

Historical and recent records of Greater Grison *Galictis vittata* in Paraguay, with nomenclatural comments

Paul SMITH¹, Robert D. OWEN², Hugo DEL CASTILLO³, M. L. ORTIZ⁴ and Arnaldo CABRERA⁴

Abstract

Paraguay generally has been omitted from the published distribution of Greater Grison *Galictis vittata*, despite historical mentions of the species there including a specimen collected in 1930. Historical mentions of *G. vittata* in Paraguay are reviewed here, and previous nomenclatural confusion is reviewed and clarified. Two recent records, a specimen and an observation, add respectively a second documented locality to the Atlantic Forest ecoregion of eastern Paraguay, and extend the known Paraguayan distribution approximately 675 km north-westwards into the Dry Chaco. The species is probably widespread at low density across much of the country.

Keywords: Atlantic Forest, Chaco, *Galictis allamandi*, *Galictis cuja*, *Grissonella huronax*, Lesser Grison

Registros históricos y recientes del Grisón Mayor *Galictis vittata* en Paraguay, con comentarios sobre su nomenclatura

Resumen

Con algunas excepciones, el Paraguay ha sido excluido de las distribuciones publicadas de *Galictis vittata*, a pesar de anotaciones históricas de la especie en Paraguay, y un espécimen colectado en 1930. Se revisaron menciones históricas de *G. vittata* en Paraguay, y la confusión anterior sobre la nomenclatura fue revisada y aclarada. Reportamos dos registros adicionales recientes, un espécimen colectado y una observación en vida silvestre. Con estos nuevos registros se agrega una segunda localidad para la ecorregión del Bosque Atlántico en la Región Oriental del Paraguay, y se extiende la distribución paraguaya conocida a 675 km aproximadamente al noroeste hasta la ecorregión del Chaco Seco. Probablemente la especie se extiende en baja densidad en la mayoría del territorio paraguayo.

Palabras claves: Bosque Atlántico, Chaco, *Galictis allamandi*, *Galictis cuja*, *Grissonella huronax*, Grisón Menor

Introduction

Greater Grison *Galictis vittata* is a widespread, medium-sized, lowland mustelid occurring as four subspecies from southern Mexico to northern Argentina (Yensen & Tarifa 2003a). Despite its diurnal habits, broad range of habitats used, and its extensive distribution, the species is surprisingly poorly studied; it seems to occur at low density throughout its range (Arita *et al.* 1990, Canevari & Vaccaro 2007).

The presence of the species in Paraguay has been subject to dispute. Excepting Bornholdt *et al.* (2013), the country was omitted from modern treatments of the species's distribution (Yensen & Tarifa 2003a, Canevari & Vaccaro 2007). It does occur in southern Santa Cruz Department, Bolivia (Anderson 1997, Tarifa *et al.* 2010), and in a few localities in Provincia Misiones, Argentina (Díaz & Lucherini 2006, Massoia *et al.* 2006), but the Rio Paraná has long been known to be a dispersal barrier for certain mammal species (Bertoni 1914). Consequently, the mapped range of the species often forms a wide arc around northern and eastern Paraguay, but omitting the country entirely (Yensen & Tarifa 2003a, Canevari & Vaccaro 2007). In fact, Bornholdt *et al.* (2013), citing a specimen collected in 1930, provided the first specimen-based record for the country.

This paper reports historical mentions of *G. vittata* in Paraguay, clarifies nomenclatural confusion in early literature, and confirms the species's continued occurrence in Paraguay

by reporting two recent records. These suggest a wide distribution across the country, and extend the known habitat associations to the Dry Chaco.

Nomenclature

As currently understood the genus *Galictis* Bell, 1826 contains two extant species, the larger Greater Grison *G. vittata* (Schreber, 1776) and the smaller Lesser Grison *G. cuja* (Molina, 1782). The larger species has a mainly tropical distribution in Central and South America, the smaller species a temperate distribution in the Southern Cone; there is a poorly understood region of sympatry in central South America (Yensen & Tarifa 2003a, 2003b, Bornholdt *et al.* 2013).

Confusion over the type of *Viverra vittata* Schreber, 1776 and *Galictis allamandi* Bell, 1837 (actually paintings by different artists of the same specimen) led many influential turn-of-the-century zoologists, including Ihering (1911), to use *G. allamandi* for the larger species and *G. vittata* for the smaller (Husson 1978), a situation still occurring at least until Krumbiegel (1942).

Modern treatments (e.g. Yensen & Tarifa 2003a, Wozencraft 2005, Paglia *et al.* 2012) synonymise *G. allamandi* under *G. vittata* (the name now used for the larger species). However, references to *G. vittata* in older literature, including Rengger (1830), typically apply instead to *G. cuja* as currently recognised (Cabrera 1958, Yensen & Tarifa 2003a, 2003b).

Historical records

Bertoni (1914) listed both *Grison allamandi* (Bell.) and *Grison vittatus* (Schreber) in the first systematic catalogues of Paraguayan mammals, giving both the Guaraní name “Dyaguapé”. Unfortunately he provided no more than a locality, Puerto Bertoni (Fig. 1, locality 4), for both species; an asterisk next to *G. allamandi* indicates that he was reporting it for Paraguay for the first time. In an update of the same catalogue, Bertoni (1939) listed *Grison allamandi* (Bell.) and *Grisonella huronax* Thomas, this time providing the additional locality Itá (Fig. 1, locality 5) for the former and giving the common names of “Yaguapé” for *G. allamandi* and “Yaguá kambé, (or) Yaguapé” for *G. huronax*.

Bertoni’s general failure to provide details or literature references has led many modern Paraguayan biologists to consider his more unlikely records to be equivocal or hypothetical. A lack of modern Paraguayan records of *G. vittata* thus led to a general consensus that the widespread and common Lesser Grison *G. cuja* is the only species of the genus in Paraguay.

However between these two publications Bertoni (1932) published a short, apparently overlooked, note on these species where he claimed to have been able to compare the ‘common’ *huronax* with the ‘robust’ and ‘much larger’ *Grison allamandi*. The text becomes somewhat confusing as he alluded to differences between *G. allamandi* and “*G. vittatus*” (= *cuja* as currently recognised), and then stated that these large individuals presented all the ‘exact colours of *crassidens*’ (= *vit-*

tatus as currently recognised), leaving it unclear as to which name he suggested was applicable. Although he alluded to a whiter coloration and robust form in his *G. allamandi* than in his *G. huronax*, the brief description of the coloration in the larger specimens is non-diagnostic by itself.

Interpreting the confusing nomenclature in the context of current knowledge, it is apparent that known synonyms of modern *G. vittata* are being used solely to describe this larger taxon and synonyms of *G. cuja* are being used solely to describe the smaller taxon. Furthermore peculiarities in the nomenclature used in Bertoni (1914) make it clear that Ihering (1910) is the principal taxonomic source for many of his carnivore families, including the Mustelidae. Ihering (1910) provided detailed descriptions of both species that allow his *G. allamandi* to be conclusively identified as modern *G. vittatus* and his *G. vittatus* to be definitely associated with modern *G. cuja*. Thus Bertoni, in following Ihering (1910), is certainly referring to two different species.

In 1930, a specimen was collected by Emil Kaempfer in Colonia Independencia (Departamento Guairá), Paraguay (Fig. 1, locality 1), at the western limit of the Atlantic Forest ecoregion. Bertoni (1932, 1939) made no mention of, and presumably was unaware of, this specimen. The specimen, AMNH 77695 (skull only) was first reported by Bornholdt *et al.* (2013). It seems to have been the only specimen of *G. vittata* for Paraguay until another was collected in 2010.

Modern records

A decomposing and bloated road-kill specimen was found on 17 September 2010 by PS and HDC (accompanied by Robert and Ulrike Wylands) on the Super Carretera Itaipú, Departamento Alto Paraná (Fig. 1, locality 2). The specimen was photographed *in situ* (Fig. 2; additional photographs are available at <http://www.faunaparaguay.com/galictisvittata.html>). The off-white head stripe and tips of the dorsal hairs suggest that this specimen is attributable to *G. v. brasiliensis* (Thunberg, 1820). Although heavily altered, the natural vegetation here is Atlantic Forest, with the immediate area being characterised by islands of disturbed forest, pasture land and isolated human dwellings. The specimen, an adult male (Figs. 2–3) was deposited at the nearby Museo Itaipú Binacional, where it is catalogued as CBMI 284, skull and skeleton. Bornholdt *et al.* (2013) made no reference to this specimen and presumably did not know of its existence.

Measurements for CBMI 284, compared with means and ranges reported by Yensen & Tarifa (2003a), are listed in Table 1. For all equivalent measurements, CBMI 284 falls within or above the range listed for *G. vittata* by Tarifa & Yensen (2003a). In addition, the specimen exhibits clearly the m1 metaconid mentioned by Bornholdt *et al.* (2013) as diagnostic for *G. vittata* (Fig. 3, lower).

Two adults were observed on 10 February 2012 by PS, Keith Millar, Kevin Guest and Richard Koepsel at approximately 10h00 (with good ambient light) at Km 603 of the Ruta Trans Chaco, Departamento Boquerón (Fig. 1, locality 3). This was in an area of arid Chaco vegetation, heavily modified for cattle ranching. Both animals were observed from a vehicle through 10 × 40 binoculars. They emerged from roadside vegetation, crossed the road and then walked along the roadside

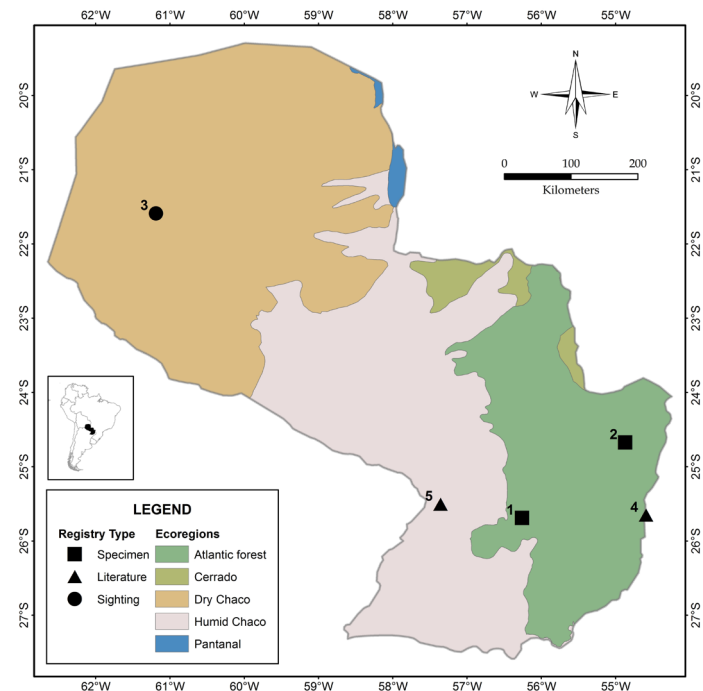


Fig. 1. Paraguay, indicating localities for Greater Grison *Galictis vittata*. Specimen localities (squares): 1, Colonia Independencia, Departamento Guairá, 25°41'S, 56°16'W (AMNH 77695); 2, Super Carretera Itaipú, Departamento Alto Paraná, 24°40'30.3"S, 54°52'19.3"W (CBMI 284). Sighting locality (circle): 3, Departamento Boquerón, 21°35'39.5"S, 61°11'21.7"W. Literature localities (triangles): 4, Puerto Bertoni, Departamento Alto Paraná, 25°39'S, 54°36'W (Bertoni 1914); 5, Itá, Departamento Central, 25°30'S, 57°22'W (Bertoni 1939). Datum WGS84.



Fig. 2. Greater Grison *Galictis vittata* encountered dead on 17 September 2010, in Departamento Alto Paraná, Paraguay (Museo Itaipú Binacional catalogue number CBMI 284). Ventrrolateral view (upper); dorsolateral view (lower).



Fig. 3. Same individual Greater Grison *G. vittata* as in Fig. 2. Ventral view of cranium showing fully erupted teeth, fused sphenopalatine suture (upper); Lingual view of left mandible, showing m1 and m2, with m1 metaconid diagnostic for *G. vittata* (lower; see Bornholdt *et al.* 2013, Fig. 1).

Table 1. External and cranial measurements of Paraguayan grison specimen CBMI 284 (Fig. 1, locality 2), and measurements (mean and range) for Greater Grison *Galictis vittata* in Yensen & Tarifa (2003a).

Character	CBMI 284	Yensen & Tarifa
Weight (g)	4400	2348 (1475–3800)
External characters (mm)		
Total length	600	676.2 (600–760)
Tail length	170	157.4 (135–195)
Head + body length	430	518.8 (450–600)
Hind foot length	93	82.8 (66–97)
Ear length	34	25.8 (20–32)
Craniodental characters (mm)		
Greatest length of skull	95.2	
Basilar length		80.15 (71.5–96.5)
Condylbasilar length	91.6	88.17 (80.3–97.9)
Palatal length	46.0	
Postpalatal length		39.29 (37.1–42.8)
Length of nasals	26.4	
Maxillary tooththrow length	28.6	28.04 (23.1–32.5)
Maxillary molariform tooththrow length	23.1	
Zygomatic breadth	58.1	50.98 (45.4–56.2)
Mastoid breadth	55.8	47.87 (42.9–54.4)
Squamosal breadth		40.79 (37.8–43.0)

Character	CBMI 284	Yensen & Tarifa
Postorbital breadth	21.8	19.79 (17.8–22.2)
Least interorbital breadth		20.41 (16.5–23.2)
Postdental breadth		11.04 (9.7–11.9)
Width across upper canines	22.2	20.04 (17.1–23.3)
Maximum breadth of tooththrow		30.15 (28.1–33.2)
Length of auditory bulla		23.49 (21.4–25.2)
Width of auditory bulla		11.19 (8.1–13.4)
Angular length of mandible	58.2	53.43 (47.1–59.2)
Mandibular ramus height	11.1	
Mandibular tooththrow length	34.3	
Mandibular molariform tooththrow length	27.6	

Total length (and therefore, head + body length) of CBMI 284 were measured in *rigor mortis* condition, so are underestimates. Where uncertainty exists regarding equivalency of the two sets of measurements, they are listed separately.

towards the observers before disappearing again into vegetation at a distance of about 3 m. The large size of these animals compared with *G. cuja* was obvious even at the greatest observed distance (20 m), but even more diagnostic was the heavy, waddling gait (reminiscent of Wolverine *Gulo gulo*) and quite different from the sliding, weasel-like movements of the smaller species, with which PS is familiar.

This record extends the known Paraguayan distribution of *G. vittata* approximately 675 km north-westwards, well into the Dry Chaco. Characteristics necessary for subspecific designation were not observed. The populations nearest to this locality, in Bolivia, are referred to *G. v. andina* Thomas, 1903, so the subspecific identity of Chaco *G. vittata* cannot be assumed to be the same as those east of the Rio Paraguay.

These records suggest that *G. vittata* is uncommon but widespread in Paraguay and may have been overlooked because of a wide-ranging assumption that all Paraguayan *Galictis* are *G. cuja*. The presence of *G. vittata* in both the Dry Chaco and the Atlantic Forest ecoregions means that it probably occurs throughout much of the country, thus expanding the known areas of sympatry with *G. cuja*. Additional records to confirm the continuing presence of *G. vittata* in other regions in Paraguay will be necessary to clarify the southern limits of the species's range, as well as the geographic limits of two of the four currently recognised subspecies (*G. v. andina* and *G. v. brasiliensis*) (Yensen & Tarifa 2003a).

Acknowledgements

We thank James Spalding (Director General, Itaipú Binacional) and Carlos Barboza Martínez (Jefe, División de Educación Ambiental) for permission to examine the specimen. Cesar Balbuena prepared the map in Fig. 1. Lucy Aquino provided a translation of the Abstract for the Resumen. José González-Maya and two anonymous reviewers provided helpful comments, and brought the recent publication of Bornholdt *et al.* (2013) to our attention.

References

Anderson, S. 1997. Mammals of Bolivia, taxonomy and distribution. *Bulletin of the American Museum of Natural History* 231: 1–652.

Arita, H. T., Robinson, J. G. & Redford, K. H. 1990. Rarity in Neotropical forest mammals and its ecological correlates. *Conservation Biology* 4: 181–192.

Bertoni, A. de W. 1914. *Fauna Paraguaya. Catálogos sistemáticos de los vertebrados del Paraguay. Peces, batracios, reptiles, aves y mamíferos conocidos hasta 1913*. M. Brossa, Asunción, Paraguay.

Bertoni, A. de W. 1932. Sobre mustélidos del Paraguay. Yaguapé (mamíferos). *Revista de la Sociedad Científica del Paraguay* 2: 104–105.

Bertoni, A. de W. 1939. Catálogos sistemáticos de los vertebrados del Paraguay. *Revista de la Sociedad Científica del Paraguay* 4: 1–50.

Bornholdt, R., Helgen, K., Koepfli, K.-P., Oliveira, L., Lucherini, M. & Eizirik, E. 2013. Taxonomic revision of the genus *Galictis* (Carnivora: Mustelidae): species delimitation, morphological diagnosis, and refined mapping of geographical distribution. *Zoological Journal of the Linnean Society* 167: 449–472.

Cabrera, A. 1958. Catálogo de los mamíferos de América del Sur. *Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigación de las Ciencias Naturales, Zoología* 4: 1–305.

Canevari, M. & Vaccaro, O. 2007. *Guía de mamíferos del sur de América del Sur*. Literature of Latin America (L.O.L.A.), Buenos Aires, Argentina.

Díaz, M. M. & Lucherini, M. 2006. Mephitidae, Mustelidae, Procyonidae. Pp. 100–107 in Barquez, R. M., Díaz, M. M. & Ojeda, R. A. (eds) *Mamíferos de Argentina. Sistemática y distribución*. Sociedad Argentina para los Estudios de Mamíferos (SAREM), Tucumán, Argentina.

Husson, A. M. 1978. *The mammals of Suriname*. E. J. Brill, Leiden, Netherlands.

Ihering, H. 1911 (for 1910). Os mamíferos do Brasil meridional; Carnivora. *Revista Museo Paulista* 8: 147–272.

Krumbeigel, I. 1942. Die Säugetiere der Südamerika-Expeditionen Prof. Dr. Kriegs. 17. Hyrare und Grisons (*Tayra* und *Grison*). *Zoologischer Anzeiger* 139: 81–108.

Massoia, E., Chebez, J. C. & Bosso, A. 2006. *Los mamíferos silvestres de la Provincia de Misiones, Argentina*. Fundación de Historia Natural Félix de Azara, Buenos Aires, Argentina.

Paglia, A. P., da Fonseca, G. A. B., Rylands, A. B., Herrmann, G., Aguiar, L. M. S., Chiarello, A. G., Leite, Y. L. R., Costa, L. P., Siciliano, S., Kierulff, M. C. M., Mendes, S. L., Tavares, V. da C., Mittermeier, R. A. & Patton, J. L. 2012. Annotated checklist of Brazilian mammals, 2nd edn. *Occasional Papers in Conservation Biology* 6: 1–76.

Rengger, J. R. 1830. *Naturgeschichte der Säugethiere von Paraguay*. Schweighauserschen, Basel, Switzerland.

- Tarifa, T., Yensen, E., Rios-Uzeda, B., Zambrana, V., Van Damme, P. A. & Wallace, R. B. 2010. Mustelidae. Pp. 445–481 in Wallace, R. B., Gómez, H., Porcel, Z. R. & Rumiz, D. I. (eds) *Distribución, ecología y conservación de los mamíferos medianos y grandes de Bolivia*. Fundación Simón I Patiño, Santa Cruz de la Sierra, Bolivia.
- Wozencraft, W. C. 2005. Order Carnivora. Pp. 532–628 in Wilson D. E. & Reeder, D. M. (eds) *Mammal species of the world. A taxonomic and geographic reference*, 3rd edn, 1. Johns Hopkins University Press, Baltimore, U.S.A.
- Yensen, E. & Tarifa, T. 2003a. *Galictis vittata*. *Mammalian Species* 727: 1–8.
- Yensen, E. & Tarifa, T. 2003b. *Galictis cuja*. *Mammalian Species* 728: 1–8.

¹**FAUNA Paraguay; and Para La Tierra, Reserva Natural Laguna Blanca, Departamento San Pedro, Paraguay.
Email: faunaparaguay@gmail.com**

²**Department of Biological Sciences, Texas Tech University, Lubbock, TX 79409 USA; and Raúl Casal 2230 c/ Pizarro, C.P. 1371, Barrio Republicano, Asunción, Paraguay.**

³**FAUNA Paraguay; and Guyra Paraguay.
Internet: www.fauparaguay.com; and www.guyra.org.py**

⁴**Centro Ambiental Itaipú Binacional, Supercarretera Itaipú, Hernandarias, Departamento Alto Paraná, Paraguay.**