

First record for the state of Rondônia and revised distribution map of *Chiroderma trinitatum* Goodwin, 1958 (Mammalia: Chiroptera: Phyllostomidae) in Brazil

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ABSTRACT: In the present work we report the first record of *Chiroderma trinitatum* Goodwin, 1958 for the state of Rondônia, northern Brazil. A map with all known records of *C. trinitatum* from Brazil is also presented. The record is based on a fluid preserved specimen with skull removed. The new record, though expected, fills a distributional gap in the Amazonic region of Brazil.

The Neotropical genus *Chiroderma* Peters, 1860 comprises six species that occur in Mexico, southward to continental Central America and the Antilles to southern South America (Gardner 2008; Taddei and Lim 2010). The five South American species, *Chiroderma doriae* Thomas, 1891, *C. salvini* Dobson, 1878, *C. trinitatum* Goodwin, 1958, *C. villosum* Peters, 1860 and *C. vizottoi* Taddei and Lim, 2010, all have a small to medium-sized forearm (38-54 millimeters) and a skull length that varies between 20 and 29 mm (Gardner 2008; Taddei and Lim 2010).

The only South American species not known in Brazil is *C. salvini*, although it has been recorded on the Bolivian border, in the department of Pando, near the northern bank of the Madre de Dios river (Anderson 1997). *C. villosum* is widely distributed in the Brazilian territory, occurring in 19 states in northern, central, eastern and southern Brazil (Gardner 2008, Peracchi *et al.* 2011). The remaining three species have a more restricted distribution: *C. doriae* occurs in Atlantic Forest, Cerrado and Pantanal habitats, and is known to occur only in eastern and central Brazil and southern Paraguay (Gregorin 1998; Gardner 2008); the recently described *C. vizottoi* is considered to be endemic to the Caatinga biome in northeastern Brazil (Taddei and Lim 2010); and *C. trinitatum* is endemic to the Amazon basin (Baker *et al.* 1994; Taddei and Lim 2010; Bernard *et al.* 2011), where it occurs sympatrically with *C. villosum* (Gardner 2008).

Two subspecies of *C. trinitatum* were recognized by Gardner (2008): *C. t. gorgasi* Handley, 1960 and *C. t. trinitatum* Goodwin, 1958. These subspecies represent two allopatric populations, with *C. t. gorgasi* distributed west of the Andes, in Colombia Ecuador, and Panama, and *C. t. trinitatum* occurring in eastern Ecuador, eastern Colombia, Venezuela, Surinam, Guianas, Peru, Bolivia, and in the Amazon basin of Brazil. Although *C. trinitatum* has been reported to occur on a number of localities from South

America (*e.g.* Gardner 1976; Anderson 1997; Simmons and Voss 1998; Lim and Engstrom 2000; Montenegro and Romero-Ruiz 2000), only eight locality records are known in Brazil (Pine *et al.* 1970; Reis and Peracchi 1987; Taddei *et al.* 1990; Nogueira *et al.* 1999; Kalko and Handley 2001; Bernard and Fenton 2002; Sampaio *et al.* 2003; Martins *et al.* 2006; review in Bernard *et al.* 2011). This study aims to report the first record of *C. trinitatum* for the state of Rondônia, northern Brazil, and to provide a map showing all known locality records for this species in Brazil.

The present record is based on a fluid preserved specimen with skull removed that is deposited in the Museu de Zoologia da Universidade de São Paulo (MZUSP), under the collection number MZUSP 35026 and field number MC 018. It is an adult female and was captured with mist nets on July 14, 2001, between the municipalities of Monte Negro and Cacaúlândia, at the right bank of the Jamari river (10°17'40" S 63°19'31" W, 143 m a.s.l.), in an Amazon forest area (Figure 1). The specimen was considered adult based on the fused epiphyses of the metacarpals and phalanges. The following cranial and external measurements were taken (following Vizotto and Taddei 1973) using a digital caliper: greatest length of the skull (GLS), postorbital breadth (PB), maxillary tooththrow length (C-M), mandibular tooththrow length (c-m), lower molar series length (lm), width across upper molars (M-M), width across upper canines (C-C), length of mandible (LMA), forearm length (FA), length of the first phalanx of the third digit (1P3) and length of the second phalanx of the third digit (2P3). We measured a total of 38 specimens of *C. doriae*, *C. salvini*, *C. villosum*, and *C. trinitatum* for comparison. Measurements of the holotype of *C. trinitatum* were obtained from Goodwin (1958). The measured specimens are deposited in the MZUSP and Museo de la Salle, Bogotá (MLS) collections.

TABLE 1. Selected external and craniodental measurements (in mm) of adult specimens of *Chiroderma doriae* from Brazil, *C. salvini* from Colombia, *C. trinitatum* from Trinidad, Venezuela, and Brazil, and *C. villosum* from Venezuela and Brazil. Average and range values are presented when more than one specimen is available for each sex. See text for character acronyms. * Values taken from Goodwin (1958).

| CHARACTERS | <i>C. trinitatum</i> | <i>C. trinitatum</i> * | <i>C. trinitatum</i> | | <i>C. doriae</i> | | <i>C. villosum</i> | | <i>C. salvini</i> | |
|------------|----------------------|------------------------|------------------------|-------|-------------------------------|-------------------------------|-------------------------------|-------------------------------|-------------------|--------|
| | NEW RECORD | HOLOTYPE | | | | | | | | |
| | 1 ♀ | 1 ♀ | 2 ♂ | 1 ♀ | 7 ♀ | 6 ♂ | 11 ♀ | 8 ♂ | 1 ♂ | 1 Ind. |
| FA | 37.99 | 40.5 | 36.99 (36.71-37.27) | 37.70 | 51.78 (50.39-53.12) | 50.56 (47.47-51.59) | 45.68 (43.92-51.17) | 44.95 (42.06-49.17) | 44.26 | 46.79 |
| 1P3 | 13.63 | - | 13.24 (12.97-13.51) | 14.01 | 19.81 (19.19-20.60) | 19.81 (18.74-20.76) | 16.17 (14.97-16.93) | 16.08 (14.54-16.77) | - | - |
| 2P3 | 21.00 | - | 19.75 (19.56-19.94) | 21.64 | 29.04 (27.27-30.00) | 28.59 (26.09-31.50) | 24.57 (22.14-26.40) | 24.10 (21.86-26.22) | - | - |
| GLS | 20.97 | 22.5 | 21.15 (20.81-21.42) | 21.50 | 28.44 (27.87-28.67) n=4 | 28.38 (27.82-29.11) n=5 | 24.55 (24.39-24.71) n=2 | 24.39 (24.11-24.70) n=3 | 25.20 | 25.67 |
| LMA | 13.86 | - | 13.79 (13.48-14.10) | 14.02 | 20.18 (19.51-20.79) n=4 | 20.01 (19.67-20.35) n=5 | 16.96 (16.79-17.13) n=2 | 16.36 (16.14-16.66) n=3 | - | - |
| c-m | 7.71 | - | 7.66 (7.57-7.75) | 7.85 | 11.27 (10.70-11.58) n=4 | 11.36 (11.13-11.60) n=5 | 9.60 (9.51-9.69) n=2 | 9.39 (9.33-9.57) n=3 | 9,7 | 10,07 |
| lm | 3.86 | - | 3.97 (3.91-4.04) | 3.95 | 5.88 (5.59-6.12) n=4 | 5.96 (5.81-6.26) n=5 | 4.95 (4.95-4.95) n=2 | 4.74 (4.51-4.84) n=3 | - | - |
| C-M | 7.17 | 7.7 | 7.22 (7.15-7.29) | 7.18 | 10.21 (9.80-10.75) n=4 | 10.42 (10.26-10.68) n=5 | 8.93 (8.89-8.97) n=2 | 8.53 (8.40-8.69) n=3 | 8.98 | 9.45 |
| PB | 5.46 | - | 5.06 (4.97-5.16) | 5.38 | 6.46 (6.40-6.50) n=4 | 6.56 (6.31-6.70) n=5 | 5.91 (5.85-5.97) n=2 | 5.90 (5.72-6.04) n=3 | 5,83 | 6,13 |
| C-C | 4.24 | - | 4.22 (4.08-4.37) | 4.61 | 6.03 (5.98-6.16) n=4 | 5.94 (5.62-6.50) n=5 | 5.65 n=1 | 4.99 (4.87-5.13) n=3 | - | - |
| M-M | 9.24 | - | 9.45 (9.17-9.73) | 9.38 | 13.16 (12.90-13.45) n=4 | 13.13 (12.91-13.35) n=5 | 11.46 n=1 | 11.08 (10.87-11.35) n=3 | 11,26 | 11,89 |

TABLE 2. Brazilian records of *Chiroderma trinitatum*. The records are plotted on the map of Figure 1.

| NUMBER | LOCALITY | COORDINATES | REFERENCE |
|--------|---|--------------------|--|
| 1 | Amapá: Floresta Nacional do Amapá | 01°18' N, 51°35' W | Martins et al. (2006); Martins et al. (2011) |
| 2 | Pará: Belém | 01°27' S, 48°30' W | Kalko and Handley (2001) |
| 3 | Pará: rio Xingu, LT Jurupari | 02°11' S, 52°17' W | This study |
| 4 | Amazonas: Projeto Dinâmica Biológica de Fragmentos Florestais (PDBFF), Manaus | 02°24' S, 59°43' W | Sampaio et al. (2003) |
| 5 | Pará: Alter do Chão | 02°30' S, 54°57' W | Bernard and Fenton (2002) |
| 6 | Amazonas: Reserva Ducke, Manaus | 03°00' S, 59°52' W | Reis and Peracchi (1987) |
| 7 | Acre: Parque Nacional da Serra do Divisor, rio Moa and serra da Jaquirana | 07°23' S, 73°41' W | Nogueira et al. (1999), Nogueira et al. (2004) |
| 8 | Acre: rio Juruá, Cruzeiro do Sul | 07°40' S, 72°40' W | Taddei et al. (1990) |
| 9 | Rondônia: rio Jamari, Monte Negro | 10°17' S, 63°19' W | This study |
| 10 | Mato Grosso: Serra do Roncador | 12°40' S, 51°46' W | Pine et al. (1970) |

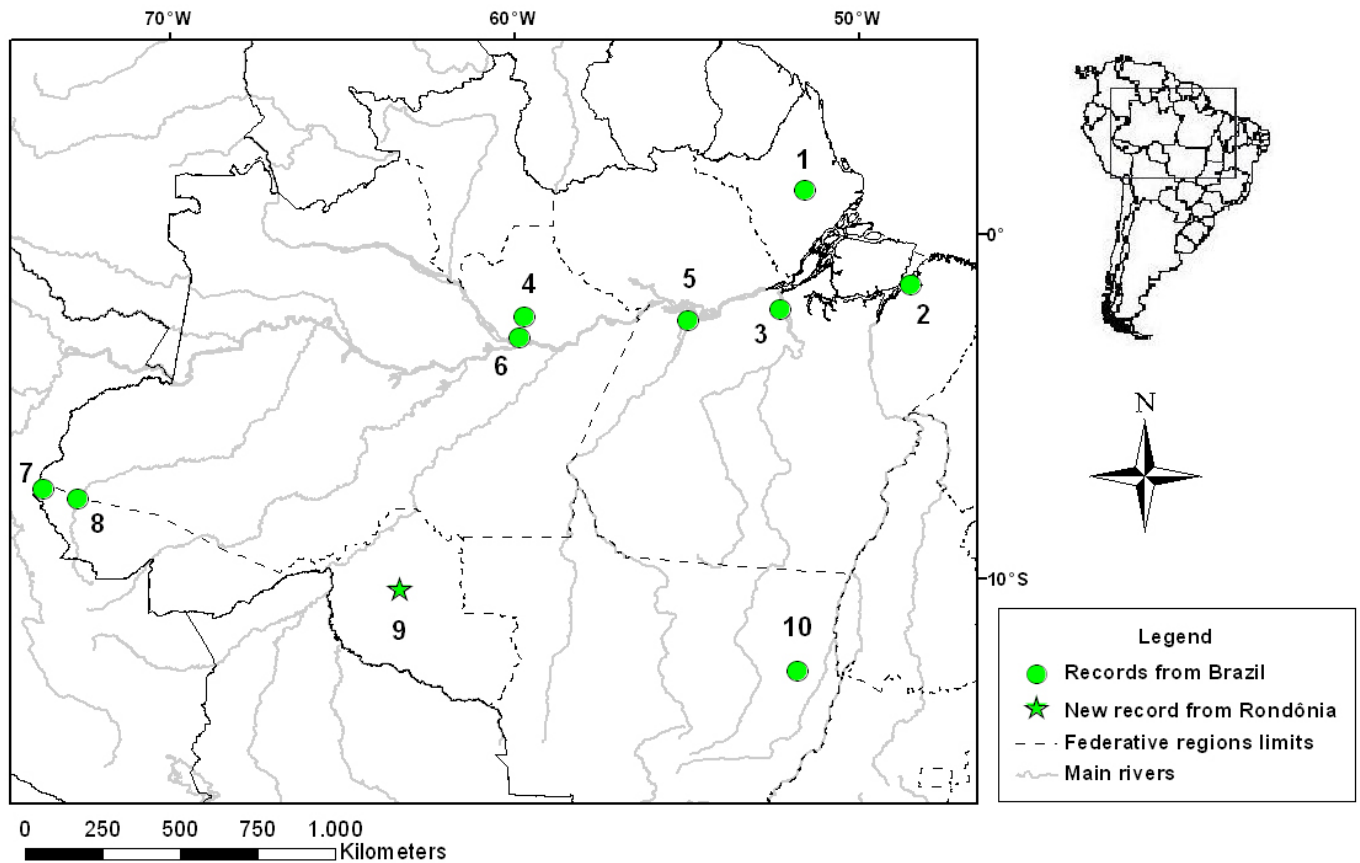


FIGURE 1. Brazilian records of *Chiroderma trinitatum*. Numbers indicate localities listed in Table 2.

The genus *Chiroderma* is easily diagnosed by its greatly reduced nasal bones, which form a notch between the two halves of the maxillary and premaxillary bones (Figure 2; Vizotto and Taddei 1973; Straney 1984). *Chiroderma trinitatum* is readily distinguishable from its congeners by forearm size and length of upper tooththrow (Goodwin 1958; Table 1), with no overlap with the larger species (Gardner 2008; Taddei and Lim 2010; Table 1). The upper inner incisors are convergent on their distal third, touching each other near the tip (Figure 2). This feature is similar with the condition found in *C. doriae* and *C. vizottoi* and different from the parallel upper inner incisors of *C. villosum* (Taddei and Lim 2010). A phylogenetic analysis based on molecular data has established a sister-group relation between *C. doriae* and *C. trinitatum* (Baker et al. 1994), which suggests that this dental character has a good phylogenetic signal.

A total of ten locality records can now be recognized for *C. trinitatum* in Brazil (Figure 1). Apart from the eight localities previously assigned in the literature, and the new record for Rondônia, an additional record for the state of Pará is registered here. Detailed information about these localities is provided in Table 2. The selected external and craniodental measurements for the specimen MZUSP 35026 fell between the expected values for *C. trinitatum* and there was no overlap with the same measurements for the larger species of *Chiroderma* (Table 1).

The record of *C. trinitatum* from Rondônia, though expected, fills a distribution gap for the species in Brazil. Nevertheless, the known Brazilian records are widely spaced from one another, and in two additional states in the Amazônia Legal Brasileira (Roraima and Maranhão) the species has not been recorded yet (Bernard et al. 2011).

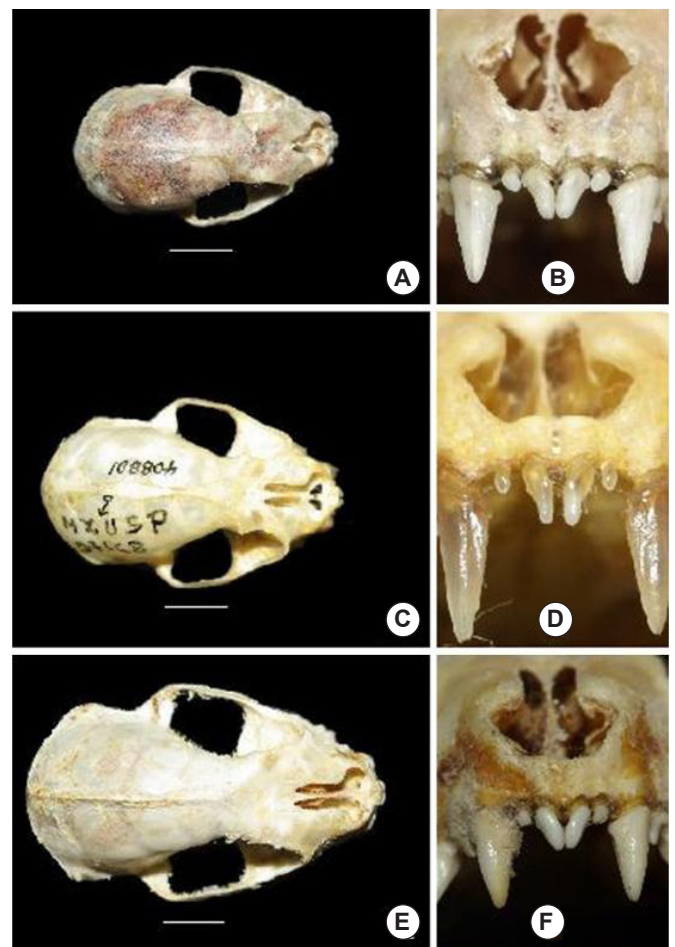


FIGURE 2. Dorsal and frontal views of skulls of *Chiroderma trinitatum* (MZUSP 35026) (A-B), *C. villosum* (MZUSP 27168) (C-D), and *C. doriae* (MZUSP 35029) (E-F). Scale = 5mm. Photo: P. Bernardo.

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APPENDIX 1. Specimens examined and respective locality information (COUNTRY: **State**, locality, *municipality*, voucher number [latitude/longitude]). See text for Museum acronyms.

Chiroderma doriae: BRAZIL: **Rio Grande do Norte**, Mata da Estrela, Usina Pedrosa, *Baía Formosa*, MZUSP 35027 [06°25' S 35°03' W]; **Mato Grosso do Sul**, Fazenda Barma, *Brasilândia*, MZUSP (28591, 28688) [21°35' S 52°07' W]; **São Paulo**, Fazenda Santa Carlota, *Cajuru*, MZUSP 35028 [21°20' S 47°14' W], *São Roque*, MZUSP 15112 [23°31' S 47°07' W], Parque Estadual da Ilha Anchieta, *Ubatuba*, MZUSP (29456, 31852) [23°32' S 45°04' W], Parque Estadual de Ilha Bela, Ilha de São Sebastião, *Ilhabela*, MZUSP 35029 [23°46' 45°20'], Barra do Ribeirão Onça Parda, *Sete Barras*, MZUSP 10632 [24°19' S 47°51' W], Caverna Morro Preto, Parque Estadual do Alto Ribeira, *Iporanga*, MZUSP 34012 [24°31' S 48°41' W], *Iguape*, MZUSP 21082 [24°43' S 47°32' W], *Cananéia*, MZUSP 26354 [25°01' S 47°57' W], Parque Estadual da Ilha do Cardoso, *Cananéia*, MZUSP 28037 [25°08' S 47°56' W].

Chiroderma salvini: COLOMBIA: **Norte de Santander**, Bochalema, *Cúcuta*, MLS 2037 [07°36' N 72°39' W]; **Florencia**, *Caquetá*, MLS 2220 [01°36' N 75°36' W].

Chiroderma trinitatum: VENEZUELA: **Amazonas**, *Belén*, MZUSP (27166, 27167) [03°39' N 65°46' W]. BRAZIL: **Pará**, rio Xingu, LT Jurupari, MZUSP 35033 [02°11' S 52°17' W]; **Rondônia**, rio Jamari, *Monte Negro/Cacaulândia*, MZUSP 35026 [10°17'40" S 63°19'31" W].

Chiroderma villosum: VENEZUELA: **Amazonas**, Chaparito, MZUSP 27168 [05°40' N 67°37' W]. BRAZIL: **Pará**, rio Trombetas, *Lago Leonardo*, MZUSP (13197, 13209) [01°11' S 56°40' W], rio Trombetas, *Lago Jacaré*, MZUSP 13335 [01°27' S 56°01' W], cachoeira do Espelho, rio Xingu, *Altamira*, MZUSP 22677 [03°39' S 52°23' W], rio Tapajós, *Uruá*, MZUSP (12627, 12628, 12629) [04°50' S 56°22' W], Centro Kaiapó de Estudos Ecológicos, *Ouritânia do Norte*, MZUSP (29150, 29151, 29152) [07°41' S 51°52' W]; **Piauí**, Parque Nacional Serra das Confusões, *Guaribas*, MZUSP 33502 [09°13' S 43°49' W]; **Rondônia**, cachoeira de Nazaré, rio Machado, *Vale do Anari*, MZUSP (20200, 20201) [09°45' S 61°55' W], Pedra Branca, *Ariquemes*, MZUSP 22827 [10°03' S 62°07' W]; **Mato Grosso**, *Aricá*, MZUSP (6494) [15°57' S 55°56' W]; **Espírito Santo**, Fazenda Santa Terezinha, *Linhares*, MZUSP (35030, 35031) [19°07' S 39°59' W], Restinga, Aracruz celulose, *Aracruz*, MZUSP 35032 [19°53' S 40°36' W].

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