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NEW AND SIGNIFICANT DISTRIBUTIONAL RECORDS OF PARAGUAYAN REPTILES AND AMPHIBIANS FROM ALTO PARAGUAY, MISIONES, ÑEEMBUCÚ, PRESIDENTE HAYES AND SAN PEDRO DEPARTMENTS

Registros novedosos en la distribución de reptiles y anfibios paraguayos en los Departamentos de Alto Paraguay, Misiones, Ñeembucú, Presidente Hayes y San Pedro

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Abstract. Here we present 19 new or significant herpetofauna departmental records from five Paraguayan departments; Alto Paraguay, Misiones, Ñeembucú, Presidente Hayes and San Pedro with the interest of updating currently understood distributions. Many of these records are common species highlighting the gaps still prevalent in Paraguayan herpetofauna and the need for more inventory work in the country.

Keywords. *Chironius maculoventris*, *Epictia albipuncta*, *Leptodactylus mystacinus*, *Rhinella dorbygni*, *Stenocercus doellojuradoi*, *Xenodon dorbignyi*.

Resumen. Presentamos aquí nuevos o significativos registros departamentales para 19 especies en cinco departamentos de Paraguay; Alto Paraguay, Misiones, Ñeembucú, Presidente Hayes y San Pedro a fin de actualizar las distribuciones conocidas. Varios de estos registros son de especies comunes, resaltando así los vacíos que aún existen en el conocimiento de la herpetofauna paraguaya y la necesidad de más trabajos de inventarios a nivel nacional.

Palabras clave. *Chironius maculoventris*, *Epictia albipuncta*, *Leptodactylus mystacinus*, *Rhinella dorbygni*, *Stenocercus doellojuradoi*, *Xenodon dorbignyi*.

INTRODUCTION

According to the most recent reviews of the herpetofauna of Paraguay there are 87 species of amphibian and over 180 species of reptile. (Cacciali *et al.*, 2016; Motte *et al.*, 2019b). However, a lack of homogeneous research and sampling effort of herpetofauna across the 17 departments of Paraguay highlight distinct gaps in our understanding and demonstrate that their distribution continues to be poorly understood (Smith *et al.*, 2016). Our current understanding of Paraguayan herpetofauna mostly stems from the publishing of a multitude of short collection expeditions and localized inventory attempts (Scott and Lovett, 1975; Brusquett and Lavilla, 2006, Caballero-Gini *et al.*, 2011; Núñez, 2012; Motte *et al.*, 2015; Smith and Clay, 2015; Cacciali *et al.*, 2016; Smith *et al.*, 2016; Atkinson *et al.*, 2017; Motte *et al.*, 2019a).

In the interest of keeping published distributions up to date and filling in gaps in current understanding, here we report new or significant (in reference to a poorly-known species) Paraguayan departmental distribution records, from five departments, for 14 species of reptiles and five species of amphibians. Paraguay is split broadly into two regions by the Paraguay River, the Chaco (or Occidental region) to the west and the Oriental region to the east. The five departments included in this report are Alto Paraguay, Misiones, Ñeembucú, Presidente Hayes and San Pedro. Alto Paraguay is located in the north of Paraguay, in a zone of transition between the Dry Chaco and Pantanal ecoregions. Currently there are 70 recorded reptile and 40 amphibian species documented to occur in Alto Paraguay department. Presidente Hayes (41 amphibian and 73 reptile species) is in the southeast of the occidental region of Paraguay, bordered by the Rio Paraguay, and Humid Chaco on the east side, Rio Pilcomayo to the south

and the Dry Chaco on the west. On the opposite side of the river to Presidente Hayes, San Pedro is a transitional department of Cerrado, Humid Chaco and Atlantic Forest. San Pedro has the highest diversity of reptiles, with 94 species, and 37 amphibian species. Ñeembucú (26 amphibian and 53 reptile species) is nestled in the southwest of the Oriental Region, on the Paraguay and Paraná rivers, consisting primarily of Humid Chaco. Misiones (36 amphibian and 31 reptile species) borders Ñeembucú to the east side, consisting of Humid Chaco and Mesopotamian Grassland. (Keel *et al.*, 1993; Dinerstein *et al.*, 1995; del Castillo and Clay, 2005; Weiler *et al.*, 2013; Cacciali *et al.*, 2016; Smith *et al.*, 2012; Smith *et al.*, 2016; Atkinson *et al.*, 2017).

MATERIALS AND METHODS

All specimens were collected using a range of accepted sampling techniques (Ribeiro-Júnior *et al.*, 2008). These include pitfall trapping, active searching, collection of roadkill/dead specimens and incidental pickups. Voucher specimens were collected and, when necessary, dispatched ethically and humanely using techniques described by Simmons (2015), collected under the following Ministerio del Ambiente y Desarrollo Sostenible of Paraguay (MADES) issued permit numbers; 107305, 111168, 132107, 132108, 145104, 167506, 167516, 177291, 178677, 178681, 219864, 219866, 219868, 219869, 219871 and 222358. All specimens are preserved and housed at the Colección Científica de Para La Tierra (CZPLT) in Pilar, Ñeembucú department, Paraguay under permit N° 177291 issued by MADES. Species identifications were confirmed using external morphological characteristics, including general patterning/coloration, scale counts, snout-vent length (SVL) and tail measurements (TL).

The scale counts for snakes follow the methodology of Dowling (1951) and Peters (1964), including dorsals post-head, mid-body and pre-cloacal (DOR), ventral scales (VEN), subcaudal scales (SC) and supralabials (SL). Scale counts for blind snakes follow the methodology of Francisco *et al.* (2012), including mid-dorsal scales (MID-DOR), mid-ventral (MID-VEN), SC and SL. All the collection localities mentioned are mapped in Figure 7.

RESULTS

Reptiles

Stenocercus doellojuradoi Freiberg, 1944 (Tropiduridae)

CZPLT-H-556 (near Tajamar 1, Chaco Lodge, Presidente Hayes department; 19.ix.2013; Col. J-P. Brouard).

This individual (Figure 1A) represents the second formal record of this species in the Paraguayan Chaco. Previously known in Paraguay from two individuals collected in Boquerón (Carosini *et al.*, 2021). This is the first specimen to be collected in the department of Presidente Hayes. The species was identified by the dorsal pattern, presence of an antehumeral fold, lack of mite pockets, notched and smooth ventrals and gulars, posteriorly projected preanals and the fact that the mental does not contact the first pair of sublabials (Torres-Carvajal, 2007).

Teius oculatus (d'Orbigny & Bibron, 1837) (Teiidae)

CZPLT-H-624 (5 km SW Mburicá, Paraguay, Arroyo Caí Mbocá, Ñeembucú department; 14.i.1992; Col. J. Contreras).

A single specimen (Figure 1B) identified incorrectly on the specimen label as *Teius teyou*. Known from the Oriental Region of Paraguay, this species has previously

been recorded in Alto Paraná, Canindeyú, Itapúa, Misiones and San Pedro (Cacciali *et al.*, 2016). This is the first record for this grassland species in Ñeembucú. The species was identified based on the atrophied fifth toe of the hind foot, in combination with the short tail (relative to SVL) and distinctive, more extensively greenish dorsal coloration (Ceï, 1993).

Aspronema dorsivittatum (Cope, 1862) (Scincidae)

CZPLT-H-692 (Río Verde, San Pedro department; 08.iii.2014; Col. J. Sarvary).

This individual (Figure 1C) shows a single, fused frontal scale, unusual for this species (and contributing to an earlier erroneous identification as *Notomabuya frenata*). This is the first record from San Pedro department of this uncommon but apparently widespread species in Paraguay, and represents an additional species present at the highly biodiverse locality Rancho Laguna Blanca (Smith *et al.*, 2016; Atkinson *et al.*, 2017). There are previous reports of this species from Alto Paraguay, Central, Itapúa, Ñeembucú and Presidente Hayes departments (Cacciali *et al.*, 2016, Martínez *et al.*, 2020a). The species was identified by the unique combination of the slender, depressed body shape, long tail and discrete lateral banding pattern of a broad dark band bordered by thinner white bands (Ceï, 1993).

Ophiodes aff. *striatus* (Diploglossidae)

CZPLT-H-2259 (Compañía Pira Ka'aguy, San Ignacio, Misiones department; 16.v.2021; Col. A. Vera Burró).

This single specimen (Figure 1D) represents the first record for the Misiones department, with previous Paraguayan records from Caazapá and Itapúa departments (Cacciali *et al.*, 2016). This individual was identified as *Ophiodes* aff. *striatus* or *Ophiodes* sp. "3" following Borges-Martins

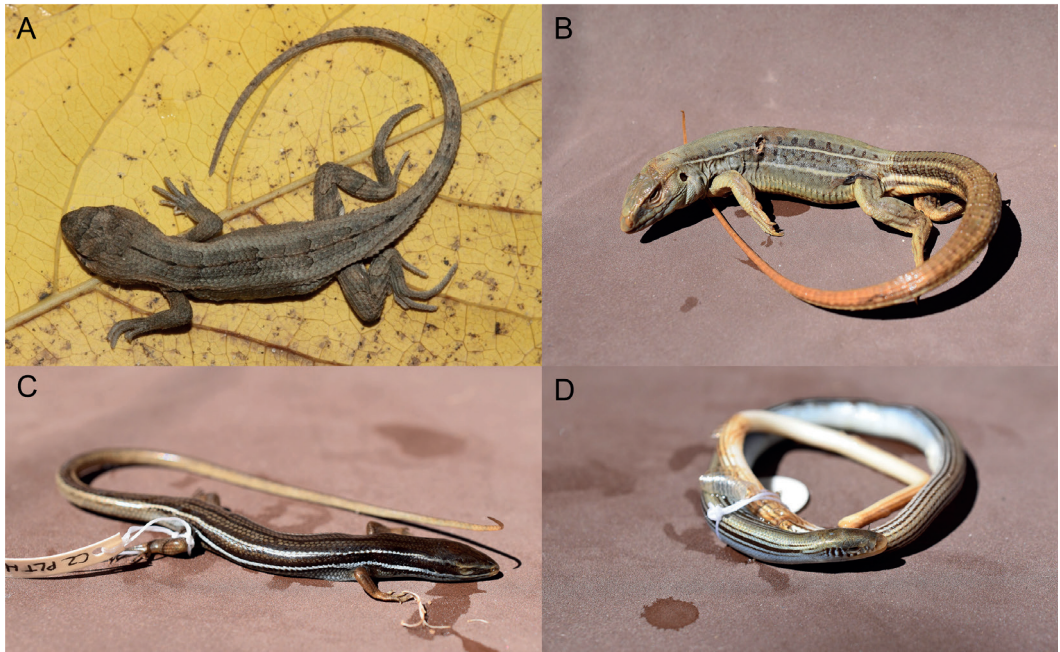


Figure 1 - **A** CZPLT-H-556. Juvenile of *Stenocercus doellojuradoi* (Tropiduridae), Chaco Lodge, Presidente Hayes department (Photo: Jean-Paul Brouard). **B** CZPLT-H-624. *Teiús oculatus* (Teiidae), 5km SW Mburicá Paraguay, Arroyo Caí Mbocá, Ñeembucú department (Photo: George Hicks). **C** CZPLT-H-692. *Aspronema dorsivittatum* (Scincidae), Río Verde, San Pedro department (Photo: George Hicks). **D** CZPLT-H-2259. *Ophiodes* aff. *striatus* (Diploglossidae), Compañía Pira Ka'aguy, San Ignacio, Misiones department (Photo: George Hicks).

(1998) and Cacciali and Scott (2015), this being a green species in which the vertical bars on the face do not extend onto the body (consistent with the nomenclature used by Cacciali *et al.* (2016)).

***Amphisbaena camura* Cope, 1862 (Amphisbaenidae)**

CZPLT-H-1462 (Centro IDEAL, Pilar, Ñeembucú department; v.2017; Col. J. Sarvary).

CZPLT-H-2141 (Centro IDEAL, Pilar, Ñeembucú department; 21.xii.2020; Col. J. Ayala Santacruz).

CZPLT-H-2167 (Museo Paolo Alberzoni, General Díaz, Pilar, Ñeembucú department; 31.v.2021; Col. G. Morgan).

These specimens (Figure 2A) collected within urban gardens of Pilar are the first records for Ñeembucú department and

confirm that the species occurs throughout the Paraguay River Basin with previous records from Alto Paraguay, Central, Cordillera, Guairá, Paraguairí and San Pedro departments (Cacciali *et al.*, 2016; Smith *et al.*, 2016). This large amphisbaenid is easily identified by a combination of the large size (>300 mm), dark body coloration with contrasting pale collar and body and tail rings less than 220 in number (Ceí, 1993; Montero and Terol, 1999).

***Bothrops pauloensis* Amaral, 1925 (Viperidae)**

All specimens published as *Bothrops diporus* from Rancho Laguna Blanca, San Pedro department (CZPLT-H 090, 092, 137, 396, 447, 793) (Smith *et al.*, 2016), have been reidentified as *B. pauloensis* (Figure 2B). These represent the first departmen-

tal records of this Cerrado endemic snake (Valdujo *et al.*, 2002; Carrasco *et al.*, 2019), considered Vulnerable at the national level (Martínez *et al.*, 2020b). The species was previously known only from Amambay and Canindeyú departments (Cacciali *et al.*, 2016). The species was identified based on the reduced but conspicuously-patterned, squarish dorsal markings well-separated from the small ventrolateral markings, the small spots on the dorsal head (lacking postcephalic stripes) and the absence of a lacunolabial scale (Jansen, 2006; da Silva and Rodrigues, 2008). We draw attention to the distinctive coloration of the juveniles of the species (Jansen, 2006; Figure 2C), quite distinct from that of the juveniles of other *Bothrops* pres-

ent in Paraguay, which show coloration much more closely resembling their respective adults.

***Leptophis ahaetulla* (Linnaeus, 1758) (Colubridae)**

CZPLT-H-2293 (99km E of Pilar on Ruta IV, Misiones department; 31.xiii.2021; Col. P. Smith). SVL 589 mm; TL 330 mm; DOR 15-15-13; VEN 167; SC 146; SL 8 (4 and 5 contact the eye). Anal divided.

The first specimen (Figure 2D) documentation from Misiones department of this widespread species. The species has now been documented in all Paraguayan departments except Caazapá, Caaguazú and Guairá (Cacciali *et al.*, 2016). This unmistakable species was identified based



Figure 2 - A CZPLT-H-2167. *Amphisbaena camura* (Amphisbaenidae). Museo Paolo Alberzoni, General Díaz, Pilar, Ñeembucú department (Photo: George Hicks). **B** *Bothrops pauloensis* (Viperidae). Rancho Laguna Blanca, San Pedro department (Photo: PLT). **C** Juvenile of *Bothrops pauloensis* (Viperidae). Rancho Laguna Blanca, San Pedro department (Photo: PLT). **D** CZPLT-H-2293. *Leptophis ahaetulla* (Colubridae). 99 km E of Pilar on Ruta IV, Misiones department. (Photo: George Hicks).

on the distinctive green coloration with black eye-stripe and dark-edged scales, combined with the pholidosis (Cei, 1993).

***Boiruna maculata* (Boulenger, 1896) (Colubridae: Dipsadinae)**

CZPLT-H-1215 (6.2km E of Pilar on Ruta IV, Ñeembucú department; 9.x.2017; Col. J.K. Dickens). SVL 1090 mm; TL 265 mm; DOR 19-19-17; VEN 212; SC 71; SL 7. Anal divided.

A single male roadkill specimen (Figure 3A) of this snake is the first record for Ñeembucú department, predictably extending its distribution to the southwestern corner of the country. Previous records from Alto Paraguay, Boquerón, Central, Itapúa, Misiones

and Presidente Hayes departments (Cacciali *et al.*, 2016). The species was identified based on the pholidosis and the blackish subcaudals following Scott *et al.* (2006).

***Erythrolamprus almadensis* (Wagler, 1824) (Colubridae: Dipsadinae)**

CZPLT-H-2258 (Compañía Pira Ka'aguy, San Ignacio, Misiones Department; 08.x.2020; Col. A. Vera Burró). SVL 374 mm; TL 102 mm; DOR 19-19-17; VEN 154; SC 62; SL 8 (4 and 5 contact the eye). Anal divided.

This specimen (Figure 3B) represents the first documented record of this widespread species in Misiones. The snake was found dead, in the process of eating a dead *Leptodactylus mystacinus* (Figure 3C) (which was



Figure 3 - A CZPLT-H-1215. *Boiruna maculata* (Colubridae). 6.2 km E of Pilar on Ruta IV, Ñeembucú department (Photo: Jeremy Dickens). B CZPLT-H-2258. *Erythrolamprus almadensis* (Colubridae). Compañía Pira Ka'aguy, San Ignacio, Misiones Department (Photo: George Hicks). C CZPLT-H-2258 eating CZPLT-H-2257. *Erythrolamprus almadensis* (Colubridae) and *Leptodactylus mystacinus* (Leptodactylidae). Compañía Pira Ka'aguy, San Ignacio, Misiones Department (Photo: Alvaro Vera Burró). D CZPLT-H-1573. *Erythrolamprus jaegeri* (Colubridae). Estancia Santa María, San Ignacio, Misiones department (Photo: George Hicks).

also a new departmental record). This species has been previously recorded in Amambay, Central, Concepción, Cordillera, Itapúa, Presidente Hayes, San Pedro and Ñeembucú (Giraud and Contreras, 1994; Cacciali *et al.*, 2016). This distinctive species can be easily identified by a combination of the unique white V-shaped mark bordered with black on the fronto-parietal in combination with the pholidosis (Ceï, 1993).

***Erythrolamprus jaegeri* (Günther, 1858)
(Colubridae: Dipsadinae)**

CZPLT-H-1573: (Estancia Santa Maria, San Ignacio, Misiones department; 4.ix.2020; Col. A. Vera Burró). SVL 280 mm; TL 100 mm; DOR 17-17-17; VEN 157; SC 69; SL 8 (4 and 5 contact the eye). Anal divided.

A single specimen (Figure 3D) collected in Mesopotamian Grasslands, is the first record of this species for Misiones department. Previous records from Caaguazú, Caazapá, Canindeyú, Concepción, Cordillera, Guairá, Itapúa, Presidente Hayes and San Pedro departments (Smith and Clay, 2015; Cacciali *et al.*, 2016). This distinctive species was identified on the basis of the distinctive green and red coloration of live animals, in combination with the pholidosis (Ceï, 1993).

***Xenodon dorbignyi* (Bibron, 1854) (Colubridae: Dipsadinae)**

CZPLT-H-2291 (Estancia Santa Ana, Ñeembucú department; 26.viii.2021; Col. G. Hicks, J. Wang and F. O'Leary). SVL 368 mm; TL 59 mm; DOR 21-21-17; VEN 125; SC 29; SL 7. Anal divided.

A single specimen (Figure 4A) was collected from Estancia Santa Ana in Ñeembucú department, found with the anterior half of its body within a burrow. Upon pulling the snake out, it was consuming an *Odontophrynus americanus*, an anuran that has previously been identified as a dietary mainstay for *X. dorbignyi* (Baptista

de Oliveria *et al.*, 2001). A juvenile was also photographed by A. Vera Burró in Misiones (Figure 4B), also confirming the species presence in that department. Previously, only known from one specimen collected in Central department and various unvouchered reports (Cacciali *et al.*, 2016). This distinctive species was identified by a combination of the pholidosis, dorsal pattern, orange-coloration on the subcaudals and upturned "hognose" (Ceï, 1993).

***Epictia albipuncta* (Burmeister, 1861)
(Leptotyphlopidae)**

CZPLT-H-1574 (Estancia Santa María, San Ignacio, Misiones department; 9.ix.2020; Col. A. Vera Burró). SVL 236 mm, TL 14 mm, MID-DOR 254; MID-VEN 249; SC 21; SL 4.

CZPLT-H-1575 (Estancia Santa María, San Ignacio, Misiones department; 9.ix.2020; Col. A. Vera Burró). SVL 190 mm, TL 20 mm, MID-DOR 249; MID-VEN 229; SC 19; SL 4.

CZPLT-H-1576 (Estancia Santa María, San Ignacio, Misiones department; 9.ix.2020; Col. A. Vera Burró). SVL 88 mm, TL 8 mm, MID-DOR 250; MID-VEN 231; 23; SL 4.

CZPLT-H-1577 (Estancia Santa María, San Ignacio, Misiones department; 9.ix.2020; Col. A. Vera Burró). SVL 80 mm, TL 5 mm, MID-DOR 248; MID-VEN 229; SC 20; SL 4.

Two adults (Figure 4C) and two juveniles of this poorly known blind snake constitute the first report of the species from the Mesopotamian Grasslands of Misiones department. All specimens show the whitish rostral scale typical of this species. These are the most southerly reports of the species in Paraguay, with previous records from Central and San Pedro departments (Cacciali *et al.*, 2016). The species was identified because of the presence of a white rostral scale, the shape of the blotches in the longitudinal lines and the pholidosis, following Francisco *et al.* (2012).



Figure 4 - **A** CZPLT-H-2291. *Xenodon dorbignyi* (Colubridae). Estancia Santa Ana, Ñeembucú department (Photo: George Hicks). **B** *Xenodon dorbignyi* (Colubridae). Misiones Department (Photo: Alvaro Vera Burró). **C** CZPLT-H-1574. *Epictia albipuncta* (Liotyphlopidae). Estancia Santa María, San Ignacio, Misiones department (Photo: Paul Smith). **D** CZPLT-H-1776. *Epictia vellardi* (Liotyphlopidae). Agua Dulce. Cuatro Bocas: El Campero, Alto Paraguay department (Photo: Paul Smith).

***Epictia vellardi* (Laurent, 1984) (Leotyphlopidae)**

CZPLT-H-1776 (Agua Dulce. Cuatro Bocas: El Campero, Alto Paraguay department, 08.xii.2020, Col. S. Ríos) SVL 203 mm; TL 8 mm; MID-DOR 247; MID-VEN 233; SC 13; SL 4.

A single specimen (Figure 4D) representing the first record for Alto Paraguay. This species has previously been recorded in western Paraguay, in the departments of Boquerón and Presidente Hayes, and marginally onto the eastern bank of the Paraguayan river in Concepción and Central departments (Cacciali *et al.*, 2016). The species was identified because of the absence of a white rostral scale, the shape of the blotches in the longitudinal lines and the pholidosis, following Francisco *et al.* (2012).

Amphibians

***Rhinella dorbygni* (Duméril & Bibron, 1854) (Bufonidae)**

CZPLT-H-1205, 1207 (Estancia Santa Ana, Ñeembucú department; 5.viii.2017; Col. PLT Team).

CZPLT-H-1338 (Ñeembucú department; 15.xii.2018; Col. PLT Team).

CZPLT-H-1417, 1418 (Ñeembucú department; 21.i.2019; Col. B. L. Pett).

CZPLT-H-1478 (Ruta IV, Ñeembucú department; 12.ii.2019; Col. H-P. Davis).

CZPLT-H-1526 (Base Militar Pilar, Ñeembucú department; 28.xii.2019; Col. R. Wyer and B. Pett).

CZPLT-H-1626 (Puerto Elisa, Ñeembucú department; 3.xii.2020; Col. J. Ayala).

CZPLT-H-1680 (Puerto Elisa, Ñeembucú de-

partment; 11.xii.2020; Col. N. Alves).

CZPLT-H-1681 (Puerto Elisa, Ñeembucú department; 11.xi.2020; Col. A. Quiñones).

CZPLT-H-1696 (Puerto Elisa, Ñeembucú department; 15.xii.2020; Col. F. C. Recalde Ruiz).

CZPLT-H-2042, 2051 (Paso Canoa, Ñeembucú department; 28.i.2021; Col. A. Quiñones).

CZPLT-H-2050 (Paso Canoa, Ñeembucú department; 27.i.2021; Col. A. Quiñones).

CZPLT-H-2088 (Paso Canoa, Ñeembucú department; 26.i.2021; Col. N. Alves).

CZPLT-H-2179 (Base Militar Pilar, Ñeembucú department; 22.vi.2021; Col. J. Wang).

CZPLT-H-2187 (Base Militar Pilar, Ñeembucú department; 25.vi.2021; Col. J. Wang).

CZPLT-H-2201 (Estancia Delfino, Pilar, Ñeembucú department; 12.vii.2021; F. O'Leary).

CZPLT-H-2278 (Estancia Santa Ana, Ñeembucú department; 25.viii.2021; J. Wang).

Associated with the Paraguay River Basin, these records represent the first published specimens (Figure 5A) of this species for Ñeembucú department (Brusquetti and Lavilla, 2006; Weiler *et al.*, 2013), where its presence is no surprise. Previous Paraguayan records are from Alto Paraguay, Central, Concepción, Cordillera, Paraguari, Presidente Hayes and San Pedro (Brusquetti and Lavilla, 2006; Weiler *et al.*, 2013). This species has been widely referred to as *R. fernandezae* in the Paraguayan literature, but this has recently been demonstrated to be a junior synonym of the current name (Pereyra *et al.*, 2021). It was identified on the basis of the distinctive greenish dorsal coloration, conspicuous cephalic crests and single post-commissural row of keratinized warts (Weiler *et al.*, 2013).

***Boana punctata* (Schneider, 1799) (Hylidae)**

CZPLT-H-1231 (Estancia Santa Ana, Ñeembucú department; 27.x.2017; Col. J. K. Dickens).

CZPLT-H-1243, 1246, 1247, 1249 (16 km E of Pilar on Ruta IV, Ñeembucú department; 24.xi.2017; Col. PLT Team).

CZPLT-H-1257 (22.2 km E of Pilar on Ruta IV, Ñeembucú department; 24.xi.2017; Col. PLT Team).

CZPLT-H-1325 (Estancia Santa Ana, Ñeembucú department; 19.xi.2018; Col. S. Van Beckum).

CZPLT-H-1423 (Ñeembucú department; 22.i.2019; Col. B. L. Pett).

CZPLT-H-1444 (Ruta IV, Ñeembucú department; 12.ii.2019; Col. H-P. Davis).

CZPLT-H-1649 (Puerto Elisa, Ñeembucú department; 5.xii.2020; Col. S. Krabbendam).

CZPLT-H-1652 (Puerto Elisa, Ñeembucú department; 8.xii.2020; Col. C. Torres).

CZPLT-H-1765 (Puerto Elisa, Ñeembucú department; 19.xii.2020; Col. A. Quiñones).

This is a common small frog widely distributed in Paraguay, except the humid, forested southeastern Oriental region in Caazapá and Itapúa departments (where the species is likely at least marginally present). Surprisingly these records represent the first specimens (Figure 5B) of the species from Ñeembucú department, where the species is a common and widespread component of the local anurofauna (Brusquetti and Lavilla, 2006; Weiler *et al.*, 2013). This frog was identified based on its unique green and red coloration and transparent ventral, unmistakable in the Paraguayan anurofauna (Weiler *et al.*, 2013).

***Trachycephalus typhonius* (Linnaeus, 1758) (Hylidae)**

CZPLT-H-1279 (Arroyo San Lorenzo, Pilar, Ñeembucú department; 5.v.2018; Col. J. K. Dickens).

CZPLT-H-1327 (Fabrica de Textiles, Pilar, Ñeembucú department; undated; Col. H-P. Davis).

CZPLT-H-2107 (Estancia Santa Ana, Ñeembucú department; 17.iii.2021; K. Armstrong).

An adult (Figure 5C) and two juveniles,

representing the first documentation of this widespread and common species in Ñeembucú department (Brusquetti and Lavilla, 2006; Weiler *et al.*, 2013). The species has now been documented to occur in all Paraguayan departments. This large and distinctive frog was identified on the basis of the paired vocal sacs, expanded greenish digital pads and the milky secretion produced by live animals (Weiler *et al.*, 2013).

***Leptodactylus mystacinus* (Burmeister, 1861) (Leptodactylidae)**

CZPLT-H-2257 (Estancia Santa María, San Ignacio, Misiones department; 08.x.2020; Col. A. Vera Burró).

This single specimen (Figure 5D) represents the first record for Misiones. Found dead, being eaten by an *Erythrolamprus al-*

madensis (Figure 3C). Widespread in the Oriental region of Paraguay, this species has previously been recorded in Alto Paraná, Caazapá, Canindeyú, Central, Cordillera, Guairá, Itapúa, and San Pedro (Weiler *et al.*, 2013). The species was identified by the mustard-coloured dorsal coloration and the thin regular bands on the dorsal surface of the hind legs - as opposed to a reddish dorsal coloration with black stripes separating the species from the recently described *L. apepyta* Schneider *et al.* 2019.

***Odontophrynus americanus/reigi* (Odontophrynidae)**

CZPLT-H-1293, 1294, 1295 (Estancia Santa Ana, Ñeembucú department; 23.x.2018; Col. H-P. Davis).

CZPLT-H-1311 (Estancia Santa Ana, Ñeem-



Figure 5 - A CZPLT-H-1626. *Rhinella dorbygni* (Bufonidae). Puerto Elisa, Ñeembucú department. (Photo: George Hicks). B CZPLT-H-1231. *Boana punctata* (Hylidae). Estancia Santa Ana, Neembucú department (Photo: Leigh McMahon). C CZPLT-H-1279. *Trachycephalus typhonius* (Hylidae). Arroyo San Lorenzo, Pilar, Neembucú department (Photo: Jeremy Dickens). D CZPLT-H-2257. *Leptodactylus mystacinus* (Leptodactylidae). Estancia Santa María, San Ignacio, Misiones department (Photo: Alvaro Vera Burró).

bucú department; 31.x.2018; Col. P. Ugo-
lini).
CZPLT-H-1502, 1504 (Base Militar Pilar,
Ñeembucú department; 28.xii.2019; Col. R.
Wyer and B. Pett).
CZPLT-H-1517, 1519, 1520 (Estancia Santa
Ana, Ñeembucú department; 27.xii.2019;
Col. R. Wyer and B. Pett).
CZPLT-H-1580 (Base Militar Pilar, Ñeem-
bucú department; 9.xi.2020; Col. K. Atkin-
son).
CZPLT-H-1602, 1603, 1605 (near Pilar,
Ñeembucú department; xii.2019; Col. R.
Wyer).
CZPLT-H-1608 (Base Militar, Pilar; undat-
ed; Col. unknown).
CZPLT-H-1613 (Puerto Elisa, Ñeembucú
department; 2.xii.2020; Col. J. Ayala).
CZPLT-H-1687, 1688 (Puerto Elisa, Ñeem-
bucú department; 11.xii.2020; Col. S. Krab-
bendam).
CZPLT-H-2033 (Paso Canoa, Ñeembucú
department; 27.i.2021; A. Quiñones).
CZPLT-H-2171 (Base Militar Pilar, Ñeem-
bucú department; 02.vi.2021; J. Wang).
CZPLT-H-2191 (Base Militar Pilar, Neem-
bucú department; 05.vii.2021; J. Wang).
CZPLT-H-2193 (Base Militar Pilar, Neem-
bucú department; 06.vii.2021; J. Wang).
CZPLT-H-2194 (Base Militar Pilar, Neem-
bucú department; 07.vii.2021; J. Wang).
CZPLT-H-2205 (Estancia Delfino, Neem-
bucú department; 12.vii.2021; F. O'Leary).
CZPLT-H-2208 (Estancia Santa Ana, Ñeem-
bucú department; 13.vii.2021; J. Wang).
CZPLT-H-2209, 2210, 2211, 2212, 2213 (Es-
tancia Delfino, Ñeembucú department;
13.vii.2021; G. Hicks).
CZPLT-H-2224, 2225 (Estancia Delfino,
Ñeembucú department; 14.vii.2021; G.
Hicks).
CZPLT-H-2232, 2233, 2234, 2235 (Es-
tancia Delfino, Ñeembucú department;
15.vii.2021; A. Holley).
CZPLT-H-2236, 2237, 2238, 2240 (Es-
tancia Delfino, Ñeembucú department;

15.vii.2021; F. O'Leary).
CZPLT-H-2246, 2247, 2248, 2249 (Es-
tancia Delfino, Ñeembucú department;
16.vii.2021; A. Holley).
CZPLT-H-2252, 2254, 2255 (Estancia Del-
fino, Ñeembucú department; 16.vii.2021; F.
O'Leary).
CZPLT-H-2265 (Base Militar Pilar, Ñeem-
bucú department; 17.viii.2021; J. Wang).
CZPLT-H-2285, 2286, 2287 (Estancia Santa
Ana, Ñeembucú department; 26.viii.2021;
J. Wang).

Multiple specimens (Figure 6A) from
multiple localities of this irruptive species
suggest that it is widespread in Ñeembucú
department, despite these being the first for-
mal records (Brusquetti and Lavilla, 2006;
Weiler *et al.*, 2013). These specimens are
identified as a member of the *O. americanus*
species group on the basis of the longitu-
dinal warts on the dorsum (eliminating *O.*
lavillai). However, the newly described *O.*
reigi Rosset *et al.*, 2021 can only be distin-
guished from *O. americanus* on the basis of
cytogenetics, vocalizations and molecular
analyses, for which current data is unavail-
able.

Significant records

Chironius maculoventris Dixon *et al.* 1993 (Colubridae)

CZPLT-H-2308 (26km E of Pilar on Ruta IV,
Ñeembucú department; 09.ix.2021; Col. R.
Smith). SVL 786 mm, TL 338, DOR 14-12-10;
VEN 168; SC 103; SL 8 (4 and 5 contact the
eye). Anal divided.

A single specimen (Figure 6B) repre-
senting confirmation of *C. maculoventris* in
Ñeembucú. This species was previously con-
sidered to be a subspecies of *C. quadricarinatus*
and was raised to species status by Hollis
(2006). Previously, it has been mapped with-
in Ñeembucú by Cacciali and Cabral (2015)
and Cacciali *et al.* (2016), however no clari-

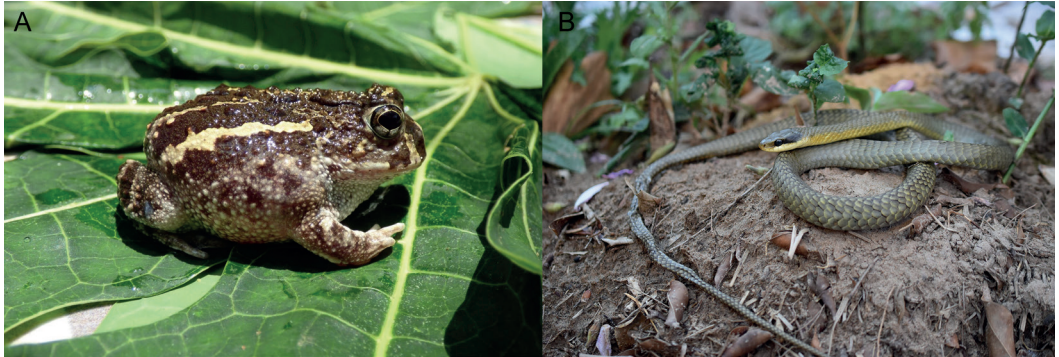


Figure 6 - **A** CZPLT-H-1580. *Odontophrynus americanus/reigi* (Odontophrynidae). Base Militar, Pilar, Ñeembucú department (Photo: Paul Smith). **B** CZPLT-H-2308. *Chironius maculovenstris* (Colubridae). 26km E of Pilar on Ruta IV, Ñeembucú department (Photo: George Hicks).

fication was made that Giraudo and Contreras (1994) cited this as *C. quadricarinatus*. We correct this here and provide specimen documentation to support this. The species was identified by the uniform olive coloration of the top of the head with the dorsum (compared with the chestnut top of the head in *quadricarinatus*), distinct postocular stripe and speckled ventrum (Dixon *et al.*, 1993).

DISCUSSION AND CONCLUSION

The addition of four reptile and four amphibian records in Ñeembucú department elevates the species count to 56 reptiles and 31 amphibians. The amphibian species reported are notably widespread and common throughout large areas of Paraguay (Weiler *et al.*, 2013) and their presence in Ñeembucú is unsurprising, reflecting the limited amount of herpetological sampling carried out in the department to date. Within Misiones, the records herein increase the number of reptiles to 41 and the number of amphibians to 32. The one new reptile record, and the reidentification of *B. diporus* as *B. pauloensis*, increases the number of reptiles recorded in San Pedro to 96, still the highest level of departmental reptile biodiversity in Paraguay (Cacciali *et al.*, 2016, Smith *et al.*,

2016; Atkinson *et al.*, 2017). The confirmation of *Stenocercus doellojuradoi* in Presidente Hayes increases the reptile species count in this department from 73 to 74. The presence of *Epictia vellardi* in Alto Paraguay increases the number of reptiles in this department to 71 (Cacciali *et al.*, 2016).

The reporting of these new and significant herpetological records, although not greatly extending the distributional range of any of the included species, highlights the fact that gaps in our knowledge of the distribution of the herpetofauna of Paraguay continue to exist, and the importance of ongoing inventory work throughout the country, with the focus on poorly-sampled departments is paramount. As an additional observation, some of the species mentioned above are a result of corrections of previous misidentification within existing museum collections, and it is recommended that existing collections be regularly reviewed by researchers considering a constantly changing taxonomy.

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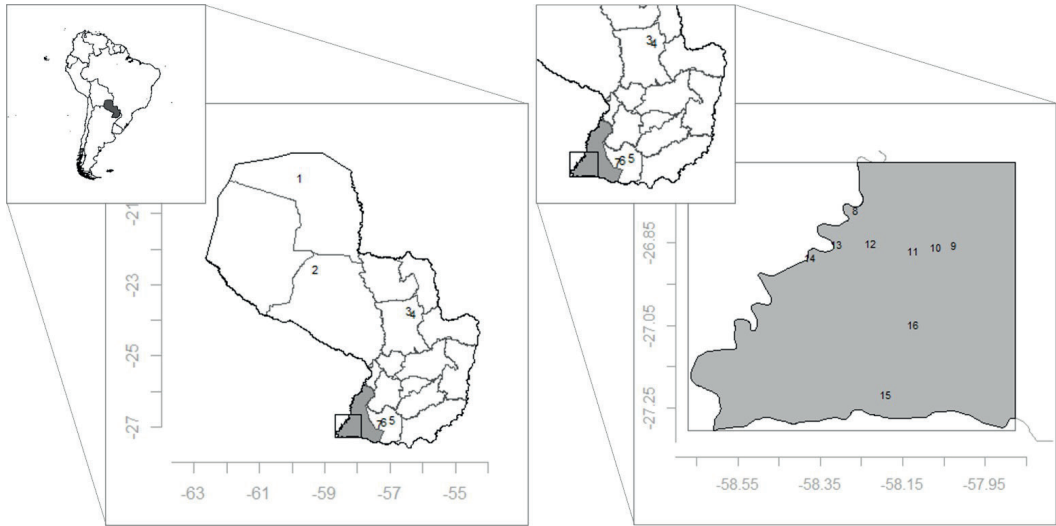


Figure 7 - Map of the localities for each species recorded. **1:** Agua Dulce. Cuatro Bocas: El Campero, Alto Paraguay department (19.98326325° S, -59.75787819° W), **2:** near Tajamar 1, Chaco Lodge, Presidente Hayes department (22.55014435° S, 59.30040231° W), **3:** Rio Verde, San Pedro department (23.72860398° S, 56.41836238° W), **4:** Rancho Laguna Blanca, San Pedro department (23.81398634° S, 56.29519765° W), **5:** Estancia Santa María, San Ignacio, Misiones department (26.78286853° S, 56.94334473° W), **6:** Compañía Pira Ka'aguy, San Ignacio, Misiones department (26.83880324° S, 57.17188477° W), **7:** 99km E of Pilar on Ruta IV, Misiones department (26.90711972° S, 57.32061668° W), **8:** 5km SW Mburicá Paraguay, Arroyo Caí mbocá, Ñeembucú department (26.77048461° S, 58.26473595° W), **9:** 26km E of Pilar on Ruta IV, Ñeembucú department & Estancia Santa Ana, Ñeembucú department (26.85537814° S, 58.02701444° W), **10:** 22.2 km E of Pilar on Ruta IV (26.85945803° S, 58.06944458° W), **11:** 16 km E of Pilar on Ruta IV, Ñeembucú department (26.86742114° S, 58.12437622° W), **12:** 6.2km E of Pilar on Ruta IV, Ñeembucú department (26.84983301° S, 58.22853174° W), **13:** Base Militar Pilar, Ñeembucú department (58.307394603104974° S, 26.846173750648124° W); Centro IDEAL, Pilar, Ñeembucú department (58.30879609972945° S, 26.854079112419306° W); Museo Paolo Alberzoni, General Díaz, Pilar, Ñeembucú department (58.31042599133259° S, 26.85126190729781° W); Fabrica de Textiles, Pilar, Ñeembucú department (58.31223917789543° S, 26.849839095137547° W); Arroyo San Lorenzo, Pilar, Ñeembucú department (58.311039913241885° S, 26.866330362648043° W), **14:** Estancia Delfino, Pilar, Ñeembucú department (26.8848411° S, 58.37401353° W), **15:** Paso Canoá, Ñeembucú department (27.21687982° S, 58.19157589° W), **16:** Puerto Elisa, Ñeembucú department (27.04652397° S, 58.12516934° W).

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