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Philander opossum as prey of *Didelphis marsupialis* in a rainforest in México

Philander opossum como presa de *Didelphis marsupialis* en una selva tropical húmeda en México

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Neotropical rainforests hold a high mammalian diversity with complex species interactions. Opossums are a common group of mammals inhabiting these forests. In México, the common opossum *Didelphis marsupialis* and the four-eyed opossum, *Philander opossum* are sympatric species in these forests. The study site is located at Los Tuxtlas Biological Station in Veracruz, México. We filmed a video *in situ* of an interaction between 2 species of opossums using a cell phone camera. The morphological characteristics of both species of opossums correspond to adult individuals of *D. marsupialis* and *P. opossum*. The video shows an individual of *D. marsupialis* crossing a trail and carrying a corpse of an individual of *P. opossum* in its snout. We document the first report of *P. opossum* as a prey of *D. marsupialis* in a rainforest in México and discuss whether it was due to predation or to an opportunistic encounter of a corpse that was removed for later consumption. *Didelphis marsupialis* is known to act as a scavenger and to hunt other opossum species. Our observations coincide with a study documenting a predation event of *D. marsupialis* over *P. opossum* in Barro Colorado, Panamá, and adds valuable information on *D. marsupialis* feeding habits in tropical rainforests.

Key words: Common opossum; feeding habits; four-eyed opossum; Los Tuxtlas; Veracruz.

Las selvas húmedas Neotropicales albergan una diversidad de mamíferos con interacciones complejas entre especies. Los didélfidos, conocidos como tlacuaches, son mamíferos comunes en estas selvas húmedas. En México, el tlacuache común, *Didelphis marsupialis* y el tlacuache cuatro ojos, *Philander opossum* son especies simpátricas en estas selvas. La zona de estudio se localiza en una selva tropical húmeda de la Estación de Biología Los Tuxtlas, en Veracruz, México. Se filmaron ambas especies de tlacuaches *in situ* usando un teléfono celular. Las características morfológicas de ambas especies corresponden a individuos adultos de *D. marsupialis* y *P. opossum*. El video muestra a un individuo de *D. marsupialis* cruzando una vereda y llevando en su hocico un cadáver, como presa, de un individuo de *P. opossum*. Se documenta el primer reporte de *P. opossum* como presa de *D. marsupialis* en una selva tropical húmeda en México. Se discute si este escenario ocurrió por un evento de depredación, o bien, por un encuentro fortuito con una carcasa que estaba siendo trasladada para su consumo. Se conoce que *D. marsupialis* consume carcasas, aunque también caza otras especies de tlacuaches. Nuestro estudio coincide con observaciones que documentan la depredación de *D. marsupialis* sobre *P. opossum* en Barro Colorado, Panamá y contribuye a proveer información relevante sobre los hábitos alimenticios de esta especie en selvas tropicales húmedas.

Palabras clave: Hábitos alimenticios; Los Tuxtlas; tlacuache común; tlacuache cuatro ojos; Veracruz.

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Neotropical rainforests harbor a high diversity of mammals holding complex species interactions. Opossums are a group of mammals that are well represented in these forests (Voss and Jansa 2021). Specifically, México holds 7 species of opossums, among these, *Didelphis marsupialis* and the four-eye opossum *Philander opossum* are sympatric in Los Tuxtlas rainforests and present similar habits (Gardner 1982; Ramírez-Pulido *et al.* 1982; Coates-Estrada and Estrada 1986). Although the differential use of space seems to be a factor that allows the coexistence of species of opossum, some traits such as size and feeding habits, are important features in differentiating their ecology (Leite *et al.* 1996).

The study of the feeding habits of opossums is a fundamental aspect of their natural history (Voss and Jansa 2021). Overall, opossums such as *Didelphis, Lutreolina* and *Philander* are considered omnivorous, and are known to consume large amounts of insects (Sandidge 1953; Leite *et al.* 1996; Cáceres and Monteiro-Filho 2001), crustaceans (González-Ruíz *et al.* 2022), birds (Cordero and Nicolas 1987; Cáceres and Monteiro-Filho 2001), snakes (Cordero

and Nicolas 1987; Cáceres and Monteiro-Filho 2001; Niño-Reyes *et al.* 2020), and mammals (*i. e.*, *Felis catus* and *Rattus rattus*; Cordero and Nicolas 1987), including other opossum species (Wilson 1970; Cordero and Nicolas 1987; Macedo *et al.* 2010). Other didelphids are known to prey on species of opossums, such as *Marmosa paraguaya* and *Philander quica* on *Monodelphis* sp. (Macedo *et al.* 2010; Pires *et al.* 2010), and *Lutreolina crassicaudata* on *Marmosa* sp. (Monteiro-Filho and Dias 1990). We report a species interaction between *D. marsupialis* and *P. opossum* in a tropical rainforest in México.

The study site is located at Los Tuxtlas Tropical Biological Station (Los Tuxtlas) in southeastern México. Los Tuxtlas includes a polygon of 644 ha of tropical rainforest surrounded by a landscape matrix of pastures for agriculture and livestock (Coates 2017; Von Thaden *et al.* 2020; Figure 1). Due to deforestation, certain large native mammal species as *Panthera onca* and *Puma concolor* have been extirpated from the region or occur in diminished population abundances as in the case of *Odocoileus virginianus* (Flores-Martínez *et al.* 2014; Ríos-Solis *et al.* 2021). Loss of large predator species for example, is a process that can promote the increase of herbivores and mesopredators abundances (Terborgh 2001). Recent studies in Los Tuxtlas have documented the occurrence of large population abundances of medium-sized mammals, including opossums, such as *D. marsupialis* and *P. opossum* (Ríos-Solis *et al.* 2021; Flores-Martínez *et al.* 2022).

We filmed a video of an interaction between two opossums approximately at 30 km of the Catemaco-Montepío road (18º 34' 59'' N, 95º 04' 06'' W; at 300 m altitude), using an iPhone 8 cell phone camera, and with the help of lighting from a Toyota, Hilux pickup truck (Appendix 1).

The video was taken at 23:24 hr on February 3, 2023, and shows one large opossum crossing a trail, carrying a corpse of another smaller opossum in its snout. The large opossum exhibits a mottled color pattern, showing a distinctive shift in coloration within the first third of the tail; it was identified as an adult of *D. marsupialis*. The smaller opossum has a uniform grayish coloration, with a black tail except for the last third, where it changes to white; it was identified as an adult of *P. opossum*. Despite detecting human presence, *D. marsupialis* continued carrying its prey until reaching the edge of the trail. Once it reaches a vegetation patch, the individual of *D. marsupialis* is observed to pause for a moment to hold its prey more firmly after a maneuvering to avoid a branch that was blocking its path (Figure 2a-c).

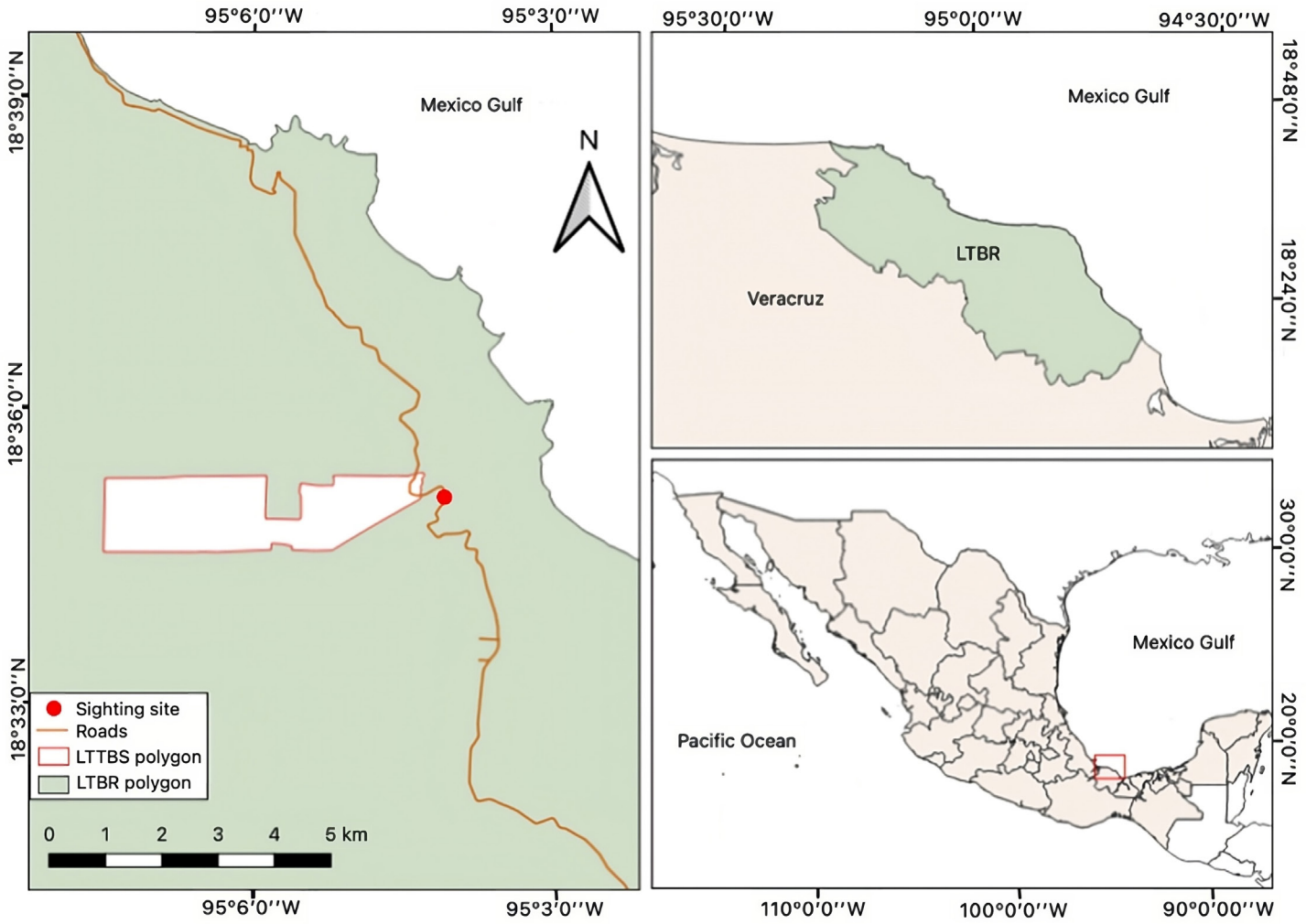

Figure 1. Maps depicting the study site near Los Tuxtlas Tropical Biology Station (LTTBS) and its geographic location within Los Tuxtlas Biosphere Reserve (LTBR), Veracruz, México.

This study reports the first record of direct evidence of an individual of *P. opossum* as prey of an adult individual of *D. marsupialis* at Los Tuxtlas. *Didelphis marsupialis* is known to be an opportunistic species with omnivorous feeding habits (Cordero and Nicolas 1987). We do not know if this episode resulted from a predation event or by encountering a corpse of an adult individual of *P. opossum* and opportunistically removing it. On the other hand, a scenario for a potential predation event is supported by the fact that we observed that the general condition of the corpse of *P. opossum* with an apparent absence of *rigor mortis*, based on the flexibility of its body, suggests that the specimen had not been dead for long. This suggests that, more than being a scavenger event, it could be a hunting event. Moreover, the video was recorded in February, coinciding with the dry season and low fruit production at Los Tuxtlas (Dunn *et al.* 2010). Therefore, it is possible that *D. marsupialis* may resort to hunting as a

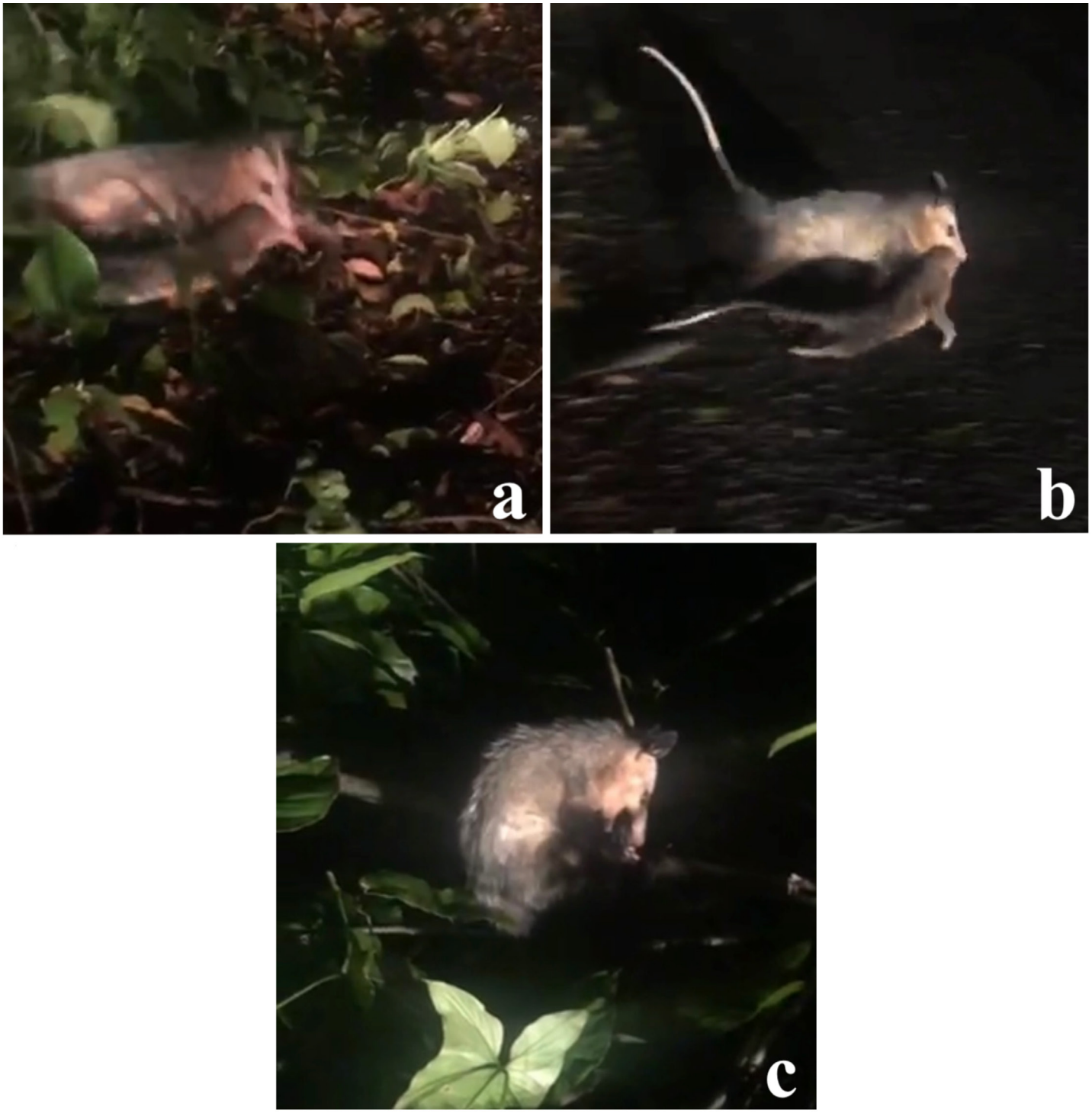

Figure 2. a-c) Sequence of images showing an adult individual of the common opossum, *Didelphis marsupialis* crossing a road and carrying the corpse of an adult individual of the four-eyed opossum, *Philander opossum* in its snout, near Los Tuxtlas Tropical Biology Station, Veracruz, México. Images and video are available in jj@ib.unam.mx and vladimir.rojas@st.ib.unam.mx.

strategy to compensate for the scarcity of other trophic resources, as has been observed in *Didelphis, Lutreolina* and *Philander* (Voss and Jansa 2021). Predation interactions between opossums have been reported on multiple occasions (Monteiro-Filho and Dias 1990; Macedo *et al.* 2010; Pires *et al.* 2010), including a description of confrontation, and the subsequent predation by an individual of *D. marsupialis* on *P. opossum* in Barro Colorado, Panamá (Wilson 1970).

A second possibility is that *D. marsupialis* encountered a corpse of an individual of *P. opossum* and opportunistically removed it to feed elsewhere (Niño-Reyes *et al.* 2020). A scavenging behavior have been documented in other opossum species as *Lutreolina crassicaudata* (Facure and Ramos 2011), *D. aurita* (Carvalho *et al.* 2005), *D. virginiana* (McManus 1974; Hopkins and Forbes 1980; Sandidge 1953), and *D. marsupialis* (Cordero and Nicolas 1987). Further, opossums of the genus *Didelphis* are not fast animals, reaching maximum running speeds of only 7.4 km/h, which can complicate hunting success (McManus 1974). This study documented a fortuitous event of the feeding habits of opossums adding relevant information to their natural history (Leite *et al.* 1996; Flores-Martínez *et al.* 2014; Voss and Jansa 2021; Flores-Martínez *et al.* 2022).

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Literature cited

Cáceres, N. C., and E. L. A. Monteiro-Filho. 2001. Food Habits, Home Range and Activity of *Didelphis aurita* (Mammalia, Marsupialia) in a Forest Fragment of Southern Brazil. Studies on Neotropical Fauna and Environment 36:85-92.

Carvalho, F. M. V., F. A. S. Fernandez, and J. L. Nessimian. 2005. Food habits of sympatric opossums coexisting in small Atlantic Forest fragments in Brazil. Mammalian Biology 70:366-375.

Coates, R. I. 2017. La Estación de Biología Tropical Los Tuxtlas desde su fundación. Pp. 13-26 *in* Avances y Perspectivas en la Investigación de los Bosques Tropicales y sus Alrededores (Reynoso, V. H., R. I. Coates, and M. L. Vázquez-Cruz, eds.). Instituto de Biología, Universidad Nacional Autónoma de México. México City, México.

Coates-Estrada, R., and A. Estrada. 1986. Manual de identificación de campo de los mamíferos de la Estación de Biología Los Tuxtlas. Universidad Nacional Autónoma de México. México City, México.

Cordero, G. A., and R. A. Nicolas. 1987. Feeding habits of the opossum (*Didelphis marsupialis*) in northern Venezuela. Fieldiana Zoology 29:125-131.

Dunn, J. C., J. Cristóbal-Azkarate, and J. J. Veà. 2010. Seasonal Variations in the Diet and Feeding Effort of Two Groups of Howlers in Different Sized Forest Fragments. International Journal of Primatology 31:887-903.

Facure, K. G., and V. Ramos. 2011. Food habits of the thick-tailed opossum *Lutreolina crassicaudata* (Didelphimorphia, Didelphidae) in two urban areas of southeastern Brazil. Mammalian Biology 76:234-236.

Flores-Martínez, J. J., *et al.* 2014. Mamíferos terrestres de la estación de biología tropical de Los Tuxtlas. Revista Digital Universitaria 15:110.

Flores-Martínez, J. J., *et al.* 2022. Spatiotemporal Coexistence of Mesopredators and Their Prey in a Defaunated Neotropical Rainforest. Tropical Conservation Science 15:1-11.

Gardner, A. L. 1982. *Virginia opossum*. Pp. 3-36 *in* Wild mammals of North America (Chapman, J. A., and G. A. Feldhamer, eds.). John Hopkins University Press. Baltimore, U.S.A.

González-Ruiz, Y. De Los Á., M. G. Pimiento-Ortega, and Y. Herrera-Martínez. 2022. First record of predation by the Andean white-eared opossum *Didelphis pernigra* on the red swamp crayfish *Procambarus clarkii* in Colombia. Therya Notes 3:143-146.

Hopkins, D. D., and R. B. Forbes. 1980. Dietary patterns of the Virginia opossum in an urban environment. The Murrelet 61:20-30.

Leite, Y. L. R., L. P. Costa, and J. R. Stallings. 1996. Diet and vertical space use of three sympatric opossums in Brazilian Atlantic Forest Reserve. Journal of Tropical Ecology 12:435-440.

Macedo, L., F. A. S. Fernandez, and J. L. Nessimian. 2010. Feeding ecology of the marsupial *Philander frenatus* in a fragmented landscape in Southeastern Brazil. Mammalian Biology 75:363-369.

McManus, J. J. 1974. *Didelphis virginiana*. Mammalian Species 40:1-6.

Monteiro-Filho, E. L. A., and V. S. Dias. 1990. Observações sobre a biologia de *Lutreolina crassicaudata* (Mammalia: Marsupialia). Revista Brasileira de Biología 50:393-399.

Niño-Reyes, A., *et al.* 2020. New record in the diet of *Philander andersoni*. Therya Notes 1:14-18.

Pires, M. M., *et al.* 2010. Young didelphid consumption by *Micoureus paraguayanus* (Didelphimorphia: Didelphidae) in southwestern Brazil. Mastozoología Neotropical 17:183-187.

Ramírez-Pulido, J., *et al.* 1982. Catálogo de los mamíferos terrestres nativos de México. Editorial Trillas. México City, México.

Ríos-Solís, J. A., *et al.* 2021. Diversity and activity patterns of medium and large-sized terrestrial mammals at the Los Tuxtlas Biosphere Reserve, México. Therya 12:237-248.

Sandidge, L. L. 1953. Food and dens of the Opossum (*Didelphis virginiana*) in Northeastern Kansas. Transactions of the Kansas Academy of Science 56:97-106.

Terborgh, J., *et al.* 2001. Ecological Meltdown in Predator-Free Forest Fragments. Science 294:1923-1926.

Von Thaden, J. J., *et al.* 2020. Dinámica de los cambios en el uso del suelo y cobertura vegetal en la Reserva de la Biosfera Los Tuxtlas (2006-2016). Revista Mexicana de Biodiversidad 91:1-14.

Voss, R. S., and A. S. Jansa. 2021. Opossums: An adaptive radiation of new world marsupials. Johns Hopkins University Press. Baltimore, U.S.A.

Wilson, D. E. 1970. Opossum predation: *Didelphis* on *Philander*. Journal of Mammalogy 51:386-387.

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Appendix 1

Video of an adult individual of the common opossum (*Didelphis marsupialis*) crossing a road and carrying the corpse of an adult individual of a four-eyed opossum (*Philander opossum*), in the rainforest near Los Tuxtlas Tropical Biology Station, Veracruz, México. Video available in https://drive.google.com/file/d/1VjaOCUXYZn3-Y2886ccj-rZVqJfASqlW/