



New records and range expansion of *Chironius carinatus* (Linnaeus, 1758) (Serpentes, Colubridae) from the state of Paraíba, northeast Brazil

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Abstract

The current work provides a new state record of the snake *Chironius carinatus* (Linnaeus, 1758) based on two specimens collected in the Atlantic Forest of Paraíba state, northeastern Brazil. This species occurs in the Amazon and Atlantic Forests. The new records fills in a gap in the species' distribution on the Brazilian coast. In Paraíba, *C. carinatus* occurs in sympatry with two other *Chironius* Fitzinger, 1826 species, *C. flavolineatus* Jan, 1863 and *C. exoletus* (Linnaeus, 1758).

Keywords

Atlantic Forest, colubrid, snake, South America.

Academic editor: Raul F.D. Sales | Received 5 July 2019 | Accepted 4 October 2019 | Published 18 October 2019

Citation: Araújo P, França RC, Nascimento FS, Laranjeiras DO, Rodrigues França FG (2019) New records and range expansion of *Chironius carinatus* (Linnaeus, 1758) (Serpentes, Colubridae) from the state of Paraíba, northeast Brazil. Check List 15 (5): 927–932. <https://doi.org/10.15560/15.5.927>

Introduction

The genus *Chironius* Fitzinger, 1826 currently includes 22 species distributed from Central America (Honduras and Saint Vincent in the Caribbean Sea) to southern South America in Uruguay (Dixon et al. 1993; Hollis 2006). This genus is characterized by the presence of a relatively low and even number (10 or 12) of dorsal scale rows at midbody (Dixon et al. 1993; Hollis 2006; Kok 2010). In Brazil, 15 species are currently recognized: *Chironius bicarinatus* (Wied, 1820), *C. brazili* Hamdan

& Fernandes, 2015, *C. carinatus* (Linnaeus, 1758), *C. diamantina* Fernandes & Hamdan, 2014, *C. exoletus* (Linnaeus, 1758), *C. flavolineatus* (Jan, 1863), *C. foveatus* Bailey, 1955, *C. fuscus* (Linnaeus, 1758), *C. laevicollis* (Wied, 1824), *C. laurenti* Dixon, Wiest & Cei, 1993, *C. maculiventris* Dixon, Wiest & Cei, 1993, *C. multi-ventris* Schmidt & Walker, 1943, *C. quadricarinatus* (Boie, 1827), *C. scurrulus* (Wagler, 1824), and *C. septentrionalis* Dixon, Wiest & Cei, 1993 (Costa and Bérnills 2018). Snakes of this genus feed primarily on hylid anurans (Rodrigues 2008). They are diurnal and present

terrestrial and arboreal habits and inhabit lowland rainforests to open savannas, but most species occur in low to mid-elevation forests (Dixon et al. 1993).

Chironius carinatus differentiates from the other species of the genus by presenting a combination of 12 scale rows at midbody, a divided anal plate, a fairly consistent scale row reduction of 12-12-8, and a green or olive dorsum with a pattern consisting of large yellowish spots on the first scale row of the tail, pale flecking on most dorsal scales or two broad reddish-brown stripes anteriorly (Dixon et al. 1993). *Chironius carinatus* was previously comprised by three distinct subspecies: *C. carinatus carinatus* that occurs in Brazil, French Guiana, Suriname, Guyana, and Venezuela; *C. carinatus spixi* (Hallowell, 1845) that occurs in Venezuela and Colombia; and *C. carinatus flavopictus* (Werner, 1909) found in Ecuador, Colombia, Panama, and Costa Rica (Dixon et al. 1993). These were later elevated to full species status (Hollis 2006).

In Brazil, *C. carinatus* presents a disjunct distribution: it can be mainly found in the Amazon rainforest located in the states of Acre, Amapá, Amazonas, Maranhão, Pará, Rondônia, and Roraima, and it also occurs in the Atlantic Forest in the northeast of Brazil, in the states of Alagoas, Bahia, Ceará, Pernambuco, and Piauí (Dixon et al. 1993; Guedes et al. 2014; Roberto et al. 2015). Herein, we report a new record of this species, extending its distribution in coastal Brazil.

Methods

The two specimens were found already dead in the urban area of the municipality of Santa Rita, Paraíba, Brazil. They were fixed in 10% formalin, preserved in 70% alcohol, and housed in the Herpetological Collection of Universidade Federal da Paraíba (CHUFPB). Morphometric measurements were taken with a digital caliper (precision 0.01 mm). The specimens were collected under ICMBIO permits (SISBIO 21799-1).

We performed a literature review of the occurrences of *Chironius carinatus* in South America and considered records from five scientific collections: Coleção Herpetológica Alphonse Richard Hoge (IBSP-Herpeto), Coleção de Herpetologia da Universidade Federal de Sergipe (CHUSF), Coleção de Herpetologia do Museu Paraense Emílio Goeldi (MPEG), Coleção de Herpetologia do Museu de Zoologia da Universidade de São Paulo (MZUSP), Coleção de Herpetologia Museu de Ciências Naturais PUC Minas (MCNR) and Coleção de Anfíbios e Répteis do INPA (INPA-H). An updated distribution map for the species was created using ArcGIS 10.1 (Fig. 1).

Results

Chironius carinatus (Linnaeus, 1758)

New records (Fig. 1). Brazil: Paraíba: Municipality of Santa Rita (07.1554°S, 034.9672°W), F. Nascimento coll.,

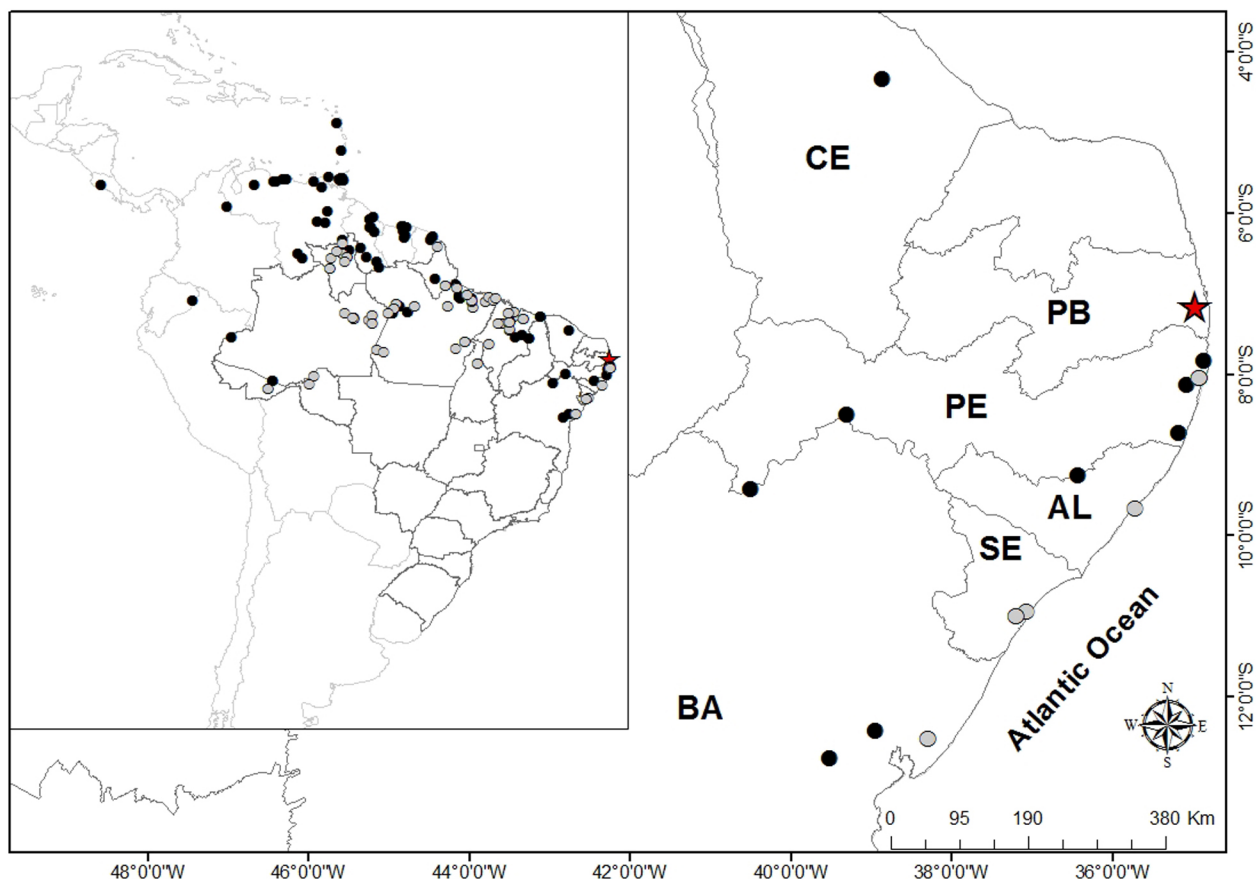


Figure 1. Known geographic distribution of *Chironius carinatus*, including the new records. Black circles = published records; gray circles = voucher records; red Star = new records from the state of Paraíba, Brazil.



Figure 2. Specimens of *Chironius carinatus* from Santa Rita, Paraíba, Brazil. **A.** Ventral body view of CHUFPB 30274. **B.** Dorsal body view of CHUFPB 30274. **C.** Dorsal body view of CHUFPB 30275. **D.** Close up of head and tail of CHUFPB 30274.

10 March 2019 at 17:15 (1 adult ♀, CHUFPB 30274). Brazil: Paraíba: Municipality of Santa Rita (07.1275°S, 034.9845°W), F. Nascimento coll., 28 May 2019 at 16:27 (1 adult ♀, CHUFPB 30275).

Both individuals were found on the side of a forest fragment in the urban area of the city. However, the first individual (CHUFPB 30274) was found dead on an asphalt and the second was beaten to death by residents of the region (CHUFPB 30275).

Identification. The first specimen (CHUFPB 30274) was identified following Dixon et al. (1993), based on the following diagnostic characters: dorsal scale row 12-12-8; 155 ventrals, 127 subcaudals, 9 supralabials, 10 infralabials, 1 preocular, 2 postoculars, 1 loreal, divided anal plate, and a olive-green dorsum with a pattern consisting of large yellowish spots on the first scale row of the tail (Fig. 2). The first specimen had a snout-vent length of 550 mm, tail length of 296 mm, head length of 25.3 mm, head width of 10.61 mm, head height of 8.7 mm, body height of 10.8 mm, body width of 10.2 mm, ocular diameter of 15.17 mm, distance between nostrils of 4.6 mm, and body mass of 49 g. The second specimen (CHUFPB 30275) had dorsal scale row 12-12-8; 158 ventrals, 122 subcaudals, 9 supralabials, 9 infralabials, 2 preocular,

2 postoculars, 1 loreal, divided anal plate, a snout-vent length of 874 mm, tail length of 426 mm, head length of 28.8 mm, body height of 14.6 mm, body width of 13.9 mm, ocular diameter of 5.5 mm, distance between nostrils of 6.9 mm, and body mass of 191 g. It was not possible to measure head width and head height of the second specimen due to its injuries.

Discussion

In the Atlantic Forest of Paraíba two other *Chironius* are found: *C. exoletus* and *C. flavolineatus* (Pereira-Filho et al. 2017). The second one is quite common and can be found in the edges of small forest fragments, while the first one is rare and occurs only in denser forests. Both *C. carinatus* and *C. exoletus* seem to be vulnerable to low-quality of forest fragments. Although the two individuals of *C. carinatus* were found outside forests, Santa Rita municipality still has large patches of dense vegetation where there are some snakes that are restricted to forest fragments, such as *Lachesis muta* (Rodrigues et al. 2013). Even though Paraíba state has already been thoroughly surveyed (Pereira-Filho et al. 2017), we continue to find new species, such as *Micrurus potyguara* Pires, da Silva Jr, Feitosa, Prudente, Preira-Filho & Zaher, 2014

(Pires et al. 2014) and new state records, indicating the need for more surveys.

Acknowledgements

We thank Isabella M.M.C. Pedrosa for your help with the language review. PA thanks PROPESQ-UFPB for a PIBIC scholarship. RCF thanks FAPESB for a PhD scholarship (BOL0353/2016) and CNPq for Doutorado Sanduíche no Exterior (SWE) scholarship (208442/2017-0). FGRF thank the financial support from CNPq (Universal grant 404671/2016-0).

Authors' Contributions

FSN collected the specimens; DOL collected voucher records; RCF and FGRF took the photographs and made the figures; PA, RCF and FGRF wrote the manuscript; all authors reviewed the manuscript.

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Appendix

Table A1. Locality records of *Chironius carinatus*, literature records and records of material examined from five scientific collections ((Alphonse Richard Hoge Herpetological Collection (IBSP-Herpeto), Herpetology Collection of the Federal University of Sergipe (CHUSF), Emilia Goilio Paraense Museum Herpetology Collection (MPEG), Herpetology Collection of the Museum of Zoology of the University of São Paulo (MZUSP), Herpetology Collection Museum of Natural Sciences PUC Minas (MCNR), and INPA Amphibian and Reptiles Collection (INPA-H)).

Country	Locality	Latitude	Longitude	Source
Costa Rica	Puntarenas	09.977841	–084.829405	Goldberg and Bursey 2004
Ecuador	Rio Cononaco	–01.387403	–075.831585	Dixon et al. 1993
French Guiana	Cayenne	04.922420	–052.313453	Dixon et al. 1993
	Roura	04.728495	–052.325425	Kok 2010
	Cacao	04.548928	–052.491857	Kok 2010
Guyana	Berbice	05.376818	–057.972801	Dixon et al. 1993
	East Demerara	05.754543	–058.422308	Dixon et al. 1993
	Buxton	06.762277	–058.043457	Dixon et al. 1993
	Essequibo Islands	06.561194	–058.462615	Dixon et al. 1993
	Karanambu	03.751420	–059.309673	Dixon et al. 1993
	Acarahy Mountains	01.826991	–057.501045	Dixon et al. 1993
	New River	02.394262	–057.788204	Dixon et al. 1993
	West Demerara	06.560810	–058.461955	Dixon et al. 1993
	Demerara River	05.752810	–058.374611	Dixon et al. 1993
	Upper Takutu–Upper Essequibo	02.826896	–058.737894	Kok 2010
Suriname	Commewijne	05.740211	–054.873122	Dixon et al. 1993
	Para	05.492929	–055.210641	Dixon et al. 1993
	Afobaka Dam	04.956042	–054.992371	Dixon et al. 1993
	Brokopondo District	04.728096	–055.048336	Dixon et al. 1993

Country	Locality	Latitude	Longitude	Source
Suriname	Charlesburg	05.847136	−055.167928	Dixon et al. 1993
	Plantage Peperpot	05.778247	−055.129398	Dixon et al. 1993
	Kwatta	05.884167	−055.281178	Dixon et al. 1993
Trinidad	Brickfield	10.48408	−061.467798	Dixon et al. 1993
	Arima	10.616806	−061.274159	Dixon et al. 1993
	Bush forest	10.372078	−061.041318	Dixon et al. 1993
	Sangre Grande	10.585264	−061.131569	Dixon et al. 1993
	San Rafael	10.571768	−061.264119	Dixon et al. 1993
	Tabaquite	10.382745	−061.298406	Dixon et al. 1993
	Valencia	10.653734	−061.197145	Dixon et al. 1993
Venezuela	Paveca	10.228096	−067.864058	Dixon et al. 1993
	San Antonio	07.817819	−072.442573	Dixon et al. 1993
	La Esmeralda	03.174548	−065.545220	Dixon et al. 1993
	Rio Orinoco	02.810142	−065.095780	Dixon et al. 1993
	Bolívar	06.355639	−063.582294	Dixon et al. 1993
	El Manteco	07.351688	−062.53557	Dixon et al. 1993
	Rio Uairen	04.550740	−061.096781	Dixon et al. 1993
	Ucaima, Bolívar	06.242872	−062.833473	Dixon et al. 1993
	Conejo Blanco	10.500425	−066.951136	Dixon et al. 1993
	Miranda	10.497461	−066.644364	Dixon et al. 1993
	Monagas	09.746692	−063.181647	Dixon et al. 1993
	Cumanacoa, Sucre	10.250618	−063.918679	Dixon et al. 1993
	Santa Rosa	09.895792	−069.767413	Dixon et al. 1993
	Aragua, El Limón	10.290410	−067.627479	Roze 1959
	Paria Peninsula, Sucre	10.666666	−062.500000	Roze 1959
France	Guadalupe Island	16.016130	−061.681271	Cunha and Nascimento 1993
Saint Vincent and the Grenadines	Saint Vincent Island	13.264020	−061.214940	Cunha and Nascimento 1993
Brazil	Acará, Pará	−02.015974	−048.319000	MPEG.HOP 011693
	Alto Alegre do Pindaré, Maranhão	−03.667262	−045.843000	MPEG.HOP 016083
	Amarante do Maranhão, Maranhão	−05.611276	−046.743000	MPEG.HOP 016071
	Aracaju, Sergipe	−10.94696	−037.07400	IBSP-HERPETO 46067
	Arari, Maranhão	−03.457045	−044.777000	MPEG.HOP 013442
	Arari, Maranhão	−03.564345	−044.706000	MPEG.HOP 014333
	Bacabal, Maranhão	−04.252983	−044.771000	MPEG.HOP 015013
	Bacabal, Maranhão	−04.221754	−044.786000	MPEG.HOP 015558
	Bacabeira, Maranhão	−02.978119	−044.317000	MPEG.HOP 015014
	Belém, Pará	−01.455755	−048.490000	MPEG.HOP 000387
	Belém, Pará	−01.319014	−048.441000	MPEG.HOP 018564
	Belém, Pará	−01.401717	−048.443000	MPEG.HOP 021081
	Boa Vista, Roraima	02.823510	−060.676000	MPEG.HOP 021095
	Bragança, Pará	−01.062061	−046.784000	MPEG.HOP 005045
	Cachoeira do Arari, Pará	−00.856397	−048.960000	MPEG.HOP 018256
	Chaves, Pará	−00.175430	−049.869000	MPEG.HOP 011721
	Filadélfia, Tocantins	−07.575043	−047.843000	MPEG.HOP 024404
	Fortaleza, Paraná do Urariá, Amazonas	−03.608124	−058.229000	MZUSP 5243
	Igaparé Estação (próx.a São Marcos), Roraima	04.174409	−061.136000	IBSP-HERPETO 24017
	Ilha de Maracá, Roraima	03.416542	−061.667000	MZUSP 9994
	Itacotiara, Amazonas	−03.330043	−058.556000	IBSP-HERPETO 44411
	Jacareacanga, Pará	−06.223748	−057.761000	MPEG.HOP 024425
	Jacareacanga, Pará	−06.485282	−057.099000	MPEG.HOP 024430
	Juruti, Pará	−02.163421	−056.095000	MPEG.HOP 022535
	Lago Januári (Rio Negro), Amazonas	−03.209999	−060.032000	MZUSP 5236, 5237
	Macapá, Amapá	00.035573	−051.071000	MPEG.HOP 000152
	Maceió, Alagoas	−09.67244	−035.723000	IBSP-HERPETO 48712
	Manaus, Amazonas	−03.11836	−060.078000	INPA-H028643
	Marabá, Pará	−05.373763	−049.130000	MPEG.HOP 018448
	Mata de São João, Bahia	−12.52835	−038.309000	IBSP-HERPETO 1060
	Missão Catrimani, Roraima	01.718018	−062.301000	MZUSP 7451
	Monte Alegre, Pará	−02.001415	−054.074000	MPEG.HOP 015187
	Mucajá, Roraima	02.443223	−060.918000	MZUSP 9782
	Novo Airão, Amazonas	−02.627869	−060.942000	IBSP 80563
	Oiapoque, Amapá	03.844178	−051.832000	IBSP-HERPETO 13879

Country	Locality	Latitude	Longitude	Source
Brazil	Oriximiná, Pará	−01.761831	−055.864000	MPEG.HOP 002162
	Oriximiná I, Pará	−01.763727	−055.863000	MPEG.HOP 022309
	Ourém, Pará	−01.550915	−047.117000	MPEG.HOP 001642
	Palmeirândia, Maranhão	−02.646145	−044.897000	IBSP-HERPETO 21758
	Peri - Mirm, Maranhão	−02.591191	−044.853000	IBSP-HERPETO 21757
	Portel, Pará	−01.936763	−050.820000	MPEG.HOP 018416
	Porto Velho, Rondônia	−08.758938	−063.896000	MPEG.HOP 018000
	Recife, Pernambuco	−08.052244	−034.929000	IBSP-HERPETO 17299
	Refúgio Ecológico Charles Darwin, Pernambuco	−07.828545	−034.874117	Moura et al. 2011
	Reserva Ecológica de Carnijó, Pernambuco	−08.134714	−035.082917	Moura et al. 2011
	Reserva Ecológica de Carnijó, Pernambuco	−08.724861	−035.180119	Moura et al. 2011
	Recife, Pernambuco	−8.052241	−034.928619	Moura et al. 2011
	Cabrobó, Pernambuco	−8.508234	−039.310061	Moura et al. 2011
	Agrestina, Pernambuco	−8.455510	−035.944484	Moura et al. 2011
	Rio Branco, Acre	−9.975238	−068.428000	MPEG.HOP 000094
	Rio Mucajaí, Amazonas	02.743371	−062.193000	MZUSP 3828
	Santa Inês, Maranhão	−03.664443	−045.384000	MPEG.HOP 014363
	São Cristovão, Sergipe	−11.012360	−037.208000	CHUSFS C03124
	São Luís, Maranhão	−02.539305	−044.283000	MPEG.HOP 020544
	Serra dos Carajás, Pará	−06.076818	−050.031000	MCNR 3568
	Silves, Amazonas	−02.835388	−058.213000	MZUSP 5125
	Taiano, Roraima	03.261800	−061.071000	MPEG.HOP 018330
	Usina Hidrelétrica de Jirau (Jací-Paraná), Rondônia	−09.540562	−064.373000	MPEG.HOP 023963
	Urbano Santos, Maranhão	−03.205913	−043.399000	MPEG.HOP 010419
	Vila Amazonia, prx. Parintins, Amazonas	−02.616814	−056.658000	MZUSP 5104
	Viseu, Pará	−01.439141	−046.362000	MPEG.HOP 010898
	Viseu, Pará	−01.207376	−046.142000	MPEG.HOP 011420
	Vitória do Mearim, Maranhão	−03.460267	−044.872000	MPEG.HOP 022011