

First record of the genus *Metachirus* in Guatemala

Primer registro del género *Metachirus* en Guatemala

LUIS A. TRUJILLO^{1*}, AND BÁRBARA I. ESCOBAR-ANLEU^{1,2,3}

¹Escuela de Biología, Universidad de San Carlos de Guatemala (USAC). Edificio T-10, 2do. Nivel, Ciudad Universitaria, zona 12, 01012. Guatemala City, Guatemala. E-mail: trujillososaluis@gmail.com (LAT).

²Panthera Guatemala, Guatemala City 01002, Guatemala.

³Centro Agronómico Tropical de Investigación y Enseñanza (CATIE), Sede Central, Cartago, 30501. Turrialba, Costa Rica. E-mail: bescobar@panthera.org (BIE-A).

*Corresponding author

The genus *Metachirus* has a wide distribution throughout the Americas, but there are significant gaps in its distribution in northern Mesoamerica, having only been documented in a few localities in Honduras and México. During biological expeditions in northern and northeast Guatemala, we gathered evidence about the presence of the genus *Metachirus* in the country. We observed and photographed a brown four-eyed opossum individual, *M. myosuroides*, in Sierra Caral Water and Forest Reserve, Izabal, Guatemala. Our observation of *M. myosuroides* helps to fill in some of the gaps in the distribution of the northern populations of the species and represents the addition of a new genus to the mammal fauna reported for the country.

Key words: Didelphidae; Laguna del Tigre National Park; marsupial; Metachirini; Sierra Caral.

El género *Metachirus* tiene una amplia distribución en toda América, pero existen grandes vacíos en su distribución en el norte de Mesoamérica, donde sólo ha sido documentado en algunas localidades de Honduras y México. Durante expediciones biológicas en el norte y noreste de Guatemala, recolectamos evidencia sobre la presencia del género *Metachirus* en el país. Observamos y fotografiamos un individuo de la zarigüeya café de cuatro ojos, *M. myosuroides*, en la Reserva Hídrica y Forestal de Sierra Caral, Izabal, Guatemala. Nuestra observación de *M. myosuroides* llena vacíos en la distribución de las poblaciones norteñas de la especie y representa la adición de un nuevo género a la fauna de mamíferos reportada para el país.

Palabras clave: Didelphidae; marsupial; Metachirini; Parque Nacional Laguna del Tigre; Sierra Caral.

© 2023 Asociación Mexicana de Mastozoología, www.mastozoologiamexicana.org

The genus *Metachirus* Burmeister, 1854 currently comprises 3 Neotropical species: *M. nudicaudatus* É. Geoffroy Saint-Hilaire, 1803, *M. myosuroides* Temminck, 1824 and *M. aritanai* Miranda, Nunes, Machado, Farias, Menezes, Ardente, Dos Santos-Filho, Bredin and da Silva, 2023 ([Voss et al. 2019](#); [Voss 2022](#); [Miranda et al. 2023](#)). For a long time, the genus was considered monotypic, with all of its known diversity included in a single species, *M. nudicaudatus* ([Gardner 2005](#); [Gardner and Dagosto 2007](#); [Voss and Jansa 2009, 2021](#)). Several phylogeographic studies demonstrate significant genetic divergence among *M. nudicaudatus*, identifying different monophyletic clades across its distribution ([Patton et al. 2000](#); [Patton and Costa 2003](#); [Voss et al. 2019](#)). After these studies and different integrative taxonomic approaches, the clade *M. myosuroides* was revalidated and delimited as a species, as well as *M. aritanai* which was recently described ([Miranda et al. 2023](#)).

The genus *Metachirus* has a wide geographical range with records ranging from northern Argentina to Chiapas in southern México. Nonetheless, the known distribution of the species shows fragmented patterns with large gaps in northern Mesoamerica, a region where knowledge of the group is scarce ([Voss et al. 2019](#); [Bautista-Alcantara et al. 2022](#); [Voss 2022](#); [Miranda et al. 2023](#)). Recent studies have revealed that *M. nudicaudatus* is limited to northeastern

Amazonia ([Voss et al. 2019](#); [Voss 2022](#); [Miranda et al. 2023](#)). As currently understood, and based on available information, *M. myosuroides* has a wide distribution from México through the humid ecosystems of Central America to South America ([Voss et al. 2019](#); [Voss 2022](#)). Furthermore, the recently described species *M. aritanai* is restricted to the Xingu-Tocantins interfluvium, within the Xingu endemism center *sensu* [Silva et al. \(2005; Miranda et al. 2023\)](#), in the Brazilian Amazon.

Brown four-eyed opossums, as defined by [Voss and Jansa \(2009\)](#), can be distinguished from other large marsupials in the subfamily Didelphinae by a combination of external and internal morphological features. These include a pair of small cream-colored spots above the eyes, a general brown color, short fur, little or no hair extension at the base of the tail, light to dark brown tail color without a distinction between the basal and distal portions, and the absence of a marsupium in females ([Emmons 1997](#); [Eisenberg and Redford 1999](#); [Reid 2009](#); [Voss and Jansa 2009, 2021](#)). One unique characteristic of the genus *Metachirus* is the contact between the frontal and squamous bones in the lateral region of the braincase ([Voss and Jansa 2009](#)).

The primary objective of this report is to provide the first record of the brown four-eyed opossum in Guatemala, specifically in Sierra Caral Water and Forest Reserve

located in Morales municipality, Izabal department. Additionally, this contribution aims to fill gaps in the distribution of *M. myosuros* in Central America.

During a night walk in La Firmeza (15° 24' 18.4" N, 88° 41' 53.4" W, 472 m), a private reserve located in Sierra Caral, part of the Merendón mountain range, we observed and photographed a specimen of *Metachirus myosuros*. This walk was made together with local park rangers of San José Bonanza community, as part of the joint monitoring and conservation actions that Panthera (a worldwide organization dedicated to the conservation of wild cats and their habitat) has been carrying out in the area since 2017 with the support of the Foundation for Ecodevelopment and Conservation (FUNDAECO), the co-manager institution of this protected area. Sierra Caral is a 190 km² area located in the Guatemalan Caribbean region that presents tropical humid forest with altitude varying between 200 and 1,260 m (Figure 1). Izabal and its low tropical humid mountains are characterized by an average temperature of 26.5 °C and a mean annual precipitation of 3,461 mm (Instituto Nacional de Sismología, Vulcanología, Meteorología e Hidrología, INSIVUMEH 2010; Pérez-Consuegra et al. 2017). It is considered one of the most biodiverse forest remnants in Cen-

tral America (International Conservation Fund of Canada; ICFC 2023), and is home to endemic beetles and amphibians, migratory bird species, as well as endangered and rare mammal species (Pellecer et al. 2019; Sasso et al. 2020; Smith 2021; ICFC 2023).

On June 19, 2019, at 22:49 hr, we had an encounter with and photographed an individual of *M. myosuros* standing on a tree at around 2.5 m above ground, with its tail partially coiled around a branch. The identification of the individual was based on external morphological characteristics that distinguish species within the genus *Metachirus* from those of *Philander*, which is the most similar genus (Reid 2009; Voss and Jansa 2009; Figure 2). The observed individual exhibited an overall chestnut-brown color, a relatively thin and hairless tail without a color division between the basal and distal portions, and a larger size relative to their body and head. The photographed individual presented the dorsal portion of the tail darker than the ventral portion with the basal color fading to whitish distally (Figure 2). We observed the individual for around 5 min until we decided to leave the area to continue our walk. During that time the individual remained motionless in the tree and we did not observe any additional behavior.

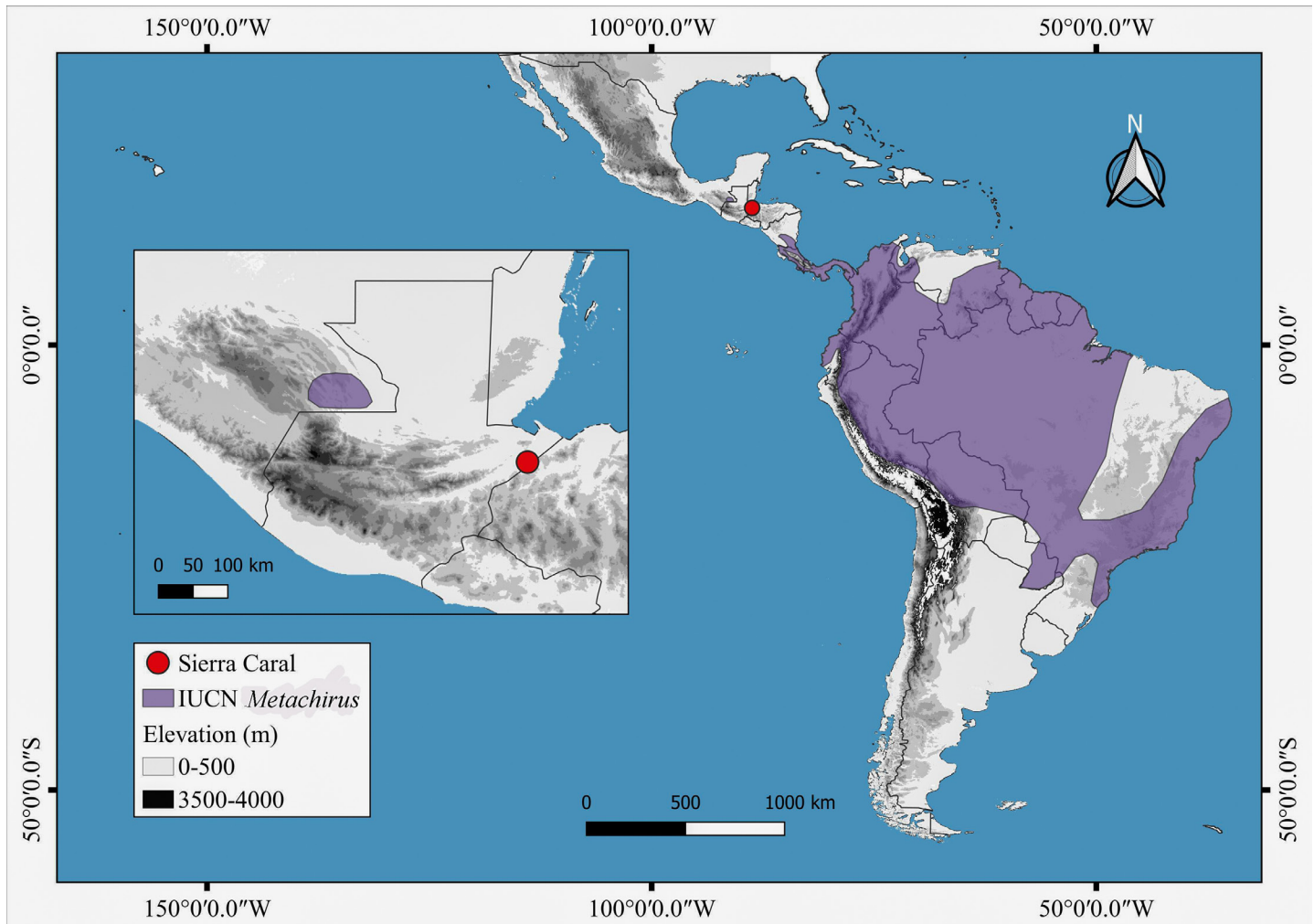


Figure 1. Distribution of the genus *Metachirus* according to IUCN (obtained from Brito et al. 2021). Red dot: record of *M. myosuros* in Sierra Caral Water and Forest Reserve.

Marsupials are one of the least studied groups of mammals in Guatemala, with almost no information available about the species that inhabit the country. Based on current knowledge, there are confirmed records of 6 species of marsupials distributed across 5 genera in Guatemala: *Chironectes minimus*, *Didelphis marsupialis*, *D. virginiana*, *Caluromys derbianus*, *Philander vossi* and *Marmosa mexicana* (McCarthy and Pérez 2006; Astúa et al. 2022). Our photographic record has allowed us to confirm the presence of the genus *Metachirus* in the country. The confirmation of *M. myosuuros* in Guatemala is a significant discovery, as this species had been previously identified as expected in the last country's mammal review and in the last taxonomic checklist of living American Marsupials (McCarthy and Pérez 2006; Astúa et al. 2022). This finding increases the country's marsupial list to 7 species and 6 genera.

As currently understood, *M. myosuuros* is a widely distributed species, with records ranging from southern México to northern Argentina (Voss et al. 2019; Voss 2022). However, huge gaps exist in its distribution, especially in northern Mesoamerica, where previous to this note, only few records from México and Honduras have been documented (Mérida and Cruz 2015; Marineros et al. 2019; Bautista-Alcantara et al. 2022). Our record provides novel evidence on the distribution of the species' northern populations and offer insights into the ecosystems they inhabit. It should be noted that on March 25, 2012, around 18:00 hr, we observed during a few minutes an individual of *M. myosuuros* feeding on organic waste that included beans, fruit residues, and remains of fried fish near the kitchen of the Wildlife Conservation Society (WCS) biological station in El Perú, Laguna del Tigre National Park, Petén, Guatemala. However, when the brown four-eyed possum noticed our presence, it jumped twice before running up a nearby tree and we were unable to capture a good quality photo of the individual. Therefore, efforts should be directed towards this area to confirm the presence of this species, since it would represent one of the northern most records. This underscores the importance of collecting individuals and gathering more comprehensive information about the species in these specific localities and the broader region.

Notwithstanding the lack of a voucher specimen, the photographic record provides the necessary evidence to formerly include *M. myosuuros* in the Guatemalan marsupial's checklist. Conspicuous external morphological characters allow to clearly distinguish between the species within the genus *Metachirus* and *Philander* (Reid 2009; Voss and Jansa 2009; Figure 2). One particularity of our photographic record is that the individual was walking through a low branch with its tail partially coiled in it. This is an unusual behavior because the genus *Metachirus* is considered mainly terrestrial and most of the reports are from individuals captured or seen on the ground (Reid 2009; Voss and Jansa 2009, 2021; Miranda et al. 2023). Although it has been considered that this genus does not have a prehensile tail (Reid 2009; Voss and Jansa 2009), all didelphids



Figure 2. Comparison between a) *Metachirus myosuuros* photographed in Sierra Caral Water and Forest Reserve protected area, Morales, Izabal, Guatemala, and b) *Philander vossi* from south México. Photo credits: B. I. Escobar-Anleu and J. Cruzado-Cortés. The arrows point to 2 of the characteristics that distinguish the genera *Metachirus* and *Philander*: the different coloration pattern between the tail of both genera and the general coat color of the species.

are perhaps capable of caudal prehension to some extent (Voss and Jansa 2009). Evidence of this is 1 video recording of *M. nudicaudatus* carrying vegetal material on its tail, presumably for nest construction (Delgado et al. 2014) and records of other didelphid species carrying nest material with their tails (Voss and Jansa 2009; Delgado et al. 2014). Now, our observation provides new evidence for this and the flowability of prehension for these species.

Investing in exploration, monitoring, and biological research is necessary to better understand the distribution patterns of wildlife. Only a comprehensive knowledge about biodiversity will ensure the long-term preservation and conservation of Guatemala's natural resources. Information about species distribution is vital to protect ecosystems and promote data-based conservation and action plans.

Acknowledgements

As biologists graduated from USAC, the only public university in Guatemala, we thank those who throughout history have fought to defend its autonomy, but especially those who do so at this time of crisis when we do not have a rector. We would like to thank J. Cruzado-Cortés for sharing the photo of *Philander vossi*. We also want to thank FUNDAECO for their conservation efforts in the area, as well as for their support to Panthera's work in recent years. A special thanks to the FUNDAECO team in Sierra Caral: E. Pérez, F. Rivas and J. Díaz. We also thank A. Cerezo for his support and comments in the preparation of this manuscript and 4

anonymous reviewers that helped improve earlier versions of this note.

Finalmente, queremos agradecer a los guardarecursos que nos han apoyado en campo en estos últimos años en Sierra Caral: A. Súchite Súchite, G. Chacón, B. García y E. Quiñónez, pero sobre todo a E. Gutiérrez, B. Ramírez (QEPD), B. Méndez, O. García y N. Méndez que nos acompañaron en la caminata nocturna donde observamos la especie. Queremos dedicar este trabajo a los pasados, actuales y futuros guardarecursos de las áreas protegidas de Guatemala, reconocemos que su trabajo es vital para la conservación de los recursos naturales y el desarrollo de la ciencia en el país. Les agradecemos profundamente todo lo que hacen.

Literature cited

- ASTÚA, D., J. J. CHEREM, AND P. TETA. 2022. Taxonomic checklist of living American marsupials. Pp. 1-48 in *American and Australasian Marsupials: An evolutionary, biogeographical, and ecological approach* (Cáceres N. C., and C. R. Dickman, eds.). Springer International Publishing. Zug, Switzerland.
- BAUTISTA-ALCANTARA, L. F., D. E. WILSON, AND M. A. TURCIOS-CASCO. 2022. Annotations on the taxonomy of the opossums (Didelphimorphia: Didelphidae) of Honduras. *Mammalia* 86:641-643.
- BRITO, D., ET AL. 2021. *Metachirus nudicaudatus*. In: IUCN 2023. The IUCN Red List of Threatened Species. Version 2022-2. www.iucnredlist.org. Accessed on March 27, 2023.
- DELGADO, C. A., ET AL. 2014. Uso de la cola y el marsupio en *Didelphis marsupialis* y *Metachirus nudicaudatus* (Didelphimorphia: Didelphidae) para transportar material de anidación. *Mastozoología Neotropical* 21:129-134.
- EISENBERG, J. F., AND K. H. REDFORD. 1999. *Mammals of the neotropics: the central neotropics, third volume*. The University of Chicago Press. Chicago, U.S.A.
- EMMONS, L. H. 1997. *Neotropical rainforest mammals: a field guide*. The University of Chicago Press. Chicago, U.S.A.
- GARDNER, A. L. 2005. Order Didelphimorphia. Pp. 14-15 in *Mammal species of the world: a taxonomic and geographic reference* (Wilson, D. E., and D. M. Reeder, eds.). John Hopkins University Press. Washington, D. C., U.S.A.
- GARDNER, A. L., AND M. DAGOSTO. 2007. Tribe Metachirini. Pp. 35-39 in *Mammals of South America. Volume 1: Marsupials, Xenarthrans, Shrews, and Bats* (Gardner, A. L., ed.). University of Chicago Press. Chicago, U.S.A.
- INSTITUTO NACIONAL DE SISMOLOGÍA, VULCANOLOGÍA, METEOROLOGÍA E HIDROLOGÍA (INSIVUMEH). 2010. Datos meteorológicos de la estación Pto. Barrios, Izabal, Guatemala, para el período 1993-2003. www.insivumeh.gob.gt. Accessed on March 28, 2023.
- INTERNATIONAL CONSERVATION FUND OF CANADA (ICFC). 2023. Land acquisition: Sierra Caral Cloud Forest, Guatemala. www.icf-canada.org/our-projects/projects/sierra_caral. Accessed on March 30, 2023.
- MCCARTHY, T., AND S. PÉREZ. 2006. Land and freshwater mammals of Guatemala: faunal documentation and diversity. Pp. 625-674 in *Biodiversidad de Guatemala* (Cano E., ed.). Universidad del Valle de Guatemala. Guatemala, Guatemala.
- MARINEROS, L., C. O'REILLY, AND O. RODRÍGUEZ. 2019. Nuevo registro de *Metachirus nudicaudatus* (Desmarest, 1817) en Honduras. *Scientia hondurensis* 2:38-41.
- MÉRIDA, J. E., AND G. A. CRUZ. 2015. Primer registro del marsupial *Metachirus nudicaudatus* en Honduras (Reserva Biósfera Río Plátano). *Cuadernos de Investigación UNED* 7:337-339.
- MIRANDA, C. L., ET AL. 2023. A new species of jupati, genus *Metachirus* Burmeister 1854 (Didelphimorphia, Didelphidae) for the Brazilian Amazon. *Mammalia* 87:172-189.
- PATTON, J. L., M. N. F. DA SILVA, AND J. R. MALCOLM. 2000. Mammals of the Rio Juruá and the evolutionary and ecological diversification of Amazonia. *Bulletin of the American Museum of Natural History* 244:1-306.
- PATTON, J. L., AND L. P. COSTA. 2003. Molecular phylogeography and species limits in rainforest didelphid marsupials of South America. Pp. 63-81 in *Predators with pouches: the biology of carnivorous marsupials* (Jones, M., C. Dickman, and M. Archer, eds.). CSIRO Publishing. Collingwood, Australia.
- PELLECCER, J. M., J. R. MORALES, AND S. G. PÉREZ. 2019. Noteworthy records of the northern naked-tailed armadillo, *Cabassous centralis* (Cingulata: Chlamyphoridae), in Guatemala, Central America. *Edentata* 20:17-21.
- PÉREZ-CONSUEGRA, S. G., ET AL. 2017. Distributional extensions of *Carollia castanea* and *Micronycteris minuta* from Guatemala, Central America. *Mammalia* 82:72-77.
- REID, F. 2009. *A field guide to the mammals of Central America and southeast Mexico, second edition*. Oxford University Press. New York, U.S.A.
- SASSO, T., C. L. COX, AND D. L. GILROY. 2020. Social behavior in *Nototriton brodiei* in the cloud forest of Cusuco National Park, Honduras. *South American Journal of Herpetology* 17:29-32.
- SILVA, J. M. C., A. B. RYLANDS, AND G. A. B. DA FONSECA. 2005. The fate of the Amazonian areas of endemism. *Conservation Biology* 19:689-694.
- SMITH, A. B. T. 2021. Two new species of *Phalangogonia* Burmeister, 1844 (Coleoptera: Scarabaeidae: Rutelinae). *The Coleopterists Bulletin* 75:259-265.
- VOSS, R. S., AND S. A. JANSA. 2009. Phylogenetic relationships and classification of didelphid marsupials, an extant radiation of new world Metatherian mammals. *Bulletin of the American Museum of Natural History* 322:1-177.
- VOSS, R. S., AND S. A. JANSA. 2021. Opossums: an adaptive radiation of New World marsupials. Johns Hopkins University Press. Baltimore, U.S.A.
- VOSS, R. S., D. W. FLECK, AND S. A. JANSA. 2019. Mammalian diversity and Matses ethnomammalogy in Amazonian Peru. Part 3. Marsupials (Didelphimorphia). *Bulletin of the American Museum of Natural History* 432:1-87.
- VOSS, R. S. 2022. An annotated checklist of recent opossums (Mammalia: Didelphidae). *Bulletin of the American Museum of Natural History* 455:1-76.

Associated editor: Itandehui Hernández Aguilar.

Submitted: April 16, 2023; Reviewed: June 28, 2023.

Accepted: July 14, 2023; Published on line: August 4, 2023.