CONSERVATION BIOLOGY OF FRESHWATER TURTLES AND TORTOISES

A Compilation Project of the IUCN/SSC Tortoise and Freshwater Turtle Specialist Group

Edited by

Anders G.J. Rhodin, John B. Iverson, Peter Paul van Dijk,
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Black Spiny-necked Turtle, Spix's Sideneck Turtle,
Tortuga de Canaleta, Cágado do Cerrado

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Acanthochelys spixii (Duméril and Bibron 1835) – Black Spiny-necked Turtle, Spix's Sideneck Turtle, Tortuga de Canaleta, Cágado do Cerrado

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Summary. – *Acanthochelys spixii* (family Chelidae) is a medium-sized freshwater turtle with a reasonably wide distribution in South America, including southeastern Brazil, Uruguay, and northeastern Argentina. The species inhabits diverse wetland areas in slow-moving or standing shallow water such as swamps and ponds, often with abundant submerged vegetation, showcasing adaptability to various environments. Most aspects of the ecology of *A. spixii* remain unknown. The diet is composed mainly of insects and some results suggest the species has a generalist habit. Activity is mainly nocturnal, but diurnal courtship and nesting events have been reported. Nesting occurs from February to May, and clutch size ranges from 4–8. Eggs are nearly round and measure 25–27 mm in length. *Acanthochelys spixii* has recently been assessed as globally Vulnerable on the IUCN Red List, but the scarcity of population status and life history data for the species is a limitation to proposing potential conservation measures.

Distribution. – Argentina (Corrientes), Brazil (Bahia, Distrito Federal, Goiás, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina, São Paulo), Uruguay (Rivera, Tacuarembó, Cerro Largo, Treinta y Tres, Rocha, Maldonado, Canelones).

Synonymy. – *Emys depressa* Spix 1824 (junior homonym, not = *Emys depressa* Wied-Neuwied *in* Merrem 1820 [= *Phrynops geoffroanus*]), *Emys aspera* Cuvier *in* Gray 1830 (nomen oblitum), *Platemys spixii* Duméril and Bibron 1835 (nomen novum), *Hydraspis spixii, Acanthochelys spixii, Platemys radiolata spixii*.

Subspecies. – None recognized.

Status. – IUCN Red List: Vulnerable (VU A2c+4c; assessed 2023 [in press 2025]); Near Threatened (NT, assessed 1996); Uruguay: Least Concern (LC).

Taxonomy. — The Black Spiny-necked Turtle was first described by Johann Baptist von Spix as *Emys depressa* Spix 1824, but that name was preoccupied by *Emys depressa* Wied-Neuwied *in* Merrem 1820, a name applied to what is currently considered to be a junior synonym of *Phrynops geoffroanus* (Schweigger 1812). Duméril and Bibron (1835) therefore formally renamed the species *Platemys spixii* in honor of Spix, and it remained in the genus *Platemys* for the next ca. 150 years. Although Mertens (1967) considered it possible that *P. spixii* could represent only a southern race of *P. radiolata*, McBee et al. (1985) demonstrated through karyology of all recognized species in the genus *Platemys* that *P. platycephala* warranted monotypic status and that *P. macrocephala*, *P. pallidipectoris, P. radiolata*, and *P. spixii* represented a distinct monophyletic lineage. Rhodin (1985) noted that the genus name *Acanthochelys* (Gray 1873) was available for this group, and this was formalized by Iverson (1986). The monophyly of *Acanthochelys* was further corroborated by Derr et al. (1987) based on allozymes, and Huebinger

Figure 1. Adult female *Acanthochelys spixii* from La Coronilla, Rocha, Uruguay. Photo by Alejandro Fallabrino.

et al. (2013) based on mitogenomics, and Thomson et al. (2021) based on 15 nuclear loci. No subspecies have been described for *A. spixii*, although it was briefly considered a subspecies of *Platemys radiolata*.

The type specimen of both *depressa* and *spixii* is a lectotype (ZSM 3003/0) designated by Hoogmoed and Gruber (1983). Its type locality was originally "Aquis paludosis provinciarum Rio de Janeiro et fluminis Sti Francisci" (translated as "Marshy water bodies of the province of Rio de Janeiro and tributaries of the São Francisco River"), which was restricted to "Rio São Francisco, near Rio dos Pandeiros, Minas Gerais, Brazil" by Rhodin et al. (1984). In a type catalogue series, Franzen and Glaw (2007) stated that according to the original description and Vanzolini (1981), this locality probably refers to sites near Pedras de Maria da Cruz (15°37'S, 44°23'W), Januária (15°29'S, 44°23'W), or Juazeiro (09°24'S, 40°30'W), from where the specimen was first collected.

Description. — *Acanthochelys spixii* is a medium-sized turtle, with maximum adult size of 202 mm straight-line carapace length (SCL) in females in Uruguay (Estrades et al., unpubl. data). The maximum recorded SCL in Brazil for females is 180 mm SCL, while for males it is 178 mm (Bager et al. 2016). The same study reported sexual size dimorphism for the species, where females are significantly larger than males, following the general pattern for most species of Chelidae (Bager et al. 2016). Specimens recorded from Brazilian Cerrado natural populations are smaller, where the mean SCL measurement was 128 mm for males with body mass of 247 g and 139 mm SCL for females with 330 g of body mass (Fraxe Neto et al. 2011). In Uruguay, the record size for females is 202 mm and 1.0 kg and for males 181 mm and 0.7 kg (Estrades et al., unpubl. data).

The carapace is slightly domed, higher in females than males, elliptical, broader posteriorly, and widest across

Figure 2. Adult male *Acanthochelys spixii* from Brasília National Park, Distrito Federal, Brazil. Photo by Gabriel Horta.

Figure 3. *Acanthochelys spixii* adults in plastral view; to the left a male, at right a female. Photo by Gabriel Horta.

Figure 4. Adult male *Acanthochelys spixii* from Brasília National Park, Distrito Federal, Brazil. Photo by Gabriel Horta.

Figure 5. *Acanthochelys spixii* juvenile from La Coronilla, Rocha, Uruguay, ca. one year old. Photo by Alejandro Fallabrino.

marginals 8 (Cabrera 2022). A nuchal scute is present, two times longer than broad. A deep dorsal groove, absent in hatchlings, extends between the first vertebral scute and anterior half of the fifth vertebral. There are 11 marginal scutes on each side, and a pair of supracaudals. Neural bones are completely absent; all pleural bones of each side contacting in the midline.

Carapacial coloration in adults is primarily black, but sometimes dark reddish-brown, equal in both sexes. Carapace of hatchlings and juveniles in their first months of life is dark black with a red or deep orange spot on the border of each marginal and supracaudal scute.

The plastron is broad, with its anterior lobe semicircular. It bears a large intergular that separates the smaller gular scutes. The posterior lobe is markedly narrower than the anterior lobe. One axillary and one inguinal scute are present on each side, both triangular. The plastral coloration is totally black or dark brownish-black in adults of both sexes. In hatchlings and young turtles there are big spots or blotches, orange or red, on a black background.

The head is flat, elongated and oval, covered with irregularly sulcate skin. The pair of nares are at the anterior extreme of the snout. The eyes are anterolateral with brilliant yellow irises. Two short chin barbels are present.

Figure 6. *Acanthochelys spixii* hatchlings from Punta del Diablo, Rocha, Uruguay. Photos by Alejandro Fallabrino.

The dorsum and upper sides of the neck bear prominent cornified conical tubercles among sparse granular scales. The head, extremities, and tail are either black, dark brown, or grayish brown in adults.

The legs are short but robust, and the feet are webbed, with five claws on the forefoot and four on the hindfoot, the latter with larger and sharper claws. Sexual dimorphism occurs in carapacial depth (deeper in females), and a concave plastron and longer tail in adult males than in females (Cabrera 2022).

Distribution. — *Acanthochelys spixii* is a species with a relatively wide distribution in South America (TTWG 2021, 2025), occurring in southeastern Brazil

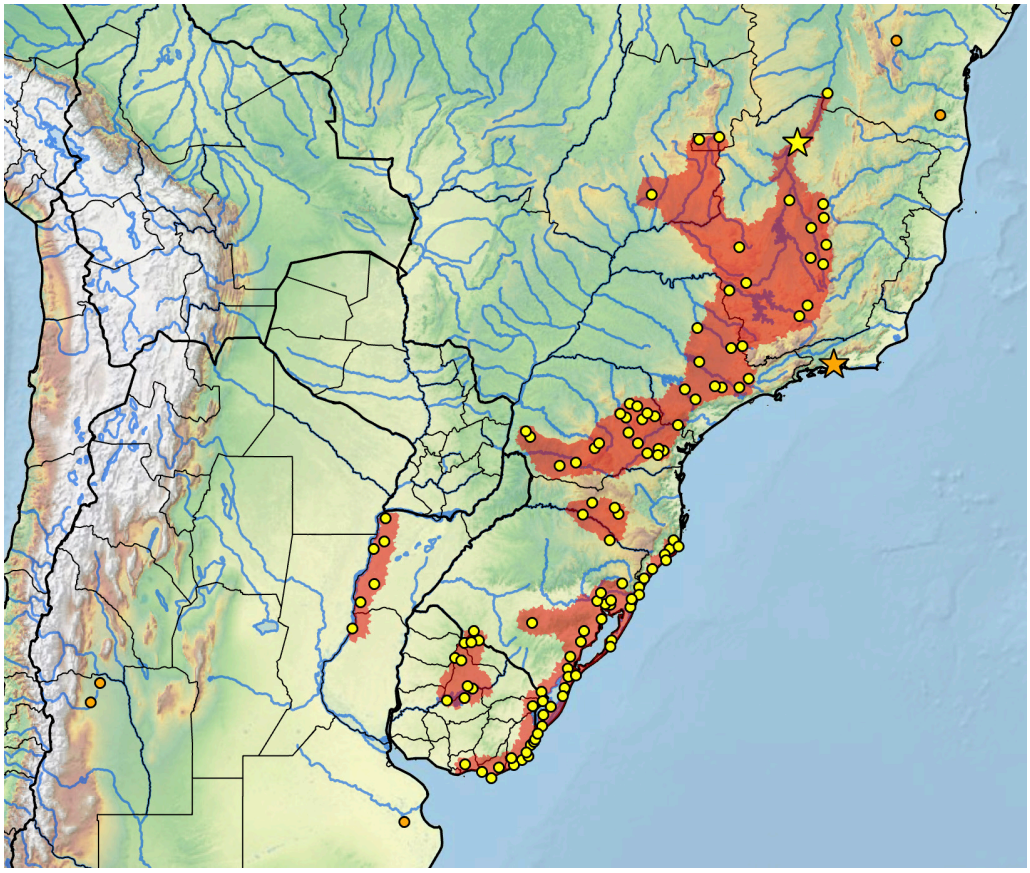

Figure 7. Estimated distribution of *Acanthochelys spixii* in Brazil, Uruguay, and Argentina. Yellow dots = museum and occurrence records of native populations based on literature records (Iverson 1992; TTWG 2021, 2025); orange dots = probable translocated specimens; stars = type localitires (orange star = first erroneously restricted type locality [Ernst 1983]; yellow star = second restricted type locality [Rhodin et al. 1984]). Colored shading = estimated historical indigenous range. Distribution is based on fine-scaled GIS-defined level 12 HUCs (hydrologic unit compartments) constructed around verified localities and then adding HUCs that connect known point localities in the same watershed or physiographic region, and similar habitats and elevations as verified HUCs, based on TTWG (2021, 2025) and adjusted based on data from the authors. Map by Chelonian Research Foundation.

(Bahia, Distrito Federal, Goiás, Minas Gerais, Paraná, Rio Grande do Sul, Santa Catarina, and São Paulo), Uruguay (Rocha, Maldonado, Tacuarembó, and Rivera [Carreira et al. 2005], and Canelones, Cerro Largo, and Treinta y Tres [Estrades et al., unpubl. data]), and northeastern Argentina (Corrientes) (Freiberg 1940; Waller 1988; Sánchez et al. 2019; Cabrera 2022). Reported occurrences in Chaco and Formosa Provinces likely pertain to *A. pallidipectoris* (Rhodin et al. 1984). Richard (1987) recorded one specimen in Mendoza Province, but no further records exist from there, suggesting it was likely non-native (Richard and De La Fuente 1992).

The lack of sufficient information on the natural history and habitat use makes it challenging to confidently define the current Area of Occupancy (AOO) and Extent of Occurrence (EOO) for *A. spixii*. TTWG (2025) has calculated the estimated indigenous historical range (indigenous AOO) as 593,661 sq. km, and the estimated indigenous historical Extent of Occurrence (EOO) as 1,861,836 sq. km. Based on literature records and unpublished data from the authors, we have estimated an EOO of 1,717,276 sq. km. When excluding the marine areas within that range, this becomes 1,649,523 sq. km. The species has been recorded from sea level up to 1,082 m a.s.l. in the Serra da Canastra National Park, Minas Gerais, Brazil (Mendonça et al. 2015).

Habitat and Ecology. — *Acanthochelys spixii* inhabits diverse wetland areas in slow-moving or standing shallow water such as swamps and ponds, often with abundant submerged vegetation (Quintela and Loebmann 2009). In Uruguay, the species is distributed in coastal zones, and inhabits crystalline temporary and permanent ponds, in lime-sandy bottom aquatic zones with scarce vegetation (Vaz-Ferreira and Sierra de Soriano 1960; Freiberg 1967; Buskirk 1991; Cabrera 1998) (Fig. 6). In Brazil, the species is found in habitats at the interface between open areas, such as the Cerrado, and closed formations, exemplified by the Atlantic Forest (Souza 2005), as well as in anthropogenic habitats such as residential areas, urban parks, and rice plantations (D'Amato and Morato 1991; Ribas and Monteiro Filho 2002) (Figs. 7-8).

Behavior. — The species' activity pattern is mainly nocturnal (Lema and Ferreira 1990; Lema 2002; Miorando

Figure 8. Habitats of *Acanthochelys spixii* in Uruguay and Brazil. **A.** Cabo Polonio National Park, Rocha, Uruguay. Photo by Andrés Estrades. **B and C.** Brasília, Distrito Federal, Brazil. Photos by Gabriel Horta. **D.** Araucária, Paraná, Brazil. Photo by Rafael M. Valadão. **E and F.** Serra da Canastra National Park, Minas Gerais, Brazil. Photos by Rafael M. Valadão.

2006), but diurnal courtship and nesting events have been reported (Lehmann 1988; Buskirk 1991; Molina 1998; Miorando 2006; Colli 2012). Activity, movement, and habitat use all increase with increasing air and water temperatures (Miorando 2006; Horta 2008).

Remarkably, the species displays burrowing behavior, particularly in response to drying ponds, as observed by Horta (2008). Observations by Fallabrino (unpubl. data) suggest that individuals can burrow to a depth of approximately 50 cm below the ground surface. This turtle presumably estivates underground when aquatic habitat is not available.

Diet. — The diet of *A. spixii* is composed mainly of insects (Brandão et al. 2002; Brasil et al. 2011; Chaviel et al. 2022) and some studies suggest the species has a generalist habit. Likewise, Richard (1999) reported that aquatic insects comprised more than half the prey items, supplemented with tadpoles, fish, snails, and spiders, and beef, fish meat, shrimp, and small frogs may be eaten in captivity (Molina et al. 1990). Brasil et al. (2011) found high dietary niche overlap between sexes, but there was no difference in niche breadth.

Reproduction. — Reproductive ecology of the species has not been well studied. Molina et al. (1990) noted

that the nesting season in Brazil is from February to May, and Achaval and Olmos (2007) suggested that breeding occurs in August in Uruguay. From September to February, neonates are common in its range in Rocha, Uruguay (Karumbé Project 2023).

In a study conducted in Brasilia National Park, breeding takes place in the rainy season, where three mating events were observed between November and December (Colli 2012). Despite seasonal differences with less activity and more habitat use during the dry season, no sexual differences have been observed, although females increased their terrestrial movements during the nesting period (Horta 2008).

It has been observed that this species lays an average of 5 eggs, as reported by Fallabrino et al. (2007) in Uruguay. D'Amato and Morato (1991) documented a clutch of 4 eggs in Brazil, with egg dimensions ranging from a maximum of 27.2 x 25.1 mm to a minimum of 24.8 x 23.7 mm. Four eggs each were also found in two females in the Brasilia National Park populations (Horta 2008; Colli 2012). Clutches were buried at a depth of 4 cm below the ground surface. Studies conducted by Lehmann (1988) and Richard (1999) indicated variability in clutch sizes, ranging from 5 to 8 eggs.

Observing three eggs from laying to hatching, Métrailler (2005) found that *A. spixii* may exhibit the longest incubation time of all South American Chelidae: 587 to 615 days, including a diapause period, which the author suggested could be an adaptation to the South American climate where dry and rainy seasons could present irregular patterns. *Acanthochelys* eggs seem to be well adapted to their environment and minor changes can have serious consequences for their reproduction and embryonic diapause (Lamprecht 2018).

Hatchlings of *A. spixii* have a carapace length of 31–32 mm and a weight of approximately 5 g, according to Lehmann (1988).

Acanthochelys spixii produces eggs with shells classified as type V (Kusuda et al. 2013), characterized by a rigid structure composed of a mammillary core layer and two well-developed palisade layers. The presence of a rigid shell with two palisade layers suggests greater mechanical resistance against the weight of the nesting substrate, as well as enhanced water retention capacity, both crucial for successful embryonic development in terrestrial environments (Kusuda et al. 2013).

Parasites. — Records of several species of helminths have already been confirmed for the species, such as *Camallanus* sp., *Caimanicola brauna, Cheloniodiplostomum* sp., *Contracaecum* spp., *Dioctophyme renale, Physaloptera* sp., *Polystomoides* sp., *Spiroxys contortus, Temnocephala brevicornis, Telorchis platensis,* and others (Ferreira-Yuki et al. 1993, Mascarenhas et al. 2013, 2016, 2017, 2022; Chaviel et al. 2020, Palumbo et al. 2024). No positive serologies were found for *Leptospira* spp. in *A. spixii* from urban and peri-urban areas in Brazil's extreme south (Schulz et al. 2025).

Monteiro-Filho et al. (1994) found three individuals of *A. spixii*, two females and one male, all were parasitized by leeches of the family Hirudidae, probably belonging to the genus *Glossiphonia*. Infestation levels varied considerably, and the leeches were primarily concentrated in the axillary and inguinal skin folds, suggesting a preference for regions protected by the shell and rich in vascularized tissue.

Population Status. — *Acanthochelys spixii* has been described as rare (Bonin et al. 2006), while Buskirk (1991) found several animals when searching in suitable habitat. In Uruguay, no density data or quantitative population estimates are available. In Brazil, population studies have been conducted in Brasilia National Park between 2005 and 2007 (Fraxe Neto et al. 2011). Throughout the study period, recapture rates displayed a range between 0.01 and 0.23 individuals per unit effort, with a narrower range of 0.01 to 0.04 individuals observed during the dry season. The mean population size was estimated at 30 adult turtles found per month, with fluctuations recorded between 10 and 35 adults per month across the four-year span. Notably, the annual population growth rates were calculated at 1.37 for the period from 2005 to 2006 and 0.59 for the subsequent year, 2006 to 2007.

In Serra da Canastra National Park, Minas Gerais, Brazil, an extensive targeted search effort for semiaquatic chelonians was conducted by Mendonça et al. (2015). A total of 60 water bodies were sampled, comprising 178 sampling points across 26 water bodies in 2012, 143 points in 13 water bodies in 2013, and 155 points in 21 water courses in 2014. Utilizing a sampling effort involving 898 funnel traps, 38 individuals of *A. spixii* were captured, but from only two of the 60 surveyed water bodies.

A population study in the State Park of Itapeva, northern Rio Grande do Sul, Brazil, captured 50 individuals in a 10-ha area between 2005 and 2006, and 70 individuals ten years later in the same area (Armiliato 2018). In the first period, 50 turtles (24 females, 22 males, and 4 juveniles) were captured 87 times, whereas 70 turtles (36 females, 17 males, and 17 juveniles) were captured 124 times during 2016–2017. The sex ratio was not significantly different from 1:1 in 2005–2006 (1.09:1) but was female-biased by 2.11:1 in the second sampling period. Survival rates were higher for females than males, with little intrasexual variation between periods. The annual survival in 2005–2006 was 0.90 for males (confidence interval, 0.66–0.97) and 0.97 for females (confidence interval, 0.85–0.99). Ten years later, both sexes showed a small decrease in the annual survivorship values, with males to 0.86 (confidence interval, 0.75–0.93) and females to 0.96 (confidence interval, 0.89–0.99) (Armiliato 2018). Focusing on females, the number of large females (150–160 mm SCL) decreased from 6 to 1 between sampling periods,

while mid-sized females (120–130 mm SCL) increased from 4 to 8. The overall population is likely stable since Itapeva Park continues to protect the habitat of the species, but it is isolated in this littoral area that suffers from housing and tourist development pressures.

Threats to Survival. — The primary threat to *A. spixii* is habitat degradation resulting from urbanization and deforestation (Bonin et al. 2006; Marques et al., in press). Analyzing data from the MapBiomas Brasil, MapBiomas Chaco, and MapBiomas Pampa collections (MapBiomas 2023) allowed a diagnostic assessment of land cover within the species' distribution. As of 2021, the majority of this area has undergone conversion from natural to anthropogenic environments (62.3%). In Argentina, the situation indicates greater environmental preservation (90.6%), followed by Uruguay (62.4%). Conversely, in Brazil, a reversal of this situation is observed: only 34.8% of the Brazilian distribution area is covered by natural habitat.

In Uruguay, the destruction and degradation of the habitat used by the species is due to the advance of urban development and agricultural conversion; road mortality is also an important threat to the species (Fallabrino et al. 2007). Sales of the species as pets has been reported (Carreira and Maneyro 2015; David 2019). With the increasing use of social networks, we have noticed an increase in illegal trade using these mass media. In Uruguay, there is legal breeding of the species regulated by decree N° 353/999 (1999) and updated by decree 186/002 (2002), but to date, no turtles with legal papers have been found for sale at veterinarians, fairs, or aquariums.

Similar ecological challenges are apparent in Brazil. When assessing land use data for the country, which encompasses over 90% of the species' distribution area, we observed that over the last 37 years, 8.9% of its habitat has been converted into anthropogenic environments (MapBiomas 2023). In Rio Grande do Sul, Brazil, the breeding habitat of certain species is exposed to potential impacts resulting from large-scale rice cultivation. This agricultural activity is mainly concentrated at the edges of the large coastal lagoon, thereby encroaching on important mating and nesting areas for this species (Vogt et al. 2023). Other areas within its geographic range are experiencing environmental changes due to various human activities, such as mineral extraction, agricultural practices, periodic forest fires, and the spread of hydroelectric power generation facilities. Free-living *A. spixii* have been chronically exposed to a substantial quantity of agrochemicals while inhabiting agricultural matrices in the southwest region of São Paulo State in Brazil. Kubo et al. (2025) found strong and highly significant evidence of chromosomal damage and other erythrocytic nuclear abnormalities in the free-living population from contaminated environments. Despite the demonstrated adaptability and persistence of the species even in some significantly altered environments, these multiple threats pose a credible risk of eventual extinction of the species. The species has recently been assessed as Vulnerable on the IUCN Red List of Threatened Species (Marques et al., in press).

Conservation Measures Taken. — Captive-breeding programs are currently underway in Brazil and Uruguay, representing an initial effort for a conservation strategy. Although legislation exists in Argentina, Brazil, and Uruguay to safeguard freshwater turtles, challenges related to implementation persist.

In Uruguay, this species is protected under the Ley de Fauna Nº 9481, included in the "Official List of Species of the Wild Fauna" (Decree 514/001), and protected by law (Decree 164/996). The control work and the adjustment of penalties are aspects that must be improved to protect this and other species of fauna in the country.

Since 2006, Karumbé NGO has an education program for the conservation of freshwater turtles in Uruguay. In this, the organization works to eliminate the use of turtles as pets by offering a better quality of life by relocating them into controlled natural shelters. Between 2014 to 2022, they have received only a few *A. spixii* from captivity, all purchased or illegally extracted from the wild.

Since the implementation of the National System of Protected Areas (SNAP) in Uruguay, there are natural populations of *A. spixii* in seven Uruguayan protected areas: Laguna de Rocha, Cabo Polonio, Laguna de Castillos, Cerro Verde, San Miguel, Valle del Lunarejo, and Laguna Garzón. Two RAMSAR sites also include this species: Laguna de Rocha, Bañados del Este and Franja Costera in the department of Rocha. People in Uruguay who find *A. spixii* in urban areas or in the wild, or disoriented hatchlings on the beaches of the Atlantic Ocean, occasionally contact Karumbé to inquire as to what is recommended. In all cases, Karumbé provides instructions for transferring these individuals to a freshwater wetland, or undertakes the translocation themselves. In 10 years, Karumbé has rescued and relocated 50 individual *A. spixii*.

In Brazil, the species has been recorded in the following protected areas: Taim Ecological Station, Lagoa do Peixe National Park (NP), Itapuã State Park (SP), Morro do Osso Municipal Natural Park, Banhado Grande Environmental Protection Area (EPA), Delta do Jacuí State EPA, Delta do Jacuí SP, Itapeva SP, Baleia Franca EPA, Serra do Tabuleiro SP, Escarpa Devoniana State EPA, Piraquara State EPA, Iguaçú EPA, Passauna EPA, Paraíba do Sul Basin EPA, Serra da Canastra NP, Morro Da Pedreira EPA, Sempre Vivas NP, Brasília NP, Pandeiros River Basin EPA, Planalto Central EPA, and Cafuringa EPA.

Conservation Measures Proposed. — No focused conservation measures are currently considered urgent, but the inclusion of the species in long-term ecological and monitoring studies is crucial for monitoring population status and potential emerging threats and conservation needs.

Captive Husbandry. — In captivity, *A. spixii* should be housed in a semi-aquatic environment with both land and water areas. The habitat should include hiding spots and basking areas, with water quality maintained through regular cleaning. However, captive breeding attempts for this species have been discouraging, with no more than 10 juveniles reported in the literature (Molina 1999).

Current Research. — *Acantochelys spixii* requires further detailed research in several important areas. Studies are essential to assess population size, distribution, and demographic trends, and to gain further insights into the current conservation status of the species. The advent of social networks in Uruguay has led to an increase in annual reports of this species observed in the wild across the country. Due to this surge in observations and a corresponding lack of comprehensive knowledge, there is a pressing need to enhance research efforts focusing on the biology, ecology, and conservation challenges of *A. spixii*.

A long-term study on the autecology and conservation of *A. spixii* at Parque Nacional de Brasília has been conducted on natural populations since December 2004, led by Guarino Colli from the University of Brasilia (Horta, pers. comm.). The project is focused on demography, life-history, feeding habits, behavior, genetics and patterns of activity, movement and habitat use. The major findings of the project will be be available soon and may assist the development of a management plan for the species.

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