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## CONSERVATION NOTES, FIRST RECORD OF *TRACHEMYS DORBIGNI* IN PARAGUAY, AND AN ILLUSTRATED BILINGUAL KEY TO PARAGUAYAN TESTUDINES

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**Abstract.**—Ten species of native Testudinids in three families have been documented to occur in Paraguay, eight of which are of national conservation concern. Many species are known from few or largely undocumented records, and there exists confusion in the nomenclature employed historically that has contributed to persistent misunderstandings. With this in mind and in the light of new data, we critically review the latest conservation assessment and provide recommended amendments for five species. To address these issues and to assist future researchers with reaching an accurate identification, we provide the first illustrated, bilingual (English/Spanish) key to Paraguayan species. We also provide the first documented records of Black-bellied Slider *Trachemys dorbigni* and the family Emydidae as an autochthonous species in Paraguay, taking the number of native Paraguayan species to eleven.

**Key Words.**—*Acanthochelys*; *Chelonoidis*; *Hydromedusa*; identification key; *Kinosternon*; *Mesoclemmys*; *Phrynops*

**Resumen.**—Se ha documentado la presencia de diez especies nativas de Testudinidos en Paraguay, pertenecientes a tres familias, y ocho de las cuales enfrentan amenazas a su conservación a nivel nacional. Muchas especies se conocen a partir de registros escasos o prácticamente indocumentados, y existe confusión en la nomenclatura empleada históricamente, lo que ha contribuido a malentendidos persistentes. Con esto en mente y a la luz de nuevos datos, revisamos críticamente la última evaluación de conservación y ofrecemos modificaciones recomendadas para cinco especies. Para abordar estas cuestiones y ayudar a futuros investigadores a lograr una identificación precisa, presentamos la primera clave ilustrada bilingüe (inglés/español) de las especies paraguayas. También proporcionamos los primeros registros documentados de la tortuga de vientre negro (*Trachemys dorbigni*) y la familia Emydidae como una especie autóctona en Paraguay, elevando a once el número de especies nativas paraguayas.

**Palabras Claves.**—*Acanthochelys*; *Chelonoidis*; clave de identificación: *Hydromedusa*; *Kinosternon*; *Mesoclemmys*; *Phrynops*

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### INTRODUCTION

Ten species of native Testudinids in three families have been documented to occur in Paraguay (Cacciali et al. 2016), but despite their distinctive and charismatic nature, they have received little attention from Paraguayan researchers. A recent review of their national distribution (Cacciali et al. 2016) and a national conservation assessment applying International Union for Conservation of Nature (IUCN) criteria (Martínez et al. 2020) highlighted that many species are known from few

records and clarified that errors of identification are a persistent and continuous problem that may be holding back research interest in the group. Indeed, with very few exceptions, most of the modern Paraguayan literature dealing specifically with this group has consisted of review-style publications, natural history notes, and distribution extensions, focusing largely on the species occurring in the Chaco region and often published in obscure or difficult to obtain journals (Table 1). On the other hand, the early literature pertaining to Paraguay employs confusing or sometimes erroneous

**TABLE 1.** Post-1970 publications dealing specifically with Paraguayan Testudinids listed in chronological order.

| Publication             | Species covered                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Subject           |
|-------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
| Bour 1973               | Vanderhaege's Toad-headed Turtle <i>Mesoclemmys vanderhaegei</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Taxonomy          |
| Buskirk 1988            | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i> , Chaco Side-necked Turtle <i>A. pallidipectoris</i>                                                                                                                                                                                                                                                                                                                                                                                                        | Distribution      |
| Fritz and Pauler 1992a  | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Taxonomy          |
| Fritz and Pauler 1992b  | Chaco Side-necked Turtle <i>Acanthochelys pallidipectoris</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Distribution      |
| Giraud 1996             | Chaco Side-necked Turtle <i>Acanthochelys pallidipectoris</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Distribution      |
| Fritz and Pauler 1999   | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Taxonomy          |
| Vinke and Vinke 2001    | Red-footed Tortoise <i>Chelonoidis carbonarius</i> , Chaco Tortoise <i>C. chilensis</i> , Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i> , Chaco Side-necked Turtle <i>A. pallidipectoris</i> , Scorpion Mud Turtle <i>Kinosternon scorpioides</i>                                                                                                                                                                                                                                                         | Natural History   |
| Metrailler 2003         | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Natural History   |
| Vinke and Vinke 2003    | Red-footed Tortoise <i>Chelonoidis carbonarius</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Natural History   |
| Metrailler 2005         | Vanderhaege's Toad-headed Turtle <i>Mesoclemmys vanderhaegei</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Distribution      |
| Metrailler 2006         | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Natural History   |
| Weiler Gustaffson 2006  | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Distribution      |
| Artner 2007             | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Natural History   |
| Buskirk 2007            | Scorpion Mud Turtle <i>Kinosternon scorpioides</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Behavior          |
| Vinke and Vinke 2006    | Red-eared Slider <i>Trachemys scripta elegans</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Distribution      |
| Vinke and Vinke 2008    | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Natural History   |
| Vinke and Vinke 2009a   | Red-footed Tortoise <i>Chelonoidis carbonarius</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Natural History   |
| Vinke and Vinke 2009b   | Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Natural History   |
| McCallister et al. 2013 | Chaco Tortoise <i>Chelonoidis chilensis</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Parasitology      |
| Vinke et al. 2013       | Vanderhaege's Toad-headed Turtle <i>Mesoclemmys vanderhaegei</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Literature review |
| Vetter et al. 2022      | South American Snake-necked Turtle <i>Hydromedusa tectifera</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Distribution      |
| Villalba et al. 2022    | Chaco Side-necked Turtle <i>Acanthochelys pallidipectoris</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Distribution      |
| Smith et al. 2024       | Saint-Hilaire's Side-necked Turtle <i>Phrynops hilarii</i>                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Distribution      |
| Vetter and Clay 2026    | Chaco Tortoise <i>Chelonoidis chilensis</i> , Red-footed Tortoise <i>C. carbonarius</i> , Pantanal Side-necked Turtle <i>Acanthochelys macrocephala</i> , Chaco Side-necked Turtle <i>A. pallidipectoris</i> , Vanderhaege's Toad-headed Turtle <i>Mesoclemmys vanderhaegei</i> , Saint-Hilaire's Side-necked Turtle <i>Phrynops hilarii</i> , Geoffroy's Side-necked Turtle <i>P. geoffroanus</i> , South American Snake-necked Turtle <i>Hydromedusa tectifera</i> , Scorpion Mud Turtle <i>Kinosternon scorpioides</i> | Veterinary        |

nomenclature that has created considerable difficulties of interpretation and undoubtedly led to persistent errors of understanding.

Given the propensity for misidentifications expressed in the literature (Cacciali et al. 2016) and the high number of species considered to be of national conservation concern (Martínez et al. 2020), we provide the first bilingual English/Spanish key to the Paraguayan Testudinids as an aid to researchers. We take the opportunity to critically review the conclusions of the last conservation assessment for the species (Martínez et al. 2020) in the light of our own data and publications from

subsequent years, and we document the presence of a new species and family in Paraguay.

#### CONSERVATION NOTES

The latest review of the national conservation status of Paraguayan reptiles applying IUCN criteria (Martínez et al. 2020) found one species to be Critically Endangered (Chaco Side-necked Turtle, *Acanthochelys pallidipectoris* A2ce, A3ce, A4ce, C1, C2a(I).); four to be Endangered (Saint-Hilaire's Side-necked Turtle, *Phrynops hilarii*, B2a, Williams' Side-necked Turtle, *P. williamsi*, B2a,

TABLE 2. Proposed changes to national conservation assessments of Martínez et al. (2020).

|                                                                  | Martínez et al. (2020) | Our recommendation |
|------------------------------------------------------------------|------------------------|--------------------|
| Saint-Hilaire's Side-necked Turtle <i>Phrynops hilarii</i>       | Endangered B2a         | Vulnerable B2a     |
| Geoffroy's Side-necked Turtle <i>Phrynops geoffroanus</i>        | Vulnerable B1, B2a     | Data Deficient     |
| Williams' Side-necked Turtle <i>Phrynops williamsi</i>           | Endangered B2a         | Endangered A4c B2a |
| Vanderhaege's Toad-headed Turtle <i>Mesoclemmys vanderhaegei</i> | Vulnerable A4c         | Least Concern      |
| Black-bellied Slider <i>Trachemys dorbigni</i>                   | Not Evaluated          | Data Deficient     |

Red-footed Tortoise, *Chelonoidis carbonarius*, A2cd, and Chaco Tortoise, *C. chilensis*, A2cd); three to be Vulnerable (Geoffroy's Side-necked Turtle, *Phrynops geoffroanus*, B1, B2a, Vanderhaege's Toad-headed Turtle, *Mesoclemmys vanderhaegei*, A4c, and South American Snake-necked Turtle, *Hydromedusa tectifera*, B1, B2ab(iii)); and two Least Concern (Pantanal Side-necked Turtle, *Acanthochelys macrocephala*, and Scorpion Mud Turtle, *Kinosternon scorpioides*). We note that in the methods and references for Martínez et al. (2020), the IUCN global assessment (<https://www.iucnredlist.org/resources/redlistguidelines>) was cited, yet the IUCN assessment specifically for national level assessments (<https://www.iucnredlist.org/resources/regionalguidelines>) was neither cited nor mentioned in the methods. In the light of new data presented here, we take the opportunity to update Martínez et al. (2020) using the national criteria dictated in the IUCN guidelines with some additions and corrections to the published conservation assessments. The changes to these designations that we recommend and their justifications are summarized in Table 2.

**Chaco Side-necked Turtle, *Acanthochelys pallidipectoris*.**—Villalba et al. (2022) extended the range of this species approximately 80 km northwest into the mid-basin of the Pilcomayo River, documenting two individuals near Comunidad Pelicano (−22.55778S −61.98016W) where they were occupying roadside ditches.

**Saint-Hilaire's Side-necked Turtle, *Phrynops hilarii*.**—Martínez et al. (2020) noted that the species had not been recorded in any protected area in Paraguay to that point, and they state that the fragmented and limited area of occupation puts the species at a high rate of extinction in Paraguay, considering the species Endangered with criteria B2a. It is by far the most abundant native turtle found in national zoological collections, so we

would add capture for the pet and zoological trade to the threats listed by the authors. Individuals of *P. hilarii* in zoological collections regularly lay eggs (Zoológico Juan XXIII, pers. comm.), though staff commonly lack the expertise to raise them.

Description of the range as fragmented is perhaps inaccurate, as just three data points were assessed by Martínez et al. (2020), all along the Paraguay River (from Cacciali et al. 2016), covering a straight-line distance of approximately 500 km. Cacciali et al. (2016) did not examine any specimens that supported these map points and the basis of all of them were literature references (Krieg 1948; Giraudo and Contreras 1994; Marano 2011). Given the lack of concrete data available to Martínez et al. (2020), it would have been more accurate to assess the species on the basis of it being reported (and not documented) from these three localities (i.e., Data Deficient), rather than to infer that these are confirmed records representing fragmented populations. Further, despite the lack of verifiable evidence to support any of these reports, the two most northerly of the mapped localities on the Paraguay River (Krieg 1948; Marano 2011) were later treated without supporting argument as possibly introduced by the Turtle Taxonomy Working Group (TTWG; 2021). We consider introduction to these areas to be unlikely, given the remote areas from which they are reported, and we provide some important context on the literature records assessed by Martínez et al. (2020) here.

Based on Krieg (1948), the northernmost record from Riacho Mosquito, Alto Paraguay Department (not Presidente Hayes/Alto Paraguay border as stated by Cacciali et al. 2016) is from a travel account that referenced *Platemys* sp. The identification of this taxon as *P. hilarii* was inferred by Cacciali et al. (2016) based on an illustration in Krieg (1948: p.232) that shows the head of a *P. hilarii* (not accompanied with a specimen number or locality), labeled as *Platemys* sp. In a footnote on the following page, however, Krieg (1948:



**FIGURE 1.** Juvenile Geoffroy's Side-necked Turtle (*Phrynops geoffroanus*) Belén, Concepción Department, Paraguay. (Photographed by Dirk-Peter Gärtner).

p.233) notes that what he called fish-eating turtles (on Riacho Mosquito) were mostly of the genera *Platemys* and *Phrynops*. He added that he knew *Phrynops hilarii* from the Paraná near Rosario in Argentina. Thus, there is some ambiguity around the application of names here, with Krieg (1948) clearly referring to more than one species on the Riacho Mosquito, whilst injecting some doubt over his ability to correctly identify them. We consider that this record is unreliable, and the presence of *P. hilarii* on the upper Paraguay River requires confirmation.

Giraud and Contreras (1994) list the species from Pilar, Ñeembucú Department, noting that in the case of *Chelonia* their reports are based on visual records, though they provided no details for any of them beyond the locality. We have since confirmed the presence of this species in Pilar during our own field work and have located a voucher specimen in the Colección Zoológica de la Fundación Para La Tierra (CZPLT-H 2670) to properly document it. Multiple individuals observed inhabiting sewage ponds within the urban area of the city of Pilar also imply that the species may be far less sensitive to environmental conditions than previously suggested by conservation assessors (López et al. 2013; Martínez et al. 2020).

Thomas Vinke (pers. comm) and Marano (2011) claimed that Dirk-Peter Gärtner photographed *Phrynops hilarii* near the city of Concepción. No details of the record were provided and the supporting photograph was not included in the publication. In November 2025 we contacted Herr Gärtner and were able to obtain a copy of the photograph (Fig. 1) and he very generously shared

details regarding the record, noting that they were brought to him by local children who had captured them within a 5-km radius of Roble in the village of Belén, Concepción Department (coordinates of Roble -23.4566978 -57.283536) and that the identification as *P. hilarii* was by “Vinke on the DGHT forum” (Deutsche Gesellschaft für Herpetologie und Terrarienkunde). The individuals were kept in captivity for about a year before they escaped from the enclosure, with Herr Gärtner noting that they are excellent climbers, and that he has seen them on branches up to 1.5 m from the ground. The two individuals in the image provided to us by Herr Gärtner are juvenile Geoffroy's Side-necked Turtle (*P. geoffroanus*; Fig.1), not *P. hilarii*. Thus, we consider that this record is erroneous and that presence of *P. hilarii* in the area of Concepción Department also requires confirmation.

*Phrynops hilarii* commonly occurs in urban parks in Asunción, though the origin of these individuals is typically assumed to be captive, and they have thus been ignored by researchers (and by Martínez et al. 2020). Nonetheless, it is significant that *Phrynops hilarii* (sic) was listed as occurring in Asunción as long ago as Bertoni (1939). Cacciali et al. (2016) included the Bertoni reference to *P. hilarii* in the synonymy of *P. geoffroanus* with a query, and it was assessed as such by Martínez et al. (2020) without further discussion. This is an arbitrary decision, however, as the situation of Asunción on the Paraguay River places it well within the mapped area of *P. hilarii* that was assessed, and essentially equidistant between now confirmed records of *P. geoffroanus* (to the north) and *P. hilarii* (to the south). Simultaneously it ignores the existing, documented populations of both species from this locality on the unproven assumption that they are of captive origin, in favor of literature reports from further afield that are no better documented than that of Bertoni (1939).

Subsequent to the publication of Martínez et al. (2020), *P. hilarii* has been documented photographically approximately 160 km east of Pilar along the Paraná River in eastern Misiones and western Itapúa departments (Smith et al. 2024). This makes occurrence of the species throughout the vast and largely impenetrable wetlands of the Ñeembucú Wetland Complex, which extend between the city of Pilar and these new documented localities to be more probable than possible. Added to the data points used by Martínez et al. (2020) this suggests a much wider

range along the Paraguay and Paraná Rivers than previously known. Indeed, it extends the area of occupancy (AOO) beyond the 500-km<sup>2</sup> limit for Endangered status.

Based on the predicted range of the species and the large number of wild caught individuals in local zoos, we suspect that this species is almost certainly less threatened in Paraguay than suggested by Martínez et al. (2020), and that the low number of records is an artifact of the inaccessibility of the habitat combined with a low number of biologically trained observers within the species range. The area of Isla Yacyretá is likely to be close to the eastern limit of the species in Paraguay, reflected in its distribution on the Argentine side of the river (Cabrera 1998), and there is an apparent association with the Humid Chaco ecoregion in Paraguay that extends west from here and north along the Paraguay River. The region to the east belongs to the Atlantic Forest region, from where the species is possibly mostly absent. The true northern limits of the range along the Paraguay River require further investigation and the historic origin of urban populations in Asunción should be investigated (this may represent a similar narrow area of mid-river sympatry with *P. geoffroanus* as seen on the Paraná). *P. hilarii* may not extend into the tropics (it does not elsewhere in its range), restricting its distribution to the south of the country. Given that the records reported by Smith et al. (2024) extend the AOO beyond the limit for Endangered status and the number of reported locations is certainly an artifact of observer effort, we suggest that the status of this species in Paraguay be re-evaluated to Vulnerable B2a, with further re-evaluation required should a wild origin of urban Asunción populations be confirmed.

**Geoffroy's Side-necked Turtle *Phrynops geoffroanus*.**—The individual of *P. geoffroanus* illustrated by Martínez et al. (2020: their Fig. 5) is a *P. williamsi*, and the map provided for the species (their Fig. 6) also corresponds to that species. The assertion by Martínez et al. (2020) that the species does not occur in any protected area is incorrect; its occurrence in the Reserva Natural Isla Yacyretá is well documented (MNHNP 6611 and Supplemental Information Figs. S16-S17). Cacciali et al. (2016) assigned literature reports from the Tagatiyá watershed (Müller 1939) to this species, this area also being at least nominally protected as a Reserva Natural and we concur

that this is a reasonable assumption based on the information provided herein by Herr Gärtner from this general area.

Martínez et al. (2020) considered the species Vulnerable B1, B2a, noting a distribution extension of less than 20,000 km<sup>2</sup>, with a fragmented AOO, and fewer than 10 isolated records, and indeed the stated source Cacciali et al. (2016) maps only nine localities in five departments scattered across the Oriental region of Paraguay. At this point it becomes important to note that just three of these localities are represented by specimens that were examined by Cacciali et al. (2016), and the others refer to unexamined specimens and literature references. This is of some relevance, especially in reference to older literature, as Cacciali et al. (2016) specifically noted that decades of confusion among the *Phrynops* species in Paraguay (*hilarii*, *geoffroanus*, and the more-recently described *williamsi*) mean that the nomenclature is impossible to completely untangle. Thus, at least some of these six unconfirmed records may refer to another species (see *P. hilarii* above), while at least one of the records assessed as *P. hilarii* certainly refers to *P. geoffroanus* (Marano 2011).

The Paraguayan distribution of *P. geoffroanus* with respect to *P. hilarii* requires clarification, but it appears to largely replace that species to the north and east globally (TTWG 2021). Paraguayan records of *Phrynops* turtles in the tropics north of Asunción may well all refer to *P. geoffroanus* as there are no confirmed records of *P. hilarii* from other range countries north of 26°S. That said, *P. hilarii* and *P. geoffroyi* do occur sympatrically, at least at Isla Yacyretá in the mid-Paraná River and thus presumably may do so on the Paraguay River too, unless the possible latitudinal/climatic barrier is insurmountable to *P. hilarii*. Similarly, in the Atlantic Forest region where *P. hilarii* has not yet been documented to occur, past confusion with the much more recently described Williams' Side-necked Turtle *P. williamsi* Rhodin and Mittermeier (1983) is a possibility. Martínez et al. (2020) recognized that *P. geoffroanus* is still poorly known in Paraguay, with few literature references and the true extent of the distribution is not certainly known. Based on the clarifications provided herein, we consider it most parsimonious that the records of *Phrynops* on the Paraguay River north of Asunción probably refer mainly or entirely to *P. geoffroanus* and that many of those occurring on tributaries away from the Upper Paraná likely do

too (with *P. williamsi* occurring only in the rapid-flowing Atlantic Forest streams of Alto Paraná and Itapúa departments).

We believe it premature, however, to assume that all nine of the assessed records refer to *P. geoffroanus* in the context of a conservation assessment, given that doubt surrounds two-thirds of the dataset. Furthermore, we note that these data points (as correctly mapped by Cacciali et al. (2016) extend over an area of approximately half of the Oriental region of Paraguay, representing an AOO in the region of 80,000 km<sup>2</sup>. If all of these identifications were indeed assumed to be correct, this AOO would be well above the B1 threshold of < 20,000 km<sup>2</sup> for Vulnerable, requiring further assumptions to be introduced in claiming unsupported range fragmentation to justify it. This species may alternatively be more widespread or more threatened than the available data suggests, and we believe that this doubt should be more properly reflected in a categorization of Data Deficient.

***Williams' Side-necked Turtle Phrynops williamsi***.—Martínez et al. (2020) assess the species to be Endangered B2a based on a distribution that they stated is marginal and fragmented, and the area of occupation contains just three presumed subpopulations. The species is endemic to the rapidly flowing, often rocky streams in the Atlantic Forest and Pampa ecoregions (Regolin et al. 2023), essentially making it endemic to the former in Paraguay. In truth, the distribution in Paraguay is not marginal; the Upper Paraná River and its offshoots represent a considerable portion of the global range of this species (TTWG 2021).

This is another poorly known species, with few records; however, a focus on the number of reported localities with the designation Endangered B2a ignores the principal threat to the species (though the authors do mention it in the threats section), which is its association with a specific microhabitat within the highly threatened Atlantic Forest ecoregion. Approximately 10% of the original Paraguayan Atlantic Forest cover still remains in a highly fragmented and degraded state, and despite a nominal Zero Deforestation Law in force in the Oriental Region of Paraguay, the national deforestation rate is globally second only to Indonesia (Mohebalian et al. 2022). This infers a serious and continuing population decline for this species. The designation of Endangered

A4c B2a better reflects this inferred and suspected population reduction of > 50% where the causes of reduction have not ceased, may not be reversible, and more properly addresses the actions required to save this species.

***Vanderhaege's Toad-headed Turtle Mesoclemmys vanderhaegei***.—Martínez et al. (2020) consider the species Vulnerable A4c, because it is distributed in the Cerrado and Atlantic Forest, and both of these ecoregions have a high degree of deforestation as a result of agro-ranching development. They add that the species occurs in two protected areas (Parque Nacional Cerro Corá and Reserva Bosque Mbaracayú). Vulnerable A4c refers to an observed, estimated, inferred, projected or suspected population reduction of 30% or more, where the causes of reduction may not have ceased OR may not be understood OR may not be reversible, resulting in a decline in the AOO or extent of occurrence (EOO).

In apparent contradiction to this, the authors also state that the distribution in Paraguay is wide, citing records from the departments of Amambay, San Pedro, Cordillera, Central, Caaguazú, y Paraguari (Vinke et al. 2013), Alto Paraguay (Fritz and Pauler 1992a), Canindeyú (Cacciali et al. 2016), and Misiones (though not all of these are included on their map; their Fig. 4). They again contradict themselves by noting that it occurs widely in almost all of the Paraguayan ecoregions including the Pantanal (Fritz and Pauler 1992a), Central Forest, Cerrado, and Atlantic Forest (Cacciali et al. 2016) to which we think the Humid Chaco must be added based on the localities provided. They add that the species is not specialized and that it inhabits lentic and lotic waterbodies, streams, rivers, natural and artificial lagoons, swamps as well as environments degraded by human influence (Vinke et al. 2013; Marques et al. 2014), even occurring in what they called contaminated habitats. Crucially they admit that there are no existing studies demonstrating that any of these factors have negative ecological consequences on the species. If such studies do not exist, then any decline must be inferred to reach a designation of Vulnerable. Strong circumstantial evidence is required to infer the necessary decline of > 30% over the last 10 y to meet the criteria over the entire geographic area being assessed. We think that an unspecialized species with a wide distribution across almost all of the ecoregions of the country, that is of potential occurrence in

almost any kind of water body and that is able to tolerate human disturbance and even persists in contaminated habitats does not meet these criteria nor provide any reason to infer that it might. We consider that it should be treated as Least Concern.

**South American Snake-necked Turtle *Hydromedusa tectifera*.**—Martínez et al. (2020) state that the species is restricted to the Cerrado and Atlantic Forest, but all documented Paraguayan records are from the Atlantic Forest ecoregion (Cacciali et al. 2016). The species has recently been reported from the Itay River in Caazapá Department (Vetter et al. 2022).

**Red-footed Tortoise *Chelonoidis carbonarius*.**—The claimed special adaptation resulting in a dependence on holes made by Giant Armadillo (*Priodontes maximus* in the Dry Chaco by Martínez et al. (2020), misunderstands the cited text of Noss et al. (2013) and is erroneous. There is no correlation between the distribution of these two species (Cacciali et al. 2016; Smith and Ríos 2018), and the tortoise occurs over a wide area from which the armadillo has been extirpated or does not occur. It is well known that the tortoise will use burrows of the armadillo, but to describe this as a dependency is to misrepresent the reality and to erroneously link the survival of the tortoise to that of the armadillo, massively exaggerating the conservation threat to the species. In fact, Noss et al. (2013) directly contradicts this assertion of reliance on armadillo burrows by noting that these tortoises rely principally on shelters including fallen trees, dense bromeliad ground cover, and leaf mulch, but that the tortoises also use armadillo burrows and rock crevices.

**Black-bellied or D'Orbigny's Slider, *Trachemys dorbigni*.**—The Black-bellied or D'Orbigny's Slider (*Trachemys dorbigni*) is a freshwater turtle distributed in subtropical southeastern South America in southern Brazil (southeastern Santa Catarina and Rio Grande do Sul), Uruguay, and northeastern Argentina (floodplains of the Rivers Paraná and Plate in northern Buenos Aires, Entre Ríos, Corrientes, eastern Santa Fe, and eastern Chaco provinces; TTWG 2021). Records in other states in Brazil have been attributed to artificial introduction, but some may represent range extensions (Ciccheto et al. 2018). It is the only member of the genus that occurs south of

the equator and is now usually considered to be monotypic (TTWG 2021).

Though the species has been listed by several authors as being present in Paraguay, to date there have been no confirmed records (Cacciali et al. 2016). Nonetheless, the presence of the species very close to the Paraguayan border on the opposite banks of the Paraná River in the Argentine provinces of Chaco and Corrientes (Cabrera 1998) led Cacciali et al. (2016) to consider it a species that may occur in Paraguay and suggest that it is likely present in the swamps of Departamento Ñeembucú. Here we provide the first images of wild individuals of this species, confirming that it does indeed occur on the Paraguayan side of the Paraná River.

On 10 September 2025 Sergio Galeano photographed an adult *Trachemys dorbigni* at Isla Yacyretá, Itapúa Department, Paraguay (-27.43472 -56.75513). The individual was observed in restored freshwater ponds lined by grassy reeds which had originally created by excavations during the building of the Yacyretá dam and have since been reclaimed by nature. The animal was wary, rapidly submerging when approached. This distinctive genus is easily distinguished from all native freshwater turtles previously documented in Paraguay by the short neck and the longitudinally green-and-yellow striped head. It could be distinguished furthermore from exotic escapees of the genus *Trachemys* by the black border to the yellow blotch on the mandibula, the orange (as opposed to red) stripe behind the eye, and the orange markings on the marginal scales of the carapace (Fig. 2 top). A second individual was then found by Adolfo Vera (and observed by Paul Smith) 79.5 km east of here at San Juan del Paraná, Itapúa department, Paraguay (-27.309962 -55.960582) on 19 October 2025 in a roadside pond (Fig 2 middle). These are the first confirmed Paraguayan records of the species. The species occurs sympatrically with Saint-Hilaire's Side-necked Turtle *Phrynops hilarii* and Geoffroy's Side-necked Turtle *Phrynops geoffroanus* on Isla Yacyretá.

Prior to this, an individual of this species was encountered by Sergio Galeano walking across a suburban street in Barrio Mil Viviendas, Ayolas, Misiones department in February 2023 (-27.3850727 -56.84288; Fig 2). It was originally suspected to be an escape because of the urban setting but based on the habitat availability in the area (with ample nearby park land and close to the



**FIGURE 2.** (Top) Adult Black-bellied Slider (*Trachemys dorbigni*) Isla Yacyretá, Itapúa Department, Paraguay. (Photographed by Sergio Galeano). (Middle) Adult *Trachemys dorbigni* San Juan del Paraná, Itapúa Department, Paraguay. (Photographed by Paul Smith). (Bottom) Adult *Trachemys dorbigni* Barrio Mil Viviendas, Ayolas, Misiones Department, Paraguay. (Photographed by Sergio Galeano).

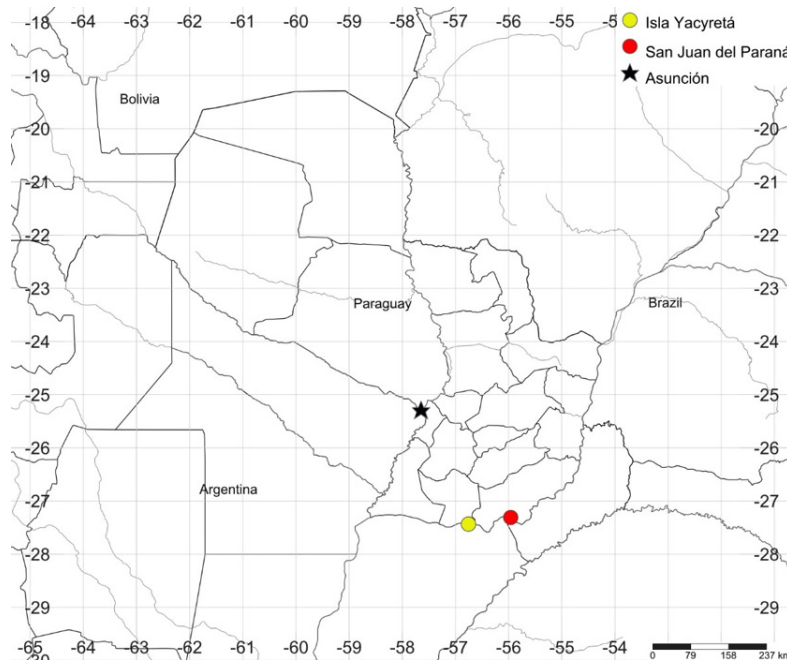
banks of the Paraná River) and the geographical proximity to the Isla Yacyretá record, we consider it a real possibility that wild populations also occur in

this area. Locating and confirming them should be a priority for researchers.

The range of this species in Paraguay is probably limited to the extreme south of the country in wetlands bordering the Paraná River in western Itapúa and Misiones departments (Fig. 3), but future research will likely extend the range westwards into Ñeembucú Department. The global conservation status of the species has not been evaluated by the IUCN, but the species was considered to be Least Concern in a recent review by a specialist group (Rhodin et al. 2018). Nationally, the species is considered to be Vulnerable in Argentina (Prado et al. 2012); however, the species is by necessity Data Deficient in Paraguay because it is known only from a pair of reports. Attempts to locate additional populations are required to properly evaluate its conservation status in the country, especially given that the level of conservation concern in Argentina is likely to also be the case in Paraguay.

We have previously observed this species in zoological collections of native species in Paraguay in the cities of San Cosmé y Damián and Encarnación (both Itapúa Department) close to the banks of the Paraná River. While these captive individuals were stated to be of wild origin by the collection managers, they were unaware of (or unwilling to divulge) more accurate capture localities, leading to the possibility that they could have originated from Argentina. The presence of exotic species in these collections further cast doubt on a possible local origin of the specimens.

The exotic and popular pet species Red-eared Slider (*Trachemys scripta elegans*) is similar in appearance to *T. dorbigni* (Supplemental Information Fig. S5) and has also been observed as an escape (or deliberate introduction) in the wild in Paraguay on multiple occasions. There are populations in Asunción in Parque Guasu Metropolitano (-25.26444 -57.53611; since at least 2020) and the Jardín Botánico (-25.24877 -57.57307), and near Castillo Carlota Palmerola in Areguá, Central Department (SDR July 2013) (-25.30528 -57.38173), as well as a single record in the Chaco near Filadelfia (approximately -22.3500 -60.0300), Boquerón department (Vinke and Vinke 2006). With this confirmation that *Trachemys dorbigni* indeed occurs in the wild in Paraguay, the number of native Testudines now known to occur in Paraguay is increased to 11 species in seven genera (*Chelonoidis*, *Kinosternon*, *Trachemys*, *Acanthochelys*, *Phrynops*, *Mesoclemmys* and



**FIGURE 3.** Map of Black-bellied Slider (*Trachemys dorbigni*) localities in Paraguay. Yellow circle: Isla Yacyretá, Itapúa Department. Red circle: San Juan del Paraná, Itapúa Department. The capital city of Paraguay, Asunción is marked with a black star.

*Hydromedusa*) and four families (Testudinidae, Chelidae, Kinosternidae and Emydidae). New species of reptiles continue to be added to the country list with regularity (Atkinson et al. 2018; Cabral and Cacciali 2021; Carosini et al. 2021; Smith et al. 2021, 2022; Cacciali and Ortega 2023), suggesting that the Paraguayan reptile fauna remains incompletely known.

#### KEY TO PARAGUAYAN TESTUDINES

Supplemental Information: [http://www.herpconbio.org/Volume\\_21/Issue\\_2/Smith\\_et\\_al\\_2026\\_Suppl.pdf](http://www.herpconbio.org/Volume_21/Issue_2/Smith_et_al_2026_Suppl.pdf)

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