Journal MVZ Cordoba
2019; 24(3):7366-7371.
https://doi.org/10.21897/rmvz.1352

Short Communication

Relative abundance and activity patterns of *Didelphis marsupialis* in a peri-urban area of Medellin, Colombia

Isaías Saldaña G[1] MV; Ana Cadavid R[1] M.Sc; Daisy Gómez R[1*] M.Sc.

[1]Corporación Universitaria Remington. Facultad de Medicina Veterinaria. Grupo de investigación GINVER. Calle 51 Nro. 51-27. Medellín, Antioquia, Colombia. [*]Correspondencia: daisy.gomez@uniremington.edu.co

Received: August 2018; Accepted: May 2019; Published: October 2019.

ABSTRACT

Objective. The relative abundance and activity patterns of the common opossum *Didelphis marsupialis* were determined in a peri-urban area of Medellín municipality, Antioquia department. **Materials and methods.** The study was developed in the Remington Veterinary practice at Santa Elena Corregimiento. The data recording was carried out through camera trapping methodology for three months (June-August 2017) with a total effort of 166 days-camera. **Results.** With a total of 275 independent records, we calculate the relative abundance index (52.88 UNITS). The activity patterns show a first activity peak beginning the night (19:00) and a second one after midnight (3:00), reducing the activity in the sunrise hours. **Conclusions.** These results present a high relative abundance in comparison to another Colombian localities, besides a population active reproductively. At the same time, they become a tool to support conservation strategies and sensitizing local people about the wildlife of this region.

Keywords: Ecology, opossum, suburban areas, wildlife (*Source: AGROVOC, Environmental thesaurus for Colombia*).

RESUMEN

Objetivo. Determinar la abundancia relativa y los patrones de actividad de la zarigüeya común (*Didelphis marsupialis*) en una zona periurbana del municipio de Medellín, departamento de Antioquia. **Materiales y métodos.** El estudio se desarrolló en la sede de prácticas y clínica veterinaria Remington ubicada en el corregimiento de Santa Elena. Para el registro de datos se empleó la metodología de fototrampeo durante 3 meses (junio-agosto de 2017), invirtiendo un esfuerzo total de 166 días/trampa. **Resultados.** Se obtuvieron un total de 275 registros independientes de la especie y se estimó una abundancia relativa de 52.88. El patrón de actividad muestra un primer pico de actividad al comienzo de la noche (19:00) y un segundo pico en la madrugada (3:00), con una posterior disminución hacia las horas de la madrugada. **Conclusiones.** Los resultados muestran una abundancia relativa alta con respecto a otras localidades en Colombia, además de evidenciar una población reproductivamente activa. Al mismo tiempo se convierten en una herramienta para el fortalecimiento de estrategias de conservación y sensibilización a los pobladores locales sobre la fauna de la región.

Palabras clave: Ecología, fauna silvestre, suburbano, zarigüeya (*Fuente: AGROVOC, Tesauro ambiental para Colombia*)

How to cite (Vancouver)
Saldaña GI, Cadavid RA, Gómez RD. Relative abundance and activity patterns of *Didelphis marsupialis* in a peri-urban area of Medellin, Colombia. Rev MVZ Cordoba. 2019; 24(3):7366-7371. DOI: https://doi.org/10.21897/rmvz.1352

ISSNe: 1909-0544

INTRODUCTION

Housing development around large urban concentrations implies strong transformations of the natural habitat and the loss of the remaining forest cover, which leads to a fragmented landscape with reduced natural areas available, generating direct effects on the faunal composition of an area and contributing to the loss of its local biodiversity (1,2). These transformations generate additional pressures on animal populations, forcing individuals to compete for available habitat and causing differential effects on their survival and abundance (1). Thus, before such changes, some species disappear, or their populations decline, while others are favored by the emergence of new resources and changes in ecological interactions (3).

The study of biodiversity in urban and peri-urban areas provides useful tools for the design of conservation strategies aimed at promoting the persistence of fauna populations and connectivity between fragments of forest cover (2). In this context, the specific study of species tolerant to housing makes it possible to determine and understand directly the factors that facilitate the permanence of fauna in intervened areas, and at the same time obtain basic information to generate strategies that promote the coexistence of wildlife in urban environments.

The common opossum (*Didelphis marsupialis*) is one of the few nonflying mammals tolerant to the transformation associated with housing. This species does not possess an imminent risk of extinction, due to the fact that its population size is estimated to be large and its high tolerance to habitat transformation, reflected mainly in its capacity to use alternative resources in urban environments (i.e. food for domestic animals and roofs such as nests) (4,5). However, in some peri-urban areas the possum is still perceived as a harmful and undesirable animal and in others it has been reported as one of the species with the highest rates of roadkills (6), which represents an additional threat to the permanence of its populations in this type of environment.

The high occurrence of opossums in peri-urban environments and the environmental services that can be provided by the control of small vertebrates and the dispersion of seeds (7), make them a potential study model to understand the effects of habitat transformations and vehicular traffic on wildlife. The objective of this work was to evaluate the relative abundance and activity patterns of the common opossum *D. marsupialis* in secondary forest fragments in a peri-urban zone of high vehicular traffic in the Aburrá Valley.

MATERIALS AND METHODS

Study area. The study was conducted at the veterinary practice headquarters of the Corporación Universitaria Remington (6.23907° N, 75.51438° W) located in the Corregimiento of Santa Elena, peri-urban area of the municipality of Medellín (Antioquia Department). The headquarters has an area of 70,400 m2 and is composed of land for grazing and some fragments of secondary forest highly intervened, which are delimited by high flow vehicular roads (Figure 1). The area is located at 2,300 meters above sea level and corresponds to the very humid low montane forest life zone (bmh-MB; Holdridge 1964).

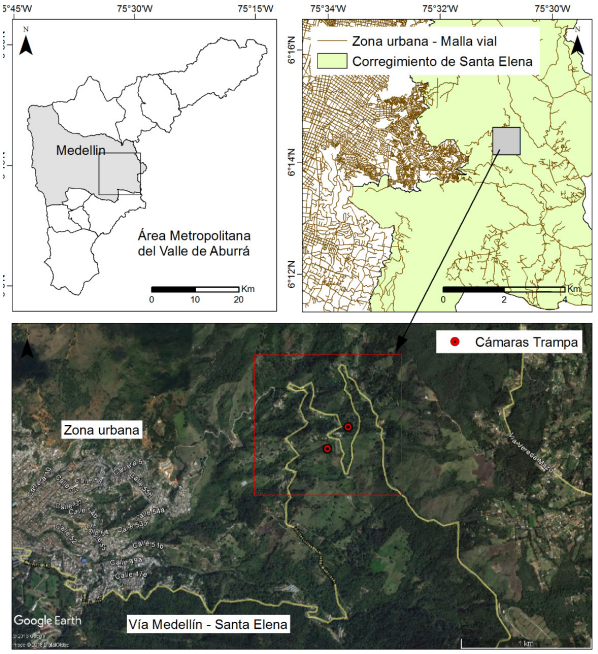

Figure 1. Geographical location of the study area in Santa Elena village, Medellín, Colombia.

Methods. For the recording of *D. marsupialis*, two Bushnell Trophy Cam HD camera traps were installed in each of two forest fragments present in the study area (Figure 1). The cameras were fixed to trees no higher than 30 cm from the ground and located on trails close to water bodies in which the presence of traces of fauna was identified. Throughout the sampling, a video recording configuration of 20 s at 40 s intervals was used. The cameras were installed from June 6th to August 28th, 2017, accumulating a total sampling effort of 166 days/trap.

During the entire sampling period the camera traps were baited with two types of baits. The first corresponded to a canned fish in tomato

sauce, which was drilled and fixed during the entire sampling time to the installation tree of the camera. The second type was composed of a mixture of cereals, grains and peanut butter that was left in boluses of approximately 200 g on the ground in front of the camera. This mixture was renewed every week during the review and data collection process in order to maximize the number of records (8,9).

Data analysis. To determine the activity pattern and estimate the abundance values of the species, only independent records were used, using as selection criteria an interval greater than 30 min between records (10,11). The daily activity pattern was generated from the recording hours of each video using the Kernel density curves method (12). This analysis was performed with the Overlap package in program R version 3.4.3. Relative abundance was estimated as the number of independent records over the total number of sampling records by a correction factor of 100 (traps/night) (13). Additionally, to allow comparisons with previous studies of the species, the relative abundance index was estimated as the number of independent records per 100 days of traps (11, 14). This index is also referred to as detection frequency and can be interpreted as a measure of sampling success (14).

RESULTS

A total of 520 records were obtained throughout the sampling time, including wild mammals, domestic fauna, some birds and 275 independent records of *D. marsupialis*. The records of the species corresponded to individuals of both sexes with notable differences in size and reproductive condition. The differences in size allowed the distinction between juveniles and adults, and the reproductive activity of females was evidenced through individuals with visible marsupium, possibly housing offspring, and individuals with offspring on their backs (Figure 2).

From the independent records we estimated a relative abundance of 52.88 for the species in the area and a relative abundance index or detection frequency of 165.66 photos/100-night traps. The pattern of activity was exclusively nocturnal, with no activity during the light period, and characterized by two peak peaks in the night-break period (Figure 3). The first peak is observed between 19:00 and 20:00 h, in which the activity density reaches the maximum value of 0.14. Activity then decreases and fluctuates towards midnight, and a second peak of activity is observed between 2:00 and 3:00 h (activity density = 0.11), after which activity decreases dramatically towards 6:00 h (Figure 3).

Figure 2. Records of Didelphis marsupialis A. Female with offspring on back. B. Adult feeding. C. Juvenile. D. Adult.

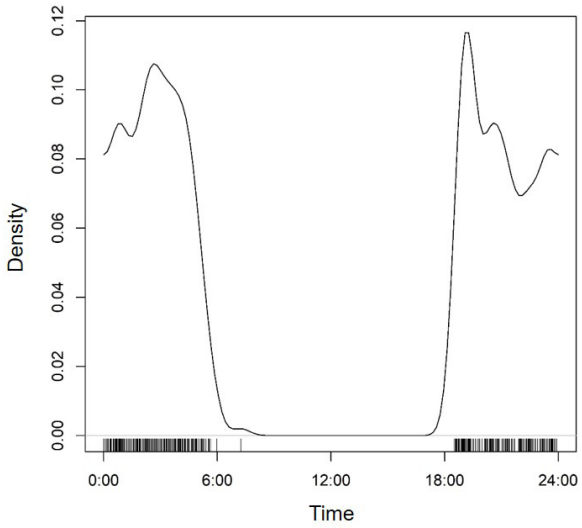

Figure 3. Activity patterns of the opossum *D. marsupialis* estimated by Kernel densities.

DISCUSSION

The estimates of relative abundance in this study were considerably higher than those reported for other areas of the country. The relative abundance of *D. marsupialis* has been estimated to be close to 13 in the foothills of the Farallones de Cali (effort of 2488 days/trap) (8), and for areas of the Aburrá valley, abundance indices of 0.18 (Santa Elena corregimiento) and 0.40 photos/100 night trap (Caldas municipality) have been reported with sampling efforts of 360 days/trap and 38 days/trap respectively (9). Although it is not possible to estimate the number of individuals in our study area, abundance estimates, and records suggest that the area possibly maintains a stable and reproductively active population of *D. marsupialis*.

Although *D. marsupialis* is a species commonly recorded in diversity studies, its relative abundance has been underestimated for the country. Using the footprint trap methodology, the specie associated mainly with secondary coverages has been reported, with greater abundances in grassland areas and crops (15) in tropical dry forest ecosystems. Meanwhile, with live capture traps, the relative abundance was estimated in areas of immersed secondary forest between crops in northern Colombia (16).

The strictly nocturnal activity pattern found for the species in this work coincides with that reported for populations in other peri-urban areas of the country (8), and for populations in natural areas in other areas of the Neotropics (Costa Rica) (17). Likewise, the pattern is similar to the activity profiles documented for the species of genus *D. pernigra* (18) and *D. aurita* (19). Although *D. marsupialis* is a widely distributed species in the country (5), our results constitute the second effort to specifically address the activity patterns of the species in peri-urban environments, as a basis for understanding the ecological factors that allow its permanence in urban forest remnants.

We consider that the abundance values obtained in this study should be taken with caution, since landscape and sampling conditions may have generated an overestimation. Although *D. marsupialis* can make use of diverse vegetation cover, habitat availability optimate for the species in the study area is reduced and is limited to forest fragments that do not exceed 15 m in width, which could force the individuals present to use the same area with greater intensity. The monitoring of a small area, with reduced habitat, in addition to the use of an attractant in the traps and a low number of sampling units, clearly generated an increase in the probability of detection of the species and a direct increase in abundance estimates. Under these conditions, we suggest that the relative abundance and the estimated detection frequency be considered more as an approximation to the probability of use that the species makes of the area and not as an approximation to a population status variable.

Although the present study only estimates the relative abundance in a short time, it allows establishing a baseline for the species in intervened areas of the Aburrá valley, opening the possibility for research questions on population dynamics and their responses to anthropic pressure. This information is of importance in local conservation scenarios, where estimates of population variables allow us to recognize the real impacts of problems such as vehicular traffic that affect the species in Antioquia (6).

Additionally, it is important to consider that the application of these estimates should be considered with caution and understood within the context of the regional landscape, in order to avoid erroneous conclusions about the real abundance of the species. The reason is that in small fragments an overestimation of population variables may be occurring, associated with an effect of the size of the habitat available, as has been reported for other mammalian species (20).

Conflict of interests.

The authors declare no conflict of interest with publication of this manuscript.

Acknowledgements

We thank the Corporacion Universitaria Remington for funding the study, the GINVER research group and the wildlife study group UFASI. To Camilo Sánchez Giraldo and two anonymous reviewers for their valuable contributions during the writing of the manuscript.

REFERENCES

1. McKinney, M. Effects of urbanization on species richness: A review of plants and animals. Urban Ecosyst. 2008; 11(2):161-176. doi: 10.1007/s11252-007-0045-4. https://doi.org/10.1007/s11252-007-0045-4

2. Marin M, Alvarez F, Giraldo C, Pyrcz T, Uribe S, Vila R. Butterflies of an andean periurban cloud forest in the Aburra valley, Colombia. Rev Mex Biodivers. 2014; 85(1):200-208. doi: 10.7550/rmb.36605. https://doi.org/10.7550/rmb.36605

3. Bradley C, Altizer S. Urbanization and the ecology of wildlife diseases. Trends Ecol Evol. 2006; 22(2):95-102. doi: 10.1016/j.tree.2006.11.001. https://doi.org/10.1016/j.tree.2006.11.001

4. Astua D, Lew D, Costa L, Pérez-Hernandez R. Didelphis marsupialis [Internet]. The IUCN red list of threatened species. 2016 [citado 2 de septiembre de 2017]. doi: 10.2305/iucn.uk.2016-1.rlts.t40501a22176071.en https://doi.org/10.2305/IUCN.UK.2016-1.RLTS.T40501A22176071.en

5. Solari S. Didelphis marsupialis. En: Sánchez-Londoño J, Marín-C D, Botero-Cañola S, Solari S. eds. Mamíferos silvestres del Valle de Aburra. Área metropolitana del Valle de Aburra, Corantioquia. Universidad de Antioquia: Colombia; 2014. ISBN 978-958.8513-79-9. https://acuareladelmundo.com/2015/06/20/imama-mamiferos-silvestres-del-valle-de-aburra/

6. Delgado-V C. Muerte de mamíferos por vehículos en la vía del Escobero, Envigado (Antioquia), Colombia. Actu Biol 2007; 29(87):229-233. https://aprendeenlinea.udea.edu.co/revistas/index.php/actbio/article/view/329342/20785822

7. Franco-Quimbay J, Rojas-Robles R. Frugivoría y dispersión de semillas de la palma Oenocarpus bataua en dos regiones con diferente estado de conservación. Actu Biol 2004; 37(102):273-285. https://aprendeenlinea.udea.edu.co/revistas/index.php/actbio/article/view/329005

8. Mosquera M, Corredor G, Cardona P, Armbrecht I. fototrampeo de aves caminadoras y mamíferos asociados en el pidedemonte de farallones de Cali. Bol Cient Mus Hist Nat. 2015; 18(2):144-156. https://www.thefreelibrary.com/Fototrampeo+de+aves+caminadoras+y+mamiferos+asociados+en+el...-a0451148391

9. Cabrera J, Galeano R, Mazabel R, Quintana D, Monsalve B. Evaluación del estado actual de zarigüeyas (Didelphis marsupialis) en tres zonas del valle de Aburrá. J Agric Anim Sci. 2017; 6(1):30-40. https://doi.org/10.22507/jals.v6n1a3

10. González-Maya J, Schipper G, Benítez A. Activity patterns and community ecology of small carnivores in the Talamanca region, Costa Rica. Small Carniv Conserv. 2009; 41:9-14. http://nebula.wsimg.com/b329222e5d557b18e18cf81bc29bb639?AccessKeyId=35E369A09ED705622D78&disposition=0&alloworigin=1

11. O'brien T, Kinnaird M, Wibisono H. Crouching tigers, hidden prey: sumatran tiger and prey populations in a tropical forest landscape. Anim Conserv. 2003; 6:131-139. doi: https://doi.org/10.1017/S1367943003003172

12. Ridout M, Linkie M. Estimating overlap of daily activity patterns from camera trap data. J Agric Biol Environ Stat. 2009; 14(3):322-337. doi: https://doi.org/10.1198/jabes.2009.08038

13. Díaz-Pulido A, Payán E. Manual de fototrampeo: una herramienta de investigación para la conservación de la biodiversidad en Colombia. Instituto de Investigaciones de Recursos Biológicos Alexander von Humboldt y Panthera Colombia: Colombia; 2012. http://repository.humboldt.org.co/bitstream/handle/20.500.11761/31415/240.pdf?sequence=1&isAllowed=y

14. Jiménez-Alvarado J, Moreno-Díaz C, Alfonso A, Giordano A, Vela-Vargas M, Gómez-Hoyos D, et al. Ciudades biodiversas: mamíferos medianos de la reserva forestal protectora bosque oriental de Bogotá, D.C. Colombia. Mammalogy Notes. 2017; 4(1):37-41. https://docs.wixstatic.com/ugd/f964e0_d0f6bd7c3cc6408081d7fc55b4d7012d.pdf

15. Orjuela C, Jimenez G. Estudio de la abundancia relativa para mamíferos en diferentes tipos de coberturas y carretera, finca hacienda cristales, área Cerritos - La Virginia, municipio de Pereira, departamento de Risaralda - Colombia. Univ Sci. 2004; 9:87-96. https://revistas.javeriana.edu.co/index.php/scientarium/article/view/5028

16. Adler G, Arboledo J, Travi B. Population dynamics of Didelphis marsupialis in northern Colombia. Stud Neotrop Fauna Environ. 1997; 32(1):7-11. doi: https://doi.org/10.1076/snfe.32.1.7.13462

17. Arroyo-Arce S, Thomson I, Fernández C, Salom-Pérez R. Relative abundance and activity patterns of terrestrial mammals in Pacuare Nature Reserve, Costa Rica. Cuadernos de Investigación UNED. 2017; 9(1):15-21. https://doi.org/10.22458/urj.v9i1.1673

18. Ramirez-Mejia A, Sánchez F. Activity patterns and habitat use of mammals in an andean forest and a eucalyptus reforestation in Colombia. Hystrix. 2016: 27(2):1-7. https://doi.org/10.4404/hystrix-27.2-11319

19. Caceres N, Monteiro-Filho E. Food habits, home range and activity of Didelphis aurita (Mammalia, Marsupialia) in a forest fragment of southern brazil. Stud Neotrop Fauna Environ. 2001; 36(2):85-92. https://doi.org/10.1076/snfe.36.2.85.2138

20. Maffei L, Noss A. How small is too small? Camera trap survey areas and density estimates for Ocelots in the Bolivian Chaco. Biotropica. 2008.; 40(1):71-75. https://doi.org/10.1111/j.1744-7429.2007.00341.x