

**Two New Species of Astatinae, with Notes on the
Habits of the Group
(Hymenoptera: Sphecidae)**

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Astata immigrans n. sp. (plates XXXI-XXXIII figures 1-13)

Female, holotype: Length 5.5 mm. Of the usual stout form. Black; mandibles testaceous mesad, reddish apically; veins at base of wings and a prestigmatal spot creamy white, remaining venation of fore wings more or less testaceous, venation of secondaries much paler; tibiae, more or less, and tarsi brownish; tegulae and sclerite at costal base of fore wings dark brownish, wings hyaline, abdomen red. Head and thorax generally, very finely coriaceo-reticulate, subopaque. Mandibles bidentate, with a few punctures outwardly at base, malar space very short; clypeus with the disc gently convex; with a few large punctures, the margin depressed, narrowly produced mesad into two rounded teeth with a low lobe on either side; antennae with joint 3 considerably longer than 4, 4 slightly longer than 5, the interocular space at vertex being slightly greater than joints 3 plus 4; ocelli arranged nearly in an equilateral triangle, the anterior ocellus very slightly the farthest removed; a small scar that narrows anteriorly, borders the inner margin of the eyes opposite each posterior ocellus; a fine impressed line from anterior ocellus extending more than half way to the base of the clypeus; a few scattered punctures on frons and vertex. Anterior portion of pronotum smooth and shining, scutellum more shining in its anterior portion, metanotum shining, almost smooth; disc of propodeum finely margined, very finely reticulate, although the sculpture is not as fine as that of the thorax proper; there is a delicate carinula at the base and a large shallow subtriangular depression at the apex, the pleura with some fine oblique striae, the posterior face is steep, largely smooth and shining mesad with an oval fovea above. First joint of fore tarsus with a comb of four bristles, the apical bristle the heaviest, and each bristle about twice as long as the diameter of the joint; fore and posterior femora with some long erect hairs beneath. Forewings with the marginal cell very short, only a little longer than high and shorter than the stigma, the poststigmatal part about as long as the substigmatal part; second submarginal cell sessile at the marginal cell, its basal or 1st t.c. border with a stub of a vein mesad; third submarginal cell very short, nearly twice as high as long, the long sides subparallel. Pygidium with the marginal carinae and hair fringe indicated only at apex. Vestiture of sparse pale hair.

Male, allotype: Length 5.5 mm. Head and thorax black, abdomen red darkening apically. Pale markings as follows: mandibles widely creamy yellow mesad, a large squarish spot each side before declivity of face, prothoracic lobes, tegulae and veins at base of wings creamy white; apex of femora quite narrowly, (and obscurely in the posterior femora) and the fore tibiae and tarsi generally, pale yellowish to yellowish brown, base and apex of tibiae 2 and 3 less obviously pale. Mandibles bidentate at apex and a low wide tooth on inner margin at base of second apical tooth, malar space not twice as wide as long; clypeus triangularly produced, the apex somewhat attenuated; antennae showing only very slight swellings latero-ventrad at base of 7, 8 and 9. The sculpture is less fine than in the female, the pleura are sprinkled pimple-like with fine granulations; the sides of the propodeum are

not striate, the posterior face is shining with scattered granulae, and the fossa is somewhat more developed than in the female. Pygidial area with a few large punctures; terminalia shown in fig. 11. Vestiture moderate, of erect silvery hair.

Holotype: Oahu: Honolulu, at Experiment Station, H.S.P.A., May 24, 1943; on *Portulaca oleracea* Linn. (F. X. Williams). *Allotype*: Oahu: Ewa, July 18, 1939, on *Portulaca oleracea*. (F. X. Williams). *Paratypes*: Ewa, Oahu, 3 ♀♀, August 3 and 4, 1939, 2 ♂♂, July 18, 1939; Honolulu, Oahu, 1 ♂ and 1 ♀, June 19, 1942, 1 ♀ and 4 ♂♂, late May, 1943, and 4 ♀♀ and 2 ♂♂, June, 1943 (reared).

This small species is related to *Astata bella* Cresson (Trans. Am. Ent. Soc. [Proc.] 9: vi, 1881 ♂ "Hab.-San Diego, California").

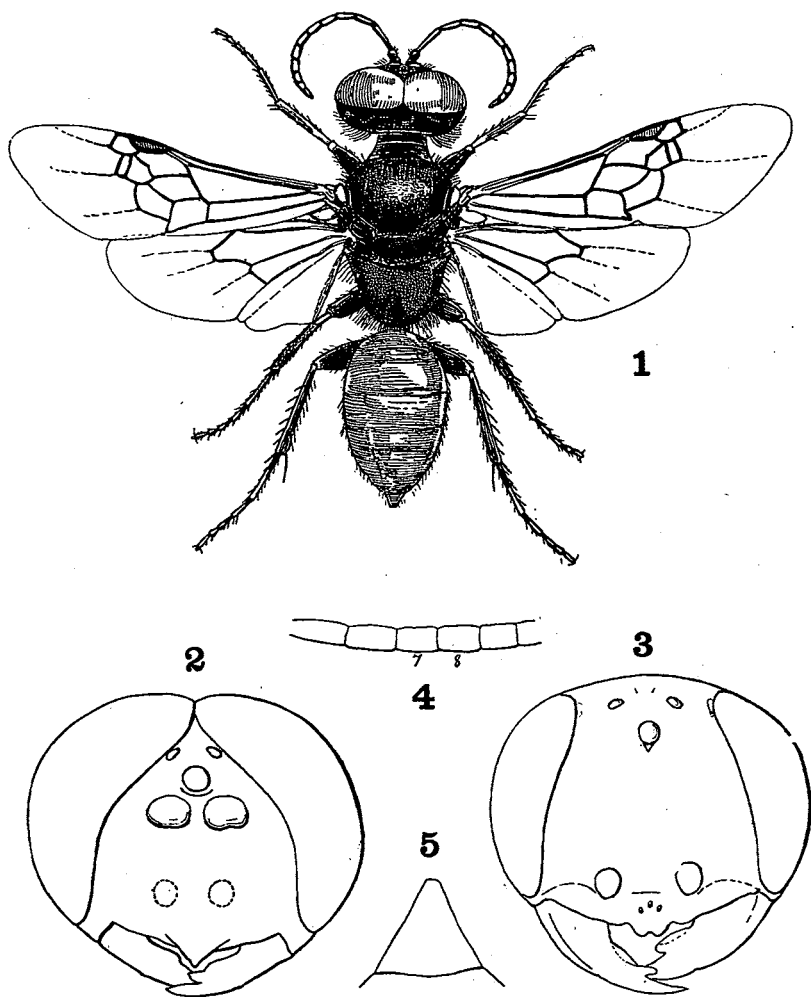
While at the Academy of Natural Sciences of Philadelphia, Mr. P. H. Timberlake of the University of California Citrus Experiment Station, Riverside, California, kindly compared specimens of the *Astata* from Honolulu, Hawaii with the type of *Astata bella* ♂ and of *Astata elegans* ♀.* Mr. Timberlake believes that the *Astata* from Hawaii—which I describe as *A. immigrans*—is different from *A. bella*, and I quote from his notes taken in Philadelphia: Comparing *A. bella* Cress., type ♂, "Cal.": "Differs from the Honolulu ♂ in having the white spots on frons extending upward each side of anterior ocellus. Eyes more broadly touching on vertex."—"Poststigmatal part of marginal cell nearly twice as long as the substigmatal part (the two parts nearly equal in the Honolulu species). The type has the tegulae and tubercles white. Wings with a faint cloud across marginal, second and third submarginal cells."

Comparing *Astata elegans* Cress., type ♀, "W.T.": "Differs from the Honolulu ♀ in having tegulae, entirely, tubercles and a spot behind tubercles, ivory-white. Median lobe of clypeus armed apically with three equal teeth. Stigma larger. Marginal cell about twice as large as in the Honolulu species, the part beyond end of stigma somewhat less than twice as long as wide, instead of as long as wide."

Astata immigrans has a very short marginal and third submarginal cell, in this respect approaching the genus *Diploplectron* Fox.

On July 18, 1939, I observed some small wasps on a large spreading plant of *Portulaca oleracea* Linn. that was growing in the hot sunshine at Ewa Plantation Company, Oahu. Most of these wasps proved to be the active *Solierella rohweri* (Bridwell), but there was also a stouter-bodied species with a red abdomen that was new to

* W. H. Patton (Can. Ent. 27 [1]:280, 1895) states: "*Astata montana*, Cress. [Syn. *Ast. elegans*, Cress., ♂ ♀; Syn. *Ast. bella*, Cress., ♂];—the three names belong to one variable species." Maidl and Klima (Hymenopterorum Catalogus, Pars 8, Sphecidae 1:22, 1939) accept Patton's synonymy. The present writer believes that more than one species is involved in this synonymy.



EXPLANATION OF PLATE XXXI

1. *Astatata immigrans*, male. Length 5 mm.
2. *Astatata immigrans*, male, head from in front.
3. *Astatata immigrans*, female, head from in front.
4. *Astatata immigrans*, male, portion of antenna, to show slight latero-ventral swellings based on 7, 8 and 9.
5. *Astatata immigrans*, female, pygidial outline.

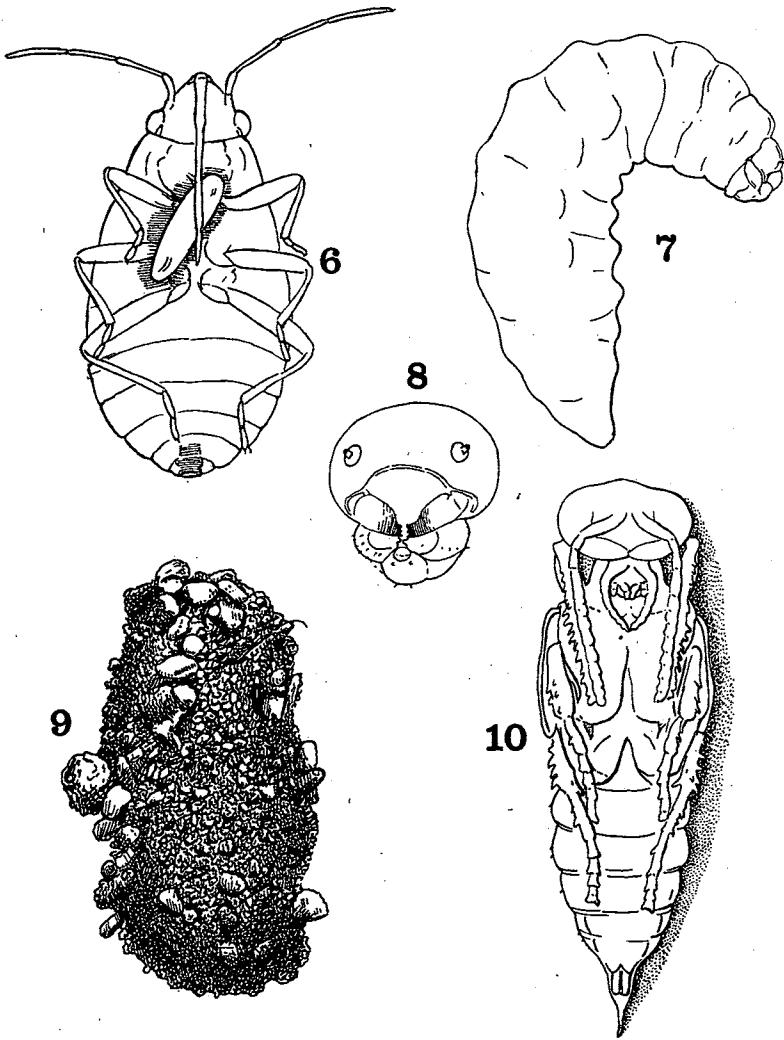
me. A half dozen of these, including both sexes in fresh condition were captured by means of wide-mouthed vials. They were determined as a species of *Astata*, and it was surprising, in my experience that insects of this genus, so wary elsewhere, could be so readily taken here.

No further attention was paid to *Astata immigrans* until June 19, 1942, when the wasps were found rather abundantly on *Portulaca* at the Experiment Station, H.S.P.A., Honolulu. The following year the first of these wasps was observed on May 22, at the same place; they continued numerous through June and July, becoming scarce by early August, although the last specimen, a male was taken on September 19. In 1944 it was first seen on June 10. On March 14, 1945 a female *Astata* was observed on *Portulaca* on the hot Waianae lowlands, and again specimens were seen on March 22, in Honolulu. The wasp is at least two-brooded here, becoming scarce or disappearing in the late fall and winter in the few acres at the Experiment Station, where their presence or absence may to some extent be regulated by the periodic destruction of *Portulaca* and other weeds there. I believe that in more favorable localities it may persist throughout the year, as does the little *Nysius* bug that constitutes its prey.

In sunny weather the male stations himself upon some stem or other convenient object from which he surveys his small world. The huge, chiefly lichen-green eyes and the shining wings make him conspicuous enough as he pivots about alertly or pursues some passing insect, to return to or near his station again. He appears to mate frequently and is often carried about by the female. The latter in her search for immature bugs creeps among the *Portulaca* stems or on the soil under the plants. Her eyes of the usual size are bluish, becoming black towards the mandibles.

It is very difficult to study the nesting activities of *Astata* in the field. She catches her relatively small prey, stings it to paralysis and is off in a flight too swift to follow. But I was rather successful in observing her activities in a large jar. In such a situation female wasps lived from 13 to 17 days.

On May 24, 1943, I placed several inches of sifted soil in two large jars, added some *Portulaca* plants, a quantity of immature *Nysius migriscutellatus* Usinger (1942), a species of bug commonly found on this weed, and finally put in *Astata immigrans* wasps. Some days later the two wasps were observed each holding an immature bug to her breast. The nest holes were not located however, there being too much loose soil and debris about. Nevertheless, one of the two jars stocked with a single female wasp yielded a progeny of eight males and six females, between June 20 and 29. Thus the life-cycle—from egg to adult—occupied a minimum of about 26 days.



EXPLANATION OF PLATE XXXII

6. Young *Nysius* bug with egg of *Astata immigrans* glued on its breast.
7. *Astata immigrans*, large larva.
8. *Astata immigrans*, larval head, last stage, slightly inclined forward from mouth.
9. *Astata immigrans*, cocoon. Length about 8 mm.
10. *Astata immigrans*, pupa. Length 6.5 mm.

Much better results were obtained commencing June 14, 1944, when a 9" x 15" jar was placed on its side so that a tongue of shallow, well-packed soil extended free from the mass of *Portulaca* plants towards the mouth of the jar. Young *Nysius* bugs were added from time to time and a single male and three female wasps introduced. On June 15, a fourth female was added. The jar was kept on the laboratory counter and away from direct sunlight. The soil was but slightly moistened. The wasps' activities were observed only at irregular intervals. The male wasp by his frequent matings appeared to interfere with nesting operations, carried on by the females.

Late in the morning of June 17 a single wasp was noted excavating her burrow on the tongue of soil. She would back out dragging a load of soil with her mandibles or throw it behind her with her fore feet, so that a low inconspicuous heap was formed before the short burrow. Presently she sallied forth among the *Portulaca* plants, to return at 11:25 A.M. with a *Nysius* nymph beneath her body which she thus carried into her burrow. Other bugs were brought in at 11:40, 11:49, 11:55 A.M., and at 12:00 M. Other *Astata* were observed nesting close by. They quarrelled to some extent.

The wasp likes to search the tips of the plant for her prey; she appears little excited when a suitable *Nysius* nymph is found, but grasps it and brings her abdomen beneath and forward to sting the bug to near immobility. One of these wasps observed malaxating her prey held it beneath her, venter up, by means of her first and second pairs of legs and applied her mouth parts to its throat and leg bases. When that is finished *Astata* grips the basal portion of the bug's antennae with her mandibles, releases the leg-hold and walks or hops off with her burden, by an often circuitous route, to the nest hole which she enters headfirst. The burrow except when completely stored appears to be always left open. It is a short affair of more than one cell, and each wasp undoubtedly excavates several burrows in her lifetime.

At least one individual was engaged in nesting activities as late as June 26. On the day following I carefully dug up the main burrow area. Small groups of bug nymphs were thus exposed in some cells, and in two cases there was an *Astata* egg glued obliquely on the bug's breast. The victims could do no more than twitch their toes. In other cells were larvae spinning their cocoons, and some prepupae and a pupa in their very flimsy envelopes. A few of these early stages were preserved.

The delicate, glassy white egg is about 1.05 mm. long (fig. 6). The larva (fig. 7), at least when well grown, shows no pilosity except sparsely about the mouth region of its globular head; the body is little modified, having no lateral thoracic papillae such as occur in the Larridae, and the lateral body ridges are not conspicuous.

The pupa (fig. 10) is at first creamy white with glassy appendages; the legs are short-spined while the abdomen bears dorso-lateral spine bands. It is an active wriggler. The cocoon (fig. 9) is a fragile affair of silk and grains of soil and unless carefully taken up in its entirety is likely to fall apart.

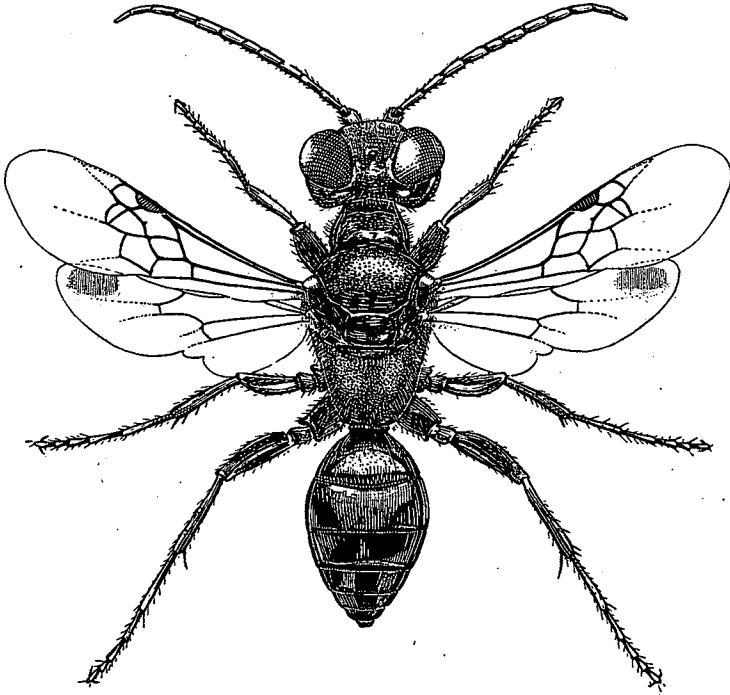


Figure 1.—*Diploplectron* sp., ♂. San Francisco, California.

In all, twenty-three individuals of *Astata* in various stages were secured from these cells. Six males and eleven females (two of which were in a crippled condition) were hatched, becoming fully developed from July 10-14.

Observations on the biology of other species of *Astata* have been made in several parts of the world by a number of entomologists. The species of Hemiptera which these wasps favor belong to the family Pentatomidae, but they also store bugs of the families Coreidae and Lygaeidae. In the San Francisco Bay region of California, I have found a species of *Astata* with a red abdomen preying upon adult *Nysius strigosus* Uhler and nymphs of what was probably *Lygaeus bicrucis* Say.

For literature on the genus *Astata* consult Hymenopterorum Catalogus, Pars 8: F. Maidl et A. Klima; Sphecidae I. (Astatinae—Nyssonidae), 1939.

The genus *Diploplectron* Fox (Trans. Amer. Ent. Soc. Phil., 20: 534, 1893) differs from *Astata* most obviously in the venation of the forewings, and in having the compound eyes of the male well separated at the vertex. The wasps average much smaller in size than *Astata*, and the genus has fewer species and a more limited distribution, occurring in the United States chiefly west of the Mississippi, and in South Africa. Further collecting will probably extend the distribution of these obscure little wasps. There may be considerable variation in wing venation among individuals of the same species of both *Astata* and *Diploplectron*, and our species need further study.

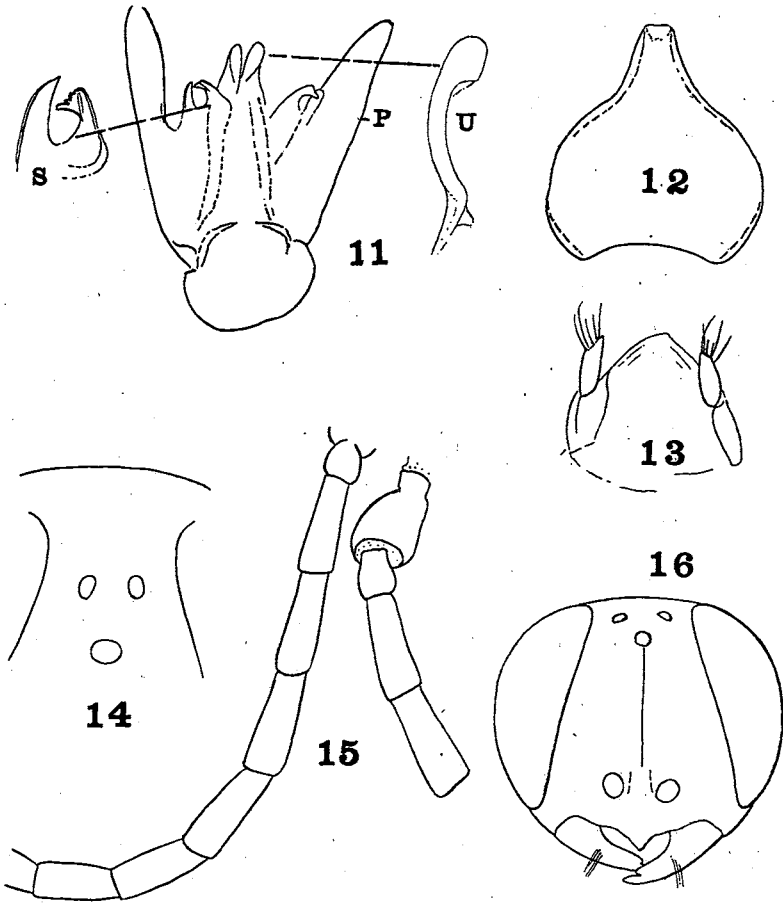
At least three species of *Diploplectron* are found in California. Two species occur in the region of San Francisco, while what may be a third species inhabits the Sierra Nevada Mountains. Southern California should yield one or more species. In San Francisco itself there is a *Diploplectron* (text figure 1) separable from a form that occurs nearby, at San Rafael, in Marin County and Menlo Park, San Mateo County, and no doubt elsewhere, chiefly in having longer antennal joints. These two insects, as far as known, inhabit different subfaunal areas.

The writer has made but scant observations on the biology of *Diploplectron*. In San Francisco, the wasp was noted chiefly during the summers of 1922 and 1930. The female *Diploplectron*, an active little polished black insect, keeps close to the ground, entering superficial holes and rummaging under debris in her search for the nymphs of *Sphragisticus nebulosus* (Fallen) (Lygaeidae), a small black bug that is found in such situations. The wasp stings her prey, grasps it by the antennae and bears it nestwards. She has the aggravating habit of hopping upgrade with her apparently heavy burden and then of disappearing in flight. The nest is dug in the sand, several bugs being stored in a cell. The egg is glued to the breast of one of these bugs. This wasp also preys upon bug nymphs of a paler color, species undetermined.

At Menlo Park, during the summer of 1937, another species of *Diploplectron* was taken preying upon an adult *Rhyparochromus californicus* Van Duzee and what appeared to be a nymph of *Emblethis vicarius* Horvath, both of the family Lygaeidae. The bug determinations were made by the late Mr. E. P. Van Duzee.

***Diploplectron reticulatus* n. sp. (plate XXXIII, figures 14-16)**

Male, type: Length 4.8 mm. Head and thorax subopaque, abdomen shining. Black; mandibles reddish with some yellow near base, antennae brownish, paler apically, first and second pairs of legs dark brown, tarsi paler, posterior femora, tibiae and tarsi orange-red, tegulae pale brown, postnotum and propo-



EXPLANATION OF PLATE XXXIII

11. *Astata immigrans*, male, terminalia; P, paramere; S, volsellar plate; U, lateral plate of aedeagus.
12. *Astata immigrans*, male, ninth sternite.
13. *Astata immigrans*, male, tenth abdominal segment.
14. *Diploplectron reticulatus*, male, type, ocelli.
15. *Diploplectron reticulatus*, male, type, portion of antenna.
16. *Diploplectron reticulatus*, male, type, head.

deum with faint indications of reddish, abdomen orange-red. Head very finely reticulate; clypeus drawn out mesad as a simple narrow lobe; antennal joints 3 and 4 subequal; interocular space at vertex slightly less than joints 2 + 3; ocelli in an acute triangle; line from anterior ocellus to near clypeus not strong. Thorax very finely reticulate, except scutellum which is largely glabrous; disc of propodeum finely reticulate in a transversely wavy effect, depressed mesad apically, only a trace of marginal curved groove; propodeal pleura finely reticulate and with short oblique carinulae, this sculpture more obscure on posterior face which has a triangular fovea above. First recurrent and first transverse-cubital veins interstitial, second recurrent received in middle of second submarginal cell, third submarginal cell of usual abbreviated form, about equal in length above and below; apex of posterior wing with an infumate spot. Last visible ventral segment with the apical portion narrowed, parallel-sided, rounded and subtruncate apically.

Tucson, Arizona, May 20, 1920 (F. X. Williams). One male in fair condition.

Evidently related to *D. vierecki* Pate (Ent. News, 52: 4-6, 1941) from El Paso County, Texas, but differs from that species in its simple, conically pointed clypeus and in its wholly reticulate mesonotum—without small, moderately close punctures.

Type to be deposited in the collection of the California Academy of Sciences.