

Consumption of *Eryngium proteiflorum* by the Mexican cottontail (*Sylvilagus cunicularius*)

Consumo de *Eryngium proteiflorum* por el conejo serrano (*Sylvilagus cunicularius*)

YURY GLEBSKIY^{1,2,*}, DANIELA AIMEE PARRA-CAMPOS¹, AND ZENÓN CANO-SANTANA¹

¹Laboratorio de Interacciones y Procesos Ecológicos, Departamento de Ecología y Recursos Naturales, Facultad de Ciencias, Universidad Nacional Autónoma de México. Ciudad Universitaria C. P. 04510. Ciudad de México, México. E-mail: agloti@ciencias.unam.mx (YG); aimee.parra6@gmail.com (DAP-C); zcs@ciencias.unam.mx (ZC-S).

²Posgrado en Ciencias Biológicas, Universidad Nacional Autónoma de México.

*Corresponding author

Despite its abundance and important role in ecosystems, the diet of the Mexican cottontail, *Sylvilagus cunicularius*, has not been studied enough. Previous studies report only the consumption of Poaceae species by this cottontail. In this note, we report the consumption of *Eryngium proteiflorum* by the Mexican cottontail at Pico del Águila located on top of the Ajusco volcano, México City, México. Cottontails consume *E. proteiflorum* leaves from the base to avoid spikes, and they use this source of food all year. Therefore, *E. proteiflorum* could be an important source of nutrition for cottontails, and they appear to be important consumers of this plant.

Key words: Alpine grasslands; Apiaceae; camera traps; diet; mountain.

A pesar de su abundancia y el importante papel que juegan en los ecosistemas, la dieta del conejo serrano, *Sylvilagus cunicularius*, no se ha estudiado lo suficiente. Los estudios previos solamente reportan el consumo de especies de la familia Poaceae por parte de este conejo. En esta nota reportamos el consumo de *Eryngium proteiflorum* por el conejo serrano en el Pico del Águila, localizado en la cima del volcán Ajusco, Ciudad de México, México. Los conejos comen las hojas de *E. proteiflorum* empezando por la base para evitar sus espinas y usan este recurso durante todo el año. Por lo tanto, *E. proteiflorum* podría ser una importante fuente de nutrientes para los conejos y éstos parecen ser importantes consumidores de la planta.

Palabras clave: Apiaceae; cámaras trampa; dieta; montaña; pastizal alpino.

© 2024 Asociación Mexicana de Mastozoología, www.mastozoologiamexicana.org

Alpine grasslands in the Mexican volcanic belt are home to a great variety of species, many of which are endemic (Steinmann *et al.* 2021). However, these ecosystems are endangered due to their small size (they can only be found on the tops of a few mountains), the fact that they are located close to the most heavily populated areas of México (therefore the anthropogenic pressure is high), and climate change (Steinmann *et al.* 2019, 2021). At the same time, our knowledge of the natural history of plants and animals that live there is scarce (Steinmann *et al.* 2019, 2021).

One example of this is the endemic Mexican cottontail (*Sylvilagus cunicularius*) that inhabits the Mexican volcanic belt (Cervantes *et al.* 1992). Although it is common across several ecosystems in central México, there are few studies concerning this rabbit, and in particular, information on its diet is scarce and mostly based on occasional observations (Ceballos and Galindo 1984; Cervantes *et al.* 1992). In natural areas, this cottontail consumes grasses like *Muhlenbergia macroura*, *Stipa ichu* and *Festuca amplissima* (Cervantes *et al.* 1992), and in cultivated areas, the

young leaves of oats, maize, and barley (Ceballos and Galindo 1984). Notice that all those species belong to the Poaceae family. Therefore, this work aims to report the consumption of *Eryngium proteiflorum* (an herb of the Apiaceae family) by the Mexican cottontail in a high-altitude environment.

We monitored the fauna on top of El Pico del Águila (approximately 3,850 m) on the Ajusco Mountain, south of México City (Figure 1) for 1 year (May 2022-May 2023) using 5 camera traps. One of the traps was pointing directly at an individual of *E. proteiflorum* and all the data presented here was collected by this trap. The camera trap used was a HC801A Trail Camera set to take 2 pictures when the motion sensor was activated and a delay of 5 sec before the next activation. The camera trap was active 24 hr a day and checked once a month. The vegetation in the location consists predominately of grasses, some spatially located *Pinus* trees, and the herb *E. proteiflorum* is common. Two seasons are distinguishable: the dry from October to April and the rainy from May to September.

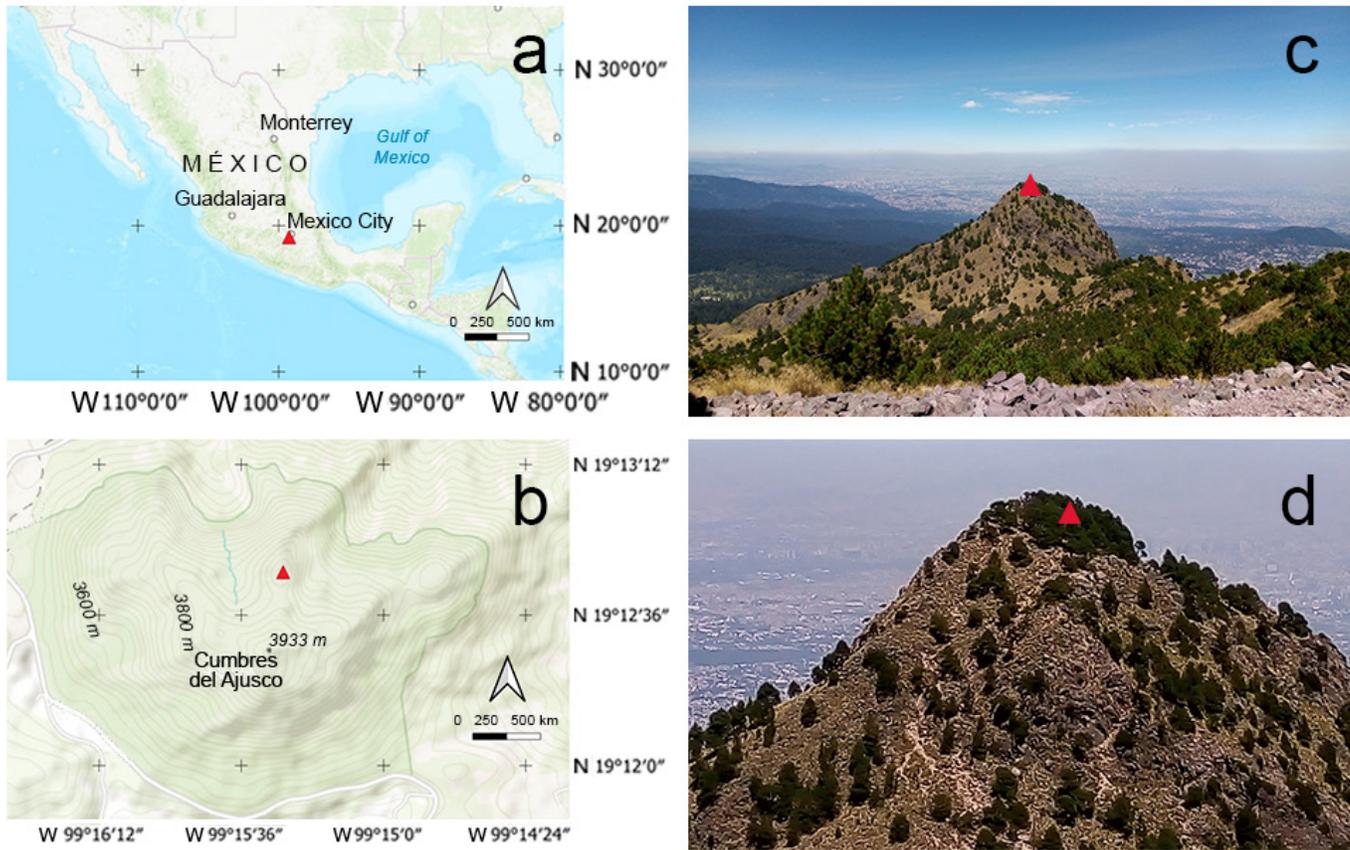


Figure 1. Location where the Mexican cottontail (*Sylvilagus cunicularius*) was observed consuming *Eryngium proteiflorum* a) general location map, b) map of the mountain (the red triangle represents the sampling point), c) general view of the Pico del Águila, south of México City, d) view of the forest where traps were located (the red triangle shows exact location of the trap).

We observed 3 events of *E. proteiflorum* consumption by Mexican cottontails on August 20, 2022, at 19:17 hr; on September 15, 2022, at 17:19 hr, and on April 21, 2023, at 16:40 hr. The pattern of consumption was the same in all observations: the Mexican cottontail bites a leaf in its mid-section and pulls it away, dividing the leaf longitudinally in half, and then proceeds to consume it, starting with the basal portion (Figure 2). In all 3 events, the duration of the interaction was short (1-2 min), and rabbits consumed 1 to 2 leaves per event. Based on the photographs before and after predation *E. proteiflorum* did not seem to be heavily damaged by the consumption (since it's apparent biomass and coverage experienced little change).

Identification of the rabbit species is tricky since the Mexican cottontail is sympatric with the morphologically similar Eastern cottontail (*S. floridanus*), the main external difference between the 2 is their size; Mexican cottontail is larger (Ceballos and Galindo 1984; Chapman and Ceballos 1990). Our photographs suggest that the species present in this region is *S. cunicularius* because it appears to be larger than individuals of *S. floridanus* found in nearby locations, and the fecal pellets found in the study site are bigger than 1 cm in diameter and have a regular shape, matching the description of the Mexican cottontail (Aranda 2012).

The consumption pattern is explained by the leaf morphology: *E. proteiflorum* leaves are serrated with small spikes pointing forward; therefore, Mexican cottontails eat them from behind to avoid getting hurt. As for the importance of *E. proteiflorum* for the Mexican cottontail, its main food source is likely the grasses (Cervantes et al. 1992) that dominate alpine grasslands; however, previous studies have suggested that food variety is important for rabbits. For example, Gidenne et al. (1998) conclude that having a single origin of fiber (particularly wheat) is detrimental to the domestics' rabbit (*Oryctolagus cuniculus*) health. Therefore *E. proteiflorum* could be important as a source of nutrients and diet variation for the cottontail. Another advantage that *E. proteiflorum* provides is that, unlike most vegetation at Pico del Águila, this plant does not completely dry up even at the end of the dry season, providing the Mexican cottontail with fresh vegetation when it is scarce.

From *E. proteiflorum* point of view, the Mexican cottontail appears to be the main herbivore that consumes it since we did not register any other mammal consumers or see signs of insect predation, although further studies are needed to confirm this observation. Visually the plant does not appear to be heavily affected by predation (only a small portion of the biomass is taken) and in this case it was able

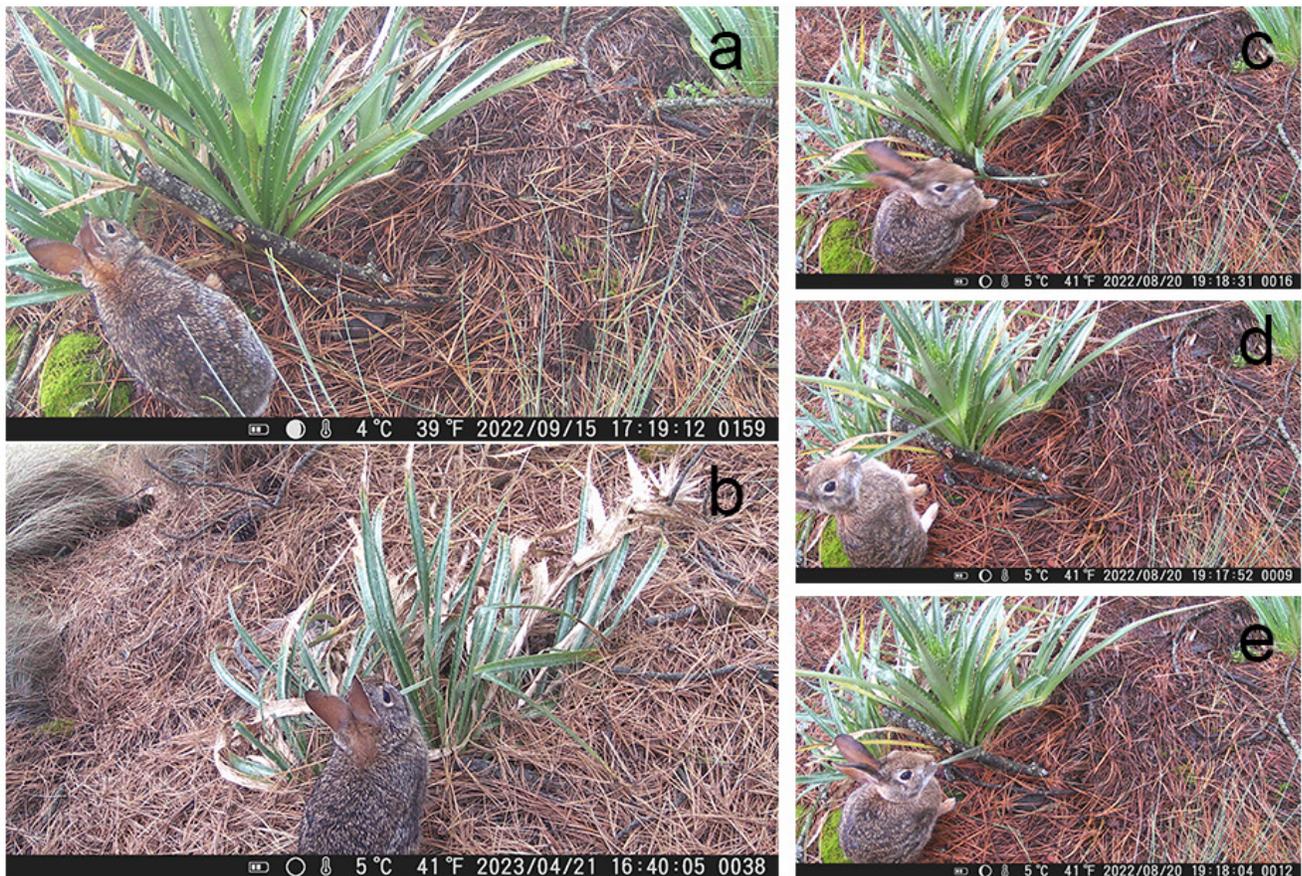


Figure 2. Consumption of *Eryngium proteiflorum* by the Mexican cottontail, *Sylvilagus cunicularius* in El Pico del Águila on the Ajusco Mountain, México City. a) In September 2022, b) in April 2023, notice that the plant lost part of its leaves during the dry season, c) separating the leaf from the plant, d, e) consumption of the leaf. Images available at agloti@ciencias.unam.mx.

to complete reproduction. In Figure 2, the emerging flower could be observed in pictures c, d and e (in the center of the plant), and 8 months later the already dead flower is seen in picture b. This suggests that the damage by herbivory was not enough to prevent this plant reproduction. Although since 3 events of herbivory were performed on the same plant, the cumulative effect could be significant and further studies are needed to better understand the impact of the Mexican cottontail on *E. proteiflorum*.

In conclusion, we observed a previously unknown interaction between *E. proteiflorum* and Mexican cottontail, contributing to the knowledge of this animal diet. At the same time, further studies are needed about the Mexican cottontail diet.

Acknowledgements

We are thankful to I. Castellanos-Vargas for technical support, and to M. Glebskaya, and C. Martinez-Calderon for their help in the field work. This project was financially supported by the CONAHCYT scholarship to Y.G. (CVU 817316) and a PAPIIT grant IN212121 (El efecto de la urbanización sobre el tlacuache *Didelphis virginiana* en un matorral xerófilo de la Ciudad de México) to Z. Cano-Santana. Two anonymous reviewers provided comments that contributed to improving this note.

Literature cited

- ARANDA, M. 2012. Manual para el rastreo de mamíferos silvestres de México. Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO). México City, México.
- CEBALLOS, G. G., AND L. C. GALINDO. 1984. Mamíferos silvestres de la Cuenca de México. México City, México.
- CERVANTES, F. A., ET AL. 1992. *Sylvilagus cunicularius*. Mammalian Species 412:1-4.
- CHAPMAN, J. A., AND G. CEBALLOS. 1990. The cottontails. Pp. 95-110 in Rabbits, hares and pikas: status survey and conservation action plan (Chapman, J. A., and J. E. C. Flux eds.). International Union for the Conservation of Nature and Natural Resources. Gland, Switzerland.
- GIDENNE, T., ET AL. 1998. Effect of the dietary fiber origin on the digestion and on the caecal fermentation pattern of the growing rabbit. Animal Science 66:509-517.
- STEINMANN, V. W., ET AL. 2019. La vegetación alpina mexicana. Editorial Impresora Apolo. México City, México.
- STEINMANN, V. W., ET AL. 2021. Diversity and origin of the Central Mexican alpine flora. Diversity 13:31.

Associated editor: Beatríz Bolívar Cimé.

Submitted: November 24, 2023; Reviewed: January 23, 2024.

Accepted: February 6, 2024; Published on line: February 19, 2024.