Check List the journal of biodiversity data

NOTES ON GEOGRAPHIC DISTRIBUTION

Check List 19 (5): 605–610
https://doi.org/10.15560/19.5.605

PENSOFT

New record of Spot-Legged Turtle, *Rhinoclemmys punctularia* (Daudin, 1801) (Reptilia, Testudines, Geoemydidae), from an Amazon ecotonal zone in the Tocantins–Araguaia river basin, Brazil

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Abstract. We report a new record of *Rhinoclemmys punctularia* (Daudin, 1801), extending the geographic distribution of this species by 450 km towards the south to the Araguaia River in the state of Pará, Brazil. The new record comes from an ecotonal area of the Cerrado and Amazon biomes, which indicates a possible adaptability of this species in fragmented environments and in agricultural areas. These new findings help enable future investigations better understand the distribution of *R. punctularia* in the southern Amazon Basin and in ecotones.

Keywords. Chelonians, distribution, freshwater, range extension, reptiles

Academic editor: Manuella Folly
Received 7 February 2023, accepted 7 August 2023, published 13 September 2023

Agostini MAP, Batista EO, Dias Junior WR, Vogt RC, Portelinha TCG (2023) New record of Spot-Legged Turtle, *Rhinoclemmys punctularia* (Daudin, 1801) (Reptilia, Testudines, Geoemydidae), from an Amazon ecotonal zone in the Tocantins–Araguaia river basin, Brazil. Check List 19 (5): 605–610. https://doi.org/10.15560/19.5.605

Introduction

The freshwater turtle *Rhinoclemmys punctularia* (Daudin, 1801), popularly known as "Perema" or "Aperema", has two subspecies in South America: *R. p. flammigera* (Paolillo, 1985), restricted to Venezuela on the upper Orinoco River, and *R. p. punctularia* in Suriname, Guyana, French Guiana, Trinidad and Tobago (probably introduced), and Brazil (Amapá, Amazonas, Bahia, Espírito Santo, Maranhão, Pará, Piauí, Rio de Janeiro [introduced], Roraima, and Tocantins states; Turtle Taxonomy Working Group 2021; Guedes et al. 2023). The Spot-Legged Turtle, *R. punctularia*, is a medium-sized species that can reach an average carapace length of 26 cm in females and 20 cm in males. Its main threats are the pet trade, deforestation, and habitat loss (Ferrara et al. 2017). This species inhabits lakes, streams, flooded swamps, and coastal marshes, and some individuals were recorded in terrestrial environments; it is characterized as a semi-aquatic species (Vogt 2008; Ferrara et al. 2017; Brito et al. 2022).

Although the distribution of *R. punctularia* was described from the Amazon (Daudin 1801; Pritchard and Trebbau 1984; Rhodin and Carr 2009; Ávila-Pires et al. 2010) and Cerrado biomes (Silva et al. 2011; Dornas et al. 2011; Pereira et al. 2013), there is evidence of

a disjunct distribution in the Atlantic Forest domain (Valle et al. 2016; Oliveira et al. 2018). Furthermore, non-indigenous populations have been reported in Rio de Janeiro state and were probably introduced by the illegal pet trade (Siciliano et al. 2014; Oliveira et al. 2020). In the Tocantins–Araguaia river basin, this species occurs in an ecotonal zone between the Open Ombrophilous Forest and Savannah, which are typical vegetation of the Amazon and Cerrado biomes, respectively (Haidar et al. 2013).

Information on *R. punctularia* is still scarce due to difficulty in capturing individuals in the wild (Brito et al. 2022). Most research has been on its geographic distribution (Ávila-Pires, Hoogmoed and Rocha 2010; Silva et al. 2011; Dornas et al. 2011; Pereira et al. 2013; Siciliano et al. 2014; Valle et al. 2016; Oliveira et al. 2018), taxonomy and systematics (Daudin 1801; Fretey, Hoogmoed and Lescure 1977; Sites Jr, Greenbaum and Bickham 1981; Paolillo 1985; Rhodin and Carr 2009), ecology (Wariss, Isaac and Pezzuti 2012; Oliveira 2018; Brito et al. 2022), cytogenetics (Cavalcante et al. 2020), and veterinary uses (Bonini-Domingos et al. 2007; Harnoster, Svitin and Preez 2019). So, it is one of the least studied turtle species in Brazil, and there is a priority to identify and understand the population structure of *R. punctularia* in different locations to contribute to its biology and natural history (Vogt 2008; Ferrara et al. 2017).

The present study expands the geographical distribution of *R. punctularia* and additionally present biometric data of adult individuals. We extend the distribution of *R. punctularia* within the Tocantins–Araguaia river basin, a Cerrado–Amazon ecotonal area between Pará and Tocantins states, Brazil.

Methods

Three specimens of *Rhinoclemmys punctularia*, one adult female and two adult males, were captured using a fishing method with a nylon line, a hook without piercing tip, and beef bait (Pezzuti 2003; Bernhard et al. 2017) in December 2020 in a small stream (called "igarapé") approximately 54 km from the municipality of Santana do Araguaia, Pará state, Brazil.

This area is characterized as a semideciduous and evergreen ecotone of Seasonal Semideciduous Forest with Ombrophilous Forest and has flat or gently undulating relief associated with argisols and petrics plinthosols. The predominant species of plants are *Anadenanthera colubrina*, *Aspidosperma subincanum*, *Astronium fraxinifolium*, *Combretum duarteanum*, *Guazuma ulmifolia*, *Handroanthus serratifolius*, *Hymenaea courbaril*, *Myracrodruon urundeuva*, *Pseudobombax tomentosum*, *Physocalymma scaberrimum*, and *Tabebuia roseo-alba*, with preferred species that grow on soil gravel (*Casearia arborea*, *Copaifera langsdorffii*, *Duguetia marcgraviana*, *Micropholis venulosa*, *Myrcia sellowiana*, *Tachigali vulgaris* and *Virola sebifera*) and indicator species (*Protium heptaphyllum*, *Tetragastris altissima*, and *Tapirira guianensis*; Haidar et al. 2013).

The captures took place in a small stream 24 km from the Araguaia River, below a small bridge of an internal farm-access road, located between an area of well-preserved vegetation (the farm legal reserve) and an area of soybean cultivation (Fig. 1). All specimens were measured, weighed, and photographed using personal smartphones. On the first day of fieldwork (13 December 2020), we established where the species had been reported by local workers a year before. On the second day, we installed eight fishhook traps in the stream and seven in a nearby flooded area. We also attempted to locate animals at a small dam behind a farmhouse, approximately 250 m from the Araguaia River, but no turtles were captured.

The species diagnosis follows descriptions by Daudin (1801), Vogt (2008), and Ferrara et al. (2017) using morphological characteristics and our identification was confirmed by the specialist and curator of the Collection of Amphibians and Reptiles of the National Institute for Research in the Amazon (INPA), RCV in December 2020. All fieldwork was carried out in accordance with the authorization ICMBio/IBAMA n. 14032-3 (RCV) and n. 76575-1. Only one specimen was deposited in the Collection of Amphibians and Reptiles of the National Institute for Research in the Amazon (INPA).

The map was created using QGIS v. 3.10 (QGIS 2019). The occurrence records were compiled from Global Biodiversity Information Facility (GBIF.org 2021),

Figure 1. Capture site of *Rhinoclemmys punctularia* at Santana do Araguaia, Pará state, Brazil. Photo: Thiago Portelinha.

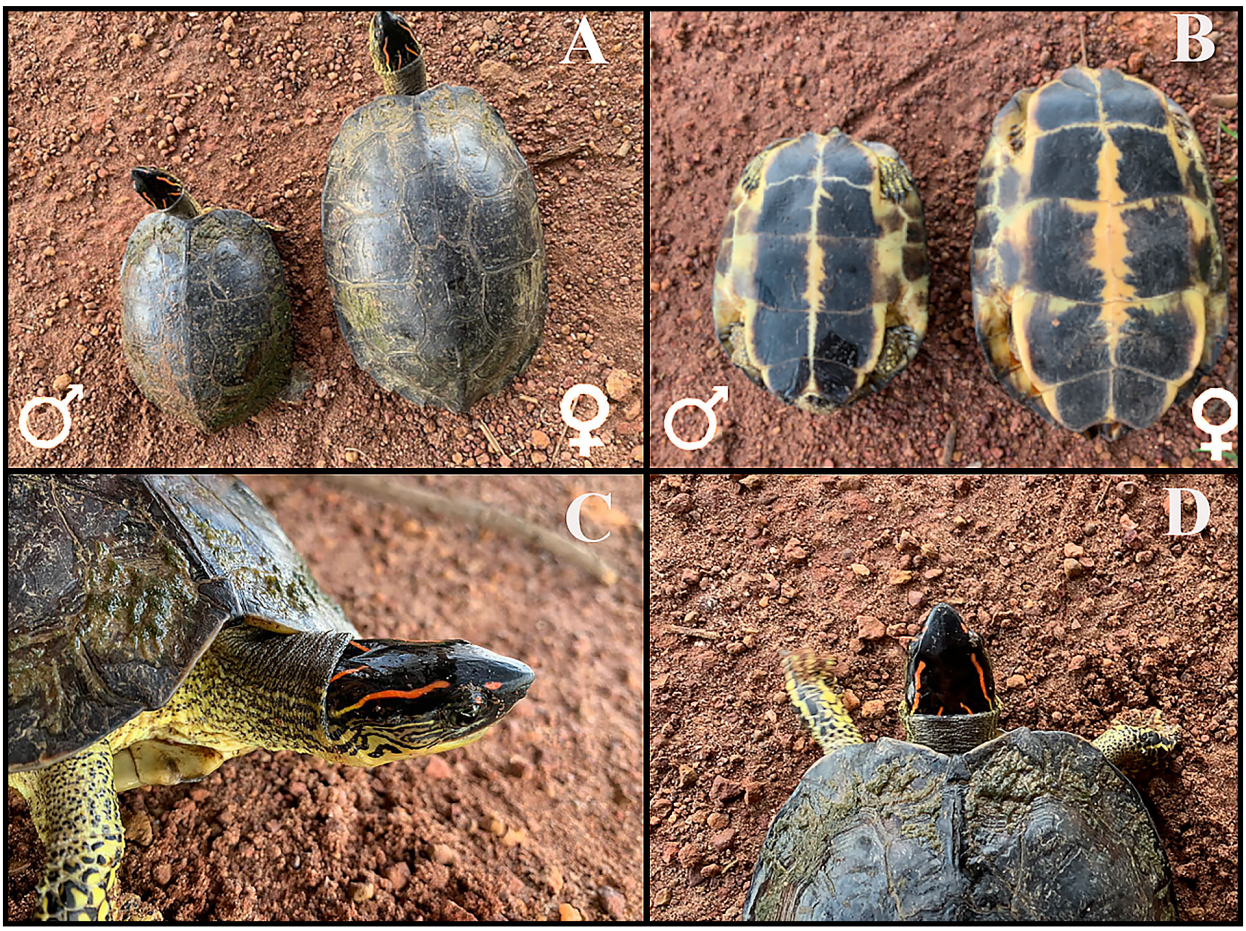

Figure 2. Two adult specimens of *Rhinoclemmys punctularia* (male: specimen deposited at the "Coleção de Anfíbios e Répteis do Instituto Nacional de Pesquisas da Amazônia" [voucher: INPA-H 42626] on the left, and female on the right). **A.** Carapace view. **B.** Plastron view. **C.** Lateral head view. **D.** Upper head view. Photos: Maria Augusta P. Agostini and Thiago Portelinha.

SpeciesLink (https://specieslink.net/), and Vertnet (http://vertnet.org/) databases and also included records from the Instituto Nacional de Pesquisas da Amazônia collection (Manaus, Amazonas, Brazil). These records were cross-checked with records cited in the literature by Amazonian turtle specialists (Ferrara et al. 2017; Turtle Taxonomy Working Group 2021).

Results

Order Testudines Batsch, 1788
Family Geoemydidae Theobald, 1868
Genus *Rhinoclemmys* Fitzinger, 1835

***Rhinoclemmys punctularia* (Daudin, 1801)**
Figure 2

New record. BRAZIL – **Pará** • Santana do Araguaia, stream near of Araguaia River; 09°43′17.8″S, 050° 23′01.2″W; 15.XII.2021; Portelinha TCG, Agostini MAP, Dias Junior WR, Oliveira OL, leg.; fishing method on a small stream; 1 ♂, INPA-H 42626. • same locality, 09°43′18.3″S, 050°23′01.4″W; 16.XII.2021; Portelinha TCG, Agostini MAP, Dias Junior WR, Oliveira OL, leg.; fishing method on a small stream; 1 ♂, and 1 ♀.

Identification. The species is easily identified by its elongate black to dark-brown head, reddish-orange wavy lines from the back of the eye to the nape, and two dots anterior to the orbits, which give this species its name (Ernst and Barbor 1989). The neck has a well-defined pattern of intersecting black and yellow lines. The carapace is oval and dark brown, with continuous keels from the nape and vertebral shields to the supra-tail scute, which may be discontinuous in adults; the plastral scutes are black in the central region, bordered by light yellow. Females are larger than males and their carapace can reach up to 26 cm in length. Males have a longer, thicker tail and a slightly concave plastron (Vogt 2008; Ferrara et al. 2017; Fig. 2).

The first individual, captured on 15 December 2020, was an adult female with a carapace length of 22 cm, and the two others, captured on 16 December 2020, were both males with carapaces of 16.1–17.5 cm (Table 1). The female and one male were released at the same capture site (Fig. 1), and the other male was collected and deposited at INPA collection.

Geographic range. *Rhinoclemmys punctularia* is widely distributed in Pará but is mainly concentrated in the northernmostern area of the state, with few records in the east on the border with Tocantins state. Our new data expand the geographic range of *R. punctularia* by 450 km to the south (Fig. 3).

Table 1. Information on individuals of *Rhinoclemmys punctularia* captured in Santana do Araguaia, Pará state, Brazil. SCL = straight carapace length; SCWmax = maximum straight carapace width.

ID	Date of capture	Capture location		SCL (cm)	SCWmax (cm)	Mass (g)	Sex
		Latitude	Longitude				
1	15 Dec. 2020	09°43′17.8″S	050°23′01.2″W	22.0	15.6	1,390	Female
2	16 Dec. 2020	09°43′17.8″S	050°23′01.2″W	16.1	11.5	500	Male
3*	16 Dec. 2020	09°43′18.3″S	050°23′01.4″W	17.5	15.5	607	Male

*Specimen deposited in the Coleção de Anfíbios e Répteis do Instituto Nacional de Pesquisas da Amazônia (INPA-H 42626).

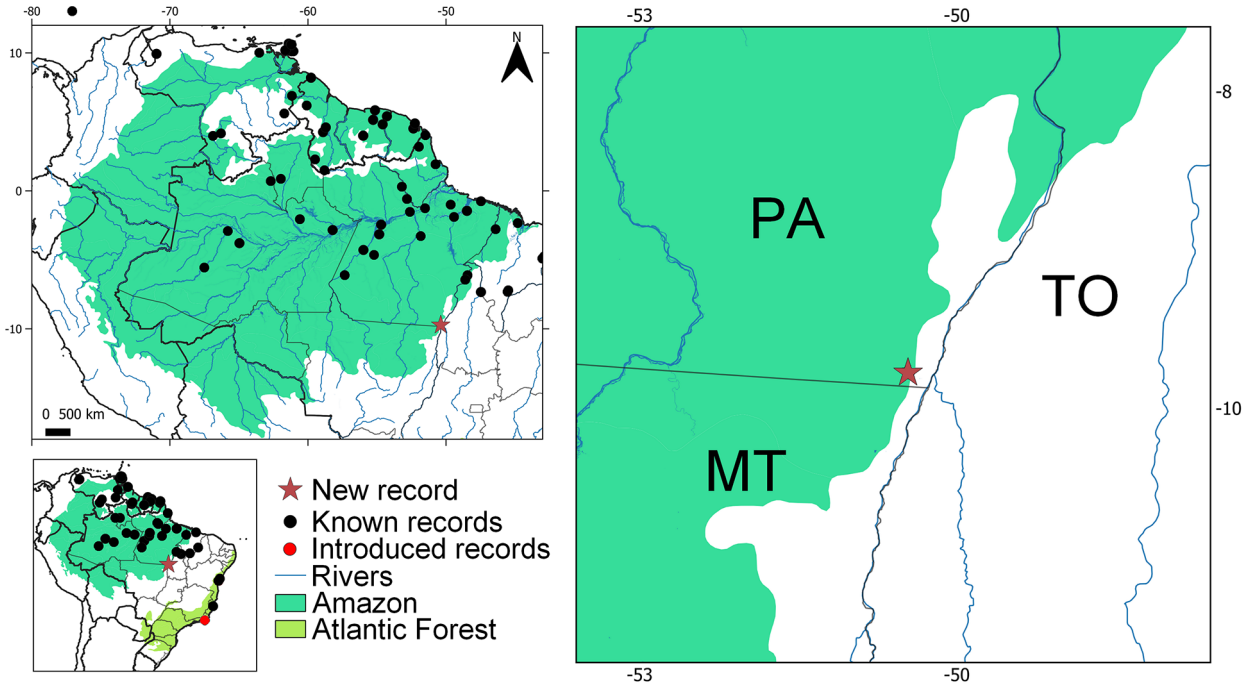

Figure 3. Distribution records in Amazon biome and the disjunct distribution in the Atlantic Forest domain, and the study area (new record) for *Rhinoclemmys punctularia*. Dark dots = previously known occurrences, red star = new record, and red dot = introduced record. Map created by Arielli Fabrício Machado.

Discussion

Here, we reported the first record of *Rhinoclemmys punctularia* in southeastern Pará state. This new occurrence is 450 km from the closest previously known record in the Araguaia River, at the municipality of Ananás, Tocantins state (Dornas et al. 2011). The new record expands the species' area of distribution south towards in the Araguaia River and adds more than 80,000 km^2 to the previously known extent of occurrence (3,267,964 km^2) reported by Ferrara et al. 2017.

Although listed as Least Concern (Turtle Taxonomy Working Group 2021), efforts should be addressed to understand the effects on the species by habitat loss, fire, and deforestation caused by cattle ranching and agriculture in the Amazon–Cerrado ecotone. Furthermore, considering that fire is an important known threat to *R. punctularia* (Oliveira et al. 2018) and pesticides and heavy metals are known in tissues of other Amazonian turtle species (Pignati et al. 2018; Frossard et al. 2021), and that our new record lies inside a farm with extensive cattle ranching and field crops, future studies should evaluate ecotoxicological effects and demographic parameters for this population. Other suitable ecotonal areas in the region should be surveyed for new additional occurrences (Ferrara et al. 2017), which if found will enable studies on population structure and reproductive biology of *R. punctularia*.

Acknowledgements

We thank the field team, Adailton Fernandes Gloria, Angelo Ferrari Júnior, Averaldo Viana Ribeiro Pereira, Dalmy Ferreira de Abreu, Emival Pinto Rocha, Gerilto da Silva Luz, João Batista Carvalho Pinto, José Luiz Aragão Anastácio, Lenine Barros Cruz, Olivia Lopes de Oliveira, Rafael de Araújo Pons, and Mariceudo Pinho de Carvalho (from a distance). Arielli Fabrício Machado made the map. We acknowledge the "Programa Quelônios da Amazônia" (PQA) Tocantins, Fazenda Fartura, and Naturatins for field support; the Brazilian Institute for the Environment and Natural Resources (IBAMA) and Chico Mendes Institute of Conservation of Biodiversity (ICMBio) for fieldwork authorization; and the Federal University of Tocantins (UFT), National Institute of Amazonian Research (INPA), Center for

the Study of Amazon Chelonians (CEQUA) for technical and scientific support. This work was supported by Foundation for Research Support of the state of Amazonas (FAPEAM) and is part of MAPA's Ph.D. thesis in the Biodiversidade e Biotecnologia da Amazônia Legal-BIONORTE graduate program at UEA/UFAM. We also thank the reviewers of the manuscript for their contributions which helped improve this study.

Author Contributions

Conceptualization: MAPA, TCGP. Data curation: RV. Formal analysis: TCGP, MAPA. Investigation: TCGP, WRDJ, MAPA. Methodology: TCGP, MAPA, WRDJ. Validation: EOB, RV. Writing – original draft: TCGP, MAPA, RV, EOB. Writing – review and editing: MAPA, EOB, TCGP.

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