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First record of *Xenoglossa* (*Cemolobus*) *ipomoeae* (Robertson, 1891) in Mississippi: Distribution, ecology, and conservation implications

Katherine A. Parys[1], Kimberly T. Huntzinger[1], Arathi Seshadri[1], & Tahir Rashid[2]

Abstract. The first record of *Xenoglossa* (*Cemolobus*) *ipomoeae* (Robertson) (Apidae: Eucerini) for the state of Mississippi, USA, is reported. This species is a rarely encountered specialist bee that is known to forage on *Ipomoea pandurata* (L.) G.F.W. Mey (Convolvulaceae), potentially along with other closely related plants in the genus *Ipomoea* Linnaeus. A single female was collected in Bolivar County during 2017 that a represents a significant southwestern range expansion for this bee species.

INTRODUCTION

Xenoglossa (*Cemolobus*) *ipomoeae* (Robertson, 1891) is native to the United States, with a distribution reported to be deciduous forests east of the Great Plains, ranging from Illinois east to North Carolina, and south to Georgia (Mitchell, 1962; Austin, 1978). Additional published reports are known from many of the states within this area (Fowler, 2020a, b; Fowler & Droege, 2020). Recent discovery at multiple locations in eastern Colorado represents a significant western range expansion (Carper *et al*., 2018).

Originally described and treated as a monotypic genus in the family Apidae, *Cemolobus* Robertson has been of dubious placement but was recently reclassified as a subgenus of *Xenoglossa* Smith alongside a suite of other name changes in Eucerini (Michener, 2007; Dorchin *et al*., 2018; Freitas *et al*., 2023). This species is large (12.5 – 14 mm) and distinctive among other bees of this size with a protuberant trilobed clypeus (LaBerge, 1957; Mitchell, 1962). It is reported to be oligolectic on plants in the genus *Ipomoea* Linnaeus (Convolvulaceae), and in particular, *Ipomoea pandurata* (L.) G.F.W. Mey (Robertson, 1895; Austin, 1978). The bees are early morning visitors, with the first female bees arriving to blooms between 6:30 and 7:00 h, and males lingering until

[1] USDA ARS Pollinator Health in Southern Cropping Ecosystems Research Unit, Stoneville, Mississippi, 38776, USA (katherine.parys@usda.gov)
[2] Alcorn State University, Mound Bayou, Mississippi, 38762, USA
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12:00 to 13:00 h (Austin, 1978). No information is available about the nesting biology of *X. ipomoeae*, though other species in the genus *Xenoglossa* as currently recognized in Freitas *et al*. (2023) have had their nesting behavior described. This species is of potential conservation interest due to the specialized foraging behavior and infrequent collection (Carper *et al*., 2018). Here we report the first occurrence of *X. ipomoeae* from Bolivar County, located in northwestern Mississippi, USA.

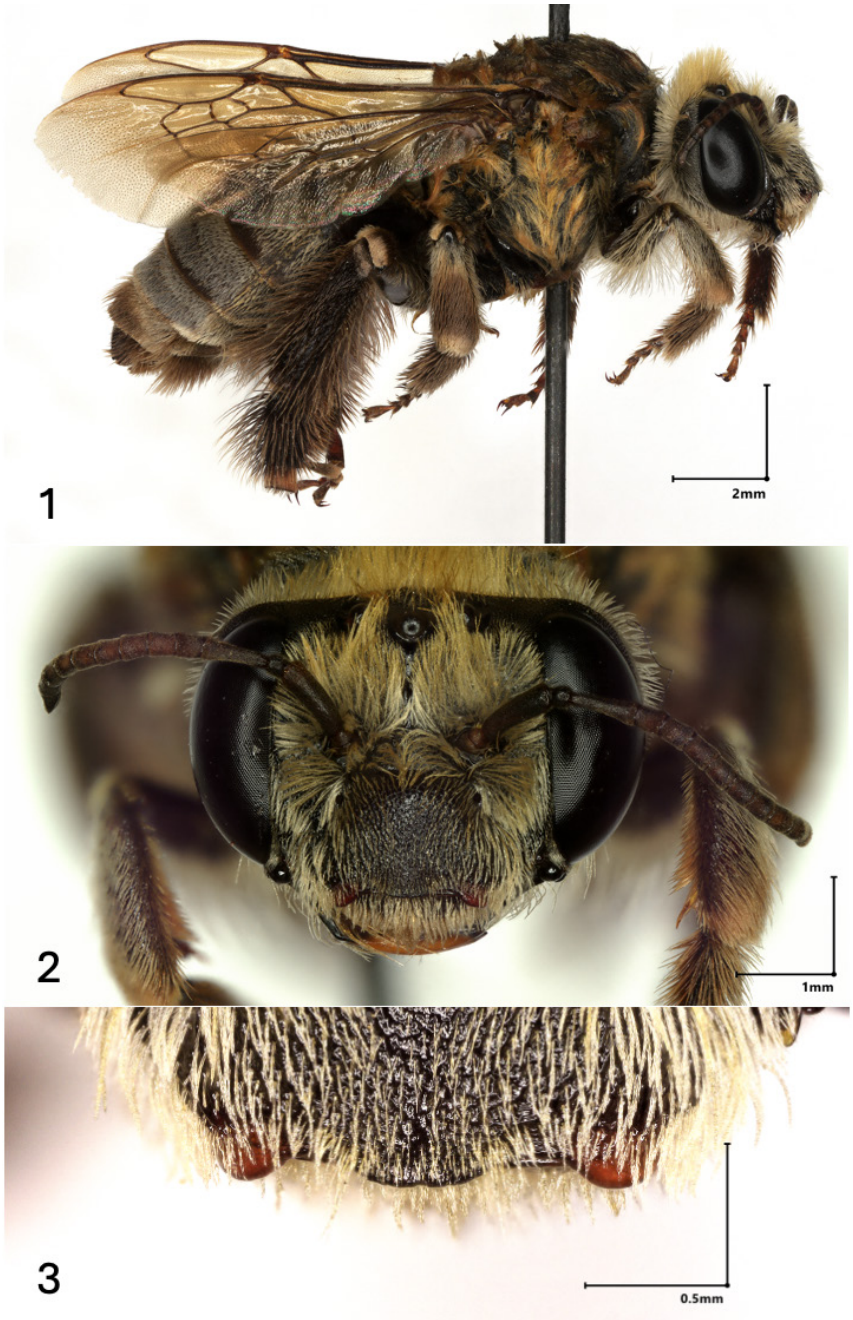
MATERIAL AND METHODS

The specimen of *X. ipomoeae* was collected at the Alcorn State University Extension/ Research Farm and Technology Transfer Center Station located in Bolivar County, Mound Bayou, MS (33.8705, -90.7079). The research station is located on a 45-acre piece of land outside of town and grows a wide variety of crops for experimental and demonstration purposes. In 2017, a series of small plots (4 rows by ~150 m) were planted with sunflower, *Helianthus annuus* L. (Asteraceae), which is commonly planted by producers in the region for doves (Nelms *et al*., 2012). Collections were made using 10 "bee bowl units" or modified pan traps, consisting of three 3.25 oz Solo® cups, one each painted fluorescent yellow, fluorescent blue, and flat white, per unit. These bee bowls were deployed once weekly in the field for 24 h. After collection all specimens were temporarily stored in 70% ethanol, then pinned and preserved (Droege, 2024). Specimens were sorted to morphospecies and identified to genus by K.T. Huntzinger using general keys (Mitchell, 1960, 1962; Michener *et al*., 1994; Michener, 2007). The specimen is deposited at the Parys Lab collection located at the USDA ARS Pollinator Health in Southern Crop Ecosystem Research Unit in Stoneville, MS.

Maps were generated using R version 4.3.1 (R Core Team, 2023) and the following R packages: cowplot v. 1.1.3 (Wilke, 2024), ggrepel v. 0.9.5 (Slowikowski, 2024), ggspatial v. 1.1.9 (Dunnington, 2023), googleway v. 2.7.8 (Cooley, 2023), maps v. 3.4.2 (Becker *et al*., 2023), rnaturalearth v. 1.0.1 (Massicotte & South, 2023), rnaturalearthdata v. 1.0.0 (South *et al*., 2024), sf v. 1.0.16 (Pebesma, 2018; Pebesma & Bivand, 2023), tidyverse v. 2.0.0 (Wickham *et al*., 2019), with available distribution data (GBIF, 2024a, b). County centroids were used when specimen records included county names but had not been georeferenced in GBIF. Images were taken using a Keyence VHX-7000.

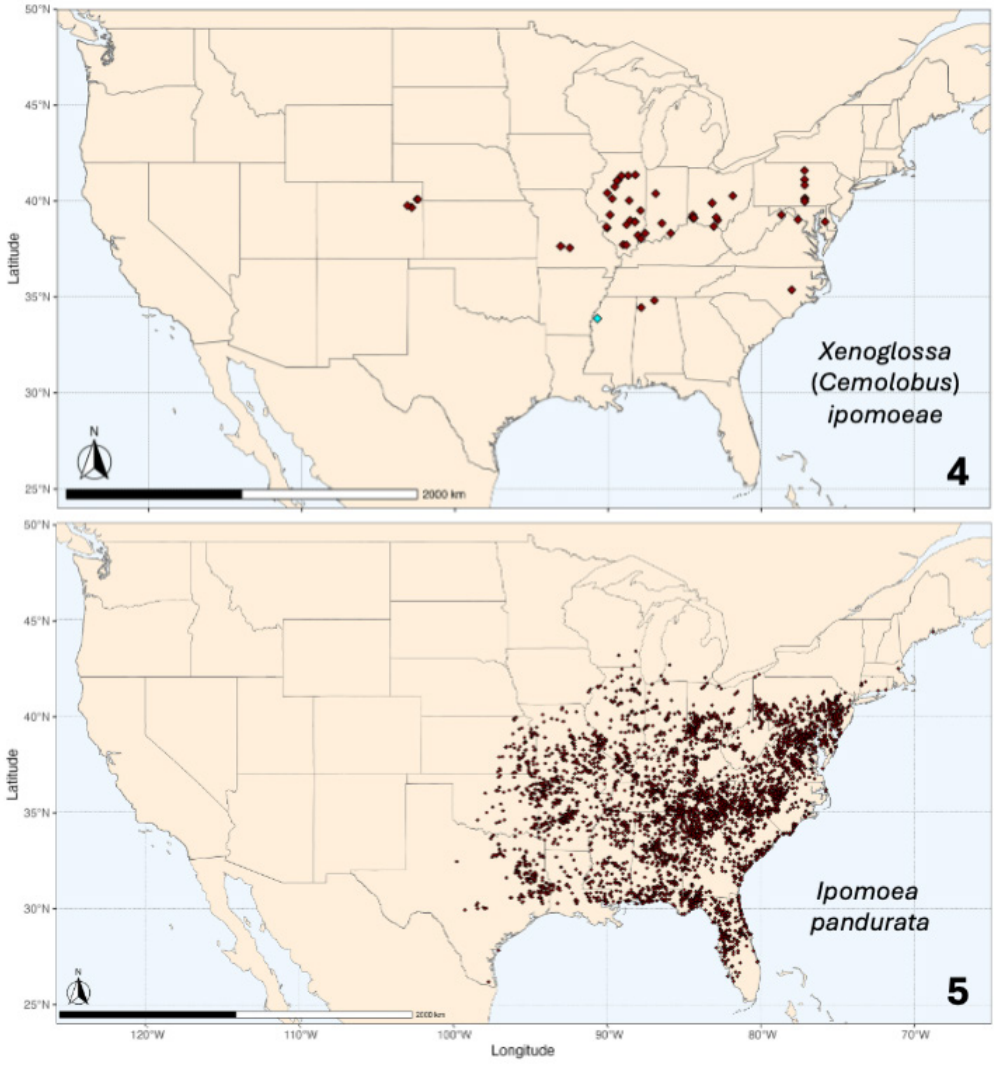
RESULTS AND DISCUSSION

A single female specimen of *X. ipomoeae* was collected in a bee bowl by members of the Parys Lab (Figs. 1–3). Verbatim label data is as follows: SIMRU22879; USA: Mississippi, Bolivar Co., Alcorn Research Farm, 33.871265, -90.699184, Bee Bowl (Blue), 7/18/2017, Parys Lab et al. In approximately 10 years of extensive bee research in the larger Mississippi Delta, this is the first and only specimen of *X. ipomoeae* collected. Overall, the bee fauna in the state of Mississippi is undersampled and understudied (Parys *et al*., 2018; Chesshire *et al*., 2023). Recent analysis of geographic bias in native bee distributions suggested that there is an urgent need to sample broader geographic areas to fill in gaps in the knowledge of species distributions, patterns of bee abundance, and bee diversity across both space and time (Jamieson *et al*., 2019; Chesshire *et al*., 2023).



Figures 1–3. Female specimen of *Xenoglossa* (*Cemolobus*) *ipomoeae* (Robertson) collected in Mississippi, USA. **1**. Lateral habitus; specimen has residue on thorax from vane trap. **2**. Facial habitus. **3**. Detail of the distinctive trilobed clypeus.

Only a fraction of the *X. ipomoeae* records publicly available are georeferenced for mapping (Carper *et al*., 2018; GBIF, 2024b), but the closest records to Bolivar County, Mississippi, appear to be those from Limestone County, Alabama (~350 km) or LaClede County, Missouri (~440 km) (Fig. 4). This specimen therefore represents a sizable southwestern range expansion and may be the furthest south collection known. Mitchell (1962) reported *X. ipomoeae* from Georgia but did not note a specific locality; that record does not appear in Fig. 4.



Figures 4–5. Distribution maps for the specialist bee, *Xenoglossa* (*Cemolobus*) *ipomoeae* (Robertson) and its floral host, *Ipomoea pandurata* (L.). **4**. Distribution for *X. ipomoeae* with the Mississippi record in teal. 5. Distribution for *I. pandurata* using data from GBIF.

The specimen of *X. ipomoeae* was collected as part of a larger study on sunflowers, and there was no in-field weed management performed in or around the field. Late season photographs from the field show *I. pandurata,* which is distinctive in its coloration among species known to be in the area (Elmore & McDaniel, 1983). In the past, nine species of *Ipomoea* were reported in the greater Mississippi Delta (Elmore & McDaniel, 1983). The Vascular Flora of Washington County (adjacent to Bolivar County) reports eight species, with *I. pandurata* being listed as overall rare, primarily found on roadsides and weedy areas, and in bloom from May through September (Gunn *et al*., 1980). Given the sporophytic self-incompatibility in *I. pandurata,* cross-pollination is essential for successful seed production in this species, but there are no studies to document the pollination biology of this relatively rare, endemic plant species in the greater Mississippi Delta (Stucky & Beckmann, 1982). While Austin (1978) considered *X. ipomoeae* to be the primary pollinator of *I. pandurata,* the study was inconclusive because of the absence of this bee in North and South Carolina regions where the study was done, though there are no recent records from either state available (GBIF, 2024b). This report documenting *X. ipomoeae* in the Mississippi Delta allows for future studies on the pollination biology of *I. pandurata,* that will improve our understanding of the sexual reproduction and hence the geographic range of the host plant species. An additional species, *Ipomoea batatas* L. (sweetpotato), is grown commercially in the region and on the experiment farm where the bee specimen was collected. Similar to *I. pandurata*, sweetpotatoes produce the most nectar in the early morning, which then steadily declines until noon (Real, 1981).

Rarely encountered species are of considerable interest to conservation biologists for a variety of reasons (Silva *et al*., 2020). Documenting the presence of *X. ipomoeae* in Mississippi suggests the importance of continued surveys on other known populations of *I. pandurata* in the region, particularly those not in row crops, where *Ipomoea* is controlled as a weed through herbicide sprays (Webster & Nichols, 2012). Interestingly enough, *I. pandurata* does not exist in Colorado where additional populations of *X. ipomoeae* were recently found (Fig. 5) (Carper *et al*., 2018), suggesting that other similar species of *Ipomoea,* including sweetpotato, should be examined more closely by melittologists for *X. ipomoeae*. It is unclear whether these are naturally disjunct populations of *X. ipomoeae* and the species is truly rare and patchy, or additional confirmation that the bee fauna of much of the United States remains murky. Other bee species are known to have very disjunct distributions, but additional investigations in the future may merit molecular confirmation (Kasparek *et al*., 2023; Aubert *et al*., 2024). It cannot be ruled out that *X. ipomoeae* occurs in the areas between currently known locations where the bee fauna has not been thoroughly studied.

Overall, this discovery highlights the importance of targeted survey efforts for rarely encountered species along with their host plants. For better understanding of the interactions of rare bee species in relation to the surrounding landscape and to improve future bee conservation efforts further research is needed on a larger scale.

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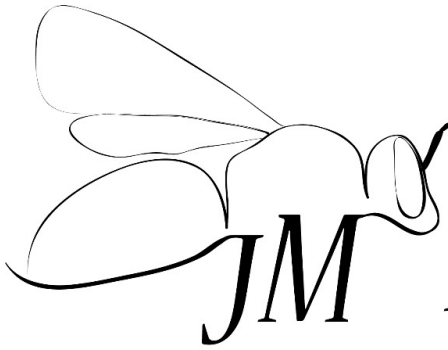

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