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## First record of *Rhinetula denticrus* Friese (Halictidae: Halictini) from México


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**Abstract.** *Rhinetula denticrus* Friese is recorded for the first time in Mexico. During curatorial work, a specimen collected in 1980 from Cárdenas, Tabasco, Veracruz Biogeographic Province, was discovered, representing the northernmost known record of the genus in the Neotropical region. In addition, we provide new observations on the nesting habits of this species.


### INTRODUCTION

The known distribution of *Rhinetula* Friese extends from the lowland tropical rain forests of Honduras to eastern Peru and Bolivia within the Neotropical region (Gonçalves & Melo, 2006; Roberts & Brooks, 1987). These are solitary bees that nest underground and exhibit matinal and crepuscular activity patterns (Danforth *et al.*, 2019; Roubik, 1993; Wolda & Roubik, 1986). This group within the Halictini is related to other genera in the subtribe Caenohalictina, such as *Dinagapostemon* Moure & Hurd, *Agapostemonoides* Roberts & Brooks, and *Paragapostemon* Vachal and, as well as *Agapostemon* (*Agapostemon*) Guérin-Méneville and *Agapostemon* (*Notagapostemon*) Janjic & Packer. Together, these genera form the *Agapostemon* clade, which is characterized by the extension of the facial fovea to the ocular emargination, the presence of many longitudinal striae in the genal area, and a dorsally extended lateral propodeal carina. Males have a basitibial plate, and the terga exhibit yellow markings (Gonçalves & Melo, 2010; Janjic & Packer, 2003).

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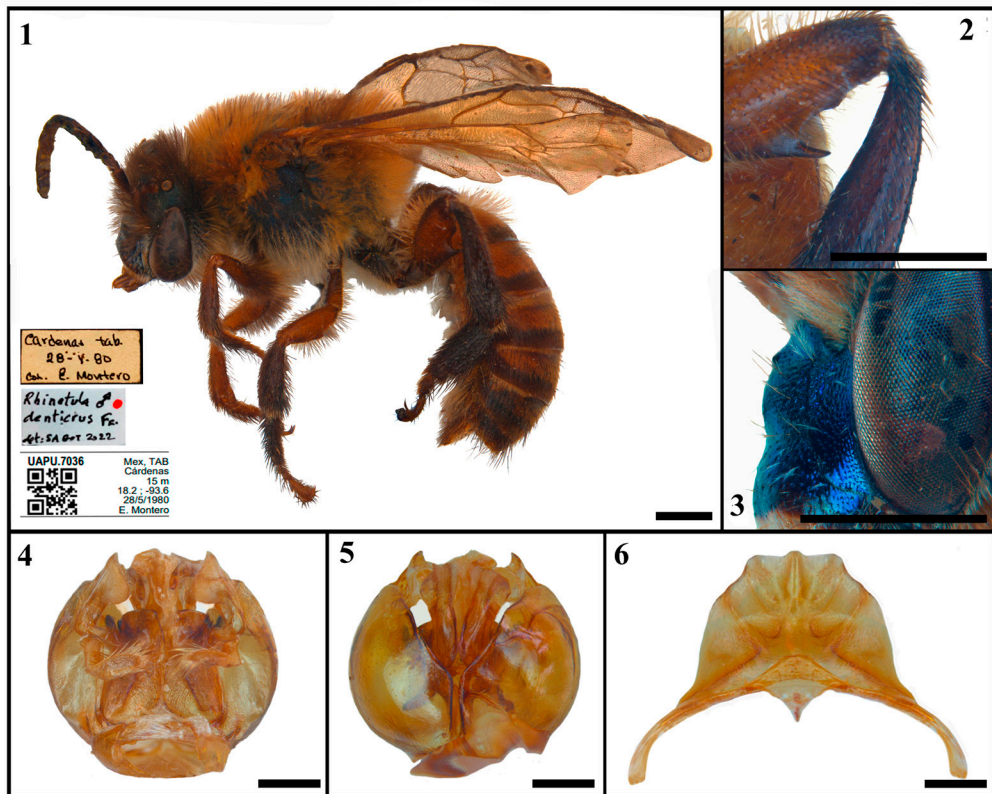
*Rhinetula* is distinguished from other genera by the significant reduction in the length of its metapostnotum, its large body size (8.8–11.2 mm), and a well-developed lateral gradular carina on the metasomal terga. Additionally, the antennae are of similar length in both males and females (Gonçalves & Melo, 2006, 2010; Michener, 2007; Roberts & Brooks, 1987). Unlike nocturnal bees such as *Megalopta* Smith (Halictidae: Augochlorini), *Rhinetula* does not exhibit noticeably enlarged ocelli (Danforth *et al.*, 2019; Michener, 2007). Currently, two species are recognized within the genus, which differed in their geographical distribution: *Rhinetula rufiventris* Friese is restricted to South America, while *Rhinetula denticrus* Friese is distributed in Central America (Gonçalves & Melo, 2006, 2010). *Rhinetula denticrus* is poorly represented in biological collections, and little is known about the biology of these species. While they are obligatorily crepuscular, there have been reports of males foraging during the day (Roberts & Brooks, 1987; Wolda & Roubik, 1986). In contrast to crepuscular bees, *R. denticrus* lack specialized visual structures for obligate dim-light conditions, yet they are part of the crepuscular melittofauna in tropical forests (Danforth *et al.*, 2019; Michener, 2007; Roubik, 1993).

Ayala *et al.* (1996) estimated the presence of 191 species and 22 genera of Halictidae in México. In recent decades, however, this number has increased, and this family is now represented in the country by 25 genera (*sensu* Michener, 2007) and 269 species (Sagot, in prep.). In this study, we report the first occurrence of *R. denticrus* in México, a new record of both genus and species of native bees, extending its northernmost distribution within the Neotropical region. Additionally, we provide the first documentation of this species' nesting habits, contributing to a deeper understanding of its biology.

## MATERIAL AND METHODS

The male specimen representing a new record from México was identified to the genus level using Michener (2007) and to the species level using the original descriptions and identification keys for *Rhinetula* (Gonçalves & Melo, 2006; Roberts & Brooks, 1987). The male genitalia, the sixth sternum (S6), and the seventh tergum (T7) were dissected, cleared with a 10% KOH solution to observe morphological details more clearly, and then pinned to the specimen labels. The material studied is deposited in the entomological collection of Centro Occidente Mexicano (CECOM) - Instituto de Ecología, INECOL A.C., Centro Regional del Bajío, Pátzcuaro, Michoacán.

The distribution map was created using QGIS software (version 3.22) based on locality records from DiscoverLife bee species guide and world checklist (Ascher & Pickering, 2023), as well as published literature (Gonçalves & Melo, 2006; Roberts & Brooks, 1987). The specimen labels for the new record were transcribed *verbatim*, and information contained in their QR codes is given in squared brackets [...]. A backward slash (\) is used to indicate separate labels on the same specimen pin. The biogeographical regionalization of the Neotropical region follows Morrone (2014). Images of the anatomical structures were taken with a Leica MC 170 HD camera mounted on a Leica M205C stereomicroscope, processed with Leica Application Suite software, and edited using Photoshop (CS®) program. Plant names associated with floral records that appeared in the literature were verified and updated according to the International Plant Names Index.



**Figures 1–6.** Male specimen of *Rhinetula denticrus* Friese, new record for México. **1.** Habitus, lateral view. **2.** Hind leg showing long and acute ventral femoral tooth. **3.** Detail of clypeus and supraclypeal area in profile. **4, 5.** Genital capsule in dorsal and ventral view. **6.** S7 and S8, ventral view. Scale bar: 2.0 mm in Fig. 1; 1.0 mm in Figs. 2 and 3; 0.5 mm in remaining figures.

## SYSTEMATICS

### *Rhinetula denticrus* Friese (Figs. 1–6.)

**DIAGNOSIS:** Male. Head with erect pubescence dark brown (Fig. 1). Clypeus with conspicuous longitudinal striae; supraclypeal area with strong transverse striae that extend across the middle (Fig. 3). Legs and terga dark brown, with some areas amber. Hind leg with ventral femoral tooth long and acute (Fig. 2). Erect setae on T4–T6 dark brown, decumbent hairs relatively sparse and not entirely covering the terga (Gonçalves & Melo, 2006; Roberts & Brooks, 1987). Genitalia (Figs. 4 and 5); S6 and T7 as in Fig. 6.

**MATERIAL EXAMINED:** 1 ♂ [UAPU 7036], [México], Cárdenas, TAB [Tabasco], [15 msnm], [Coordinates: 18.2, -93.6] 28-V-80, [28/05/1980], Col. [Collector] E. Montero \ *Rhinetula denticrus* Fr. [Friese] Det. [Determined] [Philippe] Sagot 2022 [handwritten] (ECOAB). Deposited in the Colección Entomológica del Centro Occidente Mexicano “Gonzalo Halffter Salas” (IEXA-CECOM), Instituto de Ecología, INECOL, A.C., Centro Regional del Bajío, Pátzcuaro, Michoacán, México.

FLORAL RECORDS: *Cassia* L. (Fabaceae), *Croton panamensis* Müll. Arg. (Euphorbiaceae), *Tapirira guianensis* Aubl. (Anacardiaceae), *Psychotria* L. (Rubiaceae) (Basset *et al.*, 2003; Roberts & Brooks, 1987).

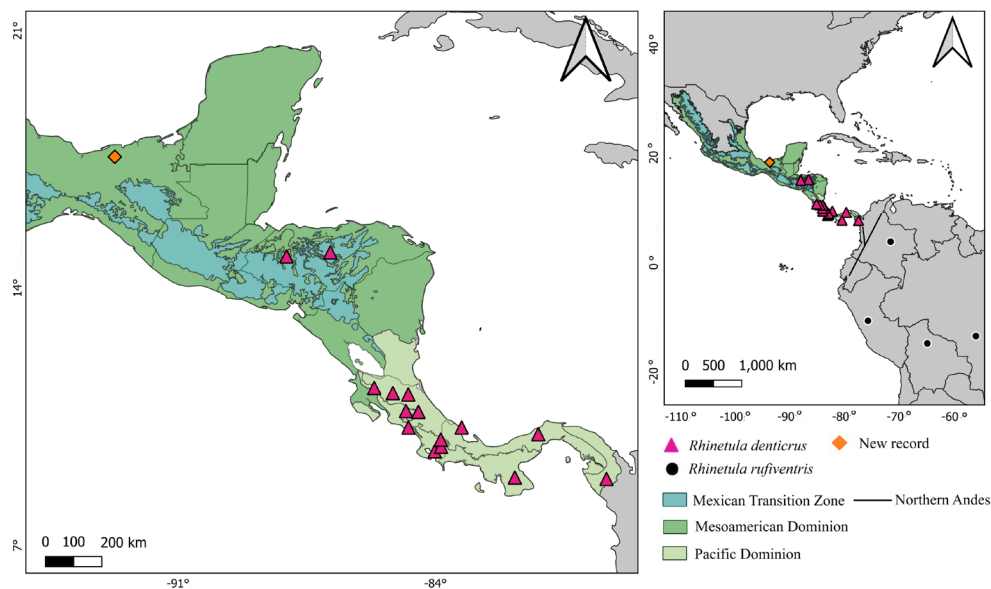
NESTING: Underground/Communal. In a naturally regenerating, abandoned coffee plantation in Costa Rica, nests of *R. denticrus* were documented in loose soil within an abandoned leafcutter ant nest (Formicidae: Attini, *Atta* spp.). Multiple entrance holes were observed in the ground, with at least three bees actively entering and exiting their nests around 7 a.m. (Hsu, pers. comm.).

DISTRIBUTION: Colombia: Departamento Antioquia: Amalfí, San Cristóbal, San Luis. Costa Rica: Provincia Alajuela: San Carlos. Provincia Cartago: Turrialba, Provincia de Heredia: Sarapiquí, Puerto Viejo, Provincia Puntarenas: Garabito, Golfito, Playón. Provincia San José: San José. Honduras: Provincia Atlántida: Tela, Provincia de Cortes: Santa Cruz de Yojoa. Panamá: Provincia de Zona del Canal: Isla Barro Colorado, Zona del Canal de Panamá. Provincia Colón: Gamboa. Provincia de Darién: Parque Nacional de Darién, Provincia Panamá: Capira, El Llano, Santa Rita (Ascher & Pickering, 2023; Roberts & Brooks, 1987).

## DISCUSSION

At first glance, species of *Rhinetula* could be confused with *Dinagapostemon* or even some species of the genus *Caenaugochlora* Michener (Halictidae: Augochlorini), as both genera share features such as hairy eyes and, in some cases, similar color patterns. Most records of *Rhinetula* come from Central America and include specimens captured using light traps, suggesting that these bees are active during nocturnal and morning hours, in addition to exhibiting some daytime activity (Danforth *et al.*, 2019; Michener, 2007; Roberts & Brooks, 1987). Similar to other crepuscular genera such as *Megalopta* and *Ptiloglossa* Smith (Colletidae: Diphaglossini), *Rhinetula* appear to be attracted to household lights, which may facilitate their capture (Roberts & Brooks, 1987). Our note represents the first documentation of the nesting habits of *R. denticrus*, consistent with the solitary and communal behaviors proposed for *Rhinetula* in the phylogenetic hypothesis of *Agapostemon* (Janjic & Packer, 2003). However, further studies on nesting behavior and structure are needed to better understand its biology, as bees in Halictinae displays significant variation in social behaviors, even within a single genus and among populations of the same species (Danforth, 2002; Wcislo & Danforth, 1997).

The known distribution of *R. denticrus* extends from the humid forests of Central America in the Chocó-Darién biogeographic province within the Pacific domain, to the Mosquitia biogeographic province in the Mesoamerican domain (Gonçalves & Melo, 2006). In this study, we report a new record from the Veracruz biogeographic province in México, specifically in the South Veracruz-Tabasco Rainforest district (Morrone, 2014), representing the northernmost occurrence of this species in the Neotropical region (Fig. 7). The Veracruz province, together with the Yucatán Peninsula province, is one México's primary biodiversity hotspots, harboring the largest remaining areas of tropical rainforests in the country (Corlett & Primack, 2011; Morrone, 2014; Myers, 2003). However, these forests are increasingly impacted by both natural phenomena, such as fires and hurricanes, and human activities, including deforestation, conversion of natural areas to agriculture and livestock use, oil extraction, and expansion of tourist infrastructure (Dinerstein *et al.*, 1995; Morrone, 2014). The states of Tabasco, Veracruz, and Chiapas exhibit the highest rates of land use change associated with vegetation cover loss (Díaz-Gallegos *et al.*, 2010). Additionally, environmental pressures from



**Figure 7.** Distribution maps of the known species of *Rhinetula* and the new record of *R. denticrus* Friese in México.

climate change could further impact the region, potentially resulting in warmer conditions that promote the expansion of dry ecosystems (Lyra *et al.*, 2017), thereby threatening the survival of *R. denticrus* populations and other species adapted to the tropical rainforest ecosystems.

In Mesoamerica, the lack of comprehensive faunistic and taxonomic studies often results in recorded species diversity being significantly lower than the actual diversity. In Tabasco, only 136 bee species have been documented (Sagot, in prep.), but species richness is likely much higher than currently recorded (Ayala, pers. comm.). More sampling is needed in Tabasco, particularly in the locality where the *R. denticrus* specimen was collected, as well as in other areas with tropical forests in southeastern México and Central America.

It is also essential to carry out curation work in the miscellaneous sections of regional entomological collections, as such efforts have led to significant advancements in our understanding of the region's melittofauna in recent years, including the description of new genera and species and the expansion of known distributions (Flórez-Gómez *et al.*, 2022; Mérida-Rivas *et al.*, 2022; Roig-Alsina, 2024; Vivallo *et al.*, 2023; Zabinski, 2024). Continued exploration of bee diversity is required to fully understand the richness and functional structure of native bee communities in the region. Additionally, it is important to learn more about the potential role of *R. denticrus* as a floral visitor and pollinator of plant species that bloom at night or in the early hours of the day.

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