



## Short communication

## Assembling rodent's feeding links: Observation of Sumichrast's Vesper Rat, *Nyctomys sumichrasti* (Rodentia: Cricetidae), feeding on fruits of *Tabernaemontana glabra* (Apocynaceae)



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## ABSTRACT

Assembling feeding links is a task that requires gathering information about the ecological interactions of multiple species. Depending on the studied group, this information can be highly difficult to obtain, for example, dietary information is one of the most valuable and yet poorly known aspects of many Neotropical mammals, and especially of small, understudied, and elusive rodents. Here, we reported a new dietary item consumed by the Sumichrast's Vesper Rat, *Nyctomys sumichrasti* in a Neotropical deciduous forest of Costa Rica. Rodents were observed feeding on the fleshy and oily arils that enclose the seeds of *Tabernaemontana glabra* fruits. This field observation may represent an opportunistic visitation of *N. sumichrasti* to the fruits of *T. glabra*, as birds seem to be the primary agents of seed dispersal for *Tabernaemontana* species. Natural history observations like this are essential as they contribute to the state of knowledge of the resources, feeding links, and food webs of complex Neotropical ecosystems, as well as the potential ecological roles (e.g., seed dispersers or seed predators) performed by several rodent species on numerous Neotropical plants.

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Understanding the nature of species interactions is one of the main goals of ecological research (Hall and Raffaelli, 1993). For example, documenting what eats what (i.e., predation), one of the basic interactions of living systems, is essential to assemble feeding links between species that can help us to explain major patterns and the dynamic of biological communities (Pimm et al., 1991). Despite its apparent simplicity, assembling feeding links between species can be challenging, especially when considering the scale and specificity of some interactions (e.g., endemic species), the elusive behavior or remote habitats of some species (e.g., deep-sea fishes) or the high and sometimes unknown diversity of species that are interacting with each other (e.g., Megadiverse ecosystems).

With over 2,200 species, rodents are one of the most taxonomically, dietary, ecologically, and behaviorally diverse group of mammals around the world (Pardiñas et al., 2017). In general, many aspects of rodent ecology are difficult to investigate, as direct observations in nature are rare due to their small size, nocturnal habits, restricted distribution, and elusive behaviors of these animals (Missagia et al., 2019). Despite the development and advance of research techniques (e.g., stable isotope and DNA metabarcoding), gathering detailed data on some ecological aspects such as diet is still challenging, limiting our understanding and our ability to

perform intraspecific and interspecific comparisons among species or assembling feeding links between rodents species and their preys.

The Sumichrast's Vesper Rat, *Nyctomys sumichrasti* (Saussure, 1860) is a nocturnal and arboreal Neotropical rodent species belonging to one of the most diverse families of rodents in the New World (Cricetidae: Rodentia). It is a medium-sized mouse with their upperparts orange and their underparts creamy white, large eyes with conspicuous dark eye rings and a dark and long-haired tail with a pronounced terminal tuft (Reid, 2009). Although the Sumichrast's Vesper Rat is widely distributed from Veracruz, Mexico to eastern Panama (Reid, 2009), little is known about the most basic aspects of its natural history, including its dietary information.

*Nyctomys sumichrasti* feeds mainly on plant materials and insects (Hunt et al., 2004). Among their dietary resources, it has been reported eating fruits of *Psychotria gracilis* and *Hoffmania* sp. (both Rubiaceae—Eisenberg, 1989), *Bonellia nervosa* (Primulaceae—Ceballos, 1990), *Cordia diversifolia* (Boraginaceae—Genoways and Jones, 1972), *Ficus* sp. (Moraceae—Genoways and Jones, 1972), *Bactris baileyana* and *Elaeis oleifera* (both Arecaceae—Bessesen and Saborío-R, 2009); young leaves of *Daphnopsis americana* (Thymelaeaceae—Timm and Vriesendorp, 2003); and moths (Lepidoptera—Reid, 2009).

Here, we reported a new food item including by the Sumichrast's Vesper Rat in its diet. On the evening of 16 January 2020, one of the authors (VJA-C) observed two adult individual Sumichrast's Vesper Rats of

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unknown sex feeding on a fruit of a *Tabernaemontana glabra* tree (Apocynaceae) (Fig. 1). Observations were performed at Sector Santa Rosa, Guanacaste Conservation Area, Guanacaste Province, Costa Rica (10° 50' N, 85° 37' W) at 300 m a. s. l. The area is covered with a Neotropical deciduous forest containing small patches of evergreen forest (Janzen, 1982a). Both rodents were observed from 18:30 to 18:40 h on a horizontal branch approximately at 4 m high and 1-cm in diameter in a 5-m *T. glabra*.

When detected, the rodents were feeding on a fruit of *T. glabra* that were already open. Based on the observations of the incisor marks, it appears that rodents chewed on the thick and woody husk of the fruit (Fig. 1, white arrow) in order to expose and better reach the tightly packed mass of fleshy, bright red-orange arils enclosing the dark brown seeds (Fig. 1, white circle and red arrow). For about the total time of the observation (about 10 min), the rodents grasped the branch with their hind feet and handled the seeds with their front feet, agilely stirring the arils despite the strong winds that were abruptly moving the tree and the branches in several directions. As detected by Timm and Vriesendorp (2003) and by us, *N. sumichrasti* may be able to maintain their feeding position despite disadvantageous weather conditions, an ability that can be facilitated by several morphological adaptations (e.g., long tail) that allow the species to exploit food resources on other strata not available for other rodents.

*Tabernaemontana glabra* is a Neotropical tree distributed from México to Bolivia. It grows in the mature and successional dry forest, mainly on the North Pacific of Costa Rica, where is commonly found in a wide range of habitats such as semievergreen and riparian habitats, second-growth woodlands, forest edges and pastures (Foster and McDiarmid, 1983; Morales, 2005). Based on the natural history of *Tabernaemontana donnell-smithii*, a close-related species of *T. glabra*, rodents are probably taking advantage of the stringy, extremely oily, and highly nutritious arils of the seeds (Foster and McDiarmid, 1983) that are available all year round (Morales, 2005). This nutritious reward is often consumed by birds, who are the primary agents of seed dispersal for *T. donnell-smithii* (McDiarmid et al., 1977; Foster and McDiarmid, 1983) and probably for *T. glabra* as well.

As virtually no information is available about the natural history and ecology of *T. glabra*, this may be the first report of an interaction between a potential mutualistic partner and this Neotropical plant species. Opportunistic visitation of rodents (this communication), birds (McDiarmid et al., 1977) and monkeys (Muskin and Fischgrund, 1981) on plants of the genus *Tabernaemontana* is expected, especially since morphological, nutritional and phenological characteristics of the genus seems to have evolved to capture the largest possible number of facultative frugivores and potentially seed dispersers (Foster and McDiarmid, 1983).



**Fig. 1.** Two individuals of Sumichrasti's Vesper Rat, *Nyctomys sumichrasti*, feeding on a fruit of *Tabernaemontana glabra* at Santa Rosa National Park, Costa Rica. White arrow: Incisor bites performed to open the thick exocarp. White circle: The second individual rodent starting to eat the arils of a *T. glabra* seed. Red arrow: Same second individual with the arils of the seed partially removed. Pictures by VJA-C.

We consider that further evidence is needed to elucidate the ecological role of *N. sumichrasti* as a potential disperser or predator of *T. glabra* seeds. Scarce evidence on other Neotropical rodents suggests that they can perform both roles (Janzen, 1982b; Sahley et al., 2016; Leiser-Miller et al., 2019), contributing either way to the structure of plant populations and the dynamic of biological communities. We strongly agree that natural history observations like this are essential to comprehend the ecological roles of small and elusive animals in many biological interactions (Acosta-Chaves et al., 2018). Moreover, casual observations captured in multimedia devices, including citizen science data, are important as they increase and build on the current knowledge of resources, feeding links, and ultimately on the food webs from complex Neotropical ecosystems.

### Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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