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Updated distribution map and notes on the cranial morphometry of *Dasyprocta azarae* Lichtenstein, 1823, Azara's Agouti (Mammalia, Rodentia, Dasyproctidae), in South America

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Abstract

Dasyprocta azarae Lichtenstein, 1823 is currently distributed in Argentina, Brazil, and Paraguay, with controversial records in Bolivia. Recent records using trail cameras have expanded its distribution in the Chaco region of Paraguay, but its distribution remains unclear because of its morphological similarity to species in Bolivia and northwestern Argentina. We present an updated map of distribution of *D. azarae* based on the review of specimens in biological collections and literature. Our results show that *D. azarae* is distributed in four biomes, across 11 ecoregions, and has an extent of occurrence of 2,512,985 km^2.

Keywords

Biological collections, conservation, ecoregions, skull, trail cameras

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Introduction

The genus *Dasyprocta* Illiger, 1811 (Mammalia, Rodentia, Dasyproctidae) comprises 13 recognized species of large Neotropical rodents (Patton and Emmons 2015; Mammal Diversity Database 2021). *Dasyprocta* species are distributed from southern Mexico through Central America south to Paraguay and Argentina, as well as several Lesser Antillean islands, and occupy a wide variety of ecosystems from humid forests and, savannas to the arid Chaco (Patton and Emmons 2015). Within the genus, *Dasyprocta azarae* Lichtenstein, 1823, Azara's

Agouti, is one of the smallest species of the genus (<3kg) and is found in the central portion of South America, including parts of south-central Brazil, Paraguay, northern Argentina, and controversially in eastern Bolivia (Patton and Emmons 2015). However, this species has been excluded from the latter country (Teta and Lucero 2016). Its distribution includes the southwest and central-south of Brazil, from the states of Mato Grosso to the west side of the Serra do Espinhaço and Goiás in the north to the coast in the states of Rio Grande do Sul and São Paulo to the west side of the Serra do Mar, eastern Paraguay, and the provinces of Corrientes, Formosa, and Misiones in Argentina (Woods and Kilpatrick 2005; Patton and Emmons 2015). It occurs at elevations from sea level to 700 m a.s.l. (Patton and Emmons 2015). In recent years, its presence has been confirmed in western Paraguay (Tabilo et al. 2020), and additional records have been added for the northern region of Argentina (Chatellenaz et al. 2015), mostly based on trail camera records and observations, but a number of museum specimens have also been reported (Patton and Emmons 2015; Teta and Lucero 2016; Teta and Reyes-Amaya 2021).

Dasyprocta azarae inhabits ecosystems such as the Atlantic Forest, savannas, and plantations of palm trees of the genus *Attalea* Kunth. and legumes of the genus *Mucuna* Adans. (Almeida and Galetti 2007; Zimmermann et al. 2012; Catzeflis et al. 2016). It feeds on mangoes, avocados, cashews, and other domestic crops (Patton and Emmons 2015; Tabilo et al. 2020). It is abundant and is frequently recorded with trail cameras (Kasper et al. 2007). *Dasyprocta azarae* is an important seed disperser (Da Silva et al. 2011). Nonetheless, there are several information gaps in the status of its populations, biology, distribution, and ecology, which is reflected in its conservation assessment, as it is currently globally listed as Data Deficient by the International Union for Conservation of Nature (Catzeflis et al. 2016). For example, although its presence has been suggested in some areas such as western Paraguay, and it probably extends north to the Beni River in Bolivia, there is no evidence to support its presence there (Patton and Emmons 2015). Its distribution is not entirely well defined, as then the eastern limits of *D. variegata* Tschudi, 1845 and the western boundary of *D. azarae* are unclear; additional specimens are much needed to delineate more accurately the distributional range of these taxa, especially from Chacoan areas in eastern Bolivia and western Paraguay (Teta and Lucero 2016; Teta and Reyes-Amaya 2021). In consequence, there are currently two different distribution hypotheses for *D. azarae* and *D. variegata* (Patton and Emmons 2015; Teta and Reyes-Amaya 2021).

According to Iack-Ximenes (1999), *D. azarae* and *D. variegata* can be differentiated mainly by the deposition of hair pigments and by the different types of hair present in regions of the body (especially the rump), characteristics that are still used for the delimitation of species (Patton and Emmons 2015). Recent studies have suggested some discrete cranial characters and cranial-dental measurements showing variation in populations of *D. azarae* in the northeast and the possible presence of *D. variegata* in the northwestern region of Argentina (Teta and Lucero 2016; Teta and Reyes-Amaya 2021). Clarifying the distribution limits of *D. azarae* and *D. variegata* by comparing the biomes these species inhabit might be useful, considering that *Dasyprocta* exhibits a larger exclusivity in their distributional ranges, in comparison with other large rodents, probably driven by the strongly contiguous allopatry among agouti species (Maestri and Patterson 2021). Similarly, morphometric information might be relevant to evaluate specific limits of the genus in the southern part of South America (Patton and Emmons 2015). To help fill gaps in the knowledge of *D. azarae*, we provide an updated database of distributional records based on museum specimens and other published and unpublished records, an updated map, and cranial morphometric data, which is potentially useful in discriminating species.

Methods

To obtain cranial morphometric data, we reviewed specimens of *Dasyprocta azarae* deposited in the Zoologische Staatssammlung München, (ZSM), Germany, and the Field Museum of Natural History (FMNH), Chicago, USA. We took cranial measurements with digital calipers to the nearest 0.01 mm, as suggested in previous studies (e.g., Ojasti 1972; Ramírez-Chaves et al. 2018), including: condylo-incisive length (CIL), length of diastema (LD), length of maxillary toothrow (MTR), length of molars (LM), breadth of M1 (BM1), breadth of P4 (BP4), breadth of palatal bridge (BPB), nasal length (LN), least interorbital breadth (LIB), breadth of braincase (BB), zygomatic breadth (ZB), zygomatic length (ZL). We compared the measurements using descriptive statistics (means and ranges) and a principal component analysis (PCA) to explore differentiation in the geometric morpho-space together with other five other species of *Dasyprocta*: *D. fuliginosa* Wagler, 1832, *D. leporina* (Linnaeus, 1758), *D. punctata* Gray, 1842, *D. prymnolopha* Wagler, 1831, and *D. variegata*. With the analyses, we also explored the morphometric distinction in skull size between the two species thought to be present in Argentina, Bolivia, and Paraguay, according to Teta and Lucero (2016) and Teta and Reyes-Amaya (2021). We also performed a PCA to explore intra- and interspecific differentiation in morpho-space.

To update the distribution of *D. azarae*, we searched for additional localities in the literature and online databases such as the Global Biodiversity Information Facility (GBIF). From GBIF, we included records that were supported by museum vouchers (Appendix 1 Table A1); however, we emphasize that these records warrant a physical evaluation for better taxonomic verification. With this information, we calculate the distribution area and list the terrestrial biomes and ecoregions (Dinerstein

et al. 2017) that *D. azarae* inhabits. To provide additional information for future assessment of threats, we also estimated the extent of occurrence (EOO) and area of occupancy (AOO). We calculated the EOO using the minimum convex polygon method and the AOO by summing the area of grid squares in GeoCAT (Bachman et al. 2011) in which the species is known, using grid squares of 2 km² as recommended by the IUCN (2010).

Results

We found 141 records that provide evidence of *D. azarae* in Argentina, Brazil, and Paraguay. Of these, 73 records are based on specimens collected between 1900 and 1951 and housed at the ZSM, eight records based on specimens collected between 1902 and 1946 and housed at the FMNH, 28 records in online databases, and 40 records previously reported in the literature (Appendix Table A1). Nine records are from three previously unreported localities in southwestern Paraguay and Brazil. The records in Paraguay and Brazil come from four biomes: Tropical Dry Broadleaf Forest, Tropical and Subtropical Grasslands, Savannas and Shrublands, and Flooded Grasslands and Shrublands. We also found that *D. azarae* is present in 11 ecoregions (Fig. 1A). The records come from an elevational range between sea level to 700

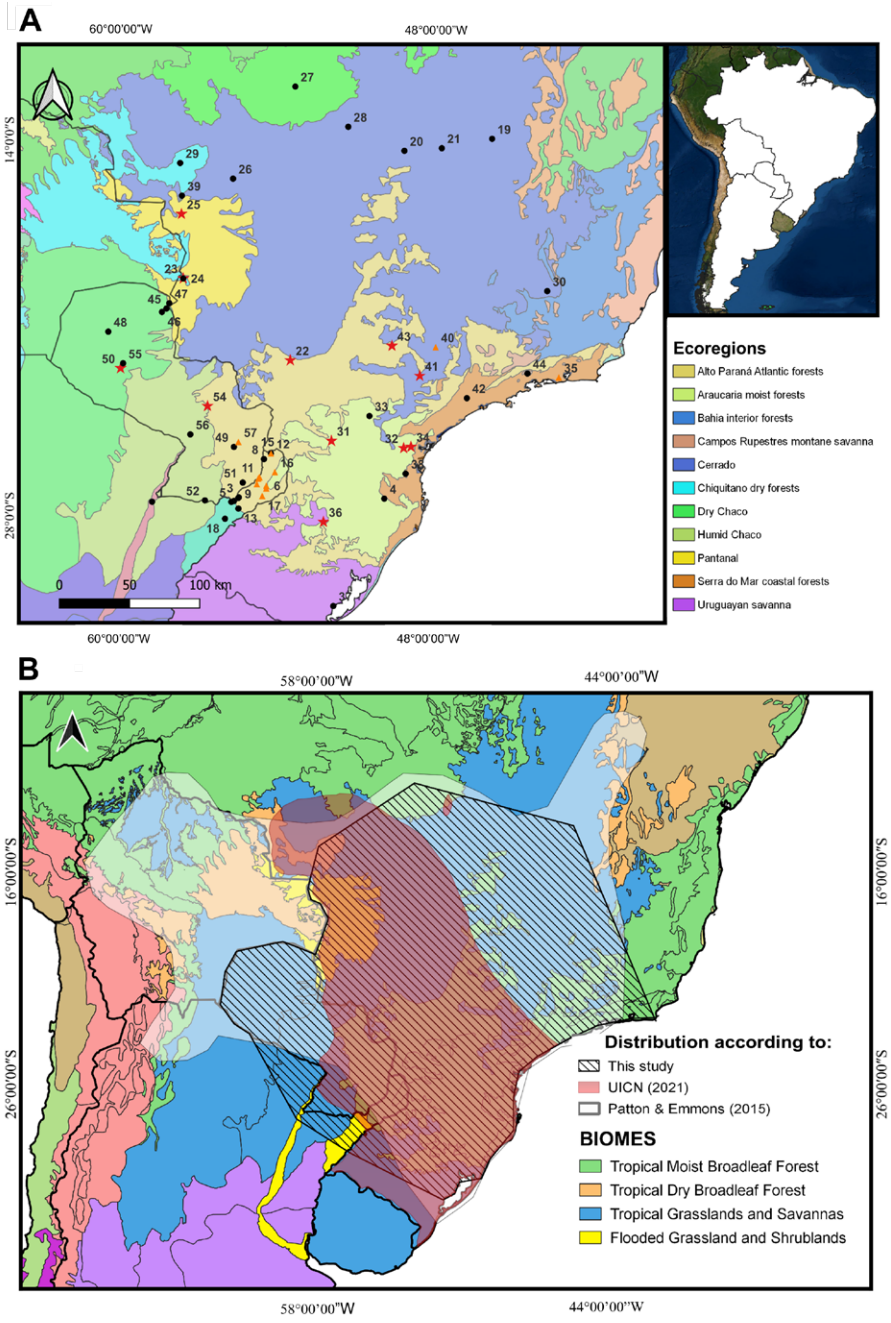

Figure 1. Updated records of *Dasyprocta azarae* in the ecoregions and biomes of Argentina, Brazil, Bolivia, and Paraguay. **A.** Distribution by ecoregions. New records (red stars) are based on museum vouchers reviewed in this study. Previously known points of occurrence include museum specimens available in databases (orange triangles) and records in literature (black dots). **B.** Distribution by biomes including previous polygons of the distribution suggested by the IUCN (Catzeflis et al. 2016) and preview studies (Patton and Emmons 2015).

m. We exclude one anomalous record at 1,700 m (the type locality of *Dasyprocta variegata yungarum* Thomas, 1910, which was listed as a junior synonym of *D. azarae* by Patton and Emmons (2015) but not by the Mammal Diversity Database (2022). The AOO of the species is 228 km^2 and the EOO is 2,512,985 km^2 (Fig. 1B).

***Dasyprocta azarae* Lichtenstein, 1823**
Figure 2

New records. BRAZIL – **Paraná** • Municipality of Curitiba; 25°28′45″S, 049°18′19″W; 936 m a.s.l.; 1908; leg. Gründing; 1 ♂ adult, 1 adult sex unknown, skin, ZMS1908/404, ZMS-1938/273 • Municipality of Curitiba; 22°54′30″S, 053°37′30″W; 235 m a.s.l.; 03.II.1839; Leg. Kühlhorn; 3 ♂ adult, skin and skull, ZSM 1938/15, ZSM 1938/275, ZSM 1938/3025 • Municipality of Piraquara, Roca Nova, Serra do Mar; 25°25′58″S, 049°01′59″W; 1150 m a.s.l.; 26.IX.1900, 26.VIII.1901; leg. J.A. Robert; 2 ♀ adult, skin, ZSM 1900/201, ZMS 1901/117 – **Mato Grosso do Sul** • Municipality of Invihema, Rio Ivinhema; 22°12′28″S, 053°35′24″W; 377 m a.s.l.; 20.V.1938, 07.VII.1938; leg. Kühlhorn; 1 ♂ adult, 2 ♂ juvenile, 2 ♀ adult, skin and skull, ZMS 1838/143-1838/144, ZMS 1838/154; skin, ZMS 1938/271-1838/272 • Municipality of Cáceres; 16°45′00″S, 057°42′00″W; 142 m a.s.l; 30.V.1927; leg. A.M. Olalla; 1 ♀ adult, skin and skull, FMNH 52333 • Municipality of Ladárido; 19°09′00″S, 057°38′00″W; 971 m a.s.l.; 17.VIII.1926; leg. C. C. Sanborn; 2 ♀ adult, skin and skull, FMNH 26724-26725 • Municipality of Passo Fundo; 28°13′49″S, 052°20′19″W; 746 m a.s.l.; 15.II.1926, 14.IV.1928; leg. Barbieux; 3 adult sex unknown, 4 juvenile sex unknown, 39 unknown, skin, ZMS 1926/116, ZMS 1926/325-1926/326, ZMS 1927/55, ZMS 1928/184, ZMS 1928/239, ZMS 1928/291-1928/307, ZMS 1930/23-1930/27, ZMS 1831/95-1931/108; skull, ZMS 1928/308, ZMS 1928/311 – **São Paulo** • Municipality Araçatuba, Fazenda Varjão; 20°54′40.7″S, 050°43′36.0″W; 417 m a.s.l.; 06.II.1941; leg. A.M. Olalla; 2 ♀ adult, skin and skull, FMNH 52333, FMNH 52334 • Municipality Botucatu, 570 m from Vitoriana; 22°47′00.0″S, 048°24′00.0″W; 570 m s.a.l.; 15.III.1902; leg. A. Hempel; 1 ♂ adult, skin, FMNH 18882.

PARAGUAY – **San Pedro** • Nueva Germania, Gran Chaco; 23°54′42″S, 056°41′55″W; 139 m a.s.l.; 15.I.1931, 23.II.1931; leg. Krieg; 5 ♂ adult, 1 ♂ juvenile, 1 ♀

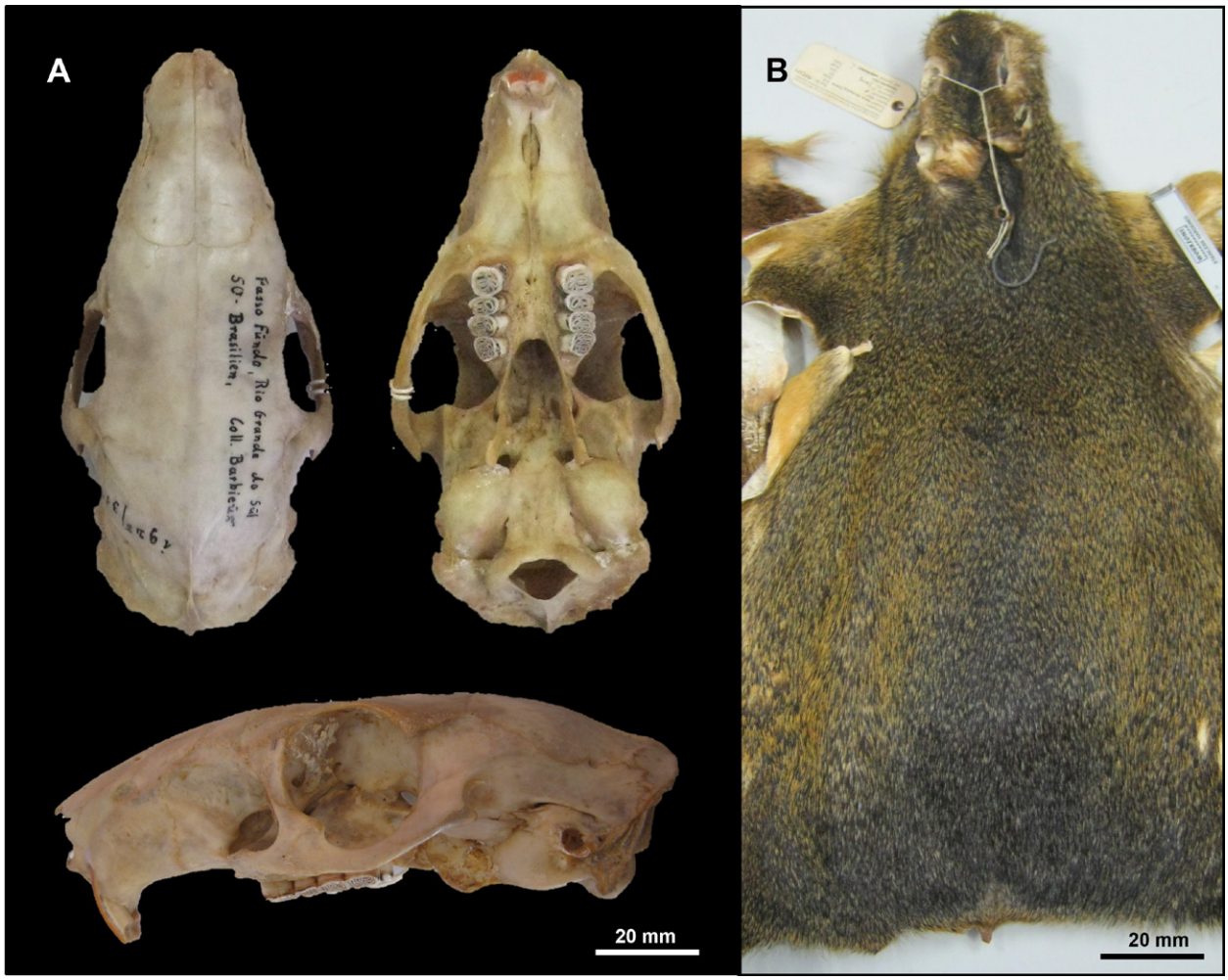

Figure 2. *Dasyprocta azarae*. **A.** Details of the skull, from Brazil (ZSM 1928-311 condylo-basal length is 92.86 mm) **B**. Details of a skin, from Paraguay (ZSM 1931-371).

adult, 2 ♀ juvenile, skin and skull, ZMS 1926/433, ZMS 1931/370–1931/377.

Identification. We identified the specimens as *D. azarae* using external traits (Fig. 2): small size and color overall grayish, with yellow to orange tones, and mid-back and rump darker than sides but of same tone. Other small *Dasyprocta* species living with overlapping geographic ranges lack the overall homogeneous yellow-olivaceous color coupled with grayish to blackish hindquarters (Patton and Emmons 2015).

Cranially, the reviewed specimens present traits that match those described for *D. azarae* by Teta and Lucero (2016): the nasofrontal suture is W-shaped; the orbital branch of the maxilla is not interrupted by the lacrimal bone, and the middle palatine process is absent. Like previous studies, we found no marked differences in skull size between female and male specimens, and measurements overlap in both sexes (CIL: 85.40–90.63 mm in females, 86.10–91.86 in males), although smaller marginal values can be found in females (Table 1).

Our morphometric analyses at the interspecific level show that the first two components of the PCA using seven cranial and three mandibular measurements of 30 specimens of *D. azarae* and 85 specimens of other species accounted for 97.20% (PC1 = 78.175%, PC2 = 19.026 %) of the variation (Table 2). The measurements that contributed the most to the variation are the condylo-incisive length and the nasal length in the PC1, and the zygomatic breadth in the PC2 (Fig. 3A). Similarly, in the intraspecific analyses including 30 specimens of *D. azarae* from Argentina, Bolivia, Brazil, and Paraguay, the first two components of the PCA accounted 99.21% (PC1 = 95.052%, PC2 = 4.1547%) of the variation, which is due to the condylo-incisive length and nasal length measurements in the first principal component and the zygomatic breadth in the second principal component (Fig. 3).

The PCA plots also reveal that the *D. azarae* is segregated along the first principal component for the cranial variables. This component represents size, confirming that the *D. azarae* is consistently smaller than other species of *Dasyprocta* from South America. In addition, the specimens assigned to *D. azarae* are mostly separated in the geometric space of species such as *D. variegata* which are larger, and with *D. leporina* that although overlap in the PC1 and PC2, *D. azarae* is generally smaller (Fig. 3A). Additionally, PC2 shows segregation between the *Dasyprocta* species, where *D. fuliginosa* and *D. prymnolopha* are segregated on the negative axis. Furthermore, the PCA reveals a segregation in the geometric space of *D. azarae* from localities in Argentina–Bolivia and those in Brazil (Fig. 3B).

Discussion

We largely confirm the hypothesis on the distribution of *Dasyprocta azarae* suggested by Teta and Reyes-Amaya (2021). However, we propose that the geographic distribution of this species is almost twice that suggested by Catzeflis et al. (2016). We also provide EOO and AOO which have not been previously calculated. Our results

Table 1. Cranio-dental measurements of specimens of *Dasyprocta azarae* from Argentina, Brazil, Bolivia, and Paraguay. The values include the *N*, ranges (parentheses), average and standard deviation. Data for *Dasyprocta variegata* come from Teta and Lucero (2016).

Measurement (mm)	Brazil Argentina			Paraguay Argentina *D. variegata*		Teta and Lucero 2016		Teta and Reyes–Amaya 2021		Bolivia *D. variegata*		
						Bolivia *D. variegata*						
	Male	Female	Unknown	Male	Female	Unknown	Unknown	Unknown	Unknown	Unknown	Female	Male
CIL	1 (86.14)	6 (85.40–0.63) 89.1 ± 1.66	2 (88.66–92.7) 90.68 ± 2.85	5 (84.42–1.86) 87.2 ± 2.9	1 (90.97)	9 (82.65–3.51) 88.279 ± 3.39	4 (85.96–90.6) 88.18 ± 1.94	2 (94.74–96.54) 95.64 ± 1.27	8 (88.23–99) 94.64 ± 3.86	13 (88.4–102.1) 92.79 ± 3.19	28 (89–99.6) 93.8 ± 3.46	17 (88.2–96.7) 93.44 ± 3.36
LD	2 (24.98–26.3) 25.64 ± 0.93	6 (24.91–8.02) 26.20 ± 1.44	2 (24.97–27.9) 26.43 ± 2.07	5 (24.1–28.55) 25.73 ± 1.7	1(25.84)	9 (24.48–27.3) 26.52 ± 0.89	4 (26.27–9.85) 28.42 ± 1.60	2 (30.58–31.55) 30.96 ± 0.54	8 (26.56–31.62) 29.25 ± 1.82	20 (25.2–32.8) 27.76 ± 2.68	31 (24.2–1.9) 28.11 ± 1.94	27 (24.6–32.2) 28.04 ± 2.05
MTR	2 (17.82–18.30) 18.06 ± 0.33	6 (17.54–8.88) 18.21 ± 0.57	2 (18.48–18.5) 18.49 ± 0.01	5 (16.47–8.15) 17.45 ± 0.73	1 (18.47)	9 (18.33–9.86) 19.1 ± 0.56	4 (17.64–8.49) 18.14 ± 0.40	2 (21.24–1.75) 21.49 ± 0.36	8 (17.32–20.05) 19.03 ± 0.87	17 (17.1–0.3) 18.58 ± 2.22	27(16.9–20.5) 18.9 ± 0.85	21 (17.2–20.06) 18.74 ± 1.3
LM	2 (12.95–13.15) 13.05 ± 0.14	6 (11.67–3.10) 12.24 ± 0.47	2 (13.08–13.6) 13.34 ± 0.36	5 (12.1113.64) 12.8 ± 0.56	1 (13.44)	—	—	—	—	17 (12.5–4.9) 13.82 ± 0.59	27(13–14.4) 13.68 ± 0.63	21 (12.4–15) 13.61 ± 0.61
BM1	2 (4.02–4.07) 4.36 ± 0.48	6 (4.21–4.99) 4.75 ± 0.34	2 (4.53–4.69) 4.61 ± 0.11	5 (4.43–4.92) 4.56 ± 0.23	1 (5.02)	—	—	—	—	19 (4.1–5.4) 4.61 ± 0.42	28 (4.3–6.5) 4.78 ± 0.48	22 (3.9–5.9) 4.77 ± 0.46
BP4	2 (4.57–5.18) 4.875 ± 0.43	6 (4.40–6.16) 5.29 ± 0.58	2 (4.37–4.70) 4.53 ± 0.23	5 (4.28–5.22) 4.75 ± 0.37	1 (5.27)	—	—	—	—	19 (3.7–5.7) 4.74 ± 0.63	28 (3.7–7.1) 4.98 ± 0.67	23 (4.1–6.2) 5.02 ± 0.64
BPB	2 (8.31–8.32) 8.315 ± 0.007	6 (7.89–9.95) 8.84 ± 1.11	2 (7.68–7.75) 7.15 ± 0.05	5 (7.34–9.25) 8.14 ± 0.7	1 (7.85)	—	—	—	—	20 (8.0–11.5) 9.19 ± 0.89	31 (7.1–11.7) 9.21 ± 0.77	27 (7.4–10.7) 9.26 ± 0.80
LN	2 (36.81–36.82) 36.82 ± 0.007	6 (34.97–38.65) 37.37 ± 1.53	2 (36.96–38.83) 37.9 ± 1.32	5 (32–62–37.08) 35.1.8 ± 1.67	1 (37.45)	9 (31.75–37.26) 34.42 ± 1.86	4 (32.89–35.3) 34.34 ± 1.16	2 (41.5–42.97) 42.23 ± 1.04	8 (32.91–46.97) 40.33 ± 4.01	20 (36.7–46.0) 40.94 ± 2.55	29 (38.4–45.6) 41.59 ± 2.20	26 (35.7–44.2) 41.39 ± 2.11
LIB	2 (27.57–29.54) 28.555 ± 1.39	6 (26.88–30.22) 28.76 ± 1.17	2 (28.22–30.08) 29.15 ± 1.32	5 (26.93–31.28) 28.33 ± 1.8	1 (29.09)	9 (26.39–29.47) 27.90 ± 1.14	4 (26.27–29.85) 28.42 ± 1.60	2 (30.48–31.35) 30.95 ± 0.54	8 (25.98–33.68) 31.14 ± 2.52	20 (28.6–32.9) 30.58 ± 1.24	31 (26.9–35.9) 30.65 ± 1.76	27 (26.3–35.1) 30.67 ± 1.88
BB	2 (34.21–35.31) 34.76 ± 0.77	6 (31.35–35.10) 33.48 ± 1.89	2 (34.12–35.51) 34.81 ± 0.98	5 (34.28–37.01) 35.11 ± 1.11	1 (35.62)	—	—	—	—	20 (35–39.5) 36.91 ± 1.36	31 (34.6–40.1) 36.94 ± 1.41	25 (34.4–40) 36.97 ± 1.40
ZB	2 (47.46–47.58) 47.52 ± 0.084	6 (45.38–49.54) 48.12 ± 2.37	2 (48.94–49.86) 49.4 ± 0.65	5 (44.28–50.59) 47.89 ± 2.7	1 (46.76)	9 (44.43–49.83) 46.75 ± 2.07	4 (46.07–50.64) 48.14 ± 2.01	2 (50.31–52.45) 51.38 ± 1.52	8 (47.85–54.3) 51.50 ± 2.21	17 (48.7–55.1) 50.69 ± 1.88	30 (47.3–53.8) 50.77 ± 1.78	25 (47.1–53.6) 50.59 ± 1.8
ZL	2 (24.44–26.93) 25.685 ± 1.76	6 (25.75–8.63) 27.08 ± 1.20	2 (28.27–1.27) 30.03 ± 1.76	5 (25.63–8.03) 27.28 ± 0.94	1 (29.82)	9 (82.65–93.51) 88.279 ± 3.39	4 (85.96–90.6) 88.18 ± 1.94	2 (94.74–6.54) 95.64 ± 1.27	—	19 (25.8–32.0) 28.96 ± 1.16	31 (26.3–31.1) 28.71 ± 1.59	26 (27.2–31.9) 28.85 ± 1.5

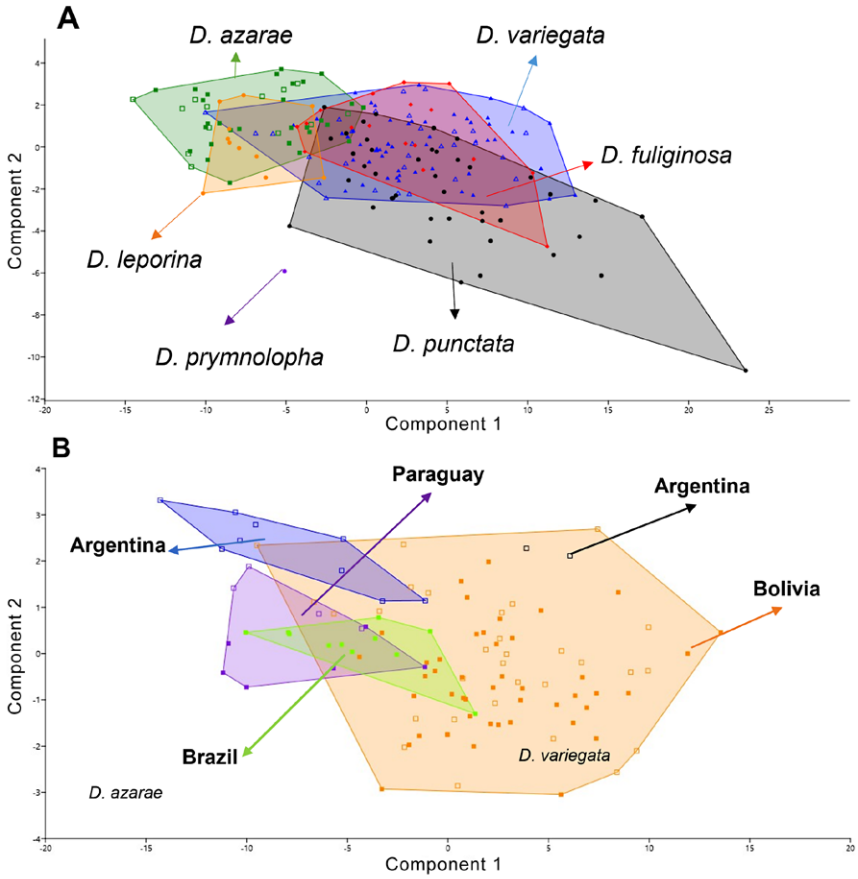

Figure 3. PCA plot (first two PCs) of species of *Dasyprocta* from South America. **A.** Craniodental measurements for five species: *D. azarae* (green squares), *D. fuliginosa* (red diamond), *D. leporina* (orange dots), *D. prymnolopha* (purple triangles) and *D. variegata* (blue triangles). **B.** Craniodental measurements for population of *D. azarae* and *D. variegata* from Argentina, Bolivia, Brazil, and Paraguay. Filled squares represent the specimens measured by us and squares the specimens reported by Teta and Reyes-Amaya (2021).

show that *D. azarae* occurs in Argentina, Brazil, and Paraguay, and that recent records based on trail cameras in Paraguay likely represent *D. azarae* (Tabilo et al. 2020). Trail-camera records of Maffei et al. (2002), Chatellenaz et al. (2015), and Tabilo et al. (2020), together with the museum vouchers, show that *D. azarae* is a widely distributed species in southern South America and is easily observable in various ecosystems. In turn, this species is susceptible to excessive hunting by humans (Kasper et al. 2007).

Cranially, the reviewed specimens fall within the morphometric ranges known for *D. azarae* and are generally smaller than *D. variegata* (Teta and Lucero 2016). In addition, the morphometric variation found among *D. azarae* populations provide us with information on their morphological limits throughout their distributional range. The differences found between the populations of Brazil and Argentina may be due to differences in environmental characteristics of the differing biomes. Although *D. azarae* is cranially smaller than *D. variegata*, there is overlap when specimens from Bolivia are included in the analyses (Iack-Ximenes 1999; Maffei et al. 2002; Patton et al. 2015). Nevertheless, altitude, biomes, and external morphological traits are useful in distinguishing these species.

For high-elevation localities in Bolivia, our results match the findings of Teta and Lucero (2016), who suggested that populations in the department of Santa Cruz might belong to *D. variegata*. This agrees with the geographical characteristics of the regions, as there is a transition west of Santa Cruz and extending to northwestern Argentina between the Tropical Dry Broadleaf Forest and Tropical Moist Broadleaf Forest biomes (Olson et al. 2001). The environmental characteristics of these biomes may be a geographic barrier to these morphologically similar species. Additional morphological study of *D. azarae* and *D. variegata* might help to solve the taxonomic problems and geographical limits of these species (Patton and Emmons 2015).

The information we provide contributes to the cranial morphometrics of *Dasyprocta* species in South America. Currently such data are available only from some regions (e.g., Teta and Lucero 2016; Ramírez-Chaves et al. 2018) or select species (Teta and Reyes-Amaya 2021). For example, the absence of clear morphometric gaps between female and male skulls suggests the absence of sexual dimorphism in *D. azarae*; this phenomenon has not been previously assessed but was suggested for other *Dasyprocta* species (Ojasti 1972). This information can be also used to evaluate biogeographic patterns related to body size (Bergmann's rule) and geographic range (Rapoport's rule) within *Dasyprocta*, as has been

evaluated for other widely distributed groups of rodents (Maestri and Patterson 2021). Finally, we also consider that the distributional information has use in updating the global and national conservation status of *D. azarae* (Catzeflis et al. 2016).

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Authors' Contributions

Data curation: IYMF, BDP. Formal analysis: IYMF, PAOL, FARP, HERC. Investigation: IYMF, PAOL, FARP. Methodology: HRC. Visualization: IYMF, HERC Writing – original draft: IYMF, HERC. Writing – review and editing: PAOL, FARP, BDP.

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Appendix

Table A1. Occurrence data for *Dasyprocta azarae* in the South America based on literature, online databases, and specimens from biological collections. Abbreviations are: the Field Museum of Natural History (FMNH); Fundación de História Natural Félix de Azara (FHNFA); Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN); Museum of Comparative Zoology (MCZ); Museu de História Natural Capão da Imbuia (MHNCI); National Museum of Natural History of Paraguay (MNHNP); Museu Nacional do Rio de Janeiro (MNRJ); Museu de Zoologia da Universidade de São Paulo (MZUSP); Coleção de Mamíferos, Departamento de Zoologia, Universidade Nacional de Brasília, Brasília, Brazil (UNB); Smithsonian National Museum of Natural History (USNM); Coleção de Mamíferos do Museu de Zoologia da Universidade de Campinas (ZUEC); Zoologische Staatssammlung München (ZSM). Literature records, Maffei et al. (2002), Massoia et al. (2006), Chatellenaz et al. (2015), González et al. (2019). Caballero-Gini et al. (2020), and Tabilo et al. (2020), are from camera trapping.

No.	Country	Locality	Elevation (m)	Coordinates	Reference
1	Argentina	Corrientes, Santa Teresita	66	27°28′43.0″S, 058°48′33.8″W	Teta and Lucero 2016; Teta and Reyes-Amaya 2021: MACN-Ma 3.51
2	Argentina	Misiones, Candelaria	91	27°27′00″S, 055°43′00″W	Massoia et al. 2006
3	Argentina	Misiones, Candelaria, Loreto	122	27°18′59″S, 055°32′04″W	Teta and Lucero 2016: MACN-Ma 35.14, MACN-Ma 35.11-35.12, MACN-Ma 34.678; Teta and Reyes-Amaya 2021: MACN-Ma 35.10
4	Argentina	Misiones, desembocadura del arroyo Itaembé	895	27°21′48″S, 050°02′27″W	Massoia et al. 2006
5	Argentina	Misiones, Garupá	92	27°29′07″S, 055°49′10″W	Massoia et al. 2006
6	Argentina	Misiones, Guaraní	432	26°53′04.1″S, 054°29′54.7″W	GBIF: FHNFA-CFA04590, FHNFA-CFA05886
7	Argentina	Misiones, Guaraní, San Vicente	513	26°58′60″S, 054°30′00″W	GBIF: FHNFA-CFA09427
8	Argentina	Misiones, Iguazú, Río Urugua-í, 30 km de Puerto	118	25°53′14″S, 054°35′07″W	Teta and Lucero 2016, Teta and Reyes-Amaya 2021: MACN-Ma 49.348; MACN-Ma51.16; MACN-Ma 50.572
9	Argentina	Misiones, Libertador General San Martín	214	26°49′20.0″S, 054°51′11.1″W	GBIF: MACN-Ma 11-1
10	Argentina	Misiones, Montecarlo, Laprida	202	26°34′10.7″S, 054°45′20.7″W	GBIF: FHNFA CFA06958
11	Argentina	Misiones, Montecarlo	211	26°34′02.1″S, 054°45′03.0″W	GBIF: MACN-Ma 20425
12	Argentina	Misiones, Parque Nacional Iguazú	187	25°40′59″S, 054°27′16″W	Patton and Emmons 2015
13	Argentina	Misiones, Parque Provincial de la Sierra	171	27°44′00″S, 055°33′00″W	Chatellenaz et al. 2015: human observation
14	Argentina	Misiones, Puerto San Juan	186	27°20′00″S, 055°33′00″W	Massoia et al. 2006
15	Argentina	Misiones, Santo Domingo	248	25°40′49″S, 054°19′09.4″W	GBIF: MACN-Ma 24908
16	Argentina	Misiones, San Pedro	544	26°22′47.6″S, 054°10′23.4″W	GBIF: FHNFA CFA06294
17	Argentina	Misiones, Torta Quemada	447	27°16′00″S, 054°39′00″W	GBIF: FHNFA CFA04525- CFA04526
18	Argentina	Santo Tomé, Gobernador Virasoro, Predios grupo Las Marías	130	28°06′39″S, 056°03′23″W	Chatellenaz et al. 2015
19	Brazil	Bahia, Fazenda Jatobá-Floryl	892	13°57′00″S, 045°57′59″W	Patton and Emmons 2015: UNB-1560
20	Brazil	Goiás, Pouso Alto (Picanjuba)	666	14°23′48″S, 049°16′42″W	Patton and Emmons 2015: USNM-283473
21	Brazil	Goiás, Rio São Miguel	690	14°18′00″S, 047°52′00″W	Patton and Emmons 2015: MNRJ-2305
22	Brazil	Mato Grosso do Sul, Ivinhema, Rio Ivinhema,	377	22°12′28″S, 053°35′24″W	This study: ZSM-1938/143; ZSM-1938/144; ZSM-1938/154; ZSM-1938/271; ZSM-1938/272
23	Brazil	Mato Grosso do Sul, Ladário, Urucum	138	19°09′00″S, 057°38′00″W	This study: FMNH 26724; FMNH-26725
24	Brazil	Mato Grosso do Sul, Urucum, near Corumbá, Maracaju	146	19°09′28″S, 057°37′59″W	Patton and Emmons 2015: MNRJ-4612
25	Brazil	Mato Grosso, Cáceres	114	16°45′00″S, 042°00′00″W	This study: FMNH 28336
26	Brazil	Mato Grosso, Chapada dos Guimarães	654	15°25′59.98″S, 055°45′00″W	Patton and Emmons 2015: USNM-113431
27	Brazil	Mato Grosso, Jacaré, alto Rio Xingu	315	12°00′00″S, 053°24′00″W	Patton and Emmons 2015: MNRJ-11974
28	Brazil	Mato Grosso, São Domingo	229	13°30′00″S, 051°24′0.32″W	Patton and Emmons 2015: MZUSP-6986
29	Brazil	Mato Grosso, Tapirapuã	185	14°51′03″S, 057°45′26″W	Patton and Emmons 2015: MNRJ-904
30	Brazil	Minas Gerais, Lagoa Santa, Rio das Velhas, Lassance	767	19°37′36.9″S, 043°52′59″W	Patton and Emmons 2015: MNRJ-2304
31	Brazil	Paraná, Cantagalo	851	25°12′32″S, 052°02′04″W	This study: ZSM-1938/273
32	Brazil	Paraná, Curitiba	936	25°28′45″S, 049°18′19″W	This study: ZSM-1908/404; ZSM-1938/15; ZSM-1938/275; ZSM-1938/3025
33	Brazil	Paraná, Monte Alegre	795	24°17′01″S, 050°36′02″W	Patton and Emmons 2015: MHNCI-485
34	Brazil	Paraná, Roça Nova, Piraquara, Serra do Mar.	1150	25°25′58″S, 049°01′59″W	This study: ZSM-1901/117; ZSM-1900/201

No.	Country	Locality	Elevation (m)	Coordinates	Reference
35	Brazil	Río de Janeiro, Rio de Janeiro, Realengo	27	22°50′51.0″S, 043°26′54.6″W	GBIF: MCZ-1842
36	Brazil	Río Grande do Sul, Passo Fundo	746	28°13′49″S, 052°20′19″W	This study: ZSM-1926/116; ZSM-1926/325–1926/326; ZSM-1927/55; ZSM-1928/184; ZSM-1928/239; ZSM-1928/291–1928/292; ZSM-1928/294–ZSM-1928/308; ZSM-1928/311; ZSM-1930/23–1930/27; ZSM-1931/100–1931/108; ZSM-1931/130; ZSM-1931/379–1931/380; ZSM-1931/95–1931/99
37	Brazil	Rio Grande do Sul, São Lourenço do Sul	13	31°21′55″S, 051°58′42″W	Patton and Emmons 2015: MZUSP-249
38	Brazil	Santa Catarina, Corupá	58	26°25′59″S, 049°13′42″W	Patton and Emmons 2015: MSCJ
39	Brazil	Mato Grosso, Cáceres	677	16°04′S, 057°41′W	Patton and Emmons 2015: MNRJ-5833
40	Brazil	São Paulo, Américo Brasiliense	742	21°43′12″S, 048°05′59″W	GBIF: ZUEC-1457; ZUEC-1464; ZUEC-1467; ZUEC-1476; ZUEC-1477; ZUEC-1686; ZUEC-1708
41	Brazil	São Paulo, Botucatu	536	22°47′00″S, 048°42′00″W	This study: FMNH-18882
42	Brazil	São Paulo, Cotia	821	23°36′06″S, 046°55′12″W	Patton and Emmons 2015: MZUSP-25531Locality type
43	Brazil	São Paulo, Lins, Vila America	417	21°40′00″S, 049°45′00″W	This study: FMNH-52333; FMNH-52334
44	Brazil	São Paulo, Serra da Bocaina	1719	22°42′00″S, 044°37′59″W	Patton and Emmons 2015: MZUSP-25792
45	Paraguay	Alto Paraguay, Estancia Cerro Corá	90	20°16′29.2″S, 058°15′54.6″W	Tabilo et al. 2020
46	Paraguay	Alto Paraguay, Estancia Santa Teresita	93	20°24′12.5″S, 058°26′09.4″W	Tabilo et al. 2020
47	Paraguay	Boquerón, Estación Los Tres Gigantes	84	20°4′42.44″S, 058°9′39.06″W	González et al. 2019
48	Paraguay	Boquerón, Estancia San Juan	154	21°08′13.23″S, 060°27′47.91″W	Tabilo et al. 2020
49	Paraguay	Caaguazú, Colonia Sommerfield	277	25°25′59″S, 055°43′0″W	Patton and Emmons 2015: MNRJ-43170
50	Paraguay	Colonia Mennonita	144	22°30′00″S, 060°00′00″W	This study: FMNH 64200
51	Paraguay	Itapúa, Capitán Mesa	287	26°45′46″S, 055°23′06″W	Teta and Lucero 2016; Teta and Reyes-Amaya 2021: MACN-Ma 47.345, MACN-Ma 47.346
52	Paraguay	Itapúa, Extremo Occidental de la Isla Yaciretá	72	27°25′32″S, 056°48′55″W	Teta and Reyes-Amaya 2021; Teta and Lucero 2016, MNHNP-1098
53	Paraguay	Itapúa, Nueva Aborada	197	26°37′00″S, 054°48′00″W	GBIF: FHNFA-CFA05972, FHNFA-CFA05973, FHNFA-CFA05974, FHNFA CFA06033
54	Paraguay	Nueva Germania, Chaco	96	23°54′45″S, 056°42′60″W	This study: ZSM-1926/433; ZSM-1931/370, ZSM-1931/371, ZSM-1931/372, ZSM-1931/373, ZSM-1931/374, ZSM-1931/375, ZSM-1931/376, ZSM-1931/377
55	Paraguay	Orloff, Paraguay	134	22°18′59.4″S, 059°54′17.6″W	Patton and Emmons 2015
56	Paraguay	Presidente Hayes, Zona Cerrito, Estancia Playada	69	24°57′59.8″S, 057°21′56.1″W	Caballero-Gini et al. 2020
57	Paraguay	Sati, Rio Yuqueri	252	25°15′00″S, 055°33′00″W	GBIF: MCZ-28091