of the suitable habitat.

Table 1. Presence records used in omission rate validation of the different SDM. Native: Mediterranean points; PSA: projected model to the Southern Cone of South America; SCSA: Southern Cone of South America model.

Model	Total points	10%ile threshold				MaxSSS threshold			
		Inside points	Omission rate	χ^2	p	Inside points	Omission rate	χ^2	p
Native	535	480	0.10	337.62	<0.05	517	0.03	465.42	<0.05
PSA	263	247	0.06	202.89	<0.05	253	0.04	224.52	<0.05
SCSA	263	236	0.10	166.09	<0.05	256	0.03	235.75	<0.05

Table 2. Variables used in species distribution Model of *Tarentola mauritanica*. The table shows the code of variables and the percentage contribution of the variables.

Variable	Percentage contribution
Bio17: Precipitation of the Driest Quarter	26.5
Bio6: Minimum Temperature of the Coldest Month	21.7
Bio4: Temperature Seasonality (standard deviation $\times$ 100)	21.5
Bio12: Annual Precipitation	10.7
Bio10: Mean Temperature of the Warmest Quarter	6
Bio15: Precipitation Seasonality (Coefficient of Variation)	4
Bio14: Precipitation of the Driest Month	2.4
Bio11: Mean Temperature of the Coldest Quarter	2.4
Bio16: Precipitation of the Wettest Quarter	2.4
Bio7: Temperature Annual Range (Bio5 – Bio6)	1
Bio5: Maximum Temperature of the Warmest Month	0.6
Bio13: Precipitation of the Wettest Month	0.5
Bio1: Annual Mean Temperature	0.3

established populations of *T. mauritanica* in Chile, potentially threatening Chilean lizards' biodiversity. The SDM results suggest a suitable habitat patch to the south of these established populations, where *T. mauritanica* has not yet been recorded. Due to the current uncertainty regarding the consequences of the dispersion and invasion of *T. mauritanica* on the native fauna of Chile, it is important to prevent its spread in this area

In the south of the studied area, there is no suitable habitat, likely because it is a cold area, with temperatures below 5°C in the coldest quarter, representing a threshold where the prediction falls to near zero. Therefore, the records in the extreme south (i.e., Bariloche, Río Negro province, Argentina, see [Supplementary Online Material](#)) could be considered accidental introductions, where the establishment of populations is not feasible. Future monitoring of *T. mauritanica* in this region will help confirm this hypothesis.

We also presented an updated geographic distribution map of *T. mauritanica* in the SCSA. We included new records from online databases, personal fieldwork, and museum collections (MLP), which helped us better understand the occupied area. Surprisingly, most of these records were not published in any scientific article. This highlights the importance of implementing

data from citizen science projects, online databases, and scientific museum collections in studies on the geographic distribution of invasive species.

We obtained the potential conflict areas between the native geckos of the study area and *T. mauritanica* by overlapping the EOO of the former with the suitable habitat of the latter. Those species with a high degree of overlapping would present a higher conflict with *T. mauritanica*. The endemic and threatened species *Homonota taragui* (Cajade et al. 2013; Arzamendia et al. 2016a) presented a 100% of overlapping, being the most vulnerable species in case of spread and colonization by *T. mauritanica* in its range (Table 3). *Homonota williamsii* presented almost 70% of their range that could be a suitable habitat for *T. mauritanica*. Although this species is considered Least Concern (Ávila 2017a), it is an endemic species, so caution should be exercised as new records appear in their area. *Homonota taragui* and *Homonota williamsii* live in rocky grasslands (Ávila et al. 2012; Cajade et al. 2013). Despite *T. mauritanica* being commonly cited as inhabiting urban areas, Loveridge (1947) points out that they live in caves, wells, or water pipes, on cliffs, date palms, or beneath *Opuntia* leaves, the bark of fallen trees, clods of earth, or boulders. In addition, Vogrin et al. (2017) mention that they live in shrublands and rocky areas, such as

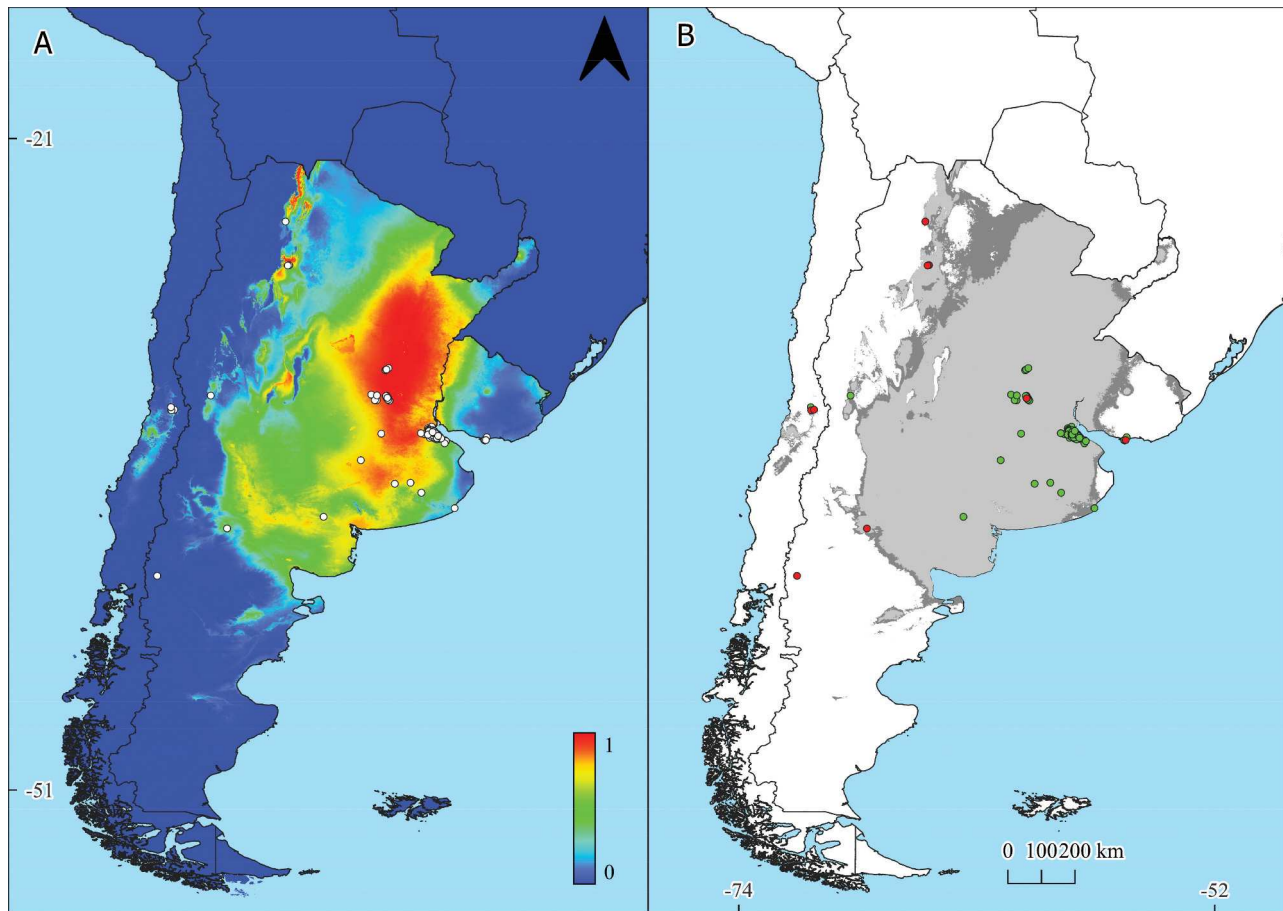


Figure 2. Prediction of the range of *Tarentola mauritanica* in the Southern Cone of South America. (A) Projected SDM; heat-bar ranges from the best (red) to worst (blue) suitable habitat; white dots: current presence records in the study area; (B) suitable habitat 10%ile threshold (pale gray areas); MaxSSS threshold (dark gray areas); green dots indicate new records from this work, and red dots indicate previously known records.

cliffs and mountain peaks. Therefore, an expansion from urban to natural areas in the future is not discarded and people must be careful about the translocation to natural areas. *Homonota whitii* showed one of the highest overlapping percentages. However, this species mainly inhabits the Chaco serrano habitats, and their conservation status is Least Concern with a stable population trend (Ávila et al. 2013; Ávila 2017b).

Homonota andicola, *H. borelli*, *H. horrida*, *H. underwoodi*, and *Phyllopezus pollicaris* presented moderate to low overlapping (<50% approximately). *Homonota darwini*, *H. gaudichaudii*, and the species of the genus *Phyllodactylus* had a low percentage (<10%) of overlapping. All of these geckos are considered Least Concern by the IUCN Red List, so it is unlikely that the invasion of *T. mauritanica* could be a major threat for them (Aguilar et al. 2015; Lobos et al. 2015; Arzamendia et al. 2016a, 2016b, 2016c, 2016d, 2016e; Ávila 2017a, 2017b; Aparicio et al. 2019; Cacciali et al. 2019; Goldberg 2021). *Homonota uruguayensis* also presented a moderated overlapping

area, however this is another endemic and threatened species that inhabits rocky areas and grasslands, with a decreasing population trend (Carreira and Maneyro 2021). Thus, it is another species to consider with special precautions regarding its dispersion and anthropic displacement.

The geographic assessments we conducted here can be used to obtain a potential conflict assessment by identifying areas highly vulnerable to a *T. mauritanica* invasion. Our results could be further refined by using finer-scale data on land cover type, which can vary within a small management unit. Finer-scale predictions of habitat suitability would allow planning of location-specific management activities such as monitoring and inventories, even within smaller management units such as natural areas (e.g. national parks and reserves, state parks) and agricultural areas. Also, some studies accounted for life history traits and human factors, which tend to correlate to invasion success in predicting the establishment of alien

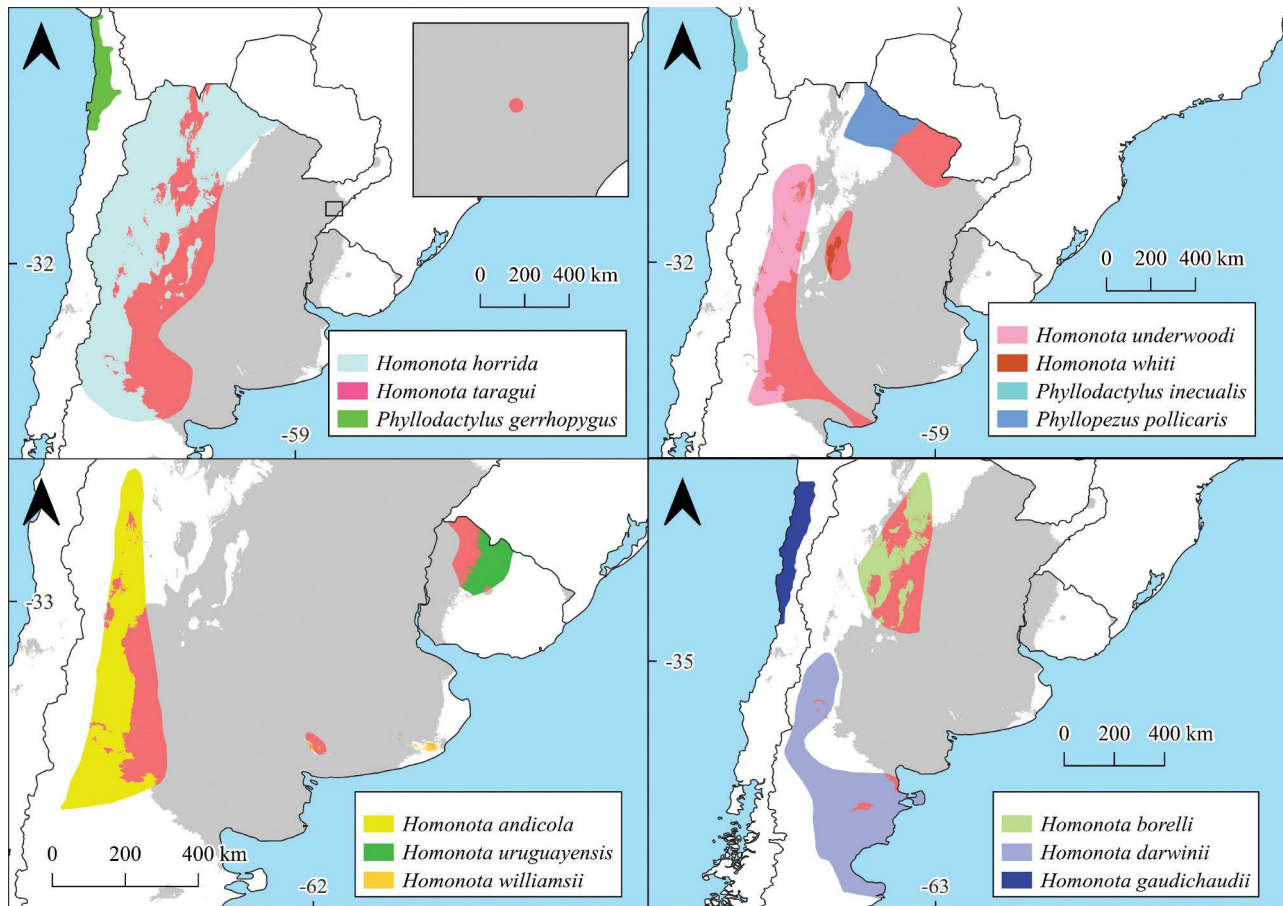


Figure 3. *Tarentola mauritanica* and native geckos in the Southern Cone of South America. Grey polygons: suitable habitat of *Tarentola mauritanica*; color polygons: extension of occurrence of native geckos; red polygons: overlap of *Tarentola mauritanica* suitable habitat with native geckos extension of occurrence.

Table 3. Suitable habitat of *Tarentola mauritanica* and distribution of native geckos of the Southern Cone of South America. The overlap between suitable habitat and extension of occurrence (only within the SCSA) is indicated in square kilometers and percentages. IUCN conservation statuses are displayed. CR: critically Endangered; LC: least Concern; EN: endangered.

Species	Suitable habitat/EOO (km ²)	Overlap (km ²)	Overlap (%)	IUCN
<i>Tarentola mauritanica</i>	1,397,558.36	-	-	LC
<i>Homonota andicola</i>	197,389.51	63,667.316	32.25	LC
<i>Homonota borelli</i>	237,937.27	121,774.65	51.17	LC
<i>Homonota darwini</i>	316,938	6,678.81	2.10	LC
<i>Homonota gaudichaudii</i>	69,163.4	0	0	LC
<i>Homonota horrida</i>	1,149,705.82	368,623.97	32.06	LC
<i>Homonota taragui</i>	13.21	13.21	100	CR
<i>Homonota underwoodi</i>	340,812	160,421.23	47.07	LC
<i>Homonota uruguayensis</i>	37,998.67	16,380.55	43.10	EN
<i>Homonota whiti</i>	42,698.6	35,013.54	82	LC
<i>Homonota williamsii</i>	4,488.30	3,042.34	67.78	LC
<i>Phyllodactylus gerrhopygus</i>	59,867.02	0	0	LC
<i>Phyllodactylus inaequalis</i>	20,110.74	0	0	LC
<i>Phyllopezus pollicaris</i>	178,214.06	90,057.93	50.53	LC

reptiles (Fujisaki et al. 2015; Mahoney et al. 2015). In the future, it would be interesting to study the possibility of niche competition between native geckos and *T. mauritanica* through niche similarity analysis

and human habitat alterations, such as human-mediated transport, disturb degree, land use, and population density. In the present study, we only considered environmental variables, but the

interspecific interactions and human factors are also important in the invasion process, and thus including these variables may improve the predictions. In conclusion, we suggest special concern to the endemic and endangered species, living in rocky areas, a habitat type that can be used by *Tarentola mauritanica*.

Acknowledgments

We would like to thank Santiago Torres. We also appreciate the collaboration of Emilio (Granja Los Pibes) and Flavio Maldonado (Bioparque La Máxima) for their attention and collaboration. We thank Dirección de Flora y Fauna of Buenos Aires province, which gave us the necessary permits to perform this work. We thank Leandro Alcalde and Jorge Daniel Williams, curators of the Herpetological Collection at the Museo de La Plata, for facilitating the inspection of the specimens. We thank those who reviewed the article, providing extremely interesting suggestions that have significantly improved the initial manuscript.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Funding

DGV and MCJR were supported by fellowships from Consejo Nacional de Investigaciones Científicas y Técnicas de Argentina (CONICET). IB, DOD, and FPK are Research Fellows of CONICET.

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