

First record of nesting of a marsupial *Tlacuatzin balsasensis* (Didelphidae) in a wasp comb

Primer registro de anidación de un marsupial *Tlacuatzin balsasensis* (Didelphidae), en un nido de avispas

AKETZALI MARTÍNEZ-MARTÍNEZ¹, DIEGO GUERRERO-GUERRA¹, ROSA MARÍA GÓMEZ-UGALDE^{1*}, NATALIA MARTÍN-REGALADO², AND MARIO C. LAVARIEGA²

¹Instituto Tecnológico del Valle de Oaxaca, Tecnológico Nacional de México. Carretera al ITAO s/n, C. P. 71233, San Jesús Nazareno. Santa Cruz Xoxocotlán, Oaxaca, México. E-mail: sagitario.ketza1998@gmail.com (AM-M); diegon.guerra95@gmail.com (DG-G); rosa.gu@voaxaca.tecnm.mx (RMG-U).

²Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional Unidad Oaxaca, Instituto Politécnico Nacional. Hornos 1003, C. P. 71230. Santa Cruz Xoxocotlán, Oaxaca, México. E-mail: nataliamartinregalado@gmail.com, (NM-R); mlavarriegan@ipn.mx (MCL).

*Corresponding author

Mammals construct, reuse, or adapt nests for purposes such as maternity, rest, and protection from environmental factors. American marsupials can either construct their own nests or occupy those abandoned, but the use of wasp combs as structural support has not been previously observed. In this study, we document the construction of a nest by a small Neotropical marsupial utilizing a wasp comb as support. While carrying out field surveys at Yerba santa, Municipality of Yosondúa, Oaxaca, México, we were noticed by residents of a wasp nest. We went to the sighting site to measure the height of the branch supporting the nest. The nest was examined, measurements were taken (length, width, and diameter of the entrance), and photographic records were obtained of the small mammal inside. The wasp nest was located on a thin branch 4 m above the ground. It measured 25 cm in length and 15 cm in width, with an entrance opening of 7 cm positioned on the underside. Inside a single individual of a small marsupial was observed. The individual was identified as *Tlacuatzin balsasensis* based on its small size, brownish slightly gray dorsal fur and yellow buff underparts, and geographic range. The nest fitted to known descriptions of *Tlacuatzin* nests, as the size, entrance, and location above the ground. However, the base material consisted of wasp comb, an animal-built material. Wasp nests provide robust material that may also offer environmental protection and refuge from predators for the small marsupial. To our knowledge, this represents the first recorded instance of a mammal nesting in a wasp nest.

Key words: Behavior; Deciduous forests; Mixteca region; Oaxaca; *Polybia*; refuge.

Los mamíferos construyen, reutilizan o adaptan sus nidos para la maternidad, el descanso y la protección frente a factores ambientales. Los marsupiales americanos pueden construir sus propios nidos u ocupar los abandonados, pero el uso de panales de avispa no se había observado anteriormente. Documentamos la construcción de un nido por parte de un pequeño marsupial neotropical utilizando un panal de avispa. Durante muestreos de campo en Yerba Santa, Municipio de Yosondúa, Oaxaca, México, los habitantes del lugar nos notificaron de un nido de avispas. Después de inspeccionarlo, encontramos un pequeño mamífero en su interior. Se inspeccionó el nido, se tomaron medidas (largo, ancho y diámetro de la entrada) y se obtuvieron registros fotográficos del individuo. El nido de avispas se localizó sobre una rama delgada a 4 m del suelo. Medía 25 cm de largo por 15 cm de ancho, con una entrada de 7 cm posicionada en la parte inferior. En su interior se observó un individuo de un pequeño marsupial. El individuo fue identificado como *Tlacuatzin balsasensis* con base en su tamaño pequeño, pelaje dorsal ligeramente gris parduzco y partes inferiores de color beige amarillento y rango geográfico. El nido se ajusta a las descripciones conocidas, en cuanto al tamaño, entrada y ubicación sobre el suelo. Sin embargo, el material de base consistió en un panal de avispa, el cual proporciona un material resistente que también puede ofrecer protección ambiental y refugio contra los depredadores. Hasta donde sabemos, este es el primer caso registrado de un mamífero anidando en un panal de avispa.

Palabras clave: Comportamiento; Oaxaca; *Polybia*; refugio; región Mixteca; selva baja caducifolia.

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Marsupials use nests as shelters and to protect and lactate their young until they can provide themselves with food (Tyndale-Biscoe and Renfree 1987). Therefore, females build better-quality nests (Kimble 1997) and change nests less frequently than males (Reid 1997). For females, the search for appropriate nesting sites is vital to protect their

numerous offspring and is more stressing for those species that lack a pouch (Astúa and Guilhon 2022). Marsupials can build nests (Kimble 1997) but more commonly exhibit opportunistic nesting behavior by appropriating and reconditioning the nests of other species (Hunsaker II and Shupe 1977; Monticelli and Gasco 2018). Therefore, the



Figure 1. Geographical location of Yerba Santa, Municipality of Yosondúa, in the Mixteca region, State of Oaxaca, México.

discovery of their nests is usually by chance ([Armstrong and Jones 1971](#); [Zarza et al. 2003](#)).

The location of marsupial nests is related to the stratum they use ([Pine 1981](#); [O'Connor et al. 1982](#)), for example, the semi-aquatic species *Chironectes minimus* ([Zimmermann, 1780](#)) usually makes underground cavities with entrances above the water level ([Reid 1997](#)); while the four-eyed opossum *Metachirus nudicaudatus* ([É. Geoffroy Saint-Hilaire 1803](#)), of terrestrial habits, builds nests with dry leaves intertwined with pieces of roots, which are spherical, and apparently without an entrance ([Loretto et al. 2005](#)). The descriptions of small marsupial nests agree that the nests are located more than 0.7 m above the ground, are spherical (approximately 20 cm in diameter), with openings of 3-4 cm at the bottom, and for their conditioning they use dry leaves ([Hunsaker II and Shupe 1977](#); [Husson 1978](#); [Jiménez and Rageot 1979](#); [Redford and Eisenberg 1992](#); [Engstrom et al. 1994](#); [Zarza et al. 2003](#)). They can also use holes in banks of ground, branches, or cactus, and the use of abandoned bird nests is also common ([Alonso-Mejía and Medellín 1992](#); [Reid 1997](#)). Additionally, the use of artificial nests (wooden boxes; [Brito-Vera et al. 2022](#)) has been recorded. In all cases, marsupial species seem to share the behavior

of transporting organic material for nesting with the help of their tails ([Redford and Eisenberg 1992](#); [Kimble 1997](#); [Pereira and Schlindwein 2016](#)).

[Ramírez-Pulido et al. \(2014\)](#) recognize that nine species of marsupials inhabiting México. However, molecular genetic studies carried out by [Arcangeli et al. \(2018\)](#) on the genus *Tlacuatzin* Voss and Jansa, 2003 suggest that in México this taxon is formed by five phylogenetic clades in México, two of which are distributed in the state of Oaxaca: *Tlacuatzin canescens* ([Allen 1893](#)) and *Tlacuatzin balsasensis* [Arcangeli et al. 2018](#)

Tlacuatzin is an endemic taxon to México ([Arcangeli et al. 2018](#)); the species of this genus are small (20-60 g) and have mainly nocturnal, semi-arboreal, and solitary habits; they are considered omnivores, feeding mainly on insects and fruits and occasionally on small vertebrates ([Zarza et al. 2003](#)). These species frequent the ground more than others and in western México, the reproductive season runs from August to October, and they have 8 to 13 young ([Reid 1997](#)).

The nests of *Tlacuatzin* species have been described as spherical and constructed of dry leaves and twigs lined with plant remains ([Nelson 1899](#); [Armstrong and Jones 1971](#); [Reid 1997](#); [Zarza et al. 2003](#)). The species *Tlacuatzin*



Figure 2. a) Individual of *Tlacuatzin balsasensis*, inside a wasp comb of *Polybia* sp.; b) close-up.

insularis (Merriam, 1898), from the Islas Marías, nests in cactus, and abandoned nests of birds, such as orioles (Armstrong and Jones 1971; Zarza et al. 2003). In Chamela, Jalisco, the nests of *Tlacuatzin sinaloae* have been found on trees (*Cenostigma eriostachys* (Benth.) Gagnon & G.P.Lewis, *Bonellia macrocarpa* subsp. *pungens* (A.Gray) B.Ståhl & Källersjö), shrubs (*Neltuma juliflora* (Sw.) Raf.) and cacti *Opuntia excelsa* Sánchez-Mej.), at 0.70-5.0 m above the ground (Zarza et al. 2003). In this note, we document the use and conditioning of a *Polybia* sp. wasp comb by the *Tlacuatzin balsasensis* for use as a nest.

The record was carried out in the community of Yerba Santa in the Municipality of Santiago Yosondúa, in the Mixteca region, in the central west of the state of Oaxaca, México. Its geographical location is between the coordinates 16° 48' N and 16° 49' N, and 97° 34' W and 97° 33' W (Figure 1). It is located at a distance of 96.8 km SW

from the City of Oaxaca. The topography is heterogeneous, with an altitudinal gradient that varies from 1,200 m in the lowest area to 1,750 m in the highest area. The site has tropical deciduous forests in the lower parts, while in the middle elevations, it changes to oak or oak-pine forests, and in the higher parts, there is pine forest.

During wildlife monitoring activities in Yerba Santa, local residents reported the accidental discovery of a wasp comb on a recently cut branch during clearing work. Based on this report, the following were carried out: (1) locating and georeferencing the site of the discovery; (2) measuring the height of the branch supporting the comb; (3) conducting a detailed examination of the comb, recording its morphometric variables in centimeters (length, width, and diameter of the entrance); and (4) photographing the resident specimen. Additionally, wasp remains present inside the nest were collected to determine their taxonomic

identity. Taxonomic identification was performed through comparative morphological analysis of adult specimens collected at the site.

On March 5, 2021, the first author was notified of the remains of a wasp comb that had been removed from a tree during land-clearing activities. According to the report, the nest was extracted due to concerns over potential wasp. The site inspection revealed that the wasp comb was suspended 4 meters above ground on a *Lonchocarpus* sp. branch; it had an opening underside, and inside an individual of opossum was discovered. The geographic coordinates of the record were 16°48'5.40" N, 97°35'14.28"W. The individual was determined as *Tlacuatzin* due to its small size and grayish fur color, instead of reddish as presented in *Marmosa mexicana* Merriam, 1897 (Zarza *et al.* 2003). As the specimen was not collected, morphometrics (e.g., skull dimensions, molar lengths) were unavailable. Species identification was therefore based on fur coloration and range criteria from Arcangeli *et al.* (2018) as *T. balsasensis* due to the specimen possessing a brownish slightly gray dorsal fur and yellow buff underparts (Figure 2) and near of the range of this species. The dimensions of the nest were: width 15 cm, length 25 cm, and diameter 15 cm; the opening of the nest was 7 cm in diameter. The exact depth of the nest is unknown, but it was observed that the individual could stay completely inside. The edges and interior of the nest were covered with leaves that partially separated the nest cells (Figure 2).

Videos and photographs of the species were obtained and subsequently, the nest was placed on a high branch of an *Ehretia tinifolia* L. tree near the location of the discovery to allow the animal to continue their cycle life.

When reviewing published information on the nests occupied by species of the genus *Tlacuatzin*, we found that these have been described as balls of dry leaves and twigs lined with crushed leaves and arranged in the fork of small trees and shrubs, or holes in cactus or branches (Nelson 1899; Armstrong and Jones 1971; Reid 1997). Nests have been found 0.9 to 2.4 m above the ground (Nelson 1899) and usually have a small opening on the underside. The nest described here was found 4 m above ground and in other characteristics, it conforms to previous descriptions, in terms of the flattened leaves lining the entrance and interior, and the position of the opening. However, the base material of the nest consisted mainly of wasp comb. The use of these combs had not previously been reported in nests of marsupials or other small mammals, so this is the first record of the use of wasp combs as a nesting site for a marsupial or any other mammal.

Both mammals and birds often resort to wasp combs in search of larvae as a food source (Jeanne 2009; Kratzer 2022). There are also mutualistic interactions, in which birds and wasps find benefit from building nests nearby (Hindwood 1955; Quinn and Ueta 2008). In Africa, it was found that vertebrates and wasps preferred artificial nests

that were not previously occupied by the other species, suggesting that they avoided each other (Veiga *et al.* 2013). Brito-Vera *et al.* (2022) reported the use of artificial nest boxes with the presence of abandoned wasp nests by *Marmosa simonsi* Thomas 1899, but not utilizing the comb as in the present findings.

The nesting record that we present, together with the report by Brito-Vera *et al.* (2022), suggests that there is no rejection by small marsupials to occupy sites previously used by wasps as nests. On the other hand, the documented finding reinforces the conception of the opportunistic behavior of *Tlacuatzin* sp. to occupy pre-constructed sites as nesting and/or refuge sites (Armstrong and Jones 1971).

Finally, our nesting record of *T. balsasensis* in wasp combs represents the first documented report for the genus *Tlacuatzin*. However, further ecological studies are required to confirm if the use of this organic material is common in species of the *Tlacuatzin* genus and if it provides them with any nutrients or advantages over others plant materials or to deter predators.

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