

**A DISTINCTIVE NEW *PERDITA* SPECIES (HYMENOPTERA:
APOIDEA: ANDRENIDAE) FROM WEST-CENTRAL TEXAS
ASSOCIATED WITH *SALVIA* (LAMIACEAE)**

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Abstract.—*Perdita dolanensis*, NEW SPECIES, a long-tongued member of subgenus *Epimacrotera*, is described from Dolan Falls Preserve, Val Verde Co., Texas. This is the first *Epimacrotera* known to collect pollen from the Lamiaceae. Floral hosts and phylogenetic relationships of *Epimacrotera* are discussed.

Key Words.—Insecta, Hymenoptera, Andrenidae, Panurginae, *Epimacrotera*, *Salvia*.

Perdita, with more than 615 recognized species, is easily the largest American genus of bees, even following the recent removal of the segregate genus *Macrotera* (Michener 2000). Our understanding of *Perdita* was greatly expanded by the work of P. H. Timberlake who, in a series of publications spanning more than 50 years (1928–1980), described over 500 *Perdita* species and subspecies. The pace of description of new *Perdita* species has slowed dramatically in the post-Timberlake era. Only seven new *Perdita* species have been described in the past 20 years (Griswold and Parker 1988, Griswold 1993, Snelling and Danforth 1992). Here I describe a distinctive new *Perdita* species from the Devils River of western Texas, a biologically interesting area on the western portion of the Edwards Plateau (Amos and Rowell 1988) which has been little collected for bees.

Abbreviations and measurements used in the description which follows are: S for sternum, T for tergum, BL for body length, WL for forewing length (measured from base of vein R to apex of marginal cell), HW for head width, HL for head length, TW for thoracic width (measured across pronotum) and AbW for abdominal width (measured as maximal width of T3).

PERDITA (EPIMACROTERA) DOLANENSIS Neff, NEW SPECIES

Types.—Holotype, male. TEXAS: VAL VERDE CO.: Dolan Falls Preserve (29°54.66' N, 100°59.43' W), 29 Apr 2001, J. L. Neff. ex flowers of *Salvia farinacea* Benth. Allotype, female, same data as holotype. Both deposited in Snow Entomological Museum, University of Kansas, Lawrence, Kansas. Paratypes: 6 female and 10 male paratypes, same data as holotype; deposited: Snow Entomological Museum, Lawrence, Kansas; Texas A&M University Entomology Collection, College Station, Texas; and J. L. Neff Collection, Austin, Texas.

Male.—Measurements: $n = 11$, mean BL = 3.92 ± 0.31 mm (3.4–4.2), mean WL = 3.07 ± 0.17 mm (2.8–3.3), mean HW = 1.29 ± 0.09 mm (1.1–1.4), mean TW = 1.19 ± 0.10 mm (1.0–1.3), mean AbW = 1.44 ± 0.11 mm (1.3–1.6). *Color:* Head, thorax predominately dark blue, without pale maculation. Clypeus, supraclypeal area black; labrum dark brown; mandible narrowly dark brown basally, clear yellow-brown medially, red-brown on apical fourth. Antenna dark brown; scape with metallic hints above; flagellum pale yellow-brown beneath. Pronotal tubercles, discs of mesoscutum and scutellum black; tegula translucent pale brown. Legs black, becoming dark brown on distal tarsomeres and claws; tibial spurs surrounding marginal cell brown (occasionally some brown on other veins). Abdomen dark brown-black with apical half of T7 yellow-brown. *Structure:* Head distinctly broader than long (HW/HL = 1.29). Gena very broad (maximal width $1.8 \times$ eye width) with a broad, blunt posteroventral process. Facial fovea small,

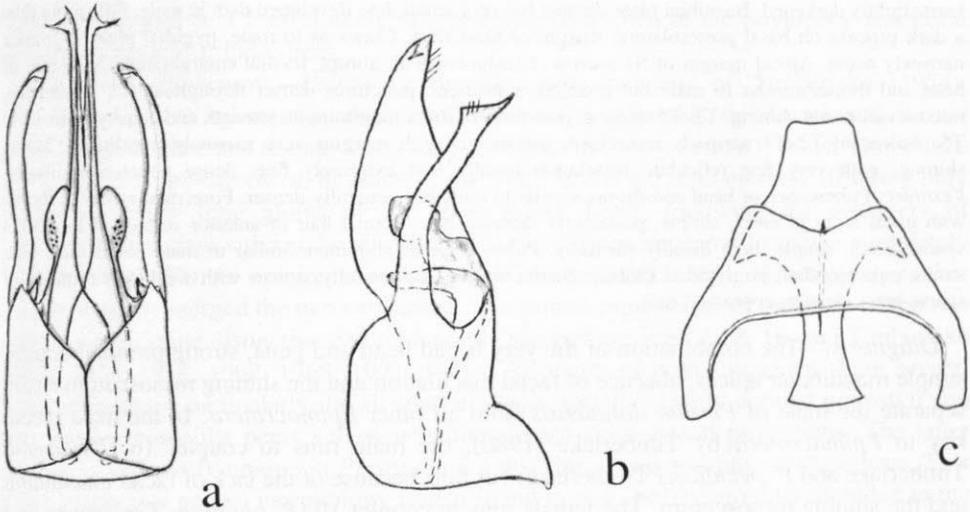


Figure 1. Male genitalia of *Perdita dolanensis*. a. Genital capsule, dorsal view. b. Genital capsule, lateral view. c. Sterna 7 and 8.

shallow, approximately twice as long as wide. Lateral ocellus separated from vertex by $1.4\times$ diameter lateral ocellus and from eye by $2.6\times$ diameter lateral ocellus. Clypeus very weakly protuberant and not extending anteriorly past articulation of mandible; disc almost plane; lateral extensions fully visible, only slightly depressed. Supraclypeal area weakly elevated with medial line forming strong ridge extending about half way from apex of supraclypeal area to median ocellus. Mandible strongly curved and elongate; apex nearly reaching base of opposing mandible with apical fourth of mandible tapering to acute tip (not abruptly narrowed). Mouthparts elongate, glossa in repose exceeds proboscis fossa by approximately diameter of median ocellus. Pronotum greatly modified with strong, flangelike, protuberant pronotal angle; side of pronotum beneath pronotal angle deeply impressed. Stigma approximately half as broad as marginal cell; marginal cell short, broadly truncate, as long as stigma, slightly shorter than 1st submarginal cell; 2nd submarginal cell approximately half as long as 1st on posterior margin. Veins 2m-cu and Cu1a weak but present. Basitibial plate well developed but small; disc concave, polished. Claws bifid; inner ramni nearly as long as outer. Abdomen broad, flattened, widest at T3; apex of T7 acute, plane, suggestive of a pygidial plate but not delimited laterally; S6 weakly emarginate apically. Genitalia and accessory sterna as figured (Fig. 1). Frons, medial portion of vertex dulled by weak tessellation; vertex, upper part of frons very sparsely punctate, punctures becoming denser along eye and on lower part of frons. Clypeus, supraclypeal area shining with strong but sparse punctures. Gena, lateral portions of vertex shining with minute, very sparse punctures. Thorax finely tessellate but shining with tessellation densest on sides of propodeum and pronotum; punctuation very fine and sparse. Terga shining except basal half of T2, basal fourth of T3 tessellate. T1, apices of T2–5 broadly impunctate, discs of T2–5 finely, sparsely punctate. Sterna with basal 2/3 finely tessellate; apices impunctate. *Vestiture*: Entirely pale, sparse, erect on head and thorax. Very fine, short, appressed on discs of T1–5 with hair slightly denser, longer, more erect laterally. T6 with long finely barbed hairs. T7 with long, finely barbed hairs along pygidial plate. Sterna with fine appressed hairs on discs becoming slightly longer laterally.

Female.—*Measurements*: $n = 6$, mean BL = 5.39 ± 0.30 mm (5.05–8), mean WL = 3.60 ± 0.17 mm (3.4–3.8), mean WL = 1.25 ± 0.05 mm (1.0–1.3), mean TW = 1.36 ± 0.06 mm (1.3–1.4), mean AbW = 1.54 ± 0.08 mm (1.5–1.7). *Color*: Color as in male but mandible darker, mainly dark brown with apex translucent red, only distal flagellomeres of antenna light beneath. *Structure*: Head slightly broader than long (HW/HL = 1.10). Gena approximately as wide as eye. Facial fovea shallow, narrow, elongate, approximately one third as long as eye. Clypeus similar to male but slightly more produced, supraclypeal area, labrum as in male. Mandible normal, not elongate, with small subapical tooth. Mouthparts elongate (glossa + prementum = 2mm), glossa in repose extending beyond proboscis fossa by approximately twice diameter of median ocellus. Pronotum with strong pronotal angle; dorsal margin weakly produced; pronotal ridge interrupted by deep, arcuate depression. Venation as in male but all veins of forewing at

least slightly darkened. Basitibial plate distinct but very small, less developed than in male, little more than a dark process on basal posterolateral margin of hind tibia. Claws as in male, pygidial plate with apex narrowly acute. Apical margin of S1 narrow, translucent with abrupt, medial emargination. Sculpture of head and thorax similar to male but with tessellation stronger, punctures denser throughout. T1 impunctate, microtesselate but shining. T2–T5 shining, punctures of discs increasing in strength and density from T2 to T5. Apices of T2–T4 narrowly impressed, impunctate with margins very narrowly translucent. Sterna shining, with very fine reticulate tessellation basally and extremely fine, dense punctation distally. *Vestiture*: Pubescence of head and thorax similar to male but generally denser. Forecoxa, venter of thorax with usual array of erect, simple, posteriorly directed hair. Scopal hair of anterior surface of hind tibia sparse, erect, simple, bent distally medially. Pubescence of abdomen similar to male but denser, with strong pale pygidial, prepygidial fimbria. Sterna without hair basally, apices with weak fine fimbriae of sparse erect, denser, appressed hair.

Diagnosis.—The combination of the very broad head and gena, strong pronotal angles, simple mandibular apices, absence of facial maculation and the shining mesoscutum easily separate the male of *Perdita dolanensis* from all other *Epimacrotera*. In the most recent key to *Epimacrotera* by Timberlake (1980), the male runs to couplet 16 (*P. diversa* Timberlake and *P. peculiaris* Timberlake) but fails because of the lack of facial maculation and the shining mesoscutum. The female runs to couplet 10 (*P. biguttata* Timberlake and *P. euphorbiae* Timberlake) in Timberlake's 1962 key but fails because of the absence of facial maculation and the thorax largely dark blue. The female is most similar to *P. diversa* Timberlake but is readily distinguished from it by the strong pronotal angles, black supraclypeal area, the less protuberant clypeus and slightly shinier mesoscutum.

Etymology.—The epithet *dolanensis* refers to Dolan Falls on the Devils River, one of the largest permanent waterfalls in Texas and the type locality of the species.

Material Examined.—See Types.

DISCUSSION

Host Plant and Floral Utilization Patterns in Epimacrotera.—*Salvia farinacea* (commonly known as mealy sage), the only known floral host of *Perdita dolanensis*, is a common, perennial herb found on limestone-derived soils in central and west Texas and adjacent New Mexico (Correll and Johnston 1970). The violet-blue or purple flowers attract a wide array of visitors with the major pollinators apparently medium to large bees, particularly species of *Bombus*, *Xylocopa*, *Anthophora*, *Melissodes* and *Megachile*. Under most circumstance, small visitors like *Perdita dolanensis* are probably no more than minor pollinators.

Perdita dolanensis is the only *Epimacrotera* thus far known to collect pollen from the Lamiaceae. Females at Dolan Falls were observed to actively collect pollen from *Salvia farinacea* and the scopal loads of two females with pollen consisted only of agglutinated *Salvia* pollen. *Perdita nigrocaerulea* Timberlake was collected on *Salazaria* (Lamiaceae) but only males are known. *Perdita dolanensis* belongs to a group of long-tongued species associated with plants with tubular or funnel-form corollas: *P. dichroa* Timberlake and *P. diversa* Timberlake on *Nama* (Hydrophyllaceae), *P. nigriventris* Timberlake on *Lycium* (Solanaceae) (JLN, personal observation) and *P. peculiaris* Timberlake on *Leucophyllum* (Scrophulariaceae) (JLN, personal observation). It is likely that many, perhaps all, of these bees are oligolectic but floral records are still too sparse to establish this rigorously. A group of short-tongued species (*P. biguttata* Timberlake, *P. crassula* Timberlake, *P. euphorbiae* Timberlake, *P. nanula* Timberlake, *P. polycarpae* Timberlake, and *P. williamsi* Timberlake) is associated with the small, open flowers of *Euphorbia* and/or *Chamaesyce* (Euphorbiaceae). An analysis comparing mouthpart evolution and host plant

utilization should be a fruitful exercise when more is known of the phylogeny and floral utilization pattern of these bees.

Subgeneric Placement.—Following the key and diagnosis of Timberlake (1954), *Perdita dolanensis* belongs to subgenus *Epimacrotera* (relatively slender stigma, distinct male basitibial plate and female facial fovea elongate and very narrow). When Timberlake (1954) erected *Epimacrotera*, he stated it was very similar to *Glossoperdita*, differing only in the extremely long glossa of the latter group. Later, following the discovery of apparently annectant species, he suggested the two groups appeared to merge completely (Timberlake 1960), an opinion reiterated by Michener (2000: 289). Nonetheless, neither author formally merged the two subgenera. The genital capsules of all members of the two subgenera are quite distinctive and remarkably similar (see Figs. 1a & 1b, and Timberlake 1954, 1956, 1958, 1962, 1968, 1971, 1980). All males of both subgenera share several unusual features, particularly the slender, elongate, usually acutely pointed gonostyli and the slender, bladelike penis valves with their sharp apico-lateral projections. The latter feature is apparently unique in *Perdita* and a possible synapomorphy of these bees. This same distinctive genital morphology is also found in two species currently included in the Sphaeralceae group: marginata subgroup of *Perdita s. str.* (*P. pubescens* Timberlake and *P. schwarzi* Timberlake [first noted by A. R. Moldenke, *in lit.*]), suggesting these bees also belong to the *Epimacrotera-Glossoperdita* complex.

The apparently synapomorphic genitalic characters shared by the two subgenera suggest it might be reasonable to merge them into *Glossoperdita*, the oldest name available for this group. However, the work of Danforth (1996) points to a different set of relationships. His study, the first rigorous phylogenetic analysis of the Perditiini, found *Glossoperdita* to be polyphyletic with *Perdita (Glossoperdita) hurdi* Timberlake a sister of *Hesperoperdita* (in a clade with *Epimacrotera* and *Heteroperdita*) while *Glossoperdita* (minus *P. hurdi*) was part of a large, poorly resolved clade of “higher” *Perdita*. While a few of his characters are problematic, most seem to be robust. My reanalysis of his data matrix, with added genitalic characters not included in his analysis, found a slightly different set of relationships. Nonetheless, it failed to recover a clade of *Epimacrotera + Glossoperdita + P. hurdi* and none of the clades were well supported. While the genitalic similarities of *Glossoperdita* and *Epimacrotera* are impressive, there is little to be gained, and perhaps much to be lost, in making taxonomic changes while relationships remain poorly resolved. A species level analysis involving additional characters, and perhaps a molecular analysis, will probably be necessary to fully resolve the relationships of these taxa.

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