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An extraordinary northward range extension of the bee *Andrena* (*Cnemidandrena*) *pachucensis* Donovan, 1977 (Hymenoptera, Andrenidae) to New Mexico, USA

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Abstract. *Andrena* Fabricius, 1775 is one of the most diverse bee genera worldwide, yet the biology and distribution of many species are poorly known. Here I present the first record of *Andrena pachucensis* Donovan, 1977 in the United States. This species was originally described from 11 specimens collected in the state of Hidalgo Mexico. The type specimens are housed at University of Kansas where museum records indicate there are eight not 11 type specimens. The discovery of two additional specimens in Taos, New Mexico, represents a remarkable northward range extension of about 1,900 km.

Key words. Hidalgo, Mexico, Taos, museum records, type specimens

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INTRODUCTION

The bee family Andrenidae, commonly known as mining bees, comprises 3,089 species worldwide, making up a large percentage of native bee diversity (Ascher and Pickering 2025). Understanding the biodiversity, biogeography, general ecology, and pollination interactions of bees is vital due to bees being the most important pollinators, and their pollination services being crucial for agricultural and native plant species (Danforth 2007; Burkle et al. 2013; Garibaldi et al. 2013; Hung et al. 2018). Bees in the genus *Andrena* Fabricius, 1775 are one of the most diverse animal genera in the world containing 1,738 species (Wood 2025). The genus mainly has a Holarctic distribution, while the biology of a few species has been extensively studied, the biology and pollination ecology remains largely unknown for most species (Rozen 1973; Davis and LaBerge 1975; Larkin et al. 2008; Wood 2025). However, some *Andrena* species are very effective pollinators (amount of pollen deposited per visit), when compared to the European honeybee, with the *Andrena* subgenus *Melandrena* depositing 2.5 times more pollen per visit (Park et al. 2016).

Due to the high number of species within the genus, many subgenera have been proposed to further separate species into more manageable groups. The subgenus *Cnemidandrena* was described by Hedicke (1933), and it contains about 50 species, 32 of which are from the New World, depending on taxonomic interpretation (Donovan 1977; Gusenleitner and Schwarz 2002; Tadauchi and Xu 2002; Wood 2024). While only a few species have been included in molecular studies, they have shown that the subgenus is monophyletic (Bossert et al. 2022; Pisanty et al. 2022). Members of this subgenus are typically rare in biological collections, and although some information is available on their nesting behavior, seasonal activity, floral associations, and parasites, the overall biology of *Cnemidandrena* remains poorly understood (Donovan 1977; Wood 2024).

Andrena pachucensis was described by Donovan (1977) from 11 specimens, two females and nine males, collected over 60 years ago. The only ecological information available for this species comes from what is available on the specimen label data, which has three collection dates—17 June 1961 (two females), 28 July 1954 (five males), and 26 August 1962 (four males), with both females on the plant genus *Haplopappus* Cass. (now *Isocoma* Nutt.) (Donovan 1977). Additionally, all specimens were collected from Epazoyucan, Pachuca, and a third locality 8km west of Pachuca, all in Hidalgo, Mexico (Donovan 1977). All records were from 2,437–2,469 m (Donovan 1977). See Results and Discussion for updated type specimen information.

This report documents the first confirmed specimens of *A. pachucensis* since its original description, documenting a new flower association, phenology records, and a significant range extension into New Mexico, United States.

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METHODS

Specimens were obtained from the University of Kansas Snow Entomological collection (SEMC), where the type material of *A. pachucensis* is housed. Identification of specimens was done using keys in Michener (2007), Donovan (1977), and comparisons with type specimens. Photos were taken with a Macropod Pro 3D photomacrography system from Macroscopic Solutions® consisting of a Canon EOS 6D Mark II camera. Zerene Stacker® program was used to condense images into a single fully focused image. Adobe Photoshop was used to add scale bars, crop, and combine separate photos into a single figure. A map was made using Natural Earth, free vector and raster map data at naturalearthdata.com and edited using QGIS v. 3.34.1-Prizren. Coordinates for all specimens of *A. pachucensis* were approximated based on the label data and information in Donovan (1977).

RESULTS

***Andrena* (*Cnemidandrena*) *pachucensis* Donovan, 1977**
Figure 1

New records. UNITED STATES — New Mexico • Taos County, Taos; 36°23′14″N, 105°35′02″W; elev. 2,120 m; 18.IX.1995; Charles Michener leg.; ex *Chrysothamnus linifolius*; 2 ♀, SM0633714 KUNHM-ENT, SM0633714 KUNHM-ENT.

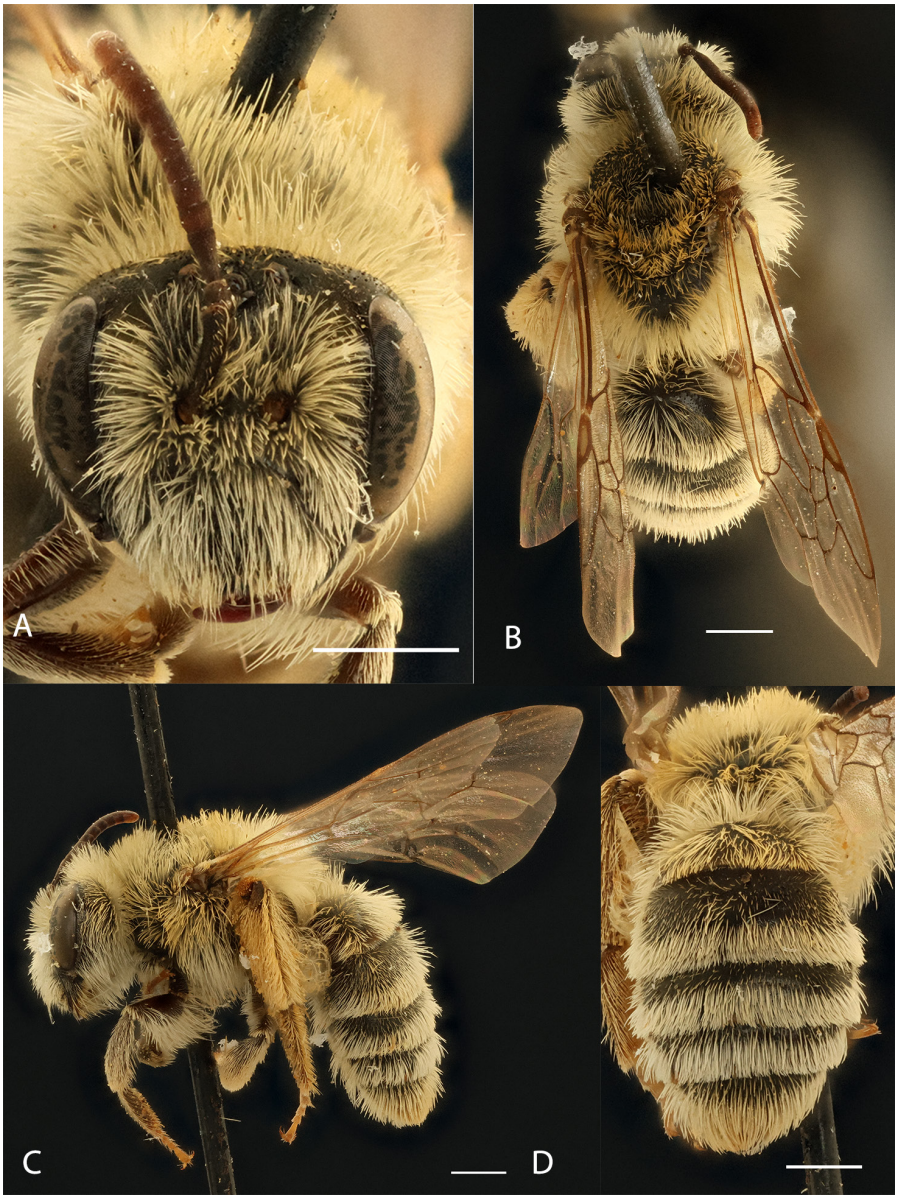

Figure 1. Holotype female of *Andrena pachucensis* Donovan, 1977. **A.** Facial view. **B.** Dorsal habitus. **C.** Lateral habitus. **D.** Detail of metasoma in dorsal view. Scale bars = 1 mm.

Materials examined. MEXICO — Hidalgo • Epazoyucan; 20°00'55"N, 098°38'26"W; elev. 2,469 m; 17.VI.1961; ex Isocoma; 1 Holotype ♀, SEMC1110946. 5 miles West Pachuca; 20°07'11"N, 098°49'32"W; elev. 2,408 m; 26.VIII.1962; Ellen Ordway leg.; 1 allotype ♂, 3 paratypes ♂, SEMC1110947, SM0394492, SM0394491, SM0394493. Pachuca; 20°06'05"N, 098°45'46"W; elev. 2,408 m; 28.VII.1954; 3 paratypes ♂, SM0394494, SM0394496, SM0394496.

Identification. The morphological identification of this species was determined using the key to subgenera of *Andrena* of North and Central America (Michener 2007: 243–247). From this it was determined the specimens fit within the subgenus *Cnemidandrena*, keying out to couplet 28, due to the specimens matching the presence of the main morphological features for the subgenus, namely the middle basitarsus being expanded medially, having a well-developed humeral angle, and terga 2–4 and usually 1 with well-developed apical pale fasciae. After this, Donovan's (1977) key to females of *Cnemidandrena* was used and lead to the determination of the specimens as *A. pachucensis*. The specimens fit the species morphology from the key in Donovan (1977), due to the presence of concolorous apical fasciae, smooth scutum, apical fasciae on tergum 1, wings lightly colored apically, scutum moderately shagreened, and metanotum dull (Figure 1). Further morphological comparisons indicated the characters of the specimens matched the main characters of the description: flagellar segment 1 slightly longer than segments 2 plus 3, vertex above lateral ocellus equal to one ocellar diameter, pronotum well developed, vestiture white to light yellow, propodeal enclosure with anterior half irregularly roughened, and scutum nearly shiny. To verify identification, I compared specimens to the holotype, allotype, and paratypes of *A. pachucensis*.

DISCUSSION

During the identification of the new specimens, it was discovered that only the holotype female, allotype male, and six paratype males were present in the collection at the University of Kansas. Additionally, the holotype female labels had a floral record on the genus *Isocoma* Nutt., while in Donovan (1977) it is listed as holotype female and paratype female were collected on *Haplopappus* Cass. This was likely the case due to *Isocoma* formally being a section of *Haplopappus*, from 1928 to 1991, when it was elevated back to genus level (Hall 1928; Nesom 1991). Upon reviewing the available museum records with the collection manager at University of Kansas, it appears these eight specimens are the only specimens that have been housed in the collection for this species. It is unclear where the additional single female, and two male paratypes have gone, potentially sent to another museum, or the information was incorrectly listed by Donovan (1977). It would be very disappointing if the specimens were lost due to the rarity of this species, and therefore elevating the importance of the two newly discovered female specimens. Due to these circumstances, until further understanding of what happened to the other type specimens, they should be treated as unknown, with the only floral record occurring on *Isocoma*.

The results of this research demonstrate the importance of natural history collections and taxonomy in the identification and understanding of the natural world. There is much left to learn and discover, especially for insects. This is the first record of *A. pachucensis* in the United States and elevates the number of available specimens for the species from eight to 10 and of female specimens from one to three. From this significant range extension of roughly 1,900 km (Figure 2), it provides clues as to the habitat this species may have preference for and develop further understanding on floral preferences, and seasonality. The two newly identified specimens are from Taos, New Mexico, at an elevation of 2,120 m. The holotype, allotype, and paratypes were collected at elevations of 2,408 m and 2,469 m. Given this information, it is likely that this species has habitat preferences within high elevation mountains. The reasoning for the new specimens occurring at an elevation ~300 m lower than the Mexican specimens is likely due to biogeographic zonation seen in other organisms that creates distinct environmental zones, that of which temperature change is a main driving factor, though many other factors exist (Lomolino et al. 2017). Focusing on just temperature change, an increase in elevation and latitude, corresponds to a temperature decrease. Therefore, an increase or decrease in elevation corresponds similarly to an increase or decrease in latitude (Lomolino et al. 2017). It is likely that the specific environment that *A. pachucensis* occupies changes in elevation relative to its latitude or vice versa. Therefore, the specimens in Mexico are at a higher elevation relative to being at a lower latitude, while the new specimens are at a lower elevation due to being at a higher latitude. This is a simple explanation of what is a much more complicated process of climate patterns that create the different environmental zones throughout Southwestern United States and Mexico.

Additionally, the holotype female was recorded on the plant genus *Isocoma* Nutt, in the family Asteraceae. While the two newly identified specimens were collected on *Chrysothamnus linifolius* Greene [=*Lorandersonia linifolia* (Greene)] also in the family Asteraceae (Urbatsch et al. 2005). *Isocoma* and *Lorandersonia* are both in the tribe Astereae but are in different subtribes, *Isocoma* in Machaerantherinae and *Lorandersonia* in Solidagininae (Nesom 2020). This suggests that this bee species may collect pollen from more than a single plant species and subtribe, but may be restricted to the Astereae tribe, providing further insight into the

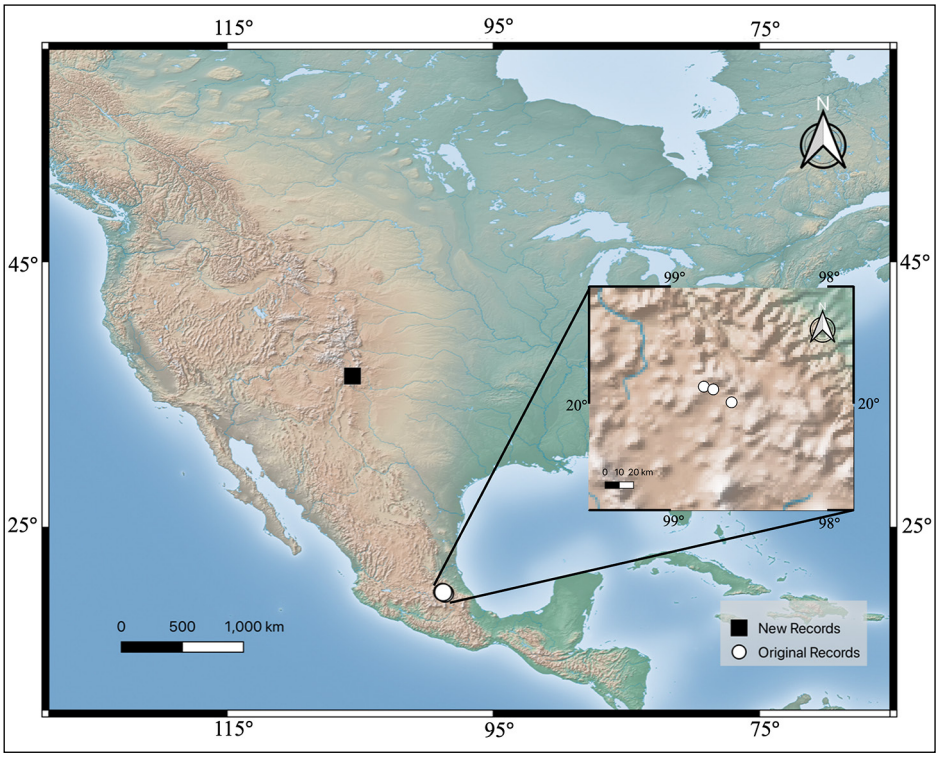

Figure 2. Occurrence records of *Andrena pachucensis* Donovan, 1977. Circles: all previously known records in Hidalgo, Mexico; square: new records from New Mexico, United States.

foraging preferences of this elusive bee. The newly identified specimens were also collected in mid-September, indicating it is likely active from summer to early fall. Donovan (1977) considered *A. pachucensis* to be closely related to *Andrena costillensis* Viereck and Cockerell, 1914 (scutum dull, tesselate) and *Andrena columbiana* Viereck, 1917 (tergum 5 pubescence not concolorous with apical fasciae), which are both more widespread throughout Western United States. *Andrena costillensis* and *A. columbiana* are mainly active in July and August, and most commonly associated with plants in the Astereae tribe (Donovan 1977). Future, studies should aim at determining the current presence of *A. pachucensis* in New Mexico, as the specimens reported here were collected 30 years ago.

There have been other similar disjuncts of bee species including *Trachusa interdisciplinaris* (Peters, 1972) and *Macrotera parkeri* (Timberlake, 1980) both of which have been found in Puebla, Mexico but have Northern disjunct discoveries (Thorp and Brooks 1994; Danforth 1996; Minckley and Radke 2021). It is likely that for *A. pachucensis,* more populations are present in the areas between the type locality and the new record locality, scattered across high elevation mountains of Sierra Madre Oriental, the Southern Rocky Mountains, and the Trans-Pecos region of West Texas. In the light of climate change and habitat destruction, there is always the possibility this species may be in decline or slip away before we have any real understanding of it.

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ADDITIONAL INFORMATION

Conflict of interest

The author declares that no competing interests exist.

Ethical statement

No ethical statement is reported.

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Data availability

All data that support the findings of this study are available in the main text.

REFERENCES

Ascher JS, Pickering J (2025) Discover life bee species guides and world checklist (Hymenoptera: Apoidea: Anthophila). https://www.discoverlife.org/mp/20q?guide=Apoidea_species&flags=HAS. Accessed on: 2025-08-08.

Bossert, S, Wood TJ, Patiny S, Michez D, Almeida EA, Minckley RL, Packer L, Neff JL, Copeland RS, Straka J, Pauly A, Griswold T, Brady SG, Danforth BN, Murray EA (2022) Phylogeny, biogeography and diversification of the mining bee family Andrenidae. Systematic Entomology 47 (2): 283–302. https://doi.org/10.1111/syen.12530

Burkle LA, Marlin JC, Knight TM (2013) Plant-pollinator interactions over 120 years: loss of species, co-occurrence, and function. Science 339 (6127): 1611–1615. https://doi.org/10.1126/science.1232728

Danforth BN (1996) Phylogenetic analysis and taxonomic revision of the *Perdita* subgenera *Macrotera*, *Macroteropsis*, *Macroterella*, and *Cockerellula* (Hymenoptera: Andrenidae). University of Kansas Science Bulletin 55: 635–692.

Danforth B (2007) Bees. Current Biology 17 (5): 156–161. https://doi.org/10.1016/j.cub.2007.01.025

Davis LR, LaBerge WE (1975) The nest biology of the bee *Andrena* (*Ptilandrena*) *erigeniae* Robertson (Hymenoptera: Andrenidae). Illinois Natural History Survey Biological Notes 95: 1–16. https://doi.org/10.5962/bhl.title.15002

Donovan BJ (1977) A revision of North American bees of the subgenus *Cnemidandrena* (Hymenoptera: Andrenidae). University of California Publications in Entomology 81: 1–107.

Fabricius JC (1775) Systema Entomologiae sistens insectorum classes, ordines, genera, species, adiectis synonymis, locis, descriptionibus, observationibus. Officina Libraria Kortii, Flensburg and Leipzig, 832 pp. https://doi.org/10.5962/bhl.title.36510

Garibaldi LA, Steffan-Dewenter I, Winfree R, Aizen MA, Bommarco R, Cunningham SA, … Klein AM (2013) Wild pollinators enhance fruit set of crops regardless of honey bee abundance. Science 339 (6127): 1608–1611. https://doi.org/10.1126/science.1230200

Gusenleitner F, Schwarz M (2002) Weltweite Checkliste der Bienengattung *Andrena* mit Bemerkungen und Ergänzungenzu paläarktischen Arten (Hymenoptera, Apidae, Andreninae, *Andrena*). Entomofauna, Supplement 10: 1–1280.

Hall HM (1928) The genus *Haplopappus*: a phylogenetic study in Compositae. Carnegie Institution of Washington 389: 1–391.

Hedicke H (1933) Beiträge zur Systematik der Gattung *Andrena* F. (Hym. Apid.). Mitteilungen aus dem Zoologischen Museum in Berlin 19: 199–220.

Hung KLJ, Kingston JM, Albrecht M, Holway DA, Kohn JR (2018) The worldwide importance of honey bees as pollinators in natural habitats. Proceedings of the Royal Society B: Biological Sciences 285 (1870): 20172140. https://doi.org/10.1098/rspb.2017.2140

Larkin LL, Neff JL, Simpson BB (2008) The evolution of a pollen diet: host choice and diet breadth of *Andrena* bees (Hymenoptera: Andrenidae). Apidologie 39 (1): 133–145. https://doi.org/10.1051/apido:2007064

Lomolino MV, Riddle BR, Whittaker RJ (2017) Biogeography Biological Diversity across Space and Time. Fifth edition. Sinauer Associates, Sunderland, MA, USA, 32–33pp.

Minckley RL, Radke WR (2021) Extreme species density of bees (Apiformes, Hymenoptera) in the warm deserts of North America. Journal of Hymenoptera Research 82: 317–345. https://doi.org/10.3897/jhr.82.60895

Michener CD (2007) The bees of the world. Second edition. The Johns Hopkins University Press, Baltimore, MD, USA, 953 pp.

Nesom GL (1991) Taxonomy of *Isocoma* (Compositae: Astereae). Phytologia 70 (2): 69–114.

Nesom GL (2020) Revised subtribal classification of Astereae (Asteraceae). Phytoneuron 53: 1–39.

Park MG, Raguso RA, Losey JE, Danforth BN (2016) Per-visit pollinator performance and regional importance of wild *Bombus* and *Andrena* (*Melandrena*) compared to the managed honey bee in New York apple orchards. Apidologie 47 (2): 145–160. https://doi.org/10.1007/s13592-015-0383-9

Peters DS (1972) Drei neue Arten der Megachilidae aus Mexico (Insecta: Hymenoptera: Apoidea). Senckenbergiana Biologica 53: 373–382.

Pisanty G, Richter R, Martin T, Dettman J, Cardinal S (2022) Molecular phylogeny, historical biogeography and revised classification of andrenine bees (Hymenoptera: Andrenidae). Molecular phylogenetics and Evolution 170: 107151. https://doi.org/10.1016/j.ympev.2021.107151

QGIS (2025) QGIS Geographic Information System (Version 3.34) [Software]. Open Source Geospatial Foundation. https://qgis.org

Rozen JG (1973) Notes on the bee *Andrena accepta* Viereck (Hymenoptera, Andrenidae). Journal of the New York Entomological Society 81 (1): 54–61.

Tadauchi O, Xu H-L (2002) A revision of the subgenus *Cnemidandrena* of the genus *Andrena* of Eastern Asia (Hymenoptera, Andrenidae). ESAKIA 42: 75–199. https://doi.org/10.5109/2663

Thorp RW, Brooks RW (1994) A revision of the New World *Trachusa*, subgenera *Ulanthidium* and *Trachusomimus* (Hymenoptera: Megachilidae). University of Kansas Science Bulletin 55: 271–297.

Timberlake PH (1980) Supplementary studies on the systematics of the genus *Perdita* (Hymenoptera, Andrenidae) Part II. University of California Publications in Entomology 85: 1–65.

Urbatsch LE, Roberts RP, Neubig KM (2005) *Cuniculotinus* and *Lorandersonia*, two new genera of Asteraceae: Astereae and new combinations in *Chrysothamnus*. SIDA, Contributions to Botany 21 (5): 1615–1632.

Viereck HL, Cockerell TDA (1914) New North American bees of the genus *Andrena*. Proceedings of the United States National Museum 48: 1–58.

Viereck HL (1917) New species of North American bees of the genus *Andrena* contained in the collections of the Academy of Natural Sciences of Philadelphia. Transactions of the American Entomological Society 43(4): 365–407.

Wood TJ (2024) New Asian *Andrena* species, with notes on the subgenus *Cnemidandrena* (Hymenoptera: Andrenidae). Zootaxa 5404 (1): 167–188. https://doi.org/10.11646/zootaxa.5404.1.11

Wood TJ (2025) Additions, corrections, and other changes to the hyper-diverse bee genus *Andrena* Fabricius, 1775 (Hymenoptera: Andrenidae). Animal Taxonomy and Ecology 71 (2): 143–316. https://doi.org/10.1556/1777.2025.00082